NEWS · SEP 2, 2024

Newsletter V35-1: Western WinterBlast® 2024 Recap; Dream Team Interview with Eric Tucker, Pyro Pete, Martin Hildeberg & Patrice Guy; and more

What is it about the desert? Things survive out here despite all Beautiful things Even the detritus, full of bullet holes Somehow the color scheme is just right



It has been decreed: Western WinterBlast and Do It will each last five days from now on!

Summer, 2024 - Volume 35

by Mark Devon, WPA Communications VP

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Western WinterBlast 32 Retrospective: We came we saw we conquered, as usual. Big Desert fun.









What is it about the desert?
Things survive out here despite all
Beautiful things
Even the detritus, full of bullet holes
Somehow the color scheme is just right

1992 my first blast
Tooling through the desert in an RX7 colleague from work at the wheel
Six year old Julian in the back

What the heck is this WPA thing
Heard about it from some Californios
PGI Lacrosse WI.

All the good things about PGI without the egos they said
We shall see
Long time gone now, gone to that great gig in the sky
Dentist and Microbiologist by day, Shade Tree pyro by night.
What are the chances of that?
Pioneer Inn room facing 95, rough stuff
|Trucks going by all night
Same bad coffee they have now
Plus ça change
Greeted by Kevin Bruckner at registration
“Welcome to the WPA member 149”
Beautiful fireworks, no music, Bill Page performing
How does he get those colors I’ve never seen anything like it
Doc Barr acting out his second childhood, Fred May talking Mexican fireworks
Count me in Man

by Mark Devon

Meet your 2024 board

Ellen Webb - President

Lonnie Ross - VP

Mark Devon - Communications VP

Dennis Miele - Secretary

TBD - Accounting

Shell builders all, even Dennis has built at least one shell under his belt. Or was it a rocket?

DO-IT 2024

Host Hotel: The Travelodge associated with the El Capitan Casino: https://elcapcasino.com/accommodations/. Our discount rate is $60/night + tax.
We have rooms blocked from September 19-26th. Call the hotel directly at 775-945-3321 or

800-922-2311 and say you are with the WPA, to receive the discount. You will NOT receive the
discount, if you make your reservation online.

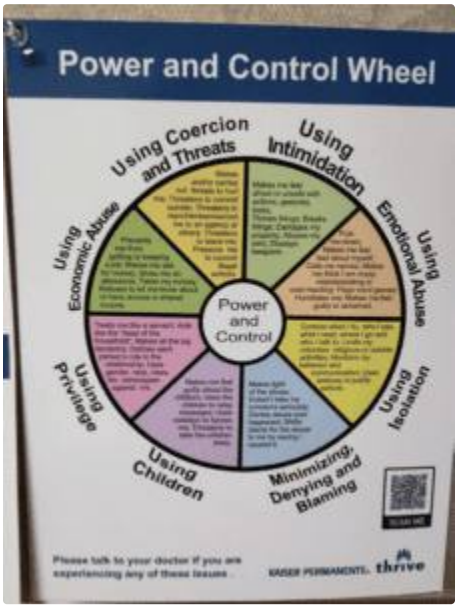
If reservations are not being made in a timely manner, our block will be reduced. In the past, the
hotel has been completely sold out on the weekend, so make your reservations early!

Registration: On site at The Bug's RV from 8am until 9pm Wednesday - Saturday. Despite inflation, the board has voted to keep the registration fee the same as last year at $100. The Board also voted (after much discussion) to raise the clean up deposit to $50 from $20.

Registration Fees and Cleanup Deposit: The registration fee remains $100, but the cleanup deposit has increased to $50 from $20. This deposit can be earned back by participating in the cleanup or donated to the club.

Note that this is a deposit you can earn back when you help clean up OR if you don't care about
the money, you can donate your share to the club. Why raise the deposit? In a nutshell, the town of Hawthorne generously provides the space for this event. They have been gracious over
the years and actively shared their appreciation for the business we bring into town as well as
our nightly displays. There are only two thematic concerns. We can be a little too noisy and we're a little too messy. We can address the mess quite easily with more active participation in
clean-up. Last year there were roughly 20 people who helped clean up - less than 15% of attendees. Unlike Western WinterBlast, there's no temporary labor available at Do It. We are 100% responsible
for our own mess, and need your help! Again, it's a deposit, you earn it back when you help clean up on Sunday as per the WPA clean up policy at events..

At the BOD zoom meeting last night I was advised to dig up and reprint a particularly heartfelt
admonition from a certain Keif Adler regarding the subject of volunteering for the club. I looked
through the newsletters of the last couple years but couldn't find it. So lets try another tack: WE NEED VOLUNTEERS. VOLUNTEER GOD DAMMIT! DON'T MAKE ME USE ANY OF THE BELOW TECHNIQUES. PLEASE TALK TO YOUR DOCTOR IF YOU ARE EXPERIENCING ANY OF THESE ISSUES AND GET HER TO VOLUNTEER AS WELL.


Power and Control Wheel
Using Coercion and Threats
Using Intimidation
Using Emotional Abuse
Using Isolation
Minimizing, Denying and Blaming
Using Children
Using Privilege
Using Economic Abuse
Power and Control
Please talk to your doctor if you are experiencing any of these issues
KAISER PERMANENTE
thrive

Western WinterBlast Havasu Mayhem - Thanks to Wanda Garret



Jackalope roman candle blitz



Hauter National Anthem



















New member all the way from Canada John Adria and Wasatch Pyro Kyle Madsden



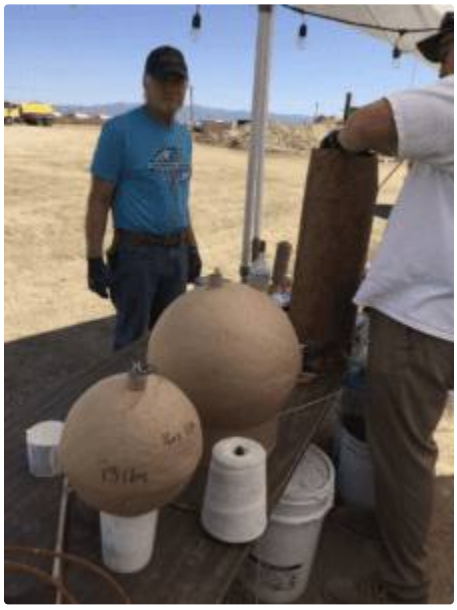
Matthew Pierce with some nice ones

Above photos by Wanda Garrett

Do-it 2023 Pictures, Mark Devon



Who are these guys? I want to be their friend.



