

SPACE BASED TECHNOLOGY APPLICATION FOR TRANSPORTATION

**VISIONING FOR
NEW TRANSPORTATION APPLICATIONS**

**INTEGRATION OF SPACE BASED TECHNOLOGY APPLICATION
FOR EXPANDING TRANSPORTATION USER SERVICES**

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**VISIONING NEW TRANSPORTATION
USER SERVICES BY APPLYING ADVANCES IN
SPACE BASED TECHNOLOGIES**

EXPLORE AND IDENTIFY APPROPRIATE SPACE BASED TECHNOLOGY APPLICATIONS AND NEW USER SERVICES FOR MEETING CURRENT AND FUTURE TRANSPORTATION REQUIREMENTS

- EXPLORE CURRENT AND FUTURE TRANSPORTATION ISSUES THAT ARE POTENTIALLY SOLVABLE THROUGH SPACE BASED TECHNOLOGY APPLICATION.
- EXPLORE SPACE BASED TECHNOLOGY PRODUCTS AND ADVANCES NOW AND IN THE FUTURE APPLICABLE TO TRANSPORTATION.
- IDENTIFY SOLUTIONS BY INTEGRATING TECHNOLOGIES THAT OFFER POTENTIAL NEW SOLUTIONS AND TRANSPORTATION USER SERVICES.

Commercial Remote Sensing products and Spatial Information Technologies Application to Transportation

SAFETEA-LU PROGRAM

*The Program Provides for Establishing and Validating Space Based
Technology and Products Transportation*

Technical Scope :

Commercial Remote Sensing – Imageries From Satellites And Above
Ground from Air Space

Spatial Information Technologies - GPS Based Position , Navigation And Timing
Technologies, Geospatial Information Systems (GIS) And Intelligent Transportation
Systems

Transportation Service Areas : Including Infrastructure Management and Construction

New Applications – New User Services Through Technology Integration

EXPLORE CURRENT AND FUTURE TRANSPORTATION ISSUES THAT ARE POTENTIALLY SOLVABLE THROUGH SPACE BASED TECHNOLOGY APPLICATION

- 1) **Safety**; (Technology Goal) Significantly Reduce Or Eliminate Transportation Fatalities
And Injuries; Prevent Potential Incidents And/ Or Minimize Losses After An Incident
- 2) **Mobility**; (Technology Goal) Develop Landmark User Services For Significantly Improving
The Mobility Of Transporting People And Freight On Land, Sea Or In Aviation
- 3) **Global Connectivity** : (Technology Goal) Develop Space Based Technology Applications To
Facilitate More Efficient Transportation Flow That Can Be Monitored And Managed From
Around The Globe.
- 4) **Environmental Stewardship** (Technology Application Goal) Implement Advanced
Technology Based Solutions To Assess And Reduce The Impact Of Environment
From Transportation Systems For Communities.
- 5) **Transportation Security** : (Technology Application Goal) Provide Technology Tools And
Systems For Cost Effective Monitoring And Management Of Security Without Impairing
Mobility . Improve Preparedness And Response To Critical Security Issues

**EXPLORE INTEGRATION OF SPACE BASED TECHNOLOGY ADVANCES
FOR TRANSPORTATION APPLICATIONS**

*SPACE BASED TECHNOLOGY ADVANCES WILL CONTINUE INTO THE NEXT
DECADE AND WILL OFFER SIGNIFICANT MARKET DRIVEN PRODUCTS AVAILABLE
FOR INTEGRATION TO NEW TRANSPORTATION USER SERVICES*

❖ **EMERGING ADVANCES IN COMMUNICATION SYSTEMS , ACCESS AND
PORTABILITY TO COMMUNICATE LOCALLY AND GLOBALLY**

❖ **PROGRESS IN MODERNIZATION, ACCURACY, AVAILABILITY AND
INTEGRITY OF GPS BASED POSITION NAVIGATION AND TIMING SYSTEMS
(PNT) , PRODUCTS AND SERVICES**

❖ **ADVANCES IN HIGH RESOLUTION COMMERCIAL REMOTE SENSING
TECHNOLOGIES (RS TECHNOLOGIES) USING SATELLITE, AERIAL AND
UNMANNED SENSING PLATFORMS AND COMPLEMENTING DATA
COLLECTION AND ANALYSIS CAPABILITIES**

