Worldwide rules and guidance

Recommendations, Regulations and Guidance

- ICAO
- FAA
- EASA
- Key FAA & EASA differences
- Other Activities

Resources

ICAO - Manual on Aeroplane Upset Prevention and Recovery Training

- http://www.icao.int/Meetings/LOCI/Pages/Upset-Prevention-and-Recovery-Training-Provisions.aspx

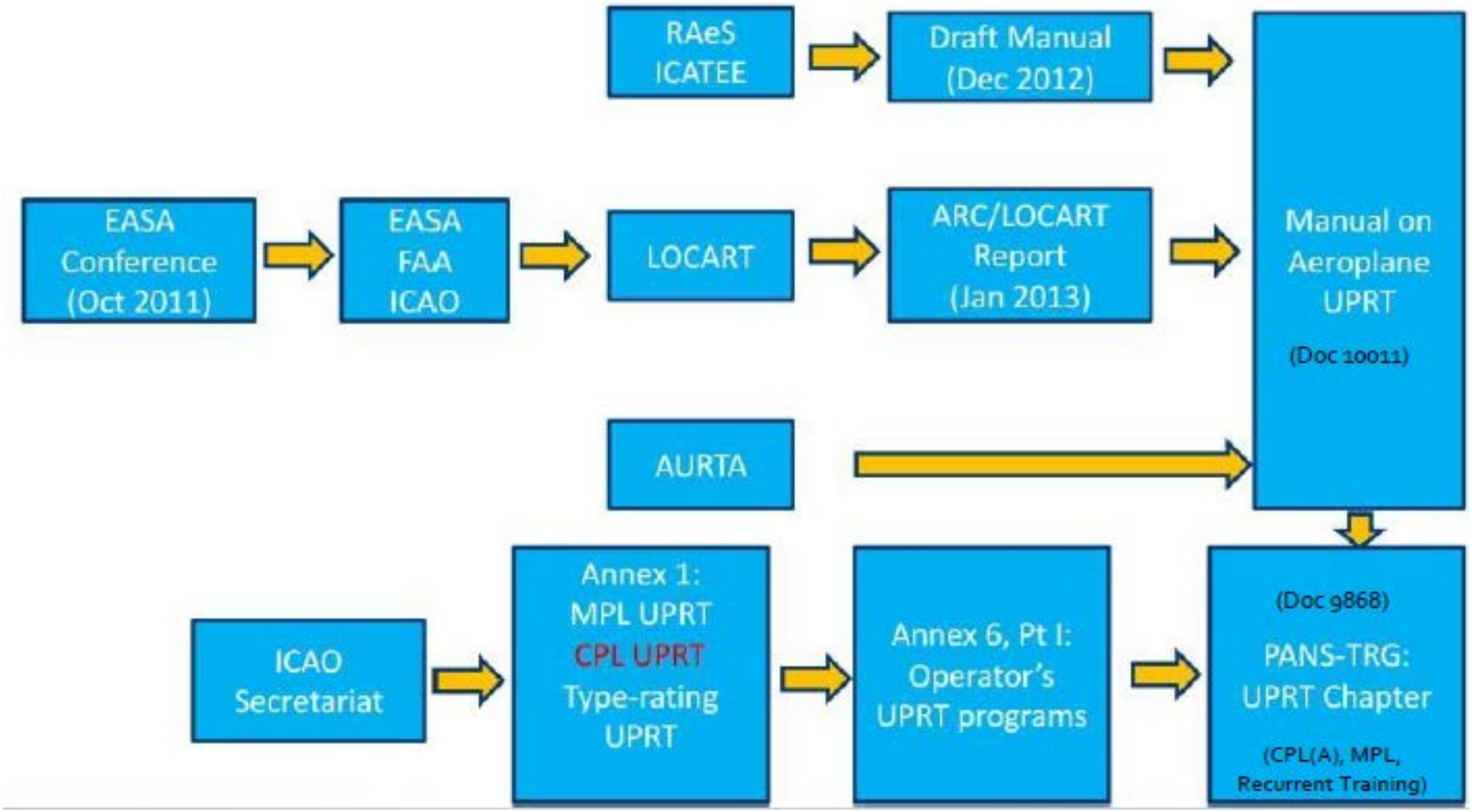
FAA - AC 120-111, Upset Prevention and Recovery Training