Go big and/or go home



Keep on truckin', 10-4 good buddy. Not to be confused with the dog food truck which burned up outside the event



Ellen Webb and Kyle Madsden discussing whether they have to pay taxes on $13.24 of gambling winnings at El Cap the night before.



Only at the WPA would an 18 wheeler carrying dog food catch on fire just outside the event and burn to the ground. What happens if you don't follow NFPA 1123 to the letter.

2023 International Fireworks Symposium, Mark Devon



From Hawthorne to Gudja, Malta. So far away and yet so close.
2023 International Fireworks Symposium



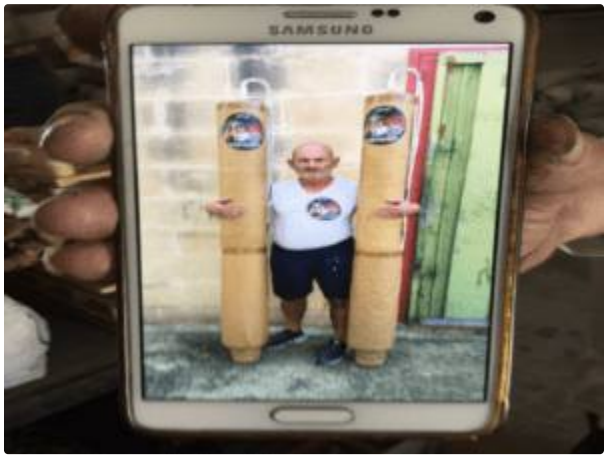
Shell spiking at the Gudja fireworks factory, Malta April 2023. Lotsa string. +10 points for using his butt to tension the string.



Inside a signature Maltese Beraq shell: How do they get timing that tight with time fuse? Rumor has it that the time fuse has been replaced by slurries of varying speeds.



They like their string. Remind me to buy shares of string makers



Compensating for something



Even the inserts have enough string to cover Rhode Island



Bigger shells than Mikhail normally sees in little old Austria

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Ruminations of the Dream Team on Pyro-musical Extravaganzas, Stage FX, and Drones:

Eric Tucker, Pyro Pete, Martin Hildeberg and Patrice Guy; moderated by Peter Rogoz.



Pyro Pete with some former juvenile delinquents he met through the Rock and Roll business



Eric Tucker talking about putting together the Boston Pops show with CBS news



Martin Hildeberg & Co wins another competition somewhere in Europe



Patrice Guy, our man in Canada

Part 1: Introductions and background, on competitions, and telling a story

TRANSCRIPT

'76 Pro Line VP Peter Rogoz moderated a Zoom meetup of our heroes for a Western WinterBlast seminar
arranged by Steve Wilson and began by asking people to introduce themselves.

Peter Rogoz
All these guys had very low key [self] introductions, but the fact of the matter is probably most of the world's most incredible shows you've seen the last couple of decades have come from the
minds of these guys things from international competitions to major amusement park installations to the largest touring groups in the world, to the largest international events in the
world. This is literally a dream team of pyros. We're talking massive worldwide events, things like
Olympics, World Cups, things like that is what these guys are called in for. So, thank you guys
again for spending a little bit of time with us.

Eric Tucker
My name is Eric Tucker. I am the show designer and independent show designer and consultant and and I have to say, I listened to the end of the, of the session before us (with

Jim Widmann
and Eric Krug on the world record 62” shell), and I loved it. And I quote “the small shells [are] 32
inches and below”. Well, they're just fantastic.

Pyro Pete
Hey, everybody. Peter Cappadocia “Pyro Pete”, mostly stage pyro with a heavy emphasis on flames. I design and build flaming systems. I studied with Thane Morris, Ilya Popov, Bob Bauer
and all the heavyweights that started the flames. So Pyro Stage Flames by night, aerial or stuff I
call Eric [Tucker]. I don't mess around with that styling. That’s up to you guys

Patrice Guy
I'm the owner of Northstar Fireworks in Ontario, and for the past three or four
years, I've been moving in to the drone industry. So my time now is much more focused on drones and a little bit less on pyro than it was before.

Martin Hildeberg
Thank you, Peter Martin Hildeberg is my name. I'm from Sweden. We're a small country. I ran a
small fireworks company. It's a small market. Everything's small at our end of the world. But I've
been around doing fireworks competitions around the world and I've been pretty successful over
the years and, well, I'm passionate about musicals and firework shows in general. That's what I
like to do. Design stuff.

Peter Rogoz
Martin, if you want to kick this one off, you do quite a bit of pyro musical work?
What mediums outside of Cairo, if any, do you speak inspiration from? Are there any particular
art forms that influence your things outside of fireworks?

Martin Hildeberg
Well, anyway, I used to work as a deejay and used to work with the light installation shows and
that sort of thing in the eighties and early nineties. And light shows, I find I mean, has always inspired me with the color combinations and, well, the movement of lights following the

music
and so on. It's it's very similar to some of the aspects of prior musical design
So that, that that's what I feel the most inspired me.

Peter Rogoz
Anyone else in the group have a musical background by chance working with music did before
pyrotechnics sort of. So, what was your experience?

Pyro Pete
I was a theater major, and I used to play in a punk band. One of the worst guitarists that have ever been recorded on an album. I have that going for me.

Peter Rogoz
All right. And Eric, what's your, what's your experience?

Eric Tucker
My background was music, theater, ballet, modern dance, not obviously as a dancer, but backstage. I've always been a backstage guy. Music mixing and theater. A lot of, I get a lot of inspiration. Thanks, dance. Every time I watched it on stage, you know, it's like I could do that. I
could do that. And then you try and can't do that. But music, I think, probably is the answer, the biggest answer for me. Okay, so, music and dance.. I know I've definitely taken a big amount of inspiration from
shows like Cirque du Soleil type shows in Vegas, especially just because they have such an abstract movement and a music model.