❖ **ADVANCES IN GEOSPATIAL INFORMATION SYSTEMS (GIS) THAT
COMPLEMENT PNT AND RS TECHNOLOGIES FOR GEO-REFERENCING AND
POSITION LOCATION**

**IDENTIFYING CURRENT AND FUTURE SPACE
BASED TECHNOLOGY APPLICATIONS AND PRODUCTS THAT OFFER
THE POTENTIAL FOR NEW TRANSPORTATION USER SERVICES**

Potential Examples:

Aviation: Next Generation Air Traffic Efficiency, Enhanced Security , Lower Cost
Higher Range GPS Augmentation, Guidance Systems and Runway Incursion
Elimination

Highway: Crash Avoidance , Congestion Mitigation Through Traffic Flow
Management Smarter and More Efficient Operations and Increasing Flow Capacity

Rail: Intelligent Rail Road Systems, Automated Train Control and Zero Risk
Grade Crossings

Maritime: container Flow Management and Security, Congestion Mitigation at
Ports

Transit: Improved Urban Mobility, Intelligent Rider Management , Route Planning

A VISION EXERCISE FOR SPACE BASED TECHNOLOGY APPLICATION

- Offers Selection of Appropriate Space Based Technologies for Problem Solving
- Promotes Technology Investment, Co-Opetition and Technology Competitiveness
- Achieves Fusion of Data for Increasing Accuracy
- Supports Development of New Tools and Supporting Systems
- Compensates Potential Weaknesses in Stand Alone Individual Technologies
- Promotes Compatibility and Interoperability with Future Space Based User Services
- Enhances Unified Application to Critical Life Saving Functions
- Provides a Framework to develop Open Architecture for Technology Integration
- Potential to Reduce Cost of Implementation
- Expanded Application to New User Service Areas
- Provides Comprehensive and Developer-Manufacturer- User Guidance
- Potential Reduction in Fixed Infrastructure Requirements

PNT-Remote Sensing and GIS Integration

Potential Cutting Edge Applications For Future Transportation Systems

- Enhanced And Reliable Safety Of Life Applications
- Accurate Vehicle Navigation Path , Position & Location Communication
- Rapid Geo Referencing In Geographic Information Systems,
- Improved Traffic Management , Accurate Vehicle Navigation Path Determination Position Location And Communication,
- Physical Location Referencing For Vehicle To Vehicle And Vehicle To Infrastructure Communications,
- Imagery Guided Harbor Navigation,
- Physical Condition Assessment Of Transportation Infrastructure Including Rail Roads And Grade Crossings
- Positive Rail Separation,
- Seamless Inter Modal Freight Transportation,
- Safe Landing Of Aircrafts And Minimizing Runway Incursions,
- Integrating Imageries And Gis With Its Technologies For Upgrading E-commerce
- Real Time Management Of Global Freight From Origin To Destination Through Loading And Unloading At Ports
- Significant Advances In Current State-of -The -Art Just In-time (Jit) Delivery Systems

**SPACE
BASED
SYSEMS**

Remote Sensing & Imagery Technologies

GPS Based PNT Technologies

Geospatial Information Systems (GIS)

Projected Commercial Remote Sensing Technology Advances:

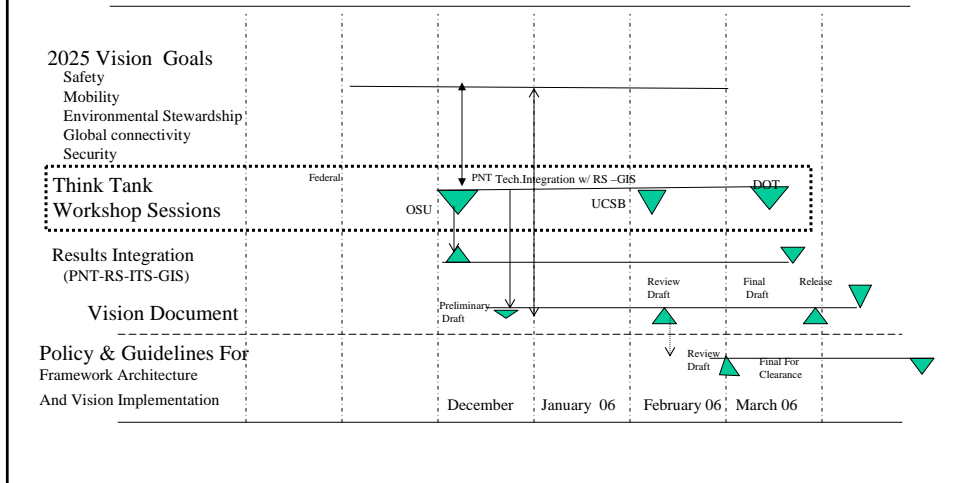
- High Resolution Imageries At Any Location With Minimal Satellite Revisit Delays
- Space And Above Ground UAV Capabilities For Any Time Any Where Imageries
- Automatic Geo Referencing And Analysis Of Imagery And Spatial Information
- Advanced Sensors For Accurate And Rapid DEMs

