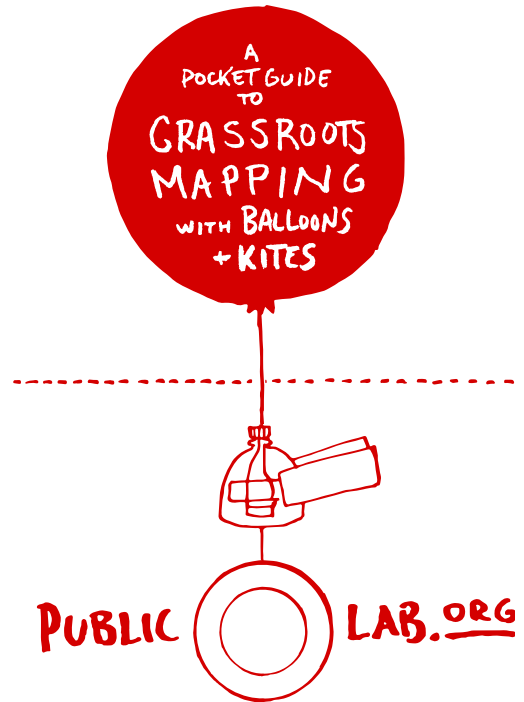


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To: Public Lab  
55 Cromwell St 1D  
Providence, RI 02907  
USA



Date:	Location:
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Collaborators:	Conditions:
	N W E Windspeed: S
Question you hope to answer:	
What went wrong:	
What went right:	
No. times flown:	Est. flight altitude:

## Choose a launch site

When selecting a place to fly from, you'll have to be upwind of the site you want to map.

With your group, look over a map or drawing of your site, and visit the site ahead of time to scout for power lines, trees, or other obstacles, and get a sense of the wind.

## Be safe and responsible

Check that you are five miles or more away from the nearest airport. Otherwise, speak with the airport about sending a "Notice to Airmen" or NOTAM. Bring an existing map, and/or print out satellite imagery of where you'll be mapping (Google, USGS, etc) to help in planning.

## Consider privacy and safety

With a kite or balloon, you're going to meet people where you're mapping. If it's your own neighborhood, great -- you'll meet your neighbors. Either way, expect to talk with people about what you're doing. If you're mapping a pollution site, you may meet the people responsible for polluting. Be prepared and be thoughtful!

## Help write this booklet

*This book is a living document; **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)

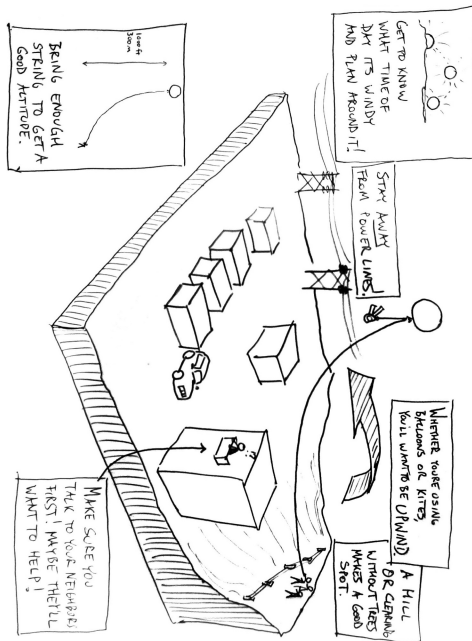
*Give it a read over and add your stuff!*

*Post suggestions at <https://publiclab.org/n/14600>  
Or use the last page to send them in by mail!*

## Improve this guide

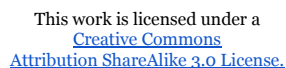
This is a collaboratively written booklet -- suggestions welcome!

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



## Logbook





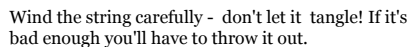
To edit this booklet for the next printing, see:

Add your name here

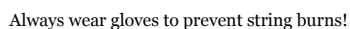


Any digital camera around 2-300 grams that has a 'continuous shooting mode' can work. You can also use a Canon camera with the CHDK to trigger a photo every 5 seconds.

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).

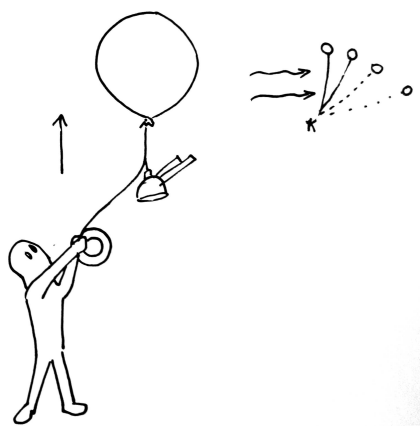


A second person just to wind the string can be very helpful.



