FAA Regulations for Unmanned Free Balloons

The Federal Aviation Administration (FAA) creates and enforces the rules for the airspace overlying the United States. The regulations are location in the United States Federal Register in a document called the Code of Federal Regulations (CFR). The part of the CFR that deals with aviation is located in title 14 (Title 14 CFR). Title 14 is broken down into several parts. Part 101 is the section that deals with unmanned free balloons (as well as a few other things such as model rockets and kites). Therefore, when talking about balloon regulation you will use the CFR Title 14 part 101. The full regulation can be found here: https://www.ecfr.gov/current/title-14/chapter-I/subchapter-F/part-101. Unmanned free balloons are specifically addressed in subpart D of part 101. General Applicability for unmanned free balloons is discussed in subpart A of part 101.1(a)(4)(i-iv) including weight restrictions. Below we will examine the key things you need to know.

General

- An unmanned free balloon may carry a single payload package that weighs up to six pounds
- An unmanned free balloon may carry two or more payload packages that weigh up to 12 pounds.
- An unmanned free balloon may carry a payload package that weighs up to four pounds and has a weight/size ratio of no 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. (Recall that Pressure = Force/Area ($P = F/A$). For a given force, such as weight, the smaller the area, the higher the pressure.)
- While waivers related to payload weight can be obtained through the FAA, no waivers will be obtained for payloads flown under the Nationwide Eclipse Ballooning Project (NEBP).

Operations:

- You cannot launch a balloon from an airport without permission. MSGC primarily operates from airports. We have agreements with the airport managers at each airport we launch from, we call the airport at least 24 hours before each launch, and we notify ATC (Air Traffic Control) of our launch location and time of launch at least 24 hours before launch. If launching from an airport, select a small airport without a control tower with very limited air traffic.
- You need to be able to see 5 miles (visibility), have no more than 50% cloud cover at launch and across your entire flight path.
- You cannot fly over a town or open-air group of people for the first 1,000 feet of (vertical) flight.
- Your balloon and its payload cannot be a hazard to people if it should hit them.

Equipment and Markings

You need two ways to terminate the flight. MSGC uses the nichrome cutdown unit (this has two methods, a manual cut and another on a timer). The latex balloon will also pop if it gets too high. These are three independent flight termination systems. If the balloon has a controllable vent, the vent can be opened making a fourth termination system.

A radar reflector is a simple devise that hangs in the payload string so that the payload shows up on radar.

You need a strobe light that can be seen 5 miles away if you fly before sunrise or after sunset.

If the payload string is more than 50 feet long you need colored streamers that can be seen from 1 mile away. MSGC has never flown a payload string that long.

You need a breakaway point in the payload string that will break at no more than 50 lbs. MSGC uses a 40lbs test line at the cutdown to meet this requirement.

Read the full section below on **notice requirements**. A summary is provided here that describes what MSGC does on its' flights. A NOTAM (Notice To Airman) is filed with flight service (https://www.1800wxbrief.com) or 877-487-6867, 24 hours before the launch. The airport that the balloon will be launched from (if using an airport) is contacted and permission is received to operate from their airfield. The local air traffic control enroute center (Salt Lake Center for MSGC) is contacted via email and/or phone will the information requested below (a sample template is provided in the appendix that MSGC uses on all its flights). On the day of the flight ATC is contacted 30 minutes before launch, at launch, then at altitudes 18,000, 30,000, 45,000, burst/cutdown, 45,000, 30,000, 18,000, and landing. Position reports are provided upon request. This protocol was established through a strong working relationship between MSGC and Salt Lake Center, our local Air traffic control center. Not all air traffic control centers will want to deal with all of these phone calls. When flying less than 12 lbs. as you will be doing on eclipse day, this phone call should not be required, however the NOTAM should be filed.

Below are the parts of CFR Title 14 part 101 that apply to unmanned free balloons source: https://www.ecfr.gov/current/title-14/chapter-I/subchapter-F/part-101:

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.

Appendix

How to File a NOTAM

Flight Service 877-487-6867 (Call to file NOTAM)

When calling flight service the first question is “which state are you calling for?”. Say “Montana”.

An operator will come on the line. Say “I would like to file a NOTAM for an unmanned free balloon”.

