

UNMANNED AIRCRAFT SYSTEM DEPLOYMENT OPTIONS

A Look at the UAS Regulatory Environment and Choices for Deployments of UAS Technology



Introduction:

As the use cases, regulations and acceptance of Unmanned Aircraft Systems (UAS) continue to mature, the desire and ability to bring UAS capabilities to a wide array of industries comes to the fore. This paper, drawn from Unmanned Experts Inc.'s (UMEX) considerable field experience, is designed to highlight the options and considerations for those companies interested in this new technology.

Typical Use Cases:

For this nascent industry, new and ingenious uses for UAS are being developed weekly (e.g. moving blood samples in Africa just started in Feb 2016). For U.S. industries the greatest potentials that UMEX personnel are witnessing are in Critical Infrastructure Inspections (e.g. High Definition photographic or thermal imagery of transmission lines, cell towers, bridge supports, power plants, rail lines and wind farms, etc.) and 3D Ortho-mapping of ground sites (to include pre- and post-construction surveys, geo-rectified urban and site planning and vegetation management, etc.). Other popular roles include Law Enforcement use, especially for Search & Rescue; Precision Agriculture and crop health surveys; and also real estate and insurance estate monitoring.

Relevant Regulations:

1. **Federal.** First and foremost, the current (Spring 2016) U.S. regulatory environment designates Small UAS (under 55lbs) as 'aircraft' to be legally supervised by the Federal Aviation Administration (FAA). Surprisingly, the FAA regulates UAS depending upon the intent of their use, so for recreational purposes a typical mid-range UAS (e.g. DJI Inspire 1) is governed by guidance (note *only guidance!*) provided by [Aircraft Circular 91-57A](#).
2. The same aircraft used in ANY commercial capacity (a very broad definition, to include promotional videos and 'free' services) is regulated under 14 CFR Part 71 and 91a and through [Section 333 Exemptions](#) from House Bill HR 658 (FAA Reauthorization Act of 2012). For this Paper, only the Section 333 use cases are relevant.
3. Each Section 333 Exemption (which applies to a specified aircraft type or fleet) must be accompanied by a separate Certificate of Waiver or Authorization (COA) which further limits the airspace and operating envelope. All UAS flown under the 333 / COA combination must also be [federally registered](#).
4. It should be noted that the FAA is due to issue an updated '[Small UAS Rule](#)' (Part 107) sometime in the coming months. It is expected to remove the requirement for a manned pilot's license but mandate a ground-school exam.

- 5. Further updates and restrictions on 333 and COA limits have been recently provided by the FAA in [N JO 7210.891](#) to include clarity on COA applications and operations near airfields, which require a Letter of Agreement (LOA).
- 6. **State and Local.** Although the FAA has jurisdiction over all U.S. airspace, many States and Local governments are imposing restrictions on launch and recovery of UAS from specific locations (i.e. National Park Service lands). Tracking these laws are complicated but some good resources are found via [AUVSI](#).

Deployment Options

As with any novel niche capability being introduced to a new corporation, the options are either to develop an 'in-house' ability to utilize the technology, or to contractually 'outsource' the operations to a 3rd party team of subject matter experts (SMEs). There is significant debate as to the strengths of each approach, and UMEX initially expects a relatively even split across most industries, with a gradual move to in-house programs as autonomous options increase, reducing training burdens and barriers to entry. Considerations for each approach are summarized below:

1. In-House UAS Program Management Considerations:

<p style="text-align: center;">Admin</p> <ul style="list-style-type: none"> • Section 333 • COAs • Ops Manuals • Safety Progs • Insurance • Registration 	<p style="text-align: center;">Preparation</p> <ul style="list-style-type: none"> • Aircraft • Sensors • Crew Training • Data Manage
<p style="text-align: center;">Operations</p> <ul style="list-style-type: none"> • Pre-Site Survey • Ground Control • Permissions • Deployment • Data Capture 	<p style="text-align: center;">Data Management</p> <ul style="list-style-type: none"> • Storage • Processing • Deliverables • Information Production

- A. **Admin.** To build an internal UAS capability requires the development of the entire management and safety chain associated with commercial aircraft operations. This includes obtaining all Federal and State permissions (currently 333 / COA), licenses

(manned pilot, aircraft registration, etc.) as well as developing a set of Operational, Flight and Safety Manuals containing relevant guidance to UAS crews and program managers. Insurance requirements are also remarkably steep, requiring evidence of training, standards compliance and other legal mandates.

