



# The Evolution of Unique Interiors...



**...and their effect on cabin safety**

Michelle Albert – The Boeing Company

# Agenda

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- Decades of Design Evolution
- Influencing Factors on Safety
- Today's Challenges
- Looking to the Future

# The Past...

1930's

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## Ford Trimotor, circa 1933



Cabin Lighting

Exposed Metal Seat Frames

Metal Headers  
Square Corners

No PSU's!

Hat Racks

Flight Deck Door  
Step up



## De Havilland DH86, circa 1935

Source: Wikipedia

# The Past...

1940's

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## Douglas DC-3, circa 1940

Venting

Side Facing Seats

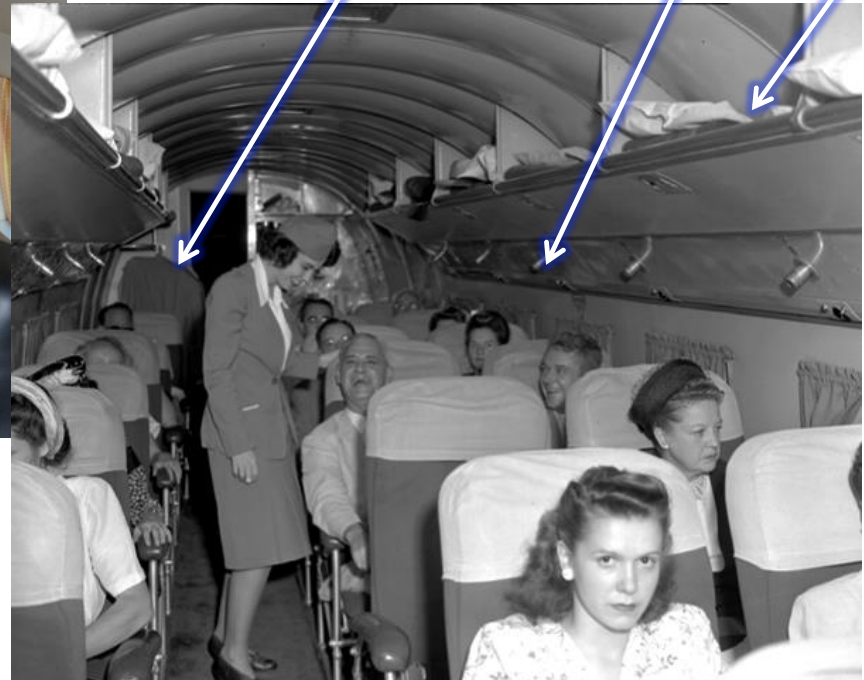


Lamp and Dresser

Aft Facing Seats

Closet

Gasper Air Hat Racks



## Douglas DC-3, circa 1940

Source: Wikipedia

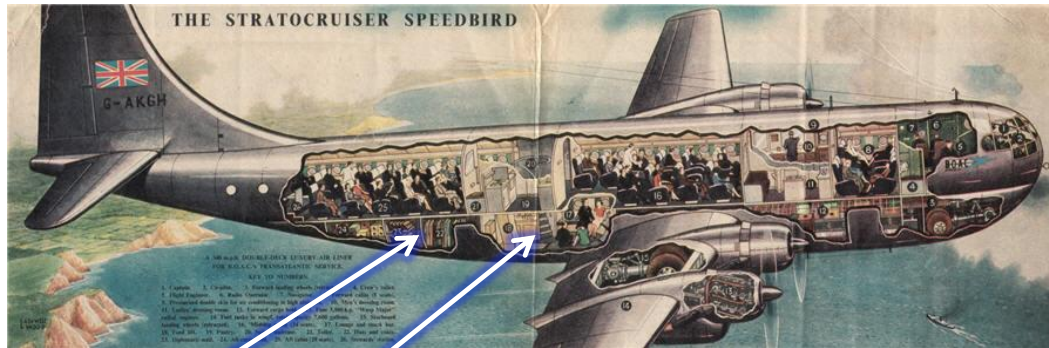


# The Past...

1940's

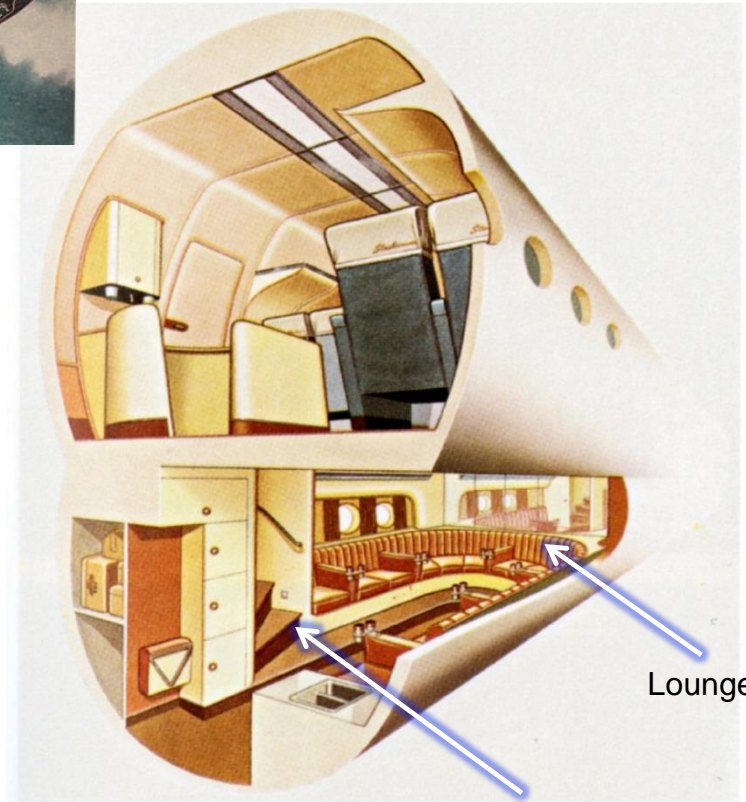
## Boeing 377 Stratocruiser

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Bulk Cargo

Lounge



Lounge

Circular Staircase

Source: "Design Is Mine"

# The Past...

1950's

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## Boeing 707



Gasper Air  
Reading lights

## Douglas DC-8



Knife

## Lockheed - Constellation



Recline



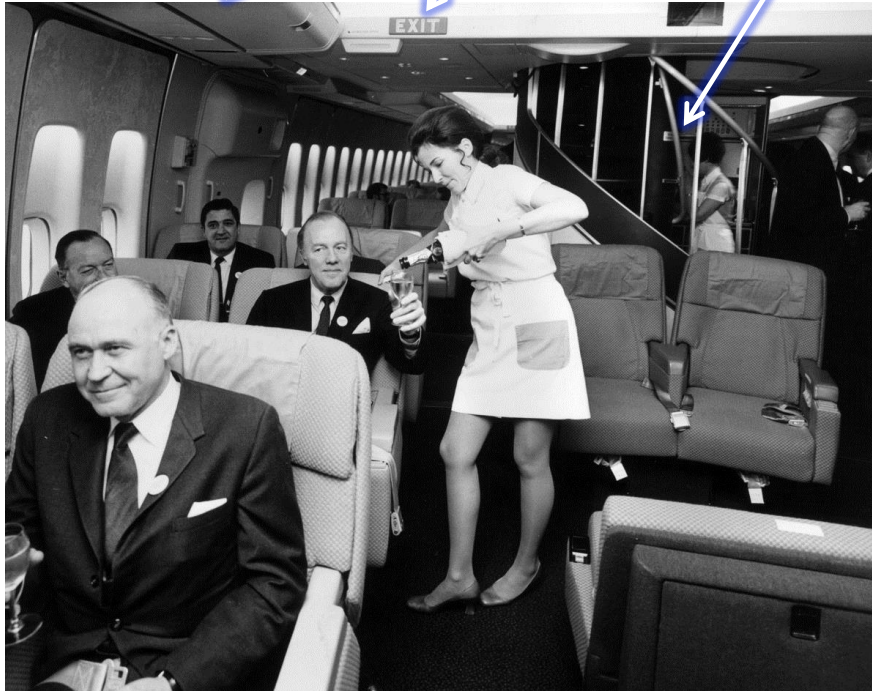
# The Past...

