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SMALL ARMS DEFENSE JOURNAL
VOLUME 13 NUMBER 5 | SEPT/OCT 2021

SMALL ARMS DEFENSE JOURNAL

VOL 13, NO 5 | SEPT/OCT 2021

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ON THE COVER

The **Malyuk** bullpup assault rifle is the latest entry in the Ukrainian arsenal, and the latest in a long lineage of bullpup versions of the AK platform.

PHOTO PROVIDED BY: INTERPROINVEST LLC

See story on page 26.

FEATURES

COLUMNS

CORRECTION & CLARIFICATION

In *Twist Rates and the .338 Norma* by Ward W. Brien, published in *Small Arms Defense Journal* Vol. 13 No. 3., Stan Earl Ellis was incorrectly identified as the President of the U.S. Army Sniper Association. The article read: "During the 'vendor shoot day,' I shot it with the current President of the U.S. Army Sniper Association, Stan Earl Ellis, and others." The sentence should have read, "During the 'vendor shoot day,' I shot it with Stan Earl Ellis and others." We regret this error.

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NEW PRODUCTS

FN HERSTAL

FN EVOLYS™

FN Herstal has announced the entry of a brand new machine gun with unique features—the **FN EVOLYS™.** It features an innovative and open architecture and is an ultralight weapon that combines the firing capabilities of a belt fed machine gun with ergonomics and balance similar to an assault rifle. It has been developed in two calibers: 5.56x45mm NATO and 7.62x51mm NATO.

The FN EVOLYS™, with a weight between 5.5 and 6.2kg, depending on the caliber, is much lighter than current reference machine guns. This reduced weight enables the user to move across difficult terrain quickly and to engage with a high volume of fire when needed with no difficulty. Its reduced weight and excellent balance also mean that the weapon can be fired from any position. Transitioning from one firing position to another is made easy by the design of the sling attachment interface.

The FN EVOLYS ultralight machine gun fires like a machine gun, and handles like an assault rifle. The ambidextrous fire selector has both semi-auto and full auto positions. The buttstock is adjustable in length and height. The hydraulic buffer gives a steady rate of fire and reduces recoil.

The EVOLYS was designed from the start to fire intensively with a sound suppressor and therefore showed no reduction in performance when fitted with a suppressor, no excessive fouling and no debris projected toward the user, even for left-handers.

Another innovation in the FN EVOLYS™ is the patented lateral feed mechanism, which has allowed the design to include several major improvements requested by users:

- The one-piece long top rail enables mounting a combination of various in-line optical sights such as day and night sights together, or magnifiers for instance, without removing the iron sights.
- Easy, instinctive and fast access to all controls by left or right-handed shooters for improved handling in the field
- All actions can be done with just one hand, including engaging the belt.
- Cartridges are automatically repositioned when the feed cover is closed if the belt is not correctly placed on the feed tray. This avoids a failure to feed the first round, which is a great reassurance for the user.
- The last link is automatically ejected, clearing the way for a faster and more reliable reload.

fnherstal.com

FN HERSTAL

FN Elity™

Belgium-based FN Herstal unveils the newly-developed version of its high performance weapon mounted ballistic calculator for snipers, precision shooters and spotters. The operational feedback collected from around the world last year has led to improvements in terms of ergonomics and usability. This version appears today under a brand new name: **FN Elity™.**

The FN Elity Weapon Mounted Ballistic Calculator can fit onto any squad or sniper team weapon of any caliber and spotting scopes. It is an all-in-one system that comes standard with the following:

- A laser range finder that can measure a human-size target at distances of up to 1,750m.
- Visible and infrared laser pointers.
- An infrared illuminator with variable light intensity and adjustable beam cone.
- A ballistic solver, developed by ApexO (AFS®), that provides real time shooting corrections and goes beyond classic G1,G7 drag coefficients to calculate the bullet trajectory.
- Embedded sensors (e.g. temperature, pressure, humidity, elevation angle) that provide the data needed to fine-tune the shooting corrections according to the environment.

- An Android app, based on the well-known AFS® software from ApexO and using Bluetooth to configure every parameter of the ballistic solver for an improved user experience.
- The latest generation OLED screen displaying relevant information visible in the most difficult weather and light conditions.

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NEW PRODUCTS

EOTECH®

Vudu® 8-32x50 SFP Long-Range Riflescope

Say hello to the EOTECH **Vudu 8-32x50 SFP riflescope.** Its 32x magnification builds confidence, providing a large, bright target image. Its competition-grade turrets with easy-to-read MOA adjustments and zero stop are perfect for rapid, repeatable adjustments. The Vudu 8-32x50 SFP riflescope delivers features F-Class, benchrest and varmint shooters love. And like all EOTECH optics, the Vudu 8-32x50 SFP will endure the rigors of everyday professional use.

High-magnification optics like the Vudu 8-32x require the best glass and a large objective lens for optimal light transmission. Vudu uses multi-coated XC™ High-Density (HD) glass delivering edge-to-edge clarity and unparalleled light transmission and color reproduction. The combination provides vivid views at any power.

The 8-32x features the HC2, MOA-based, hashmark reticle that was designed for the precision long-range shooter. The non-illuminated crosshairs allow for elevation and windage correction, while the ultra-small center aiming dot (0.15MOA at 32X) provides the utmost accuracy.

EZ-Clik™ competition height turrets, calibrated in .125 MOA (1/8" per click @ 100 yards), add exact dialing for dead-on holds; easy-to-read scales provide repeatable and surgically precise adjustments while its EZ Chek (zero stop) enables rapid turret resets. A large, 34mm main tube allows up to 100 MOA elevation and 80 MOA windage adjustment, necessary for dialing drop and wind at extreme distances. A side-mounted parallax adjustment dial fine-tunes the reticle focus while observing the target. Its one-piece eyepiece and included throw-lever offers fast and fluid transitions from low to high magnification.

Vudu Scopes feature an aircraft-grade aluminum main tube with a hard-anodized, durable finish, creating a lightweight riflescope in a tough-as-nails, waterproof package. Each riflescope passes substantial environmental testing, ensuring unsurpassed durability in all conditions.

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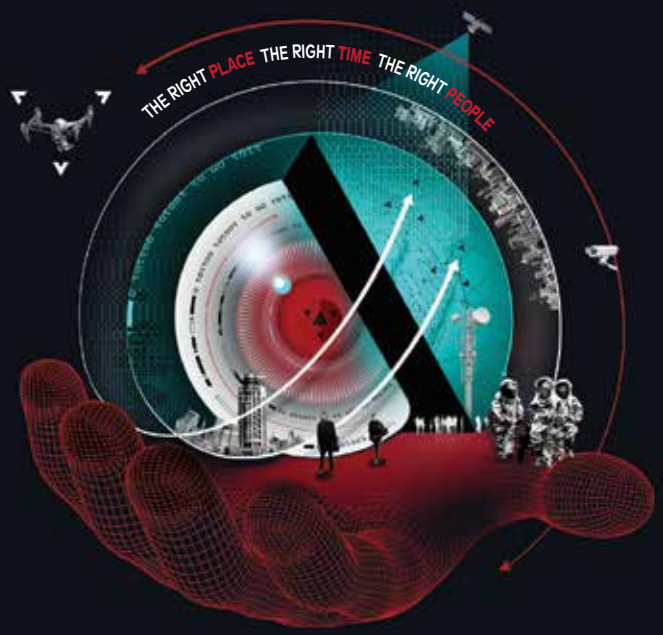


ISRAEL'S LARGEST HLS, DEFENCE & CYBER EXHIBITION

ISDEF 2021 - Crisis and Disaster Management

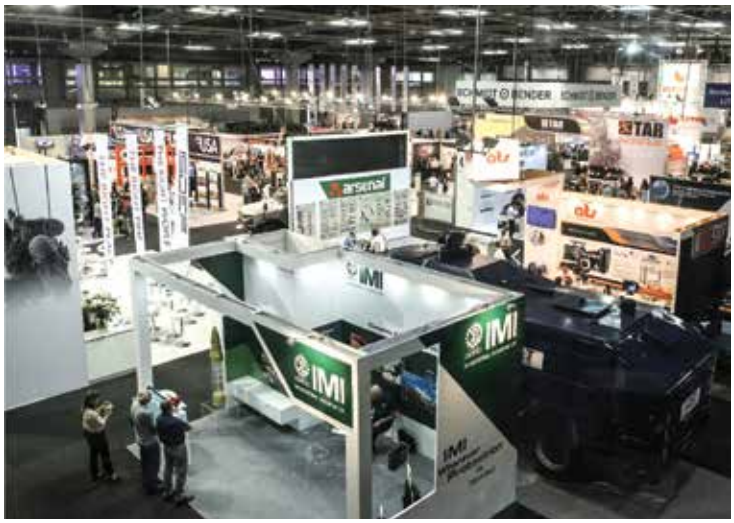
The 11th ISDEF exhibition, a must-attend international event for professionals who are passionate about defence and homeland security, will take place on November 9-11 in Tel Aviv, Israel.

Our previous event, ISDEF 2019, was the most significant international defence, homeland security and cyber exhibition in Israel so far, with over 300 exhibitors offering a wide range of technologies and solutions.

Each year, the exhibition provides an extensive array of solutions to successfully manage today's global challenges and requirements within the defence, security and cyber arenas. ISDEF delivers a phenomenal platform for the display of technological developments in the fields of Security, Law Enforcement, Cyber, Intelligence, Counter- Terrorism, Critical Infrastructure and Search & Rescue.

ISDEF's delegates include Director Generals, Ministers, Department Heads and CISO's from various Israeli Ministries, members of the General Staff, IDF, Senior Officers from the Israeli Police, the Commissioner of the Israeli Fire & Rescue Authority, and high-ranking officials from the Israeli Prison Service, ISA (Shin Bet), the Mossad, Israel Railways, Israel Airport Authority, Mine Action Authority, Israel National Cyber Directorate and many others.

Our visitors' quality and unique demographics are one of ISDEF's key advantages. We endeavour to bring official delegations to ISDEF, including Heads of State, Chiefs of Staff, governmental ministers, and high-ranking Army, Navy and Air Force representatives from around the globe. ISDEF hosts delegations from various security-related organisations such as police, intelligence agencies, cyber, homeland security and the energy sector.



Looking Towards the Future

With unprecedented media exposure, diplomatic engagement, and attendance in the 2019 event, ISDEF has set the bar even higher for future defence and security exhibitions in Israel. We are confident that we will continue to exceed these expectations at our upcoming event in November 2021.

In light of the global COVID-19 pandemic, which has brought many economic and public safety challenges globally, this year, the ISDEF conference will focus on Crisis Management. The conference will bring together leading experts and authorities to share their knowledge, experience, and lessons learned to generate enhanced operability and management in future crises and mass events.

Renowned as a leading authority in crisis management and their R&D developments for homeland security and cyber technologies, Israel has been applauded globally for its outstanding management of the covid-19 crisis. The conference will provide an invaluable platform to share Israel's experience and methodologies with authorities and stakeholders from other countries.

If you would like to take part in the conference as a speaker or participant, visit www.isdefexpo.com to learn more.

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Figure 0. **SCAMP.**

Why the SCAMP Is Now, and Always Will Be, King of the Hill

By Jay Bell

The manufacture of ammunition is a tricky business. For what other manufactured product do you have numerous manufacturing steps, and one might only discover a massive catastrophic failure at the end of the manufacturing process at the acceptance test for the product? Plus there is only one way to be 110% sure each product/round works, by pulling the trigger, which consumes the product in destructive testing. In order to make a cost-effective product, one needs to crank out ammunition in high volume. The high volume makes it more difficult to make a great product due to minor variations in the raw materials, tooling and equipment. Therefore, making tons of the highest quality ammo is exponentially more difficult.

The pinnacle of high-speed production and advanced manufacturing technology in ammunition manufacturing is the Small Caliber Ammunition Modernization Project (SCAMP). This successful government endeavor for the U.S. Army was spearheaded by Gulf & Western Corporation (G&W) back in the late 1960s. The effort was started at Twin Cities Army Ammunition Plant near Minneapolis, MN. It was mothballed in 1975. By 1976 it was transitioned to Lake City Army Ammunition Plant in Independence, MO. G&W was the prime contractor and subcontracted out many pieces, including some of the machine fabrication by Bliss in Hastings, MI.

Back in the 1960s, the U.S. small caliber ammunition production was still being manufactured on World War I technology equipment, much of it developed before World War II. There were minor upgrades for World War II, like having individual motors to run the machine versus all the machines running off a giant line shaft (see *Figure 2)*. A cartridge case line consisted of around 11 processes/steps that were conducted in a single station and single operation presses. For example, the first machine in the process was the First Draw of the cup, resulting in a first drawn part. The standard machine was a Bliss 304 that would take a cup and perform the first draw. It did it 3 or 4 at a time (4 up) in 5.56mm at around 90 strokes per minute. Multiplying by 4 stations provided 360 parts per minute (ppm). The SCAMP line took nearly all of these operations and combined them into **one** giant machine with the added benefit of producing at 1,200 ppm. It accomplished this task by copying from the high-speed rotary beer/soda can technology with multiple turrets stations, each conducting one of the steps. Each turret is around 4 to 5 feet in diameter and contains 24 identical tooling sets, all performing the identical step. Therefore, feed a brass cartridge case cup in one end of the machine and come out with a nearly finished cartridge case at the other end of the machine. The cartridge case line is bigger than an 18 wheeler truck in length and width and has around 8 turrets. To round out the SCAMP line, there was a similar bullet manufacturing line and loading line

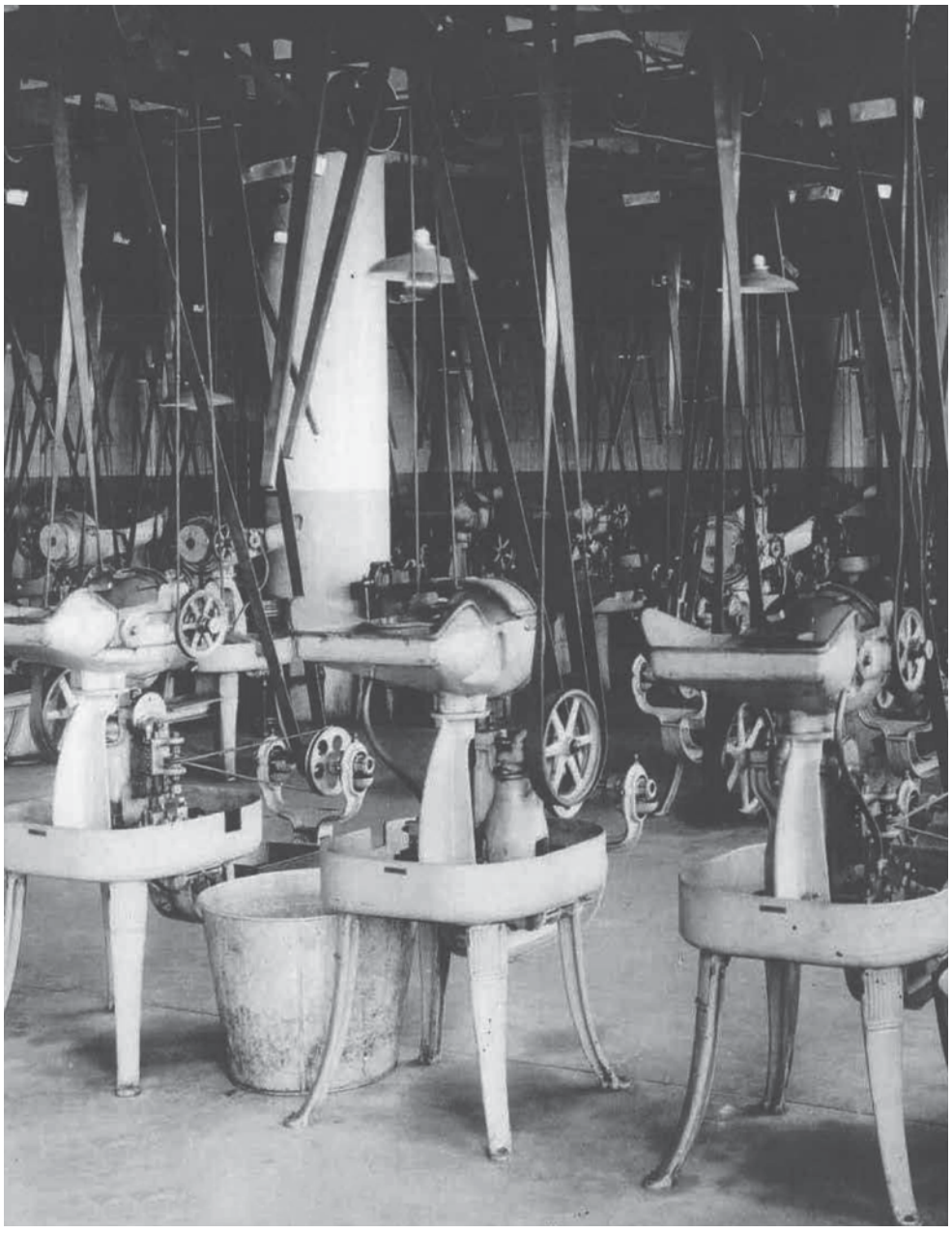
(see *Figure 3)*.

The more amazing feature is that over 50 years later there is still no equipment that manufactures faster or in a lesser number of machines. The leading ammunition manufacturing companies in the world today only have machines that max out at around 250 parts per minute. Think about that for a minute. After all of the advancements in manufacturing in the last 50 years—3D solid modeling, CNC precision tooling manufacturing, programmable logic computer control—and we are no better or faster than 50 years ago! (See *Figure 4*.)

It would be unfair to say these manufacturers are not capable of making a competing product with the SCAMP. I'm confident they are very capable of meeting this task and probably improving upon it; however, the commercial market does not require a machine that can manufacture more than 250 ppm. If there was a need for 1200 ppm, they could just procure 5 of the machines and make 1,250. The four SCAMP lines at Lake City are capable of manufacturing over 1.5 billion rounds a year on three shifts. There are very few commercial or government organizations that need to manufacture that much ammunition—especially of one caliber. The only reason the Lake City SCAMP lines are still running might be the change back in the late 1990s to allow the operating contractor to fully utilize the excess production capacity for the global market to include commercial ammunition. That is correct—a large majority of the Winchester and Federal 5.56mm/.223 ammunition on the commercial market comes off the SCAMP line.

SCAMP is a development and manufacturing success and marvel, yet technically a commercial failure. What in the world do I mean? As discussed above, the output is so massive that very few organizations need the capacity. Modern equipment manufacturers have machines that are suited to their customer's exact needs. If the customer needs more than 250 ppm, just buy two or more of the machines.

It is estimated that there were 8-10 SCAMP lines manufactured. To the best of current information, Israel still has one upgraded line and a 9mm line. Taiwan had one, however it was recently in a flood, and Pakistan still has one. It is believed that PMC Korea had one at one time. There are rumors



BLISS

Figure 2. **Bliss machines on a line shaft.**

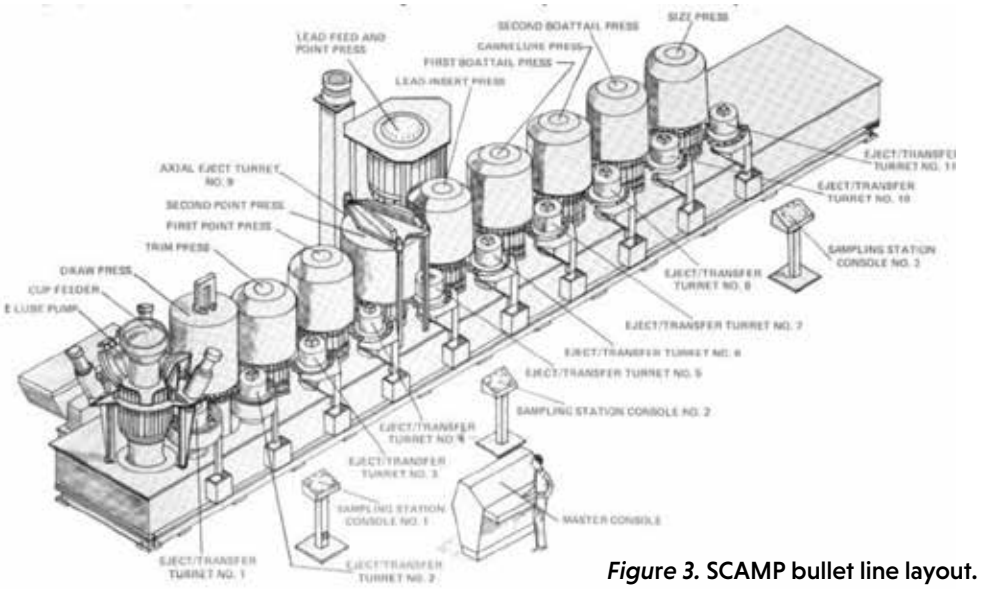


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Figure 3. **SCAMP bullet line layout.**

IMI

Figure 4. **SCAMP loader from control room.**

that a line was returned by the customer to Gulf & Western. There was also a line in 7.62x51mm NATO.

