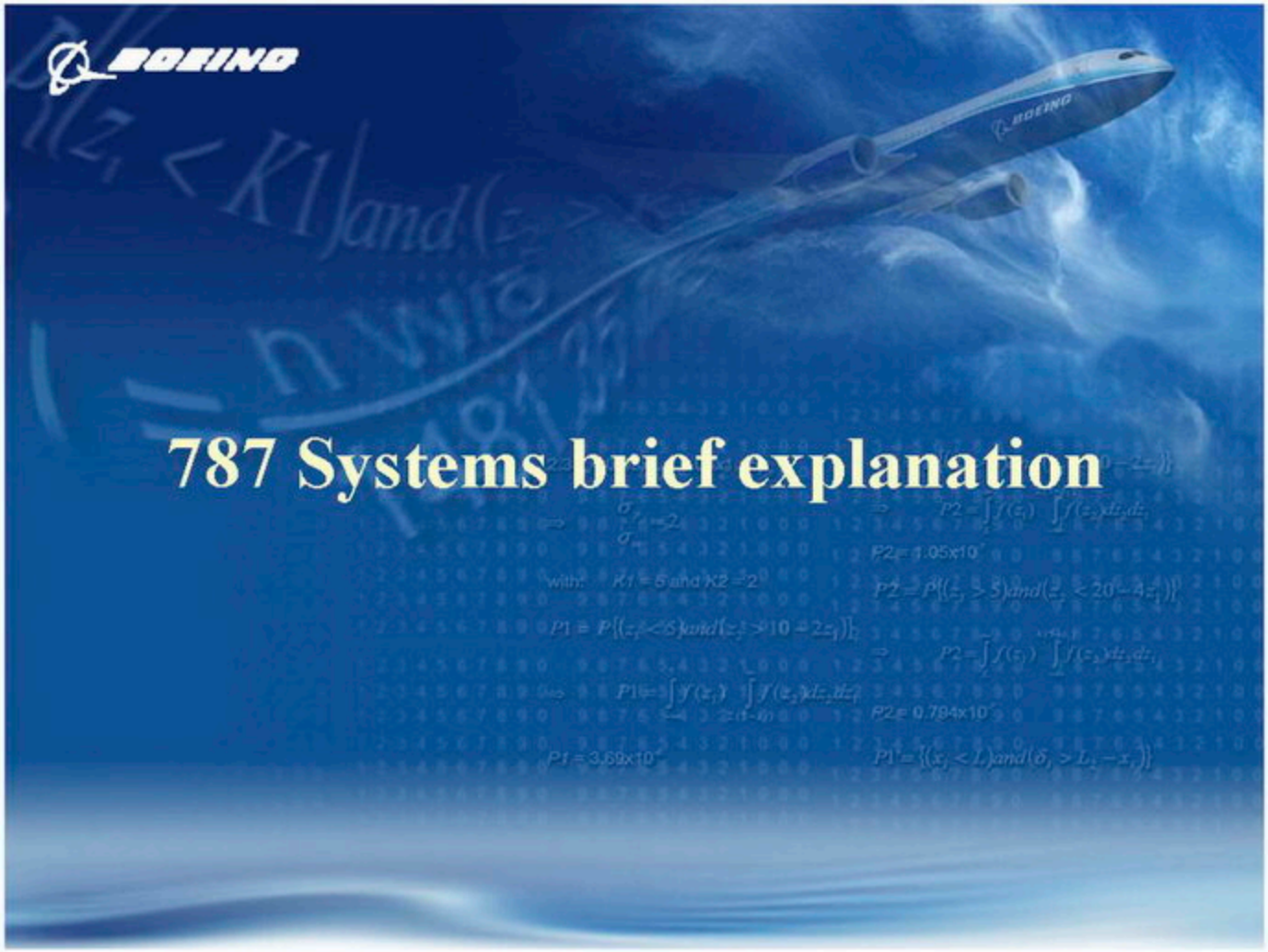

787
BOEING
DREAMLINER


BOEING
787 Systems brief explanation

Configured for Success

787-8 Design Features

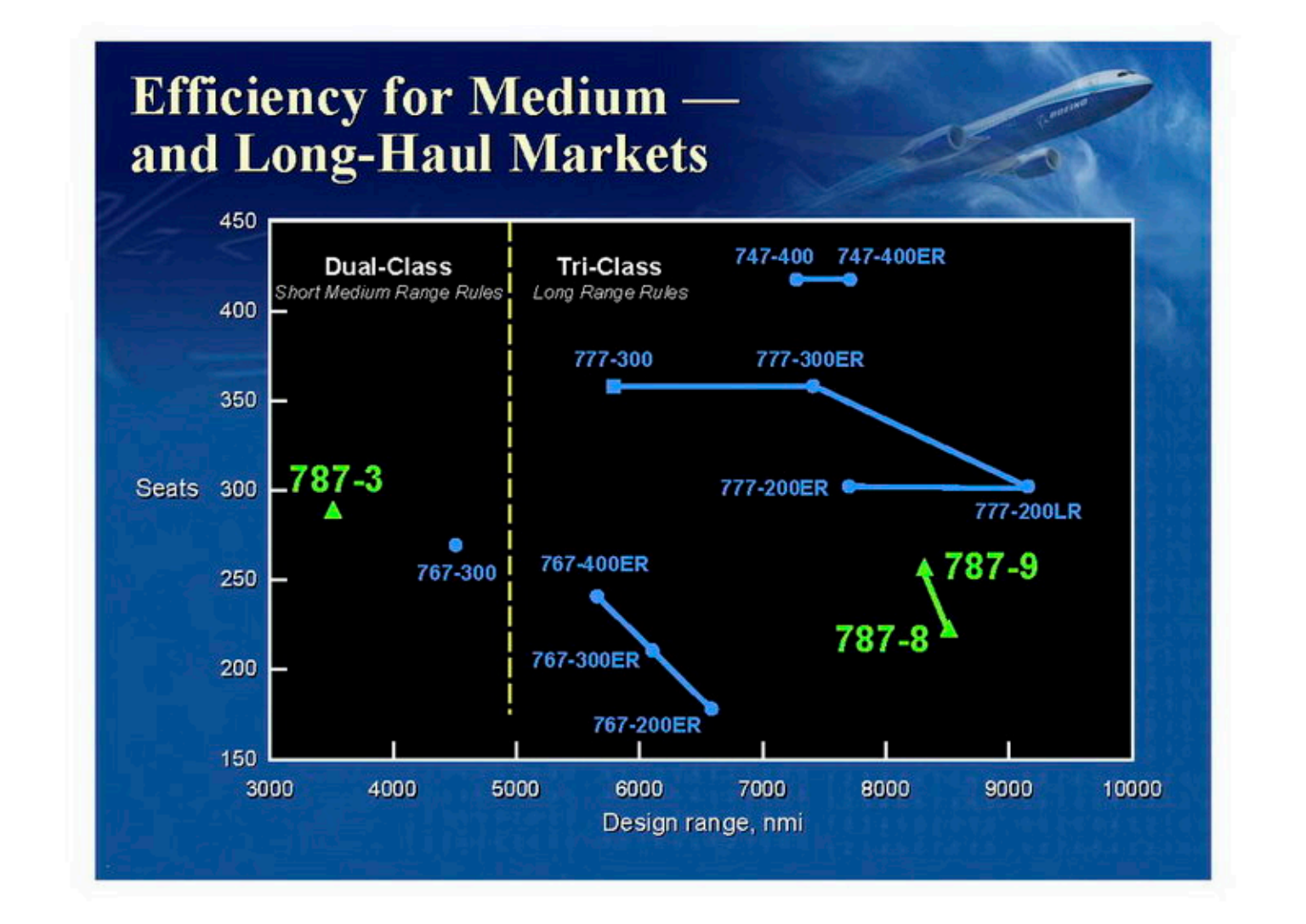
The 787 Is a Complete, Flexible, Efficient Family

