

Presentation to:
NASA VAMS TIM #3

System Wide Capacity Increasing Concept

Boeing
Air Traffic Management
Metron Aviation

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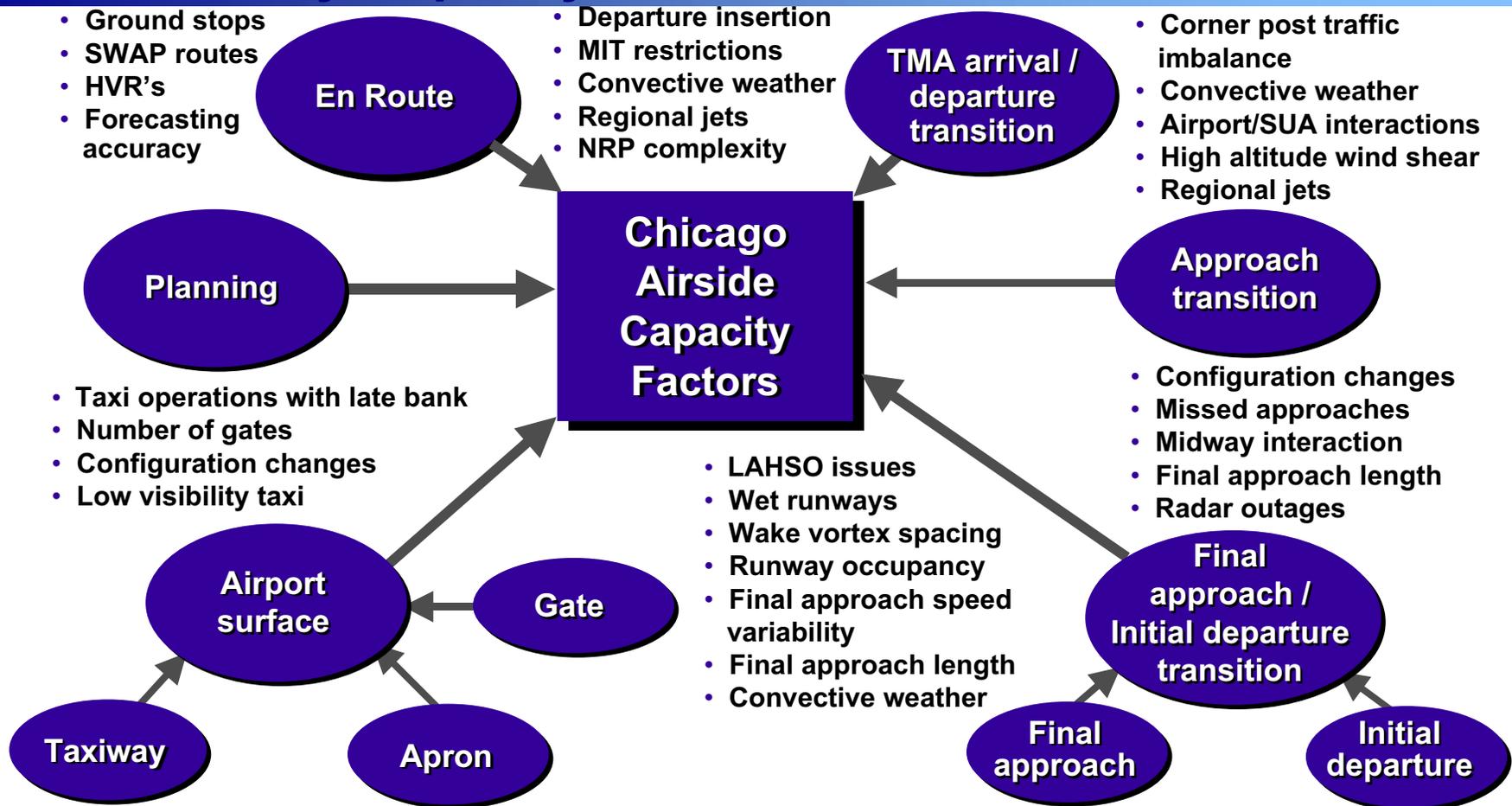


