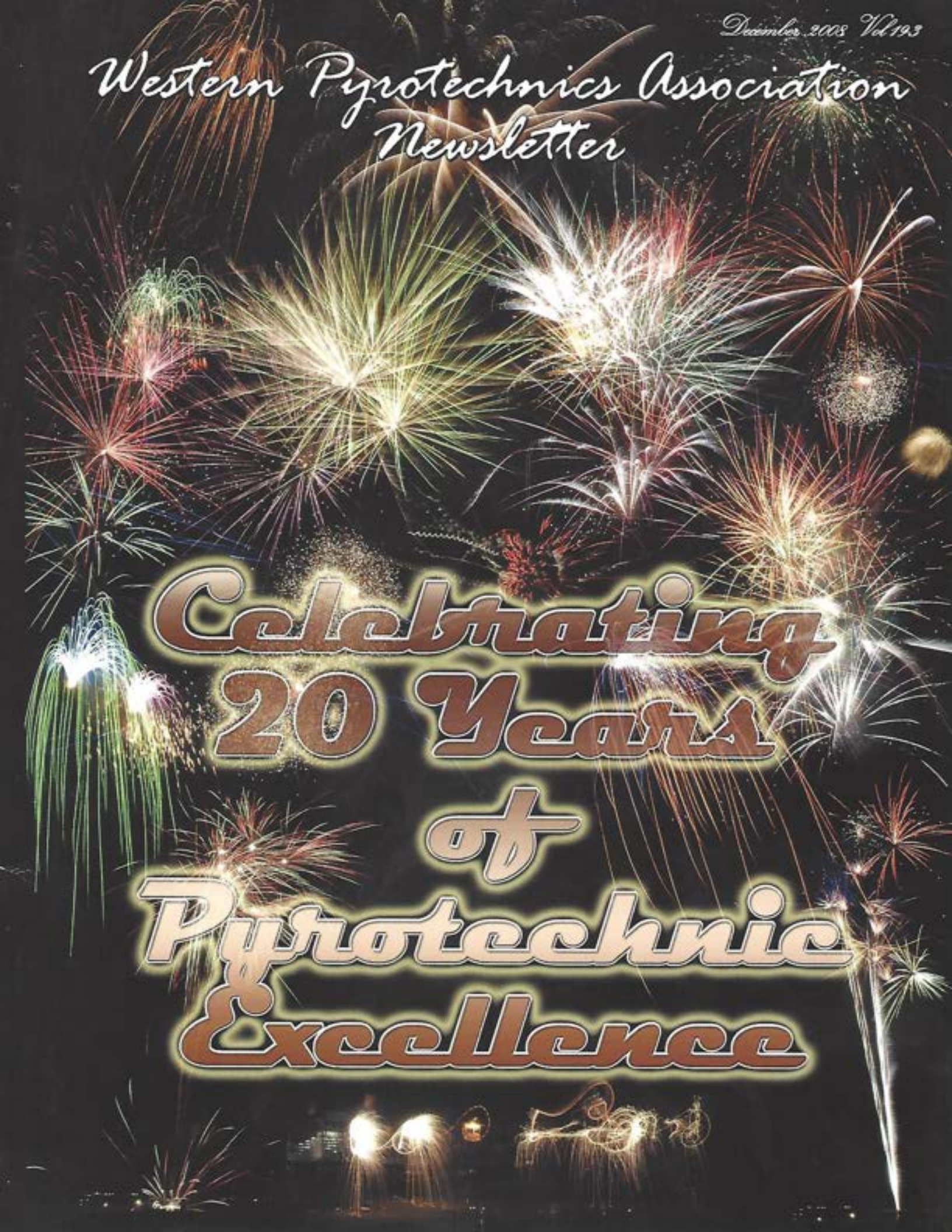
December 2008 Vol 193

Western Pyrotechnics Association Newsletter



Celebrating 20 Years of Pyrotechnic Excellence

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WPA Newsletter, Volume 19, Issue 3

September, 2008
Volume 19, Issue 3
Western Pyrotechnics Association
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From Your Editor
By Tom Calderwood, V.P. Publications

I hope that the holidays brought good times to you, and that Santa was able to stick in an extra roll or two of some chicken wick (fuse) in your stalking.

In this newsletter, we have an interesting article from Neils Anderson, a long-time pyro, concerning e-matches. I think a lot of us have seen an accidental firing of an ematch. Neils experienced a very interesting accidental firing, but he decided to do something about it. Interesting reading.

We also have an article from Charley Wilson and the RMPG gang. I'm a black-powder rocket guy at heart. I love the golden tail and the slower lift-off. Charley wrote an article about BP rocket fuel mix, as well as some other interesting uses for it. Great read for the person wanting to get into BP rockets and for folks who have built'em for years.

