Information Displays in Aerospace: Past, Present, and Future

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Why is display technology so important to the aerospace industry?

- Touches just about every aspect of aviation from design and build to operations and maintenance

- Electronic displays have enabled significant progress in safety, efficiency, and human interface within aerospace industry
A Brief History of Flight Instruments

Early Single Seat Aviation
Early Commercial Transport

314 Clipper Control Deck
Transport Aircraft – Last of an Era

377 Stratocruiser
Moving into the Turbo Jet Era

DC-8 Flight Deck
Continuing the Turbo Jet Era

747-200 Flight Deck
A thousand lights, gauges & switches
The Beginning of Electronic Displays
Evolving Electronic Displays

757/767/777 Flight Deck
Electronic Displays:

Enabling information from data

747-400 and 747-200
Engine Instruments / Crew Alerting

314 Clipper Engineer’s Panel

EICAS enabled by CRTs supported move from 3 to 2 crew

Engine Instruments and Alerting Challenges
Engine Instruments / Crew Alerting
Electronic Checklist & Synoptics

Challenges?
Integration & Linkage of Information

Condition: The C2 pump pressure is low.

**C2 ELEC pump selector**

- **ON**
- **OFF**

HYD PRESS C2 message stays shown:

- **C2 ELEC pump selector**
- **OFF**
Navigation Display

Basic Navigation Display with Flight Plan Path

Navigation Display with Terrain

Navigation Display with VSD

Future Challenges?
Enhanced Navigation Display - 787
Interactive Flight Deck Displays
Going to Paperless
Primary Flight Information

Growth of Situation Awareness
Synthetic Vision Displays
Head-Up Displays

Superimposing on the outside view
Enhanced Vision Displays

Enhancing the outside view

Normal HUD

HUD w/ EVS

Photo Courtesy
Rockwell-Collins International
Displays in Airplane Design

Historical View

Drafters circa 1920s

Drafters circa 1960s
Displays in Airplane Design

Airplane design today!

Designing the 777
On CATIA

Designing the 777 and the 787
Displays as Enablers (Disablers)

• CRTs enabled Moving Maps, Electronic Checklists, System Synoptics
• LCDs enabled common displays with multiple display configs, i.e., 737 Classic EFIS and 737 NG (with 777 formats)
• HUDs enabled safer and low visibility approaches

• What will future display technology enable?
Future Needs for Aviation

• Continued enhancements to safety
• Increased capacity and efficiency in flight operations
• Move to paperless (facilitates integration and database updates)
• Continued emphasis on reduced non-recurring time and cost
• Continued pressure on recurring cost, power and weight
What might the future hold?

- Virtual windows - flight crew and passengers
- Touch-enabled display and control
- Head Worn Displays for maintainers and pilots
- Fully immersive 3-D computer design
- High reliability, low cost, light weight
- Easily upgradeable – economically support the 30-40 year airframe life cycle
Summary

- We have seen where we have been
- We know where we are today
- We have discussed some of the possibilities for the future
- It is up to us together to determine where we will go next
- An exciting future is before us