The In-time Aviation Safety Management System Concept for Part 135 Passenger and Cargo Operators

ACSF Safety Symposium

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NASA Aeronautics Research Institute
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The In-time Aviation Safety Management System Concept for Part 135 Operators

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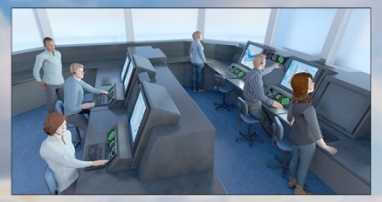
Innovating the Future of Aviation Safety

Radar Based

Safety + Density
Human centered traffic &
safety management



Info-centric NAS

Collaborative Environment
Service oriented architecture
for tailored mission services
+ ML
+ IoT

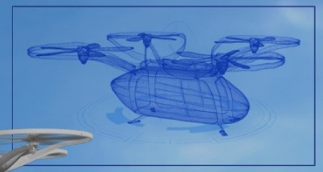
Class A

xTM
Provider of Services

FAA
Industry Data Exchange

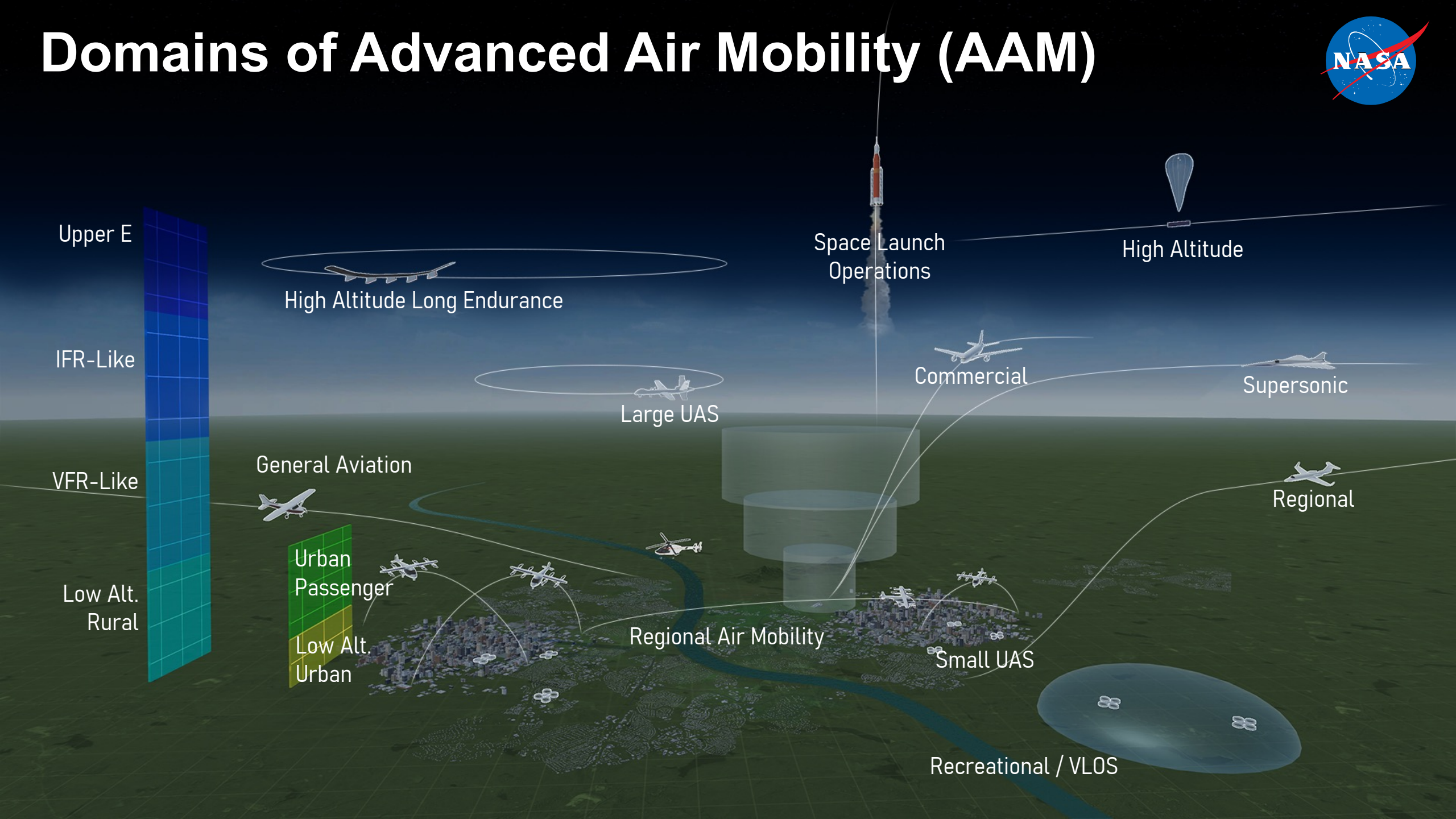
Sky for ALL

Highly Automated
Complexity, scalability,
and dynamic adaptation
+ digital mesh
+ AI
+ IoT