[Inspiration leads to discussion of competitions]

Peter Rogoz
Are there any other art forms like that that anyone is particularly inspired by?

Patrice Guy
What inspired me when I started, when I was a 14, 15, 16 years old in Montreal, they had a fireworks competition. And every Saturday I would go there with a a band like this and I'd come
up after their show, four or five full size pages of notes, and one show every year. Again, I never
failed to to attend. That was always the American show, scripted by Eric Tucker. Because, Eric, you had shows you are the only designer that I knew. And there I still know that was not afraid to let a black sky.
You were not afraid at all. Sometimes there's some call for it. You would do it when I would be

when I would want to to to shoot ten shells, you would shoot one, but it would be the right show.
Always the right product. And I learned so much watching you.

Eric Tucker
Montreal is, is huge. I was in, I was trained in fireworks in France and and I remember getting told you have to go to Montreal and you have to watch these guys, Panzera, do a show? You got to go. And I remember going and ideas! Roman candles and stuff in France. But I went and I
watched Panzera perform and I couldn't believe what I was seeing, you know, I said, That's Roman candles? And it was beautiful, and it was European arrayed stuff, and it just stuck with me. I said, we can do more than just shoot shells. We can go right and left, we can create facades, we can be
musical, we can [do] all that stuff. So, and thanks to, thanks to France for taking me in and, and
giving me some training in the beginning, probably saved my life from a very strict standpoint.
Their approach to stuff was so different than what I was used to in the United States. Thanks to
RUGGIERI.

Peter Rogoz
Speaking of Montreal and some inspiration from Montreal, we do have a question in here, and I
think most of you guys have worked on these kinds of projects. Is, is there a difference in your
design approach when you're designing for a competition display like a Montreal versus just working for a client or standard client?

Martin Hildeberg
Well, of course, of course there are big differences. Well, the competition may have some idea
or request of that type of show that is suitable for their audience and they're a place that they of
course, when you do a competition, you think of especially the budget is something that you don't consider much because then you're just sad. So, you're more or less, you do the show, at
least me. I do the show that I feel is necessary for this competition. And I don't count the dollars or cents
when I do it. And well, so. So, there is one big difference at least.

Patrice Guy
Martin, you mention about trying to find out what the audience likes. You know, you know that
the audience in country A doesn't always like the same thing as the audience in country B. I was invited about ten years ago to do a competition in Belgium, the competition on the seaside
in Belgium. I forget the name of the city.

Martin Hildeberg
Knokke-Heist

Patrice Guy
Yeah, exactly. And I was invited there too, to shoot a show. And before, before we shoot they introduce us to the jury. So, I go see the jury that were finishing dining. There was lots of empty
wine bottles on the table and. Okay, so this is Patrice is a designer of the show tonight. Yeah. Yeah yeah, you're the one with the Rock and Roll soundtrack. That's me. Yeah. We don't like it. *Laughs.* I was offered that competition before.

Peter Rogoz
How much, how much does the thought of the audience take over versus the thought of your own kind of instincts and the design?

Eric Tucker
I think the first rule of show business is, “know your audience”. And the second time I went to Montreal, I mean, the first time I was so scared, I was just petrified. Right? And, and the second
time I went back, I was doing a series of shows with Les Mis[erables] in concert. They had taken
the show from Broadway and had put it into coliseums, and I did a couple of the shows and it inspired me. And so, I went, and I asked the owner of Les Mis, Cameron (a Canadian). And I said, “I'd like to use this as a backing for a show in Montreal.” And if he knew what Montreal was
about. And he said, ”Yes”. And he had literally sent me master tapes in French. So, the next year I go
into Montreal as an Anglo doing Les Mis in French. And it infuriated the judging panel because
immediately the accords were going on and Quebec was trying to secede from Canada. And you know, here's this Anglo walking and doing, doing a story that all had grown up with their whole lives in French – it didn't work out for me. Show - it was good, I thought. But it didn't work out. Know your audience.

Peter Rogoz
I would not have thought of that.

Eric Tucker
Well, I didn't either at the time. At the time, I didn’t either.

Martin Hildeberg
Well, it's hard. The juries is one thing. The audience may be another. But of course, the jury is
the part of the audience that is most important in terms of the result of the competition. But of
course, you really want the appreciation of the the actual crowd there. That, that's very important to me, that, that's what you like to hear and that's when you're successful in a way,
if... But sometimes the jury can have a very different opinion for some reason.
I remember one time in Hanover, Germany, for instance, when I used the ABBA song, we since
we're Swedish, we, we tend over the years to have used the Swedish music, including Abba for
a number of occasions. And we used The Winner Takes It All, which is actually a song from the
loser’s perspective, sort of. But for some reason I heard from sources in the jury that they were
annoyed that because we have been winning it three years straight before there.
So, so it was kind of a statement bragging from us to use that song so that they were annoyed
and we were not allowed to win anymore. Even we, if we thought it was our best show ever. But
these things can happen.

Peter Rogoz
For those of you that have competed multiple times, have you developed a strategy for kind of
designing a show? Like do you have an idea of like jurors and this competition? I know kind of
like this art and stuff like that, and this one is a little bit different this way. Is that something you're able to do?

Martin Hildeberg
Well, you're third [behind] the audience and the jury and what they like, of course, and not least
from the sides, what is actually, what can be seen. And sometimes you make mistakes of the

distances and, like in Hanover, I put two wide fronts that nobody could actually see. So, I had to
later compress the width. So, you always learn of course.

Eric Tucker
But you get to do stuff. If you don't have a client that you're taking care of. You get to do whatever, you know, and if you push the parameters. The one thing about what I found in Montreal is that I could try stuff that was risky. Once I got my feet under me and, and, and the
pain of doing the French thing that didn't work out was over.
You could try stuff because there was nobody to tell you you couldn't, other than doing stuff that
wasn't safe. And weather plays a big part. You could do a perfect show and have a bad day and
nobody sees it after the first 3 minutes because fog comes in, you know?

