

Safety Information

Vanderbilt Aerospace
Design Laboratory



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A SDS Information

Explosives:

- Cesaroni Pro54 Rocket Motor Reload Kit
- Owen Compliance Black Powder

Composite Fibers:

- Fibre Glast Part #1069 - 5.7oz Graphite 3K 2 x 2 Twill Carbon Fiber
- Fibre Glast Part #262 4 oz. Fiberglass Fabric
- Fibre Glast Part #251 Continuous Strand Mat
- Soller Composites Carbon Fiber

Epoxy:

- Fibre Glast Part #2000 System 2000 Epoxy Resin
- Fibre Glast Part #2020 20-minute Epoxy Hardener
- Fibre Glast Part #2060 60-minute Epoxy Hardener
- Fibre Glast Part #2120 120-minute Epoxy Hardener
- West System 105 Epoxy Resin
- West System 205 Fast Hardener
- West System 206 Slow Hardener
- West System 207 Special Clear Hardener
- West System 209 Extra Slow Hardener
- Devcon 2 Ton Epoxy [1:1]: 5-Minute Epoxy Resin, 2-Ton Hardener
- Devcon 5 Minute Epoxy amber [1:1]: 5-Minute Epoxy Resin, 5-Minute Epoxy Hardener
- Gorilla Epoxy-Resin
- Gorilla Epoxy-Hardener
- Loctite Fast Cure Epoxy
- J-B Weld Steel Reinforced Epoxy Resin and Hardener - Twin Tubes

Polyester Resin:

- Fibre Glast Part #77 Polyester Molding Resin
- Fibre Glast Part #69 MEKP Hardener

- Fibre Glast Part #188 Orange Tooling Gel Coat

Mold Compounds:

- Meguiar's M08, Mirror Glaze Maximum Mold Release Wax (23-135A): M0811
- PARTALL Paste #2
- Fibre Glast Part #13 - PVA

Solvents:

- Ethyl Alcohol, 70%
- Klean-Strip Acetone
- Mineral Spirits 75
- SCIGRIP 4 Solvent Cement for Acrylic

Glues/Adhesives:

- 3M Super 77 Adhesive, Bulk
- Ethyl 2-Cyanoacrylate

Liquid Foams:

- DOW GREAT STUFF Gaps & Cracks Insulating Foam Sealant 12oz HC EF QP
- 3M Polyurethane Foam Insulation Adhesive CR-20, Part A
- 3M Polyurethane Foam Insulation Adhesive CR-20, Part B

Surface Finishes:

- Rust-Oleum PTOUCH 2X +SSPR 6PK FLAT GRAY PRIMER
- Rust-Oleum STRUST +SSPR 6PK FLAT BLACK
- MINWAX Clear Aerosol Lacquer, Clear Gloss
- 3M Polyurethane Sealant 540 (Various Colors)

B Written Safety Statement

Written Safety Statement

By signing my name below, I agree to abide by all of the laws, regulations, safety standards, and procedural guidelines in the High Power Rocketry Safety Code, the National Association of Rocketry Handbook, and the Academy of Model Aeronautics Handbook, the Federal Aviation Regulations, all Tennessee Environmental and Safety laws, and the various Material Safety Data Sheets appended to this document. By signing here, I also hereby assert my agreement to abide by the ruling of the Huntsville Area Rocketry Association (HARA) range safety inspector, and understand that if the team does not comply with the Safety and Mission Assurance (SM&A), the team will not be allowed to launch the rocket. My signature affirms that I have read and understand all pertinent safety information and will act according to the procedures set out by the Safety Officer.

