

International Railway Safety Council - 2018

Dublin, Ireland

'The continued quest for zero air accidents'

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"There is nothing dangerous in flying except complacency"

Orville Wright 1903



September 1908 - Fort Meyers, Virginia, USA



Lieutenant Thomas Selfridge fatally injured

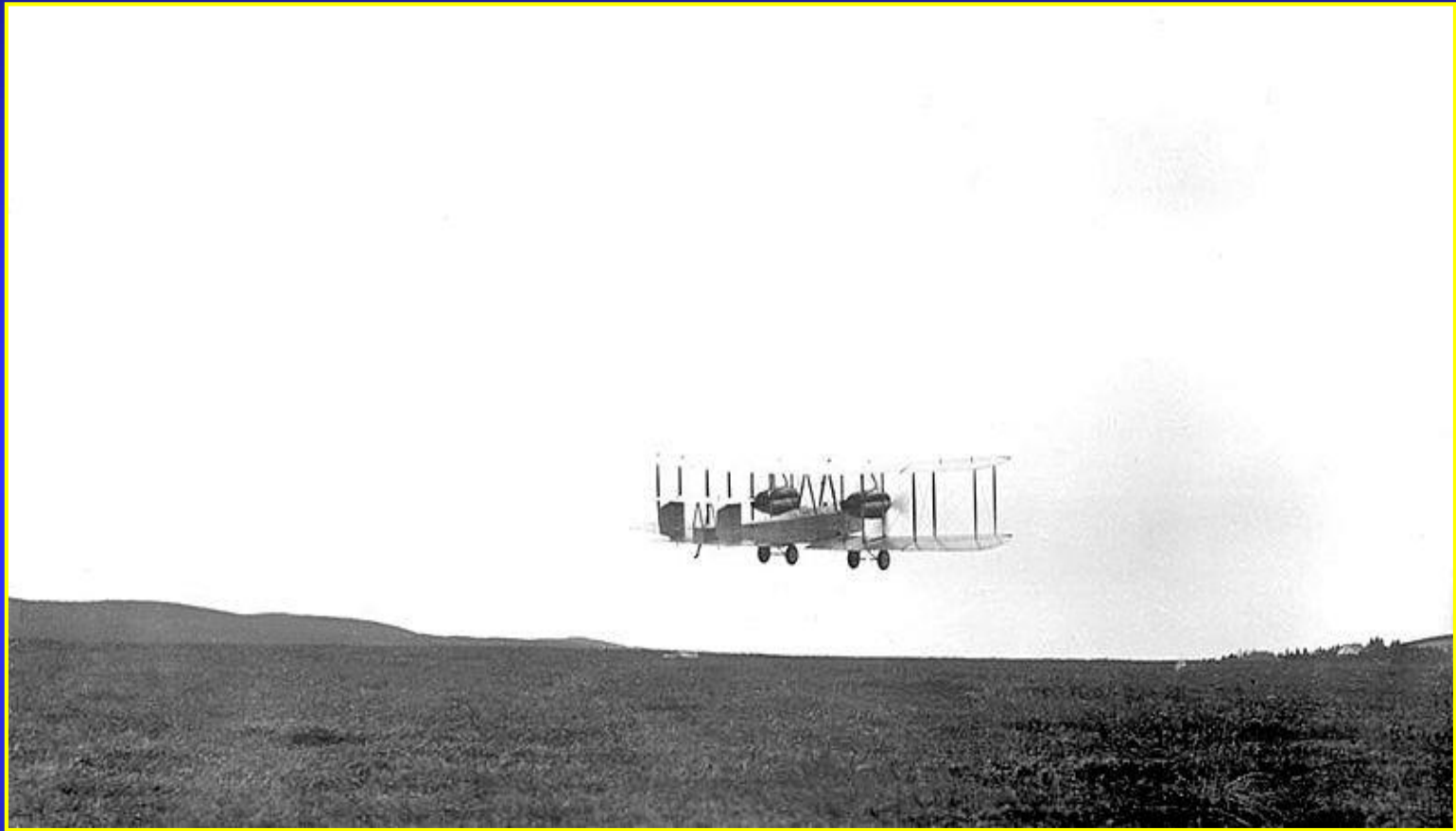


RISK

“The possibility of incurring misfortune or loss”



Advancement in Aviation - Long Range Navigation



**Alcock and Brown – first non-stop WEST to EAST transatlantic flight
in June 1919 from St. John's, Newfoundland to Clifden, Ireland.**



Long Range Navigation



Took-off from Baldonnell Aerodrome, Dublin - 12 April 1928

Landed Greeny Island, Newfoundland - 13th April 1928

Evolution of the Aviation System

- Potential of aviation as a mass transport system.
- Ability to cross vast oceans, borders and bring wealth to/from nations.
- A need to build confidence.
- Have an orderly development of a safe aviation system.



