

A colorful flag with vertical stripes of red, yellow, green, blue, and purple is flying against a blue sky with light clouds. The flag is positioned on the right side of the frame, with its pole extending downwards.

# **In-flight Internet Access Technology, Industry and Marketing**

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11/6/2007

# Outline



- Motivation
- Technologies
  - inside cabin
  - cabin to ground
- Industry, Regulations & Marketing
  - companies, services
  - frequencies
  - price, market response
- Conclusion & Future directions

# Motivation



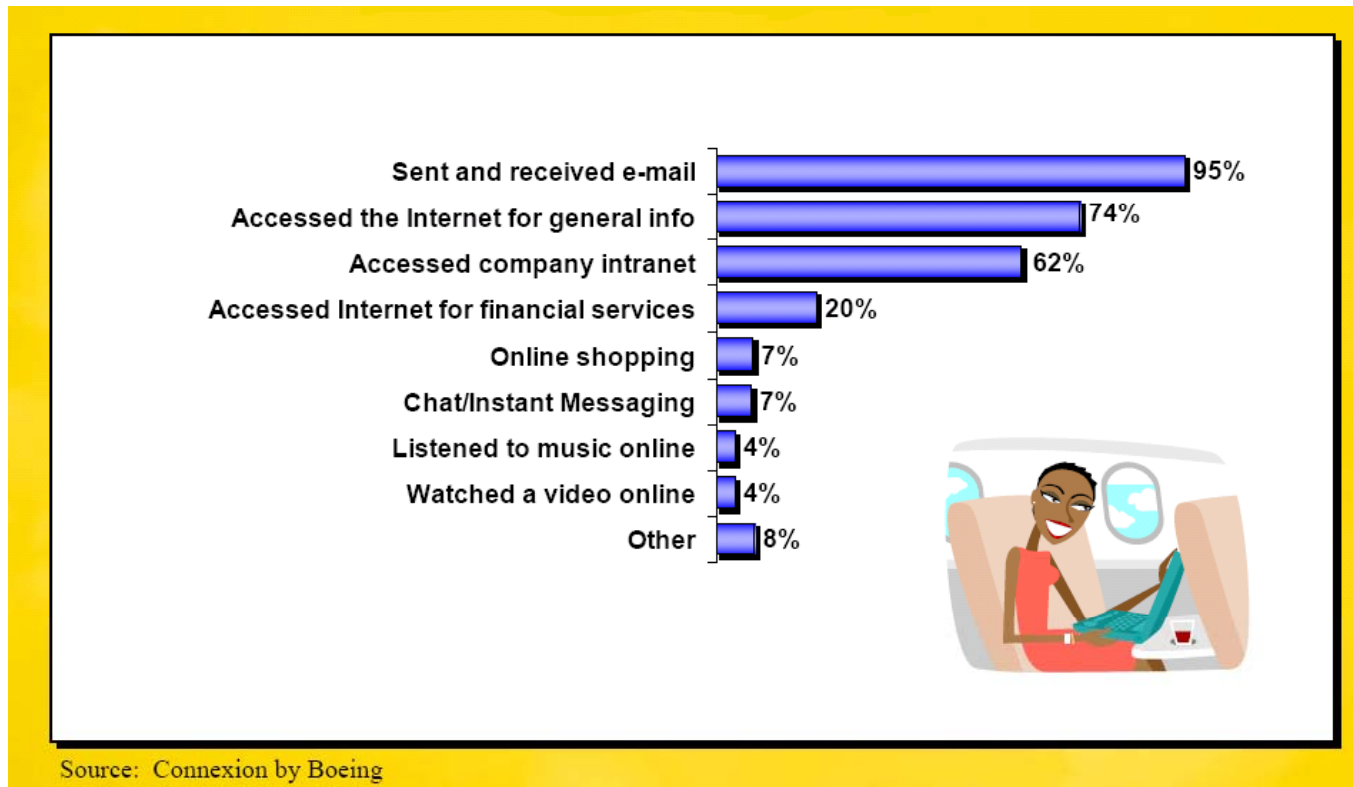
- What can you do in the flight?



**YEAH!!!**

# Motivation

- What service do we want?

