



# 787

DREAMLINER™

BOEING COMMERCIAL AIRPLANES



# Boeing 787 Dreamliner Flight Deck Safety, Comfort, Efficiency



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717 737 747 757 767 777 MD11 MD80 MD90



# Guiding Principles for Flight Deck Design







# The Boeing Flight Deck Philosophy

*The pilot is the final authority for the operation of the airplane.*

- Both crew members are ultimately responsible for the safe conduct of the flight
- Flight crew tasks, in order of priority, are: safety, passenger comfort, and efficiency
- Design for crew operations based on pilots' past training and operational experience
- Design systems to be error-tolerant
- The hierarchy of design alternatives is: simplicity, redundancy, and automation
- Apply automation as a tool to aid, not replace, the pilot
- Address fundamental human strengths, limitations, and individual differences—for both normal and non-normal operations
- Use new technologies and functional capabilities only when:
  - They result in clear and distinct operational or efficiency advantages, and
  - There is no adverse effect to the human-machine interface

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# The 787 Flight Deck Provides More Value

## The 787's new design provides:

- Safety enhancements
- Increased operational capability and efficiency
- A comfortable and secure environment
- More standard airplane
- Reduced upgrade costs
- Common Boeing product line

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# More Features Are Provided as Basic

- Dual HUD
- Vertical situation display
- Large format map 1280 NM range
- Independent TCAS displays
- RNP .1
- Full face O2 masks
- Triple tuning control panels
- ATC uplink preview windows/ MCP
- Electronic flight bag
- Electronic checklist
- Enhanced ground proximity warning system
- Airport map
- Single SATCOM w/full provisions for dual\*
- Flight deck printer
- HF data link\*
- Flight interphone system
- Dual cockpit voice recording, extended recording
- Auto scan weather radar
- Full time tactical map
- Message based synoptic selection

\* Optional on the 787-3

# Selectable Features



- Most features are basic
- Options support airline specific mission requirements
  - HUD low-visibility takeoff guidance
  - Flight deck humidification
  - Dual SATCOM
  - Flight deck door surveillance cameras
  - Dual ADF
  - Additional flight crew oxygen and remote fill

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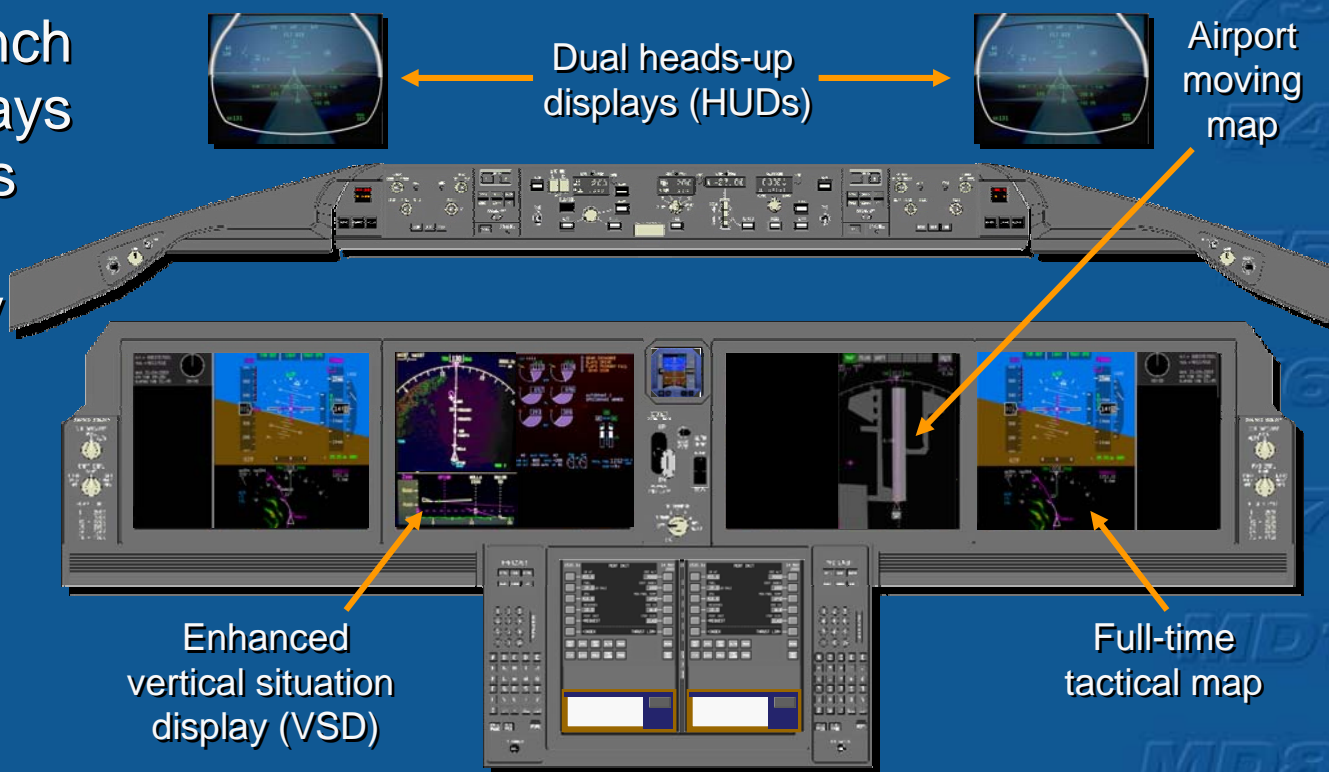