Is it all about the story?

Peter Rogoz: Yeah, it's a great point that, that brings me to the next question since we're kind
of on the subject of designing things. How does story influence the show design, does the story
ever outweigh the technical knowledge or facts?
For instance, in competitions, it sounds like story can kind of take first chair because you're kind
of doing what you want to do, and you can drive it. You find that's the case with clients as well,
or are you sometimes forced to do more technical things? What's, what's that balance like?

Eric Tucker
I think story line is the number one, number one imperative for me these days.
But I'm getting older and so I don't [unintelligible]. Telling a story means that you can take your
audience and they can if they can relate to your story, they can step in and then they become
not a viewer, but a participant with you. And it's powerful. I think that we're talking about blackouts. I mean, at most it's theater, right? And the most powerful lighting cue in theater is the blackout. So sometimes if the music and the storyline drives you there, you can compress and go dark and your audience leans in and you got them. Once you got them, you can take them anywhere you want because they're participating with you. It's a it's a theatrical technique, directional misdirection or cues that those kind of moves in theater, I think, apply to us just as just as well, especially if you're trying to tell a story. And nowadays

if you're using, I'm getting a little head of your of your questions. But if you're using projection or there's there is in fact a graphical story that you're supporting, you're then in a position of supporting a storyline, not being the story lines. Different, different position.

Pyro Pete
And sometimes you have to worry about stealing focus from the story and then sometimes, you know, like what Eric alluded to, what Eric said earlier about if you've got video and then you've got fireworks and you've got performers, sometimes people don't know where to look, you know,
So a stage pyro cue could bring them back to they're supposed to be looking here and then the aerial element will come in over the top and remind.
So, yeah, it's playing nice with others and moving the focus around to where it needs to be. I don't know how to do that. I just it sounded good.
[All laugh]

Eric Tucker
Well, Peter, you do know [how] to do that.

Pyro Pete
But if we go back to magicians and performances like we've done together, Eric, where we've done a huge [thing] in the back, but then a guy's coming through a trap door, so now boom, we have to have something to focus on to that, you know, to breathe. So, we are kind of telling the audience where to look.

Eric Tucker
Directional and misdirectional moves that takes the audience where you need them to be. Yeah... it's straight theater. We don't, we don't think about it that way. But it's, you know, it's right out of the theater books.

Patrice Guy
What I was going to say is that for a competition, a good team, a good story is, will make or break. But I've seen also when you're in competition, guys, starting with bad stories and they

should have corrected it before they did even the first cue. So once your story is done, the soundtrack is done. Listen to it for a week before you start programing code. Sometimes you start in the wrong direction and you stay on it.

Stay tuned for Part 2! Coming in the next WPA and PGI bulletins

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DMX, DRONES, AND PYRO: DESIGNING HYBRID SHOWS

Will Harvey - Finale Fireworks USA

will@finalefireworks.com
Reprinted by permission from ISF convention Malta April 2023

ABSTRACT

Shows that combine fireworks with lights, lasers, and special effects create challenges for designers. Drone fleets are broadening the range of technologies used in hybrid shows. Augmented reality glasses are likely to broaden the range further within a few years. Show designers face an increasingly complex challenge to incorporate disparate technologies in coherent, unified designs. The challenge is not just a matter of seeing the effects together in a combined visualization. Since designing for different kinds of effects requires different skills and tools, hybrid shows often involve multiple authors, specialists in their own realms. Getting the various elements of a show to line up and work well together therefore entails collaboration and tool paths for the collaborators to iterate over their contributions to the show design in the context of the moving target formed by the contributions of others. This paper explores some considerations in the design of hybrid shows involving fireworks, lights, and drones, presenting a set of observations aimed at being useful to show designers for a design challenge that will become increasingly significant.

INTRODUCTION

Pyro, lights, and drones are the subject of this paper. Observations from the design of hybrid shows involving these three elements likely extend to future technologies that will be incorporated into fireworks shows. Hybrid shows, i.e., shows that combine fireworks with other
kinds of effects, span a range from humble backyard hobbyist shows to large scale music festivals like Defqon1 in the Netherlands, Tomorrowland in Belgium, and the Electric Daisy Carnival in the United States. Hybrid shows offer a different experience from pyro alone. They
also offer different economics, as they replace pyro product that would be consumed in a show

with effects from light fixtures or drones that will be reused; exchanging per-show expense for
capital equipment. This paper examines two use-cases to draw out two observations: 1) by optimizing designs for cost savings, replacing pyro with lights can save as much as 30-50% of
the product cost, and 2) by tightly integrating designs of pyro and drones, the delivered experience can transcend the sum of its pyro and drone parts. Both observations center around
the design process of hybrid shows, so that is the focus of the paper. OPTIMIZING DESIGNS FOR COST SAVINGS We can all relate to the pyro design motif of using strobes or flares across a front line of positions as a lead-up to the beginning of a show, the strobes or flares engendering a sense of anticipation for the aerial effects soon to follow. That is perhaps the easiest element in a pyro show to imagine replacing with lights, because it is as close as you can get to one-for-one. A pyro strobe or flare can be replaced with a bright LED par light of comparable lumens. Let us imagine Step 1, as illustrated in Figure 1.



Fig. 1 – Step 1: Replacing front positions of pyro strobes with LED par light fixtures

Replacing pyro strobes or flares with par lights immediately leads to an opportunity – whereas
pyro strobes flicker at their own internal frequencies, light fixtures have variable rate strobing frequencies that can be adjusted as part of the design. Moreover, every individual flash of a strobing light fixture can be independently programmed as part of a custom designed flashing
sequence. Unlike pyro, for which every ignition involves the setup and cost of an e-match,

light
flashes and movements require no effort beyond the design itself. As an example, instead of nine strobing effects (Figure 1) across nine front positions, one can create a randomized, accelerating front with just a few key strokes in scripting software like Finale 3D: 1) Select the nine par light fixture positions (blue squares in Figure 1) and click a 1/4 second red flash effect
to add one single short flash to each fixture. 2) Press Control-D three times to duplicate the nine
effects to 18 then 36 then 72 flashes total. 3) Press S to put the 72 flashes into a sequence and
type in 10 seconds to set the sequence duration. 4) Press Shift-M to randomize the order of the
72 flashes. 5) Do the command “Speed up cadence at end” to make the sequence speed ramp
up from slow to fast. The result of these commands is a customized nine-position flashing sequence that creates more anticipation than just nine flashing strobes from pyro or par lights.
The timing of the sequence is shown in the timeline of Figure 2. Each little red line is a 1/4 second flash from one of the nine par light fixture positions.