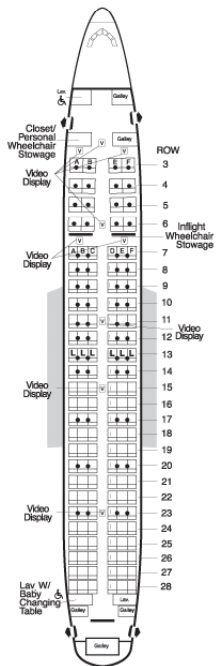


[1] <http://www.aircell.com/images/stories/about/presentations/AIX-04.2006.pdf>

- However, how to do it?

# Technologies

- Inside cabin connection
- Cabin-to-ground connection



# Inside Cabin

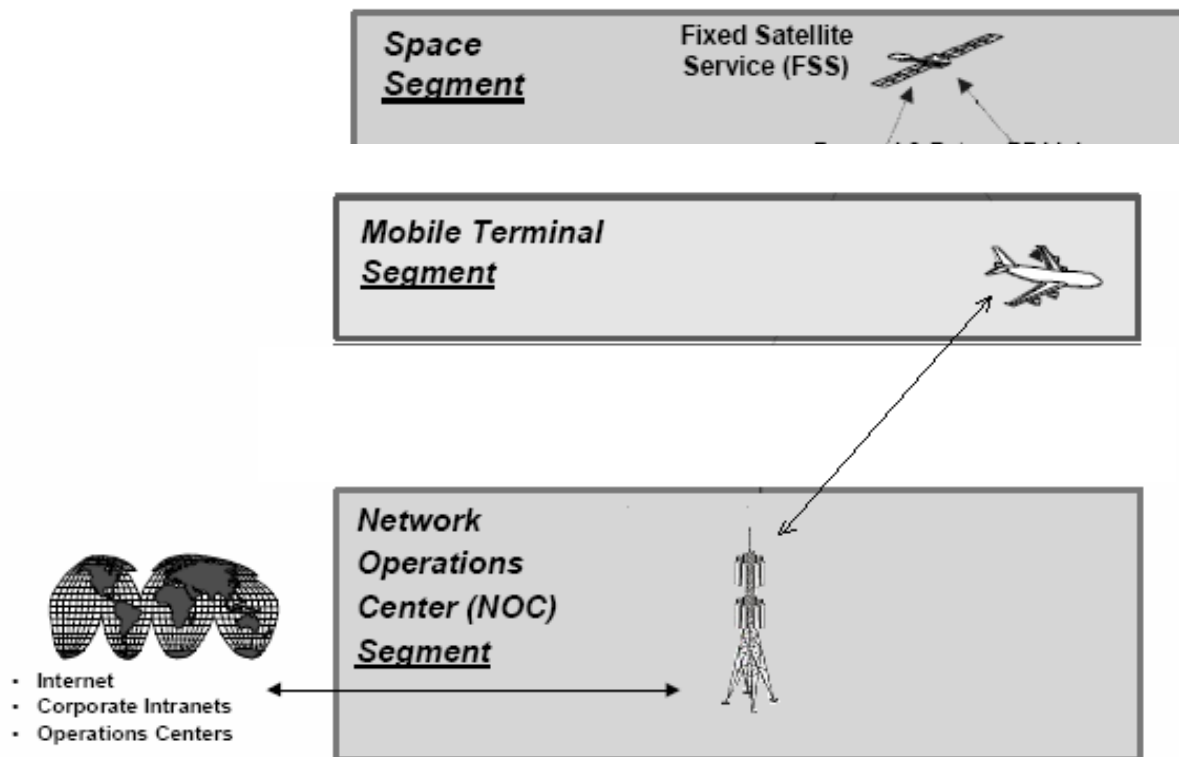


- Cabin is a **LAN**
- **Ethernet** Connection
  - Cable for
- **Wi-Fi** Connection
  - IEEE 80
- One outlet to



# Cabin to Ground

- Air-to-satellite + satellite-to-ground
- Ai



[2] Connexion by Boeing – Broadband Satellite Communication System for Mobile Platforms, 2001 MILCOM, Vol 2, 755-758.

