UNOLS
Uncrewed Aerial Systems (UAS) Operations from the U.S. Academic Research Fleet: Operator's Handbook

A publication from the UNOLS Scientific Committee for Oceanographic Aircraft Research

Photos courtesy of Luc Lenein, Chris Zappa and NSF/USAP

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Version 1.0: UNOLS Council Endorsement and Release – March 28, 2019
Version 2.0: Changed the word Manned to Crewed and Unmanned to Uncrewed - July 8, 2021

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Objectives

With the recent publication of the Federal Aviation Administration (FAA) small Uncrewed Aircraft Systems (UAS) rule, a policy for academic research vessels (ARVs) has become necessary. Operation of UAS, or drones, from or over ARVs may not take place without demonstrated compliance with national or international regulations (International Coalition for Sustainable Aviation, ICSA, Federal Aviation Administration, FAA) and specific approval of the ship's captain or designee, as a minimum. This policy also applies to the high seas, or the airspace above areas beyond the exclusive economic zones of the nations of the world. This applies to crew, technicians and members of the science party, and refers to all operations, whether recreational, educational, or professional. The purpose of this document is to provide guidance to the research community and operator institutions.

UNOLS recognizes that UAS must be safely integrated into the airspace of the proposed experiment site. All UAS operation must also demonstrate compliance with ship operation requirements, and any other oversight entities (e.g. University Center of Excellence, Risk Management office) associated with the operator institution or with funding agencies (e.g. ONR environmental review). It also recognizes that UAS are built in a variety of shapes and sizes and serve diverse purposes, and therefore there is not a unique approach to operating UASs from research vessels.

This document represents the agreed information from discussions during recent UNOLS Scientific Committee for Oceanographic Aircraft Research (SCOAR) meetings and has been reviewed and approved by its Subcommittee on UAS Shipboard Operations.

This Handbook is divided into three parts:

- **Chapter 1** includes introductory/general information.
- **Chapter 2** contains requirements and recommendations for safe operations on academic research vessels.
- **Chapter 3** contains appendices of various templates of common forms, such as communications plans and UAS pilot logs. These templates are provided as examples and can be modified to suit a specific UAS activity. Note that specific institutions will have different requirements.

Finally, this handbook should be viewed as a living document which, as UAS technology evolves, and as published research on the use of UAS from research vessels is made available, the recommendations and appendices are expected to evolve. Comments from any UNOLS institution, on any aspect of this Handbook, would be welcomed.

Acronyms, Abbreviations & Terminology

ADIZ – Air Defense Identification Zones
AGL – Above Ground Level
AMAP - Arctic Monitoring and Assessment Programme
ARV – Academic Research Vessel
BRLOS – Beyond Radio Line-of-Sight
BVLOS – Beyond Visual Line-of-Sight
COA – Certificate of Authorization, applies for both Public Agencies or Commercial UAS flights
CONMAP - Council of Managers of National Antarctic Programs
CW – Continuous Wave
DoD – Department of Defense
EIA - Environmental Impact Assessment
EM – Electromagnetic
EVLOS – Extended Line of Sight
FAA – Federal Aviation Administration
ICAO – International Civil Aviation Organization
ICSA - International Coalition for Sustainable Aviation
IR – Infrared
LASER - Light Amplification by Stimulated Emission of Radiation
NOTAM – Notice to Airmen
Part 107 – New Small UAS Regulations (Aug 29th, 2016)
PIC – Pilot in Command
RPA – Remotely Piloted Aircraft
RPC – Remote Pilot Certificate
SCOAR – Scientific Committee for Oceanographic Aircraft Research
Section 333 Exemption – Congressional exemption from the prohibition of commercial UAS flights
UAS – Uncrewed Aircraft System(s)
UAS Registration – Each aircraft must have an FAA number (starts with N or FA)
UNOLS – University-National Oceanographic Laboratory System
UTC – Universal Time Coordinated
UV – Ultraviolet
VFR – Visual Flight Rules
VLOS – Visual Line of Sight

Chapter 1 – General Information

1.a. Introduction

Technological advances have led to increased UAS capability and deployability in recent years. Most categories of UAS are now available at low cost, are lightweight and easily transportable, making it very attractive to the research community, both for science and outreach purposes. Technological advances will continue and will make their uses a common occurrence on research vessels.

The principle objective of aviation regulatory guidelines is to achieve and maintain the highest possible level of safety. In the case of UAS, this means ensuring the safety of any other airspace user and of persons, environment, wildlife, infrastructure and equipment on the ground, including areas and equipment of scientific importance. Hazards and risks should be identified and assessed for each specific deployment as for any airborne object, advance notification and communications with other operators in any given region is essential to reduce risk of harm.

1.b. Size & Category

Remotely Piloted Aircraft (RPA) and UAS can vary in size to those that are small (micro-), very light to light (mini-) and can be hand-launched, to those that are large to very large (major). Some countries have in place their own UAS classification system by size or weight of the unfuelled RPA component of the system and some countries have not yet agreed upon a classification system. Countries which have developed their own category systems and definitions, use varying terminology and size/weight categories so that no two agreed systems are identical.

Below (Table 1 & 2) is an attempt to summarize the range of size generally used for research purposes (Fladeland et al. 2017, NCAR / EOL Workshop - Uncrewed Aircraft Systems for Atmospheric Research).

Table 1. Representative UAS Classification

Weight kg	Normal Operating Altitude, ft	Mission Radius km	Typical Endurance, hrs	Representative Platforms
< 2	< 400	5	< 1	Black Widow, Raven
2 - 25	< 3000	25	2 - 8	Aerosonde, Scan Eagle, Puma
25 - 150	< 5000	50	4 - 12	Manta B
150 - 600	< 10,000	200-500	8 - 14	SIERRA, Viking 400, TigerShark
>600	<18,000	1000	>20	Ikhana (Predator B)
>600	>18,000	5000	>24	Global Hawk

Table 2. NASA UAS Classification Matrix

Category	I	II	III
Weight	≤ 55 lb (25 kg)	55-330 lb (25-150 kg)	> 330 lb (150 kg)
Airspeed (kt)	≤ 70	≤ 200	> 200
Type	Model or sUAS	sUAS	UAS

For the purposes of simplicity of this Handbook, in consistency with the Council of Managers of National Antarctic Programs (CONMAP) UAS handbook we consider that there are only three categories of UAS. Those with a RPA that is:

Small – Less than 2 kgs
Medium – Greater than 2 kgs but less than 25 kgs
Large – Greater than 25 kgs.

Most RPAs, if not all, that have been deployed from research vessels in support of science currently fall within the medium category and therefore that category is the focus of the Handbook. Note that the first category, "small," is likely geared toward outreach (e.g. gathering video of deployment or recovery of gear from the research vessels) or reconnaissance and mapping (e.g. 3D mapping of an iceberg) at localized geographic extents.

As countries prepare and formalize their national UAS guidelines, UNOLS will utilize the size categories/class terminology as per their national legislation.

With this in mind and balancing the increasing need and pressure from the science community, FAA came up with several approaches to simplify the flight request process.

1.c. FAA Operation of Small Uncrewed Aircraft (Part 107)

FAA Part 107 (https://www.faa.gov/uas/) is a set of federal regulations that introduces a new, simpler and easier process for UAS flights. It enables a new small drone operating license (https://www.faa.gov/uas/) and simplified procedures for operating small UAS (take-off weight<55lbs).

The new remote pilot certificate with small UAS rating (Small Drone License) enables the holder to operate a small drone for non-recreational purposes. Similar to a driver's license, this license will require the applicant to pass a knowledge test and pass a security vetting, but at $150 (as of August 2018), it is significantly more obtainable than a private pilot's license, which was the previous requirement for legal drone operation. More information on the Small Drone License can be found on the FAA UAS dedicated website (https://www.faa.gov/uas/).

The simplified rules codifies many of the operational limits found in the Section 333 Blanket COA, but removes the restriction on FAA-approved drones and introduces a new process to obtain airport authorization to fly within their airspace control.

Main aspects (see FAA UAS website for details):

- The pilot must have remote pilot certificate with a small UAS rating.
- No careless or reckless operations.
- No carriage of hazardous materials, but other material or items may be carried.
- Maximum altitude of 400 feet and maximum groundspeed of 100 mph.
- May fly only during daylight and within visual line of sight, or close enough to see the aircraft clearly without additional vision aids.
- No flying over people unless they are part of the operation or are under a covered structure.
- Flights near airports will require prior airport authorization.
- A visual observer may be used however it is not required for flights.
- Records of all flights must be made available to the FAA and any other oversight entity (e.g. Center of Excellence).

Certain provisions or restrictions may be waived on a conditional basis through application via the FAA's waiver process.