Air Traffic Management

Concept

Operational Issues

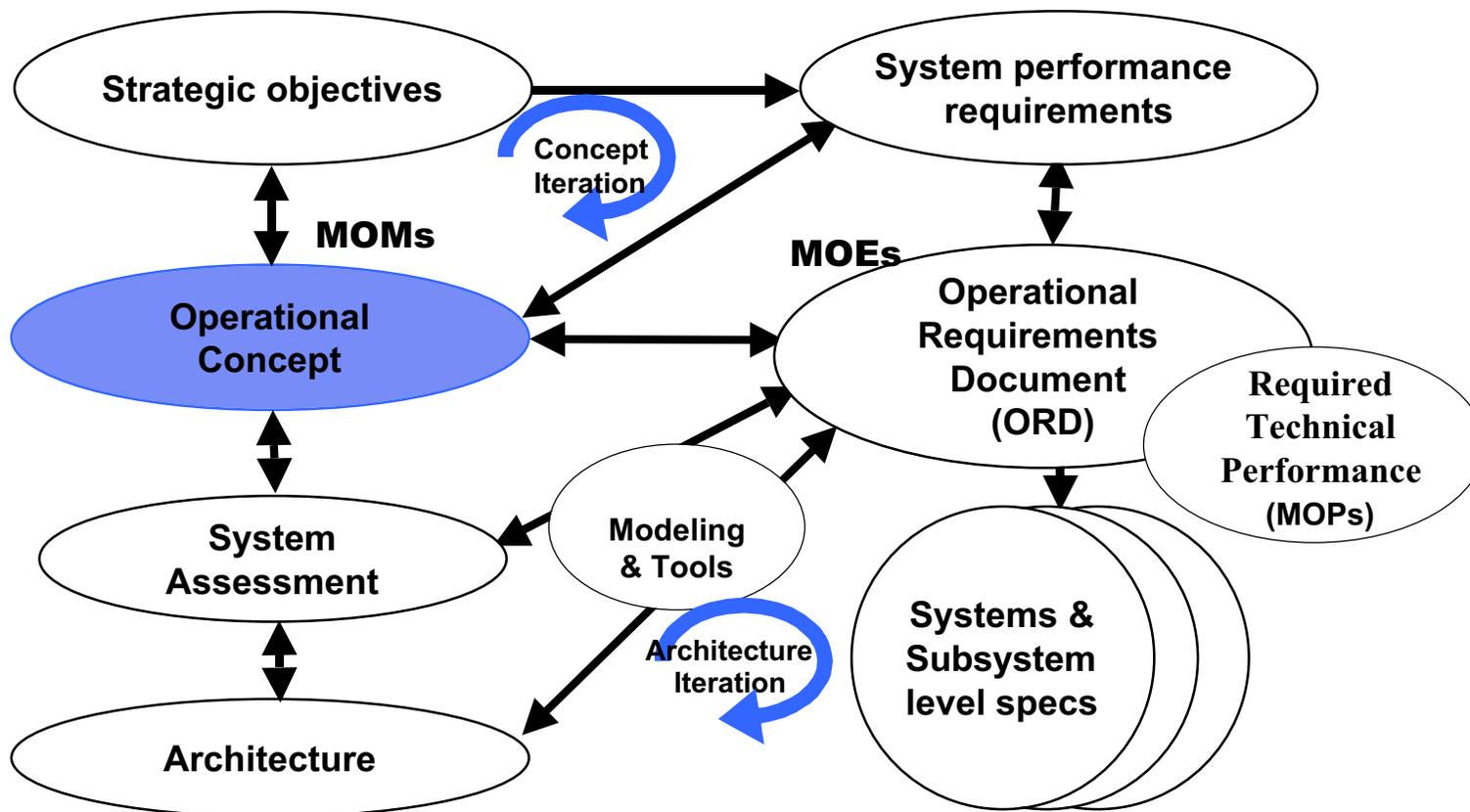
Case Study Capacity Factors



- **Complex, inter-acting constraints dynamically change airport and airspace capacities**

