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# WPA Newsletter

August, 2006  
Volume 17, Issue 2

Western Pyrotechnics Association  
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Canoga Park, CA 91309  
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## Do It? You Bet! By Tom Calderwood, Ed.

Thank you for taking time to read through this newsletter. It takes more than a few hours to put it together, as well as contributions from all of the authors.

We are including the DoIt Registration form in this newsletter. We are trying out this format of putting the form as a tear out. By including the registration with the newsletter, we save a substantial amount of money in postage. The alternative is to put the registration in as a separate form, but this way saves us the hassle of stuffing the envelopes. Let me know what you think: tom@westernpyro.org

We will also have on-line registration available. Because of the costs of dealing with internet shopping carts, we will be charging a small handling fee for all on-line transactions.

I want to take my hat off to Kief Adler for his outstanding (and patient) work with the ATF&E. It became apparent that after our last WWB that the record books were not in order. This is big. This is huge. Kief worked with the ATF&E agents and spent many long hours getting this straightened out. Kief has been a hard worker for the club and has made many efforts to make sure we can stay running within the confines of the law. Watch the email list for more info.

Don't forget the Fireworks Alliance (<http://www.fireworksalliance.org>) and Fireworks Foundation (<http://www.fireworksfoundation.org>). They are separate groups working to keep our craft alive. Support them in any way you can.

I'm looking forward to seeing y'all at the next Do It, and trying out some of those parlon stars. 'Cause even with the rules, we can still have a LOT of fun and make a LOT of smoke to snort.

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## Important Notice:

The Western Pyrotechnic Association, Inc., also known as the WPA, is a non-profit group of fireworks professionals and their apprentices. This newsletter is a vehicle for their exchange of information in this craft and the right to publish this information is guaranteed by the Constitution of the United States of America. Nonetheless, readers are urged to learn and obey all laws and regulations of all federal, state, and local jurisdictions and of their agencies and representatives. Some information herein may contain incomplete descriptions of fireworks techniques based on the experience of its author(s) in a controlled environment with circumstances, and conditions different from the reader. Readers must form their own opinion as to the application of this information. This information is considered documentary in nature and no opinion is given as to its suitability or use. No warranties are made either expressed or implied, including but not limited to warranties of the accuracy of the information herein. The WPA is not responsible for the opinions of authors or mistakes in printing. All information is intended solely for viewing by members of the Western Pyrotechnic Association, Inc. and its associates. The WPA's entire liability and anyone else's remedy shall be a refund of the subscription price. In no event shall the WPA, or its officers, or the editor, be held liable for any damages whatsoever arising out of use or inability to use the information in this publication, even if said parties have been advised of the possibility of such damages. This publication is published by and is the sole property of the copyright owner, and is not to be sold or reproduced in whole or in part without written consent of the editor and publisher. The contents of this newsletter are Copyright 2006. All Rights Reserved by the Western Pyrotechnic Association, Inc., or the author(s), if so indicated, and is re-published by permission of the copyright owner. Any previous agreement to allow any one to re-publish any material from the WPA, Inc. Newsletter is revoked and void as of March 1, 1995. Reproduction without permission will be deemed a purchase and implied authorization by the user to accept billing and make payment of a minimum \$50 user's fee per instance of use. Distribution is limited to paid subscribers. Submission of written material, graphics, and photographs dealing with pyrotechnics or fireworks, related technologies or activities of, and information to the benefit of the members of the WPA, Inc. are gladly solicited. All submissions become the property of the Western Pyrotechnic Association, Inc., and may be edited or rejected for any reason. No payment is made for submissions and submitted materials cannot be returned.

# A Letter From Your Prez

By Russ Laurie

Hello fellow members of the WPA!

I hope that everyone had a safe and joyous 4<sup>th</sup> of July. I know I did, working a show in Davis, CA, with a group of newbies and a couple of veterans – all the while helping to develop new members for the club.

So speaking of the club, what has the BOD has been up to since the last WPA newsletter? Let's see. With a lot of help from Kief Adler we have been dealing with the ATF&E about getting our clubs licenses renewed. This has been a very tough road. Seems that they (the ATF&E) don't like the way we have been conducting our record keeping at WWB and DO IT. This also means the Manufacturing members as well. With that said, we are now going to have to create a new chair position with staff at WWB and for DO IT. That position will be in charge of our record keeping. This is not an easy job but someone must do it or we face the possibility of not having our licenses renewed in the future. So if there is someone out there who would be interested in this new extremely important position, please contact the BOD and we will be happy to discuss the requirements of the position with you.

The BOD is working with Lake Havasu City to sign a 3 year contract to have WWB and DO IT at SARA Park. We have the new contract(s) and will be sending them off to LHC very soon. We are also in the processes of renewing the club's insurance policies. So far there are no fee increases (which is a good thing).

Which brings up DO IT 06. One thing new this year is the DO IT registration forms are going to be in **THIS** newsletter. That's right we are saving the club around \$1,500.00 by not having a separate mailing. The DO IT forms will also be available on line at the club's web site. There will be a small processing fee for using the on-line forms but a small price to pay for having the convenience of using an on-line pay system. I'm happy to say that there is no fee increase over last year's registration. Things are going smoothly so far behind the scenes to make DO IT a booming success (pun intended). We are in the process of obtaining the art work for this year's event T- shirt, something new and fresh. We are hoping to have as many members out there this year a possible.

