# IPA Fireworks Glossary of Terms

No Glossary can be all-inclusive, and experience is the best teacher, but please make every effort to be as accurate as can be with your nomenclature. The Local AHJ (Authority Having Jurisdiction) - will take you far more seriously if you know what you are (both) talking about - and consequently take you as more of an expert. If there are other Terms you know (or a definition of a term contained here) which is believed more accurate, please let us know what it is at iowapyro.com/contact. It will be taken into consideration for use.

Thank You - the Iowa Pyrotechnic Association

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**1123** (Short for NFPA-1123) - The Code which governs ALL Outdoor Displays. Some Locales have adopted other Code(s), but Insurance Companies mandate adherence to 1123 directly through their policies.

**1124** (Short for NFPA-1124) - The Code which governs ALL Indoor (Proximate) Displays.

**1126** (Short for NFPA-1126 The Code which Governs all Transportation/Storage of Fireworks Provisions

**Abuse of Fireworks** - The intentional Alteration and/or use of a Fireworks Device that is inconsistent with the Owner or Manufacturer's stated method of use. Drilling a new hole in a new position – and placing a new Fuse into a benign (non-exploding) device in order to cause it to explode instead, is an example of Fireworks Abuse

**Aerial Bomb** - An antiquated, incorrect term for an aerial shell. We in Pyrotechnics never (ever) make "bombs".

**Aerial Firework** - A device that functions in the air, such as a shell, rocket, mine, roman candle, or Cake. (See "Cake", "Multi-Tube Device").

**Aerial Shell** - Either a spherical or canister type firework fired using a mortar, the shell is propelled into the sky by a lift charge where it deflagrates igniting the effects contained in it's middle in a pre-determined pattern.

**AFSL aka American Fireworks Safety Laboratory** - US Government testing Facility, which by Act of Congress is charged with Safety Testing a representative Sample of EVERY Fireworks Device either brought into, or made in the United States. Every explosive Product coming into the Country, MUST have (per US Law) an "EX Number" (see EX Number) if it is either offered for Sale, or merely Stored in the US. The AFSL is the only Authorized Issuer of "EX Numbers" in the US. If not, it is a "Banned, Illegal Explosive Device". (See "Banned, Illegal Explosive Device").

**AHJ aka Authority Having Jurisdiction**. - An AHJ may be any number of entities. To be an AHJ, one must have some ultimate control of at least one aspect of a display, which may keep the entire display from happening at all.

> This includes, but is not limited to the Local and/or State Fire Marshals. An Insurance Carrier or Underwriter. The Members of a Board of Supervisors, City Council, Board of Regents, DNR, Coast Guard, and/or Port Authority. These are some of (but not nearly all) examples of an AHJ – for example: it could even be an employee of the DOT, or the Landowner of a proposed site.

**Air Launching** - A method of launching aerial shells using compressed air rather than a black powder lift charge. Shells are placed into a rotating gun-like turret that positions each tube into a firing point over an air valve/opening. The air propels the shell into the sky where computer timing chips with built-in altimeters in the shell trigger the burst charge at the correct altitude.

**Assortment** - A variety of fireworks Shells sold in a box by most vendors. Counts vary between Vendors and sizes.

**Apogee** - The absolute Top of a Fireworks (Shell's) height when launched. In Theory, if the Builder has calculated correctly, the Shell will burst at this point in the Air.

**Bag Mine** - A type of mine usually made on-site consisting solely of a lift charge and stars within a sealed craft paper, or plastic bag. (See Craft Paper)

**Bare Match – aka "Raw Match"** - Standard black match (Black Powder impregnated string), without any sort of covering or protection. Usually has a very slow burn rate.

**Barrage** - A rapid-fire repetition of an aerial effect, as in a Finale. Hundreds of Shells shot close together, or all at once.

**BATFE - aka The Bureau of Alcohol, Tobacco, Firearms**, & Explosives (Formerly the BATF - then - and before that; simply the ATF) - A US Governmental Agency Responsible for the enforcement of US Alcohol, Tobacco, Firearm, & Explosives Laws (hence the name). It has broad, enforcement powers and does Law, Code, Rule, Regulating & monitoring of all Firework activity in the US.

**Battery** - A group of fireworks fused together as one unit so that they will ignite all at once or in a short period of time, such as a Saturn missile or roman candle battery.

**Binder** - A substance used to hold certain pyrotechnic compositions together, such as stars. In certain Compositions – most any gum/resin – may be a good binder. Formulae specific.

**Black Powder (aka Black, Gunpowder)** - The most common material used in fireworks; It yields a low-speed explosion and consists of charcoal, sulfur (aka Salt Peter), and potassium nitrate. Used to make loud sound, propel devices into the air, make black and/or quick-match fuse, and used in combination with various compositions to make a variety of different effects. Sometimes used for special effects. All Firework devices use Black Powder in some form.

**Black Match** - A common type of fuse that consists of black powder impregnated cotton string. It burns at about one inch per second, "exposed" to the air, but can burn up to 60 feet per second if it is encased in a paper tube (quick match). 6 inches of "Raw" Black Match is Mandated by 1123 to stick outside the mortar if the Device is to be Hand-Lit before it hits the "Pipe". (See "Bare Match")

**Black Shell aka "Blind" or Dark Shell** - Falls back to the ground without bursting. A "Blind Shell" whose fuse fails to light the burst charge. Sometimes the shell will blow on impact when it lands, (especially if it uses a chlorate mixture).

**"Blow Blind"** - when the Burst Charge "Breaks" the Shell, but the stars inside the shell fail to ignite. (See "Break).

**Bombette** - a very small device that is used in larger shells, similar to a firecracker. (See "Insert").

**Bottom-Fused** - Time-Fuse protruding from the bottom of the Hemi or "Can"ister. Method of shell construction where the time fuse enters the shell at the bottom travels up through the Shell and Ignites the Burst Charge. It is ignited by the lift charge. Nearly all spherical shells, as well as most small cylindrical shells, are bottom fused.

