
# FAA AAM/UAM Research

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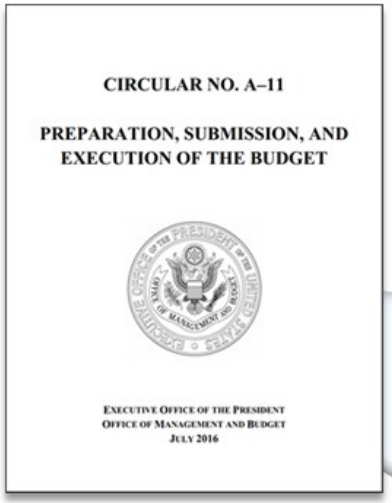
# Research, Engineering & Analysis Division (AUS-300)

- Responsible for developing the FAA's plans and strategic framework for applied AAM/UAM/UAS research that is needed to inform FAA policy, rulemaking and implementation.
- Our office collaborates across the FAA and with other federal, industry, academic, and international partners to identify research gaps, develop research requirements, and provide technical expertise and oversight of research necessary to support safe integration into the NAS.

# FAA's Research Approach

**OMB Circular A-11, Section 84.2**


CIRCULAR NO. A–11

PREPARATION, SUBMISSION, AND EXECUTION OF THE BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
JULY 2016

1. **Basic research**

   Experimental or theoretical work for acquiring new knowledge of the underlying causes and based on observable facts.

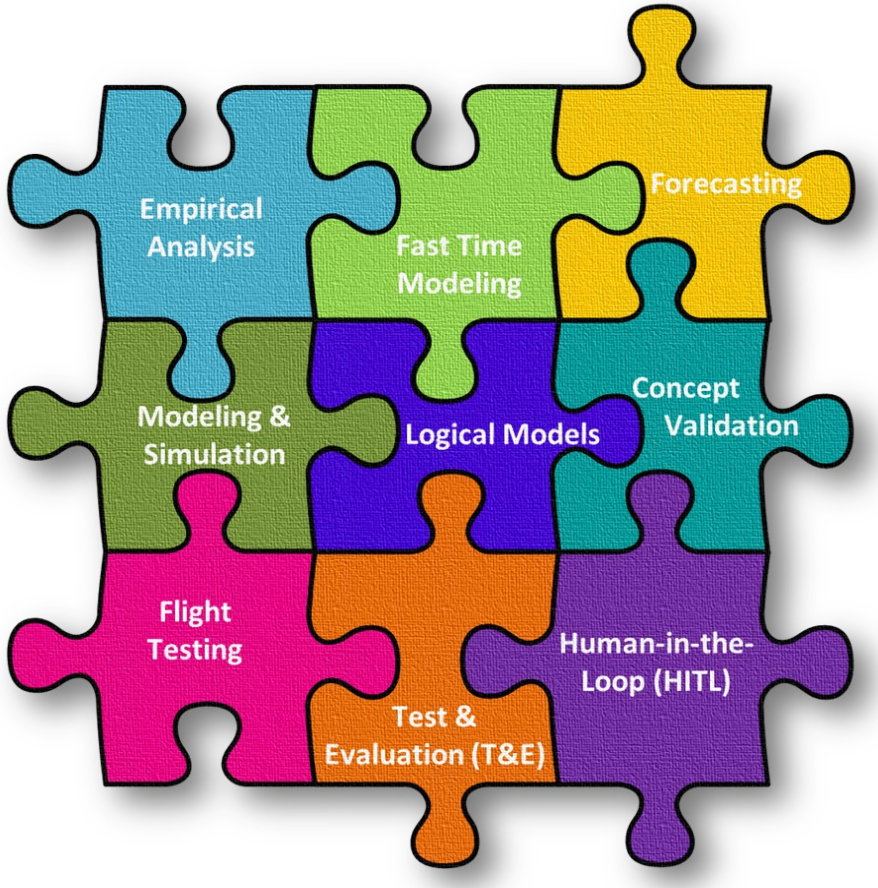
2. **Applied research**

   Original investigation directed primarily towards a specific practical aim or objective.

