

 **BOEING**



787
DREAMLINER™

BOEING COMMERCIAL AIRPLANES



Boeing 787 Dreamliner Flight Deck Safety, Comfort, Efficiency



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Boeing Commercial Airplanes

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

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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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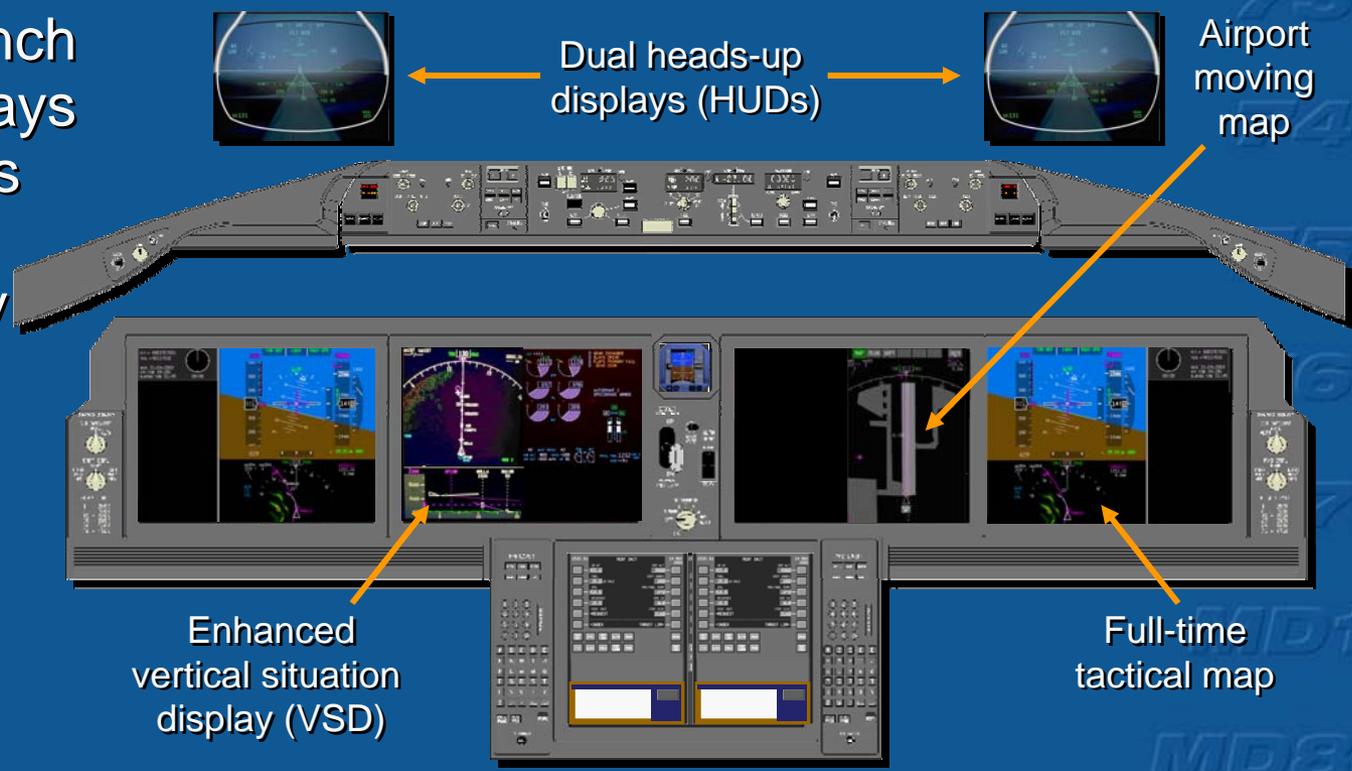
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Standard Features Support Safety Initiatives

