

Federal Aviation Regulations Concerning Unmanned Rocket Operations

Pertinent Regulations and Proper Interpretation

Federal aviation regulations permit the operation of unmanned rockets in the United States in accordance with FAR 101, specifically Subpart C – Unmanned Rockets. Sec. 101.21 – 101.25 describe all limitations that must be observed to legally operate unmanned rockets in United States airspace. Any deviation from these restrictions requires a waiver of the appropriate part of FAR 101 subpart C as provided for in Sec. 101.3, specifically:

Sec. 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]

The applicability of FAR 101 to unmanned rocket operations is covered by Sec. 101.1, specifically Sec. 101.1 (a) (3) (ii) (a) – 101.1 (a) (3) (ii) (d), to wit:

Sec. 101.1 Applicability.

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

(1) Except as provided for in Sec. 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 Sec. 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.

So FAR 101 **does not in any way limit** the operation of rockets having less than 4 oz. (113.4 g) of slow-burning propellant (e.g. black powder) that are made of paper, wood, or breakable plastic containing no substantial metal parts and weighing, in toto, less than 16 ounces (1 pound, 453.6 g) when operated in a manner that does not create a hazard to persons, property, or other aircraft.

The federal regulations **do limit** unmanned rocket operations of rockets that do not meet the exemption discussed above, specifically Sec. 101.23:

Sec. 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]

However, a special provision is made for large model rockets, defined in Sec. 101.22, specifically:

Sec. 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 Sec. 101.23 (b), (c), (g), and (h), provided:

- (a) That person complies with all provisions of Sec. 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 Sec. 101.25 is also provided to the manager of that airport.

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

This special provision specifically allows the operation of rockets containing up to 125 g (4.4 oz) of propellant (black powder or otherwise) that weigh less than 1,500 g (52.9 oz., 3.3 lb) including propellant provided that Sec. 101.25 – Notice Requirements is complied with as well as Sec. 101.23 (a), (d), (e), (f), which concern safe operation and visibility requirement limitations on flight operations.

The notification requirement is given by Sec. 101.25:

Sec. 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]

If and only if flight operations of large model rockets, as defined in Sec. 101.22, above, will occur within 5 miles of an airport runway, must the information required in Sec. 101.25 be furnished to the manager of the nearby airport. This is only a requirement of notification. No permission need be obtained nor waiver requested as long as the unmanned rocket operations fall within either the exemption outlined in Sec. 101.1 (a) (3) (ii) or the large model rocket special provisions outlined in Sec. 101.22.

Operations involving unmanned rockets that do not meet the requirements of either Sec. 101.1 (a) (3) (ii) or Sec. 101.22 require that a waiver of the appropriate parts of FAR 101 be obtained from the FAA in accordance with Sec. 101.3. For unmanned rockets meeting the above requirements, a waiver is, in fact, impossible to obtain since no part of FAR 101 need be waived for flight operations.

A full copy of FAR Part 101 is attached as Appendix A for reference.

Appendix A

PART 101--MOORED BALLOONS, KITES, UNMANNED ROCKETS AND UNMANNED FREE BALLOONS

Subpart A--General

Sec.

101.1 Applicability.

101.3 Waivers.

101.5 Operations in prohibited or restricted areas.

101.7 Hazardous operations.

Subpart B--Moored Balloons and Kites

101.11 Applicability.

101.13 Operating limitations.

101.15 Notice requirements.

101.17 Lighting and marking requirements.

101.19 Rapid deflation device.

Subpart C--Unmanned Rockets

101.21 Applicability.

101.22 Special provisions for large model rockets.

101.23 Operating limitations.

101.25 Notice requirements.

Subpart D--Unmanned Free Balloons

101.31 Applicability.

101.33 Operating limitations.

101.35 Equipment and marking requirements.

101.37 Notice requirements.

101.39 Balloon position reports.

Authority: 49 U.S.C. 106(g), 40103, 40113-40114, 45302, 44502, 44514, 44701-44702, 44721, 46308.

Subpart A--General

Sec. 101.1 Applicability.

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

(1) Except as provided for in Sec. 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 Sec. 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 Sec. 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]

Sec. 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]

Sec. 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.

[Amdt. 101-1, 29 FR 46, Jan. 3, 1964]

Sec. 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, Amdt. 101-4, 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.

Sec. 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 Sec. 101.19 and with additional limitations imposed by the using or controlling agency, as appropriate.

Sec. 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 top of any structure and within 250 feet of it, if that shielded operation does not obscure any lighting on the structure.

Sec. 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.

Sec. 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]

Sec. 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

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

Sec. 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 Sec. 101.23(g) and with additional limitations imposed by the using or controlling agency, as appropriate.

Sec. 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 Sec. 101.23 (b), (c), (g), and (h), provided:

- (a) That person complies with all provisions of Sec. 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 Sec. 101.25 is also provided to the manager of that airport.

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

Sec. 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]

Sec. 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, Amdt. 101-1, 29 FR 47, Jan. 3, 1964, unless otherwise noted.

Sec. 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 Sec. 101.33 (d) and (e) and with any additional limitations that are imposed by the using or controlling agency, as appropriate.

Sec. 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.

[Dkt. 1457, Amdt. 101-1, 29 FR 47, Jan. 3, 1964, as amended by Amdt. 101-5, 56 FR 65662, Dec. 17, 1991]

Sec. 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, Amdt. 101-1, 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]

Sec. 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.

Sec. 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.

14 CFR 101 * Amendment 101-7 * Dec. 28, 1995