# Satellite Relay

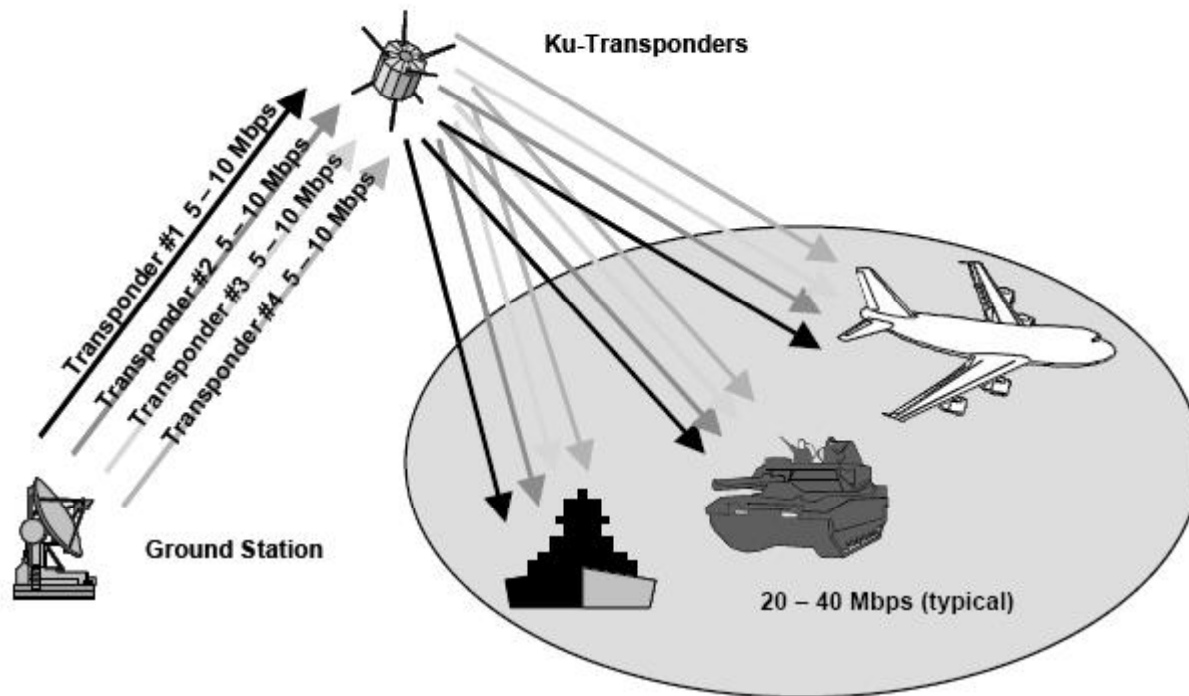


- Components
  - Ku-band antennas on top of fuselage
  - Geostationary satellites



