

stamp
here

To: Public Lab
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by the Public Lab community

Help write this booklet

*This book is a working draft; **we invite you to help expand it, add to it, bring it up to date.***

*Let's try to keep it focused on "**for first timers**" -- but we can link to lots of activities on the website for more advanced techniques!*

We welcome:

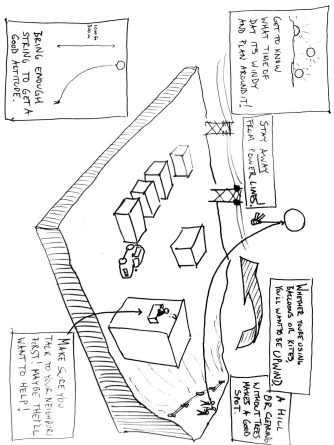
1. Corrections and edits
2. Additions: provide new text suggestions in comments, for either (please specify)
 - a. Guidance and support for new mappers
 - b. Advanced tips and tricks
3. New diagrams or requests for diagrams (line drawings only)
4. New sections (thought we may run a subset in print depending on costs)

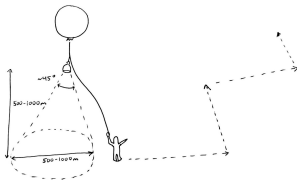
Give it a read over and add your stuff! The layout and design will change.

Improve this guide!

<i>Proposed change to improve this booklet! Cut out this page and mail it.</i>	<i>Your name/attribution line:</i>
<i>Page # or section:</i>	<i>[] addition [] correction [] change/update</i>
<i>Changes/proposed text/drawings:</i>	

Logbook

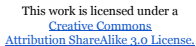




When using kites, be sure there is enough pull to carry the camera (consider a bigger kite or a windier day or launch spot if not), and let out ~20 meters of string before making a loop and attaching the camera. Staying away from buildings or trees will help to fly in clear, consistent wind.

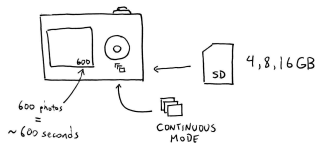
Use the logbook pages to take good notes on your flight. Bring a GPS if you have one, and write down the latitude and longitude, or record a track.

Rigging a camera & preparing to fly



To edit this booklet for the next printing, see:
PublicLab.org/n/14600

<i>Date:</i>	<i>Location:</i>
	<i>Lat:</i> <i>Lon:</i>
<i>Collaborators:</i>	<i>Conditions:</i>
	N W E Windspeed: S
<i>Question you hope to answer:</i>	
<i>What went wrong:</i>	
<i>What went right:</i>	
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Choose and prepare your camera

Any digital camera around 2-300 grams that has a 'continuous shooting mode' can work. You can also use a Canon camera with the CHDK to trigger a photo every 5 seconds.

To fly longer, you may need a newer battery, a larger memory card, or you can set your camera to a lower resolution. An 8 GB card fills up in about 45 minutes, depending on how fast your camera is shooting (every 2-5 seconds is ideal).



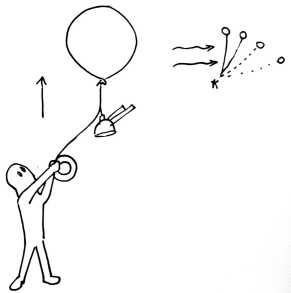
Wind the string carefully - don't let it tangle! If it's bad enough you'll have to throw it out.

A second person just to wind the string can be very helpful.



Always wear gloves to prevent string burns!

Don't fly near power lines or in thunderstorms.



Letting go

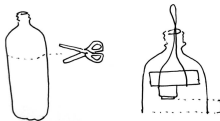
Let balloons rise as fast as you can, but control the speed with your gloves or a shirt sleeve so you don't get burned. If there's wind, it will push them down as soon as you stop letting them rise.

Build a camera capsule

See updated and refined options at <https://publiclab.org/wiki/photo-rig>

This simple protective cover stops your lens from hitting the ground, and protects your camera from hitting walls and trees.

Cut a soda bottle in half and put the camera inside the top with the loop through the bottle neck.

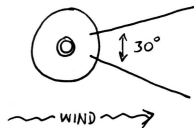
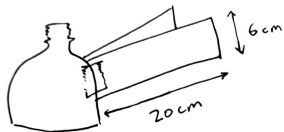


Be sure the camera lens is protected even when it's extended!

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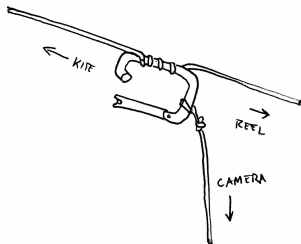
Date:	Location:
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	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> N W E S </div> <div>Windspeed:</div> </div>
Question you hope to answer:	
What went wrong:	
What went right:	
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Use the rest of the bottle to make 'wings' to stabilize it in the wind. Cut strips and crease them to keep them straight.