Not far behind DO IT is WWB 18. Yes 18 years of pyro enjoyment and excitement for all ages to enjoy. We are looking for a theme for this years Blast so if you have any ideas (ones that are clean and can be put in print) send your ideas to us via the list/digest. We are in the process of sending out our invitations to bid on the Public Display (I hope A.M. Pyro is listening). But to be fair, we are excepting all bids and the BOD will review each and every one of them to come up with the best package for our members and the City of Lake Havasu.

And lastly we are upgrading our web site so look for new and better things to come from that. The on-line pay system will be up and running for both DO IT and WWB 18. We have had some issues with this type of pay system before but I'm assured that all the bugs will be worked out and this will be a smooth system.

In closing, we, the BOD, and of course me, the WPA Prez, hope to see as many of you members out attending DO IT 06 come this October and WWB 18 come next February. For this club is all about you and your love for pyro.

Stay safe and remember to "SMELL SOME SMOKE"

---

## The Treasurer Doth Spake

By Ann Huffman

Fellow pryos 4<sup>th</sup> of July has come and gone. You know what that means. Do It is just around the corner. Yes, time to smell the smoke and have some fun. We will be in beautiful Lake Havasu City under the Arizona skies before you know it.

Let's one and all get your registration forms in and hotel rooms booked. Lets all make this one of the best Do IT's we've ever had.

The weather should prove to be nice. Bring the family and come out. Looking forward to seeing all of you at Do IT.

# Secretary's Musings

## By Rita Oesterle

Not much to report as this is the "quietest" time for me. The 4th of July show I helped on went very smoothly. No brush fires, great crew (of course Don was the operator and I am a proud mom )

The online registration forms should be a reality very soon. Please note that there will be a fee to go this route. The fee does NOT go to WPA. I did want to remind all of you about protection yourself from the extreme heat. Here are quotes from the July 2006 Lake Havasu City Chamber of Commerce publication.

- Avoid strenuous activity on hot days
- Limit activities to the coolest part of the day (4:00 a.m. – 7:00 a.m .)
- If active between 11:00 a.m. and 4:00 p.m. drink at least one quart of water every hour.
- Stay in air conditioned areas, if possible
- If an air conditioning in not available, stay on the lowest floor, away from sunshine, and go to a publicly air conditioned area in the hottest part of the day.
- Have a buddy system where relatives, neighbors, or friends check on each other.
- Wear lightweight, light-colored clothing.
- Drink plenty of water often to help you body stay cool.
- Drink plenty of water, even if you don't feel thirsty.
- Avoid drinks with alcohol or caffeine, which worsen the effects heat has on you body.
- Eat small meals often.
- Do not leave pets or children unattended in parked vehicles.
- Avoid foods that are high in protein or salt.
- Avoid using illicit drugs (such as cocaine, amphetamines and methamphetamines).
- If your heart begins to pound, or if you become light headed, confused, weak or faint STOP ALL ACTIVITY. GET ASSISTANCE IMMEDI-

ATELY.

My favorite rule is for limiting activities to 4:00 a.m. – 7:00 a.m. That would really limit manufacturing at DO IT.

Hope the heat will not stop any of you from joining us for another DO IT by the River in Lake Havasu this October. Registration will start onsite at 9am Thur. Oct. 12.

Check the registration form NOW for the cutoff date for the free shirt. It is Sept 8 and that is when it is supposed to be in the PO Box at Canoga Park, NOT THE POST-MARK DATE.

Hope all your shows were full of oohs and aahs on the 4th.

### **Classified Ads**

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# From the VP—Do It 2006 Registration Form

By Pete Wood

To all my fellow members:

As you read through this newsletter, you will come across the DO IT 2006 Registration Form ! That's right, Do IT is just around the corner and why not just fill out the form while you're thinking of it and looking at it? Avoid the rush and be the first one on your block to have your Do It 2006 registration !

What I am wanting to bring to your attention is the space marked on the application, next to the Spouse / Life Partner in which it asks for an additional \$10.00 if planning on attending seminars. This is for the SPOUSE and / or LIFE PARTNER ONLY! This fee does NOT APPLY TO THE REGISTERING PRIMARY MEMBER!! There was some confusion last year in regard to this fee. I hope I've explained it and made it clear for all.

Looking forward to seeing all of you this coming October in Lake Havasu !!

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## “Speak Pyro” - by Tyler Norman

If you're a newcomer to the world of pyrotechnics, you may be confused by the onslaught of jargon you will encounter. Of course you don't want to sound like an idiot when chatting with a seasoned professional over a plastic cup of warm beer after the show, so with tongue firmly planted in cheek, here's a list of some of the lingo.

**BALL** – common name for the highly flammable pearls of the Prometheus Oyster, which is commonly found off the west coast of Italy. These are the flaming objects used in Roman Candles.

**BROCADE** – An insult commonly used by pyros.

**BURST CHARGE** – when someone, particularly the smug waiter at Ruth's Chris Steakhouse, hands you an afterglow-party bill so massive that it makes your head explode.

**CAKE** – commonly found at afterglow parties and in the underwear of those who have been close to a low-breaking shell.

**C.P.S.C.** – an acronym whose meaning is far too obscene to be printed in a family-friendly magazine such as this.

**DOUBLE CROSSETTE BROCADE** – what you call your cheating lover who's dating a pyro with bigger shells.

**LANCE** – that lanky, stubble-faced slacker across the street who

you just know is breaking into your garage and smoking all your chemicals. Used as an object of blame, consciously or not, when trying to explain to your source of funding how your \$100 worth of black powder ran out so quickly.

