



# NASA General Aviation Research National General Aviation Roadmap Small Aircraft Transportation System

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# Outline



The **Golden Rule** of the information age is  
“Time is the Scarce Commodity.”

Early in the 21st century,  
the demand for personal transportation will soar beyond supply.

The Millennial Opportunity:  
SATS creates more time for more people.

**SATS Concept**

**States-Driven Industry Opportunities**

**National Strategies**



# Solving 21st Century Transportation Challenges



**The Small Aircraft Transportation System  
is a safe travel alternative,  
freeing people and products from transportation delays,  
by creating access to more communities in less time.**



# The Next Generation Cockpits and Aircraft



Lancair Columbia 300



Cirrus SR-20



21st Century Propulsion

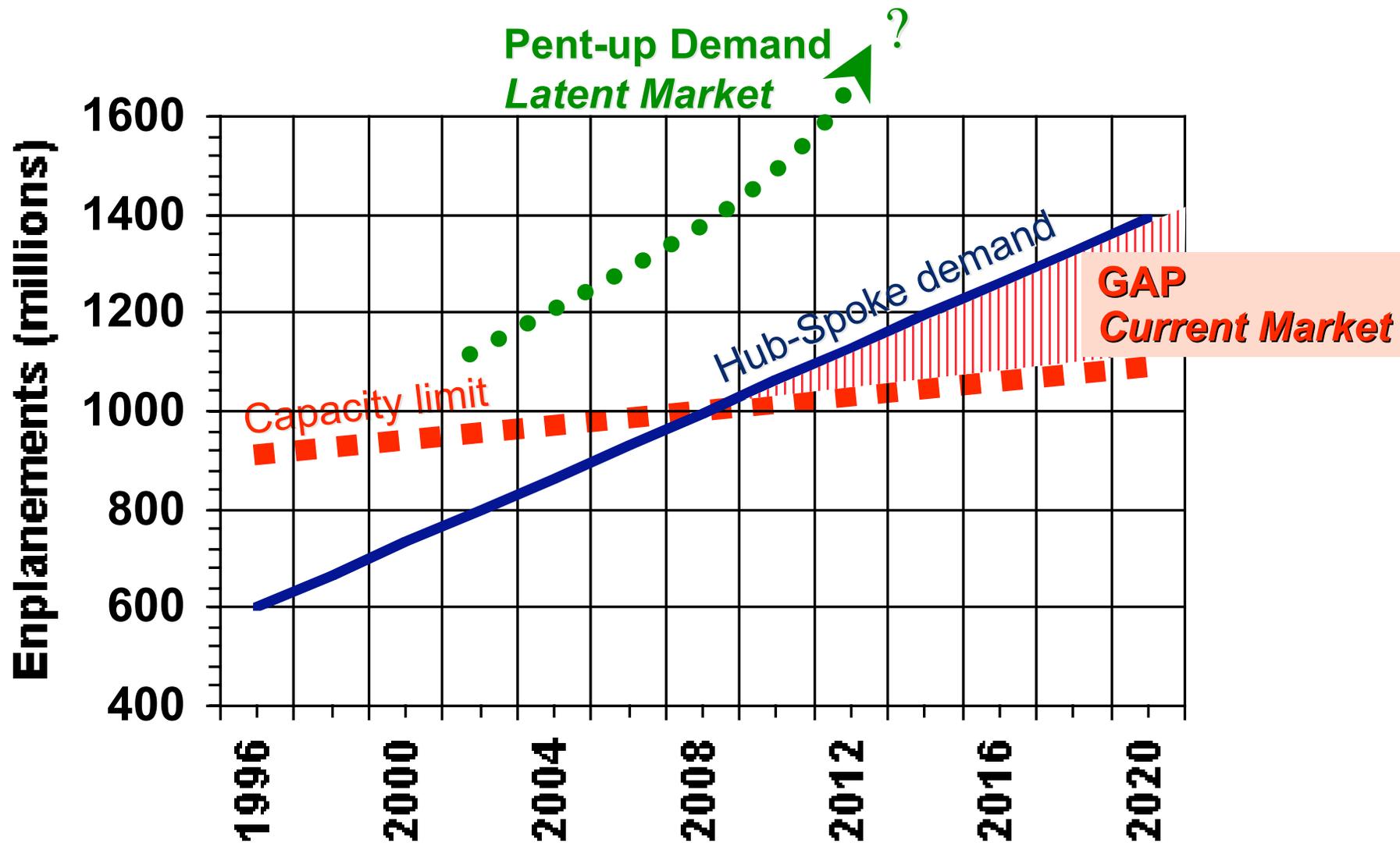
and Others....