- http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-111.pdf

EASA - AMC and Guidance Materials group: Part-ORO-Organisation Requirements for Air Operations

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

Broad effort



ICAO Standards

(PANS-TRG, DOC 9868)

7.4 Regulatory requirements In several instances UPRT is not optional. It is a requirement for the MPL as well as for those pilots receiving type rating training or commercial air transport operator-specific initial and recurrent training.

ICAO Standards

Annex 1, Personnel Licensing (MPL)

2.5.3.2

Flight experience in actual flight shall include at least the experience requirements at 2.3.3.1, upset prevention and recovery training, night flying and flight by reference solely to instruments.

Note 1.— Procedures for upset prevention and recovery training in actual flight are contained in the Procedures for Air Navigation Services — Training (PANS-TRG, Doc 9868).

Note 2.— Guidance on upset prevention and recovery training in actual flight is contained in the Manual on Aeroplane Upset Prevention and Recovery Training (Doc 10011).

ICAO Standards

3.3.2.3

Type-Specific FSTD Training 3.3.2.3.1 The type-specific FSTD UPRT is applicable to the type-rating training and the recurrent training of commercial air transport pilots. It addresses all multi-crew training objectives including high-altitude operations and provides guidance that may be adapted for single crew type-rating and recurrent training.

ICAO Recommendation

Annex 1, Personnel Licensing (CPL)

2.4.3.2.2 Recommendation.— The applicant should have received, in actual flight, upset prevention and recovery training, approved by the Licensing Authority.

Note 1.— Procedures for upset prevention and recovery training in actual flight are contained in the Procedures for Air Navigation Services — Training (PANS-TRG, Doc 9868).

Note 2.— Guidance on upset prevention and recovery training in actual flight is contained in the Manual on Aeroplane Upset Prevention and Recovery Training (Doc 10011).

ICAO Recommendations (continued)

Table 3-3. Type-Specific FSTD Training

A. Aerodynamics
B. Causes and contributing factors of upsets
C. Safety review of accidents and incidents relating to upsets
D. G-awareness
E. Energy management
F. Flight path management
G. Recognition
H. Upset prevention and recovery techniques
I. System malfunction
J. Specialized training elements (slow flight and steep turns)

ICAO Recommendations (continued)

3.5 OEM Recommendations — UPSET Recovery Techniques

Nose-High Recommendation [1]Recognize and confirm the developing situation. Announce: "Nose High"	
PF	**PM**
[2]A/P - DISCONNECT	Monitor airspeed and attitude throughout the recovery and announce any continued divergence.
A/T - OFF	
APPLY as much nose-down control input as required to obtain a nose-down pitch rate.	
Thrust - Adjust (if required)	
Roll - Adjust (if required) not to exceed 60 degrees	
When airspeed is sufficiently increasing: [3]RECOVER to level flight	

ICAO Recommendations (continued)

3.5 OEM Recommendations — UPSET Recovery Techniques

Nose-Low Recommendation	
Warning: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads [1]Recognize and confirm the developing situation. Announce: "Nose Low "	
PF	**PM**
[2]A/P - DISCONNECT	Monitor airspeed and attitude throughout the recovery and announce any continued divergence.
A/T - OFF	
RECOVER from stall if required	
[3]ROLL in the shortest direction to wings level.	
Thrust and drag - Adjust (if required)	
[4]Recover to level flight	

ICAO Recommendations (continued)

Stall. An aerodynamic loss of lift caused by exceeding the critical angle of attack.

Note.— A stalled condition can exist at any attitude and airspeed, and may be recognized 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. An occurrence whereby the aeroplane experiences conditions associated with an approach-to-stall or an aerodynamic stall.