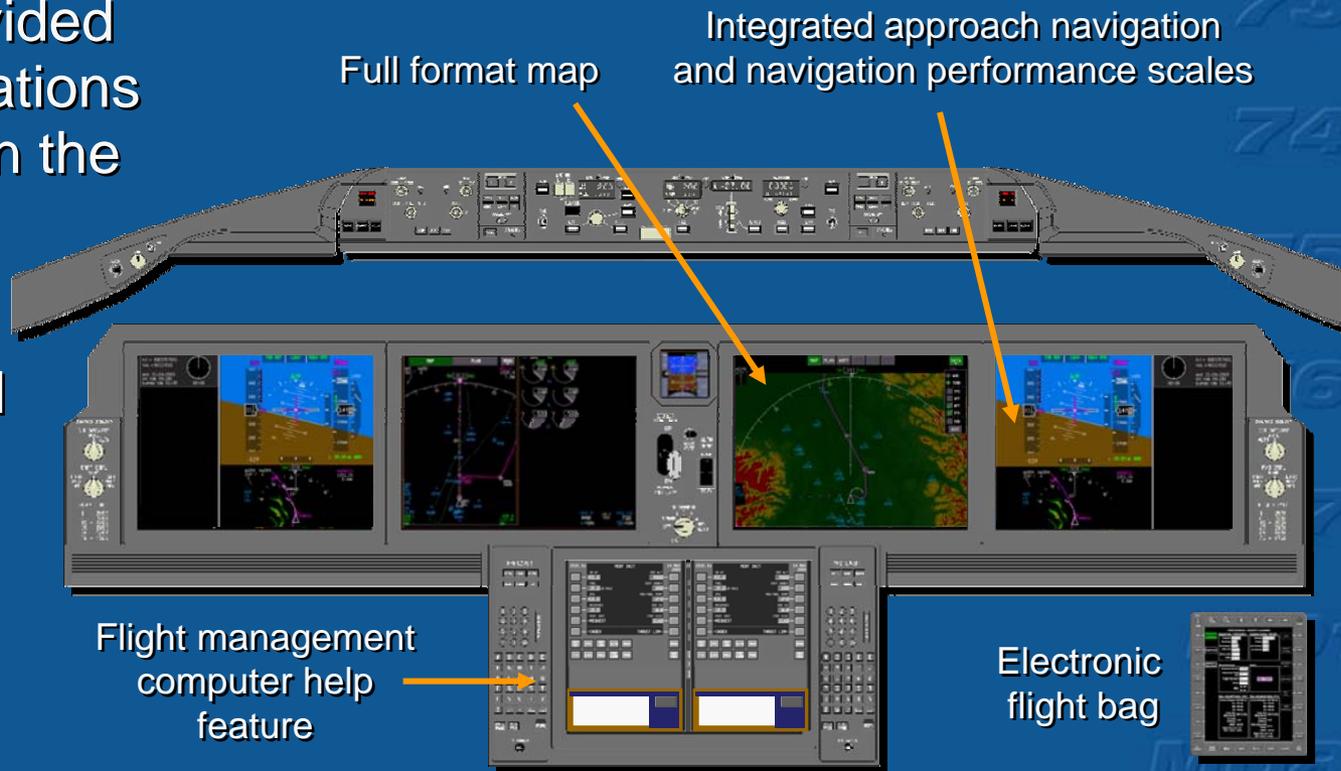
- Five large 12-inch by 9-inch displays plus dual-HUDs provide more room to display information
- Standard applications lower spares costs





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



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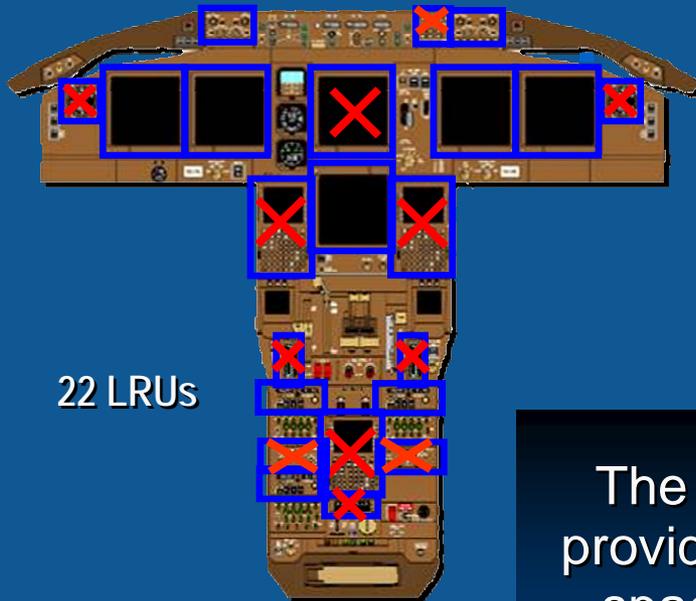
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More Value With Fewer Parts