Bold Prediction

I predict that SCAMP will always be the biggest and highest-rate machine ever made for ammunition. My reasons are as follows:

1. Only a government needs and can afford the capacity of SCAMP speed lines.
2. Only a government can afford to keep it running, in the Trump Slump (2017-2020) any commercial entity would have shut it down, at least for a little while.
3. Most other governments would have trouble coming up with the funding needed to take on this task to create something faster than SCAMP.
4. Most governments now have a multitude of calibers they use, reducing the need for high volume in any one caliber.
5. The never-ending push for lightweight will add to manufacturing variability and uncertainty in the future "main" caliber.
6. Modern trends in manufacturing are the cellular model where you have multiple duplicate units, like the Setpoint lines at Lake City for 7.62x51mm and .50 caliber.

A Multitude of Calibers

As of right now, the U.S. government (all services and all 3-letter agencies) use/procure approximately 12 to 15 calibers. Some of these are mentioned below. Here are all of the other major calibers procured around the world.

- NATO Pistol: 9mm
- NATO Rifle: 5.56mm, 7.62x51mm, .50 caliber, .30-06 Blank
- SAAMI Pistol: .380, .40 S&W, .45 ACP
- SAAMI Rifle: 6.5 Creedmoor, .300 Blackout, .300 Win Mag, .338 Lapua
- Non-Standard Domestic: .300 Norma Mag, .338 Norma Mag
- Non-Standard Eastern Bloc: 9x18mm, 7.62x39mm, 7.62x54R, 12.7x108mm, 14.5mm
- Experimental: 5.56mm Lightweight Small Caliber Ammunition Telescoping (LSAT)
- Next Generation Squad Automatic Rifle: 6.8 Case Telescoping from AAI/Textron, 6.8 True Velocity, and 6.8 SIG

If anything, this list will only continue to grow over time. As more agencies continue to get funding to procure the latest and greatest plus funding to develop new rounds and weapons. USSOCOM is pushing 3 to 4 calibers on their own right now. Those calibers that fall off the wayside in the future end up sticking around for a very long time, like the .30-06 Blank. Its sole purpose appears to be for ceremonial purposes. The last time the U.S. government made .30-06 ball ammo was in the late 1970s, yet the

U.S. ARMY

Figure 6. **SCAMP bullet line and buggies full of bullets.**

blanks continue to be procured every couple of years. The rounds are usually produced by other countries. The 7.62mm Bottlenose blank is currently manufactured in Korea and the .30-06 Blank has been procured from Brazil for decades.

Modern Trends

In the 2010 timeframe, Lake City was going through one of its multiple "modernization" efforts. This particular effort was for the 7.62 NATO and .50 caliber cartridge case lines. I believe the thought process was along the lines of SCAMP—they wanted something **dramatically** different. The objectives were different than those for SCAMP. The objectives were modern, cellular, continuous flow, many commercial off-the-shelf parts, interchangeability of parts, precision and simplicity. The current list of major ammunition equipment manufacturers lined up for the business, however, it ended up going to an engineering firm that was known for making roller coasters. Setpoint of Salt Lake City was selected to make 4 each back end cells for both calibers, for a total of 8 cells. The price was originally around $3.5 million dollars for 7.62 NATO and $4.5 million for the .50 caliber. Unconfirmed stories have the total cost considerably more after numerous changes and unplanned facility upgrades. These lines took a part that was through 3rd draw and finished the part to go to priming and then loading. Therefore, the steps line were as follows: pre-pocketed the case, headed the case, head turned the case, performed a body anneal before taper, then tapered the part, trimmed the mouth and final mouth & neck annealed the part. Washing was integrated into the cell system to have clean-finished cases ready to move to the priming operation.

The Setpoint lines only run around

Back in the 1960s, the U.S. small caliber ammunition production was still being manufactured on World War I technology equipment, much of it developed before World War II.

35 ppm, however, the original objective was closer to 42 ppm. 35 ppm means that on 3 shifts they can theoretically run around 18 million per year, per cell. They do make some very consistent ammunition. Many people have said that the normal production is equal to the old match-grade cartridge cases. The key areas that are involved are base wall and neck wall minimal runout, consistency of head turn dimensions and consistency of annealing. The improved wall variation seems to come from the improved holding of the part through the draws. The head turn seems to come from better tool control from PLC and greater precision spindles. The induction anneal is a major upgrade. The parts drop one at a time through the coil and the new controls and better design make them near perfect.

The Setpoint team did make many leaps in technology from their experience in a wide array of manufacturing processes, from roller coasters to electric car battery assembly. One key development was induction anneal of cases for body anneal (before taper) and mouth and neck anneal to eliminate stress cracks in the necks. The traditional induction anneal was a long exposure of the parts marching past the induction coil. Typically, the parts rolled through a "tunnel" to try to get a consistent anneal. Sometimes parts would get hung up as they traveled. This might result in a part getting too much anneal on one side and not enough on another. Setpoint dropped the round through a single coil, which is much more consistent. The result is a much better case (see *Figure 7).*

The most interesting unplanned upgrade at Lake City was the upgrade in power requirements. The old presses had electric motors that powdered a giant flywheel, which powered the ram for the tonnage to move metal in the draws, pre-pocketing, heading and taper operations. The only surge in power was to start the flywheel from a complete stop, which did not happen all at the same time and typically only once a shift—if things were running like clockwork. Even if a machine was having massive issues, you still were not starting the machine flywheel but a dozen times a day. The Setpoint lines had multiple servo drives to move metal. The servos require huge amounts of power to stop and start the stroke of the ram. Each system had at least 3 servos multiplied by 8 systems for a total of 24 servos. Now multiple that by two for the stop and start of the stroke and there were 48 firings of the servos **each minute.** When multiple servos were fired at the same time the system had a power surge, and the lines would trip the electrical breaker fuse switch. The rumored cost was over $10 million dollars for the power upgrades.

SETPOINT

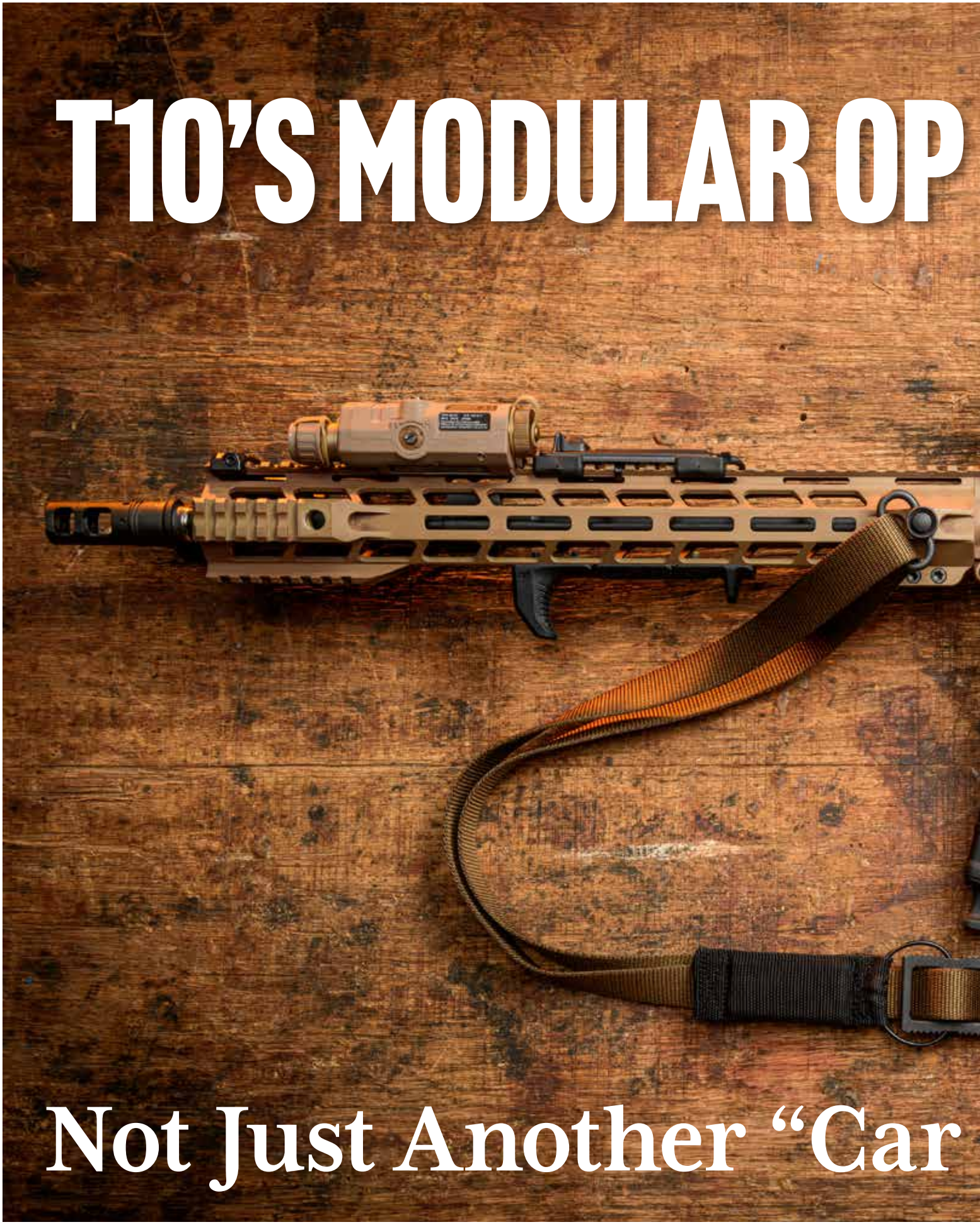
Figure 7. **Setpoint's commercial case line.**

Initially, it took Lake City many years to get their arms around the Cellular Servo Lines. This is understandable. This is a different type of manufacturing. The old systems were chain drives, cranks, rams and huge flywheels and the new system was indexing dials, servos and electronics. In conversations with the people that were deeply involved in running these lines, they were not initially well regarded. Roughly 8 out of 10 said they would not recommend buying them again. However, as time progressed, they became more and more (at least) used to the lines.

The other issue is the potential longevity of the Setpoint lines. The World War II vintage machines are heavy cast iron frames and giant flywheels. These machines have been fully rebuilt multiple times to like-new condition with replacement of the bronze bushings and re-scraping the gibbs and ways of the ram. They are also modernized with Programmable Logic Control systems to improve the machines to semi-modern standards. These machines can literally be rebuilt an unlimited amount of times. The servo cells are too new to know if they can last the 70-plus years of the old crank presses. The rumor mill indicates that there are currently more lines on order from Setpoint.

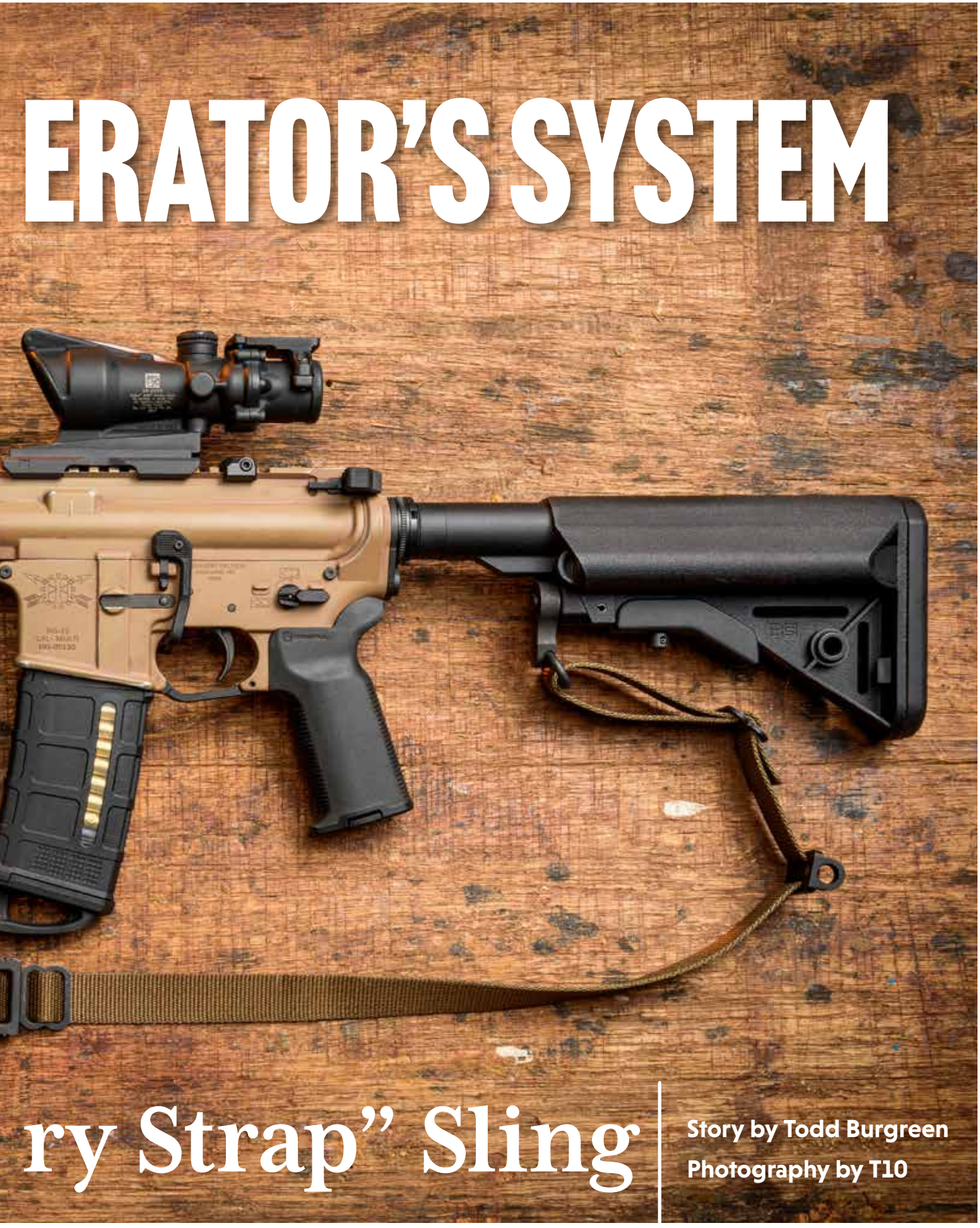
The global ammunition market lags behind other industries in terms of equipment technology. The Setpoint systems approach brought it into current times. There are numerous other trends where ammunition producers are going with more modern concepts. Time will tell if the trend continues or if there are to be another 50 years of stagnation. Outside of the SCAMP and Setpoint lines, the rest of Lake City and the U.S. ammunition base still uses a majority of the World War II surplus equipment—just rebuild it once every 5 or 10 years and it keeps on hammering out parts. SADJ

T10'S MODULAR OP



Not Just Another "Car

ERATOR'S SYSTEM



ry Strap" Sling

Story by Todd Burgreen
Photography by T10

An important component of the T10 slings is their Break-Away Pull-Tab System. The oversized pull tab is connected to the sliding buckle via coated stainless steel cable. Paul wanted the pull tab larger than the sling so that it could be found intuitively in the dark or when under stress. The T10 2:1 point QD adapter is also visible.

Previous page. **The T10 MOS consists of T10 ALPHA (or BRAVO) 2:1 Point Sling, Safe-Break Pull Tab System, Swinger SOPMOD Stock, Swinger Sling Mount, 2:1 Point Sling QD adapter, T10 Heavy Duty Black Nitride QD, 45° Offset 1913 QD Rail Adapter, Steel Thumb Loop Cables (5", 6", 7") and Mil-Spec Triglide.**

This is not your typical sling review because the T10 (Tech Ten Tactical) Modular Operator's System (MOS) is not your typical sling system. We all recognize that an operator's weapon is just the starting point for being prepared. Training and ancillary equipment such as sights/optics, ammunition, magazines and lights/lasers all combine to support the platform and enhance capability. Sling setup and configuration on a rifle or carbine is often ignored, while a holster's importance in effectively carrying and deploying your handgun is readily recognized. Why isn't the rifle sling so prominent in gear consideration? It should be.

Brief range sessions will not highlight the importance of a rifle sling. Often a sling is removed so as not to "get in the way" during perfunctory drills. Editorially speaking, slings are removed before photo sessions so as not to take away or distract from the weapon being discussed. The connation here is that the rifle sling is a mere strap to loop over your shoulder. Time spent with T10's founder, Paul Bergman, will quickly educate you differently. The guy is passionate about his product and how it improves performance and user experience.

Any participation in serious training will educate how important proper sling setup is, especially if the weapon is used in a CQB environment where transitioning between shoulders is paramount. While T10 provides numerous individual components, we are going to focus on T10's all-inclusive Modular Operator's System (MOS) to convey the full effect of what is being offered. The T10 MOS is the result of six years of research and development, including overseas testing and listening to feedback from elite operators. T10's Paul Bergman is a 21-year veteran of the U.S. Navy. A large part of Paul's service time was as a Gunner's Mate supporting various SEAL Teams. Paul is a subject matter expert in small arms in use

By placing the T10 Sling Mount under the front of the buttstock, T10 uses the weight of the weapon to reinforce the QD connection point, especially when hanging—not pulling away as some slings systems do when placed on the side of the buttstock.

by the U.S. Navy and U.S. Marine Corps, as well as in a wide variety of other domestic and foreign weapons systems. One can only imagine the number and types of training evolutions and downrange action Paul has witnessed that laid the groundwork for the MOS sling system. Let's get into the details of the T10 MOS sling system.

The T10 MOS consists of T10 ALPHA (or BRAVO) 2:1 Point Sling, Safe-Break Pull Tab System, Swinger SOPMOD Stock, Swinger Sling Mount, 2:1 Point Sling QD adapter, T10 Heavy Duty Black Nitride QD, 45° Offset 1913 QD Rail Adapter, Steel Thumb Loop Cables (5", 6", 7") and Mil-Spec Triglide. All of this translates into a sling system that is thought out in every detail. Two key elements of the T10 MOS are the T10 ALPHA or BRAVO sling mated to patented T10 Swinger Sling Mount.

The Swinger Sling Mount allows for 200 degrees of motion when used with T10's Swinger SOPMOD stock. A T10 Stock Insert allows for B5 Enhanced SOPMOD or LMT SOPMOD stocks to be retrofitted to accept the Swinger Mount. The Swinger Sling Mount is installed by QD socket type fitting. By placing the T10 Sling Mount under the front of the buttstock, T10 uses the weight of the weapon to reinforce the QD connection point, especially when hanging—not pulling away as some slings systems do when placed on the side of the buttstock. The Swinger Sling Mount's ability to swivel side to side minimizes sling binding or wrapping around your neck during transitions between shoulders. This is important when shooting from behind cover, in or near vehicles, corners, doorway, hallways, etc. The Swinger Sling Mount's distinctive shape is no accident. This design allows the sling to stop rotating before twisting can occur. The Swinger Sling Mount is made of 1/4-inch solid steel with a large QD push

The T10 Swinger Sling Mount allows for 200 degrees of motion. The Swinger Sling Mount is installed by QD socket type fitting into a T10 designed insert that fits into a cavity under the stock.

button to allow for quick removal from your rifle if needed.