Greg Dandurand is back with his write up for Do It 08. I can always depend on Greg for an excellent write up.

I included an interesting article from Ken Kosanke concerning something he calls a "Festival Ball Comet". Remember that this was written up in the early/mid 80s, so adjust the prices accordingly. However, I don't think I've seen this, and it sounds like fun!

Don't pass up Pete's write up on some proposed by-law changes. We need your input and vote on the next general meeting at WWB XX

Speaking of which, I intend to run for another term as your publications person.

I hope to see you at WWB XX!!!

Important Notice:

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Proposed By-Laws Changes
By Pete Wood, WPA President 2008

To all:

At the upcoming business meeting, to be held at WWB XX, the membership will be asked to approve the reassignment of certain duties that are currently listed as the Secretary's and to be placed under the responsibility of the Treasurer, where they are more applicable to that position.

The areas of reassignment would be the items shown below, which are currently under the responsibility of the Secretary. These items we feel, would be better served by the Treasurer.

Also, we would like to add to the Secretary's position, the responsibility of receiving all event monies and forms, and coordinating the receipt of such, to the Treasurer and Event Registration Chairperson.

The items shown below, are from the current WPA By-Laws, and listed under the Secretary's description of duties. These are what we would like to see moved to the Treasurer's position.

6. Filing of annual Corporate officer's statements.
7. Filing of any and all required Nonprofit applications to obtain Tax Exempt ruling(s).
8. Qualify the association to do Business in any state where business was or will be transacted.
9. Maintain organized corporate records.

As stated above, we are proposing the addition of having the Secretary take on the responsibility of receiving all event monies and forms, and coordinating the receipt of such, to the Treasurer and Event Registration Chairperson.

Thanks in advance, and if you have any questions regarding this proposed change, please feel free to e-mail me at pete@westernpyro.org

See you at the business meeting!

Pete Wood
WPA President, 2008

Around the WPA





Phil Hines sent this shot from his yard for a charity show at Sea Cliff in Aptos. Not many people can watch a show from their driveway!

Do you have an unusual pyro picture? Sent them my way at tom@westernpyro.org

Brian Oberquell sent these two barge shots from a Canada Day show. These are two separate barges shooting a sync'd show using iPods loaded with music and firing cues. Sure beats out CDs that skip, or cassette tapes that just won't play at the same speeds!

The Treasurer Speaks

By Ann Huffman

I would like to take this time to announce and reflect on the position of WPA Treasurer. I have been the WPA Treasurer for several years now and I come to all of you with a Heavy Heart that I must tell you I will be stepping down. This was a extremely hard decision to make, but due to some very wonderful things that have recently happened in my life this is one of those things that I have had to let go. I have enjoyed working as your Treasurer implanting lots of new ideas which has helped stream line the inter workings of our club.

I have had the great pleasure of working along side some of the Best Board Members we have. Also Members who's great ideas and efforts to make our club strong and fight for what we all believe in, the love of fireworks and our freedom of them. Over the last several years our club has grown and I am very proud to be able to say that I have had the pleasure to be part of this. I can't thank all of you enough for allowing me to have this wonderful experience and to be part of The WPA.

I hope to be able to work behind the scenes as time permits me in the future. The WPA was started by a small hand full of members for the love of fireworks. I have seen this club grow stronger each year, with the growth of members having that same desire and love that started this club.

I now come to you asking and begging to look deep inside your self and I know there must be someone out there or two with the desire to fill this position and help carry on the WPA as Treasurer. Anyone with interest in this please contact me and I will see that you not only get the facts as to what the position entails but will also be there to help support you in your quest to fill this position as Treasurer.

Again, It is hard to express all my feelings as there are so many of you that have touched my life but I can say that it is been a very proud time in my life to have severed so many club members to benefit our desire and love of Fireworks. Also the Board that I have worked with. Thanks Pete and Kief for all you have done for me and your support over the years. And of course Mike Hill who has always been there also in my support of the club. See You All at Our 20th Anniversary in Lake Havasu this Feb. Remember our General Meeting also. Would love to see a full turn out of members, it is your club too so go and Vote.

Best Regards to all

Ann Huffman
WPA Treasurer

From Kathy's Desk

By Kathy Bauer

From the desk of Kathy (use to be Baird) Bauer
Interim Secretary

I am trying very hard to fulfill the duties of secretary. Some of you might remember me from my past years as treasurer. It is my pleasure to step in and help again.

My thoughts go each day to Rita as I attend to the business at hand of renewing memberships and welcoming new members to our wonderful organization. Rita did a wonderful job as our secretary for so many years. She is missed.