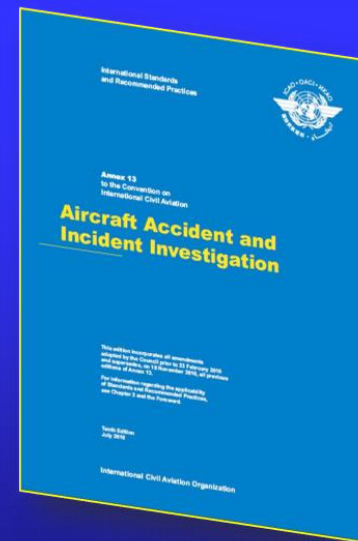
International Civil Aviation Organisation (ICAO)

- In 1944: Chicago Convention on International Civil Aviation was signed (52 States).
- In 1947: Convention set up the International Civil Aviation Organization (ICAO) - *Means to secure international co-operation and the highest possible degree of uniformity in regulations, standards, procedures and organisation.*
- Standards and Recommended Practices (SARPS) were developed and prescribed through Annexes.
- Currently 19 Annexes.
- Supported by extensive documentation/guidance material.



International Civil Aviation Organisation (ICAO)

- **Template for the development and implementation for all aspects of the aviation system.**
- **Provisions set at a minimum acceptable standard of safety for the inclusion of all states.**
- **Provides the basis for State Aviation Regulation.**
- **Operator requirements.**
- **Annex 13 Investigation.**
- **National and European Regulations.**
- **Ever evolving.**



Investigating Body or Entity (Annex 13)

- Each Member State shall ensure that safety investigations are conducted or supervised, without external interference, by a permanent national civil aviation safety investigation authority capable of independently conducting a full safety investigation.
- The safety investigation authority shall be functionally independent in particular of aviation authorities responsible for airworthiness, certification, flight operation, maintenance, licensing, air traffic control or aerodrome operation and, in general, of any other party or entity the interests or missions of which could conflict with the task entrusted to the safety investigation authority or influence its objectivity .
- The safety investigation authority shall, in the conduct of the safety investigation, neither seek nor take instructions from anybody and shall have unrestricted authority over the conduct of the safety investigations.



Objectives of the Investigation (Annex 13)

- The sole objective of the investigation of an accident or serious incident shall be the prevention of similar type occurrences in the future.
- Learn from mistakes, errors, omissions, technical/operational failures – recommend change when appropriate.
- Safety investigations shall in no case be concerned with apportioning blame or liability.
- They shall be independent of, separate from and without prejudice to any judicial or administrative proceedings to apportion blame or liability.
- Investigation Private and Confidential.



Obligations to Investigate

Accident

- **Fatality – Serious Injury – Damage – Structural Failure.**

Serious incident

- **An incident involving circumstances indicating that there was a high probability of an accident associated with the operation of an aircraft.**

Incident

- **An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.**

Early years: Investigative authorities were reactive to the investigation of *'Accidents'* only.



Shannon Airport – gateway to the west



President Airlines Shannon Estuary 10 Sept 1961



6 crew - fatal
77 passengers - fatal



President Airlines - Shannon Estuary 10 Sept 1961

Probable Cause

“Failure of the captain to maintain control of the aircraft after becoming airborne due to either:

A defective artificial horizon

and/or

A fault in the right hand aileron tabs”.

“Contributory causes could have been unsuitable weather conditions and possible crew fatigue”.



AAIU Flight Recorder Download Facility



Investigations identified common Contributory Factors

Technical – unreliability of engines/systems.

Mechanical failures.

Airborne Instrumentation.

Ground Navigation Equipment.

Air/ground Communications.

Weather.

Fatigue.



Associated Common Occurrence Categories

- **Runway Excursion (RE)** – lateral veer off or overrun of a runway.
- **Loss of Control in Flight (LOC-I).**
- **Controlled Flight into Terrain (CFIT)** – collision with terrain, water, obstacle.
- **Abnormal Runway Contact (ARC)** – hard landing.
- **System/Component Failure or malfunction (SCF)** – related either to its design, the manufacture process or maintenance.



