Brace for Impact
Time for a new position?

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www.cranfield.ac.uk
Thank you
Between 2013 and 2017:

- The most common accident was Runway/Taxiway Excursion, followed by Gear Up Landing/Gear Collapse and Hard Landings, in that order.

- The top three latent conditions contributing to accidents were Regulatory Oversight, Safety Management and Flight Operations.

- The top three threats were Weather, Aircraft Malfunction and Wind/Wind Shear/Gusts.

Source: IATA, 2018
Safety on board

- Read the safety card
- Listen to the pre-flight safety briefing
- Do what the cabin crew tell you to do in an emergency
16.5.4 The Brace Position

The brace position can be described as the position a passenger should adopt in order to minimize the injuries associated with the rapid deceleration forces of an aircraft impacting the surface.

Each accident is different and the forces of impact vary; however, a passenger adopting a suitable brace position is more likely to be able to evacuate themselves following an impact.

There is no global standard for brace positions and these can vary according to the seat type, direction of travel and restraint type used. Operators should determine their brace positions based on State regulations and research.
What to do with hands?
What to do with hands?
What to do with hands?

THOR - advanced 50th percentile male dummy
What to do with legs?

In an emergency, fasten your seat belt tightly and take a position to protect yourself against impact.
What to do with legs?
So what is the best brace position?

Recommendations from previous research

CAA (1995)  
TUV Germany (2006)  
FAA (2015)

Which brace position will increase survivability?
Current ICAO Guidance — *Doc 10086*

**BRACE 1**
- Feet behind knees
- Torso towards knee
- Hands on head

**BRACE 2**
- Feet behind knees
- Torso towards knee
- Hands beside leg or holding ankles
Passengers are becoming larger on average

- “Obese occupants have higher risks of fatalities and injuries in frontal crashes than normal-weight individuals. In particular the chest and the lower extremities are the body regions that are more likely to be injured for obese than non-obese occupants.”

  (Jones, Ebert, Hu and Reed, 2017)

- Approximately 30% of the World’s population are either overweight or obese.
“…current seating space designs may not adequately accommodate a significant proportion of the intended users at present, a situation that will not improve if the trend towards increasing passenger widths continues.”

(Molenbroek, Albin and Vink, 2017)
Testing options – the original way
Testing options – whole aircraft tests
Testing options – sled testing
Testing options – finite element modelling

Source: TASS International
• Is the airline industry fundamentally committed to a particular way of thinking about passenger post-crash survivability?

• If so, does this thinking overly prioritise commercial imperatives?

• Has regulatory inattention to the subject of brace position hindered a more proactive attitude?

• Do oft quoted statistics such as “0.08 serious aircraft accidents per million flying hours” deter the search for more innovative solutions?
How can we account for…

• The different types of accident scenario

• The different seating configurations of aircraft

• The wide variety of passengers and crew
  • e.g. height, weight, flexibility, comprehension, language

• Testing of new seating concepts

• The benefits of a standardised approach

Source: Airbus
place your hands on your knees, and bring your chin towards your chest.
10 things you didn’t know about the new Qantas Business Suite

2. There’s a lap-sash seatbelt

A key safety measure for the gate-to-gate recline is a three-point seatbelt similar to what you wear in a car (and in the first class seat on Qantas’ Airbus A380).

An over-the-shoulder belt combines with the waist-height belt for additional extra restraint during the take-off and landing stages, and can withstand the 16G forces exerted in what is classified as a ‘survivable accident’.
IBRACE (International Board for Research into Aircraft Crash Events)

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