**Bottle Rocket** - a small rocket about the size of a standard firecracker, attached to a thin, Foot long stick for stabilization. Unpredictably flies (sometimes with a whistle) and ends in a firecracker-like report. Never suitable for a Display.

**Bottom Shot** - (Usually)a Flash-Powder), charge in a multi-break shell whose last shot is a salute.

**Branching** - sparks that split up into smaller sparks, which looks similar to the branch of a tree, or a fork in a River.

**Break** - the area of the Shell containing the "Stars" and/or the effects. Multi-break shells contain many of these areas which result in multiple bursts in the sky.

**Brick** - many bundled packs of firecrackers which resembles a red brick.

**Brocade** - A round, "star-burst"-like burst pattern. Generally has silver tail effect, and is brighter than willow or tiger tail-style bursts. Looks spider-like.

**Bunker** - One of the Four types of Magazines. An Explosives Storage facility of a more permanent type (See Magazine). Classified by the BATFE as a Type-1 or Permanent Magazine.A Specially Constructed, Immovable, Building, usually built into a hillside and reinforced entrance.

**Burning** - an exothermic oxidation/reduction reaction. Fireworks typically use oxygen-rich salts such as perchlorates (usually), chlorates (seldom), or nitrates (rarely) to rapidly oxidize fuels such as metals, gums, sulfur, or charcoal.

**Burst** - the release of effects contained within a Shell's Burst-Charge "Area" into the air by an aerial device causing the Shell's "Pattern" of "Stars" to become visible.
**Burst Charge** - a composition placed inside aerial shells which explodes at the shell's maximum altitude (apogee), bursting apart the casing of the Shell and igniting/propelling the effects in the designated pattern. Commonly made of black powder (sometimes with special compositions such as whistle mix), both with and without special effects, but can also be made with potassium chlorate for specialty Shells.

**Caliber** - refers to the inside diameter of a mortar or the size of a shell. IE; A 3" Shell is Shot from a 3" "Caliber" Mortar.

**Cake** - a repeating aerial firework consisting of many shots, named after its usual short, cake-like appearance. Cakes consist of a two fuses (one on each "end") attached to many tubes (sometimes hundreds), of various sizes which fire in a pattern (determined by the fusing), launching a variety effects into the air, including brocades, comets, tourbillions, "bees", crossettes, reports, mines, whistles, spinners, and fish among others.

**Candle** - short term for roman candle.

**Cannon Fuse aka "Visco", or "Safety Fuse"** - a Plastic-like coated, Water Resistant (will burn underwater, but if allowed to soak - will not), Fuse used to extend times on Large (over 6") Shells which allows Hand-Lighting of Large Shells per NFPA 1123. (See "Visco' "Safety" Fuse).

**Celebration Roll (Firecrackers)** - a chain of hundreds or thousands of firecrackers traditionally used by the Chinese to frighten away bad spirits. Often chain-fused together to form "Strings".

**Cherry Bomb** - an old cherry-sized salute filled with explosive flash powder and covered in a red sawdust/glue coating. Banned in the US since 1966 but still available in some parts of the world.

**Choke** - purposely narrowed portion of a fountain/rocket tube, usually made out of clay (either contained in the nozzle or not), that is used to increase internal pressure, which therefore increases the velocity of the products being ejected to create thrust.

**Chrysanthemum** - a dense, spherical burst of stars that retains its shape before fading. "Bursts" sometime with a "Pistil" of a different color in the middle. This is the most well-known type of firework shell break.

**Comet aka a "Shooting Star", or a "Comet's tail"**. - Basically a large star that emits thick showers of bright sparks on the way up. Composition - a mixture of pyrotechnic chemicals which contains a fuel, an oxidizer, and various other chemicals to produce colors and effects.

**Consumer (1.4G) Fireworks** - Consumer fireworks are classified as fireworks UN0336, and UN0337 by the U.S. Department of Transportation at 49 CFR 172.101. Some small devices designed to produce audible effects are included, such as "dragon's eggs", "spinners", tourbillions, whistling devices, and ground devices which contain 50 mg or less of explosive materials. Aerial devices can contain no more than 130 mg or less of explosive materials. This term also includes fused set-pieces (lance sets), containing components even though, if weighed together they would exceed 50 mg of highly unstable salute powder.

**Comet** - A Comet is essentially one giant star. For instance a 3" comet will typically be a 2 7/8", round "puck" shaped "star" wrapped in paper with a "lifting charge" of black powder in the bottom of the paper. Widely varying compositions are used. (See "Crossette Comet").

**Continuity test** - a test to find whether an electrical circuit works. It involves sending a low-amperage current through the ignitors to see if the circuit is complete without actually igniting them. Most modern e-match (the ignitors), have an "all fire" current of >1v @ 370milliamps on up. They will typically have a "no fire" current rating of <250millivolts @ 200 milliamps or less.

**CPSC aka the Consumer Products Safety Commission** - The US Governmental Institution which tests Thousands of Consumer Products & Reports (or Misreports), of the Safety Performance of each Product. The CPSC has tracked products for 63 years. Despite its claims & stated Intention to Shut Fireworks down for being "too Dangerous", the CPSC has never found a Safer Product than Fireworks. Their "Annual Report on Fireworks" provides our most concrete evidence to prove Fireworks Safe. They remain the Hobbyist's most "Untrustworthy Ally".

**Crackle** - clusters of small, sharp reports usually found in specialty shells and as the ending volley on some cakes (see multi-tube device).

**Craft paper** - brown paper commonly used in fireworks construction for things such as Shell "Pasting", Small Tubes and Quick match "pipe".

