



# NextGen CNS Test Bed Status and Plans

## A National Asset is Open for Business

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- Why? (The Business Case for the Test Bed)
- What is it?
- Where is this Capability Located?
- How Can it be Used?
- Plans and Next Steps



- Next Generation ATS Poses Significant Safety and Operational Challenges
  - Dynamic airspace
  - Piloted and unpiloted vehicles
  - Much higher traffic densities
  - Considerably different human-automation paradigm
- Prior to the CNS Test Bed, no testing facility focused on highly reliable, highly available advanced aviation communications, navigation, and surveillance as critical systems



Requirement	Highly Suitable Solution
1. Multiple airports representative of the national mix	<ul style="list-style-type: none"> <li>✓ Cleveland Hopkins Int'l (commercial)</li> <li>+ Burke Lakefront (biz jets and charters)</li> <li>+ Lorain County (GA, unimproved)</li> </ul>
2. Full breadth of traffic types and volumes (but not too busy)	<ul style="list-style-type: none"> <li>✓ CLE is #39 busiest</li> <li>✓ Heavy enroute traffic (east-west)</li> <li>✓ Continental hub &amp; pilot training</li> </ul>
3. Central location (ease of access)	<ul style="list-style-type: none"> <li>✓ Hour flight from Sensis (Syracuse) and from Washington DC</li> <li>✓ Ready access nationwide</li> </ul>
4. Dynamic range of weather (big impact on aviation)	<ul style="list-style-type: none"> <li>✓ Can't do better than Cleveland!</li> </ul>
5. Near a research center and source of skills	<ul style="list-style-type: none"> <li>✓ NASA's Glenn Research Center</li> </ul>
6. Cooperative airports management and local governments	<ul style="list-style-type: none"> <li>✓ Proactive City of Cleveland and airports leaders</li> </ul>

# National Test Bed for Next Generation Air Transportation System

## Lorain County Regional Airport (LPR)

- No Tower
- General Aviation Activity



## NASA Glenn Research Center



## Cleveland Hopkins International Airport (CLE)

- Continental Airline Hub
- Commercial Airline Activity

## Downtown Cleveland

BKL

CLE

LPR

## Burke Lakefront Airport (BKL)

- Contract Tower
- Business Jet Activity



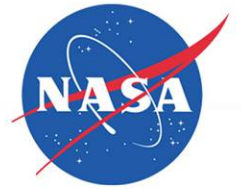
15 nmi

10 nmi

Three Northeast Ohio Airports networked together with NASA Glenn Research Center



- Phase 1 is Implemented, “Operational”, and In Use
  
- Phase 1 has 3 Major Elements
  1. Advanced airspace and surface surveillance
  2. Wireless surface communications
  3. Secure, information sharing infrastructure



