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THE
IMAGING & GEOSPATIAL
INFORMATION SOCIETY

UAVs 101

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GeotechCenter Webinar

September 16, 2015

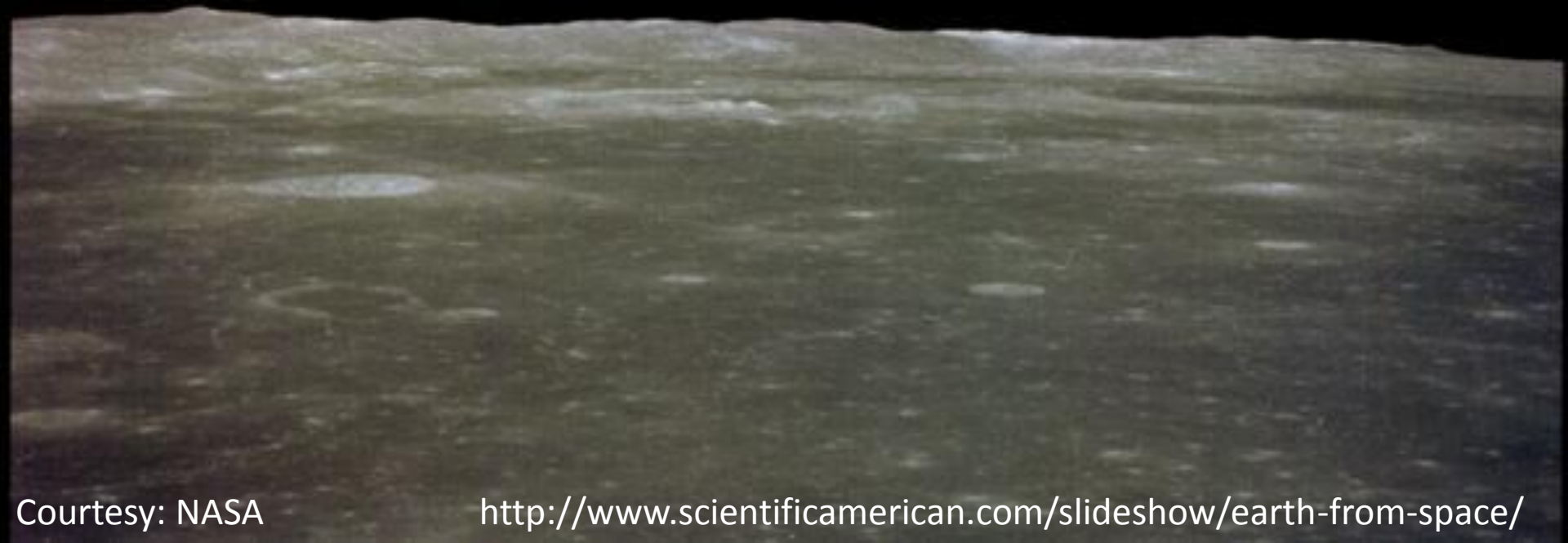
WEBINAR TOPICS

- What is a UAV, how does it work, and what are some of the types appropriate for civilian and classroom use? And, what are the applicable rules and regulations that an educator, local government, or private company must follow? This webinar will begin with a high-level overview, but quickly dive into the myths and misconceptions that people may have about what can and cannot be done lawfully with a UAV. The session will be as interactive as possible, with provocative slides that are intended to illicit discussion. By the end of the webinar, participants should have acquired the basic framework of technology and the law that will allow them to further research their particular interests on their own. (Disclaimer, the speaker is not a lawyer, and will not be providing legal advice. Rather, he will be providing references to the law as background information so you attendees can speak knowledgeably with a legal professional.)

Recall when the world was flat?



And then we figured out it's round?



**Like pioneers before us,
We see a new way to map the world**



UAS adds a degree of freedom never before available



change is in the air

ASPRS UAS Technical Demonstration and Symposium

September 28 – October 1, Reno, NV



ALTAVIAN



AEROVEL

1. We can map from above



2. We can map from below



http://i.vimeocdn.com/video/457087859_640.jpg

3. We can map outside

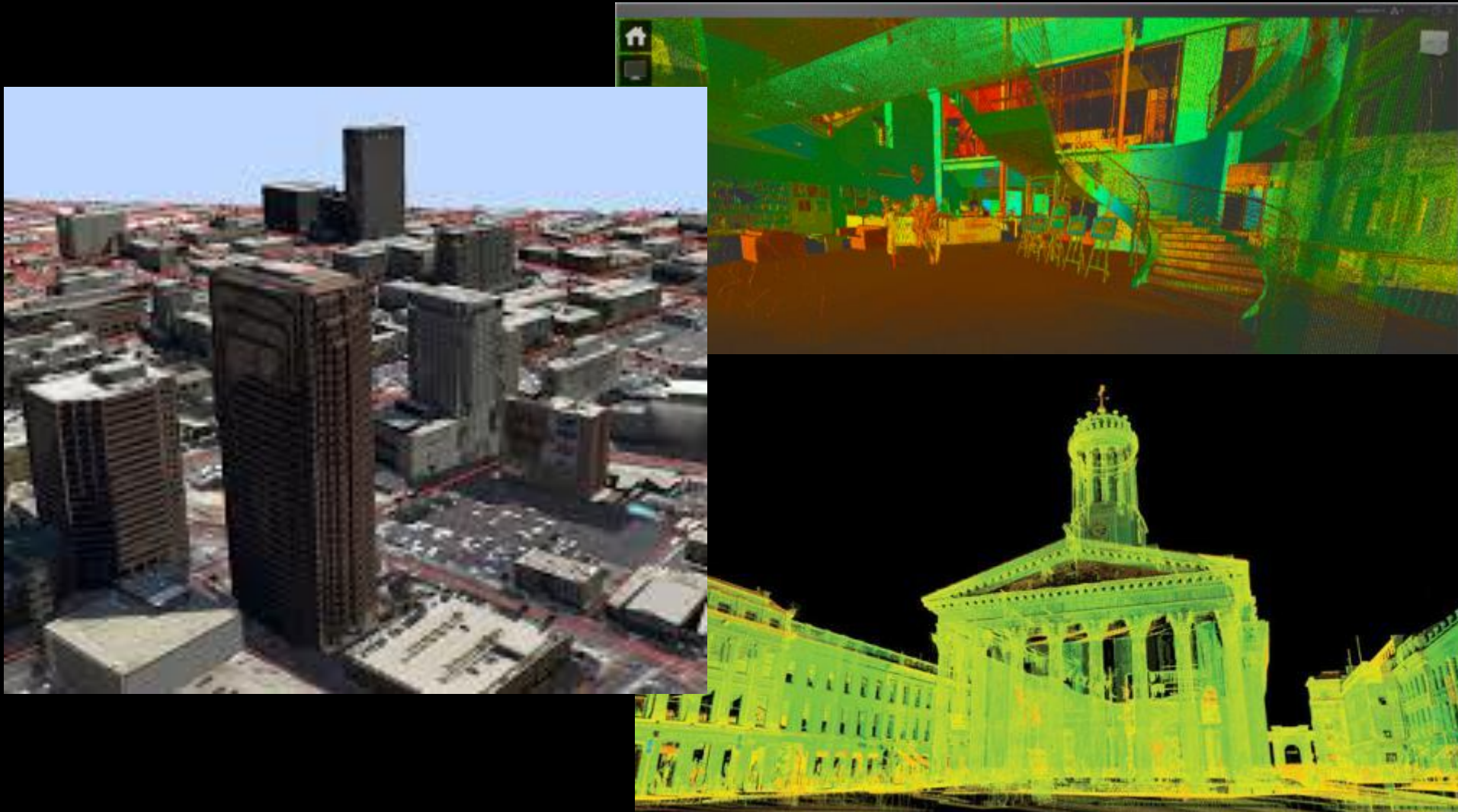


4. We can map inside



<http://adventuresindigitalarchaeology.wordpress.com/2014/05/06/rescue-lidar-in-southern-jordan/>

