U P R T

Shortened Overview

UPRT EASA Workshop

Introduction

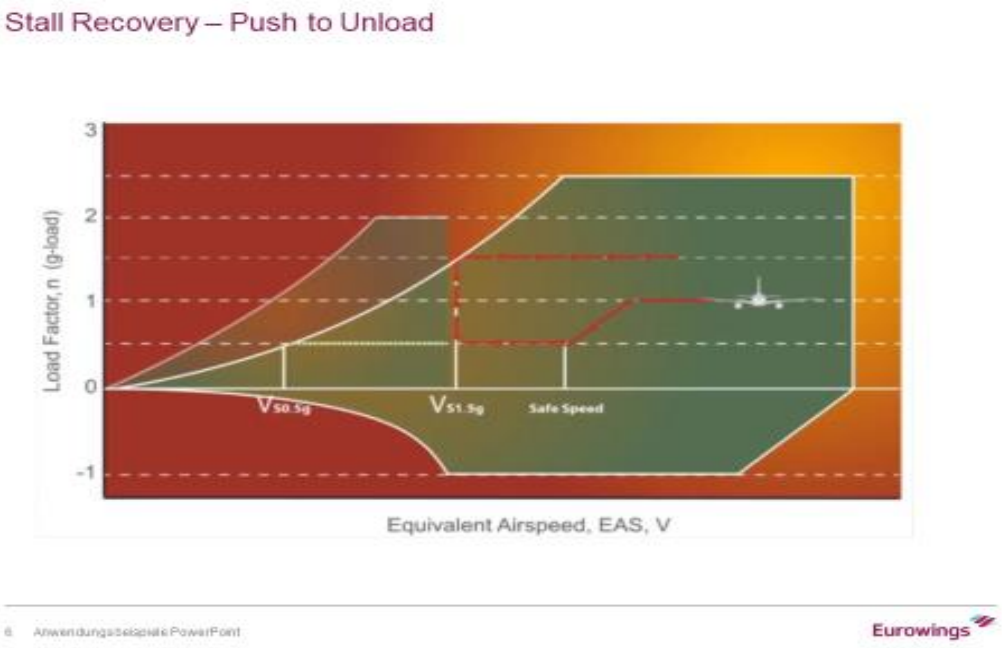
The Upset Prevention & Recovery Training (UPRT), which will be implemented in the conversion and recurrent training, primarily has two objectives:

- 1. Increase the ability of pilots to recognize and avoid situations that may lead to airplane upsets
- 2. Improve the pilots' ability to recover control of an airplane that has exceeded the normal flight regime.

To reach these objectives, both academic and practical training will be provided.

Academic Training

Thorough understanding of environmental factors, aerodynamics, flight dynamics, aircraft performance,



aircraft design principles and human factors is an indispensable prerequisite for successful upset prevention. Academic training is therefore of critical importance for the success of a UPRT program.

- The academic training including the above mentioned elements will be provided by a CBT.
- The Student has to confirm by signature that he has clicked the CBT

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Practical Training

- The UPRT will be embedded in the conversion and recurrent training events.
- The recovery training will be a manoeuvre based approach, where the focus is on the recovery itself as an isolated event.
- The upset prevention training will, to the maximum extend, use real time scenarios.
- Instructors should make sure that pilots are able to recognize and manage the threats and errors that may lead to an upset condition.

- Threats: Environmental

  Aeroplane Systems

- Errors: Pilot/Human

Practical Training Initial and Recurrent

…SESSION GUIDE

1 Demonstrate the tools available for UPRT.

- G-Load indication on the SD
- AOAPROT, AOAMAX, VSW on PFD
- FPV

G-Load

To monitor the correct sidestick input for recovery the indicated g-load on the system display can be used:

It is displayed in amber when the value is above 1.4 g or below 0.7 g.