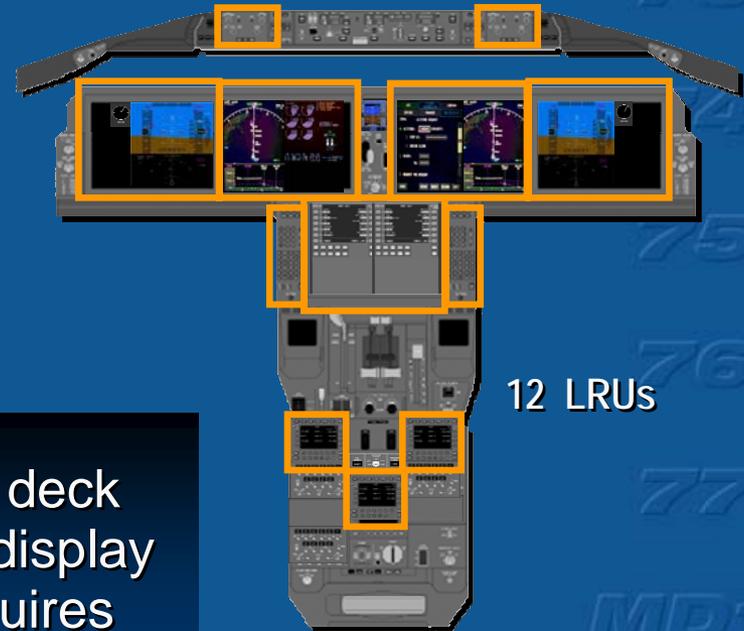


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22 LRUs

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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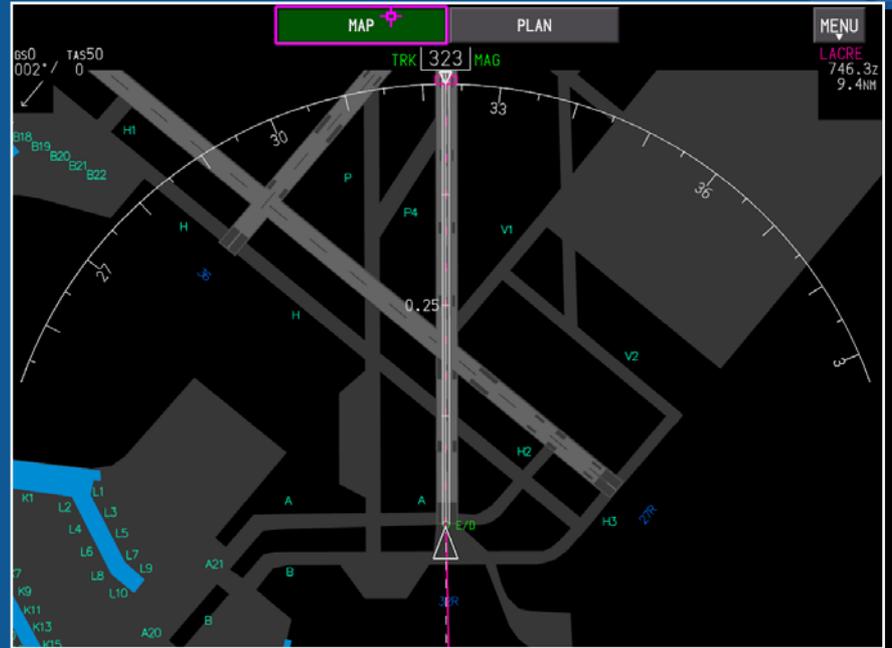
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Airport Moving Map Maintains Crew Awareness