5. We can fuse to make 3D/4D/nD maps



Thanks to UAS
With these degrees of freedom

We will be able to do things
We have always wanted to do

And things of which
We have not yet dreamed...

**What's at stake depends
on how flat your world is**



Modified from base image of theflatearthsociety.org

UAS, a new way to map the world



<http://hdw.eweb4.com/wallpapers/2158/>

UAS @ ASPRS : What we do ...

- Promote the ethical application of earth observation, sensing and geomatics (includes photogrammetry, remote sensing, geographic information systems, and other supporting geospatial technologies);
- Advance understanding and public awareness of the geospatial and related sciences;
- Promote a balanced representation of the interests of government, academia, and private enterprise.

- Founded in 1934, the American Society for Photogrammetry and Remote Sensing is a scientific association serving professionals worldwide.



UAS @ ASPRS : What we do ...

- Coordination with other UAS Stakeholder Communities
- Rulemaking Support
- Calibration & Test Ranges
- Standards
- Education & Conferences
- Coordination with Test Sites



Key (mapping) UAS Components

- Observers & Operators
- Platform or “Truck”
- Payload
- (Ground Control System)²
- Support Equipment
- Data / Communication Links
- GI Infrastructure



The Platform

- Airframe
- Propulsion system
- Flight control computer / system
- (Precision) navigation system
- [Sense/Detect & Avoid System]
 - Eyes/Human
 - Sensors/Non-Human



Different Nomenclatures

Size/Endurance/Altitude

- Nano (NAV)
- Micro (MAV)
- Mini / Small (SUAS)
- Tactical (TUAS)
- Medium Altitude Long Endurance (MALE)
- High Altitude Long Endurance (HALE)

Application

- Unmanned [Mapping] [EO]
 - UMAS/UMAR/UMAV
- Unmanned [Combat]
 - UCAS/UCAR/UCAV

Consensus ?

- Lack of consensus for Civil UAV's
 - Mass
 - Configuration/Airframe
 - Application
 - Level of Autonomy
 - Type of Operation
 - Level of [Military] Employment

Representative Classes

Roland E. Weibel & R. John Hansman, SAFETY CONSIDERATIONS FOR OPERATION OF UNMANNED AERIAL VEHICLES IN THE NATIONAL AIRSPACE SYSTEM, March 2005

Table 6: Summary of Vehicle Classes

Class	Representative Aircraft	Mass Range	Operating Area	Operating Altitudes
Micro		Less than 2 lb	Local	Near-surface to 500 ft
Mini		2 to 30 lb	Local	100 to 10,000 ft
Tactical		30 to 1,000 lb	Regional	1,500 to 18,000 ft
MALE		1,000 to 30,000 lb	Regional/ National	18,000 ft to FL 600
HALE			Regional/ National / International	Above FL 600
Heavy*		Over 30,000 lb	National / International	18,000 ft to FL 450

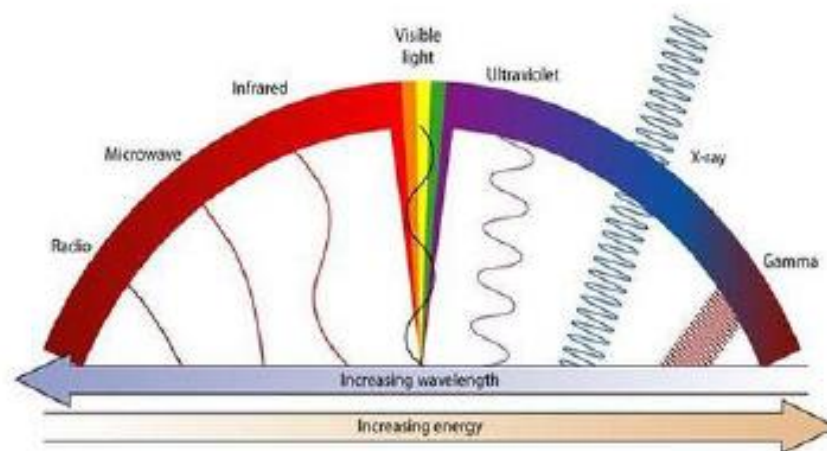
Clarify Context ...

- Terms
 - UAV: Unmanned Aerial Vehicle
 - [s]UAS: Unmanned Aircraft System
 - RPV: Remotely Piloted Vehicle
 - RPA(S): Remotely Piloted Aircraft (System)
 - RPS: Remotely Piloted System



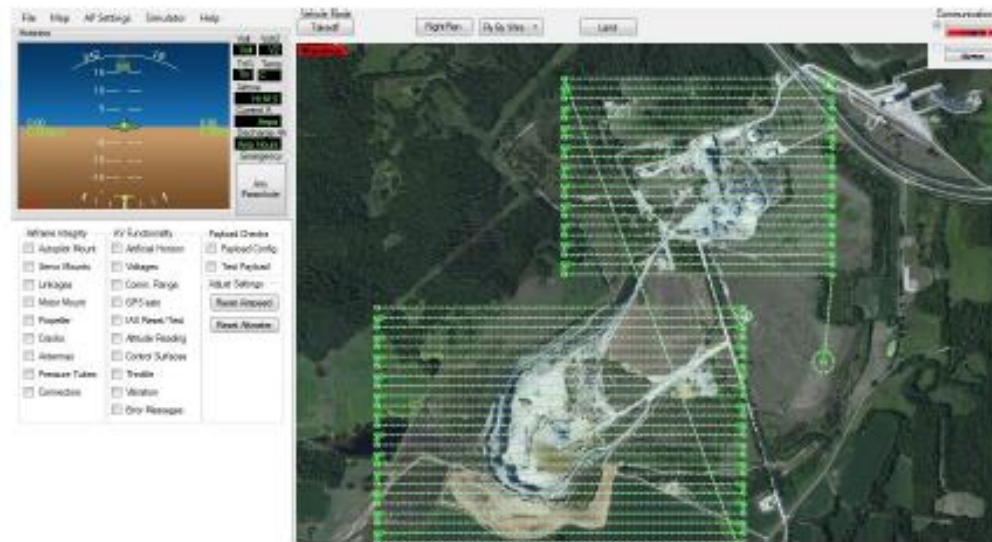
[Imaging] Payloads

- Spectral Range
 - Color/Visible
 - Infra-Red / Thermal
 - LiDAR
 - RADAR/Microwave
 - Hyperspectral / Multispectral
- Types
 - Active
 - Passive
- Application