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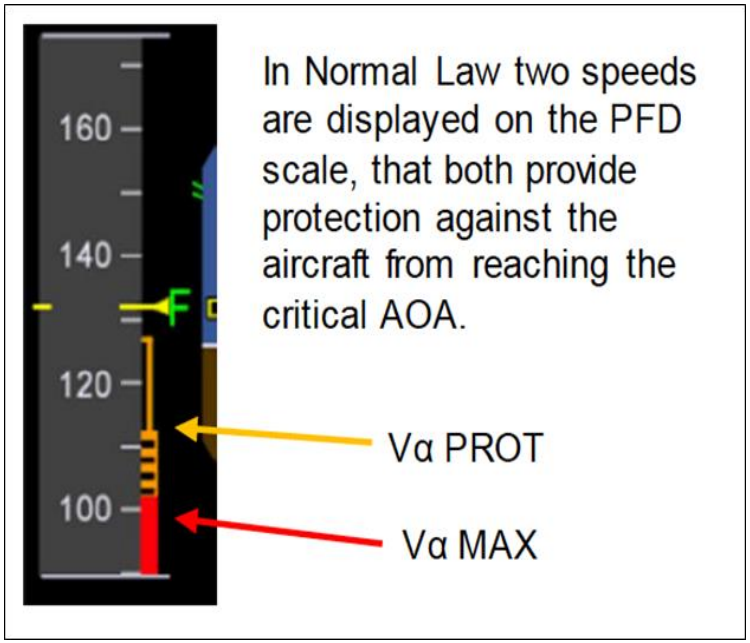
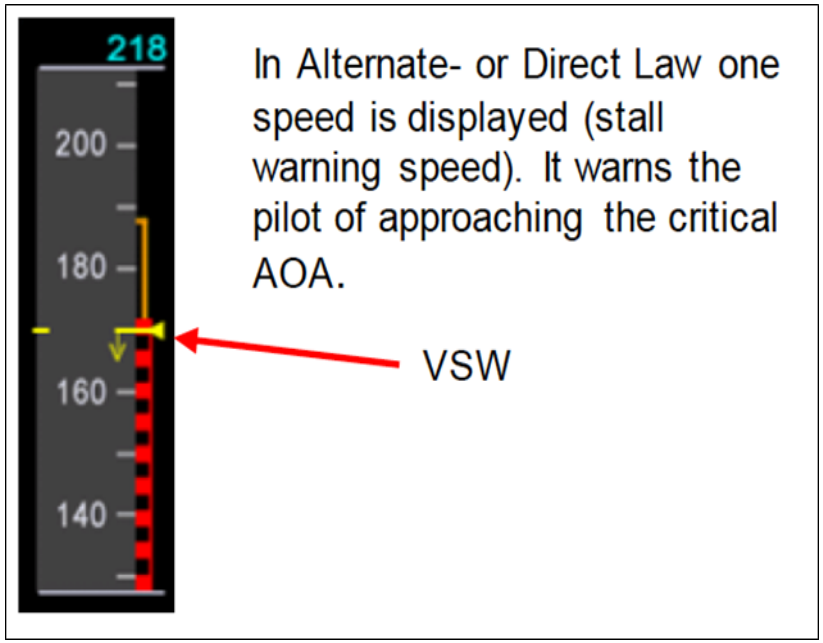
- AOAPROT, AOAMAX, VSW on PFD





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Practical Training Initial and Recurrent

The Flight Pah Vector (FPV) The FPV indicates the aircraft's vertical flight path with respect to the ground. In dynamic manoeuvres, the "bird" is directly affected by the aircraft inertia and has a delayed reaction. As a result, the "bird" should not be used as a flight reference in dynamic manoeuvres. The angle of attack (AOA) is the angle between the body's reference line and the oncoming airflow. So the FPV does not represent the AOA directly. However, the FPV, in relation to the actual pitch can be used to get an idea of the aircrafts energy state. This picture shows a stalled condition in a nose low attitude. Observe AOA as difference between pitch and FPV. IAS, IAS trend and V/S can be used to build situation awareness.

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Practical Training Initial

AOA & G-LOAD AWARENESS

Activate crash inhibit on IOS. Turn on the FPV to increase AOA awareness. Do not use as flight reference. Set ADR 1+2 to off on the overhead panel to revert to alternate law. Use AIR DATA SWITCHING CAPT on 3 or FO on 3 as required. Disregard ECAM. The instructor begins on the CM2 seat, pilot 1 on CM1 seat and pilot 2 on the instructor seat.

