



International Civil Aviation Organization

ICAO Regional Accident Investigation Workshop - Asia and Pacific Regions
(Colombo, Sri Lanka, 25 - 26 June 2015)



Cabin Safety Investigation

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26th June 2015

FOR THE JOURNEY



← **EMBRAER**
Commercial Aviation



← **EMBRAER**
Executive Jets



← **EMBRAER**
Defense and Security



**EMB-110
BANDEIRANTE**



ERJ 145 FAMILY



EMB 120 Brasilia



E-Jets[®]





103 airlines, 61 countries, 1712 aircraft in service
[EJets + ERJs] *March/15



Intelligence, Surveillance and Reconnaissance (ISR) Systems

EMB 145 AEW&C / MP / Multi-Intel



Light Attack and Advanced Training

Super Tucano



Tactical Military Transport

KC-390



Transport of Authorities

Aircraft Modernization

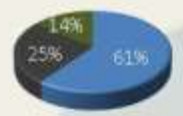
Unmanned Aerial Vehicle (UAV)



ASIA PACIFIC FLEET



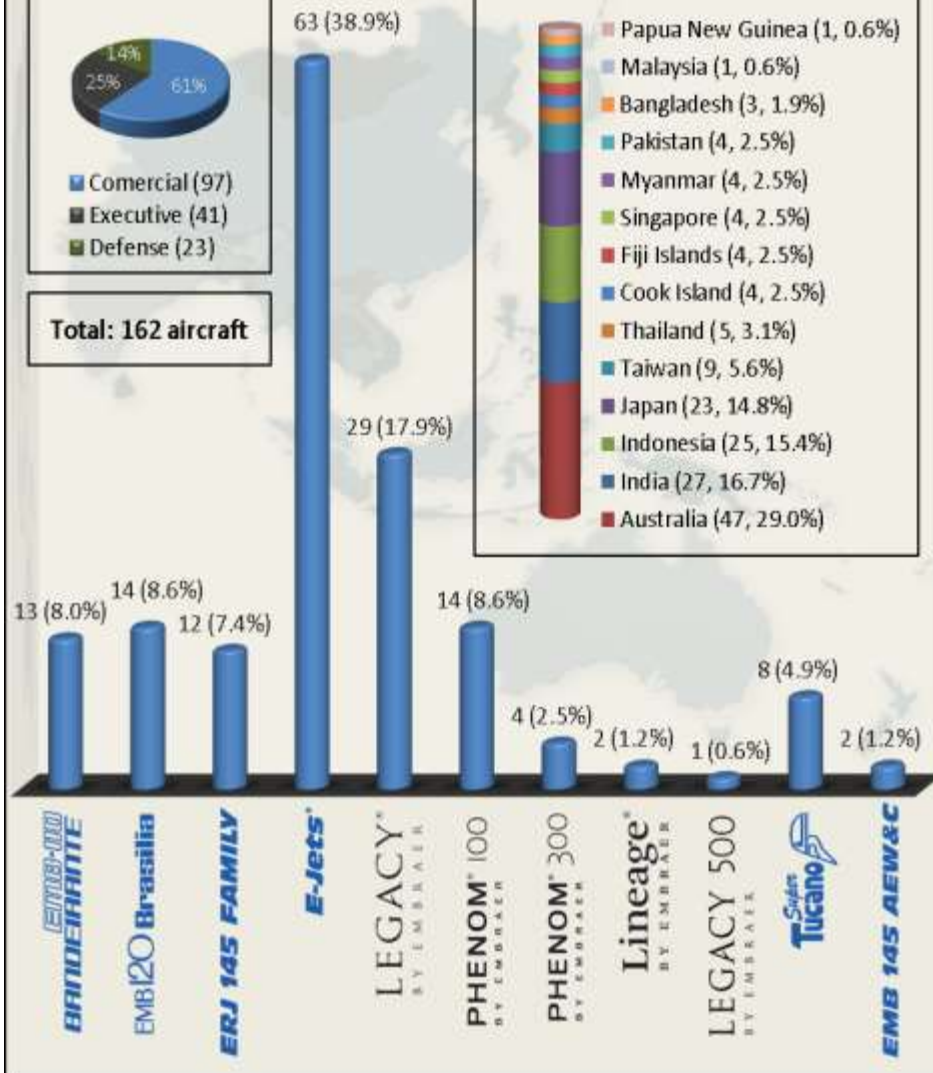
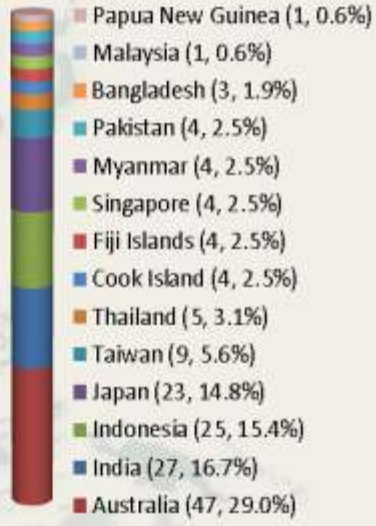
Fleet by Operation