ICAO Recommendations (continued)

Stall recovery procedure. The manufacturer-approved aeroplane-specific stall recovery procedure. If a manufacturer-approved recovery procedure does not exist, the aeroplane-specific stall recovery procedure developed by the operator based on the stall recovery template contained in the FAA Advisory Circular, AC 120-109.

FAA Regulations

§121.423 – Pilot Extended Envelope Training

- Extended envelope training must include
  - Manually controlled slow flight
  - Manually controlled loss of reliable airspeed
  - Manually controlled instrument departure and arrival
  - Upset recovery maneuvers
  - Recovery from bounced landing

FAA Regulations (continued)

§121.423 – Pilot Extended Envelope Training

- Instructor-guided hands-on experience from full stall and stick pusher activation, if equipped
- Have to use a Level C, or higher, simulator
- All maneuvers every 2 years, except bounced landings (every 3 years)

FAA Regulations (continued)

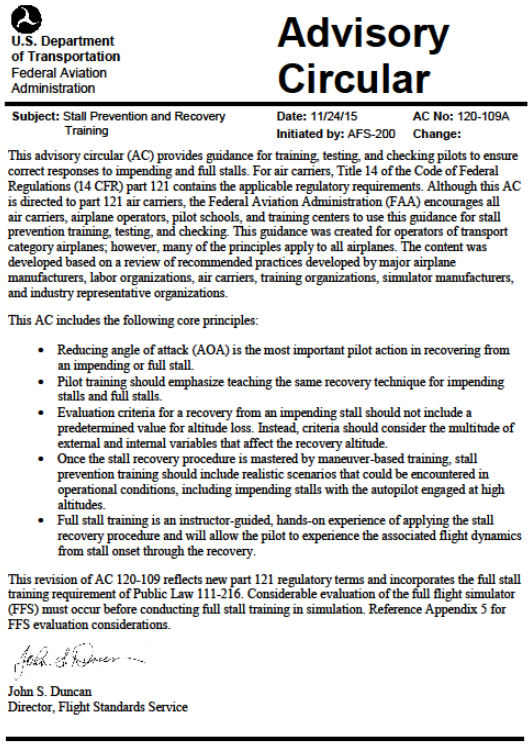
- Part 60…modify simulators to
  - Improve aerodynamics past stall warning through post-stall
  - Add icing physics instead of only end effects like stall speed increase
  - Upgrade instructor operating station to help instructors understand simulator limitations

FAA Regulations (continued)

- For ALL pilots (in part 121 operations)
  - Extended envelope training compliance by March 12, 2019 for initial, upgrade, transition, or requalification training
  - Extended envelope training compliance by March 31, 2020 for recurrent training

FAA Guidance

AC 120-109A



U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Stall Prevention and Recovery Training
Date: 11/24/15
Initiated by: AFS-200
AC No: 120-109A
Change:

This advisory circular (AC) provides guidance for training, testing, and checking pilots to ensure correct responses to impending and full stalls. For air carriers, Title 14 of the Code of Federal Regulations (14 CFR) part 121 contains the applicable regulatory requirements. Although this AC is directed to part 121 air carriers, the Federal Aviation Administration (FAA) encourages all air carriers, airplane operators, pilot schools, and training centers to use this guidance for stall prevention training, testing, and checking. This guidance was created for operators of transport category airplanes; however, many of the principles apply to all airplanes. The content was developed based on a review of recommended practices developed by major airplane manufacturers, labor organizations, air carriers, training organizations, simulator manufacturers, and industry representative organizations.