1.d. Certificate of Authorization (COA)

COA is an authorization issued by the Air Traffic Organization to a public operator (e.g. University) for a specific UAS or RPA activity. After a complete application is submitted, FAA conducts a comprehensive operational and technical review. If necessary, provisions or limitations may be imposed as part of the approval to ensure the UA can operate safely with other airspace users. In most cases, FAA will provide a formal response within a targeted duration of 60 days from the time a completed application is submitted.

Note that traditionally, COAs have been tied both to a specific platform and defined operational area. However, FAA now also provides "blanket" permission to public aircraft operators meeting specific government functions under the "broad area COA". This mechanism allows public UAS operations anywhere in the National Airspace System as long as they stay at or below 200 feet (although some public entities have been approved for increased flying heights). The aircraft must be small (under 55 lbs.) and they must be flown during the day and within the line of sight of the operator. As such, it provides similar flexibility to Part 107 for public aircraft operators with similar restrictions. One major difference between Part 107 and a broad area COA operation is that one must issue a Notice to Airmen (NOTAM) 24 hours prior. These "broad area COAs" were first provided to the FAA designated UAS test sites and are obtainable to support approved government/public aircraft operations.

1.e. FAA Section 333 Exemption

FAA Section 333 (https://www.faa.gov/uas/media/Sec_331_336_UAS.pdf) is a Congressional exemption from the prohibition of commercial UAS flights, defined as an interim policy to speed up airspace authorizations for commercial and university UAS operators who obtain Section 333 exemptions. The new policy helped bridge the gap between the COA process, where every UAS operation is evaluated individually, and the future, final version of the proposed small UAS rule.

Under this policy, the FAA can grant a Certificate of Waiver or Authorization (COA) for flights at or below 200 feet to any UAS operator with a Section 333 exemption for aircraft that weigh less than 55 pounds, operate during daytime Visual Flight Rules (VFR) conditions, operate within visual line of sight (VLOS) of the pilots, and stay certain distances away from airports or heliports.

1.f. Flowchart for decision-making

The flow chart below (Figure 1) may be used by science party and operator institution as a tool to assist them with safe UAS operations in a range of situations. It recommends appropriate steps to take in the pre-planning stages of the activity. The flow chart will be updated regularly as the FAA and UNOLS policies evolve. Note that FAA policies on UAS operation are constantly evolving; this chart is only meant to provide general guidelines for safe and legal operation and one should always refer to the most recent regulations of their governing airspace entity.

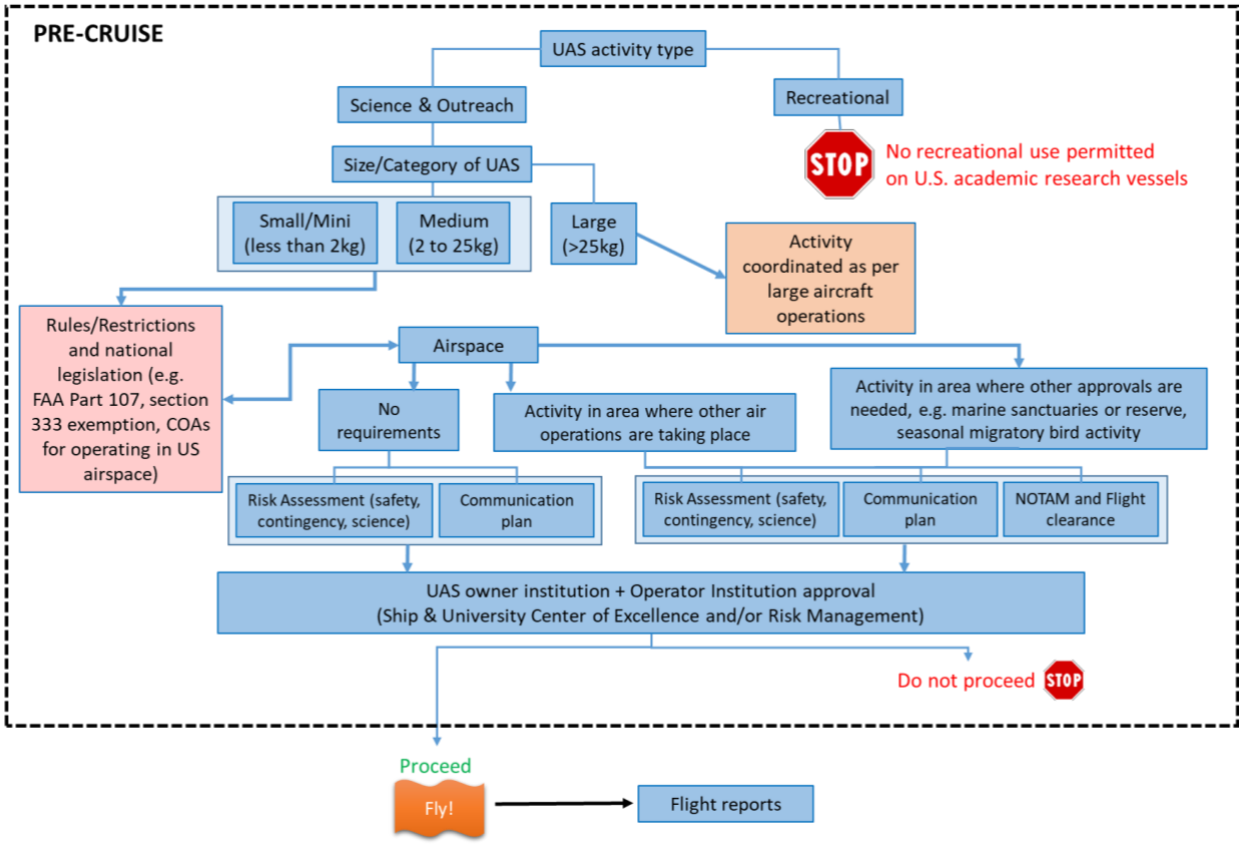


Figure 1. Flowchart for UAS Operation decision-making

1.g. Timeline

Figure 2 shows a typical expedition timeline, highlighting the critical steps needed to ensure a successful UAS deployment during a research cruise.

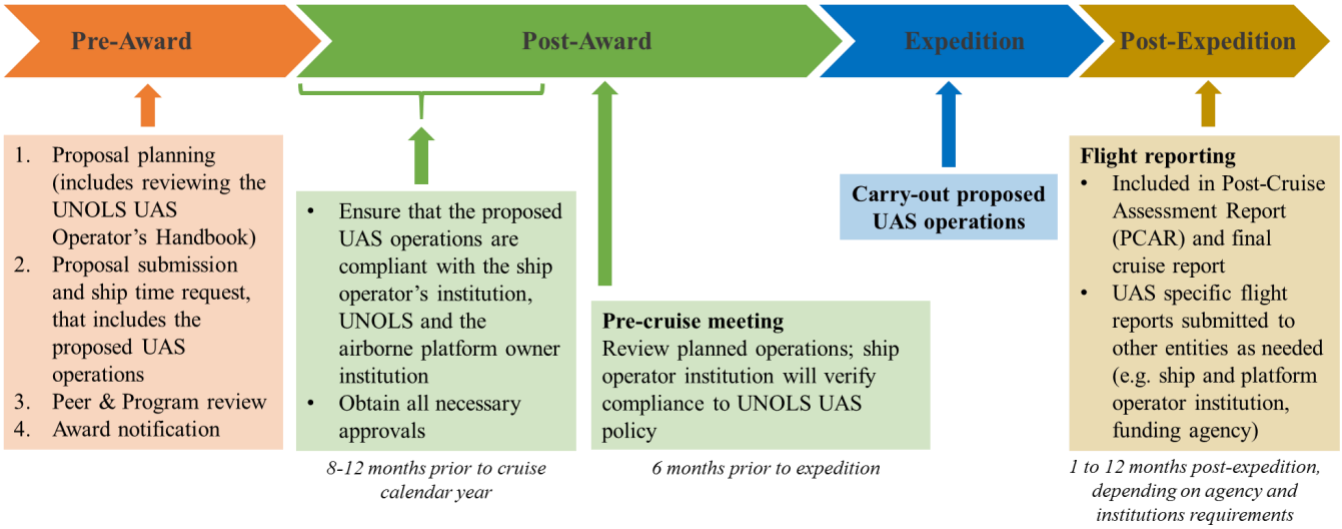


Figure 2. Expedition Planning Timeline.

1.h. Future considerations

With the lack of operational service history and certification experience with UAS, this document does not yet provide specific guidance on procedures for things such as type design and airworthiness certification. Members are encouraged to establish best practices, which should be shared and which may be reflected in future revisions of this Handbook as such experience and service history is obtained.

Chapter 2 – Requirements

Internationally, crewed aircraft operations are heavily regulated. In the case of uncrewed aircraft, the international civil aviation community is currently working on the regulation of UAS operations. Some countries have developed and have in place regulation, while in other countries there is little regulation of uncrewed operations.