- Commercial (97)
- Executive (41)
- Defense (23)

Total: 162 aircraft

Fleet by Country

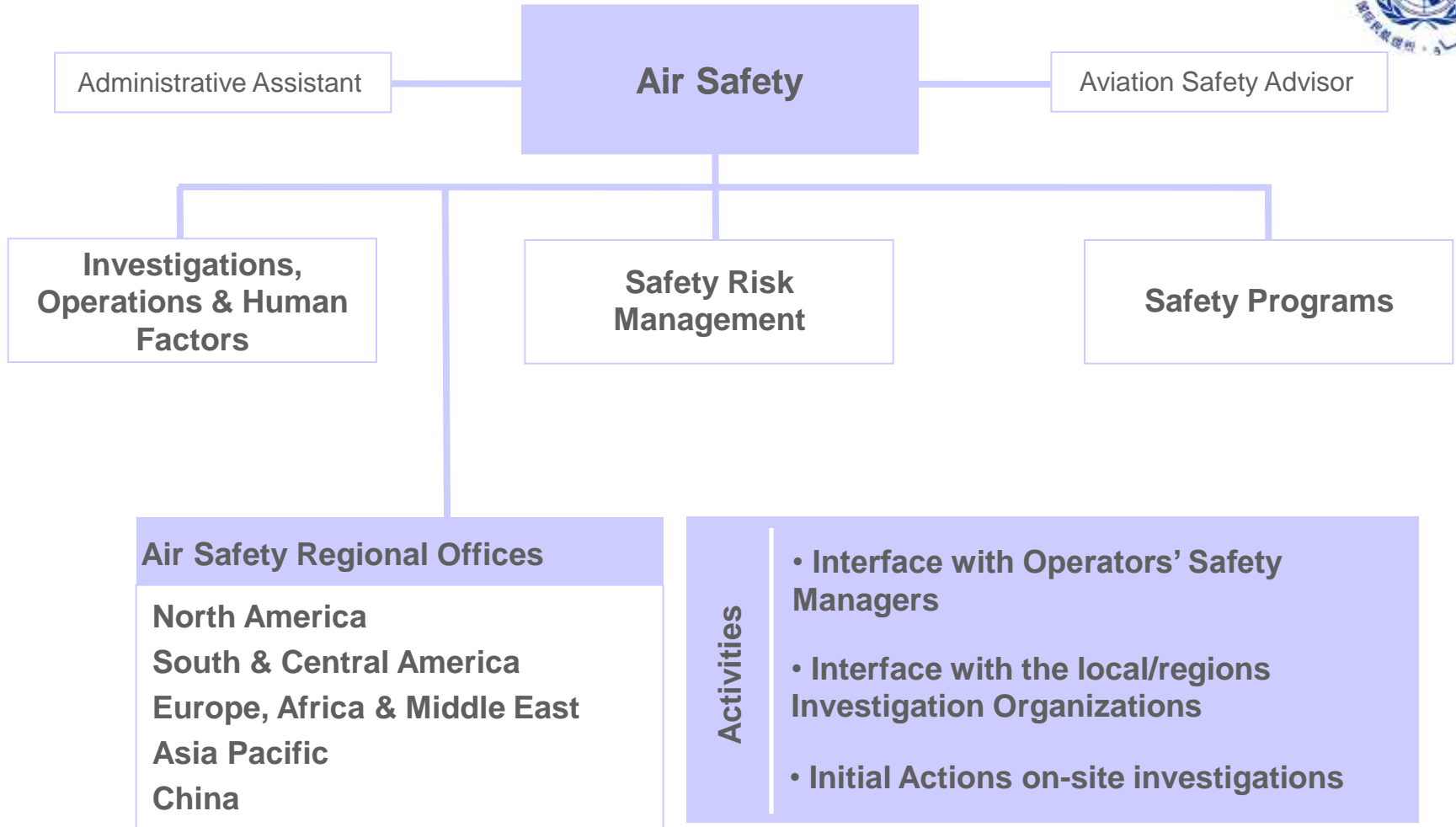


AIR SAFETY TEAM



40 people based in 6 countries

AIR SAFETY TEAM



Cabin Safety Investigations



Cabin Safety Investigations



CASE STUDIES

Cabin Safety Investigations



Model: EMB-110P1

Serial Number: 110-258

Registration: PT-TAW

Date of Occurrence: 28th Jul 2014 14:30 local (17:30 Z)

People on board: 3

Injury: 1 (light)

City: Foz do Iguaçu, PR



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Left Engine



Right Engine



Co-pilot's 5 point harness



Failure of top strap



Cabin Safety Investigations



Cabin Safety Investigations



Model: E190-100LR

Serial Number: 19000223

Registration: B-3130

Date of Occurrence: 24th August 2010, 21:10 local

People on board: 96

Fatalities: 44

Serious Injury: 35

Minor Injury: 17

City: Yichun Lindu Airport, Heilongjiang, China



Source: AFP







Survivable Accident

- Forces transmitted to occupants through the seat and restraint system cannot exceed the limits of human tolerance
- Structure in the occupants' immediate environment must remain substantially intact to the extent that a liveable volume is provided throughout the crash



Crashworthiness

What is aircraft crashworthiness?

Crashworthiness of an aircraft is how well the aircraft protects the occupants in the event of a “survivable” accident.

OBJECTIVE



- TO INCREASE OCCUPANT SAFETY,
- TO IDENTIFY OPPORTUNITIES THROUGH INNOVATIVE SOLUTIONS CONSIDERING AVAILABLE RESOURCES



CANNOT BE USED OR REP



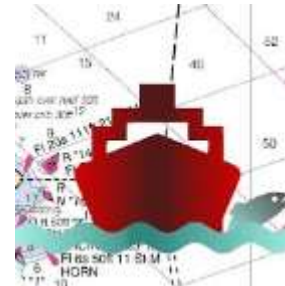
FOR THE



INTRODUCTION - Research Group Members



- Product Development Engineers
- Accident Investigators
- Airworthiness Engineers
- Human Factor Engineers
- R&D Engineers



