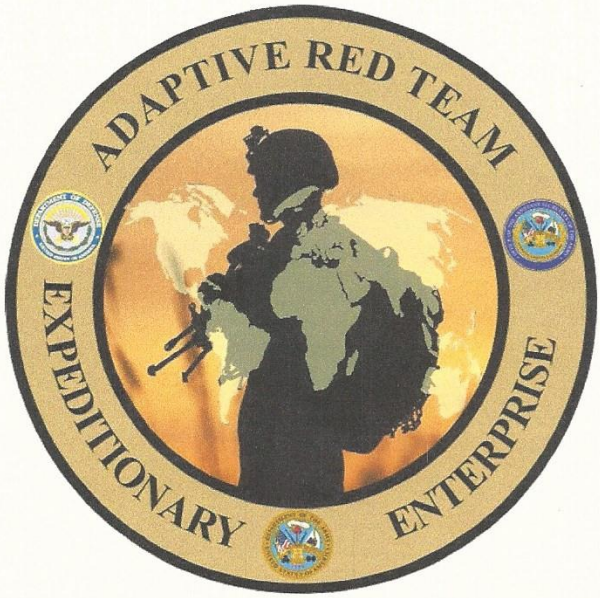


Adaptive Red Team (ART)
Technical Support and Operational Analysis (TSOA)

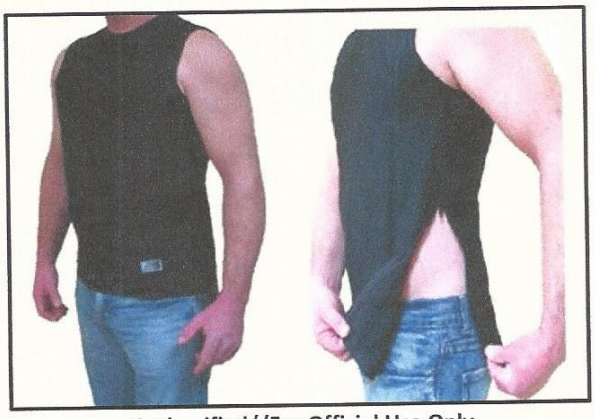
Technology summary
Bullet Blocker Gabriel Ballistic Base Layer

25. Gabriel Ballistic Base Layer (BBL) Compression Vest (CV)

(U//FOUO) **Deployable Force Protection (DFP) Functions**: Reduce Soldier Overburden, Increase Force Protection (Soldier)

(U//FOUO) **Organization**: MJ Safety Solutions, LLC/ Doing Business as (DBA) Bullet Blocker

(U//FOUO) **Description**: The Gabriel BBL CV (**Figure 25-1**) provides certified United States (U.S.) National Institute of Justice (NIJ) Level IIIA personal ballistic protection (see note below) in a design that affords the service member (SM) maximum concealability, mobility, and comfort. The Gabriel BBL CV distributes the weight of the integral ballistics evenly over the whole upper torso (front and back); resulting in diminished fatigue and pressure on stress points. The ballistic materials used are lightweight and flexible.



Unclassified//For Official Use Only

Figure 25-1: (U//FOUO) Gabriel BBL compression vest front/side view (note hidden zippers on side to aid in donning/doffing)

(U//FOUO) The Gabriel BBL CV is specifically designed to be concealable, low weight, and provide maximum mobility for the SM. Each Gabriel BBL CV is ergonomically designed to be sized to fit any human body dimensions, providing:

- (U//FOUO) Smart fabric technology to help the wearer stay cool, dry, and comfortable
- (U//FOUO) Uninhibited mobility for close quarters battle (CQB) tactics
- (U//FOUO) Nearly invisible footprint under most outer garments (**Figure 25-6**)
- (U//FOUO) Hidden side zippers on each side to ease donning and doffing (**Figure 25-1**)
- (U//FOUO) Suspension system to prevent rolling and sagging of ballistic panels inside the Gabriel BBL CV

