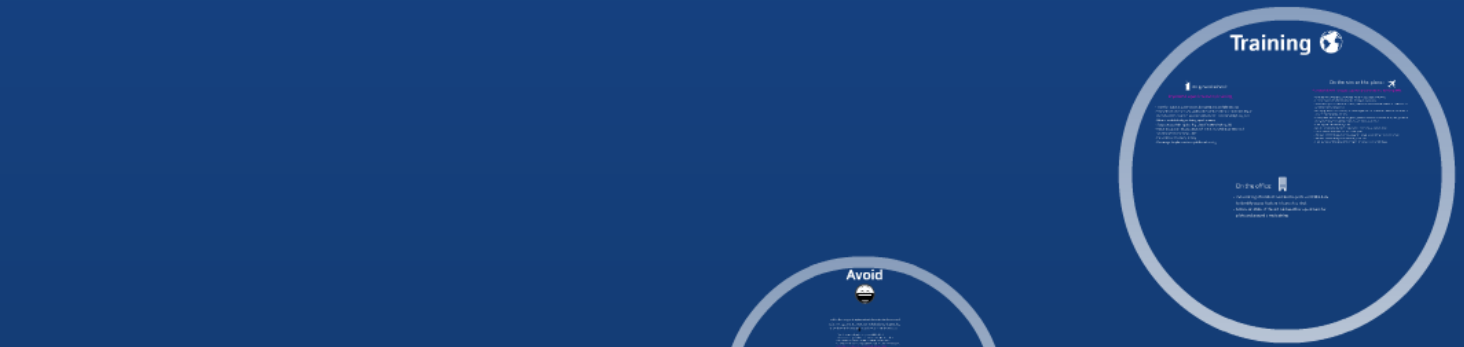
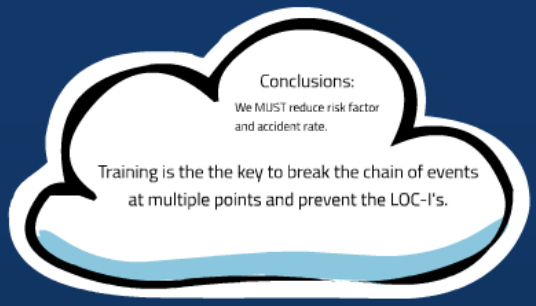
Francisco Gómez Ortigoza G.

LOC-I

Loss of control - inflight





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LOC-I

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LOC-I

Loss of control - inflight

Definition

Loss of aircraft control while, or deviation from intended flightpath, in flight.

Loss of control inflight is an extreme manifestation of a deviation from intended flightpath.
The phrase “loss of control” may cover only some of the cases
during which an unintended deviation occurred.

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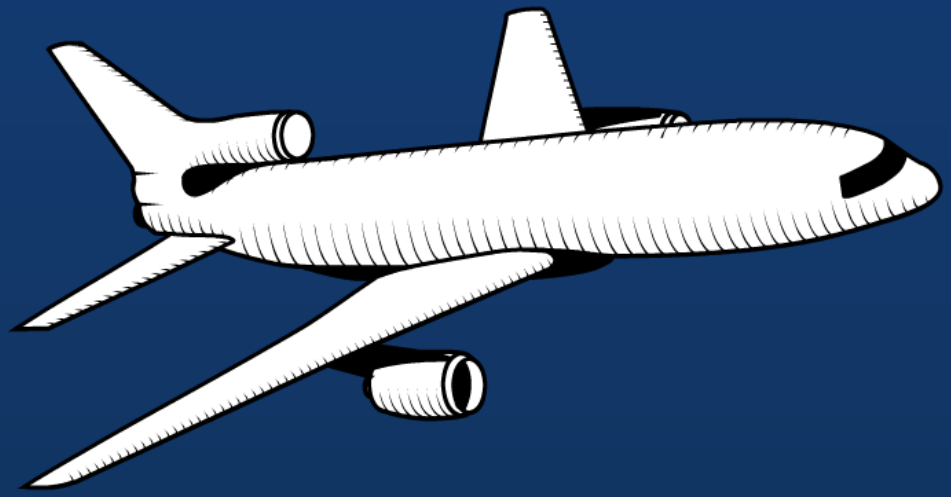
during which an unintended deviation occurred.

LOC-I Taxonomy use

- Used only for airborne phases of flight in which aircraft control was lost.
- Loss of control can occur during either Instrument Meteorological Conditions (IMC) or Visual Meteorological Conditions (VMC).
- The loss of control during flight may occur as a result of a deliberate maneuver (e.g., stall/spin practice).
- Stalls are considered loss of control and are included here.