1970's

Bins and PSUs

EXIT

Circular Staircase



**747-100, circa 1970's**

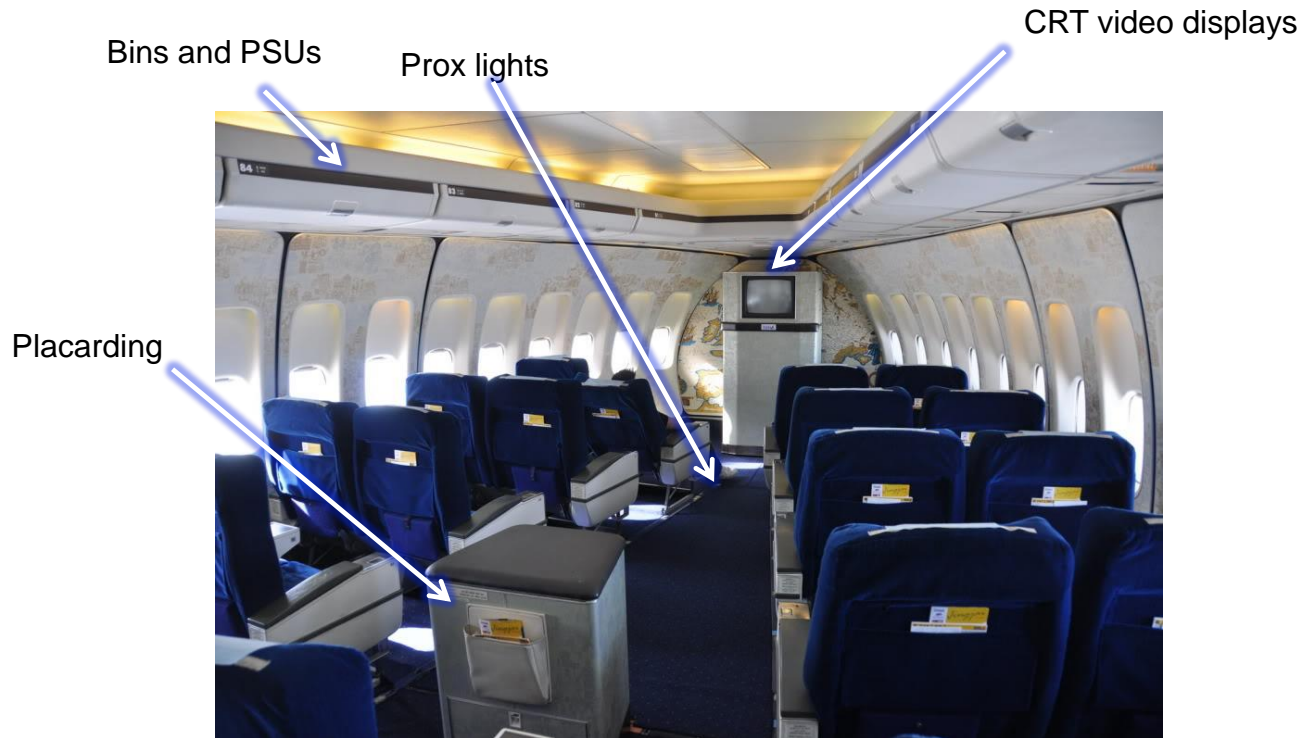


**747-200, circa 1970's**

# The Past...

1970's

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**747-100 First Class, circa 1970**