  Note: (U) *A US NIJ Level IIIA protects against 8.1 gram (g) (125 grain [gr]) .357 SIG (SIG Sauer initially designed it) full metal jacket (FMJ) flat nose (FN) bullets at a velocity of 448 meters/second (m/s) ± 9.1 m/s (1470 feet/second (ft/s) ± 30 ft/s) and 15.6 g (240 gr) .44 Magnum semi jacketed hollow point (SJHP) bullets at a velocity of 436 m/s (1430 ft/s ± 30 ft/s). It provides protection against most handgun threats, as well as Level I, IIA, and II threats.*

(U//FOUO) A U.S. NIJ Level IIIA provides ballistic protection from most handguns. To obtain a higher level of ballistic protection, Levels III and IV, would require a ballistic vest or plate carrier system. Level III and IV provide ballistic protection from rifle projectiles of various sizes and speed, as well as, all Levels I, IIA, II, and IIIA.

(U//FOUO) The Gabriel BBL CV front and back ballistic panels (**Figure 25-2**) fit inside the carrier (the compression vest), leaving an approximate six inch (in) non-ballistic gap on each side. This is designed to allow protection for the vital front and back torso areas while affording maximum mobility. The FSR stated that side coverage could be added, but mobility would be reduced.

Unclassified//For Official Use Only

Figure 25-2: (U//FOUO) The Gabriel BBL CV front (top left) and back (bottom left) ballistic panels (note that each panel is serialized with date of manufacture, warnings, and care instructions (right); also note the silver snap at the top of the top of each panel)

- (U//FOUO) The ballistic material used in the Gabriel BBL CV vest is Kevlar® XP™ 300. This material allows the creation of an NIJ IIIA vest design that provides enhanced ballistic performance and reduces back face deformations by ~15%. The architecture of Kevlar® XP S300 with +45°/–45° of two layers of fiber lay-up allows the incorporation of fewer layers of material; reducing weight by up to 10%.
- (U//FOUO) The Kevlar schedule of layers is covered by a 420 Denier coated pack cloth (**Figure 25-2**) designed to resist rips and tears, doesn't fray, and repels water. The pack cloth is permanently sealed with a finish offering superior water repellent properties under all weather conditions that will not crack, blister, or peel. Each panel is serialized, identifying the date of manufacture, warnings, and care instructions. Each panel has a snap at the top to secure to the carrier when emplaced inside; one panel has a male snap, the other a female snap to prevent emplacing the ballistic panel in the wrong side of the carrier.
- (U//FOUO) The Gabriel BBL CV carrier provides a compression fit to house the ballistic panels, but is designed to provide additional system attributes.
  - (U//FOUO) The carrier is comprised of an antimicrobial textile product that inhibits the growth of bacteria and retards the resultant odor.

- (U//FOUO) The carrier material wicks moisture from skin to the exterior and also pulls salt from sweat, removing the abrasive substance leftover from perspiration for added comfort. In cold weather, the moisture wicking material prevents built up sweat from cooling the body too quickly, because the sweat will have evaporated.
- (U//FOUO) The compression fit has been proven to improve athletic performance before, during, and after activity through improved circulation, muscle containment, and reduced muscle vibration. Through heightened blood circulation, compression clothing reduces the risk of blood clots, Deep Vein Thrombosis (DVT), and swelling in limbs and ankles. It applies pressure to the skin surface to increase the body's awareness for improved posture, agility, and stability. These are considered attributes that support military operations for the individual SM.
- (U//FOUO) With properly sized ballistic panels inserted, the smooth, slippery feel of the carrier material reduces the potential for rubbing and/or chaffing of the skin, even with the compression fit.

(U//FOUO) Even when a bullet is stopped, the blunt trauma of a high velocity hit can be devastating (**Figure 25-3**). Engineered to reduce back face signature (BFS), the non-penetrating impact the vest makes on the body after being hit, the Gabriel BBL CV absorbs and dissipates energy more efficiently than the standard requires. Where the Level IIIA NIJ maximum allowable BFS of a .44 Magnum round is 44 millimeters (mm) at a velocity range of 1400-1460 ft/s, the Gabriel BBL CV ensures an average BFS of less than 39 mm.