T10 innovation does not stop with the Swinger Sling Mount. The ALPHA and BRAVO slings are worthy for consideration as stand-alone use without the complete T10 MOS system. T10 ALPHA (316 stainless steel Buckle/DLC Coated) and BRAVO (4140 carbon steel Buckle/black nitride coated) slings are a full 84 inches long (longer lengths possible if mission requires) of the finest U.S.-made materials and methods. T10's website does a great job detailing specifications in terms of materials used, stitch patterns, thread type, slide stop design and so on. Paul wanted slings that could double as pull straps, tie-off lines or any other use that might be required afield.

An important component of the T10 slings is their Break-Away Pull-Tab System. The oversized pull tab is connected to the sliding buckle via coated stainless steel cable. A zip tie can be used as well to secure the tab to the sliding buckle. Paul wanted the pull tab larger than the sling so that it could be found intuitively in the dark or when under stress. The pull tab was designed to utilize gross motor skills for adjustment either by pushing or pulling via web of your hand once the thumb is inserted inside the cable. No need to grasp only with fingers which can be problematic with gloves on or in dark, wet and/or cold conditions. With the T10 sling, hook your thumb within the cable, which will guide your hand to the oversized tab, so you can then push away to open the sling while then seamlessly grasping the forend with your hand to engage target. The same general method is used to pull the tab inward toward your body to tighten up the sling. Paul states there is an economy of motion to the T10 movements. All important in a hostile environment. An integral stop stitched into the T10 sling keeps you from sliding the buckle too far forward perhaps entangling with the forward QD mount. The connecting stainless steel cable between the sliding buckle and pull tab will release if 180 pounds of force is encountered. This keeps the operator moving during CQB operations if snagged on something. The sliding buckle has machined ridges on the side that can be used to adjust the sling if the pull tab is removed by choice or breaks away. The T10 sling method takes longer to write about than to actually do.

The Swinger Sling Mount's distinctive shape is no accident. This design allows the sling to stop rotating before twisting can occur.

The T10 MOS gives the user a complete system from SOPMOD buttstock

The Swinger Sling Mount's ability to swivel side to side minimizes sling binding or wrapping around your neck during transitions between shoulders. This is important when shooting from behind cover, in or near vehicles, corners, doorway, hallway, etc.

An important component of the T10 slings is their Break-Away Pull-Tab System. The oversized pull tab is connected to the sliding buckle via coated stainless steel cable. T10 designed the pull tab to be larger than the sling so that it could be found intuitively in the dark or under stress. The connecting stainless steel cable between the sliding buckle and pull tab will release if 180 pounds of force is encountered.

(an upgrade over most standard issue buttstocks) to forend with 45 degree offset QD rail adapter. The T10's 2:1 point QD adapter allows both single and two point sling use. Each method has its pros and cons, along with advocates for and against. The T10 MOS allows the user to decide.

Since encountering the T10 MOS sling, I've incorporated it every chance I get with various AR rifle/carbine evaluations. Echo Valley Training Center's Hesco Shoot House and numerous range vehicles provide excellent proving ground for both weapons and T10 MOS sling. It does not take long to appreciate the difference between what the T10 MOS offers versus other slings when maneuvering down a hallway to different doorway configurations or working around a vehicle trying to maintain as much cover/concealment as possible. The ability to shift your weapon into the optimum position without adversely impacting the sight picture due to snagging/binding is significant.

If carrying or using a rifle is part of your job description, you will have no doubt about how important a sling is. A sling is far more than a mere carry strap. A sling offers retention of your weapon in a rough and tumble tactical realm, assists with accurate shot placement, et al. The T10 MOS sling does all this and more—it promotes smooth interface between user and weapon by allowing the rifle to be placed in optimum positions while navigating around terrain and structures. SADJ

WEBSITE OF INTEREST

T10
techtentactical.com

SA-80 0.22 Small Bore Rifle. Note the use of an L41A1 "Kit Conversion" magazine.

New SA80 0.22 Small Bo

Story and Photography by Richard D. Jones

The recent introduction of the L85A3 variant of the British SA-80 5.56mm assault rifle, or "Individual Weapon" (IW) as it is called, has now been followed by a further in-house development by Heckler & Koch, the current fleet support manager of the group of small arms that were developed under the "Small Arms of the Eighties" (SA-80) program.

The requirement for a new SA-80 configured small bore rifle arose when the existing .22 Long Rifle calibre L41A1 "Kit Conversion" (Sub-calibre device) was declared obsolete and withdrawn from service. This has left regular units and Cadet forces with no alternative to practice their indoor range marksmanship skills with a service-issue rifle offering the necessary handling and shooting skill requirements of the parent weapon.

The new variant, according to contract details, will be a "Modification of the SA-80 Light Support Weapon (LSW)(1) and Conversion to SA-80 0.22 Small Bore Rifle." System of operation of the new variant is simple "blow-back" using a modified form of breech-block used in the L41A1 "Kit Conversion" and the magazine of the latter. Initial issues of the new variant will be configured as the current L85A2 variant, although this might change as fleet-conversion to L85A3 standard continues over the longer term. The new variant has as yet (May 2021) to be allocated a requisite "L" Series designation.

The contract for conversion will see an unspecified number of L86A2 LSW held in reserve stocks converted to the new configuration by Heckler & Koch at their Oberndorf facility in Germany. Principal features of the conversion will be:

a. A new purpose-built and fitted barrel in 0.22 Long Rifle (LR) calibre.
b. To meet a built-in design requirement, 'Select-Fire' components as fitted to the parent weapon will re-manufactured to permit single-shot only as a built-in design requirement or removed entirely (e.g. Select-Fire lever fitted to the left rear of the receiver in the latter case).
c. The upper and lower receiver (TMH)(2) have been modified to avoid interchangeability issues with the current SA-80 A2 and A3 in service rifles.

While the number of LSWs to be converted remains unknown, numbers are likely to be significant, based on contract costs. The first contract for conversion, awarded in September of 2020, was in excess of GBP £386,000. This initial contract was followed in October of 2020 by another valued at £425,000 plus; although it is presently thought that

SA-80 0.22 Small Bore Rifle, with magazine removed. Note the absence of "select-fire" lever on the lower rear of the receiver.

re Rifle to Enter Service

the second contract is an enhancement of the initial contract, rather than a "second buy." As is becoming increasingly common with British MoD procurement of small arms, "suppliers" are also being asked to provide a "life-cycle and maintenance service" as part of the contract, making it difficult in the first instance to assess "unit" cost from a total contract sum.

The UK Ministry of Defence (MoD) sponsors a significant number of Tri-Service "Cadet" units, the total number of enrolled cadets is significant, being listed in April of 2020 as in excess of 130,000, who all require, depending on circumstances, to be taught basic shooting skills. With the withdrawal of the L41A1 "Kit conversion" already mentioned, the concurrent withdrawal of the very long-serving No8 Mk1 0.22 bolt action rifle (based on the 0.303" No4 rifle) leaves only the recently introduced "Cadet Small Bore Rifle - L144A1" (based on the Savage Mark II FVT .22 LR bolt action rifle) available for development of basic shooting skills within Cadet units (the new small bore variant of SA-80 going a long way to meeting an effective training need of the Cadet forces, over and above that of the manually-operated bolt action alternatives).

When will we begin to see examples of the new rifle entering service? Sometime soon is probably reasonable, if somewhat obvious, as there is clearly a significant ongoing requirement for such a capability of small bore rifle and weapon handling skills that the new variant provides. Known contract delivery dates specify (a notional?) start date from September of 2020 to final delivery in September of 2023, initial deliveries no doubt being severely impacted by the ongoing business uncertainties of the current COVID pandemic.

Author's Comment: There is thought to be significant sporting market potential for a copy of this new variant when produced from newly manufactured components, which are fully compliant legally with the requirements for a "purpose-built" self-loading only, small bore calibre rifle. Few of us will ever get to own the select-fire original, this variant based on the full-calibre rifle, offering the size and handling characteristics of the parent, is likely to be as close to owning an L85A2 that most shooters will get!

(1) L86A2, as it is otherwise known.

(2) TMH (Trigger Mechanism Housing). As this component (lower receiver) carries the weapon's serial number it is classed as the "The Weapon" in British use. SADJ

The Malyuk rifle is available in 5.56x45mm, 7.62x39mm and 5.45x39mm, and feeds through AKM- and AK-74-type magazines.

The Ukraine has long been flirting with the idea of adopting a bullpup rifle for its armed services and security forces—at least for as long as it has been independent from the former Soviet Union.

Ukraine's "Baby" AK Packs a Punch!

By Pierangelo Tendas | Photography by InterProInvest LLC

The "Malyuk" rifle, offered by the InterProInvest company and the Krasilov Aggregate Plant, is the latest entry in a lineage of Kalashnikov-based bullpup designs to come out of Ukraine—and so far has been met with more success than its predecessors.

The Ukraine has long been flirting with the idea of adopting a bullpup rifle for its armed services and security forces—at least for as long as it has been independent from the former Soviet Union. Experiments with a bullpup conversion of the well-known Kalashnikov AK/AKM/AK-74 started with the State-run "Scientific Center for Precision Mechanical Engineering" and the National Space Agency of Ukraine in 1993/1994, under the direction of an engineer from the earlier entity, by the name of Sergei Naumov.

In 2003, it was announced that the result of such a long effort would "soon" be inducted into service with

Members of Ukraine's 73rd Naval Spetsnaz Center conducting a VBSS (Visit, Board, Search & Seizure) training session with Malyuk rifles.

Right-side view of the IPI Malyuk, a.k.a., "Vulkan-M," bullpup assault rifle. This sample is shown with a 5.45x39mm magazine.

the Ukrainian Armed Forces: named the Vepr ("Wild boar"), this was the first assault rifle to be fully engineered in the Ukraine, and it was a pretty straightforward, somewhat crude-looking bullpup conversion of the AKM assault rifle design—so much so that plans were to proceed to do an overhaul and conversion of existing 5.45x39mm caliber AK-74Ms already in Ukrainian service at a meager cost—the equivalent of approximately 160 U.S. dollars per rifle, and that's including the additional "overhaul" to the design introduced in 2004 with the addition of an underbarrel grenade launcher based on the 40mm GP-25.

Featuring a black polymer pistol grip and lower handguard portion directly taken from the AK-74M, a side-mounting bracket for optics, an AKM-type rear sight and a fixed front sight patterned after the AR-15 style Delta, the Vepr rifle languished for years as adoption was postponed almost indefinitely. As of October 2004, only ten test samples for military trials had been produced, and after so many years, and with many more years passing, it was clear to almost everybody that the Vepr was essentially dead in the water.

But despite the political turmoil that saw Ukraine torn between the east and the west (or maybe *because* of that turmoil) things were still moving. Another Ukrainian State-owned firearms manufacturer—more specifically RPC FORT, best known for its line of semiautomatic pistols—reached an agreement with Israel Weapon Industries Ltd. in 2008 to start licensed manufacturing of the IWI Tavor and X95 line of bullpup rifles, carbines and submachine guns in 9x19mm, 5.56x45mm and 5.45x39mm for Ukrainian government entities.

Pushed by individual members of the military and a combination of public and (mostly) private investors, the Vepr design was updated and

improved in the following years. Pictures and scarce information concerning an improved prototype initially named "Vulkan," then "Vulkan-M," would surface here and there from 2005 onwards.

It was not until 2015 that the company behind the development of these prototypes—InterProInvest, or IPI for short, some of whose members had participated in various capacity to the development of the Vepr—officially launched the final version, dubbed the Malyuk ("Baby kid" in Ukrainian) at the Arms & Security Expo in Kiev.

Since then, the Malyuk rifle has been showcased in numerous international trade shows of the armaments and defense sector, and aside from InterProInvest, at least another company—the State-owned KAZ, or Krasilov Aggregate Plant, as announced in 2015—seems to be engaged in its manufacturing.

It is likely that the former manages the handling of property rights and the manufacturing for potential export sales, while the latter manufactures the Malyuk for internal customers within the Ukrainian military and law enforcement market.

Indeed, unlike the Vepr, the Malyuk has been officially adopted by the Ukrainian Ministry of Defense and has been observed with some Ukrainian Army, National Guard and Special Forces units.

The USE—Ukrspecexport trading company, a subsidiary of the State-owned Ukroboronprom conglomerate—handles foreign sales of the Malyuk rifle, although if any foreign contracts have been won at all, so far none have been publicly announced.

Manufactured or … Converted?

Like its predecessor, the Vepr, the IPI Malyuk assault rifle is essentially a bullpup conversion of the AK/AKM rifle design that can be built or assembled on newly manufactured receiv-

Manufactured by InterProInvest and the Krasilov Aggregate Plant, the Malyuk rifle has been adopted by the Ukrainian Ministry of Defense and is in service with the Ukrainian Ground Forces, Special Forces and National Guard.

ers and barrels, or be assembled from parts taken from existing stocks.

As of today, the Malyuk rifle is available in three calibers: 5.56x45mm, 5.45x39mm and 7.62x39mm. All versions feed from the relevant AK-variant magazines, including 40-round RPK and RPK-74 magazines. The 5.45mm and 7.62mm variants are in service with units of the Ground Forces, Special Forces and National Guard of the Ukraine.

In the process of manufacturing (or conversion of) the standard receiver, the barrel and gas block of an AK-type rifle are fitted with numerous polymer modules: a rear block that acts as the buttstock and new magazine well for the rifle, with a ribbed buttpad that can twist to the side, providing access to a storage compartment for a standard AK cleaning kit; a full-length top cover that goes literally butt to barrel, integrates the return spring for the bolt carrier group, and features a 27-slot MIL-STD 1913 Picatinny aluminum rail for optics and flip-up iron sights; and a grip and forend assembly,

The "Riff" is a man-portable, battery powered anti-drone weapon manufactured by InterProInvest and built on a polymer chassis using Malyuk rifle parts.

with a wide trigger guard and drilled slots at 3, 6, and 9 o'clock on the handguard for additional Picatinny rail portions, allowing the installation of tactical accessories or—possibly with the use of an additional interface—underbarrel grenade launchers.

The polymer components are rein-

The ribbed buttpad can be rotated out of the way to access a standard AK cleaning kit stored within the polymer assembly.

The Malyuk has been observed with Ukrainian forces, as in this picture taken during a joint training session between Ukrainian and U.S. special forces; the two operators in the front are armed with Malyuk rifles, the operator in the rear is a member of the U.S. special forces armed with an unknown M4 carbine variant.

forced with metal inserts where needed, but the top cover features multiple venting holes on both sides and the grip assembly is hollow; according to the company literature provided by InterProInvest, this feature is a "convection cooling system," meant essentially to allow better air flow and improve cooling during intense use.

The Malyuk rifle mounts a standard AK-74M-type barrel, minus the front sight but with the standard AK-74-type muzzle brake and relevant mount; unscrewing these two reveals a thread at the muzzle where a proprietary silencer, manufactured specifically for the Malyuk by InterProInvest, can be attached. Tests, which can be observed in various videos easily found on numerous hosting platforms, show the silencer to be very effective.

The bolt of the Malyuk rifle is essentially the same as an AK bolt, and the same goes for the bolt carrier, meaning, of course, that the Malyuk shares its predecessor's working system, but in the Malyuk's case, the integral cocking handle has been removed from the bolt carrier.

The gas tube is also model-specific and includes a sleeve on which a flat polymer charging handle is attached. The resulting forward cocking handle can supposedly be located on either side of the rifle for left-handed or right-handed users—although that requires field stripping—and is reciprocating.

Being based on the AK design, the Malyuk has no hold-open capabilities on its own, other than those poten-

The field strip reveals the high commonality of components between the Malyuk and the legacy, conventional AKM and AK-74M rifles.

tially provided by the magazine—it can feed from magazines with a hold-open feature.

Another concession to ambidexterity in the Malyuk platform exists in form of a clip-on sheet metal brass deflector that can be attached to the rear portion of the top Picatinny rail to partially wrap around the ejection window and push spent cases away from the shooter's face.

Additionally, a recent CAD drawing released by IPI shows a new type of buttpad for the Malyuk, which can be extended to adjust the rifle's LOP to fit the body ergonomics and individual equipment of each user. A concept patterned after a similar system found on the VHS-2 bullpup rifle of Croatian manufacture, the extendable buttpad could, in conjunction with the brass deflector, make the Malyuk more left-hand friendly.

Members of Ukraine's 73rd Naval Spetsnaz Center conducting a VBSS (Visit, Board, Search & Seizure) training session with Malyuk rifles.

Not Really Drop-In

All this said, however, the Malyuk should not be mistaken for a straightforward drop-in conversion kit for AK-type rifles, as according to InterProInvest, the existing original AK receiver and some components would need to undergo "substantial" modifications for the rifle to be converted into the Malyuk configuration.

For starters, a new trigger assembly is required; it attaches in front of the original trunnion, and is kept in place by a dedicated metal support. The InterProInvest company released the instruction manual for the Malyuk

The lever located just over the barrel, clearly visible in this photo, is not a gas regulator but a retaining latch that must be fully rotated counterclockwise to allow field stripping.

rifle on its official website (albeit in Ukrainian only) where other modifications to the original trigger group are also illustrated.

The new trigger group also includes a flat lever, which is located inside the trigger guard and behind the trigger itself (pretty much looking like a second trigger) that doubles as a magazine release catch. By pushing it, the magazine is released and pushed out of its well, effectively making the Malyuk a drop-free magazine release design, a feature whose importance is often overlooked.

On the other hand, particularly in the 7.62x39mm version, there isn't much space between the magazine and the grip for the user to rock the magazine in or pull it out in a conventional way, so a solution that would make reloading more practical was paramount. For the same reason, the magazine well has been designed in a way that allows the magazines to be inserted without needing to be rocked back as users would normally need to do with a conventional AK derivative.

The Malyuk rifle can retain the standard AKM-type fire selector, or be fit-

TECHNICAL SPECIFICATIONS

Manufacturer	InterProInvest LLC., KAZ (Krasilov Aggregate Plant)
Model	Malyuk ("Vulkan-M")
Type	Assault rifle
Calibers and Twist Rates	5.56x45mm (1:9"), 7.62x39mm (1:9.½"), 5.45x39mm (1:7")
Action	Select-fire, gas-operated, long-stroke piston driven
Trigger System	Single action
Safety	Manual safety
Capacity	10-, 30- or 45-round in AKM-, AK-74- or RPK-compatible magazines
Sight Systems	MIL-STD 1913 Picatinny rail for optics
Rate of Fire	660/700rpm
Barrel	16.33in, removable flash hider
Overall Length	28in
Weight (Empty)	8.37lbs
Materials	Steel barrel, receiver and action; reinforced polymer top, bottom and rear assemblies
Finishes	Matte black finish on metal surfaces, matte black polymer assemblies

The Malyuk bullpup assault rifle is the latest entry in the Ukrainian arsenal, and the latest in a long lineage of bullpup versions of the AK platform.

ted with an ambidextrous low-profile two-position lever for semiautomatic and full automatic fire. The manual safety is separated, located within the grip assembly in form of a cross-bolt push button that blocks the trigger.

Disassembly of the Malyuk rifle isn't hard, but not as straightforward as one would expect from an AKM derivative. In order to field strip the Malyuk, a retaining latch located just above the barrel must be fully rotated counterclockwise and a front passing pin removed to the right, allowing the grip assembly and the upper railed assembly to be detached in this exact order, allowing access to the moving component. The Malyuk strips in six major parts overall. The rear polymer assembly, the one that acts as both the buttstock and the new magazine well, is secured to the receiver and cannot be removed.

Pros and Cons

The Malyuk rifle features front and rear attachment points for a standard AK sling on both sides; it is 28 inches long overall with its 16.33-inch barrel, and weighs in at 3.8kg (8.37lbs), which is still pretty hefty all things considered, and despite the massive use of polymers.

At a rate of fire that reaches 660 to 700rpm, the Malyuk is still pretty controllable (potentially because of the weight levels) and muzzle velocities range between 715 to 940 meters per second (approximately 2345 to 3083 fps) depending on the caliber.

While the Malyuk appears to be better from many points of view if compared to the oh-so-many other AK bullpup conversions that hit the market in the past decades, it is clear even at a first glance how it suffers from severe inherent drawbacks, ranging from poor ambidexterity to a less than stellar trigger: long linkages aren't conclusive to great triggers after all, and the trigger pull weight of the Malyuk has been recorded as ranging from 2 to 5 kilograms (4.4 to 11 pounds), as illustrated in official literature.