Evolution of Airspace Operations and Safety

Domains of Advanced Air Mobility (AAM)



System-Wide Safety

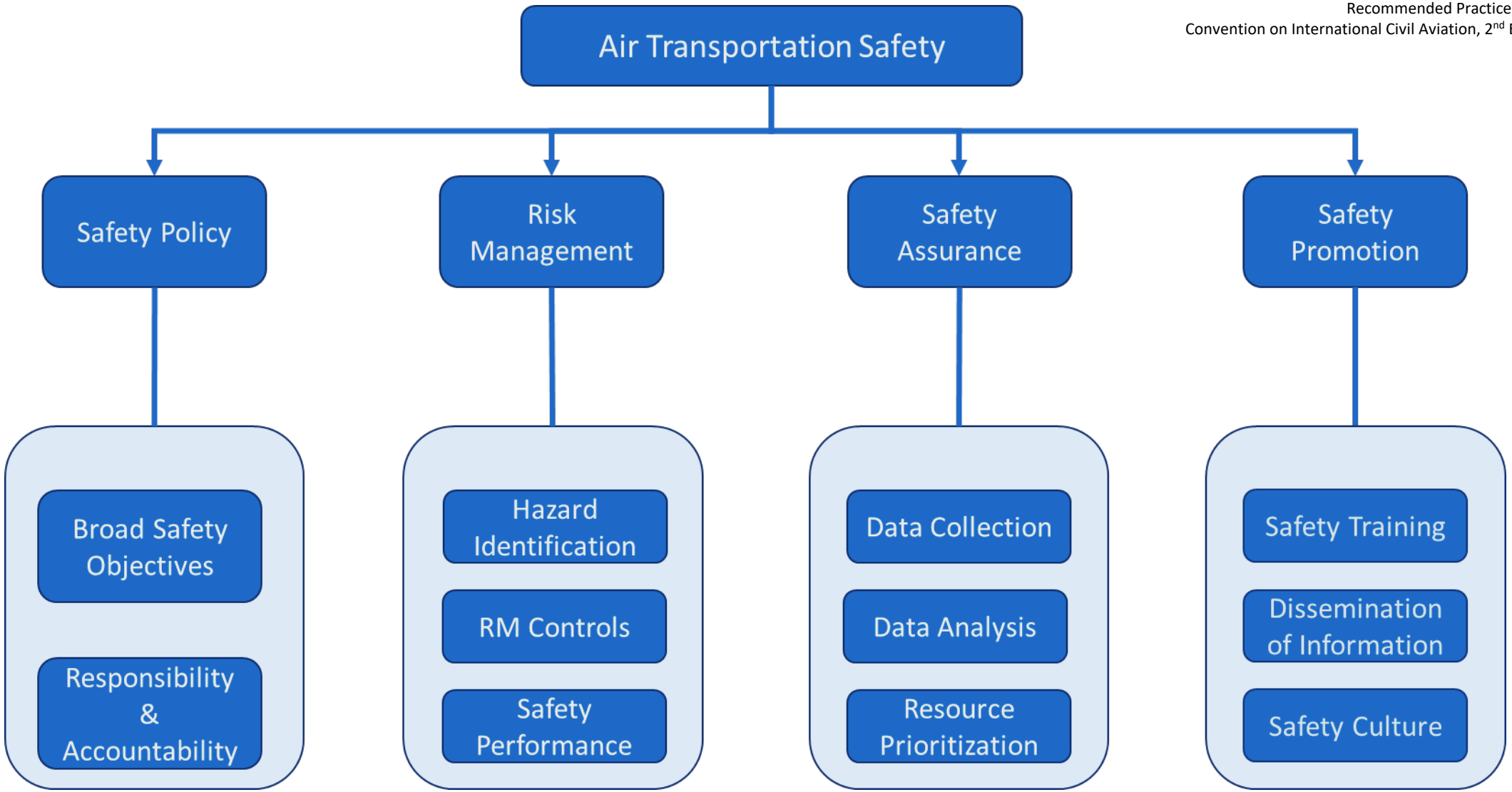
Average Accident Statistics for Parts 135 and 121*

Operator	Accidents per 100,000 Flight Hours	Average Flight Hours	Average of All Accidents (Min/Max)	Average of All Fatalities (Min/Max)
Part 135 Commuter (Table 8)	1.53	325,481	4.9 (2/9)	1.9 (0/13)
Part 135 On-Demand (Table 9)	1.46	3,403,277	48.9 (29/73)	30.5 (12/69)
Part 121 Commercial Air Carriers (Table 5)	0.18	17,911,713	32.0 (14/54)	9.5 (0/52)