Lessons Learnt

- Investigation of accidents – brutal approach.
- *'Blood on Seats'*.
- Improve Regulation.
- Regulatory Oversight.
- Oversight by the Operator.
- Training.
- Utilisation of Technology.
- **SAFETY** being increasingly viewed as the management of **RISK**.



Investigative bodies adopted a Proactive Approach through the Investigation of Serious Incidents.

Need for access to relevant safety critical information

Investigations of Serious Incidents required a positive non-punitive safety reporting culture.



Occurrence Reporting - Regulation (EU) No 376/2014

- Regulation aims to improve aviation safety by ensuring that relevant safety information relating to civil aviation is reported, collected, stored, protected, exchanged, disseminated and analysed.
 - that, where appropriate, safety action is taken in a timely manner based on analysis of the information collected;
 - the continued availability of safety information by introducing rules on confidentiality and on the appropriate use of information and through the harmonised and enhanced protection of reporters and persons mentioned in occurrence reports; and
 - that aviation safety risks are considered and dealt with at both Union level and national level.

"Just Culture" in which air operators and other operators are not punished for actions, omissions or decisions taken by them which are commensurate with their experience and training, but where gross negligence, wilful violations and destructive acts are not tolerated.



Flight Data Monitoring (FDM)

- FDM has played a crucial role in enhancing aviation safety.
- FDM is the systemic, proactive use of digital flight data from routine flight operations.
- FDM programmes assist an operator to identify, quantify, assess and address operational RISKS – identify emerging threats and trends.
- Exceedances are set against the normal expected flight regimes.
- Operators download all FDM information at the end of flight operations.
- Automatic comparison is made between the actual flight and the normal expected flight regime.
- Any exceedances are automatically brought to the attention of the FDM 'Gate Keeper'.
- Investigation undertaken by the Operators Safety Office.
- Safety critical exceedances brought to attention of the Investigation body.



Reported Events in Ireland and/or to Irish Registered aircraft abroad



Case Study - Santry Cross



Safety Oversight

- ICAO requires the state to establish a State Safety Programme to achieve an acceptable level of safety in aviation operations.
- State Safety Oversight – ICAO check state's compliance with the provision of the 19 Annexes through the Universal Safety Oversight Audit Program (USOAP). In 2010 – 10,000 state protocol questions had to be answered ...
- Aviation Regulator – audited by the European Aviation Safety Agency (EASA).
- Operators/Maintainers, Service providers and Aerodrome Operators are required to implement a Safety Management System (SMS) – organised approach to managing safety, including the necessary organisational structures, accountabilities, policies and procedures.
- Risk Analysis and Mitigation.
- Threat/Error management (TEM) and Crew Resource Management (CRM).



Evolution of technology - Jet aircraft

- **From 1952:** Dials and gauges in cockpit - early auto-flight systems.
- **From 1964:** More elaborate auto-pilot and auto-throttle systems.
- **From 1980:** Electronic cockpit displays, improved navigation performance and terrain avoidance systems to reduce Controlled Flight into Terrain (CFIT) accidents.
- **From 1988:** Fly-by-wire technology enabled flight envelope protection, to reduce Loss of Control in Flight (LOC-I) accidents.

Traffic Collision Avoidance Systems (TCAS).

Enhanced Ground Proximity Warning Systems (EGPWS).

Unmanned Aircraft Systems (UAVs).....