We are getting ready for our 20th anniversary Winter Blast; a spectacular event in the making. Please be sure your memberships are up to date. I know this year is difficult financially on so many of us, but you can save on your renewal fees and registration fees by getting them in by the end of December. Consider it on sale until the 1st of the year!

I'm looking forward to seeing old friends and greeting new faces at this historic Winter Blast.

Sincerely,
Kathy

Western WinterBlast XX
Celebrating 20 Years of Pyrotechnic Excellence!

By Kief Adler

Western WinterBlast XX—Celebrating 20 Years of Pyrotechnic Excellence
By Kief Adler, Winterblast Chairman

Twenty years have passed since the first members of the Western Pyrotechnic Association held Winterblast One over a rainy, snowy President's Day weekend in Mesquite, Nevada. Since then, however, Winterblast has been held in Lake Havasu City, Arizona. Home to better weather, the London Bridge, some fine bass fishing and a group of fireworks fanatics who appear every President's Day weekend in February to light up the sky! Hey! That's us!

Yes, it's that time again. Time to shave pennies off of each gift you give out for Christmas and get ready for that trip to Arizona. Fellow members, next year will be the rock em, sock em grand daddy of them all Winterblasts and you do NOT want to even think about missing it! In celebration of our 20th year we will be offering you FIVE days of Winterblast for the price of four. You read it right, Winterblast will be 5 days next year and prices are the same as last year. Even the hotels are holding their prices down for us. Five days to manufacture. Five nights to shoot. One more Afterglow. One more public display.

Yes, there's no mistake on that last sentence. To make sure that our 20th anniversary is remembered for year's to come, Winterblast 20 will have TWO Public Displays! One will be by Aaron Mayfield of A M Pyro and the other will be from Sammy Bruggema and Pyro Spectaculars. And this does not take into account the numerous demos and smaller shows put on by our various members, nor the Fireworks America memorial show for our recently departed former secretary, Rita Oesterle. And those gas bombs!

Here's another reason to make it out: The City is allowing us to fence off a large portion of the lower parking lot to allow MEMBER ONLY parking, as well as RV parking. RV owners (members only) will be parked for a flat fee of $30 which will help pay for the rent-a-fence. Members will park for free. The only catch is that we all have to use the back road into Sara Park (just make a right turn at the light by ACE hardware and follow the road around and you'll end up in our lot).

There's a new food vendor for us also and a new Afterglow venue for night #1. As we will begin Winterblast on Wednesday the 11th of February, our first Afterglow will be at Mudshark's and not the host hotel (where we'll be for the next 4 nights). Scott of Mudshark's is promising us a great Afterglow and is also the first LHC business to offer a "show your badge and save" discount for WPA members. Stop in at Mudshark's for a meal and show your badge to the server when you sit down and Scott will take 15% off your bill. SWEEEEET.

There'll be lots more to tell you so make sure that you're signed up for the club's email list to get the latest news. Come for the fireworks, stay for the camaraderie! Look me up when you do... I'm always there somewhere!

Western WinterBlast XX, will be held February 11-15, 2009. See you there!

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Western Pyrotechnic Association
Meeting Minutes
November 12, 2008

Pete called to order the teleconference meeting of the Western Pyrotechnic Association at 7:10 p.m. on 11/12/2008.

I. Roll Call:

- Pete Wood, President
- Kelly Goebel, Vice President
- Tom Calderwood, Vice President: Publications
- Ann Huffman, Treasurer
- Kathy Bauer, Interim Secretary
- Kief Adler, WWB20 Chairman

II. Approval of minutes:

No previous minutes to approve

III. WWB20 discussion:

- Kief Adler presented the following information to the board for discussion:
- The staff list had been created for the upcoming 20th Anniversary Winter Blast.
- He is still working on the choice of food vendor for the event, with new choices being considered along with past food vendors. Good news about new sponsorship for the club and afterglows.
- There will be a new parking area at Sara Park for WPA members only. It will consist of the lower 2/3rd of the parking area. Signs will be created to distinguish the clubs parking area.
- Members will access Sara Park using the back road, instead of the main entrance. Signs will be created for directions that will be needed.
- A motion was made, and passed, for a 2nd public display at this winter blast. Kief is soliciting donations to off-set the extra expense. This will be special to the 20th anniversary Winter Blast, due to the extra day of celebration.
- The radio communication at the winter blast were discussed and it was noted the need for separate channels for safety, emergency, security, etc. This will help the mass of chatter during the event.

IV. Secretary Report

- Secretary reported that 97 members, including 5 new members, have paid membership dues for 2009, to date.
- New post office box has been set up in Fontana.

V. Treasurer's Report

- Treasurer reported the current bank balance was $49,126.52.
- DO-IT profit and loss was presented:
  - Do It had a gross profit of $2,560.94. A very good year for Do-It.

