

# Enabling Methods For One Way Luminescent "Cold" Tracers

**By:**

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## Contents:

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Theme: “Correct Aim And Fire Again”

3. Introduction
4. Traditional Pyrotechnic Tracers
8. Commercial Reduced Risk & Non-Flammable Tracing Ammunition
9. ARDEC “One Way Luminescent” Tracer Technology & Enablers
13. “Light-To-Light” Enabling Technology
15. “Heat-To-Light” Enabling Technology
19. “Pressure-To-Light” Enabling Technology
23. Guest Speaker: PNW Arms
28. Recommendations
29. Conclusions
30. Credits

## Introduction:

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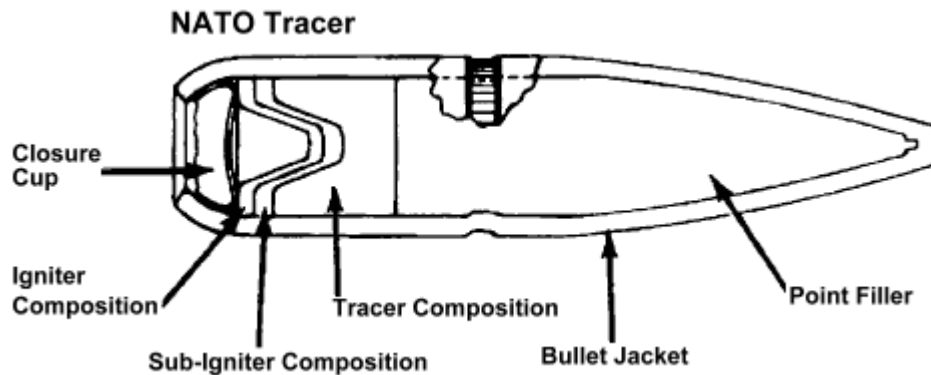
### Public Information Defining Current Tracer Technology:

A tracer projectile is constructed with a hollow base filled with a [pyrotechnic flare](#) material, often made of [phosphorus](#) or [magnesium](#) or other [bright burning chemicals](#). In [NATO](#) standard ammunition (including [U.S.](#)), this is usually a mixture of [strontium](#) compounds ([nitrate](#), [peroxide](#), etc.) and a metal fuel such as [magnesium](#). This yields a bright red light. [Russian](#) and [Chinese](#) tracer ammunition generates green light using [barium](#) salts. Some modern designs use compositions that produce little to no visible light and radiate mainly in infrared, being visible only on [night vision](#) equipment.<sup>[5]</sup>

There are three types of tracers: **bright** tracer, **subdued** tracer and **dim** tracer. Bright tracers are the standard type, which start burning immediately after exiting the muzzle. A disadvantage of bright tracers is that they give away the shooter's location to the enemy; as a military adage puts it, "tracers work both ways". Bright tracers can also overwhelm night-vision devices, rendering them useless. Subdued tracers burn at full brightness after a hundred or more yards to avoid giving away the gunner's position. Dim tracers burn very dimly but are clearly visible through night-vision equipment.

Source: Wikipedia

# Traditional Pyrotechnic Tracer Ammunition Designs:



## Tracer Ammunition



Clockwise From Upper Left: Intres.com, Cartridgecollectors.com, Ammo2Go.com, K. Gross Photo.

## Traditional Burning Tracer Firing:

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Note: Automatic Weapons Fire & Secondary Ignition Fires



Above: Daily Mail UK Tracers.

## Highly Visible Firing Signatures & Significant Fire Risk:

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### Persistent Problems With Current Tracer Technology...



