Unmanned Aircraft Systems (UAS) Interim Standard Operating Guide (SOG)

1. Purpose / Background

The use of UAS can make significant contributions to MIT research, education, service, and outreach in a variety of disciplines. MIT seeks to permit UAS to be utilized productively by members of the community. This SOG establishes certain procedures to ensure compliance with applicable federal, state, and local regulations and to reduce risks to persons, property, security and privacy.

The operation of UAS, including drones and model aircraft, is regulated by the Federal Aviation Administration (FAA), and changes to the regulatory framework are emerging and multi-faceted. As the law continues to evolve, this policy will be modified as needed to remain compliant.

2. Scope

This SOG applies to:

- MIT employees and students operating unmanned aircraft systems (UAS) in any indoor or outdoor location, including off campus, as part of their Institute employment or as part of Institute activities;
- The operation by any person of unmanned aircraft system or model aircraft on or above MIT property;
- The purchase, development or construction of unmanned aircraft systems with funding through MIT, and;
- The hiring or contracting for any unmanned aircraft services by an MIT DLC.

This SOG does not apply to the use of UAS at Lincoln Laboratory, which is governed by a separate Lincoln Laboratory policy.

3. Prerequisites

Prior to outdoor UAS flight, operator must hold a remote pilot airman certificate or part 61 pilot certificate or be under the direct supervision of a person who does hold a remote pilot airman certificate or part 61 pilot certificate. UAS must be registered with the FAA.

4. Procedures

4.1 Rules Applicable to all UAS Operations at MIT:

4.1.1 Only small UAS as defined by 14 CFR Part 107 and FAA Advisory Circular 107-2 (see Appendix A) are permitted on MIT campus.

4.1.2 All MIT operators of UAS must read and operate in accordance with this SOG.

4.1.3 UAS shall not be used to monitor or record areas where there is a reasonable expectation of privacy in accordance with accepted social norms. If operating a UAS for purposes of recording or transmitting visual images, operators must comply with applicable privacy laws.

4.1.4 The campus community should report violations of this policy, as well as any reckless, irresponsible and/or malicious activity involving UAS, to MIT Police.

4.1.5 All accidents or near misses with UAS must be reported to EHS.

4.1.6 In order to operate UAS at off campus, non-MIT locations, written permission from the property owner is required.

4.1.7 International Use. Some UAS, as well as their embedded camera chips, are heavily restricted by US Export Control Law both by the International Trafficking in Arms Regulations (ITAR) and Export Administration Regulations (EAR). You are free to use, ship (unless to an OFAC-sanctioned country) and share EAR99 category items, but you cannot bring ITAR-controlled items to MIT without approval, share them with non-US persons or ship them out of the country. EAR-controlled items also have some restrictions. Prior to purchasing or utilizing a UAS, individuals should contact MIT's Export Control Officer (exportcontrolhelp@mit.edu) to determine whether an approved Technology Control Plan is necessary. Although FAA regulations will not apply to flying UAS in airspace outside the U.S., jurisdictional, country-specific, and local laws may still apply to the use of UAS. Please contact the Office of the General Counsel for further assistance (mitogc@mit.edu).

4.1.8 All members of the MIT community are responsible for complying with Institute SOG on UAS as well as with FAA regulations and other applicable federal, state, and local laws.

4.2 Procedures for Outdoor Flights:

Outdoor flights of UAS are governed by FAA regulations. Operators are also responsible for abiding by the guidance below.

4.2.1 Any MIT employee or student wishing to operate UAS for MIT programs for research or educational purposes (collectively, the "MIT-related purposes") must operate in accordance with FAA regulations -- 14 CFR Part 107, Operation and Certification of Small Unmanned Aircraft Systems, FAA Advisory Circular 107-2 and this SOG.

4.2.2 Flight operations over MIT-owned property shall occur at locations designated for UAS flights with permission from the DLC representative authorized to manage the space. (See Appendix B for current list). Any flights over MIT's Cambridge campus within 5 nautical miles of Logan Airport, would also require approval from FAA Headquarters (When MIT obtains blanket approval from FAA Headquarters, to operate UAS within certain timeframes, this will not be required).

4.2.3 Any third party wishing to use a UAS or model aircraft on or over MIT property must receive prior approval from EHS, the Insurance Office, and the DLC manager of the space. Third parties planning to use UAS must also provide proof of FAA registration and approval and furnish evidence of UAS liability insurance. Operation of a UAS by a third party over Institute property will only be permitted by written agreement.

4.2.4 Any MIT party wishing to use UAS for non-research or non-educational use on or over MIT property must receive prior approval from EHS, the Insurance Office, and the DLC manager of the space.