Print Name: Bradley Bark	Signature: <u>Bradley Bark</u>	Date: <u>9/14/16</u>
Print Name: Arthur Binstein	Signature: <u>Arthur Binstein</u>	Date: <u>9/14/16</u>
Print Name: Nina Campano	Signature: <u>Nina Campano</u>	Date: <u>9/15/16</u>
Print Name: Michael Gilliland	Signature: <u>Michael Gilliland</u>	Date: <u>9/14/16</u>
Print Name: Dustin Howser	Signature: <u>Dustin Howser</u>	Date: <u>9/14/16</u>
Print Name: Grady Lynch	Signature: <u>Grady Lynch</u>	Date: <u>9/14/16</u>
Print Name: Paul Moore	Signature: <u>Paul Moore</u>	Date: <u>9/15/16</u>
Print Name: Jimmy Pan	Signature: <u>Jimmy Pan</u>	Date: <u>9/14/16</u>
Print Name: Derek Phillips	Signature: <u>Derek Phillips</u>	Date: <u>9/14/16</u>
Print Name: Brian Ramsey	Signature: <u>Brian Ramsey</u>	Date: <u>9-14-16</u>
Print Name: Paul Register	Signature: <u>Paul Register</u>	Date: <u>9-14-16</u>
Print Name: Ross Weber	Signature: <u>Ross Weber</u>	Date: <u>9-15-16</u>

C Shop Safety Guidelines

Shop Safety

The School of Engineering's principal Machine (Model) Shop is located on the first floor of Featheringill Hall in the west wing. A smaller Model Shop is located in Olin Hall on the first level. Additional machine tools and associated equipment are located in some of the research labs in the School. The single most important issue in the School in using any of these Shop facilities is safety. The primary objective of all people that use the Machine Shops must be to uphold safety. There is nothing that can be designed or built using the Machine Shops that is worth trading for a permanent disability. This handout is intended to give you some guidelines to working safely in the Machine Shops as well as familiarize you with some of the hazards.

The Machine Shop is a more hazardous environment than people are used to. All personnel must be properly trained before using the equipment. **When you enter the shop, you should make a conscious effort to adjust mentally and physically to the increased hazards around you.** Consult the first five safety rules below to adjust yourself to existence in a shop environment. Scrupulously follow safe procedures. Be careful to think through each operation before you execute it. Use your common sense. Do not do things that seem unsafe.

The shop supervisor or faculty PI or trained assistant is there to help you use the shop. However, they cannot be everywhere at once. Users of the shop must assume responsibility for the safe use of the facility. If you are unsure of the proper method to do something, wait until the shop supervisor or other trained person can give you guidance. If you notice an unsafe condition in the shop, fix it or bring it to the attention of the shop supervisor. If you think someone is using the equipment unsafely, suggest a safer alternative or bring that activity to the attention of the shop supervisor.

General Safety Rules

The rules listed below apply to all people doing work in the School's Machine (Model) Shops. They are not all encompassing. Most shop areas and machines have specific safety rules that relate to their use, and these should be consulted. The following rules are a good general guide to safe use of the facility.

- **Never work alone.** When you are working in the shops you must have a second person present who is capable of rendering assistance in case of an accident. Accidents do happen. You need to have a second person present so that if you become unable to help yourself, the second person can render aid and contact outside help. At Vanderbilt, the emergency number to call for assistance is 1-1911.
- **Never work when you are impaired.** This includes times when you are too tired, stressed, or otherwise inhibited from exercising appropriate caution in the shop. Do not enter the shop when you are under the influence of any intoxicants or medications that might make you drowsy or alter your ability to be alert to reality. Do not use the shop when you are too frantic to think clearly and carefully. Try to avoid last minute shop work in favor of a consistent weekly effort. Deadline-driven haste can lead to ruined projects and/or serious injuries. Do not use the shop if you are wearing a cast or bandage that limits your mobility. In an emergency you must be able to react quickly to avoid injury.

- **Wear all necessary protective gear and clothing. This always includes safety glasses and shoes that completely enclose your feet. Some shop activities will require additional safety gear.** All persons, including visitors, entering the Machine Shop shall wear eye protection appropriate to the hazard. All such eye protection must conform to ANSI standard Z87.1. Safety glasses that conform to the standard are marked with a Z87.

If you wear glasses already you should be aware that most eyeglasses purchased in the United States conform to ANSI Z87.1 for frontal impact. You may wear such glasses for work in the shop. To protect your eyes from side impact you can add side shields to your existing glasses or purchase prescription safety glasses for use in the shop.