787-8
223 passengers (three-class)
8,500 nmi / 15,700 km

787-3
296 passengers (two-class)
3,500 nmi / 6,500km

787-9
259 passengers (three-class)
8,300 nmi / 15,400 km

Efficiency for Medium — and Long-Haul Markets

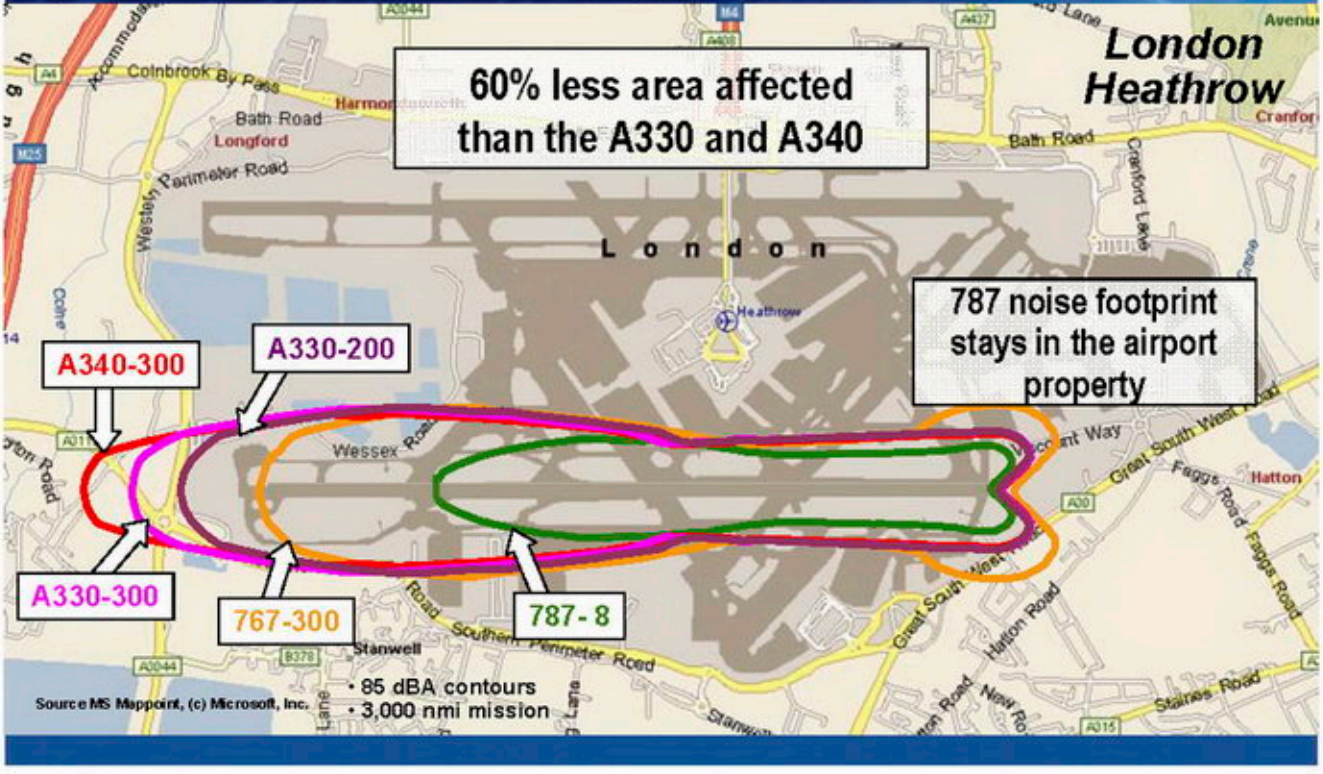


Creating New Non-Stop Routes

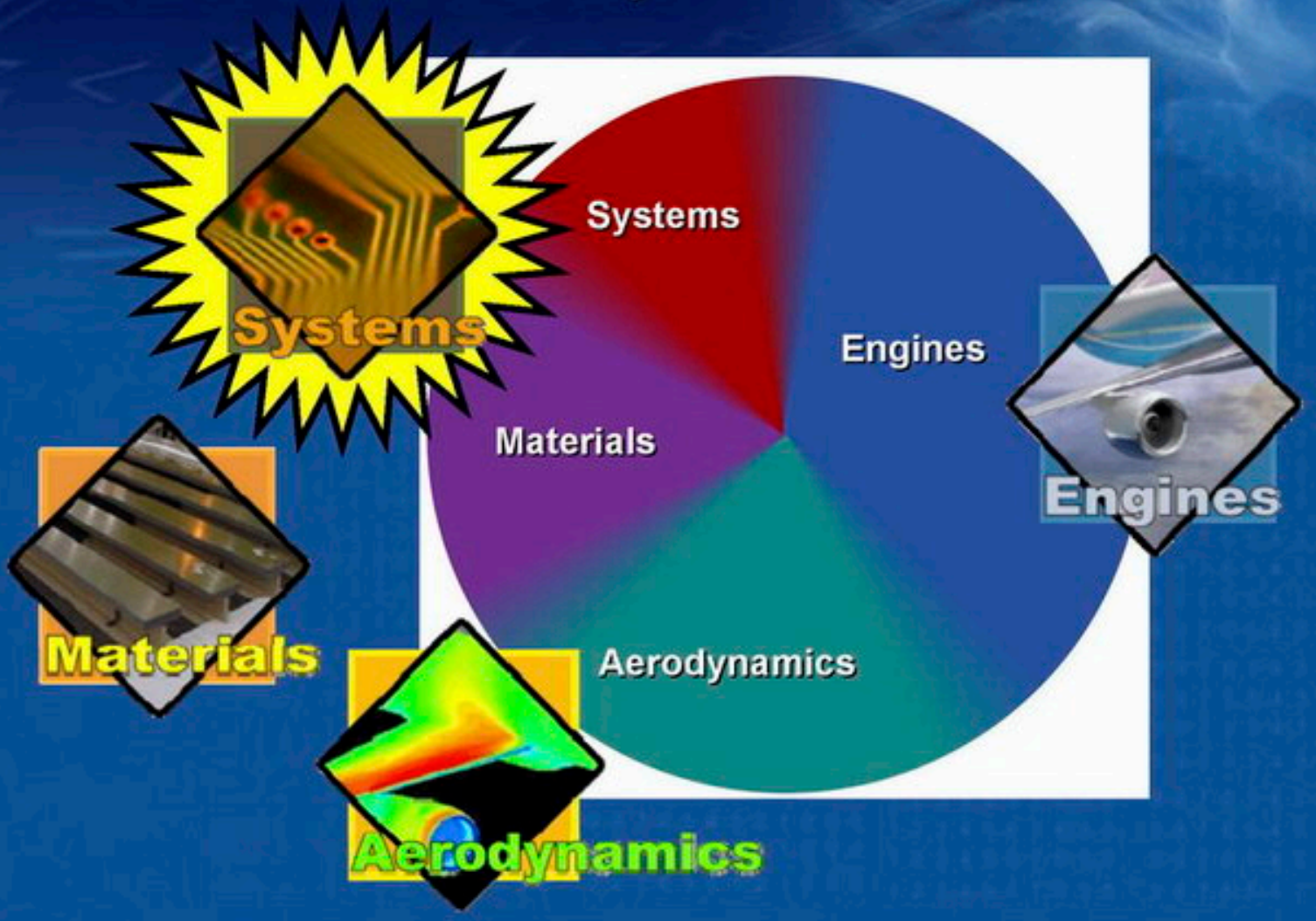
