Academy of Model Aeronautics

Safety Handbook

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Welcome!

Founded in 1936, the AMA is the world's largest sport aviation organization, representing a membership of more than 200,000.

Over the years AMA established and evolved a safety program which guides modeling activities through education and voluntary compliance. As technology advances and the model community continues its growth, disciplines and interests have increased.

Most model flying that takes place today is recreational rather than within a formal competition framework, and sometimes it occurs on publicly accessible sites with little or no formal control. Creating a safe environment to protect bystanders, other model pilots, as well as surrounding property, is crucial and the responsibility of every individual participating in modeling activities.

AMA highlights the most important safety aspects through its Safety Code, but the safety program encompasses many more facets.

This safety handbook is a compilation of AMA documents and programs as they pertain to safe model operation. It is intended to provide a centralized location to find all pertinent safety information, and can be a valuable tool for club officers, contest directors, event managers, and others.

Academy of Model Aeronautics
National Model Aircraft Safety Code

Effective January 1, 2018

A model aircraft is a non-human-carrying device capable of sustained flight within visual line of sight of the pilot or spotter(s). It may not exceed limitations of this code and is intended exclusively for sport, recreation, education and/or competition. All model flights must be conducted in accordance with this safety code and related AMA guidelines, any additional rules specific to the flying site, as well as all applicable laws and regulations.

As an AMA member I agree:

- I will not fly a model aircraft in a careless or reckless manner.
- I will not interfere with and will yield the right of way to all human-carrying aircraft using AMA's *See and Avoid Guidance* and a spotter when appropriate.
- I will not operate any model aircraft while I am under the influence of alcohol or any drug that could adversely affect my ability to safely control the model.
- I will avoid flying directly over unprotected people, moving vehicles, and occupied structures.
- I will fly Free Flight (FF) and Control Line (CL) models in compliance with AMA's safety programming.
- I will maintain visual contact of an RC model aircraft without enhancement other than corrective lenses prescribed to me. When using an advanced flight system, such as an autopilot, or flying First-Person View (FPV), I will comply with AMA's Advanced Flight System programming.
- I will only fly models weighing more than 55 pounds, including fuel, if certified through AMA's Large Model Airplane Program.
- I will only fly a turbine-powered model aircraft in compliance with AMA's Gas Turbine Program.
- I will not fly a powered model outdoors closer than 25 feet to any individual, except for myself or my helper(s) located at the flightline, unless I am taking off and landing, or as otherwise provided in AMA's *Competition Regulation*. VIEW
- I will use an established safety line to separate all model aircraft operations from spectators and bystanders.

Regulatory Compliance

Key elements of AMA's Safety Code include the requirement to see and avoid manned aircraft and maintain model aircraft operations within visual line of sight.

In addition to operating within our safety programming, AMA members should comply with any and all applicable federal, state, and local laws and regulations.

In February 2012, and again in July 2016, Congress officially recognized the efficacy of community-based safety programming in managing the aeromodelling activity within the United States. With the passage of the FAA Modernization and Reform Act of 2012 (PL 112-95)[1], Congress set aside further regulation of model aircraft provided, "the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization. (Section 336, Special Rule for Model Aircraft.)

Under Section 336, AMA members can operate their model aircraft within the boundaries of AMA's safety guidelines and programming.

Model Operations Near Airports

When within five (5) miles of an airport, AMA members must notify the airport(s) before model operations take place. Permanent flying locations, such as chartered club flying sites, should establish a mutually agreed-upon operating procedure to eliminate the need for constant and repeated notification.

When within three (3) miles of an airport, model aircraft should remain below 400 feet above the ground unless there is notification or an agreement with the airport that allows models to safely go higher.

Be Aware of No-Fly Zones

Do not fly near stadiums, critical infrastructure (correctional facilities, water treatment centers, utilities, etc.), large open air events, or any time or place where model aircraft operations are prohibited.

Privacy

It's important that you respect the privacy and property of others and be aware of your surroundings. What might seem like a cool flight path to you may be a nuisance or perceived as invasion of privacy by others.

Using imaging technology for aerial surveillance with a model aircraft capable of obtaining photographs and/or videos or using any types of sensors for collection, retention, or dissemination of surveillance data or information about individuals, homes, businesses, or property locations where there is a reasonable expectation of privacy **is strictly prohibited** by AMA, unless you have obtained written permission from the individual property owner(s) or manager(s).

AMA members should educate themselves on community ordinances, guidelines, or any laws regulating the ownership and operation of a model aircraft.

General Safety Practices

Adherence to AMA's safety regulations should not be viewed as an obstacle to the enjoyment of model flying, but rather as proof that model fliers are responsible and can operate safely in a community-based environment. It is to each model pilot's personal benefit to make certain that no action on his or her part will result in an unsafe situation or an accident.

Before each flight, the pilot should verify the model's condition and proper function to ensure a safe and efficient flight. A pilot should check for proper fitting and placement of parts, with special attention to the engine(s), propeller(s), and control surfaces.