Do not wear contact lenses in the welding shop. The intense light from the arc welding torches can cause contact lenses to damage your eyes. Additional information can be obtained from the American Welding Society, <http://www.aws.org>, web site under Safety & Health. Persons exposed to foot injury hazards shall wear foot protection appropriate to the hazard. Leather shoes are necessary to protect your feet from stray droplets of molten metal in the welding area. Additional information can be obtained from the American Welding Society, <http://www.aws.org>, web site under Safety & Health. Certain dusts and fumes require respiratory protection. In the event that a respirator is necessary, the Shop Supervisor may require you to obtain and wear one for operations that expose you to airborne hazards. Additional information can be obtained from the American Welding Society, <http://www.aws.org>, web site under Safety & Health. Any employee or personnel wearing any respirator other than a dust mask must have medical surveillance through the Vanderbilt Occupational Health Clinic, <http://www.vanderbilt.edu/HRS/wellness/occhealth.htm>, and be fit-tested by VEHS.

When it is not practical to reduce sound levels below ninety decibels, then persons exposed to such sound levels shall wear hearing protection in the form of foam ear inserts.

Leather gloves are available in the welding areas for protection from the heat and radiation of welding. Additional information can be obtained from the American Welding Society, <http://www.aws.org>, web site under Safety & Health.

Welding requires the use of welding masks with appropriate eye-protective lenses and natural fiber clothes that completely cover your skin. The electric arc in particular is an intense source of ultraviolet and infrared radiation. Even a brief exposure of your unprotected eyes can cause severe damage to your sight. Do not look at an electric without the correct eye protection. If you expose bare skin to the light of the arc, the radiation is intense enough to give you severe sunburn. Natural fiber clothes are required because they will not melt onto you in the presence of high heat, as some man made materials will. Additional information can be obtained from the American Welding Society, <http://www.aws.org>, web site under Safety & Health.

- **Long hair must be tied up securely.** Most of the power tools in the shop are based around a rapidly rotating shaft. In use the shaft is frequently sticky with oil. Long, loose hair can stick to such a rotating shaft and pull the owner of the hair into the tool. Long hair must be kept out of harm's way by tucking it into a cap, tying it up. Or knotting it in a way that prevents it from dangling.

- **Remove all personal accessories and loose clothing that might get caught in moving machinery. This includes rings, watches, jewelry, personal stereos, shop rags, ties, and open jackets.** Like long hair, things that dangle from your person can get caught in rotating machinery. Regardless of the fashion, it is not worth risking your health. Loose garments must not be worn in the shop. Tuck in loose shirttails and sweat pants ties. Keep tight fitting jackets or coats closed. Do not keep shop rags in your pockets. Do not wear personal stereos or headphones while you are working in the shop.
- **Never leave a machine running unattended.** Some of the tools in the shop can be set to cut automatically. You must keep your attention focused on the machining operation. If you are focused on the process, you will be more likely to react appropriately in the event of an accident.

The Machine (Model) Shops in the School are used primarily for building prototypes. As a result most set-ups are not tried and tested in a production sense. It is inevitable that some set-ups will go bad. If you are paying attention to the operation, you may be able to avert injury to yourself and the people around you.

- **Never leave a chuck key in a chuck or a drawbar wrench on a drawbar. If the key or wrench is in use your hand must be on it.** Chuck keys and drawbar wrenches can be accidentally launched across the shop if they are left in place. The startup power of the lathes and mills can throw the tools with enough force to puncture a body cavity. You must be careful not to leave the chuck keys and drawbar wrenches in place when they are not in use. The same rule applies to the chuck keys used to tighten the chuck on the drill presses.
- **Keep your hands well away from the point of contact between the work piece and the cutter. If you must hand hold the work to keep it in place, your set-up is unsafe; improve it.** While working on the lathes and mills you should never hand hold your work. If the tool or work piece is vibrating, the chances are high for a sudden shift in the set-up. If you are hand holding the tool or work piece, you might not be able to get out of the way as the parts come together. Besides, the cutting forces are too large for you to be effective in securing the work piece or tool.

When using the drill presses, especially with large drills and tough to cut materials, you must clamp the work to the drill press table. If the drill catches an unclamped work piece, the rotating part can cut your hand. On the band saws, table saw, router table, chop saw and any other tool that is designed to be used with a hand fed work piece, be certain to keep your hands, fingers, and other body parts out of the path of cutters and away from the point between the work piece and the cutter.

Keep all parts of yourself at least 6 inches from the point of contact between any work piece and any cutter. Do not remove chips with your fingers. Use brushes, pliers, or compressed air.