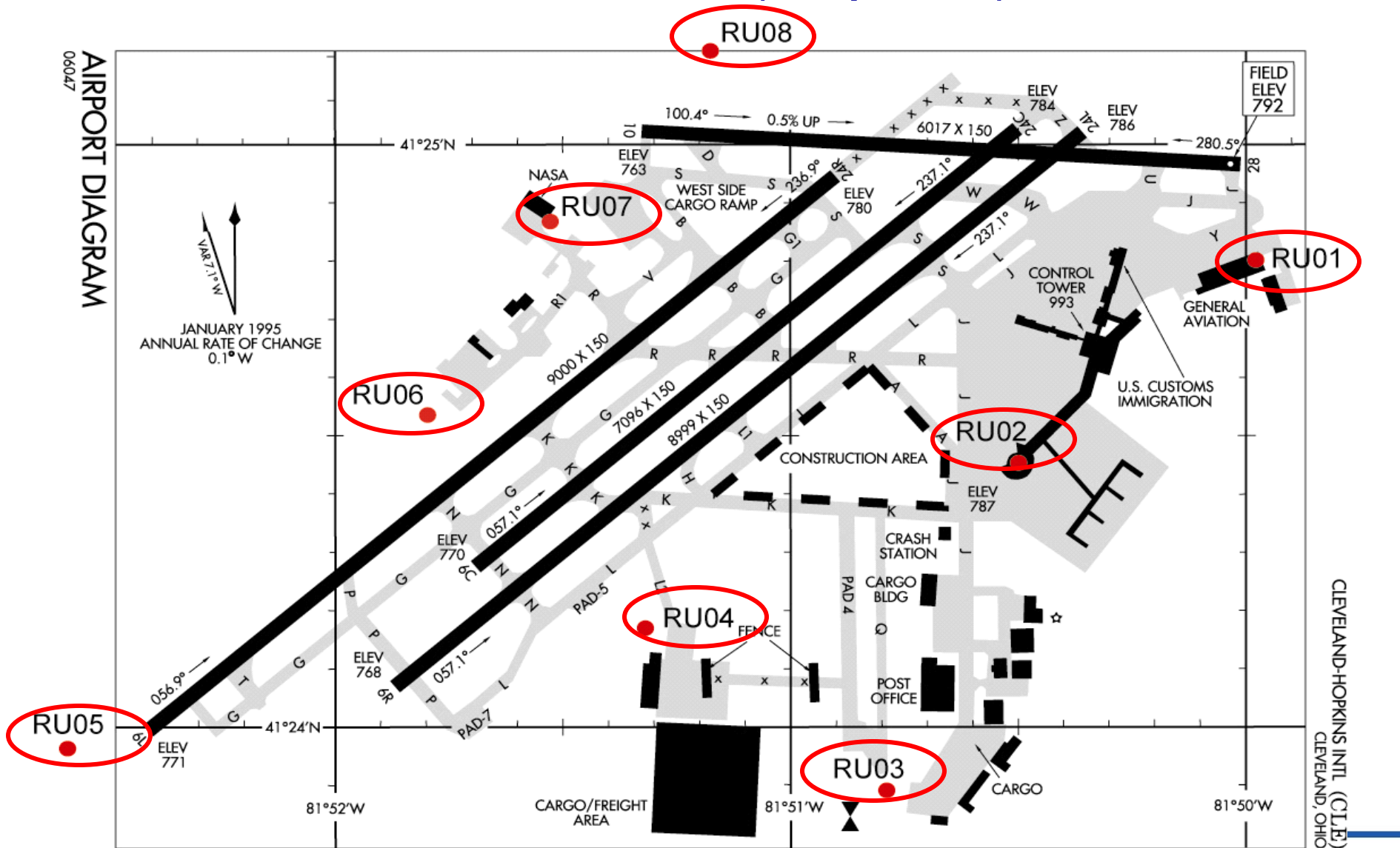
- Phase 1 (completed): Latest generation ADS-B/Multilateration ground stations implemented at:
  - Hopkins (8 sensors)
  - Burke Lakefront (5 sensors)
  - Lorain County (4 sensors)
  - One remote site to enhance wide area/regional surveillance capability
- Phase 2 (near future): Addition of:
  - Long range radar at Brecksville Ohio (60 miles south of Cleveland)
  - ASR-9 at Hopkins
  - Flight plan data from STARS (terminal airspace) and from SAFA (enroute airspace)
  - Gate/ramp area surveillance



