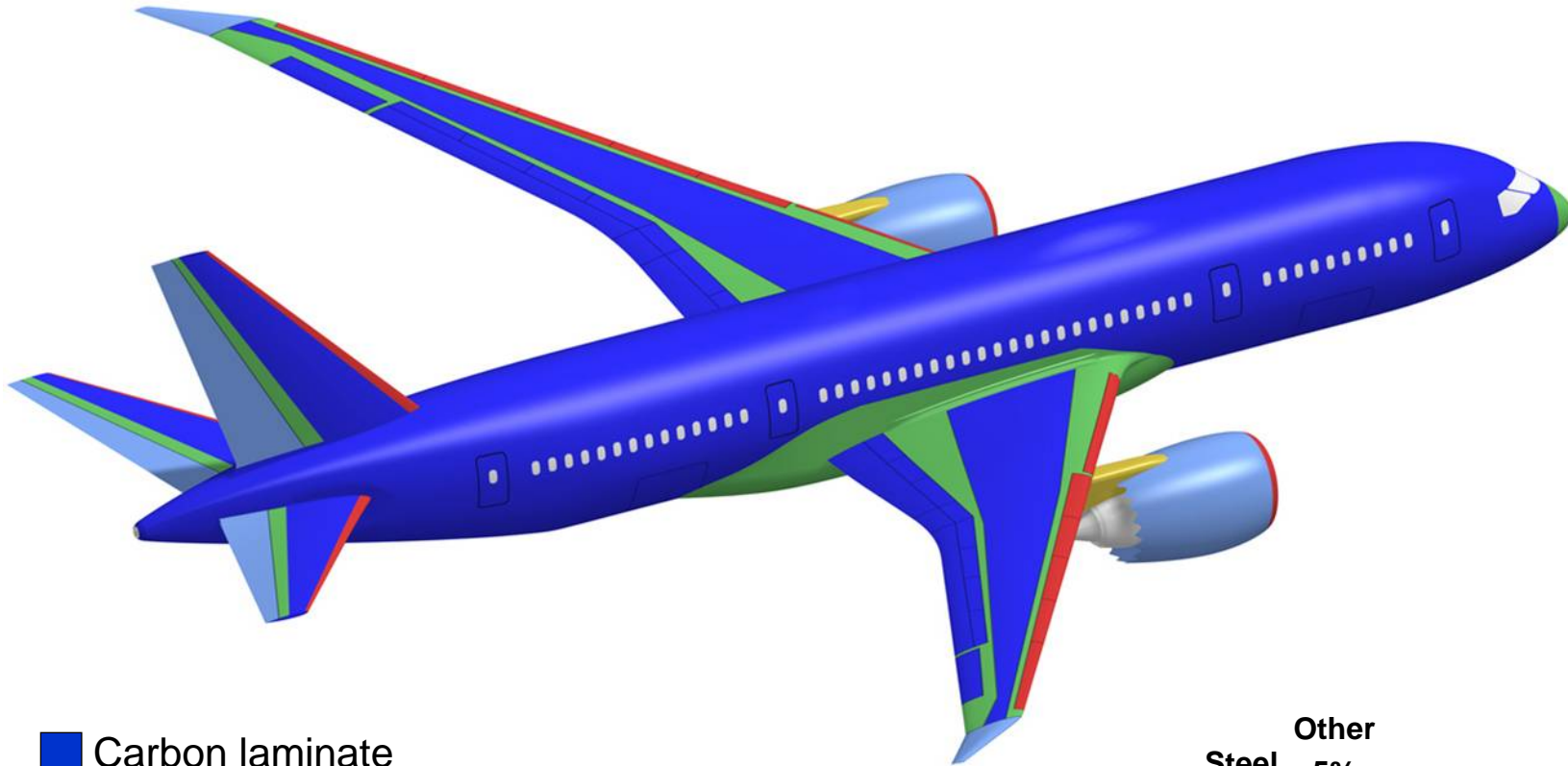


 **BOEING**

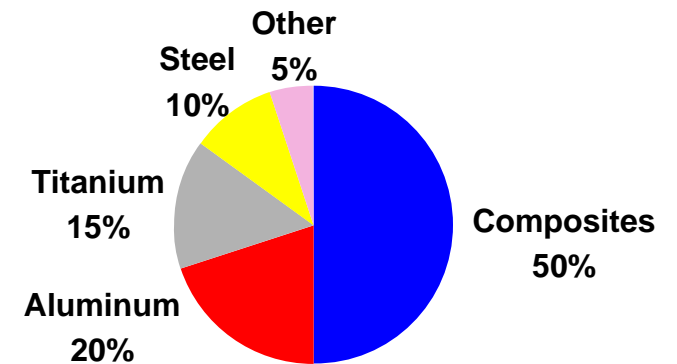


# Composite Structure

By weight	787	777
- Composites	50%	12%
- Aluminum	20%	50%

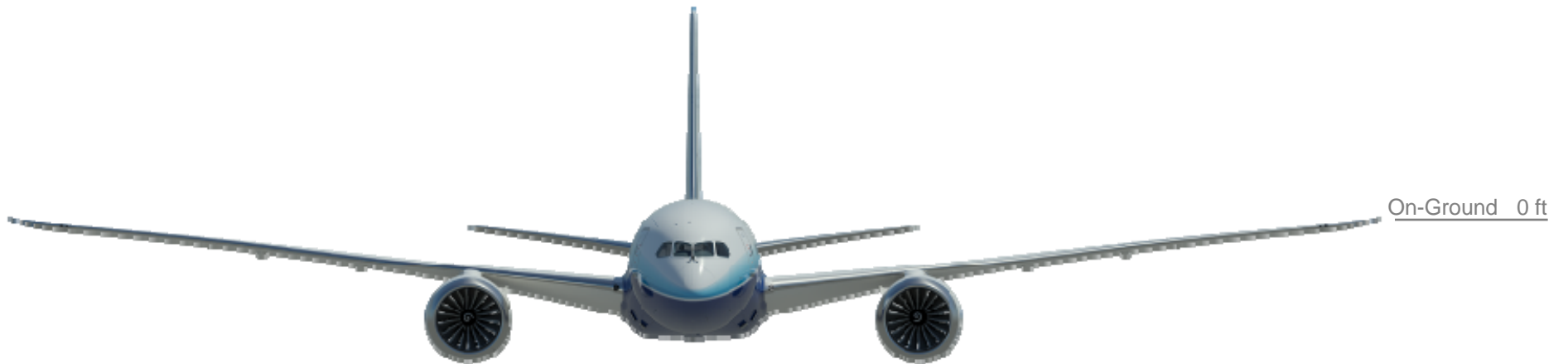


- Carbon laminate
- Carbon sandwich
- Fiberglass
- Aluminum
- Aluminum/steel/titanium pylons