Source: NASA Sponsored Airspace Preliminary Design Case Study

System Engineering Context for Operational Concept



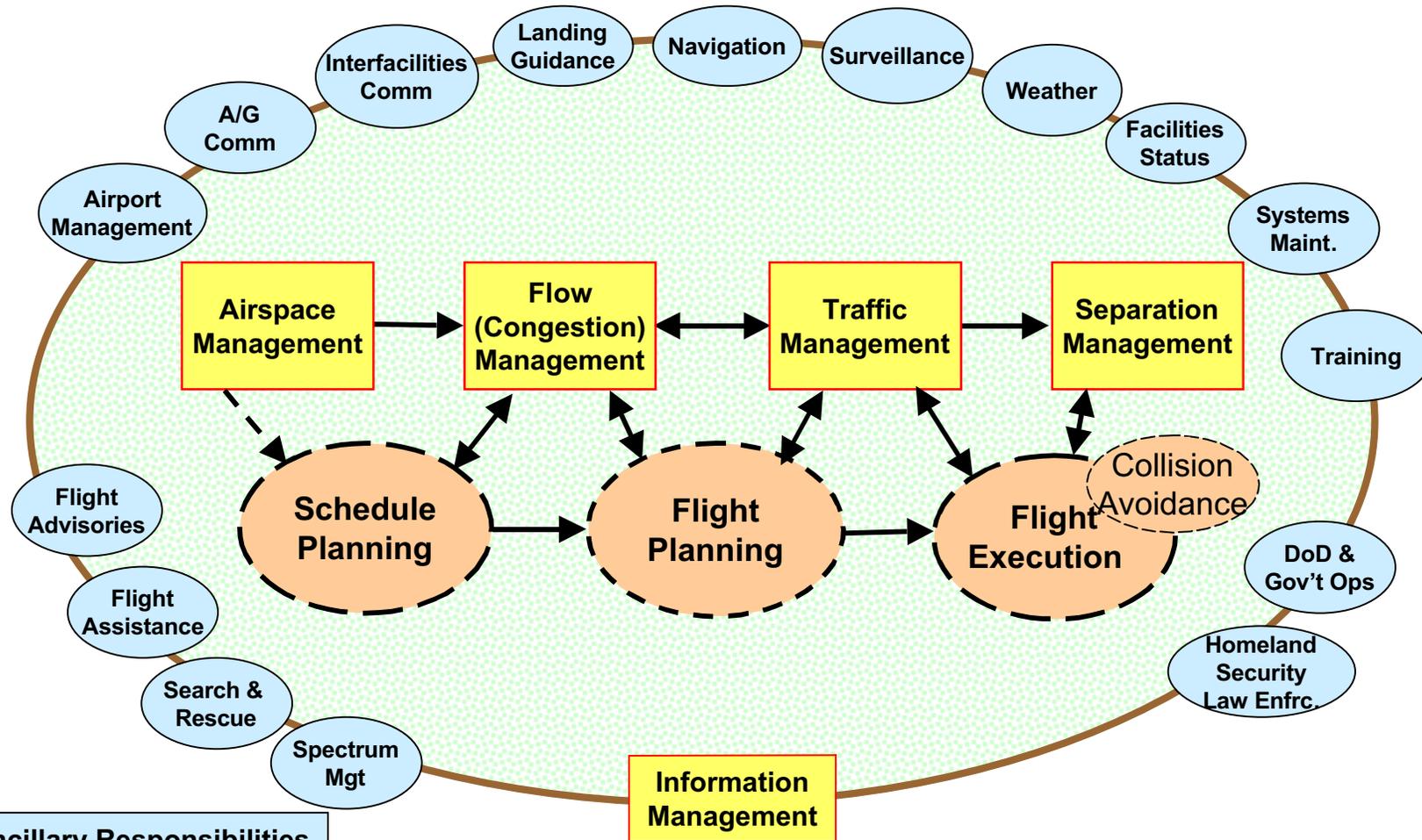
MOM – Measures of Mission

MOE – Measures of Effectiveness

MOP – Measures of Performance

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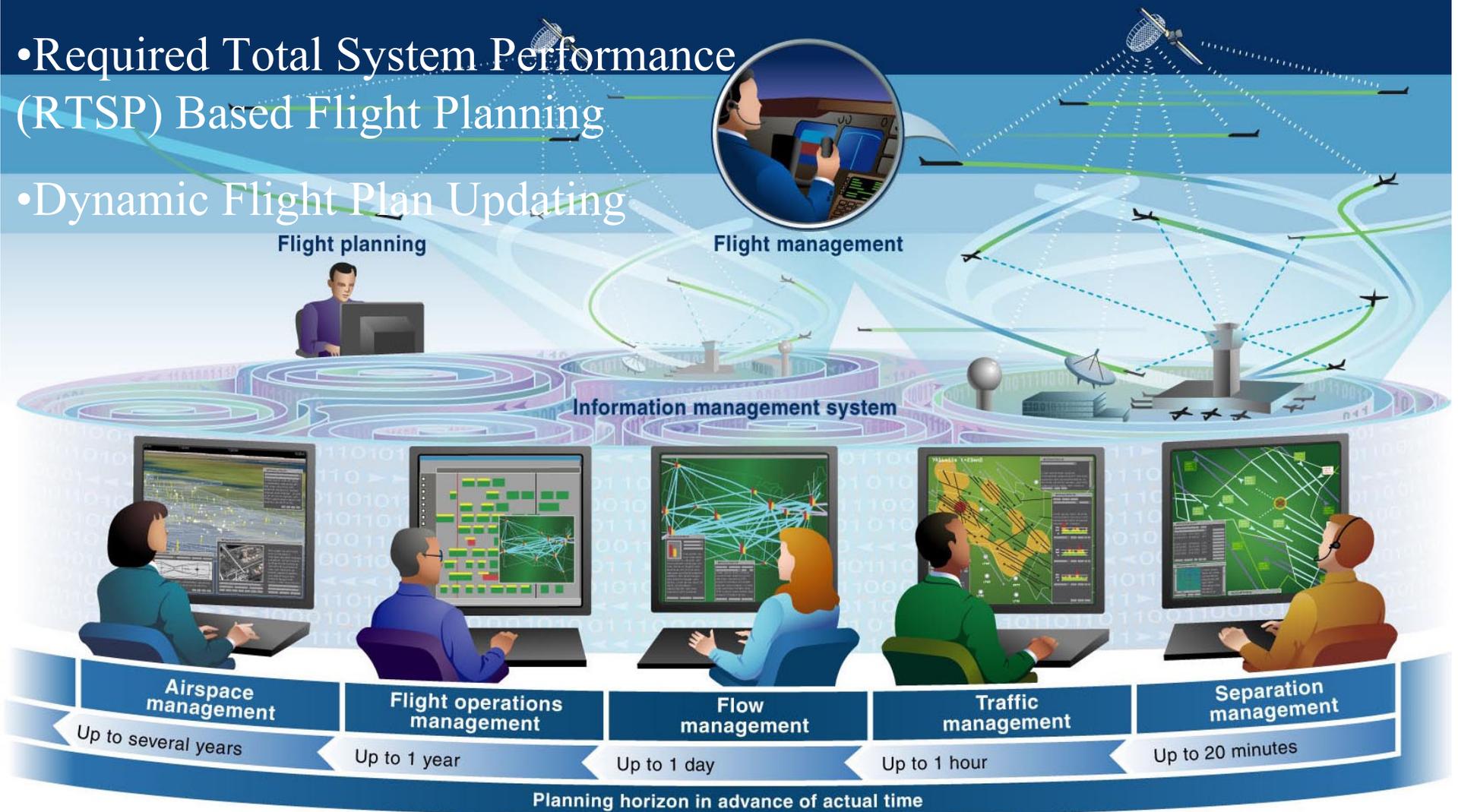
System Wide Capacity Increasing Concept Context