**QUICK MATCH** – an online dating service frequented by pyros.

**SALUTE** – the gesture you make when a rocket hits you in the head.

**SHELL** – the most common firework. These are harvested from the Chinese Bang-Bang Snail (*Pyrotechnis spectacularis*). These snails are usually between 3 and 6 inches in size, though they have been known to grow in excess of 16 inches.

**SHELL OF SHELLS** – The one almighty shell that rules over all others with infinite power and wisdom. Its numerous incarnations into this world are usually 16 inches or larger.

**TOURBILLION** – a rare tropical flower.

Commit these terms to memory and you should have some idea of what the blazes these guys around you are talking about. And if you live in Southern California, don't forget to tune in to the WPA's own Jed "The Fish" Gould on KROQ 106.7, weekdays from 1 to 4 PM.

## So You Want To Write An Article—by Tom Calderwood

This is just a quick note to help out the poor Newsletter Editor format your next great article:

1. The computer is not a type writer. You don't have to hit the return key at the end of each and every line.
2. Use a common font. While "Garamond Premiere Pro Lt Disp" (a real font) looks good on your computer, chances are that I don't have that font.
3. Double returns are a double no-no. The paragraph can be formatted so that a space is added after the paragraph. This helps the software format the sentences when it comes time for jumping between columns. I have to go through any article and look for double-returns and eliminate them.
4. This goes for double spaces as well. We did this on the typewriter, but the software takes care of it now. Remember? You're typing in Word, not on a Smith-Corona.
5. If you do bullet points or numbered items, please don't use tabs! Chances are that the columns in the newsletter will not be the same width as your article, so I also have to go through and eliminate tabs.

But through all this. DO write articles. This newsletter is by us, for us. The editor's job is to make your work fit, and the above just helps the process. If you still double-space, that's OK. I'll only cuss under my breath a \*little\* bit.

### \*\*\*\*\*FIREWORKS VIDEOS FOR SALE\*\*\*\*\*

**#50. The 2006 Western Winter Blast XVII** Video at Lake Havasu, Arizona. This video contains all demos and much of what was shot off on Friday, Saturday and Sunday nights. Satisfaction guaranteed! **DVD \$25.00.** VHS (if you insist) \$15.00.

**#49. 2005 NFA EXPO** video at Fond Du Lac, Wisconsin. All the new product for next season. 6 hours with descriptions, sources and Trade Show displays. **DVD \$30.00.** VHS \$20.00.

**#48. 2005 PGI CONVENTION** Video. Includes all demos and all competition and more. 8 hours. **DVD \$40.00.** VHS \$25.00.

+++++ **HOTM** +++++ This is a separate, very edited, one hour and 45 minute video, on **DVD**, of **HOT FIREWORKS** (from video #48 above) from the Mason City PGI Convention. You can use this for keeping anyone occupied and getting them in the mood, visitors, customers, in-laws, kids, anyone! Very high quality! Great gift item! **DVD \$25.00.** Includes postage.

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# The Use of Titanium in Pyrotechnics

by K.L. Kosanke

Titanium is a very effective generator of white (silver) sparks when used in the manufacture of fireworks. This is because of three of its properties: it ignites easily and burns readily in air, it has a high boiling point, and it is corrosion resistant. Because of this unique combination of desirable properties, the use of titanium in fireworks is generally easy, relatively safe<sup>(a)</sup> and very effective. Before discussing the ways in which titanium is used in fireworks and giving some sample formulations, it is useful to discuss why the properties mentioned above are so important for a pyrotechnic spark generator.

Except for smoke items, flame temperatures in fireworks range from about 1700 °C for black powder compositions, through about 2300 °C for typical color formulations, to perhaps more than 3000 °C for some metal fuel color formulations<sup>1</sup>. It is important that a material intended to produce sparks in fireworks ignites easily at these temperatures and that it be capable of continued burning in air after leaving the flame. Particles merely heated to high temperature but not ignited may leave the flame glowing brightly but will fade to invisibility very quickly as they rapidly cool.

In most instances, it is important that a material intended to produce sparks in fireworks have a high boiling point. This is because particles that are vaporized in a

flame will not be available to produce trailing sparks, which are incandescent solid or liquid particles. Also, in colored flames, the chemistry is complex and easily interfered with<sup>2</sup>. Particles that vaporize in such a flame are likely to alter that chemistry, with the result of weakening or destroying the flame's color. Often it is impossible to reformulate such a composition to again produce strong colors. However, it is preferable that the addition of spark-producing particles does not require such reformulation.

It is important that a material intended to produce sparks in fireworks be corrosion resistant, or at least capable of being easily protected against corrosion. If the other materials in a formulation chemically attack the spark-generating material, it may no longer be present in sufficient quantity to produce effective sparks when the firework is used. Thus the useful shelf life of the item will be limited. More important, the corrosion process generates heat, which may be sufficient to cause spontaneous ignition of the composition.

Table 1 rates the metals most commonly used in fireworks for these three important properties.

As can be seen in Table 1, titanium's set of properties is the best of any of the listed metals. It ignites easily, has a high boiling point, and is highly corrosion resistant. This makes titanium the easiest spark generating material to use, and it can be used to produce attractive sparks in more types of formulations than any of the other metals. Titanium can be added to most pyrotechnic formulations without significantly altering the performance of the composition except for the additional production of white (silver) sparks<sup>(d)</sup>. Tables 2a, 2b, and 2c give examples demonstrating how easily titanium can be used to produce sparks by simply adding 10 to 20% of it to standard (non-sparking) formulations.