# 787 Wing Flex - On-Ground

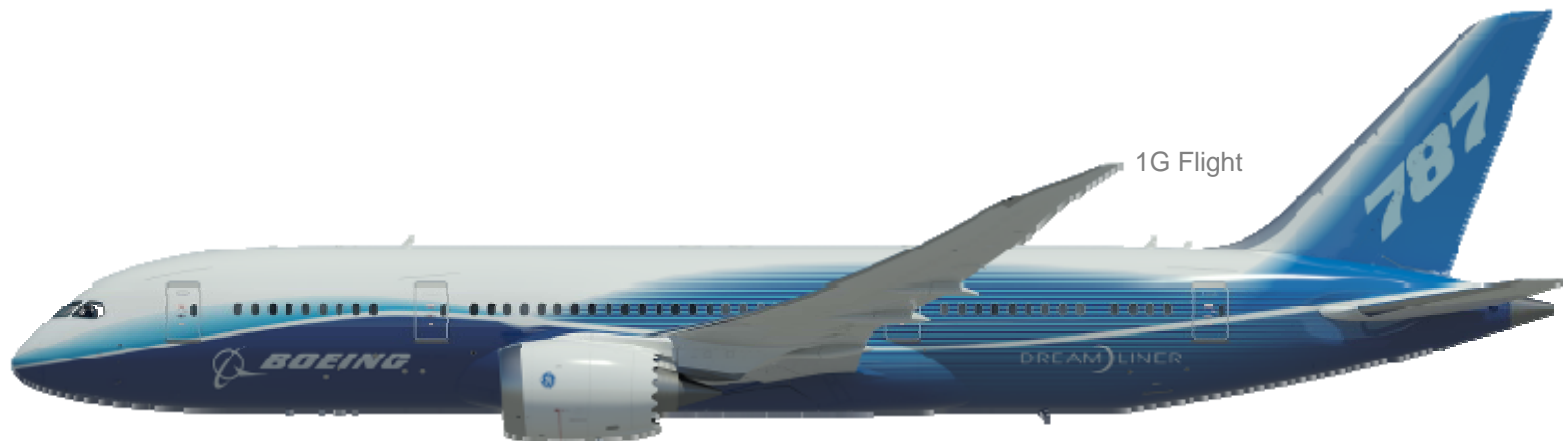


# 787 Wing Flex - 1G Flight



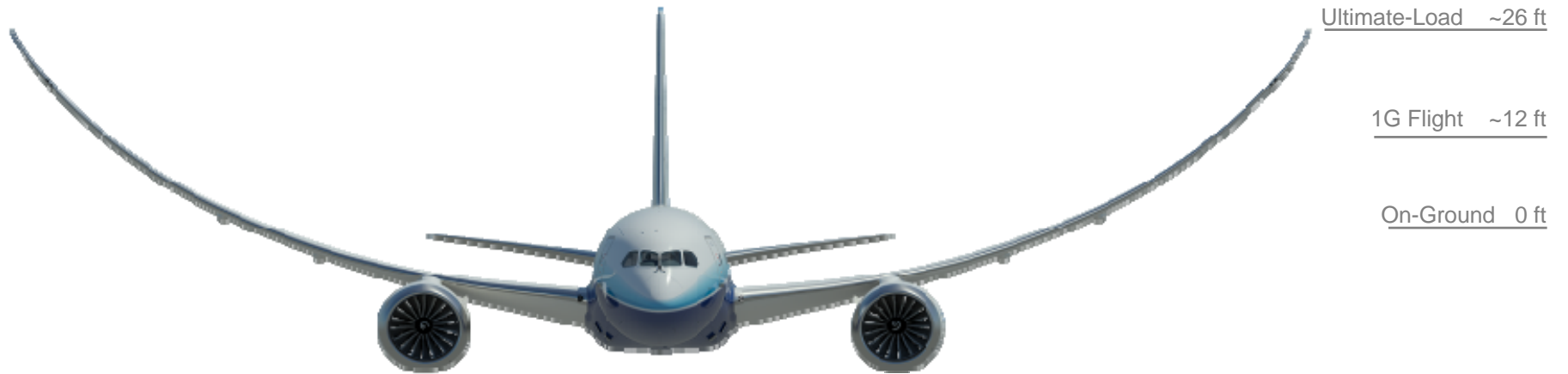
1G Flight ~12 ft

On-Ground 0 ft



1G Flight

# 787 Wing Flex



# 787 Static Load Test @ Ultimate Load

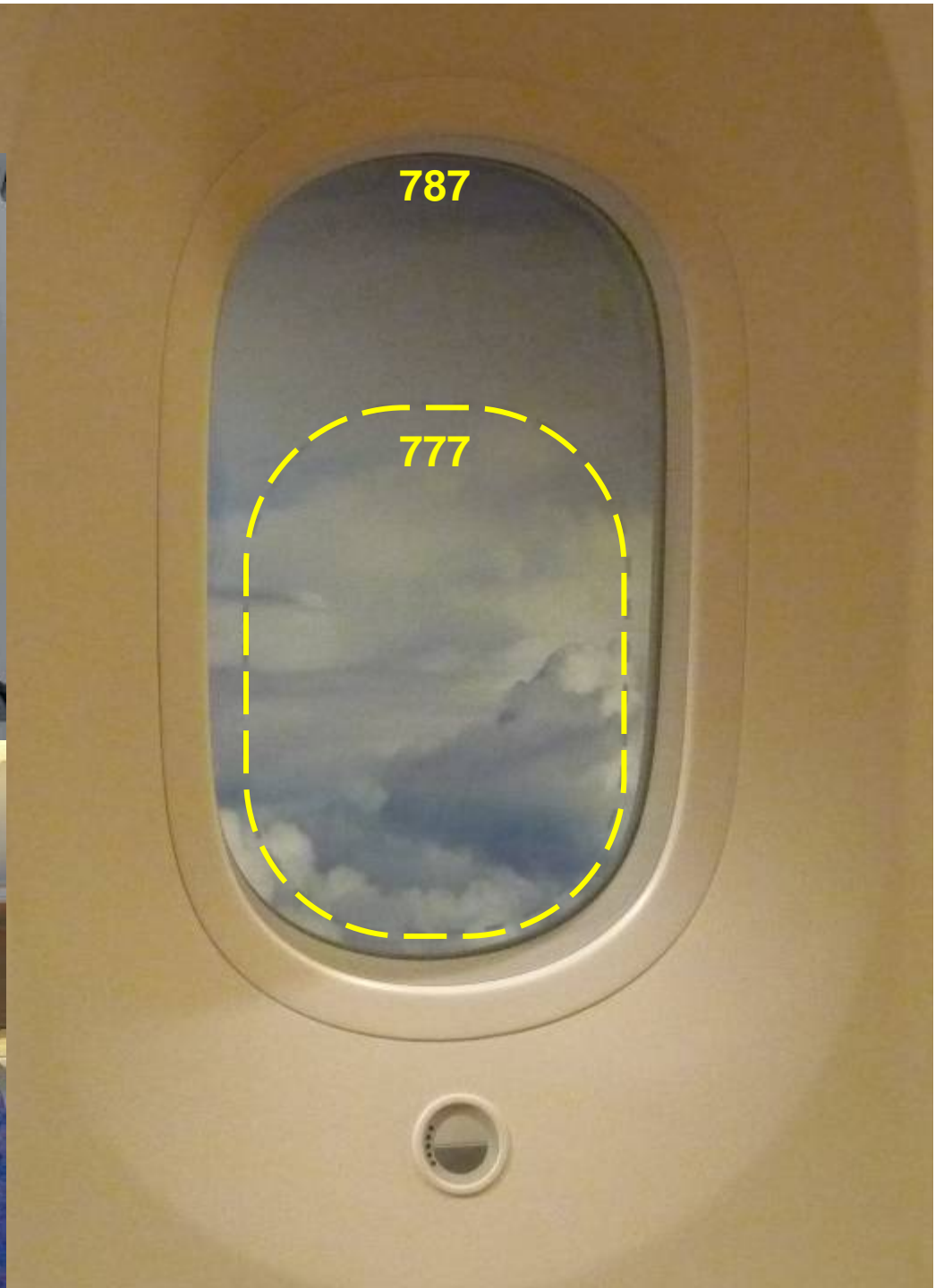




# 787 Cabin Experience

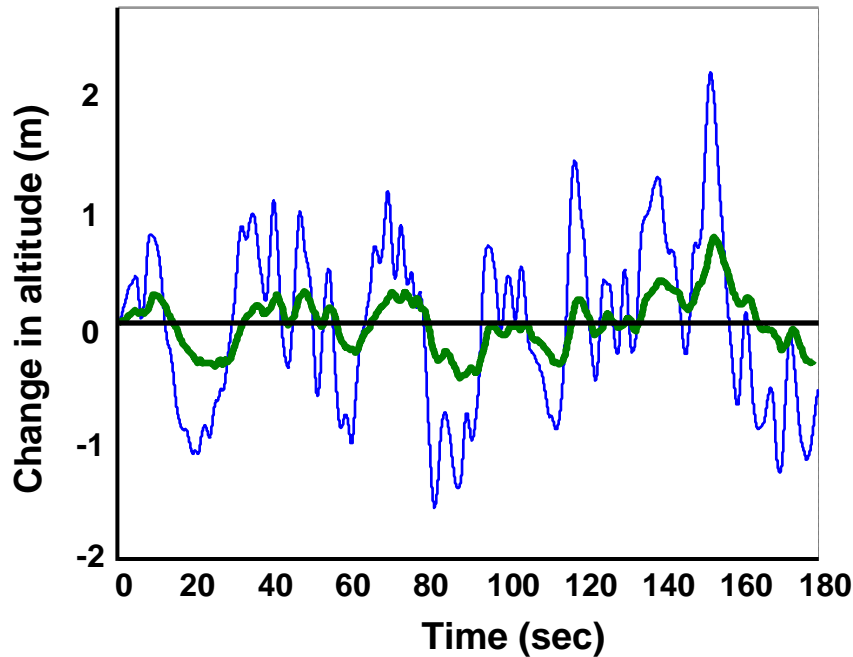


# 787 Windows



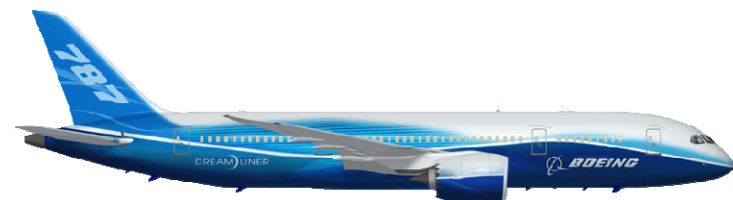