The 787 can efficiently connect more than 450 new city pairs

Quiet for Airport Communities

85 dB Noise Contours at Heathrow



Breakthrough Technologies Reduce Fuel Burn Per Seat by 20%



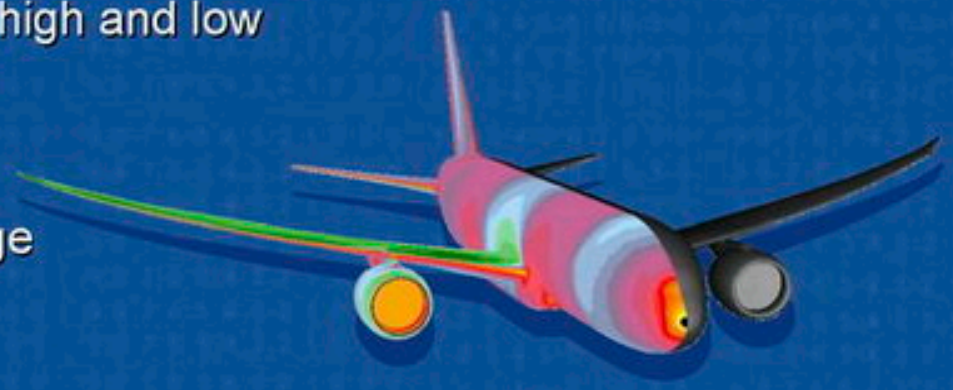
Engine Technology Advancements

Engine and nacelle features
(Common to RR and GE engines)