In the summer of 2016, the UNOLS Council endorsed the following UAS policy:

"With the recent publication of the FAA small UAS rule, a policy for U.S. academic ships has become necessary. Effective immediately, operation of Uncrewed Aircraft Systems (UAS), or drones, from or over U.S. academic ships may not take place without demonstrated compliance with national or international regulations (ICSA, FAA) and specific approval of the ship's captain or designee, as a minimum. This applies to crew, techs and members of the science party, and refers to all operations, whether recreational, educational, or professional. Obtaining national approvals, such as FAA's Sec 333 exemption or Certificate of Authority or Waiver (COA), as well as pilot qualifications, are not a guarantee the operations will be approved by the ship's captain. Recreational or hobbyist freedom of use over land is not available at sea, so the importance of contacting the ship's operator ahead of time is critical."

UNOLS SCOAR and its subcommittee on UAS Shipboard Operations make the following recommendations to assist with the safe operation of UAS from U.S. academic research vessels, recognizing that as countries develop their own UAS regulation, these recommendations will have to evolve such that it does not contradict their national rules and regulations.

2.a. Planning and Preparation

1) All UAS deployments are to be conducted for support of science, including science support, ship logistics and operations, outreach/documentation of research, and for use in emergency and search and rescue situations. Recreational use is not permitted on U.S. academic research vessels.

2) All proposed UAS operations conducted from an academic research vessel must be approved by the oversight entity of the ship (vessel operator) and UAS operator institution. A number of institutions now have a flight request system in place to check FAA compliance of the proposed effort. The research vessel must have an approved shipboard UAS operations policy tailored to the specific ship.

3) All UAS operational plans must be covered in pre-cruise planning meetings with the research vessel crew.

4) Liability insurance coverage must be compliant with the requirements imposed by the ship operator institution and the institution that owns the UAS or RPA.

5) A reciprocal waiver agreement is required to address the potential liability of the ship operator if the

UAS is damaged while in storage, transit, or while being handled by the ship's crew.

6) Recognizing that there are many regions of the world where no crewed air operations take place and that there are areas that require detailed coordination with range operators (restricted and warning airspace along the coast of continental United States). In these areas, advanced communication of planned UAS operations, emplacement of UAS restrictions (height and radius around crewed air operations locations and facilities) or emplacement of technologies such as "geo-fences" is required.

7) If operations are conducted in waters or airspace where no local regulations are in place, or in high seas, it is recommended to follow the general guidance of the Convention on International Civil Aviation Organization (ICAO). Note that it is the responsibility of the UAS operator to determine that the proposed operation area is clear of any controlled airspace or Air Defense Identification Zones (ADIZ).

8) Where practical, all major components of any UAS must carry identification marks, including any national registration and identification information, in order to identify the pilot and operator for record keeping or in the event of an accident, incident or near-miss. Any such marks, especially on medium and large RPA should be placed on the deployed aircraft in a manner that can be clearly visible during flight. Brightly colored RPAs might be appropriate for over the water use, for retrieval/recovery purposes.

9) Ship operator institutions are to take a common approach to safety risk assessment based on a recognized and commonly accepted air operations framework so that RPA operations can be carried out in as safe a manner as crewed aircraft operations and not present a hazard to persons, property or the ocean environment that is any greater than that attributable to the operation of crewed aircraft preforming the same or similar activity.

10) Each RPA pilot must produce proof of appropriate training and certification, and the ship operator institution must ensure that each RPA pilot is appropriately trained in accordance with national regulations and in a manner that is consistent with, for example, the provisions of Annex 1 to the Convention on International Civil Aviation (ICAO) *Personnel Licensing*, and provides proof of proficiency of training or competency for the specific category and type of RPA to be flown. If the pilot is flying his/her own manufactured RPA, specific airworthiness certification must be required.

11) Ensure that proposed UAS or RPA operations is in compliance with Department of Defense (DoD) requirements if the project or airborne platform is funded by DoD.

2.b. Shipboard Procedures

1) A pre-flight plan must be developed prior to the start of a field experiment using UAS. A standard ship-specific checklist must be used.

2) Risk assessment must be part of a pre-flight check-list to be completed prior to UAS flight operations. All UAS deployments conducted from research vessels must involve appropriate notifications (see Appendix 2). In areas with crewed air operations, use of a communications plan and the NOTAM (or similar) system may be required.

3) Prior to UAS launch, a safety brief must be held for all personnel involved with the operation.

4) All UAS operations conducted from research vessels must contain provisions for safe and appropriate retrieval of waste in the event the UAS suffers an accident as part of its operations.

5) Any UAS accident, incident or near miss must be reported immediately in accordance with Appendix 6.

2.c. Post-Cruise Actions

1) It is strongly recommended that as enabling technology develops, on attributes such as search and avoid capabilities or perception and avoidance systems, that ship and UAS operators consider routine integration of such technologies, after maturation, in UAS deployments.

2) All ship operator institutions must routinely share operational and certification information and any documentation developed, in support of the sharing of best practices and to facilitate the establishment of national accreditation and operational programs.

3) A flight record for each UAS flight should be submitted to the operator institution and UNOLS SCOAR, in accordance with Appendix 5.

Chapter 3 – Supporting materials

This section of the Handbook contains guidance in the form of templates and supporting materials provided by other institutions.

The risk assessment must be part of a pre-flight check-list to be completed prior to UAS flight operations. All UAS deployments conducted from research vessels must involve appropriate notifications (see Appendix 2). In areas with crewed air operations, use of a communications plan and the NOTAM (or similar) system may be required.

Appendix 1: Risk assessment and management

Environmental considerations

As with any activity undertaken from research vessels, at remote locations or not, an Environmental Impact Assessment (EIA) should be used to determine the level of environmental impact a proposed activity is expected to have. That EIA should include waste management and recovery procedures for the safe recovery of any RPA that has crashed.

Safety of human life considerations

In many instances, UAS use provides a safe alternative to crewed aircraft operations. In UAS operations, from the point of view of safety to human life, the most severe possible outcomes are those that result in injury or death to persons on the ground or persons in other aircraft.

Identification of hazards and assessment of risk related to deployment of UAS from research vessels is a continuously applied process that is aimed at ensuring all risks are mitigated to a low or equivalent rating. It also incorporates provisions that allow those risks which cannot be mitigated to be addressed. There are many examples of "Consequence-Probability", or "Cause-Consequence", or "Hazard –Risk" matrices available. The Example below (Table 3.1.1) is of a "cause-consequence" matrix, with severity classifications, likelihood of occurrence and related definitions.

Example of a cause-consequence matrix

Severity/ Likelihood	No Safety Effect	Minor	Major	Hazardous	Catastrophic
Probable					
Remote					
Extremely Remote					
Extremely Improbable					

Table 3.1.1: Example of a cause-consequence matrix, which categorizes risk based on four levels of likelihood of occurrence and five levels of potential severity. Green = low risk; Yellow = medium risk; and Red = high risk. (Chart from Arctic Monitoring and Assessment Programme, AMAP, 2015, page 15).

Severity Classifications and Likelihood of Occurrence

Severity definitions related to occupants of an aircraft do not apply to an uncrewed system. In UAS operations the most severe possible outcomes are those that result in injury to people, either in another aircraft or on the ground. As a result of this, NASA (NASA 2007) has suggested hazard categories for RPAs as shown in Table 3.1.2, and four categories of likelihood of occurrence (Table 3.13).

Severity Level	Definition
Catastrophic	Failure conditions that are expected to result in one or more fatalities or serious injury to persons, or the persistent loss of the ability to control the flight path of the aircraft, normally with the loss of the aircraft.
Hazardous	Failure conditions that would reduce the capability of the RPAs or the ability of the flight crew to cope with adverse operating conditions to the extent that there would be the following: (1) A large reduction in safety margins or functional capabilities; (2) Physical distress or higher workload such that the RPAs flight crew cannot be relied upon to perform their tasks accurately or completely; or (3) Physical distress to persons, possibly including injuries.
Major	Failure conditions that would reduce the capability of the RPAs or the ability of the flight crew to cope with adverse operating conditions to the extent that there would be a significant reduction in safety margins or functional capabilities; a significant increase in flight crew workload or in conditions impairing flight crew efficiency; a discomfort to the flight crew, possibly including injuries; or a potential for physical discomfort to persons.
Minor	Failure conditions that would not significantly reduce RPAs safety and would involve flight crew actions well within their capabilities. Minor failure conditions may include a slight reduction in safety margins or functional capabilities or a slight increase in flight crew workload (such as routine flight plan changes).
No Safety Effect	Failure conditions that would have no effect on safety (that is, failure conditions that would not affect the operational capability of the airplane or increase flight crew workload).