Not to mention the solution chosen to obtain a quick and ambidextrous drop-free magazine capability—with what's essentially a "second trigger" located inside the trigger guard, right behind the trigger proper—requires a good amount of training to prevent mishaps.

All in all, the Malyuk may be one of the best (if not *the* best) AK bullpup conversions (certainly not a straightforward drop-in one) but it still carries the original sin of being essentially that—a conversion.

As the history of firearms has shown, bullpup designs have been successful as long as they've been designed as bullpups from the ground up; and while even *that* is not always guaranteed—and everything ultimately goes down to each one's individual ideas and preference about bullpup rifles, which are and will remain a controversial point of conversation for the foreseeable future—the fate of conversions has never been stellar.

Whether or not the Malyuk will follow or break this tradition is still left to be seen. In the meanwhile, as of 2021, InterProInvest is publicizing no less than three additional versions of the Malyuk design.

More specifically, the Shepit ("Whisper") is a special applications marksman version of the baseline Malyuk with a longer barrel, equipped with a purpose-built silencer and supported by a long machined cradle that also doubles as a bipod attachment; the "Riff", instead, is a 100 Watt portable, battery powered anti-drone weapon built on the Malyuk rifle's polymer structure.

Lastly, the Malyuk-K is a semiautomatic-only version of the design meant for civilian sales, available in two variants: the K-01, chambered in 7.62x39mm, and the K-02, chambered in 5.56x45mm/.223 Remington. This version is commercially available in the Ukraine at a price close to 76,000 UAH, which is over $2,800 USD at the current exchange rate at press time. That's pretty expensive, even by high-end American and European MSR standards. Is it worth it? As of today, we haven't had a chance to verify. SADJ

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Explosives, Propellants and Ignition—A Chronological Journey (Part 2)

By Paul Evancoe

In Part 1 of this article, we explored the developmental chronology of explosives and propellants along with their entwined relationship to one another. In this segment (Part 2), we'll explore the developmental chronology of explosives used for ignition and the firearms firing mechanisms that advanced as a result of their invention. In the case of ignition explosives and firearms firing mechanisms, there is no question which came first (e.g., the chicken or the egg). Clearly, explosives, propellants and ignition development advanced firearms design.

Explosive's ignition evolution is perhaps one of the more intriguing aspects of the explosives and propellants development story. The earliest form of small arms used a matchlock for ignition of the black powder main charge. The first references to the use of what is believed to have been a matchlock-style firing mechanism was by the Janissary (meaning "new soldier") corps of the Ottoman army in (circ.) 1394. The Janissary corps was an elite infantry unit that provided security for the Ottoman Sultan and his household—basically his private army. The Janissary corps historically marked the first modern standing army in Europe.

The matchlock firearm used by the Janissary corps employed a simple lever-like mechanism that held a smoldering piece of rope/cord above a flash pan filled with black powder. To fire the gun the shooter would pull an S-shaped lever, which held the smoldering cord, up. This motion forced the opposite end down, putting the smoldering rope in contact with the black powder in the open flash pan. This, in turn, ignited the powder in the flash pan which subsequently burned through a small torch hole that connected the flash pan to the interior firing chamber of the barrel, igniting the main charge. Obviously, it didn't work very well in the rain and was a safety nightmare in the wind because the smoldering rope occasionally dropped sparks into the open flash pan, causing accidental discharges. Nonetheless, it was a beginning and firearms ignition technology quickly evolved from this unsophisticated creation.

The matchlock was followed by the wheellock. The wheellock's name comes from its rotating steel wheel which provided ignition. Developed in Europe in the early 1500s, the wheellock was little more than a small steel friction wheel mechanism positioned above the flash pan. It worked by spinning a spring-loaded steel wheel against a piece of iron pyrite, which in turn, generated sparks that ignited the powder in the flash pan below. The pyrite was clamped in a small (vise-like) jaw on a spring-loaded arm (called a "dog"), which rested atop the flash pan cover.

When the trigger was pulled, the pan cover was simultaneously opened, and the wheel was rotated with the pyrite pressed into contact under spring tension. This produced a shower of sparks that fell into the flash pan, igniting the primer charge. The primer charge burned through a small torch hole into the barrel and ignited the main charge of propellant. The operation of a Zippo lighter is a close modern analogy of the wheellock mechanism; where a toothed steel wheel is spun in contact with a piece of flint (sparking material) under spring tension to ignite the fuel.

In contrast to the common matchlock firearms of that era, which required a smoldering cord to fire the flash pan, the wheellock firearm was the first to be instantly ready to fire and could be operated with one hand (most desired for pistol application). Conversely, wheellock mechanisms were complex and therefore costly to make. Nonetheless, the wheellock his-

PAUL EVANCOE

The flintlock debuted sometime in the 17th century. The trigger mechanism uses a spring-operated hammer that carries a piece of flint clamped in its vice-like jaws. The flash pan is covered with a hinged top cover that has a purposeful striker face called a "frizzen." When closed, the frizzen prevents the powder in the frizzen (flash) pan it covers from spilling out and also provides a margin of weatherproofing.

torically marked the first self-igniting firearm. A complete gun was composed of a "lock, stock and barrel" and that is precisely the genesis of that old saying still used today.

The snaplock came next. Believed to have originated in southern Germany during the 1540s, it looked and operated much like a flintlock, which was essentially an improved version. In all snaplocks (and flintlocks), a flint is held in a clamp at the end of a bent lever called the cock. When the gun is "cocked", the cock is held back, against the pressure of a spring, by a catch (later called a "sear") which is part of the trigger mechanism.

When the trigger is pulled, the catch is released, and the spring transports the cock rapidly forwards. The flint strikes the face of a curved plate of hardened steel, called the "steel." This creates a shower of white-hot steel shavings (sparks) which fall downward into the flash pan below containing the flash powder. The flash from the pan burns through the torch hole into the barrel and ignites the main propellant charge. The term "flash in the pan" is derived from this process when it failed to burn through the torch hole and ignite the gun's main propellent charge. It was just a "flash in the pan."

From a manufacturing perspective, the snaplock was both easy and cheap to produce. Operationally, the flash pan could be primed, and the gun loaded in advance for firing at a moment's notice, giving its user the first shot advantage in a gunfight. By the 1560s the German snaphance superseded the snaplock, further refining the flintlock-style action. By 1640 the snaplock and its improved versions was largely superseded by the flintlock, except in Sweden and Russia, where the snaplock remained in use into the 1690s. There is no historical rationale for that decision although one might surmise that it was budgetary.

As an aside, it's worth mentioning that pneumatic weapons (air guns) made their debut during this same timeframe (circ. 1580). Expensive to build, these rapidly repeating air guns were used by wealthy European aristocrats for sport hunting. They were chambered in .46 caliber and fired a lead ball similar to their black powder cousins at nearly the same velocity. Reportedly, they were lethal out to 100 yards against big game like wild boar and deer. These air guns far exceeded the accurate range of black powder muskets of the same period. Designed by Italian gunmaker Bartolomeo Girardoni (circ. 1779), the Austrian army quickly adopted Girardoni's air rifle (circ. 1780) as an alternative non-black powder rifle for military use (imagine a combat air rifle). Notably, at the turn of the century Girardoni's air rifle was carried by the Lewis and Clark Expedition to explore and map the western part of North America. But that's a different story in a future *SADJ* issue.

Returning to guns that use a chemical propellent … sometime in the early

PAUL EVANCOE

The caplock consists of a hammer and a nipple (also referred to as a cone). The hollow metal nipple contains a flash hole which leads into the gun barrel's breech-end firing chamber. The percussion cap is placed over the hollow metal nipple. Pulling the trigger releases the hammer, and the falling hammer strikes the percussion cap, causing the friction sensitive mercuric fulminate to detonate. Flames from this explosion travel through the hollow nipple which doubles as the torch hole to ignite the main powder charge.

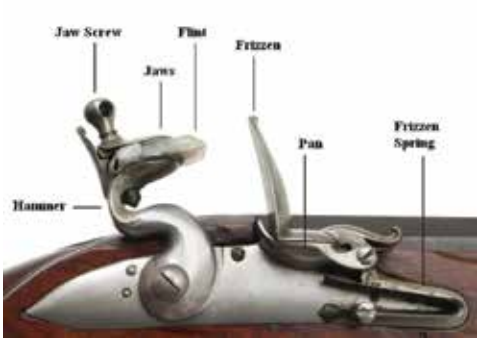
17th century the flintlock debuted with a mechanism more closely resembling today's firearms. The trigger mechanism was further refined, as was the spring-operated hammer that carried a piece of flint clamped in its vice-like jaws. The flash pan was now covered with a hinged top cover that had a purposeful striker face called a "frizzen." The frizzen prevented the powder in the frizzen (flash) pan it covered from spilling out and also provided a margin of weatherproofing from the environment.

The flintlock worked similar to its predecessor flint-ignited weapons. When the trigger was pulled, a spring flung the hammer forward. The hammer drug the flint it carried (clamped securely in its small vice-like jaws) down the frizzen's steel striker face while also opening the hinged top cover. The flint against steel generated a shower of sparks that dropped into the black powder primer in the frizzen (flash) pan igniting it. The primer burned through the torch hole igniting the gun's main propellant charge—and bang!

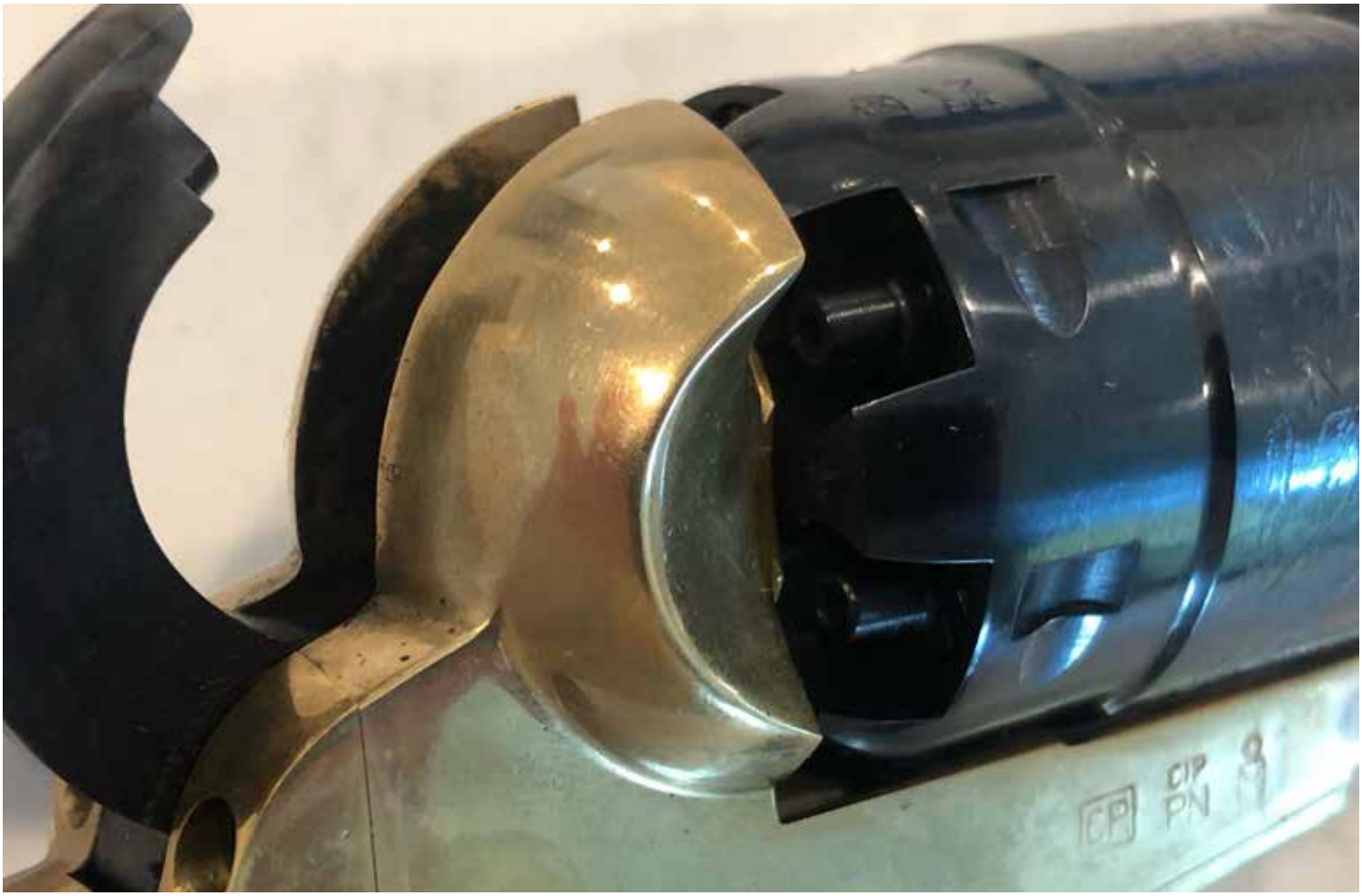
Since these early ignition systems had no safety as we know them today, most were built with a hammer halfcock position to prevent accidental discharge. A halfcocked hammer was held about halfway back from the fully cocked firing position and was not in contact with the frizzen (no chance of sparks). The trigger was disengaged as well. In order to fire the gun, the shooter had to physically pull the hammer to its full backward (fully cocked) position. This generated another old saying, "Don't run off halfcocked." Meaning, you can't fire your gun if the hammer is in the halfcocked position.

While still lacking battlefield and environmental reliability, the flintlock remained the main source of ignition for muzzle loading firearms until the mid-19th century, when flintlocks were replaced by more reliable percussion lock systems. Even though long obsolete, flintlock weapons are still sought after by modern re-enactors, collectors and hunters in U.S. states that have dedicated black powder hunting seasons. Flintlock weapons are still produced today by quality firearms manufacturers such as Armi Sport, Pedersoli and Euroarms.

As early as the 1650s, there was a



Flintlock Mechanism



PAUL EVANCOE

Cap and ball pistols led to the modern revolver. These early black powder pistols required time intensive loading for each of its 6 chambers. While it outgunned the single shot muzzle loading pistol that preceded it, the cap and ball recover was still slow to load.

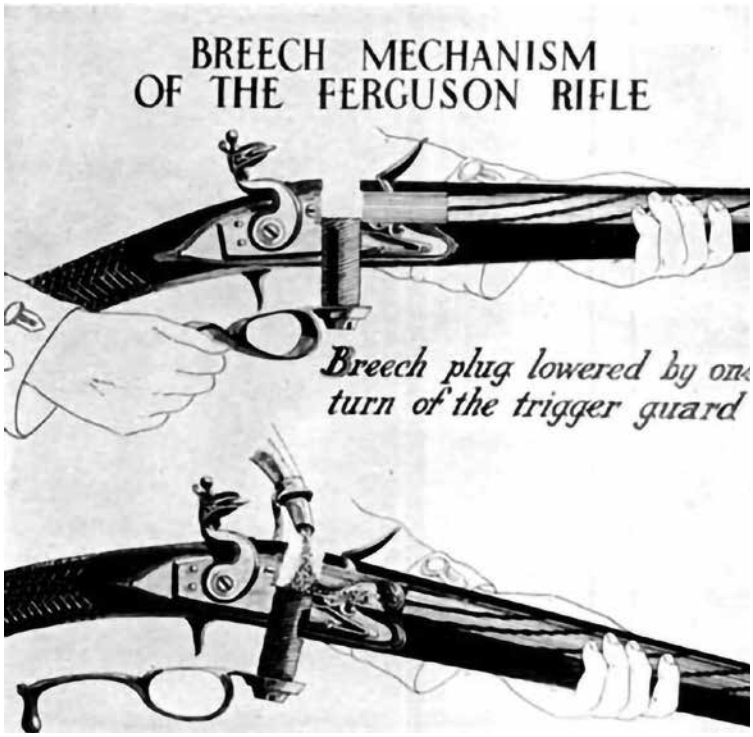
design effort to make the flintlock muzzle loader a faster firing, more reliable firearm. Breech-loading seemed to be part of the solution for faster loading. A number of various ideas were tried but only a few caught on. One of the more notable was developed during the reign of England's King William III (1689-1702). It worked by unscrewing the gun barrel from the rest of the gun's frame (later known as the "receiver") so the barrel could be breech loaded. The technique didn't work very well for long guns because of the barrel length, but it worked acceptably for pistols. The pistol version became popular during the subsequent reign of Queen Anne of Great Britain (1702-1714) and it took her name—the "Queen Anne pistol."

Another breech-loading flintlock design of this era employed a removable screw plug set into the side of the barrel's breech (bottom) end. This made loading the tight-fitting bullet and patch easier than ramming it down the length of the barrel from the muzzle end and somewhat accelerated the otherwise complex loading process. Most importantly, the removeable screw plug concept for firearm breech-loading was established.

In 1704, Frenchman Isaac de la Chaumette, designed a flintlock breech loading barrel. Chaumette's design used a barrel top loading port with a plug that could quickly be opened and closed by 3 revolutions of the trigger guard. In Chaumette's unique design, the plug remained attached (captured) to the barrel once the loading port was opened. The ball and powder were loaded from the top of the barrel through the open port and then, with 3 turns of the trigger guard, the plug was cranked closed. Chaumette's crude screw "bolt action" was the father of the modern breech-loading bolt action.

About 65 years later, during the 1770 timeframe, British Army Colonel Patrick Ferguson improved Chaumette's 3-crank removeable breech plug design for use by the British Army in the American Revolutionary War. A Scotsman by birth, and American citizen by choice, Ferguson had remained intensely loyal to the British Crown. As a loyalist and regular officer in the British Army during the American Revolutionary War, he fought with British General Charles Cornwallis against the American Patriot militia (his fellow Americans) in the Carolinas. Hated by the Patriots as traitor, he was later targeted and killed by the Patriot militia during the Battle of Kings Mountain. However, he did, prior to his death, advance breech-loading technology with his unique breech-loading action.

The Ferguson Ordnance Rifle, as it was known, employed a specially designed trigger guard that also acted as the crank to rotate a threaded tapered screw-plug on the barrels breech end. One complete turn of the crank dropped the plug low enough to allow the loading of a lead ball projectile into the open breech which was followed by a slight overcharge of black powder. The overcharge was



British Army Manual for the Ferguson Rifle

then sheared to the proper charge volume as the screw plug closed the rifle's breech. This eliminated the need to measure each powder charge—marking a huge advancement in reloading speed. Since the weapon was loaded from the breech, instead of the muzzle, the Ferguson Ordnance Rifle had the capability to fire six to ten rounds per minute, which was a comparatively high rate of fire for its day and far exceeded the three rounds per minute speed for muzzle loading weapons.

Chambered to fire a standard .615 caliber British carbine ball, about 100 Ferguson Ordnance Rifles were procured and field tested by the British Army in the American Revolutionary War. At the time, its superior firepower was likely unappreciated because the gun's speedy reload capability was overshadowed by its complex and lengthy manufacturing process (and cost). Reportedly, there were four dedicated gunsmiths making Ferguson's Ordnance Rifle and they could barely make 100 rifles in 6 months. The gun's improved breech loading mechanism was far more sophisticated to manufacture than the flintlock and that made it four times more costly per rifle than the older muzzle loading flintlock musket. As a result, the Ferguson rifle was not adopted for British military service, but it did lead the way to improved breech-loading actions.

This is where firearm design and manufacturing get interesting. John Hall, an American born in 1781 in Portland, ME, grew up as an accomplished woodworker and shipwright, but his love was tinkering with firearms and Hall became a self-taught gunsmith. Hall soon realized that flintlock muzzle loading firearms needed a standard for manufacturing so spare parts and repairs could be made by nearly anyone with a mechanical aptitude. He also dreamt of a means to mass produce a better design of breech-loader that operated more simply to reduce loading time. And all this he accomplished.