Don't fly near power lines or in thunderstorms.

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<i>Question you hope to answer:</i>	
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<i>What went right:</i>	
<i>No. times flown:</i>	<i>Est. flight altitude:</i>



## Letting go

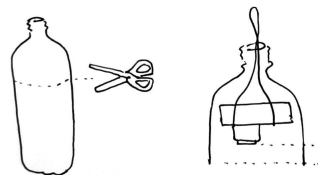
Let balloons rise as fast as you can, but control the speed with your gloves or a shirt sleeve so you don't get burned. If there's wind, it will push them down as soon as you stop letting them rise.

## 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.

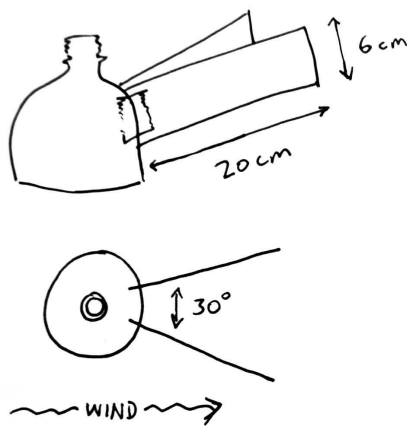


Be sure the camera lens is protected even when it's extended!

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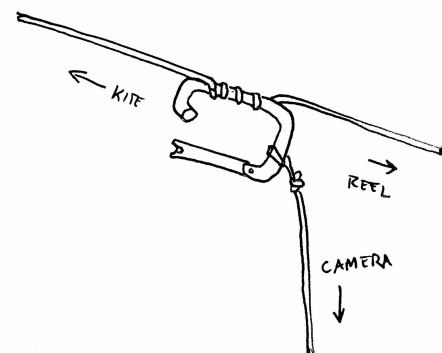
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Question you hope to answer:		
What went wrong:		
What went right:		
No. times flown:	Est. flight altitude:	



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:



<i>Date:</i>	<i>Location:</i>
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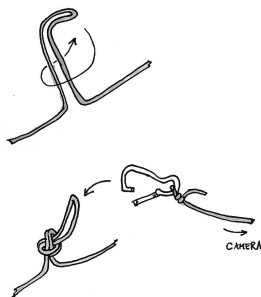
## Attach your camera

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!

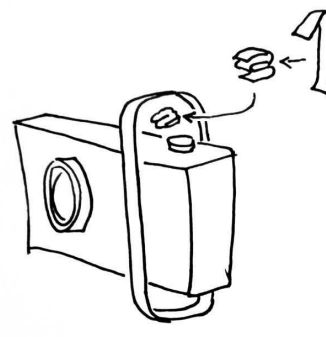


For kites, you don't need to make a tied loop; the tension of the kite pulling will hold a carabiner on if

## 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

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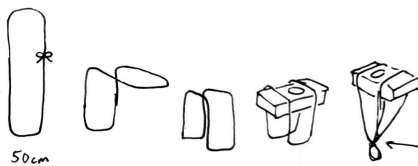
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Question you hope to answer:	
What went wrong:	
What went right:	
No. times flown:	Est. flight altitude:

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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!

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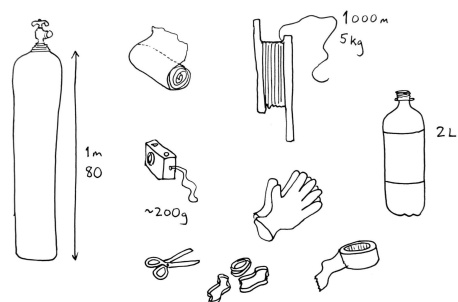
## Attach the string

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.

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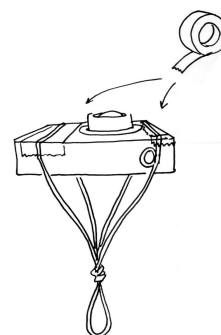
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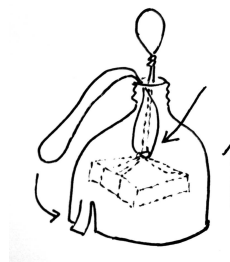
## Materials list

- Plastic soda bottle
- Scissors
- <300g digital camera with continuous shooting mode (such as a Canon PowerShot)
- 4GB or larger memory card
- Cloth or leather work gloves
- Duct or gaffers tape
- Rubber bands, carabiner, velcro strip

## 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!

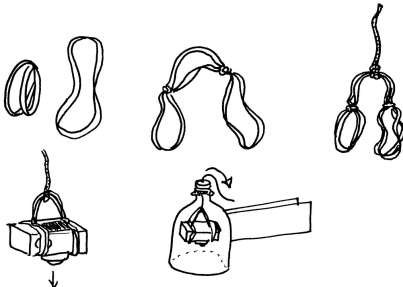
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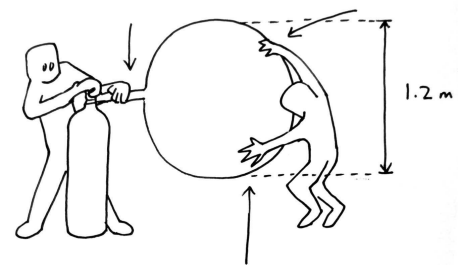
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If you're using string, you can put the cap on over the string when the camera is snugly in place, trapping the string.