Table 3.1.2: NASA Hazard categories for RPAs. (NASA 2007).

Likelihood of occurrence	Definition
Probable	Anticipated to occur one or more times during the entire system//operational life of an item.
Remote	Unlikely to occur to each item during its total life. May occur several times in the life of an entire system or fleet.
Extremely Remote	Not anticipated to occur to each item during its total life. May occur a few times in the life of an entire system or fleet.
Extremely Improbable	So unlikely that it is not anticipated to occur during the entire operational life of an entire system or fleet.

Table 3.1.3: Four categories of likelihood of occurrence. Each level of likelihood has a qualitative and quantitative definition. This table shows the qualitative definitions (FAA 2000). The quantitative levels vary

across aviation advisory material depending on the aircraft system in consideration.

Appendix 2: Communications plan

Any planned UAS activity should be communicated appropriately to avoid any conflict with other air or surface activities. In areas where there is no crewed air operations control, then in-person or email communications to station or field personnel in the area may be the most appropriate level of communications. It is the responsibility of the ship operator institution to ensure that the plan is submitted and approved prior to the start of the UAS operations.

In areas where there are crewed air operations or in a military controlled area (Warning and restricted airspace along the coast of the United States), a more exhaustive communications plan may be appropriate. An example communications plan is provided in this appendix.

The communications plan should be completed by the UAS operator/pilot, distributed to all other operators working in the same area as the proposed UAS operations prior to any planned UAS operations.

In the event of the cancelation of any planned UAS activity a cancelation notice should be issued as soon as cancelation is confirmed utilizing the same distribution mechanism and list as the communications plan.

Example of **UAS OPERATIONS & COMMUNICATIONS PLAN for Antarctic Ops**

Pilot Contact Information Phone:_____ Email:_____ Other telephone number:_____ Other contact information:_____ (For Vessel Launches) Radio Call Sign: _____ Vessel #:_____ Phone: _____ VSAT: _____ Iridium: _____

7 days prior: Distribute email, including authorization from appropriate authorities (if applicable), to air traffic service providers and appropriate government operators and any non-governmental operators in the area.

7 days prior to 24 hours in advance: Complete NOTAM template (Appendix 3) then contact:_____ by phone: or email: _____ _____ to request a NOTAM be issued for operation area.

24 hours in advance: Obtain and review operation area crewed aircraft operator's schedule for the next day and weather forecasting information. By_____ (Local time) on day of flight, prior to flight, crewed aircraft operators will confirm their daily flight plan(s). Review and alert all conflicts/possible conflicts. Reconsider UAS operations in consultation with manager and air traffic service providers and taking into account weather conditions and weather forecasts.

1 hour prior:

- ☐ Operator files a flight plan through appropriate national Antarctic program unit, following any operational procedures. [It is recommended that flight plans be submitted in accordance with

Chapter 3 of ICAO Annex 2, Rules of the Air.]

- Receive and review weather briefing, review all NOTAMs, and determine if there are any other flight plans on file for the operating area.

- Contact appropriate air traffic service unit via telephone or other acceptable means to confirm that if any special use airspace or altitude reservation (ALTRV) is active.

10 minutes prior: In preparation for launch, broadcast a warning announcement on VHF-FM Channel 16,; e.g., "UAS flight operations are commencing from LAT/ LONG of research vessel or launch site." Maintain a listening watch on VHF-FM Channel 16 for any area traffic.

During flight operations: Periodically broadcast a warning announcement on VHF-FM Channel 16]; e.g., "UAS operations are in effect between the surface and_____feet within 10 nautical miles of LAT/LONG."

Lost Link/Lost Comms (Emergency Comms): Pilot will comply with the lost link/lost comms procedures stipulated in their operating procedures. Operator will immediately contact appropriate person via phone and report the Lost Link condition, time, and LAT/LONG. Immediately broadcast on VHF-FM Channel 16,; e.g., "UAS flight operations are commencing emergency return at_____feet Above Ground Level (AGL)."

Coordination with other operators: This information should be shared with all other operators in the area.

Appendix 3: NOTAMS (Notice to Airmen) or similar notification

In some cases, a NOTAM (or similar) may be required to give notice to crewed aircraft of planned UAS operations. Below is an example of a NOTAM in such instances.

PART 1 : PILOT CONTACT DETAILS	
Contact Person	
Contact Telephone	
Contact Email	

** Your national Antarctic program Air Operations manager will complete a NOTAM for circulating to Antarctic operators from the information provided on this request form. The NOTAM will be posted on [website] and an approved copy returned by email to you.

PART 2 : NOTAM DETAILS			
NOTAM Type		New ☐ Cancel* ☐	Replace* ☐
* If you selected CANCEL or REPLACE, please indicate the previous NOTAM number ☐			
A	Launch Location (long/lat)		FORMAT – Degrees Minutes Decimal Seconds
	Centre of flight location (long/lat)		FORMAT – Degrees Minutes Decimal Seconds
	Radius of flight (metres)		
B	Valid From Time	UTC	FORMAT – YYMMDD hhmm
C	Valid To Time	UTC	FORMAT – YYMMDD hhmm
D	Daily Schedule		
E	NOTAM Text	(includes details of platform and mission description)	
F	Lower and Upper Limit	FEET above terrain	
PART 3 : AUTHORISATION (to be completed by air operations)			
The information in this NOTAM request is declared as accurate/authorised for promulgation.			

Air Unit		Field/Ship Ops		Environmental	
Name					
Signature			Date		

On completion return to: _____

Guidance on completion of form

User/Pilot

1) Enter your contact information into Part 1.
2) In Part 2 select either new if new request, replace if updating or resubmitting request and cancel if no longer require that UAS mission.
3) Enter in 2A location (longitude/latitude) of launch and centre of flying area in Degrees Minutes Decimal Seconds for center of flying area and in NOTAM text add name of site [e.g. White Nunatak, Syowa Station, from SA Agulhas II vessel] and radius of flight (meters).
4) Enter in 2B/C/D the UTC date and time for when on location.
5) Enter in 2F maximum flying height above terrain in feet.
6) Enter in 2E any further relevant information that qualitatively describes the mission to be flown such as platform type and any particular flying characteristics [e.g. DJI's Flamewheel F550 hex rotor hovering over location at different points
above the survey area].

Air unit/Station admin/Ship admin

1) Confirm with field ops/station leader that request for NOTAM is approved; [at this stage it may be required to contact environment office, air unit, ships or health & safety if appropriate no prior approval or permitting has been done for the operation of the UAV.]
2) If approved, transfer information on to NOTAM website and activate as required. If not approved await resubmission of approved NOTAM and do not fly.
3) Transfer information on to NOTAM form for circulation to other operators in the area.
4) Circulate NOTAM.

Appendix 4: Reporting, record-keeping and sharing of information-Pilot Record

In order to record the pilot history and particulars related to each pilot, a pilot should maintain a pilot log form which is a record of flights completed, including location, aircraft make and model, types of take-off and landings, and flight times. A pilot should carry this record with him/her at all times while operating UAS in hard copy or electronic format.

Date	Time		Aircraft		Location		Mission	Pilot	Others
	Start	End	Make/model	Name/registration	Launch Lat/long	Flight radius			

		Flight duration		Type of piloting time		
Type of takeoff	Type of landing	VLOS	BVLOS	In command	Instructor	Signature

Appendix 5: Reporting, record-keeping and sharing of information-Flight Record

In order to record the flight history of all UAS operations undertaken from UNOLS research vessels, a pilot should complete and submit a flight record report (Appendix 5) after the completion of each UAS flight. The flight record is specific to the aircraft flown, the payload and the mission parameters. When complete, flight records should be submitted to the operator institution and UNOLS SCOAR.

