Unmanned Aircraft Systems

General Overview

Presented To: American Institute of Aeronautics and Astronautics

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Overview

• What is a UAS?
• Why UAS?
• The Role of FAA
• UAS Integrated Vision
• Who is Operating in the NAS?
• How UAS are Currently Used in the NAS
• Where are UAS Operating?
• FAA Modernization and Reform Act of 2012
• A Look Ahead for FAA
• Summary
What is a UAS?

• An Unmanned Aircraft System (UAS) historically has had various names
  – Drone, ROA, RPA, UAV, Model/R-C

• UAS come in all kinds of shapes & sizes

• UAS have many uses
  – Agricultural to Zoological

• UAS have many different users
  – Government entities
  – Universities
UAS Come in Various Shapes and Sizes
More UAS
UAS is a “System”

Command & Control Links
(Radio Spectrum)

Unmanned Aircraft

Ground Control Station
(hardware/software)
Why UAS?

• **Effective for missions that are Dull, Dirty or Dangerous**
  – Humans not put at risk
  – Continuous operations

• **Lower cost than manned aircraft**

• **Presents opportunity for a burgeoning U.S.-based industry with significant growth and job potential**

• **United States is a global aerospace leader in terms of safety and technology**
  – Embracing UAS opportunities now will enhance our leadership position
  – Thoughtful, prudent integration will ensure integration risks are accurately identified and properly mitigated
UAS Demand

- **Increasing demand**
  - Projected spending $5.9B/year up to $11.3B/year
  - Total $94B over 10yrs*
    - *2011 study by Teal Group Corp.
  - Forecast that 10K UAS added to NAS
  - Flight and sensor tech is getting less costly

- **Increasing demand = jobs**
  - Job growth anticipated
  - Manufacturing, training, maintenance, software, etc.
Safety Promotion

- Safety Policy
- Risk Management
- Safety Assurance
The Role of FAA

• **FAA is a Regulator**
  – Must assure the safety of all aircraft, people, and property

• **FAA is a Service Provider**
  – Must ensure the safety and efficiency of all the National Airspace System and international airspace delegated to U.S.

• **Successful UAS Integration requires BOTH roles**
  – FAA has established a single integration office
UAS Integration Vision

• Safe, efficient, and timely integration of UAS into the National Airspace System (NAS)
  – Safe
    • Because that is, and will continue to be the FAA’s mission!
  – Efficient
    • FAA is committed to increasing system reliability
  – Timely
    • FAA is dedicated to enabling UAS integration
Who is Operating UAS in the NAS?

Two Methods of FAA authorization today

• Public Use Aircraft – Certificate of Waiver or Authorization (COA)
  – Department of Agriculture
  – Department of Commerce
  – Department of Defense
  – Department of Energy
  – Department of Homeland Security
  – Department of Interior
  – Department of Justice
  – NASA
  – State Universities
  – State/Local Law Enforcement

• Civil Aircraft – Special Airworthiness Certificates in the Experimental Category and Special Flight Permits
  – Raytheon
  – AAI Corporation
  – General Atomics
  – Boeing
  – Others

• Routine UAS operations are prohibited over urban or populated areas, except where the level of airworthiness allows.
How UAS are Currently Used in the NAS

• FAA has authorized UAS operations for:
  – Border Patrol
  – Firefighting
  – Disaster Relief
  – Search and Rescue
  – Training for Ops Missions
  – Operational Missions
  – Research
    • System Development
    • Sensor Development & Testing
  – Marketing and Development
Where Are UAS Operating?

- UAS are operated in most classes of airspace (not Class B)
- UAS operations must avoid flight over heavily trafficked roads or open-air assembly of people, except where level of airworthiness allows
FAA Modernization and Reform Act of 2012

- **UAS Roadmap**
  - In coordination

- **Comprehensive Plan**
  - In coordination

- **sUAS Rule**
  - In coordination with DOT

- **UAS Test Sites (6)**
  - Selection process commenced Feb 14

- **Arctic Plan**
  - Released

- **FAA/DOJ/NIJ agreement**
  - Law enforcement COAs
  - Signed March 2013
Test Site Update

• Test Site Screening Information Request (SIR) – Released
  – Currently 50 applicants from 37 states
  – Lead Applicants must be Non-Federal Public entities
  – Ground Infrastructure, Research Objectives, & Airspace Use & ATC Feasibility Study
  – Safety
  – Experience
  – Risk Consideration
  – Economic Impact
  – Details at: https://faaco.faa.gov/index.cfm/announcement/view/13224
Test Site Privacy

- In conjunction with Test Site SIR release, FAA also issued Request for Comment on a proposed privacy approach for the UAS Test Sites
  - Comment period open for 60 days
  - FAA will finalize Test Site privacy policy after public input considered
  - Final Test Site operator agreements will include approved privacy approach
A Look Ahead for FAA