# Standard Features Support Safety Initiatives

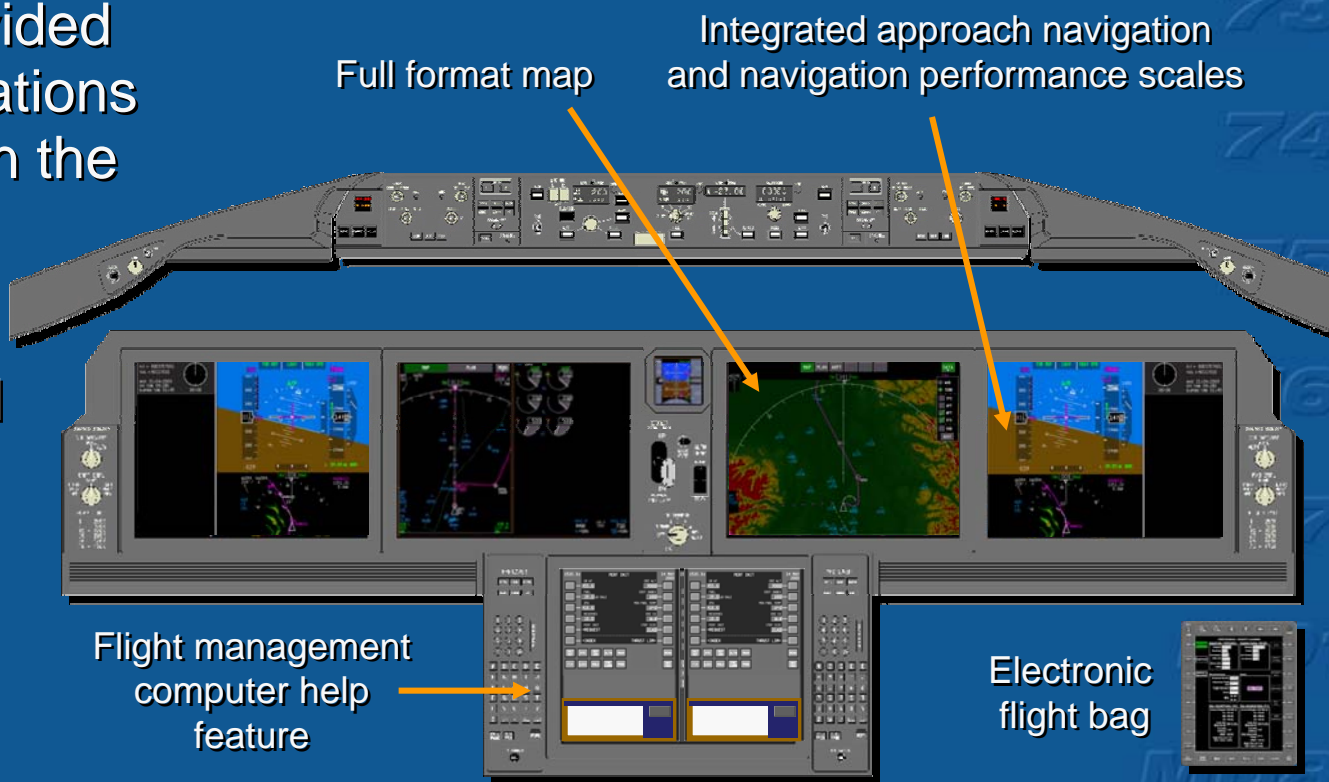
- Five large 12-inch by 9-inch displays plus dual-HUDs provide more room to display information
- Standard applications lower spares costs