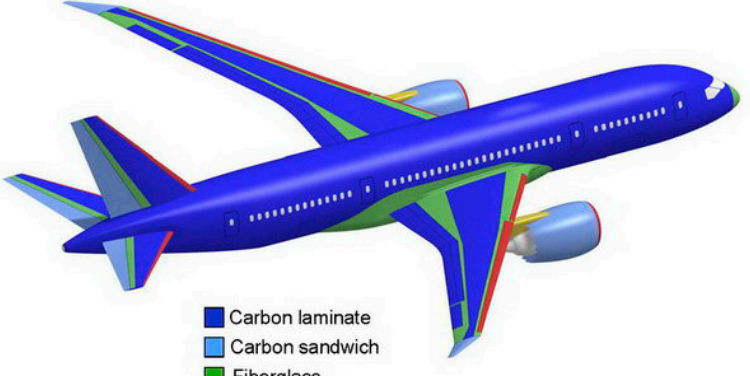
- Higher bypass ratio and higher pressure ratio compressor
- High-flow low-speed fan
- Advanced materials and coatings
- No-engine-bleed systems architecture
- Low-noise nacelles with chevrons
- Engine types are interchangeable at wing / pylon interface

Advanced Aerodynamics

- State of the art 3-D aerodynamic analysis and design tools provide:
  - Advanced transonic wing design for improved speed and lift
  - High performance, but mechanically simplified high lift system for high reliability and reduced maintenance cost
  - Multi-disciplinary optimization for best combination of weight, drag and engine performance
- Tightly integrated packaging of systems to reduce the size of aerodynamic fairings for reduced weight and drag
- Advanced aerodynamic features validated through extensive wind tunnel test program at both high and low Reynolds number facilities
- Laminar flow nacelles
- Variable camber trailing edge



Composite Solutions Applied Throughout the 787



787 Advanced Systems

Efficient Airplane Systems

- Advanced Energy Management – The More Electric Airplane
- Flight Controls – Variable Camber Trailing Edge and Drooped Spoilers

Highly Integrated Avionics

- Common Core Systems open architecture
- Integrated Flight Controls Electronics
- Integrated Communication/Navigation/Surveillance equipment
- Integrated Airplane Systems control

e-Enabled Airplane

- Broadband connectivity within airplane and with ground
  - Flight Deck
  - Crew Information System
  - Onboard Health Maintenance
  - Cabin systems

Trade Study decisions assume Life Cycle Costs of the airplane

Advanced Energy Management

Generate, Distribute, and Consume energy in an effective and efficient manner.

Hybrid AC and DC Primary Distribution Systems
(230 Vac, 115 Vac, ±270 Vdc, 28 Vdc)

Elimination of Pneumatic Bleed System

Electric Wing Ice Protection

Liquid Cooled Power Electronics

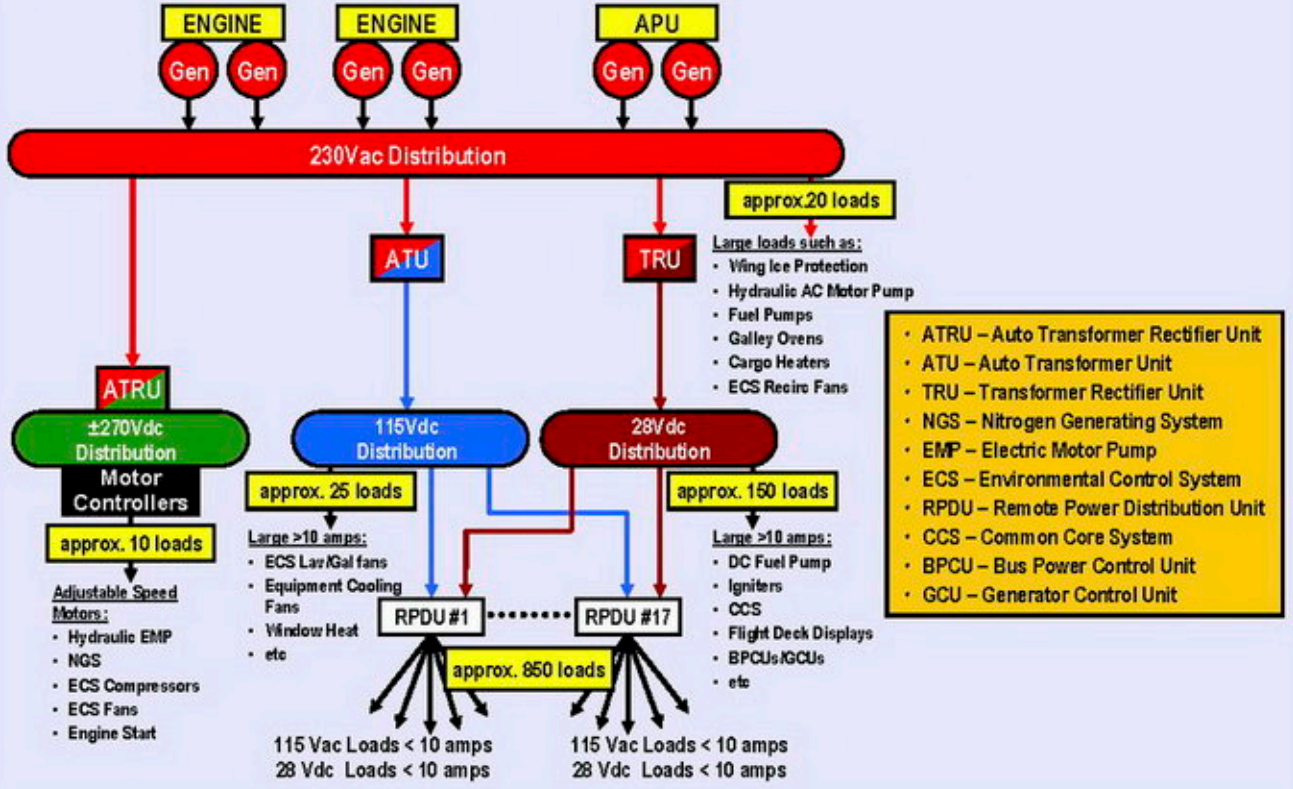
Two 250 kVA Variable Frequency Starter/Generators per engine