In addition to the many ways titanium can be used by simply adding it to standard non-sparking formulations,

**Table 1. Some Properties of Metals Commonly Used in Fireworks.**

Metal	Ease of Ignition <sup>(b)</sup>	Boiling Point <sup>3</sup>	Corrosion Resistance <sup>(b)</sup>
Aluminum	Hard	2467°C	Moderate
Iron	Easy	2750°C	Low
Magnalium (50:50)	Moderate	<sup>(c)</sup>	Moderate
Magnesium	Easy	1090°C	Low
Titanium	Easy	3287°C	High
Zinc	Moderate	907°C	Moderate



## The Use of Titanium in Pyrotechnics (Continued)

by K.L. Kosanke

**Table 2a. Examples Demonstrating the Conversions of Non-Sparking Formulations to Silver Sparking Ones.**

Ingredient	Parts by weight			
	Flash Salute	Silver Flash	Whistle	Silver Whistle
Potassium perchlorate	70	70	70	70
Aluminum (German dark)	30	30	—	—
Sodium benzoate	—	—	30	30
Titanium <sup>(e)(f)</sup>	—	15	—	10
Reference	5	—	6	—

**Table 2b. Examples Demonstrating the Conversions of Non-Sparking Formulations to Silver Sparking Ones.**

Ingredient	Parts by weight			
	Wheel Driver	Silver Wheel	Red Fire	Silver & Red
Potassium nitrate	75	75	—	—
Charcoal (air float)	15	15	—	—
Sulfur	10	10	—	—
Potassium perchlorate	—	—	66	66
Strontium carbonate	—	—	20	20
Accaroid resin <sup>(g)</sup>	—	—	14	14
Titanium <sup>(e)(f)</sup>	—	20	—	15
Reference	—	—	5	—

there are two other applications that should be addressed. The first is a very attractive sparkler that generates an abundance of white sparks that seem to flow in long-lived cascades from the end of the sparkler. The second is sparking primes that some have used successfully in place of cross-matching inside aerial shells. Table 3 gives formulations for these applications.

In addition to a few unique uses, titanium has the ability to produce white (silver) sparks in most standard (non-sparking) formulations without the necessity of altering the basic formulation. Thus it may not be an exaggeration to proclaim titanium as the most versatile and easiest to use pyrotechnic material in fireworks today

The author gratefully wishes to acknowledge the technical and editorial assistance of John Bergman, Bob Winokur, and John Conkling.

### Notes

1. The use of titanium metal in pyrotechnic formulations is relatively safe, particularly in regard to adverse chemical reactions. However, titanium metal powders finer than about 240 mesh are quite susceptible to accidental ignition by static electricity, and the presence of an oxidizer only aggravates this situation. Thus caution is appropriate when using titanium finer than 100 mesh, particularly when it is possible that the material contains titanium finer than about 240 mesh. Titanium metal powders finer than about 325 mesh can be almost pyrophoric (spontaneously burn in air). Material this fine must be handled with extreme caution.
2. Ease of ignition and degree of corrosion resistance are given in subjective terms. This is because the author is not aware of a reference that appropriately quantifies them. The information presented is based on the general observations of the author and reviewers.
3. The exact boiling point of 50:50 magnalium could not be found in the literature. However, based on information supplied by Reade Metal, Inc., its boiling point is probably in the range from 1200–1500 °C.

## The Use of Titanium in Pyrotechnics (Continued)

by K.L. Kosanke

**Table 2c. Examples Demonstrating the Conversions of Non-Sparking Formulations to Silver Sparking Ones.**

Ingredient	Parts by weight			
	Blue Star	Silver & Blue	Bright Green	Bright Silver & Red Fire
Potassium perchlorate	61	61	16	16
Copper carbonate	12	12	—	—
Parlon	13	13	—	—
Accroides resin	9	9	—	—
Rice starch <sup>(h)</sup>	5	5	(i)	(i)
Barium nitrate	—	—	42	42
Magnesium <sup>(i)</sup>	—	—	25	25
Polyvinyl chloride	—	—	15	15
Lamp black	—	—	2	2
Titanium <sup>(e)(f)</sup>	—	10	—	20
Reference	(6)	—	(6)	—

**Table 3. Examples of Other Uses for Titanium in Fireworks.**

Ingredient	Parts by weight		
	Titanium Sparkler	Sparking Prime	Sparking Hot Prime
Potassium perchlorate	100	—	70
Titanium	100 <sup>(k)</sup>	15 <sup>(l)</sup>	15 <sup>(l)</sup>
Dextrin	45	(m)	(m)
Hydroxypropylguar <sup>(n)</sup>	5	—	—
Potassium nitrate	—	75	—
Charcoal (air float)	—	15	20
Sulfur	—	10	—
Accroides resin	—	—	10
Potassium dichromate	—	—	2
Reference	8	—	—

4. Strobe formulations and many glitter formulations<sup>9</sup> are the most notable exceptions to this rule. Also, regarding spark color, it must

be noted that titanium sparks can appear yellowish in some formulations.

5. The titanium used can be either granular sponge or flakes, both work satisfactorily. However, granular sponge does work somewhat better in salutes while flake material works better in most other applications<sup>4</sup>.

6. The particle size of the titanium used in these formulations generally falls into one of three ranges; -10 to +20 mesh, -20 to +40 mesh, and -40 mesh. The choice of particle size is dependent on the desired duration of the sparks to be produced by the firework. Coarse material produces longer-lived sparks. However, for a given weight of titanium, there are many more particles in the finer material, and the number of sparks produced is roughly proportional to the number of particles.

