Unmanned Aircraft Systems (UAS): A Paradigm Shift in Aviation

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“The trouble with the future is that it usually arrives before we’re ready for it.”

Arnold H. Glasow
Two UAS Perceptions

Regarded as a Disruptive Technology

-or-

Viewed as a Positive Step Forward in the Evolution of Aviation

UAS Technology

• What is it?
  – UAS, UAVs, RPAs
  – Drones
  – RC aircraft models
  – System of systems

• Where did it come from?
  – Military Applications
    • Intelligence, surveillance and reconnaissance (ISR)

• How has it changed?
  – Not just for tactical
  – Technology development -> innovation
  – Widespread availability (affordable)
  – Increasing education
Unmanned Aircraft System

A System – Not limited to an Aircraft

Classification

• Unmanned aviation systems (UASs) defined by several characteristics.
  – **Size**: Micro, small, medium, or large
  – **Mission**: Information or logistics
  – **Control**: Visual Line-of-sight (VLOS), Line of sight (LOS), terrestrial repeating (TR), or Satellite (SATCOM)

• UAS pilots are often referred to as “Operators”
Airframe Categories

System Architecture
A Glimpse into the Future of UAS

Public Use
- Law Enforcement
- Customs and Border Protection
- Search and Rescue
- Fire and Forest Services

Science
- Advanced Remote Sensing
  - Weather & Storm Tracking
- Coastline Monitoring and Ecosystem Conservation
  - Crop Monitoring

Commercial Use
- Structural Inspections
  - Power line and Pipeline Inspection
  - Oil Rig Inspection
  - Bridge
- Precision Agriculture
- Cargo Transport

Necessity Drives Market Development

- Market developments will indicate where UAS applications likely to be most necessary;
  - Large systems for high-altitude data missions
    - Public Use Agencies
  - Small systems for data missions and specialized logistics
    - Largest market for commercial use
Cost Effectiveness

- Different characteristics = different price tags
  - **Size:** Rapid cost increase as size/weight grows
  - **Mission:** Rapid increase as sensor sensitivity and/or payload weight increase
  - **Control:** Roughly, each step from LOS to TR to SAT increases cost by order of magnitude
  - **Pilots:** Offboard pilots more expensive than onboard pilots

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**Least expensive:** Micro/small systems utilizing VLOS control regimes, adjunct crews

**Most expensive:** Large systems utilizing SAT control regimes, dedicated crews

**Draganflyer**

1. Ground Control Station/Crew (GCS)
2. Data Link
3. Ground Data Terminal
4. Air Vehicle
5. Payload
**Business Opportunities**

- **Customers**
  - Commercial
  - Civil government (Federal, State, Local)
  - Military/Tactical or public use (DoD, law enforcement)

- **Challenges**
  - Apparent benefits > perceived costs
  - Regulations/laws in constant state of flux
  - Public outreach and knowledge

- **Must have a convergence of**
  - Enabling technologies
  - Need
  - Viable economic climate

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**Career Opportunities**

Market and opportunities significantly expanding

- Business Development
- Analysis, Development, and Engineering
- Assembly/Technician Positions
- Support
- Management
- Operations (including operators/pilots)

*Career details available in 2015 ERAU-Worldwide Unmanned Systems Related Career Opportunities report*
Regulations/Laws

Major Regulation

- **FAA Modernization and Reform Act of 2012**
- **AC 91-57** n/a for commercial
- **COAs/333/SACs**
- **FAA NPRM for Operation and Certification of sUAS**
  - 50lbs with registered (displayed) N-number
  - Limited ops: VLOS, daylight, <100mph, <500ft AGL, class G (B-E requires ATC),
  - Operator to pass knowledge exam (17yrs and older, recurrent every 24mo, register with TSA)
- **Florida specific**
  - SB 92: **Freedom from Unwarranted Surveillance Act** (1 July 2013)
  - HB 649/SB766: **Surveillance by a Drone** (1 July 2015)

**NPRM: (sUAS)**
Concerns about UAS

• Integration in the NAS
  – Detect and Avoid
  – Air Traffic Management
• Privacy
  – IV Amendment
• Human Interface Issues
  – Cognitive and Perceptual
• Operator/Crew Training and Qualification
• And many more

Questions