- B. **Preparation.** Once the paperwork has been completed, decisions on which data is required should be made to inform the selection of sensors (cameras, thermal imaging, multi-spectral or LIDAR for example) and the aircraft platform for their carriage. A Size, Weight, Power and Cost (SWaP-C) matrix, tied to endurance and weather limits will assist in these deliberations. After selection, crew training and data management processes will need to be established and employed.
- C. **Operations.** Not all locations are best-suited to UAS use, with legal, environmental and platform restrictions providing the operating envelope. Thorough understanding and pre-study inspection of both airspace and ground environments for each job site is mandatory. Extensive ground-control and pre-mission planning will require addressing as well as satisfying land-owner permissions and local operating issues. Notifications to other airspace users (NOTAMs) and other deconfliction tools may need to be processed in a specified timeframe. Finally, deploying correctly trained, current and qualified personnel, with sufficient aircraft, batteries, Personal Protective Equipment (PPE) and specialist equipment is no small undertaking, especially in adverse weather conditions.
- D. **Data Management.** Once the requisite number of flights have been completed, the real work commences in turning the sensor data into actionable intelligence and information. Secure storage of proprietary sensor product is one issue, as well as the transfer of very large data sets before and after processing. The computing requirements for high-end proprietary or Commercial off the Shelf (COTS) software (e.g. Pix4D) is substantial and trained data processing personnel are required to manipulate the imagery or mapping data into client-specific formats (Arc/GIS for example). A thorough grounding in photographic and photogrammetric processes is essential to elucidate the desired informational product from the mass of data captured.

2. Outsourced 3rd Party Managed Services

Considerations:



E. **Contract.** To outsource the entire UAS inspection and survey task requires careful vendor selection and a number of enterprise clients have undertaken ‘UAS Assessments’ with interviews and ‘fly-offs’ between possible companies. Vendors should be selected on legal review of their stated capabilities, any past performance (typically limited at this stage of the industry), aircraft and sensor options and data management processes. Insurance coverage is a significant hurdle for smaller companies and should be closely assessed. Few UAS firms have fully engaged with OSHA / MSHA and other compliance agencies, and the process is lengthy, as is bringing them on as a ‘supplier’ in internal systems.

F. **Operations.** The selected vendor should demonstrate full comprehension of the air, ground and environment limits of their 333 / COA / Part 107 clearances and undertake extensive pre-site surveys of client job sites. Completing all health and safety protocols prior and during a field deployment is also paramount, and evidence of training, PPE and HSE understanding should be examined closely. Liaison on the job site is often very beneficial to both the client in terms of education and the vendor in terms of delivering the best product. Safe flight conduct, checklist discipline as well as the willingness to ‘just say no’ if conditions deteriorate should be observed. A rapid ability to re-plan the sortie is essential and should be expected from a vendor.

G. **Data Management.** Most reputable UAS companies have an internal data management capability and should be able to rapidly (within 24 hours) provide an initial top-level ‘hot wash’ debrief with some pertinent imagery or mapping product. The delivery of the numerous large data sets, in different formats and in different stages of analysis needs to be closely coordinated to provide ‘actionable intelligence’ from the deliverables, rather than just data. A thorough ‘Deliverables Review’ should follow within a few days with the client’s project manager and any follow up questions should be readily addressed.

Resource Assistance

Unmanned Experts® Inc. is a Colorado-based Corporation with peerless experience in both Program Management and Managed Services in the North American commercial UAS market place. The UMEX team is fully equipped to establish, train and manage an in-house program and possesses all the licenses, certifications, aircrew, back-shop support and equipment to undertake the most challenging flight inspection and surveying tasks.

UMEX has a considerable [catalog of online courses](#), some free introductory briefs and others intensive groundings in various aspects of the Unmanned Aircraft spectrum.

We regularly run [ground and flight training courses](#), both in our Denver location and across the country, and are able to provide bespoke training packages at your location upon request.

UMEX is able to rapidly produce and mentor client 333 exemption requests and COAs, as well as assist in program development or to consult on aircraft, sensor and data management choices.

Should you have any questions or a request for assistance, please contact us at (303) 398-7056, or at operations@unmannedexperts.com. All the Best and Fly Safe!



Very Respectfully,
 Keven Gambold
 CEO
 Unmanned Experts Inc.