# Operational Capability and Efficiency



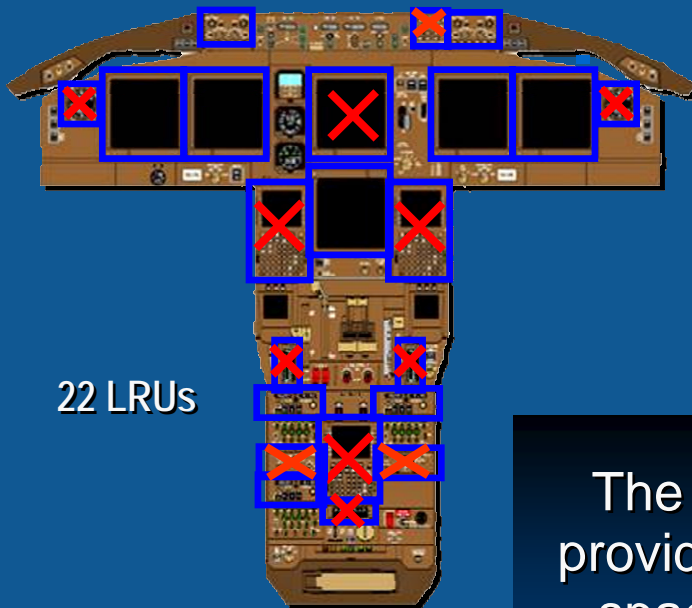
- Features provided improve operations in flight and on the ground
- Operating costs reduced
- Will be RNP 0.1 and GLS Cat I capable



