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Spaceport Operations Element

NASA Ames Research Center

And

NASA Kennedy Space Center

Outline

- NASA Ames Air Traffic Management Technologies
- Space Transportation of the Future
- Spaceport Flight Operations Research Topics

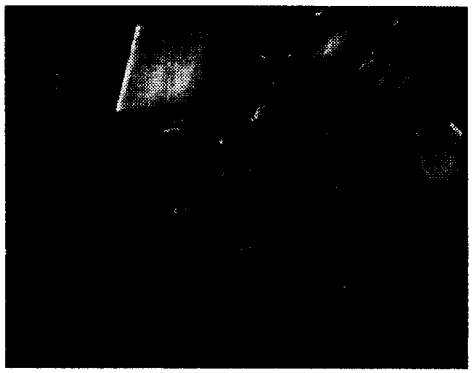
Air Traffic Management at Ames

- NASA Ames Unique Air Traffic Control Software
  - Center TRACON Automation System, CTAS
  - Future ATM Concepts Evaluation Tool, FACET
- NASA Ames Unique Research Facilities
  - Future Flight Central
  - Vertical Motion Simulation
  - Pseudo Aircraft Simulator

Ames Developed Technologies

Traffic Management Advisor

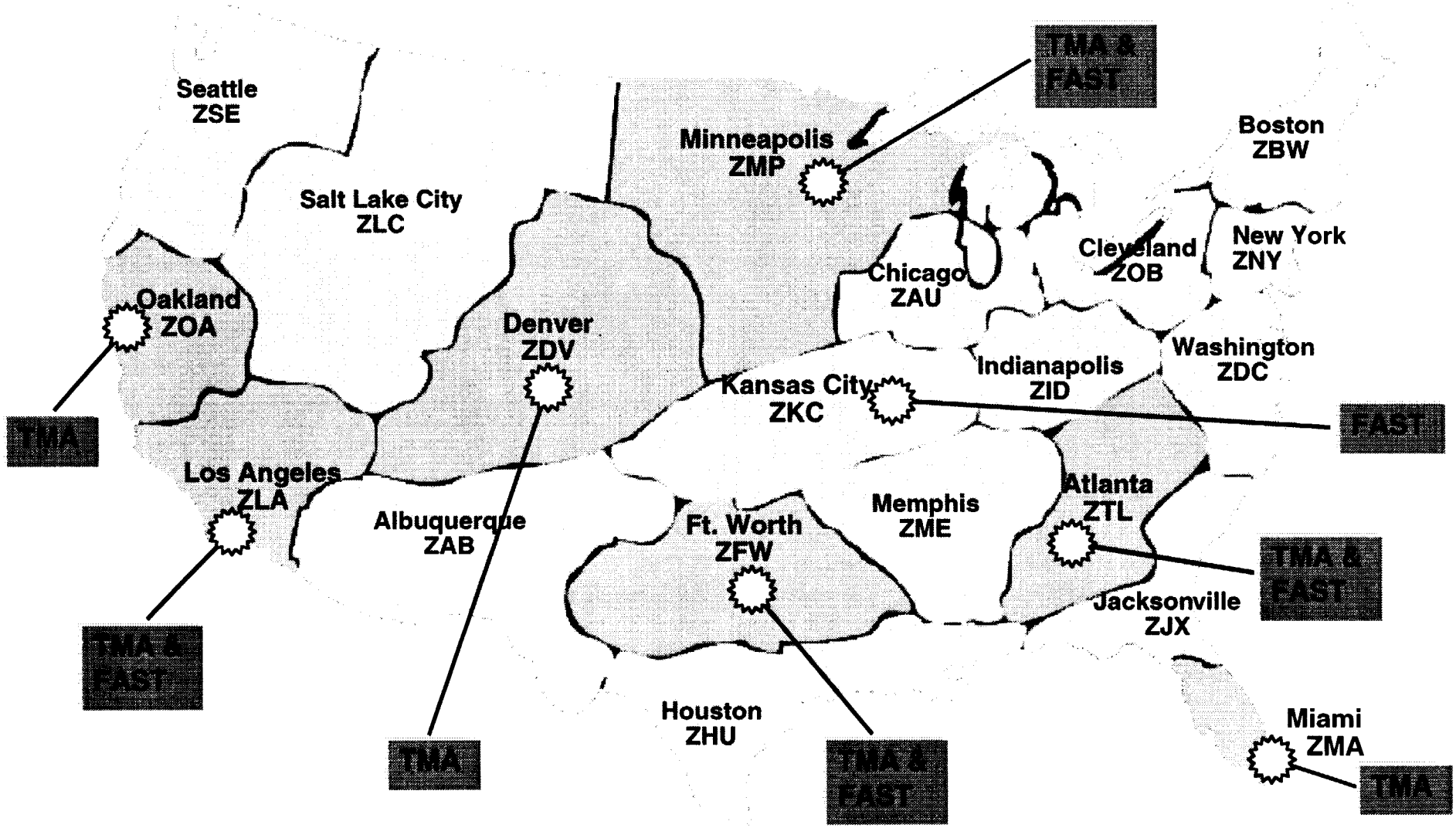
Surface Movement Advisor

