

# Wireless Technology for Aircrafts

## Opportunities and Challenges

“Fly-by-Wireless” Workshop  
March 27-28, 2007

Presented by  
Henrique A Alves  
[henrique.alves@embraer.com.br](mailto:henrique.alves@embraer.com.br)



- Introduction to EMBRAER
- Wireless Technology for Aircraft – Opportunities and Challenges



- One of the world's major commercial aircraft manufacturers
- Significant market share
- Global customer base
- Renowned international partners
- Excellent financial performance
- Brazil's largest exporter in 1999, 2000 and 2001
- Investment Grade – Moody's Investor Service and Standard & Poor's
- A dispersed capital ownership, with no controlling groups

## Operations in Brazil, United States, Europe and Asia



## Commercial Aircraft



## Defense Systems



## Executive Jet Market



# ERJ 145 Family



**ERJ 135**

37 Seats



**ERJ 140**

44 Seats



**ERJ 145**

50 Seats



**ERJ 145 XR**

50 Seats  
(2,000 nm range)

# EMBRAER 170/190 Family



## **EMBRAER 170**

70 to 80 Seats – 2,000 nm Range  
Certification – 1st Q/2004



## **EMBRAER 175**

78 to 88 Seats – 1,900 nm Range  
Certification – 4th Q/2004



## **EMBRAER 190**

98 to 114 Seats – 2,300 nm Range  
Certification – 3rd Q/2005



## **EMBRAER 195**

108 to 122 Seats – 2,100 nm Range  
Certification – 2nd Q/2006



## Integrated Market Approach



**Systems  
& Services**



**Training**



**Intelligence,  
Surveillance and  
Reconnaissance**



**Combat**



**Transport**

## Super Tucano



## AMX/ A-1M



# Special Mission Aircraft



**I S R** | **SYSTEMS**  
Intelligence | there's no escape  
Surveillance  
Reconnaissance



AIR



GROUND



SEA

## Versions



Legacy 600



Legacy Shuttle



Transportation of  
Authorities

# Executive Jet Market – New Jets



# Lineage 1000 – 'Ultra-Large' Business Jet



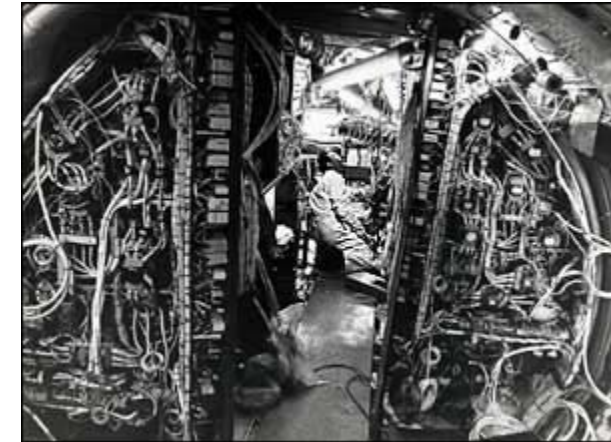
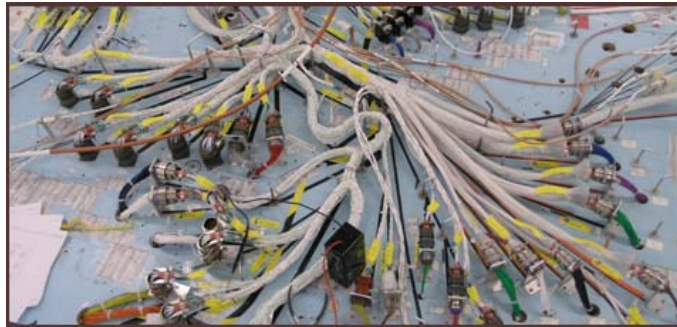
- Introduction to EMBRAER
- **Wireless Technology for Aircraft – Opportunities and Challenges**

- In a general overview Wires are used to:
  - Sending and Receiving
    - Power
    - Data
    - Comand / Control