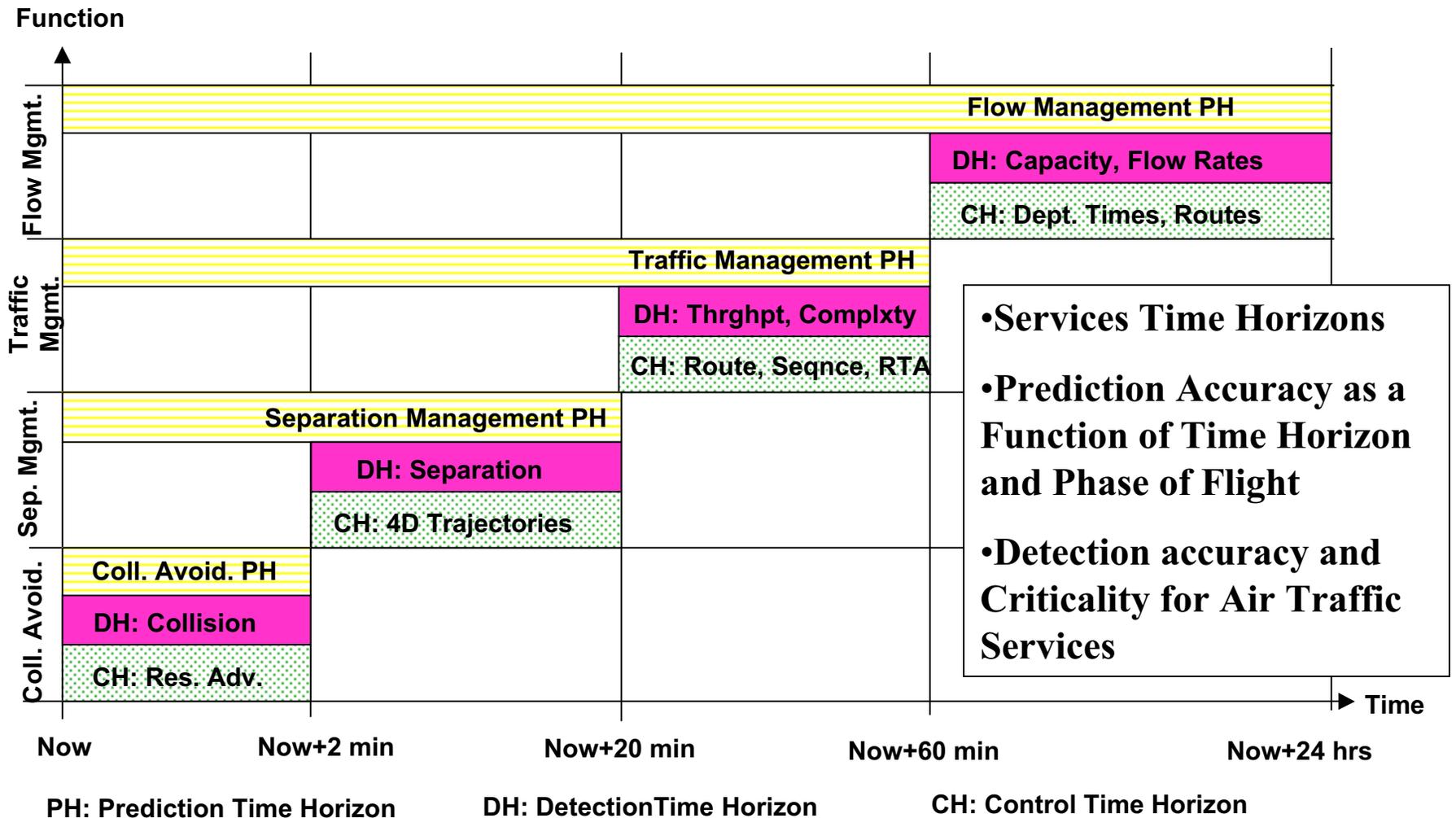
- ATM Ancillary Responsibilities
- Air Traffic Domain Core Responsibilities
- Typical Airspace Operator Responsibilities

Management = Monitor, Assess, Plan, and Execute

- Integrated Services with Time Partitioning
- Enriched Trajectory Based Flight Plans
- Required Total System Performance (RTSP) Based Flight Planning
- Dynamic Flight Plan Updating