Hall rifles and carbines marked the use of a pre-manufactured combustible paper cartridge inserted into an upward-tilting chamber design breech-loading flintlock firearm. Patented in 1817, Hall's breech-loading rifle design had the barrel's chamber end (the bottom several inches of the barrel's breech-end firing chamber) made from a separate metal part that was hinged to the barrel assembly at the bottom firing chamber-end of the barrel. That allowed the chamber to pivot upward, exposing its open front end for loading. Essentially, the weapon was still loaded from the front end using this short pivoting breech-end chamber but without the need to ram the charge all the way down the bore from the muzzle end. Once the combustible paper cartridge was inserted into the open chamber, the pivoting breech block was closed which realigned the loaded chamber to the barrel's bore. The flash pan was charged, the hammer was cocked, and the gun was ready to fire.

At the time, the use of pre-manufactured paper cartridges was not new to muzzle loading, but paper cartridges weren't previously made using combustible self-consuming paper specifically for breech-loading application. Previous paper cartridge versions simply contained a pre-measured charge of black powder with a lead ball wrapped in paper. When using old style paper cartridges, the shooter would bite the paper cartridge's powder-end open and dump the premeasured powder charge it contained down the muzzle. He would then use the paper as wadding and ramrod the wadding and lead ball down the bore to firmly seat it on top of the powder. He still had to charge the flintlock's flash pan to prime the gun before it was ready to fire. While it was faster than old style individual component muzzle loading, the design still had room for improvement and Hall did just that.

Hall's combustible cartridges were made from paper soaked in a potassium nitrate solution and then dried before forming the nitrated paper into a cartridge case. The nitrated paper was intended to be exceedingly flammable and self-consuming. Using a rounded end wooden dowel of the gun's bore diameter, the paper cartridge case was formed over the dowel. The top end was twisted and tied closed with a wrap of silk thread. The empty paper casing was then inserted into a hole in a wooden block drilled to its outer diameter with the open end up. The projectile (ball, or later the bullet-shaped maxi-ball) would be inserted into the paper casing followed by a pre-measured amount of black powder. Then the open end of the paper cartridge would be twisted and tied closed. And, that was the process for making each cartridge.

All the shooters had to do was open the gun's breech, insert the paper cartridge with the ball-end facing forward (muzzle end), close the breech, charge the flintlock's flash pan, cock the flintlock's hammer and the gun was ready to fire. This seeming small invention by Hall ultimately led to modern breech-loading firearms and metallic-cased ammunition decades later.

Hall began hand manufacturing his new breech loading rifles at the rate

PAUL EVANCOE

Percussion caps come in various sizes for use on pistols and rifles. They are fitted over the nipple and provide ignition of the main propellant charge.

of 50 per year until the U.S. Army Ordnance Corps ordered 200 rifles in December of 1814 with full delivery by December of 1815—one year later. Hall knew he couldn't produce that many rifles in that short timeframe using his current hand-building methods, so he reluctantly turned down the contract. In doing so, Hall recognized that individually hand-building and hand-fitting parts to each rifle during the rifle's assembly was the major inhibiting factor slowing rifle production. In a manufacturing move well ahead of his time, he adapted his breech-loading design to something he deemed the "uniformity principle." Today we know it as mass production of interchangeable parts.

Hall proposed his revolutionary new concept of interchangeable parts along with a manufacturing strategy to mass produce them to the Army in June of 1816. That lead to a War Department contract award for 1,000 of his "Model of 1819" Hall rifles with interchangeable parts as the primary condition in the contract. Now all he had to do was turn his vision into reality.

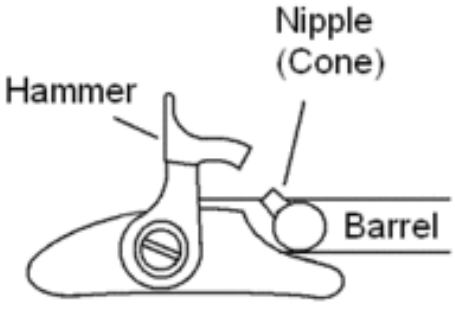
At the Army's urging, Hall set up his manufacturing plant at the Army's Harpers Ferry Arsenal in WV. There he sequestered an old sawmill located on Virginius Island in the Shenandoah River adjacent to the arsenal. Hall used the old sawmill's water wheel and mechanical power distribution system composed of rotating shafts, leather belts and pulleys to power his unique metal forming and cutting machine tools. While other firearms manufacturers employed gunsmiths, who used hand cutters and files to form parts, Hall used mill power to run machine tools and achieve the quality control necessary for mass production of interchangeable parts. His mill-powered metal machining methods had far greater cutting, grinding and drilling precision than one-off hand manufacturing could begin to achieve. Hall additionally invented special gauging tools to verify tolerances for quality control. When necessary, Hall's machine-cut surfaces were hand filed to tolerance to ensure fit and interchangeability.

Hall mass produced thousands of rifles not only establishing the machine processes necessary for mass manufacturing interchangeable parts, but he also established the concept of quality control along with its procedures and special gauging tools. The lessons learned by Hall about the principles of mechanical power distribution, machine system manufacturing, mass production accuracy, quality control, economy of effort and efficiency went on to benefit the later generations of firearms designers and manufacturers like Colt (1836), Sharps (1848), Spencer (1860) and Browning (1879). While his machine production advances are largely forgotten, Hall can be credited to laying the conceptual foundation for Henry Ford's 1913 automobile mass production assembly lines.

In 1814, coincidental to Hall's successes, English gunsmith Joseph Manton patented a predecessor to the percussion cap. It was comprised of a small fulminate-filled copper tube that detonated when crushed by the hammer of his tube lock or scant bottle lock. Percussion-style ignition was further developed in 1822 by the English-born American artist Joshua Shaw, as a small copper cup filled with fulminate of mercury that was designed to fit over a replaceable nipple threaded into the torch hole. The percussion cap is a single-use percussion ignition device that was invented in tandem with the caplock mechanism to specifically provide muzzle loaded firearms all-weather firing reliably. The caplock (or percussion lock) system used percussion caps struck by the hammer to set off the gunpowder charge in percussion guns—including percussion rifles and cap and ball firearms.

For the purpose of definition henceforward, "cap and ball" describes caplock firearms discharging a single

bore-diameter spherical bullet with each shot. Any firearm using a caplock mechanism is a percussion gun. Any long gun with a caplock mechanism and rifled barrel is a percussion rifle. Percussion caps have been manufactured in various sizes to fit snugly over different sized nipples, but all caplock mechanisms rely upon a hammer impact.



The percussion cap is a purpose-made small shallow cylinder of copper or brass with one closed end that forms a miniature cup. A small amount of a friction-sensitive explosive material such as mercuric fulminate (or fulminate of mercury), made from mercury, nitric acid and alcohol is cast inside the closed end. The caplock mechanism itself consists of a hammer and a nipple (also referred to as a cone). The hollow metal nipple contains a flash hole which leads into the gun barrel's breech-end firing chamber. The percussion cap is placed over the top of the hollow metal nipple. Pulling the trigger releases the hammer, and the falling hammer strikes the percussion cap, causing the friction sensitive mercuric fulminate to detonate. Flames from this explosion travel through the hollow nipple which doubles as the torch hole to ignite the main powder charge. Percussion caps are manufactured in small sizes for pistols and larger sizes for rifles and muskets.

Ironically, the first purpose-built caplock guns were commissioned by English bird hunters and sportsmen around the 1820s. As a result of the mechanism's physical compactness and superior reliability compared to the flintlock, gunsmiths were able to manufacture pistols and long guns with two barrels. Early caplock handguns with two or more barrels equipped with a single lock are known as turn-over or twister pistols, because the second barrel had to be manually rotated into position to align its cap nipple with the hammer. Pocket-sized versions of this pistol were widely used by gamblers in the Old West. With the addition of a third barrel, and a ratchet to mechanically turn the barrels while cocking the hammer, these caplock pistols evolved into the pepperbox revolver during the 1830s and later into the cap and ball revolver that looked and operated very similar to today's revolvers.

The caplock offered many improvements over the flintlock. The caplock was easier and quicker to load, more resilient to weather conditions, and far more reliable than the flintlock. Many older flintlock weapons were converted into caplocks so that they could take advantage of these attributes.

Japanese Samurai's Matchlock Converted to Percussion Lock.

A pair of Caplock Twister Pistols

John Wilkes Booth's single-shot caplock derringer used to assassinate Abraham Lincoln.

Even though the metal percussion cap rapidly gained in popularity and became the most widely-used type of primer, it had some shortcomings. Its small size made it difficult to handle under the stress of combat or while riding a horse. Subsequently, several manufacturers developed alternative "auto-priming" systems.

The "Maynard tape primer," for example, used a roll of paper "caps" much like today's toy cap gun. The Maynard tape primer was fitted to some firearms used in the mid-nineteenth century and briefly used in the American Civil War. Other priming strategies used disc-shaped, or pellet-type primers that were held in a small magazine. Cocking the gun's hammer automatically advanced a primer disc or pellet into position above the torch hole. However, with the manufacturing systems in the early and mid-nineteenth century these automatic feed systems were difficult to manufacture, and they functionally generated more problems than they solved. They were quickly shelved in favor of placing a single percussion cap over a nipple. While using the percussion cap was unwieldy under some conditions, sufficient quantities of percussion caps could easily be carried to replace those dropped in the heat of battle.

Beginning around the 1820s, the armies of France, Russia, Britain and America began converting their muskets to the new percussion system.

Caplocks were generally applied to the British military musket (the Brown Bess) in 1842. The first percussion firearm produced for the U.S. military was the percussion carbine version of the M1819 Hall rifle (circ. 1833). The Americans' breech-loading caplock Hall rifles, muzzle loading rifled muskets and Colt Dragoon cap and ball revolvers gave the Americans a firepower and accuracy advantage over the British-made smoothbore flintlock (Brown Bess) muskets used by Santa Anna's troops during the 1846-1848 Mexican American War. As a result, Santa Anna lost, and the U.S. gained California and Texas as the prize.

Dragoons, from which Colt took the name for its earliest cap and ball revolvers, were originally a class of mounted infantry who used horses for mobility but dismounted to engage in battle on foot. The name "Dragoon" is derived from the type of handgun they carried, called a "dragon." The dragon was a one hand operated flintlock-fired small version of the blunderbuss. Early dragon handguns were decorated with a carving of a mythical dragon's head with its open mouth around the muzzle end. When fired, the muzzle blast would give the impression of a fire-breathing dragon. These single shot dragons (handguns) were carried by the French Army's Dragoon Regiment. "Dragoon" is the French word for "dragon." Dragoon regiments were established in most European armies during the late 17th and early 18th centuries and gradually morphed into conventional cavalry and trained for mounted combat (from horseback) using swords and firearms. The modern European and American military still use the Dragoon name for some armored and ceremonial mounted regiments.

In Japan, matchlock pistols and muskets were converted to percussion from the 1850s forward, and their new guns were all manufactured as caplocks. The holdout to converting were the Austrians, who used a variant of Manton's tube lock in their Augustin musket until 1855 when the Lorenz rifle, a conventional caplock design, was introduced. Even so, the Augustin musket was used in the Second Italian War of Independence in 1859 and the Austro-Prussian War in 1866. Even though the problem of handling and placing the small percussion caps on the nipple under the stress of combat was still not resolved, the Lorenz rifle was also used in the American Civil War 1859-1865—a little known fact.

The first practical solution for the problem of handling percussion caps in battle was the Prussian 1841 (Dreyse needle gun) rifle. This uniquely designed lock used a long needle to penetrate a paper cartridge filled with black powder and strike the percussion cap that was fastened to the base of the bullet. Even though it had several reliability glitches, it was widely used by the Prussians and other German states in the mid-19th century and it was credited as providing a major battlefield advantage in the 1866 Austro-Prussian War. By the time of the Franco-Prussian War (1870-1871) a few years later, the paper cartridge had already begun its evolution into the metallic cartridge. Clearly, the percussion cap's wide use directly led to the invention of the modern metallic cartridge case, and that in turn, made possible the general adoption of the breech-loading action for all varieties of rifles, shotguns and pistols.

Caplocks used on Springfield and Enfield rifle muskets.

Loading sequence for percussion revolvers.

After the American Civil War, Britain, France and America began converting existing caplock guns to accept brass rimfire and centerfire cartridges. For muskets such as the 1853 Enfield and 1861 Springfield, this conversion involved installing a firing pin in place of the nipple, and a trapdoor in the breech that would accept loading of the new metallic cartridges. Examples include the Trapdoor Springfield, Tabatiere rifle, Westley Richards and Snider Enfield conversions. American colonists and local natives subsequently purchased military surplus Sniders for use as hunting and defensive weapons.

The British army used Snider Enfields contemporaneously with the Martini-Henry rifle until the .303 Lee-Metford repeating rifle entered service at the very end of the black powder era in 1888. A box magazine fed a rear-locking bolt action repeating rifle in the classic British .303 caliber, and the .303 Lee-Metford instantly became the most modern military rifle ever built to use metallic cartridges with black powder propellant. Like the M1888 Austrian Mannlicher, that had a close resemblance, the .303 was developed while the search for a suitable smokeless propellant was underway throughout Europe.

Caplock revolvers such as the Colt Navy and Remington were also widely converted during the late 19th century, by replacing the existing cylinder with one designed for modern ammunition. These were used extensively by the Turks in the Russo-Turkish War (1804-1813) the U.S. Cavalry during the Indian Wars (1841-1923) and by cowboys, gunfighters, lawmen and outlaws in the Old West.

In the 1840s and 1850s, the percussion cap was first integrated into a metallic cartridge, where the bullet is held in by the metal casing, the casing is filled with gunpowder, and a primer is installed at the bottom end. By the 1860s and 1870s, breech-loading metallic cartridges had made the percussion cap obsolete.

Today, reproduction percussion firearms are popular for recreational shooters and percussion caps are still readily available (though some modern muzzleloaders use modern shotshell primers instead of caps). Most of today's percussion caps use non-corrosive compounds, such as lead styphnate. Styphnic acid, when compounded with lead, is an explosive used as a component in primer and detonator mixtures for less sensitive secondary explosives. While less volatile than most initiating explosives, lead styphnate is toxic and can cause heavy metal poisoning if ingested.

And the story continues. In the next *SADJ* issue (Part 3), we'll explore the chronological development of modern primer caps and metallic cartridges. SADJ

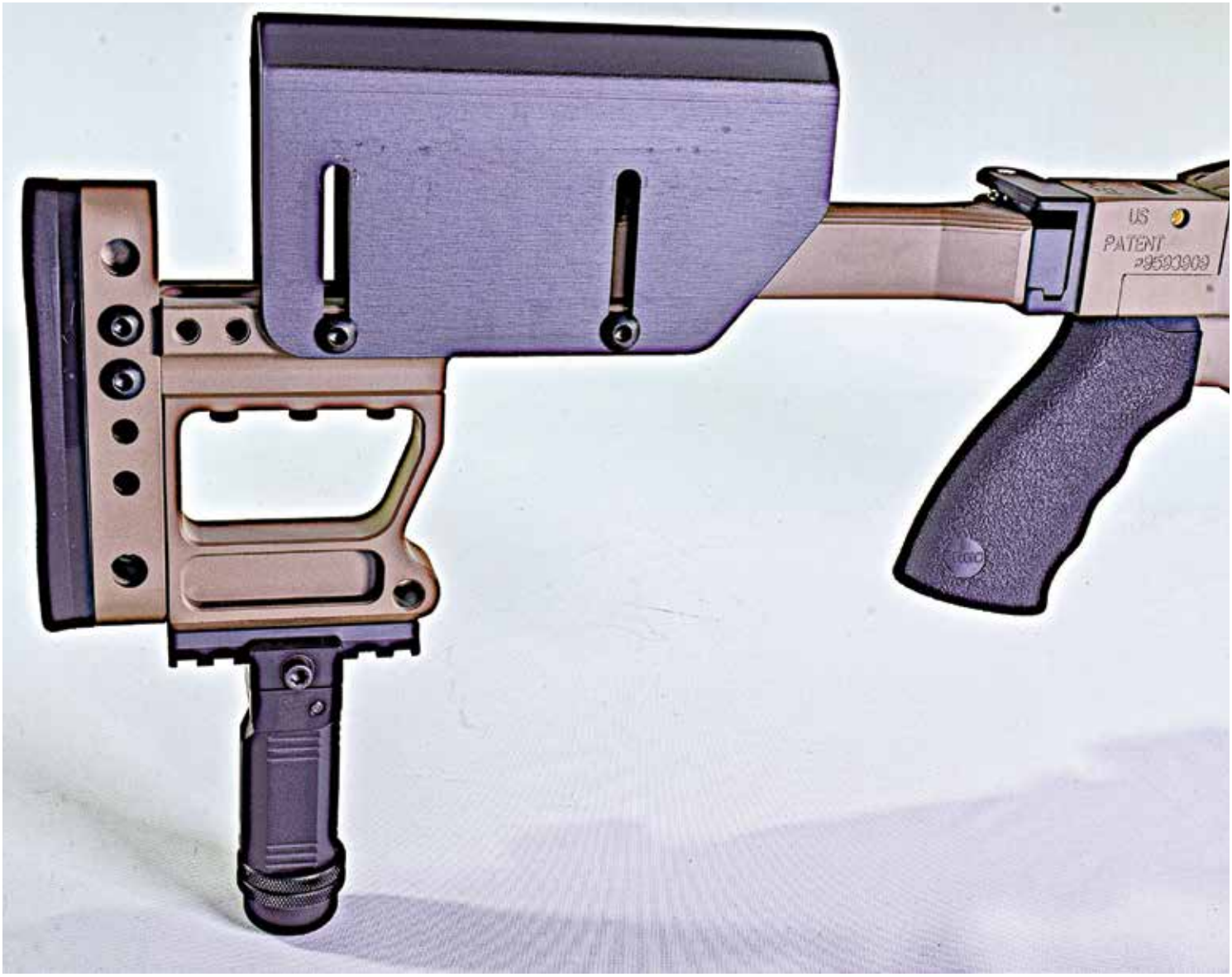
A chassis rail enables the shooter to mount the G10 to platforms such as the rock-solid CruxOrd tripod.

Extreme Lead Delivery

SOF-Ready .300 Winchester Magnum

Story & Photography by Gordon Meehl

The task given was simple enough. Find or build a "best in class" sniper rifle. The execution, however, proved mind-spinning at times. As I saw it, there were two primary criteria I had to meet. The first was very specific: "sniper rifle." Whatever the end product ended up being, it had to be appropriate for tactical long range use (so exotic, blueprinted and temperamental "race" guns probably wouldn't fit the bill). With the



The G10's foldable stock is also adjustable for length of pull, comb height and recoil pad position.

term "best in class" being a nebulous waypoint on this journey, closing the open-ended nature of that descriptor seemed like a good place to start.

Luckily, in my part of the Tar Heel state (NC) I have easy access to arguably two of the best long range learning facilities in the U.S. where I can learn from those who earned a living with a magnified view of the world. Both Coleman's Creek Training Facility in Ellerbe, NC and Todd Resource Management in Chesterfield, SC are frequented by military and LE snipers whose lives, and the lives of others, literally depended on their equipment and their knowledge of that equipment. There was no better place to start than by talking to *real* snipers.

There were a lot of various brand names thrown around and their pros and cons were talked about with great energy and in great detail. The discus-

Adding an S7 bipod and CTK Precision monopod give the shooter a rock solid platform.

McRee's patented M-LEV® ensures a level shooting platform, helping the shooter eliminate accuracy-robbing cant.

sion was never lacking input or topics to stir the hearts of those hanging around the line. There is an internet's worth of knowledge to be found at each of these ranges. I've seen people with less to say about politics than on finer points of long range shooting and I loved every minute of our discussion.

Out of the fray, one name seemed to keep coming up and examples of his craftsmanship could be seen on the shoulders of the guys hitting steel at long range and on the backs of more than few elite warfighters. The oft-mentioned name was Scott McRee, owner and namesake of McRee's Precision, so I decided to give him a call. He was quite willing to spend a few hours sharing years of experience and engineering alchemy.

Scott took a different approach to helping me solve the challenge of finding the "ultimate sniper rifle." Rather than going over the decision tree of what I should be looking for, he told me he had already built the ultimate sniper rifle for a select special operations group. He explained that the best way for me to learn why it's the ultimate sniper rifle is to get hands-on experience ... and he would let me borrow a rifle he had built for said group. WHAAAT?

The inclusion of six (three on each side) M-LOK slots allows the addition of a wide variety of mission-specific accessories.