Unclassified//For Official Use Only

Figure 25-3: (U//FOUO) Gabriel BBL CV stopping a .40 caliber round (left) and round retrieved (right) (note the mushroom effect resulting from impact with the ballistic panel, blunt trauma would be transmitted to the body underneath from this impact)

(U//FOUO) Multiple rounds, fired in close proximity at any protective vest, will cause the ballistic material to fatigue and/or deform, and increase the potential for subsequent round penetration (**Figure 25-4**). The Bullet Blocker field service representative (FSR) stated that the Gabriel BBL CV should be replaced if it receives a single round impact, but is designed to withstand six handgun rounds.

Unclassified//For Official Use Only

Figure 25-4: (U//FOUO) Gabriel BBL CV ballistic layers revealed after removing the 420 Denier pack cloth covering, showing deformation created by multiple rounds in close proximity

(U) **Objectives:** Multiple:

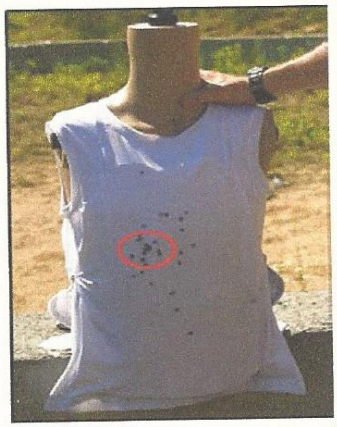
- (U//FOUO) To allow the Gabriel BBL CV to be worn by SMs and assessors to obtain feedback on the comfort, mobility, and overall feel.
- (U//FOUO) To demonstrate the Gabriel BBL CV's Level IIIA ballistic protection via a live fire assessment.

(U//FOUO) All objectives were successfully met:

- (U//FOUO) Four SMs (two male Border Tactical [BORTAC] members, one female and one male U.S. Army soldiers, and one assessor [a previous Navy SEAL]) wore the Gabriel BBL CV for up to seven days continuously and provided direct feedback to the Bullet Blocker FSR and the White Cell data collector.
- (U//FOUO) The Gabriel BBL CV was placed on a manikin and fired upon at ranges from ten meters (m) to one m with nine mm (36 rounds) and .40 caliber pistols (18 rounds). At least 21 rounds of nine mm were fired, and hit the front torso before a penetration occurred (see full assessment below). Based on this assessment, it was determined by all witnessing that the Gabriel BBL CV met or exceeded the NIJ Level IIIA ballistic protection standard.

(U//FOUO) **Experiment:** Gabriel BBL CVs were provided to two BORTAC members during the Program Manager (PM) training and another two SMs and an assessor during the five day ART/TSOA event to determine comfort, mobility, heat buildup, and general durability. All five wore their Gabriel BBL CV throughout the event.

- (U//FOUO) On Day minus two, during live fire training at the PM training course, a Gabriel BBL CV was fitted to a manikin and fired upon with nine mm (**Figure 25-5**) and .40 caliber automatic pistols. The sequence of fire is provided in **Table 25-1**. Penetration was inspected after each phase of the sequence. Thirty-six nine mm FMJ and 18 .40 caliber SJHP rounds were fired; a total of 54 rounds. Two nine mm FMJ rounds penetrated at some point from the 22nd round fired to the 36th; none of the .40 caliber rounds penetrated.