# Ride Quality - Smoother Ride

## Vertical Gust Suppression



- With Enhanced Gust Suppression
- Without Enhanced Gust Suppression

- Uses the flaperons and elevators
- Counters light to moderate turbulence to improve ride quality
- Passengers have a more comfortable flight



# 787 Cabin Experience

**Windows - Larger**

**Pressure - Lower**

**Humidity - Higher**

**Air Quality - Improved**

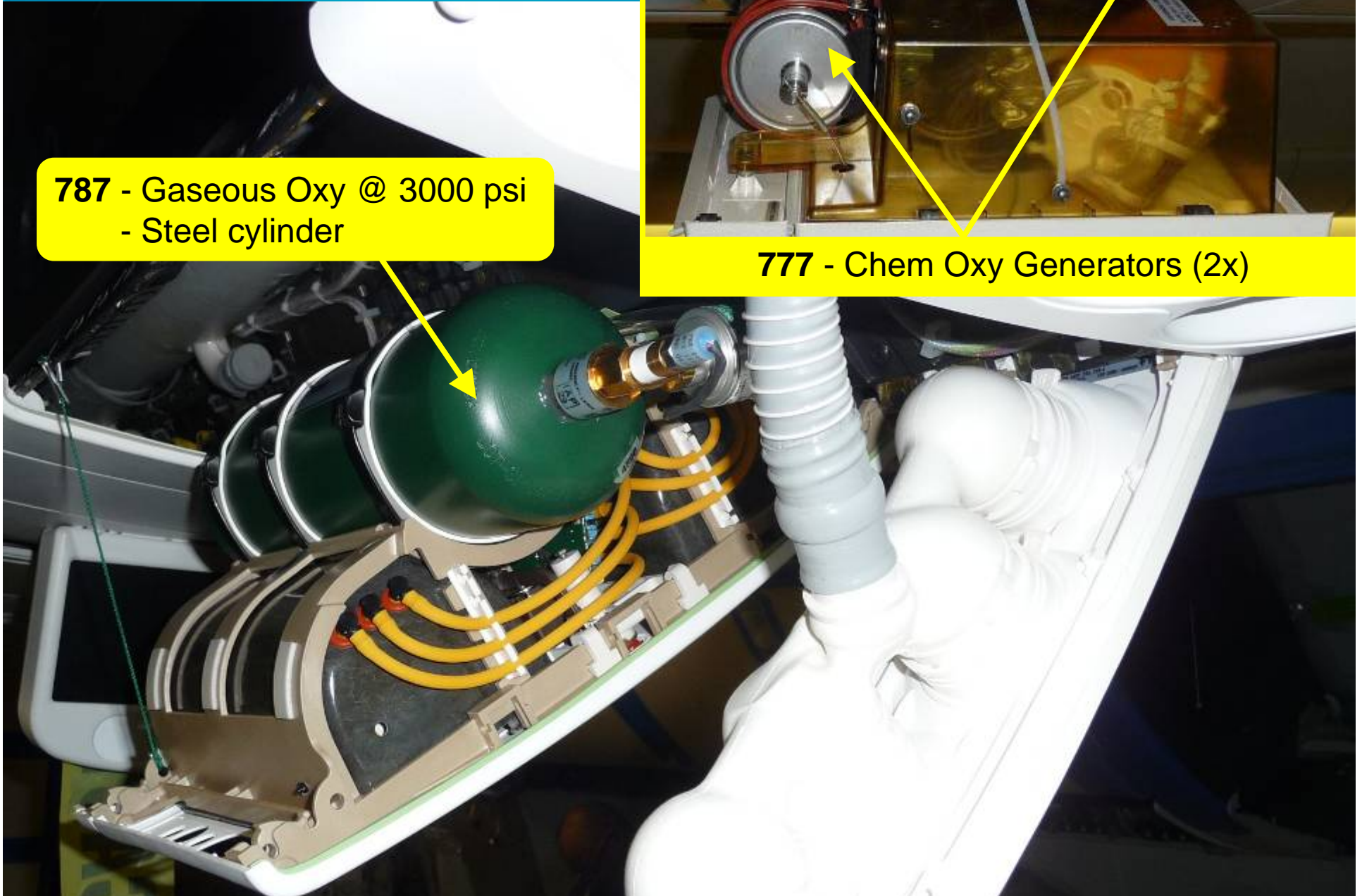
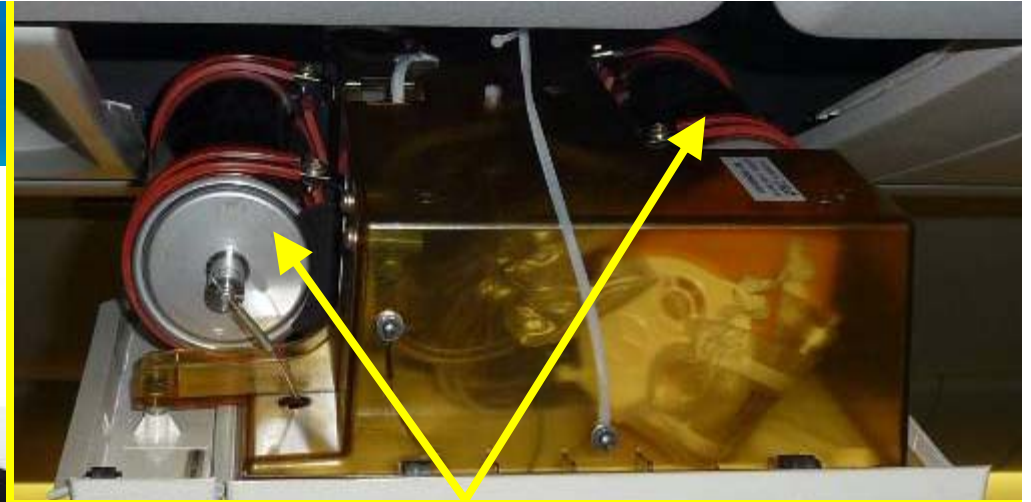
**Ride Quality - Improved**