This AC includes the following core principles:

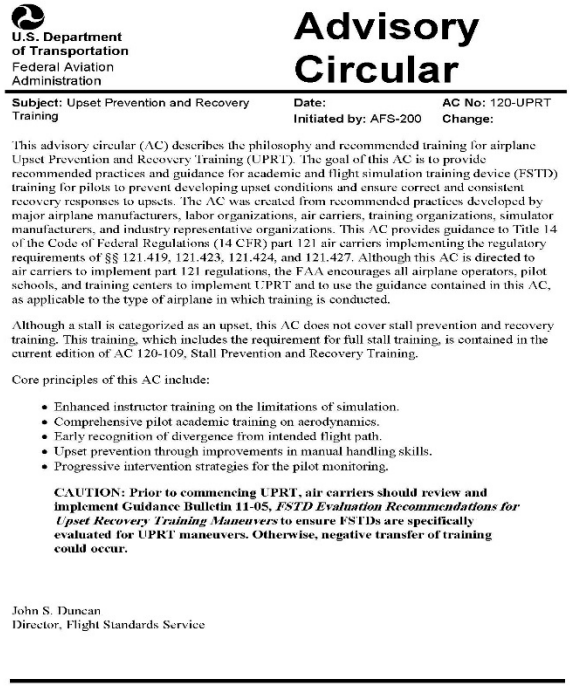
- Reducing angle of attack (AOA) is the most important pilot action in recovering from an impending or full stall.
- Pilot training should emphasize teaching the same recovery technique for impending stalls and full stalls.
- Evaluation criteria for a recovery from an impending stall should not include a predetermined value for altitude loss. Instead, criteria should consider the multitude of external and internal variables that affect the recovery altitude.
- Once the stall recovery procedure is mastered by maneuver-based training, stall prevention training should include realistic scenarios that could be encountered in operational conditions, including impending stalls with the autopilot engaged at high altitudes.
- Full stall training is an instructor-guided, hands-on experience of applying the stall recovery procedure and will allow the pilot to experience the associated flight dynamics from stall onset through the recovery.

This revision of AC 120-109 reflects new part 121 regulatory terms and incorporates the full stall training requirement of Public Law 111-216. Considerable evaluation of the full flight simulator (FFS) must occur before conducting full stall training in simulation. Reference Appendix 5 for FFS evaluation considerations.

John S. Duncan
Director, Flight Standards Service

http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-109A.pdf

AC 120-111



U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Upset Prevention and Recovery Training
Date:
Initiated by: AFS-200
AC No: 120-UPRT
Change:

This advisory circular (AC) describes the philosophy and recommended training for airplane Upset Prevention and Recovery Training (UPRT). The goal of this AC is to provide recommended practices and guidance for academic and flight simulation training device (FSTD) training for pilots to prevent developing upset conditions and ensure correct and consistent recovery responses to upsets. The AC was created from recommended practices developed by major airplane manufacturers, labor organizations, air carriers, training organizations, simulator manufacturers, and industry representative organizations. This AC provides guidance to Title 14 of the Code of Federal Regulations (14 CFR) part 121 air carriers implementing the regulatory requirements of §§ 121.419, 121.423, 121.424, and 121.427. Although this AC is directed to air carriers to implement part 121 regulations, the FAA encourages all airplane operators, pilot schools, and training centers to implement UPRT and to use the guidance contained in this AC, as applicable to the type of airplane in which training is conducted.

Although a stall is categorized as an upset, this AC does not cover stall prevention and recovery training. This training, which includes the requirement for full stall training, is contained in the current edition of AC 120-109, Stall Prevention and Recovery Training.

Core principles of this AC include:

- Enhanced instructor training on the limitations of simulation.
- Comprehensive pilot academic training on aerodynamics.
- Early recognition of divergence from intended flight path.
- Upset prevention through improvements in manual handling skills.
- Progressive intervention strategies for the pilot monitoring.

CAUTION: Prior to commencing UPRT, air carriers should review and implement Guidance Bulletin 11-05, *FSTD Evaluation Recommendations for Upset Recovery Training Maneuvers* to ensure FSTDs are specifically evaluated for UPRT maneuvers. Otherwise, negative transfer of training could occur.

