**Police Sniper Use of Thermal Image Rifle Scopes – Position Paper**

The American Sniper Association recognizes the advancements in technology and equipment being made available to police snipers. One of those pieces of equipment being thermal imaging scopes. Up until recently, thermal imaging has primarily been utilized in handheld forms, and used for searching and locating individuals in outdoor, low-light environments.

As image quality, resolution, and durability have improved, so has interest in using thermal imaging for weapon-mounted sighting systems. Though popular with some wild game hunters, there are limitations and concerns regarding their use by police snipers. This position paper will address the issues sniper teams need to consider as they relate to purchasing, training, and use of these types of scopes in law enforcement sniper operations.

**Terminology**

First, let us define our terms. Night vision scopes absorb all available light, magnify it, then display it on a digital screen.

Thermal imaging scopes work by measuring the heat signals of various objects and comparing them to one another. Thermal imagers are passive, and only sense differences in heat. Those variations are also displayed on a digital screen inside of the scope.

There are technical terms which will be significant when choosing what scopes to purchase for the team’s use. The application of these standards and specifications will be explained in detail in the attached ASA Thermal Imaging Technical Addendum.

**Refresh Rate (Hz)**

What it is: The refresh rate, measured in Hertz (Hz), indicates how many times per second the image on the screen is updated.

Why it matters: A higher refresh rate (such as 60 Hz) means smoother and more fluid images, making it easier to track moving subjects. Lower refresh rates can result in choppy or lagging images, which can be problematic when identifying and tracking human targets.

**Resolution (Pixels)**

What it is: Resolution refers to the number of pixels that make up the image on the screen (e.g., 640x480 pixels). More pixels mean more detailed and clearer images.

Why it matters: Higher resolution provides better image quality, crucial for identifying fine details like facial features. This level of detail is essential for police snipers to positively identify individuals before making decisions.

**Magnification**

What it is: Magnification is how much closer the scope can make distant objects appear. Optical magnification uses lenses, while digital magnification enlarges the image electronically.

Why it matters: Proper magnification helps snipers see and identify targets at various distances. Too little magnification may make it hard to identify a target, while too much can reduce the field of view and make it harder to maintain situational awareness.

**Pixel Pitch**

What it is: Pixel pitch is the distance between the centers of two adjacent pixels, measured in micrometers (µm).

Why it matters: Smaller pixel pitch provides higher resolution and better image clarity. For police snipers, a pixel pitch of 12 µm or smaller is ideal for detailed imaging.

**Spatial Resolution**

What it is: Spatial resolution is the ability of a thermal imaging system to distinguish between objects and is measured by combining pixel pitch and field of view available.

Why it matters: Higher spatial resolution allows snipers to see fine details and distinguish between objects in the horizontal and vertical field of view, which is critical for accurate identification.

**Observation Range**

What it is: The observation range is the maximum distance the scope can detect and identify objects. It can be defined in the visible light spectrum as PPM (Pixels per meter) and measured against the international standard DORI- Detection, Observation, Recognition, Identification. Detection 25PPM- The detection level allows for reliable and easy determination of whether a person or vehicle is present.

•   Observation 62PPM - The observation level gives characteristic details of an individual, such as distinctive clothing, while allowing a view of activity surrounding an incident.

•   Recognition 125PPM - The recognition level determines with a high degree of certainty whether an individual shown is the same as someone that has been seen before.

•   Identification 250PPM - The identification level enables the identity of an individual beyond a reasonable doubt.

DORI, though, is used for the visible light spectrum and should be used to compare identification with other thermal standards. There are several US thermal standards, such as DRI from 1950 and NVThermIP, which require knowing a great deal of input factors of the device to determine the pixels needed to identify a subject.

Why it matters: A longer observation range allows snipers to identify targets from greater distances. For police snipers, a minimum observation range of 300 yards is recommended, with higher ranges being preferable for flexibility.

**Minimum Specifications for Identification**

To reliably identify a subject, the thermal scope should have:

Resolution: At least 640x480 pixels for clear and detailed images.

Refresh Rate: At least 50 Hz for smooth image updates.

Pixel Pitch: 12 µm or smaller for better image clarity.

Spatial Resolution: High enough to distinguish fine details.

Observation Range: A sufficient PPM to enable positive identification of a subject

Clip-On Capability: It should be a clip-on model in front of a day scope.

**Basic Functionality**

A thermal scope detects infrared radiation (heat) emitted by objects. This radiation is converted into an electronic signal and then processed to create a visual image displayed on the scope's screen. It works like this:

Detection: The thermal scope's sensor detects infrared radiation emitted by objects in the environment. Everything emits some level of infrared radiation, with warmer objects emitting more.