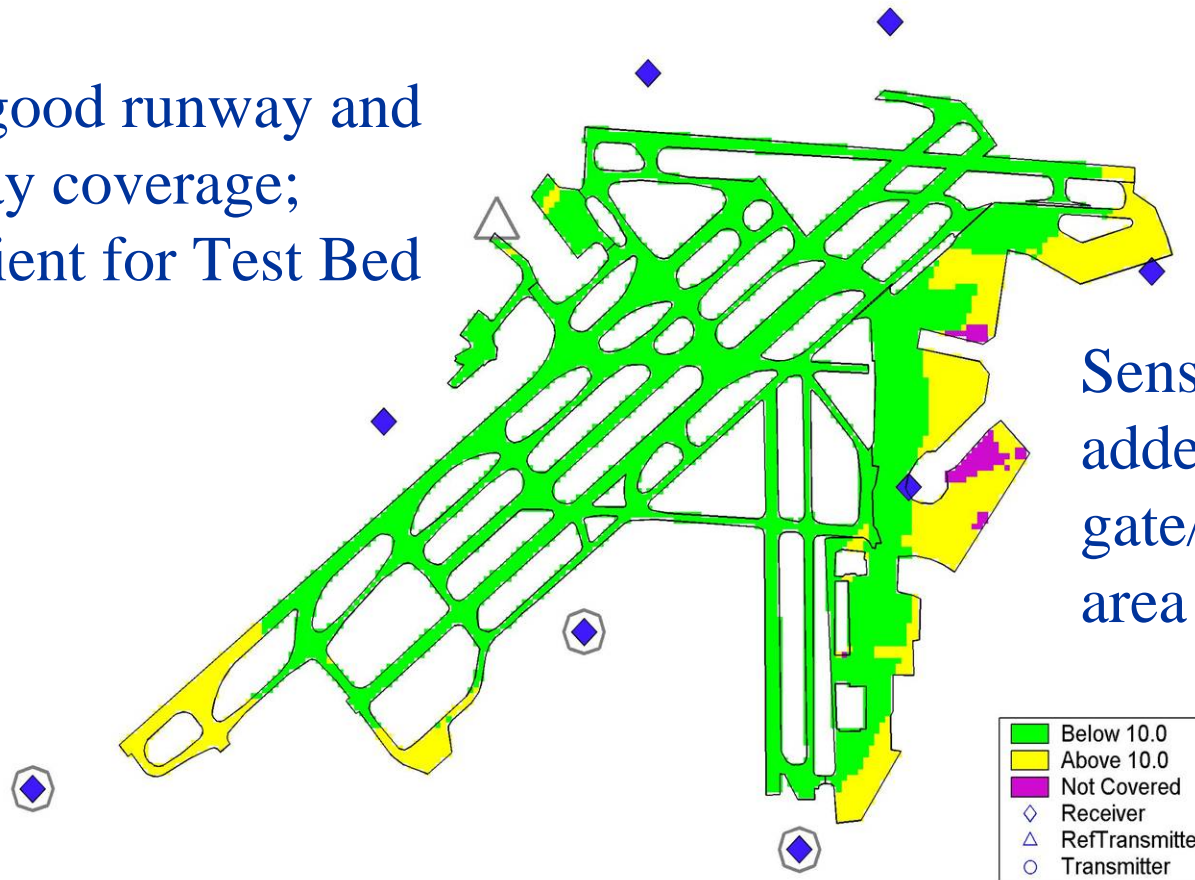
# Sensis Surveillance System Installation (Burke Lakefront)



# Multilateration Sensor Locations (Hopkins)



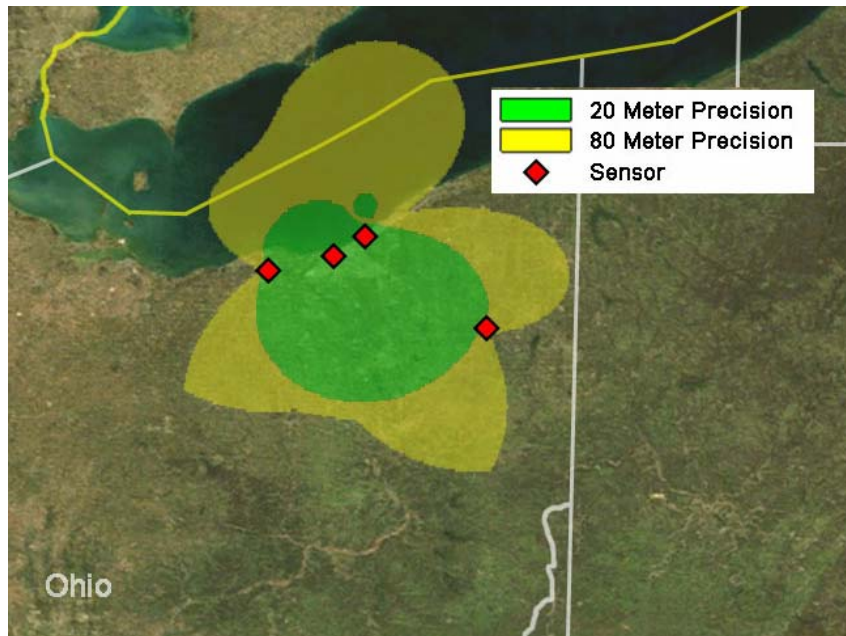
Very good runway and taxiway coverage;  
Sufficient for Test Bed uses