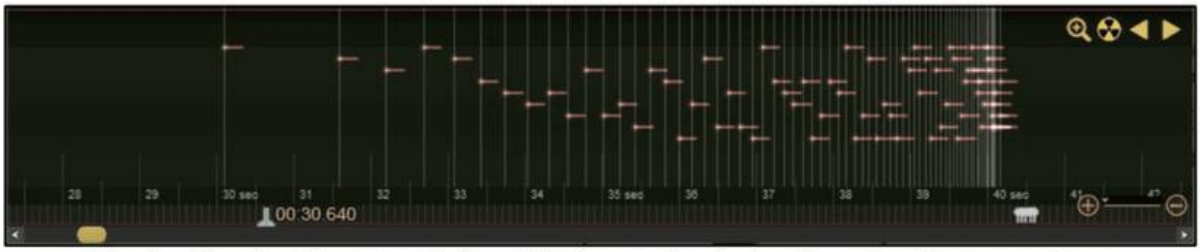


Fig. 2 – Timeline illustrates timing of flashes randomized and accelerating to a cadence

The 10 second accelerating sequence of flashes ends in an anti-climax: Nothing. What comes
next? In pyro designs, the flashing ground strobes or flares might be followed by a front of rising
effects, as a visual transition between activity on the ground to activity high in the air from aerial
shells. Replacing the pyro rising effects with spotlights could be Step 2, as shown in Figure 3.



Fig. 3 – Step 2: adding spotlight fixtures to replace pyro rising effects

Replacing pyro rising effects with spotlights is not as straight forward as replacing ground strobes or flares with par lights, because light beams are not as stimulating as pyro in a head-to-head comparison. Relative to a pyro rising effect, a light beam is just plain boring. You
can make up for some of the difference, though, by adding sequences and angles, similar to Step 1. As an example, consider as Step 2 the following design steps: 1) Select the nine spotlight fixture positions (blue squares in Figure 3) and click a 1/10th second red flash effect to
add one single short flash to each spotlight fixture. 2) Press F to fan them out. 3) Press S to put
the nine flashes into a 0.2 second sequence, and select the “Center to outside” option to make
the nine quick flashes travel outward from the center. The sequence of Step 2 is shown in progress in Figure 4, as the fan is opening like a peacock tail.

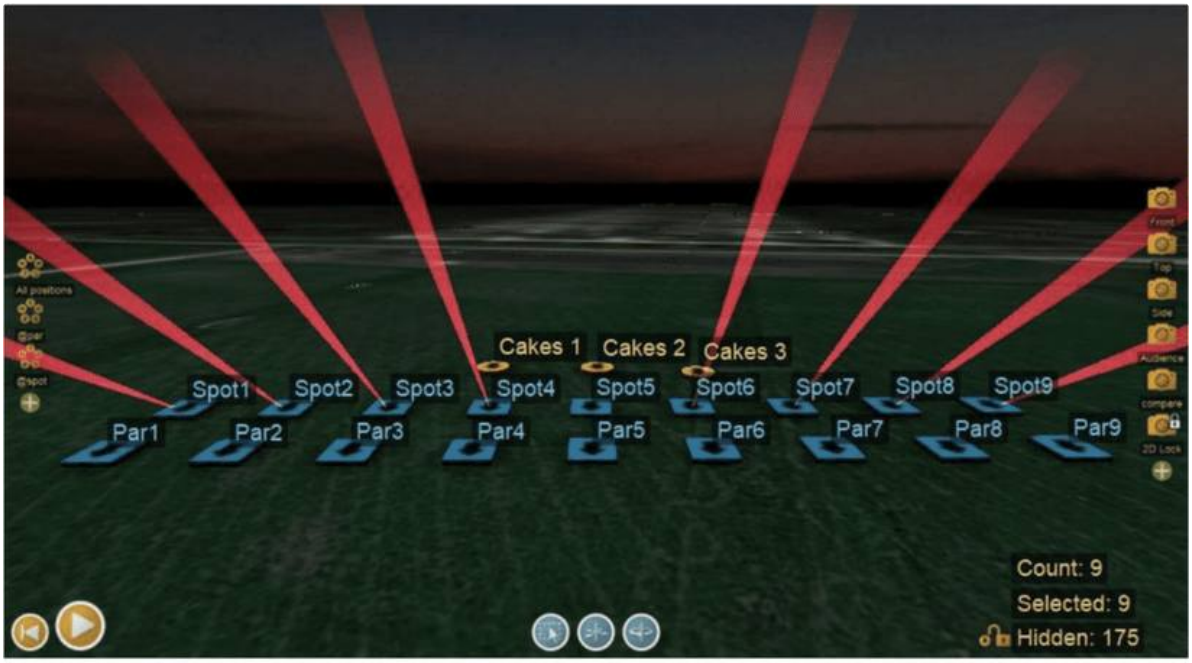


Fig. 4 – A fan sequence acts as a transition from ground to sky and from lights to pyro

The fan sequence opens extremely quickly – 0.2 seconds total time from first to last. Unlike the
Step 1 sequence of ground flashes, which occupied 10 seconds of show time, the Step 2 spotlight sequence is just a transition. It serves two purposes: 1) to replace pyro rising effects
with light beam effects to save cost, and 2) to bridge the transition from light effects to pyro effects. It might have been possible in Step 1 to replace pyro with light flashes without the audience noticing, but ground flares and strobes are about the only kind of pyro effect for which
that is possible. Any large scale replacement of pyro with lights in a show requires changing the
nature of the show from a pyroonly show to something new, a hybrid show. Thus, the bridge purpose of the spotlight effects in Step 2 is part of a greater need to create the expectation early
in the experience that the show will blend pyro and lights together, setting the stage for things to
come. Having created the lead-up in Step 1 and the transition in Step 2, Step 3 is to add the aerial pyro. A small aerial flight of shells from a few cakes is shown in Figure 5, along with the
par light flashes and spotlight beams superimposed.