Unclassified//For Official Use Only

Figure 25-5: (U//FOUO) Gabriel BBL CV front torso after 36 nine mm rounds fired; two penetrations occurred in the area where multiple rounds impacted (red circle) after 21 nine mm rounds had been fired

Table 25-1: (U) Sequence of fire during Gabriel BBL CV live fire assessment

Caliber/Round Type	Rounds Fired	Distance	Aim Point	Penetrations
9 mm/FMJ	3	10 m	Front torso	0
9 mm/FMJ	3	10 m	Front torso	0
9 mm/FMJ	15	5-10 m	Front torso	0
9mm/FMJ	15	5-10 m	3" circle/front torso	2
After the 9 mm was fired at the front torso, the manikin was reversed to fire the .40 caliber at the back torso				
.40/SJHP	1	10 m	Back torso	0
.40/SJHP	1	10 m	Back torso	0
.40/SJHP	1	10 m	Back torso	0
.40/SJHP	1	10 m	Back torso	0
.40/SJHP	1	10 m	Back torso	0
.40/SJHP	1	10 m	Back torso	0
.40/SJHP	12	1 m	Back torso	0

Unclassified//For Official Use Only

(U//FOUO) What new capability (or improvement to existing capability) did this represent to the SM? The Gabriel BBL CV provided flexibility, comfort, reduced fatigue, and enhanced mobility while providing concealable NIJ Level IIIA ballistic protection.

(U//FOUO) **Observations**: The following Gabriel BBL CV assessment is provided from SM, engineer/ scientist, and vendor perspectives:

(U) General Observations:

- (U//FOUO) Day minus two: Two Gabriel BBL CVs, previously sized for specific male BORTAC members, were issued and worn throughout the PM training. A third Gabriel BBL CV was placed on a manikin and shot to determine penetrability.
- (U//FOUO) Day minus one: Two Gabriel BBL CVs continued to be worn by BORTAC members during PM training.
- (U//FOUO) Day one: FSR attended in-briefings and Gabriel BBL CVs were issued to one female SM and one male assessor (previous SM), both previously sized for individual fit.
- (U//FOUO) Day two: One Gabriel BBL CV was issued to a male SM who had not been previously sized and wore a vest that was approximately his size, but a little big.
- (U//FOUO) Day three through Day five: A total of five Gabriel BBL CVs continued to be worn throughout the event.

(U) Technical Performance:

(U//FOUO) The live fire assessment described above was considered to have met or exceeded the ballistic protection standard of NIJ Level IIIA; especially since the Bullet Blocker FSR stated that the Gabriel BBL CV was to be replaced after receiving six rounds in any location(s).

(U//FOUO) The Gabriel BBL CV was designed to provide NIJ Level IIIA ballistic protection in a concealable manner (**Figure 25-6**). It was not intended to be worn in combination with a ballistic vest or plate carrier system. Although, if the situation dictated the necessity to concomitantly wear a ballistic vest/plate carrier and the Gabriel BBL CV, it is anticipated that it would provide an added layer of protection from

shrapnel, fragmentation, and projectile penetration and/or the related blunt trauma imparted. However, the combined heat buildup of wearing both systems simultaneously could be an issue.

Unclassified//For Official Use Only

Figure 25-6: (U//FOUO) Torso on the left is wearing the Gabriel BBL CV in a concealed manner; the torso on the right is not wearing the Gabriel BBL CV

(U//FOUO) Knowing that there would be working canines (K9) participating in ART/TSOA 15-3, Bullet Blocker brought a prototype K9 ballistic vest. The wearable, NIJ Level IIIA K9 vest was demonstrated to MissionTEQ (the technology incorporating K9s) FSRs and discussions ensued on potential future collaboration.

(U) Human Systems (user interface):

(U//FOUO) The consensus of all five Gabriel BBL CV wearers was that it was very comfortable and allowed a full range of mobility. As designed, the compression vest distributed the weight equally throughout the torso and eliminated any specific pressure points. Three of five SMs stated that they had forgotten that they were even wearing soft body armor.

(U//FOUO) The inherent heat buildup, common to all soft body armor, was considered similar to currently issued/worn military, emergency medical technician (EMT), and BORTAC soft body armor. But, the experienced comfort and mobility reduced the discomfort and fatigue normally caused by the heat.