Ground Control System

- Flight Planning
 - Know the system !
 - Be Thorough !
- An avionics flight display
- Navigation Systems
- System Health Monitoring and Prognostics Screens
- Graphical Images and Position Mapping
- Secure Communications Systems
- Inward Data Processing



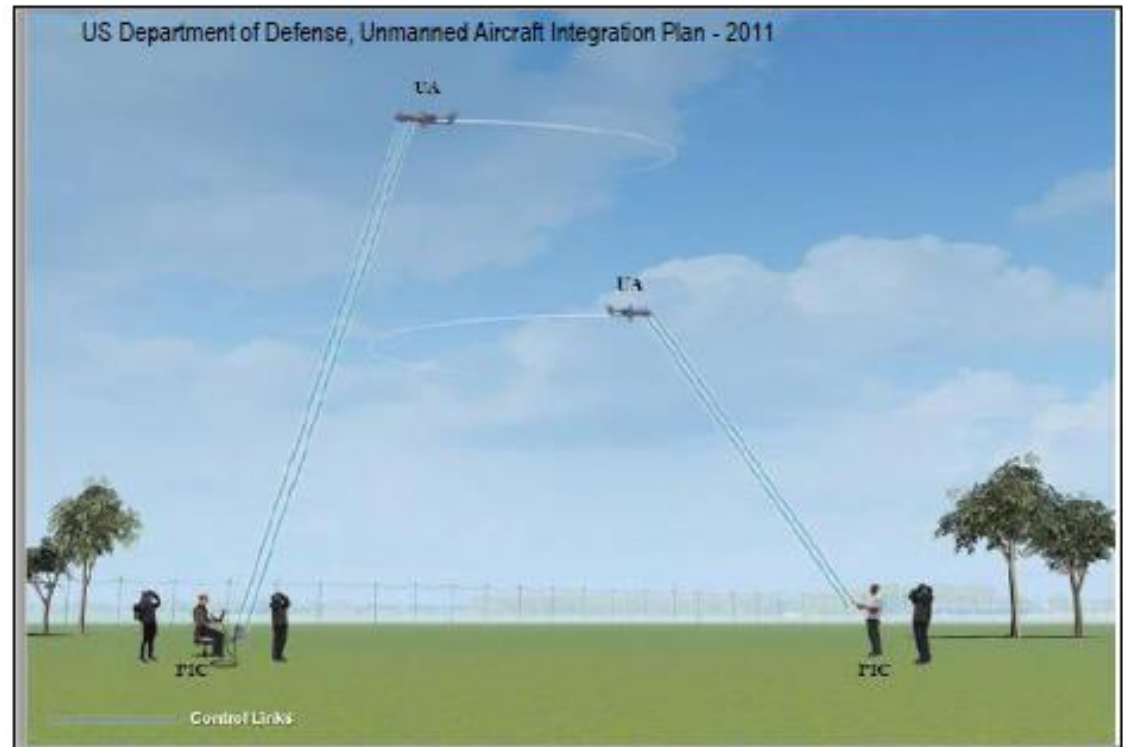
Source Pierre le Roux

Control / Interaction Levels

- Direct Control of Vehicle – also Take-Off (Launch) and Landing (Recovery)
- Fly-by-Wire / Attitude Command
- Payload Control – Distinct from Vehicle Control
- Autopilot (Different Configurations)
- Autonomous
- Operational Control less Take-Off (Launch) and Landing (Recovery)

Types of Operation

- **Visual Line of Sight (VLOS)**
 - *Extended Visual Line of Sight (EVLOS)*
- Beyond Line of Sight (BLOS)
- Remote Split Operations (RSO)



Considerations



More Examples



Inspection

- Interactive Control
- Appropriate Sensor for Task



Pipeline Monitoring

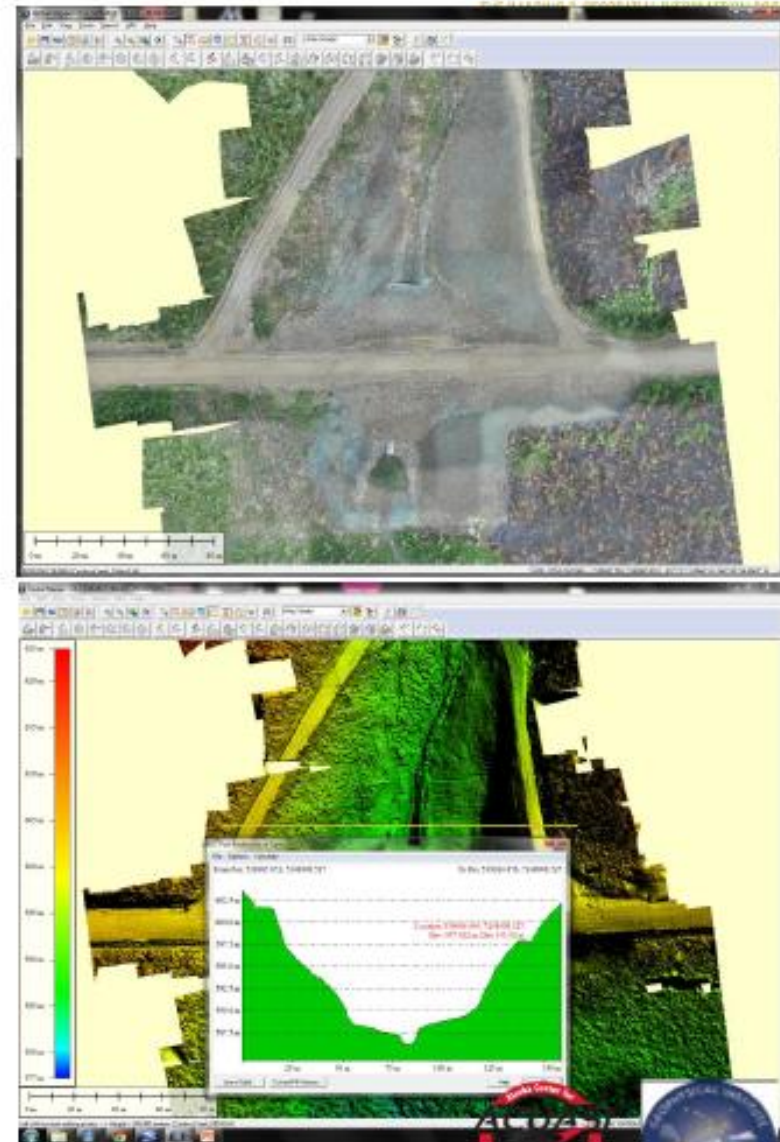
- Autonomous Operation ?
- Harsh Environments
- What do we need to see / sense ?