VI. Publications Report

- Tom reported he is actively looking for articles for the current newsletter to be published soon.
- He has investigated bulk mailing rates of $.38 for postage of the newsletter.

VII.Old Business

- Post event for Do-It was discussed.
- Registration went well.
- The new badge machine worked well. WWB20 badges and Membership Cards for 2009 will be made with the badge machine. Membership Cards for 2009 will be given out at WWB20. Those not in attendance will have theirs mailed to them.
- The membership data base has been given to the Interim Secretary.

IX. New Business:

- Upcoming board positions that will be up for election/re-elections at February's meeting include secretary and VP publications.
- Clarifications of the Treasurer and Secretary's responsibilities was discussed. There are a few items under the duty of the Secretary that are being considered to be transferred to the Treasurer's duties. It was decided to table the discussion to a future meeting after more consideration.
- The board also discussed the possible change of Board positions to create a Secretary/Treasure position and a Membership/Registration position. No decision was made at this time.

X. Adjournment:

- Pete adjourned the meeting at 9:57 p.m.

Minutes submitted by: Kathy Bauer

Minutes approved by: WPA Board of Directors via email proxy



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The Do It That Almost Wasn't!

by Greg Dandurand

"We're on a mission from God." On Wednesday afternoon, as I sat crossed-legged in the meditation garden behind the dumpsters at work; I could hear Elwood Blues' iconic phrase over and over in my head. Shifting my butt, I was able to move the keychain in my pocket, thus unsticking the button that caused the repeating slogan. I knew that I was going to have a long day on Thursday, leaving before sun's first light to arrive in Lake Havasu to help set up for the event. I wanted to leave Wednesday night, but I was taking a psychology course and the instructor hated people who didn't show up. The class was way over my head, the only thing I figured out so far is that if someone wanted to pry the top off my head and muck around in there for a while, they were going to need hip boots and a Taser.

Thursday morning arrived too quickly. I had hit the snooze bar twice and was dragging myself out of bed when it went off again. A quick shower and I was on the road. Traffic wasn't heavy; before I knew it I was off I-10 at Vicksburg, then Bouse, Parker, and ending at Sara Park. I pulled in and headed toward the storage containers. Many hands make light work, they were already empty. I saw Pete Wood and Bill McGregor, the co-chairs for Do-It. We exchanged pleasantries and then set down to figure out what was left. Since we had a small crowd, we didn't need to set up much. I went to registration for my credentials and it was sad not to see Rita Oesterle, she was always happy to see me and I enjoyed her company. Ann Huffman was handing out badges, assisted by Don Oesterle. We talked for a bit, and I was glad to see him and told him how much we all missed Rita. I headed back down to the site. I was the Safety Chair (that and fifty cents would get me a soda), but we had been to this site many times, so there were no surprises on where equipment had to go. Most of the blast shields and ready boxes were at their stations; I was awaiting the arrival of the backhoe from the city to dig in the big guns. Wrangling up some help, we were able to do it (no pun intended) in record time. Manufacturing was humming along, now we just had to wait for dark.

As night fell, the C line started cranking out the light and noise of Thunder Kings and Saturn Missile Batteries (a Richard Hasse personal favorite HAHA). The B line was slow, but with the smaller crowd, that was to be expected. We shut down early that night and hit the afterglow tent. Doug Tollefson stepped up to the plate (again, no pun intended) and acted as the afterglow chairman. He did a fantastic job all weekend, we had tri-tip one night (sponsored by Area 51) and Mexican food the next. Ken Kegee brought some home brew; Bill McGregor used his local contacts to get some also. We had a margarita machine, too. A lot of hard work went into the afterglows and it was very much appreciated!

Friday had the wind kicking up, a pain but not an insurmountable problem. I spent the day wandering around manufacturing and visiting with everyone. It is nice to catch up with the folks you only see once or twice a year. I try to make it a point to learn something new about someone each time. That can be interesting!! As I was heading down to manufacturing for a seminar, Pete and Bill pulled up. Pete asked what I was thinking about, so I told him "the geopolitical ramifications of using Pez dispensers with heads in the shapes of African gods to dispense vitamins to children in third world nations", he and Bill gently shook their heads and drove away. Rich Vidmar was teaching his famous mine building class. I had wanted to attend at previous events, but now I had the time. They are easy to make, and we talked about different techniques. I thought he needed an assistant, so I took one of his sandwich bags and created Baggy the three-inch mine puppet. Rich was very good-natured about it, even agreeing to have his picture taken with his new mascot. Now I bet he wishes he had taught a "mime" class. The evening's shooting went well, with only one minor glitch. The Zen philosopher Basho once wrote, "a flute with no holes is not a flute, a donut with no hole is a Danish". That can also be extended to mean that a shell with no lift is a ground salute. Someone put a canister shell into a gun upside down, as I saw the lift poof upward; I just had enough time to say "Oh Sh—" before the shell deflagulated (I can't say detonated, Chris Spurrell said it wasn't the right term in his class) in the gun, vaporizing two guns and the rack. We had just bought those at WWB, so I had to summon my inner Zen to not yell too much. More vigilance on my part is needed next time. No one was hurt. The rest of the evening was uneventful, with some nice homemade product going into the air. We only had one shell make a round trip, and I found it the next morning for the burn pile. Our shell builders are getting better and better! The big tri-tip and margarita afterglow ended the evening.