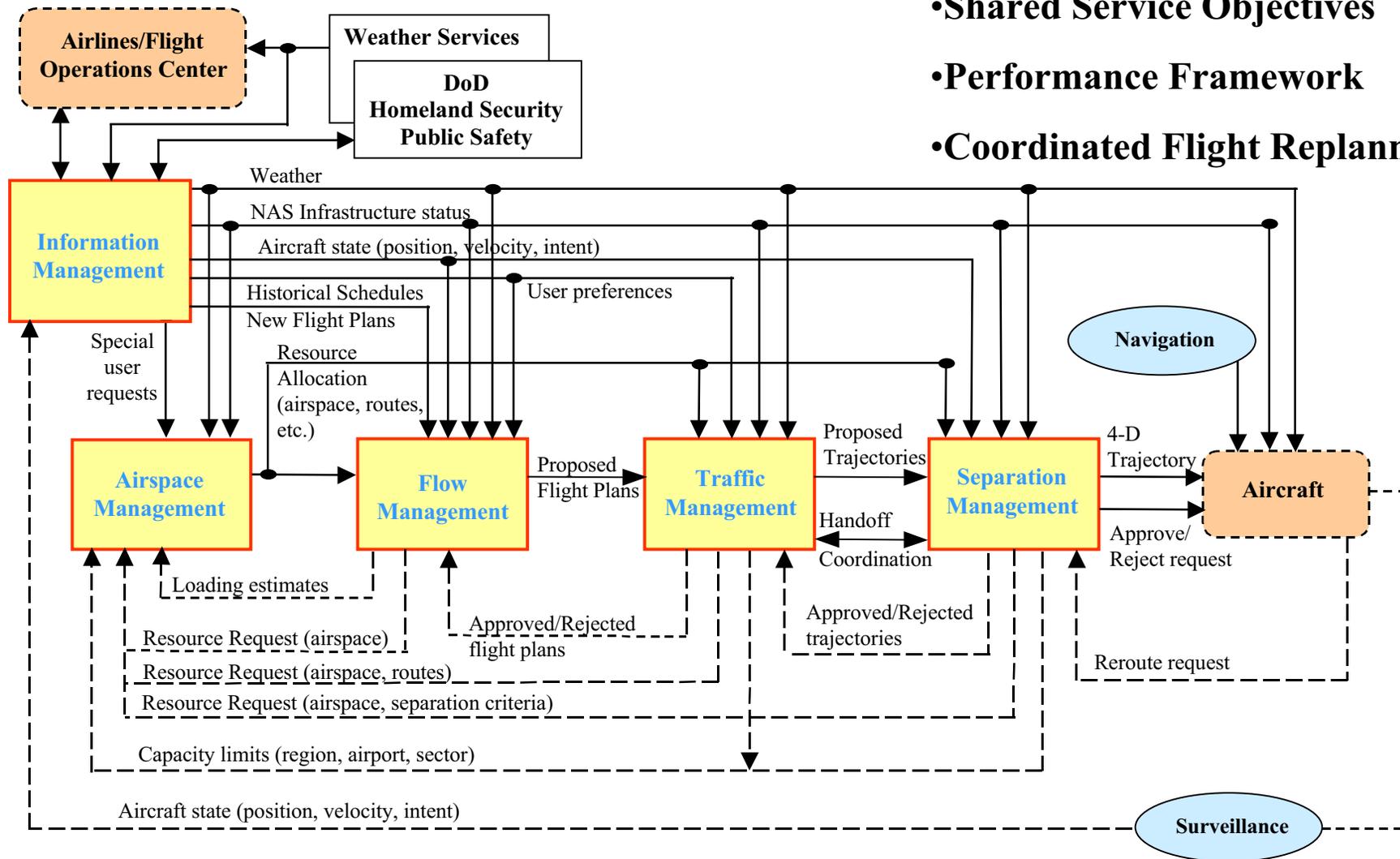


Time Partitioning of ATM Services



Air Traffic Management as an Integrated Set of Core Services

- Shared Service Objectives
- Performance Framework
- Coordinated Flight Replanning



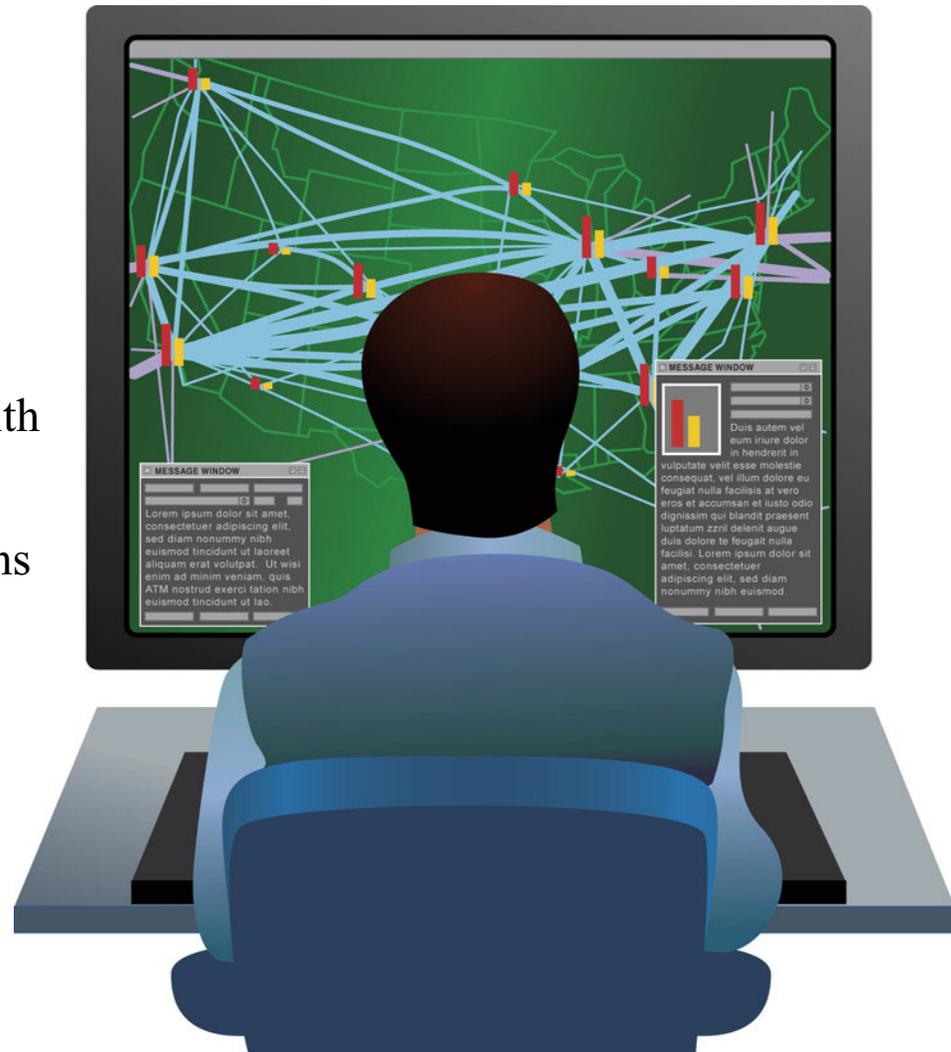
Airspace Management

- Dynamic Infrastructure Health Monitoring
- Estimation of Actual Total System Performance
- Determination of Required Total System Performance
- Time Horizon Determination and Allocation to ATM Services
- Dynamic Airspace Configuration
- Long Term Monitoring and Feedback of System Performance