Sensors need to be added to obtain gate/non-movement area coverage

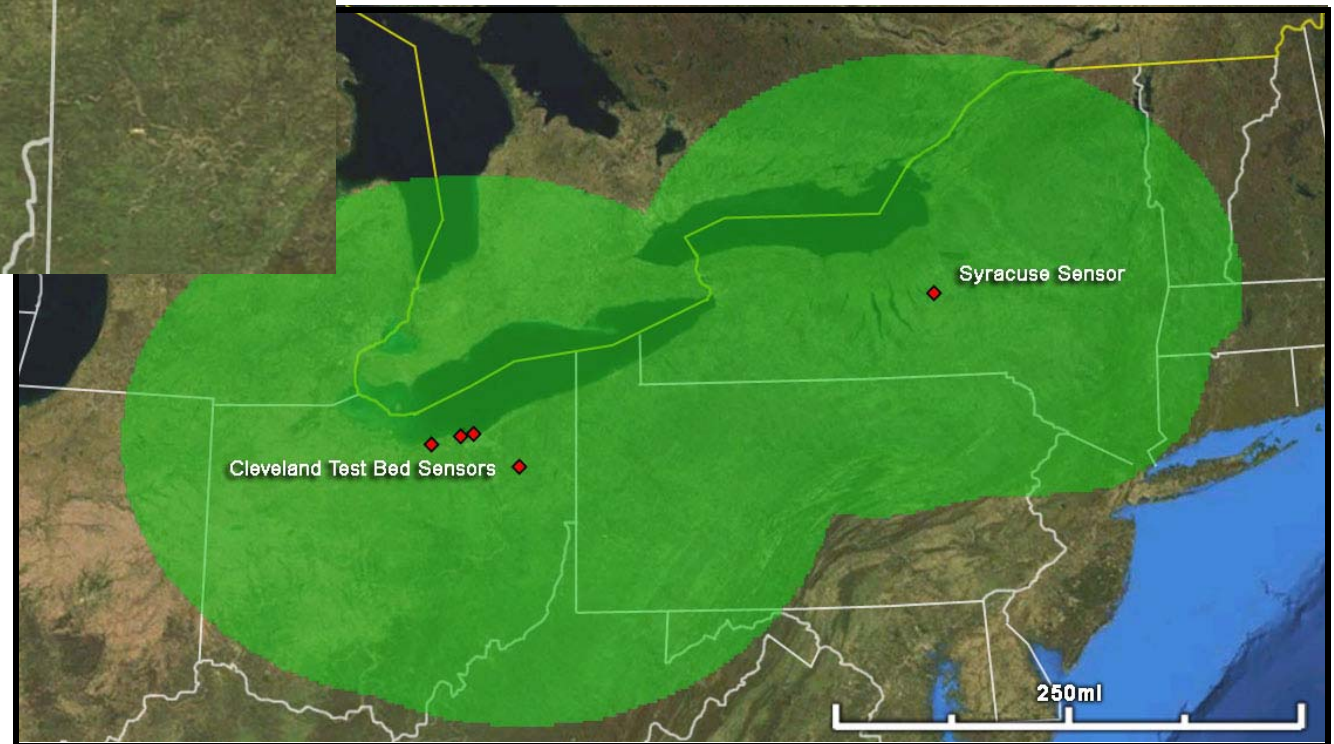
## Cleveland Hopkins International Airport