**Food Service - Unchanged (sorry)**

# 787 Pax Oxygen

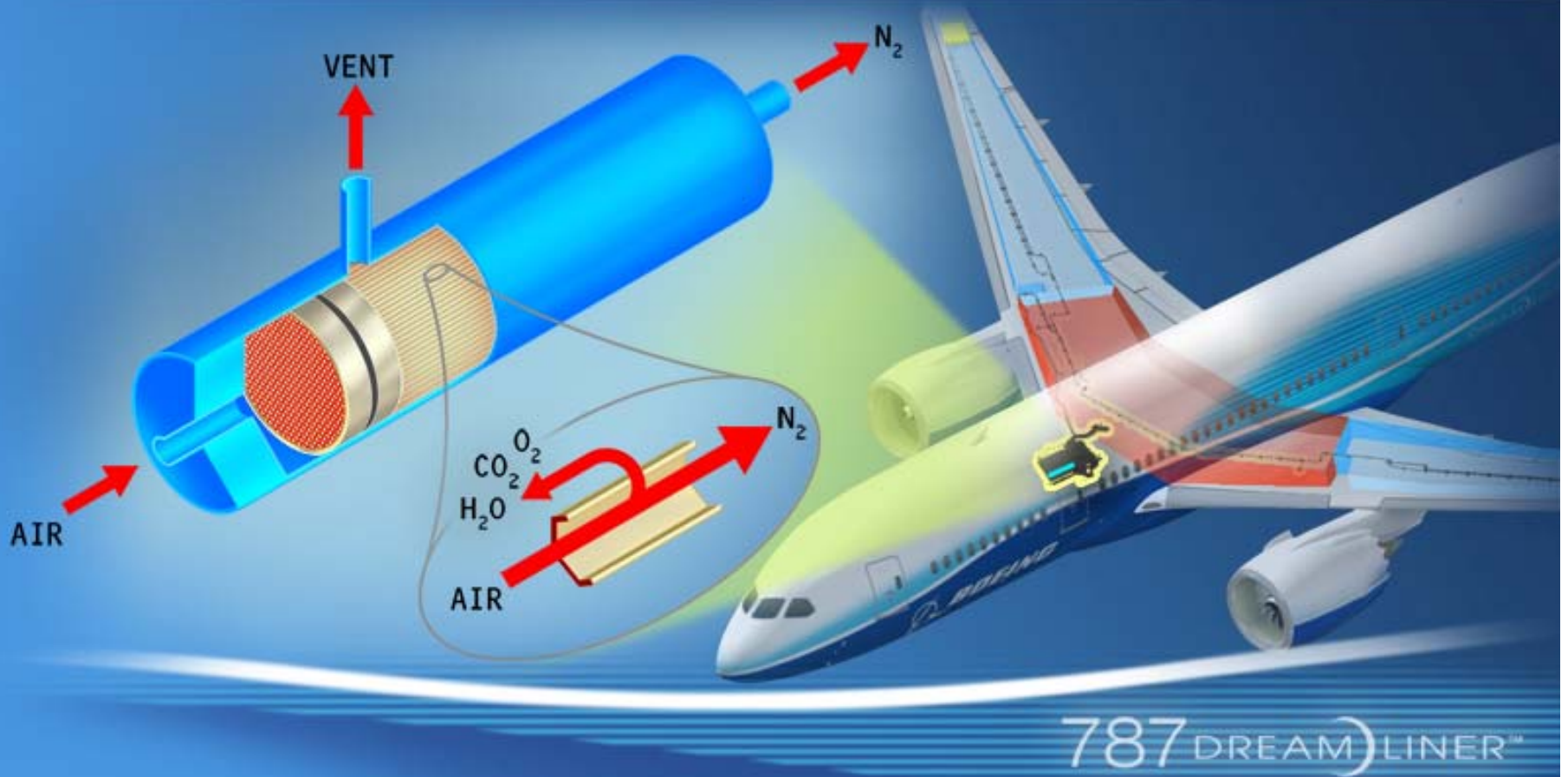
787 - Gaseous Oxy @ 3000 psi  
- Steel cylinder

777 - Chem Oxy Generators (2x)