APU with Two 225 kVA Starter/Generators

Adjustable Electric Air Conditioning

Adjustable Speed Motors and Motor Controllers

Electrical Systems Overview



Electronic Circuit Breakers

- Display-based control and indication of breaker state
- Accessible on Multi-Function Displays (MFDs) and maintenance access devices

Environmental Control Systems

- Overhead cabin air distribution
- Upper and lower air recirculation
- HEPA Filters and Gaseous Air Purification* for recirculated air
- Personal Air Outlet (Gasper) System* - Basic
- Optional Flight Deck Humidification System

- Forced air cooling for essential E/E equipment
- Draw-thru cooling for minor E/E equipment
- Liquid cooling for Power Electronics*

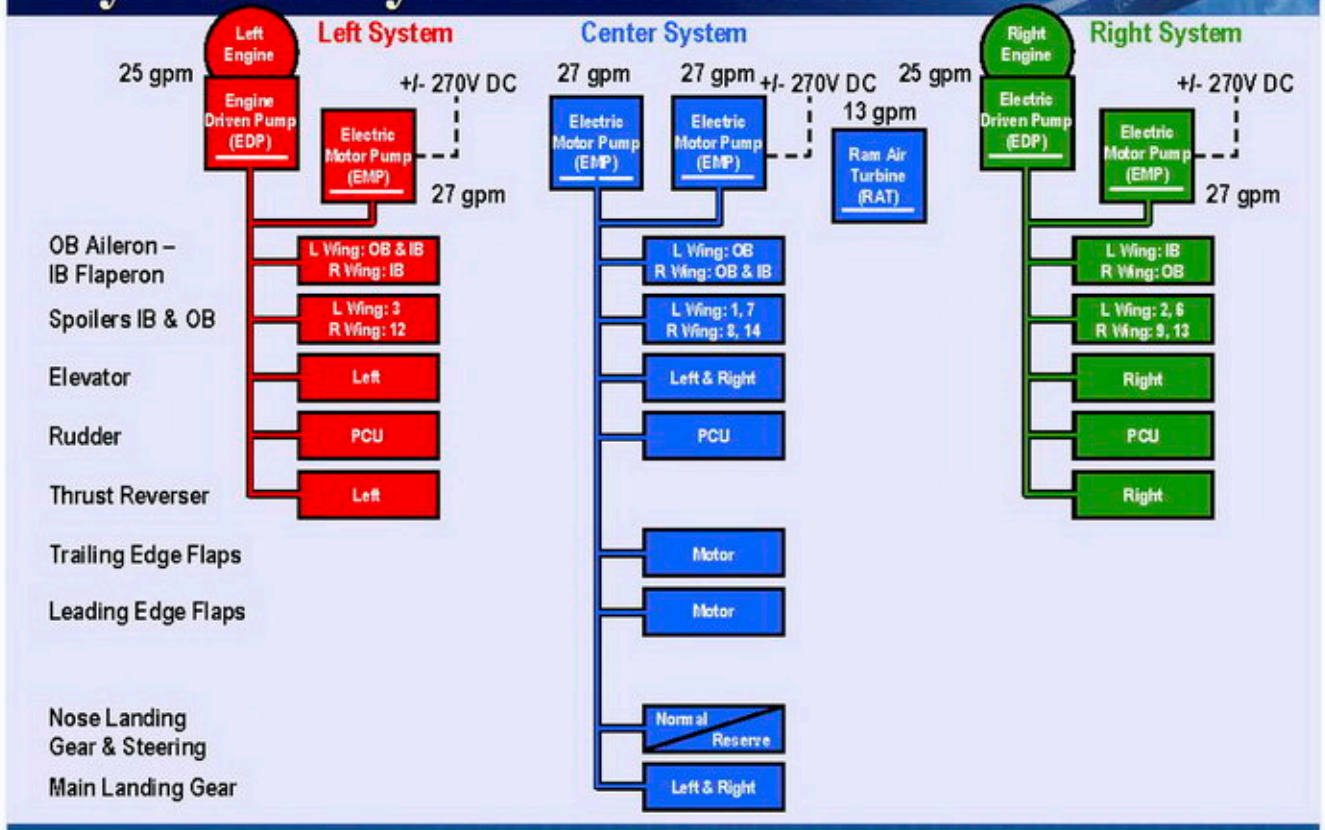
- Electric Air Conditioning*
- 6,000 foot maximum cabin altitude*
- Integrated galley refrigeration*
- Conventional cabin pressure control – two outflow valves