**Cross matching aka "Safety Matching"** - A technique used to effectively ignite the time fuse in shells. A piece of black match is threaded through a hole in the time fuse, so the fire is securely transferred from the black match to the black powder core of the time fuse.

**Crossette comet** - a comet that contains an internal bursting (splitting) charge of flash and/or black powder that causes it to burst into several fragments. (See "Comet").

**Cue (in E-Fired Displays)** - Each "section" of the Display, as determined by how the Firing System is wired. If the entire Show calls for 200 Devices/"Cues", and "Cue #1" has only one Shell Wired to it, firing "Cue #1" will fire only 1/200$^{th}$ of the Display, leaving 199 more Devices/"Cues" to fire. If each "Cue" in the Display has 10 Devices on it (usually the maximum number of E-Matches allowed on each "Cue" of a Modern-Day Firing Panel), the entire 200 Device Display, will consist of only 20 "Cues".

**Cue (in Hand-Fired Displays)** - Each “section” of the Display, as determined by how the Devices are Fused. If you need 200 total cues, ALL devices could be fired with ONE fuse, if that fuse were connected to all devices. If so, you would only need light the fuse once, stand back, and watch the Display. Usually, in a Hand-Light Show, each “section” of the Main Body of a Display consists of one device each. This means Lighting each device in the Main Body, then one (or more) Fuses for the Finale.

**“Cubed Stars” - (See Cut Stars)**

**Cut Stars aka “Cubed” stars** - Are cut from damp pyrotechnic composition with a knife much like cutting cubes from a strip of “Play-doh”.

**Dark Fire aka “dark primer”** - a composition that emits almost no light as it burns, which can be applied between different color layers of stars. The star will burn one color, "burn out", then appear to ignite again in a different color. 2 or more colors for “Color Changing” Shells often use this primer.

**Daybox -** A Type-2, Mobile, or Portable Magazine (Pre-Approved by the BATFE and is designated Semi-Permanent Storage), transported onto the Shoot Site - the Day-of the Display (Hence the name). The Day-box is to follow Rules as set forth in the “Orange Book”. (See Orange Book)

**Daylight Shell** - a shell designed to be fired during the day, which contains more visual effects such as reports, smoke, or whistles for audible, rather than a visual effect .

**Decomposition** - a chemical reaction in which an explosive compound or mixture is converted by burning into a more stable form (like ash).

**Deflagration** - a rapid decomposition reaction which is accompanied by the production of heat, light, and copious amounts of compressed, heated gas as the Shell is expelled from the Mortar Mouth. The rapidly expanding gas produces the concussion in the air, which we perceive as an explosion (the boom). Fireworks and other low explosives function by deflagration - they never detonate.

**Delay** - a pyrotechnic compound/device that is used for timing between the ignition of firework elements, such as in between Strings in Finale Racks or multiple roman candle barrages. Delays can be as simple as using visco (or canon-type) fuse inserted in the middle of a line of quick-match, a “bucket”, spolette,or as elaborate as a dedicated (pre-manufactured) delay inserted into a Shell’s Fuse or a dedicated, slow-burning chemical composition.

**Detonator aka a “Squib”**- a small explosive used to set off high explosives. Not to be confused with firework electric ignitors(e-match). Pyrotechnicians use E-Match Ignitors - NEVER Squibs!

**Detonation** - a high-speed, exothermic chemical reaction in which the explosive decomposition of a substance forms an energy wave that propagates through the substance at supersonic speeds. High explosives such as “Det-cord”, Nitro-glycerin, dynamite, and TNT detonate; fireworks do not.

**Display Fireworks** - Formerly known as "Class B" fireworks. Fireworks for professional use. Display fireworks are classified as fireworks UN0333, UN0334 or UN0335 by the U.S. Department of Transportation at 49 CFR 172.101. This term also includes fused set-pieces (aka lance-pieces), containing components which together exceed 50 mg of salute powder.

**Display Operator aka "Lead" and/or "Co-Lead" Shooter** - A Display Operator refers to the individual who is in Charge of, Develops, Designs, and Shoots a Show (Display). A "Lead" and/or a "Co-Lead" is exactly the same thing and does all the same functions and duties. These Duties include obtaining Permits, mustering up a Crew, ordering Product. Transporting and/or causes transport. Stores, sets up, and Shoots the Display.

> The "Co-Lead" is a "straw-man" device created by the PGI to facilitate becoming a "Lead" Shooter. In certain locales, a PGI "Lead" Shooter certification is a requisite in obtaining a permit, and one of the requirements to fulfill becoming PGI Certified, is to be the "Lead" on 1 Show. The "Co-Lead" designation bypasses this requirement for permitting. Basically, a Co-Lead must do everything a "Lead" does on a Show (Except apply for the Permit).

**Dragon Eggs** - crackling sparks in the air. Can be produced by small metal-fillings, or a composition. Often, the conclusion of some cakes and found in specialty Shells.

**Drivers** - Fountains which are essentially, small rocket motors, used to propel devices such as pinwheels, or girandolas round and round.

**Dross** - burned-up (used), now inflammable, waste product of combustion. Leftover compositions. (See "Burning", "Reduction")

**Dud** - a Firework that fails to fire for whatever reason(s).

**Electric Ignitor (e-match)** - used in the electrical ignition of fireworks. Consists of two lead wires connected to each other by a small filament of nickel-chromium (nichrome) wire coated with pyrogen covered by a Plastic (usually), or rubber (sometimes), Sheath over the pyrogen. When current passes through the ignitor, the nichrome filament heats up and ignites the pyrogen, which flares up like a "strike anywhere" match, and lights the fuse. The protective Sheath over the pyrogen should never be exposed. Often incorrectly called Squibs, which are electrical caps that detonate in order to set off high explosives. Pyrotechnicians DO NOT use Squibs.

**Electrical Ignition aka "E-Fired"** - the ignition of a fireworks display by electrical means. Most modern-day shows are e-fired.

