

# Collaboration on Trajectory-Based Future ATM (Sector-Less)

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MSR

The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

**MITRE**  
**Technology**  
**Program**

# Problem

Near term: Given a sector-less operational concept, what are the communication requirements?

**DATA LINK, SATCOM  
VOICE COMM  
GROUND-GROUND COMM**

Long term: What are the key evolution and implementation steps?

**ARCHITECTURE ELEMENTS**

*Is the concept valid?*

*Assumed it was...*

*Is it global?*

*Yes, from a communications standpoint...*

*What are the airspace usage implications?*

*Not answered yet...*

*What is the operating environment?*

*Made an attempt to define 2020+ environment*

*What are the operational scenarios?*

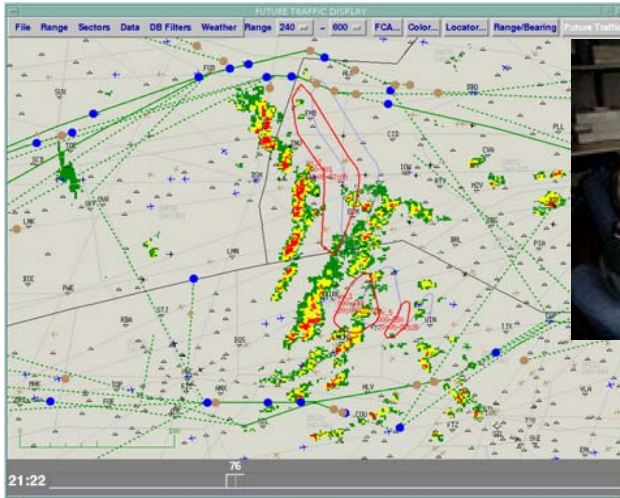
*Defined these too...*

*Is the evolution feasible?*

*Yes, from a communications standpoint... (ID'd the uncertainties)*

# Background

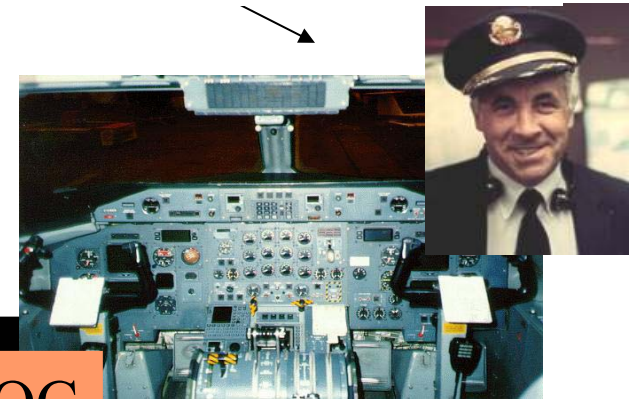
EEC Concept: One controller manages one flight (maybe more) from departure to destination anywhere in the world