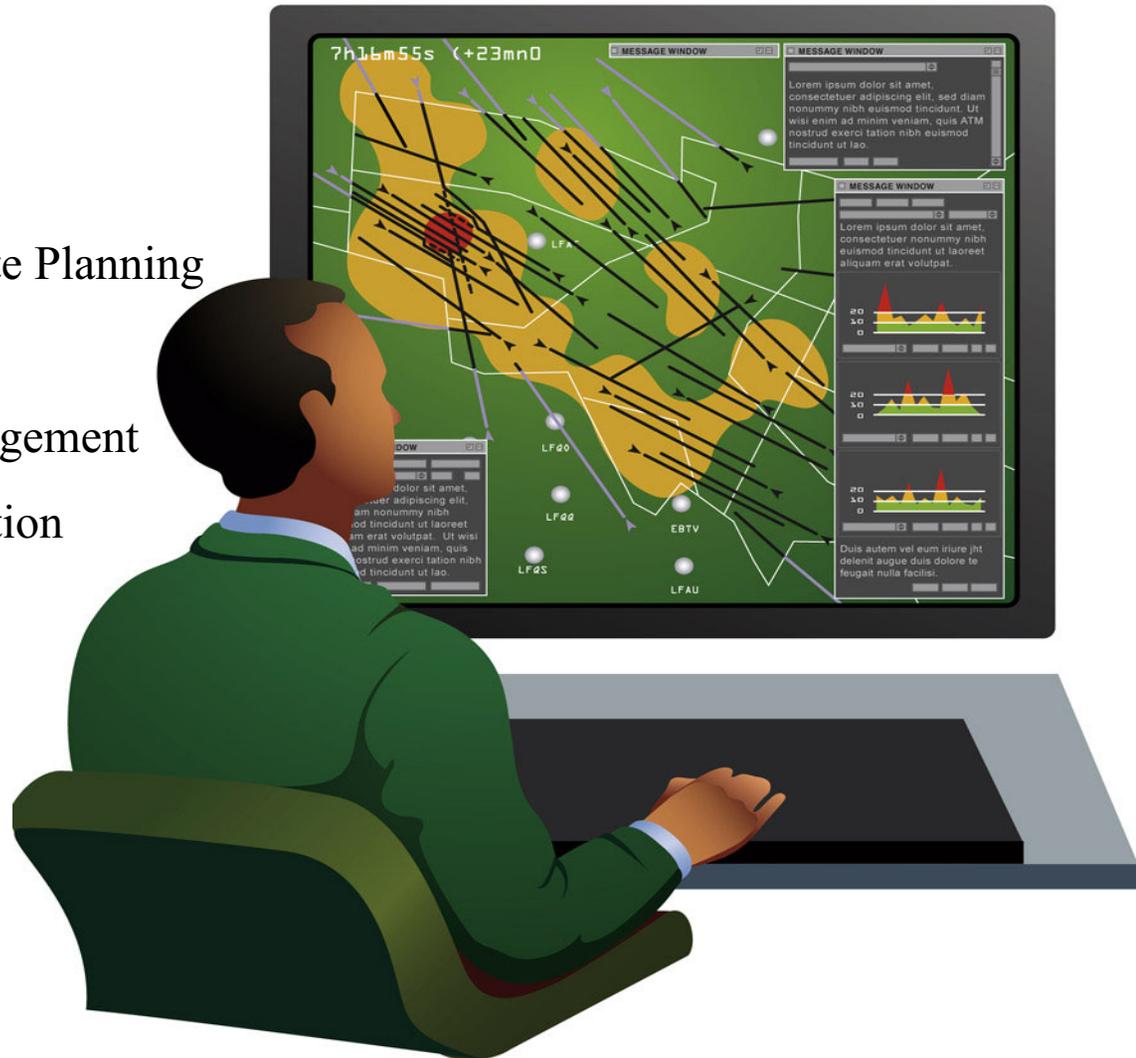
Flow Management

- Enhanced Flow Prediction with Uncertainty Estimation
- Enriched Constrained Resource Set
- Equity Based Allocation of Delay
- Uncertainty Based Flow Planning with Discounting
- Schedule Connectivity Considerations
- Flight Plan Controls
- Back Up Flow Planning



Traffic Management

- Multi-sector Traffic Planning
- Surface, Terminal and En Route Planning Integration
- Complexity and Spacing Management
- Traffic Management Coordination
- Flight Plan Controls
- Back Up Traffic Management