Date	Time
Aircraft	
Flights/hours since last major inspection	Flights/hours remaining until next major inspection

Payload (instruments, comments)
Comms link(s) (type, comments)

Fuel weight	Payload weight
TOW	Without wings

PIC (start of flight)
Pilot
Other persons

Mission description (include whether VLOS, EVLOS, BVLOS and BRLOS)

Weather conditions

Wind	Temperature
Precipitation	Visibility
Air pressure	
Launcher	Pressure used
Takeoff location	Battery voltage
Control tower	Tower notified time start

Flight log

Takeoff time		Hand-overs
Time	Incidence	Time/Role/Name
Landing time		Tower notified stop time

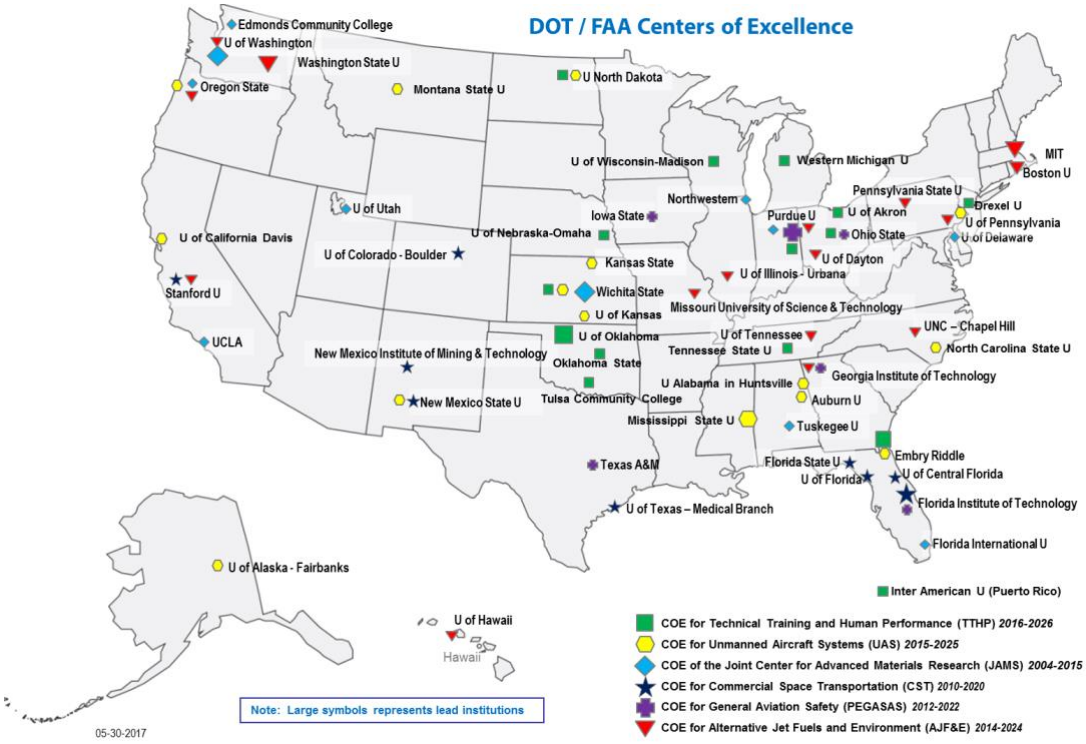
Landing location
Fuel consumed
Battery charge
Flight duration

Distance flown		
Battery voltage		
Notes		
Signature(s)		

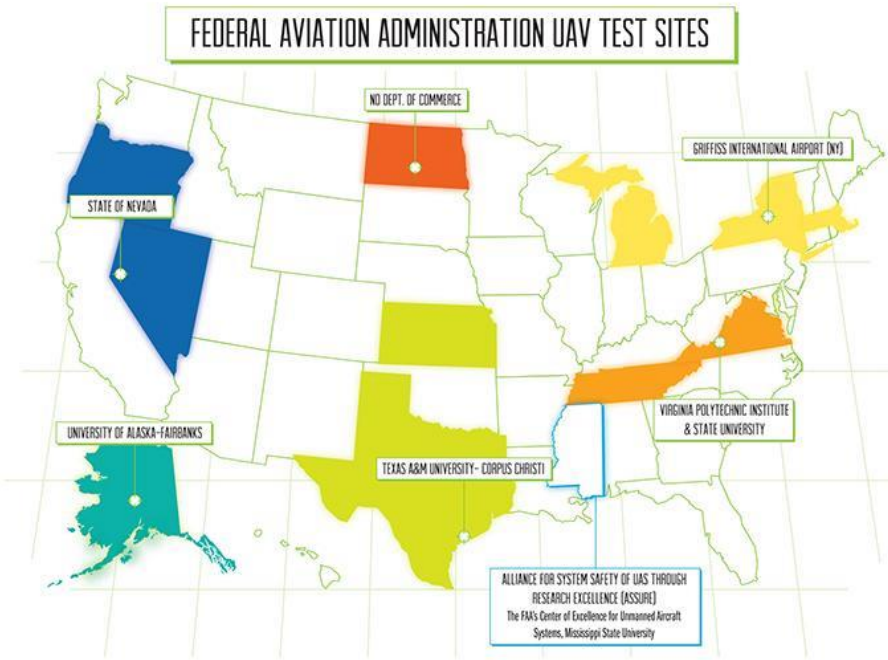
Appendix 6: Reporting, record-keeping and sharing of information - Accident, Incident and Near-Miss Reporting

Any UAS flight that is interrupted by an event which then causes an accident, incident or near-miss of any type, should be reported immediately to the air operation unit that had oversight of the operational plan, and may require the completion of an accident, incident or near-miss reporting form.

Appendix 7: Centers of Excellence and FAA Test Sites



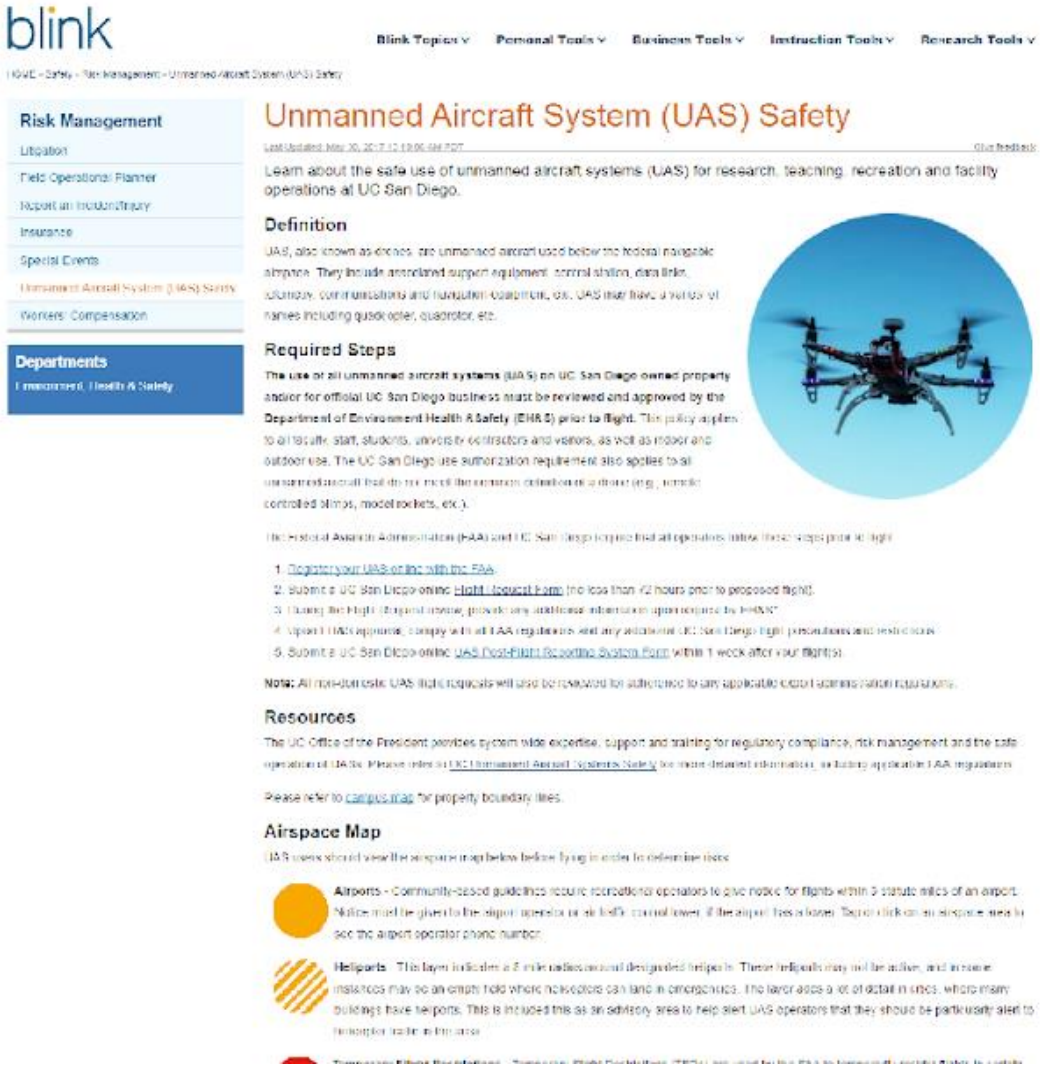
The UAS Test Sites support UAS integration by providing an avenue for the UAS industry and stakeholder community to conduct more advanced UAS research and operational concept validation.