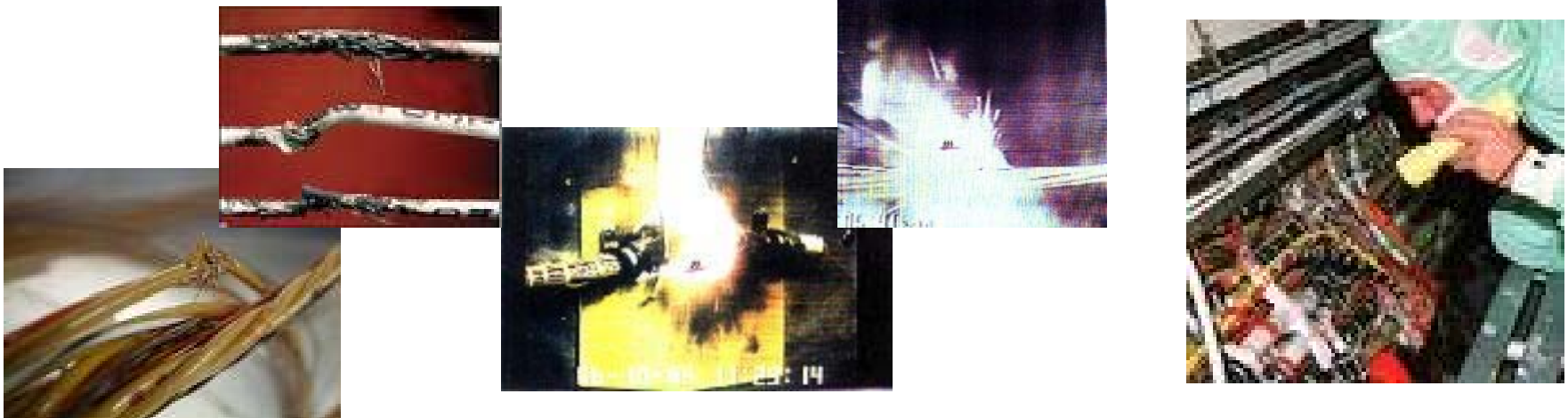




- But Wires adds:
  - Weight and Volume: Wire + Connectors + Protections



- Certification / Maintenance / Troubleshooting issues

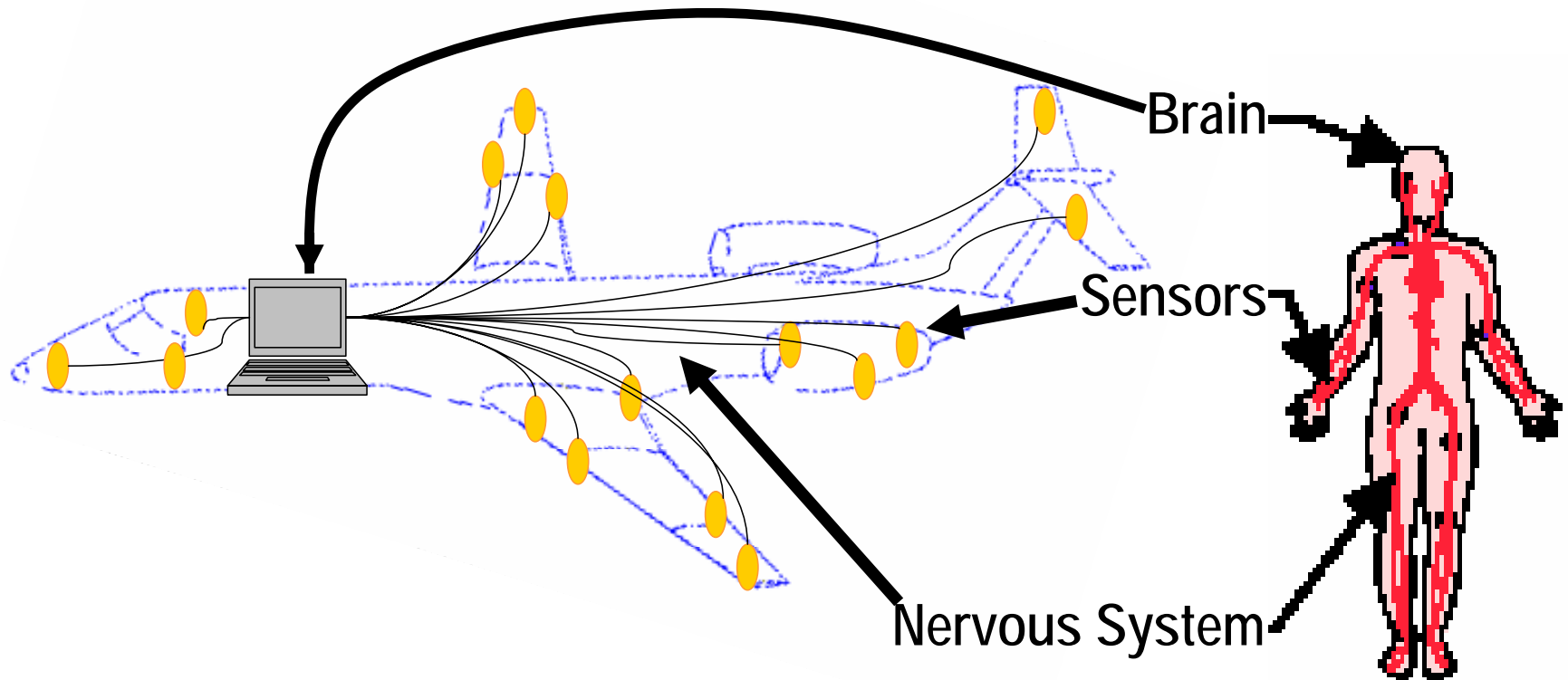


- Market and Engineering Requirements

| Item                                      | Market Requirements   | Engineering Requirements  |
|---|---|---|
| <b>Product</b>                            | Meet or exceed market requirements <ul style="list-style-type: none"> <li>- Performance</li> <li>- Comfort</li> <li>- Safety</li> <li>- State of the art</li> </ul> | Low weight<br>Low power consumption<br>Compact installation   |
| <b>Time to Market</b>                     | Date of service entry   | Short design & development cycles   |
| <b>In-Service Availability</b>            | Reliability<br>Maintainability  | Robust design<br>Maturity at entry into service<br>Ease troubleshooting and repair  |
| <b>Cost</b>                               | Low operation cost<br>Low acquisition cost  | Low non-recurring costs <ul style="list-style-type: none"> <li>- Efficient design tools and processes</li> <li>- Reduced engineering hours</li> <li>- Reduced development tests</li> </ul> Low recurring costs <ul style="list-style-type: none"> <li>- Simple but efficient solutions</li> </ul> |
| <b>Environmentally Friendly Solutions</b> | Energy saving<br>Noise reduction<br>Low emissions   | Low fuel & power consumption<br>Efficient insulation<br>Active noise reduction systems  |

- Some Aeronautical Trends ...
  - Aircraft Health Monitoring / Aircraft Sensing
  - Advanced Flight Navigation and Control
  - More Electric Aircraft
  - Office in the Sky, Comfort and Entertainment
  - Faster Ground/Flight Testing