**"EX" Number** - Issued by the US Government only. A Sample of you Explosive Device must be sent to the ASFL for testing. If, after rigorous testing, your item(s) pass, you are issued an "EX" Number. With this "EX" Number, you may sell, transport, store just as with anyone else's product. Due to Insurance concerns however, some Vendor's will not allow your hand-built product, and their purchased product to be Shot in a Public Display. Check with yours - prior - to scheduling a Display.

**Exothermic** - a chemical reaction produced by the reactants of a composition called "Reduction". As the composition burns it gives off heat (and some) light. Firework reactions are generally exothermic. (See "Dross", "Reduction", "Burning, "Decomposition").

**Explosive** - a composition/substance that has the potential to undergo rapid chemical decomposition (reduction), producing much heat, and large volumes of gas.

**Fallout** - debris of all types, such as chunks of cardboard, wood, plastic "hemis", wood from rocket fins/sticks, ash, and leftover tubes from inserts, etc. that rain down over the ground after a Fireworks Display. People not directly in the process of Firing the Show, are strictly forbidden to be within this area due to the dangerous Fallout. Fallout is unsafe for people and to dry materials below since the pieces are usually still hot or smoldering as they fall.

**Fallout zone** - Per NFPA 1123, an area 70' per inch of Shell Diameter in ALL Direction from the mouth a the Mortar of cleared area where fallout (including dud shells), are expected to fall (IE; A 3" Shell requires 210' in all directions, or 420' across). Must be clear of any firing personnel, spectators, animals, inhabited buildings, dry grass, gasoline containers, hazards such as bulk fuel tanks, and other flammable materials.

**Finale** - the last portion of a firework display. During a finale, usually the best, largest, loudest, 'works, are ignited in huge quantities and in a short amount of time, creating an intense, beautiful, fast-paced, final display.

**Fish aka "Bees", or sometimes "Falling Leaves"** - a type of aerial effect that looks like a swarm of glowing objects flying around randomly. The effect is created using small chunks of fast-burning fuse that actually propel themselves through the air when lit.

**Firecracker** - a small rolled paper tube containing flash powder, typically braided by their fuses into long strings. When the fuse is lit, the flame travels to the inside of the firecracker and ignites the powder, causing it to explode. In the United States, firecrackers can only contain 50 mg of flash powder. It is widely believed that the PGI currently holds the World record for setting them off, with a Firecracker String consisting of 10,800,000 Firecrackers.

**Firework** - a device that functions mainly by combustion to create visible and/or audible effects for the purpose of visual/audible entertainment. Fireworks are divided into two groups: those known as Consumer Fireworks, and those that can only be used by professionals known as Display Fireworks.

**Fireworks Display aka Fireworks Show (See "Fireworks Show")** - A Show using Fireworks as the Main Show Instrument. Shows may be Choreographed to Music or Not. Long, or Short, Fast, or Slow. Themed, or not. A Display is an Expression of Creativity. There is no one way to Display one.

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**Firing Computer aka Firing Panel -** Modern Systems today generally use a Special Firing Program on a Computer (usually a LapTop), or a Dedicated Firing System. Dedicated Systems are of course more expensive. The System will Supply not only the Firing Script, but the Show's Music as well. Most newer Systems have a "Refresh Rate" of as little as .01 Seconds ($1/10^{th}$ Second), so the Supply Battery Needs to be in good to excellent condition, and capable of supplying sufficient amperage when called on to do so.

> The Computer is connected with one cable to a "Field Module", or simply a "Module" through either its USB, or Serial Port. As many current computers do not have a built-in Serial Port, they must rely on a "USB-to-Serial Port" Adapter. These Adapters are quite common & most Big Box, and/Office Supply/Computer Stores stock them for $20.00 to $50.00.
>
> Each E-Match (you can piggyback, or Multi-Fire), up to 10 - E-Matches per Cue on some systems), is connected to the "Field Mod". Each "Field Mod" gets its power either internally (on some systems), or from the Supply Batter(ies). The Supply Batteries will supply 12 to 48 volts on most systems in use today. (See Module, Supply Battery)

**Firing current** - the amount of current required to ignite an electrical ignitor. A common all-fire specification is >.500millivolt @ >370milliamps. If Designing an E-RFired Show, the Designer (Choreographer) of the Show should take this into consideration as to not overtax the Supply Battery's Capacity. (See Supply Battery)

**Flash Powder** - an unstable, energetic explosive mixture consisting of an oxidizer (usually in Fireworks, potassium perchlorate) and a finely powdered metal fuel (usually aluminum which is white/silver in color), used to create firecrackers and reports (bottom shots) for shells. Flash powder can be easily set off by both friction and static, and is very dangerous to manufacture.

**Flitter** - a type of tail effect consisting of bright flashes of light left behind by a star. The "Flitter" floats lightly down after the initial Device Break.

**Flare aka Fusee** - a long tube containing a pyrotechnic composition which burns slowly with a bright, red, colored flame. Used mainly to warn motorists of a roadway obstruction or broken down car. Also used as the Traditional way to ignite fireworks.

**Flowerpot** - a Shell which blows at the mouth of the Mortar or anytime a shell explodes prematurely in the mortar (without blowing the Mortar), spraying the effects into the air like a mine.

**FMSCA aka The Federal Motor Carrier Safety Administration** - US Federal Agency charged with the Safety Inspections of Motor Vehicles which traverse US Highways (especially in Commerce).

**Fountain** - small, tube firework that produces a continuous, upward showers of sparks. May be Canister, Flare, or Cone-Shaped. May be a "Driver" (have Thrust), or not.

**Fuel** - ingredient in pyrotechnic compositions that burns extremely rapidly in the presence of an oxidizer. Common fuels are guar gum, red gum, sulfur (Salt Peter), aluminum, and charcoal.
Fuse - device used to transfer fire to a firework or to the different parts within a firework.