- Electric heating for door floor areas*
- Draw-thru ventilation for Lavatories, Galleys, and Crew Rests

- Supplemental electric heating for Forward and Bulk Cargo compartments*
- Forward* and Bulk Cargo heating and ventilation for animal carriage
- Optional Forward Cargo air conditioning

*Different from 777

Hydraulic System Architecture



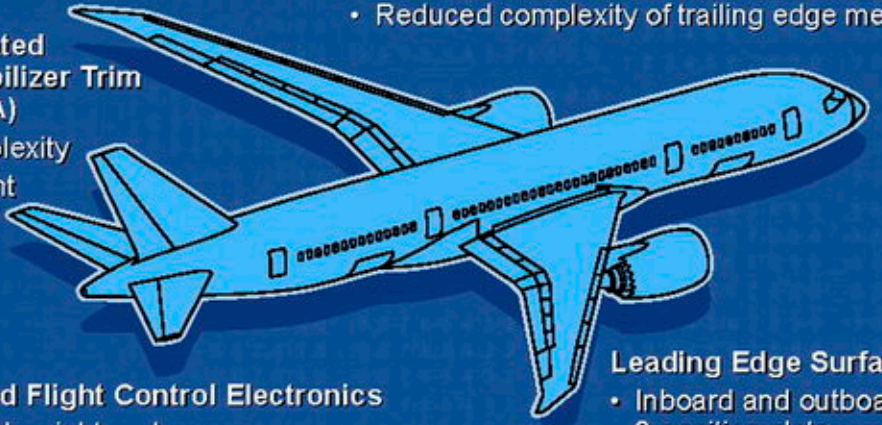
5000 psi systems with common pumps

787 Fly-by-Wire Flight Controls

All Surfaces Fly-By-Wire
- Eliminates cables
- Reduced weight
- Improved functionality

Trailing Edge Surfaces
- Inboard and outboard single slotted flaps
- Single outboard ailerons
- Single flaperons
- Seven spoiler pairs with droop function
- Trailing Edge Variable Camber (TEVC)
- Reduced complexity of trailing edge mechanism

Electric Integrated Horizontal Stabilizer Trim Actuator (HSTA)
- Reduced complexity
- Reduced weight

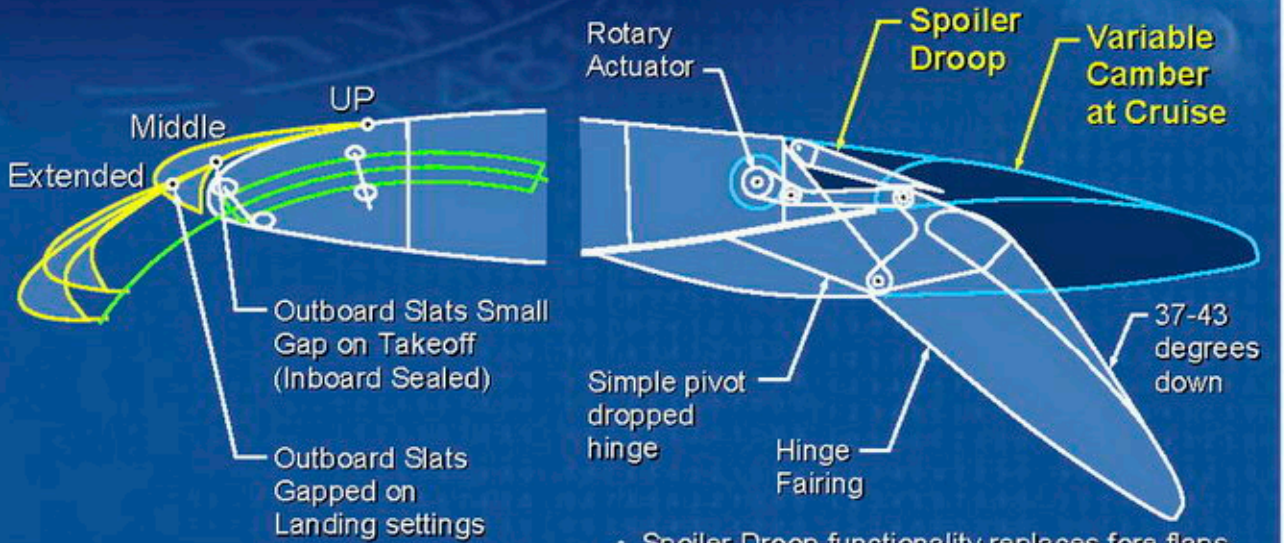


Integrated Flight Control Electronics
- Reduced weight and space

Leading Edge Surfaces
- Inboard and outboard 3-position slats
- Sealing Krueger Flap at pylon

High Lift Function

- Leading Edge and Trailing Edge Kinematic Motion

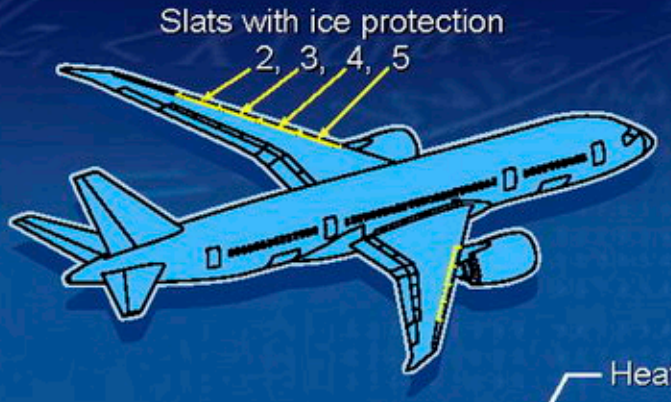


- Spoiler Droop functionality replaces fore flaps and maintains gap and overlap requirements.
- Spoilers driven down via fly-by-wire control.

