Radio-Controlled small/micro Unmanned Aircraft Systems/Model Aircraft (m/sUAS) Operations Utilizing Failsafe, Stabilization, Autopilot, Ground-Station, Cameras/Sensors

1. Definition of terms

Please refer to Page 3, section 7, which contains an alphabetical listing of the definitions of the terms that are used in this document.

2. Operations, requirements, and limitations

a) AMA pilots should first be capable of manually flying their sUAS without utilizing GPS or Intelligent Orientation Control (IOC).

b) AMA pilots, when flying sUAS utilizing an autopilot system, must be able to deactivate the autopilot automated flight at any time to resume manual control of the sUAS.

c) AMA pilots should perform preflight inspections of their sUAS electronic and navigational control, and power and mechanical systems before each flight.

d) AMA pilots must perform a manual RC test flight of their sUAS before activating a newly installed stabilization or autopilot system and/or after any repairs or replacement of the sUAS essential flight systems.

e) sUAS exceeding 55 pounds cannot use an autopilot for automated flights, except for a failsafe-activated emergency landings or a “return to launch” (RTL).

f) AMA pilots may control the flight path of an sUAS with a standard gimbal RC transmitter or a smartphone, tablet, smartwatch, laptop, and/or proprietary controller with mission software using radio frequency telemetry modules for the control link.

g) sUAS must operate on frequencies approved by the FCC for wireless video, radio control, and ground station telemetry systems. Some systems, because of power output or Amateur Band frequencies, will require FCC licensing (AMA documents #580 & 590).

3. Autopilot Flight Mode Operations:

All flight operations must be conducted within current AMA safety programming. Some autopilot flight-mode functions must not be operated at their maximum capabilities because they are contrary to AMA/FAA sUAS rules.

Note: Any flight modes requiring supplemental operational rules are indicated by an asterisk (*).

AMA approved sUAS flight modes not requiring GPS

a) Stabilization—stabilizes roll and pitch attitude.

b) Altitude hold—maintains a desired altitude.

General rules for sUAS operations

a) AMA sUAS flights must be conducted in accordance with the AMA National Model Aircraft Safety Code, AMA supplemental rule documents, flying site specific rules, FAA regulations, and any laws relating to sUAS operations (AMA document #105).

b) AMA pilots must fly their sUAS strictly for hobby/recreational use.

c) AMA pilots, when flying sUAS either manually or utilizing FPV, stabilization, or autopilot systems for automated flight, must at all times maintain the sUAS within VLOS.

d) AMA pilots must provide prior notification of their intent to fly an sUAS to an airport operator and/or air traffic control tower when they will be flying within 5 miles of an airport.

e) sUAS must not be flown in a careless or reckless manner or at locations where sUAS activities are prohibited, or in close proximity to crowds of people at outdoor sporting events, music festivals, political gatherings, firework displays, or beaches (see section 3b).

f) All AMA pilots shall avoid flying sUAS directly over unprotected people, animals, vessels, vehicles, or structures so as not to endanger the life and property of others who are not directly involved in the sUAS activity.

g) All sUAS flights must yeld right-of-way to man or other unmanned aircraft.

h) All AMA pilots or their spotters must monitor the airspace surrounding sUAS while in flight. If aircraft, people, or property become endangered, pilots must maneuver the UAS to avoid a collision (AMA document #540-D).

c) Acrobatic—allows aerobatics.

d) Land/takeoff—auto-programmed landings/takeoffs.

AMA-approved sUAS flight modes requiring GPS

a) Return to launch (RTL)—returns sUAS to launch point via GPS.

b) Loiter—automatically maintains location, altitude, and heading.

c) Automated—autopilot-scripted program controls a sUAS's flight path via waypoints.

d) Intelligent Orientation Control (IOC)—sUAS forward direction follows relative control stick movement and not the direction in which the sUAS's nose points.

e) Targeted/guided—sUAS will fly directly to waypoint selected on mission planner software.

f) Drift—sUAS roll and yaw flight attitude determined by stick position.

g) Geofencing—autopilot programed for sUAS flight site boundaries (no-fly zones).

h) Position hold—sUAS maintains location and heading, but not altitude.

i) Circle—sUAS will circle a selected point with nose continuing to point toward center.

j) *Auto-tracking/follow me—sUAS will follow a subject's movements using GPS-tracking or vision-augmented tracking.

4. Range, Separation, Altitude, Weight, Speed

a) **Range**—flight range of sUAS is limited to VLOS of the pilot/operator.

b) **Separation**—AMA pilots should maintain the flight path of their sUAS at safe minimum separation distances from pilots, helpers, spectators, vehicles and structures as follows:

> 4.4 pounds or less and Park Pilot model aircraft not exceeding 2.0 pounds should maintain a minimum separation of 10 feet from pilots/helpers, 25 feet from spectators, and 50 feet from vehicles/structures.
>
> greater than 4.4 pounds should maintain a minimum separation of 25 feet from pilots/helpers, 60 feet from spectators, and 80 feet from vehicles/structures.

c) **Altitude—**Maximum altitude of sUAS is limited to 400 feet above ground level (AGL) when within 5 miles of an airport.

d) **Weight**—sUAS are limited to a maximum flying weight of 55 pounds, unless in compliance with AMA's Large Model Airplane program (AMA document #520-A).

e) **Speed**—model aircraft utilizing an onboard autopilot system for automated flight are limited to a maximum speed of 100 mph.

