ISSUE 48

APOGEE

PEAK OF FLIGHT

NEWSLETTER

Making Yer Own Electric Matches

By Harry Gilliam (Skylighter, Inc.)

Editor's Note: I got this article from a e-zine of Skylighter (with their permission, of course). They sell chemicals to make fireworks and other pyrotechnics. This article is useful to rocketeers, because igniting rocket motors is always an issue. A reliable electric match is essential; particularly if you are flying clustered motors in a design. If you decide to make your own; please remember that working with chemicals can be hazardous to your health. I recommend calling the folks at Skylighter for tips and other safety precautions. Also, you may need a LEUP permit to buy certain chemicals.

An electric match is a small device essentially consisting or a couple of wires attached to a small explosive composition that goes pop when you apply a current to the wires. The explosive power is not too much greater than a toy cap, but more than enough to ignite just about any firework device. They are designed to be used one time and thrown away.

Several years ago, my friend Phil Martinez announced that he was gonna start making electric matches commercially. My cynical unspoken reaction was "here goes yet another otherwise intelligent fireworks guy, trying to reinvent yet another pyro wheel. Ho humm." Phil, of course, proved what a complete dunce I was. He now gets orders for more ematches than he can he can sanely cope with and it just keeps getting worse! His particular claim to fame is an ematch that is generates a hotter flame than the others do. He and I do some horse-trading now and then and after one particularly profitable escapade (for him, not me-I practically gave him a thoroughbred, thinking I was getting rid of a nag.), he, feeling sorry for me, sent me this note along with a box of circuit-board looking strips:

"I have a quantity of copper-clad strips that I used when I first started experimenting with e-matches. I have approx. 600 pieces each measuring .4" x 4.5". What I used to do is spiral wrap the nichrome wire around the strips and then apply stainless steel soldering flux to one side and solder using the flank of the soldering iron tip. I would then flip the strip over and do [solder] the other side. This was followed by a flux-neutralizing bath of sodium bicarbonate in water. The ignitor chips can then be cut with a pair of scissors from the strip. All of the strips have a routed edge so that the finished product will have the nichrome spanning an unsoldered step on the tip of the chip (for better contact with the pyro comp). There are 2 varieties of foundation board: approximately 200 pieces of a flexible board that is no longer available, and the rest using the conventional woven glass laminate material.

If you want these let me know, as I no longer use this method and they are cluttering-up my work bench! Perhaps you may want to include one with a nichrome wire order, or start to sell them as a product offering to go along with the wire. By the way, maybe you can hire some itinerant workers like your neighbor Linda Chavez ! That way you can reduce the price of your chemicals. Just don't run for public office (ha-ha) [very funny guy, Phil is, ha ha]. The following are 2 fluxes that work on nichrome wire:

"Dunton's NOKORODE Tinner's Fluid"
M. W. Dunton Co.
3 Bridle Road
West Warwick, RI 02893
(401) 821-1832 www.nokorode.com/mwd

"Oatey all-purpose Liquid Soldering Flux"
Oatey Co.
4700 West 160th Street
Cleveland, OH 44135
(216) 267-7100

Both of these might be found at Home Depot, Lowe's, or a plumbing supply store. They both contain hydrochloric acid,

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ammonium chloride, and zinc chloride and as such require neutralizing in sodium bicarbonate/water solution and a thorough wash in clean water afterwards! They are packaged in 4 oz. squeeze bottles and cost ca. $5.00/bottle. Let me know if you have any further questions."

So, in case all this escapes you, what we have is a small buncha the foundation boards that Phil used to use to make his ematches with. We also nabbed from him a roll of the selfsame nichrome bridge wire he uses to make his ematches. You just diagonally wrap the little foundation board strips with the wire, coat the boards with solder, and then snip off little bits to make yer ematch heads. Solder a piece of our shooting wire onto back end of the match head, one lead on each side. Finally, you dip the nichrome wire-end of each match head into yer ignitor composition(s) layers, let dry, and you have a really cheap electric match. Such matches can cost as little as 5-10¢ each, vs. $0.75 and up for the store-bought variety.

Each bag of foundation boards is enough to make between 180 and 200 electric match heads. Ematch Foundation Boards, 10 to a bag, #ZGN5035 $7.50

Nichrome Bridge Wire, 10 feet, #GN5020 $2.10

Shooting Wire, 500 feet, #GN5010 $23.50

Ready-Made Electric Match Heads.

If, after reading the above, you find you are either disinclined to make your own ematch heads or are truly one of life's solder-challenged relicts, you may want to consider buying electric match heads ready made. There are no bridge wires to solder; they are already soldered in place. Just solder your lead wires on and follow the easy directions (read below) for making ignitor composition and coating the match heads with it. 50 match heads to a bag (includes match making instructions). #GN5030 $7.75

Making Electric Matches Using Skylighter's Electric Match Heads

Skylighter's electric match heads are made for us by a rabid golf widower, who has nothing else to do. Comparable to Davey Fire matches, each has a thin nichrome bridge wire to convert electrical energy to heat. A minimum of 0.5 amperes will cause the bridge wire to heat and then break open in a fraction of a second. Therefore an extremely heat sensitive ignition composition must first be applied to the tip of the match.