# 787 Fuel Tank Inerting

## Nitrogen Generation



# Airplane/Engine Architecture

- No-engine-bleed-air systems

Wing LE Anti-Ice  
Air Conditioning  
Cabin Pressure  
Engine start

777  
bleed air  
bleed air  
bleed air  
bleed air

787  
electric  
electric  
electric  
electric

- Engine Generators

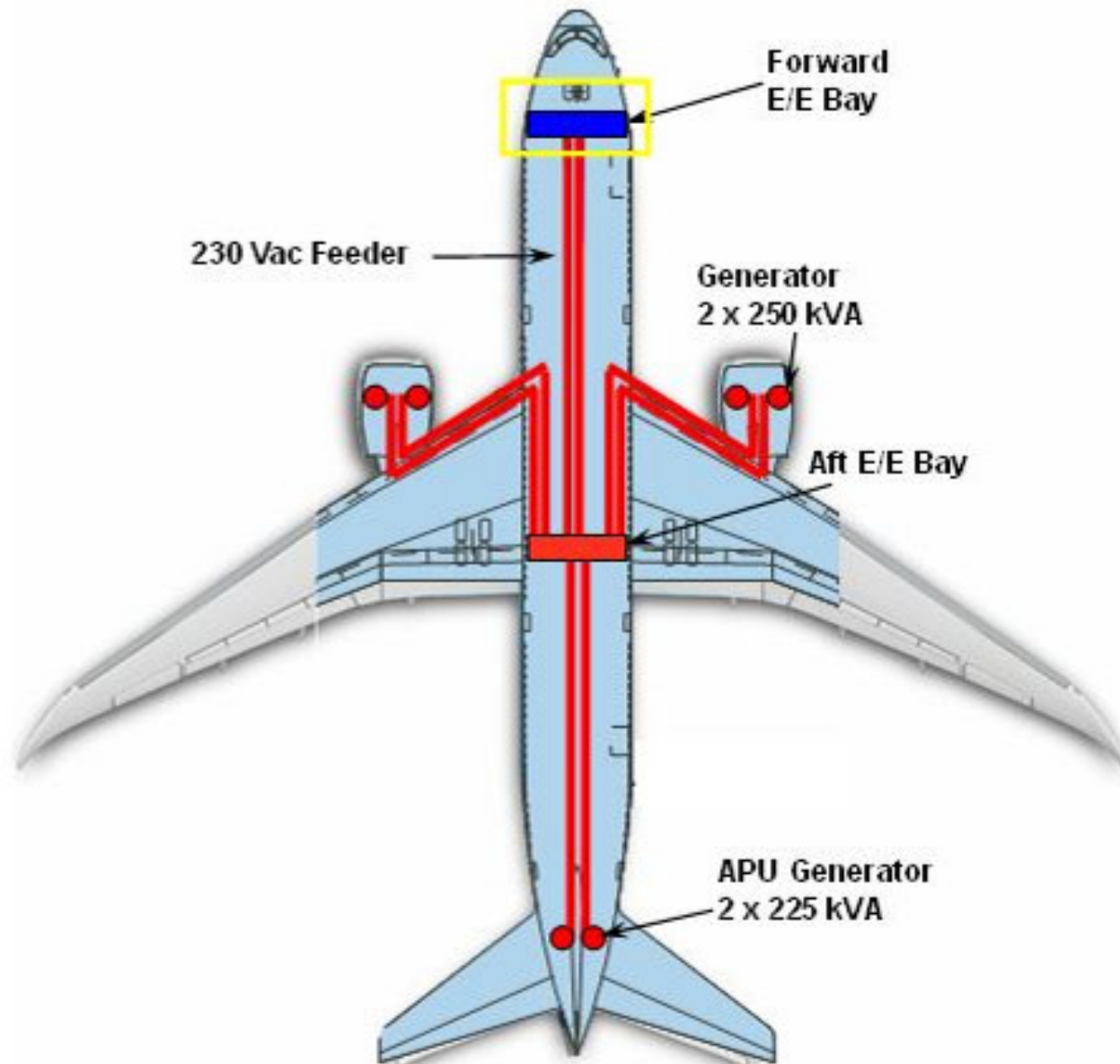
777  
240 kVA  
(2 @ 120 kVA)

Generators

787  
1000 kVA  
(4 @ 250 kVA)

Starter/Gen's

# EE vs Pneumatic Power Distribution



# Electronic Circuit Breakers

- No physical CBs in Flight Deck
- CB control and state indication are display based.
- Accessible on Multi-Function Display (MFD) and maintenance access devices
- A few Thermal CB are located in the Fwd EE-Bay

SYS MENU	FLIGHT DECK CB	NON-NORMAL CB	CB BY STATE	CB SEARCH		
CB BY ATA	CB BY BUS	CB BY LOCATION	RECENT USED CB	CB CUSTOM LIST		
CE2100713	CIRCUIT BREAKER NAME 1	TRIPPED	DETAILS	CONTROL	▲	
CE2100714	CIRCUIT BREAKER NAME 2		DETAILS	CONTROL	↑	
CE2100715	CIRCUIT BREAKER NAME 3		DETAILS	CONTROL	1	
CE2100701	CIRCUIT BREAKER NAME 4		DETAILS	CONTROL		
CE2100702	CIRCUIT BREAKER NAME 5		DETAILS	CONTROL		
CK2100780	CONTACTOR NAME 6	TRIPPED	DETAILS	CONTROL		
CE2100716	CIRCUIT BREAKER NAME 7	UNK	DETAILS	CONTROL		
CE2100717	CIRCUIT BREAKER NAME 8		DETAILS	CONTROL	2	
CE2100718	CIRCUIT BREAKER NAME 9		DETAILS	CONTROL		
CE2100719	CIRCUIT BREAKER NAME 10		DETAILS	CONTROL		
CE2100703	CIRCUIT BREAKER NAME 11		DETAILS	CONTROL		
CE2100721	CIRCUIT BREAKER NAME 12		DETAILS	CONTROL		
CE2100722	CIRCUIT BREAKER NAME 13		DETAILS	CONTROL		
CE2100723	CIRCUIT BREAKER NAME 14	UNK	DETAILS	CONTROL		
CK2100724	CONTACTOR NAME 15		DETAILS	CONTROL		↓
CE2100725	CIRCUIT BREAKER NAME 16		DETAILS	CONTROL		▼