John S. Duncan
Director, Flight Standards Service

http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-111.pdf

FAA Guidance (continued)

AC 120-111, Upset Prevention and Recovery
APPENDIX 1. TRAINING ELEMENTS AND EVENTS

A. Aerodynamics
B. G Awareness
C. Energy Management
D. Flightpath Management
E. Causes and Contributing Factors of Upsets
F. Review of Accidents and Incidents Relating to Airplane Upsets
G. Recognition
H. Upset Recovery Techniques
I. Specialized Flight Training Elements for Upset Prevention (manually controlled slow flight, manually controlled loss of reliable airspeed, manually controlled arrivals and departures)
J. System Malfunctions
K. Normal and Degraded Modes for Envelope Protected Airplanes

FAA Guidance (continued)

AC 120-111

TABLE 1. NOSE HIGH RECOVERY TEMPLATE

Either Pilot: Recognize and confirm the developing situation. Announce: "Nose High"	
Pilot Flying	**Pilot Monitoring**
AP: DISCONNECT[3]	MONITOR airspeed and attitude throughout the recovery and ANNOUNCE any continued divergence.
A/THR: OFF	
PITCH: Apply as much nose-down control input as required to obtain a nose-down pitch rate.	
THRUST: Adjust (if required)	
When airspeed is sufficiently increasing: RECOVER to level flight[4]	

NOTE: Recovery to level flight may require use of pitch trim.

NOTE: If necessary, consider reducing thrust in airplanes with underwing-mounted engines to aid in achieving nose-down pitch rate.

WARNING: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.

FAA Guidance (continued)

AC 120-111

TABLE 2. NOSE LOW RECOVERY TEMPLATE

Either Pilot: Recognize and confirm the developing situation. Announce: "Nose Low"	
Pilot Flying	**Pilot Monitoring**
AP: DISCONNECT[5]	MONITOR airspeed and attitude throughout the recovery and ANNOUNCE any continued divergence.
A/THR: OFF	
RECOVER from stall if required	
ROLL[6] in the shortest direction to wings level.	
THRUST and DRAG: Adjust (if required)	
RECOVER to level flight.[7]	

NOTE: Recovery to level flight may require use of pitch trim.

WARNING: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.

FAA Guidance (continued)

AC 120-111:

APPENDIX 2. SAMPLE TRAINING SCENARIOS AND MANEUVERS

1: NOSE-HIGH ATTITUDE IN AN AIRPLANE WITH UNDER-WING MOUNTED ENGINES

2: LOSS OF RELIABLE AIRSPEED SCENARIO 3: SUB-THRESHOLD ROLL

3: MANUALLY-CONTROLLED SLOW FLIGHT

FAA Guidance (continued)

TABLE 1. STALL RECOVERY TEMPLATE (WITH ASSOCIATED RATIONALE)

1	**Autopilot and autothrottle/autothrust……Disconnect**
Rationale	While maintaining the attitude of the airplane, disconnect the autopilot and autothrottle/autothrust. Ensure the pitch attitude does not increase when disconnecting the autopilot. This may be very important in out of trim situations. Manual control is essential to recovery in all situations. Leaving the autopilot or autothrottle/autothrust connected may result in inadvertent changes or adjustments that may not be easily recognized or appropriate, especially during high workload situations.
2	**a) Nose down pitch control……..Apply until impending stall indications are eliminated** **b) Nose down pitch trim……..……..As Needed**
Rationale	a) Reducing the angle of attack is crucial for recovery. This will also address autopilot-induced excessive nose up trim. b) If the control column does not provide sufficient response, pitch trim may be necessary. However, excessive use of pitch trim may aggravate the condition, or may result in loss of control or high structural loads.
3	**Bank……..……Wings Level**
Rationale	This orients the lift vector for recovery.
4	**Thrust…….……As Needed**
Rationale	During a stall recovery, maximum thrust is not always needed. A stall can occur at high thrust or at idle thrust. Therefore, the thrust is to be adjusted accordingly during the recovery. For airplanes with engines installed below the wing, applying maximum thrust may create a strong nose-up pitching moment if airspeed is low. For airplanes with engines mounted above the wings, thrust application creates a helpful pitch-down tendency. For propeller-driven airplanes, thrust application increases the airflow around the wing, assisting in stall recovery.
5	**Speed brakes/Spoilers……..……..……..Retract**
Rationale	This will improve lift and stall margin.
6	**Return to the desired flightpath.**
Rationale	Apply gentle action for recovery to avoid secondary stalls then return to desired flightpath.