Thus, the choice of titanium particle size involves a tradeoff between producing a modest number of long-lived sparks and producing many more short-lived sparks. In general, the size of the titanium is scaled approximately to the size of the fireworks item. For example, a large gerb (1" to 2") probably would use -10 to +20 mesh titanium, while a medium gerb (½ to 1") probably would use -20 to +40 mesh titanium, and a small gerb (<½") probably would use -40 mesh titanium.

7. Accaroid resin is also known as red gum and accroides resin.

8. It is satisfactory to use dextrin in place of soluble glutinous rice starch.

9. Binding of the star should be accomplished using a non-aqueous binding system such as nitrocellulose-acetone. As an

## The Use of Titanium in Pyrotechnics (Continued)

by K.L. Kosanke

alternative, Parlon can be substituted for PVC, and the Parlon solvated using acetone and methylethylketone<sup>7</sup>.

10. The magnesium called for is 60 mesh material coated with linseed oil.
11. The titanium called for in the sparkler formulation is only identified as "mixed fines." This probably equates to -100 mesh material although slightly coarser material might also be used effectively. Remembering the caution in note (a) above, it might be prudent to sieve the -100 mesh titanium with a 240 mesh screen and dispose of any material finer than 240 mesh.
12. The titanium used in the sparking primes should be no coarser than -40 mesh; -100 mesh works well.
13. A dextrin—water binding system could be used but this can result in long-lasting moisture accumulation in the powder train of the time fuse. Thus, it is generally preferred to use the nitrocellulose-acetone binding system with primes.
14. Most likely CMC (sodium carboxymethylcellulose) can be used in place of hydroxypropylguar in this formulation.

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Ed.—I would like to thank the Kosanke's for allowing us to reprint this article with their blessings.  
(<http://www.jpyro.com/v2/>)

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# Pass the Parlon Please, part II

by Peter Saline

Few ingredients over the past 30 years or so have had the impact on fireworks manufacturing as that of Parlon. Parlon, or chlorinated natural rubber is a product used widely in the paint industry. I first became aware of it through Troy Fish's work in Pyrotechnica VII and subsequently in Dave Johnson's 'Go-Getter' manuscript. In it's most common form, we find it as a light fluffy ivory colored powder containing some flakes. It is one of the least dense pyro chemicals used; perhaps only Cabosil and lampblack being lighter for a given measure. A similar product known as Alloprene is cited in the Budarick work, "The Knox Pyroballets".

The beauty of Parlon lies in it's multiple assets to the average color star formula. Aside from the fact that it can serve as a fuel much like the resins of shellac or red gum, it is also a viable chlorine donor. But there's more! Parlon serves as a flame deoxidizer and can be an excellent binder when dissolved by a variety of non-aqueous solvents such as acetone, methyl ethyl ketone (M.E.K.), xylene, etc. In fact, formulations containing magnesium and at least 15% Parlon dissolved in an appropriate solvent essentially become essentially impervious to outside moisture for practical fireworks purposes.

Many years ago, I actually began removing dextrin entirely from my favorite color star formulas if they contained sufficient amounts of Parlon for binding. The aqua formula in the table below derived from the Veline

work, is an example of this kind of thinking. If you take up this practice, remember to add some Parlon to make up the slight difference in fuel.

At the WWB 17 Star Manufacturing Workshop we attempted to make all of the above star formulas, but alas, only completed 3 of them, primarily due to time constraints ignored by the over-ambitious seminars scheduler. Nonetheless, each of the formulas are worth a try, lest they wouldn't be included here. Baechle's amber is a most unusual departure from the usual yellow or charcoal orange. The indigo is sensitive to the type of aluminum used; made properly it is said to burn the color of blue ink. The magenta formula was given to me by Jim Farrell (a WPA charter member) but was called "purple" at the time. After making it several times, the lighting designer in me aptly changed the name to magenta. It has a gorgeous hue with good saturation.

What follows is some paraphrasing of Jim Farrell's article on the subject from the September 1989 WPA Newsletter. Although his article is some 16 years old now, the process of cutting good parlon bound stars remains the same. I have modified Jim's technique only slightly utilizing Steve Wilson's amazing discovery of adding Coleman fuel to the process; thus getting away from the otherwise gooey and often frustrating adventure.

Start by weighing the chemicals for a given formula. I'd highly suggest starting with only a 100 gram batch to ensure that you have the right ingredients before ruining a batch of several kilos. (Believe me, it's easy to get one thing wrong and waste your valuable chemicals.) Next you'll want to run the batch through a

	<u>Amber</u>	<u>Red</u>	<u>Magenta</u>	<u>Indigo</u>	<u>Aqua</u>	<u>Green</u>
	(Baechle)	(CJW)	(Farrell)	(Baechle)	(Wilson)	(Farrell)
Potassium Perchlorate	5		10	50	38	
Barium Nitrate	25				17	67
Strontium Nitrate	25	45	39			
Parlon	18	16	17	20	15	18
Red Gum	4	7		2	6	5
Sulfur		4	5			
Charcoal, Air Float		2	5			
Lampblack	4					
Magnesium						10
Aluminum, fine	15			4		
Magnalium		16	12		9	
Strontium Carbonate		10				
Barium Carbonate					10	
Copper Carbonate			12		5	
Black Copper Oxide				10		
Potassium Benzoate				4		
Sodium Benzoate	4					
Hexamine				10		

medium screen at least twice for initial mixing. Window screen is fine for this purpose.