- **Support work pieces and cutting tools as securely as possible. A vibrating set-up is usually an indication that the work piece and/or tool are not held strongly enough to resist the applied cutting forces. You must take the time to secure the set-up to resist**

the force of cutting or use a different operation to do the job. Do not try to make do with a flimsy set-up.

Expect to spend a lot (80% or more) of your time in the shops making set-ups. It is the nature of prototyping. Unfortunately, it is also hard to visualize when you are thinking about work in the shop. This is where a well-metered approach to work in the shop will pay off. If you think things are taking longer than you expected, you can scale down or redesign your work. At the last minute it is hard to make such large changes.

- **Have the shop supervisor or other trained person check you out the first time you use each machine or process in the shop. Do not operate any machinery with which you are unfamiliar.** Each and every tool in the shop has safe operating procedures associated with it. Do not work on any tool in the shop until the shop supervisor or other trained person has introduced you to its safe operation. You should get checked out even on tools you have been taught to operate elsewhere. The tools in the shop may have idiosyncrasies that you should know about.

Clean Up Procedures

Careful clean up is part of the safe operation of the shops. If a person cannot find a needed tool in its regular place or if a person is required to work in someone else's mess, the result will be frustration. It is difficult to keep safety in mind when you are frustrated. So it is important, especially in times of heavy use, to keep the shop clean with everything returned to its correct place at the end of its use.

- **Shut off power to the machine.** Turn off the main power switch for the machine. Disengage all power feeds and lead screws.
- **Un-mount all cutters.** Remove all end mills, lathe tools, drills, and similar tools from their tool holders.
- **Put away all measuring tools, hand tools, material scraps, and drawings.** Put away all objects that do not belong permanently with the machine. If you do not know where something goes, ask the shop supervisor. If the shop supervisor is unavailable, leave whatever it is in plain sight on a table. It is better to leave it out than to put it away in the wrong place.
- **Clean chips and excess oil from machines and chip pans.** Protect your hands from sharp chips with a shop rag.

Most machines can be wiped down completely with a shop rag. If you must use compressed air, be careful with it. Do not point compressed air guns at people. Blown chips can become lodged in eyes and the compressed air itself can do severe damage to a person's body. Use the compressed air early in the clean up process. Otherwise you will blow chips all over the areas you have already cleaned.

Do not use brooms or brushes on the machine tools. The brushes and brooms pick up abrasive dirt from the floor. If abrasive gets on the machine tools they will wear very quickly.

You should clean the equipment well enough that the next user will not be able to tell what material you were using.

- **Put a light coat of way oil on the machine ways.** Move the machine slides to one extreme position and oil the exposed ways. Next move the ways to the middle of their travel and oil the newly exposed sections. Leave the machine slides at the approximate center of travel.
- **Sweep the floor in the vicinity of the machines you have used.** Collected debris should be either recycled or thrown in a scrap container.
- **Ensure all hazardous materials such as used paint, oils, solvents, degreasers, etc. are properly labeled and stored.** Vanderbilt Environmental Health and Safety (VEHS), <http://www.safety.vanderbilt.edu>, should be notified of anything requiring disposal.

D Federal Aviation Regulations

FEDERAL AVIATION REGULATIONS

§ 101.1 Applicability.

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

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

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

(3) Any unmanned rocket except:

(i) Aerial firework displays; and,

(ii) Model rockets:

(a) Using not more than four ounces of propellant;

(b) Using a slow-burning propellant;

(c) Made of paper, wood, or breakable plastic, containing no substantial metal parts and weighing not more than 16 ounces, including the propellant; and

(d) Operated in a manner that does not create a hazard to persons, property, or other aircraft.

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

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

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

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

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

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

[Doc. No. 1580, 28 FR 6721, June 29, 1963, as amended by Amdt. 101–1, 29 FR 46, Jan. 3, 1964; Amdt. 101–3, 35 FR 8213, May 26, 1970]

§ 101.3 Waivers.

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

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

§ 101.5 Operations in prohibited or restricted areas.

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

[Doc. No. 1457, 29 FR 46, Jan. 3, 1964]

§ 101.7 Hazardous operations.

(a) No person may operate any moored balloon, kite, unmanned rocket, or unmanned free balloon in a manner that creates a hazard to other persons, or their property.