*Tactical control including dynamic trajectory re-planning*

*Intra- and Inter-Facility Coordination*

*Strategic Pre-flight Coordination and Flow Management*

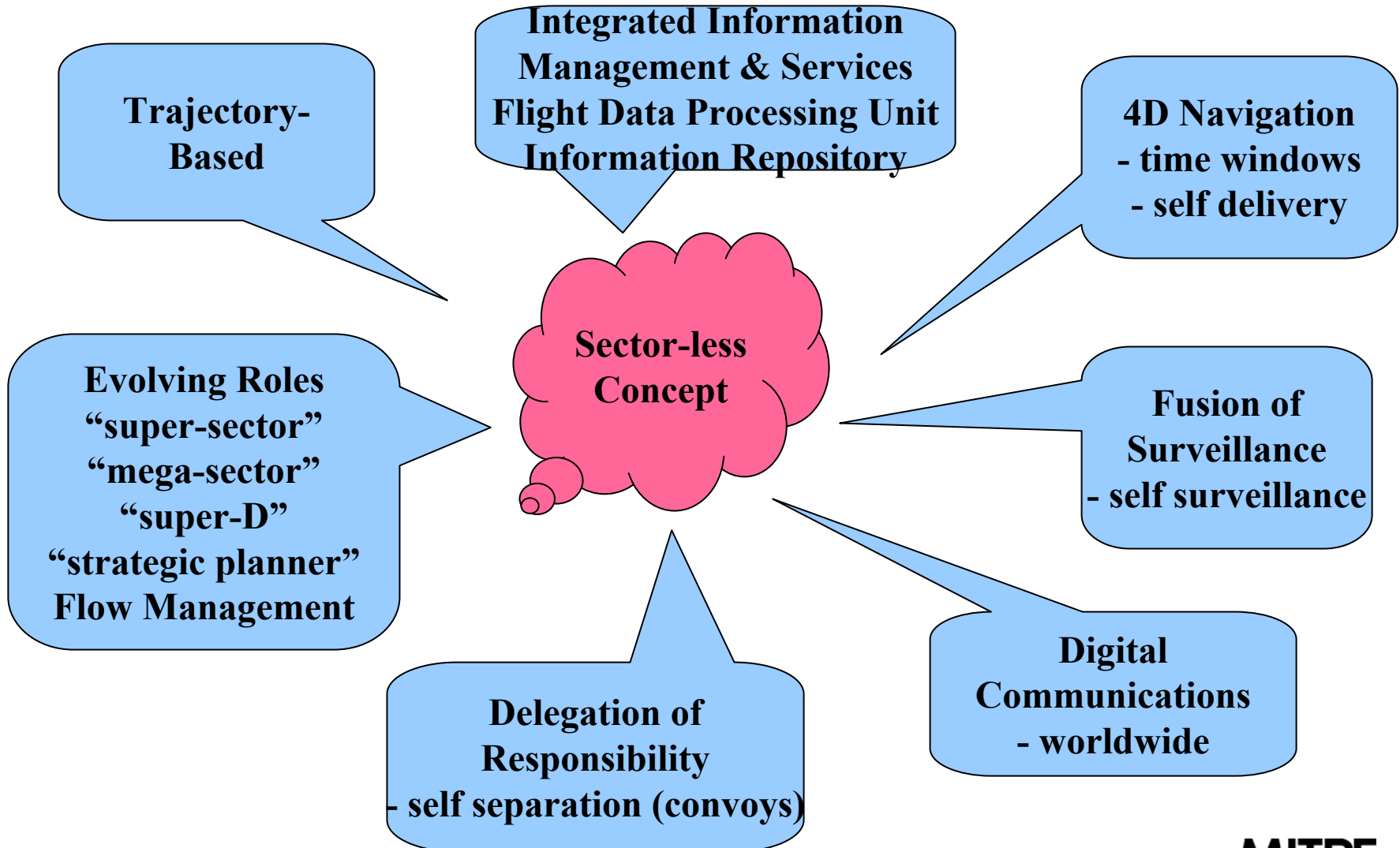


AOC

# Objective

- **To assess the communications feasibility of the proposed Eurocontrol sector-less environment**

# Activities



# Highlight SATCOM Trends:

## Smaller units, increasing data rates

Narrowband

Today

Tomorrow

### Military



- Transportable
- 10 kbps

- 64 kbps
- More powerful satellites
- MBAs, frequency reuse
- Handheld

### Commercial



- On-the-move
- 4.8 kbps

- 104 kbps
- More platforms
- Internet access
- Smaller size



Wideband

### Military



- Transportable
- 2 Mbps

- 100 Mbps
- Continue C, X, Ku, Military Ka
- Smaller antennas, phased arrays

### Commercial



- Fixed
- 1.54 Mbps

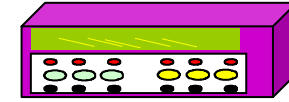
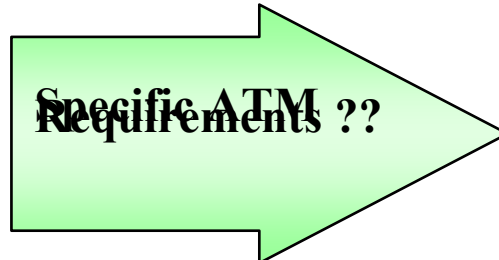
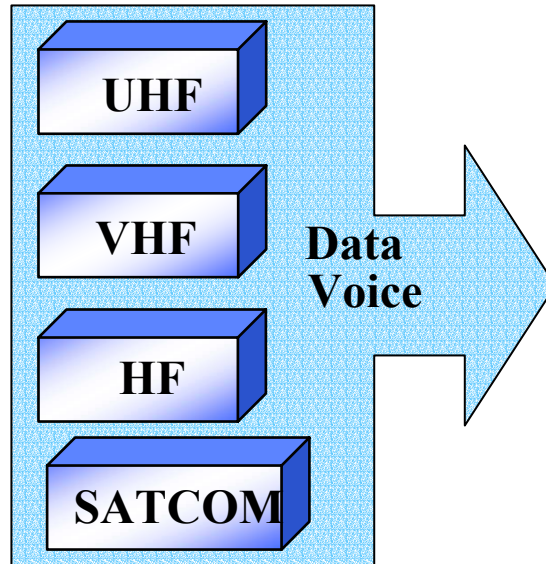
- 150 Mbps
- Continue C & Ku-band usage
- Supplemental use of Ka-band
- Smaller antennas, phased arrays