• **Today: Accommodation**
  – Improve FAA public UAS approval guidance and process
  – Refine FAA Civil/Public UAS NAS Integration Roadmap
  – Plan/oversee research and development activities
  – Gather safety data

• **Mid-term: Transition to NAS Integration - Initial**
  – Implement advanced mitigations (Ground Based Sense and Avoid (GBSAA), others)
  – Increase NAS access through small UAS rule

• **Long term: Integration into the NAS - Routine**
  – Amend operational regulations
  – Accomplish other rulemaking activities, as needed
  – Reduce dependency on individual approvals
  – Integration into the NextGen environment
Summary

• **UAS Integration**
  – FAA: Safe, Efficient, & Timely UAS Integration
    • Integration will be incremental
  – NAS Access does not equate to Integration
  – UAS must be designed into NAS Safety Culture & Standards
  – With UAS Integration, there will always be a Level of UAS Accommodation, Depending on System Technologies and Capabilities
Backup
**Arctic:** The term “Arctic” means the United States zone of the Chukchi Sea, Beaufort Sea, and Bering Sea north of the Aleutian chain.

**Certificate of Waiver; Certificate of Authorization:** The terms “certificate of waiver” and “certificate of authorization” mean a Federal Aviation Administration grant of approval for a specific flight operation.

**Permanent Areas:** The term “permanent areas” means areas on land or water that provide for launch, recovery, and operation of small unmanned aircraft.

**Public Unmanned Aircraft System:** The term “public unmanned aircraft system” means an unmanned aircraft system that meets the qualifications and conditions required for operation of a public aircraft (as defined in section 40102 of title 49, United States Code).
UAS Terms and Definitions - continued
Per Sec 331 of 2012 FAA Reauthorization

**Sense and Avoid Capability**: The term “sense and avoid capability” means the capability of an unmanned aircraft to remain a safe distance from and to avoid collisions with other airborne aircraft.

**Small Unmanned Aircraft**: The term “small unmanned aircraft” means an unmanned aircraft weighing less than 55 pounds.

**Test Range**: The term “test range” means a defined geographic area where research and development are conducted.

**Unmanned Aircraft**: The term “unmanned aircraft” means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

**Unmanned Aircraft System**: The term “unmanned aircraft system” means an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system.
Other UAS Terms

- **Unmanned Aircraft System**
  - Unmanned aircraft, control station and the command and control link used to connect the two.

- **Unmanned Aircraft**
  - Aircraft that do not have the possibility of the pilot controlling the aircraft from on or in the aircraft.

- **Control Station**
  - Where the pilot flies the aircraft.

- **Command and Control Link**
  - Spectrum and associated equipment used to fly the aircraft from the control station.
Other UAS Terms - continued

- **Lost Link**
  - Loss of command and control link between control station and aircraft

- **Line of Sight Command and Control Link**
  - Requires the pilot to be in close proximity of the aircraft (normal 150-nautical mile (nmi) max)

- **Beyond Line of Sight Command and Control Link**
  - Satellite data link communications used to fly the aircraft anywhere in the world from the control station

- **Public Aircraft – Definition in Title 14, Code of Federal Regulations (14 CFR), part 1, does not allow for commercial operations**
  - Owned by Government or at least on a 90-day lease
  - Mission must be inherently governmental and in the best interest of the American people
UAS Authorization

- Derived from Federal Register Docket #FAA-2006-25714 dated Feb 2007
  - All UAS operations require FAA authorization
  - 3 types of operations authorized outside of restricted/prohibited/warning airspace

- FAA Notice 8900.207
  - Addresses current FAA policy on UAS operations and application for use
  - Examples: observer use, currency requirements, and limits
  - Not all inclusive
Authorization – Public Operators

- **Public Operators**
  - An entity who operates a public aircraft which is *intrinsically governmental* in nature (49 CFR § 40102 & 40125)
  - e.g. DoD, NASA, CBP, state & local gov’t,
  - Aircraft + location + purpose = public use
  - Certificate of Authorization (COA) – Self-certifies UAS
Authorization – Model Aircraft and Hobbyists

- **Recreational Model Aircraft Hobbyists**
  - AC 91-57 Applies
    - remote site
    - avoid persons until tested & airworthy
    - <400 feet above ground level
    - >3 miles from airports
    - yield to manned aircraft
Authorization - Civil

• Civil Operators
  – Everybody else – non public operators
  – Experimental - §21.191 & §21.193 (R&D, training, marketing)
    FAA certifies

• **No commercial operations (compensation or hire) are permitted at this time**
UAS Integration – Future Challenges

NAS Architecture

Current State

Lost Link Procedure

Sense and Avoid

Procedures

Link Reliability

UAS Reliability

Certification

Training

Integration

UAS

Regulatory

UAS General Overview
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