





# Preventing Loss of Control In-Flight



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Loss of Control In-Flight (LOC-I) has been one of the leading causes of aircraft accidents and related fatalities in recent aviation history. In a July 2010 report from Boeing, LOC-I is identified as the highest cause of fatalities due to accidents in the commercial jet fleet worldwide from 2000 to 2009. It is therefore one of the primary areas of improvement for commercial aviation safety.

Usually loss of control occurs when the aircraft enters an area that is outside its normal operating flight envelope, for example a stall or unusual attitude. In a large number of loss of control incidents, the aircraft can be recovered to normal flight if the situation is recognised and appropriate action is taken quickly.

There is currently no simple technology solution to LOC-I, so the current focus is now on preparing crews to recognise and handle LOC-I situations. Upset Prevention and Recovery Training is regarded as the key to this preparation. There are several areas of flight crew training where upset recovery and prevention training is currently being examined, from the initial pilot training to recurrent training for licensed pilots.



## "PUSHING THE BOUNDARIES OF STATE-OF-THE-ART TRAINING AND SIMULATION"

**NLR is involved in the research that is preparing the aviation industry to provide training for the prevention of Loss of Control In Flight.** This research includes:

- **Aerodynamics** - modelling the aerodynamics outside the edge of the flight envelope to provide effective flight simulator training.
- **Simulation** - investigating the application of current training simulators for upset recovery training in the future.
- **Training** - examining the requirements for training the prevention and recovery from aircraft upsets.

This expertise can be used to support the operational analysis and development of training for upset prevention and recovery training of pilots at airlines and flight schools. This includes the evaluation of training facilities to optimise the application of simulation as an element of the training course.

Continuing to support the regulatory bodies in the identification of key requirements for LOC-I prevention now and in the future will remain an important way that NLR supports the aviation industry in the Netherlands, Europe and Worldwide.



### SUPRA

The EU Seventh Framework research project Simulation of Upset Recovery in Aviation (SUPRA) involves nine research organisations from six different countries that are aiming to enhance flight simulator technology to enable effective upset recovery training in the near future. SUPRA is employing advanced and conventional motion simulators to identify the capabilities for upset recovery training and improve the aerodynamic and motion envelopes of ground-based flight simulators. The SUPRA research focuses on three key areas: Aerodynamic Modelling, Motion Perception and Motion Cueing.

NLR is active in SUPRA in the development of the extended aerodynamic model using computational fluid dynamics (CFD), and the development and evaluation of motion cueing for conventional full flight simulators (FFS) for upset recovery using the NLR GRACE research simulator.



### ICATEE

The International Committee for Aviation Training in Extended Envelopes (ICATEE) was established in 2009 by the Flight Simulation Group of the Royal Aeronautical Society. This international working group was formed to address the growing need to enhance the training to prevent LOC-I accidents. ICATEE has introduced the concept of Upset Prevention and Recovery Training (UPRT) and is working to define the training in Awareness, Avoidance, Recognition and Recovery. ICATEE is supporting the work of the FAA & Industry Stall/Stick-pusher working group, working on updating the Industry Upset Prevention & Recovery Training Aid and providing advisory material on the training strategy for UPRT as well as enhancements and application of simulators for UPRT to ICAO.

ICATEE is supported through members from the aircraft industry, simulator manufacturers, training providers, regulators, airline operators and research institutes, and NLR has been involved since its establishment.

NLR's role within ICATEE's Research & Technology group is in supporting the training analysis, the application of simulation within UPRT and the modification of the simulator standards.