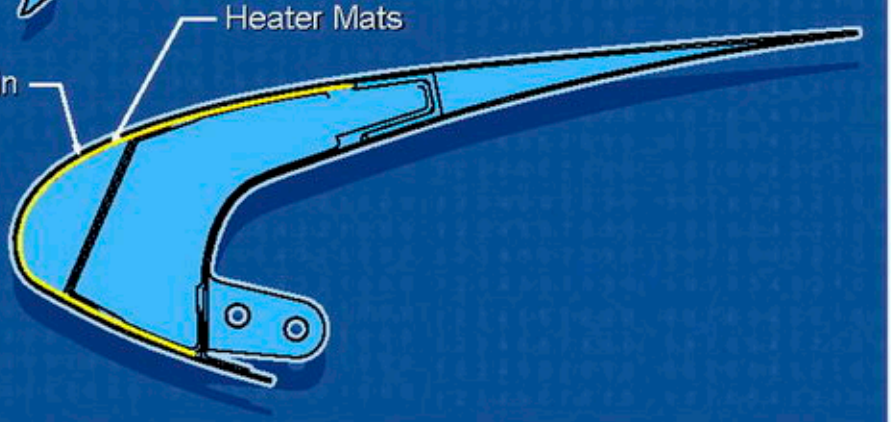
Landing Gear Systems
New Control-by-Wire

- Landing Gear Actuation
  - Electronic control and sequencing of landing gear and doors
  - Dedicated proximity sensors to monitor gear and door position, and to control sequencing
  - Alternate landing gear extension electrically controlled and hydro-mechanically released
- Brake Control
  - Control-by-wire for brake, autobrake, and anti-skid functions
  - Electric Brake Actuators
- Steering Control
  - Control-by-wire rudder pedals and dual tillers
- Brake Temperature Monitoring System – baseline
- Tire Pressure Indication System – baseline

Wing Anti-Ice System Overview



- Electrical Power – no engine bleed air
- Six heater mats in each heated slat
- Aluminum cap to protect leading edge surface



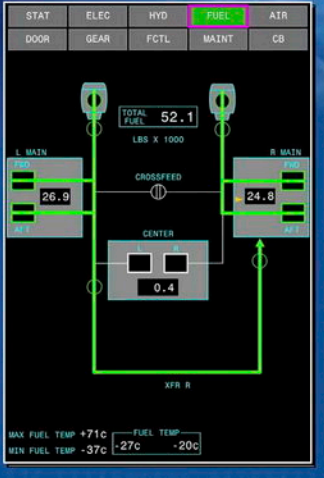
The heater mats are bonded to interior surface of the composite slat leading edge skin

Final Nose Configuration

- Four windows, fewer posts
- Pilot vision similar to 777
- Non-opening windows
- Crew escape door
- Vertically stowed wipers
- Windshield washer

Fuel Systems Improvements

- Improved Fuel Quantity availability (measuring sticks removed)
- Highly capable center tank fuel scavenge system
- Improved lateral balance correction without need to turn off fuel pumps
- Redundant jettison path of main tank fuel
- Improved anti-ignition safety using all-tank Nitrogen inerting and compliance to latest ignition prevention regulations



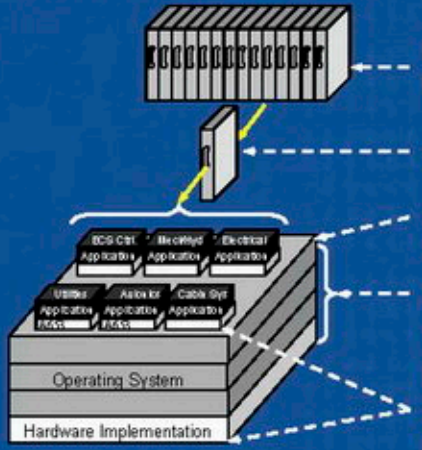
Common Core System Benefits

Common Data Network

- Open industry standard interfaces A664
- Eliminate multiple standards & protocols
- Fiber Optic Network media