# Sensis Airspace Surveillance Coverage



Multilateration, 4 sites  
10,000 ft AGL

ADS-B,  
Cleveland +  
Syracuse  
30000 ft AGL





## Comprehensive Aviation Surveillance Systems Test Bed

*Airspace and Surface Surveillance*

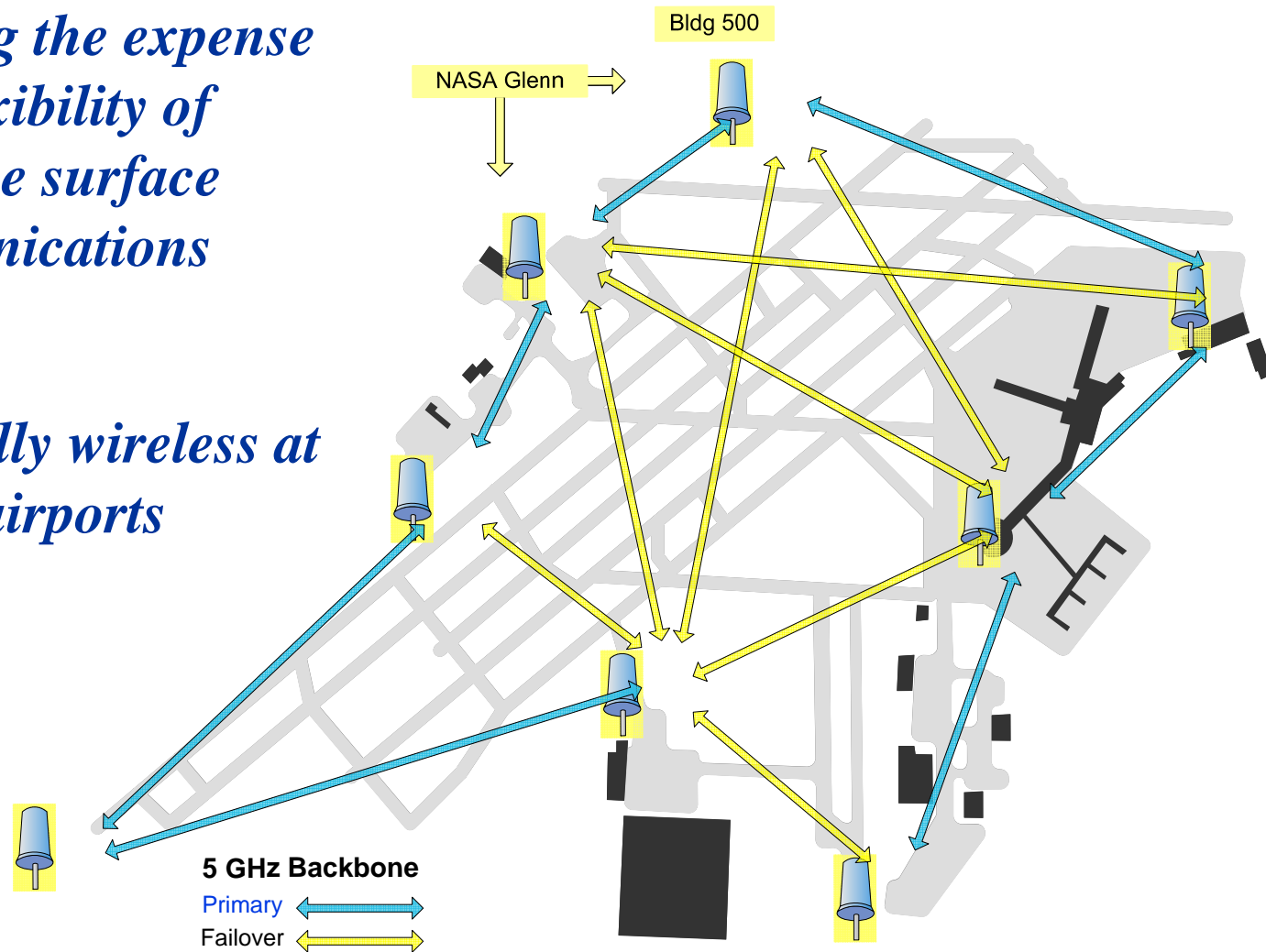
*Technologies, Safety, and Operations Analyses*