# Overhead Panels - Circuit Breakers

787

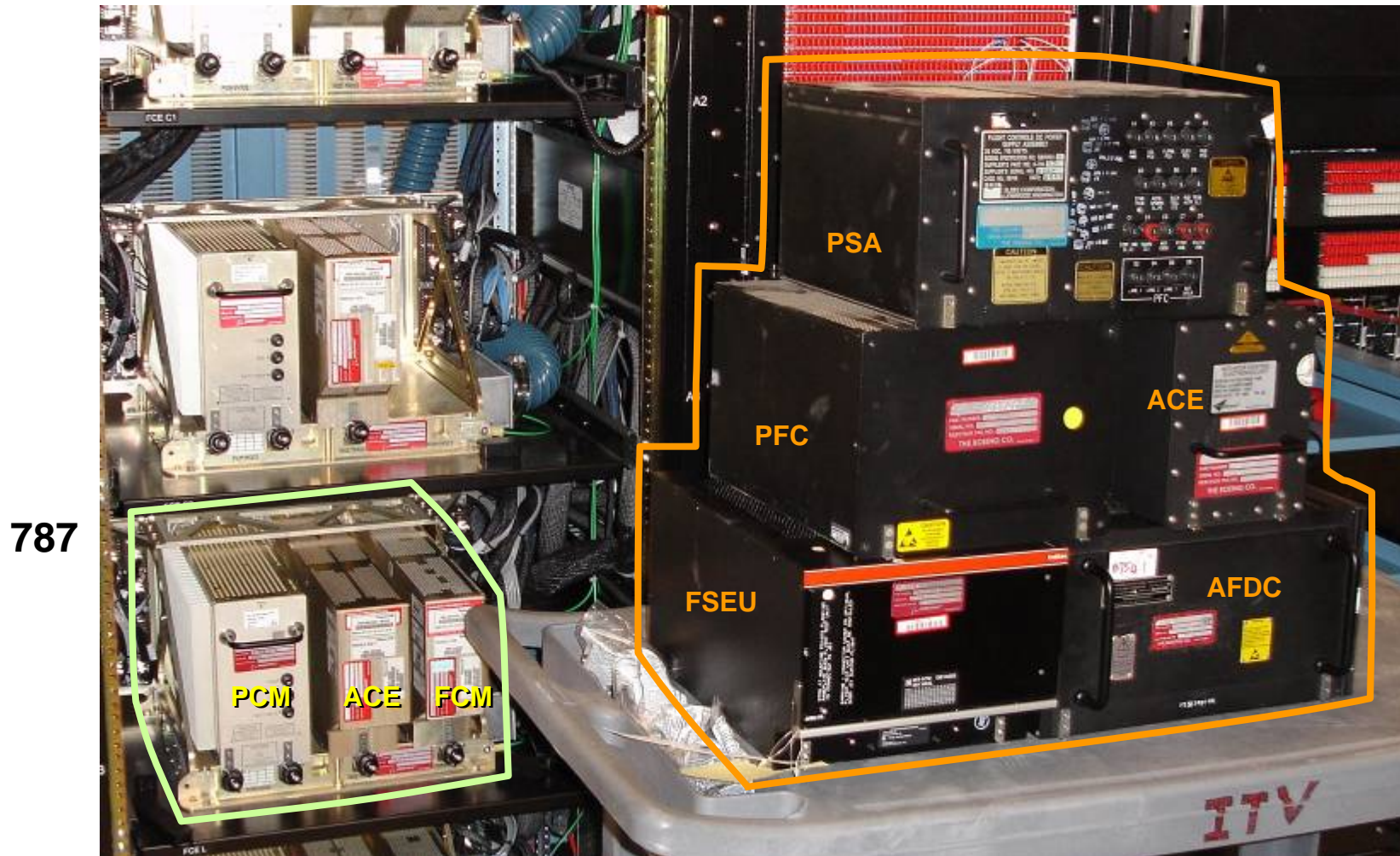


777



# Integrated FCE

Equivalent Channel of Flight Controls and High Lift



# Common Core System

## Common Computing Resource

- High integrity computing resources for hosted systems applications

## Common Data Network

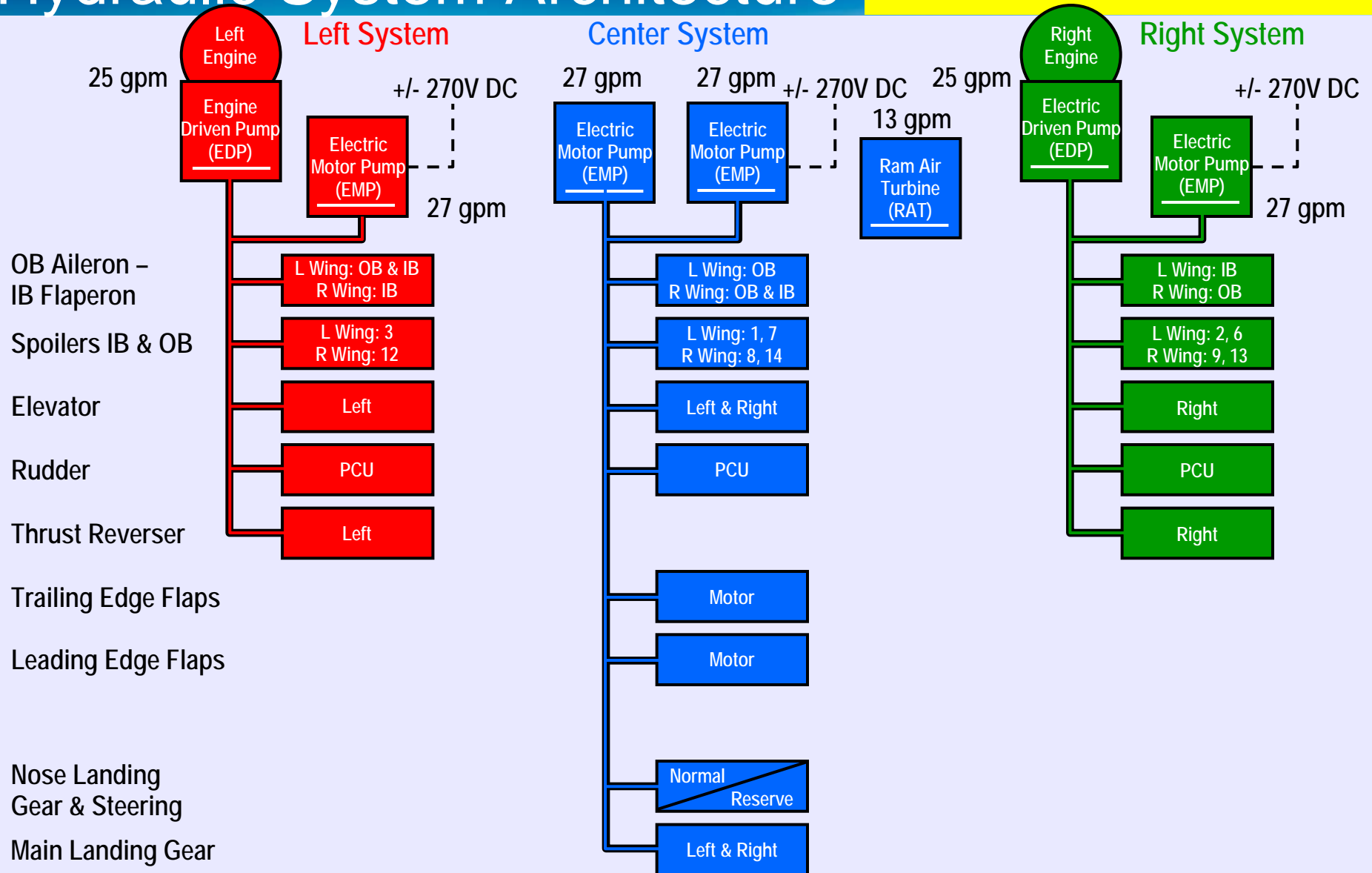
- High Integrity Network
- Open industry standard interfaces A664