They will ask if you have filed a NOTAM in the last 30 days. If you have, say “yes”, and they will then ask you for the NOTAM number. The number will look something like this “BZN 04/072”. Use the phonetic alphabet, so you would say “Bravo Zulu November zero four slant zero seven two”. They will want the following information (they may not ask in this order):

- Location (needs to be an airport or a bearing and distance from a VOR)
- Altitude-I always say “from the surface to 95,000 feet (or flight level 950).”
- They want a direction of flight (usually Eastbound-pick the direction it will go at launch)
- Date
- Time (this will be the start and end of your launch window. I do one hour. Also, the time has to be in ZULU. (Usually MT +6 but look it up to be sure as the time change in the US might not align with Greenwich England.)

Once complete they should read the NOTAM back to you. Listen to make sure it is right. If so say “read back correct”. If not fix any errors.

Be ready to copy the NOTAM number. It should be three digits followed by 3 digits a “/” and three more digits.

Next say “I also want to file a landing NOTAM”. They will want all the same info. The only difference is that they will want a landing location and an area around it. I always do a 10 Nautical mile radius. This location will have to be the closest VOR with bearing and distance. It will fall from Flight level 950 to the surface.

After you get off the phone go here: https://www.notams.faa.gov/ and search for the NOTAM. Just enter the letter “K” and the three digit code at the start of the NOTAM number ie. “KBZN” or KBIL”. Find the NOTAMS and copy paste them into the flight notice. Update the flight path and resend to the FAA email list. If you search right away they should be the first NOTAMS that come up.

Alpha	Golf	Mike	Sierra	Yankee
Bravo	Hotel	November	Tango	Zulu
Charlie	India	Oscar	Uniform	
Delta	Juliet	Papa	Victor	
Echo	Kilo	Quebec	Whiskey	
Foxtrot	Lima	Romeo	X-ray	

FAA Launch Notices
MSGC files a launch notice to the FAA as shown below:

Send one flight notice when you are pretty sure of a flight day (No more than a week out).
Send an updated report the day before the flight when you file the NOTAMS.

Borealis – Balloon Launch Exercise

NOTIFY: AREAS A & B, SECTORS 19/20 & 15, 17/39 FLM, OMIC

DATES OF USE: Thursday July 21, 2022

TIMES OF USE (Z): 1400Z-1530Z launch window with operation lasting approximately 4 hours.

Contact will notify Area A Supervisor at (XXX)XXX-XXXX and (XXX) XXX-XXX 30 minutes prior to launch.

POINT OF CONTACT: Mike Walach, Montana State University, Cell phone: XXX-XXX-XXXX

ALTITUDES (MSL): SURFACE TO APPROX. 95,000 MSL

ROUTE: Wheatland County Airport at Harlowton HWQ, SE bound track from launch point to ~30nm from BIL VOR on 330 radial.

REPORTS: POC will report the following progress points:

- Launch
- Ascending through FL180
- Ascending through FL300
- Ascending through FL450
- Burst
- Descending through FL450
- Descending through FL300
- Descending through FL180
- Touchdown

ADDITIONAL INFORMATION:

Balloon 1: IMEI# 300234065065560

- Balloon: 1200-gram latex balloon
- Total Length – balloon + parachute + payload ~ 30 feet
- Total Suspended Payload weight: 5 kg (11 pounds)
- Parachute length including suspension lines: 10 feet
- Parachute Color: Red/White
- Transponder equipped: No
- Balloon GPS monitored via Iridium satellite telemetry

Balloon 2: IMEI# 300234063047450

- Balloon: 1200-gram latex balloon
- Total Length – balloon + parachute + payload ~ 30 feet
- Total Suspended Payload weight: 5 kg (11 pounds)
- Parachute length including suspension lines: 10 feet
- Parachute Color: Orange/White
- Transponder equipped: No
- Balloon GPS monitored via Iridium satellite telemetry

NOTAMS:

!HWQ 07/139 - AIRSPACE UNMANNED FREE BALLOON HWQ SFC-FL950 SEB. 21 JUL 14:00 2022 UNTIL 21
JUL 15:30 2022. CREATED: 20 JUL 14:49 2022

!ZLC 07/154 - AIRSPACE BALLOON LDG WI AN AREA DEFINED AS 10NM RADIUS OF BIL330030
PAYLOAD FALLING
FM FL950. 21 JUL 16:30 2022 UNTIL 21 JUL 18:00 2022. CREATED: 20 JUL 14:52 2022