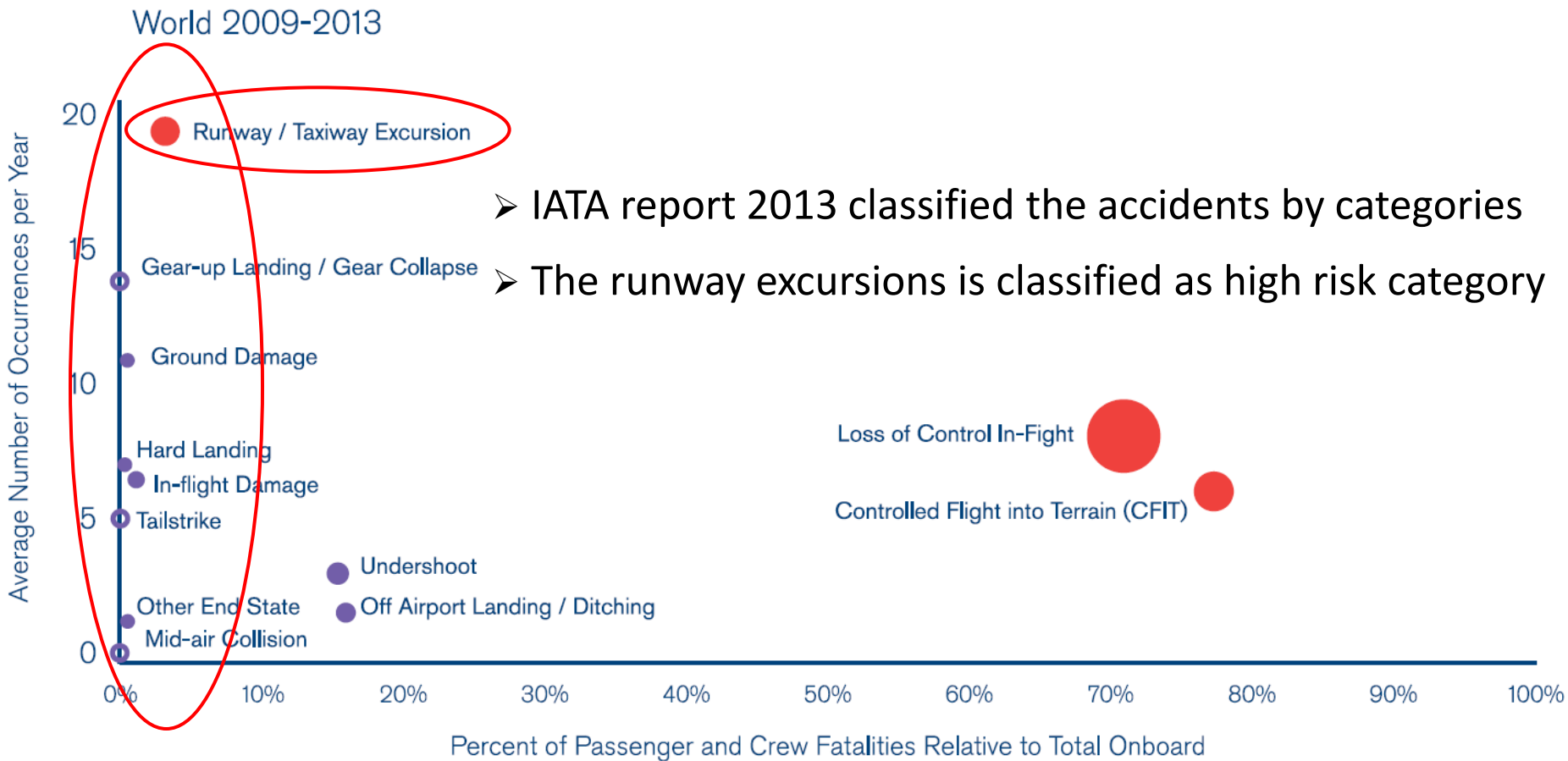
Research & Methodology



Bureau de la sécurité des transports
du Canada

1. Consider accident survivors' interviews and perceptions.
2. Use information from final accident report.
3. Consider crashworthiness aspect of deformation and its consequences on occupant protection and evacuation.
4. Compare and analyse the cabin damage with airworthiness requirements.
5. To pursue cabin improvements within feasible limits.

Survivable Aeronautical Accidents Research



The bubble size increases as the number of fatalities for the category increases
Empty bubbles indicate no fatalities for that category

Survivable Aeronautical Accidents

Runway Excursion



➤ The survivable occurrences often results from hard landings, overruns, land short of runway among others.

➤ The runway excursion was the most frequent type of accident in 2013

(IATA 2013)



FINAL CONSIDERATIONS



Crashworthiness Integration

The analysis of the results confirms that the interaction among all crashworthiness aspects happens simultaneously;

Some items (like interior systems, doors, seats and mass items) are common for occupant protection, evacuation and deformation aspects



➤ Identification of any gaps in the interface between all crashworthiness aspects

FINAL CONSIDERATIONS



Each "survivable" accident involves a very particular condition in terms of structural loads

➤ How to know the loads?

- Floor deformation, seat detachment, fuel lines rupture and the impact forces that affect the escape slide trigger mechanism.

➤ Dislodged overhead bins impede the emergency evacuation procedure.

➤ Escape slides trapping FA inside the aircraft?

Is focusing on the design considerations enough?

FINAL CONSIDERATIONS



- The structural deformation in the areas surrounding the flight crew and flight attendant seat needs to be looked into.
 - How to create additional protection in these areas?
- Crew training is an important aspect since the training supports and contributes to better emergency evacuation which protects the occupants
 - How to enhance the training? ... virtual simulation immersion?

CONCLUSION



- Keyword: Integration
- Understand that an accident or incident can be considered as an unscheduled test and a source of new learning elements.
- Work with other OEMS to do undertake research & development.
- Safety is an investment ... with tangible results...



Thank You!

FOR THE JOURNEY

