The Cloud Chamber

I am taking my inspiration from this project herehttp://www.instructables.com/id/Make-a-Cloud-Chamber-using-Peltier-Coolers/. I plan to start by making a few choice modifications to the design. Once I have it up and running then I will make more drastic changes to the project to see what gives the best result.

First off is some basic concepts on how cloud chambers work. There are three main types of radiation alpha, beta and gamma. The two types we are focusing on is the alpha and beta, this is because these are heavily ionising. The alpha particle has the greatest charge and therefore the greatest ionising power, followed by the beta particle with half the charge of the alpha particle. The ionising properties of the radiation is what allows the cloud chamber to work.

Inside the cloud chamber we create a supersaturated vapour of alcohol by cooling evaporated alcohol down to very low temperatures. This is usually achieved with a chamber of dry ice at the base. As a charged particle, like a Helium nucleus (alpha particle) or electron (beta radiation), passes through the vapour at high speeds it ionises the vapour around it leaving a trail. These are the white lines in the image on the link at the start.

Unlike most cloud chambers I'm using Peltier coolers like the one in the link to cool the alcohol. The advantage of this being that you don't need dry ice every time you want to run your cloud chamber. So I start off with a rather odd shopping list:

A Tec1-12710, A Tec1-12709, Thermal paste, A CPU fan (bigger the better), A clear plastic pot, Some thin scrap metal, Concentrated alcohol (Isopropyl or similar), Some bolts and screws, A light source (a torch to start with), A computer PSU (above 300W) and a radioactive source.

While a radioactive source is not necessary, as you can detect cosmic rays, I thought I would get one for testing. My source is some uranium glass from eBay although others are available this is a nice alpha source, some fire alarms contain americium which is a strong alpha source and can be used. WARNING! handle with care! Although these sources are rarely dangerous ingesting or mishandling a radioactive source is never a good idea, swallowing glass isn't the best idea even if it isn't radioactive. If swallowed consult a doctor immediately, better safe than sorry.

Almost all the things on the list can be found on eBay or in a dump. If your a student it is worth asking around your labs for parts. Fortunately I have most of the parts from old computers and bits lying around. The rest I managed to obtain for £20 including delivery.

If you want to build this yourself it may be worth waiting until I have a working product before you buy all the parts as I am making this up as I go. I will also add more detailed part lists as I go.

Tools: Aside from the essential tools (screw driver, hammer, duct tape, etc.) it is probably useful to have a multimeter and a inferred thermometer although they are not essential.

Okay, after that lengthy post I look forward to starting the project as soon as I receive my parts in about a weeks time!

Source: http://electronicbyte.cc/2013/03/07/the-cloud-chamber/