Clockwise From Upper Left: US Army Photo, USMC Photo, Capistrano Dispatch,, Deseret News, The Truth About Guns

# Widespread Bans On Firing Tracer Ammunition At Ranges:

## Severe Risk Of Public & Private Range Land Wildfires

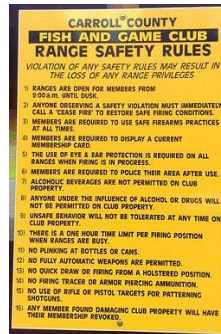


### **FIRE HAZARD!**

**No Tracer Rounds**  
All Ammo Must Be Inspected  
**No POLYCASE Inceptor Firefly**  
**Ammo Allowed On Range!**



**Firing of  
Tracers  
Prohibited**



# Commercial Reduced Risk & Non-Flammable Tracing Ammunition:

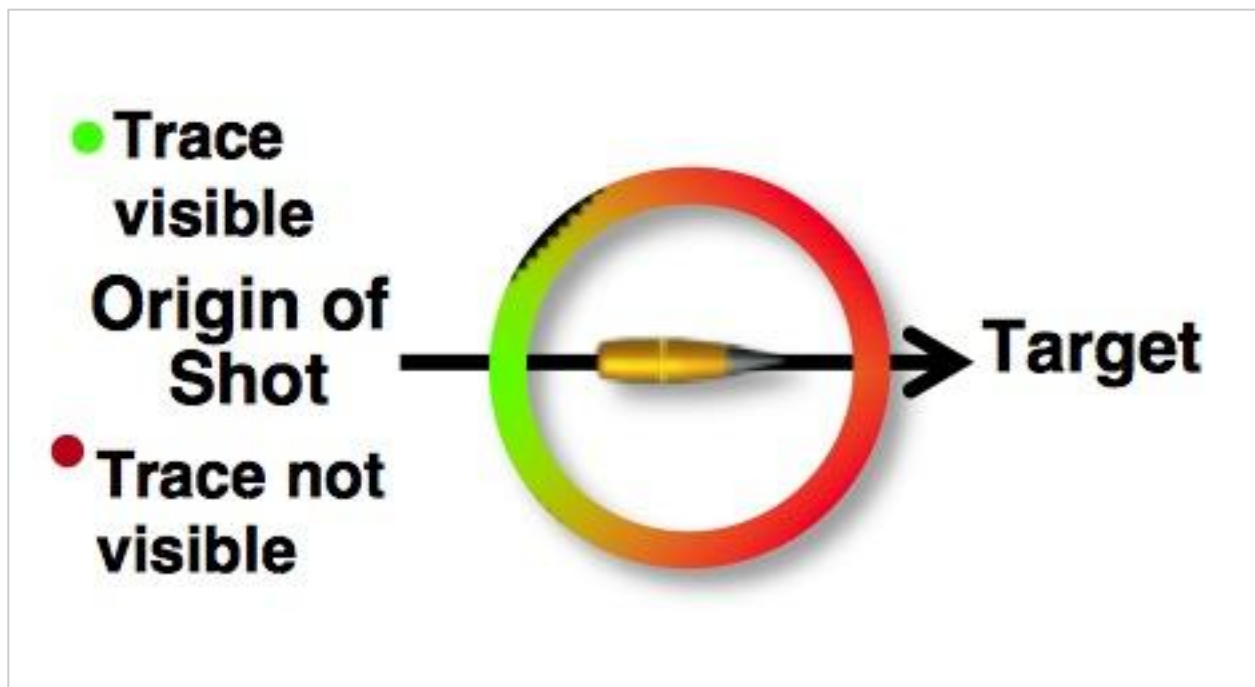


Clockwise From Upper Left: SBR Ammunition, Fiocchi, Glow Ammo, Glow Ammo, G2 Tracer, Inceptor Ammunition