Three days later I was driving back home from my local gun store with a McRee's Precision G10 .300 Winchester Magnum in the back seat. With the

A patented 2-piece split cheek piece is arguably the most adjustable on the market.

rifle in hand and a slack jaw, I called Scott back to go over the rifle and why this, of all his ballistic wizardry, is considered to be the understated pinnacle of sniper rifles by more than a couple of special operations groups. When talking with Scott about this rifle, you immediately understand that this weapon's design is carefully thought out and purposefully built.

The first and most obvious question is, why .300 Winchester Magnum (.300 Win Mag)? Why not move down to a gentler .308 Winchester? The question can be answered in one word—balance. Although the .308 Winchester and the .300 Win Mag throw the same size .308 round down range, the .300 Win Mag case carries up to 67% *more* go-go juice. To oversimplify it, more powder allows you to cheat the wind with increased bullet weight and/or increased bullet speed. Compared to the .308 Winchester, the .300 Win Mag is a heavier bullet, thus heading downrange at a higher velocity. This means, generally, that the .300 Win Mag will be more accurate and reach farther than a .308 Winchester. The .300 Win Mag can be reliably used to engage targets up to 1,500 yards. After 500 yards, the .308 Winchester starts to drop exponentially faster than the .300 Win Mag, making it less reliable at longer ranges. The price, however, is that the .300 Win Mag hits your shoulder about 6 ft. lbs. harder than the .308 Winchester. For a more in-depth comparison of the two rounds, check out **swggun.org/300-win-mag-vs-308.**

With the caliber discussion out of the way, we then talked about the choice of action. You would think a high-precision instrument used to save lives would use a high tolerance custom machined action made of exotic materials. McRee instead uses a less-than-exotic Remington 700 long action. The reason Remington actions are so common is because they work, time after time. High tolerance actions do not do so well when your job description includes waiting out a haboob that blows metal-grinding sand into even the smallest gaps. Even after being buried in Middle Eastern sand, the bolt cycles and rounds go into battery time and time again. When your life depends on it, durability and reliability means everything.

Arguably the item subject to the most personal preference is the trigger. The trigger is *the* connection point of rifle to shooter. With this in mind, a lot of consideration has been placed on what the "go switch" should be. A crisp and consistent break is essential. The key to long range precision is that every shot is consistent and predictable. This is one place where you do not want to skimp. The Timney Triggers Model 510 fits the bill to the letter. Set at 2.5 pounds, very little effort is required to send the round downrange, this means no energy goes into moving the rifle trying to move the trigger back. As expected, the Timney had just enough take up and creep to

You'll find these rifles on the back of guys who know that the ultimate long range precision rifle is not a thoroughbred, but a tough-as-hell workhorse that gets the job done every time.

A chassis rail enables the shooter to mount the G10 to platforms such as the rock-solid CruxOrd tripod.

get a good feel for the break. The subsequent over-travel is minimal, allowing for a steady follow through. After a short reset, you're good to go on reengaging the next target. [Editor's Note: Timney Triggers' Model 510 is now called the Model 510-V2, the "Elite Hunter." As with the original 510, the pull is adjustable from 1.5 to 4 pounds.]

The business end is 24 inches of proprietary 4 grooved stainless steel. Designed with 10 twists per inch, the barrel is optimized for heavier bullets. Testing bore witness to this, with 220gr Barnes Open Tip Match grouping at about .82 inches at 100 yards. Federal TLR 200gr was next, grouping at .90 inches at the same 100 yards. To be forthright, accuracy testing at 100 yards, though the standard, doesn't quite tell the story as the bullet hasn't had enough time to fully stabilize.

The barrel, action and trigger are only part of what makes this a precision instrument. What separates this as piece of functional art and sets it apart from the fray is that the barrel, action and trigger sit snugly in the masterfully-crafted McRee's Precision G10 chassis. Although it's not a simple plain-Jane chassis, it is also not crowded with gimmicky bells and whistles. The heart of this rifle is utility and functionality—above all else.

Proper fit is important to consistent shooting. Military snipers spend hours mounted on their rifles. If you're not comfortable, you'll squirm and readjust in order to be comfortable. If you can't shoot from the exact same position every time, you can't make the same shot every time. Consistency equals precision (i.e., repeatable accuracy). Rifle meets shoulder via a fully adjustable, foldable buttstock. With adjustments to length of pull from 12.5 to 14.5 inches, butt pad +/- 1 inch and a split cheek piece adjustable fore and aft as well as up and down, the shooter is assured a personalized fit.

To further help the shooter modify the rifle to his or her preferences, McRee includes mounting six M-LOK slots on either side. Additionally, the stock is pre-drilled and tapped for a monopod rail, tripod mounts and for bipod rails. Choose between a 0 MOA or 20 MOA scope rail and the rifle is almost battle ready.

On top of the G10, we mounted a Nightforce ATACR™ 7-35x56 F1 riflescope and attached it to the rail with Nightforce rings. Although not a lightweight, its 40 ounces added to the 11-pound rifle was acceptable. The 35x magnification and super clean glass makes even the smallest, most distant targets visible. With a first focal plane scope, ranging can be done at any magnification—a must-have in a target-rich tactical environment. Other features, like a Digillum™ reticle, .1 Mil turrent adjustments and the fact that the military's top shooters also choose durable Nightforce scopes made this an obvious choice for our window to the world downrange.

At the range, we first steadied the rifle using an S7™ bipod from KFS Industries. Using the Raptor Claw feet to dig into the ground, the S7 pre-loads like a champ. Using the bipod's unique cant adjustment to confirm that the M-LEV® bubble was centered assured us that our shooting position was rock solid and consistent from location to location.

We also mounted the G10 to a CruxOrd carbon fiber tripod. The rifle was quite at home, as this is the same tripod used by special operations teams across all branches of the service. Mounting the CruxOrd truss to the chassis bottom rail is quick and provided a rigid, nearly immovable platform which was unfettered by the mule kick of a heavy grain .300 Win Mag.

While some may think the long range rifle needs to set you back a year's worth of vehicle payments, McRee's Precision offers a real world, wallet-friendly build that is sought out and used by the world's top military sniper teams. You'll find these rifles on the back of guys who know that the ultimate long range precision rifle is not a thoroughbred, but a tough-as-hell workhorse that gets the job done every time. SADJ

MCREE'S PRECISION G10 .300 WIN MAG (GOVERNMENT ISSUE)

Caliber: .300 Winchester Magnum Match, optimized for bullet weights of 190-235 grains

Chamber: Match Grade, SAAMI, no neck turn

Action: Remington 700, Inspected/Reworked

Barrel: 24-inch, SS, 4 grv, 10 Twist, Proprietary Contour

Muzzle: +/- .900 dia, 5/8x24 TPI, Thread Protector included

Trigger: Timney Triggers Model 510, set @ 2lb, 4oz

Magazine: AIAW Style, 5-round capacity

Scope Base: 0 MOA or 20 MOA, 6061 T6 Aluminum Billet

Stock: McRee's G10 Folder with M-LEV® Embedded Cant Indicator, 7 Sling Attachment locations (Push-Button/Flush-Cup Style)

Forearm: Bipod dome stud standard, *Harris* ready, 6 M-LOK Slots

Grip: ERGO SUREGRIP®

Adjustment: Length Of Pull, +/- 12.5 to 14.5in, Butt Pad Up/Down, +/- 1 inch, Cheek Piece Split, For/Aft-Up/Down, +/- 1 . inch

Length: Folded: 31 3/4", Extended: 41 ½"

Cheek Piece Cover: McRee's, made in the U.S.A.

Dry Weight: 11lbs, 4oz with Rear Stock Pack and 5-round magazine (empty)

Extras:

- Embedded Action Screws
- Tripod Rail
- Drilled and Tapped for Bipod Rail
- Drilled and Tapped Monopod Rail
- Tool Kit
- Cant Calibration Instructions
- Custom McRee's T-Shirt,
- McRee's Signature Ball Cap
- Rear Stock Pack
- Minimum of 3, U.S. Patented Technologies
- Made in the U.S.A.

Price: Starting at USD $1,411 (DIY Kit)

AUTHOR'S SUGGESTED GEAR

Sitka Shooting Gloves
sitkagear.com

RE Factor Tactical Armboard
refactortactical.com

Magpul CORE™ Quick Reference Rifle Cards
magpul.com

5.11 Urban Sniper Bag
511tactical.com

Garmin Foretrex® 701 Ballistic Edition
garmin.com

Bushnell Elite 1 Mile CONX Range Finder
bushnell.com

Kestrel 5700 Ballistics Weather Meter
kestrelmeters.com

Nightforce Riflescope
nightforceoptics.com

CTK Precision Ultimate Rail-Pod (Monopod)
ctkprecision.com

CruxOrd Tripod
cruxord.com

Oakley Standard Issue Flak Jacket®
oakleysi.com

Hawk Hill Custom DOPE Card Holder
hawkhillcustom.com

S7 Bipod
s7bipod.com

APPS

Ballistic™ Advanced Edition
ballisticapp.com

JBM Ballistics
jbmballistics.com

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

By Robert Bruce

ROBERT BRUCE

Hands-on shooting was a key feature of NCRE's multifaceted attractions. Seen here on Crucible's Range 4, Trijicon's Nelson Velez enthusiastically serves up short belts of 7.62mm for attendees to experience live fire with an M240 topped by a Trijicon MGRS (Machine Gun Reflex Sight). trijicon.com

A Live-Action Product Showcase

TSSi (Tactical & Survival Specialties, Inc.), grown to be the big dog in supplying SPECOPS and more, has now gotten even bigger in recent alignment with Noble Supply & Logistics. This formidable team presented the first National Capitol Region Expo on June 24 at Team Crucible near Fredericksburg, VA.

With attendance prioritized for members of the military, federal agencies, law enforcement and disaster response professional communities, it provided the opportunity to network with industry members as well as the option to test and evaluate select products in a training environment.

The combining of TSSi and Noble Supply & Logistics provides the Warfighter with a true one stop shop to support their specific mission requirements.

Holding NCRE at Crucible's well known tactical training facility, ideally located so close to major military, national security and law enforcement entities in the Washington, DC area, is our first opportunity to show our customers a sampling of types of products and services our new team can provide. - Bill Strang, TSSi Founder, President and CEO

NCRE 2021 featured an indoor showcase with over 60 vendors, classroom training sessions and four live-fire ranges with hands-on product demonstrations. All on a fine sunny Virginia day with uncharacteristically low humidity and temperatures in the 70s.

Crucible proved to be an excellent venue, located just 60 miles south of our nation's capital, with classrooms, firearms ranges, high speed 2.1 mile track, unimproved roadways, off-road trails, matted combatives training area and scenario sites that replicate real-world environments for people operating in austere locations worldwide.

ROBERT BRUCE

TSSi employees provided security at the entrance to Crucible, vetting those hoping to attend this no-cost but necessarily restricted event. team-crucible.com and tssi-ops.com

ROBERT BRUCE

This specialized, high-risk environment (HRE) training company, provides instruction to the United States Government, Department of Defense, other Government agencies (OGAs) and multi-national corporations. team-crucible.com

ROBERT BRUCE

The TSSi/Noble lineup includes prominent names supplying military, law enforcement and EMS. Recognition of their sponsors was prominent throughout the event site. tssi-ops.com

TSSI

Crucible's easily accessible but discreetly rural training facility in Northern Virginia was perfectly suited for the event. tssi-ops.com

ROBERT BRUCE

TSSi's friendly registration team efficiently processed more than 500 attendees. tssi-ops.com

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

ROBBIE THAYER, TSSI

When it comes to catering to the appetites of hungry attendees, you can't beat the excellent chow with all the trimmings that was dished out free to all comers by the military-themed Mission BBQ team from nearby Fredericksburg. **mission-bbq.com**

ROBERT BRUCE

Who said there's no free lunch? Unlike similar events with pay-as-you-go food vendors, all NCRE attendees, exhibitors and staffers can thank these sponsors. **tssi-ops.com**

Anticipating Central Virginia's typical hot and muggy summer weather (thankfully absent right after a major storm had passed through the night before), Big Ass Fans lived up to their colorful name by cooling down the packed chow tent. **bigassfans.com**

ROBERT BRUCE

ROBERT BRUCE

Mission BBQ's friendly servers on two very busy chow lines ladled out plenty of the best picnic fare most any of us have ever eaten. And did we mention it was FREE? **mission-bbq.com**

ROBBIE THAYER, TSSI

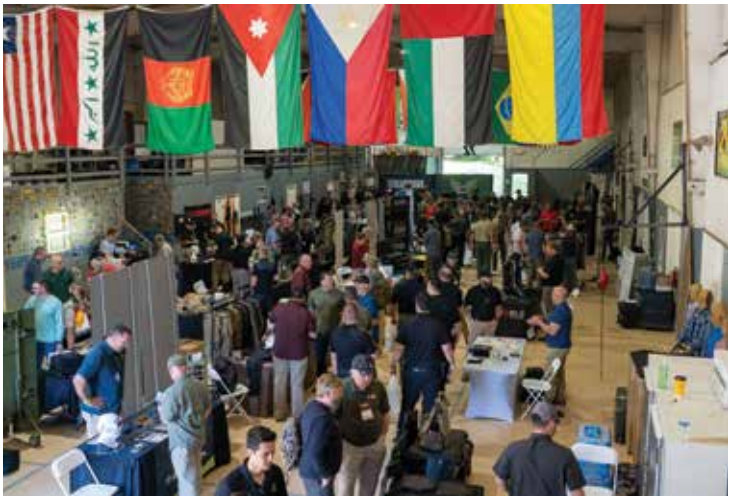
It takes a lot of planning and preparation from good folks to pull off an event like this. The TSSi/Noble team assembled for an "attaboy" photo. **tssi-ops.com**

ROBERT BRUCE

Crucible's cavernous Building 5 was the central gathering point for NCRE, packed with nearly 50 vendor exhibits. **tssi-ops.com**

ROBERT BRUCE

This big map at the entrance to Building 5 was a handy quick reference, supplementing the detailed event brochure that came with lots more in each "swag bag" registration packet.



ROBBIE THAYER, TSSI

All day long crowds of attendees circulated among the dozens of exhibit tables, where many items from TSSi's thick catalog of offerings were right there on display for up close and personal, show-and-tell experiences. tssi-ops.com

ROBBIE THAYER, TSSI

Point Blank Enterprises was the top sponsor of the event so naturally they got prime space at the entrance to the exhibit hall. And out on Range 3, they put on one of the Expo's most impressive tactical demos. PBE is the worldwide leader in the development, manufacturing and distribution of high performance, protective solutions for the U.S. Military and Department of Defense, Federal Agencies and both domestic and international law enforcement and corrections professionals. pointblankenterprises.com

ROBERT BRUCE

Point Blank's Mike Ott is well protected behind this Phalanx-M shield, the latest refinement of the respected and hard-working PHALANX line. pointblankenterprises.com

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

ROBERT BRUCE

From bullet-resistant products to cybersecurity services, arming military members, law enforcement agents, government contractors and other patriotic participants with the necessary security products and defense services is Aspetto's main priority. **aspetto.com**

ROBERT BRUCE

Cheryl Walker, Aspetto's Logistics Manager, shows the male version of the Mach V body armor, under evaluation by the USMC. The female friendly version of Mach V is currently being produced for the USAF. **aspetto.com**

ROBERT BRUCE

We were pleased to be seeing but a bit disappointed not to be able to shoot the new FN 509 Compact Tactical, shown here in both FDE and Tactical Black. Said to be "the smallest and most concealable 9mm tactical pistol available on the market. Easily deployed as an everyday carry with the standard 12-round magazines or on the range with the extended 24-round magazine." **fnamerica.com**

ROBERT BRUCE

The FN 509 Compact Tactical's 4.3-inch cold hammer-forged threaded barrel makes it compatible with today's most popular aftermarket accessories like compensators or suppressors and the FN Low-Profile Optics-Mounting System, capable of accepting more than 10 miniature red dots. Shawn Molloy also gave us a "sneak preview" of a new SCAR with AR internals. **fnamerica.com**

ROBERT BRUCE

Simunition's Mike Chin promoted the well-established FX Training System, comprised of proprietary marking cartridges, weapon conversion kit and protective equipment. **simunition.com**

ROBERT BRUCE

Vista Outdoors featured Blackhawk's new STACHE IWB holster with detachable magazine carrier. **blackhawk.com**

ROBERT BRUCE

Gerber's line of edged weapons and tools grows by leaps and bounds and there was plenty of their good stuff attracting bladesman to the display table. **gerbergear.com**

ROBERT BRUCE

While browsing display tables, helpful info cards provide quick reference when reps aren't immediately available. In this instance highlighting PRG Defense's innovative Noisefighters PanoBridge for NVGs like the PVS-14 Edge. **prgdefense.com**

ROBERT BRUCE

Tactical Balisong? Actually, this is the clever and impressively large DoubleDown Folding Machete. Gerber's Matt Carmody shows us how it folds to half its size, easily stowed in a pack, on a belt or attached to MOLLE. The unique design allows the user 3 distinct functions in one compact package; chop, cut and baton. **gerbergear.com**

ROBERT BRUCE

Here, PRG's lightweight and versatile PVS-14 Edge is secured by the helmet mounted PanoBridge, allowing users to selectively adjust the goggle's field of view from 40 to approximately 75 degrees by laterally rotating ("panning") each individual monocular outward, creating a panoramic image. **prgdefense.com**

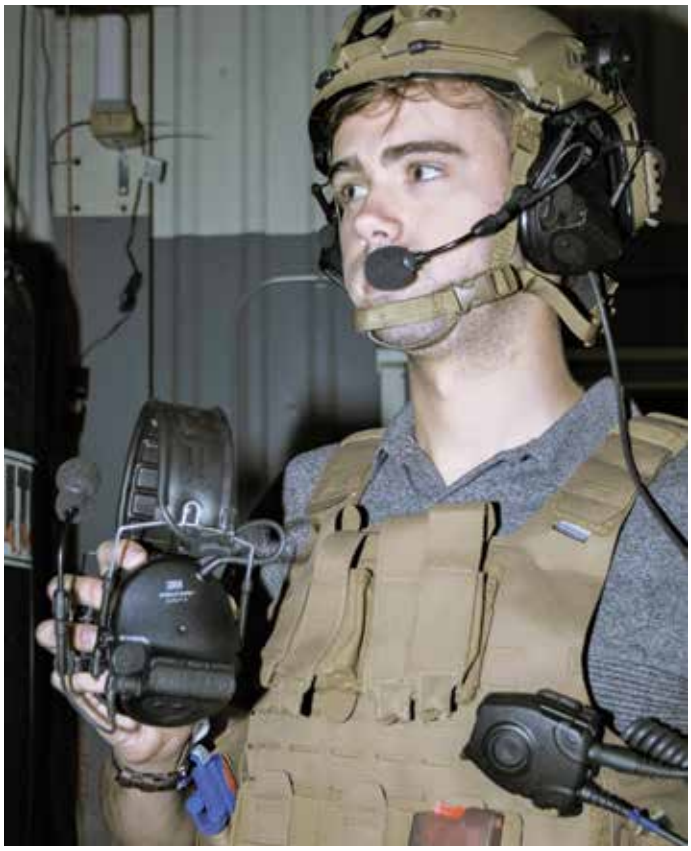
SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

ROBERT BRUCE

Our standard expo question—"What's the star of your show today?"—was answered by the Garmin guy by pointing to the new 200i. "It features enhanced mapping capabilities; a larger, 3.5" sunlight-readable touchscreen display; six-button, easy operation of the dog tracking-focused user experience; and inReach® satellite technology1, allowing for two-way messaging and interactive SOS alerts so users can focus on their dogs and the hunt." Yep, tactical/LE guys need to track their working dogs too. **garmin.com**

ROBERT BRUCE

Always working to enhance business relations with his vendors, TSSi's boss man Bill Strang talks with Mollie Martin, LE Sales Manager for Otis Technology. "Our mission at Otis Defense is to rethink and redefine gun care, giving our country's defenders better and smarter ways to keep their weapons in the best condition possible because we believe that American heroes deserve American quality." **otisdefense.com**



ROBERT BRUCE

3M Peltor intern Marshall Moller gamely models the latest version ComTac VI, improved with new omni-directional microphones and high fidelity speakers with greater sensitivity to help replicate sound more clearly and accurately. The new digital signal processing circuitry and new transmit microphone are designed to help improve speech intelligibility and the environmental listening function's ability to detect and locate sound. Blue Force Gear loaned him the PLATEminus V4 chest rig. **peltorhearingprotection.com** and **blueforcegear.com**

ROBERT BRUCE

Petzl's Brian Hughes offers the new SPIN L1D, a very high efficiency single pulley with one-way rotation and swivel. Openable even when attached to the anchor, it is designed to be used in conjunction with a descender for maximum simplicity in setting up a deviation for a heavy load. **petzl.com**

ROBBIE THAYER, TSSI

Some of TSSi's extensive line of custom TACOPS™ products were prominently featured at the entrance to Building 5. These are specialized response kits, designed by TSSi, with input from military, law enforcement and disaster response professionals. tssi-ops.com

ROBERT BRUCE

Blackside Solutions presented this super tactical ATV, surrounded with a layout of lots of specialized equipment. For more info on the company and the gear, contact TSSi and Noble, because Blackside has one of the most "stealthy and discreet" websites we've ever encountered. blacksidesolutions.com

ROBERT BRUCE

Impossible to overlook is this distinctive vehicle from Team One Network, "dedicated to supporting Law Enforcement and Military by providing practical, intense and realistic training for one single overwhelming objective – Officer Survival by Training to Win!" teamonenetwork.com

ROBERT BRUCE

Pete Peterson, a Master Breacher, stands tall, "guarding" the entrance to Kontek Industries' Mobile Modular Shoot House. It's designed to provide realistic training in CQB with the use of Simunitions or similar live-fire training means to help prepare tactical teams for demanding missions. kontekindustries.com

ROBBIE THAYER, TSS

INVISIO's Dustin Taylor shows the X5 in-ear headset and V series control units, connecting to external group radios or a vehicle's intercom. The company develops and sells advanced communication systems with hearing protection that enable professionals in noisy and mission critical environments to communicate and work effectively. invisio.com

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

Range 1

ROBERT BRUCE

Moving out to Crucible's Range 1 nearby, we found demonstrations and live fire experiences from Sinterfire and Pixels On Target.