Before applying solvent to your batch, have the following things ready:

- A mixing bowl large enough for the batch. Large stainless bowls work great. If plastic is used, be sure they are unaffected by your solvent before employing them.
- Wooden spoons with stout handles that will resist breaking.
- Star cutting knife. Preferably stainless steel. 3 or 4 inches high by at least 12" wide. Cutting edge sharpened - handle edge folded or wood. Real wide wallboard mud spreaders can be modified and employed.
- (see photo)
- 1" putty knife
- Cutting surface at least 24" square. Can be galvanized sheet metal, copper, glass, marble, or non-dissolving plastic such as polycarbonate.
- Solvent (acetone, MEK, lacquer thinner)
- Co-solvent (Coleman fuel or Walmart equivalent)
- Drying trays or screens
- Well ventilated area

## Pass the Parlon Please, part II

(Continued)

Make a solution of about 80% solvent and 20% co-solvent. The purpose of the co-solvent is to slow down the evaporation of the acetone and serve as a lubricant for the very sticky dough you'll get otherwise.

Place about 2/3rds of the mixed composition in the large bowl. Add small amounts of the solvent mixture to the dry powder and begin stirring with a wooden spoon. Add more solvent only as necessary. Be patient. **DO NOT OVER MOISTEN!** Use the putty knife to scrape off globs that stick to the spoon and bowl. Once you've figured out the right amount of solvent to powder, you may add the remaining 1/3rd of dry comp to the batch and a little more solvent mix. You are trying to make a dough ball that is easy to manage. If the dough is sticking to the bowl, add a little more Coleman fuel (and/or dry comp) and work everything into a ball. A little excess Coleman fuel oozing out of the ball is okay; it can be poured off. Too high a percentage of Coleman fuel can cause the dough to have folds and crevices that do not congeal well to the overall mass. Too much solvent is bad. Excess acetone or MEK will turn everything into a gummy mess; and during cutting, stringy webs will stretch from spoon to bowl to knife to cutting surface - very irritating. Like any other star mix, every parlon formulation handles a bit differently. You must develop a feel for each formula as you use it. That is why exact measurements are not included here.

Once you have a workable ball of dough, dump it onto the cutting surface. If it has sufficient excess Coleman fuel present, you will have little problem with everything sticking. It is not necessary to 'flour' the board with dry comp in this case. Some folks swear by flouring the dough on the top and bottom sides - but your mileage may vary.

Flatten the dough into a square cake to the desired thickness - probably 1/4" to 1/2" thick depending on your use. You can use a rolling pin or the side of your star cutting knife to do this. Some folks like to have two sticks handy to lay on either side on the cake as a reference for thickness. Rocket sticks 3/8" square by 2 feet long would be ideal. Use the side of your star knife to square up the dough cake.

Once you have a flat, square cake of the dough, you may begin the cutting process. Using your star cutting knife, plunge the edge into the cake

to form a strip with a width roughly equal to the cake thickness. In a quick motion, pull the strip toward you separating it from the rest of the cake. This takes a little practice. Work quickly. Moving the blade to the left or right as you cut helps. You may use the putty knife to help separate the strip from the star knife or the cake. Continue cutting strips and pulling them toward you. Keep the strips slightly separated from each other as they may rejoin if allowed. It may be of some use to roll the strips over 90° onto one of the cut edges to help equalize their shape. This also exposes a new side of the strip to air, expediting the drying process. Use the putty knife often to scrape any sticky dough off your cutting blade.

Once the whole cake has been cut into strips, you may wish to take a short breather, literally! It actually helps to let the strips rest a few minutes while you take in some acetone-free air.

Next you will cut the strips into cubes. Turn the whole cutting surface 90° so that all of the strips are now running lengthwise away from you. Use the cutting knife to square up the strips by pushing them into alignment. Then began cutting the strips into rows of cubes. Again you may use the putty knife to help separate the cubes from the cutting blade. Don't be too concerned about cubes that stick to each other. They are easily separated by

*(Continued Next Page)*



## Pass the Parlon Please, part II

(Continued)

hand later once they become drier. Also, there WILL be stars of odd shapes and sizes. It is far more important that some stars are not too large than too small or deformed.

Drying: Once all of the comp has been processed into cubes, you'll want to dump the batch onto a drying surface. This could be drying screens, or large sheets of paper. I like to use those cardboard trays that come from cases of beverages. Whatever you use, be sure to label the kind of star you have made. It's easy to mix them up after making 5 or 6 varieties and inhaling acetone fumes all afternoon. Most parlon stars processed in this fashion will dry in about a day. They can actually dry sufficiently for priming in a few hours if subjected to warm dry air moving at a modest velocity. Squeeze or cut open a sample star to test for dryness. Completely dry stars will be rock hard.

Although some of the star formulas may exhibit nearly 100% ignition unprimed when used in top-lit mine bags, priming is highly recommend for use in shells. I like to use a slurry prime containing hand made meal, then finished with a dusting of mixed grain and meal powder.

To make the slurry, obtain some CMC (carboxymethyl cellulose) which is a common thickener used in food products like pancake syrup. Your friendly pyro chemical vendors all carry it. Using a kitchen blender, fill the blending chamber about 2/3 full with water. Turn on the blender, and with the lid off, add small increments of the dry CMC powder; perhaps a 1/2 teaspoon or so at a time. Blend at medium speed and add CMC until it becomes curiously enough about the same consistency of warm pancake syrup. Be careful as it is real easy to over thicken this with only small increments more of CMC. (We're not trying to make Jello here.) Next start adding handmade meal powder to the syrup. I'd go with 1/2 to 1 cup as a good start. The mix will turn black and needs to be about the consistency of really thin pancake batter. (Getting hungry yet? I am.) Once mixed, transfer your slurry to another container, clean the blender thoroughly and return it to the kitchen before your spouse catches you.