# More Value With Fewer Parts

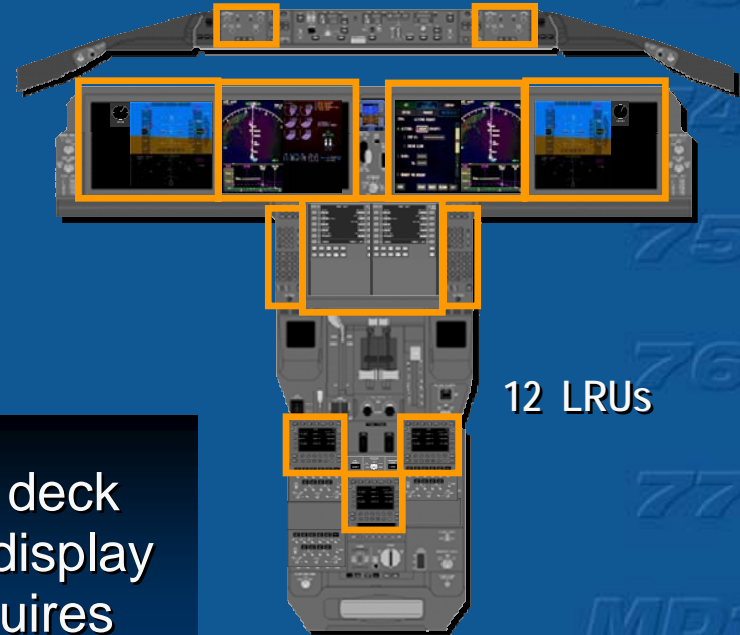


777



22 LRUs

787



12 LRUs

The 787 flight deck provides more display space but requires fewer display LRUs than the 777

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# Dual HUDs Enhance Operations

- More stable and accurate approaches
- Safer and more flexible operations for lower-visibility takeoffs
- Better crew coordination
- Enables more “eyes out” flying
- Fewer delays and diversions
- Enhanced airplane speed/energy management means lower aircraft wear and tear on wheels, tires, and brakes
- Captain upgrade training reduced



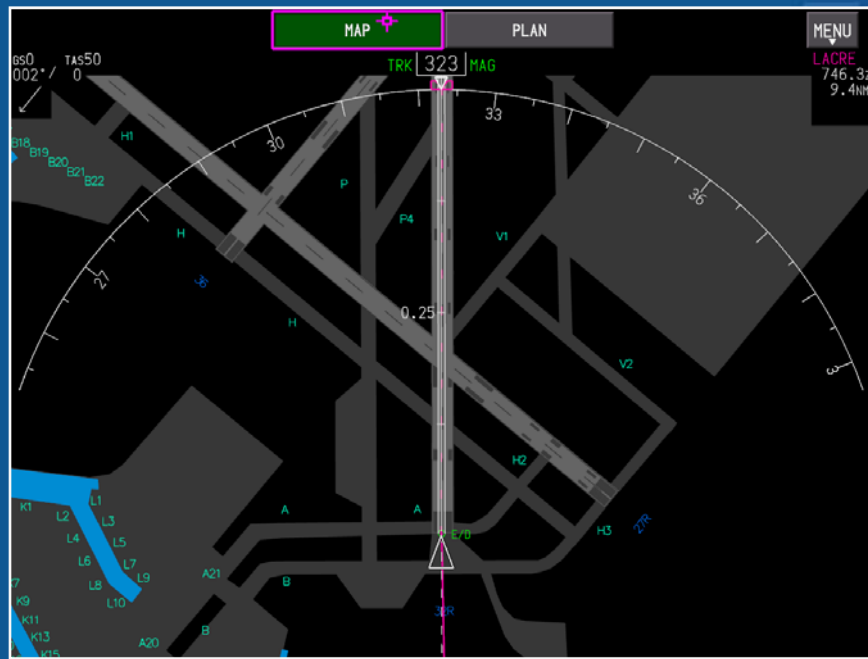
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# Airport Moving Map Maintains Crew Awareness



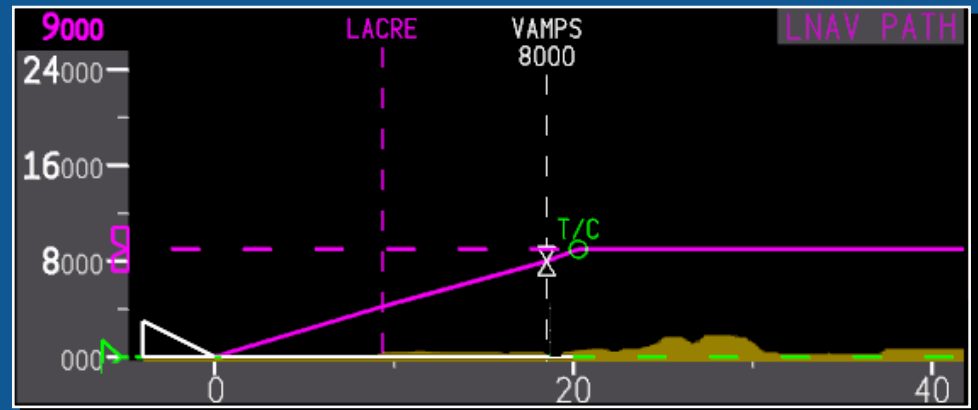
- Integrated with navigation display to maintains awareness of location on the airfield
- Airport map automatically switched at low map ranges
- Striving to increase surface operations safety