ROBERT BRUCE

Charles Ferrera, SME and Designer for Pixels, doing show-and-tell with the VooDoo M Multi Mission Uncooled Thermal Sight. "It's the next generation of thermal imaging system. We've kept what you require, improved what you asked for, and added what you've always desired. Feature rich, yet easy to use all under 18 oz." **pixelsontarget.com**

ROBERT BRUCE

A close look at the VooDoo M Multi Mission Uncooled Thermal Sight, snugly coupled with a Nightforce 1-8x day optic. Interestingly, the Pixels classroom demo, noted in the official event program, was a very stealthy event. **pixelsontarget.com**

Range 2

EOTECH and Daniel Defense formed a natural partnership to showcase eagle eye sights atop tough, tack driving weapons. Even early in the morning the line was long for live fire trigger time. **eotech.com** and **danieldefense.com**

ROBERT BRUCE

ROBBIE THAYER, TSS

Keith Porco, SinterFire's long-serving demonstration shooter, providing characteristically energetic commentary. "SinterFire is the most utilized frangible bullet in the world, continually innovating products for Gov't./LE training and the sportsmen. Proud to be the originator and leading manufacturer of the lead-free copper/tin frangible projectile." **sinterfire.com**

ROBERT BRUCE

Since 1998, SinterFire has been aggressively developing and testing a wide range of ammunition components to address the growing needs of "green" (lead-free) and "safer" (frangible) projectiles.

They offer lead-free ammunition tailored for specialized applications including Frangible, Reduced Hazard, GreenLine and Special Duty. **sinterfire.com**

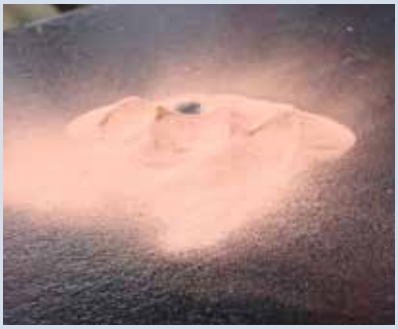
Sinterfire Demo

ROBBIE THAYER, TSSI

While all of the event's demonstrations were noteworthy, here's the first of two that stood out in particular for us. Beginning his fast, fun and fact-filled presentation on Range 1, SinterFire's Keith Porco, a former U.S. Army Ranger, cop, competitive shooter and instructor, gathers an audience on Range 1. His narration accompanies these photos of the demonstration.

ROBBIE THAYER, TSSI

SinterFire is the most utilized frangible bullet in the world, continually innovating products for government, law enforcement and sportsmen. SinterFire has been aggressively developing and testing a wide range of ammunition components to address the growing needs of a "green" (lead-free) and frangible (safer) projectile. SinterFire offers lead-free ammunition tailored for specialized applications including Frangible, Reduced Hazard, GreenLine and Special Duty.



ROBBIE THAYER, TSSI

I always start the demo with an intro to Sinterfire, in business since 1998 and the world's largest producer of lead-free frangible bullets, manufactured using an exclusive blend of copper and tin composite material and a proprietary "sintering" heat treatment process. Unlike conventional lead projectiles, which ricochet or fragment into large pieces, when SinterFire projectiles hit something harder than themselves they disintegrate into small particles. Lead-free and frangible, they're ideal for close quarter training on steel plates and in tactical shoothouses.

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

ROBBIE THAYER, TSSI

Following the enormous success of its frangible bullets, SinterFire is ushering in NXG "the Next Generation" of lead-free projectiles. Newly patented technology allows for this 100% copper product—not frangible—to compete with traditional Full Metal Jacket pricing for the first time. Designed for training, target shooting and plinking and is safe for indoor and outdoor shooting range use. Range cleanup is a snap as these 100% copper projectiles are fully recyclable and non-toxic, providing scrap value to ranges. When I strike both bullets with hammer the frangible copper/tin breaks up and the NXG pounds out flat.

ROBBIE THAYER, TSSI

I shoot a full mag of the frangible into a steel shoot box and scoop up what's inside to how the bullets break up, meeting the testing standard for the industry of the 5% rule. When striking anything as hard or harder they break up to dust and within 5% of the projectile overall weight. No fragments back at the shooter.

ROBBIE THAYER, TSSI

Then a practical demonstration of very close steel plate shooting. The bullets need to hit something as hard as themselves to break up. While SinterFire recommends that users stay at least 5 yards away with pistol and 10 yards with a rifle, I can safely get close to a steel target with the frangible pistol and rifle bullets.

ROBBIE THAYER, TSSI

After showing the crowd how the bullets work for training and the general education on break up, there's penetration. Shooting into two 16-inch blocks of clear ballistics gel shows how in soft tissue the frangible bullets pass through like an FMJ. Then our hollow points, explaining how we mold the HP into the bullet and that gives it the place to fracture.

ROBBIE THAYER, TSSI

I fire one round into gel and show how the nose of the bullet down to the depth of the HP breaks up but the base stays intact for deep penetration. Sinterfire pistol hollow points will pass FBI test protocols except the windshield test.

ROBBIE THAYER, TSSI

Our Special Duty hollow point delivers all of its energy into the intended target, but disperses energy immediately upon striking a hard surface, making it the round of choice for home defense, schools, court rooms, prisons and all places where safety is paramount.

SinterFire.com has complete details and some very dramatic videos.

Range 2

ROBERT BRUCE

Under the watchful eye of Jake Winglass, Daniel Defense Federal Sales Manager, off duty Marine Xavier Abreu, a support staffer from the Officer Basic School at nearby Quantico MCB, dials in the EOTECH VUDU 5-25X52 FFP with special MD3 reticle. And yes, the photographer wisely stepped aside quite a bit to avoid muzzle blast before the powerful 6.5mm Creedmoor round was fired from the formidable Delta 5 Pro. **eotech.com** and **danieldefense.com**

ROBERT BRUCE

This tank tough, precision machined, long ranging, spot on and hard hitting duo—the deadly combination of Delta 5 Pro topped with EOTECH VUDU5-25X52. All Daniel Defense DELTA 5 rifles are guaranteed to shoot .75 MOA or less at 100 yards when used with quality factory match-grade ammunition. Facilitating every sniper's goal of "One shot. One kill." **eotech.com** and **danieldefense.com**

ROBERT BRUCE

Emblazoned with the motto "Freedom. Passion. Precision." the Daniel Defense display tent enticed enthusiasts with an impressive layout of their highly-respected rifles topped with the latest sights from EOTECH. Among the layout we caught a glimpse of another very interesting, brand new EOTECH sight. When moving in for a closer look and capturing a photo, Business Development Manager Jon Meyer politely asked for our discretion in delaying identification of this item, "made for certain Department of Defense customers." "Of course," we said, receiving his promise of additional information when appropriate. **eotech.com** and **danieldefense.com**

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

Range 3

ROBBIE THAYER, TSSI

A short walk around the corner brought us to Range 3 where we encountered the Intellioptix display table, starring the new MGS + Universal Crew Served Weapons Sight, specifically designed and built for the M2 .50 Caliber, M60E6/E4/M240/M134 Minigun 7.62mm and MK19 40mm, all widely used by U.S. and allied armed forces. The system consists of various modules and has a very large field of view design with an unequalled 82x48mm lens that provides rapid target acquisition for stationary and moving targets. **inter2t.com**

ROBERT BRUCE

Preparing for live-fire demonstrations, Intellioptix President SG Chung settles in behind the MGS+ atop an M240 GPMG. Not needed on this relatively short range, the magnifier has been swung out of the sight path. Multiple MIL-STD-1913 Picatinny rails included for mounting optional 3x, 5x, 8x and 3-8x magnifiers, cameras, lasers for night aiming /illuminating, non-lethal escalation of force lasers, thermal or NVG sensors or other devices. **inter2t.com**

ROBERT BRUCE

In this close view of the MGS+ we see the three primary components: Modular Rail Main Body, 3x Magnifying Flip Mount and Lens Module. The patented removable LED module has a stadia line style reticle that improves accuracy by eliminating the need for sighting guesswork. Using hash marks, range can be estimated by the gunner. Just place the dot on the target and pull the trigger. **inter2t.com**

Point Blank—Literally

ROBBIE THAYER, TSSI

Point Blank Enterprises, the major sponsor of the Expo, is recognized as one of the first companies in the United States to design and manufacture body armor. Since 1973, Point Blank has grown into an internationally diversified company with the most visible brand recognition, Point Blank Body Armor is considered today to be the premier source of body-armor systems in the world. PBBA's Gary Critzer, seasoned by years in law enforcement, did the shooting for the demo and provided the narrative sequence.

ROBBIE THAYER, TSSI

This impressive setup stands ready for a dramatic demonstration and formally recorded test of the performance and stopping capabilities of both Point Blank soft armor and plates. Seen from left to right, handgun/ammo combos are Smith & Wesson 629 .44 Mag, Smith & Wesson 686 .357 Mag, Glock 21 .45 Cal, Glock 31 .357 Sig, Glock 22 .40 Cal., Glock 17 9mm. Note the chronograph for velocity information/verification on the different calibers. The soft clay insert on the target dummy is used by the National Institute of Justice to measure backface or blunt force trauma after the round hits the vest or plate when they're sent for certification.

ROBBIE THAYER, TSSI

We chronograph the rounds to give observers velocity information on the different calibers. Noted on the official Shoot Report, 9mm Federal 147 grain Hydra-Shok JHP was ripping along at 972 feet per second.

ROBBIE THAYER, TSSI

Gary Critzer explains the test setup and sequence: six handguns firing standard LE ammunition from 9mm to .44 Magnum will slam multiple hits into an AXBIIIA vest.

ROBBIE THAYER, TSSI

The torture test begins at moderate standoff range with the soft, concealable AXBIIIA vest being shot by 9mm JHP from a Glock 17.

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

ROBBIE THAYER, TSSI

Moving in to literally point blank range, a total of ten 9mm JHPs from the Glock 17 have slammed into the vest. Note the bases of two bullets that only partially penetrated. A total of 18 rounds will be fired from this combo.

ROBBIE THAYER, TSSI

Showing the devastating effects from a total of 59 rounds, the vest is badly shot up with ugly powder burns from multiple muzzle/vest contact shots. But did it stop them all?

ROBBIE THAYER, TSSI

The vest shows a rapidly increasing number of hits in different locations as the shooting sequence moved up in caliber from 9mm thru .40 Speer Gold Dot 180 gr GDHP, .357 SIG Speer Gold Dot 125gr GHDP, .357 Mag Remington GS 125gr JHP, .44 Mag Remington 240gr JHP. Critzer ramped up the test with 19 rounds of .45 ACP Winchester Ranger 230gr T Series from a Glock 21.

ROBBIE THAYER, TSSI

Gary Gritzer and Mike Hanks show the proof of extraordinary protective performance from the profoundly distressed AXBIIIA that astonishingly stopped every single round. While the target dummy's clay shows unmistakable evidence of blunt trauma, *below*, nothing made it through!)

ROBBIE THAYER, TSSI

Revolvers firing .357 and .44 Magnum JHP are impressive elements.

ROBBIE THAYER, TSSI

Point Blank's Mike Ott checking off each segment of the demonstration on the official Shoot Report.

ROBBIE THAYER, TSSI

Small Arm Defense Journal's **Robert Bruce moves in close to document the first hit.**

ROBBIE THAYER, TSSI

Extremes of the demonstration's pistols and projectiles are seen here in the 9mm Glock 17 and .44 Magnum S&W 629.

ROBBIE THAYER, TSSI

The 30260X.3 ballistic plate was dimpled but not defeated by multiple rifle rounds.

ROBBIE THAYER, TSSI

Still not convinced? Another AXBIIIA, in conjunction with Point Blank's 30260X.3 ballistic plate takes seven hits from rifles firing 5.56mm, 7.62x39mm, and .308 FMJ.

"To those who wear Point Blank products while protecting society and our National Security, Point Blank means LIFE."

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

Range 4

Drawn by the sounds of full auto fire from multiple weapons, we hurried further down the gravel road to Range 4, Crucible's longest distance shooting site. But before walking over to the live fire line we were met by a little quadricopter, eerily quiet while darting around to record documentary video.

ROBBIE THAYER, TSSI

Vantage Robots was showing and flying the new military-grade VESPER Next Generation Elite Small Drone. With its Vision GCS controller it's a complete aerial reconnaissance system built with input from military leaders, experienced operators, elite special forces, industry veterans and DoD security experts. vantagerobotics.com

ROBBIE THAYER, TSSI

Weighing just over 24 ounces, this tough little hummingbird is built to exceed specifications of the most elite federal security. Not just a daytime flyer, Vesper's payload includes two night vision 4K color cameras and an industrial grade thermal camera for superior performance. The magnetic snap-together architecture enables extremely fast transitions: the battery, props and rotor set can each be swapped in under 5 seconds. Plus, both Vesper and Vision GCS can be ready for flight at a moment's notice (less than 90 seconds from pack to air). vantagerobotics.com

Here's Tim Martin with the Vision GCS controller demonstrating the remarkably controllable, nimble and stealthy-quiet VESPER drone, offering 50 minutes of flight time, with speeds up to 45mph (72kph) and a total flight range of 25 miles (45km). Vision GCS has a 4-hour battery life and 500 GB of storage. Want one for personal missions? It's now available for direct purchase on the Vantage Robotics website. vantagerobotics.com

ROBERT BRUCE

A bit more down to earth is the extensive SimIS product lineup which includes military-grade training robots, de-escalation robotics and autonomous water vessels. On the left is their eerie, screen-faced ADRT (Autonomous De-Escalation Robotic Trainer), posed next to the amazing HTT (Human Type Target). simisinc.com

ROBERT BRUCE

Casey Batten, Lead Software Engineer for SimIs, at the input module for a well shot up HTT; semi-autonomous, mobile, trackless, smart target that provides very realistic shooting experiences for up to ten targets at a time driving on four wheels over rough terrain. "It's a live fire, 3D hit detection capable target up top, built on a steel plate base to protect from high velocity stray bullets." simisinc.com

ROBERT BRUCE

ROBBIE THAYER, TSSI

Raven Distributing was on site to promote the virtues of the novel BP7, a semiauto 12 gauge bullpup from J.H. Industries, specially designed to function reliably with low velocity, less lethal rounds. **ravendistributing.com**

ROBERT BRUCE

Alan Wirth and Tom Lannon of Raven Distributing showing the magazine fed BP7, a "less lethal only" semiauto, capable of rapidly firing specialized CTS 2581 beanbag rounds to momentarily incapacitate violent, non-compliant subjects. **ravendistributing.com**

ROBERT BRUCE

The aerodynamic Super-Sock 2581's 40 gram projectile is fully deployed immediately upon exiting the barrel at approximately 280fps, with effective range of 75 feet and accuracy relative to the shotgun, barrel length, environmental conditions and the operator. It's also available in blue, red and yellow marking powder versions. **ravendistributing.com**

ROBERT BRUCE

Show-and-tell is OK, but live fire is better. A Combat Arms Program Manager from Maryland's Joint Base Andrews gets the real BP7 experience, repeatedly popping out hard-hitting SuperSock rounds in semiauto mode. **ravendistributing.com**

ROBERT BRUCE

Trijicon's Eric Flax promoting the military and LE sight giant's latest offerings. Taking the tactical shooting world by storm with the revolutionary ACOG back in 1987, Trijicon has continued to lead the way with innovative weapon sighting solutions. **trijicon.com**

ROBERT BRUCE

Closely supervised by Trijicon's Jay Recto, a determined shooter smacks steel with 5.56mm, precisely positioned by the major military contract winning VC18 VCOG® (Variable Combat Optical Gunsight). It's a highly rugged, variable magnification riflescope designed for both CQB (close quarter battle) and long distance marksmanship. The Gemtech suppressor was a welcome addition to aid overwhelmed ear pro. **trijicon.com**

SHOW REPORT: NATIONAL CAPITAL REGION EXPO 2021

ROBERT BRUCE

A nice assortment of weapons topped with Trijicon's superlative optics, ready for hands-on, eyes-on live fire. Front and center atop an AR platform is one of the many AccuPoint variable power day scopes, available with just about any preferred reticle pattern. Note the handy little RMR on a 35 degree offset mount. **trijicon.com**

ROBERT BRUCE

Above and below; Hands-on shooting was a key feature of NCRE's many attractions and in this case some "close combat" with an M240 guided by Trijicon's wide field MGRS. The very tall and beefy tripod was a nice touch, allowing both young and more seasoned shooters a comfortable standing position. **trijicon.com**

ROBBIE THAYER, TSSI

Of course the SIG tent was a big hit all day long, offering a selection of live fire weapons from pistols to precision rifles. SIG SAUER is a top tier producer in military and law enforcement in the U.S. and allied countries. As Scott Berube confidently assured visitors, "it's our mission to provide our elite end-users with a complete weapons system they can depend on to prevail under any circumstance." **sigsauer.com**

ROBERT BRUCE

Standing tall and looking good in FDE finish, this is the latest version SIG 716 G2 DMR, chambered in powerful 6.5 Creedmoor. With M-LOK free-floating forend, Magpul grip and adjustable stock, it's topped by SIG's TANGO 6, a 5 to 30x56mm riflescope for precision shooting, tactical engagements and long range hunting. **sigsauer.com**