## Remote Data Concentrators

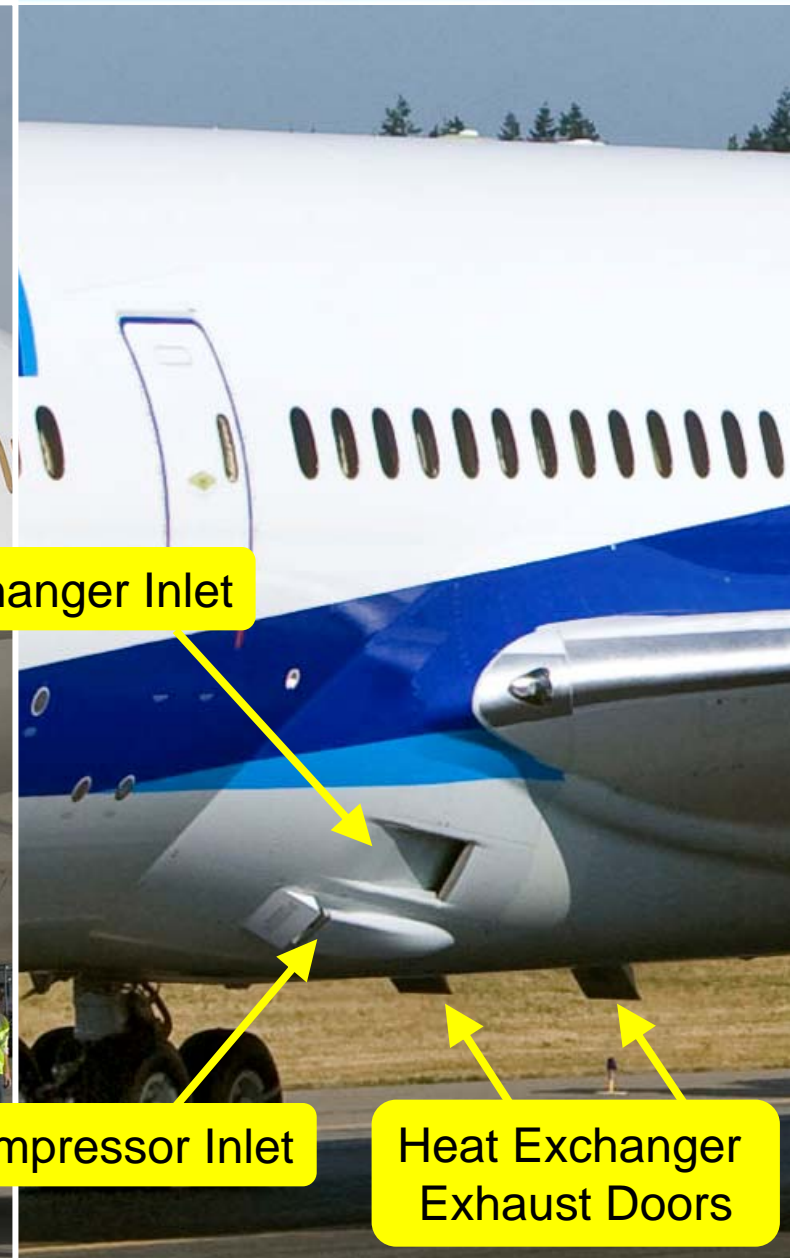
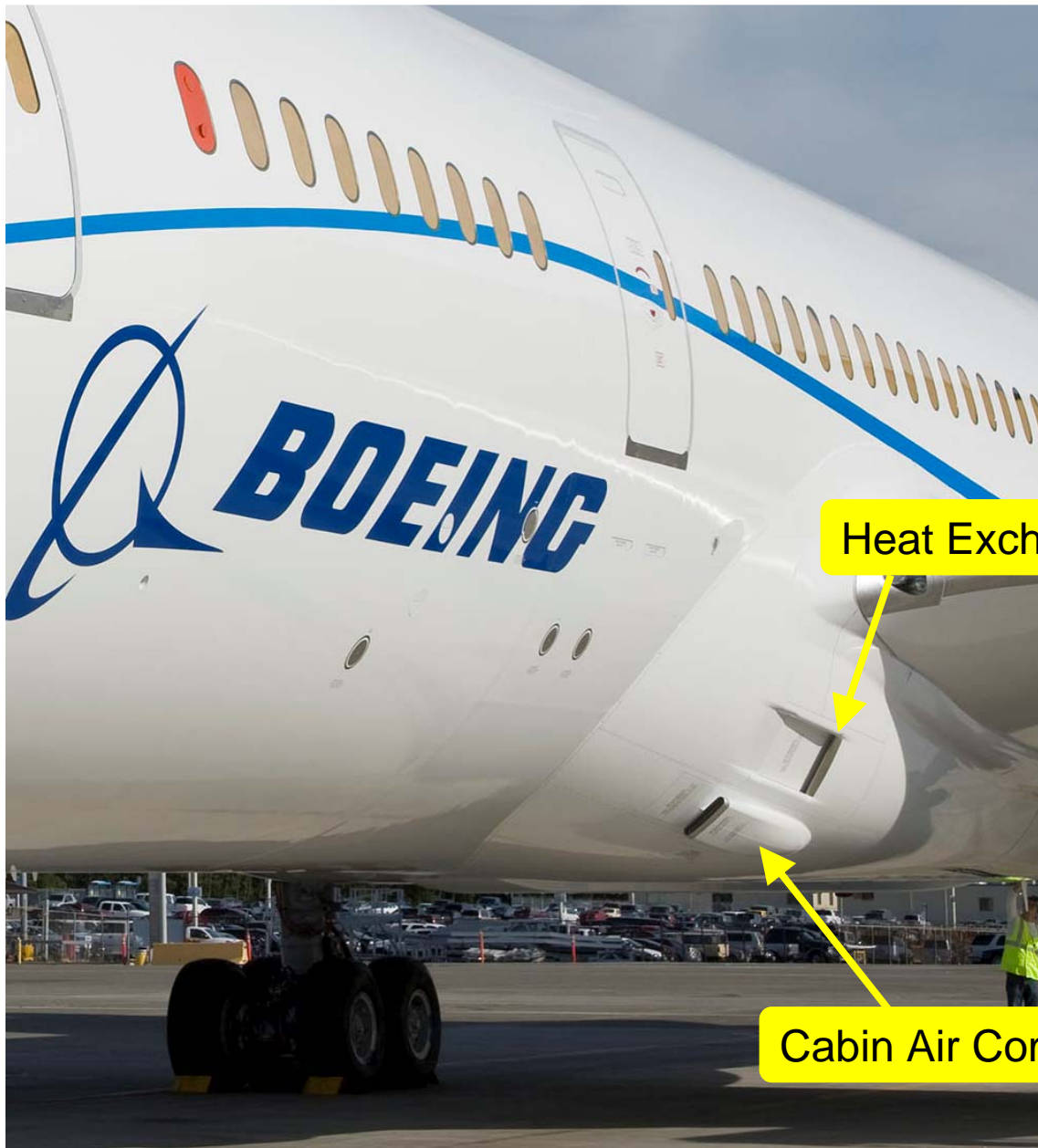
- 21 RDCs
- Remote I/O capability
- Reduces airplane wiring

# Hydraulic System Architecture

**5000 psi systems**



# External Air Sources



Heat Exchanger Inlet

Cabin Air Compressor Inlet

Heat Exchanger Exhaust Doors

# Flight Controls - 777 / 787 Common Functionality



## ***Common 777 / 787 Fly-by-wire Functionality***

- Stall Protection
- Overspeed Protection
- Bank Angle Protection
- Tail Strike Protection
- Thrust Asymmetry Compensation
- Yaw Damping, Over-yaw Protection
- Gust Load Alleviation
- Fin Load Alleviation
- Flap Load Relief & Autogap
- Lateral Gust Suppression
- Modal Suppression

# Flight Controls - 787 New Features

- P-Beta control law
- Vertical Gust Suppression (turbulence)
- Enhanced Stall Protection
  - Limits high angles of attack
- Enhanced Thrust Asymmetry Compensation
  - Adds inertial yaw detection on ground
  - Generates rudder & steering for yaw disturbances

# *P – Beta Control Law*

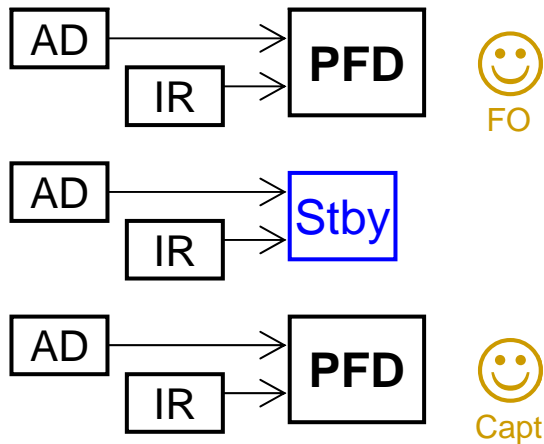


- Wheel commands roll rate (P)
- Pedals command sideslip angle (Beta)
- Opposes disturbances
- Coordinates lateral and directional control
- Automatic aileron & rudder trim
  - No aileron trim switch