# Enhancing Situational Awareness With Vertical Situation Display



- Provides superior flight crew awareness with a graphical view of vertical path
- Trend vector predicts vertical path relative to terrain and waypoint constraints
- Enhancements include display of the vertical navigation profile
- Stabilized approaches through better energy awareness



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# Simplifying Approach Procedures With Integrated Approach Navigation



- Allows GPS, localizer, VOR, and NDB approaches all to be flown with the same procedure as ILS and GLS precision approaches
- Simplifies procedures and saves one day of simulator training by allowing a common approach procedure
- Reduces many different approach procedures to one



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# Navigation Performance Scales



- Displays actual and required navigational performance
- Clear and intuitive presentation of navigation performance
- Supports RNP 0.1 nmi operations
- Enables lower weather approaches at reduced infrastructure airports
- Reduces training time

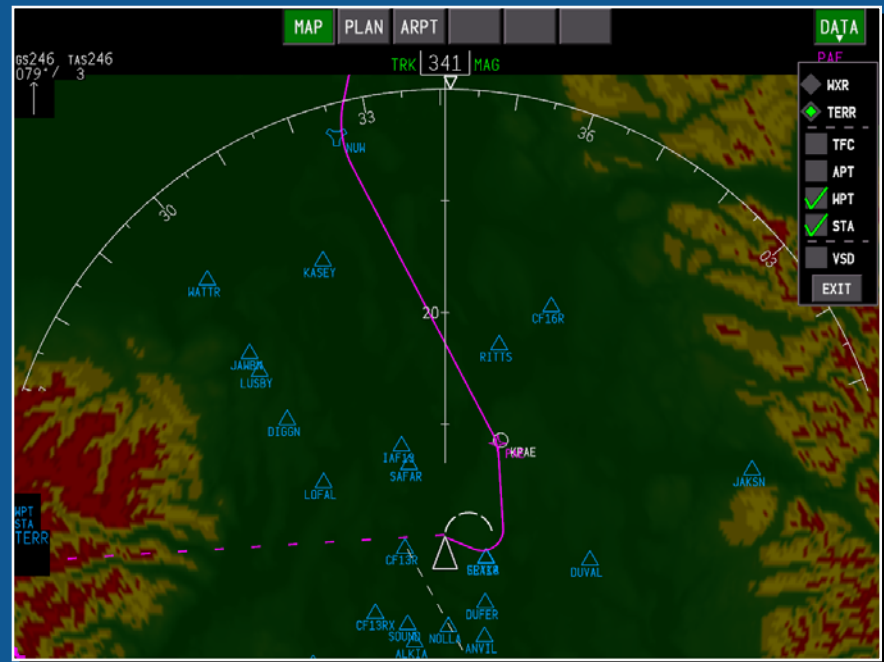




# Full-Format Map Offers More Room for Display



- Enhanced larger map includes more flight-critical information
- .5 to 1280 nmi scale
- Provides better situational awareness of path and surroundings
- Navigation display enables less expensive software upgrades—soft keys instead of hard keys





# Dual Electronic Flight Bags Are Basic

- Enhanced flight deck information
- More efficient updating of flight operations information
- Real time calculations of performance:
  - Lower thrust
  - More gross weight
  - Shorter runway
- Shorter maintenance troubleshooting time



## The EFB can provide:

- Video surveillance
- Computation of performance data
- Navigation charts
- Electronic documents
- Electronic logbook
- Airline or third party software applications platform