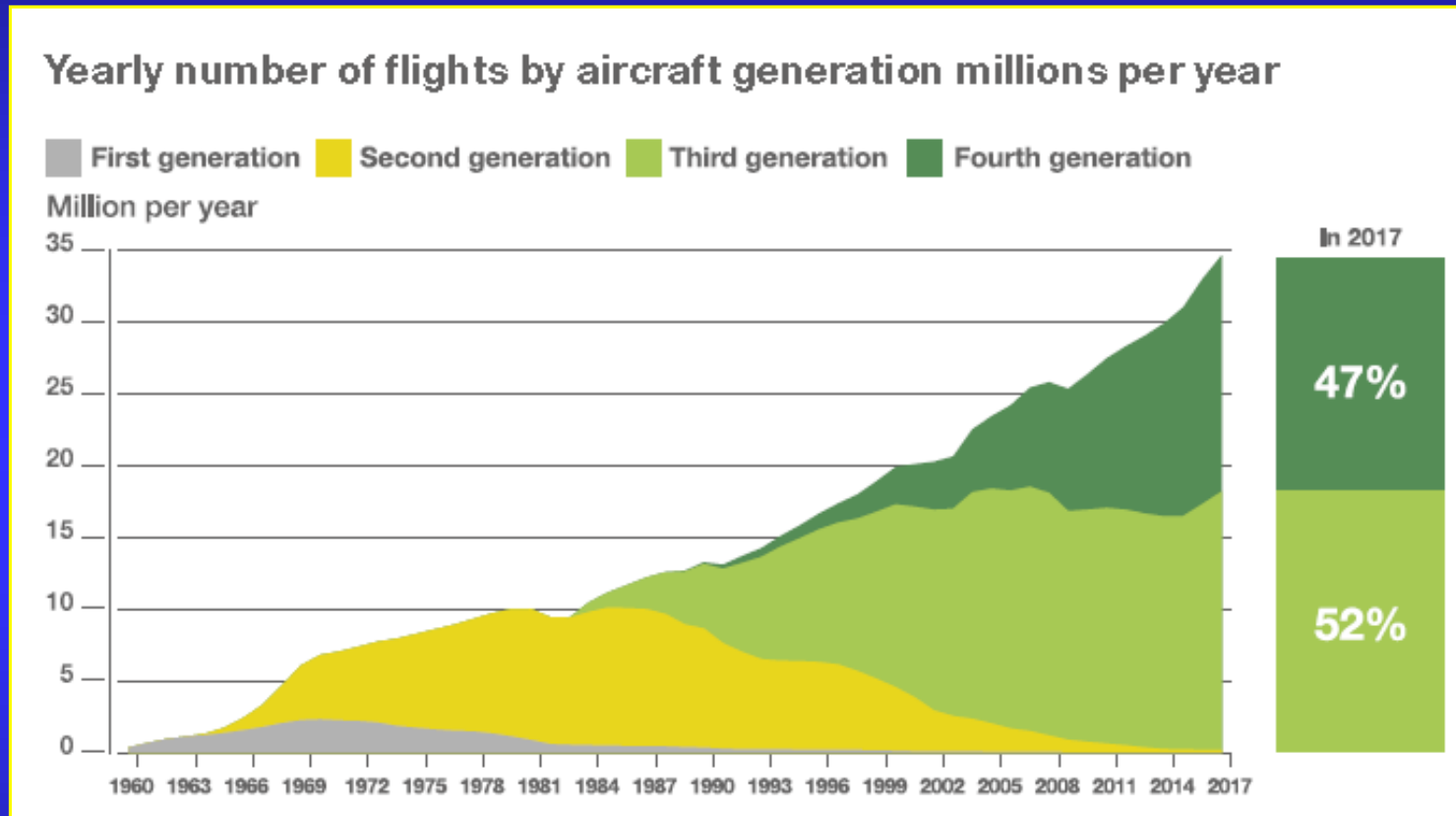


How technology has enhanced aviation safety

- Lowest sustained fatal accident rate of FIRST generation jets was around 3.0 per million flights.
- Lowest sustained fatal accident rate of SECOND generation jets was around 0.7 per million flights – meaning a reduction of almost 80% between generations.
- THIRD generation jets now achieve about 0.2 accidents per million flights, a reduction of around a further 70%.
- FOURTH generation jets have the lowest accident rate of all, at a stable average rate of about 0.1 accidents per million flights which is a further 50% reduction compared to the THIRD generation.
- CFIT accidents - reduction of 85% from SECOND to THIRD generation.
- LOC-I accidents - reduction of 75% from THIRD to FOURTH generation.



