presence here during shoots.

George is actually one of the few people out here who makes his living in the fireworks industry. Most of these other guys are talented amateurs. This recent Orange County club shoot happened a scant two weeks after the Fourth of July. Attendance was a tad sparse because many club members were literally and figuratively burnt out from the most intensive fireworks weekend of the year. Which explains how these companies, like the one he works with, Pyrotecnico, can put on 700 shows over one weekend; they hire all these guys part time.

"Fireworks are very popular in the United States," continues George. They're not just for Independence Day celebrations and New Year's. "They get used at baseball games, almost any sporting event, special events, grand openings, municipal festivals…You'll have festivals that have $250,000 fireworks budgets that will have a million spectators that will show up for that festival. In the last 10 years the fireworks industry has doubled. It went from $500 million to a $1 billion. And it continues to grow."

This past July 4, George Tasick was in Battlecreek, MI, where he was given a hero's welcome as he drove in with his fireworks truck. He says part of the allure of being a pyrotechnician is that for one brief moment, you're the star. "And then you add to that the computer firing aspect and the choreography and everything else like that, and it is a performance.

"The other aspect of why I do it goes towards an artistic perspective," he continues. "What astounds me the most is the fact that you can take such simple components; you have some fairly basic dry chemicals, some craft paper, some glue, some tape, and you can put them together into something that has an astonishing and profound effect on a very large number of people."

Crackerjacks club members resemble a sewing circle as they rig chain fuses for ball shells in preparation for a breast cancer awareness fireworks show near Indiantown in mid-July.

Basic ball shell construction. Note the stars in the hemisphere that surround the bursting charge which ignites via a pass fire from the lifting charge that sends the shell up into the air.

He also loves to teach. "There's the educational aspect of it. There's the artistic aspect of it, and then on top of everything, it's almost like you're in an exclusive club, and I don't mean just this club. If you're a pyrotechnician, there's not many of you out there."

Others in the group nod their heads in agreement. Weldon Neal, who spent an hour making one rocket is perfectly happy that it launched successfully in one second. This is his third year with Crackerjacks. "I've made a lot of friends," he says amiably. The Rocket Man blurts, "It's camaraderie."

When asked what is it about fireworks, Tom Rebenklau enigmatically replies "Chromosome damage." He pauses and shrugs. "I have no idea. You tell me why I don't like red cabbage, but I like sauerkraut. I don't know. Ever since I was a kid, I liked fireworks. I have no idea why."

The others talk about him in reverent tones. "He's like the best in the world. There is nobody who can equal Tom that I have ever met," says George Tasick. Tom opens a coffin-like box. In it are probably two dozen rockets that he has painstakingly built. When he fires them he actually takes notes on a portable cassette recorder, commenting on their performance so he can tweak it better next time. His bursts are incredible, featuring rotating clockwise and then counterclockwise explosions of white, or bursts of orange crosses, or flower petals of deep blue, the hardest color to get right.

BOOM!

Another jarring salute startles us. "That was a good poke," says the Rocket Man. "That was a good poke."

"THAT WAS A GOOD POKE"

Above, Crackerjacks Vice President George Tasick shows how mortars are arranged in a pod. They can be fired remotely through the electric firing box at his feet. Top photos, Examples of the Rocket Man, Tom Rebenklau's artistry.

BOOM!

I levitate off a folding chair about an inch… not from the impact of the explosion but more from the surprise of it. "It can be quite loud sometimes," understates George Tasick. He hands me a pair of ear plugs.

George is the vice president of Crackerjacks, a fireworks club, and we are sitting in the shade of a large tent out in the middle of a parched hayfield up around Indiantown way. It may be one of the hottest days in this already broiling summer, but this group of mostly middle-aged men seem intent on making it even hotter. They are building fireworks.

It looks like a sewing circle around here, everyone sitting at a folding table rigging chain fuses on shells. They're getting ready for tomorrow night's show to promote breast cancer awareness. They chat about their grandchildren, who won the all star game, and the weather, which, (did I mention?) is hot as blue blazes. And, for this whole long weekend, they'll camp out in this Orange County hayfield while…I was about to say, 'playing with fire.' But that's not really fair because it's more than that…much more.

INSIDER

By Phil Audibert

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History, artistry, chemistry

We've all heard the story that the Chinese first discovered black powder, but they didn't use it first for weapons; only for fireworks.

Actually fireworks go back even further than the discovery of explosives. "Prior to black powder, they would use shoots of fresh bamboo and throw those into a fire, and the water would heat up in the cells of the bamboo and crack open really loud and that was to scare spirits away," relates George Tasick. Then, 2,000 years ago, they discovered black powder, "and when you light that, you get an even bigger explosion out of it." Not only did it scare the evil spirits away, but just about everybody else too.