# Flight Management Computer Includes Detailed Help Function



- Easier to use
- Minimize keyboard entries, maximize functionality
- Reduces entry errors and data entry time to improves dispatch reliability
- Increases operating efficiency
- Reduces training time

Invalid entry in scratchpad

New help window provides options

The screenshot displays the FMC interface. At the top, the time is 08:57:04z and the date is 13 DEC 04. The main screen shows 'ACT RTE 1' with a '1/2' indicator. The 'ORIGIN' field is highlighted with a pink box and contains 'KBF1'. The 'DEST' field contains 'EGLL'. The 'RUNWAY' field contains '31L'. The 'ROUTE' field contains '<REQUEST'. The 'CO ROUTE' field contains 'BFIEGLL'. The 'ALTN' field contains '<RTE 2'. The 'KJFLK' field is highlighted with a yellow box. Below the main screen is a grid of buttons: INIT REF, RTE, DEP ARR, ALTN, VNAV, EXEC, FIX, LEGS, HOLD, FMC COMM, PROG, NAV RAD, PREV PAGE, and NEXT PAGE. A help window titled 'INVALID ENTRY' is open at the bottom, showing the message 'AIRPORT IDENTIFIER 4 CHARACTERS' and a list of valid airport identifiers: EGLL, RJAA, and KJFK. The help window also includes a 'CLEAR MSG' button and a 'TOTAL MESSAGE' counter showing '1'.

INVALID ENTRY	
AIRPORT IDENTIFIER 4 CHARACTERS	CLEAR MSG
EGLL	1 TOTAL MESSAGE
RJAA	
KJFK	

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# New Flight Deck Designed With Growth Enablers