FEDERAL AVIATION ADMINISTRATION UAV TEST SITES
ND DEPT. OF COMMERCE
GRIFFISS INTERNATIONAL AIRPORT (NY)
STATE OF NEVADA
VIRGINIA POLYTECHNIC INSTITUTE & STATE UNIVERSITY
UNIVERSITY OF ALASKA-FAIRBANKS
TEXAS A&M UNIVERSITY- CORPUS CHRISTI
ALLIANCE FOR SYSTEM SAFETY OF UAS THROUGH RESEARCH EXCELLENCE (ASSURE)
The FAA's Center of Excellence for Unmanned Aircraft Systems, Mississippi State University

Appendix 8: Operator Institution Points of Contacts

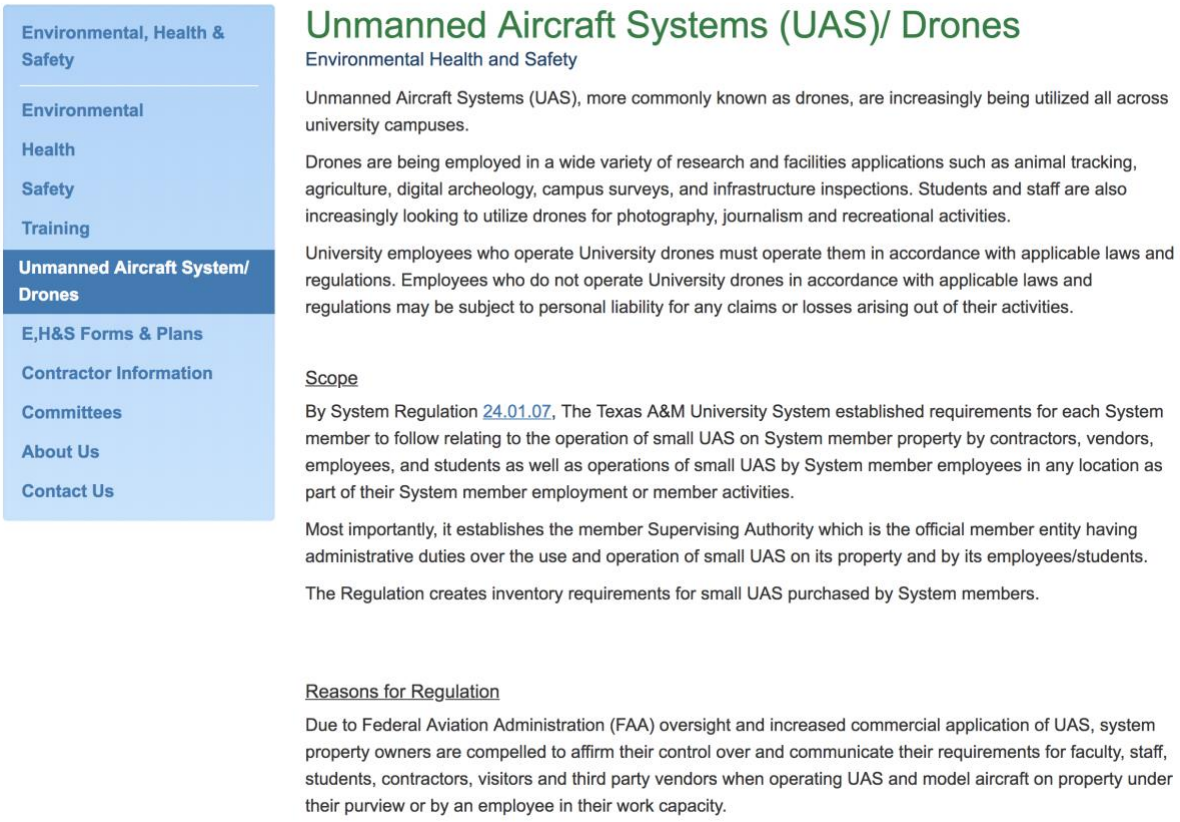
- **Scripps Institution of Oceanography – University of California San Diego**

POC: Uncrewed Aircraft System Safety group
https://blink.ucsd.edu/safety/risk/uas-drones.html



- **Texas A&M University-Corpus Christi**

POC: Environment, Health & Safety
https://safety.tamucc.edu/index.html



Appendix 9: Instrumentation – Environmental Review

LASER and electromagnetic (EM) radiation instrumentation when utilized on UAS operated from seafaring vessels within marine environments and sanctuaries, needs to strictly follow industry and research community safety standards as would be followed in any normal operating procedure. The following provides safety information on LASER operations and similar information and guidelines should be found and followed for safe operation of other EM radiation instrumentation.

Following information is taken from UTHealth Laser Safety Manual, https://www.uth.edu/safety/radiation-safety/Laser%20Safety%20Manual%20UTHSC-H%20Aug%202013.pdf, 2013).

LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. Laser is another form of radiation. The light energy generated by a laser is in or near the optical spectrum of light and amplified to extremely high intensity. This light energy is expressed as a laser's wavelength in nanometers (nm). The laser radiation is an intense, highly directional beam of light that can be directed, reflected, or focused on an object. The object will partially absorb the light, raising the temperature of the surface and/or interior of the object, and causing changes in the object. The primary mechanism of beam damage for most lasers therefore, is thermal. This is the primary hazard when using an infrared (IR) or visible laser. When the wavelength of the laser is in the ultraviolet (UV) region, then photochemical effects can occur in the object. The intensity of the radiation that may be emitted and the associated potential hazards depend upon the type and classification of laser, the wavelength of the energized beam, and the proposed uses of the laser system.

The safe use of laser systems depends upon the basic principles of recognition, evaluation, and control of potential hazards. This program will review laser operations, the associated potential hazards, responsibilities of the laser user community, and the services provided by the Radiation Safety Program to help in the safe

use of laser radiation.

CLASSIFICATIONS

Lasers are divided into a number of classes depending upon the power or energy of the beam and the wavelength of the emitted radiation. Laser classification is based on the laser's potential for causing immediate injury to the eye or skin and/or potential for causing fires from direct exposure or reflection off diffuse and reflective surfaces. Commercially produced lasers have been classified and identified by labels affixed to the laser since August 1, 1976. Any use of laser emitting devices (e.g. lidar scanner) upon UAS operating on research vessels must adhere to eye-safety standards during operation for the laser class defined for that instrumentation as follows:

1. **Class 1 laser or laser system**- cannot emit levels of optical radiation above the exposure limits for the eye under any exposure conditions inherent in the design of the laser product. For visible laser with wavelengths longer than 500 nm, the limit is 0.4 mW. For lasers of wavelengths shorter than 500 nm, the limit is 0.04 mW. There may be a more hazardous laser embedded in the enclosure of a Class 1 product, but no harmful radiation can escape from the enclosure. Class 1 lasers or laser systems are relatively safe, as long as the system is not modified.
2. **Class 1M laser system**- a class 1 laser using magnifying optics. Incapable of causing injury during normal operation unless collecting optics are used.
3. **Class 2 laser or laser system**- emits a visible laser beam which by its very bright nature will be too dazzling to stare into for extended periods. Momentary viewing is not considered hazardous. The upper radiant power limit on this type of device is 1 mW which corresponds to the total beam power entering the eye for a momentary exposure of 0.25 seconds. Class 2 lasers or laser system requires no special safety measures other than not staring into the beam.
4. **Class 2M laser system**- a class 2 laser using magnifying optics. Visible lasers incapable of causing injury in 0.25 seconds unless collecting optics are used.
5. **Class 3 laser**- can emit any wavelength, but cannot produce a diffuse or scattered reflection hazard unless focused or viewed for extended periods at close range. Safety training must be completed by the laboratory personnel before using these lasers. In addition, the laser should be operated within a well marked and controlled area. Class 3 is divided into two sub-classes 3R (formally 3A) and 3B.
    a. **Class 3R** lasers are "Marginally Unsafe." This means that the aversion response is not adequate protection for a direct exposure of the eye to the laser beam, but the actual hazard level is low, and minimum precautions will result in safe use. This sub-class only allows visible lasers with a maximum continuous wave (CW) power of 5mW and an invisible laser with a CW power of up to 5 times the Class 1 limit. It is also not considered a fire or serious skin hazard. Since the output beam of such a laser is definitely hazardous for intrabeam viewing, control measures must eliminate this possibility.
    b. **Class 3B** lasers are hazardous for direct eye exposure to the laser beam, but diffuse reflections are not usually hazardous (unless the laser is near the class limit and the diffuse reflection is viewed from a close distance). This subclass includes CW or repetitive pulse lasers with a maximum average power of 0.5 W. The maximum pulse energy for a single pulse class 3B laser in the visible and near IR varies with the wavelength. For visible lasers the maximum pulse energy is 30mJ. It increases to 150 mJ per pulse in the wavelength range of 1050-1400 nm. For UV and the far IR the limit is 125 mJ. Class 3B lasers operating near the upper power or energy limit of the class may produce minor skin hazards. Most Class 3B lasers do not produce diffuse reflection hazards. However, single pulse visible or near IR class 3B lasers with ultra-short pulses can produce diffuse reflection hazards at more than a meter from the surface. Eye protection may be needed while the laser is operating.

