The main reason to design the new auto release system was to have more control of the water rocket parachute release and build a much cleaner looking water rocket, as the system we were using was the speed flap, which works well most of the time but didn’t look that great with the elastic bands. The thing is that it also had to be made cheaply, because if it is lost you wouldn’t be too happy! There are other release systems but they cost a bit and

There is a photo shop that was near by and had a lot of the disposable cameras that they didn’t want after they processed them so we asked for them. When we checked out the internet for information on how the cameras worked, we found people who have used these cameras for there own projects. Got a lot of great information from the net and started to make our release.

THE RELEASE - We first made a coil out of old transformer wire and a steel pin from a tent peg, so that the latch to the parachute was created (see Release Info). We needed a switch that detected when the rocket had stopped going up and turned over, so a long tube with a steel ball at one end and two contacts at the other was made (see release info). We kept on adding move capacitors until the latch moved which was 4 X 80uf capacitors or about 300uf - 400uf seemed to be enough. (see Release Info).

THE CHARGER - The charger was made out of the insides of the disposable flash camera with some of the components removed and then placed in a suitable container with connection clips at the end of a length of wire from the flash camera circuit board. (see Charger Info)

With the charger, connect the clips to the two contacts on the rocket release and charge until the light comes on in the same way as when you charged the flash on the camera. Remove the clips and the release system is now primed. Pump the water rocket until you get the correct pressure for launch, then launch the water rocket. If all is correct the rocket will reach max height and turn over at which point the steel ball rolls down to the contacts at the other end of the tube and activates the latch to the parachute hatch and it then opens.

The first releases worked great on the ground trials but failed on launch due to the short tube for the steel ball switch. The main reason was the rocket was slowing down due to the drag and the ball wasn’t, so it made contact early and the parachute released into fast moving air flow and was ripped off. so we lengthened the tube and put it on the outside so that we could work out the correct length and get it right. The longer tube didn’t work as well as we had hoped and so we developed the DEPLOYMENT DELAY PIN that puts a pin in the way of the steel ball while the rocket was still going up.

We are still working on the release and will keep you updated as we do more trials. If you have any ideas that can help or just want to share them then please send us an e-mail to fullbore@rocket-fun.com

Take care and watch out for them capacitors!!!!!
Deployment System Diagrams

Side View of Deployment System

Fr ont View of Deployment System

Top View of Deployment System
The Water Rocket Automatic Release System (The Release Info)

The release system onboard the water rocket is made up of four main parts:-

- **The POWER SUPPLY**
- **The TILT SWITCH**
- **The ELECTRO-MAGNETIC LATCH**
- **The DEPLOYMENT DELAY PIN**

The parts are connected using speaker wire and soldered, the charge wire has a diode to stop shocks when you have charged the unit.

**The Power Supply - 4 X 80uf capacitors**

The 4 X 80uf capacitors were taken from disposable flash cameras found at the local photo shop. Make sure you have discharged the capacitors before you work on them as they can still be charged to 230Volts! Reference to the Charger Information pages about the dangers of You can have a total capacity in the capacitors in the range of 300uf -400uf much more than this and it is a waste as it takes longer to charge, much less and the result maybe that the electro-magnetic latch will not work. The capacitors found in the disposable flash cameras are anywhere from 80uf to 160uf. The diode was put in place to stop electrical shock after the capacitors were charged and if they happen to be touched. Sorry to say I have had a shock before this was put into place, so be warned! I charged the capacitors and left them for about ten minutes to see if there was a problem of them being left charged if there was a delayed launch before they were discharged to the electro-magnetic release, there was no problem.

**The Tilt Switch**

The Tilt Switch is simply a steel ball bearing in a long plastic tube with copper contact wires at the end. The idea is that the ball bearing stays at the bottom of the tube until the water rocket reaches its maximum altitude and starts to descend, at which point the steel ball bearing rolls down the tube and touches the contacts. Once the steel ball bearing touches the contacts the power stored in the capacitors is sent to the electro-magnetic switch which releases the hatch to the parachute bay.

The ball in practice stays in the bottom of the tube only on the power part of the launch and then moves slowly up as the rocket slows due to drag but the ball bearing doesn’t slow as much. This can lead to the early release of the chute and disaster, which will result in damage to the rocket and chute. So the answer is to make a DEPLOYMENT DELAY PIN (see OVERVIEW) to stop the steel ball moving up the tube and making the contact which releases the parachute to early.

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The Electromagnetic Latch

The electromechanical latch is made up of a coil, metal pin and a small spring. I think it's the hardest bit to do. The coil is made from the wire from an old power supply I had, all I did was to cut it open, take the metal plates apart with a knife and pliers, which left me with two types of wire, very fine and a thicker wire that I used to make the coil, approx 2 meters of wire per coil.

If you can make the coils from the fine wire then do it as it makes a better electro-magnet as there would be more wrapped wire round the central core. The problem I had was that the fine wire kept on breaking as I wrapped it round to make the coil.

To make the coil you need to know how big the hole in the centre is, so that the pin moves in and out easily. I made the peg a little bigger by putting a small piece of plastic (approx 1.5cm) around the metal peg that I used to make the pin or you can use something that is slightly bigger than the pin you are using. The coil works best the closer it is to the metal peg, so don't make the hole too big.