## The Goal: Daylight Visible, One Way Luminescent Tracers

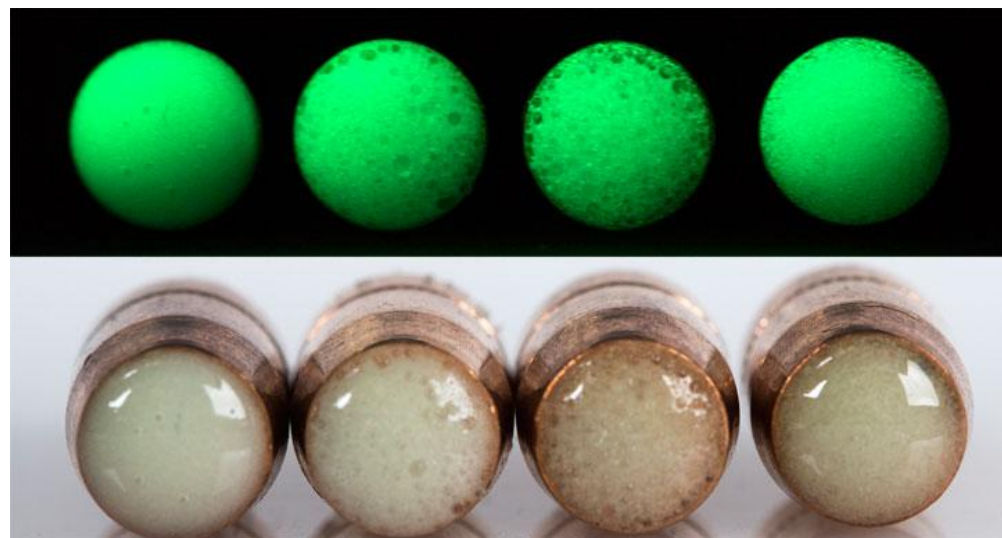
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Above: Weaponsman.com Photo

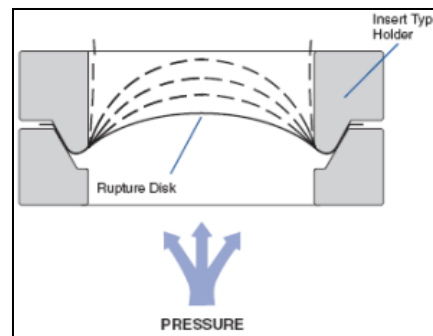
## ARDEC "OWL" Tracer Base Applique Development:

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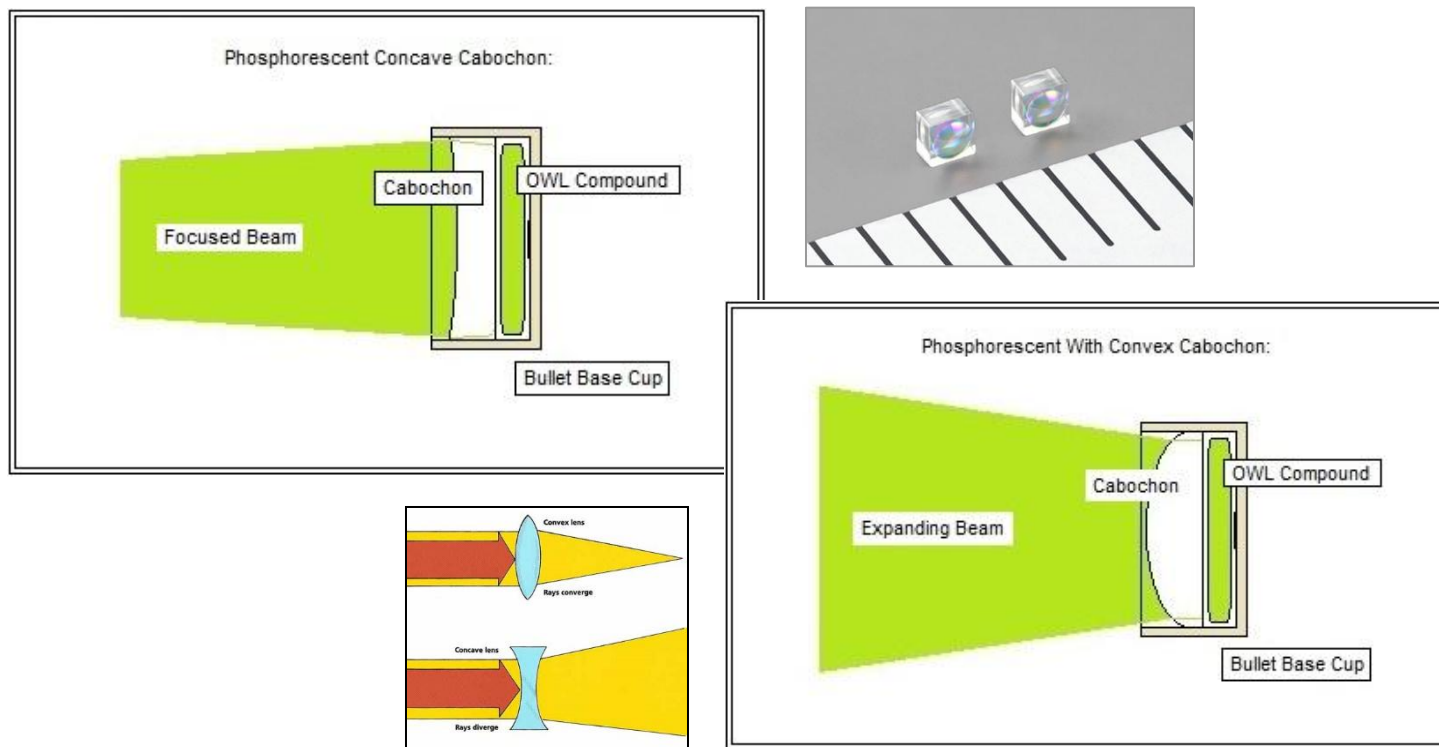
Above: US Army Photos