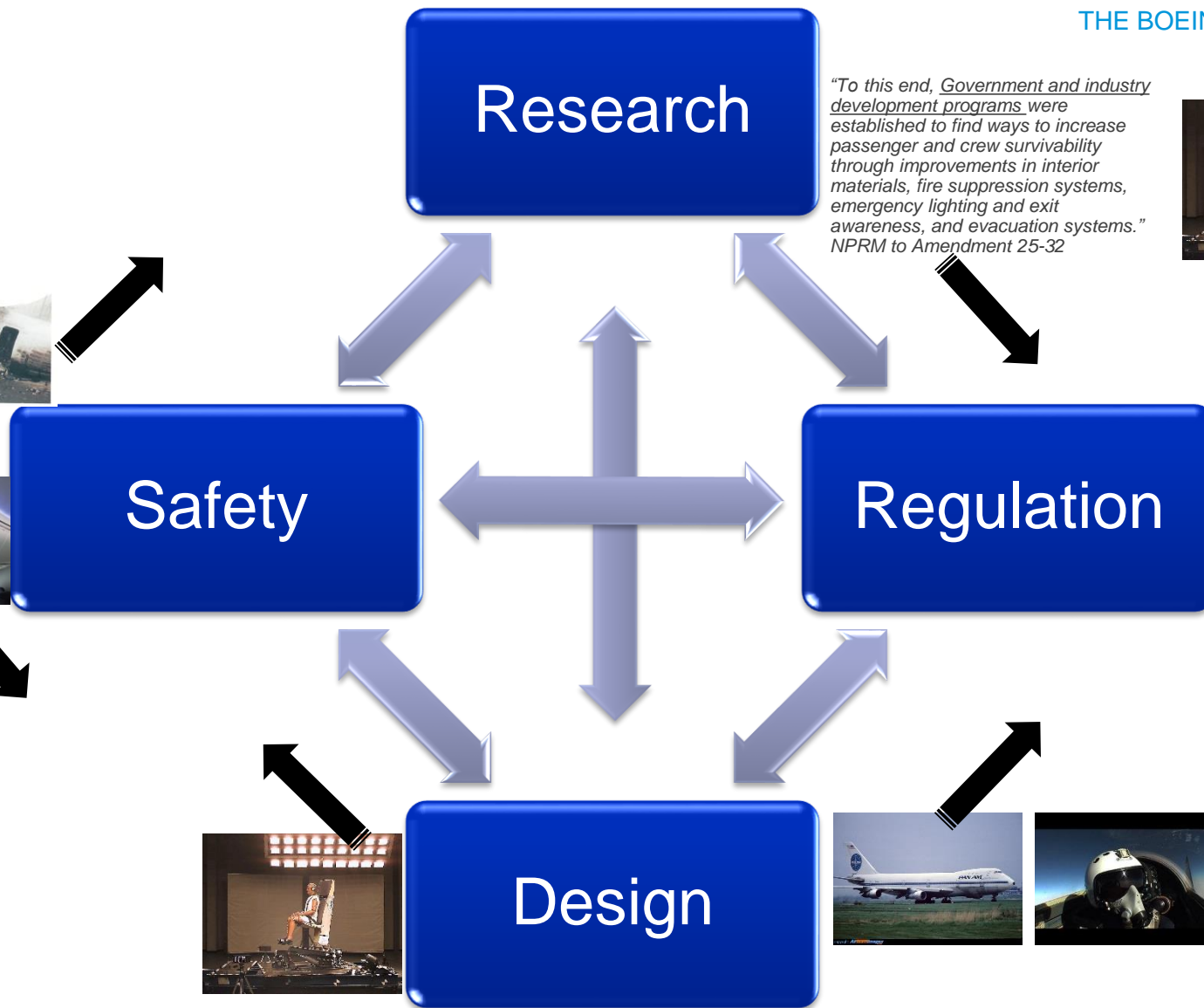
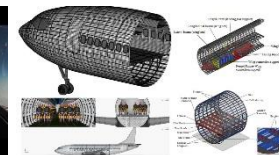
Source: "Airliners"



# Influencing Factors on Safety

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*"To this end, Government and industry development programs were established to find ways to increase passenger and crew survivability through improvements in interior materials, fire suppression systems, emergency lighting and exit awareness, and evacuation systems." NPRM to Amendment 25-32*