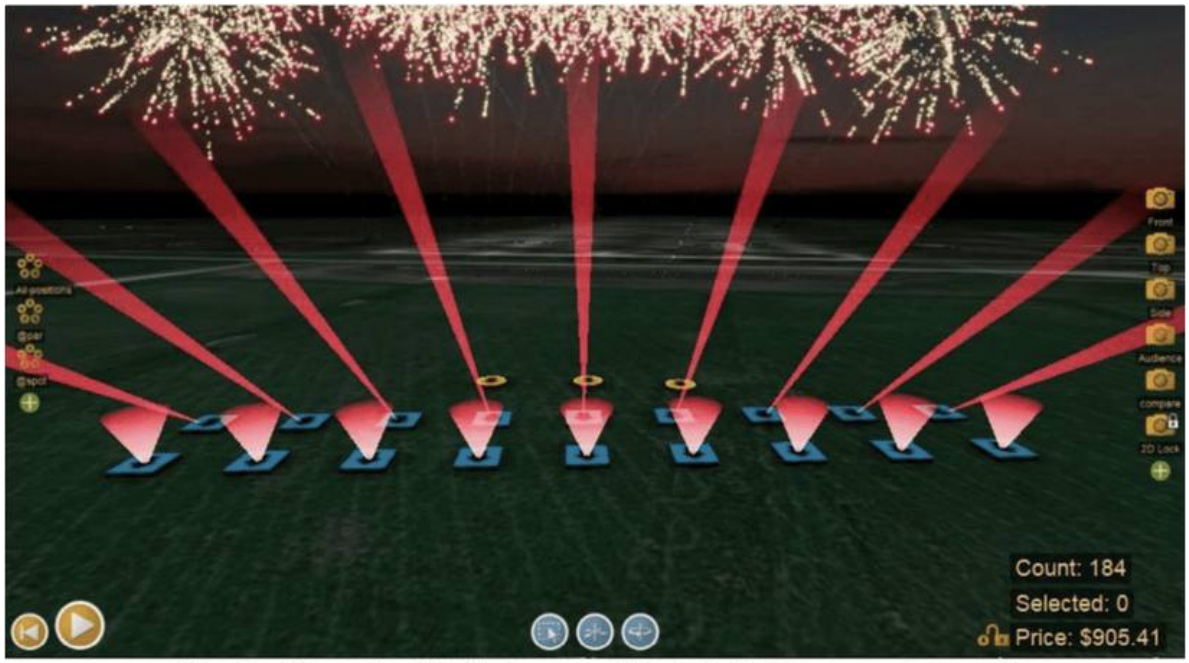


Fig. 5 – The entire 15s first scene of the hybrid show, superimposed

Altogether this scene of lights and pyro, together, consumes about 15 seconds of show time, 3
pyro ignitions, and 3 single flight fan cakes. By comparison, the corresponding all pyro show scene would include 21 pyro ignitions, 9 strobes, 9 comets, and 3 cakes, for about twice the cost. The 3-step procedure can be repeated in thematic variations to build other scenes, with
each scene ranging from 10 seconds to a minute or so, and each scene building from lights to a
climax of pyro. Figure 6 shows the start of a scene that is loosely analogous to the 15 second example but that incorporates different product and different light effect techniques, and that lasts 30 seconds.

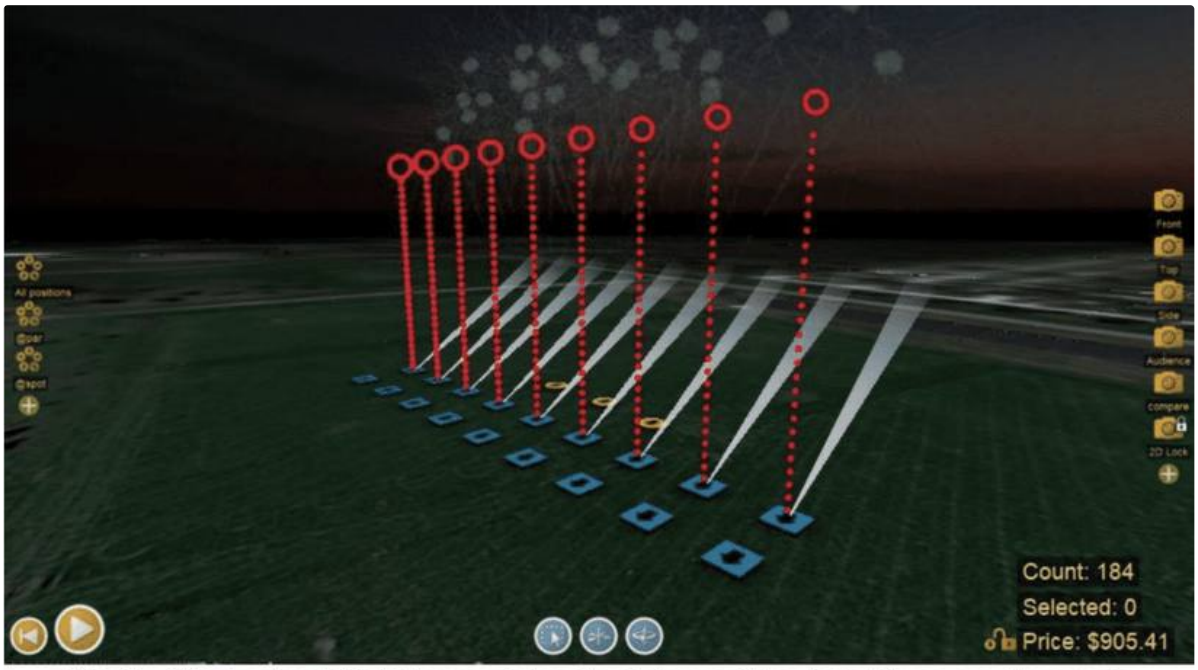


Fig. 6 – Moving head light beams rising slowly toward the dotted lines over 7 seconds

The white light beams shown in Figure 6 are from moving head spotlights, depicted in the middle of an animated sweep in which the beams slowly rise from aiming horizontally away from
the audience to aiming straight up (Figure 7) into the sky over a period of 7 seconds.