Saturday had more wind, but everyone was used to it by now. It was a quiet day, with George and crew hurriedly preparing Armageddon. For being officially unfunded due to

The Do It That Almost Wasn't —continued

event costs, it seemed to be a big show. Thank you to everyone who donated. I had my Head Pyro roundtable discussion to moderate, so I wandered to the seminar area. It went perfectly, no one spoke out of turn, and everyone agreed with everything I had to say. No one showed up, but you have to look for the little successes in life. Before Armageddon, someone hade made a set piece for Rita. I t looked beautiful and we all took a moment of quiet reflection to think of her. Armageddon went well, half hand fired and half electric, everyone worked well together. After closing down the lines, we had an excellent Mexican feast, I don't think anyone went hungry. The wind had also died down enough so that we could launch a couple of lanterns, they are neat because they are so quiet.

Sunday's cleanup went fast, the container doors were closed by 12:30. The burn pile was ready and multiple Barney's were prepped. As we watched the Salami brothers finish their creation, we speculated on what past event had caused the purple one to suffer the wrath of the crew. A theory was introduced that one of the Salami Brothers wore the costume on the T.V. show, and now was exacting his revenge. If this is true, I do not know, but with Barney rocketing skyward with flames shooting out of his butt as if he had just eaten some bad baked beans, I didn't want to broach the subject, least I end up in the same position. Farewells were said and we all headed out to our corners of the country, vowing to meet again at Western Winter Blast XX!



Rich Vidmar, Greg Dandurand and his "little friend".
(Picture from Rich's mine seminar at Do It)

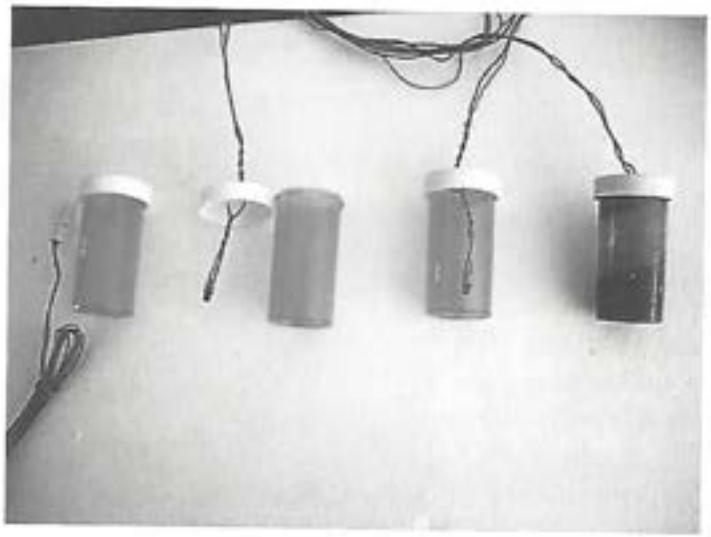
Rx for Safer Electrical Firing

by Niels Anderson

For the last 38 years I have used many different firing systems, from nail boards to digital wireless. I have been the chief pyrotechnican for the Reaction Research Society, an amateur rocket club, for the last 23 years as will as a commercial fireworks pyrotechnican. I had become overly confident that I knew electric firing systems, having done hundreds of tests and firings. Multimeters typically do not have an illuminated displays.

I was hooking up an igniter test at night that fortunately was benign, when the igniter went off just as I attached the firing cable lead wires to the capacitor firing box. I was totally surprised. This was with a firing box I had used for many years. It turns out that the firing toggle switch did not entirely disengage so that any residual current could bleed out of the capacitor. That night I tried to think of some way to eliminate this from ever happening again.

