Exploding (Reactive) Targets

Presentation to Senate Finance Public Safety Sub-Committee

September 17,2015

Exploding (Reactive) Targets

- **<u>Targets are comprised of two principal (binary) components</u>**
  - Oxidizer + fuel = reactive (exploding) target
  - Most common components are:
    - Ammonium nitrate as the oxidizer and a metal such as powdered aluminum as the fuel.
  - Varying amounts of aluminum or aluminum alloys can vary the sensitivity. (Ratio can determine function by impact of high caliber [center fire] bullet impact versus small caliber [rimfire] bullet impact.)
  - Addition of small amount of Potassium perchlorate heightens sensitivity even more particularly for rimfire impacts or when consumer fireworks are used as initiators.

Exploding (Reactive) Targets

- Have been on the market for over 10 years, maybe as long as 20 years.
- Currently sold in Virginia without restriction
- Marketed as a highly-visible "exploding" target designator particularly if being used at long ranges.
- Used for dramatic effect.
- Marketed only as a target and not for any other use.

Exploding (Reactive) Targets

- Many targets available through retail sources under brand names such as:
  - Sonic Boom
  - Zomboom
  - Sure Shot
  - Blue Thunder
  - Last Man Standing
  - Tannerite
  - Red Jacket
- All of them essentially operate in the same manner with some relatively minor differences of ingredients and/or the proportions of those ingredients. (Different recipes.)

Exploding (Reactive) Targets

- **<u>Homemade targets</u>**
  - Made from products such as instant cold packs readily available from drug stores containing ammonium nitrate.
  - Have enough packets to measure out to 1 pound and combine with 1 Tablespoon of readily available powdered aluminum.

Exploding (Reactive) Targets

- **<u>Product Comparison</u>**
  - Construction blasting may use products called *Kinepak*™ and *Kinepouch*™
  - By definition, Kinepak is a "blasting agent", a sub-set of explosives.
  - Kinepak is also a binary product that is not an explosive until it is mixed. The solid component is an oxidizer (AN) and the liquid component is a flammable liquid (fuel).
  - Can be used by itself, as a booster or a column charge in a variety of applications such as furnace de-slag applications, secondary blasting, bomb disposal, trenching, and shearing of oil well casings or drill pipe.
  - Must be initiated using blasting cap (Detonator).
  - Used under fire code permits ("USE") and only by SFMO certified blasters.

Exploding (Reactive) Targets

- **<u>Federal regulations (ATF)</u>**
- Components of targets typically not listed separately on the List of Explosive Materials.
- The components do not meet the definition of "Explosives" in 27 CFR 555.11.
- ATF does not regulate the use of exploding (reactive) targets.
- Persons manufacturing explosives for their own personal, non-business use only (e.g., personal target practice) are not required to have a Federal explosives license or permit.

Exploding (Reactive) Targets

- **<u>Detonation velocity comparisons</u>**
  - According to the International Society of Explosive Engineers (ISEE), detonation velocities of commercial explosives range from 5,400 feet per second to 25,000 feet per second.

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Detonation velocity comparisons (continued)

Product	Detonation velocity (feet per second)*
ANFO (Ammonium Nitrate/Fuel Oil)	12,000 avg.**
Dynamite	17,000
Trinitrotoluene (TNT)	22,600
Kinepak	18 - 20,000
Triacetone Triperoxide (TATP) ‡	17,400
Slurries/Water Gels (used in quarries)	14,800
Exploding targets	13,000

* As a point of reference, the speed of sound is 1,126 feet per second, or 768 mph.
**As used in construction or mining, detonation velocity is wholly dependent upon borehole diameter and ranges from 8,000 to 16,000 feet per second. (ISEE)
‡ Highly sensitive. Has no known commercial value and is prohibited for transport on the public highways.

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- **<u>Energy (blast) comparison</u>**
  - According to Dr. Jason Baird of the Missouri University of Science and Technology, when mixed reactive targets are more sensitive to functioning (exploding) and are closer in classification to a "flash powder" as opposed to a product such as Kinepak.
  - While more sensitive to initiation (exploding), reactive targets do not produce the same amount of total energy (force) when compared to a product such as Kinepak.

Exploding (Reactive) Targets

- **<u>State Comparisons</u>**
  - 2012 - Maryland amended definition of explosive to specifically include products of "two or more components" and advertised to create an explosive. (SB421)
  - 2014 – Louisiana added "exploding target" to the definition of explosives. (HB 160)
  - North Carolina, West Virginia and Tennessee have not taken any action to date.