Put a washer or some kind of end stop at each end of the piece of plastic which only needs to be approx 1.5cm and lock them into place. Leave a length of the wire to act as a connection and then start winding the wire slowly from one washer or end stop, around and around the plastic until you reach the other washer or end stop. Continue to wind the wire over the top of the wire you just wound until you get back to where you started.

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Hold the wound coil and put some tape around it to hold it together, cut the rest of the wire off leaving a small length as a connection, now remove one washer/end stop and slide off the wound coil you just made.

Scratch off the covering on the ends of the copper wire to the coil you just made, so the wire is ready to solder.

**The Spring in the Latch**

You will need a spring from a pen and then cut it in half like the picture. Bend the ends that you cut so that they don't stick or jam inside the coil. The pin is held in place with some fishing line that is tied in the groove and passes through the spring then is glued in place with the spring. The fishing line stops the pin from flying out of the coil after activation.

The pin sits against the spring, do not put any pressure on it as you glue the spring and fishing line into place. You just want the spring to push the pin back into position after activation.
The Water Rocket Automatic Release System (The Charger Info)

Warning: Before continuing any further be aware that the capacitor inside may be fully charged to 330V. You will need to remove the battery and discharge the capacitor with a 1KΩ resistor before moving any further. The capacitor can be discharged by placing a 1KΩ resistor across it’s terminals. Just be sure to use a pair of needle nose to hold the resistor or use wires and alligator clips to discharge the cap with or else you may get shocked while doing so. Also do not directly short out the cap at any time, doing so may destroy the circuit board.

We can now begin by liberating the circuit board from its plastic shell. It would be a good time to make note of the polarity on the AA battery as this will save a little time later. After the circuit board is discharged and removed from the plastic case we can begin to remove some unnecessary parts and add leads for our switches.

Remove the CAPACITOR after you have discharged it first! DANGER 300+ VOLTS. When you have removed the capacitor, put wires from the two contact points of the capacitor one NEGATIVE and one POSITIVE. The capacitor x4 is to be used in the water rocket as a power supply.

Remove the DISCHARGE CONTACTS by removing the connections or the little black box there connected too, depending what type of camera you had.

Remove the FLASH UNIT as you will not be needing it at all as it is the power you want.

Note:-

If the battery was a AAA battery size and you want to make it longer for a AA battery then cut the

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Remove 100uf Capacitor

Charge ready light is under the capacitor here

Remove Discharge Contact Points

Battery Negative

Battery 1.5volts

DANGER 330+ VOLTS

Remove Flash Unit

Capacitor, Flash Unit and Discharge Contact Points To Be Removed

Battery Charging Contact Points

Remove Charge ready light is under the capacitor here
As you remove the components, I found it was best to put the wires into place as I went along. The contact points on some flash units change and you may not be able to solder where they were so follow the board tracks along until you find a solder point and put the wire there, then test if you wish to make sure it works. My soldering isn’t very good but it still seems to work!

The discharge contact points on this flash board can be cut off if you don’t want to remove the black

**Final Assembly**  I will leave the final assembly to the reader’s discretion, but I will offer some tips and suggestions. A project box is a great idea for this size of project as the board with the battery and switch fit perfectly. You may even wish to put the battery into a battery holder instead of the one that was connected to the board. If you plan to fit this unit inside a project box put heat shrink tubing or insulating tape around exposed wires, coat all switch terminals and the bottom of the circuit board with hot melt glue, you don’t want this to blow up or shock someone unintentionally. If you use the project box you will have to remove the two standoffs used to hold the board included with the box. The hot glue gun is very useful, you can use it to secure the board and switch to the box in a position you want.

In this case I put the unit we have just made into a wooden box I had made from 5mm plywood, this was ideal as it was made for the size of the project and I could change it to any requirement.

Get all the components and put them into the location you want and hot glue them in place or if your good at doing a better job mount them any way you like.

The charge ready light was disconnected from the board and extension wires put on so that the light can be glued into the lid of the box. This means you don’t have to keep putting the light back into the lid location
A knot is made in the wire that leads out of the box to stop it being pulled, if it wasn’t there the wire would pull directly on the board which may damage the board or pull the wires out.

A screw hole was made in the base of the box so the holding screw would go through the base and be screwed to the lid. This way the lid was kept clean and tidy. If you need to change the battery, just unscrew at the

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**DANGEROUS CAPACITORS - HIGH VOLTAGE**

The capacitor in a typical camera flash circuit can store a lot of juice. We charged this one up and then discharged it by connecting the two terminals, look at the photo on the left to see what happened. (Kids, don't try this at home!)

**Safety And Common Sense** A charged high voltage capacitor of sufficient size can kill you under the proper conditions, they are not something to be taken lightly. It is current flowing through your body that causes you to feel an electric shock, therefore the more current that passes through you the more painful the shock received.
There are many different types of disposable cameras so a camera you have may be a little different from those shown, but the idea is still the same. The capacitor location is where the lead to the water rocket joins the electronic board. The switch goes where the button on the front of the camera made contact with the board, sometimes the contact points you need to solder on to will be too small and you will have to follow the tracks to a better soldering location. There is the possibility of using the original charging button so you will not have to solder any wires to a switch and this makes for a smaller box to put the whole lot in. When I tried it I found a camera with the round button that you push in, the button and 1cm of the old case was cut out. Hot glue the case around the button to the new case where a hole was made so you could push the button, watch that you don't glue the button itself though or it won't work! Line-up the button on the board with the cut out button and hot glue in position.