The following is what I came up with and wanted to share it with you. All it requires is a plastic pill bottle and an electric match. Take a regular medicine bottle that pills from the pharmacy come in, mine always have an amber tint to them. Clean off all the labels and stickers. Drill two small holes in the lid through the secondary plastic seal (children proofing mechanism) to just fit the lead wires of an electric match. Remove any protective covering or shroud from the match head itself so that the match head is unprotected. Pull the lead wires through the child proof lid so that the electric match will be contained in the lower portion of the medicine bottle, twist the leads so that the electric match cannot be pulled through the lid, twist the leads on the out side of the lid as will and trim the lead wires so that about 6 inches are remaining after the leads are twisted on the out side of the lid. Put the lid on and you're done!



Use this simple device on the lead wires and especial just before you hook anything up to a firing box's terminals. If there is residual or stray current, the match will go off with a bright light at night and coat the inside of the pill bottle like an old time electric house fuse if you are hooking up during the day. Being enclosed in the pill bottle all hot particulate is contained in the pill bottle. Day or night you will diffidently know if you need to be concerned. Super simple, super cheap. I now leave one plugged in to all my capacitor firing boxes prior to hooking up as well as checking firing cables. Make sure and check the electric match that you use for this simple safety tester before each firing to see that it is still good. Forever Green - Niels



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Black Powder Rocket Fuel

by Charley Wilson

Variations in available charcoal make huge differences in the performance of black powder fueled rockets. Some builders address this issue with configuration changes such as changing core area, fusing the core from the top vs. the bottom, different throat diameter and so on. For different batches of fuel, some builders use different tools.

However, the "standard" tooling that is similar or identical to the dimensions of historical builders was arrived at for a good reason that is still true today: the best combination of performance and effect can be achieved.

The other way to tune black powder rocket performance is to modify the fuel. In the simplest case, the rocket fuel for a core burning motor is regular 15/3/2 black powder with additional charcoal to produce the tail effect. In the most widely sold tool geometries for core burning clay nozzle rockets, the use of straight commercial powder or hot hand-made powder may result in catos. Even if the rocket does fly without exploding it will not have the traditional lovely charcoal tail.

It is not necessary to use expensive commercial black powder 'Meal D' in order to obtain good performance. Charcoals vary greatly in performance, whether hand made or purchased commercially. Goex, the famous black powder company, solves this problem by using large run batches of charcoal and blending batches to obtain consistent performance. With respect to consistency, making one's own charcoal can only come close to what commercial endeavors achieve. The simple sage advice is to choose a method and stick with it.

On the other hand, rocket fuel is not nearly as tricky as grained powder used for lift can be, performance wise. Some builders achieve good rocket performance without any milling of the fuel together at all, the components are simply sifted and/or stirred together. In this case a lot of the charcoal must be of very high quality and fast burning. The sulfur and potassium nitrate still must be finely powdered. The formula for the fuel may need to be closer to the 15-3-2 or 6-1-1 proportions.

Historical Fuel Compositions

For reference, the following compositions from famous historical sources are given:

	w3	r2	k1
KNO3	16(51.6)	16(57.1)	16(61.5)
mixed coal	12(38.7)	-	-
Charcoal	-	8(28.6)	8(30.8)
Sulfur	3(9.7)	4(14.3)	2(7.8)

k4	c2	c3
16(64)	16(58.2)	44(68.7)
-	-	-
5(20)	7.5(27.3)	16(25)
4(16)	4(14.5)	4(6.3)

Cutbush/Morel	"summer"	"winter"
Saltpeter	34(56.7)	17(53.1)
Sulphur	7(11.6)	3(9.4)
meal powder	3(5)	4(12.5)
charcoal of oak	16(26.7)	8(25)

Percentages added in parenthesis.

w3 : Weingart "1 to 3" pound formula. Mixed coal is charcoal of a wide particle size distribution. (page 92, "Pyrotechnics" 1947)

r2 : Ruggieri XIXth composition for rockets of 20 mm to 40 mm, from the Stuart Carlton translation of the 3rd edition "Principles of Pyrotechnics", 1821, p. 254

k1, k4 : Kentish formulations, from the republished version of "The Pyrotechnist's Treasury", "The Complete Art of Firework Making", p. 121, originally published 1899 (though apparently written in 1878)

Note:

Kentish gave large numbers of formulae without descriptions. One is left to guess which ones were good, and under what circumstances!

c2, c4 : Cutbush, "System of Pyrotechny", 1825. These are apparently given as 'Another' for Summer and Winter application. Rocket information was obtained from a M. Morel.

Morel's use of meal powder to augment the fuel is a sound idea. The specification for oak charcoal will give a tail effect similar to, if not the same as, today's "mixed hardwood" commercial charcoal. Oak airfloat charcoal is still pretty hot compared to some others such as mesquite and coconut shell, note the small percentage of meal, contributing just .75 percent of charcoal in the summer version and 1.875 for the winter.

The 4th composition from Kentish is likely to cato with modern chemical components and clean charcoal.