Exploding (Reactive) Targets

<u>Code of Virginia</u> definitions (as used in respective Chapters)

Title 18 Criminal Code

§ 18.2-85

"Explosive material" means any chemical compound, mechanical mixture or device that is commonly used or can be used for the purpose of producing an explosion and which contains any oxidizing and combustive agents or other ingredients in such proportions, quantities or packaging that an ignition by fire, friction, concussion, percussion, detonation or by any part of the compound or mixture may cause a sudden generation of highly heated gases. These materials include, but are not limited to, gunpowder, powders for blasting, high explosives, blasting materials, fuses (other than electric circuit breakers), detonators, and other detonating agents and smokeless powder.

Exploding (Reactive) Targets

<u>Code of Virginia</u> definitions (as used in respective Chapters - continued)

Title 59.1 Trade and Commerce

§ 59.1-137. Definition.

Whenever used in this chapter:

"Explosives" means any chemical compound, mechanical mixture or device the primary or common purpose of which is to function by explosion. The term includes, but is not limited to dynamite and other high explosives, black blasting powder, pellet powder, initiating explosives, blasting caps, electric blasting caps, detonators, safety fuse, fuse igniters, fuse lighters, squibs, cordeau detonant fuse, instantaneous fuse, detonating cord, igniter cord, igniters and those materials included in the list published annually in the Federal Register by the Department of the Treasury pursuant to the Organized Crime Control Act of 1970 (18 U.S.C. § 841 et seq.).

Exploding (Reactive) Targets

<u>Statewide Fire Prevention Code Act</u>

27-95 Definitions

"Fire prevention regulation" means any law, rule, resolution, regulation, ordinance or code, general or special, or compilation thereof to safeguard life and property from the hazards of fire or **explosion** arising from the improper maintenance of life safety and fire prevention and protection materials, devices, systems and structures, and the unsafe storage, handling and use of substances, materials and devices, including **explosives and blasting agents**, wherever located, heretofore or hereafter enacted or adopted by the Commonwealth or any county or municipality, including departments, boards, bureaus, commissions or other agencies.

27-96 Statewide Standards

The purposes of this chapter are to provide for statewide standards for optional local enforcement to safeguard life and property from the hazards of fire or **explosion** arising from the improper maintenance of life safety and fire prevention and protection materials, devices, systems and structures, and the unsafe storage, handling, and use of substances, materials and devices, including fireworks, **explosives and blasting agents**, wherever located.

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§ 27-97. Adoption of Fire Prevention Code (Partial)

The Board of Housing and Community Development is hereby empowered to adopt and promulgate a Statewide Fire Prevention Code which shall be cooperatively developed with the Fire Services Board pursuant to procedures agreed to by the two Boards. The Fire Prevention Code shall prescribe regulations to be complied with for the protection of life and property from the hazards of fire or **explosion** and for the handling, storage, sale and use of fireworks, **explosives or blasting agents**, and shall provide for the administration and enforcement of such regulations. The Fire Prevention Code shall require **manufacturers** of fireworks or **explosives**, as defined in the Code, to register and report information concerning their manufacturing facilities and methods of operation within the Commonwealth in accordance with regulations adopted by the Board. In addition to conducting criminal background checks pursuant to § 27-97.2, the Board shall also establish regulations for obtaining permits for the manufacturing, storage, handling, use, or sales of fireworks or **explosives**. In the enforcement of such regulations, the enforcing agency may issue annual permits for such activities to any state regulated public utility. Such permits shall not apply to the storage, handling, or use of **explosives or blasting agents** pursuant to the provisions of Title 45.1.

Exploding (Reactive) Targets

SFPC Definitions

EXPLOSIVE. A chemical compound, mixture or device, the primary or common purpose of which is to function by explosion. The term includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, igniters and display fireworks, 1.3G. The term "Explosive" includes any material determined to be within the scope of USC Title 18: Chapter 40 and also includes any material classified as an explosive other than consumer fireworks, 1.4G by the hazardous materials regulations of DOTn 49 CFR Parts 100-185.

High explosive. *Explosive material*, such as dynamite, which can be caused to detonate by means of a No. 8 test blasting cap when unconfined.

Low explosive. *Explosive material* that will burn or deflagrate when ignited. It is characterized by a rate of reaction that is less than the speed of sound. Examples of low *explosives* include, but are not limited to, black powder, safety fuse, igniters, igniter cord, fuse lighters, fireworks, 1.3G and propellants, 1.3C.

EXPLOSION. An effect produced by the sudden violent expansion of gases, which may be accompanied by a shock wave or disruption, or both, of enclosing materials or structures. An explosion could result from any of the following:

1. Chemical changes such as rapid oxidation, *deflagration* or *detonation*, decomposition of molecules and runaway polymerization (usually *detonations*).
2. Physical changes such as pressure tank ruptures.
3. Atomic changes (nuclear fission or fusion)

Exploding (Reactive) Targets

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- Summary
  - By definition, the combined components become an explosive
  - Proven destructive force (product)
  - Product has potential for being misapplied
  - Lack of clarity on how to regulate components (unmixed target material)
    - Other binary explosives are regulated with regards to use, storage, mixing, and transportation.