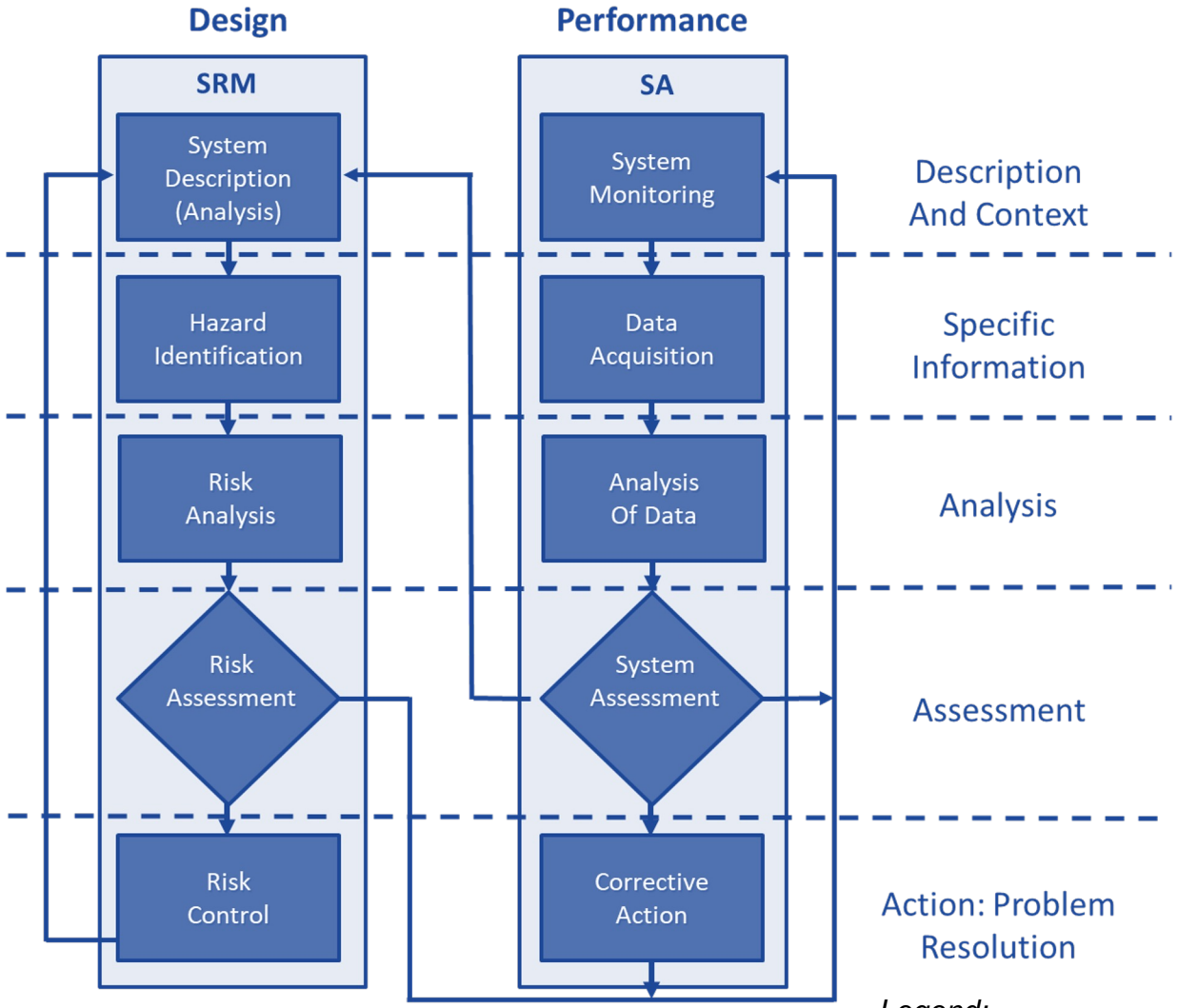
*National Transportation Safety Board, "Annual Summary of US Civil Aviation Accidents, 2019." https://www.ntsb.gov/safety/data/Pages/AviationDataStats2019.aspx

How We Achieve Aviation Safety Today

International Civil Aviation Organization, "Safety Management, Standards and Recommended Practices - Annex 19, Convention on International Civil Aviation, 2nd Edition, 2016