Five true multifunction display areas

SMRY	HYD	ELEC	FUEL	GEAR	COMM/NAV	ALERTS
STATUS	AIR	ICE/RN	FCTL	DOOR	MAINT	FIRE

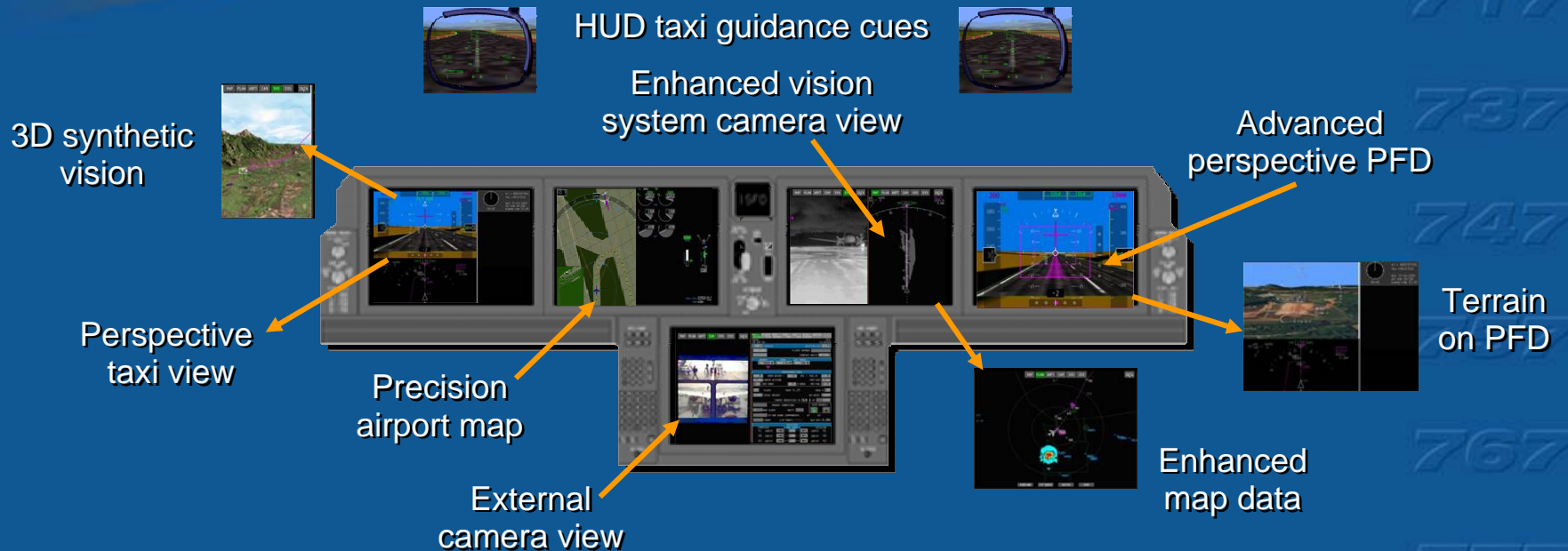
Soft menu controls



Two side displays



# Foundation for Future Enhancements



The 787 flight deck design will support incorporation of future enhancements to improve safety and efficiency, and reduce training.



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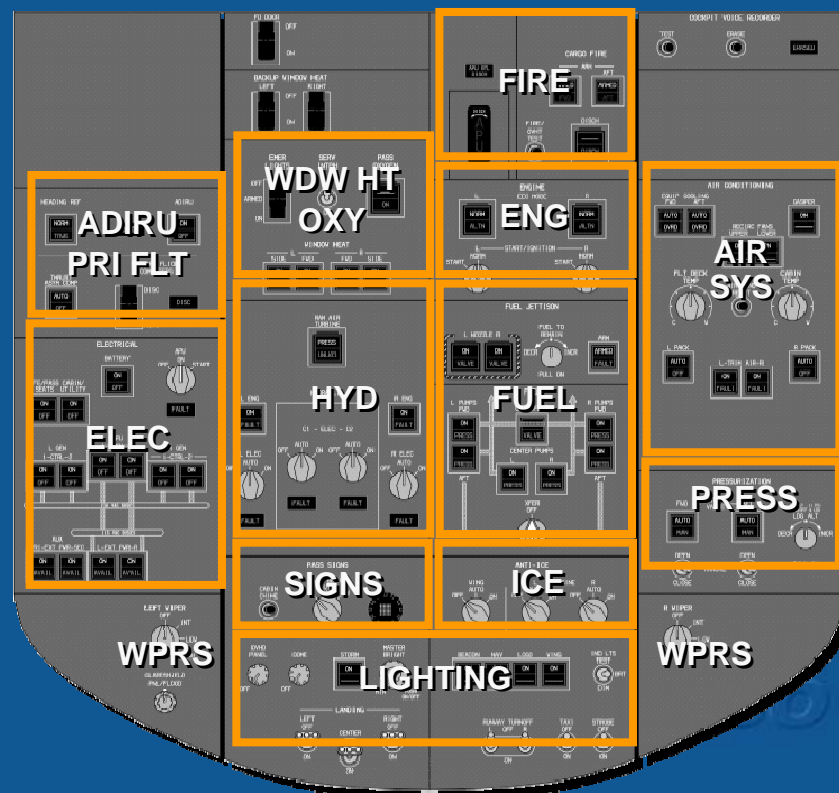
# New Systems But Familiar Procedures

The 787 has optimized aircraft systems:

- More electric airplane
- 5,000-psi hydraulics
- Electric engine starter/generator
- Electric compressors for air-conditioning packs
- Soft control circuit breakers
- No overhead maintenance panel

To maximize training commonality, the 787 will retain nearly identical procedural flows to the 777.