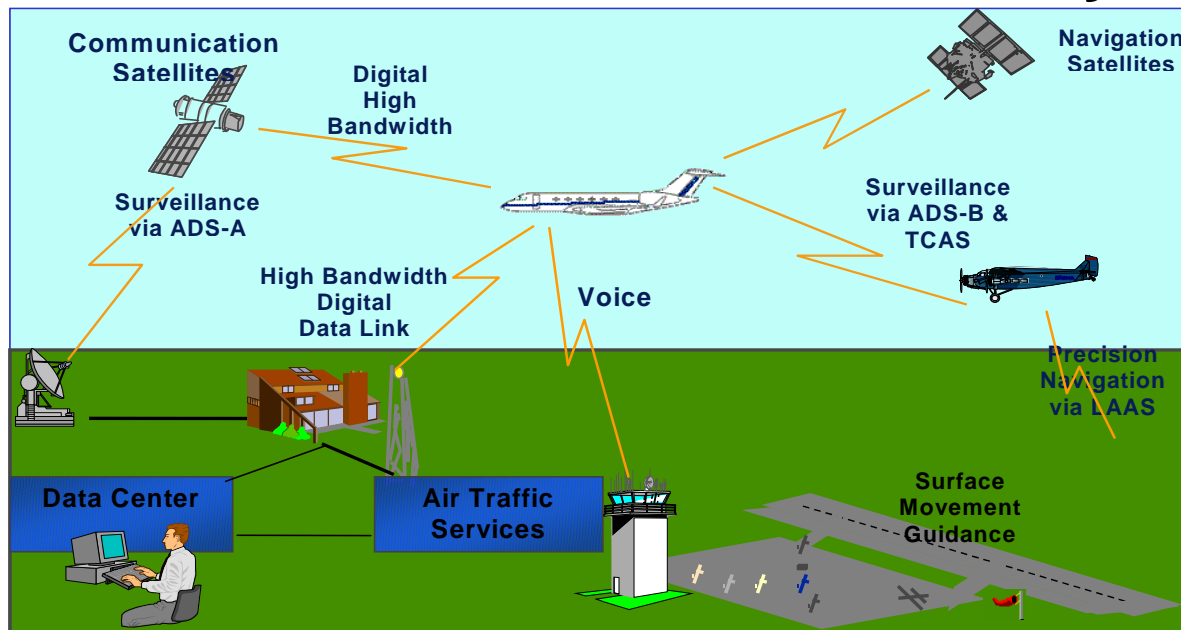
- Some Aeronautical Trends ... (1/5)
  - Aircraft Health Monitoring / Aircraft Sensing



- Some Aeronautical Trends ... (2/5)
  - Advanced Flight Navigation and Control

## Avionics

## Fly Control

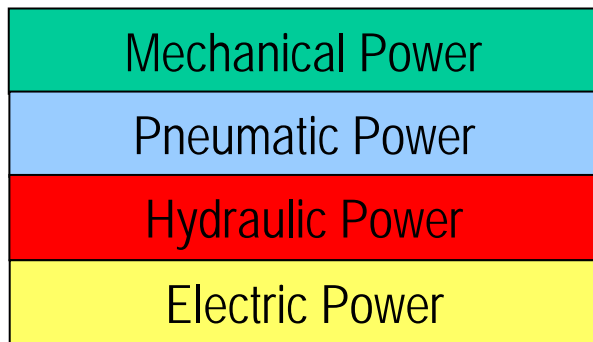


## Electronics

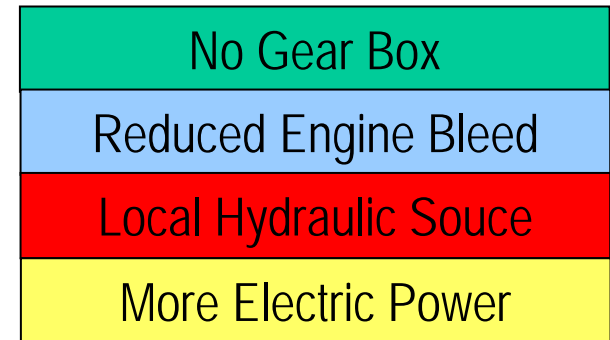
## 4D Navigation

- Some Aeronautical Trends ... (3/5)
  - More Electric Aircraft

Conventional Non-Propulsive Power



More Electric Non-Propulsive Power



# Wireless Opportunities

- Some Aeronautical Trends ... (4/5)
  - Office in the Sky, Comfort and Entertainment

Internet access

Audio/Video on-Demand

VoIP (Voice over IP)