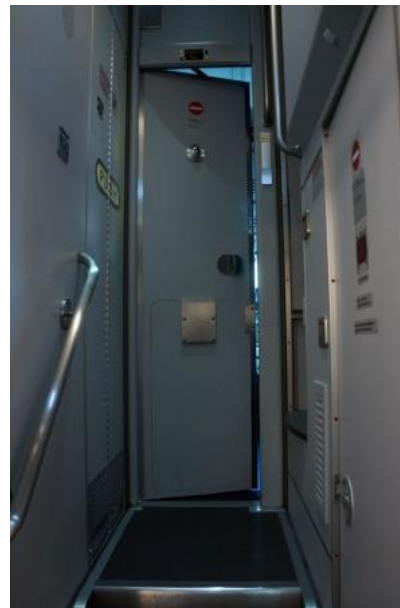
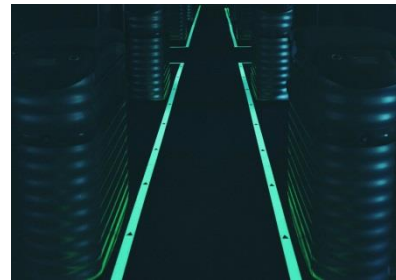
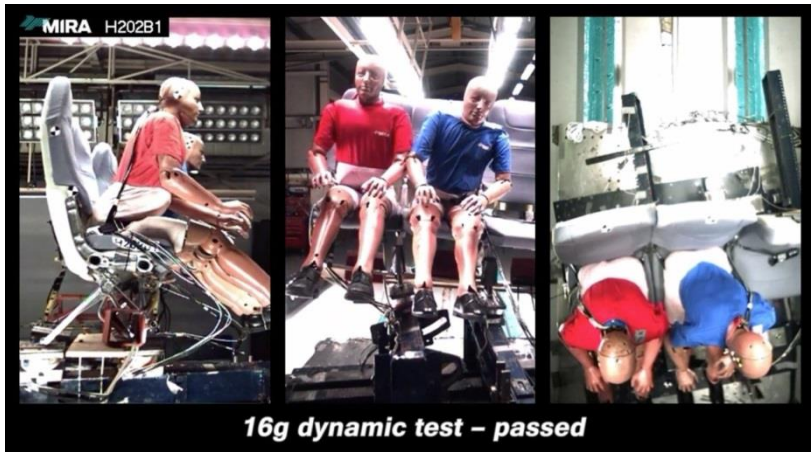


# Influencing Factors on Safety

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## Cabin safety improvements from the last 35 years

- The cabin works as a system to protect the occupants



Direct view

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STANDARD WIRING PRACTICES MANUAL

Wire Separation



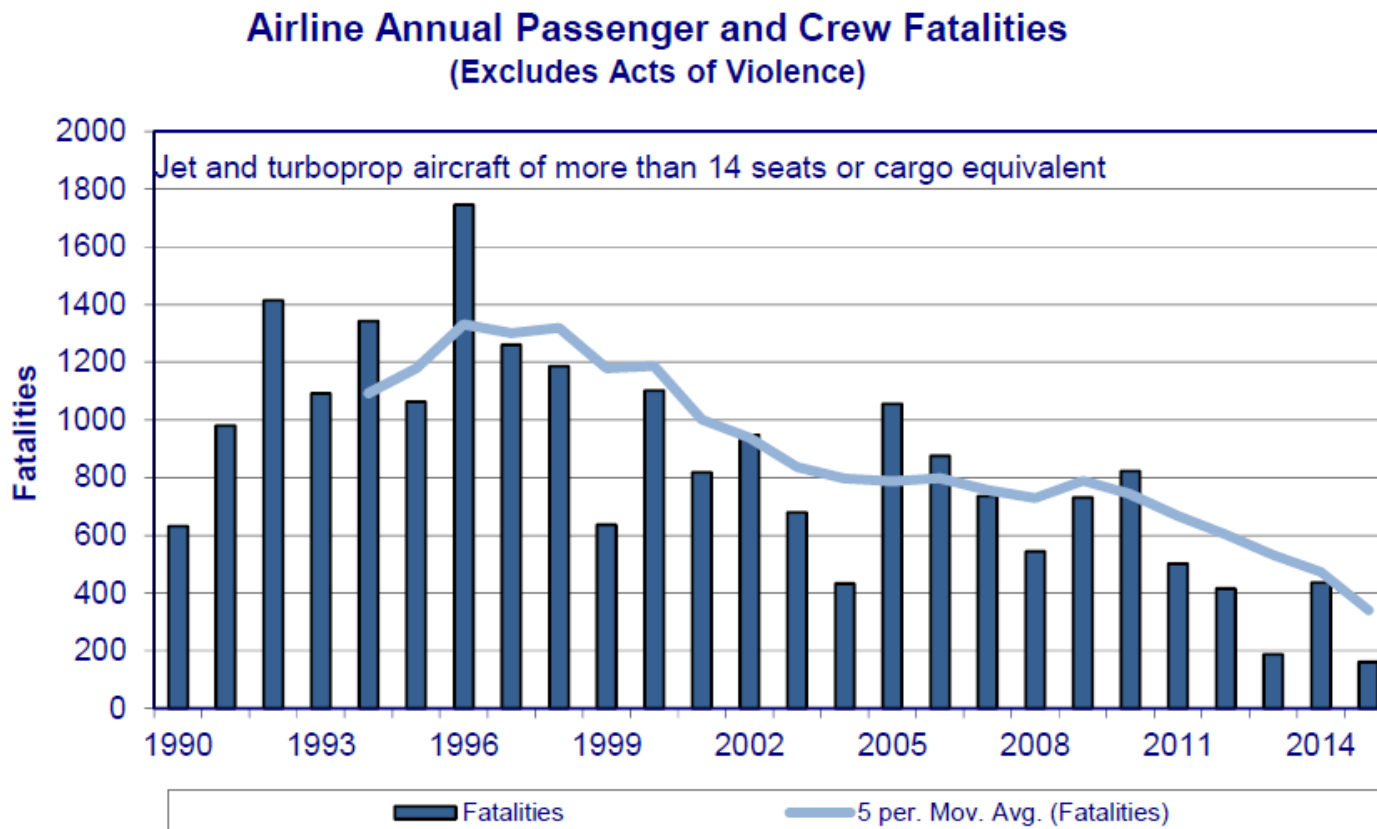
**EWIS**  
Aircraft Electrical  
Wiring Inspection