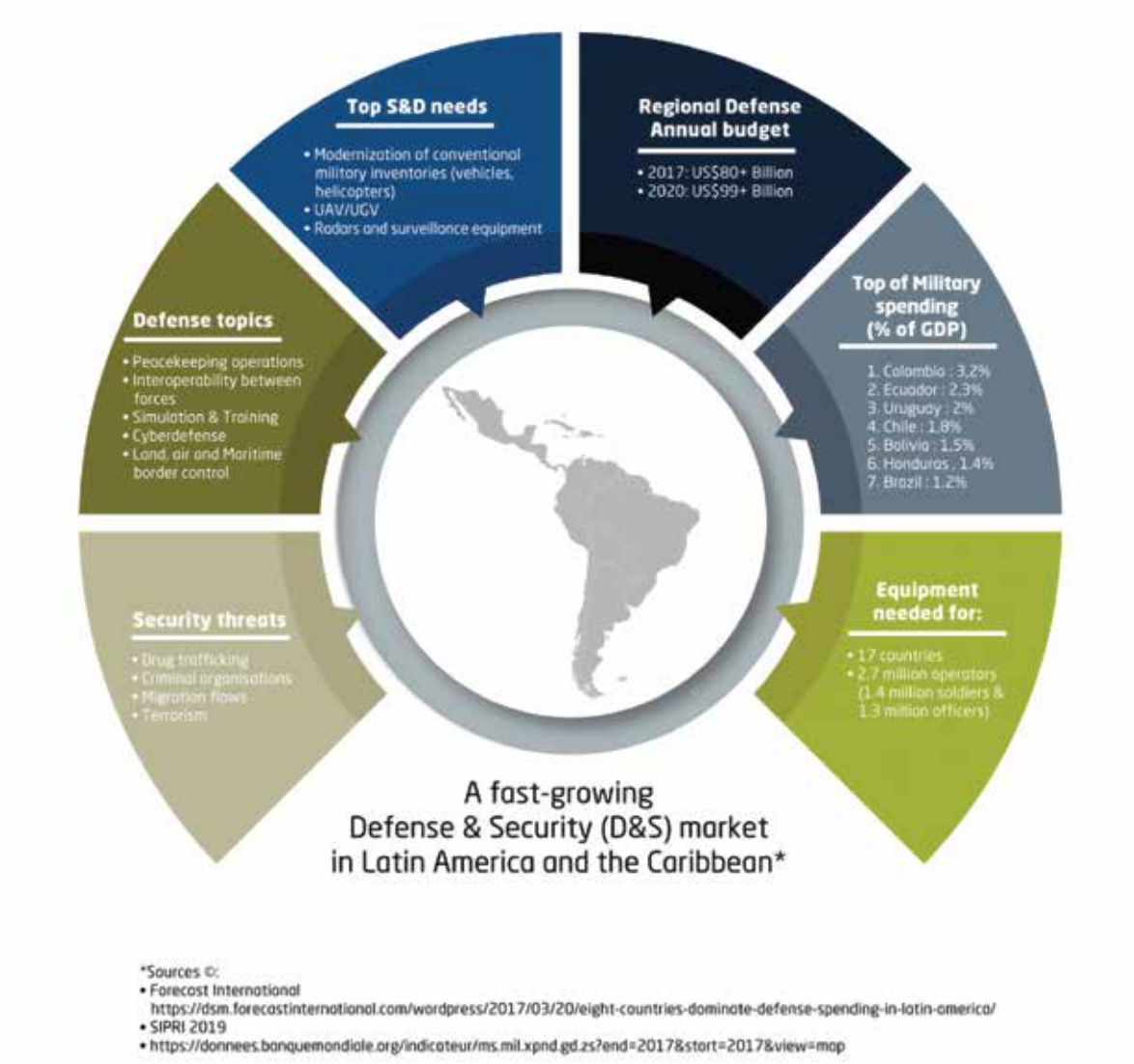
ROBERT BRUCE

An enticing selection of SIG firearms like the 9mm MPX K with plenty of SIG ammunition was ready and waiting for eager shooters. "Designed, engineered, and manufactured in America, and ready to perform whenever and wherever the need arises. SIG SAUER is combining industry-leading product innovation with decades of battle-tested experience to engineer the toughest, and most accurate pistols, rifles, optics, suppressors, and ammunition for the military and federal agencies." Alas, no sign of SIG's exciting entries in the high-stakes Next Generation Squad Weapons competition. **sigsauer.com**

ROBERT BRUCE

Full auto 9mm bursts with the stubby MPX K, offering a closed bolt gas piston system that is ultra-reliable and durable. As with all MPX, the K is modular, allowing for multiple handguard and barrel lengths and is ready to go for suppressor use. **sigsauer.com**

So, what does the future hold for NCRE? TSSI's Strang was characteristically enthusiastic, "Due to the resounding success of this event, we are pleased to announce that the National Capital Region Expo will return in 2022!" Where and when? "Stay tuned." SADJ



Expodefensa 2021–Security & Defense in Latin America & the Caribbean

EXPODEFENSA 2021
NOV 29–DEC 1

Latin American countries are growing steadily. Security and defense issues remain important and investments in this domain are made with precise budgets.

Throughout the South American continent, the security and defense needs are to maintain or restore peace, to prevent and combat natural and industrial disasters and to protect centers for exploitation of energy resources and mine sites located there.

Security issues that the continent is facing: drug trafficking, criminal organizations, migration flows, terrorism, etc. Among defense-related topics are peacekeeping operations, interoperability between forces, simulation & train-

ing, cyberdefense, land, air and maritime border control.

What Is Expodefensa?

Expodefensa is a tri-service exhibition that represents the continental hub of technological innovation in security and defense domains where the duality of equipment meets a real operational and budgetary need. An exhibition of the Colombian Ministry of Defense, Expodefensa is organized by two companies, Corferias and COGES Events, with the participation of armed, security and emergency forces. Both organizers have references in event organization, Corferias as the Bogota International Business and Exhibition Center and COGES Events as organizer of defense & security events like Eurosatory, the leading global land and airland defense and security exhibition.

Expodefensa is the international event of reference for all those in Latin America and the Caribbean who are in charge of defense and security, and who are looking for technology solutions and international equipment. Official delegations, as well as defense and security forces from the South American continent come to the exhibition to discover the widest range of defense and security products adapted to the continental requirements.

Zoom on the Last Edition

At its last edition in 2019, Expodefensa hosted 251 exhibitors from Argentina, Belgium, Brazil, Bulgaria, Canada, Chile, Colombia, Czech Republic, Denmark, the European Union, France, Germany, Israel, Italy, Lithuania, Mexico, the Netherlands, Panama, South Korea, Spain (guest honor country), Sweden, Taiwan, Turkey, Ukraine and the United Kingdom. About 25% of exhibitors came from the United States. Among attendees, there were about 13,000 professional visitors including 75 official delegations from 24 countries and 131 journalists. The numbers continue to grow with every exhibition.

Why Participate in Expodefensa 2021?

The topics covered by the event are essential today in the geopolitics and geostrategic world context, not only in Latin America, but in all the regions of the world. This is why Expodefensa presents a global vocation in terms of reflection and business.

It's one of the unique and rare defense & security physical events in the world that will take place in 2021 and is accessible for participants from all over the world. After a difficult period during the pandemic in 2020 (almost without any events), Expodefensa is a great opportunity to discover new equipment and suppliers as well as the latest technological innovations offered by international and Colombian companies.

EXPODEFENSA 2019

The event is particularly interesting for exhibitors as they can meet official delegations, VIP experts and trade visitors from Latin American and Caribbean countries. High-level attendees are concentrated in Bogota during the three days of Expodefensa.

All participants can benefit from Expodefensa and strengthen their professional networks and find new contacts to develop their business. The exhibition is also a place to exchange experiences and reflect on future solutions with security & defense players.

Save the date and come to Colombia from November 29 to December 1, 2021. The exhibition will take place at the Corferias International Business & Exhibition Center—a bio-safe venue. It's certified by the Bureau Veritas with the international SEFEGUARD label, and with the biosafety certification CHECK-IN certificate issued by the Ministry of Trade, Industry and Tourism of Colombia.

More information and registration available at **expodefensa.com.co.**

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ALTON P. CHIU

TNVC's Night Fighter 101 Course

Passive aiming through a Trijicon RMR.

Carbine 101 with Night Vision

By Alton P. Chiu

Night vision capability requires both equipment and training. Tactical Night Vision Company (TNVC) fulfills both needs by offering the full gamut of equipment, such as the PVS-31 and the GPNVG, and conducting training for beginners and advanced users alike. This piece discusses the 2-night introductory Night Fighter 101 course: course structure, equipment and lessons learned.

Course Structure

A lecture primed students on equip-

ALTON P. CHIU

Vertically align pointer aperture (green arrow) with barrel (yellow arrow) to minimize lateral offset if using parallel.

ment, challenges and mitigations while explaining the rationale behind techniques taught. Stories about the opposition searching for IR emissions, with as basic a tool as a handicam in night mode, informed students why both active aiming with a laser pointer and passive aiming through a red dot sight (RDS) were practiced.

Given the increasing popularity of articulated dual-tube goggles and the price competitiveness of the monocular, there was a pertinent discussion on which eye to use the monocular (e.g., PVS-14) being dictated by reaction once compromised. If one were still striving to stay covert, use by one's dominant eye preserves passive aiming. If switching to white (i.e., visible) light, one's dominant eye should be unaided to use a day optic with visible illumination while forgoing passive aiming under night vision goggles (NVGs). Tactics and gear are much more intertwined and require more forethought for night shooting.

Flow drills helped students sort out gear. By flowing from one posture to the next (e.g., low-ready, retention), any snags from pouches, antenna or hydration lines were revealed. Instructors also imparted a trick to spatially keep track of articulated NVGs to avoid knocking them against the environment. Instead of rotating the goggle up via the Wilcox L4 G24 mount, articulate the pods up like a brimmed hat so your peripheral vision gives spatial awareness.

Instructors repeatedly emphasized "if you can do it in the dark, you can do it in the day" as a guiding principle of selecting gear and practicing manual-of-arms. Low light, coupled with NVG plane-of-focus limitations (more on this later), requires the user to manipulate his or her firearm by tactile feel alone. Conquering this "night monster" requires competency addressed by the carbine and pistol course prerequisites. Many techniques taught by TNVC instructors were also common with the Gunsite carbine course (see *Small Arms Review* Vol. 23 No. 9). New to the author is the need to constantly apply upward pressure on the safety to ensure no movement when rubbed against gear. Furthermore, TNVC instructors encouraged students to treat the load-and-make-ready process as "rituals" to be followed religiously, to further guard against mistakes.

Students compared searching a structure using white light against using NVGs in a "Hunter-Hunted" segment. Two students hid in a shoothouse while two others searched for them. Author experienced the plane-of-focus and field-of-view (FOV) limitations of NVGs firsthand, with the lessons learned being better addressed in that section.

Marksmanship drills were typical of gun-fighting courses. Instead of bullseye shooting, rapid and effective shot placement in the upper chest and brain box was emphasized. Frequent use of failure (a.k.a. Mozambique) and Non-Standard Response drills (multiple shots to the upper chest) better represented real-world engagements. Course-of-fire was repeated with both active and passive aiming.

Much attention was devoted to the mechanical offset of a laser pointer, since it never coincides with bore and the effect is readily apparent at CQB distances. This offset can be zeroed at a certain distance (usually with a day optic) to give a converging zero. Pointer can also be made parallel with the bore so the offset is divorced from range-to-target to give a parallel zero. Students were free to choose either. Regardless, the offsets from both pointer and RDS were seared into memory through repetition.

While standing, kneeling and urban prone positions support both active and passive aiming, traditional prone is only compatible with active aiming as one's spine cannot bend enough to align NVG with day optic. This demonstration illustrated the niche for Clip-On NV devices (CNVD) and dedicated NV scopes.

To experience how NVGs slow down movement, students did turns and buddy-support drills. Snapping one's head toward a threat is a natural reac-

tion, but it was disorienting under NVG given the restrictive forty-degree FOV. This necessitated a slow scan instead. Inability to see the ground underfoot also slowed down footwork.

As a culminating experience, students shot "freestyle" at 50m targets from three different barricades with active, passive and asymmetric aiming (rifle not shouldered, aim with pointer only). Students were encouraged to experiment and the author learned what did and did not work from this exercise.

The Night Fighter 101 course covered the same marksmanship material as most carbine 101 classes. By adding the "night monster," TNVC taught students about the capabilities and limitations of the equipment.

Equipment

Aside from the usual and customary packing list, Night Fighter 101 required some NV-specific items. For students taking the class before purchasing equipment, TNVC held a "Try Before You Buy" event the night before and also had rental helmets, NVGs and laser aiming units for use during class.

For active aiming, the rifle must have both white light and IR pointer with IR illuminator recommended; the author used a SureFire Scout and ZenitCo PERST-3 (see *Small Arms Defense Journal* Vol. 13 No. 2) respectively. For passive aiming, an RDS is required with a tall mount (e.g., UNITY FAST) recommended; the author used a Trijicon RMR mounted atop a day scope. Pistols must have either night sights or RDS, in conjunction with a weapon-mounted light. Under goggles, the author found his night sights so out-of-focus as to be useless. His SureFire XVL2-IRC gave faithful service in both visible and IR spectrums.

Most students used dual-tube NVGs with a smattering of PVS-14 and one GPNVG. The author used an articulating dual-tube DTNVG with Gen3 white phosphor tubes built by TNVC, and found no cause for exercising its articulation. No student used a "skull crusher" soft NVG mount, with instructors recommending against it for comfort during the lecture. With few exceptions, students wore either plate carriers or chest rigs to manage ammunition.

The author also discovered some gaps in his gear during class. He found the OEM pads of his OpsCore FAST SF helmet wanting, and switched to 4D Tactical Zero G liner soon after. He also wished for a helmet mounted admin-light, as having both hands free is useful for taping targets, loading magazines and answering the call of nature. The class exercised a lot of kit and showed what worked and what required remedy.

Dark Focus Concepts FRS increases DOF. It swivels up, as pictured, for more light gathering.

TNVC

Hunter-Hunted using white light.

Lessons Learned

NVG is an optical instrument just like a camera lens, so there exists a plane-of-focus outside of which, objects appear fuzzy. Users typically focus NVGs at infinity so the RDS reticle is sharp for passive shooting. Objects as close as 15m still appear sharp due to depth-of-field (DOF), but anything closer is rendered an unrecognizable smear. During the "Hunter-Hunted" segment, the author failed to recognize a half-closed door, behind which a "hunted" was hiding. Another "hunted" eluded detection by breaking up his silhouette amongst detritus; this effect was further exacerbated by the monochrome NVG image. Another example of this conundrum is the need to check for laser blockage (close-distance task) when shooting through a small opening (far-distance task), lest the backsplash compromise one's own position.

Author tried focusing the dominant eye at infinity and the other eye much closer. It was no help since DOF gets shallower at closer focusing distances, even with the same f-stop (and NVGs have a fixed aperture size). In addition, brightly-illuminated objects looked like they had halos around them. The brain superimposed a sharp image from one eye onto an out-of-focus smear from another. Although this did

TNVC

Shooting drills under NVGs.

not give the author any headaches, it did not improve matters.

Products exist to increase NVG DOF at the expense of light entering the objective lens, thus requiring higher gain. As of writing, these solutions are Tarsier Eclipse by Matbock, Hoplite by Phokus Research Group and FR31 / FRS by Dark Focus Concepts. To borrow photography terms, these work on the principle of increasing the f-stop (restricting aperture) to increase DOF. The Tarsier Eclipse features an infinitely adjustable iris. The Hoplite (and its DIY solution of drilling through a scope cap) has a fixed-sized aperture on the flip-cap, so DOF is binary. The FR31 and FRS build upon that with a small aperture that slides into place for maximum DOF and slides away for a Hoplite-sized hole for CQB. For maximum light gathering, the front cap rotates up (instead of flipping open like the Hoplite) to prevent accidental opening due to shocks.

Experiencing the DOF, FOV and monochrome limitations of NVG taught the author to drastically slow down and concentrate on scanning close-medium-long range to better evaluate his environment. Searching with white light better approximates a daytime experience by somewhat maintaining DOF, FOV and color. However, it gives the opposition information with which to spring an ambush.

On the topic of mechanical offset, the author came into class with the preconception that lateral offset must be compensated at all ranges. While technically true, the author found his circular error probable (CEP) at 50m, especially with asymmetric aiming, to eclipse the offset, thus rendering it moot. Right-handers using a parallel zero can further mitigate this by rotating the rifle inward until the pointer aperture is vertically aligned with the barrel.

The scope-mounted RMR gave a comical 13mm of vertical offset, but made for quick passive aiming. In the high kneeling position, the author was able to align his NVG behind the 2.5-10x32 scope, but the image was dim and rather sensitive to head position. This made target observation and identification difficult, reinforcing the need for CNVD on a designated marksman rifle.

The author saw that some 50m targets were difficult to discern from the background, much less positively identify from ambient light alone; this cemented the need for an illuminator in the author's mind.

When shooting off his support shoulder while gripping the fire controls with his dominant hand, the author learned there was little difference compared to daytime when aiming passively. Actively, the pointer made for easier aiming, although body geometry made the top fire button of the PERST-3 difficult to reach.

The author learned that thorough live fire, preferably with some stress added, is required to ensure proper equipment selection and placement. When activating white light, he found that recoil drove the bottom of the PERST-3 into his thumb hard enough to break skin. Although he had no trouble activating the "clicky" white light tail-cap as momentary-only when dry firing, he mashed the button and activated constant-on during class. The negative impact was illustrated during a rifle to pistol transition. Upon holstering to reload the rifle, author found one-thousand lumens illuminating his legs for all the world to see. Several students also had accidental IR discharges, likely related to their tape-switch placement.

Given the reliance upon gear in night shooting, this experience taught the author to thoroughly exercise his kit. As equipment configuration constantly changes, he resolves to regularly live fire, both wearing full kit and "slick" in order to better guard against the "night monster."

Conclusion

TNVC's Night Fighter 101 course can best be summed up as a carbine 101 course using NVGs, designed to teach students the gear-specific limitations and how to overcome them. While shooting techniques may not be new, integration with NVGs provides a challenging environment to learn from. Incomparable instructors always took pains to explain the reason behind techniques. They tirelessly helped students find opportunities for improvement—so each can become a better night fighter. SADJ

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INDUSTRY NEWS

5.7x28mm–The New NATO Caliber for Pistols and Submachine Guns

Belgium-based FN Herstal announced that the FN®-designed 5.7x28mm caliber was recently recognized as a NATO caliber with the NATO STANAG 4509 (standardization agreement).

FN Herstal started the design of the 5.7x28mm cartridge in the late 1980s when body armor was becoming standard combat equipment and the modern-day battlefield required a more appropriate and more effective cartridge.

Simultaneously, FN Herstal designed the FN P90® Personal Defense Weapon (PDW), then later the FN FiveseveN® pistol, two weapons firing 5.7x28mm ammunition that are currently in service with a large number of military and police forces across the globe.

In a continuous effort to promote interchangeability of all small caliber ammunition used by allied armed forces, NATO has recently finalized the standardization process of the FN®-designed 5.7x28mm caliber by promulgating the standardization agreement (STANAG) 4509.

SS190 Ball | L191 Tracer | Sb193 Subsonic | SS192 Soft Core | FR199 Frangible | Blank

The 5.7x28mm caliber is now integrated into the Multi-Caliber Manual Of Proof and Inspection (AEP-97) and joins the standardized NATO small caliber ammunition portfolio, along with the 9x19mm NATO, the 5.56x45mm NATO, the 7.62x51mm NATO and the 12.7x99mm NATO (also widely known as the .50 caliber).

Elbit Systems Deutschland Selected by German Federal Police to Supply XACT nv33 Night Vision Goggles

Elbit Systems Deutschland was selected by the Procurement Office of the German Federal Ministry of the Interior, after a competitive tender procedure, to supply XACT nv33 Night Vision Goggles (NVGs) for the German Federal Police.

The Special Forces and Special Operation Units of the Federal Police are facing new threats and complex scenarios from organized crime and international terrorism. The XACT nv33 NVG will support the officers' in the fight against crime across Germany, as they will be equipped with the ability to operate during the nights, which is an essential requirement.

This decision by the German Federal Police follows another German customer (the German Armed Forces) that is already using the XACT nv33 NVG in various missions. The XACT product family have already been selected by a number of undisclosed NATO countries, among them Germany and the Netherlands, as well as the Israeli and the Australian Armed Forces.

The XACT nv33 is a lightweight binocular image intensifier that can be mounted on a wide variety of helmets and can be used head-mounted or hand-held. Its compact dimensions and its lightweight and the capability to use the system to drive

a vehicle in absolute darkness will further increase the operational capabilities for federal officers and better align their readiness for future security requirements.

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Available in three lengths you're already accustomed to from Maxim Defense: CCS, CQB, and SCW. If you own any of these stocks or braces and want to convert to the Pistol System all you need is the Pistol System housing, available separately. Your extension tube is already compatible.

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