Marine Operations

- Logistics
- Suitable Conops & System for Marine Environment

- Priority Information Requirements
 - Accuracy
 - Qualitative
 - Quantitative
 - Context
 - How quick / frequent ?
 - Volumes
 - Near Real Time Road Conditions ?



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ALTAVIAN



AEROVEL



NO DRONE ZONE



Federal Aviation
Administration

- Federal law prohibits flying a drone anywhere in Washington, DC.
- Violators may face federal civil and criminal penalties.
- Washington, DC is a **No Drone Zone**.

NAS Integration

Airworthy

Qualified
Crew

Compliant with Operating Rules,
Standards & Procedures

Airworthiness

Crew
Qualification

Operating
Standards

Sense /
Detect and
Avoid

Equipage

Aircraft 1500 / 12877

Airport delays

Airport	Air	Dep
London (LHR)	2.0	3.2
Istanbul (IST)	2.1	3.0
Rome (FCO)	0.4	4.8
Manila (MNL)	1.9	2.8
London (LGW)	1.4	3.0

Tweets

Flights at Kumamoto Airport currently affected by eruption of Mt. #Aso in #Japan. h... 11 hours ago

#AC894 has landed safely in Toronto. <http://t.co/p7uV2cYydx> <https://t.co/Zm5Cweo2Y1H> 12 hours ago

#AC894, Toronto-Milan, returning to Toronto. <http://t.co/p7uV2cYydx> <https://t.co/le...> 12 hours ago

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Map data ©2015 Google, INEGI | 200 km | Terms of Use

Safety Considerations

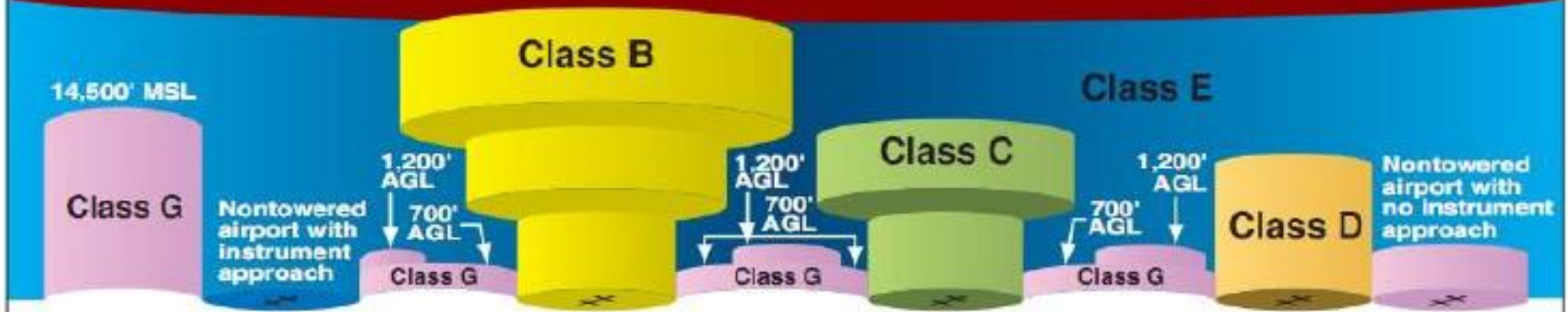
- Not just safety of other aircraft
- Consider also safety of people, property, and vehicle on the ground

FL 600

Airspace Classification

(Not to scale)

Class A
18,000' MSL



	 Class A	 Class B	 Class C	 Class D	 Class E	 Class G
Entry Requirements	ATC clearance	ATC clearance	Prior two-way communications	Prior two-way communications	Prior two-way communications*	None
Minimum Pilot Qualifications	Instrument Rating	Private or Student certification—local restrictions apply	Student certificate	Student certificate	Student certificate	Student certificate
Two-Way Radio Communications	Yes	Yes	Yes	Yes	Yes, under IFR flight plan*	None
Special VFR Allowed	No	Yes	Yes	Yes	Yes	N/A
VFR Visibility Minimum	N/A	3 statute miles	3 statute miles	3 statute miles	3 statute miles**	1 statute mile†
VFR Minimum Distance from Clouds	N/A	Clear of clouds	500' below, 1,000' above	500' below, 1,000' above	500' below,** 1,000' above	Clear of clouds†

Sources: FAA & AOPA



FAA
Beta App



FAA Selects New Unmanned Aircraft Executives

September 2, 2015 – Two veteran aviation professionals will steer the FAA's efforts to integrate unmanned aircraft.



FAA releases B4UFLY App Beta Test For UAS Users

August 28, 2015 – The FAA has released the beta version of a new IOS app that helps unmanned aircraft users fly in the right locations.



FAA Releases Pilot UAS Reports

August 21, 2015 – Newly released pilot reports show details of increased UAS encounters.



It's (a) Grand! FAA Passes 1,000 UAS Section 333 Exemptions

August 4, 2015 – The FAA continues to expand the rate of Section 333 exemption grants.



FAA Streamlines COAs for UAS Test Sites

May 21, 2015 – The FAA OKs the six UAS test sites to fly at or below 200 feet operations.



FAA Kicks Off "No Drone Zone" Effort for D.C. Area

May 13, 2015 – New UAS public outreach campaign for the region around Washington, D.C. aimed at visitors and residents



FAA Streamlines COAs for UAS Test Sites (<http://www.faa.gov/news/updates?newsId=82947>)

May 21, 2015 – The FAA OKs the six UAS test sites to fly at or below 200 feet operations.



FAA Kicks Off "No Drone Zone" Effort for D.C. Area **(<http://www.faa.gov/news/updates?newsId=82865>)**

May 13, 2015 – New UAS public outreach campaign for the region around Washington, D.C. aimed at visitors and residents.



FAA Summary Grants Speed UAS Exemptions **(<http://www.faa.gov/news/updates?newsId=82485>)**

April 9, 2015 – The FAA is now using a streamlined process to expedite Section 333 UAS exemption grants.



FAA Streamlines UAS COAs for Section 333 (<http://www.faa.gov/news/updates?newsId=82245>)

March 23, 2015 – The FAA will grant broad airspace authorization to unmanned aircraft users

Keep in Mind

- The Regulatory Environment is Changing Rapidly
 - Generally more permissive
 - Loopholes being removed, which may effectively make restrictions stronger
- A Race is On between:
 - Effective (Modern) Regulation
 - What people are doing without regard to regulation
- FAA Regulates All Airspace (Including Military and over Private Property)
- Additional Local Laws May Apply
 - Privacy
 - Public Safety

Idiosyncrasies of Terms

- UAV vs. Model Aircraft
 - Depends on intent of use, not the actual use or capability
- UAV vs. UAS
 - Vehicle vs. System
- Aircraft vs. Aerial
 - Using term “aircraft” invokes a regulatory environment

PRIVATE

**CUSTOMER
PARKING
ONLY**

**ALL OTHERS
WILL BE TOAD**

General Observations

(But consult your attorney)

- Distinction for Hobby/Recreational use is not the aircraft or the pilot, but is the use
 - Apparently, same pilot could use same aircraft for different purposes (civil on one day, commercial on another, and hobby/recreational on another)
- One stated distinction for business use is whether or not the use is “for compensation or hire”
- There is precedent for “commercial” UAS flying at hobby events

When the IRS Classifies Your Business as a Hobby

<https://turbotax.intuit.com/tax-tools/tax-tips/Small-Business-Taxes/When-the-IRS-Classifies-Your-Business-as-a-Hobby/INF22852.html>

Earning a profit

- The IRS expects that if you start a business, you intend to make money at it. If you don't, your business is likely to be a hobby. To determine if your business is a hobby, the IRS looks at numerous factors, including the following:
- Do you put in the necessary time and effort to turn a profit?
- Have you made a profit in this activity in the past, or can you expect to make one in the future?
- Do you have the necessary knowledge to succeed in this field?
- Do you depend on income from this activity?
- Are your losses beyond your control?