6. Class 4 laser- any that exceeds the Annual Exposure Limit (AEL) of a Class 3 device. Class 4 lasers have an average power level greater than 0.5 W. The lower power limit for single pulse Class 4 lasers varies from 0.03 J for visible wavelengths to 0.15 J for some near IR wavelengths. These lasers are powerful enough to be a fire, skin, and diffuse reflection eye hazard. Class 4 lasers require the use of eye protection, facility interlocks, and special safeguards.

Appendix 10: FAA Frequently Asked Questions (FAQs) (taken from https://www.faa.gov/uas/ in August 2018)

a) What is an uncrewed aircraft system (UAS)?

An uncrewed aircraft system is an uncrewed aircraft and the equipment necessary for the safe and efficient operation of that aircraft. An uncrewed aircraft is a component of a UAS. It is defined by statute as an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft (Public Law 112-95, Section 331(8)).

b) Is a UAS the same as a model aircraft?

Congress defined a "model aircraft" as a UAS that meets all of the following:

- Is capable of sustained flight in the atmosphere
- Is flown within visual line-of-sight of the person operating it
- Is flown for hobby or recreational purposes

c) Who do I contact if my question isn't answered on the UAS website?

We encourage you to first read all of the information on the website and browse our Frequently Asked Questions. If you still have questions or concerns, you may contact the FAA's UAS Integration Office via uashelp@faa.gov or by calling 844-FLY-MY-UA.

d) Is the Small UAS Rule effective?

Yes. The Small UAS Rule came into effect on August 29, 2016.

e) How can non-US citizens fly UAS for commercial purposes in the United States?

Non-U.S. citizens who want to fly for commercial purposes may do so under the Small UAS rule (Part 107) by getting a Remote Pilot Certificate (RPC) issued by the FAA. The FAA does not currently recognize any foreign Remote Pilot Certificate or equivalent because globally-recognized RPC standards have not yet been developed. To obtain an FAA-issued RPC, they must submit an application for foreign air carrier economic licensing. Application instructions are specified in 14 C.F.R. Part 375 and should be submitted by electronic mail to the Department of Transportation (DOT) Office of International Aviation, Foreign Air Carrier Licensing Division. Additional information is available at https://cms.dot.gov/policy/aviation-policy/licensing/foreign-carriers.

f) How do I fly a UAS for work or business purposes?

There are three ways to fly a UAS for work, business, or non-recreational reasons:

- Following the requirements in the Small UAS rule (Part 107)
- Following the rules in your Section 333 grant of exemption
- Obtain an airworthiness certificate for the aircraft

g) I am part of a Federal/State/local government office – how can I fly a UAS to support a specific mission e.g. search and rescue?

You may either operate under the Part 107 rule, or you may be eligible to conduct public aircraft operations for which you would need to apply for a public Certificate of Waiver or Authorization (COA) for certain operations.

h) What options do I have if my operation is not permitted under these rules (Part 107)?

If you are operating an uncrewed aircraft that weighs less than 55 pounds, generally you may apply for a Part 107 waiver (special permission) to conduct your operation. Your waiver application must outline how you intend to safely conduct your proposed operation, including any additional risk mitigation strategies you may use. An online portal will be available through www.faa.gov/uas for UAS operators to apply for waivers to applicable parts of the rule. Get more information in the FAQ section on Permissions, Authorizations, Waivers, and Exemptions.

i) Does the new Small UAS Rule (part 107) apply to recreational UAS operations?

Part 107 does not apply to UAS flown strictly for fun (hobby or recreational purposes) as long as these uncrewed aircraft are flown in accordance with the Special Rule for Model Aircraft (Section 336 of P.L. 112-95). Visit our "Fly for Fun" webpage for safety rules and guidelines that apply to recreational UAS operations. The small UAS rule codifies the provisions of section 336 in part 101 of the FAA's regulations, which will prohibit operating a UAS in manner that endangers the safety of the National Airspace System.

j) How do I know where it is OK to fly and where it is not OK to fly?

The FAA has developed a mobile app called B4UFLY to help recreational UAS operators know whether there are any restrictions or requirements where they want to fly. Additional guidance is also available in the "Where to Fly" section of this website.

k) Can I fly a model aircraft or UAS over a stadium or sporting events for hobby or recreation?

No. Federal law restricts UAS from flying at or below 3,000 Above Ground Level (AGL) within a 3 nautical mile radius of any stadium with a seating capacity of 30,000 or more people during a Major League Baseball (MLB), regular or post-season National Football League (NFL), or NCAA Division I football game, or major motor speedway event. This temporary flight restriction applies to the entire U.S. domestic National Airspace System, and takes effect starting one hour before the scheduled event

time until one hour after the event concludes. The FAA gives further detail in a Notice to Airmen (NOTAM.)

l) Do I have to notify all airports within five miles of where I want to fly recreationally?

Yes, you must contact any airports (including heliports and sea-based airports) and air traffic control towers within five miles of your proposed area of operations if flying under the Special Rule for Model Aircraft (Public Law 112-95, Section 336).

m) Can an airport operator object to model aircraft flights near an airport?

Yes, an airport operator can object to the proposed use of a model aircraft within five miles of an airport if the proposed activity would endanger the safety of the airspace. However, the airport operator cannot prohibit or prevent the model aircraft operator from operating within five miles of the airport. Conducting an operation in spite of the objection of an airport operator may be evidence that the model aircraft operator was endangering the safety of the National Airspace System.

n) I already have a pilot certificate issued under part 61. Do I need to obtain a remote pilot certificate to fly a UAS under the Small UAS Rule (Part 107)?

Yes. To act as a remote pilot in command under Part 107, a person must have a remote pilot certificate. However, part 61 pilot certificate holders who have completed a flight review within the past 24 months may elect to take an online training course focusing on UAS-specific areas of knowledge instead of the aeronautical knowledge test. The online training for current pilot certificate holders is available at www.faasafety.gov. All other members of the public must take and pass the initial aeronautical knowledge test to obtain a remote pilot certificate.

o) How can I find the closest FAA-approved Knowledge Testing Center to me?

A list of Knowledge Testing Centers (PDF) is available. You may also contact the Knowledge Test Service Providers directly to schedule your test:

- CATS: Call 800-947-4228
- PSI: Call 800-211-2754

p) Where can I find study materials for the aeronautical knowledge test?

Study materials are available online. Applicants are encouraged to review the Airman Certification Standards (ACS) for Uncrewed Aircraft Systems (PDF), the Remote Pilot Study Guide (PDF), and the online sample questions (PDF)before taking the Knowledge Test.

q) How much does it cost to get a remote pilot certificate?

Knowledge Testing Centers charge approximately $150 to people seeking to take the initial aeronautical knowledge test.

r) Will the FAA recognize any previous UAS training I've taken?

No. However, prior military or civil aviation-related training may be helpful to new applicants preparing for the aeronautical knowledge test. There is no required practical training to fly under the Part 107 rule or to get a remote pilot certificate.

s) Once I complete the aeronautical knowledge test at one of the approved centers, what is the process for obtaining my pilot certificate from the FAA?

After you have passed the initial aeronautical knowledge test, you will then complete the FAA Airman Certificate and/or Rating Application (known as IACRA) to receive a remote pilot certificate. IACRA is a web-based certification/rating application that ensures you meet the requirements and electronically submits the application to the FAA's Airman Registry. Applications should be validated within 10 days. Applicants will then receive instructions for printing their temporary airman certificate, which is good for 120 days. The FAA will then mail you your permanent Remote Pilot Certificate within that 120 days.

t) What happens if I fail the aeronautical knowledge test? How soon can I retake the test?

You may retake the test after 14 days.

u) What do I need to bring with me to take the aeronautical knowledge test?

All applicants must bring a valid and current form of identification that includes their photo, date of birth, signature, and physical residential address. Acceptable forms of identification include:

What to bring in order to take the knowledge test	
U.S. Citizen and Resident Aliens	**Non-U.S. Citizens**
Driver permit or license issued by a U.S. state or territory U.S. Government identification card U.S. Military identification card Passport Alien residency card	Passport AND Driver permit or license issued by a U.S. state or territory OR Identification card issued by any government entity

More information is available in the FAA Airman Knowledge Testing Matrix (PDF).

v) How can I tell what class of airspace I'm in?

Under the Small UAS Rule (part 107) (PDF), operators must pass an aeronautical knowledge test to obtain a Remote Pilot Certificate. This test will quiz prospective operators on how to use aeronautical charts to determine airspace classifications.

For reference, aeronautical charts and a Chart User's Guide are also available on the FAA's website. These charts are the FAA's official source of airspace classifications.