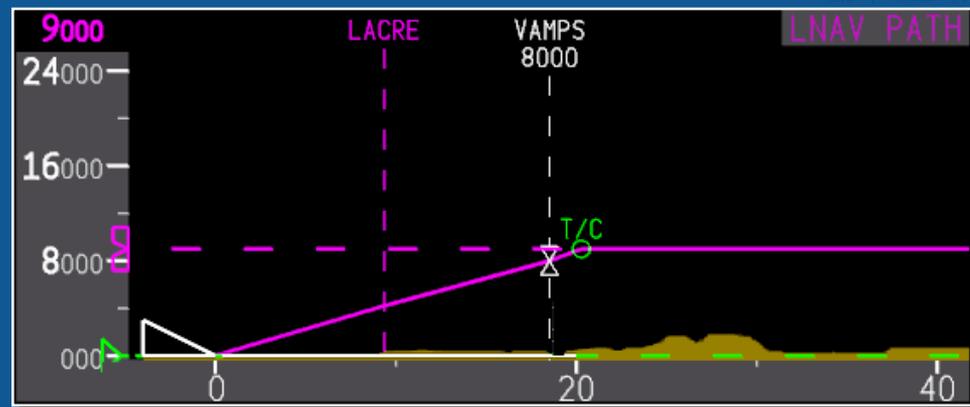
- Integrated with navigation display to maintains awareness of location on the airfield
- Airport map automatically switched at low map ranges
- Striving to increase surface operations safety



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



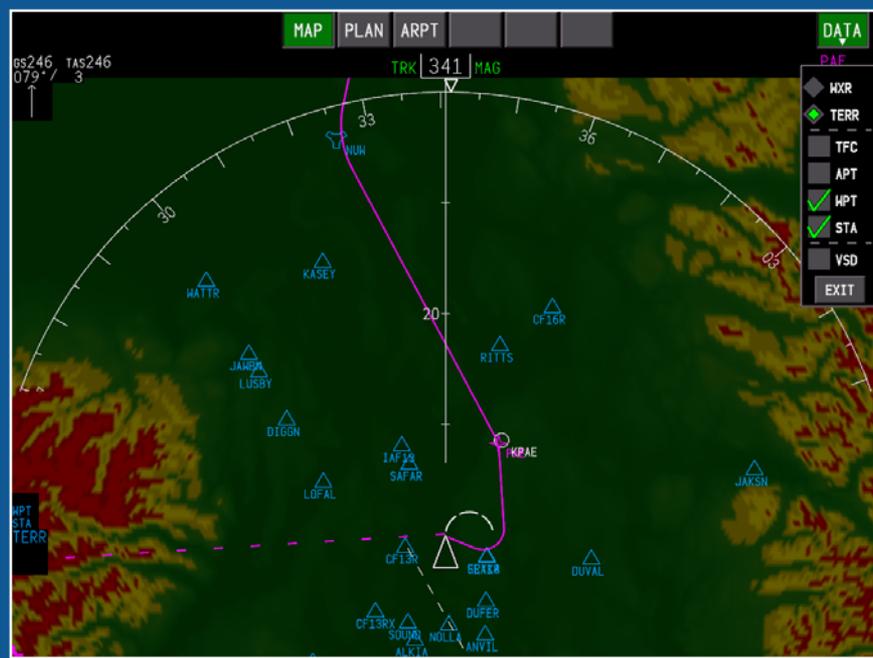
- Displays actual and required navigational performance
- Clear and intuitive presentation of navigation performance
- Supports RNP 0.1 nmi operations
- Enables lower weather approaches at reduced infrastructure airports
- Reduces training time



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



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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 with the following elements:

- Top status: 08:57:04z, 13 DEC 04
- ACT RTE 1 1/2
- ORIGIN: KBF1 (highlighted with a pink box)
- DEST: EGLL
- RUNWAY: 31L
- ROUTE: <REQUEST
- CO ROUTE: BFIEGLL
- ALTN: >
- Scratchpad: KJFLK
- Buttons: INIT REF, RTE, DEP ARR, ALTN, VNAV, EXEC, FIX, LEGS, HOLD, FMC COMM, PROG, NAV RAD, PREV PAGE, NEXT PAGE
- Help window (highlighted with a blue box):
 - INVALID ENTRY
 - AIRPORT IDENTIFIER 4 CHARACTERS
 - EGLL
 - RJAA
 - KJFK
 - CLEAR MSG
 - 1 TOTAL MESSAGE