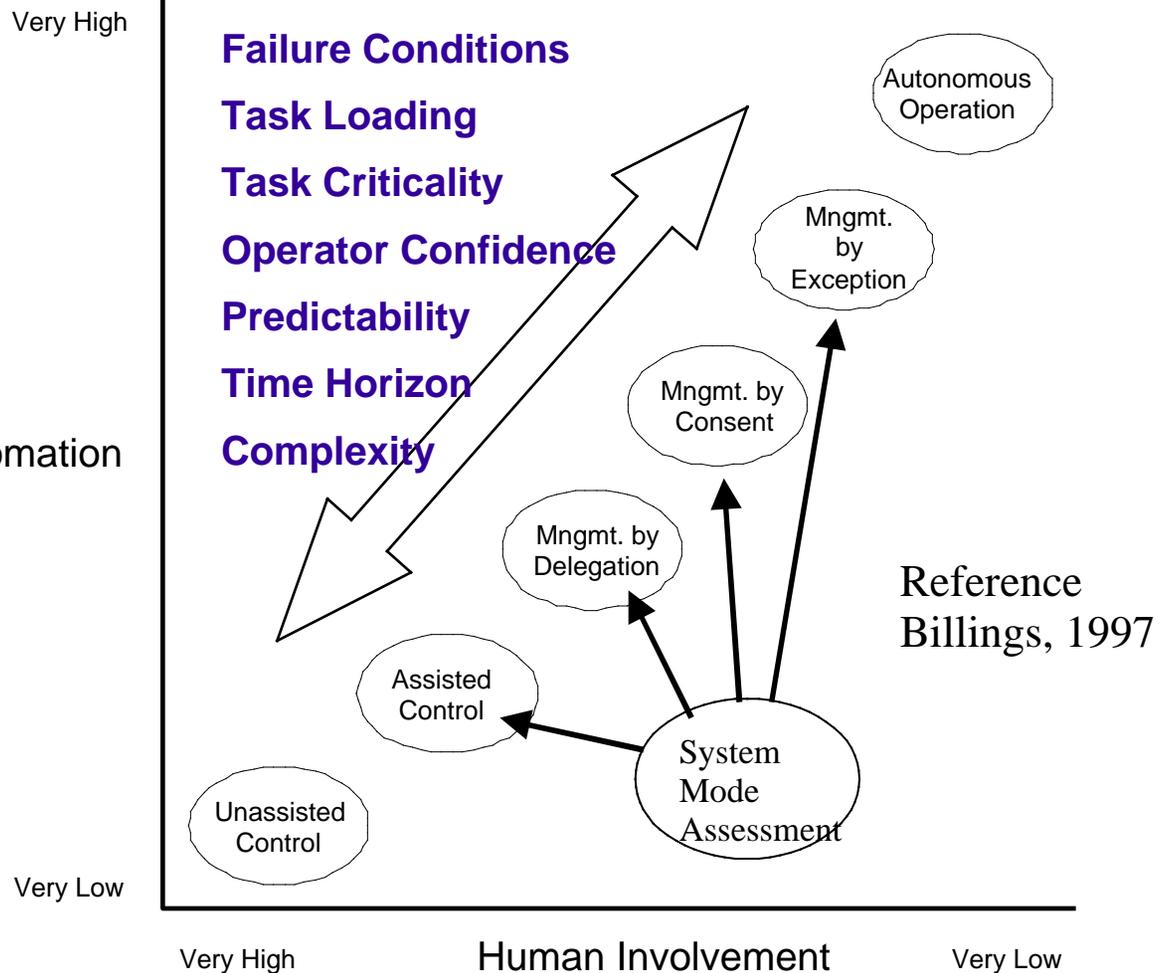
Separation Management

- Sector Based Separation Management
- Precision Procedural Control
 - Procedural Lateral and Vertical Separation
 - Enhanced ETA and RTA Longitudinal Control
- High Performance Trajectory Datalink Communication
- Enlarged Sector Span of Control
- Separation Management Monitoring and Back Up Modes
- Coordination with Aircraft Collision Avoidance