Next stop: Europe, when possibly Marco Polo brought back these primitive Chinese firecrackers and rockets. And then we all know what happened after that; someone invented the gun and the projectile and all hell broke loose. Still, Tasick adds, "Italy was very big into chemistry and so they started tinkering with what happens when I take this concept of having a fuel and oxidizer and start changing the fuels and oxidizers. And that's when you started seeing colors start to appear on the scene."

Next stop: USA. "So, when people started emigrating to the U.S., a lot of people came over from Italy into the New York area, and that's why you see almost all the major fireworks companies are Italian families." And sure enough the company that George Tasick works with, Pyrotecnica was founded by the Vitale family in 1889. It is in the same family today.

By this point the colorful chemistry that the Italians had developed was exported back to China and Japan and they started adding their own brand of artistry to their displays. And to this day, you can tell the difference between a Chinese-style firework and an Italian-style firework; the former is round in shape; the latter is like a canister.

There is a third historical milestone to this story that happens right here in America. It is the development of electronic and later computer-controlled firing and choreography systems. Nowadays, fireworks on top of 12 different skyscrapers can all be fired wirelessly. "And that's what I think America has really done well, is to take all of these things that were developed in other countries …and then we take those ideas and were able to use technology to push it further."

And so it really is more about the history, artistry and chemistry than it is the bang.

Unless you have a private invitation to Herb "Shag" Jenkins' place or are a member of this fireworks club, you're like me; clueless about what goes on here. It's just a bunch of crazies who like to play with fire and make loud noises. Right?

Well, admittedly there is a little bit of that. Reports reverberate all day long, proving that there's just something about things that go bang that has fascinated us ever since we threw a wet piece of bamboo into a campfire. And, yes, some of the locals aren't wild about all the noise or the dust and traffic on the road, but at night they have to admit that whoosh, whump and rainbow burst of colors is quite spectacular.

The inner workings of a Tom Rebenklau rocket. Powder is packed around a spindle in the cylinder to make the rocket motor. The painstakingly constructed canister on top contains the multicolored burst.

BOOM! I jump again. "That's called a salute," explains George of the loud explosion. It is not, repeat *NOT*, a firecracker that was lit on the ground. It was launched high in the sky before exploding harmlessly. A salute, they call it, but to a chap nicknamed the Rocket Man, "that was a good poke."

It doesn't take much for the child within to be hooked on this. George Tasick outlines the typical scenario. "You start out enjoying fireworks, and one day you go to a fireworks store and buy a little box of fireworks. You take that little box home and you shoot it on the Fourth of July and it's fun and exciting and you enjoy it. So what happens is, well before the next Fourth of July, that person starts planning ahead and they start becoming more ambitious. They start saving money, putting money aside to buy fireworks… And it just continues to progress, you get bigger and bigger and bigger and at a certain point they either find a club or someone mentions the fact that clubs exist that do this."

Enter Crackerjacks, which by the way, is the largest fireworks club on the east coast. Many of the guys here are from New England; at least they sound that way. Some are from the south; as far away as Georgia. They even have a member from Great Britain, but not even mad dogs and Englishmen will go out in this noon day sun…only fireworks freaks.

Basically, fireworks can be grouped into two categories: consumer grade, which is the stuff you and I can buy legally in the Food Lion parking lot a week prior to July 4, and professional grade, which is what you might call the, uh, good stuff. George continues. "You get to a point where it's 'I've kind of maxed out the consumer fireworks as far as what I can get with those; I want to get professional fireworks.' And then when they start getting professional fireworks, they'll see that there's more to know; there's more knowledge that you need to have to use them safely…Once they hit the club, there are so many people that know what they're doing that you get educated real fast. You can learn as much as you want as fast as you want."

The club holds a federal license that allows them to purchase, transport, securely store, and safely use these professional grade fireworks. It also holds the insurance policy and it has the place to set them off. But more importantly, this is where up and coming pyrotechnicians can learn from the best, like the aforementioned Rocket Man.

George points to a stooped middle-aged fellow who peers owlishly over his spectacles. His name is Tom Rebenklau, from Bridgewater, MA. "Tom is the master," says George. "The Guru," echoes Weldon Neal of Richmond. Weldon is learning how to build a rocket, and Tom is overseeing the process; you might say a sorcerer and his apprentice.

Today we will manufacture a shell. "Everything is very basic dry chemicals, cardboard, tape, paper," observes George. "But it's amazing what you can do with it when used properly in the sky." He picks up a Tupperware container filled with dark rubbery balls each one about the size of a marble. These are the stars that make the streaks of different colored light that blossom in the sky when the shell explodes.

He refers to a recipe that shows what chemicals in what proportions will produce which colors. Tomorrow's breast cancer awareness show will feature a lot of pink. Stronium, the chemical they use in road flares will be "watered down" with magnalium or magnesium aluminum, which produce white.