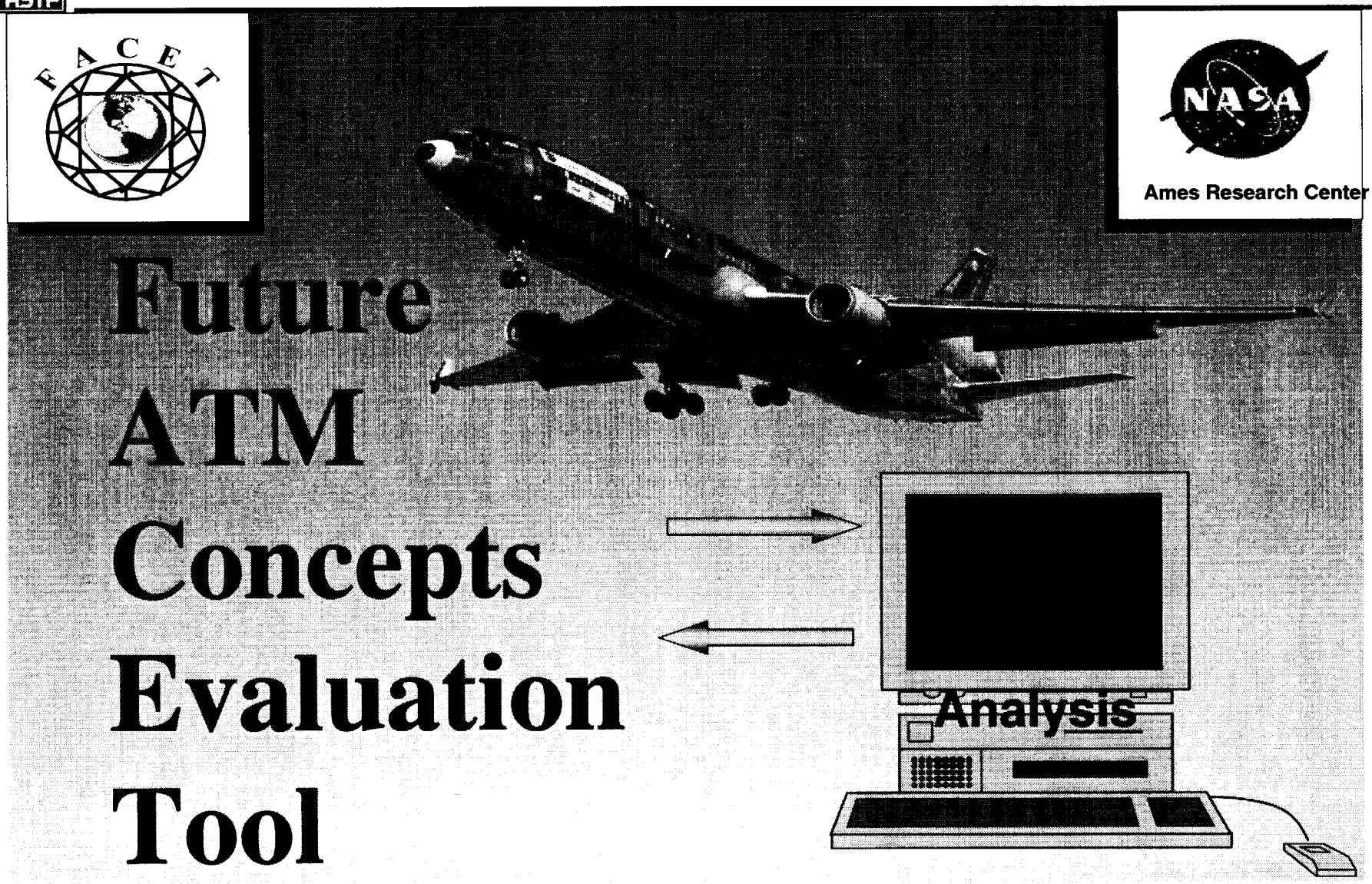


Final Approach Spacing Tool Passive

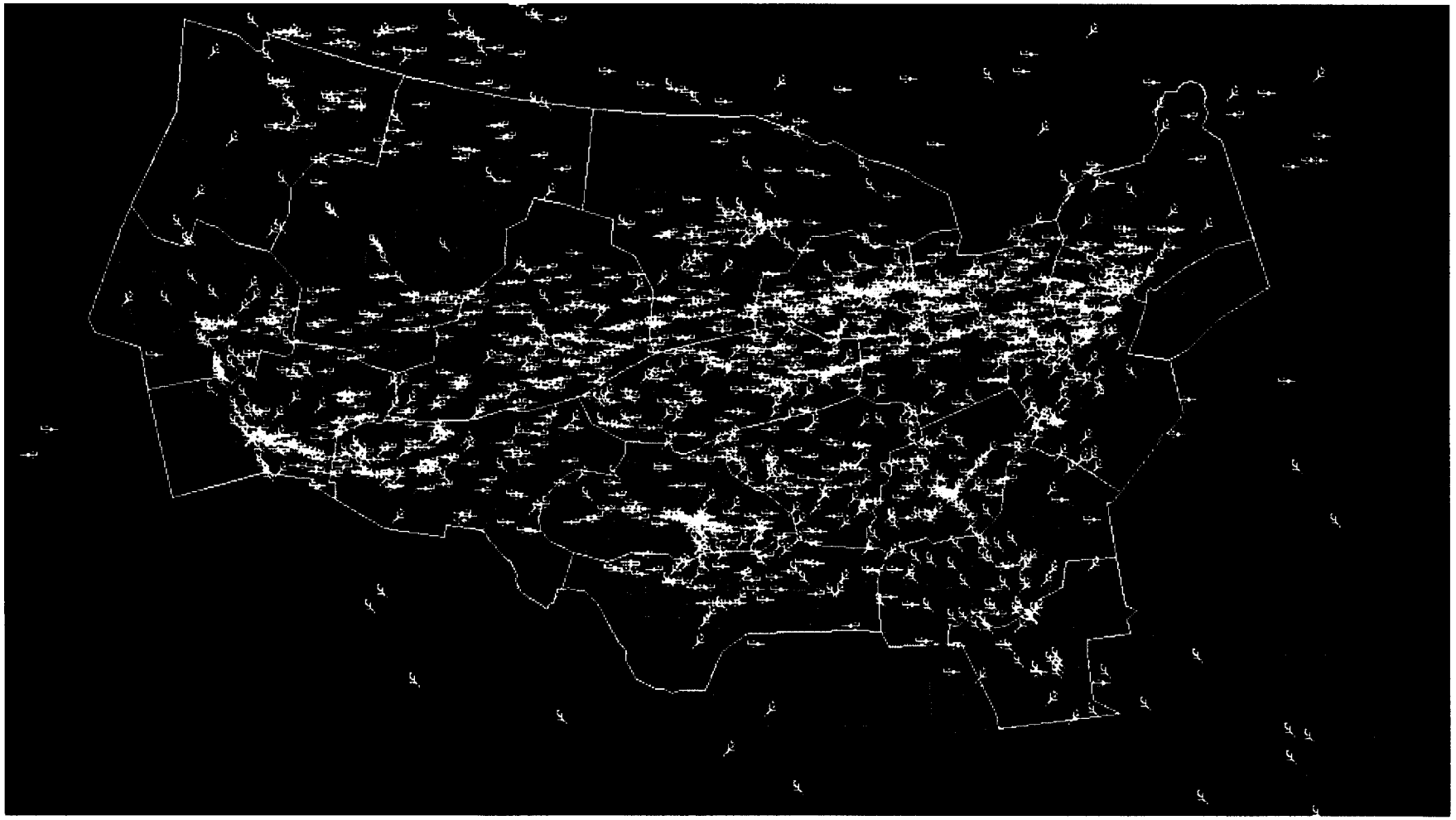
- Central to FAA's NAS Modernization
- Comprise three of the five tools selected by FAA/industry in support of on-going Free-Flight Phase 1
  - 66% of the expected cost savings due to automation
  - 43% ($222M) of implementation budget for automation tools