3. **Experimental development**

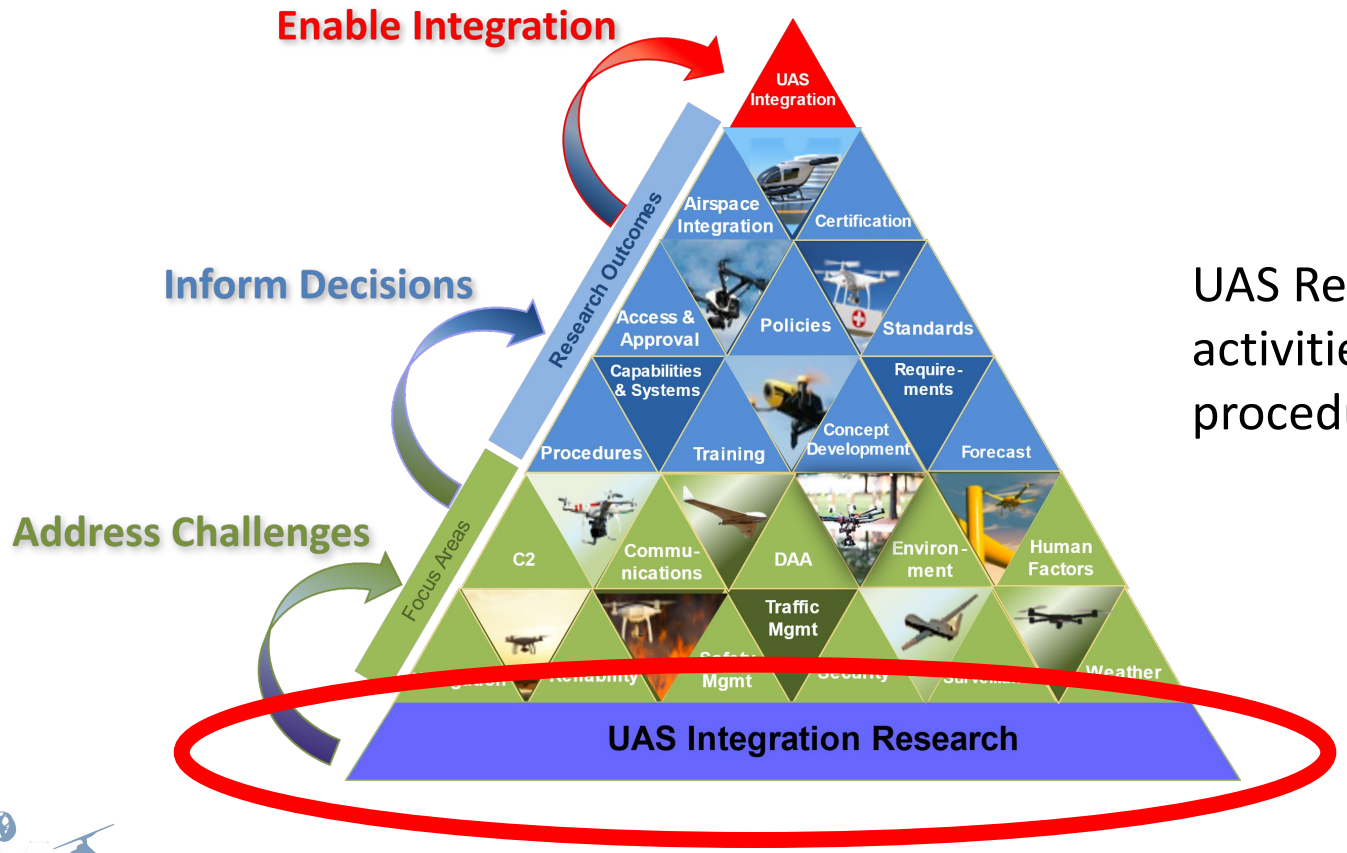
   Creative and systematic work directed at producing new products or improving existing products or processes. Experimental development will result in gaining additional knowledge.

# FAA's Applied Research Methods




*Applied research is directed towards a specific practical aim or objective.*

# UAS Integration Research




UAS Research is the foundation of UAS integration activities. Research enables informed policies, procedures, and regulations.

# Research Informs Operational Capabilities

**UAS Operations Today**

- *Part 107*
- *UAS Waivers to Part 107:*
  - *Night Operations*
  - *Operations Over People*
  - *BVLOS Operations*
  - *Operations above 400'*
  - *Operations from a Moving Vehicle*
- *Part 135 Operations*
- *UTM Pilot Program (UPP)*
- *Integration Pilot Program (IPP)*
- *Partnership for Safety Program (PSP)*
- *UAS Low Altitude Authorization & Notification Capability (LAANC)*
- *Exemptions*
- *UAS COAs*
- *Experimental Certificates*

**Research + Operations = Rules**

- Operations Over People
- Expanded Operations — *Beyond Visual Line of Sight*
- Small UAS Package Delivery Operations
- Integrated Operations
- Routine/ Scheduled Operations
- Large Carrier Cargo Operations
- Passenger Transport Operations
- Urban Air Mobility
- Advanced Air Mobility