The composition that provides this heat sensitivity is called a primer. WARNING: Primers burn and primers explode. Therefore it is important to use as little primer as possible, and then overcoat the primer with another composition which is less sensitive but will take fire from the primer and give a flame spread.

Here is a method for making electric matches that produces excellent results:

1. The twin lead wires should be soldered in place. Cut a piece of twin-lead Shooting Wire (GN5010) to length. Split the two leads apart and strip about 1/4 inch of insulation from each lead. Solder one lead on one flat side of the match head, and the other lead on the other side-it doesn't matter which. Make sure you solder these to the back end of the match, the widest part. This leaves the narrow part, the tip, clear so it can be coated with primer.

2. Coat tip (1/32 inch to 1/16 inch) with primer using the formula below. Allow to dry approximately 1 hour.

3. Recoat with H3/NC or Meal D/NC - 1/2 to 2/3 of full length of match. Allow to dry overnight. NC is nitrocellulose lacquer. H3 is Shimizu's formula of 75% potassium chlorate + 25% airfloat charcoal. Meal D is a very fine commercial black powder. High quality, ball milled powder will work, too.

4. A final coat of 5% NC lacquer is optional but is recommended.

Primer (also known as Dark Flash)

This formula has been used both for breaking crossettes (hole shot) and also in torpedoes (gravel variety). It is well known to be friction and impact sensitive. Therefore it is critical to make and use as little as possible.

Mixing instructions:

* To 5 grams of 200 mesh or finer potassium chlorate, mix a 5% nitrocellulose (NC) lacquer solution to achieve a syrupy consistency.

* To this mix 5 grams of antimony trisulfide (200 mesh or finer). Stir gently until a smooth homogenous mixture is obtained. Add more NC lacquer to maintain a syrup consistency. If it starts to harden or thicken, thin it with acetone.

We recommend testing 5% of each batch made, once they are dry. Use a "AA" battery to apply voltage to the lead wires. The finished match should give a small snap and then burst

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into flame, similar to a book match.

Electric Match Tester. This is a specially made low-voltage continuity tester that will tell you if your electric match will fire. A standard continuity tester will not work-it generates so much current it will actually fire the match. Our electric match tester is roughly the size of a half-dollar. It has a 3-volt lithium battery which should last five years or more and a red LED light. The measured current through a typical match and lighting the LED is less than 10 milliamps (mA). Although well below the 50 mA maximum test limit, all precautions should be taken. All personnel should be distant from devices under test. Especially if you make your own ematches, you should always test your matches before attempting to use them. #GN5005 $14.95

Phil's Electric Matches. Finally, if all this chatter about Phil's ematches has you salivating, you can buy the real thing and see why Phil made a fool out of yr. hmbl. prop. These matches have 6 foot long yellow lead wires, and do not have the plastic sleeve covering the head that the Oxrals do. Electric Matches, E-Max Brand, 10 to a pack, #GN5003, $9.45

To order from Skylighter, just go to the Skylighter website at http://www.skylighter.com and follow the instructions in the How to Order link. Catalogs are $3.00 in the US, $4.00 outside the US. If anyone has questions, please give us a call or email: 540-554-4543 hegilliam@skylighter.com. Our fax number is 540-554-2849.

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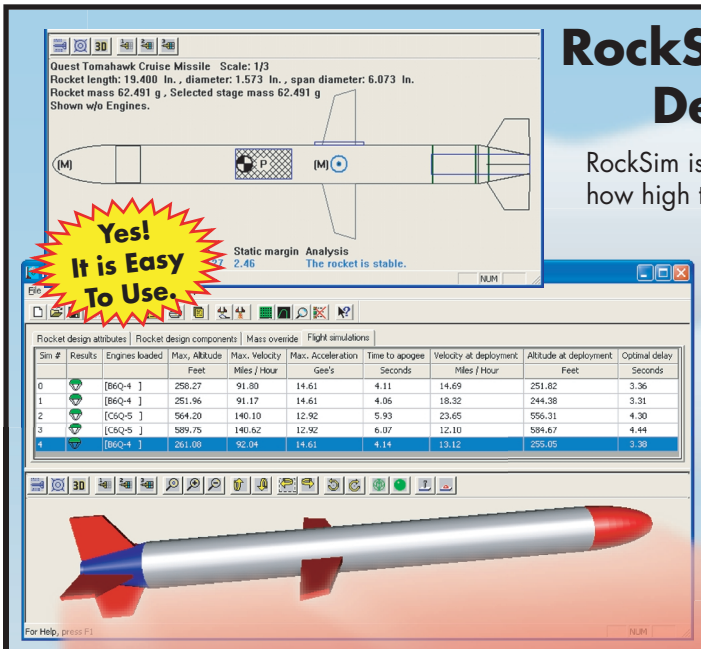
Round Hill, VA 20142-0480



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