**Gabe Mort (Italian meaning: "dead head")** - a large sack of flash powder typically suspended from a gallows-type frame at the height of a man's head; explodes to create a deafening blast and earth-shaking concussion.

**Gerb** - see fountain.

**Girandola** - a spinning horizontal wheel that lifts off and flies up into the sky, where it usually ends with a report or burst of stars and effects.

**Glitter** - a tail effect consisting of bright flashes of light and small explosive bursts.

**Go-getter** - a self-propelled star that flies (zips erratically) around randomly in the air.

**Greek Fire** - an ancient, long-burning sticky composition once used in combat. It was put in huge pots with a burning cloth (like a Molotov cocktail) and launched from catapults at enemies. Used by the Greeks to defeat the Byzantium navy, the secret of Greek Fire was lost but sought throughout the middle ages as a weapon of mass destruction.

**Green Man** - nickname for an 1600s Pyrotechnician who would wear green leaves and mud to both protect himself from being burned by falling sparks and to hide himself somewhat from the crowd while igniting fireworks. Also the symbol of the Pyrotechnics Guild International.

**Green Mix aka green powder** - essentially a raw mixture of black powder ingredients that haven't been properly combined with heat to create real black powder. Green powder is greenish, slimey/oily mixture that can burn at a variety of speeds (even that of real black powder), depending on how intimately the ingredients are mixed. Also called polverone or pulverone.

**Ground Firework** - a consumer firework that functions at ground level, such as fountains, novelties, snaps, snakes, sparklers, and smoke items.

**Gunpowder** - see Black Powder, “Green Powder”, Green Mix.

**Hangfire** - when a fuse unexpectedly begins burning at an extremely slow rate (or appears to go out). Hangfires can last anywhere from a few seconds to around half an hour, and the fuse can suddenly resume burning at its normal rate at any time.

**HDPE** - High Density Polyethylene: A very strong plastic pipe commonly used for mortars. One of Four materials allowed. During a Catastrophic Deflagration - HDPE Shreds fairly harmlessly.

**Helicopter aka Tourbillion, “Spinner”, Geyser”** - A type of Firework exhibiting a Spinning Motion. A Shell, may have this inside its “Break Charge”. A Tourbillion resembles a second hand watch movement for which it is believed to have been named for. (See “Spinner”)

**High explosive** - a high-speed, extremely powerful explosive capable of detonating, such as TNT, dynamite, or Det-cord. High explosives are not used in fireworks.

**Hummer** - a small tube filled with pyrotechnic composition and plugged at both ends, with an angled hole in the side. Upon ignition, the device spins around very rapidly. At one point during each revolution, the hole (which is producing the sound) is pointed towards the observer, who perceives it as a "humming" sound.

**Hygroscopic** - the property of a chemical composition that causes it to absorb and retain moisture from the air, often dissolving itself in a dampened, and usually unusable compound.

**IPA aka The Iowa Pyrotechnic Association (Inc)** - The Iowa Pyrotechnic Association is currently based in Vinton Iowa, and it is the largest Club in Iowa with close to 600 Members in 2015. It holds Bi-Monthly Meetings – many with Fireworks Displays – most notably "Boomtown Vinton" which draws 12,000 to 15,000 People from many States each year.

**Ignitor aka Electric ignitor aka E-Match** - Illegal Explosives aka "Illegal, Banned, Explosive Substances" - In the US any salute that contains more than 50 mg of flash powder, such as M-80s, Cherry Bombs, and Silver Salutes. Anything which does not get approval from the AFSL or in the UK anything other than "garden variety fireworks" (their equal to our "Consumer Fireworks"..

**Jumping Jacks** - small tubes fused together in packs, which look identical to firecrackers. They spin around on the ground with green and reddish colored flames out each end.

**KNO3 aka Potasiun Nitrate, "Saltpeter" -** the most common type of oxidizer used in fireworks and one of the main ingredients in black powder. (See "Saltpeter")

**Ladyfinger** - miniature firecrackers. Usually Red or Green Colored.

**Lance** - a small tube of pyrotechnic composition that burns with a steady, colorful, flare-like flame for about a minute. Lances are attached to frameworks in patterns and fused together to create set pieces. (See "Set Piece")

**Lance work** - (See "Set Piece" again).

**Leader** - the fuse that transfers fire from the day fuse/electrical ignitor/flare to the lift charge of the shell.

**Lift Charge** - charge beneath a shell (usually attached to the bottom of it) consisting of black powder used to propel the device into the sky

**Low Break** - When a Shell either was mis-manufactured without the proper amount of Black Powder to "Lift" it to Apogee, or it for some reason has lost some in-transit (broken Lift Bag, it will "Low Break". A "Low Break" will typically occur from a few feet above the Mortar, to 80 feet or so. (See "Lift Charge", "Apogee", Black Powder").

**M-80** - a small, powerful explosive created by the military (M stands for Military) for use as a grenade and gunfire simulator and later sold as a large firecracker. Once very popular in the U.S. they were banned as part of the Child Protection Act in 1966 due to the thousands of serious injuries they caused usually when someone let it go off in their hand or near their body.

**Magazine -** May be classified as a Type-1, Type-2, Type 3, or Type-4 (See Bunker). Usually a Permanent (Constructed) Building, but more often than not, a trailer (semi-trailer) parked on a lot, and requiring inspection by the BATFE at least once per three years.

**Magnalium** - a mixture of aluminum and magnesium; it is one of the most common alloys used in fireworks. Not as reactive as magnesium, and not as hard to ignite as aluminum. Makes a bright "Silver", or "White".