***Detect and Avoid***

***UAS Traffic Management (UTM)***

***- UAS Remote Identification***

***- UAS Low Altitude Authorization & Notification Capability (LAANC)***

***- Dynamic Airspace Management***

***Standards***

***Policy***

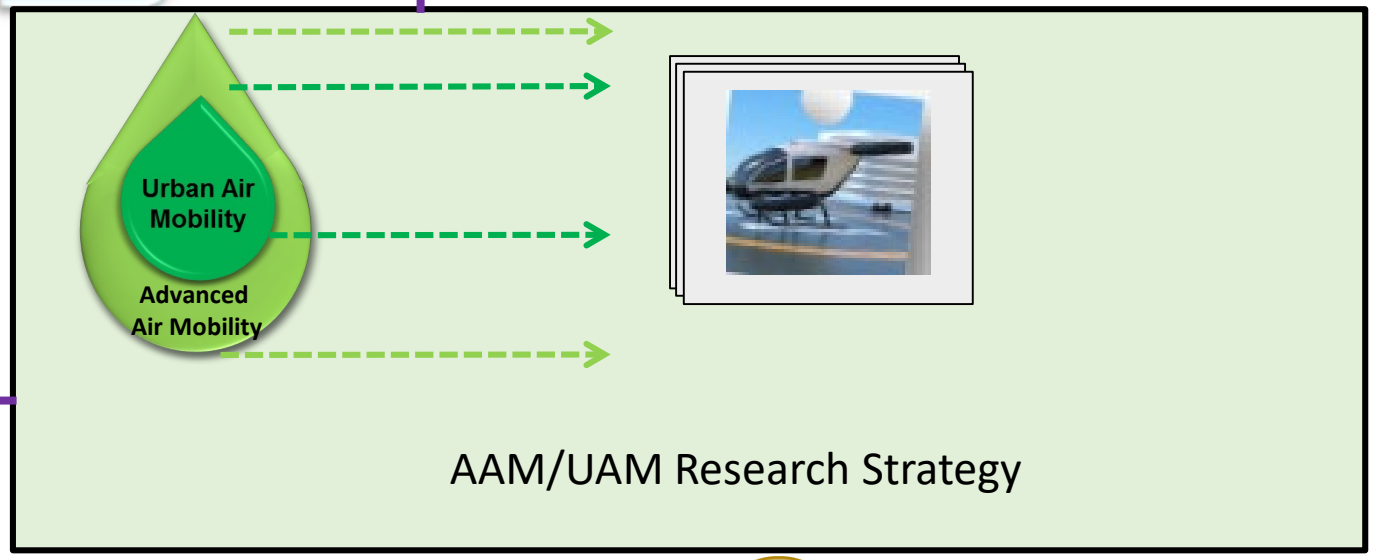
***Rules***

***Enablers***

Aviation Administration

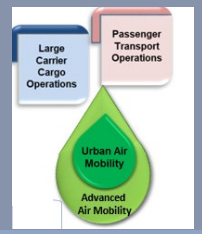
# Research Strategy Evolution

UAS Integration Research Strategy


AAM/UAM Research Strategy

**Passengers On-Board**




- Aircraft certificate (standard)
- Pilot certificate
- Operator certificate
- Standard CofA, new flight rules

**Part XXX**

**Commercial Cargo Delivery**
**Commercial Package Delivery**


- Aircraft certificate (special or standard)
- Pilot certificate
- Operator certificate
- Standard CofA, new flight rules

**Part XXX**

**Commercial Beyond Line-of-Sight**


- Aircraft certificate (special or standard)
- Pilot certificate
- New flight rules

**Parts 21, 61, 91, 137**

**Commercial Line-of-Sight**

- Pilot certificate
- Below 400 feet, UASFMs
- Aircraft compliance for operation over people

**Part 107**

**Recreational Modelers**

- No pilot certificate
- Below 400 feet, UASFMs
- Self-regulated through CBO guidelines

**AC 91-57**

Operational Complexity

FAA Involvement & Regulatory Oversight

# FAA Pathway to UAS Integration + FAA Applied Research

# UAS Research Partners

- **ANSI**: American National Standards Institute
- **ASSURE**: Alliance for System Safety of UAS through Research Excellence
- **CANSO**: Civil Air Navigation Services Organization
- **CTA**: Consumer Technology Association
- **DOC**: Department of Commerce
- **DOT:** Department of Transportation
- **DOT Volpe:** Volpe National Transportation Systems Center
- **EASA**: European Union Aviation Safety Agency
- **EUROCAE**: European Organisation for Civil Aviation Equipment
- **EXCOM SARP**: Executive Committee –Science And Research Panel
- **FAA CAMI**: Civil Aerospace Medical Institute
- **FAA WJHTC**: William J. Hughes Technical Center
- **ICAO**: International Civil Aviation Organization
- **IEEE**: Institute of Electrical and Electronics Engineers
- **ITU**: International Telecommunications Union
- **JARUS**: Joint Authorities for Rulemaking on Unmanned Systems
- **MIT/LL:** Massachusetts Institute of Technology Lincoln Laboratory
- **MITRE CAASD**: Center for Advanced Aviation System Development
- **NASA**: National Aeronautics and Space Administration
- **NATO**: North Atlantic Treaty Organization
- **NIST:** National Institute of Standards and Technology
- **REDAC:** Research, Engineering, and Development Advisory Committee