## Base Ablation Resistance Technique: Fireproof Carbon Burst Discs



Clockwise From Upper Left: [Elfab.com](http://Elfab.com), [ElmacTechnologies.com](http://ElmacTechnologies.com), [SPIE.org](http://SPIE.org) Burst Disc

# OWL Visibility Maximizing Technique: Glass “Cabochon” Lensing



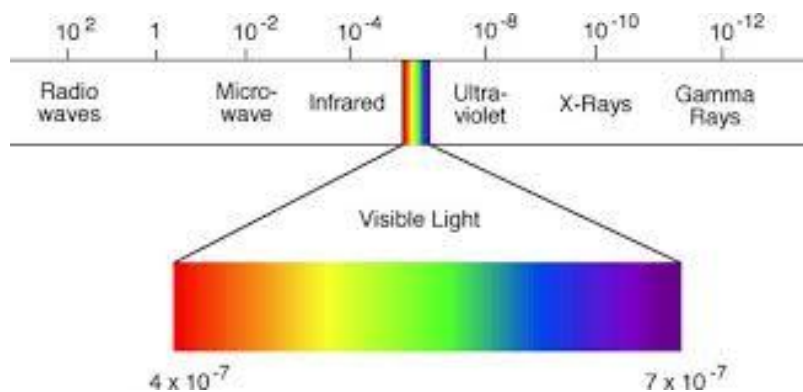
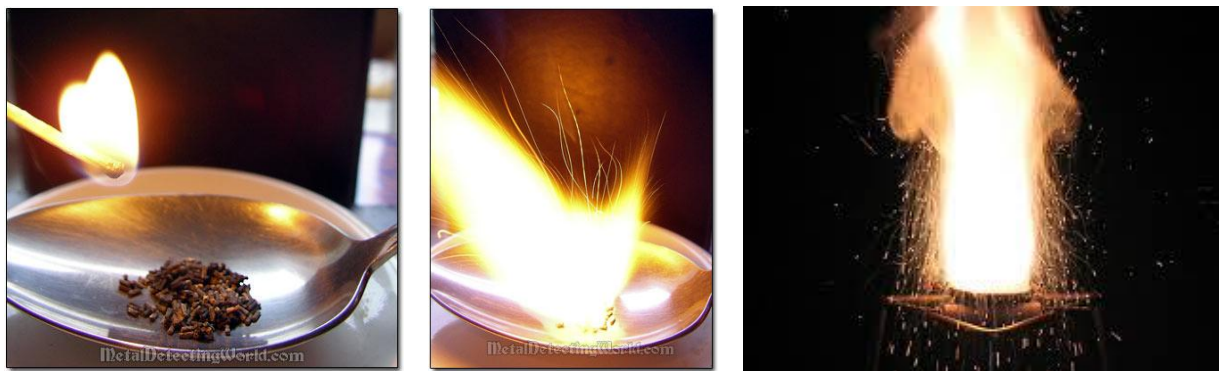
Clockwise From Upper Left: HDKent 2015, CNET Photo, HDKent 2015, David Darling Info Graphic

# Light – To - Light

Using The Light Of Powder Ignition To Activate OWL Tracer

## Burning Gunpowder Produces IR, Visible & UV Light:

Which May Then Be Used To Activate Phosphorescent Materials...