FAA Framework for Voluntary SMS Program

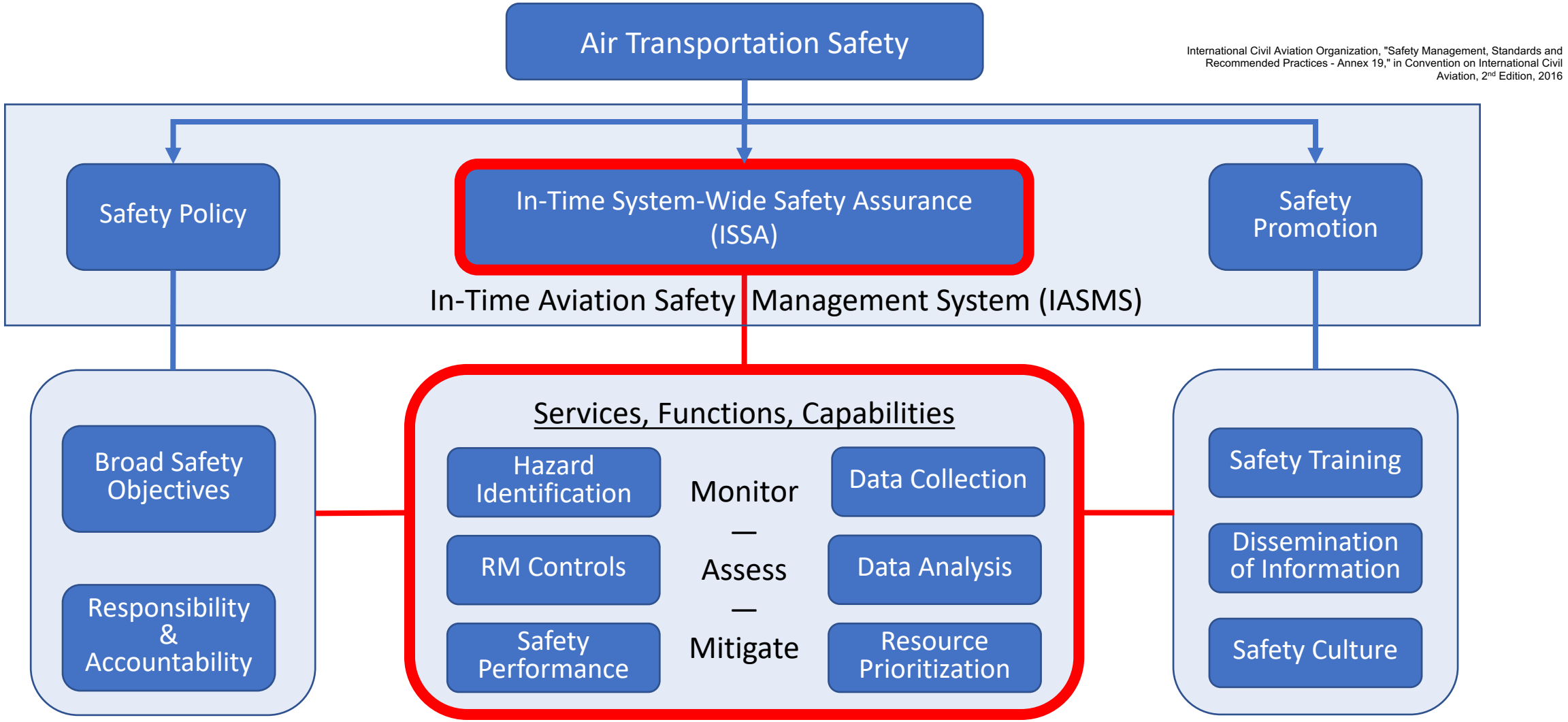


From FAA AC 120-92B, Figure 2.1

- 40 Part 135 operators participate in the FAA SMS Voluntary Program or 2.12%
- Many are large operators
- 86 Part 135 operators have submitted requests for inclusion
- FAA working to reduce the backlog