Free Flight Phase-I CTAS Sites

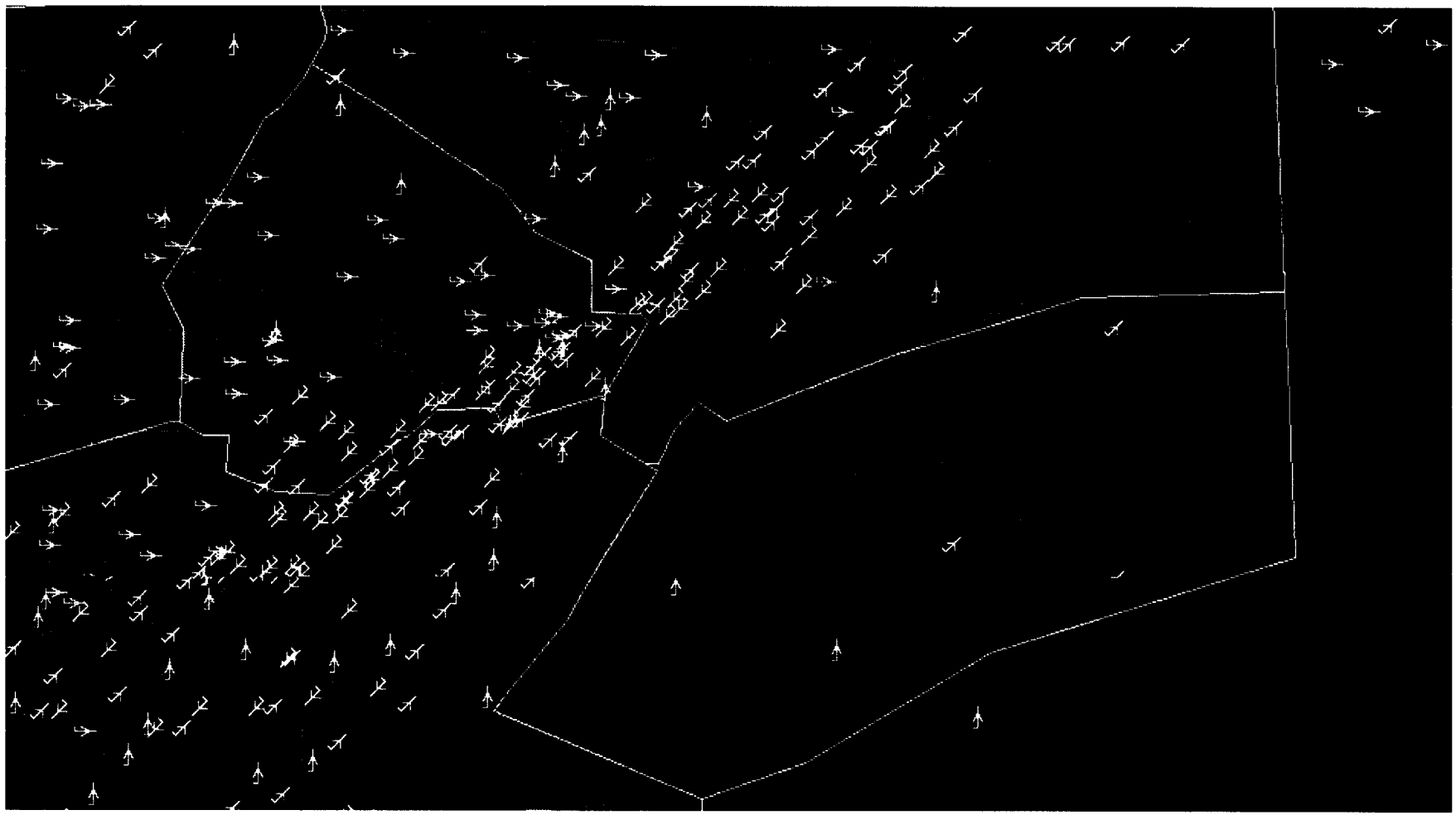



FACET
NASA
Ames Research Center
Future ATM Concepts Evaluation Tool
Analysis

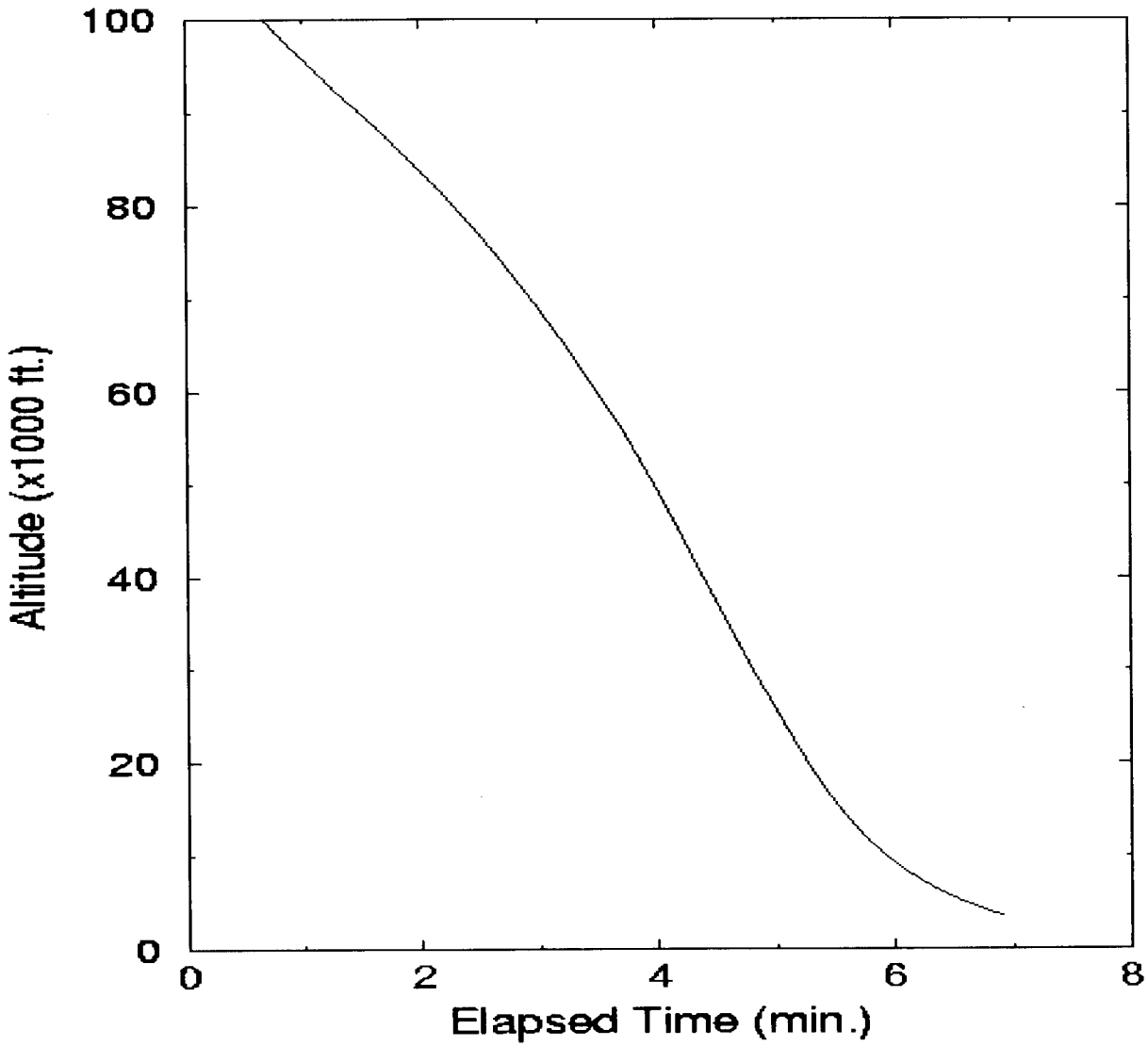
RLV Operation in the NAS



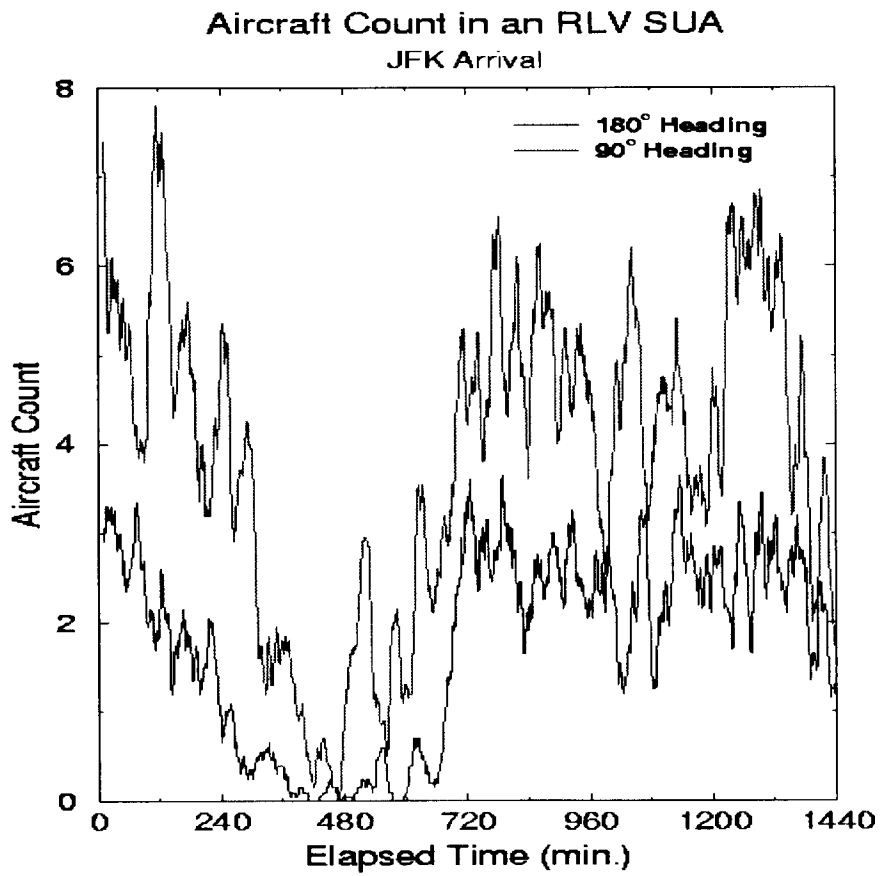
RLV Operations at JFK