4.2.5 Operators of UAS on MIT campus must meet the FAA requirements listed in Appendix A. Most of the restrictions listed are waivable if the operator can demonstrate that the flight can be conducted safely under the terms of a certificate of waiver from the FAA.

DLCs or researchers wishing to apply for a certificate of waiver should request the waiver through EHS and the Office of General Counsel who will submit the request to the FAA.

4.2.6 With the exception of model aircraft (as defined by the FAA, and as authorized by MIT, in its sole discretion), UAS that are not governed by FAA Part 107 and Advisory Circular 107-2 (as described in Appendix A) are not permitted on MIT campus.

4.2.7 Because of the close proximity to Fenway Park, the FAA may issue temporary flight restrictions, or Notices to Airmen (NOTAMs), during an event involving crowds of 30,000 or more. All UAS operators authorized to operate UAS on the MIT campus must check NOTAMs prior to each flight (https://notams.aim.faa.gov/notamSearch/nsapp.html#/).

4.3 Procedures for Indoor Flights and Outdoor Flights Contained by Netting:

Indoor flights, as well as outdoor flights under netting, are not covered by FAA regulations. However, operators of UAS in those locations must abide by the following guidance for safety purposes:

4.3.1 On the MIT campus, flight operations shall occur only at approved indoor, netted, or temporary structure locations designated for UAS flights, with prior permission from the DLC controlling the indoor space. (See Appendix B for approved locations.)

4.3.2 Individuals who wish to operate UAS at other locations inside MIT buildings will need approval in advance from EHS and the DLC managing the space. EHS and the relevant DLC will review the planned flight operations and work with the operator to mitigate any potential risk to persons or property in the area (e.g., through risk assessment, installation of cages over sprinkler heads, etc.).

4.3.3 Operators must conduct a pre-flight safety risk assessment. (See template in Appendix D)

4.3.4 Operators must follow the Guidelines for Indoor Use of Unmanned Aircraft Systems (UAS), based on the Academy of Model Aeronautics (AMA) National Model Aircraft Safety Code (see Appendix C).

4.4 Lincoln Laboratory Operations

As noted above, this policy does not apply to UAS operations at Lincoln Laboratory, which has a separate policy for UAS operations.

5. Roles & Responsibilities

5.1 UAS Operators

- Attend required training and obtain remote pilot certificate.
- Read and operate in accordance with this SOG, 14 CFR Part 107, Operation and Certification of Small Unmanned Aircraft Systems and FAA Advisory Circular 107-2 and complete UAS form on EHS UAS webpage.
- Prior to flight, obtain approval from DLC representative authorized to manage the space. For non-research or non-educational flights, also need approval from EHS and the Insurance Office.
- Register all UASs with FAA (http://www.faa.gov/uas/registration/).
- Report all accidents or near misses to EHS.

- Obtain approval from FAA for any outdoor flights within 5 nautical miles of an airport.
- Conduct a pre-flight safety risk assessment.
- For indoor flights, follow the Guidelines for Indoor Use of Unmanned Aircraft Systems (UAS), based on the Academy of Model Aeronautics (AMA) National Model Aircraft Safety Code (see Appendix C).

5.2 Departments, Labs and Centers (DLCs)

- Assure that UAS operators are following this SOG and FAA regulations.
- Assure that all UAS operators have the appropriate certificates and training.
- Assure that all UASs are registered with the FAA.

5.3 Environment, Health and Safety Office (EHS)

- Maintain this SOG and EHS UAS webpage.
- Review and approve non-research or non-educational flights and third party flights.
- Review and approve flights in other indoor locations not listed in Appendix B.

5.4 Insurance Office

- Review and approve non-research or non-educational flights and third party flights.
- Provide appropriate insurance for UAS operations.

5.5 Procurement Office

- Notify EHS of all UAS purchases.

6. Training

6.1 All MIT operators of UAS must read and operate in accordance with this SOG, 14 CFR Part 107 and FAA Advisory Circular 107-2 and complete UAS form on EHS UAS webpage.

6.2 To qualify for a remote pilot certificate, a person must:

6.2.1 Demonstrate aeronautical knowledge by either:

6.2.1.1 Passing an initial aeronautical knowledge test at an FAA-approved knowledge testing center; or

6.2.1.2 Hold a part 61 pilot certificate other than student pilot, complete a flight review within the previous 24 months, and complete a small UAS online training course provided by the FAA.

6.3 Completing the Aero/Astro Ground School or Lincoln Lab Small Unmanned Aerial Systems Training satisfies the preparation training for 6.2.1.1.