- *Reliability and fail-over/backup*
- *Coverage performance*
- *Efficiency and effectiveness vs. cost*
- *Safety scenarios*



*Overcoming the expense  
& inflexibility of  
hard-line surface  
communications*

*Test Bed fully wireless at  
all 3 airports*



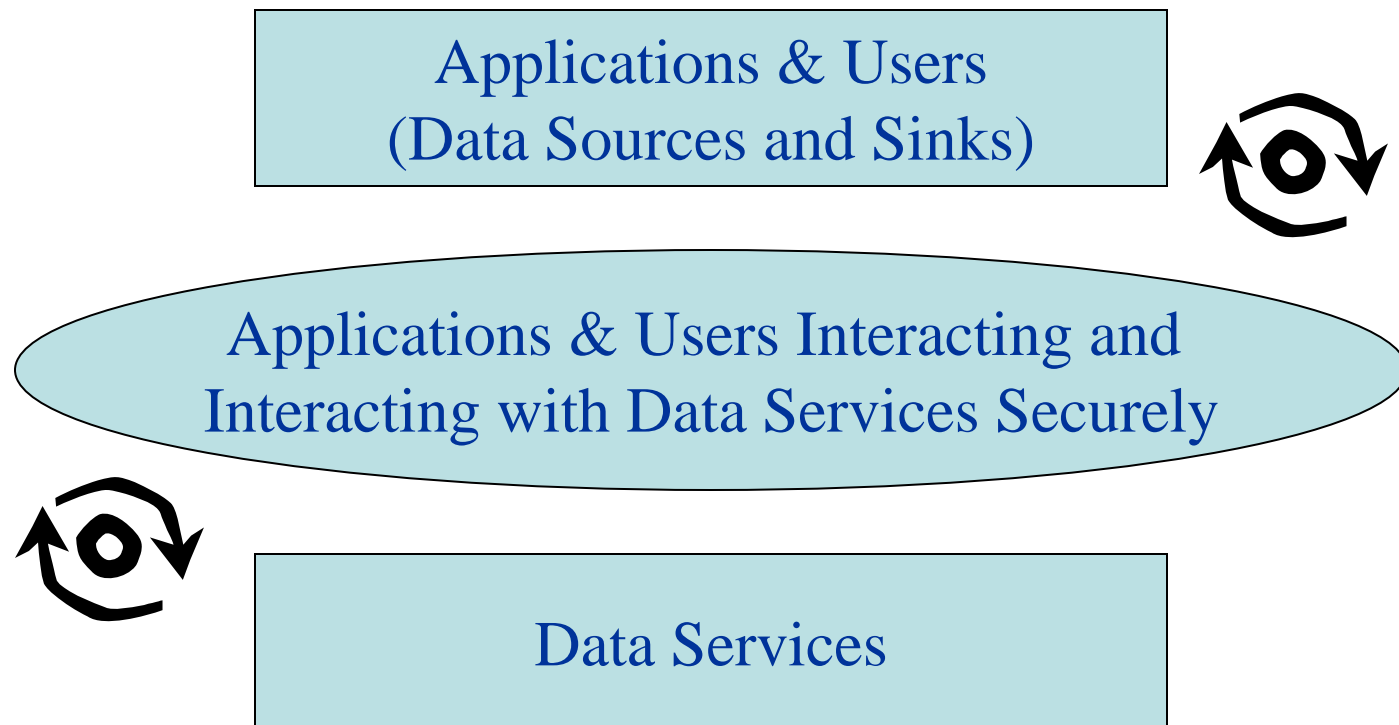


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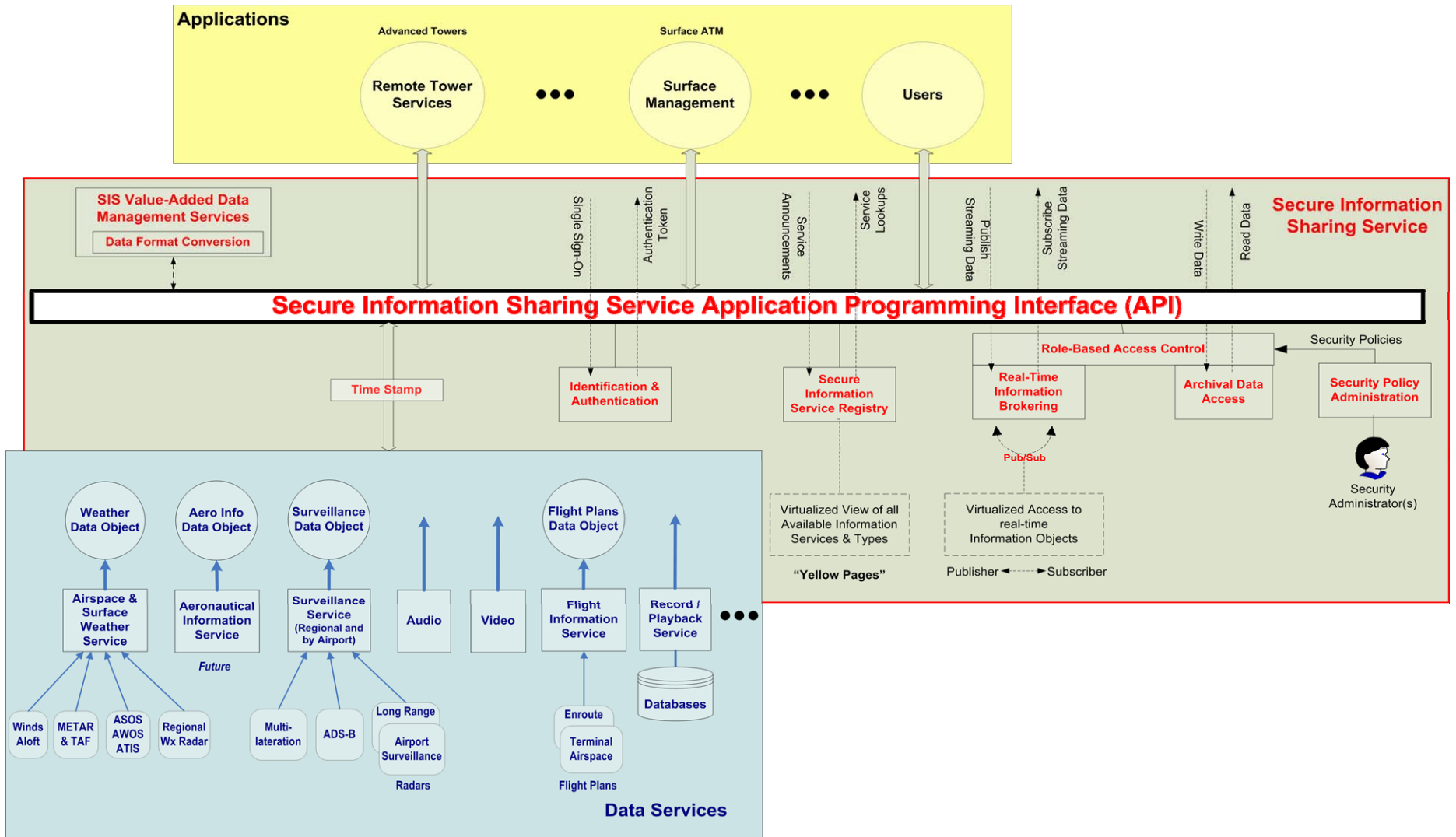
## re Wireless at Airports