**Matching** - the process of connecting multiple fireworks or portions of fireworks with quick match.

**Maroon aka "Salute" -** British term for a salute.

**Mine** - A firework similar to a shell that is fired from a mortar, ejecting effects such as stars or sparks directly from the mortar rather than as a delayed aerial effect.
Misfire - the fuse of a shell which burns (sometimes all the way into), a Fireworks device, but fails to fire - this potentially "live" shell is left in the mortar. It begins life as a hangfire. (See Hangfire)

**Missile** - a type of rocket that uses stabilizing outriggers, or fins rather than a stick for guidance.
Mortar - tube from which aerial fireworks such as shells and mines are ejected. Can be made from Cardboard (Paper), High Density PolyEthylene (HDPE), Steel, or Fiberglass. Of all four type - HDPE is probably the most forgiving. Steel may be reloaded an infinite number of times. The other three types may all (only) be reloaded up to seven times.

**Module aka Field Box -** The Device in between the Firing Panel, Computerized System, or Firing Computer that has a portion of the Show's E-Match hooked to it. Most Field Boxes (Modules) will accommodate up to 12 to 24 "Cues". The Module's job is to interpret signals from the Firing Computer and connect with the appropriate E-Match, at the proper time.

> As the Module "Listens" for the Cue in "Computerese", the Firing Computer Says (for example); "Module 3 - Fire Cue 6" (24x2 + 6). For 24 Cue Modules - this would translate into: "Cue 52" on the Show's "Script". Whatever is wired to this Cue, would Fire on Cue 52. This must be extremely Fast - as most systems "Refresh" to Fire the next Cue in about .01 Seconds. Because of Safety concerns this too must be reliable.

**Mortar aka "Gun" -** The Tube a Fireworks Device (usually a Shell), is Fired from. Per NFPA 1123, there are 4 types of Mortar types allowed. They are: Metal, HDPE, Fiberglas, and Paper. Metal Mortars are very heavy, and bulky, but may be reloaded (in a Hand-Fired Display), an unlimited number of times. Making Steel Mortars popular for Hand-Lighting Shows. The other three types (Paper, HDPE, and Fiberglas, may only be reloaded 7 times each per Show.

**Mortar Rack** - a wooden or metal frame that contains many mortars.Specs for building them may be found in NFPA-1123.

**Multi-break** - shell with numerous areas (or sections/compartments), each one bursting separately.

**Multi-tube Device aka "Cake"** - A Multi-Tube device can have any number of tubes, however in 1.3G (Display) Fireworks - 25, 49, 100, 250, 400, & 1,000 seem to be most prevalent. Ranging in Caliber from 1/2" to 4" in Diameter, these can have any number, and type of effect. They may all have one effect - repeating over, and over. They may be fast, or slow. Have varying patterns, barrages, etc.(See "Cake" also)

**Muzzle break** - when a shell bursts immediately after leaving the mortar, usually scattering its effects over a wide area the ground.

**N.E.I.S.S (Pronounced "Nice")** - The CPSC's National Electronic Injury Surveillance System (NEISS) is a national probability sample of hospitals in the U.S. and its territories. Patient information is collected from each NEISS hospital for every emergency visit involving an injury associated with consumer products. From this sample, the total number of product-related injuries treated in hospital emergency rooms nationwide can be estimated. This web access to NEISS allows certain estimates to be retrieved on-line.

**NFPA aka the National Fire Protection Agency**. - A US-based, Privately held, for-profit, non-Governmental Organization, whose numerous Safety Code Standards have been adopted by many States, Counties, and other locales. The NFPA has hundreds of codes, covering numerous topics pertaining to Fire Safety.

**Nosing paper** - thin paper wrapped around and extending off of the nozzle of a pyrotechnic device, used to hold the fuse in place and prevent sparks from prematurely igniting the device.

**Novelty** - a small firework shaped like a animal, vehicle, or structure. Novelties emit small sprays of sparks, crackle, and whistle, and often move around on little wheels.

**"Orange Book"** - nickname for the booklet titled "ATF - Explosives Law and Regulations". The cover of which is Orange. Covers Storage/Confinement (Bunkers, Day-Boxes, Magazines, etc.)

**Palm tree** - a comet shell that burns with a thick tail of sparks on the way up, then breaks several spreading "branches" of sparks.

**Parallel Burning aka Sympathetic Deflagration** - sequence where a piece of burning material ignites the piece next to it, which in turn ignites the piece next to that (such as with fuse intentionally), or though the Concussion of Deflagration (Accidental).

**Parallel (or "Ladder-type") E-Matching** - Ignition sequence where one fuse is connected to and simultaneously ignites multiple pyrotechnics devices (such as shells and set pieces). The Positive (+) of the Supply Battery goes to ALL of (one of), the wires on one side of ALL the E-Matches, and the Negative (-) goes to ALL of the other (remaining), E-Match Wires. The Main Advantage to this type of Wiring Scheme is its vast ease over Series Wiring, the entire string "Blows" simultaneously, should one E-Match "Blow" before the next in the Circuit, the rest of the Circuit is left unaffected, and will still fire. The Main Disadvantage is that Series Wiring allows you to put more (number-wise) E-Matches in the Circuit (Cue).

**Pattern (as in a shell)** - a shell's pattern is determined by how the "stars" are arranged around it's burst-charge area.

**Pattern (as in Design)** - 2 or more devices, arraigned on the field (Fallout Zone) of a Display, intentionally designed to create a specific look such as a "wall" of mines, or a "V' Shape, etc.

**PGI aka Pyrotechnics Guild International (Inc.)** - The Largest Hobbyist-oriented Fireworks Clubs in the World. Its Membership nears 3,000 People. Many Members of Local/State Clubs are Members of the PGI also. The PGI Membership represented 7 countries in 2015. Most are from the US, as the PGI is US-based. It holds an Annual Convention (in one of Four, or Five US Locations), that draws thousands of people from Around the World.

**Pinwheel** - see Wheel.

**Pipe** - loose paper tubing fitted over black match to make quick match.

**Portfires** - see Flare.

**Potassium Nitrate** - the most common type of oxidizer used in fireworks and one of the main ingredients in black powder. (See KNO3, "Saltpeter").