*Coming Soon  
to an airport near you!*



# Demand Will Soon Exceed Supply

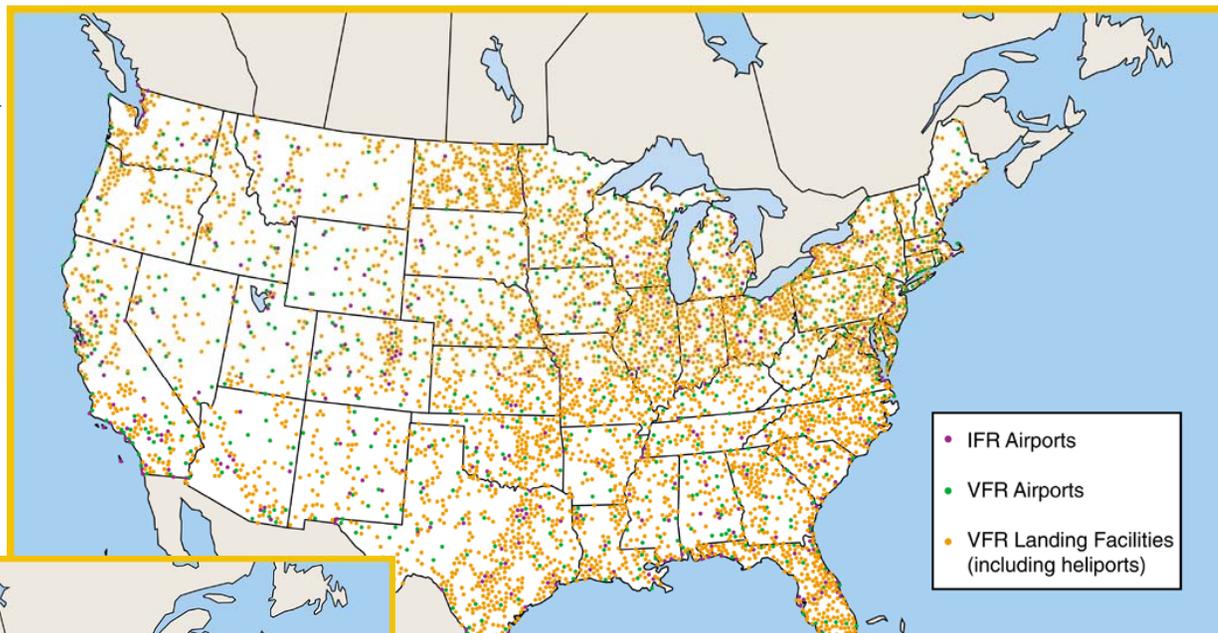
...not even considering pent-up travel demand...





# SATS Increases Accessibility and Mobility

(“. . .creating access to more communities in less time. . .”)



**Expanded Accessibility to several times more destinations**

**Fully utilized 5,400 public-use near-all-weather landing facilities can increase theoretical NAS Throughput by more than an order of magnitude**

**Improved Mobility saving more travelers more time**

Of 5,400 public-use airports, only 715 (13%) have precision instrument approaches (ILS)



# Precision Guidance to Every Runway End in America



## Highway in the Sky / Synthetic Vision with “Virtual” Approach Procedures:

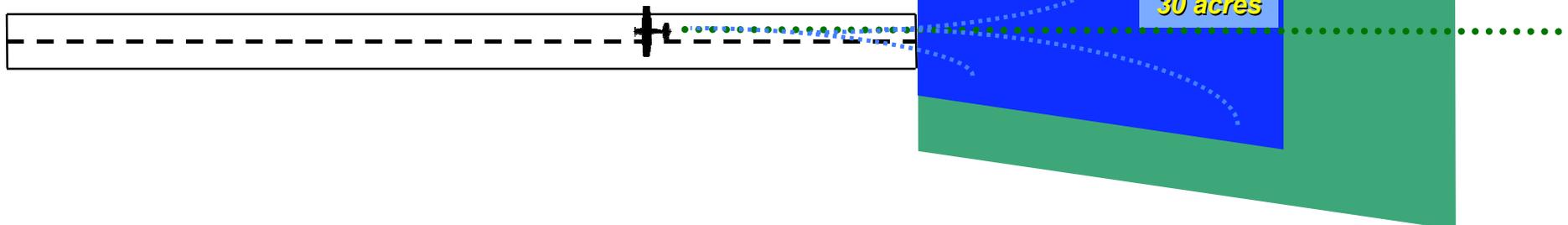
- Saves land
- Limits noise
- Increases safety



### Runway Protection Zone (RPZ)

← 1/2 mile →

← 1/4 mile →





# Digital Airspace Infrastructure



A client-server-based architecture will provide information services on an **“Airborne Internet”** to support collaborative air traffic management. Aircraft and landing facilities will be interconnected nodes in a high-speed digital communications network providing instant identification and information services on demand with seamless linking to the global transportation system.

**“Smart Landing Facilities”** will provide automation-enabled separation and sequencing in non-towered, non-radar, non-hub terminal airspace.