Common Computing Resource

- Based on Open System Architecture Principles



Modular Implementation

of common elements

with robust partitioning of functions in software

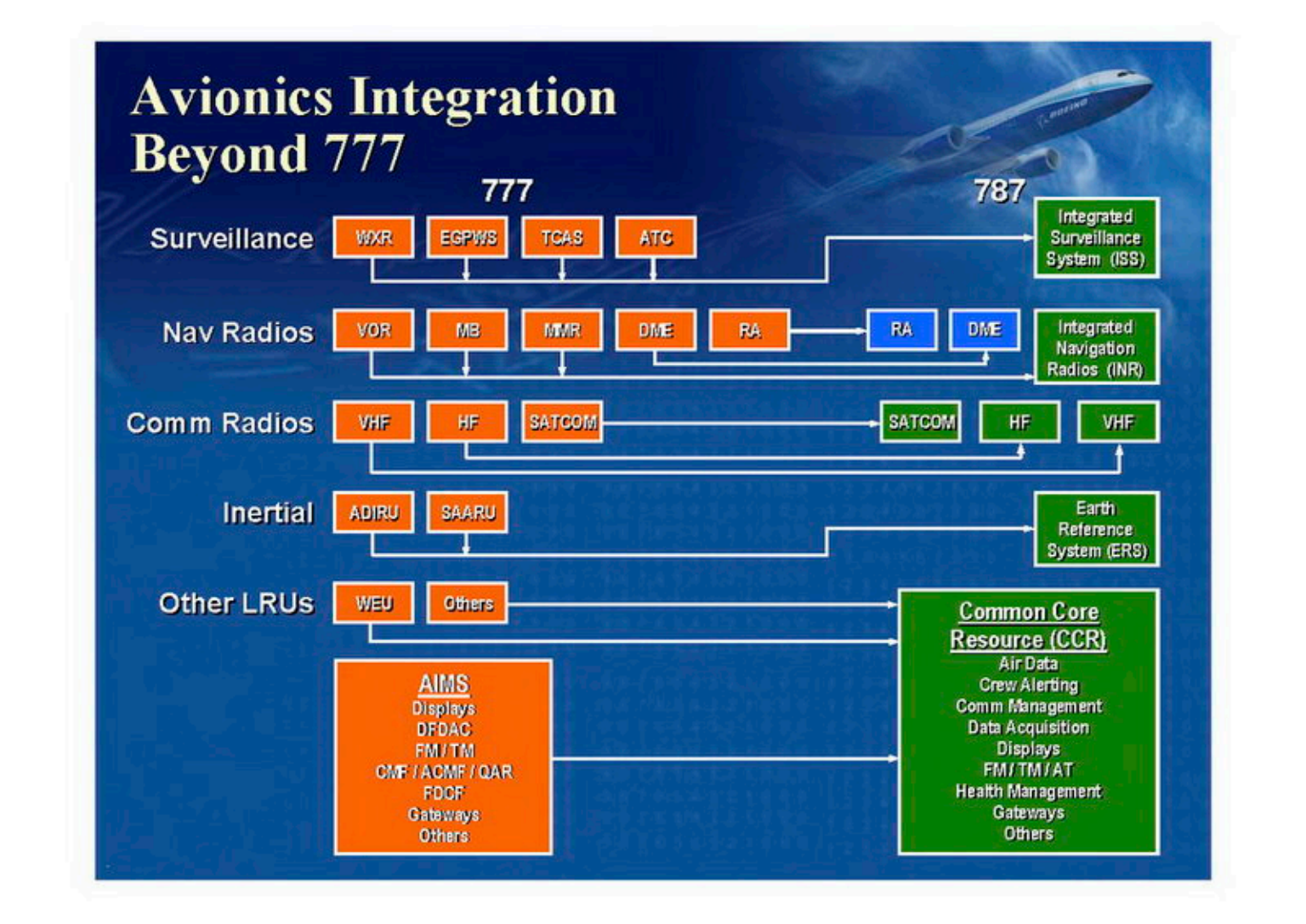
hierarchical layering of services

having well defined, standardized, rigidly enforced key interfaces A653

Remote Data Concentrators

- Reduces airplane wiring/weight,
- Ease of system upgrade/modification
- Highly reliable

Avionics Integration Beyond 777



Flight Deck

- Boeing look, feel and procedures flow
- Familiar Boeing controls
- Familiar display formats
- All 777 functions and features
- Large format displays

Display Layout Comparison

777

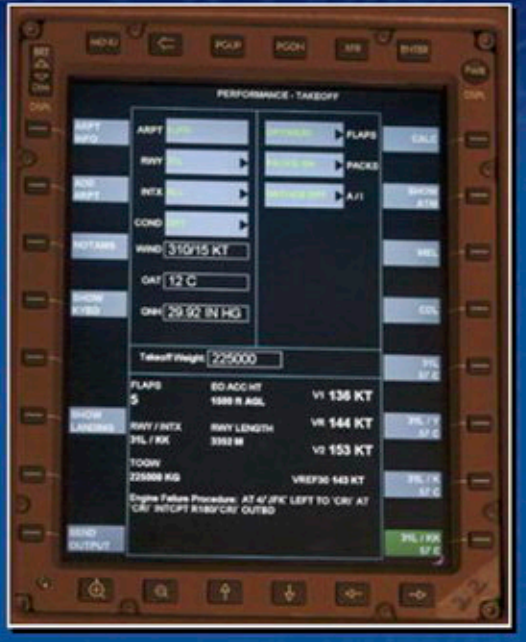
787

Class III EFB Overview

- One installed for each pilot – basic
- Avionics quality LCD
- Accessible via touchscreen, bezel keys, cursor control device and keyboard

- Interfaces to:
  - Other Avionics (e.g. Flight Management)
  - Communication systems
  - Flight Deck printer

On-board Performance Tool



- Calculates limit weights, V speeds, thrust and more
- Performance optimization and flexibility
  - Optimum flap
  - Multiple intersections
  - Calculates assumed temperature thrust reduction
  - MEL and CDL item entry
  - Airport NOTAM entry
- Data from FMC
  - Origin airport, QNH, OAT
- Simplified weight and balance

787 Program Schedule

2002	2003	2004	2005	2006	2007	2008
Airplane Announcement	Authority to Offer	Program Launch	Firm Configuration		First Flight	Certification and Delivery

Thank You