Clockwise From Upper Left:: Ammo Tests WW2 Powder (2), Hodgdon Gunpowder, RedOrbit.com Graphic.

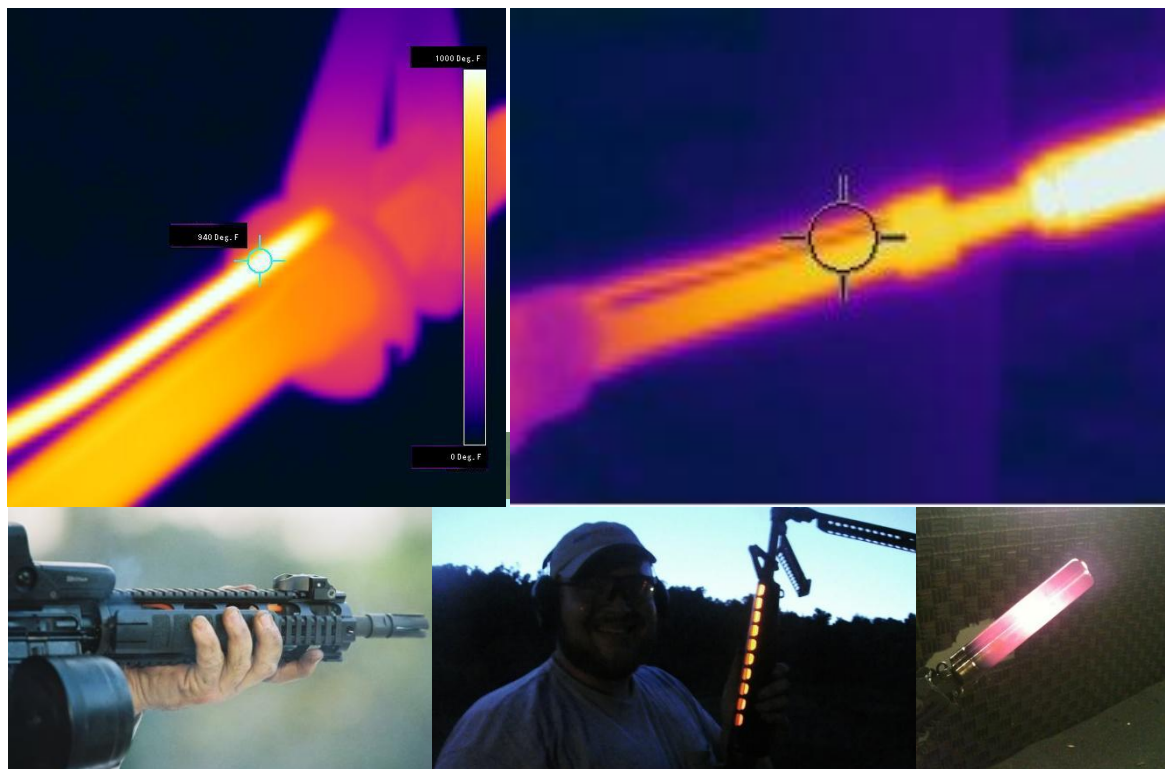
# Heat – To - Light

Using The Heat Of Powder Ignition To Activate OWL Tracer

## Weapon Firing Heat As OWL Activation Mechanism:

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Combustion + Pressure = High Enough Temperature To Glow Visibly...



Clockwise From Upper Left: HDKent 2013 (2), SureFire Photo, AR-15.com Photo, Bottershoot Photo.



## Heat And Not Electricity Actually Causes Lightbulbs To Glow:

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### How Does A Lightbulb Work?