**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.



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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!

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## What to do in different wind conditions

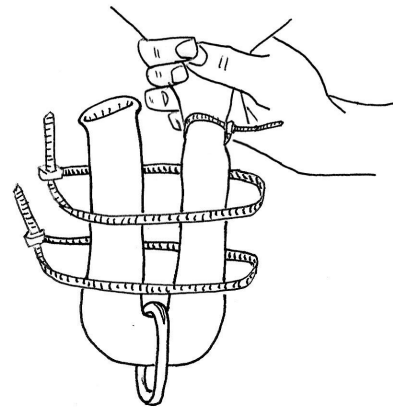
Wind speed	How to tell from your surroundings	How to fly a camera in these conditions
0-3 mph / 0-5kph	Flags hang limp; leaves on tops of trees are still	Mini balloons (36 inch mylar, mylar sleeping bag) or 5.5 foot rubber balloons
3-5 mph / 5-8kph	Flags flutter but do not fully extend, treetops and 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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Date:	Location:
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Collaborators:	Conditions:
	<div style="display: flex; align-items: center;"> <div style="text-align: center;"> N W E S </div> <div style="margin-left: 20px;">Windspeed:</div> </div>
Question you hope to answer:	
What went wrong:	
What went right:	
No. times flown:	Est. flight altitude:

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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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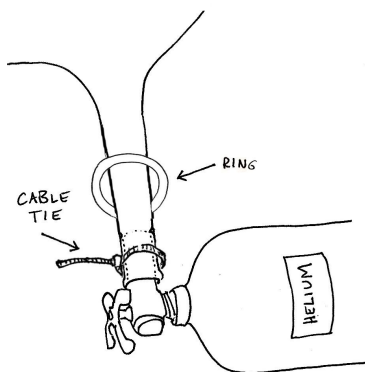
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Collaborators:	Conditions:  N W   E   Windspeed: S
Question you hope to answer:	
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No. times flown:	Est. flight altitude:

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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!

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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.

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## 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.

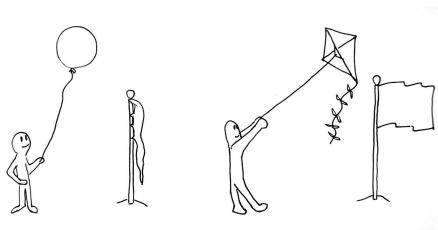
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## Working with a group

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Question you hope to answer:	
What went wrong:	
What went right:	
No. times flown:	Est. flight altitude:

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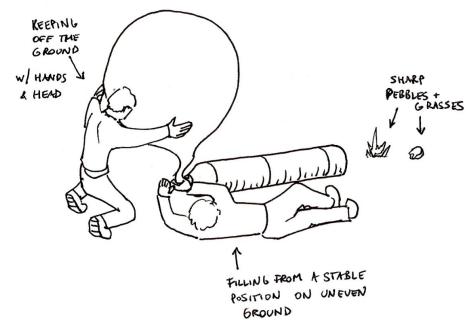


### Balloons or kites?

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.

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*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.

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## Choosing your launch site and time

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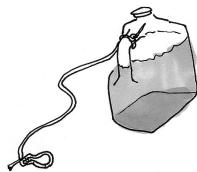
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Question you hope to answer:		
<div style="margin-top: 10px;">What went wrong:</div> <div style="margin-top: 10px;">What went right:</div>		
No. times flown:	Est. flight altitude:	

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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.

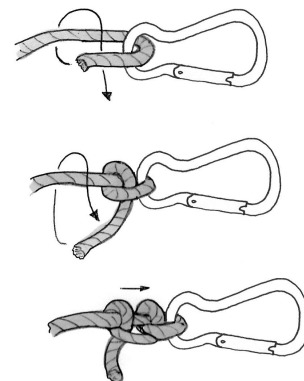
1. Tie string to a carabiner with double overhand knot (see diagram).
2. Tie the other end (5ft or so) to something heavy like a 1 gallon jug full of water -- so your balloon won't fly away as you're working.
3. Tie the clip swivel to the reel of kite string with the same knot.



Use a bottle as a mooring point

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### Double overhand knot



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