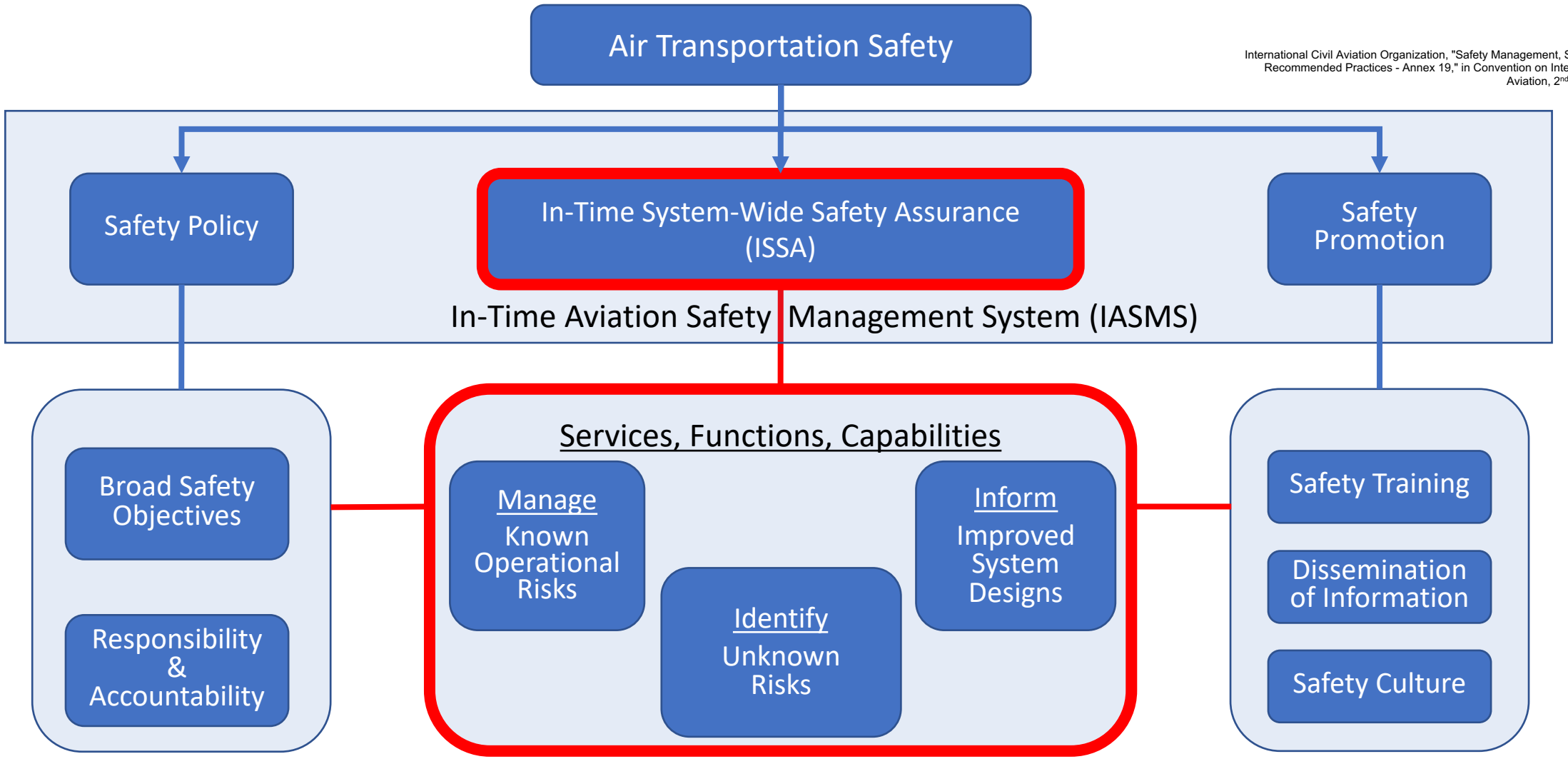
Legend:
AC: Advisory Circular
SA: Safety Assurance
SRM: Safety Risk Management

How We Achieve Aviation Safety Tomorrow



Services, Functions, and Capabilities Help to Inform and Execute Risk Management and Safety Assurance Actions

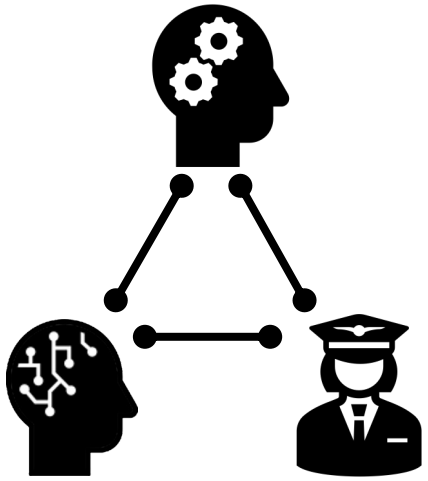
How We Achieve Aviation Safety Tomorrow



In-Time System-Wide Safety

System-Wide Safety

Cognitive Engineering



Human-Automation Teaming

National Airspace System

Data

Monitor
- Collect data
- Check data quality
- Fuse data
- Distribute data

Operational/ Vehicle	Flight Plans	Safety Data Bases

NAS System State

Assess
- Assess operational data
- Model flight planning data
- Mine safety data bases

Elevated Risk State

Mitigate

Time-dependent action
- Automatic action
- Procedure-based (augmented using decision support tool)