This will keep your camera from spinning, which blurs the photos.

you loop the string around it 5 times or more:



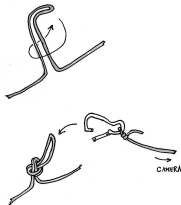
Attach your camera

When using balloons, attach the camera about 30ft below the balloon. For kites, you may want to get your kite stable in the air before attaching the camera - but try to get it within 50-100 feet of the kite, or you've lost all that altitude for your photos!

To make a connection point for your carabiner, make a temporary loop by tying an overhand knot on a loop on the string below the balloon:

A. Slacken the line below the balloon & gather a loop in your hand

B. Loop it around & through itself and pull taut; attach your camera!

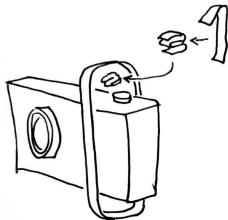


For kites, you don't need to make a tied loop; the tension of the kite pulling will hold a carabiner on if

Set up your camera to auto-trigger

For point and shoot cameras (Canon PowerShot series):

Set your camera on continuous mode. Wad up a bit of card paper or use a pencil eraser to hold down the camera trigger. A small knot works very well. Use a rubber band to hold it in place and apply pressure. Be sure the button is being pressed - you may have to double or triple the band up.



Move the rubber band to one side until you're ready to start.

Checklist for a day of mapping

- ☐ invite people to join in!
- ☐ kite or balloon
- ☐ string
- ☐ camera
- ☐ gloves
- ☐ water
- ☐ sunscreen and/or hat if it's sunny out
- ☐ charge your camera batteries the night before
- ☐ memory cards + readers
- ☐ bag to carry everything

Also useful:

- ☐ 2nd camera to document your process
- ☐ printed out map of your site
- ☐ laptop to look at images
- ☐ snacks

Date:	Location: Lat: Lon:
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Build a string or rubber band harness

Smaller Go-Pro type cameras are light enough that this full harness may not be as necessary, but the design is adaptable to a range of cameras, large and small.

Fold a 1 meter loop of string and tape it firmly onto your camera. Be sure the tape doesn't stop the lens from extending.

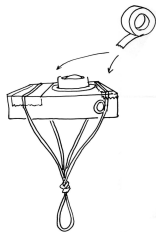


Press the tape down hard - it's the only thing keeping your camera from slipping out of the string at 500 meters high!

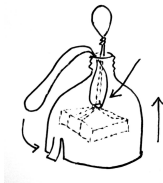
Attach the string

Use a fishing swivel clip or a small carabiner to attach your string to your balloon or kite so it can be unclipped quickly. A swivel, which lets the string twist freely, can be really important to prevent your string from twisting too much -- especially with kites, where this can make your kite dip to one side.

Flying your balloon or kite



You can add a second loop or a rubber band and hook it on the bottom of the bottle to hold the camera firmly against the top.



Balloon Mapping

- 300-1000m 50lb/25kg strength nylon string for balloons (or dacron kite string)
- One 2 meter-wide weather balloon or 5.5ft chloroprene "cloudbuster" balloon. (Chloroprene is more durable) OR or 2-3 x 84" mylar sleeping bags
- 80 cubic feet or 1.5 cu. meters of helium

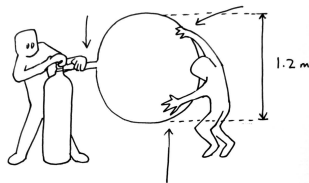
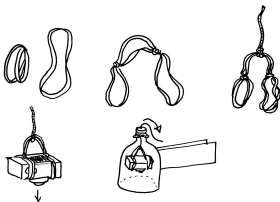
Kite Mapping

- a large kite - 1 square meter or more
- 100lb/50kg+ strength nylon/polyester string for kites
- a kite tail - 10-20ft/3-6m
- earplugs may help in higher wind!

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If you're using string, you can put the cap on over the string when the camera is snugly in place, trapping the string.

Rubber band harnesses can help reduce tape, which gums up your camera, and are a bit more flexible. Chaining rubber bands and doubling them up lets you build flexible harness that'll fit different cameras and bottles. They also hold the camera snugly against the bottle.



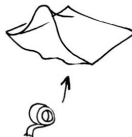
Someone should be in charge of not letting the balloon touch trees, bushes, or the ground. Three people (two for the balloon, one for the tank) makes a good team!



6. Attach the ring to the mooring point, and be sure the balloon doesn't brush against anything sharp.

Choose and prepare a balloon

1.5 meter wide weather balloons work best for heavier cameras (>150 grams), but if you can't get one, you can make one from plastic. You can use several giant trash bags, but they won't stay inflated for more than an hour -- mylar or PET plastic is far more airtight.



Where available, emergency mylar sleeping bags can be taped shut and, if carefully sealed, can stay filled for several days, unlike weather balloons. Two of these are enough to lift a typical camera.