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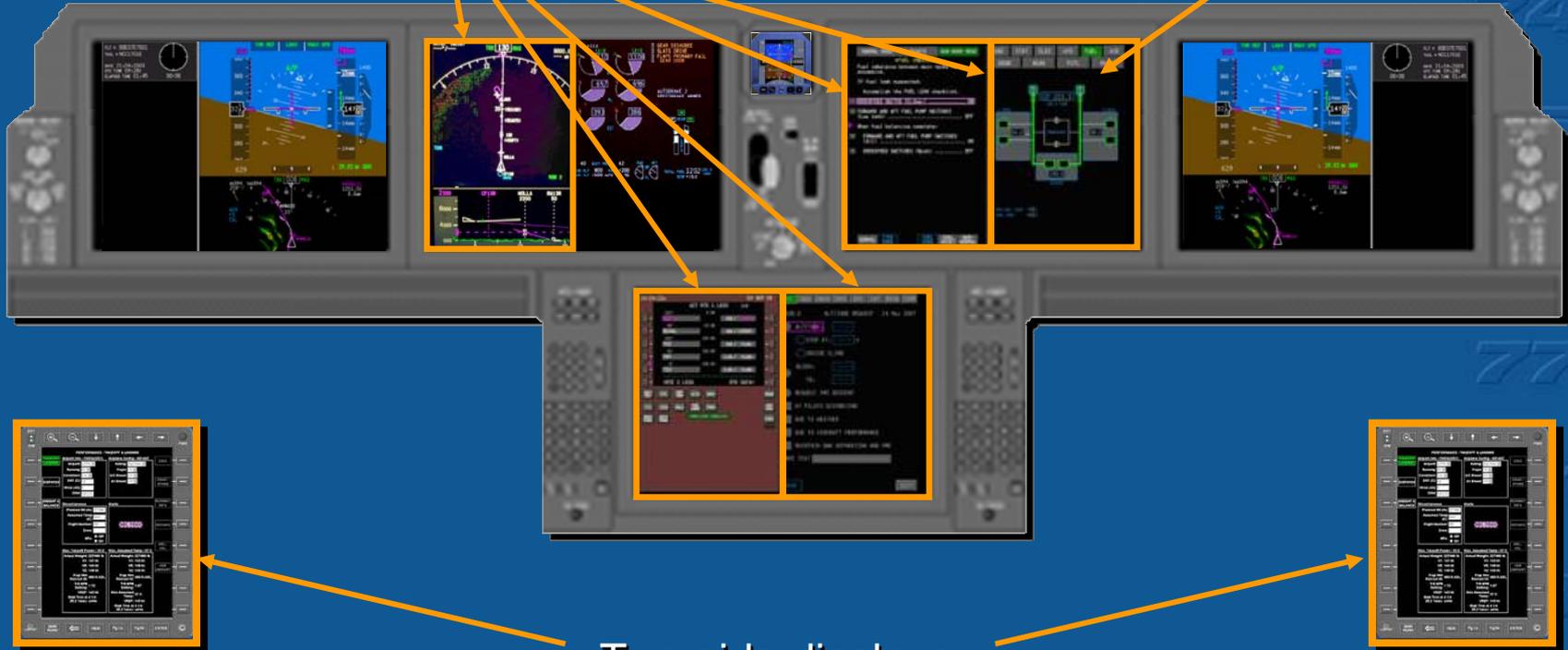
New Flight Deck Designed With Growth Enablers