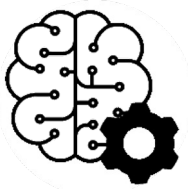
Safety Assurance Action

Time Horizon

Pre-Flight	In-Flight	Post-Flight

Reactive
Proactive
Predictive

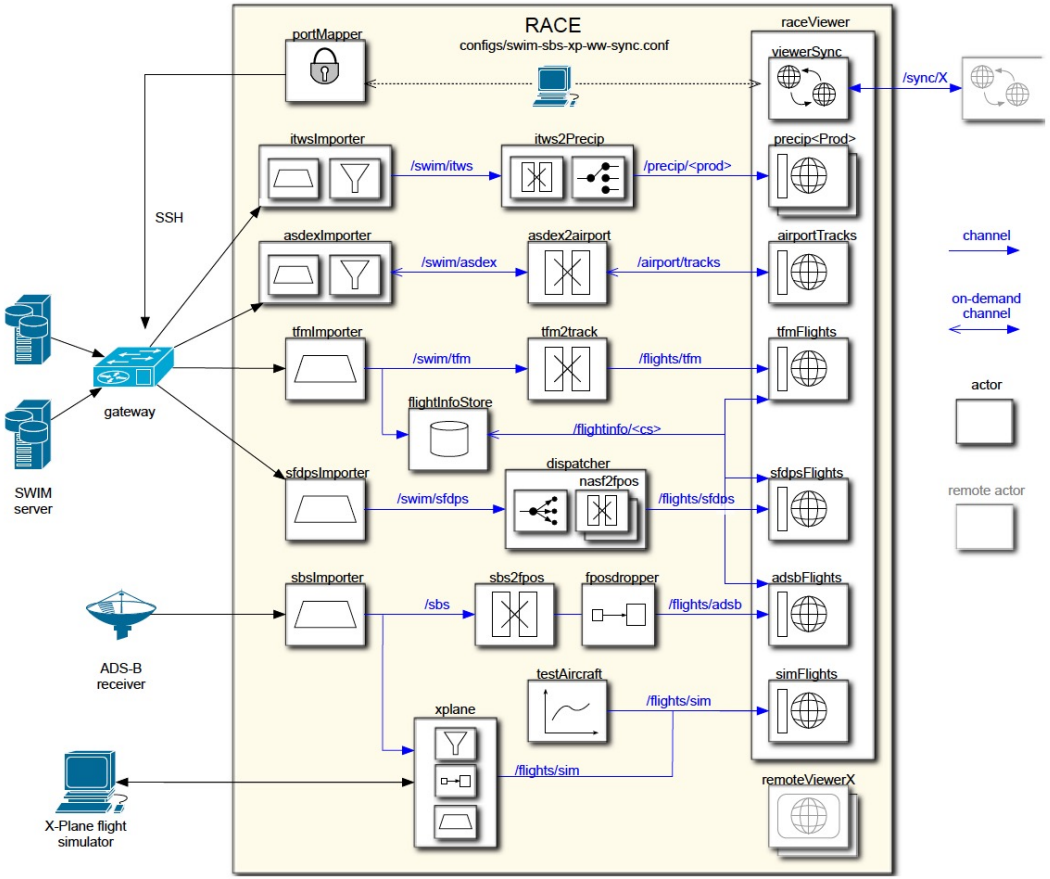
Machine Learning



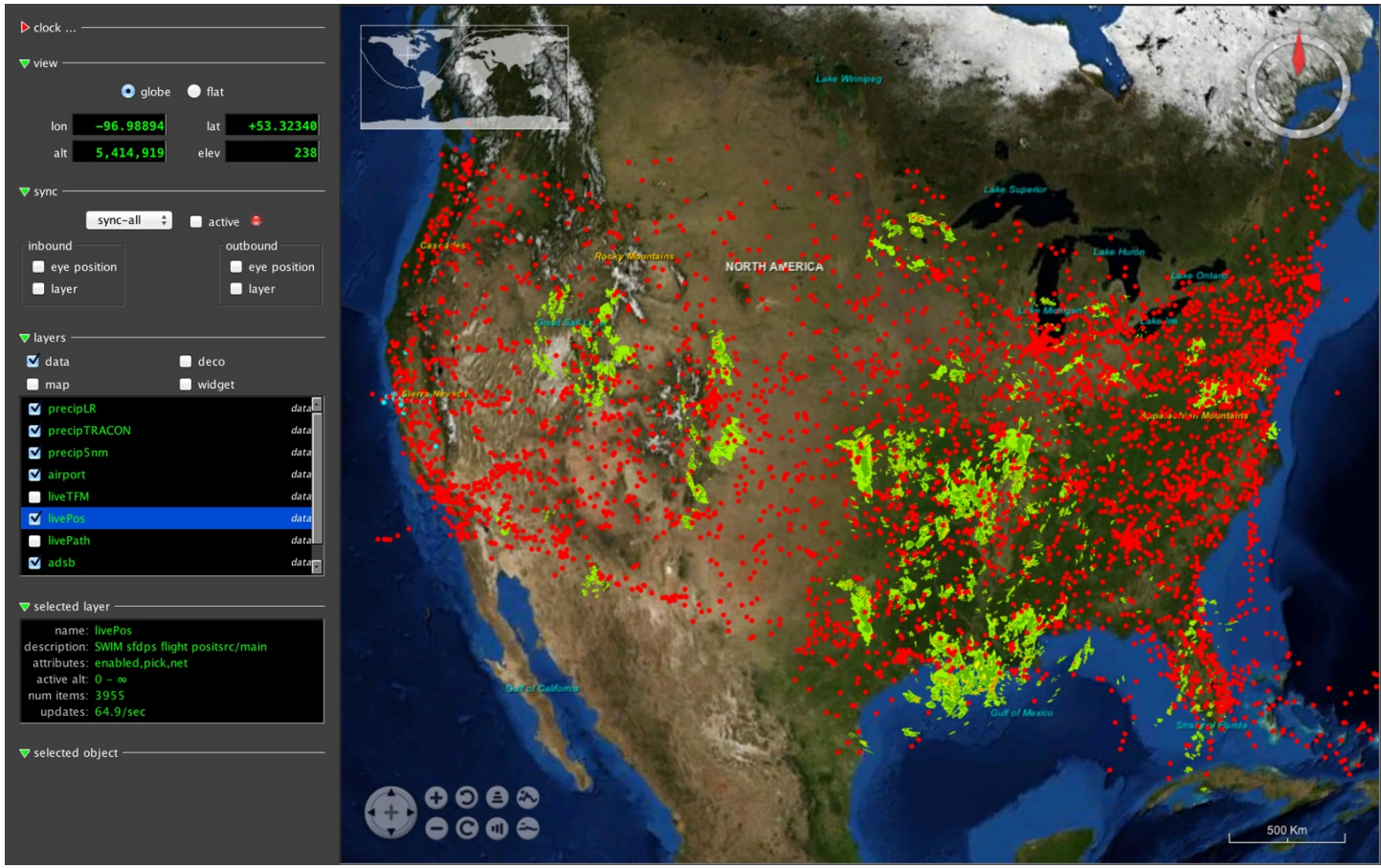
Data Visualization

Data Diversity, Volume, and Visualization

Imports FAA Data (1000 msg/sec)



4,500 Simultaneous Flights



Credit: NASA

Aviation Safety Information Analysis and Sharing (ASIAS)

System-Wide Safety

ASIAS 1.0

Characteristics of the Program:

- Data silos
- Distributed architecture
- Manual data-fusion process
- Sharing of aggregated, de-identified results via web portal
- Baseline governance, roles, and responsibilities
- Commercial and general aviation communities

ASIAS 2.0

Key Changes:

- Integrated production system to support analytic processing requirements