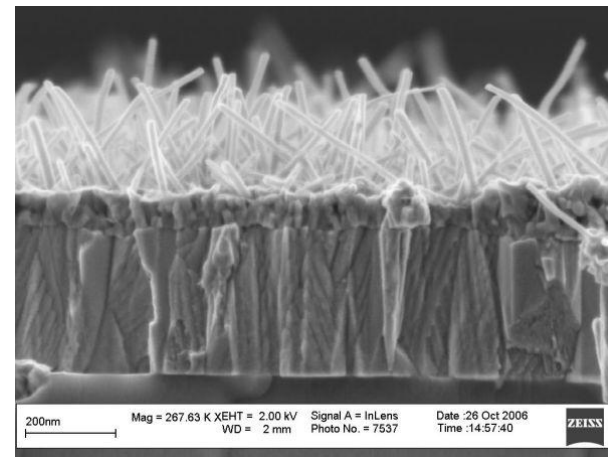
An incandescent bulb uses heat caused by an electrical current. When electrical current passes through a wire, it causes the wire to heat. The wire, or filament, *gets so hot that it glows and gives off **light***

Everyday incandescent **light bulbs** have a filament made of ***Tungsten***.

Jun17,1992; [www.pa.msu.edu/sciencet/ask\\_st/061792.html](http://www.pa.msu.edu/sciencet/ask_st/061792.html)  
Michigan State University

# Tungsten Nanowires Behave As Incandescent Bulb Filaments:

Tiny Filament Wire Structure Heats Instantly Using Powder Ignition Heat...



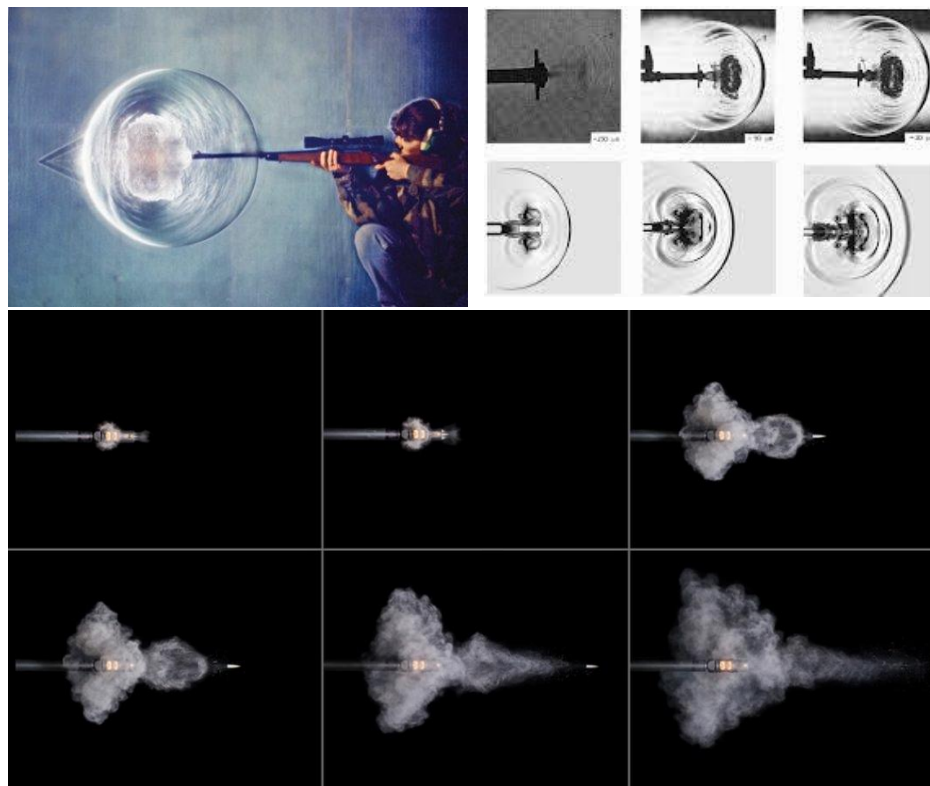
Clockwise From Upper Left: 1000Bulbs.com, Shutterstock.com, NISE Ordered Nanowires, Intechopen.com Tungsten Nanowires.