In basic shell construction, both spherical and canister, you make a space in the center for the black powder and then fill in around that space with these little gummy balls. "You can mix and match," says George. "You can put all these stars in here that burn three different colors and then you could have four whistles in there as well that would then explode outward."

The space you left inside the tube you fill with black powder.

"That's plenty big. An inch would be fine for that," interrupts the Rocket Man in his heavy Noo Yawk accent. He can't resist eavesdropping.

"You think so?" queries George.

"I know so," says Tom confidently. He's been doing this for 30 years. Besides, he's a machinist; he's used to dealing with tolerances of only a thousandth of an inch. Black powder is "like the salt, pepper and baking flour, but then," he grins, "you get into your spices." He seems to rub his hands together in glee, like a mad scientist.

Time to rig the fuse, and there are many kinds: mini ones that light other ones, ones that can burn 60 feet in one second, and ones called pass fires, that 'pass the fire' through the powder charge without igniting it until just the right

Weldon Neal of Richmond prepares to shoot a rocket that took him an hour to make, above. With a quick whoosh, it took him about a second to shoot, below.

moment. And then you have to put all this stuff on a "lift charge" to get it up in the air. "And then everything explodes out," grins George like a little kid. "And it will also light all of these stars at the same time, and that's what you see actually exploding in the air."

Whew! That's a lot of painstaking work for about three seconds worth of bang and blossom. "This is behind the scenes here," observes George. "Ninety nine percent is behind the scenes, sitting around tediously wiring or fusing things for 20 minutes of show or less. That's what it is. The amount of time you spend on whatever it is you're working on far exceeds the duration of the effect itself."

Making rockets is just as much work, maybe more. Weldon Neal has been carefully pouring black powder into his rocket by the spoonful and tamping it down around the spindle with a hammer and metal ram, which to the uninitiated like myself, is a little disconcerting. "Black powder on its own is a fairly stable composition," reassures George. "You treat it with respect, but compared to some of the other formulas that you're using, black powder is pretty much inert," confirms Tom. Okay, I'll take your word for it. Apparently impact is not the hazard here; fire is.

Here in this tent, where the sewing circle is rigging chain fuses to ball shells, we are surrounded by a fence of yellow caution tape. No open flame in this space and you must wear safety glasses at all times. Tom points to the Tupperware bowl of stars. "If this were to get a very little amount of fire, this would turn into a fireball probably six feet in diameter. It would burn a hole right through the roof and we'd all be toasted pretty well. We'd be going to the hospital with some severe burns…So things can happen very quickly." He adjusts his safety glasses. "When the fire flashes over you like that, you might not have any hair, but at least you'll be able to see for the rest of your life."

I look around and notice that nobody has any missing fingers or obvious burn marks. The Rocket Man cracks everyone up by saying, "I might not be able to hear, but I can still count to 21, my fingers and my toes… 21."

George turns serious. "Severe injuries like that are fairly rare. When you factor in the number of fireworks that come into this country versus the number of injuries, it is small, very small… The estimated annual number of injuries is about 11,000 per year. Now, there are more injuries per year from pencils. There's more injuries from playground swing sets." "Bathtub accidents!" shouts someone from the back.

George points out that half of those injuries are from "illegal explosive devices, the cherry bombs, the M-80s, the quarter sticks… so if you find them, the guy that made them is breaking the law, the guy that sells them is breaking the law, and the guy that buys and uses them is breaking the law." Crackerjacks will have no part of these things. "They're completely off the books. We don't even deal with them. We don't even classify them as fireworks. That is an illegal explosive device that has nothing to do with what we do here."

Back to the 11,000 injuries. "So you could actually cut that number in half for accidents actually caused by legitimate commercial fireworks, and then you could cut that number in half, and that half could be instances where people just burn their fingers with sparklers….people who hold on to them too long, burn their fingers, little kids who are left unattended and burn themselves. Then the next 24 percent are people being irresponsible with

Sometimes the bursting charge consists of black powder coated rice hulls.

fireworks, and then there's 1 percent where the people legitimately had an accident; something malfunctioned."

We go out into the field and look at the banks of mortars that are being loaded for tomorrow night's show. The firing tubes are basically high density polyethylene or fiberglass sewer pipes of varying diameters cut into lengths and racked vertically in wooden "pods." George Tasick explains there are many ways to fire these banks of mortars; it depends on where you are… on a barge, at a stadium, in a quarry, or in a field like this. For this Orange County show, they use electric firing modules that are connected to a main control panel.

Asked about fire danger at this dry time of year, George says "I've never seen a brush fire start that wasn't immediately stomped out or just put out with a little watering can or something. If your firework functions properly, everything is burned out by the time it reaches the ground." But just in case it doesn't, they have dozens of fire extinguishers on hand and of course, the local fire department maintains a