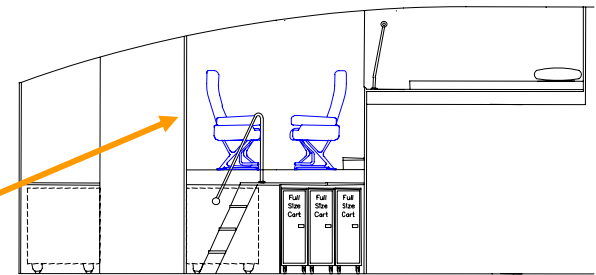
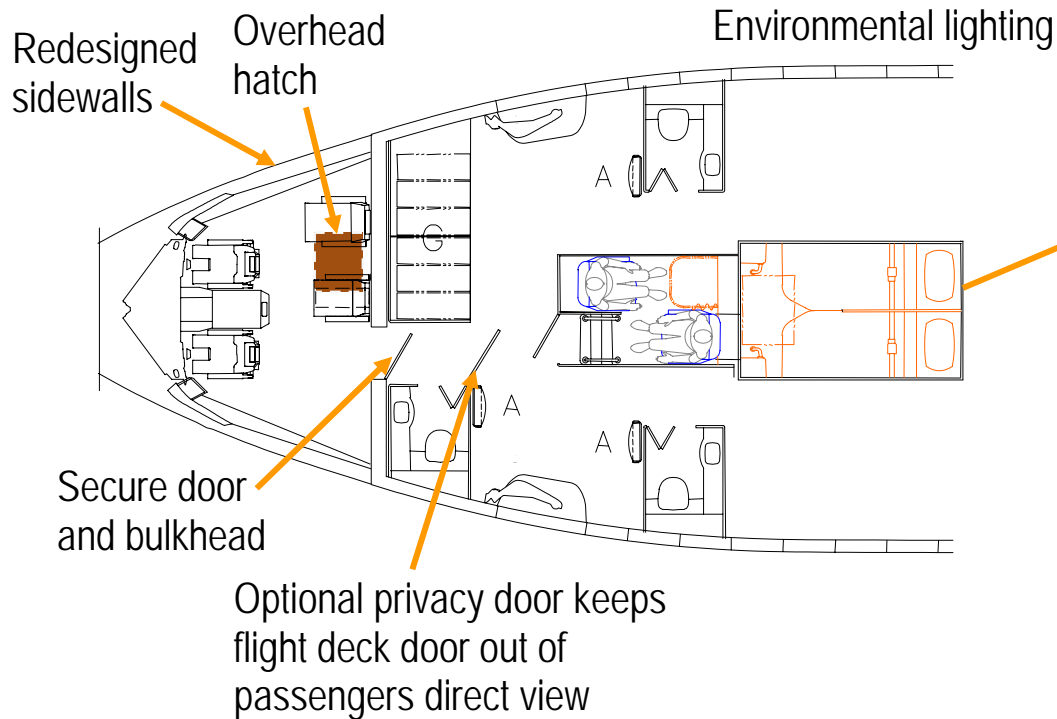
787 overhead panel similar to the 777





# A Comfortable and Secure Flight Deck

*The flight deck will be spacious, secure and quieter. It will enjoy a 6,000-foot maximum cabin altitude, with more humidity.*



A comfortable flight crew rest is an available selection (takeoff and landing capable) and is located in the overhead out of the "revenue-space."



# Training Requirements Are Minimal

## 787 Goals

- **Full transition training** – Training to qualify on an aircraft type, not based on prior experience on other aircraft → • 21 days (similar to 777)
- **STAR training** – Shortened transition and rating training to pilots currently qualified on another Boeing aircraft → • 13 days from other Boeing models
- **Differences training** – Proportionate to differences between airplane types or variants → • 5 days to/from 777, 8 days from 757/767, 11 days from 737
- **Recurrent training** – Training conducted on a regular interval to ensure continued qualification on all airplanes the pilot flies → • Common takeoff, landing, and segment currency with 777 and 767

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# The Flight Deck Designed for Pilots

- Enhanced safety
- Increased operational capability and efficiency
- A comfortable and secure environment
- More features included as basic
- Reduced upgrade costs
- Common Boeing product line

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# Questions and Answers



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# Survey



# *Questions?*