- Occurrences involving configuring the aircraft (e.g., flaps, slats, onboard systems, etc.).
- Includes pilot-induced or assisted oscillations.
- For icing-related events, which are also loss of control.
- If the loss of control is a direct result of a system/component failure or malfunction; However, loss of control may follow less severe system/component failures.

Hard data



BOEING

Commercial Airplanes

Statistical Summary of Commercial Jet Airplane Accidents

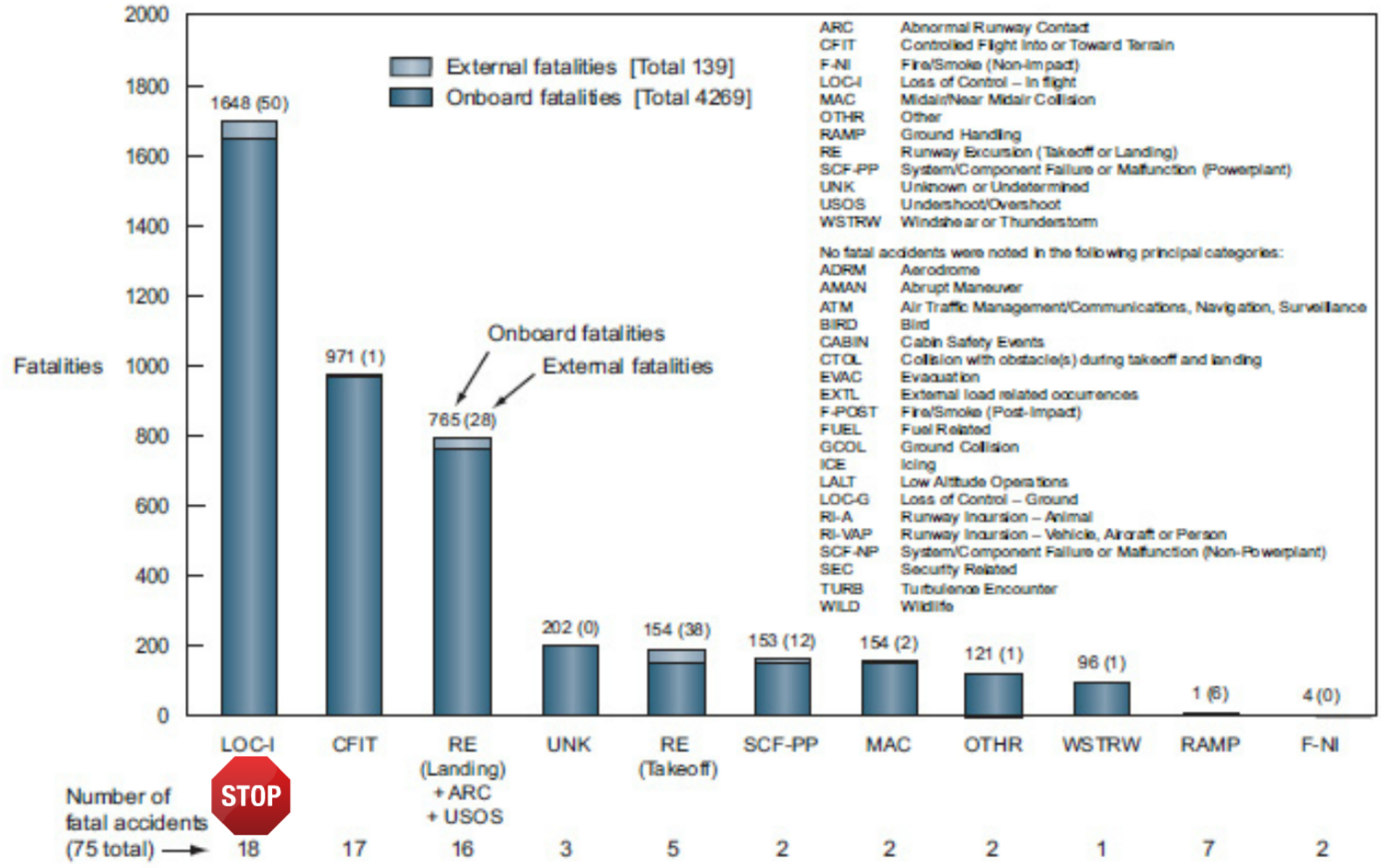
Worldwide Operations
1959 – 2012

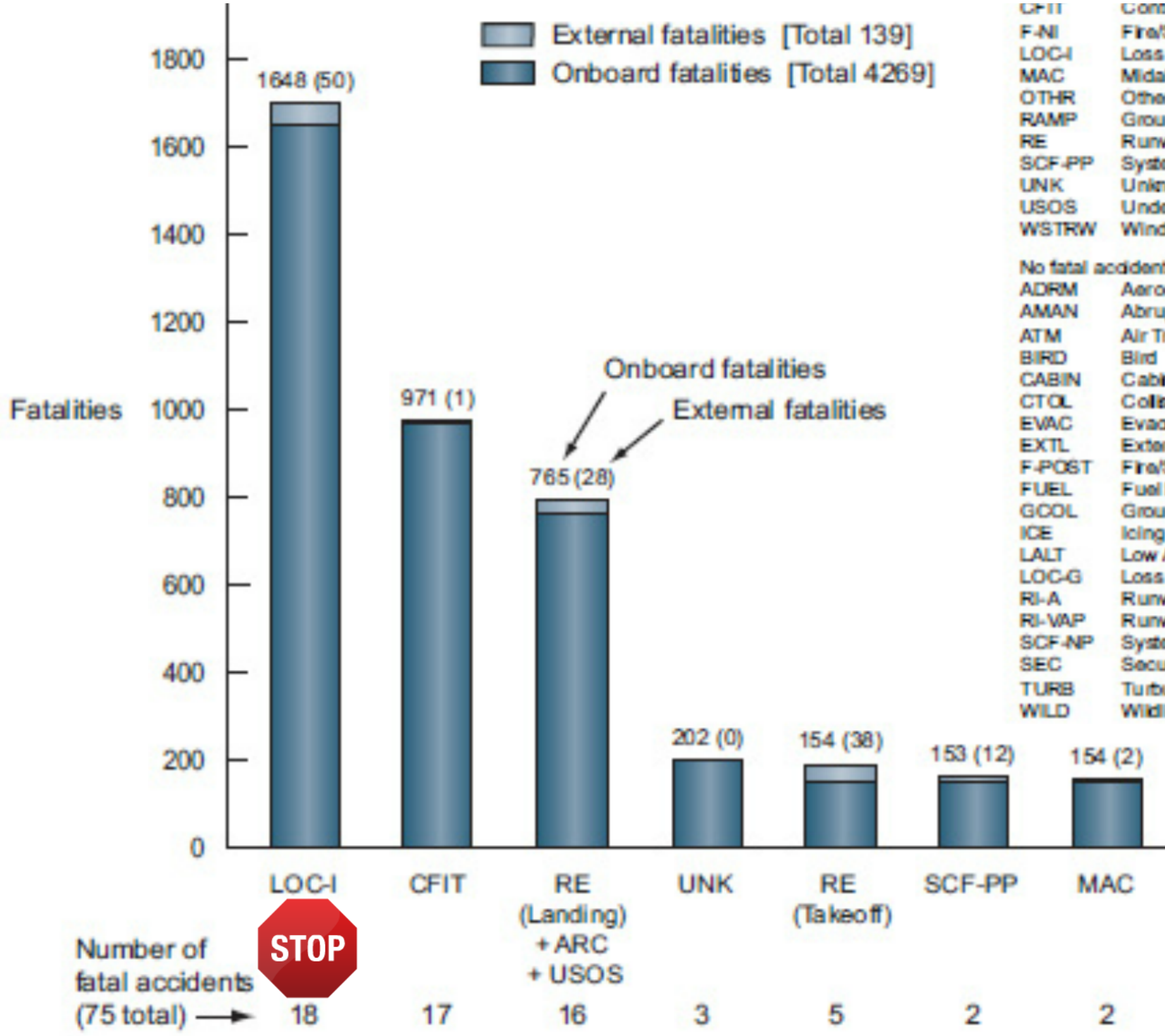
1959

2012

Fatalities by CAST/ICAO Common Taxonomy Team (CICTT) Aviation Occurrence Categories

Fatal Accidents – Worldwide Commercial Jet Fleet – 2003 Through 2012




External fatalities [Total 139]
Onboard fatalities [Total 4269]
Fatalities
1800
1600
1400
1200
1000
800
600
400
200
0
1648 (50)
971 (1)
765 (28)
202 (0)
154 (38)
153 (12)
154 (2)
Onboard fatalities
External fatalities
LOC-I
CFIT
RE (Landing) + ARC + USOS
UNK
RE (Takeoff)
SCF-PP
MAC
STOP
Number of fatal accidents (75 total)
18
17
16
3
5
2
2
CFIT
F-NI
LOC-I
MAC
OTHR
RAMP
RE
SCF-PP
UNK
USOS
WSTRW
No fatal accident
ADRM
AMAN
ATM
BIRD
CABIN
CTOL
EVAC
EXTL
F-POST
FUEL
GCOL
ICE
LALT
LOC-G
RI-A
RI-VAP
SCF-NP
SEC
TURB
WILD

Some Findings

- NASA Loss of Control Study Team.
- Boeing Statistical Summary of Commercial Jet.
- NASA Systems Analysis study on LOC.