# Pressure – To – Light

Using The Pressure Of Powder Ignition To Activate OWL Tracer

## Examples Of Pressure Waves Generated By Weapon Firing:

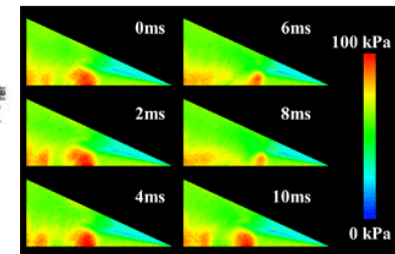
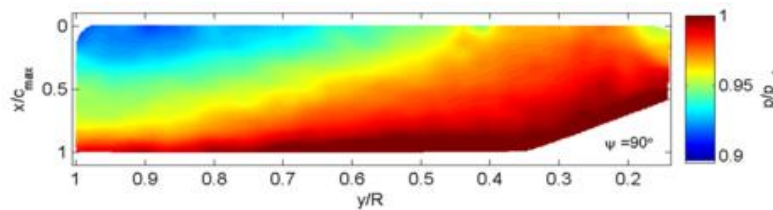
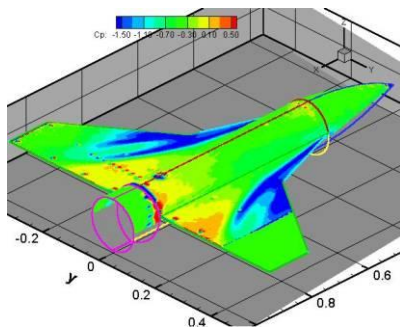
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Clockwise From Upper Left: Shooting Times Photo, US Army Photo, Here Kuulaapa Photo.

# Pressure Sensitive Paint & Cabochon OWL Technique:

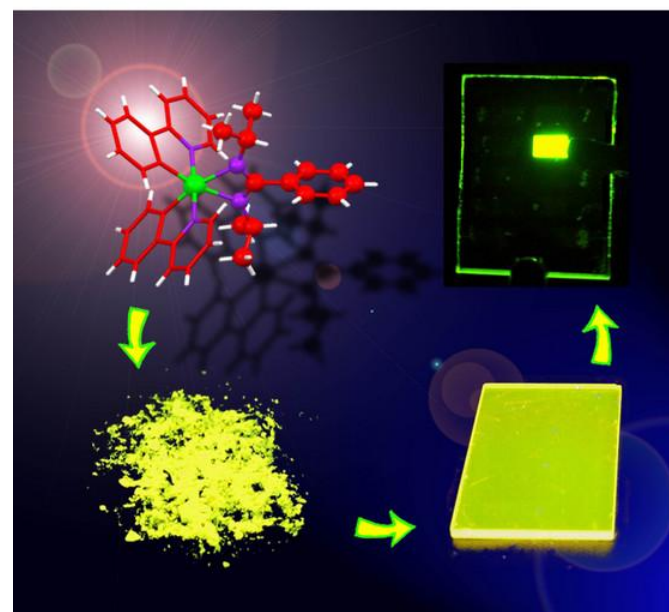
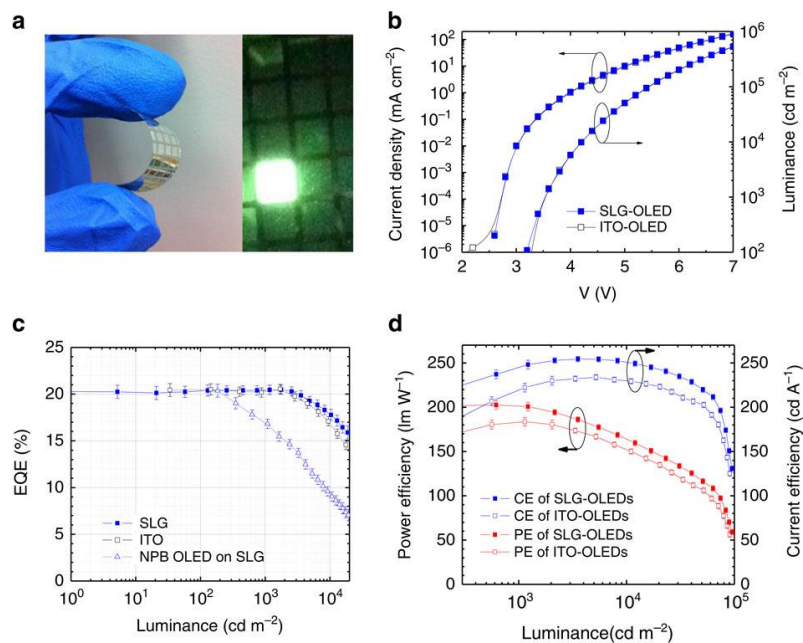
Energized By Combustion UV & Activated By Chamber Pressure...