FAA Guidance (continued)

AC 120-109A:

APPENDIX 2. SAMPLE DEMONSTRATIONS

1: IMPENDING STALL RECOVERY WITH ONLY IDLE THRUST AVAILABLE

2: STICK PUSHER (IF INSTALLED)

FAA Guidance (continued)

AC 120-109A:

APPENDIX 3. SAMPLE TRAINING SCENARIOS

1: CLEAN CONFIGURATION STALL PREVENTION (HIGH ALTITUDE)

2: TAKEOFF CONFIGURATION STALL PREVENTION

3: LANDING CONFIGURATION STALL PREVENTION

FAA Guidance (continued)

AC 120-109A:

APPENDIX 4. SAMPLE FULL STALL TRAINING MANEUVER

APPENDIX 5. FFS CONSIDERATIONS

EASA Regulations

ORO.FC.220 & 230 Operator conversion training & recurrent training and checking

- UPSET PREVENTION AND RECOVERY TRAINING (UPRT)
  (a) Upset prevention training should:
  - consist of ground training and flight training in an FSTD or an aeroplane;
  - include upset prevention elements from Table 1 for the conversion training course; and
  - include upset prevention elements in Table 1 for the recurrent training programme at least every 12 calendar months, such that all the elements are covered over a period not exceeding 3 years.

EASA Opinion 06/17

- Goal to harmonize with ICAO and FAA (albeit with differences)
- On-aeroplane “advanced UPRT course”
  - Required for CPL*, ATP, and MPL
  - Aimed to improve resilience to
  - Approach-to-stall and stall exercises conducted
- No simulator full stall training for make/model/series to be flown
  - Concerns over negative transfer of training

EASA Guidance

ORO.FC.220 & 230 Operator conversion training & recurrent training and checking

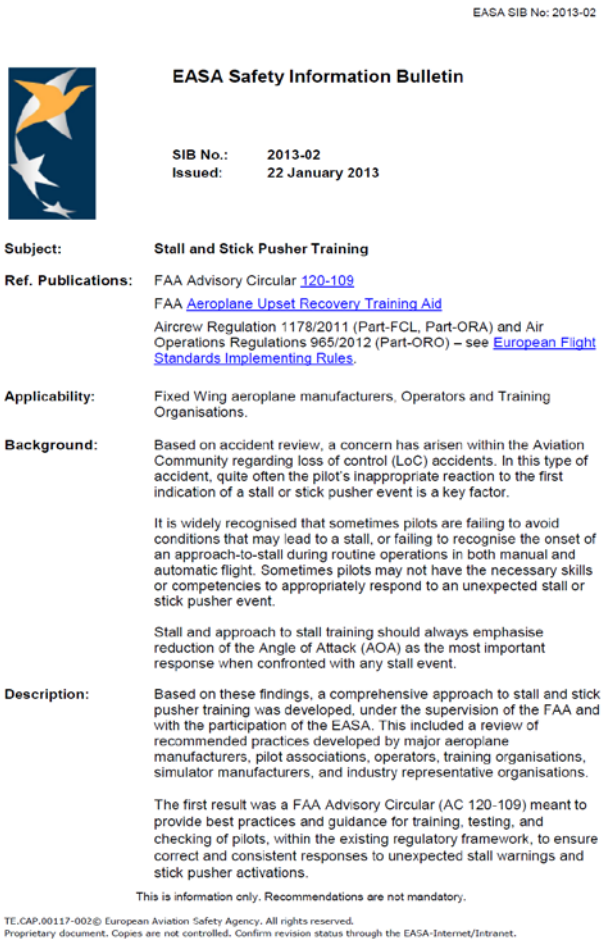
- GM1 – GM3 230 Clarifies the objective of the upset prevention and recovery training, specifies that the prevention elements should be covered by making use of manoeuvre- and scenario-based training, needs to integrate human factors, in addition, flight crews should be made aware of the limitations of the FSTD
- GM4 ORO.FC.220 & 230 – FFS Qualified for UPRT
- GM5 ORO.FC.220 & 230 – Personnel Providing UPRT