Additionally, the FAA's *B4UFLY* app, which is designed to help recreational UAS flyers know where it's safe to fly, shows users if they are in controlled airspace (Class B, C, D, or E airspaces) in a given or planned location. If the app's status indicator is yellow ("Use Caution – Check Restrictions"), a user is in uncontrolled (Class G) airspace.

w) How do I request permission from Air Traffic Control to operate in Class B, C, D, or E airspace? Is there a way to request permission electronically?

You can request airspace authorization through an online web portal available at www.faa.gov/uas/request_waiver.

x) Can I contact my local air traffic control tower or facility directly to request airspace permission?

No. All airspace permission requests must be made through the online portal.

y) Do I need a Section 333 exemption, or any other kind of special permission, to fly now that the Small UAS Rule is effective?

If you are operating a small UAS under the Small UAS Rule, once you have obtained your remote pilot certificate, and registered your aircraft, you can fly in Class G airspace as long as you follow all the operating requirements in the Rule (Part 107).

z) What happens to my Section 333 exemption now that the Small UAS Rule is effective?

Your Section 333 exemption remains valid until it expires. You may continue to fly following the conditions and limitations in your exemption. If your operation can be conducted under the requirements in the Part 107, you may elect to operate under Part 107. However, if you wish to operate under part 107, you must obtain a remote pilot certificate and follow all the operating rules of Part 107.

aa) Can my blanket Section 333 Certificate of Waiver or Authorization (COA) transfer to my UAS operation under part 107?

No. If you fly following the requirements of Part 107, you must comply with the operating provisions specified in part 107. Part 107 limits your altitude to 400 feet unless your uncrewed aircraft is flying within 400 feet of a structure (in which case you may not fly higher than 400 feet above the top of that structure). Part 107 also limits your operation to Class G airspace unless you obtain FAA permission prior to the operation to fly in controlled airspace. The blanket COA issued with your Section 333 exemption is only valid if you continue flying using the conditions and limitations in your exemption.

bb) Am I better off flying under the Part 107 rule or my Section 333 exemption?

It depends on what you want to do. UAS operators need to compare the conditions and limitations in their individual Section 333 exemption to the operating requirements in the Part 107 rule to determine which operating rules best address their needs.

cc) Can I use the new airmen certification to fulfill the pilot-in-command requirement of my Section 333 exemption?

No. You cannot "mix and match" the conditions and limitations in your Section 333 exemption with the Part 107 rule operating requirements. Section 333 exemption holders have two choices:

1. Continue to fly using their Section 333 exemption, following the conditions and limitations in the exemption
   OR
2. Get a remote pilot certificate and start flying under the Part 107 rule, following all operating rules and requirements.

dd) Is the new Small UAS Rule retroactively applied to 333 exemption holders?

No. Current Section 333 exemption holders have two choices:

1. Continue to fly using their Section 333 exemption, following the conditions and limitations in the exemption
   OR
2. Get a remote pilot certificate and start flying under the Part 107 rule, following all operating rules and requirements of Part 107.

ee) I already applied for a Section 333 exemption or have a pending request for amendment. What do I do?

The FAA has posted a letter to your docket folder on www.regulations.gov. If your operation can be conducted under the Small UAS Rule (Part 107), your petition will be closed out. If your operation

requires a waiver to Part 107 or cannot be conducted under the Rule, the FAA will contact you with specific information about the status of your Section 333 petition.

ff) Will the FAA be issuing renewals for current Section 333 exemptions?

For the most part, no. If your operation can be flown under the Part 107 rule, the FAA will not renew your exemption once it expires. If you cannot operate under the requirements of the Small UAS Rule, you will need to renew your Section 333 petition once it expires.

gg) How do I apply for a waiver to the requirements of the Part 107 rule?

Waivers are special permissions the FAA issues to authorize certain types of UAS operations not covered under the Part 107 rule. Learn more about applying for waivers to part 107.

hh) Once I submit my waiver request, how long before the FAA makes a decision? And how will I be notified?

Waiver processing times will vary depending on the complexity of the request. We encourage applicants to submit waiver requests well in advance of when they need a waiver – 90 days is strongly encouraged. Applicants will be notified via email about the outcome of their waiver processing.

ii) Will I still need a COA to fly under the Part 107 rule?

If you already have a Certificate of Waiver or Authorization (COA), you can continue to fly under those COA requirements until it expires. Section 333 exemption holders may operate under the terms of their exemptions and COAs until they expire. Public aircraft operators such as law enforcement agencies, state or local governments, or public universities may continue to operate under the terms of their COAs.

If you don't already have a Section 333 exemption and associated COA, and you are not conducting a public aircraft operation, you probably don't need one now that Part 107 is out. Civil UAS operations flown under the new rules do not require the UAS operator to get a COA.

Please contact the FAA's Air Traffic Organization for more information.

jj) Why do I need to register my UAS?

Federal law requires that small uncrewed aircraft weighing more than .55 pounds and less than 55, be registered with the FAA and marked with a registration number, either by registering online or by using the legacy paper based registration process.

kk) What is the difference between registering a UAS flown for under the Special Rule for Model Aircraft vs. UAS not flown as model aircraft?

If you operate your UAS exclusively under the Special Rule for Model Aircraft, you must use the web-based registration process to register once and apply your registration number to as many UAS as you want.

Uncrewed aircraft flown not as model aircraft must be registered individually by the owner, and each registration costs $5. Registrants must supply their name, address, and email address, in addition to the make, model, and serial number (if available) for each UAS they want to fly.

ll) Do I always have to have my Certificate of Aircraft Registration with me while flying my UAS?

Yes. You must have the FAA registration certificate in your possession when operating an uncrewed aircraft. The certificate can be available either on paper or electronically.

If another person operates your UAS, they must have the UAS registration certificate in their possession. You can give them a paper copy or email a copy to them.

Federal law requires UAS operators who are required to register (those not flying exclusively under the Special Rule for Model Aircraft) to show the certificate of registration to any Federal, State, or local law enforcement officer if asked. You can show it electronically or show the printed certificate.

mm) If my UAS weighs more than 55 lbs., what are the registration requirements?

It must be registered using the FAA's paper-based registration process.

nn) If my registered UAS is destroyed or is sold, lost, or transferred, do I need to do anything?

You should cancel your registration through the FAA's online registration system.

oo) How do I mark my uncrewed aircraft with my unique registration number?

If you complete registration using the web-based registration process and satisfy the registration requirements, you may use a permanent marker, label, or engraving, as long as the number remains affixed to the aircraft during routine handling and all operating conditions and is readily accessible and legible upon close visual inspection. Refer to this pdf (PDF, https://www.faa.gov/uas/getting_started/model_aircraft/media/UAS_how_to_label_Infographic.pdf) for additional details.

Requirements for marking uncrewed aircraft registered in accordance with the legacy registration system can be found in 14 CFR Part 45, subpart C. Guidance material on aircraft marking requirements in Part 45 can be found in Advisory Circular No. 45-2E Identification and Registration Marking.

pp) Is there a penalty for failing to register?

Failure to register an uncrewed aircraft that is required to be registered may result in regulatory and criminal penalties. The FAA may assess civil penalties up to $27,500. Criminal penalties include fines of up to $250,000 and/or imprisonment for up to three years.

There is no one-size-fits-all enforcement action for violations. All aspects of a violation will be considered, along with mitigating and aggravating circumstances surrounding the violation. In general, the FAA will attempt to educate operators who fail to comply with registration requirements. However, fines will remain an option when egregious circumstances are present.

qq) Who do I contact with registration questions or problems?

You may email registration questions to UASregistration@faa.gov. Live phone support is also available at (877) 396-4636 or international (703) 574-6777 from 10 a.m. - 6 p.m. ET Monday through Friday.

rr) How do I submit an accident report under the Small UAS Rule (Part 107) to the FAA?

An online portal is available through www.faa.gov/uas for the remote pilot to report accidents in accordance with reporting requirements in the Part 107 rule. Accident reports may also be made by contacting your nearest FAA Flight Standards District Office (FSDO).

ss) When do I need to report an accident?

The remote pilot in command of the small UAS is required to report an accident to the FAA within 10 days if it results in at least serious injury to any person or any loss of consciousness, or if it causes damage to any property (other than the UAS) in excess of $500 to repair or replace the property (whichever is lower).

tt) If someone's UAS crashes in my yard, hurts someone, or damages my property, what do I do?

Call local law enforcement. Law enforcement personnel will contact the FAA if the crash investigation requires FAA participation.

uu) What should I do if I see someone flying a drone in a reckless or irresponsible manner?

Flying a drone in a reckless manner is a violation of Federal law and FAA regulations and could result in civil fines or criminal action. If you see something that could endanger other aircraft or people on the ground, call local law enforcement.