- Can mission critical communications be accomplished in the noisy airport environment?
  - Wirelessly
  - Mobile and fixed sources and receivers
  - Securely
  - Reliably under all conditions
- Current implemented Test Bed system is IEEE 802.11; Will next implement IEEE 802.16
  - Testing in 5GHz and 900 MHz bands
  - Surveillance & administrative data
- See DeHart & Budinger presentation Wed 1:30 pm

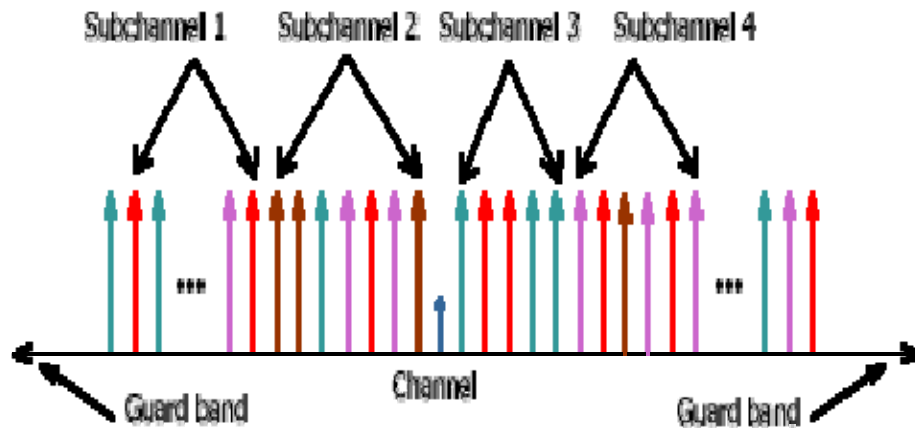
## The Concept



# Sensis Element 3: Implemented Now



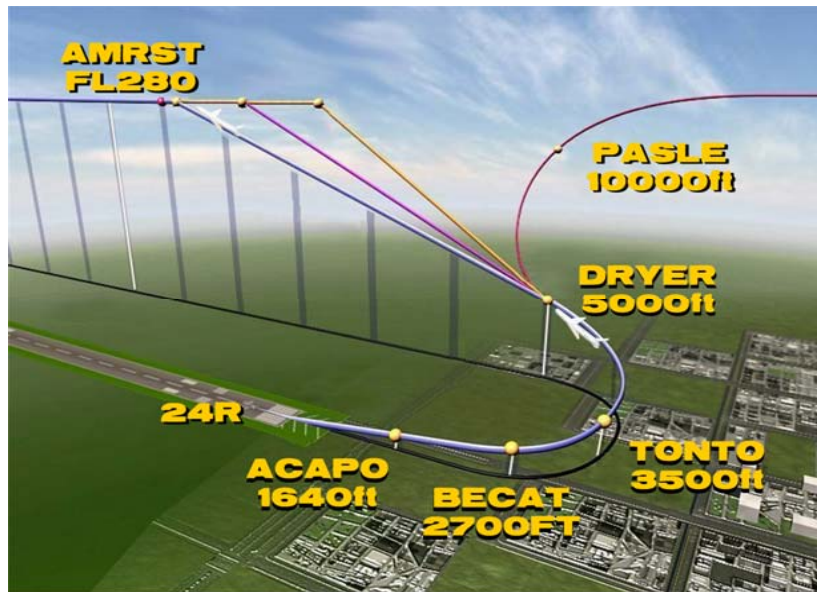
## 1. Airport Wireless Communications Research



## 2. Maturing Remoted ATC Tower Operations



### 3. Learning to fly with 4-D Trajectories



### 4. Integrated Airport Surface Management