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- The leading causal factors come from pilot/human induced category.
- The majority of recent LOC-I accidents occur during flight phases where the aircraft is relatively close to the ground where there is little time for action, and where circumstances are unforgiving of mistakes.
- Flight crew deviation from prescribed procedure or improper procedures pose significant factors in loss of control accidents.
- Poor energy management is a significant factor in loss of control accidents.
- More than half of LOC-I events result in an accident and more than half of those accidents are fatal.

The risk is identified,the priority for addressing the hazard should be:

Avoid

Detect

Recover

Avoid

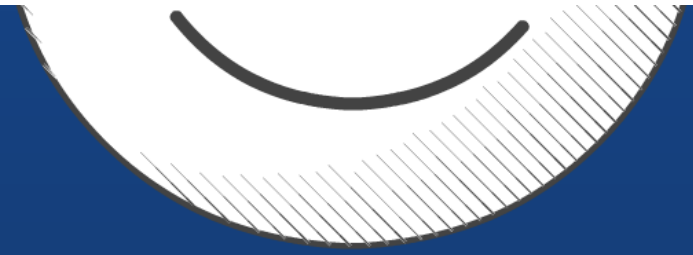
Tied to the design of systems that eliminate the hazard and safety mitigations but, may also include standard operating

Tied to the design of systems that eliminate the hazard and safety mitigations but may also include standard operating procedures and training to avoid loss of control scenarios

1) Aircraft designs and systems not susceptible to LOC-I .
2) Advanced sensing of adverse Wx associated with upset conditions.
3) ATS interaction to avoid potentially non stabilized maneuvers .
4) Envelope protection and lockout devices to prevent unsafe energy states .
5) Training to avoid hazards that could lead to loss of control .

Detect

The detect/warn category mitigation



The detect/warn category mitigation strategies but may also include training to recognize the onset of a hazardous situation.

1) Detection of immediate occurrence of de-stabilizing flight conditions.

2) Sensing the vehicle condition (including damage, degradations, and ice accretion) that may create, promote, or trigger a loss of control event, correctly interpreting sensor input, and alerting with sufficient accuracy and look-ahead to facilitate an improved response from the pilot or on board systems, or both.

3) Situational awareness of unusual flight attitudes or energy states, and other conditions suggesting the potential onset of a LOC-I .

4) Training to recognize external hazards such as weather, turbulence, and wake vortex conditions.

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3) Situational awareness of unusual flight attitudes or energy states, and other conditions suggesting the potential onset of a LOC-I .

4) Training to recognize external hazards such as weather, turbulence, and wake vortex conditions.

5) Adverse vehicle-pilot interactions potentially leading to LOC-I, considering current and novel flight configurations, with and without intermediary flight control or stability-augmentation systems

Recover

st line of defense and has strong ties to procedures and train

also benefit from automatic systems, safety and warn

Last line of defense and has strong ties to procedures and training, but may also benefit from automatic systems, safety and warning devices to aid in the recovery of the aircraft.

1) Piloted (manual) control of aircraft in an upset or LOC-I.
2) Training, procedures, and technologies to mitigate adverse flight attitudes including pilot awareness and stability augmentation technologies.
2) Automatic recovery of aircraft from an upset or LOC-I.

Training

On ground school:

Improved upset recovery training

- Train the impact of upset recovery during transitional flight training.
- Study the effectiveness of providing pilots with an enhanced understanding of the behavior of an aircraft near or outside the limits of normal flight regimes.
- Manual control strategies during upset recovery.
- Adopt a robust training aids (e.g. Upset Recovery Training Aid).
- Design a robust envelope protection/limiting, improved automation and warning systems training routine.
- Prevention vs. Recovery training.
- Encourage the pilot monitoring skills and training.

On the sim or the plane:

Provide pilots with increased opportunity to exercise manual flying skills.

- Understand the importance of simulator motion in upset recovery training.
- Evaluate the use of flight simulators for Upset Recovery Training.
- Assess how specific automated systems, both inside and outside the cockpit, are affecting the retention of manual flying skill.
- Develop guidelines for frequency of manual flight time for normal and abnormal operations in order to maintain pilot proficiency.
- Identify ways in which manual navigation, guidance, and control skills can be regularly practiced during normal flight operations in order to keep manual skills sharp.
- Encourage the pilot monitoring skills.
- Provide tools to understand the causes and effects of spatial disorientation.
- Spatial disorientation detection and recovery aids .
- Advanced Control strategies for retaining good flying qualities during a failure or damage.
- Advanced Control strategies for low-energy conditions .
- Flight planning and Guidance tools for operation during failures and damage.

On the office:

- Data mining of incident/accident reports and FDM data to identify causal factors in loss of control.
- Assure an state of the art cold weather operations for pilots and ground crew training.

Conclusions:

We MUST reduce risk factor and accident rate.

Training is the the key to break the chain of events at multiple points and prevent the LOC-I's.

Thanks for your attention