

Transportation of Helium for High Altitude Ballooning (HAB)

Compressed helium in a tank (or cylinder) is a division 2.2 material and is thus designated a hazardous material or dangerous good by the Department of Transportation (DOT) as defined by 49 CFR 172.010. This means that the transportation of compressed helium is regulated and therefore it is important that the high altitude ballooning community understand these regulations and how compressed helium can be transported for balloon launches safely and legally. This document is to help inform the high altitude ballooning community on how transportation/travel of compressed helium can be performed within the law, but it is ultimately your own responsibility to understand and follow the regulations of transporting hazardous materials and not rely exclusively on this document.

The regulations for transporting hazardous materials typically apply to commercial transport. Since the ballooning community transports compressed helium with the balloons for HAB launches we meet an exemption under “Materials of Trade” (formally “Tools of the Trade”). This exemption can be found under eCFR Title 49 → Subtitle B → Chapter I → Subchapter C → Part 173 SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS, subpart A 173.6. The short of it is if you comply with the regulations under the “Materials of Trade” (summarized below) you can transport up to an aggregate gross weight (tank plus contents) of 440lbs of compressed helium legally (if you need to transport over 440lbs see bottom of document):

0. Do not rely exclusively on this document. It is your responsibility to know and follow the regulations beyond the scope of this document and how the regulations pertain to your particular situation. See 49 CFR 173.6 for the “Materials of trade exceptions”
- 0.1. Get your tanks and helium from a licensed distributor. If you fill your tanks yourself it opens the gates to a flood of additional regulations, documentation, labeling, etc.
 1. Always transport the high altitude balloons in the same vehicle as the helium tanks
 - a. [Recommendation] Carry the “Materials of Trade” regulations within the transporting vehicle
 - b. [Recommendation] Carry the invoice from place of purchase within the transporting vehicle
 2. Each individual tank (or cylinder) of helium must not exceed 220 pounds (100 kg)
 3. The tanks (or cylinders) of helium can’t have a leaks
 4. The tanks (or cylinders) of helium must be secured. Upright is recommended, but since vapor lock is not an issue with helium they may be secured horizontally
 5. The tanks (or cylinders) of helium must be labeled with a (green) helium hazmat label
 6. The tanks (or cylinders) must be well ventilated (i.e. in a pickup truck and not in an enclosed vehicle)
 7. Whoever is driving the vehicle must be made aware that he or she is transporting compressed helium
 8. The total weight of the tanks (or cylinders) and its contents (helium) must not exceed a total weight of 440 pounds (200 kg) on a motor vehicle

Using a common K type tank (3AA 2265 – 2650 cubic inches) for example would allow the transport of ~3.6 tanks of compressed helium (i.e. 3 tanks).

For those interested in the details of the regulations as they relate to the HAB community, please see below:

1.

"When transported by motor vehicle in conformance with this section, a material of trade (see §171.8 of this subchapter) is not subject to any other requirements of this subchapter besides those set forth or referenced in this section.

[From §171.8] Material of trade means a hazardous material, other than a hazardous waste, that is carried on a motor vehicle –

(3) By a private motor carrier (including vehicles operated by a rail carrier) in direct support of a principal business that is other than transportation by motor vehicle."

Translation: as long as HAB balloons are in the same transporting vehicle as the helium tanks you are in compliance of §171.8.

2.

"(2) A Division 2.1 or 2.2 material in a cylinder with a gross weight not over 100 kg (220 pounds), in a Dewar flask meeting the requirements of §173.320, or a permanently mounted tank manufactured to the ASME Code of not more than 70 gallon water capacity for a nonliquefied Division 2.2 material with no subsidiary hazard."

Translation: Individual vessels containing helium cannot weight over 100 kg (220 lbs). Compressed helium comes in the form of tanks (or cylinders). The tanks BOREALIS often uses are type K – 3AA 2265 with a Water carrying capacity of about 2650 cu. in. (varies by manufacturer) which relates to a weight of about 120 pounds which is compliant.

3./4.

"(b) Packaging. (1) Packagings must be leak tight for liquids and gases, sift proof for solids, and be securely closed, secured against shifting, and protected against damage." and "(3) Outer packagings are not required for receptacles (e.g., cans and bottles) that are secured against shifting in cages, carts, bins, boxes or compartments."

Translations: Make sure the tanks are leak free and are secured appropriately.

5.

"(5) A cylinder or other pressure vessel containing a Division 2.1 or 2.2 material must conform to packaging, qualification, maintenance, and use requirements of this subchapter, except that outer packagings are not required. Manifolding of cylinders is authorized provided all valves are tightly closed." and "(3) A DOT specification cylinder (except DOT specification 39) must be marked and labeled as prescribed in this subchapter. Each DOT39 cylinder must display the markings specified in 178.65(i)."

Translation: Make sure the tank is labeled with a green hazmat label



7.