**Pearl** - single color star, launched from the ground. Usually Fired from a "Star Gun" (See "Star Gun").

**Peony** - loosely symmetrical break of stars without trails that fly outward and then begin to droop downward resembling the flower.

**Prime** - a composition such as black powder that is relatively easy to ignite that is mixed with water and a binder to form a slurry, then applied onto fuse or stars composed of something that is more difficult to ignite.

**Professional (1.3G) Fireworks** - See Definition And Types Of Professional Fireworks .

**Polverone** - (See "Green Mix").

**PVC (polyvinyl chloride)** - a type of plastic pipe that should NEVER be used for mortars since it can shatter into razor sharp pieces. Basically the same as ABS. (See "ABS").

**Pulverone** - (See "Green Mix").

**Pumped stars** - stars produced by compressing star composition out of a cylindrical tube like a syringe, and cutting them off at a specific length.

**Punk** - a stick looking like an incense, consisting of very-fine, compressed sawdust that burns extremely slowly, used for igniting consumer fireworks.

**Pyro** - from the Greek word for "fire", used by itself as nickname for a fireworks enthusiast.

**Pyrotechnic compositions** - A chemical mixture which, upon burning and without explosion, produces visible, brilliant displays, bright lights, or sounds.

**Pyrotechnician** - someone who builds or shoots fireworks either as a Hobby, or as a Profession.

**Quick Match** - extremely rapidly burning fuse used to ignite multiple fireworks at virtually the same instant. Burns at 60 to 100' per minute.

**Rack** - a wooden frame used to hold mortars, or a device used for launching rockets.

**Ram Rod** - a rod made of non-sparking material, typically a wood dowel, but also brass or aluminum, which is used to compress pyrotechnic compositions within a tube.

**Reduction aka Burning** - The Exothermic Process whereby a "Composition" is Burnt ("Or Reduced") into unburnt/unburnable "Dross". IE; All Fireworks (that function correctly) are "reduced" to their "Dross" State. (See "Dross", "Burning")

**Repeater aka Multi-Tube Device, or "Cake" -** firework which fires multiple aerial effects into the sky. (See Cake, Multi-tube Device).

**Report aka Bottom Shot** - explosion from a Device or Shell making an audible effect.

**Rising Effect** - whistles, stars, crackles, etc. that are released by a shell during its ascent.

**Rocket** - a firework that is propelled into the air by a fast burning engine, before releasing its effects. Rockets are rarely used in public fireworks displays having been replaced by mines and shells .

**Roman candle** - tube-shaped device that fires a series of stars into the air.

**Rondelle -** A Large Shell containing other Smaller Shells, and/or Burst Charges, which when "Bursted" each Shell/Burst exhibits a Round, "Clock" or "Counter-Clock" Pattern. If done correctly the result should all be seen as a complete circular pattern in the sky.

**Round Star** - spherical stars most commonly used in fireworks. Round stars are created by putting a type of small "core", such as lead bird shot or pasta, inside of a bowl and adding star composition and a solvent mixture while the bowl is swirled around. The star composition accumulates on the cores like snow does when you roll a snowball.

**Safe and Sane** - US consumer fireworks that do not explode or contain aerial effects. Includes fountains, novelties, smoke devices, sparklers, and snaps. Safe and Sane Fireworks are neither, accounting for the vast majority of injury for over 6 decades.

**Safety Cap** - paper cap placed over bare end of quick match fuse to prevent premature ignition.

**Safety Fuse aka Visco, Cannon, or Safety Fuse**) - a slow-burning fuse (usually green) Plasticized Fuse used to make fireworks. (See visco or cannon fuse).

**Saltpeter** - Older term for potassium nitrate (KNO3), the most common type of oxidizer used in fireworks and one of the main ingredients in black powder.

**Salute** aka (British) "Maroon") - An aerial shell, classified as a display firework, that contains a charge of flash powder and is designed to produce a flash of light and a loud report as the effect.

**Series Circuit** - An effective way of connecting electrical ignitors, whereby several E-Matches are arranged in a series (positive to negative along a single scab line), allowing multiple shots to be triggered from a single circuit. Series wiring is widely used as it is easy to check for continuity in the circuit. (See also parallel circuit)

**Series matching** - ignition sequence utilizing a Series Circuit, where devices are fused together using one or more types of pyrotechnic fuse (typically quick match and visco) allowing them to be ignited one after another. The Positive (+) of the Supply Battery is Wired to one Wire of the E-Match. The Negative (-) of the Supply Battery to the Other Wire. The Supply Battery Current flows in one wire, through the match and on through to the other Wire , and so on through that Cue, and back to the Supply Battery (Hence the Name "Series").

> The biggest Advantages of "Series" Wiring is that you can wire more E-Matches on a single Cue than with "Parallel" Wiring, the rate of fire can be controlled by length and type of fuse used in the series, and "Open" (discontinuous) circuits are found easier. The Largest Disadvantage is the Complexity of Wiring making it time-consuming, and that if One E-Match "Blows" before the next in the Series, NONE of the Following E-Matches will Fire.

**Set Piece** - a large number of lances mounted on a frame in a pattern (shapes, letters) and fused together for instantaneous ignition.

**Shell** - short term for Aerial Shell.Aerial Shells may be Spherical (Round), or a "Can" (Canister) Type Design. They may be single-break, or Multi-break. (See Aerial Shell).

**Shell of Shells** - a large shell that contains smaller shells as well as stars, and upon bursting ignite the smaller shells and create secondary bursts.

**Shot** - refers to the number of effects in a fireworks device, such as as 10-shot roman candle or a 25-shot aerial repeater (Cake).