7. Monitoring Requirements

None.

8. Record Management

- All accidents or near misses with UAS must be reported to EHS.
- All UAS must be registered with the FAA.

- UAS operators must conduct a pre-flight safety risk assessment.

9. References

9.1 Regulations:

- 14 CFR Part 107, Operation and Certification of Small Unmanned Aircraft Systems http://www.ecfr.gov/cgi-bin/text-idx?SID=ea940e919ac987cc11223ed725cf70a0&mc=true&node=pt14.2.107&rgn=div5
- FAA Advisory Circular 107-2 http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_107-2.pdf

10. Definitions

- **MIT Property** – Buildings, grounds, and land that are owned or controlled (by written agreement) by MIT.
- **Unmanned Aircraft Systems (UAS) -** UAS are also known as or may be characterized as drones. According to the FAA, a UAS is the unmanned aircraft and all of the associated support equipment, control station, data links, telemetry, communications and navigation equipment, etc., necessary to operate the unmanned aircraft. UAS may have a variety of names including quadcopter, quadrotor, etc. FAA regulation applies to UAS regardless of size or weight.
- **Model Aircraft** - Model aircraft are still considered "aircraft" and UAS for FAA purposes, but are distinguished in the FAA regulations by intended use - solely for recreational, hobby or classroom purposes. Classroom use by MIT registered students; use of model aircraft at MIT still subject to MIT Policies and approval from FAA Headquarters, if within 5 nautical miles of Logan Airport, and require checking NOTAM. Use of UAS related to MIT programs, research, or operations does not qualify as recreational use under FAA regulations. Model aircraft must be kept within visual sightline of the operator, and should weigh under 55 pounds, unless certified by an aeromodelling community-based organization. Model aircraft must be flown a sufficient distance from populated areas, and cannot be flown directly over people. Operators of Model Aircraft are expected to follow FAA Model Aircraft Operating Standards' (https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-57A.pdf).

Appendix A

Small UAS are covered by FAA Part 107 and Advisory Circular 107-2 including but not limited to the following:

a. Unmanned aircraft must weigh less than 55 lbs. (25 kg).
b. Maximum airspeed of 100 mph (87 knots).
c. Maximum altitude of 400 feet above ground level.
d. Operators must conduct a pre-flight safety risk assessment (see guidance in Advisory Circular 107-2).
e. The UAS may not operate within 5 nautical miles of an airport unless approved by FAA Headquarters.
f. Daylight operations only.
g. All UAS must be registered with the FAA.
h. All accidents, as defined in Advisory Circular 107-2, with UAS must be reported to EHS and subsequently by EHS to FAA.
i. Pilots of a small UAS would be considered remote pilots in command (PIC).
j. Operators of small UAS must meet all of the following:
    i. A person operating a small UAS must either hold a remote pilot airman certificate with a small UAS rating or be under the direct supervision of a person who does hold a remote pilot certificate (remote pilot in command).
    ii. To qualify for a remote pilot certificate, a person must:
        a. Demonstrate aeronautical knowledge by either:
            i. Passing an initial aeronautical knowledge test at an FAA-approved knowledge testing center; or
            ii. Hold a part 61 pilot certificate other than student pilot, complete a flight review within the previous 24 months, and complete a small UAS online training course provided by the FAA.
    iii. Be at least 16 years old.

Appendix B

Prior to using a UAS in any of the locations listed below, operators must obtain permission from the DLC representative authorized to manage the space.

UAS Indoor Locations:

Building 32, Stata Holodeck, CSAIL (Daniela Rus)
Building W34, 1st and 2nd floors, Johnson Hockey Rink, DAPER (Dan Martin)
Building W31, Rockwell Cage, DAPER (Dan Martin)
Building W32, Dupont Gym, DAPER (Dan Martin)
Building 41, High Bay Area (Anthony Zolnik)
Building 31, proposed renovation, Aero/Astro (outdoor under netting) (Anthony Zolnik)
Building 37, basement (Anthony Zolnik)
Building 17, Wright Brothers Wind Tunnel (Anthony Zolnik)
Building 33, high bay space in hangar (Anthony Zolnik)

UAS Outdoor Locations:

Cambridge Campus: Briggs Field and other locations (with additional approval from FAA Headquarters) (Dan Martin for Briggs Field)
Other MIT Property: Haystack Observatory, Westford, MA (Mark Derome)

Appendix C

Guidelines for Indoor Use of Unmanned Aircraft Systems (UAS) Based on Academy of Model Aeronautics (AMA) National Model Aircraft Safety Code