Practical standard for business classification

- The general rule is that if you have not turned a profit in at least three of the prior five years, the IRS will categorize your business as a hobby. This may be extended to a profit in two of the prior seven years in the specific case of horse training, breeding or racing. This is, presumably, because these endeavors involve a great amount of risk.

Unmanned Aircraft Systems

<http://www.faa.gov/uas/>

(Page Last Modified: September 25, 2014 3:03:10 PM EDT)

Model Aircraft Operations Limits

- According to the FAA Modernization and Reform Act of 2012 as
- (1) the aircraft is flown strictly for hobby or recreational use;
- (2) the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;
- (3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization;
- (4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft;
- (5) when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower...with prior notice of the operation; and
- (6) the aircraft is flown within visual line sight of the operator.

First UAV Demonstration at a US Air Show (with FAA Consent!)

<http://diydrone.com/profiles/blogs/first-uav-demonstration-at-a-us-air-show-with-faa-consent>

(Posted by [cmiser](#) on August 24, 2014 at 10:30am)

- Falcon Unmanned is pleased to have demonstrated Falcon and Falcon Hover at this weekends Rocky Mountain Airshow in Greeley Colorado. This was the first time in the US that a UAV without a military designation or special airworthiness certificate was able to perform in an outdoor air show demonstration with the FAA's consent. In the end we were flying under AMA rules as an AMA sanctioned event however I believe that the precedent has been set to open the door for future demonstrations of this type of technology under the COA process. The actual demonstration included a bungee launch of Falcon, a couple of passes of the spectatros, and recovery. This was followed by a flight of Falcon Hover along the runway across from the crowd. During both flights we were broadcasting the video feed from our new stabilized gimbal on the jumbotron. Following the main demonstrations flights were completed using Falcon Hover in an indoor netted area. While we were limited flight time this is an important milestone for the industry and showed the general public the positive benefits that unmanned aircraft can provide.

Unmanned Aircraft Systems (UAS)

Frequently Asked Questions

<http://www.faa.gov/uas/faq/>

(Page last modified: July 23, 2014 10:50:51 AM EDT)

- **Do I need to get approval from the FAA to fly a model aircraft for recreation?**
- No. FAA guidance says that model aircraft flights should be flown a sufficient distance from populated areas and full scale aircraft, should be kept within visual line of sight of the operator, should weigh under 55 lbs unless certified by an aeromodeling community-based organization, and are not for business purposes.^{1, 2}

Busting Myths about the FAA and Unmanned Aircraft

<http://www.faa.gov/news/updates/?newsId=76240>

(Page last modified: March 07, 2014 4:44:27 PM EST)

- **Previous Guidance: Model Aircraft**

Recreational use of airspace by model aircraft is covered by **FAA Advisory Circular 91-57**, which generally limits operations to below 400 feet above ground level and away from airports and air traffic. In 2007, the FAA clarified that **AC 91-57** only applies to modelers, and specifically excludes individuals or companies flying model aircraft for business purposes.

- **Updated Sept 2, 2015 with Advisory Circular 91-57A: Model Aircraft Operating Standards**

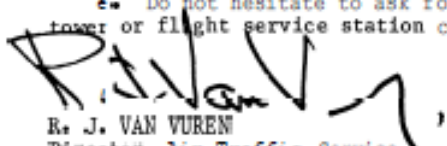
ADVISORY CIRCULAR



DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: MODEL AIRCRAFT OPERATING STANDARDS

1. PURPOSE. This advisory circular outlines, and encourages voluntary compliance with, safety standards for model aircraft operators.
2. BACKGROUND. Modelers, generally, are concerned about safety and do exercise good judgment when flying model aircraft. However, model aircraft can at times pose a hazard to full-scale aircraft in flight and to persons and property on the surface. Compliance with the following standards will help reduce the potential for that hazard and create a good neighbor environment with affected communities and airspace users.
3. OPERATING STANDARDS.
 - a. Select an operating site that is of sufficient distance from populated areas. The selected site should be away from noise sensitive areas such as parks, schools, hospitals, churches, etc.
 - b. Do not operate model aircraft in the presence of spectators until the aircraft is successfully flight tested and proven airworthy.
 - c. Do not fly model aircraft higher than 400 feet above the surface. When flying aircraft within 3 miles of an airport, notify the airport operator, or when an air traffic facility is located at the airport, notify the control tower, or flight service station.
 - d. Give right of way to, and avoid flying in the proximity of, full-scale aircraft. Use observers to help if possible.
 - e. Do not hesitate to ask for assistance from any airport traffic control tower or flight service station concerning compliance with these standards.


R. J. VAN VUREN
Director, Air Traffic Service

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AC 91-57A - Model Aircraft Operating Standards

Document Information



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91-57A - Model Aircraft Operating Standards

Date Issued

September 02, 2015

Responsible Office

AJV-115, Emerging Technologies Team

Description

This advisory circular (AC) provides guidance to persons operating Unmanned Aircraft (UA) for hobby or recreation purposes meeting the statutory definition of "model aircraft" contained in Section 336 of Public Law 112-95, the *FAA Modernization and Reform Act of 2012*. This AC describes means by which model aircraft may be operated safely in the National Airspace System (NAS). Nothing in this AC changes the requirement to comply with the statute or any applicable regulations.

- [AC 91-57A](#) (PDF, 220 KB)



U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: **Model Aircraft Operating
Standards**

Date: September 2, 2015
Initiated by: AJV-115

AC No. 91-57A

1. **PURPOSE.** This advisory circular (AC) provides guidance to persons operating Unmanned Aircraft (UA) for hobby or recreation purposes meeting the statutory definition of “model aircraft” contained in Section 336 of Public Law 112-95, the *FAA Modernization and Reform Act of 2012*. This AC describes means by which model aircraft may be operated safely in the National Airspace System (NAS). Nothing in this AC changes the requirement to comply with the statute or any applicable regulations.

2. **APPLICABILITY.** This AC provides information for any person who engages in model aircraft operations using model aircraft as defined by statute. (See paragraph 6.)