Source: “Skift” and “Flyer Talk”

# Influencing Factors on Safety

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The continuum of research, regulation, design and safety improvements have led to reduced fatalities



Source: Airlines Safety & Losses Annual Review 2015 – Flightglobal



# Today's Challenges

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- Airlines are increasingly differentiating themselves to attract passengers to fly their airline
  - Showers
  - Bars
  - Unique seats and seating configurations
  - Suites & apartments
  - Lounges
  - Passenger sleeping quarters
  
- Without continued and focused research, we can only assume the increasing safety trend for cabin designs of the future
  - Complexity of designs may require a new approach to rule making

# Today's Challenges

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- Mini-suite certification includes a requirement for attendant training on proper configuration of the doors for taxi, takeoff, and landing



Etihad A380

Source: "Parent", "Pop Sugar" & "Corofloat"

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Emirates 777 "starry skies"

# Today's Challenges

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- How do we know that flight attendant training is necessary to ensure doors are open?
  - Would it suffice to rely on the placarding and general cabin preparations to ensure the doors are open for taxi, takeoff, and landing?
  - Is this an efficient use of time spent training flight attendants?



- With new designs, we need methods to ensure all requirements are effective for maintaining safety

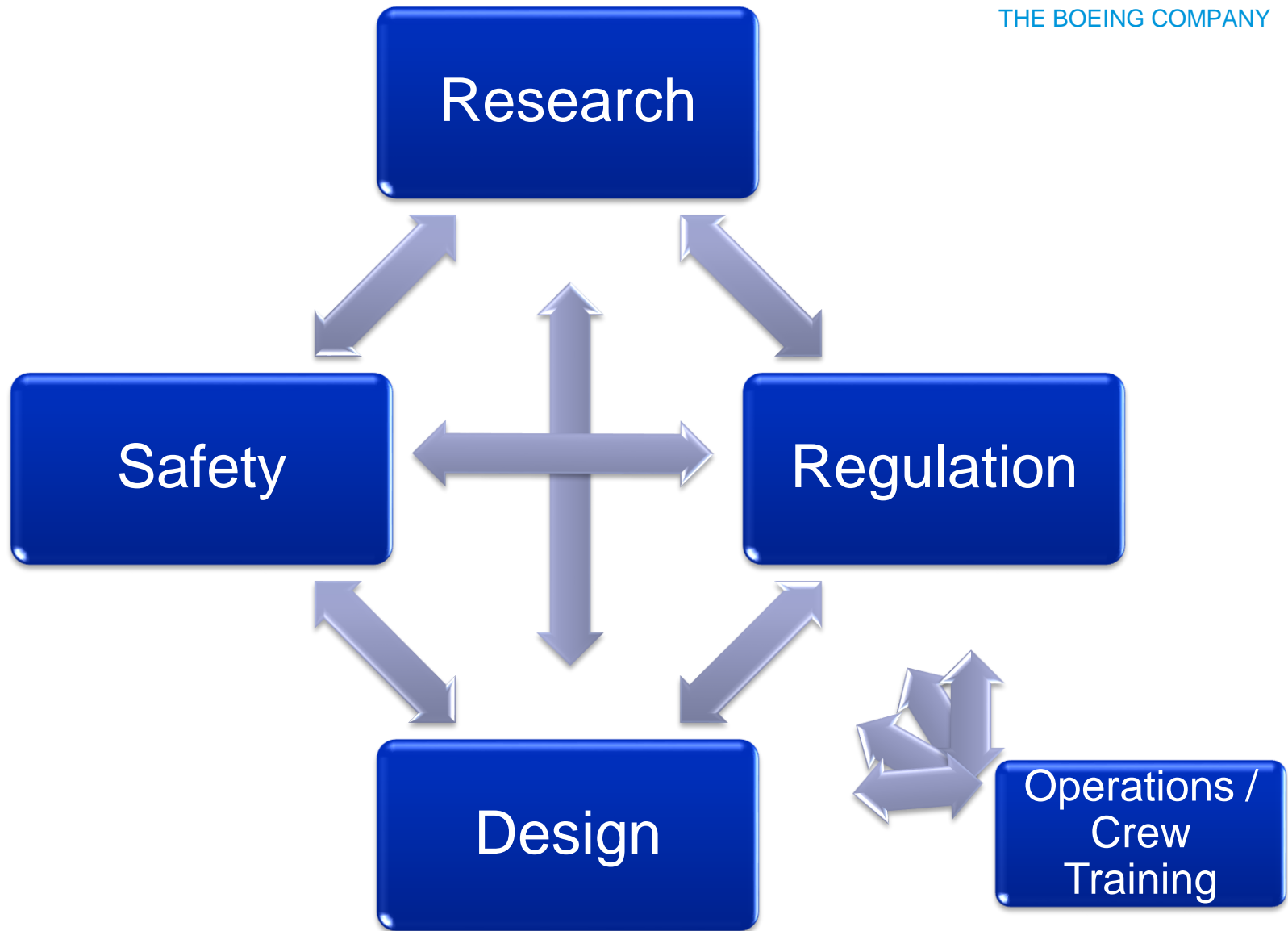
Source: "Parent", "Pop Sugar" & "Corofloat"

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# Looking to the Future

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# Looking to the Future

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- What if passenger sleeping quarters are provided above or below the main passenger cabin on commercial transport category aircraft?



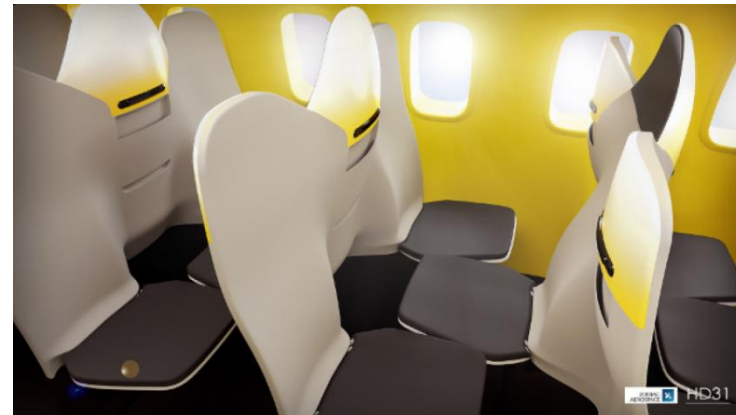
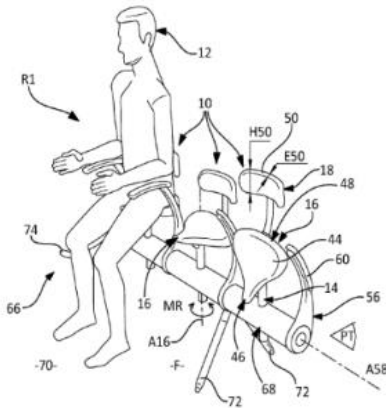
Source: "The Daily Mail"

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# Looking to the Future

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- What if passenger seats drastically change in design?