Projected Commercial GIS Advances

- High Accuracy Digital Dimensional Imageries Of National Transportation Network
- And Infrastructure Layout
- Locational Imageries Covering All Transportation Modes And Infrastructures
- Automated And Near Real Time Information Synthesis And Data Analysis

VISION WORKSHOPS
SPACE BASED TECHNOLOGY INTEGRATION FOR
TRANSPORTATION

DOT Schedules for Completing A Vision Document



2025 Space Based Technology Vision

1) Safety : (Technology Goal) Significantly reduce or eliminate fatalities and injuries in transportation systems , prevent potential incidents and/ or minimize losses after an incident .

Examples of Technology Challenges:

- Monitor, predict, mitigate and /or eliminate operational errors such as runway incursions in aviation, lane departures of vehicles in highways, front end and rear end vehicle to vehicle collisions, vehicle to infrastructure collisions and collisions of vessels at ports.
- Predict and eliminate catastrophic accidents such as HAZMAT vehicle collisions on highways, collisions at railroad crossings and potential mid air collisions before they occur
- Faster recovery and evacuation routing in major disruptions to transportation lifeline systems caused by natural or manmade disasters

2) Mobility : (Technology Goal) Develop landmark user services for significantly improving the mobility of transporting people and freight on land, sea or in aviation

Examples of Technology Challenges :

- Detect emerging mobility issues in mass transit and facilitate remedial actions to operators and options for transit riders.
 - Increase the number of aircraft access and safety in runways and capacity of aviation terminals
- And reduce the cost of aviation congestion delays that may increase from the current 10 Billion mark to over \$ 100 Billion by 2025 .**

2025 Space Based Technology Vision (Continued)

3) Global Connectivity : (Technology Goal) Developing advanced technology capabilities to facilitate more efficient transportation flow , monitoring and management systems that can be monitored and managed from around the globe.

Examples of Technology Challenges:

- Minimize marine congestion in around marine ports and terminals at major ports . U.S. Foreign trade and import and export of cargo may grow from current one Billion tons to over 2 Billion tons by 2025 and an additional 2 Billion Tons in inland waterways. About 47 Million containers are transported each year thorough global marine transportation through port systems.
- Increase the carrying capacity of existing freight and inter modal networks by reducing variability of travel time near critical urban links for freight traffic .Inter modal freight traffic from ports through connectors that link freight terminals and major highways are among the weakest links for freight handling.

2025 Space Based Technology Vision (Continued)

4) Environmental Stewardship (Technology Application Goal) Implement advanced technology technology based solutions to reduce the impact of environment on transportation systems for communities.

Examples of Technology Challenges:

- 24/7 real time monitoring of critical transportation infrastructure systems, identify disruptions and provide rapid response to restore service operations
- Provide regional transportation guidance by monitoring environmental impacts on transportation systems.

5) Transportation Security : (Technology Application Goal) Provide technology tools and systems for cost effective monitoring and management of security without impairing mobility and develop coordinated preparedness intelligent and automated response to critical security issues

Examples of Technology Challenges:

- Identify safety critical security in critical infrastructure links that have the highest vulnerability from the inventory of 525,000 bridges, 5286 airports, and 47,000 mile of interstate highways.
- Ensure automated rail separation for collision avoidance for safety critical security of rail transportation system that moves about 2100 locomotives and 150 freight cars and 20,000 passenger cars in nations 150,000 rail mile lines.