Pilot:

- Reduce to green dot speed in clean configuration.
- Establish 45° bank turn
- Thrust idle, Pitch -5°
- **Load and unload a/c by elevator input and play with VSW**.

Experience increase/decrease of VSW with varying g-loads and that AOA is independent from attitude. Loading increases Vs, unloading reduces Vs.

At 0-g the stall speed is 0! Point out, that a negative pitch would not prevent a stall.

AOA & load are the key factors!!

Practical Training Initial

STALL RECOVERY AT LOW ALT

Without exception, pilots should be taught to recover at the first indication of a stall !!!!!

To be consistent with the simulator data package provided, training in this area should be initiated with the simulator in approximately level flight, with a rate of deceleration towards the stall of approximately 1kt per second.

Pilot:

- Set Flaps 2, L/G UP, F-speed
- ATC requests: “Cancel ILS clearance, perform a 360 for regulation”.
- Maintain current configuration.
- Once turning, request the trainee to reduce thrust. - Maintain altitude.
- Wait for buffet or stall warning and apply the stall recovery procedure.

STALL RECOVERY AT HIGH ALT

Without exception, trainees should be taught to recover at the first indication of a stall !!!!

- Ask the trainee to perform a turn, increasing regularly the bank angle until buffet is detected or stall warning is triggered.
- Then, apply the stall recovery procedure and return to the previous flight parameters.
- Monitor g-load on SD during turn.

