FAA Regulations regarding unmanned free balloon flights.

My concerns for all US hab launches.

In preparation for my high altitude balloon flights here in the US, I have been researching those who already launch their own balloon projects. I'm concerned that many of them may be operating outside the FAA regulations, and are therefore at risk of being prosecuted should anything go wrong. I don't want that to happen to me, and so I am researching the regulations. My findings are here for others to observe. Please, if you are planning to fly a high altitude balloon in the USA, read and observe the regulations for your protection and the protection of other hobbyists.

Part 101 of Title 14: Aeronautics and Space.
An electronic copy of the code of federal regulations can be found at www.ecfr.gov of which, the regulations concerning unmanned free balloons can be found in part 101 of Title 14: Aeronautics and Space. These regulations are updated by the National Archives and Records Administration's Office of the Federal Register (OFR) on a daily basis. This website is also referenced from the Federal Aviation Administration website.

My reading of the regulations.

(Please read the regulations for yourself and comply with them. I will not be held responsible for the use or misuse of the information contained here. I have provided you with links to regulatory documents to aid in your compliance *)*

Researching the regulations regarding my pending high altitude balloon flights in the US, I came across a couple of blogs/articles which lead me to the above information. The authors of those articles had already done their research, but I didn't want to take their word for it, and so I looked up the documentation for myself, if only to verify that which I had already read.

As it turns out, there are a number of regulations which cause significant concerns for any project flying an "unmanned free balloon" such as:

Part 101.35: Equipment and marking requirements…
No person may operate an unmanned free balloon unless—

- It is equipped with at least two payload cut-down systems or devices that operate independently of each other;

- 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
- 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.

Complying with these regulations would be a significant engineering challenge for a high altitude balloon flight if they applied, but fortunately, they need not. These requirements are only imposed on flights which are applicable ...

Part 101.1: Applicability.

... Except as provided for in §101.7, any unmanned free balloon that—

- 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;
- Carries a payload package that weighs more than six pounds;
- Carries a payload, of two or more packages, that weighs more than 12 pounds; or
- 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.

In Summary...
In order to legally fly an unmanned free high altitude balloon under the regulations, we must either comply with the restraints in part 101.35, or preferably, avoid having to comply with them by falling outside the applicability requirements. The following checklist should ensure that an envelope and payload fall outside those applicability requirements...

1. Any single payload which weighs more than 4lbs (1.814kg) must not have a size to weight ratio of more than three ounces per square inch (85.04g per inch / 38.65g per cm) which must be determined by measuring the smallest face of the payload.
2. Any single payload may not exceed 6lbs (2.721kg)
3. Any envelope must not carry multiple payloads totaling more than 12lbs (5.443kg)
4. The suspension rope / other suspension device, must not require more than 50lbs (22.679kg) of impact force to separate it from the balloon.

These engineering constraints are actually far easier to accomplish than the otherwise required breakdown mechanisms and envelope termination systems.

Additionally, the following check list ensures compliance with Part 22.925 and FCC Part 97..

1. **DO NOT** use a cell phone aboard your payload. (See Part 22.925 of Title 47)

2. If transmitting data using a radio, obtain a H.A.M license and call sign, and observe FCC Part 97 of Title 47.

Good Practice..
Although it would appear that the majority of the regulations can be avoided, there are some which cannot be avoided and others which are simply good practice in the interests of safety. The following is my good-practice check list.

1) Ensure your launch site is not within 5 miles (10 preferably) of an operating airport, and is at least this far from any city or highly populated area.

2) Contact ATC (Air Traffic Control) to inform them of your flight and request their permission.
Regulations state that this should be done within 6 to 24 hours before the flight. I intend to do this much sooner (perhaps as much as a month in advance) and then again 24 hours before flight as well as the on-site calls to ATC before launch and notifying them of launch immediately after.

Inform them of the following:

- The balloon identification.
- Launch Location (Have longitude and latitude for them)
- Launch date and time
- Expected altitude (and cruising altitude for floating envelopes)
- Duration of flight, Ascent rate and Descent rate (as time to altitude, time cruising if any, and time to return to ground)
- Length and diameter of the balloon, length of suspension device, weight of payload, length of trailing antenna (if used)
- The forecast time and location of impact with the surface of the earth
- Cancellation notice: If the operation is cancelled, the person who intended to conduct the operation must immediately notify the nearest FCC ATC facility.
- Launch notice: The person operating must notify the ATC of the launch time immediately after the balloon is launched.

3) Position reports: The flight must be monitored and it's position recorded at least every two hours. If requested by ATC the position reports must be forwarded to them. In addition, at one hour before the balloon descent, the operator must forward the following information to ATC:

- The current geographical position of the balloon.
- The altitude.
- The forecast time of penetration of 60,000 feet standard pressure altitude.

- The forecast trajectory for the balance of the flight.
- The forecast time and location of impact with the surface of the earth.

* Note: 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.