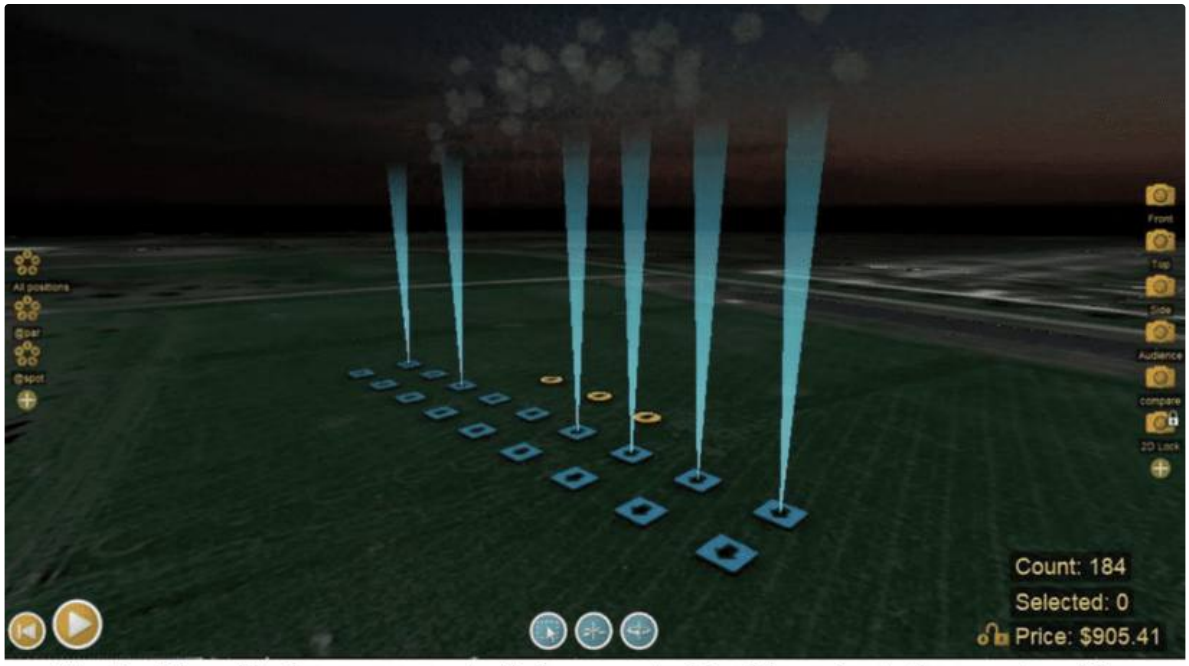


Fig. 7 – The white beams momentarily become strobing blue prior to the pyro transition

As the white light beams reach vertical, they disappear to be replaced by strobing blue beams
that remain stationary, strobing, for 3-5 seconds with staggered durations for a feathered wind-down. During the 3-5 second period of blue beams, aerial pyro shells from 3, 12-shot cakes begin to paint the sky, with each cake firing with 2 seconds in between shots. The result is
depicted in the mid-scene in Figure 8.

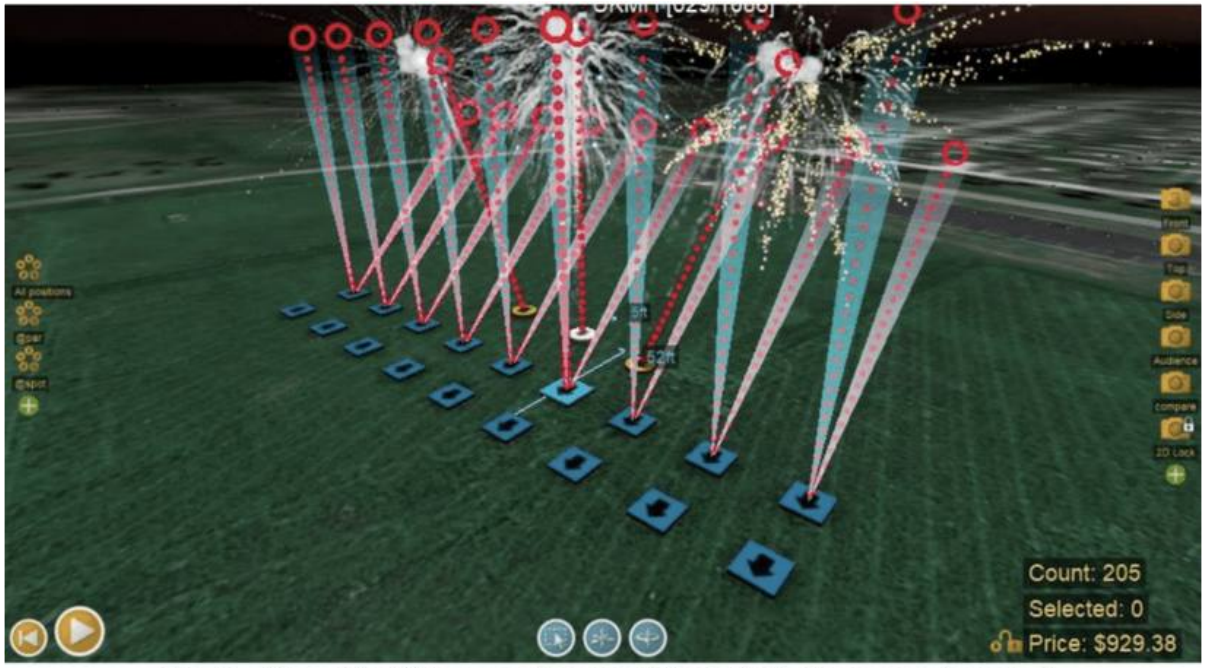


Fig. 8 – The entire 30-s second scene of the hybrid show, superimposed

All told, the white beams, the blue beams, and the partially overlapping 12-shot sequence cakes
consume 30 seconds of show time. In comparison to an all pyro show, the 12 seconds of lights
that begin the scene replace time that otherwise might be for aerial pyro, for a savings of about
1/3rd of the cost. The two example scenes together cover 45 seconds of show time, so an 8-minute show might require 10 such scenes, with an emphasis on pyro in the final scene, and
with some initial pyro and ongoing attention toward ensuring enough smoke is in the air above
the ground for the spotlights to be visible. The cost savings of the scenes are independently 30-50%, and thus the cost savings for the show would be in that same range. One might expect
to reduce a show with $2000 in product costs to $1200. The lighting designs in the show

