USGS – National Unmanned Aircraft Systems Project Office

UAS Mission Planning

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USGS-Geosciences & Environmental Change Science Center
National UAS Project Office
Denver, Colorado USA
March 2016

uas.usgs.gov
UAS Data Production Process
Cape Cod Project

Define the Area of Interest
Cape Cod Project

Identify Airports, Populated Areas, Obstacles, Hazards
Cape Cod Project

Identify Land Ownership (Public & Private)
Initiating a Project

- Class of airspace that the project will work in
- COA vs. MOA
- Specific Agency Operation Requirements
- Range approvals or Private land approvals
- Safety Plan
- Operational Procedures (OPM-11)
- Logistics
- Cost Considerations
- NOTAM
- MISHAP Procedures
- Sensors / Flight Planning
- Data Archiving
U.S. Airspace Classes at a Glance
Policies: How to Operate in the United States National Airspace

- **Certificate of Authorization (COA):**
  Authorization or waiver issued by the Air Traffic Organization to a public operator for a specific UAS activity on a case-by-case basis

- **Memorandum of Agreement (MOA):**
  - Originally signed Dec. 24, 2013 (updated Sept. 2015)
  - FAA and DOI Information Bulletin No. 14-04
  - Under 1,200’
  - Visual Line of sight
  - 5 nm from an airport (control tower)
  - 3 nm from an airport (published instrument procedures)
  - 2 nm from an airport (not having published instrument procedures)
  - 2 nm from a heliport
  - Not over people or urban settings
  - NOTAM
  - VFR weather minimums and allowed to fly at night
Specific Agency Operation Requirements

**National Park Service:**

1.) NPS UAS operations application form (one time operation or permanent)
2.) Safety plan (reviewed by NPS)
3.) NPS Research Permit and Reporting System (RPRS)
4.) Copy of the FAA Certif. of Authorization (COA) or FAA/DOI Memorandum of Agreement (MOA)
5.) Approval letter or email from any private land owner that UAS will fly over

**U.S. Fish & Wildlife Service:**

1.) Special Use Permit (SUP)
2.) Safety plan (reviewed by USFWS)
3.) Range Approval Letter
4.) (If required) Animal Care and Use Letter
5.) Approval letter or email from any private land owner that UAS will fly over

**Bureau of Land Management:**

1.) Safety plan (reviewed by BLM)
2.) (If required by the property specialist) Range Approval Letter
3.) Approval letter or email from any private land owner that UAS will fly over
## Specific Agency Aviation Contacts

### Fish and Wildlife Service (FWS)

<table>
<thead>
<tr>
<th>Name</th>
<th>E-Mail</th>
<th>Phone</th>
<th>FAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthony Lascano (National Aviation Manager)</td>
<td><a href="mailto:anthony_lascano@fws.gov">anthony_lascano@fws.gov</a></td>
<td>(703) 358-2059</td>
<td>(703) 358-2203</td>
</tr>
<tr>
<td>4501 North Fairfax Dr., ms 4401, Arlington, VA 22203</td>
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### National Park Service (NPS) / NIFC

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<thead>
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<th>Name</th>
<th>E-Mail</th>
<th>Phone</th>
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<tr>
<td>Jon Rollens (Branch Chief of Aviation)</td>
<td><a href="mailto:Jon_Rollens@nps.gov">Jon_Rollens@nps.gov</a></td>
<td>(208) 387-5227</td>
<td>(208) 387-5250</td>
</tr>
<tr>
<td>3833 S. Development Ave., Boise, ID 83705-3833</td>
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## Aviation Safety Managers:

### NPS:

- Jim Traub  
  [james_traub@contractor.nps.gov](mailto:james_traub@contractor.nps.gov)  
  (208)-387-5931

### USFWS

- Brian Mullin – USFWS  
  [brian_mullin@fws.gov](mailto:brian_mullin@fws.gov)  
  (208)-387-5515
Safety Plan