- Define the flying area both horizontal and vertical distances. The primary goal is to prevent injuries to those participating in the operation of the UAS, as well as the general community. The secondary goal is to prevent or mitigate significant property damage (e.g., hitting/discharging sprinkler heads).
- Select a flight line (behind which the pilot(s) will stand when flying).
- Behind the flight line, designate a "pit area" (where assembly, repairs, etc. are done).
- Designate the spectators' area ## feet behind the flight line.
- No one should enter an active flying area. Land all Unmanned Aircraft Systems (UAS) before allowing a pilot to retrieve their UAS.
- Visual line-of-sight contact with the UAS will be maintained at all times.
- If using First Person View system, UAS is limited to $\leq$ 15 pounds.
- If using First Person View system, the pilot must switch back to visional line-of-sight if there are any problems with the First Person View system.
- Only battery-operated UAS can be used indoors. No charging is allowed in the public spaces when these are used as flight areas because of the risk of a fire.
- Inspect the UAS before each flight: Verify that there are no loose parts, in order to prevent erratic behavior.
- Modify the program to limit the altitude, distance and speed. No higher than 6 feet below the lowest section of the ceiling, lights and/or sprinklers. Speed should be reasonably slow to accommodate the size and obstacles in the indoor flying area.
- If the type of UAS being used cannot be programed to limit the altitude/or speed, describe how the Range Safety Officer will monitor this. (For example: Have two Range Safety Officers, tools to measure the altitude and speed, communication to the pilots, etc.)

- Use the foam guard that prevents the blades from injuring people. This guard also prevents property damage. This guard can be purchased or made in an MIT hobby shop (or maker space).
- A frequency control system must be employed.
- Describe the autopilot's behavior when communications are lost. Does it hover, return home, or land?
- If more than one pilot will be operating UASs at the same time, describe the additional safety precautions that are planned. This may need to be increased based on the review.
- If a tether is used, it must be strong enough so it cannot be cut by a rotor blade.

Appendix D

UAS Pre-flight Risk Assessment

Sponsor's information:

Name: Phone: Email: Department:

UAS Operator's information:

Name: Phone: Email: Department:

Range Safety Officer Information:

Name: Phone: Email: Department:

Flight Date: Time:

Indoor Location Bldg.-Room #

UAS Model/Weight:

Safety precautions that will be implemented

- Define the flying area both horizontal and vertical distances. The primary goal is to prevent injuries to those participating in the operation of the UAS, as well as the general community. The secondary goal is to prevent or mitigate significant property damage (e.g. hitting/discharging sprinkler heads. Are sprinkler heads protected by cages or are these concealed?)
- Select a flight line (behind which the pilot(s) will stand when flying).
- Behind the flight line, designate a "pit area" (where assembly, repairs, etc. are done).
- Designate the spectators' area ## feet behind the flight line.
- Insert a floor plan that indicates the flight line, pit area, and spectators' area. No flying over people in these areas.
- No one should enter an active flying area. Land all UASs before allowing a pilot to retrieve their UAS.
- Visual line-of-sight contact with the UAS will be maintained at all times.

- If using First Person View system, the pilot must switch back to VLOS if there are any problems with the First Person View system. For First Person View, UAS limited to ≤15 pounds.
- Only battery-operated UASs can be used indoors. No charging is allowed in the public spaces when these are used as flight areas because of the risk of a fire.
- Inspect the UAS before each flight: Verify that there are no loose parts, in order to prevent erratic behavior.
- Modify the program to limit the altitude, distance and speed. No higher than 6 feet below the lowest section of the ceiling, lights, and/or sprinklers. Speed should be reasonably slow to accommodate the size and obstacles in the indoor flying area.
- If the type of UAS being used cannot be programed to limit the altitude/or speed, describe how the Range Safety Officer will monitor this. (For example: Have 2 Range Safety Officers, tools to measure the altitude and speed, communication to the pilots, etc.)
- Use the foam guard that prevents the blades from injuring people. This guard also prevents property damage. This guard can be purchased or made in an MIT shop (or maker space).
- A frequency control system must be employed.
- Describe the autopilot's behavior when communications are lost. Does it hover, return home, or land?
- If more than one pilot will be operating UASs at the same time, describe the additional safety precautions that are planned. This may need to be increased based on the review.
- If a tether is used, it must be strong enough so it can't be cut by a rotor blade.

Insurance

Insurance is required if the drone is owned and/or operated by a 3rd party.

Reviewed by

Advisor of student group
Administrator and DLC
EHS
Insurance Office

Approved by (insert Name of Administrator and DLC, date of approval)