INTERNET POSITION REPORTS: (Flight Track is the same for both Balloons)

Balloon 1

http://eclipse.rci.montana.edu Balloon Identifier: IMEI# 300234065065560

Balloon 2

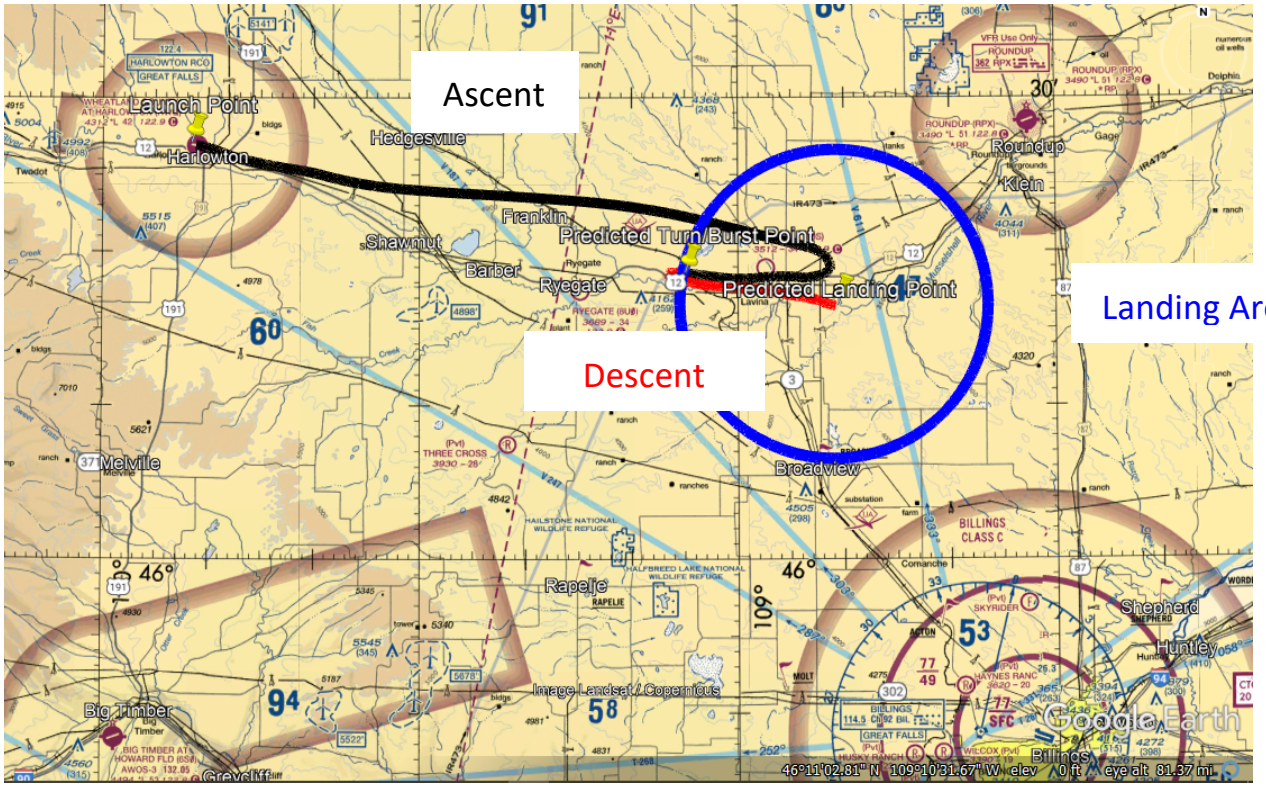
http://eclipse.rci.montana.edu Balloon Identifier: IMEI# 300234063047450

Predicted Track

Updated 7/20/2022

Predicted Flight Track

July 21, 2022



Salt Lake Center Call List

Area A Supervisor (xxx-xxx-xxxx)
Area B Supervisor (xxx-xxx-xxxx)

☐30 Minutes prior to Launch	☐Burst
☐Launch	☐Descending through FL450
☐Ascending through FL180	☐Descending through FL300
☐Ascending through FL300	☐Descending through FL180
☐Ascending through FL450	☐Landing