It is imperative that all flying sites be situated as far as practical from power lines.

Don't attempt to retrieve a model from electric power lines. Contact the local power company.

Identify each model aircraft flown outdoors with the name and address or AMA number of the owner. This is not necessary for indoor flying. Identification can be placed inside on an easy to access panel or marked on the outside of the model.

Before you participate at an AMA sanctioned event, air show, or a model demonstration, you should test your model aircraft and control systems by successfully performing all intended or anticipated maneuvers prior to the event. If you are an inexperienced pilot, it is important that you obtain the assistance of an experienced pilot for these specific events.

Your model aircraft should not carry any pyrotechnic devices that explode or burn, unless you are part of an officially designated AMA Air Show Team (AST). ASTs are authorized to use such devices and practices as defined with the Team AMA Program document.

Devices that propel projectiles or drop any object creating a hazard to persons or property are prohibited.

Free Flight fuses or other devices that burn producing smoke and are securely attached to the model aircraft during the flight are acceptable.

Rocket motors, up to a G-series size, may be used for propulsion, as long as they use solid propellants and remain attached to your model during the flight. Launching a rocket or any other missile from a model aircraft is prohibited.

AMA members interested in model rocketry should abide by the National Model Rocketry (NAR) Safety Code.

When appropriate or required by AMA safety guidelines and/or AMA *Competition Regulations*, helmets must be worn and fastened. Helmets must be OSHA, DOT, ANSI, SNELL, or NOCSAE approved or comply with comparable standards.

Propellers:

- Cracked, nicked, or unbalanced propellers or rotor blades should be replaced and not reused!
- Stay clear of the propeller arc while starting or running any engine or motor.
- Don't stop engines by throwing rags or other objects in the propeller.
- Painting tips of propellers a bright color helps you to better see the propeller arc during rotation.
- Check the propeller and spinner for tightness before each operation.
- Learn about and check for the proper grain patterns in wooden propellers to ensure strength in high rpm operation.
- Exercise extreme caution adjusting needle valve settings on engines. Most adjustments should be performed from behind the model, thus avoiding reaching around a spinning propeller.

Batteries:

Lithium batteries have become extremely popular for powering control and power systems in models because of their high energy density compared with earlier battery technologies. With high energy comes increased risk in use. The principle risk is fire, which can result from improper charging, crash damage, or shorting the batteries.

All Lithium battery vendors warn customers of this danger and recommend extreme caution in their use. However, many fires have resulted from the misuse of lithium polymer (LiPo) batteries, leading to the loss of models and automobiles. Other property, such as homes, garages, and workshops, have also burned.

A Lithium battery fire burns explosively at several thousand degrees and is an excellent initiator for ancillary fires. Fire is caused by contact between Lithium and oxygen in the air. **It needs no other source of ignition or fuel to start.**

The following is recommended for Lithium batteries to preclude ancillary fires:

- Store and charge in a fireproof container—never in your model
- Charge in a protected area that is devoid of combustibles.
- In the event of damage from crashes, etc., carefully move the battery pack to a safe place for at least a half hour to observe. Physically damaged cells can erupt into flames. After sufficient time to ensure safety, the cells should be discarded in accordance with the instructions that come with the batteries. **Never attempt to charge a cell with physical damage,** regardless of how slight.
- Always use chargers designed for the **specific** purpose; it's preferable to have a fixed setting for your particular pack. Many fires occur while using selectable/adjustable chargers that are improperly set. Never attempt to charge Lithium cells with a charger that is not specifically designed for Lithium cells! **Never use chargers that are specifically designed for NiCd batteries.**
- It is strongly recommended that you use charging systems that monitor, control, and balance the charge state of each cell in the pack. Unbalanced cells can lead to disaster if the system permits a single cell in the pack to be overcharged. This means that the charging system must provide charge cessation as each cell reaches the proper voltage. If the batteries show **any sign of swelling,** discontinue charging **and move them to a safe place—outside. They could erupt into flames.**
- **Never plug in a battery and leave it to charge unattended;** serious fires have resulted from this practice.
- Do not attempt to make your own battery packs from individual cells. Use only professionally packaged and labeled units that contain safer charging features.

Free Flight

The starting area must be carefully chosen. Considerations include wind strength and direction, relative position of buildings, runways, vehicle parking, spectator areas, and the place where models are expected to land after a normal flight, according to the wind.

Outdoor Free Flight models should be flown in an area that is clear of obstacles, persons, and other property that could be damaged by the model.

Free Flight models must be launched at least 100 feet downwind from spectators and automobile parking and the launch area must be clear of all individuals except mechanics, officials, and other fliers.

Free Flight models should only be launched when the launch area and downwind airspace are clear of manned aircraft.

Use an effective device to extinguish any fuse on the model aircraft after the fuse has completed its function.

Control Line

Prior to flying, inspect and pull-test your complete control system, including the safety thong where applicable.

The pull test will be in accordance with the current *Competition Regulations* for the applicable model aircraft category. Model aircraft that don't fit a specific category will use the Control Line Precision Aerobatics pull-test requirements.