**Short circuit** - ignition failure caused when an electrical circuit is accidentally completed in the wrong place, such as bare wires, shunting the electricity away from the ignitor.

**Silver Salute** - an illegal explosive similar to an M-80 (but slightly longer) with a silver tube.

**Smoke** - a dispersion of fine solid particles in air, typically in the 10-5-10-9 meter range. Smokes are typically produced by the incomplete burning of an organic substance (black carbon smoke) or the vaporization of a volatile ingredient which condenses in air.

**Snake** - a small black pellet that, when lit, burns slowly to produce a long column of brittle ash that resembles a snake coming out of the ground.

**Spark** - light and heat emitting particle ejected from a burning composition.

**Sparkler** - a wire coated in a pyrotechnic composition that gives off sparks while burning. Though they are considered "safe", they cause more injuries than any other firework. (See Safe and Sane)

**Spiking** - The process of tightly encasing explosive substances with paper & glue which greatly increases their explosive "punch". By tightly binding explosive materials together in a process known as "pasting up" a Shell, the explosive impact of the Shell is magnified greatly.

**Spindle** - A "Rocketeer's Tool" which is a spike-shaped piece of metal used for forming a cone-shaped combustion chamber inside a rocket. The increased surface area provides max. thrust.

**Spiral** (as in a "wound" tube) - a type of tube created by winding multiple strips of thin paper at an angle (like a toilet paper or paper-towel tube).

**Sponsor** - A Sponsor is the Person, Group, or Entity (such as a Business) who puts up the money to underwrite a Show/Display. A Show may be self-Sponsored, or Underwritten. The Sponsor must obtain location(s), furnish a cleanup crew, security, parking, personnel, etc.

**Star** - small pellet that emits light and sparks as it burns.
Star gun - small, sometimes hand-made, roman candle-like device used for testing stars.

**Star Pump** - syringe-like container through which star composition is pushed out of and cut into individual stars.

**Sticky Match** - quick match type fuse consisting of a trail of black power between two pieces of tape stuck against each other.

**Strobe** - bright stars that each flash repeatedly. Also refers to a consumer fireworks device that emits a series of extremely bright flashes.

**Supply Battery** - A Supply Battery (or Batteries), can be a "Ni-Cad", a "Gel-Cell", an Automotive, or a Marine Type - as long as its rated power output is sufficient for your Show's needs, and your Systems needs (check your Owner Manual for your particular specs).

> Generally Speaking though, a "Deep-Cycle Marine-style Battery will work the best because it Supplies constant Amperage (which is what you need), until the Battery is almost dead - then it drops off. Other types will lose Amperage as they Lose Voltage, so a "Deep Cycle" allows you to literally "get more Bang for the Buck". Make sure to keep it/them, filled, cleaned, in good condition and to charge whatever type you use before each Show.

**Thrust** - The equal and opposite reaction from the exhaust of a Rocket, or Driver Device, which propels a Device Forward.

**Time Fuse** - thick, slow burning fused used for time delays in aerial shells.

**Titanium Report aka "Snowball"** - a Flash Powder-Filled Shell, creating a loud explosion in the air with white sparks. (See "Report")

**Top-fused** - a method of shell construction where the time fuse enters the shell at the top and is ignited by the leader fuse.

**Tourbillion** - see helicopter.

**Visco aka "Cannon Fuse"-** see safety fuse. Visco is also highly Water Resistant.

**Volley** - an intense barrage of shells or rockets. May be Hundreds at one time.

**Wand aka Fusee Extension -** A "Wand" is an extension of your Arm. It may be any length, but generally it is 18" to 3' (about one meter) in length. A Wand may be store bought (some Vendors have them), or Home-Made.

> To make a Wand, cut a section of THIN-wall "EMT" Conduit (Standard-wall will not work), to the desired length. Affix a Thin-wall EMT Threaded, or "Screw-on" Coupling to one end. A standard Fusee (Automotive Flare), will fit SNUGGLY into the Coupling. Tighten the coupling onto the Fusee by Hand. Grasp the other end and you are ready to more Safely Hand-Fire.These materials are available at any home-store, or electrical Supply House.

**Waterfall** - a long series of fountains suspended upside-down, usually from a bridge, that when ignited produce long-lasting white/blue sparks that resemble a waterfall.

**Wheel aka "Pinwheel"** - device that spins rapidly using drivers, emitting sparks, whistles, and other effects. When fitted with Articulating Arms - they may gravity-operated as well.Pinwheels are used as fronts, special effects, and sometimes in the Finale, however most are a Stand-alone specialty.

**Whistle** - A high-pitched shriek caused by air rushing through a partly hollow tube as with bottle rockets, or through a special nozzle. Many Hobbyist (and Professional) Rockets use "Whistle Mix".

**Whistle Mix** - a composition that uses potassium/sodium benzoate as a fuel. Such a composition exhibits "vibrational burning", which causes the characteristic whistling sound. Whistle mix can be used for whistling devices or shell inserts, or as part of the burst charge in small shells.

**Willow**- falling trails of sparks cascading outward, and downward - like a "weeping willow tree" in shape.

**USDOT aka "The DOT"** - The US Governmental Agency responsible for the regulation, administration, and enforcement of all US Drivers Licensing, Transportation Rules/Regulations of all Commercial Goods (including Fireworks of any type) in the United States.

> The (USDOT) Agency is over/above the FMSCA, responsible for all Safety Inspections/Permitting of all Commercial Carriers including Commercial Fireworks Carriers.(See FMSCA)

**Visco aka "Cannon Fuse", or "Safety Fuse"** - A (usually) Plastic-covered, Water Resistant, Slow-Burning (approx. 1 in/second), Fuse used on Devices to add Time-Delay, and extend initial Fuse Times to allow a Shooter to get away the NFPA 1123 Mandated 75' after Hand-Ignition (prior to Shell Lift. (See "Cannon Fuse", or "Visco" Fuse).