# Highlight

## Legacy Comm Systems

### Characteristics

- Traditionally operate in a single frequency band and in a single mode
- Complex multi-national implementation
- Limited networking capability
- Unique ATM standards (ATN)

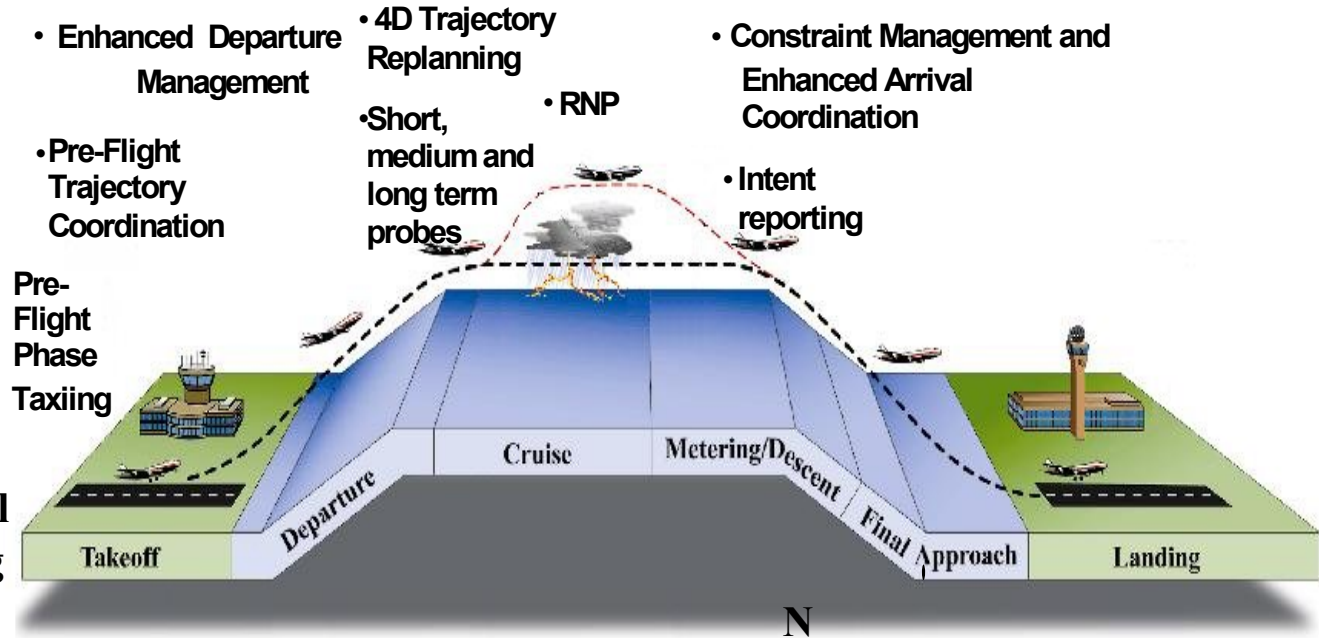


## Future

### Characteristics

- **SOFTWARE PROGRAMMABLE**
- Digital, Multi-band; multi-mode (voice video & data)
- Backwards compatible with legacy systems
- Modular design
- **DEMAND ADAPTIVE** (Dynamic Bandwidth Management)
- Networked
- Quality of Service
- Prioritized
- **COMMERCIAL STANDARDS BASED**

# Impacts



Improved situational awareness regarding the entire flight

Improved use of communications and processing power

Change in the distributed cognition and distributed decision-making process

Ability to relax operational boundaries

Improved safety through error detection, recovery, and increased redundancy

# Future Plans

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