Practical Training Initial and Recurrent

UPSET RECOVERY TRAINING

AP FD ATHR OFF, TRK- FPA (Bird) ON

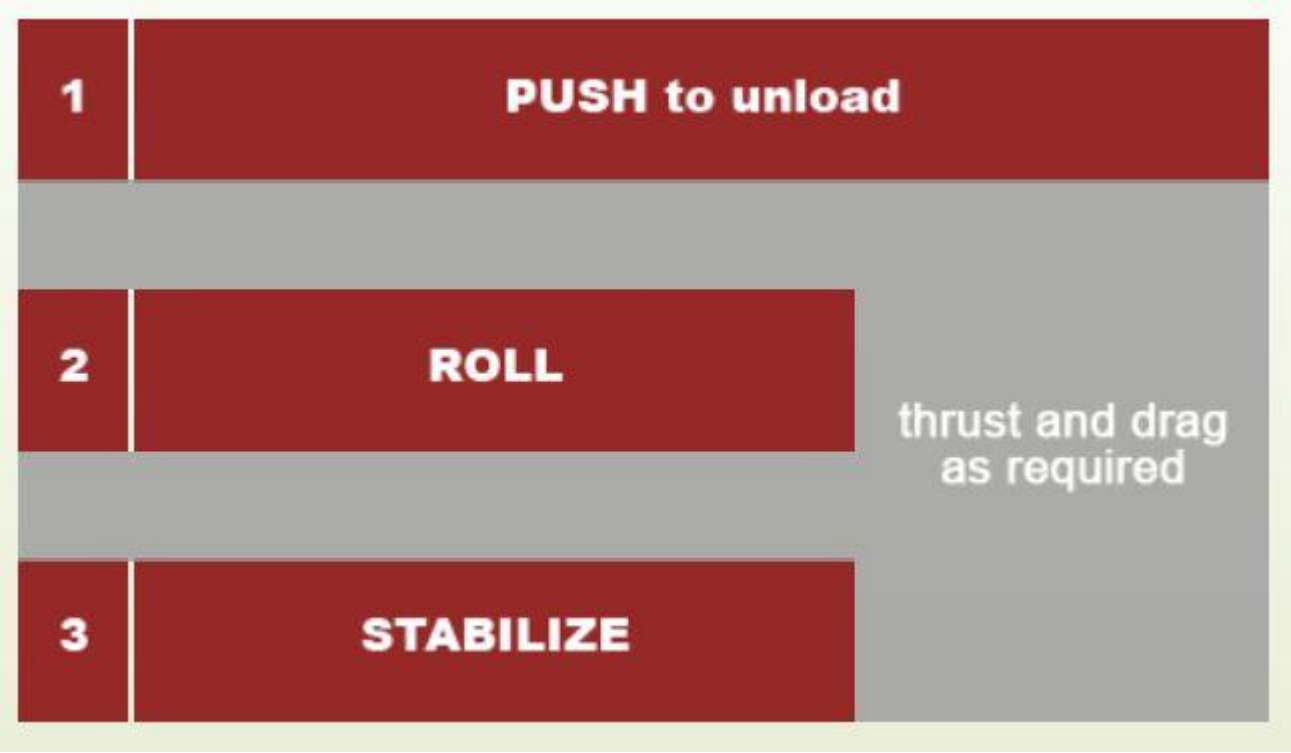
- 1 - DEMONSTRATION OF IOS TOOLS

INITIAL CONDITIONS: REPOS FL100 (**FL 350**) – CLEAN – 250KT

- 5 - NOSE HIGH – USE OF NOSE DOWN ELEVATOR TO RECOVER
- 6 - NOSE HIGH – USE OF BANK ANGLE TO RECOVER
- 7 - NOSE HIGH AND HIGH BANK UPSET RECOVERY
- 8 - NOSE LOW AND HIGH BANK UPSET RECOVERY

REPEAT FOR OTHER PILOT

RECOVERY SEQUENCE



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EXAMPLE

Instructor:

- Establish initial conditions - Set CLB thrust - At 300kt IAS slowly pitch towards 25° nose up – observe max G-Load of 1.5

- Maintain wings level - Add noseup trim during the pitch up so that the airplane will want to pitch up further upon the exchange of control to the pilot-in-training

- Slightly reduce thrust just prior to exchange of control

As the airplane pitch attitude approaches 25°NU, instruct the pilot to: “RECOVER”

Pilot: ”UPSET, I HAVE CONTROL”

- counter pitch by use of up to full nosedown elevator (observe g-load on SD)
- use stabilizer trim to relieve elevator control pressure, if necessary. A steady nosedown pitch rate should be achieved and it should be noted that the airplane would be near zero g and the associated characteristics of such.
- Stabilize normal flight when approaching the horizon by checking airspeed, adjusting thrust, and establishing the appropriate pitch attitude and stabilizer trim setting for level flight.

Capabilities and limitations of the FSTD used for UPRT

The most significant concern with UPRT conducted in FSTDs pertains to the potential of negative training, which can result from many factors including:

- the improper simulation of the upset condition,
- the improper behavior of the FSTD in the upset condition,
- the improper response of the key feedback cueing (motion, visual, sound) during the upset condition and/or
- Improper instruction.

…however, the forces imposed on the pilot and the ratio of control forces to inertial and gravity forces will not be representative of the airplane

Trainers and pilots must understand that simulators still cannot replicate all things. For example, sustained g forces, both negative and positive, are not replicated. This means that a pilot cannot rely on complete sensory feedback that would be available in an actual airplane. Additionally, such things as loose items that would likely be floating in the cockpit during a negative-g situation are clearly not replicated in the simulator.

To assure realistic aerodynamics and control forces during UPRT, all flight maneuvers should remain within an area, or envelope, where realistic data describing the aircraft behavior are available. This is called the Valid Training Envelope (VTE).

All the training maneuvers and scenarios are designed to stay within the VTE. Therefore strict adherence to the program is mandatory to avoid negative training.

There may also be preprogrammed scenarios for an upset condition on the IOS which are currently not used by Eurowings.

Teaching Human Factors in the FSTD

Additional emphasis will be placed on our ability to teach the human-factor effects during recovery exercises in the absence of realistic motion cues in FSTDs.

e.g.

- Achieving Resilience
- Deviating from 1g
- G-loads +1g - +4g
- G-loadings below +1g
- Surprise, Stress and Startle
- Counter-Intuitive Behaviour:
- □ Reducing thrust (with underwing mounted engines) in a stall recovery to achieve a nose-down pitch movement
- □ Unloading (pushing) during stall recovery in a nose-down attitude □ Unloading (pushing) at high bank angles before rolling wings level
- □ Not rolling wings level in nose-high situations before pitch attitude is acceptable and airspeed is sufficient
- □ Maintaining high g-load (up to 2,5g) during GPWS manoeuvres
- □ Not using full control authority when needed because pilots rarely are required to do so in normal operations. Pilots need to overcome this habit when recovering from severe upsets.
- Avoiding over-confidence

Thank You