LOC-I Symposium

22th - 24th June, 15

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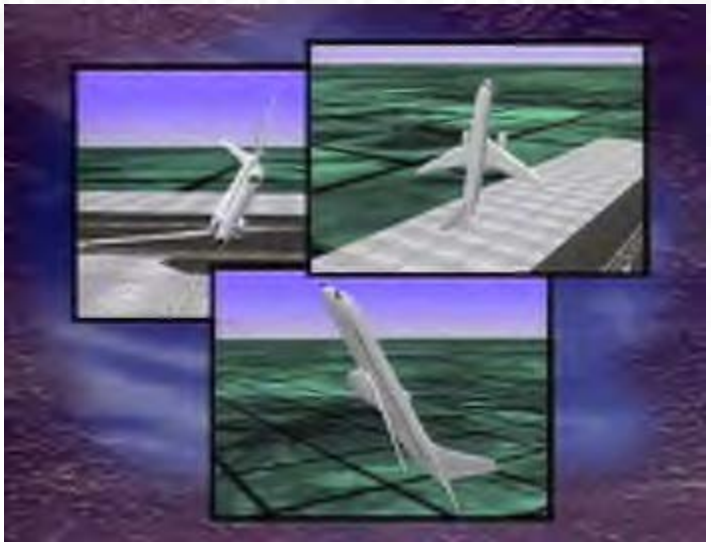
Loss of control in-flight definition

Includes a significant, unintended departure of the aircraft from controlled flight, the operational flight envelope, or usual flight attitudes. "Significant" implies an event that results in an accident or incident. This definition excluded catastrophic explosions, CFIT, runway collisions, complete loss of thrust that did not involve loss of control, and any other accident scenarios in which the crew retained control. This does include loss of control, due to aircraft design, aircraft malfunction, human performance, and other causes. (CAST)

While specific values may vary among airplane models, the following unintentional conditions generally describe an airplane upset:

- Pitch attitude greater than 25 deg, nose up.
- Pitch attitude greater than 10 deg, nose down.
- Bank angle greater than 45 deg.
- Within the above parameters, but flying at airspeeds inappropriate for the conditions.



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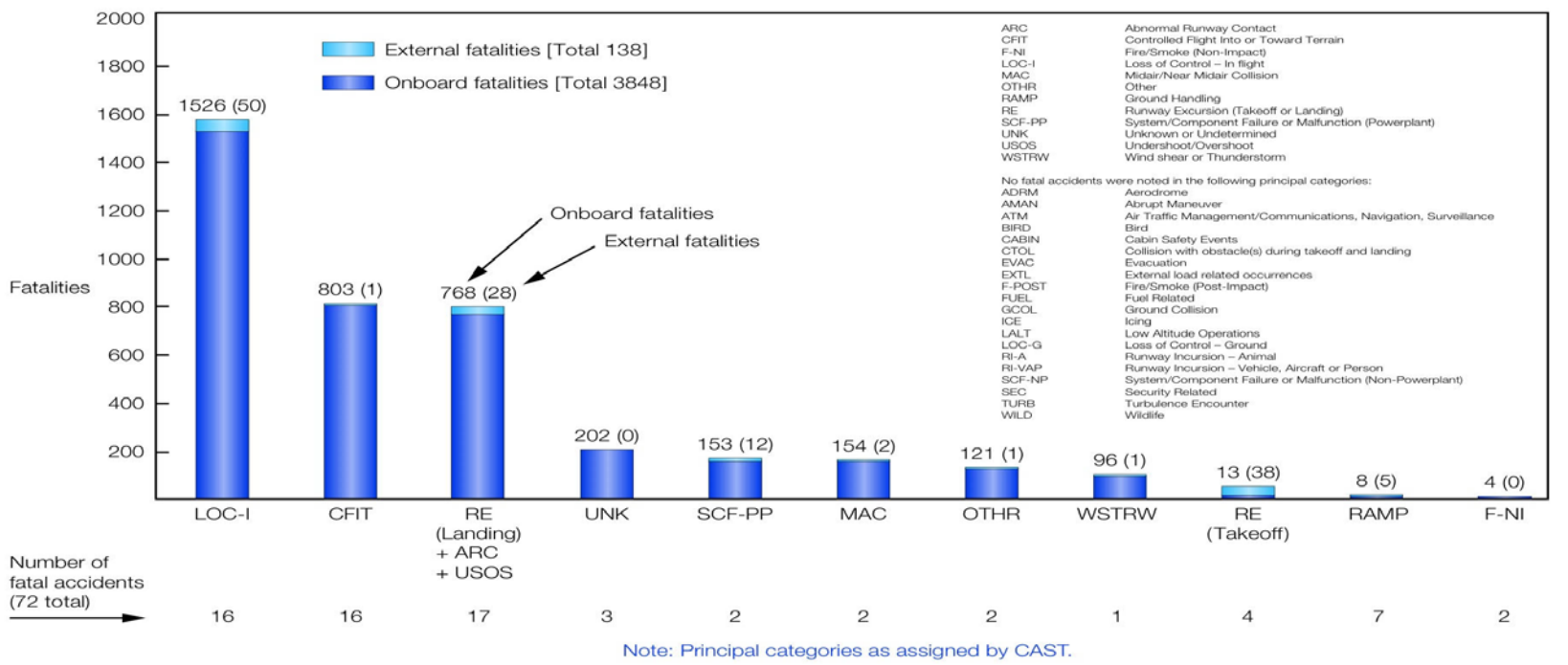
Boeing annual report on international accidents