# Looking to the Future

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- What if “passenger destination areas” become common?



Source: “Skift”, “Sam Chui Photos”

# Looking to the Future

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- What if multiple passenger apartments are provided in the main passenger cabin on commercial transport category aircraft?
  - What is the affect on cabin safety and egress?
    - How will we know?



Source: Etihad and  
"gramsluffartsblog"

# Looking to the Future

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- Airlines are demanding the ability to differentiate themselves
- How can the regulatory environment support this differentiation?



# Looking to the Future

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## LOOK AHEAD:

Consider rule making with an understanding of where cabin interior designs are headed. Avoid requirements that dictate design.



## WORK ACROSS ORGANIZATIONS:

Consider how to integrate passenger behaviors, actions and airline operations into appropriate requirements when governed by different organization



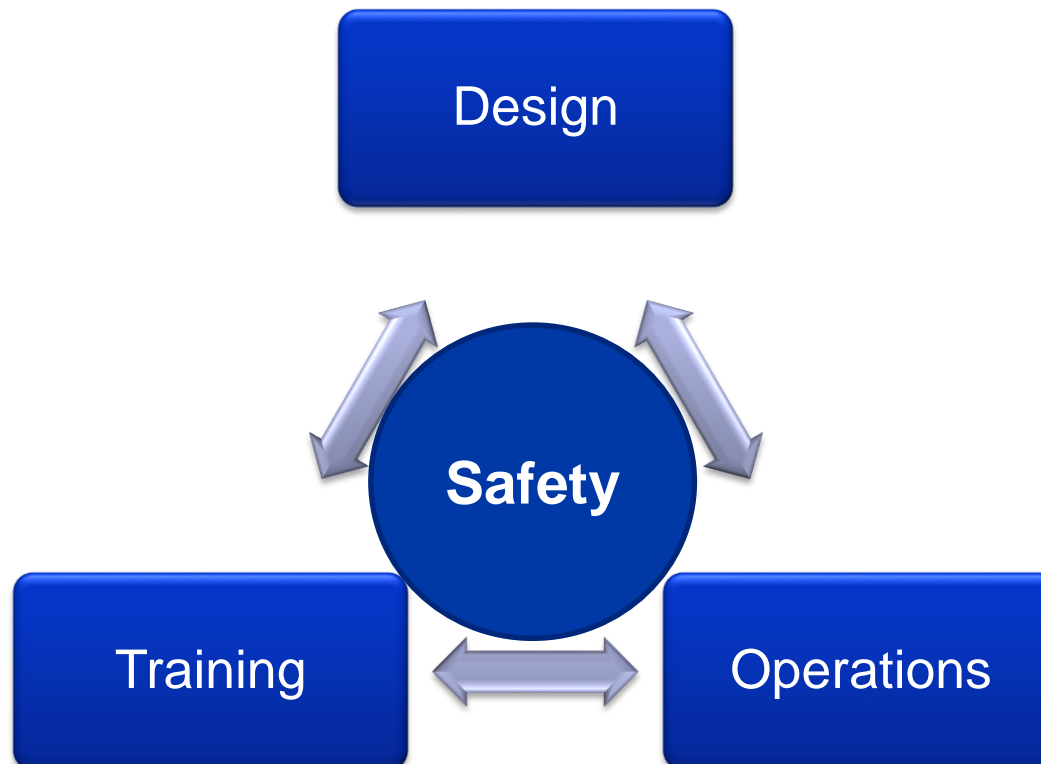
## CONSIDER HUMAN FACTORS:

Compel the industry to add human factors experts into research that supports cabin safety rulemaking as is done for flight crew. Use the human factors experts to find the appropriate balance on what we can rely on operationally, the appropriate training (if any), and what elements must be captured in the design.

# Looking to the Future

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- System efficiencies gained
  - A systems approach to regulation development that integrates design, operations, and training enables airline differentiation in a cost effective manner while maintaining our focus on safety.



# Questions?

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