Before going on with the priming process, have the following ready:

- Two large bowls like the ones used for the dough mixing process.
- A framed screen of large mesh size such a 1/8" or even 1/4"
- A dry mix of about 2/3rds handmade (notice I don't say "homemade") meal powder and 1/3 commercial grain powder such as 2Fg. (This is one of few places that the cheap-ass author ever uses commercial powder, as it is good insurance for achieving adequate star ignition.) Place this mix in some kind of generous shaker like the ones used to shake powdered sugar on French toast. (Shit, I'm starving now....)
- A drying surface large enough for all the finished stars; large sheets of kraft or layers of newspaper are good.
- A large mouth mason jar (1 qt.) with plastic screw-top lid.

What follows needs to happen quickly, but if you have everything ready, the process goes well.

Pour dry stars into the mason jar to about half full. Add to the jar perhaps a 1/2 a cup of the prepared slurry and screw on the lid. Shake the content well until all of the stars are well coated.

Having placed the screen over one of your bowls first, dump the wet stars

with the excess slurry onto the screen allowing the excess slurry to drain through the screen. In the second bowl, dust the bottom well with your dry powder mix. Once most of the excess slurry has drained off the wet stars, dump all of them into the dusted bowl and immediately dust some more with your shaker. Quickly begin swirling the stars around in the dust until they pick up most of the dry powder. Add more powder as needed. It may be necessary to separate clumps of stars that stick together. Banging the bottom of the bowl upward several times as you continue to swirl them around helps a lot. You'll get the hang of it soon enough. Additional rolling and swirling of the stars will actually help round them out some if you want to be anal. Once the stars are well coated with both the slurry and the dry mix, dump them onto the drying tray.

Pour the excess slurry from the first bowl back into mason jar, add more stars and slurry and continue the process until all of your stars are primed. Clean your bowls and jar, etc. Leftover slurry may be used for priming other batches over a period of a few weeks. Allow the stars to dry another day or so. Again, warm, dry, moving air is best.

Some tips are included here to save you some grief: If your slurry is too thick, then your stars will take up considerably more dry powder. In that case they will grow to the size of walnuts and become charcoal streamer to color changing comets. Also, having mixed grain sizes of the commercial BP or polverone with the meal powder is important. Think of the larger grain sizes as little stilts that keep the semi-wet stars from totally touching each other. If you use just fine milled meal, the stars will have a tendency to stick to each other like suction cups.

I make most of my single color stars in this fashion and save aqueous binding for glitter and charcoal stars bound with dextrin. It is this author's opinion that well formulated metal/parlon fuel stars are generally superior in color to similar dextrin/aqueous stars. While the four steps (cutting, drying, priming, drying) may seem a bit involved, most stars made in this fashion are done in two days and possibly sooner once you master the right proportions of solvent and co-solvent to dry comp and slurry consistency.

Pass me some more Parlon, please – I'm famished!

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# Phabulous Phoenix Phourth

By Greg Dandurand

Like Lawrence of Arabia I stood atop the sand dune gazing at the oasis in the distance. I could feel the desert sun pounding relentlessly on my flowing robes, the heat swirling as the wind blew around me. Too much sun can play tricks on a man's mind, I thought, as I glanced back at my scantily clad harem, awaiting my decision. "Hey! Are you OK?" The blonde asked in a deep, husky voice. Too deep, too husky for a beautiful woman like that. As I shook my head, the sand dune became a dirt pile, the oasis was the Indian casino in the distance, and my harem became the rest of the pyro crew for the show that night. I replied it was time to get out of the sun for a while.

Shooting shows in the 110+ degree heat of the Phoenix summer can be hard, but most of us have done it a time or two. We just spell each other on breaks and constantly drink water. I was on a crew that shot three shows over the weekend. We were very fortunate in that they were all dealing with the same AHJ, and were within five miles of the shop. Two (on the 2<sup>nd</sup> and 3<sup>rd</sup>) were at the same place, and basically the same show. The casino had a concert on the 2<sup>nd</sup> that was free and a paid concert on the 3<sup>rd</sup>. Set up was easy, as the big guns were already dug in and all we had to do was set up sixes on down. That went quickly, and with no newbies on the crew we all accomplished our tasks quickly and with the utmost regard for safety. As we waited around for darkness to fall and the concert to begin, a small problem began to emerge. From our vantage point on the earthen berm, we could see people pulling into our fallout area due to the fact that the free concert had been heavily promoted and people were looking for a place to view the fireworks after being turned away from the concert (which had the gates closed due to a capacity crowd). Several of us went down to block off the entrance where people were coming in and start moving people out. I love the general public (not). People wanted to stay where they were, and who the heck were we to tell them to move. Not being paid to be crowd control with my temper fuse running short, I called the head pyro on my cell phone. After explaining the reluctance of people to move, he promised to call the promoter and find a better motivational tool. That arrived in the form of several uniformed reservation police officers and their vehicles, who made short work of clearing the area. Their slogan "Go or tow" was short and to the point.