Small Unmanned Aircraft

Project Name: Rapid response mapping of coastal landscape change with UAS
Project Mission: Aerial Photography

Project Plans:
- Anticipated Project Date: Feb 29, 2016 – Mar 4, 2016
- Staff Time: 800

Project Plans Reviewed by:
- Title: Research Oceanographer
- UAS Operations/Analysis
- Date: Dec 29, 2015
- Title: NPS Safety Advisor
- Date: Dec 29, 2015
- Title: NPS Safety Advisor
- Date: Dec 29, 2015
- Title: Chief, National UAS Project Office
- Date: Dec 29, 2015

Note: Signatory by the project prepares that all personnel have the required training for the mission.

Special Instructions: Personnel should be prepared for field conditions and should take precautions for any possible inclement weather. Temperatures could range from 15-30 degrees F and rain snow is possible. Caution should be taken to stay hydrated and under shelter from the various weather conditions.

Risk Assessment Matrix

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<tr>
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Emergency Medical Attention and Evacuation Plan: Personnel certified in Advanced First Aid will be present during field operations. Any medical emergencies will be coordinated through emergency services (911) and the Cape Cod dispatch (located in Boston) 617-242-3659. In the event of a medical incident, the medical incident commander for the USGS will be Sandy B.}

Reference the Aviation Risk Mgmt Workbook, JHA’s, etc., to assist in completion of Risk Assessment Matrix.
Operational Procedures (OPM-11)

United States Department of the Interior
Office of Aviation Services
300 E. Mallard Dr., Ste 200
Boise, Idaho 83705-3991

DOI OPERATIONAL PROCEDURES MEMORANDUM (OPM) - 11

Subject: DOI Use of Unmanned Aircraft Systems (UAS)

Effective Date: January 1, 2016

Supersedes: OPM 13-11 dated October 20, 2014

Expiration: December 31, 2016

1. PURPOSE. The purpose of this OPM is to provide guidance on the operations and management of Unmanned Aircraft Systems (UAS).

2. AUTHORITY. This policy is established by the Director, Department of the Interior (DOI or Department), Office of Aviation Services (OAS) in accordance with the provisions of Departmental Manual 112 DM 12, 380 DM 1; Secretarial Order 3322 dated August 23, 2012, and the Presidential Memorandum on Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems, dated February 15, 2013.

3. BACKGROUND. Current Federal Aviation Administration (FAA) policy is provided in FAA Order 8980.1, Volume 16, Unmanned Aircraft Systems (UAS), dated June 23, 2014 and subsequent. This national policy document contains the following fundamental provisions:
   A. Unmanned Aircraft are defined as “aircraft flown by a “pilot” regardless of where the pilot is located. 14 CFR 1.1 defines “aircraft” as a device that is used or intended to be used for flight in the air.
   B. Aircraft and pilots must demonstrate compliance with applicable sections of Title 14 CFR to operate in the National Airspace System (NAS). The FAA retains the authority to approve UAS operations within the NAS in Class A, B, C, D, E and G airspace.
   C. When operating in Class A, B, C, D, E and G airspace, DOI UAS’s must be operated with a FAA Certificate of Waiver or Authorization (COA).
   D. COAs are not required in Restricted, Prohibited, or Warning airspace. However, UAS operations in these specific airspaces will be regulated and approved by the Controlling Authority (a.k.a. ‘Range Control’).

4. POLICY. UAS by definition are considered aircraft regardless of size or weight. While their methods of control and airspace utilization procedures are different than manned aircraft, the overall
# Logistics

## UAS Mission Checklist

<table>
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<tr>
<th>Paperwork</th>
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<td>Fire Extinguisher</td>
<td>Camera Mounts</td>
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<td>Vehicle Reservations</td>
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<td>UAS Manuals</td>
<td>Radio Batteries</td>
<td>2-Way Tape</td>
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<td>Backup Laptops</td>
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## Cost Considerations