- (U//FOUO) Day minus two through Day one temperature and humidity were in the mid 80°s and Gabriel BBL CV related heat buildup was noticeable, but again, no worse than that experienced by currently issued soft body armor.
- (U//FOUO) Day two through Day five temperatures were in the 60°s and humidity was lower; the added heat derived from the Gabriel BBL CV was considered a benefit.
- (U//FOUO) Physical exertion was directly proportional to the increase in heat buildup when wearing the Gabriel BBL CV, but again the vest's comfort and full range of mobility reduced the related discomfort and fatigue normally experienced.

(U//FOUO) Prior to the event, four of the five participants were provided a Gabriel BBL CV sizing sheet from Bullet Blocker. The sizing sheet incorporated instruction and diagrams to determine accurate chest, waist/girth, front seated, and back standing measurements. Height, weight, and inseam were also requested. Females were asked for their bra size, and high and full bust measurements. The sizing data was determined by each individual (or by an inexperienced partner), and the sizing sheets filled out and submitted, independently. The potential for incorrect measurements was apparent:

- (U//FOUO) One BORTAC member stated that the front panel rose into his throat when seated; this indicated that the Gabriel BBL CV front ballistic panel was too long.
- (U//FOUO) Another SM stated that there were slight bulges at the front and rear shoulder that obviated concealability, and that when driving a vehicle, the front panel pinched his shoulders. These factors indicated that the front and back ballistic panels were too wide. In this particular case, the SM had received the Gabriel BBL CV prior to the event, identified the sizing issues to Bullet Blocker, and received re-sized front and back ballistic panels on Day one of the event; all issues were resolved.
- (U//FOUO) The male SM with the oversized Gabriel BBL CV stated it was rubbing his chest and irritating his nipples, and also chaffing around his arm pits. For an expedient reduction of the irritation, the SM placed duct tape over the affected regions which provided relief. The same SM stated the front ballistic panel rode up when he was running. All conceivably caused by the vest being oversized (not previously sized for a precise fit).
- (U//FOUO) The female SM stated that the Gabriel BBL CV was comfortable and provided full range mobility, but felt a little big.
- (U//FOUO) All of these issues were probably caused by the SM not being accurately sized for the vest and/or not providing accurate measurements. A more precise means to obtain specific individual sizes and thus ensure a proper Gabriel BBL CV fit should be established.

(U//FOUO) Another issue that caused at least three of the Gabriel BBL CV wearers to remark was the side zippers. The compression vest was intended to be tucked into the trousers, but when tucked in, with equipment/kit worn on the belt or around the waist, the zippers (especially the pull tab and the slider body) caused irritation. This caused some wearers to leave the Gabriel BBL CV untucked and resulted in undesirable movement of the ballistic panels when moving and/or sitting.

(U//FOUO) SM alteration of the Gabriel BBL CV was discouraged by the FSR, as specific tools and practices (cutting sheers, sewing needles and procedures, etc.) are required to maintain the system's configuration. Alteration of the front and/or back ballistic panels would necessitate revealing the Kevlar layers, to the potential detriment of the ballistic standards provided.

(U//FOUO) All five Gabriel BBL CV wearers initially wore the vest next to their skin. Earlier, during the warmer temperatures the heat buildup and resulting sweat caused doffing of the system to be a challenge (similar to doffing a wet wetsuit). Donning and doffing was made easier by the incorporation of the left and right side zippers (**Figure 25-1**). At least one Gabriel BBL CV wearer wore a microfiber T-shirt underneath for two days during the event which was comfortable and made doffing much easier. A cotton T-shirt would not be advised as it would retain moisture and increase the SM's load.

(U//FOUO) The Gabriel BBL CV did not create an identifiable odor during the five to seven days worn, but in consistently warm to hot weather it would be anticipated. Cleaning instructions on each ballistic panel were provided. The SM would remove the ballistic panels and wipe them with a damp cloth, and wash the carrier as a piece of regular clothing.

(U//FOUO) All Gabriel BBL CV wearers reported positively that they could conduct their daily activities with only intermittent awareness of the vest; specifically when crouching, sitting, or steering a vehicle.