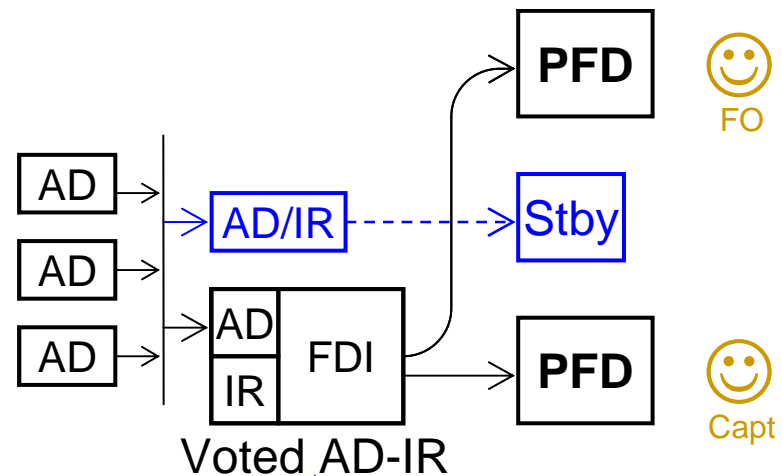
# Air Data System Design Philosophy

## Federated AD & IR (all previous models)



Fault arbitration  
by **CREW**

## Voted AD & IR (777, 787)



Fault arbitration  
by **SYSTEM**

AD = Air Data  
IR = Inertial Reference  
FDI = Fault Detection & Isolation  
PFD = Primary Flight Display

# Air Data System - Common Mode Vulnerability

- **Common Mode Hazards to Pitot-Static sensors**

- Mud Daubers
- Volcanic Ash
- Radome failure
- Pitot covers
- Maintenance errors  
(pneumatic plumbing)
- Icing
- Hail
- Birds
- Taped Static Ports

- **787 new capabilities for protection**

- Synthetic airspeed
- GPS altitude
- Common Mode Monitor



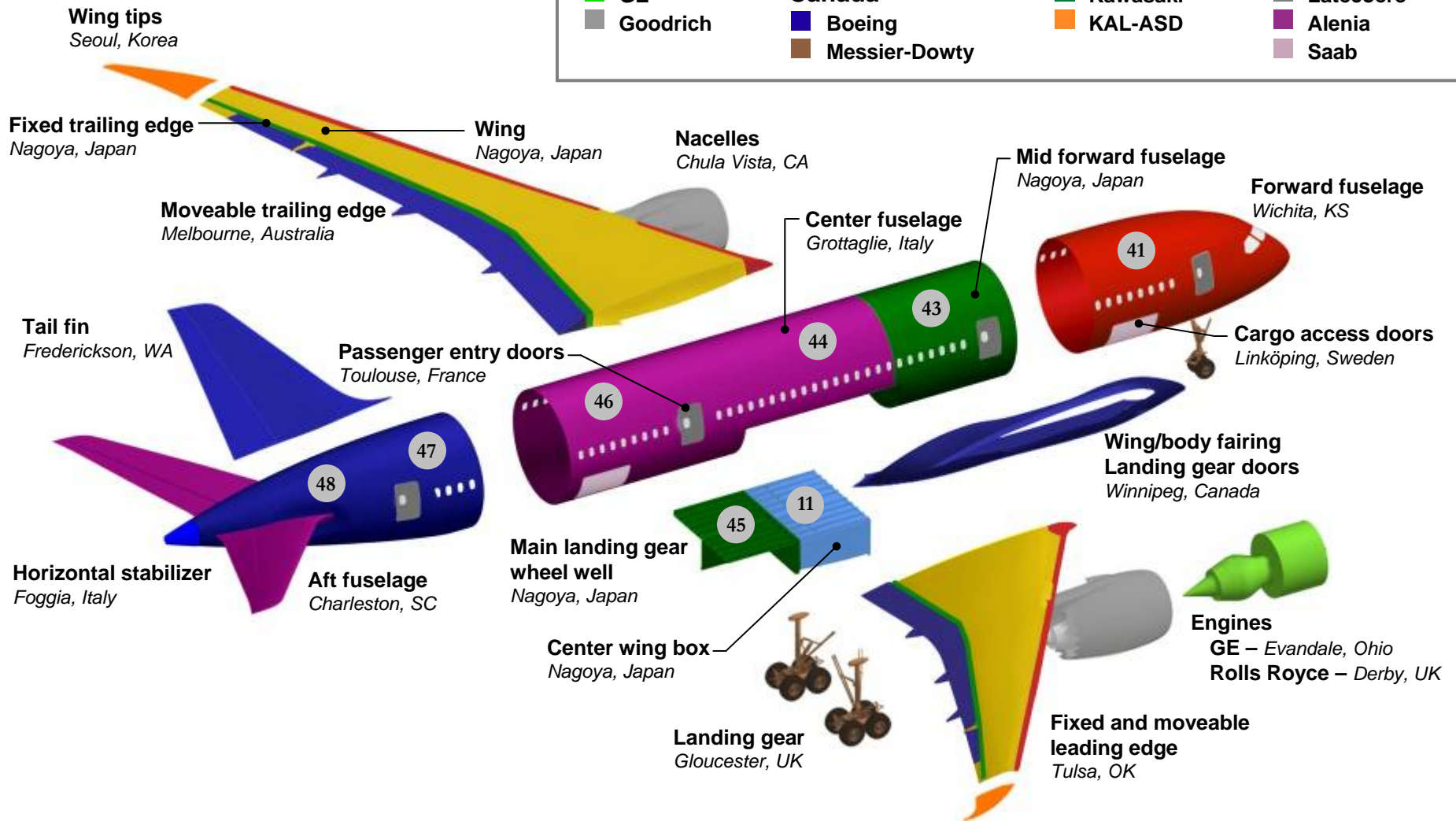


# 747

# Dream Lifter

# Partners Across the Globe are Bringing the 787 Together

U.S.	Australia	Asia	Europe
Boeing	Boeing	Fuji	Messier-Dowty
Spirit		Mitsubishi	Rolls-Royce
GE		Kawasaki	Latécoère
Goodrich	Canada	KAL-ASD	Alenia
	Boeing		Saab
	Messier-Dowty		



# Dreamlifter Route Structure



# Dreamlifter Enables Global Operations

- **Efficient transport of 787 major sub-assemblies from international partners**
- **Main deck is 65,000 cubic feet**
  - 3x capacity of 747-400 Freighter
- **Reduced transportation times versus surface transportation**
  - Dramatically reduced final assembly flow times
  - Less inventory













# 787 Structure from Asia

Fuji Heavy Industries



Kawasaki Heavy Industries



Mitsubishi Heavy Industries



Korean Air



*International partners providing key 787 structure*

# 787 Structure from Europe



*International partners providing key 787 structure*

# 787 Structure from North America



*International partners providing key 787 structure*