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



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



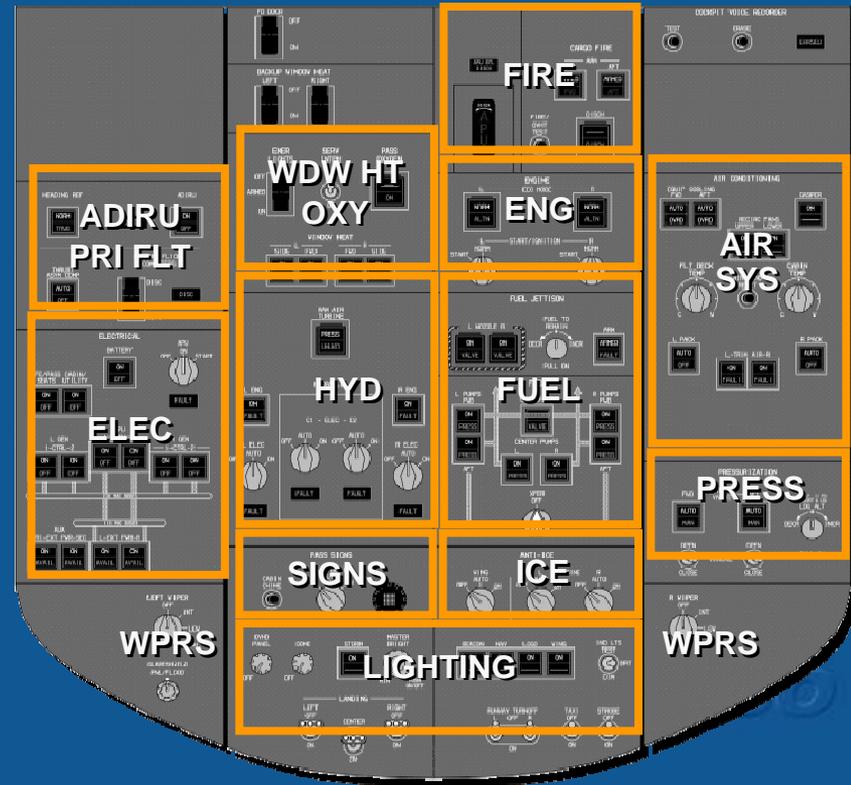
New Systems But Familiar Procedures

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



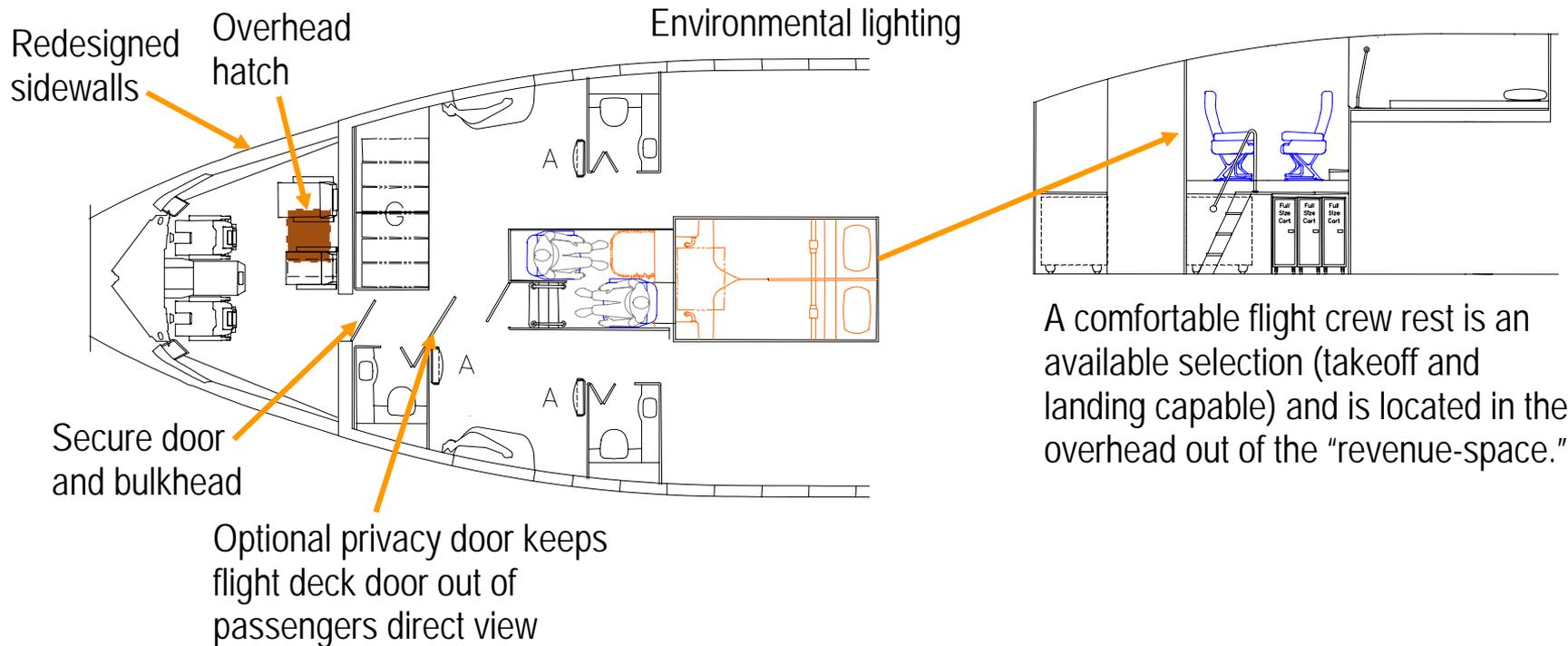
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A Comfortable and Secure Flight Deck

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





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?