- Higher volumes of data and processing speeds
- Automated capabilities to fuse disparate data sources
- Expanded fusion governance model

ASIAS 3.0

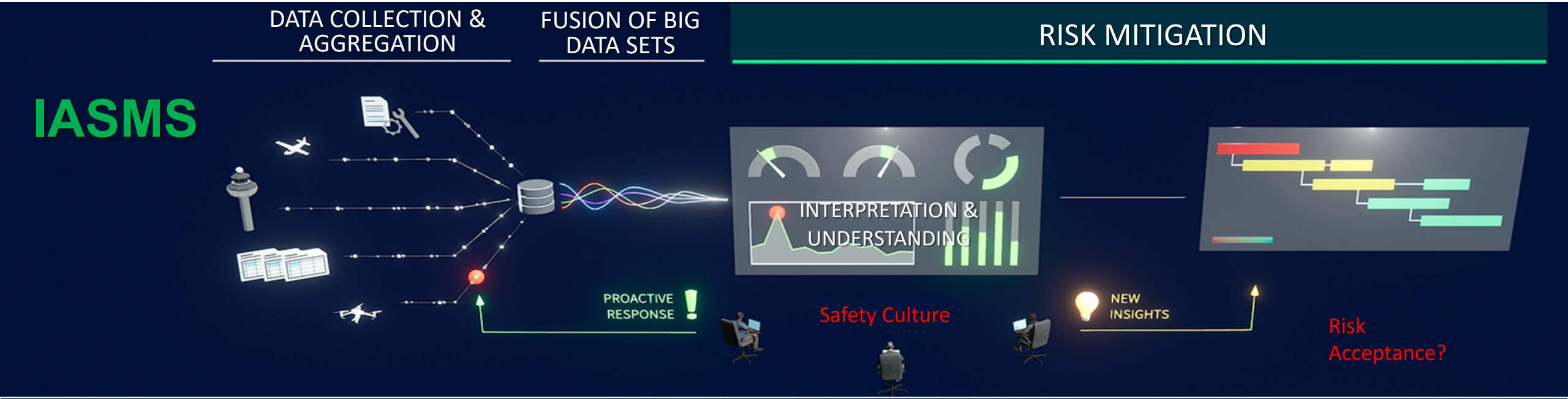
Key Changes:

- Predictive analytics and advanced tools to identify emerging risks
- Expansion – new communities, additional data, improved operating processes
- Transformed collaboration – more agile, innovative interactions
- Enhanced access to data by partners, to conduct specific analysis in controlled environments
- Application of fused data to improve quality of analysis

asias MITRE FEDERAL AVIATION ADMINISTRATION DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

Source: OIG Analysis of the FAA Concept of Operation ASIAS 3.0
DOT Report #AV2021022 (p.15), March 10, 2021