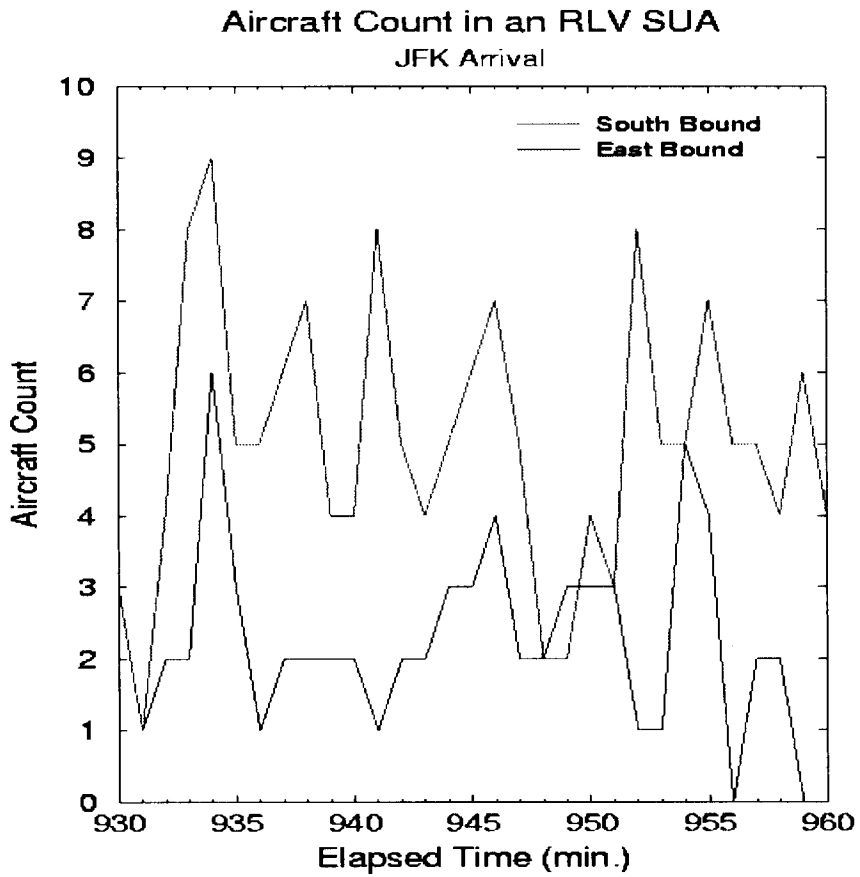


RLV Descent Trajectory



Number of Aircraft in RLV Path at JFK





Future Flight Central

Space Transportation in the Future

- NASA Space Transportation Goals and Roadmap
  - Increase safety
  - Reduce Cost
- United States Spaceport Locations
  - Inland locations
  - Increased number of spaceports
- Vision Spaceport
  - Spaceports that operate similar to today's airports

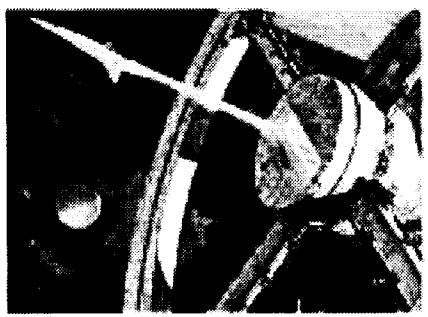
NASA Space Transportation Roadmap and Goals

Today: Space Shuttle
1st Generation RLV
- Orbital Scientific Platform
- Satellite Retrieval and Repair
- Satellite Deployment