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<th><strong>Travel Costs:</strong></th>
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<td>Hotel</td>
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<td>Equipment Shipment/Transfer</td>
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<td>Approvals</td>
<td>Travel time to site</td>
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<td>Planning</td>
<td>Weather Conditions</td>
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<tr>
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<td>Processing</td>
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</table>
Issuing a NOTAM (1-877-4-US-NTMS):

Call the NOTAM number and they will ask for the following information:

- Who is submitting the NOTAM and contact information
- Current date and time - Aircraft type: unmanned aircraft system (possibly size or weight)
- Approved FAA-COA number for the project
- Dates and times (zulu) of fights (beginning and ending)
- Flight Altitude (i.e. 0-400’ AGL)
- Affected Air Route Traffic Control Center (ARTCC)
- Flight Location (from the skyvector information including nearest airport or navaid, distance and direction) and the distance radius of the COA boundary center point or launch site
MISHAP

UAS Aircraft Mishap Checklist:

1.) Notify the following entities in this order:
   a.) FAA ARTCC – as defined in the COA if the aircraft has flown away
       and not returned through loss-of-link automation
   b.) DOI 1-877-4-MISHAP (1-877-464-7427)
   c.) File an on-line SAFECOM www.safecom.gov Fax: (208-433-5007)
   d.) File an on-line DOI Safety Management Information System (SMIS)
       report https://www.smis.doi.gov/

2.) Documentation:
   a.) Document the crash site (photos, maps, gps locations)
   b.) Save all log files, video, still frame images, ground control laptop
       screen captures
Getting a UAS Capability in DOI

What is Needed to get a UAS Capability at a Center:

1. Money to purchase the systems and monthly/hourly fees
2. Bureau National Aviation Manager approval
3. OAS-13 agreement between the Center and OAS (SES level signature)
4. FAA Class 2 Medical Exam for designated UAS trainees
5. OAS Training Classes
6. Obtain access to the FAA COA on-line system via OAS approval

What is Needed to Keep the UAS Capability Active and Functional at the Center:

1. Keep the UAS operators current (fly at least once every 90 days or simulator)
2. Proficiency checks annually with OAS instructor
3. Class 2 Medical Exam annually
4. Money for monthly/hourly fees
5. Data Management capability and procedures
6. OAS and FAA Reporting
7. Annual air-worthiness approvals from OAS on center’s specific UAS
2009-2015

Raven

T-Hawk

DOI UAS Platforms

PRESENT

Falcon UAS

Falcon Hover

Pulse Vapor 55

MLB Super Bat
Sensors

Point & Shoot or DSLR Cameras

HD Video

Calibrated Thermal Sensor

Multispectral Sensor

Courtesy of FLIR Tau 2 Sample Images

Courtesy of MicaSense Sample Images
# Flight Planning

## Unmanned Aircraft System Flight Planning

### Camera Inputs:

<table>
<thead>
<tr>
<th>FL (mm)</th>
<th>Image width (pix)</th>
<th>Image height (pix)</th>
<th>Sensor width (mm)</th>
<th>Sensor height (mm)</th>
<th>Pixel size (width)</th>
<th>Pixel size (height)</th>
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### Calculations:

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<th>GSD width (cm)</th>
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<th>GSD width (inches)</th>
<th>GSD height (inches)</th>
<th>Photo width (ft)</th>
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### Flight Planning:

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UAS Data Archiving

USGS UNMANNED AIRCRAFT SYSTEMS
DATA MANAGEMENT PLAN

Version 1.0
October 2015

UAS DATA MANAGEMENT FLOW

Figure 1 illustrates the end-to-end data flow from the initial acquisition of data to the final archival and distribution of products to the end user community.

UAS activities will be project or program driven. Projects may schedule several UAS missions to capture the required data. Missions are normally over different geographic areas. Each mission may include a single or multiple UAS collects. A UAS collect is defined as the specific collect (or flight) that is flown for its data collection.
Contracting and Cooperation

- Cooperative agreements with other agencies
- Cooperative agreements with universities
- Contracting (Section 333 exemptions)