**“Simultaneous Non-Interfering Operations”** will enable hub & spoke airport throughput to be increased developing the infrastructure capability to use stub runways, taxiways, & vertiports instead of conventional runway under adverse weather conditions.

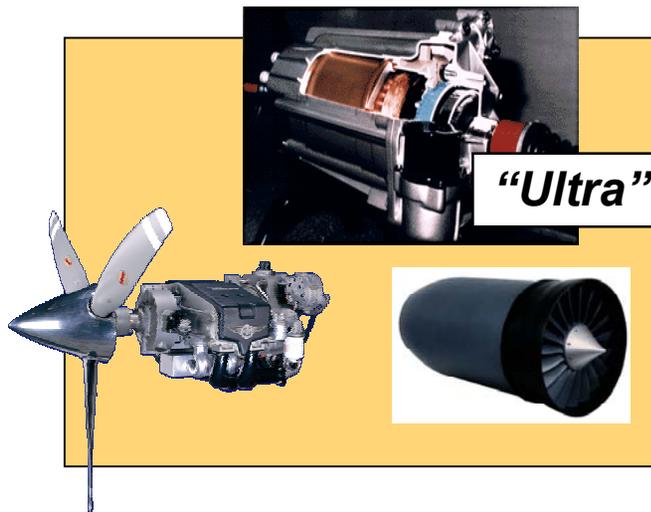




# SATS Air Vehicle Enabling Technologies



**“AutoFlight”**



**“Ultra” Propulsion**



**Affordable Manufacturing**



**“Wireless” Cockpits**



**Cyber-Training**

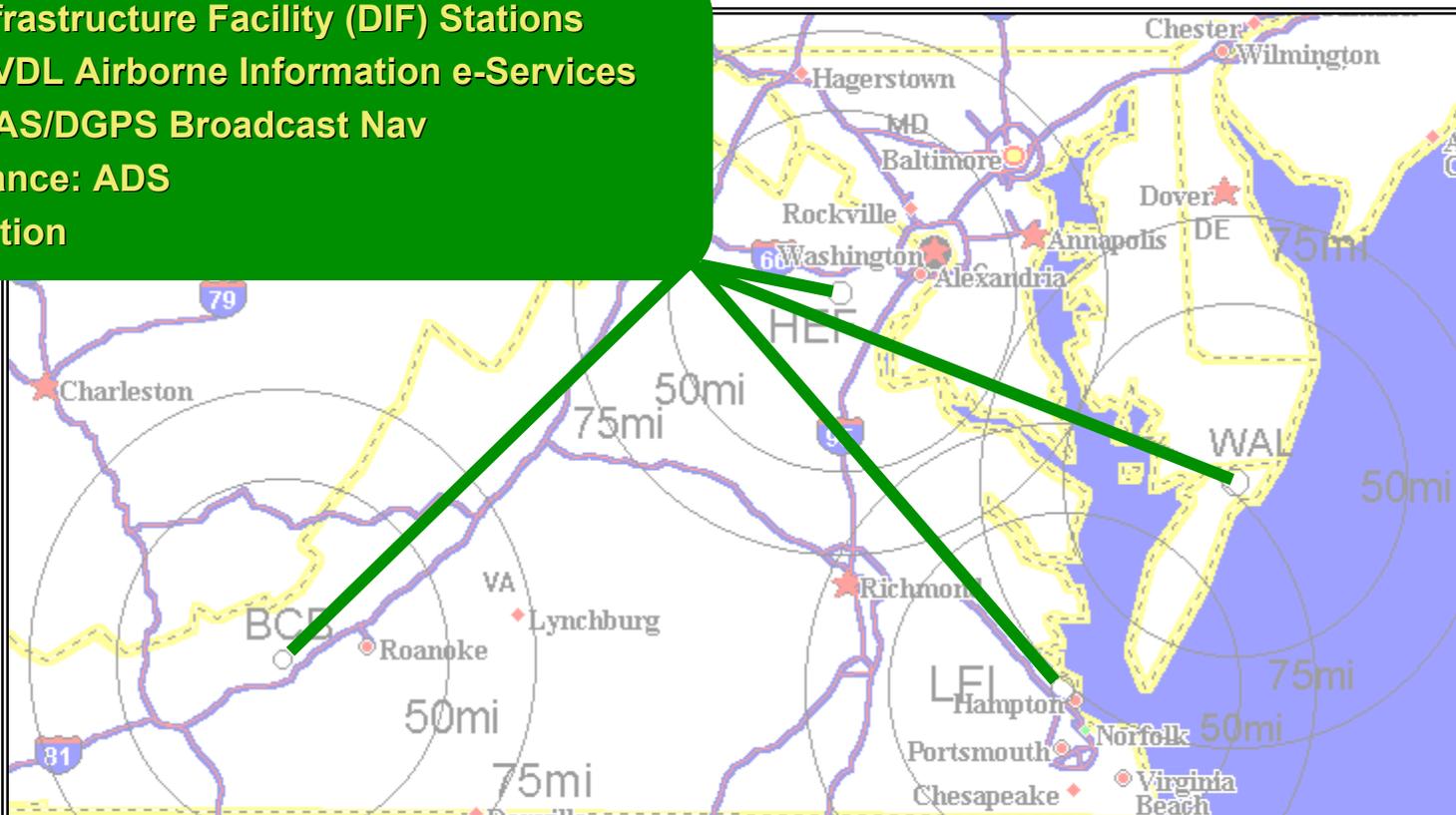


# Virginia SATSLab



## Datalink Infrastructure Facility (DIF) Stations

- Comm: VDL Airborne Information e-Services
- Nav: LAAS/DGPS Broadcast Nav
- Surveillance: ADS
- ATM Station



- Highway in the Sky (HITS) Precision Guidance to All Runway Ends
- Satellite-based Airborne Internet, Client-Server architecture
- VFR 20:1 Approach Zones in IMC using “Virtual” TerPs
- Towerless, Radarless Operations with self-sequencing & separation



# SATSLab Demonstration Scenarios

## "Prove SATS Works"



### *20:1 RPZ Approaches*

- Prove that HITS integrated with Synthetic Vision will safely support use of VFR (20:1) Runway Protection Zones and approach patterns in IMC, with potential application to virtually all runway ends and helipads in the nation.



### *Simultaneous Non-Interfering Operations*

- Prove that SATS technologies enable RIA, General Aviation, and commuter aircraft to operate at Hub or Spoke facilities in Class B airspace with potential for increased throughput.



### *SATS EnRoute*

- Prove that SATS operating capabilities enable free flight in non-radar surveilled airspace.





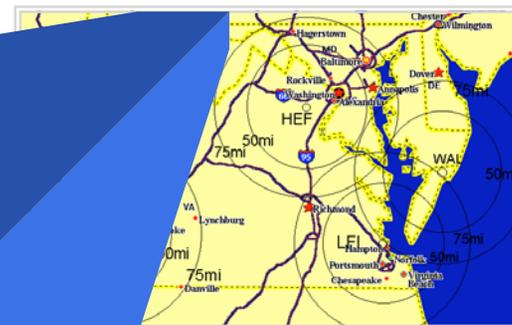


# SATSLab Demonstration SNI Scenario Design Questions



## ***Simultaneous Non-Interfering Operations***

- What mix of procedures and equipage will allow for SNI?
- Under what conditions will SNI Ops support intersecting runway, missed approach, and Land & Hold Short Operations?