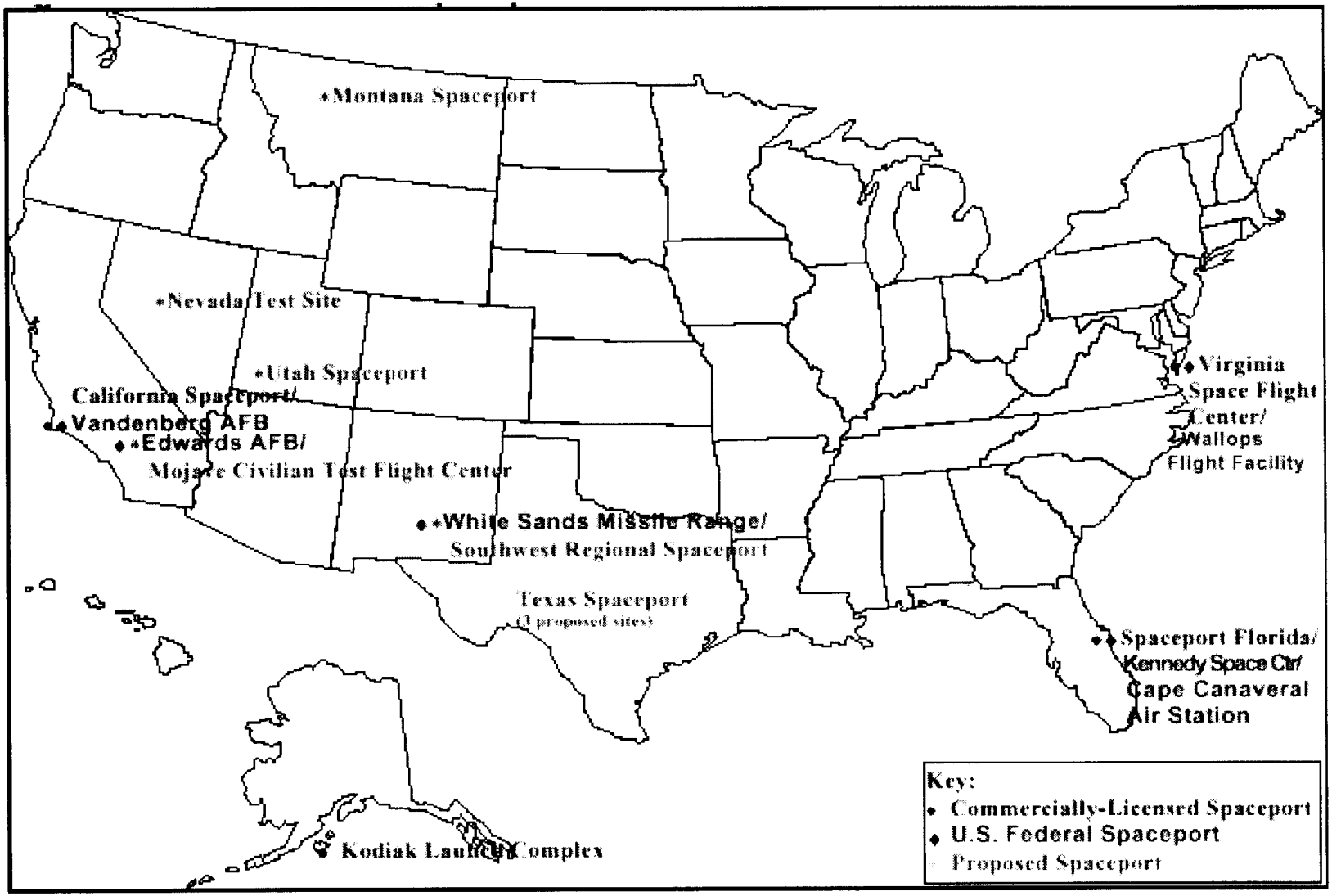
2010: 2nd Generation RLV
- Space Transportation
- Rendezvous, Docking, Crew Transfer
- Other on-orbit operations
- ISS Orbital Scientific Platform
- 10x Cheaper
- 100x Safer

2025: 3rd Generation RLV
- New Markets Enabled
- Multiple Platforms / Destinations
- 100x Cheaper
- 10,000x Safer

2040: 4th Generation RLV
- Routine Passenger Space Travel
- 1,000x Cheaper
- 20,000x Safer