Clockwise From Upper Left: Gunner's Den Cartridge, Modified Gunner's Den Cartridge HDKent 2015, Alibaba Generic Cabochons, RD.TUAT.AC.JP Graphic, NASA PSP Rotor Blade Simulation, CSIR.RES.IN Wind Tunnel Aircraft Pressure Testing Simulation.

# Piezo-Electrically Energized OLED Derived OWL Method:

## Bending Piezo-Electric Material Substrate Illuminates Bright OLED...



Clockwise From Upper Left: Intres.com, Cartridgecollectors.com, Ammo2Go, K. Gross Photo

**Guest Speaker:**

**PNW Arms**



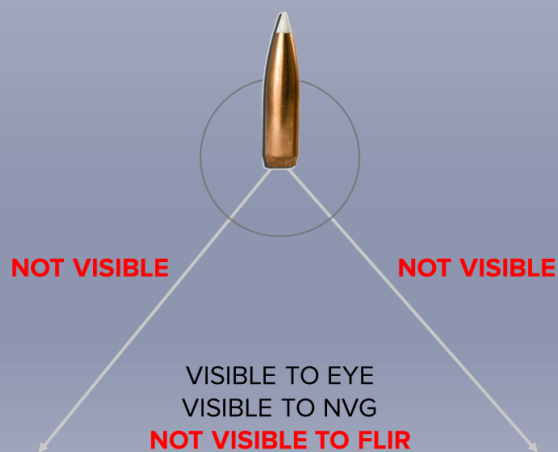
**PNW Arms**  
Weapons Science™

## OWL

One Way Luminescence  
Existing Technology  
Future of Program



# Executive Summary



OWL is a non-exothermic substance developed from bioluminescence research that transfers the energy from the explosion of the round in your chamber to the trajectory of the bullet in flight

Applied the base of every bullet, OWL establishes instant visual feedback on a per round basis in low/no light conditions without compromising the shooters location. This enables a shooter to focus on round placement during engagements and instantly produce targeting correction. As it can only be seen from the shooters perspective, OWL is utterly undetectable from the impact zone to follow.



**CONFIDENTIAL:**



(Subject Of Potential Contractor Proposed Daylight Visible OWL Trace CRADA)



## Title

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# Fred Newcome

(PNW Arms Vice President of Sales & Former Force Recon Marine)

## Recommendations:

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- 1) Incorporate Industrial Ablation Protection To Preserve OWL Tracers
- 2) Take Advantage Of The Light, Heat & Pressure Present For Initiation
- 3) Pursue Bullet Base “Cabochon” Glass Optics To Increase Visibility
- 4) Prepare For “SWAP” Advances In OLEDs & Photoluminescence
- 5) Use Commercial Ammunition Offerings To Leverage DoD Research

## Conclusions:

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- 1) One Way Luminescent Tracers Can “Burn” Longer & Brighter Through Incorporating The Previous Recommendations.
- 2) Additional Research Into Photo-Luminescent & Piezo-Electric/OLED Tracing Potential Will Yield Daylight Visible & IR OWL Tracers.
- 3) Both Long Range Marksmanship Trajectory/Wind Readings & Short Range Training Will Be Improved By Direct Feedback.
- 4) Low Cost Tracing Elements May Allow All DoD Rounds To Be Tracers.

Credits:



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With Special Thanks To:



**PNW ARMS**  
Weapons Science

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And:

Joel M. Goldman, Director

**JSSAP**

US Army ARDEC, Picatinny