Evolution of the commercial air transport fleet



Source: Airbus

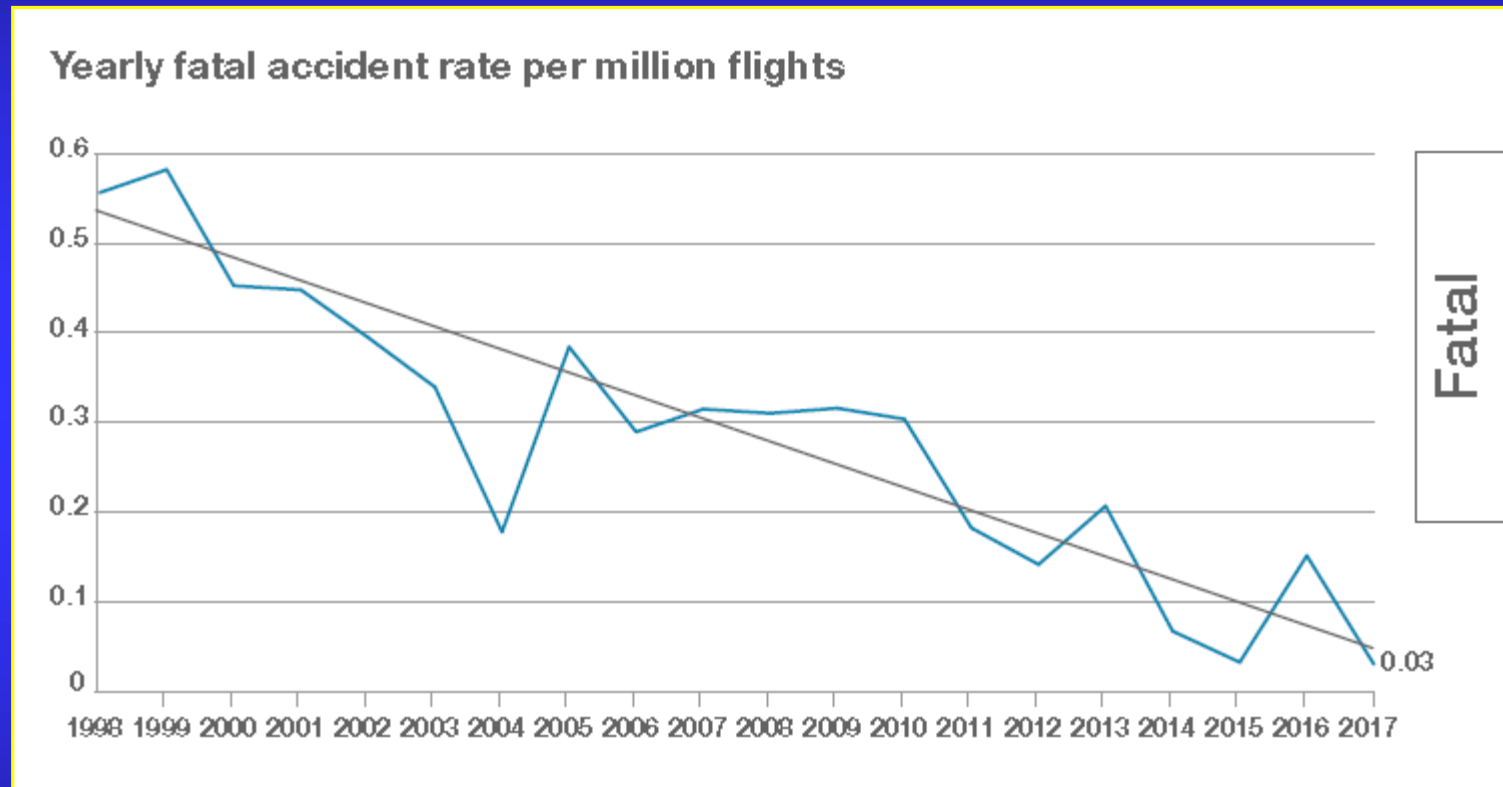


Runway Excursion (RE) Accidents – area of concern

- Most of the accidents over the past 20 years occurred during the approach and landing phase.
- Highly complex flight phases – place significant demands on the flight crew in terms of navigation, aircraft configuration changes, communications (ATC), congested airspace and degraded weather conditions.
- This confluence of high workload and the increased potential of unanticipated circumstances is exactly the kind of complex interplay of contributing factors that can lead to accidents.
- Most longitudinal Runway Excursions (RE) are related to aircraft energy management. (RE) accidents rates will improve with the introduction of real time energy and landing performance based warning systems.