Video Games

Cell phone

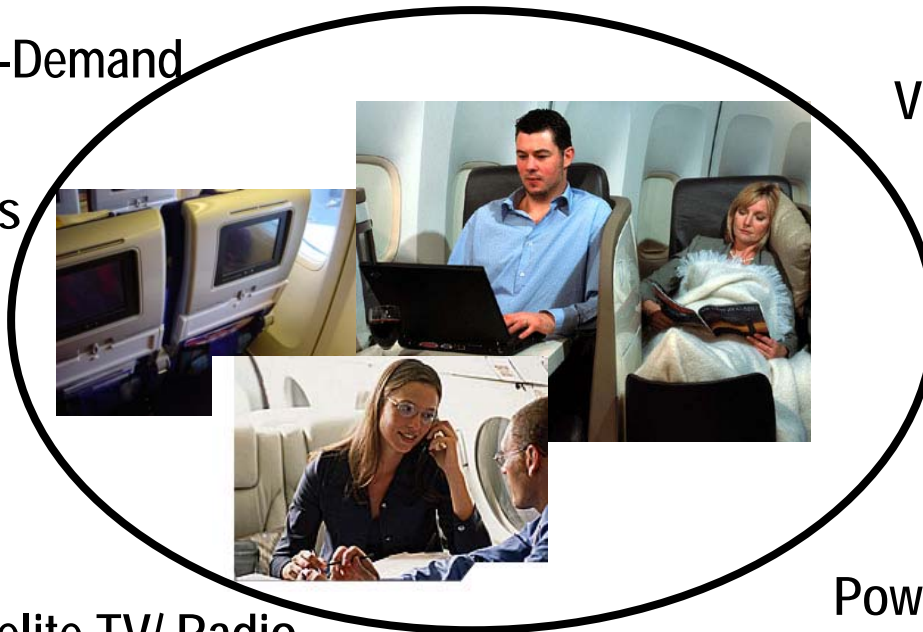
Personal TV

Light

Power

In-Flight Sattelite TV/ Radio

Sensors (temperature, smoke, humidity)



- Some Aeronautical Trends ... (5/5)
  - Faster Ground/Flight Testing
    - Aircraft Ground / Flight Testing Instrumentation is:
      - Complex
      - Time Consuming to Assemble / Disassemble

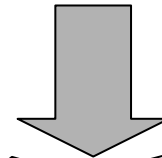
**a lot of wires!**



- Some Aeronautical Trends ...

- Aircraft Health Monitoring / Aircraft Sensing
- Advanced Flight Navigation and Control
- More Electric Aircraft
- Office in the Sky, Comfort and Entertainment
- Faster Ground/Flight Testing

- More Sensors
- More Electronics On-Board
- More Sending and Receiving Needs

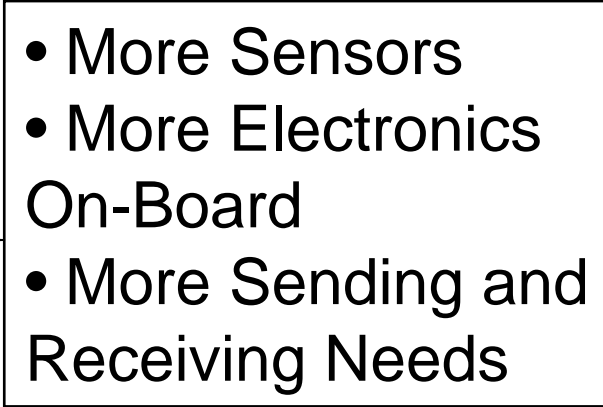


**More WIRES !?**



- Some Aeronautical Trends ...

- Aircraft Health Monitoring / Aircraft Sensing
- Advanced Flight Navigation and Control
- More Electric Aircraft
- Office in the Sky, Comfort and Entertainment
- Faster Ground/Flight Testing

- 
- More Sensors
  - More Electronics On-Board
  - More Sending and Receiving Needs

~~More WIRES !?~~

or **Wireless!!**

- RF Interference
- Wireless Networks Issues:
  - Security
  - Interferences
- FAA Regulation / Certification
- Others, maybe unknown, right now

- Wireless technology seems to fit well on Aeronautical Trends, Market and Engineering Requirements
  - Wireless technology could enabler or speed up the trends making them resulting in a better aircraft
  - Wireless technology could reduce cost while increase passenger satisfaction
- But, as any new technology, before to be applied to aerospace products:
  - Wireless technology has to achieve higher maturity level in order to:
    - Address qualification and certification issues
    - Get reliability from OEM, Suppliers and Regulation Authorities

# Thank you!