5. Recommendations and Information:

a) If your radio control system lacks failsafe capability, consider using programmable digital servos or auxiliary failsafe modules. In the event of a radio signal failure, these components will activate desired safe servo settings or an autopilot for a return to base/launch (RTL).

b) When using an autopilot, its RTL function should be programmed to return the sUAS to a safe location and terminate the flight should manual control of the sUAS be lost. When using the RTL function, pay particular attention to the manufacturers' recommended throttle setting to prevent stalling or an uncontrolled decent.

c) Some sUAS that are sold as "Follow me" flying cameras, use a smartphone to control and send GPS location data to the sUAS to track and video a subject in motion. To comply with current AMA rules, an optional remote-control device should be available for a spotter to deactivate automated flight when safe operation becomes an issue.

d) When purchasing stabilization and autopilot systems, always try to select quality equipment from reputable dealers, ensure for compatibility with other onboard systems, and install components according to manufacturers' instructions.

6. Privacy Protection Safeguards:

a) **Laws: Federal, State, and Local**—AMA members must be aware of and observe any laws regulating the ownership and operation of a sUAS.

b) **Cameras/sensors**—the use of imaging technology for aerial surveillance with radio controlled sUAS capable of obtaining high-resolution photographs and/or video, or using any types of sensors for the collection, retention, or dissemination of surveillance data or information about individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA, unless expressed written permission is obtained from the individual property owner(s) or manager(s).

7. Definitions of Terms:

A

AMA pilot/operator
An AMA member who is capable of manually operating an RC transmitter to control a sUAS flight path within its safe intended flight envelope without losing control or having a collision.

Automated Flights
Use an autopilot system to control the flight path of a sUAS. The level of automation/autonomy does not totally remove the AMA pilot from control capability since the pilot has VLOS of the sUAS and can activate and deactivate the automation.

Autopilot systems
Used to stabilize and control the flight path of a sUAS without assistance from a pilot. The autopilot system incorporates a microcontroller, inertial measurement unit, GPS receiver, and an altitude sensor. A laptop with mission software allows the pilot to program and save navigable waypoints to the autopilot system's memory for automated flight.

E

Essentials flight systems
Any systems or components necessary to maintain stable flight within a model aircraft's flight envelope. (This includes primary RC systems and any stabilization or gyros required to maintain stability and heading in certain types of sUAS that would be uncontrollable/unstable without their use.)

F

Failsafe systems
These are designed to minimize or prevent damage and safely terminate a flight when a radio-controlled sUAS loses radio signal. Radio systems can be programmed to position servos to a desired setting in the event of radio-signal failure.

First-Person View
Refers to the operation of a radio controlled (RC) sUAS using an onboard camera's cockpit view to orient and control the aircraft.

Flight envelope
The range of airspeeds, attitudes, and flight maneuvers that an sUAS can safely perform/operate for its intended use.

Flight modes
These are autopilot system firmware flight control functions or programs. A flight mode can be activated remotely by the pilot via the ground station controller or RC transmitter. The sUAS will perform the control function or automated flight program.

G

Ground stations
A ground station consists of either a laptop, tablet, or smartphone using a mission planner software application and telemetry modules to program, control, configure, and calibrate a sUAS autopilot system as well as display real-time flight status data and location maps.

M

Model Aircraft, small Unmanned Aircraft Systems (sUAS), Unmanned Aerial Vehicles (UAV), Remotely Piloted Aircraft, Multirotors (MR), and Drones
Remotely controlled and/or autopilot controlled unmanned aircraft capable of sustained flight in the atmosphere. The small sUAS have a maximum weight of 55 pounds and micro mUAS 4.4 pounds.

Multirotor
A remote-controlled model aircraft whose lift is derived from the aerodynamic forces acting on one or more powered rotors turning about vertical axes and includes tricopters, quadcopters, hexacopters, octocopters, etc.

N

Nonessential flight systems
Any systems or components that are not necessary to maintain stable flight within the sUAS flight envelope. This includes autopilot or stabilization systems that can be activated and deactivated in flight by the pilot without affecting stable flight.

P

Park Pilot aircraft
A remote-controlled mUAS limited to 2 pounds in weight, speeds of less than 60 mph, and designed for park flying in small urban area locations.

R

RC test flight
Requires an AMA pilot to manually operate an RC transmitter to control a sUAS flight path and determine if the sUAS is capable of maintaining stable flight within its safe intended flight envelope.

S

Stabilization systems
These are designed to maintain intended sUAS flight attitudes. The pilot can install, program, and/or activate a system to stabilize yaw, pitch, or roll, or any one attitude or combination of attitudes. Systems are often based on rate/heading hold gyros, or inertial motion sensors utilizing multiaxis gyros and accelerometers for attitude stabilization.

Spotter/observer
A spotter/observer is an experienced AMA RC pilot who has been briefed by the pilot on the tasks, responsibilities, and procedures involved in being a spotter. He or she must be capable and mature enough to perform the duties and able to assume conventional VLOS control of the sUAS.

T

Telemetry modules
These perform real-time two-way data communication between the sUAS autopilot systems and the ground station mission software.

V

Visual line of sight (VLOS)
Distance at which the pilot/operator is capable of maintaining visual contact with the sUAS and determine its orientation and altitude without enhancements other than corrective lenses.