# Satellite Relay

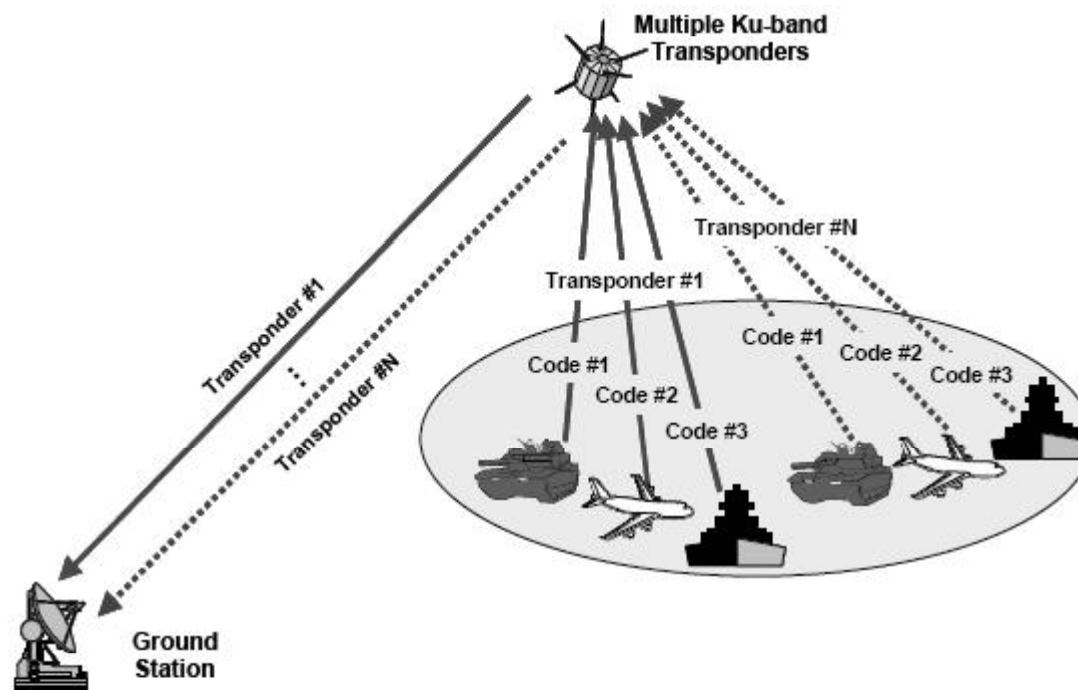
- Forward Link



[2] Connexion by Boeing – Broadband Satellite Communication System for Mobile Platforms, 2001 MILCOM, Vol 2, 755-758.

# Satellite Relay

- Backward Link
  - using **DSSS** to do multiple access



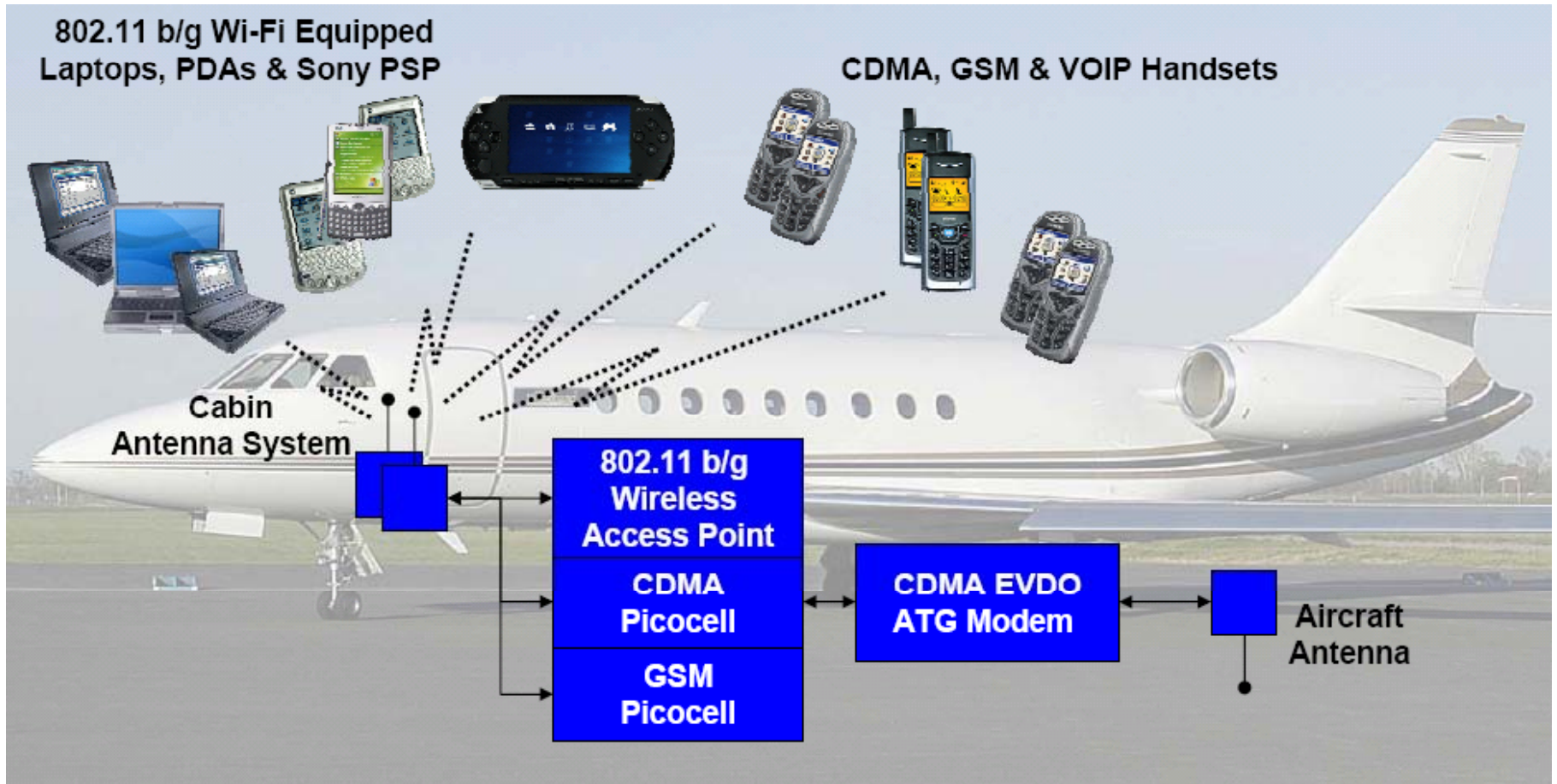
[2] Connexion by Boeing – Broadband Satellite Communication System for Mobile Platforms, 2001 MILCOM, Vol 2, 755-758.