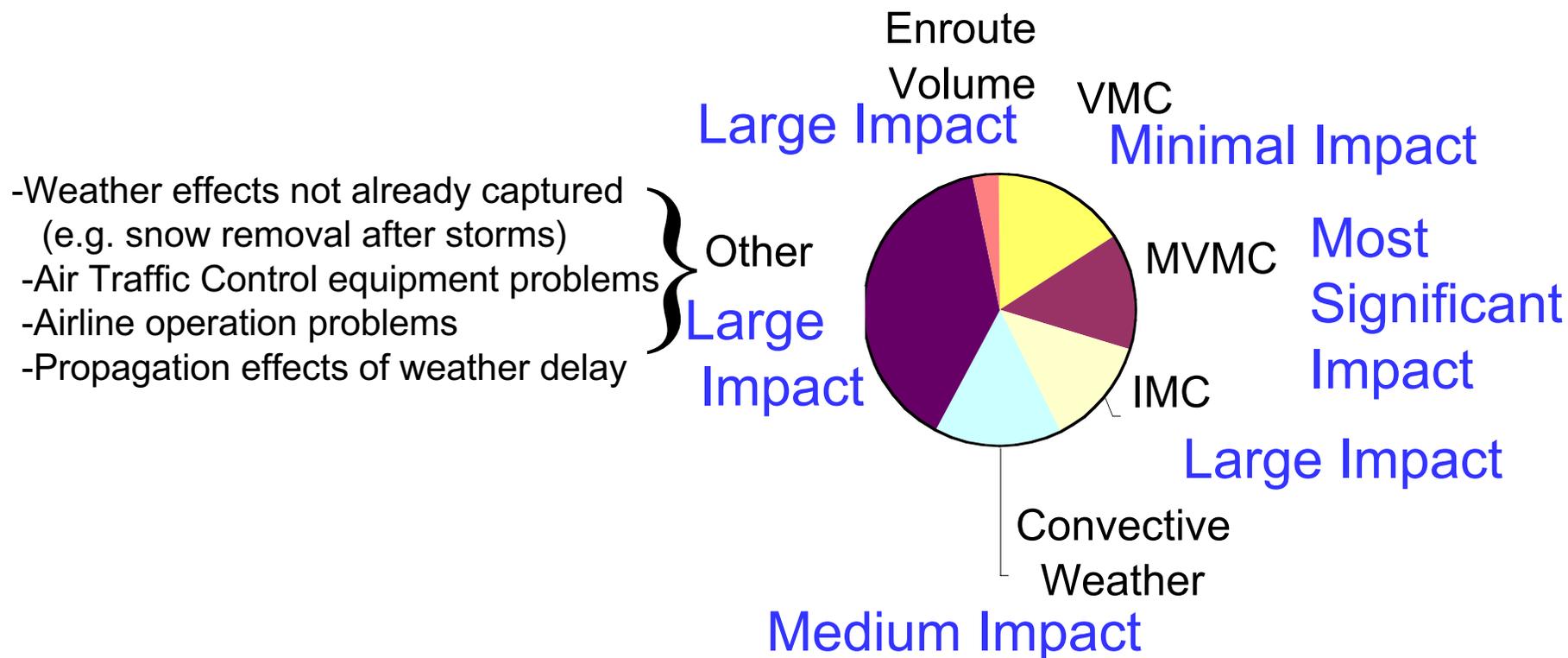


Human Roles and Responsibilities

- Human as System Manager
 - Human involved, informed and in command
 - Humans and automated systems able to monitor each other
 - Automated systems are predictable
 - Automation is supportive of human
 - Automation guards against human limitations
- Multiple, Selectable Levels of Automation
- Dynamic optimal allocation of functions between human and machine

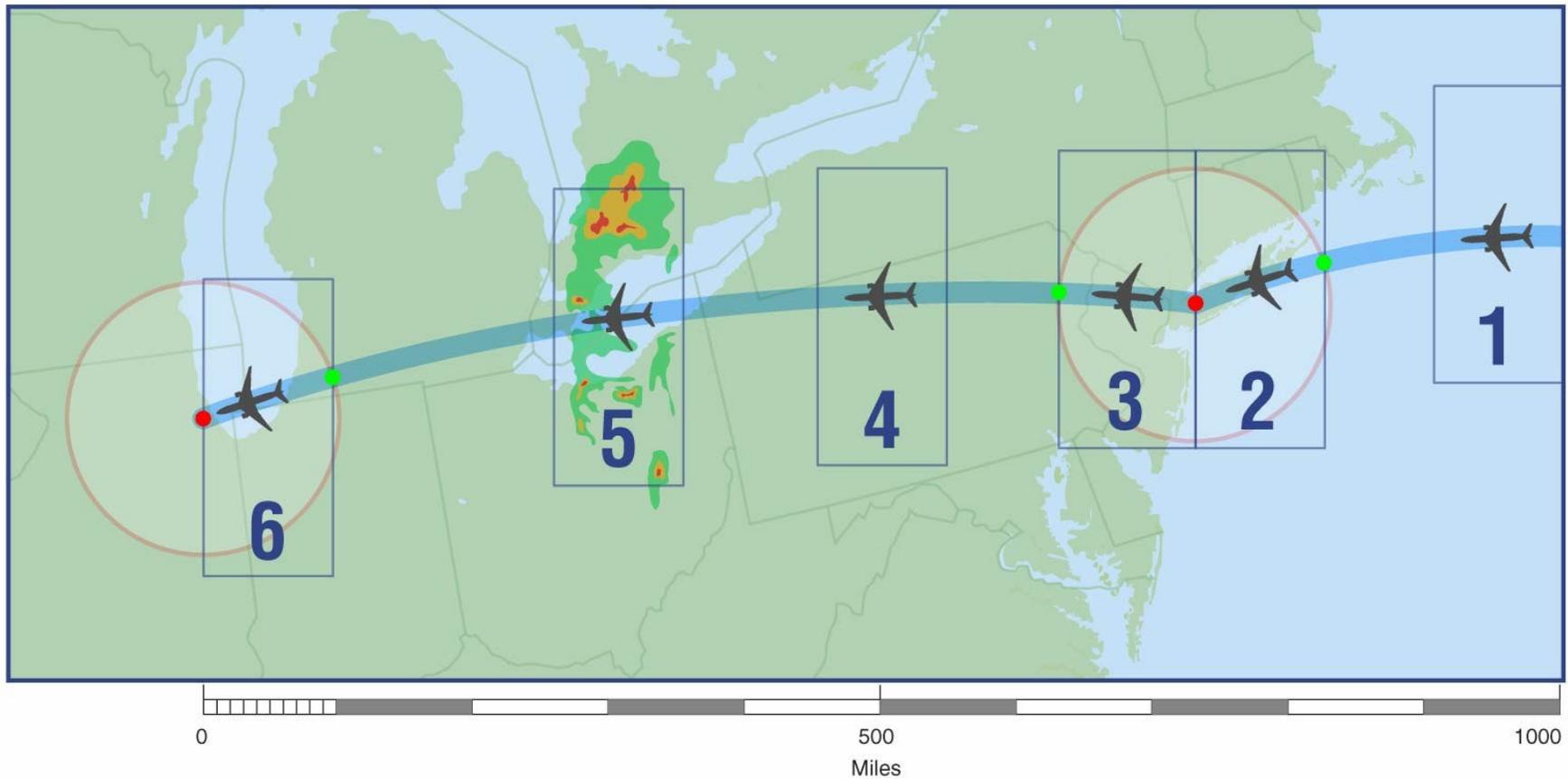


Preliminary Assessment of Capacity Benefits



VMC – Visual Meteorological Conditions
MVMC – Marginal Visual Meteorological Conditions
IMC – Instrument Meteorological Conditions

Operational Scenarios



Summary

- Enriched Trajectory Based Flight Plans
- Required Total System Performance (RTSP) Based Flight Planning
- Dynamic Flight Plan Updating
- Integrated Services with Time Partitioning
- Services Time Horizons
- Prediction Accuracy as a Function of Time Horizon and Phase of Flight
- Detection Accuracy and Criticality for Air Traffic Services
- Shared Service Objectives
- Performance Framework
- Coordinated Flight Replanning