Loss of control has become the leading cause of jet fatalities worldwide. Aside from their frequency of occurrence, accidents resulting from loss of aircraft control seize the public's attention due to the large numbers of fatalities in a single event. Below is a



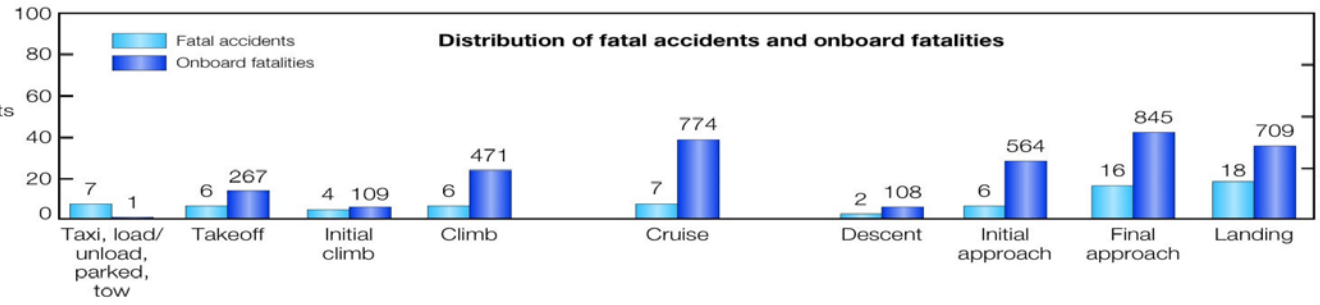
Accidents by flight phase (Boeing)

Fatal Accidents and Onboard Fatalities by Phase of Flight

Worldwide Commercial Jet Fleet | 2004 through 2013

Percentage of fatal accidents and onboard fatalities

	Taxi, load/ unload, parked, tow	Takeoff	Initial climb	Climb (flaps up)	Cruise	Descent	Initial approach	Final approach	Landing
		14%						47%	
Fatal accidents	10%	8%	6%	8%	10%	3%	8%	22%	25%
Onboard fatalities	0%	7%	3%	12%	20%	3%	15%	22%	18%
		10%						40%	
Exposure (Percentage of flight time estimated for a 1.5 hour flight)		1%	1%	14%	57%	11%	12%	3%	1%



Note: Percentages may not sum precisely due to numerical rounding.

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Causes of LOC-In-flight

- Lack of external visual references.
- Flight crew impairment.
- Training.
- Airplane maintenance.
- Safety culture.
- False instrument readings displayed to the flight crew.
- Loss of situational awareness through distraction or complacency.
- Unintentional mismanagement of aircraft systems/ System knowledge.
- Crew resource management (CRM).
- Automation confusion/ Awareness.
- Ineffective alerting.
- Inappropriate control actions.
- Low level wind shear and turbulence (Wake spacing and clear air turbulence).
- Fuel exhaustion or starvation.
- Structural or multiple power plant damage caused by, for example, by a bird strike or collision with another aircraft.

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Mitigation

- Design/Eliminate the hazard
- Safety devices to minimize risk
- **Detect/Warn**
- **Procedures/Training**
- **Placards**

- **Avoid:** Avoidance is usually tied to 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.

- **Detect:** Detection is tied to the detect/warn category of mitigations and these mitigation strategies but may also include training to recognize the onset of a hazardous situation.

- **Recover:** Recovery is the last line of defense and has strong ties to the procedures/training category, but may also benefit from automatic systems, safety devices and warning devices to aid in the recovery of the vehicle.

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Thank You

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