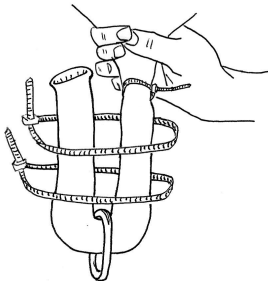
What to do in different wind conditions

<i>Wind speed</i>	<i>How to tell from your surroundings</i>	<i>How to fly a camera in these conditions</i>
0-3 mph / 0-5kph	Flags hang limp; leaves on tops of trees are still	Mini balloons (36 inch mylar, mylar sleeping bag) or 5.5 foot rubber balloons
3-5 mph / 5-8kph	Flags flutter but do not fully extend, treetops and leaves stir	Rokaku and large (9 foot) delta (basic triangular) kites. 5.5 foot rubber balloons, or mini balloons if doubled/tripled, but balloons increasingly difficult to fly..

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Preparing to launch

4. Remove the balloon neck from the helium tank, but
BE CAREFUL not to release it -- it'll fly away!

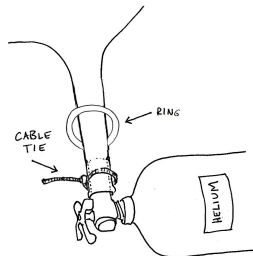


5. Fold the neck over onto itself (twisting it twice) and
around the ring. Tightly wrap with a velcro strip or
two zip ties and pull tight.

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5-10 mph / 8-15kph	Flags flap but do not fully extend; treetops stir	Large or medium delta (triangular) kites. Even large balloons difficult to fly.
10-20 mph / 15-30kph	Flags fully extend regularly, treetops sway	Small or medium delta (triangular) kites with tails or parafoil (spar-less) kites.
20-30 mph / 30-45kph	Flags snap in the wind	Smaller, more robust and stable kites. Use 10-20 foot long fuzzy tails for stability.
30+ mph / 45+ kph	Difficulty walking into the wind	Not great flying weather!

2. Stretch your balloon's opening over the helium tank opening. If you have removable zip ties, you can use one to seal the balloon onto the valve.



3. When you're done filling, push helium up out of the neck and close it with a removable zip tie (cable tie) or a very tight but untieable knot (shoelaces work well) just below the balloon.



Check the local wind conditions

Look around you!

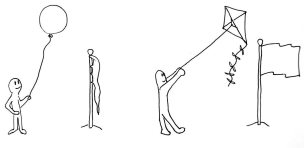
Check treetops, flag poles, clouds. Which way is the wind going on the ground? At tree level? Above in the sky? What obstacles will come up as you launch? Will the balloon change direction while rising? Check again on your satellite map - how far away are those trees, really?

Do a test flight first, without a camera: reel out, then reel in, with about a hundred feet of string. Get to know the wind conditions, especially with a kite.

The highest wind is usually around 2pm, and the lowest is at dawn. Check the weather report and plan accordingly.

Working with a group

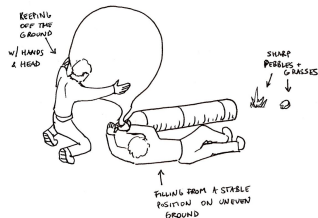
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	<i>Lat:</i> <i>Lon:</i>
<i>Collaborators:</i>	<i>Conditions:</i>
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Balloons or kites?

Decide whether to use a balloon or kite based on local wind conditions. While kites are cheaper, they're harder to fly, and you may have to prepare for both:

Balloons in <10kph wind; kites in more than that.
Look at flags to decide. Also see the **Wind Conditions** section for more.



Fill slowly, gushing helium can rip your balloon and make the tank dangerously cold.

Fill your balloon

If you're having trouble keeping the tank stable, lay the tank on the ground (upright is fine on pavement or even ground).

For larger rubber balloons, a large rubber O-ring or large carabiner can make a good clipping point for your string, so we'll seal the balloon and wrap the neck around this ring.

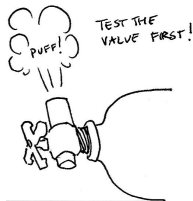
1. Pull the balloon neck through the ring.

Test the valve

If you're filling a large rubber balloon, remove the regulator if one came with your tank (not pictured) -- but small mylar balloons will need a pointy black rubber nozzle.

Carefully open the valve a tiny bit and re-close it, to see how quickly gas comes out.

Consider pre-filling smaller balloons, even at a party store or florists shop, since they're more portable!



*Filling, closing, and
mooring your
balloon*

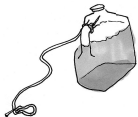
Choosing your launch site and time

<i>Date:</i>	<i>Location:</i>
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Build a mooring weight

A mooring weight can help you set aside a filled balloon in a safe place while you get other things ready.

1. Tie string to a carabiner with double overhand knot (see diagram).
2. Tie the other end (5ft or so) to something heavy like a 1 gallon jug full of water -- so your balloon won't fly away as you're working.
3. Tie the clip swivel to the reel of kite string with the same knot.



Use a bottle as a mooring point

Double overhand knot