EASA Guidance

Table 1: Elements and respective components of upset prevention training

A. Aerodynamics
B. Causes of and contributing factors to upsets
C. Safety review of accidents and incidents relating to upsets
D. g-load awareness and management
E. Energy management
F. Flight path management
G. Recognition
H. System malfunction
I. Manual handling skills

EASA Guidance



EASA SIB No: 2013-02

EASA Safety Information Bulletin

SIB No.: 2013-02
Issued: 22 January 2013

Subject: **Stall and Stick Pusher Training**

Ref. Publications: FAA Advisory Circular 120-109

FAA Aeroplane Upset Recovery Training Aid

Aircrew Regulation 1178/2011 (Part-FCL, Part-ORA) and Air Operations Regulations 965/2012 (Part-ORO) – see European Flight Standards Implementing Rules.

Applicability: Fixed Wing aeroplane manufacturers, Operators and Training Organisations.

Background: Based on accident review, a concern has arisen within the Aviation Community regarding loss of control (LoC) accidents. In this type of accident, quite often the pilot's inappropriate reaction to the first indication of a stall or stick pusher event is a key factor.

It is widely recognised that sometimes pilots are failing to avoid conditions that may lead to a stall, or failing to recognise the onset of an approach-to-stall during routine operations in both manual and automatic flight. Sometimes pilots may not have the necessary skills or competencies to appropriately respond to an unexpected stall or stick pusher event.

Stall and approach to stall training should always emphasise reduction of the Angle of Attack (AOA) as the most important response when confronted with any stall event.

Description: Based on these findings, a comprehensive approach to stall and stick pusher training was developed, under the supervision of the FAA and with the participation of the EASA. This included a review of recommended practices developed by major aeroplane manufacturers, pilot associations, operators, training organisations, simulator manufacturers, and industry representative organisations.

The first result was a FAA Advisory Circular (AC 120-109) meant to provide best practices and guidance for training, testing, and checking of pilots, within the existing regulatory framework, to ensure correct and consistent responses to unexpected stall warnings and stick pusher activations.

This is information only. Recommendations are not mandatory.

http://ad.easa.europa.eu/ad/2013-02

FAA and EASA Key UPRT Differences

	Simulator full stall training	On-airplane UPRT
FAA	✓	X
EASA	X	✓

Other Activities

- Japan
  - Understand Japan will adopt FAA part 60 change 2
  - Have heard that they will, and that they will not, require full stall training in simulation
- Australia
  - Have started their upset efforts
  - Believe they will require full stall training in simulation
- Singapore
  - Issued Advisory Circular, AC AOC-39(0), on upset training

Other Activities

- Hong Kong
  - CAD 509(A)
    - 24.3 (CPL) UPRT should be included in the relevant section of the training programme for on-aeroplane training; as well as the non-type specific training in the Multi-Crew Cooperation course (for FTO choose to adopt the alternative means of compliance under paragraph 41) in accordance with ICAO Doc 10011
  - CAD 509(MPL)
    - 24.3.1 As a requirement for the integrated MPL programme, UPRT should be a train-to-proficiency programme desired to achieve end-state objectives. It shall be incorporated into the FTO's Quality Assurance programme as well as an effective SMS programme
    - 24.3.2 UPRT shall be an integrated approach comprising theoretical knowledge academic training, aeroplane training, FSTD training