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

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

[Doc. No. 12800, 39 FR 22252, June 21, 1974]

Subpart B—Moored Balloons and Kites

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

§ 101.11 Applicability.

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

§ 101.13 Operating limitations.

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

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

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

§ 101.15 Notice requirements.

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

- (a) The names and addresses of the owners and operators.
- (b) The size of the balloon or the size and weight of the kite.
- (c) The location of the operation.
- (d) The height above the surface of the earth at which the balloon or kite is to be operated.
- (e) The date, time, and duration of the operation.

§ 101.17 Lighting and marking requirements.

- (a) No person may operate a moored balloon or kite, between sunset and sunrise unless the balloon or kite, and its mooring lines, are lighted so as to give a visual warning equal to that required for obstructions to air navigation in the FAA publication “Obstruction Marking and Lighting”.
- (b) No person may operate a moored balloon or kite between sunrise and sunset unless its mooring lines have colored pennants or streamers attached at not more than 50 foot intervals beginning at 150 feet above the surface of the earth and visible for at least one mile.

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

[Doc. No. 1580, 28 FR 6722, June 29, 1963, as amended by Amdt. 101–4, 39 FR 22252, June 21, 1974]

§ 101.19 Rapid deflation device.

No person may operate a moored balloon unless it has a device that will automatically and rapidly deflate the balloon if it escapes from its moorings. If the device does not function properly, the operator shall immediately notify the nearest ATC facility of the location and time of the escape and the estimated flight path of the balloon.

Subpart C—Unmanned Rockets

§ 101.21 Applicability.

This subpart applies to the operation of unmanned rockets. However, a person operating an unmanned rocket within a restricted area must comply only with §101.23(g) and with additional limitations imposed by the using or controlling agency, as appropriate.

[Doc. No. 1580, 28 FR 6722, June 29, 1963]

§ 101.22 Special provisions for large model rockets.

Persons operating model rockets that use not more than 125 grams of propellant; that are made of paper, wood, or breakable plastic; that contain no substantial metal parts, and that weigh not more than 1,500 grams, including the propellant, need not comply with §101.23 (b), (c), (g), and (h), provided:

- (a) That person complies with all provisions of §101.25; and
- (b) The operation is not conducted within 5 miles of an airport runway or other landing area unless the information required in §101.25 is also provided to the manager of that airport.

[Amdt. 101–6, 59 FR 50393, Oct. 3, 1994]

§ 101.23 Operating limitations.

No person may operate an unmanned rocket—

- (a) In a manner that creates a collision hazard with other aircraft;
- (b) In controlled airspace;
- (c) Within five miles of the boundary of any airport;
- (d) At any altitude where clouds or obscuring phenomena of more than five-tenths coverage prevails;
- (e) At any altitude where the horizontal visibility is less than five miles;
- (f) Into any cloud;
- (g) Within 1,500 feet of any person or property that is not associated with the operations; or
- (h) Between sunset and sunrise.

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

[Doc. No. 1580, 28 FR 6722, June 29, 1963, as amended by Amdt. 101–4, 39 FR 22252, June 21, 1974]

§ 101.25 Notice requirements.

No person may operate an unmanned rocket unless that person gives the following information to the FAA ATC facility nearest to the place of intended operation no less than 24 hours prior to and no more than 48 hours prior to beginning the operation:

- (a) The names and addresses of the operators; except when there are multiple participants at a single event, the name and address of the person so designated as the event launch coordinator, whose duties include coordination of the required launch data estimates and coordinating the launch event;
- (b) The estimated number of rockets to be operated;
- (c) The estimated size and the estimated weight of each rocket; and
- (d) The estimated highest altitude or flight level to which each rocket will be operated.
- (e) The location of the operation.
- (f) The date, time, and duration of the operation.
- (g) Any other pertinent information requested by the ATC facility.

[Doc. No. 1580, 28 FR 6722, June 29, 1963, as amended by Amdt. 101–6, 59 FR 50393, Oct. 3, 1994]

Subpart D—Unmanned Free Balloons

Source: Docket No. 1457, 29 FR 47, Jan. 3, 1964, unless otherwise noted.

§ 101.31 Applicability.

This subpart applies to the operation of unmanned free balloons. However, a person operating an unmanned free balloon within a restricted area must comply only with §101.33 (d) and (e) and with any additional limitations that are imposed by the using or controlling agency, as appropriate.