The next part was playing the waiting game. I am sure most of you have previously shot concert shows. The promoter will sit there and tell you a certain time, but that starts slipping within five minutes of coming out of his mouth. We waited and waited and waited, finally after two encores and three standing ovations, we shot the show. We had to wake up the head pyro to start the computer. The only thing I did not like is that the AHJ will not let us hand fire the shows. After clearing the guns and picking up the spent cakes and the firing system, we headed back to the shop to report our status and chit-chat with the others crews returning from their evening soirees.

The following afternoon, we repeated our routine. As we reloaded our guns, a banner tow airplane droned overhead, pulling an advertisement for a competing casino up the road. The sponsor showed up to go

over the plans and jokingly asked if we could do anything about the banner tow plane. HA HA HA, NO we could not. The reload was quick and we settled into our lawn chairs under the pop-up to await twilight. One really nice thing was that the sponsor had security block off the road and our fallout area, thus preventing an encore of the previous evening's traffic jam. Like clockwork, using precision communication techniques rivaling the tin can and string, we were able to push the button on another fine show as the concert ended. Thankfully, it was not as late as it could have been, rumor had it that the headliner was not feeling well and would not be doing a long encore. We had a low break 12 that woke us up and started a few spot fires in the desert. They would not have gone anywhere, as dirt roads on three sides and a paved road on the other hemmed us in, but the brush truck provided by the sponsor went out to do some mop-up, and promptly got stuck. I thought they sent those drivers to school, but maybe it was his first day. No harm, no foul, and everything died down as fast as it lit up. The cleanup went fast with our tow rope technique on the 8's, 10's, and 12's aided by the soft dirt in which they were planted. Triumphantly heading to the shop, horns blaring and eyes filled with glee, like the Grinch returning the presents to Whoville, we pulled into the yard (making a note to get the exhaust on the truck looked at, as it was filling the cab with too many fumes making us delusional Grinches). After cleaning the garbage out of the back, we settled in again, enjoying a few adult beverages as we awaited other crews returning, to swap stories and help out where needed. The other crew that shot the heavy metal show at a competing casino returned rather late. The head pyro commented that he would have the distinction of shooting two shows on the Fourth of July, as his finale didn't finish until 12:15 am. I commented to him that his first show was done, he just had one more to do in about 14 hours. Like the commercial says, the look on his face: priceless.

The next night: the Fourth of July. The big show. Everything else was just dung. This was it. Time to shine. OK, enough hyperbole. I was shooting for the owner of the company less than a quarter mile from where we had shot the previous two nights. Same AHJ, different sponsor. It was a bit of a weird situation. The shoot was for Rawhide, a Wild West town and tourist destination. Last year it was located up in Scottsdale, AZ. This year, they had moved it lock, stock and barrel to the reservation. Last year, hand firing up to six inch, and the biggest shell was a sixteen. This year, no hand firing and due to the tight space, the biggest shell was a four. Major bummer. We had a really stretched out shoot site. Most of the crowd was to be in a rodeo arena. We had some set pieces spelling out the names of the sponsors, some small class B cakes to be set

**"Like Lawrence of Arabia I stood atop the sand dune gazing at the oasis in the distance. ...it was time to get out of the sun for a while."**


*(Continued Next Page)*

## Phabulous Phoenix Phourth (continued)

By Greg Dandurand

up near the arena and everything else was set up in the back. We had some newbies on this show, but they were able to follow directions and do well, so it did not become a problem. One of them noticed that one of the sponsor's names was misspelled on a set piece. The head pyro said to forget it, there was nothing that could be done now. I was about to joke about spell check on lance work, but a look at the boss convinced me to save it for later. The set pieces were hand lit, with the small cakes tied to a remote firing panel. After that, the opening was all wired to a battery, with two boards for the three and fours, and the finale on a battery. It really went well for the first time shooting in this location. I set the off the opening (touch two wires here) and watched the main body of the show for a moment. We had a bad cable on one of the rails, so the boss had me run the board while he went out and swapped the cables over. I was a little nervous as I had never done this before, but when he came back from the field, he let me sit and shoot for a while, before he took over and finished the show. I set off the finale (touch the other two wires here) and that was it. We had a quick clean up and returned to the shop. The nice thing about this was that we didn't have to wait for a concert to end, we shot by 9:30, instead of 10:30 or 11:00 the other nights

Being one of the first back to the shop, we were able to help the others as they got back. The only rule was to pull any unfired product off the trucks to put in proper storage. The guns and other equipment would be unloaded in the next day or two.



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US Designers  
Flower Basket  
Hasu  
Hanabi  
Lidu  
Dragon Head



## 1.4G Brands

Wolverine West  
FirePlug  
Geisha  
Golden Bear  
Hale's  
United Pyro



Be sure to checkout our video webpage... Whether you're a class C enthusiast or a real thump-junkie, there is something for you! [www.wolverinefireworks.com/videos](http://www.wolverinefireworks.com/videos)

**Northwest** - 1.3G & 1.4G  
Wolverine West  
4616 - 25th Ave NE #528  
Seattle, WA 98105  
360.870.1833 or 206.459.0917  
west@wolverinefireworks.com



**Southwest** - 1.4G  
Outlaw Pyrotechnics  
2280 W. Betty  
Pahrump, NV 89060  
866.606.PYRO (7976)  
info@outlawpyro.com  
outlawpyro.com



**Midwest** - 1.3G  
Wolverine Fireworks Display  
205 W. Seidlers Road  
Kawkawlin, MI 48631  
989.662.0121  
east@wolverinefireworks.com

**Midwest** - 1.4G  
Captain Boom Fireworks  
PO Box 331  
Otsego, MI 49078  
269.694.BOOM (2666)  
info@captainboom.com  
captainboom.com