# Air to Ground



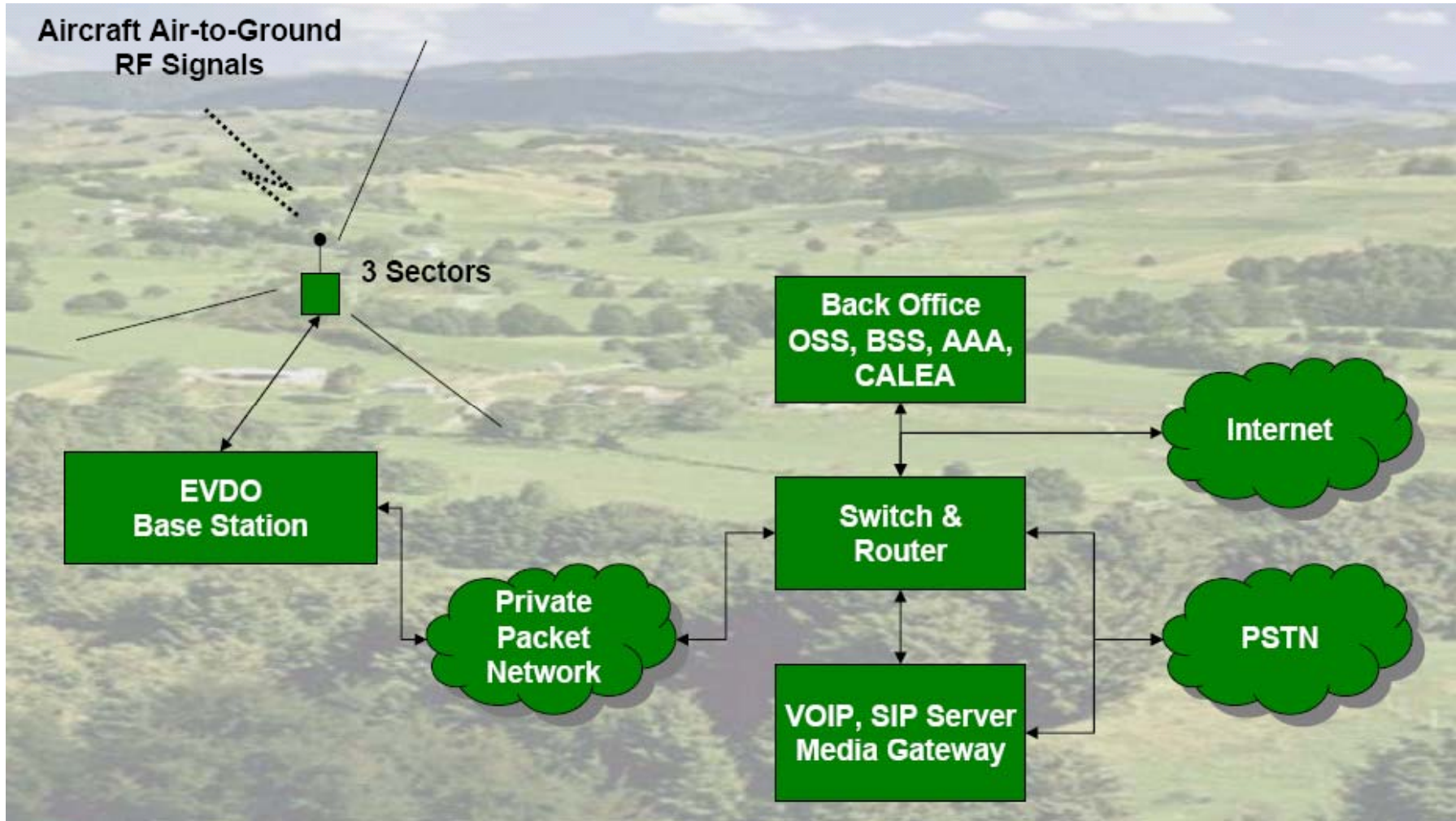
- Similar to cellphone network
  - Aircraft connects Internet via base station
- Protocol – revised CDMA 1x EV-DO
  - EV-DO short for “evolution data-only”
  - Also used by Verizon® backseat phone