- What are the impacts of emergencies on equipage and procedures?
- What approach and landing minima apply when using synthetic vision with Highway in the Sky (HITS) for SNI operations?
- What procedures and equipage will allow for transient corridors in Class B airspace for SNI Ops?



**What else?**



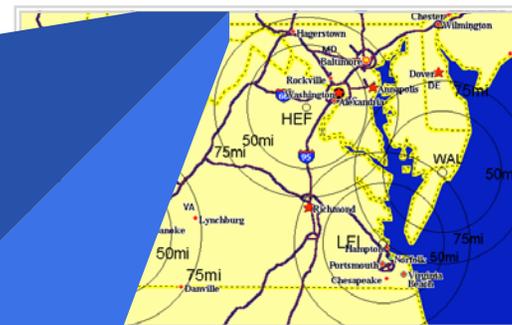
# SATSLab Demonstration

## EnRoute Scenario Design Questions



### SATS EnRoute

- What procedures and equipage will permit dynamic access through Special Use Airspace without voice communication?
- What limits in routing and altitude segments can be pilot-controlled?
- What are the impacts of emergencies on equipage and procedures?
- When should the Server *versus* the Client make separation & sequencing decisions?



**What else?**



## FAA/NASA Executive Committee



### SATS Agreement

#### **SATS Program Description:**

*"The Small Aircraft Transportation System concept is a safe travel alternative that frees people and products from transportation system delays, creating access to more communities in less time."*

#### **Joint NASA-FAA supporting statements are:**

- FAA and NASA are working together to define a SATS operational concept as it relates to the transportation infrastructure of the U.S. and will begin a NASA funded research initiative to explore the feasibility and viability of implementing that concept.
- Under the charter of the NASA/FAA Executive Committee, the agencies agree to form a working group to define the FAA-NASA engagement in SATS program development and implementation planning.

*The Small Aircraft Transportation System is a safe travel alternative freeing people and products from transportation delays, by creating access to more communities in less time.*



***“Reduce public travel times by half in 10 years and two-thirds in 25 years”***  
<http://sats.nasa.gov>