lend
themselves naturally to creating reusable show segments or macros that one can copy/paste to
create show designs quickly. Given a packing list of cakes or pyro to be used in a small show and with some knowledge of the effects, it is not unreasonable to expect to script an 8-minute
hybrid show in no more time than it takes to script an all-pyro show of the same length. It bears
mentioning that these scene examples and the procedures for scripting to save cost do not require music. Hybrid pyromusicals and pyro-enhanced light show concerts can lean more heavily on the lights because the synchronization of lights to music makes them more interesting. Whereas pyro can keep an audience's attention on its own without music, lights without music don't stand a chance. To the limits illustrated here, though, the cost saving techniques of hybrid shows do apply without music, notwithstanding the usual reliance of light
shows on music accompaniment. A summary of an example cost savings is shown in Table 1.

Table 1 – Example cost savings

Metric	Before	After
Show duration	8 minutes	8 minutes
Number of cakes	65	50
Product cost including e-matches	USD $2000	USD $1200
Music	NONE	NONE
Number of light fixtures	0	18
Capital cost of light fixtures	0	USD $9360
Price premium charged for hybrid show	0	USD $1000 (?)

Similar to charging premiums for pyromusicals, it is worth considering if a premium can be charged to the customer for a hybrid show above the standard price charged for an all-pyro show. It is hard to speculate, but for purpose of including all the terms in the cost savings equation, the example shown in Table 1 includes an $800 savings in product, plus a $1000 premium charged to the customer; the $1800 total contributing to the profits of the show. Also
part of the overall financial equation are the capital costs of the light fixtures, perhaps in the neighborhood of $9360 for the 18 fixtures used in the example show, at an average cost of $520
per fixture. No additional lighting systems or software or light control desks are required if one is
using DMX fixtures. A DMX capable firing system like Cobra, fireTEK, Pyromac, Piroshow, Pyrosure, Mongoose, Pyro Control G2, Pyrodigy, and to a limited degree FireOne controls both

the lights and the pyro together. Finale 3D supports the design process and exports scripts for
all these firing systems.

INTEGRATING COMPONENTS OF A HYBRID SHOW

A critic once told the author that he wouldn't call a pyromusical he had just seen a pyromusical
because the fireworks and the music weren't integrated artistically. He would call it a "musical
accompaniment." Although hybrid shows incorporating drones and pyro are still relatively new,
the author would guess that his critic friend would probably call many of them "drone
accompaniment." Spinning a logo in the sky with drones during a fireworks show is additive, but
not super-additive. In 2022 for the APA Fireworks Convention in Kansas City, Missouri, USA, a
hybrid pyro/drone show design by Daniel Haines of Spirit of '76 demonstrated an artistic
integration of DMX (Digital Multiplex) lights, drones, pyro, and music that provides inspiration.
The show theme was "The Yellow Brick Road". Accompanied by a narration clip from the sound
track of The Wizard of Oz, the show design began with a winding path of yellow DMX par lights
unfolding in the field in front of the audience. The par light sequence was then picked up by a
continuation of the path in the air with yellow LED lights from drones illuminating the winding
path as it rose into the sky. This opening scene is shown in Figure 9.



Fig. 9 – A "yellow brick road" of DMX par lights on the ground and drones in the sky

Since the show incorporated drones and pyro and DMX lights, multiple software tools and multiple authors were involved making different parts of the show. The drone system used for
this show was Verge Aero. The flight animation was created using the Verge Aero design tools
by people on the Verge design team. The DMX and pyro parts of the show were designed together by Daniel Haines using Finale 3D. The drone part of the show and the pyro/DMX part
of the show were integrated and visualized together in Finale 3D by exporting the drone show
from Verge in the "VVIZ" format, an open standard adopted by Verge and DSS (Drone Show Software) in connection with SPH Engineering. Finale 3D can import and visualize the VVIZ format, enabling the pyro/DMX designer to see the parts of the show together and to make changes to the pyro/DMX part of the show to line up with the drone part of the show.

The picture in Figure 9 illustrates the importance of the iteration loop for an integrated hybrid show with multiple designers. Note that the yellow path of DMX lights on the ground doesn't quite line up with the yellow path in the sky made with the drones. Although not visible in the still
picture, the problem was not just getting the dotted lines to meet. The problem was also that the
winding dotted line unfolded, or lit up, at a certain rate of speed that did not match the rate at which the drone LEDs representing the continuation of the path lit up in the sky. The

discontinuities undermined the perception that there was a single path extending along the ground and then up into the sky. Once the two parts of the show were visualized together, it was
easy to see the visual discontinuities and to fix them on the pyro/DMX side. The fixed positions
are easy to see in Figure 10. The rates at which the path unfolds on the ground and in the air similarly were easy to adjust using standard scripting features.



Fig. 10 – Fixing the discontinuities makes the perception of a single path believable

The results were magical: A path begins to unfold for the audience on the ground in a manner
consistent with the audience's initial expectations for a pyro or light show, but then the lights climb into the sky, bursting open the audience's expectations for what they were about to see.
The show ultimately delivered for the increased expectations with beautiful pyro and drone animation set up by this initial integrated path, shown in Figure 11.



Fig. 11 – The pyro/drone show delivered on the expectations set by the yellow brick road

The observations described in this paper about optimizing designs for cost savings and integrating components of hybrid shows both call our attention to the connections or transitions
among the different components. If there is an overall lesson, it is this: hybrid shows require an
integrated artistic plan, and an integrated design process to support it.

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