# Air to Ground



[3] <http://www.aircell.com/images/stories/about/presentations/AIX-04.2006.pdf>

# Air to Ground



[3] <http://www.aircell.com/images/stories/about/presentations/AIX-04.2006.pdf>

# Comparison



	Satellite	Cell Tower
Coverage	Domestic oversea	Domestic
Access Speed	5Mbps/carft ↓ 1Mbps/carft ↑	3.1Mbps/carft ↓ 1.8Mbps/carft ↑
Antenna Weight	Heavy	Light
Antenna Size	Large	Small
Investment	High	Low



# Industry, Regulations, Market

- Connexion by Boeing
  - Start program @ early 2001
  - Commercial use @ May 17, 2004
  - End service @ Dec 31, 2006
- Satellite-based Technology
  - Ethernet or Wi-Fi in cabin
- Provide service to
  - Lufthansa, ANA, etc, 10 airlines



# Connexion by Boeing

- For Customer
  - \$9.95 per hour
  - \$14.95 for less than three hours
  - \$19.95 for for 3 to 6 hours of access
  - \$29.95 for unlimited access
- Insufficient Customer
- For Airline
  - \$ 500,000 per craft
- Loss US market due to 9/11





# Other Satellite-based Solutions

- OnAir
  - joint venture with SITA & Airbus
  - satellite-based cellphone service
  - DSL speed access
- Row 44 Inc.
  - Hughes' global geosynchronous satellites
  - 81Mbps/craft ↓, 3.2Mbps/craft ↑
  - antenna less than 150 lb
- Panasonic Avionics
  - Using IntelSat satellites
- T-Mobile International with Lufthansa



# FCC Spectrum Auction

- Jun 2006, 4MHz in 800MHz band
- AirCell: 3MHz      \$31,319,000
  - 849.0-850.5 MHz & 894.0-895.5 MHz
  - in-flight broadband service
  - **air-to-ground** technology
- Live TV: 1MHz      \$7,020,000
  - 850.5-851.0 MHz & 895.5-896 MHz
  - text message service
  - satellite-based technology



# AirCell Approach

- For Customer
  - less than \$1/min for voice
  - less than \$10/flight for data
- For Airline
  - \$50,000-\$100,000 per craft
- Commercial use in 2008

# Other Issues



- Customers' response
  - too expensive
  - insufficient power supply
  - not enough space to use laptop
  - unhappy to hear neighbor's conversation
- FAA's response
  - cellphone is still forbidden onboard
  - cause interference
  - antiterrorism

# Conclusion



- Technology
  - Satellite is the only solution to achieve global coverage
  - cheap equipment (antenna, ground station)
- Market
  - cut down the price
  - convenient to use

**Thank you**