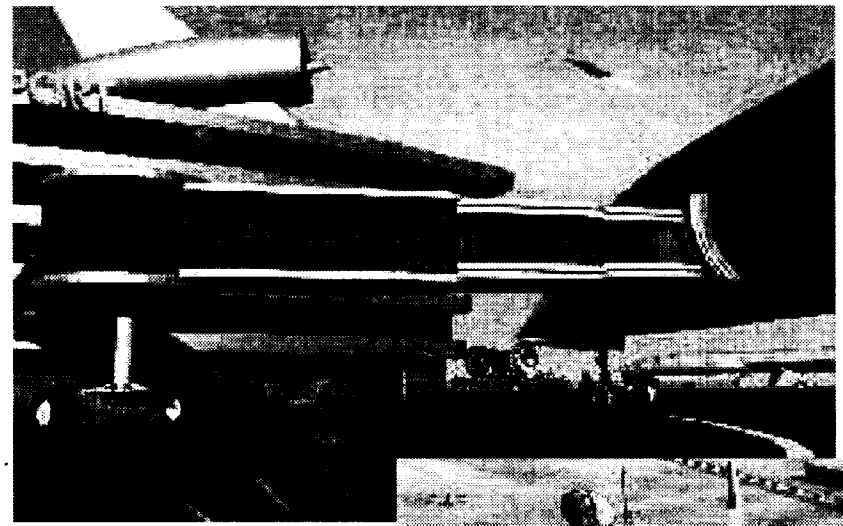
USA Spaceport Locations

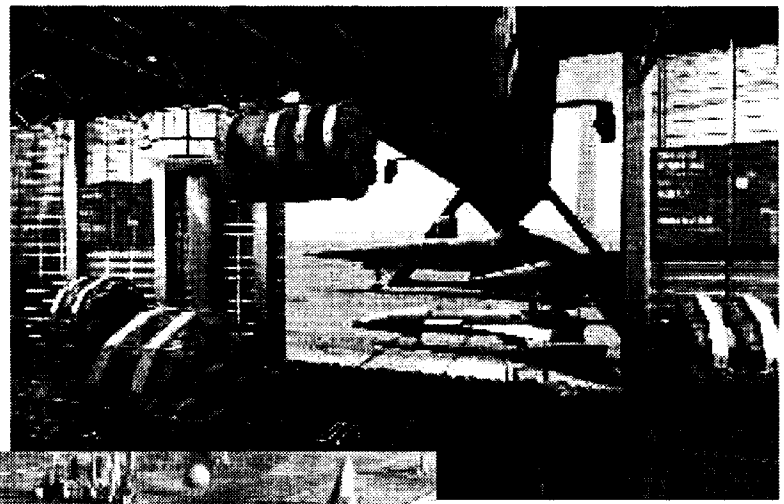


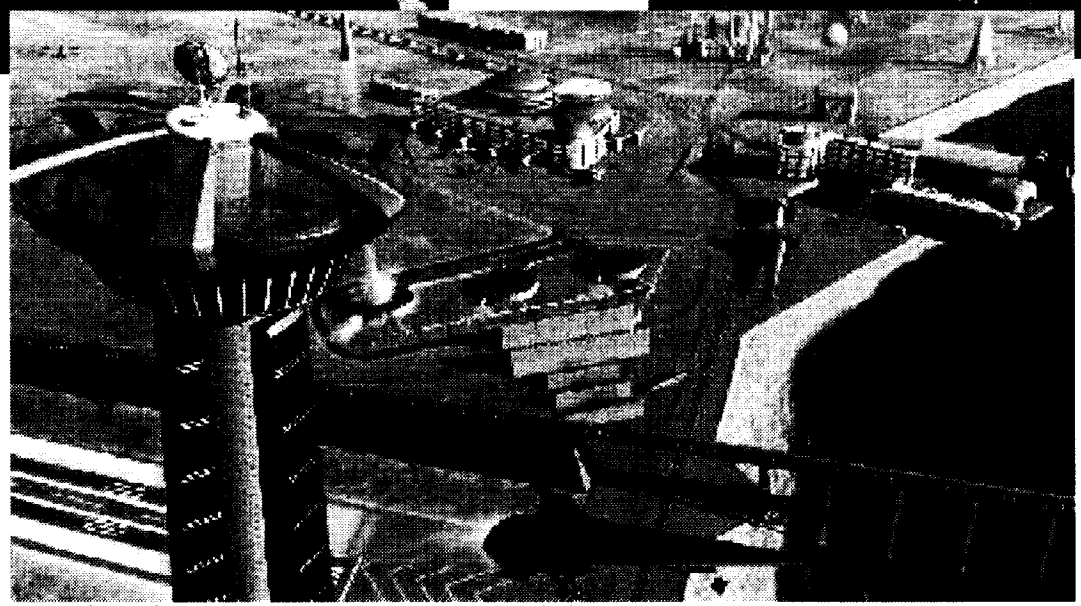
Vision Spaceport

Ultimately - Space for Anyone

High-Value Cargo Operations







Spaceport Flight Operations Research Topics

- Flight Planning and Scheduling
  - International Space Station
  - Increased and Varied Spaceport Locations
  - Aborts
  - Emergency De-orbit
- Airspace Negotiation
  - FAA Licensing
  - Trajectory negotiation
  - Range Operations

Spaceport Flight Operations Research Topics

- RLV Performance and Flight Operations
  - SHARP Technologies
  - Commercial Ventures
- Collision Detection and Resolution
  - Aircraft
  - Space Debris