Practical Fuel (in percents)

potassium nitrate	60.2	60	62.5
"fast" charcoal	8.4	10	12.5
"tail" charcoal	20	20	16.7
Sulfur	11.4	10	8.3

The first column gives the average of the first six historical formulae above. Interesting is the fact that this looks much like the 'standard 6-3-1' fuel used by many PGI members. Another approach taken by some builders is to simply 'add 20%' of some tail producing charcoal to strong black powder. This gives the results in the third column.

To produce the fuel, it is usually necessary to mill some of the ingredients. This is both for ease of mixing and performance. For safety's sake, one should avoid milling the components in the strongest black powder proportions. Charcoal and sulfur can be milled together in the classic 3/2 proportion and kept as an intermediate product, useful for other pyrotechnic uses. Another needed intermediate product is produced by milling 90 parts by weight of potassium nitrate with 10 parts of the 3/2 mix just described. The oxidizer content is so high in this mix that it will not sustain burning. It will not explode.

This intermediate product is 90% potassium nitrate, 6% charcoal and 4% sulfur. I refer to this mix as the "90 prep" mix, and is a useful intermediary for other pyrotechnic purposes as well. To use the prep mix in BP rocket fuel, an addition of both the tail charcoal and the milled sulfur and charcoal mix is needed to get to the total charcoal needed. Analogous forms of the "+ 20% charcoal", and "6-3-1" fuels are:

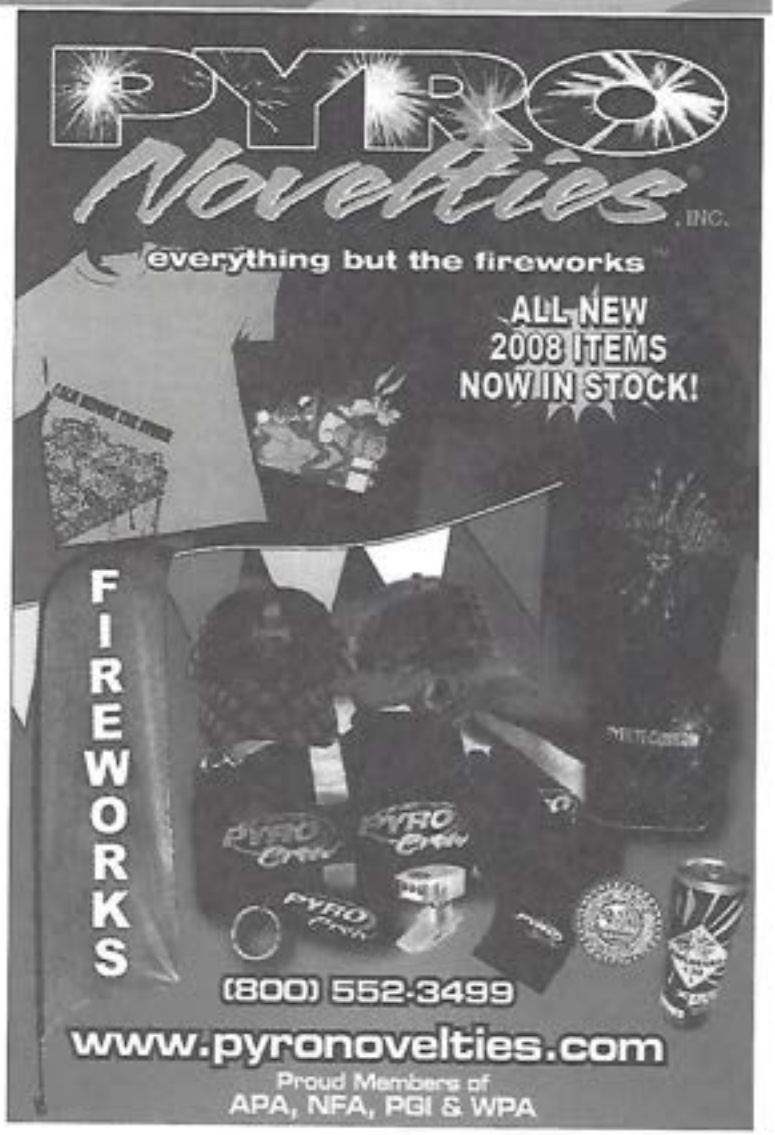
	(+20%)	(6-3-1)
90 prep powder	100	40
3/2 mix	20	11
tail charcoal	30	9

Weingart offers the simple advice that if the rockets don't fly, add potassium nitrate, and that if they fly too vigorously, add charcoal.