§ 101.33 Operating limitations.

No person may operate an unmanned free balloon—

- (a) Unless otherwise authorized by ATC, below 2,000 feet above the surface within the lateral boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for an airport;
- (b) At any altitude where there are clouds or obscuring phenomena of more than five-tenths coverage;
- (c) At any altitude below 60,000 feet standard pressure altitude where the horizontal visibility is less than five miles;
- (d) During the first 1,000 feet of ascent, over a congested area of a city, town, or settlement or an open-air assembly of persons not associated with the operation; or
- (e) In such a manner that impact of the balloon, or part thereof including its payload, with the surface creates a hazard to persons or property not associated with the operation.

[Doc. No. 1457, 29 FR 47, Jan. 3, 1964, as amended by Amdt. 101–5, 56 FR 65662, Dec. 17, 1991]

§ 101.35 Equipment and marking requirements.

(a) No person may operate an unmanned free balloon unless—

- (1) It is equipped with at least two payload cut-down systems or devices that operate independently of each other;
- (2) At least two methods, systems, devices, or combinations thereof, that function independently of each other, are employed for terminating the flight of the balloon envelope; and
- (3) The balloon envelope is equipped with a radar reflective device(s) or material that will present an echo to surface radar operating in the 200 MHz to 2700 MHz frequency range.

The operator shall activate the appropriate devices required by paragraphs (a) (1) and (2) of this section when weather conditions are less than those prescribed for operation under this subpart, or if a malfunction or any other reason makes the further operation hazardous to other air traffic or to persons and property on the surface.

- (b) No person may operate an unmanned free balloon below 60,000 feet standard pressure altitude between sunset and sunrise (as corrected to the altitude of operation) unless the balloon and its attachments and payload, whether or not they become separated during the operation, are equipped with lights that are visible for at least 5 miles and have a flash frequency of at least 40, and not more than 100, cycles per minute.
- (c) No person may operate an unmanned free balloon that is equipped with a trailing antenna that requires an impact force of more than 50 pounds to break it at any point, unless the antenna has colored pennants or streamers that are attached at not more than 50 foot intervals and that are visible for at least one mile.

(d) No person may operate between sunrise and sunset an unmanned free balloon that is equipped with a suspension device (other than a highly conspicuously colored open parachute) more than 50 feet along, unless the suspension device is colored in alternate bands of high conspicuity colors or has colored pennants or streamers attached which are visible for at least one mile.

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

[Doc. No. 1457, 29 FR 47, Jan. 3, 1964, as amended by Amdt. 101–2, 32 FR 5254, Mar. 29, 1967; Amdt. 101–4, 39 FR 22252, June 21, 1974]

§ 101.37 Notice requirements.

(a) *Prelaunch notice:* Except as provided in paragraph (b) of this section, no person may operate an unmanned free balloon unless, within 6 to 24 hours before beginning the operation, he gives the following information to the FAA ATC facility that is nearest to the place of intended operation:

- (1) The balloon identification.
- (2) The estimated date and time of launching, amended as necessary to remain within plus or minus 30 minutes.
- (3) The location of the launching site.
- (4) The cruising altitude.
- (5) The forecast trajectory and estimated time to cruising altitude or 60,000 feet standard pressure altitude, whichever is lower.
- (6) The length and diameter of the balloon, length of the suspension device, weight of the payload, and length of the trailing antenna.
- (7) The duration of flight.
- (8) The forecast time and location of impact with the surface of the earth.

(b) For solar or cosmic disturbance investigations involving a critical time element, the information in paragraph (a) of this section shall be given within 30 minutes to 24 hours before beginning the operation.

(c) *Cancellation notice:* If the operation is canceled, the person who intended to conduct the operation shall immediately notify the nearest FAA ATC facility.

(d) *Launch notice:* Each person operating an unmanned free balloon shall notify the nearest FAA or military ATC facility of the launch time immediately after the balloon is launched.

§ 101.39 Balloon position reports.

(a) Each person operating an unmanned free balloon shall:

- (1) Unless ATC requires otherwise, monitor the course of the balloon and record its position at least every two hours; and
- (2) Forward any balloon position reports requested by ATC.