3. **REFERENCES.** Title 49 U.S.C. § 40101; P.L. 112-95 (126 Stat. 77 *et seq.*).

4. **RELATED MATERIAL** (current editions).

- Subtitle VII of Title 49, United States Code (49 USC)
- Title 14 of the Code of Federal Regulations (14 CFR)
- Subtitle B of Public Law 112-95 (Feb. 14, 2012)
- *Aeronautical Information Manual* (AIM)
- Temporary Flight Restriction (TFR) listing: <http://tfr.faa.gov/tfr2/list.html>
- Aeronautical Navigation Products (Charts):
http://www.faa.gov/air_traffic/flight_info/aeronav/
- Notices to Airman: https://www.faa.gov/air_traffic/publications/notices/

5. **CANCELLATION.** AC 91-57, *Model Aircraft Operating Standards*, dated June 9, 1981, is cancelled.

in the vicinity of aerial demonstrations or major sporting events. Do not operate model aircraft in designated areas until the TFR is no longer in force.

Model aircraft must not operate in Prohibited Areas, Special Flight Rule Areas or, the Washington National Capital Region Flight Restricted Zone, without specific authorization. Such areas are depicted on charts available at http://www.faa.gov/air_traffic/flight_info/aeronav/. Additionally, model aircraft operators should be aware of other Notices to Airmen (NOTAMS) which address operations near locations such as military or other federal facilities, certain stadiums, power plants, electric substations, dams, oil refineries, national parks, emergency, services and other industrial complexes. In addition to the previously mentioned link, information regarding published NOTAMS can be found at: https://www.faa.gov/air_traffic/publications/notices/.

The requirement to not fly within TFRs, or other circumstances where prohibited, would apply to operation of model aircraft that would otherwise comply with section 336 of Public Law 112-95.

e. Model aircraft operators should follow best practices including limiting operations to 400 feet above ground level (AGL).

f. All other operators and for additional information on Unmanned Aircraft Systems please visit: <http://www.faa.gov/uas/> .

Unmanned Aircraft Systems (UAS)

Frequently Asked Questions

<http://www.faa.gov/uas/faq/>

Page last modified: July 23, 2014 10:50:51 AM EDT

- **If I fly a UAS for business purposes, such as new technology development, am I required to get approval from the FAA?**
- Yes. There are presently two methods of gaining FAA approval for flying UAS: Special Airworthiness Certificates - Experimental Category (SAC-EC) for civil aircraft, and Certificates of Waiver or Authorization (COA) for public aircraft. ^{1, 3}
- **References**
- **[1. Federal Register Notice - Clarification of FAA Policy \(PDF\), UAS Operations in the U.S. National Airspace System](#)**
- 2. FAA's [Interpretation of the Special Rule for Model Aircraft](#), Notice of Interpretation
- [3. Notice 8900.227 \(PDF\)](#), Unmanned Aircraft Systems Operations in the U. S. National Airspace System
- [4. Part A, Subtitle VII of title 49, United States Code, Section 40102, Definitions](#); and [14 CFR 1.1 General Definitions](#)
- [5, FAA Order 8130.34C \(PDF\)](#), Airworthiness Certification of Unmanned Aircraft Systems

[http://www.faa.gov/uas/media/model
_aircraft_spec_rule.pdf](http://www.faa.gov/uas/media/model_aircraft_spec_rule.pdf)

- 14 CFR Part 91
- [Docket No. FAA-2014-0396]
- **Interpretation of the Special Rule for Model Aircraft**
- **AGENCY:** Federal Aviation Administration (FAA), DOT.
- **ACTION:** Notice of Interpretation with Request for Comment
- **SUMMARY:** This action provides interested persons with the opportunity to comment on the FAA's interpretation of the special rule for model aircraft established by Congress in the FAA Modernization and Reform Act of 2012. In this interpretation, the FAA clarifies that: model aircraft must satisfy the criteria in the Act to qualify as model aircraft and to be exempt from future FAA rulemaking action; and consistent with the Act, if a model aircraft operator endangers the safety of the National Airspace System, the FAA has the authority to take enforcement action against those operators for those safety violations.

http://www.faa.gov/uas/media/model_aircraft_spec_rule.pdf

Background

The FAA is issuing this interpretation because we have received many inquiries regarding the scope of the special rule for model aircraft in section 336 of the FAA Modernization and Reform Act of 2012 and the FAA's enforcement authority over model aircraft as affirmed by the statute. In this interpretation, we explain the history of FAA oversight of model aircraft operations and the new statutory requirements that apply to model aircraft operations, and then clarify how the FAA intends to apply its enforcement authority to model aircraft operations that endanger the safety of the National Airspace System (NAS).

http://www.faa.gov/uas/media/model_aircraft_spec_rule.pdf

II. Requirements to Qualify as a Model Aircraft under the FAA Modernization and Reform Act of 2012 (P.L. 112-95, section 336).

A. Statutory Requirements

On February 14, 2012, the President signed into law the FAA Modernization and Reform Act of 2012 (P.L. 112-95) (the Act), which established, in Section 336, a “special rule for model aircraft.” In Section 336, Congress confirmed the FAA’s long-standing

position that model aircraft are aircraft. Under the terms of the Act, a model aircraft is defined as “an unmanned aircraft” that is “(1) capable of sustained flight in the atmosphere; (2) flown within visual line of sight of the person operating the aircraft; and (3) flown for hobby or recreational purposes.” P.L. 112-95, section 336(c). Congress’

intention to define model aircraft as aircraft is further established by section 331(8) of the

Act, which defines an unmanned aircraft as “an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.” Congress’

http://www.faa.gov/uas/media/model_aircraft_spec_rule.pdf

The statute requires model aircraft to be flown strictly for hobby or recreational purposes. Because the statute and its legislative history do not elaborate on the intended

meaning of “hobby or recreational purposes,” we look to their ordinary meaning and also the FAA’s previous interpretations to understand the direction provided by Congress.³ A definition of “hobby” is a “pursuit outside one’s regular occupation engaged in especially for relaxation.” Merriam-Webster Dictionary, *available at* www.merriam-webster.com

(last accessed June 9, 2014). A definition of recreation is “refreshment of strength and spirits after work; a means of refreshment or diversion.” *Id.* These uses are consistent with the FAA’s 2007 policy on model aircraft in which the Agency stated model aircraft operating guidelines did not apply to “persons or companies for business purposes.” *See*

72 FR at 6690.⁴

http://www.faa.gov/uas/media/model_aircraft_spec_rule.pdf

³ In construing statutory language, agencies should assume that the ordinary meaning of the language accurately expresses the legislative purpose of Congress. Agencies are also permitted to presume that Congress was aware of the agencies' administrative or adjudicative interpretations of certain terms and intended to adopt those meanings. See *BedRoc Ltd. v. U.S.*, 541 U.S. 176, 183 (2004); see also *Haig v. Agee*, 453 U.S. 280, 300 (1981); *Lorillard v. Pons*, 434 U.S. 575, 580-81 (1978).