# AAM/UAM: Safety Standards, Aircraft Certification, and Impact on Market Feasibility and Growth Potentials

This research will highlight, challenges and needs of the FAA to support safe integration and could be used as a tool to assist decision makers in the allocation of personnel and resources.

**Universities:** Wichita State University – National Institute for Aviation Research (WSU-NIAR), Mississippi State University (MSU), Embry Riddle Aeronautical University (ERAU), and North Carolina State University (NCSU)

**Full Research Project Title:**
Urban Air Mobility: Safety Standards, Aircraft Certification, and Impact on Market Feasibility and Growth Potentials

**Research objective(s):**
This research will allow the FAA to have a better understanding of the Urban Air Mobility (UAM) markets, viability, economics, and future challenges. The research will focus on the FAA needs to support safe integration and could be used to assist decision makers in the allocation of resources and personnel. This project will cover three major areas:

- UAM Market Potential
- Airworthiness regulations
- UAM integration into the National Airspace System

**Expected Outcomes:**

- Analysis of UAM Market Potential
- Analysis of airworthiness regulations and its applicability to UAM aircraft certification
- Evaluation of UAM integration into the NAS – Air Traffic Control and Operations

# Investigate and Identify the Key Differences Between Commercial Air Carrier Operations and Unmanned Transport Operations

*"Specific focus of this evaluation will analyze projected demand by location (e.g. rural, exurb, suburb, or urban) and the feasibility of commercial UAS air carrier operations. It will also explore the role of autonomy in UAS vehicles beginning with operations in less risky areas such as rural locations to exurbs (areas beyond the suburbs), and then on to more populated areas of suburban and metro areas. This exploration will focus on the passenger transportation environment, and investigate the workforce impact of this new capability."*
**FAA Press Release 01.13.2021**

**Universities:** Kansas State University (Lead), University of Alaska-Fairbanks, North Carolina State University, University of North Dakota, Ohio State University

**Full Research Project Title:**
Investigate and Identify the Key Differences Between Commercial Air Carrier Operations and Unmanned Transport Operations

**Research objective(s):**

- Provide findings, recommendations, and lessons learned that will enhance the FAA's understanding of the requirements for certifying large UAS for air carrier operations.
- Provide comprehensive analysis of market, feasibility, and projections of future demand.
- Explore the role of autonomy in UAS vehicles.

**Expected Outcomes:**

- Comprehensive market analysis, feasibility and projections of future demand
- Enhancement of the FAA's understanding of large UAS certification requirements beyond what is available
- Exploration of the role of autonomy in UAS vehicles beginning with less risky areas (e.g., rural to exurbs) and then onto more populated areas of sub-urbans and metro areas

# From Manned Cargo to UAS Cargo Operations: Future Trends, Performance, Reliability, and Safety Characteristics Towards Integration into the NAS

*"This research will evaluate the feasibility of commercial UAS cargo operations together with the projected demand by location. Furthermore, the research will detail anticipated needs of the FAA to support further integration of UAS cargo operations, including how greater autonomy may provide an improved level of safety."*
**FAA Press Release 01.13.2021**

**Universities:** University of Alaska - Fairbanks (lead), Kansas State University, University of Alabama - Huntsville, North Carolina State University, Ohio State University, University of North Dakota

**Full Research Project Title:**
Understand Transition Between Using Manned Aircraft for Cargo Delivery, and Introducing Unmanned Aircraft Systems (UAS) Cargo Delivery

**Research objective(s):**
- Identify needs of the FAA to support further integration of UAS cargo operations
- Comprehensive analysis of market, feasibility, and projections of future demand
- Develop a framework to make the standards more robust and increase the safety of large UAS operations in the NAS

**Expected Outcomes:**
- Analysis of UAS cargo market, feasibility, demand, and locations of likely networks.
- Enhanced understanding of Large UAS certification requirements.
- Study of the impact of autonomy on UAS cargo.

# Additional AAM/UAM Research Topics

- Design Guidance and Best Engineering Practices for Automated Systems
- Models for AAM/UAM Safe Automation
- Assess the Challenges of Retrofitting Technologies for UAM
- Crashworthiness Standards for UAM passenger vehicle

# Questions?