(U) Logistic Systems Integration:

(U//FOUO) The weight of the Gabriel BBL CV was directly proportional to the body size of the SM being fitted for it. The stated weight range was four to six pounds; the total system weight for a 165 pound, seventy inch male was four pounds.

(U//FOUO) Colors available were advertised as black, white, and nude (beige); but a wider range of colors were stated to be available upon request.

- (U//FOUO) All five Gabriel BBL CVs issued for personal assessment were black; the vest used for the live fire assessment was white. For its intended purpose as concealed ballistic protection, black appeared, at least to two SMs, as an indicator at the revealed neck line that soft body armor was being worn, even if not noticeable under their clothing.

(U//FOUO) It is not anticipated that the Gabriel BBL CV would be a repairable item. If the vest was shot, at least replacement of that ballistic panel would be expected; if not the replacement of the whole system. Minor rips or tears in the carrier fabric could be sewed or taped in a field expedient manner.

(U) **Significant Accomplishments:**

- (U//FOUO) The live fire assessment, with at least 21 nine mm rounds striking the front torso of the Gabriel BBL CV before a penetration was registered, was considered a dramatic success.
- (U//FOUO) The wide range of user feedback, to include BORTAC, Army and Air Force SMs, and a former Navy SEAL exceeded Bullet Blocker's expectations and exposed a variety of operational situations and tactics, techniques, and procedures (TTP).
- (U//FOUO) Bullet Blocker was approached by various military and government representatives asking for additional information on the Gabriel BBL CV; all were considered valuable points of contact for a small business.

(U) **Collaboration:**

Table 25-2: (U) Gabriel BBL CV Collaboration

Collaborated with	Achieved/Attempted	Comments
Trauma Kits	Attempted	Discussed potential for future integration
WolfPak Canine (K9)	Achieved	Bullet Blocker brought an actual BBL prototype canine vest to demonstrate to WolfPak K9

(U//FOUO) **Recommendations**: This was the first ART/TSOA experience for Bullet Blocker and the Gabriel BBL CV. The SMs wearing the system strongly supported the level of ballistic protection provided for the weight induced, as well as, the comfort and mobility they experienced while wearing. With further development, as discussed above and below, recommend the Gabriel BBL CV be considered for continued assessment at a subsequent ART/TSOA activity.

(U) Specific recommendations for consideration:

- (U//FOUO) The majority of recommendations are related to obtaining the correct body measurements to ensure a proper Gabriel BBL CV fit:
  - (U//FOUO) Design a better means to allow individual SMs to measure themselves (or each other) for a better fit. The sizing sheet should provide more explanation, more measurement locations, more/better diagrams, etc. Consider providing a digital video disc (DVD) for further clarification.
  - (U//FOUO) In situations where Bullet Blocker is fielding a large number of Gabriel BBL CVs, send a qualified Bullet Blocker FSR to measure SMs at their location; or train an SM (at your location) to take the measurements for other SMs.
  - (U//FOUO) Design protection for the zipper to avoid having it rub and irritate when tucked into the SM's trousers. (This issue was identified early in the event and according to the attending Bullet Blocker FSR was identified to the factory and a preliminary fix was made on a pending order during ART/TSOA 15-3 by incorporating a material cover over the pull tab in the fully closed position.)
  - (U//FOUO) Rather than have the SMs invent an inappropriate solution when deployed, provide a kit with the tools, materials, instructions, and other items necessary to perform appropriate field expedient alterations and repairs.
- (U//FOUO) Continue to explore the potential for a K9 ballistic vest.
- (U//FOUO) Investigate obtaining a National Stock Number (NSN) for the Gabriel BBL CV to allow Department of Defense (DoD) and other government organizations to procure through their established supply system(s).
- (U//FOUO) In a subsequent ART/TSOA assessment have SMs bring their soft body armor to allow a comparison in heat buildup, mobility and comfort.

(U//FOUO) Comments: The Gabriel BBL CV was enthusiastically accepted by the five personnel that wore it during ART/TSOA 15-3. After the impressive results of the live fire assessment, probably the best assessment comment made by a wearing SM was "I didn't even know I had it on."