⁴ The FAA has also addressed recreational use of aircraft by pilots in the Sport and Recreational Pilot Certificate rules, which prohibit those pilots from acting as pilot in command of an airplane carrying passengers or property for compensation or hire, or in furtherance of a business. 14 CFR 61.101(e), 61.315(c). As discussed in the Sport Pilot final rule, those prohibitions are designed to limit those pilots to “sport and recreational flying only.” 69 FR 44772, 44839 (July 27, 2004).

⁵ A commercial operator is a “person, who, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property” See 14 CFR 1.1. The FAA would therefore not consider a commercial operation to be “flown strictly for hobby or recreation purposes” because it would be conducted for compensation or hire.

Any operation not conducted strictly for hobby or recreation purposes could not be operated under the special rule for model aircraft. Clearly, commercial operations would not be hobby or recreation flights.⁵ Likewise, flights that are in furtherance of a

business, or incidental to a person's business, would not be a hobby or recreation flight.

Flights conducted incidental to, and within the scope of, a business where no common carriage is involved, generally may operate under FAA's general operating rules of part

91. See Legal Interpretation to Scott C. Burgess, from Rebecca B. MacPherson, Assistant Chief Counsel for Regulations (Nov. 25, 2008). Although they are not commercial

operations conducted for compensation or hire, such operations do not qualify as a hobby or recreation flight because of the nexus between the operator's business and the

operation of the aircraft. See, e.g., Legal Interpretation to BSTC Corporation, from

Rebecca B. MacPherson, Assistant Chief Counsel for Regulations (June 22, 2009)

(noting transportation of mining employees and guests appears to be incidental to and

within scope of operator's geological business); Legal Interpretation to Scott C. Burgess

(Nov. 25, 2008) (noting transportation of automotive dealership employees and guests

must be incidental to and within scope of operator's real estate development business).

To provide guidance, the following are examples of flights that could be

conducted as hobby or recreation flights and other types of flights that would not be hobby or recreation.

Hobby or Recreation	Not Hobby or Recreation
Flying a model aircraft at the local model aircraft club.	Receiving money for demonstrating aerobatics with a model aircraft.
Taking photographs with a model aircraft for personal use.	A realtor using a model aircraft to photograph a property that he is trying to sell and using the photos in the property's real estate listing. A person photographing a property or event and selling the photos to someone else.
Using a model aircraft to move a box from point to point without any kind of compensation.	Delivering packages to people for a fee. ⁶
Viewing a field to determine whether crops need water when they are grown for personal enjoyment.	Determining whether crops need to be watered that are grown as part of commercial farming operation.

IV. Examples of Regulations That Apply to Model Aircraft

The FAA could apply several regulations in part 91 when determining whether to take enforcement action against a model aircraft operator for endangering the NAS. The FAA's general operating and flight rules are housed in part 91 of the FAA's regulations. These rules are the baseline rules that apply to all aircraft operated in the United States with limited exceptions,¹⁴ and are the appropriate rules to apply when evaluating model aircraft operations. See 14 CFR 91.1.

Rules relevant to these operations fall generally into three categories: (1) how the aircraft is operated; (2) operating rules for designated airspace; and, (3) special restrictions such as temporary flight restrictions (TFRs) and notices to airmen (NOTAMs). These rules are discussed in greater detail below.

College Considerations

- Flying Outside US?
 - Commercial UAS has been legal in Canada for a decade
- Public or Private Institution?
 - If public, can get a COA
 - If private, would need to be working for a government and get a COA, seek a 333 Exemption
- Doesn't Matter from Regulatory Perspective
 - Teaching vs. Research
 - On Campus or Not

Certificate of Waiver or Authorization (COA) for Public Operations (Governmental)

COAs Issued, by year

Year	2009	2010	2011	2012	2013	2014
COAs Issued	146	298	313	257	423	609

Government (Public) UAS Operations

A "Certificate of Waiver or Authorization" (COA) is available to government entities that want to fly a UAS in civil airspace. Common uses include law enforcement, firefighting, border patrol, disaster relief, search and rescue, military training and other government operational missions.

Applicants must submit their COA request through an online system. The FAA then evaluates the proposed operation to see if it can be conducted safely. If granted, the COA allows an operator to use a defined block of airspace, and includes special provisions unique to the proposed operation. For instance, a COA may require flying only under Visual Flight Rules (VFR) and/or only during daylight hours.

Today, the average time to obtain an authorization for non-emergency operations is less than 60 days, and the renewal period is two years. The agency has expedited procedures to grant one-time COAs for time-sensitive emergency missions such as disaster relief and humanitarian efforts — sometimes in just a few hours.

Most COAs require coordination with an appropriate air traffic control facility and may require a transponder on the UAS to operate in certain types of airspace. Because UAS technology cannot yet comply with "see and avoid" rules that apply to all aircraft, a visual observer or an accompanying "chase plane" must maintain visual contact with the UAS and serve as its "eyes" when operating outside airspace restricted from other users.

Exemptions For Civil Operations
1,505 Granted Section 333s
as of 9/10/15
(12 issued on 9/10/15)

Section 333

Petitions Granted	Petitions Closed
548	85
As of 6/9/2015	

It's (a) Grand! FAA Passes 1,000 UAS Section 333 Exemptions

Search:



News type:



In its continuing effort to safely expand and support commercial unmanned aircraft operations in U.S. airspace, the Federal Aviation Administration has now granted more than 1,000 Section 333 exemption approvals. As of today, the agency has issued 1,008 such exemptions.

Companies and individuals from a broad spectrum of industries are taking advantage of the Section 333 exemption process. Many of the grants the FAA has issued allow aerial filming for uses such as motion picture production, precision agriculture and real estate photography. The agency also has issued grants for new and novel approaches to inspecting power distribution towers and wiring, railroad infrastructure and bridges

 @FAANews

Mississippi UAS test center to discuss research, regulation & commercial #UAS on 9/15

[@msstate](#)

<http://t.co/HnRCFnL9dp>

<http://t.co/YucDMrE4r9>

 12 Sep

RT [@USDOT](#): This #911day we acknowledge heroes in the #transportation community. #NeverForget

<http://t.co/6MU5CjW2Wr>

<http://t.co/p20aZql8jB>

 11 Sep

1,008 as of Aug 4, 2015

By law, any aircraft operation in the national airspace requires a certificated and registered aircraft, a licensed pilot, and operational approval. [Section 333 of the FAA Modernization and Reform Act of 2012 \(FMRA\)](#) (PDF) grants the Secretary of Transportation the authority to determine whether an airworthiness certificate is required for a UAS to operate safely in the National Airspace System (NAS).

This authority is being leveraged to grant [case-by-case authorization](#) for certain unmanned aircraft to perform commercial operations prior to the finalization of the Small UAS Rule, which will be the primary method for authorizing small UAS operations once it is complete.

The Section 333 Exemption process provides operators who wish to pursue safe and legal entry into the NAS a competitive advantage in the UAS marketplace, thus discouraging illegal operations and improving safety. It is anticipated that this activity will result in significant economic benefits, and the FAA Administrator has identified this as a high priority project to address demand for civil operation of UAS for commercial purposes.