Rocket sizes

Sometime before Weingart's time in the U.S., the "pound" sizing of rockets changed from the original definition. The original meaning was the weight of a lead ball which would just fit in the "mould" for the rocket. This sizing mechanism is really silly when all the variables are considered, especially the wall thickness of the casing used for a particu-

(Continued next page)



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Black Powder Rocket Fuel (cont.)

by Charley Wilson

lar rocket. As new materials became available for casings, these old sizings became irrelevant.

Even in Cutbush and Morel's day, this sizing was not widely used. Cutbush reports that Morel did not even use a mold, reasoning that if the case were not strong enough to withstand ramming or pressing in the first place, that it might not withstand or permit proper function (flight) anyhow. In any case, Cutbush describes the sizing beginning on p. 326.

PGI and other club member rocket builders today use a convention based on the inside diameter of the casing. The "caliber" of the rocket has thus lost meaning. Instead, the size is proportional to the inside diameter. A one pound rocket is 3/4 inch ID, three pound is 1 inch ID, six pound is 1.5 inch ID. Cutbush describes a six pound rocket as being three inches caliber.

3/2 Mix

The intermediate mix of fast charcoal and sulfur can be used for a few other things as well as the rocket fuel. Most notably, a perchlorate based burst charge described by Shimizu may be made with it:

very fine potassium perchlorate	70
3 charcoal 2 sulfur milled	30
Dextrin	+ 4

This is coated onto rice hulls and used to burst shells.

90 Prep Mix

This intermediate can be used in most black powder type compositions. It has the advantage of not clumping up so badly as plain potassium nitrate. For instance, a variation on Robert Winokur's lace glitter #13 is:

prep mix	53
3/2 mix	10
Sulfur	5
antimony sulfide	10
atomized aluminum	6
magnalium -60 +200	3
sodium bicarbonate	9
Dextrin	+4

The first four ingredients are mixed together thoroughly with misting of distilled water. Do not get it wet enough to clump up, just slightly damp.

The last ingredients are sifted together separately. This can be done while the first part is drying out somewhat. The idea is to have the black powder fraction maintain a level of discrete particles, which improves the glitter effect.

Gradually combine the two fractions. Do not over stir or mix vigorously. Milling is out of the question. For pumped or cut 3/4 inch stars.

- Charley Wilson

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Festival Ball Comets

By Ken Kosanke

Originally appeared in: Pyrotechnics Guild International Bulletin, No. 34 (1983), and used here with permission from Ken Kosanke. (Please note the prices quoted here are from 1983! - ed.)

Festival ball comets are inexpensive, easy to assemble and produce a nice effect. Before discussing their construction, let me acknowledge that, as far as I know, the basic idea for this firework originated with Bob Winokur.

The device consists of a festival ball shell with comet composition coating the fuse end of the shell. Festival balls are small Class "C" aerial shells, about 1¾" in diameter and are usually painted red in color. Unlifted, they cost about $20.00 per hundred. Kits of 12 lifted shells with a mortar are available for five or six dollars. The small shells have stars of any of several colors and are a fairly effective firework for the price.

To assemble a festival ball comet, first the bundle of Chinese fuse on the festival ball shell is cut off ¼ to ½ inch away from the shell. Next, a small amount of heavily dampened comet composition is molded around the fuse end of the shell (see the illustration to the left). Obviously, the length of the fuse remaining and the thickness of the comet composition covering the end of the fuse determine the time delay for the shell break. Essentially any cornet formulation can be used; however, it is important to substitute gum Arabic as the binder. Gum Arabic bound compositions dry very hard and stick tenaciously to almost any surface, in this case, to the festival ball. With most other binders, there is significant likelihood that the comet will loosen from the festival ball and fall off during the shock of firing from the mortar. The final assembly step is to apply prime to the end of the comet composition. Homemade meal powder (75% potassium nitrate, 15% charcoal and 10% sulfur) bound with nitrocellulose lacquer is quite effective, particularly when a small amount of fine grain black powder (3 or 4Fg) is sprinkled on the prime while it is still wet. The choice of fast drying nitrocellulose lacquer as binder is not critical.

As a mortar for these small festival ball comets, 1½ inch schedule 20 PVC serves adequately. (Note: 1½ inch schedule 20 PVC has an inside diameter of 1¾ inches.) I do not generally advocate the use of PVC mortars; however, I have not had problems using it with light weight festival balls. This past year, we fired more than 500 festival balls from racks of these thin walled PVC mortars, with the loss of only two mortars to cracking. As lift, ½ tablespoon of 4FA blasting powder (not 4Fg powder) seems sufficient. Obviously, the festival ball comet should be loaded into the mortar with primed comet end down.



As would be expected, the effect of these devices is an ascending comet ending in a small colored shell break. Festival ball comets can be produced for an out of pocket cost of about 25 cents each. This seems modest considering the effect produced. These devices are particularly effective when fired simultaneously in mass.

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