(b) One hour before beginning descent, each person operating an unmanned free balloon shall forward to the nearest FAA ATC facility the following information regarding the balloon:

(1) The current geographical position.

(2) The altitude.

(3) The forecast time of penetration of 60,000 feet standard pressure altitude (if applicable).

(4) The forecast trajectory for the balance of the flight.

(5) The forecast time and location of impact with the surface of the earth.

(c) If a balloon position report is not recorded for any two-hour period of flight, the person operating an unmanned free balloon shall immediately notify the nearest FAA ATC facility. The notice shall include the last recorded position and any revision of the forecast trajectory. The nearest FAA ATC facility shall be notified immediately when tracking of the balloon is re-established.

(d) Each person operating an unmanned free balloon shall notify the nearest FAA ATC facility when the operation is ended.

E

NAR High Power Rocket Safety Code

1. **Certification.** I will only fly high power rockets or possess high power rocket motors that are within the scope of my user certification and required licensing.
2. **Materials.** I will use only lightweight materials such as paper, wood, rubber, plastic, fiberglass, or when necessary ductile metal, for the construction of my rocket.
3. **Motors.** I will use only certified, commercially made rocket motors, and **will not tamper with these motors** or use them for any purposes except those recommended by the manufacturer. I will not allow smoking, open flames, nor heat sources within 25 feet of these motors.
4. **Ignition System.** I will launch my rockets with an electrical launch system, and with electrical motor igniters that are installed in the motor only after my rocket is at the launch pad or in a designated prepping area. **My launch system will have a safety interlock that is in series with the launch switch that is not installed until my rocket is ready for launch, and will use a launch switch that returns to the "off" position when released. If my rocket has onboard ignition systems for motors or recovery devices, these will have safety interlocks that interrupt the current path until the rocket is at the launch pad.**
5. **Misfires.** If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.
6. **Launch Safety.** I will use a 5-second countdown before launch. I will ensure that no person is closer to the launch pad than allowed by the accompanying Minimum Distance Table, and that a means is available to warn participants and spectators in the event of a problem. I will check the stability of my rocket before flight and will not fly it if it cannot be determined to be stable.
7. **Launcher.** I will launch my rocket from a stable device that provides rigid guidance until the rocket has attained a speed that ensures a stable flight, and that is pointed to within 20 degrees of vertical. If the wind speed exceeds 5 miles per hour I will use a launcher length that permits the rocket to attain a safe velocity before separation from the launcher. I will use a blast deflector to prevent the motor's exhaust from hitting the ground. I will ensure that dry grass is cleared around each launch pad in accordance with the accompanying Minimum Distance table, and will increase this distance by a factor of 1.5 if the rocket motor being launched uses titanium sponge in the propellant.
8. **Size.** My rocket will not contain any combination of motors that total more than 40,960 N-sec (9208 pound-seconds) of total impulse. My rocket will not weigh more at liftoff than one-third of the certified average thrust of the high power rocket motor(s) intended to be ignited at launch.
9. **Flight Safety.** I will not launch my rocket at targets, into clouds, near airplanes, nor on trajectories that take it directly over the heads of spectators or beyond the boundaries of the launch site, and will not put any flammable or explosive payload in my rocket. **I will not**

launch my rockets if wind speeds exceed 20 miles per hour. I will comply with Federal Aviation Administration airspace regulations when flying, and will ensure that my rocket will not exceed any applicable altitude limit in effect at that launch site.

10. **Launch Site.** I will launch my rocket outdoors, in an open area where trees, power lines, buildings, and persons not involved in the launch do not present a hazard, and that is at least as large on its smallest dimension as one-half of the maximum altitude to which rockets are allowed to be flown at that site or 1500 feet, whichever is greater.
11. **Launcher Location.** My launcher will be 1500 feet from any inhabited building or from any public highway on which traffic flow exceeds 10 vehicles per hour, not including traffic flow related to the launch. It will also be no closer than the appropriate Minimum Personnel Distance from the accompanying table from any boundary of the launch site.
12. **Recovery System.** I will use a recovery system such as a parachute in my rocket so that all parts of my rocket return safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.
13. **Recovery Safety.** I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places, fly it under conditions where it is likely to recover in spectator areas or outside the launch site, nor attempt to catch it as it approaches the ground.