Modernization of Airline SMS Using IASMS

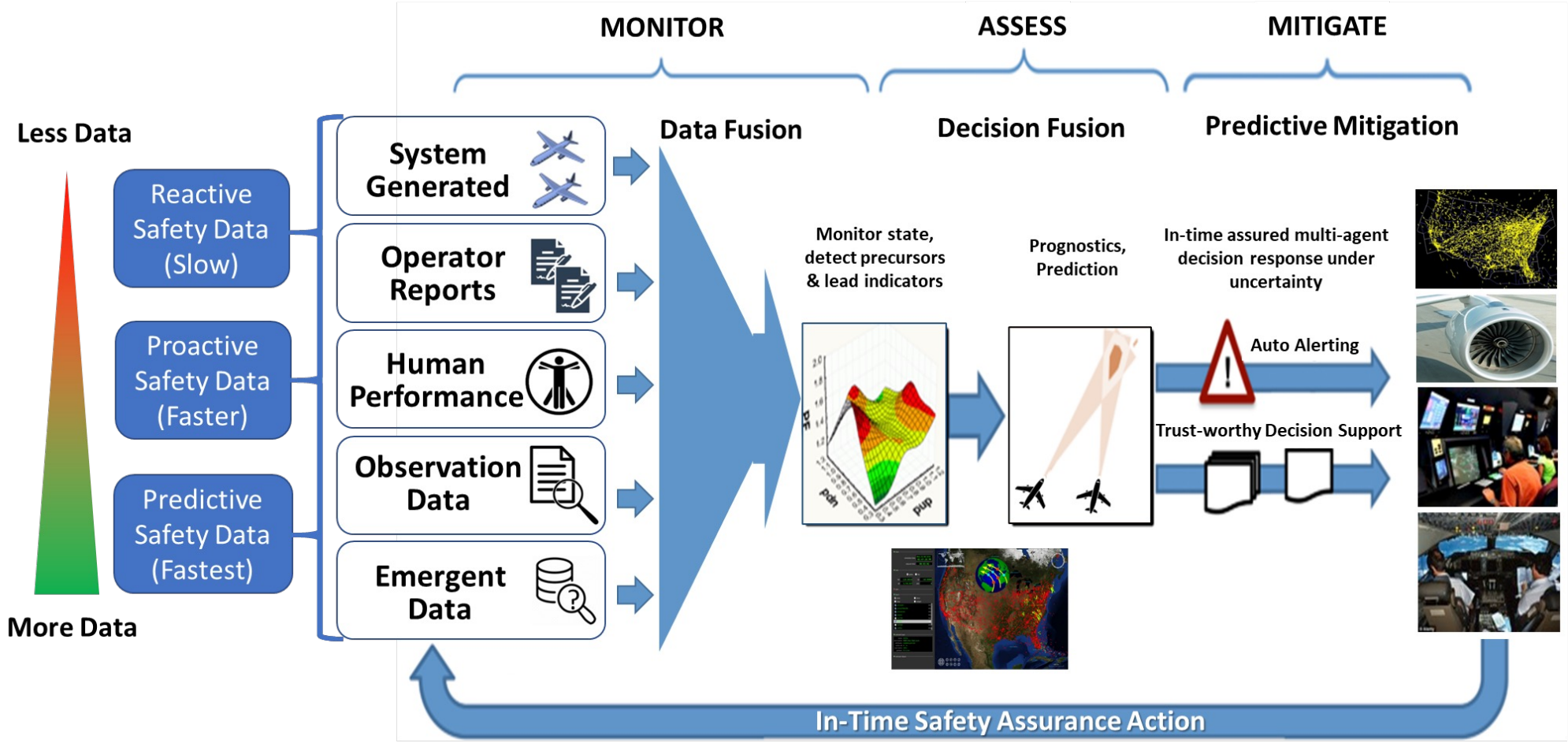


Monitor Assess Mitigate

Credit: NASA

Addressing the Challenges for Part 135 IASMS

Operational Needs	Improve in-time safety	Improve scalability	Improve accessibility	Increase participation
Info-Centric NAS Goals	In-time Safety Assurance	Tailored Safety	Interoperability	



Credit: NASA

Small Steps Toward Data Sharing

- Airport Safety Management System: Final Rule
  - Data Sharing and Reporting Plan: Option to share with tenants (i.e. Airlines) required to have a Part 5 SMS
  - Most airports owned, operated, or regulated by a local government body
  - Various state reporting and freedom of information laws are a disincentive to data sharing
- Safety Management Systems: Proposed Rule
  - Notification of hazards to interfacing persons
    - “enable a network of organizations working collaboratively to manage risk, thereby enhancing the safety benefits of SMS by assuring that hazards are communicated and mitigated effectively”
    - Interfacing persons may be other private entities or a government entity, including the FAA
    - Protection from Disclosure?

Thank you!

System-Wide Safety