The flying area must be clear of all utility wires or poles. Nonessential participants and spectators must be out of the flying area before any engine is started.

Model aircraft will not be flown closer than 50 feet to any above-ground electric utility lines.

Radio Control

Complete a successful radio equipment ground-range check (in accordance with manufacturer's recommendations) before the first flight of a new or repaired model aircraft.

Establish a safety line(s) behind which all spectators and bystanders must remain and in front of which all flying takes place. Intentional flying behind the safety line is prohibited.

Air shows and flight demonstrations must have a *straight* safety line. Any other flying activities would be able to establish a straight or a curved line.

Only personnel associated with flying the model aircraft are allowed at or in front of the safety line. Spectators must have a designated area away from the line.

No pilot or other person should touch an outdoor model in flight, while still under power, except to divert it from striking an individual.

Night flying requires a lighting system that provides the pilot with a clear view of the model's attitude and orientation at all times. Hand-held illumination systems by themselves are inadequate for night flying operations and must be supplemented with other lighting systems.

See and Avoid Guidance

As model aircraft pilots, we share the National Airspace System (NAS) with man-carrying aircraft and other FAA managed aeronautical operations. It is imperative that we yield the right of way and maintain a separation between our operations and theirs.

This document provides guidance for all outdoor modeling operations, to ensure that we do not create a hazard for our full-scale counterparts:

See and Avoid Guidance VIEW

Guidance for First-Person View (FPV) Operation

First-Person View (FPV) refers to the operation of a Radio Control model aircraft using an onboard camera's cockpit view to orient and control the aircraft. If you are involved in FPV operation, curious, or just want to learn more, please take a moment and review AMA's guidance for FPV operations:

FPV Operation VIEW

FPV Operation for Indoor Flying VIEW

FPV Racing Recommendations VIEW

System Licensing Guidance VIEW

Guidance for Advanced Flight Systems (Failsafe, Stabilization, and Autopilot)

Models using advanced flight systems allowing for automated or flight are permitted by AMA, provided the pilot remains in direct control and flies within visual line of sight. In such operations, the modeler must be able to override the automated and programmed features at all times.

The specific automated functions allowed for this type of model operation are listed in this guidance document:

Failsafe, Stabilization, and Autopilot Systems

Gas Turbine Program

The operation of gas turbine engines in model aircraft requires the modeler to prove competency in the operation, care, and maintenance of model turbines and the model aircraft flown with them. AMA has established a program for these operations, which includes the requirement for pilots to have a turbine waiver issued by AMA prior to any solo operation. You can find all of the applicable information for this program at:

AMA Gas Turbine Program VIEW

RC Pulse Jet Engines

RC Pulse Jet operations require special considerations due to the risk of fire, extreme noise, and high thrust. Considerations and requirements are outlined in the following program document.

RC Pulse Jet Engines VIEW

Large Model Airplane Program

AMA requires that model airplanes weighing more than 55 pounds must be built, inspected, and operated in compliance with the rules set forth in AMA's Large Model Airplane program (LMA). This program details specific requirements for the design, construction, and operation of model airplanes weighing up to 125 pounds:

LMA Program VIEW

RC Combat

Radio Control Combat (RC Combat) models are flown with streamers trailing behind them that are cut by other models in combat. For powered RC models, these operations use a variable setback distance based on the internal combustion engine displacement (or the electric equivalent) used on the model. Specific safety guidelines for these operations are available here:

RC Combat VIEW

RC Racing

A Radio Control racing event is one in which model aircraft compete on a prescribed course with the objective of determining a winner by being the first to cross the finish line or to post the fastest time to complete the race. AMA's safety standards for the various types of radio control racing are listed below:

General RC Racing VIEW
Giant Scale Racing VIEW
Sport Pylon Racing VIEW
FPV Racing Recommendations VIEW

Flying Site Layout Recommendations

Every flying site situation is different and there is no one-size-fits-all approach when it comes to layout and set up. Each location has different values, as well as challenges, and modelers and chartered clubs have differing individual needs.

Although there is no one-size-fits-all to designing and establishing a flying site, some modeling operations do have specific parameters for safe operation, e.g.: gas turbine powered models typically require a lengthy runway with a hard or smooth surface and sufficient airspace to maneuver. You should carefully evaluate the proposed flying site to determine what modeling operations can and cannot be accommodated at any given location.

You should also consider the environment surrounding the proposed site. Flying sites near residential areas often encounter problems relating to sound and/or overflight of private property. At such areas it might be advisable to curtail operations during early morning hours, to restrict the size of aircraft flown, or to limit aircraft to electric propulsion only.

AMA's flying site recommendations are for a typical, multiuse flying site designed to accommodate most aeromodelling operations, and are helpful if you are designing a new flying site. They can also assist you if you are encountering changes in the dynamic of your club (e.g. more active pilots, new technology, and increased interest in diverse modeling disciplines) and need to reevaluate your current layout.

Flying Site Layout Recommendations VIEW

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