FAA Resources

(as of May 2015)

- Jacqueline R. Jackson, Manager, Tactical Operations Section, FAA
(she is the one who signs off on COAs!)
- Mark Jordan, JMA Solutions supporting Unmanned Aircraft Systems Integration Office, University/College Liaison for FAA
(he helps colleges with their COAs and 333s)

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FAA Selects New Unmanned Aircraft Executives

Two veteran aviation professionals will steer the FAA's efforts to integrate unmanned aircraft.



Unmanned aircraft systems (UAS) are inherently different from manned aircraft. Introducing UAS into the nation's airspace is challenging for both the FAA and aviation community, because the U.S. has the busiest, most complex airspace in the world. The FAA is taking an incremental approach to safe UAS integration.

[What Can I Do with my Model Aircraft?](#)

UAS come in a variety of shapes and sizes and serve diverse purposes. Regardless

Top Tasks

[Read about the draft rule for small UAS](#)

[Apply for a Section 333 exemption](#)

[Connect with a UAS Test Site](#)

[Contact the UAS Integration Office](#)

[What can you do with your unmanned aircraft?](#)

Proposed Rule

- The FAA proposal offers safety rules for small UAS (under 55 pounds) conducting non-recreational operations.
- The rule would limit flights to daylight and visual-line-of-sight operations.
- It also addresses height restrictions, operator certification, optional use of a visual observer, aircraft registration and marking, and operational limits

Proposed Rule, Continued

- Under the proposed rule, the person actually flying a small UAS would be an “operator.”
- An operator would have to be at least 17 years old, pass an aeronautical knowledge test and obtain an FAA UAS operator certificate.
- To maintain certification, the operator would have to pass the FAA knowledge tests every 24 months.
- A small UAS operator would not need any further private pilot certifications (i.e., a private pilot license or medical rating).

Proposed Rule, Continued

- A small UAS operator must always see and avoid manned aircraft. If there is a risk of collision, the UAS operator must be the first to maneuver away.
- The operator must discontinue the flight when continuing would pose a hazard to other aircraft, people or property.
- A small UAS operator must assess weather conditions, airspace restrictions and the location of people to lessen risks if he or she loses control of the UAS.
- A small UAS may not fly over people, except those directly involved with the flight.
- Flights should be limited to 500 feet altitude and no faster than 100 mph.
- Operators must stay out of airport flight paths and restricted airspace areas, and obey any FAA Temporary Flight Restrictions (TFRs).

e-CFR data is current as of June 9, 2015

[Title 14](#) → [Chapter I](#) → [Subchapter F](#) → Part 101

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Title 14: Aeronautics and Space

PART 101—MOORED BALLOONS, KITES, AMATEUR ROCKETS AND UNMANNED FREE E

Contents

Subpart A—General

- [§101.1](#) Applicability.
- [§101.3](#) Waivers.
- [§101.5](#) Operations in prohibited or restricted areas.
- [§101.7](#) Hazardous operations.

Subpart B—Moored Balloons and Kites


- [§101.11](#) Applicability.
- [§101.13](#) Operating limitations.

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§101.3 Waivers.

No person may conduct operations that require a deviation from this part except under a certificate of waiver issued by the Administrator.


[Doc. No. 1580, 28 FR 6721, June 29, 1963]

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§101.5 Operations in prohibited or restricted areas.

No person may operate a moored balloon, kite, amateur rocket, or unmanned free balloon in a prohibited or restricted area unless he has permission from the issuing or controlling agency, as appropriate.

[Doc. No. 1457, 29 FR 46, Jan. 3, 1964, as amended at 74 FR 38092, July 31, 2009]

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§101.7 Hazardous operations.

(a) No person may operate any moored balloon, kite, amateur rocket, or unmanned free balloon in a prohibited or restricted area if such operation creates a hazard to other persons, or their property.

(b) No person operating any moored balloon, kite, amateur rocket, or unmanned free balloon may allow any object to be dropped therefrom, if such action creates a hazard to other persons or their property.

(Sec. 6(c), Department of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 12800, 39 FR 22252, June 21, 1974, as amended at 74 FR 38092, July 31, 2009]

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Subpart A—General

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§101.1 Applicability.

(a) This part prescribes rules governing the operation in the United States, of the following:

(1) Except as provided for in §101.7, any balloon that is moored to the surface of the earth or an object thereon and that has a diameter of more than 6 feet or a gas capacity of more than 115 cubic feet.

(2) Except as provided for in §101.7, any kite that weighs more than 5 pounds and is intended to be flown at the end of a rope or cable.

(3) Any amateur rocket except aerial firework displays.

(4) Except as provided for in §101.7, any unmanned free balloon that—

(i) Carries a payload package that weighs more than four pounds and has a weight/size ratio of more than three ounces per square inch on any surface of the package, determined by dividing the total weight in ounces of the payload package by the area in square inches of its smallest surface;

(ii) Carries a payload package that weighs more than six pounds;

(iii) Carries a payload, of two or more packages, that weighs more than 12 pounds; or

(iv) Uses a rope or other device for suspension of the payload that requires an impact force of more than 50 pounds to separate the suspended payload from the balloon.

(b) For the purposes of this part, a *gyroglider* attached to a vehicle on the surface of the earth is considered to be a kite.

[Doc. No. 1580, 28 FR 6721, June 29, 1963, as amended by Amdt. 101-1, 29 FR 46, Jan. 3, 1964; Amdt. 101-3, 35 FR 8213, May 26, 1970; Amdt. 101-8, 73 FR 73781, Dec. 4, 2008; 74 FR 38092, July 31, 2009]

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§101.3 Waivers.

No person may conduct operations that require a deviation from this part except under a certificate of waiver issued by the Administrator.

[Doc. No. 1580, 28 FR 6721, June 29, 1963]

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Subpart B—Moored Balloons and Kites

SOURCE: Docket No. 1580, 28 FR 6722, June 29, 1963, unless otherwise noted.

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§101.11 Applicability.

This subpart applies to the operation of moored balloons and kites. However, a person operating a moored balloon or kite within a restricted area must comply only with §101.19 and with additional limitations imposed by the using or controlling agency, as appropriate.

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§101.13 Operating limitations.

(a) Except as provided in paragraph (b) of this section, no person may operate a moored balloon or kite—

- (1) Less than 500 feet from the base of any cloud;
- (2) More than 500 feet above the surface of the earth;
- (3) From an area where the ground visibility is less than three miles; or
- (4) Within five miles of the boundary of any airport.

(b) Paragraph (a) of this section does not apply to the operation of a balloon or kite below the top of any structure and within 250 feet of it, if that shielded operation does not obscure any lighting on the structure.

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§101.15 Notice requirements.

No person may operate an unshielded moored balloon or kite more than 150 feet above the surface of the earth unless, at least 24 hours before beginning the operation, he gives the following information to the FAA ATC facility that is nearest to the place of intended operation:

- (a) The names and addresses of the owners and operators.
- (b) The size of the balloon or the size and weight of the kite.
- (c) The location of the operation.

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