Since 1998 fatal accident rate has been reduced by around 95%



Source: Airbus



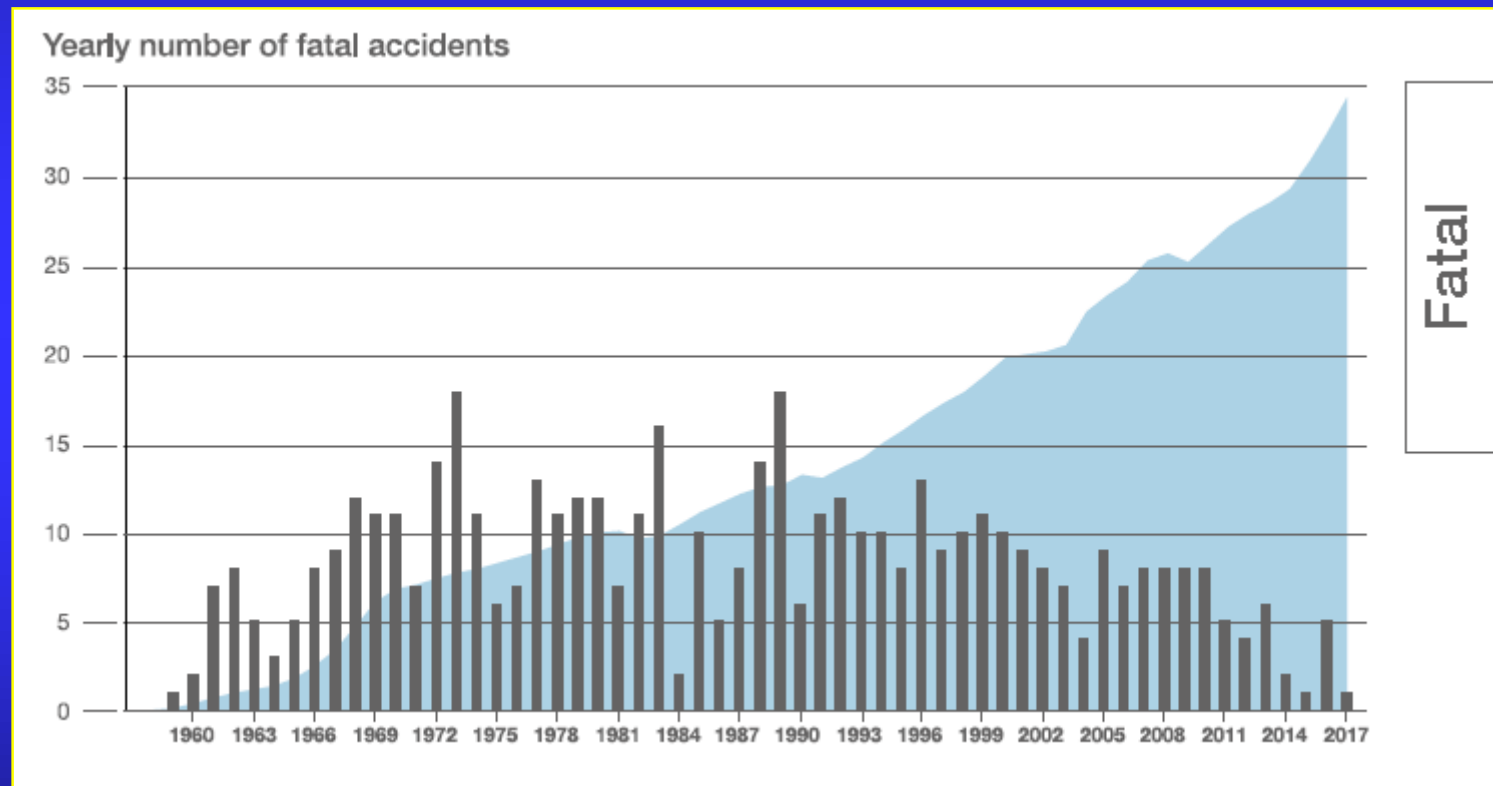
Commercial Aviation Accidents - 2017

- Airlines recorded zero accident deaths in commercial passenger jets last year, making 2017 the safest year on record for commercial air travel.
- 10 fatal airliner accidents resulting in 44 fatalities on-board and 35 persons on the ground, including cargo planes and smaller commercial passenger turbo prop aircraft.
- Worldwide, commercial airlines carried just over four billion passengers on scheduled flights in 2017.
- Flight departures - 35m flights.
- In-service fleet - 24,550 aircraft.



Number of Flights v Accidents

No growth in the number of accidents despite a significant increase in activity.



Source: Airbus



The reality is.....

- Historical data shows air traffic doubles every 15 years.
- Industry planning to deliver 2000 new aircraft per year by 2019.
- Increase in the world fleet of 21,430 aircraft by 2036.
- Growth must be supported by proportional increase in the number of appropriately trained personnel.
- If accident rate stays the same, the industry's increased exposure to accidents, in numerical terms, is in direct proportion to this increase in activity.
- More flights will mean more accidents unless we work to decrease the accident rate.



“Now more than ever, we must avoid complacency and remember to keep our minds clearly focused on new hazards and emerging threats”.

THANK YOU