“(4) The operator of a motor vehicle that contains a material of trade must be informed of the presence of the hazardous material (including whether the package contains a reportable quantity) and must be informed of the requirements of this section.

*(d) **Aggregate gross weight.** Except for a material of trade authorized by paragraph (a)(1)(iii) of this section, the aggregate gross weight of all materials of trade on a motor vehicle may not exceed 200 kg (440 pounds).”*

Translation: The operator of the vehicle must be made aware of what they are transporting. The total weight of the packages (tanks) plus contents (compressed helium) may not weigh over 440 pounds. Assuming the K type tanks described above, that would allow for the transport of 3.6 (3) tanks of compressed helium.

Transporting More than 440 lbs of tanks containing compressed Helium

If your team needs to transport helium for multiple teams or balloons and need to carry more than 440 pounds of compressed helium in a motor vehicle, you can do so under the following conditions:

- 1) You must follow all the regulations above in the “Materials of Trade” (except the 440 pound limit)
- 2) **You must not exceed an aggregate gross weight over 1001 pounds**
- 3) You must carry shipping papers

2. Above 1001 pounds aggregate gross weight (tanks and contents), you must have hazmat placards, CDL - hazmat, hazmat training, and the list goes on and on. You can read up on these regulations starting in 49 CFR 172.504 and <https://www.fmcsa.dot.gov/regulations/hazardous-materials/how-comply-federal-hazardous-materials-regulations> if you desire.

3. If you do need to transport more than 440 pounds of compressed helium tanks (and less than 1001 pounds) you must have shipping papers included in your vehicle. You can learn about how to generate shipping paper in 49 CFR 172.200 and at <https://www.fmcsa.dot.gov/regulations/hazardous-materials/how-comply-federal-hazardous-materials-regulations>.

Below you will find a pre-made “shipping paper” which can be printed off and filled out and carried in the transporting vehicle. Make sure to fully fill (don’t forget to include your “Hazardous Materials Emergency Contact Number” and make sure the “This load is over 1000lb box remains unchecked) out the document accurately and attach or carry the supplier invoice for you tanks with the shipping paper.

Hazardous Materials Emergency Contact Number: In the event of an accident and the occupants of the transporting vehicle are incapacitated, emergency first responders will contact this number in order to obtain information on dealing with the hazardous materials which are being transported and what first aid measures must be made. **This contact must be available for contact anytime the helium is being transported!** There are a number of options you can pursue as your hazardous materials emergency contact:

- Someone made “on call” while tanks are in transport with the ERG (Emergency Response Guidebook) and a Material Safety Data Sheet (MSDS) readily available who can provide safety and first aid information to first responders in the event of an accident.
- University Police (?) – If your university police offer 24/7 contact you may be able to provide their number as your hazmat emergency contact number. Check with your university police before and if you receive permission to use their contact, make sure you let them know when the tanks will be transported.
- Supplier (?) – Your supplier will have a 24/7 number which they use as their hazmat emergency contact (usually a 3rd party) which you can ask if you may piggy-back on.
- University Safety – Universities with “University Safety departments” may be able to provide a hazmat emergency contact (make sure they are aware and available while your tanks are being transported).

A new shipping paper must be created for each flight which more than 440lbs of helium tanks will be transported.

Eclipse Ballooning Project Transportation of Helium Documentation

Carrier Information			Supplier Information (Invoice Attached)		
Name:			Name:		
Address:			Address:		
City:	State:	Zip Code:	City:	State:	Zip Code:
Phone:		Date:	Phone:		

Vehicle Contents:

No. of Units	HM	Basic Description	Total Quantity
Balloons		Meteorological Balloon (g)	grams
Cylinders	X	Ltd Qty, UN1046, Compressed Helium, 2.2, n/a	lbs

Hazardous Material Information:

Identification Number	Shipping Name	Hazard Class	Packing Group
UN1046	Helium, Compressed	2.2	n/a

Material Identification: helium (dot); Helium-4; He; o-Helium; UN 1046, Helium USP

Immediate Hazards to Health: Contact with rapidly expanding gas may cause burns or frostbite. Vapors may cause dizziness or asphyxiation without warning.

Fire, Reactivity and Explosion Hazard: Helium is a non-flammable inert gas and therefore provides no fire or reaction hazard. Heated cylinders may explode and ruptured cylinders may rocket.

Accident Hazard: Heated cylinders may explode and/or damaged/ruptured cylinders may rocket. Leaking cylinders may lead to burns or frostbite or vapors may cause dizziness or asphyxiation. No Spill hazard.

Preliminary First Aid: For exposure to vapor, move victim to fresh air or give artificial respiration if victim is not breathing. For frostbite slowly warm frozen tissue and seek medical attention.

Hazardous Materials Emergency Contact Number:

THIS LOAD IS OVER 1,000 LB.
PLACECARDS REQUIRED