Conversion: The detected infrared radiation is converted into an electronic signal.

Processing: The scope's internal computer processes the electronic signal to create a visual representation.

Display: The processed image is displayed on the scope's screen, allowing the user to see objects' heat signatures.

**What a Police Sniper Sees:**

Heat Signatures: Warmer objects like people, animals, and vehicles appear brighter or differently colored compared to cooler surroundings.

Contrast: The scope highlights temperature differences, making distinguishing objects based on their heat emission easier.

Shapes and Movement: Police officers can see the shapes of people and objects and detect movement, even in complete darkness or through smoke and light foliage.

**Practical Considerations**

Identification: Police snipers need to be able to identify individuals clearly. Ensure the scope has a resolution that is high enough to distinguish facial features.

Tracking Movement: Higher refresh rates help in tracking moving targets smoothly. 50hz should be the minimum

Environmental Adaptability: Thermal scopes work well in various lighting conditions, including complete darkness, and may be able to see through light obstructions like smoke and light brush.

**Current Technology**

Currently, there are two styles of thermal image scopes available to the law enforcement market. There are standalone scopes which would be mounted on a dedicated rifle. There are clip-on models, which would be attached to an accessory rail in front of the sniper rifle’s daytime optic. For police snipers, this is the preferred scope model.

There are two primary types of thermal scopes in use. Most common are simple thermal units, with varying levels of resolution and features.

The latest technology has integrated thermal imaging with night vision, often referred to as a fusion unit. However, currently, fusion units remain very expensive, and beyond the budget of many police departments.

**Observation Considerations**

The sniper’s rifle may be used in some limited ways for observations during the deployment. The images provided while looking through the weapon-mounted thermal scope must be of a high enough resolution to allow the sniper to see and discern detailed information.

**Use of Force Considerations**

A sniper using a thermal imaging rifle scope must be able to clearly identify and differentiate all personnel at any callout location. A positive facial identification is needed. Therefore, the scope must provide an image that is clear and detailed enough to distinguish one face from another. The ability to make a positive action identification should be seen as the minimum standard.

**Limitations**

Thermal imaging scopes don’t work the way they are often portrayed in movies. They do not penetrate walls, showing a glowing human silhouette for the sniper to follow and shoot at. Even if this were possible, it still wouldn’t mean the sniper could shoot through the wall without being able to identify the silhouette as a viable target.

Secondly, thermal scopes cannot penetrate glass. If the subject of your observations is standing behind an unobstructed window, the thermal scope would be useless, as he would be invisible behind a transparent barrier.

**Implementation**

Before deploying on SWAT operations with rifle-mounted thermal scopes, there are several essential preparatory steps a sniper team must take.

First, write a policy which outlines the training program and qualification course specific to the equipment to be used by the team.

The team must purchase a scope with the technical capabilities needed to make detailed observations and positive target identifications at reasonable police sniper engagement distances. Based on current technology capabilities, this will require a scope with a minimum core resolution of 640x480 pixels.

The scope must be durable enough to withstand repeated recoil impulses generated by a sniper rifle used in training. If the scope is a clip-on model, the mounting system must also be durable and repeatable, to insure high precision and accurate shooting.

Because of the technical limitations of a weapon-mounted thermal scope, they should only be utilized in outdoor, limited-lighting situations.

The team must establish and participate in a comprehensive training program with the scopes. This training should include how to properly mount the scopes, whether the scope is fitted to a dedicated rifle, or is a forward-mounted clip-on. The snipers should then learn how to adjust, focus and zero the units. And finally, the snipers must learn how to shoot accurately utilizing just the thermal scope in various situations and environments.

Training must incorporate thermal targets, which will test the ability to use the scope in real world circumstances.

The number of hours necessary to reach this level of knowledge and skill is to be determined by the team. All this training must be structured and fully documented. At the end of the training, a structured competency test must be developed and administered on a regular basis.

The clip-on thermal scope is not a replacement or substitute for a clip-on night vision scope. They each perform different functions in different circumstances. A thermal scope is an alternative, to be used under specific conditions and circumstances.

**Position**

For the American Sniper Association to support the use of thermal imaging scopes for police sniping, there are three standards which must be met.

First, the team must buy thermal imaging equipment of sufficient quality to be capable of facial identification at reasonable police sniper engagement distances. \**(See the ASA Thermal Imaging Technical Addendum.)*

Second, the team must do sufficient training with the equipment to be proficient with it. This includes mounting and adjusting the scope, maintaining the scope, and shooting accurately with the scope. This must be tested with a purpose-designed qualification course.

Finally, use of the scope must be limited to situations where it is the best option when considering the circumstances and environment.

**Thermal Imaging Rifle Scope**

**Technical Addendum and Training Recommendations**

