



TRAINING MODULE: BALLISTIC VESTS: FIT, COVERAGE, CARE AND MAINTENANCE

PURPOSE: To provide an overview of the safety benefits of ballistic vests and current issues concerning fit, coverage, care and maintenance.

TIME: 20 Minutes

OBJECTIVES:

- Become familiar with the benefits of wearing ballistic vests
- Learn about current issues in the field of soft body armor in regards to fit, coverage, care and maintenance
- Learn about recent developments and technological advancements in ballistic vests
- Become familiar with individual and agency responsibilities as they pertain to care and maintenance of soft body armor

PARTICIPANTS MATERIALS:

- Participant Manual

TRAINER MATERIALS:

- Training Manual
- PowerPoint Presentation

Ballistic Vests: Fit, Coverage Care and Maintenance



Zero Officers Killed or Injured

Since the creation of the first bullet resistant vest in the late 1800's, numerous developments have been made in the field of soft body armor. Through World War I, World War II, and the Korean War, several vests were produced for the United States military. In 1969, American Body Armor was founded and began to produce a patented combination of quilted nylon and multiple steel plates to be marketed for the first time to American Law Enforcement. By the mid 1970's, the DuPont Corporation introduced the Kevlar synthetic fiber, which was immediately incorporated into the National Institute of Justice (NIJ) evaluation program to analyze the possibility of an everyday concealable vest.

Ballistic Vests: Fit, Coverage Care and Maintenance

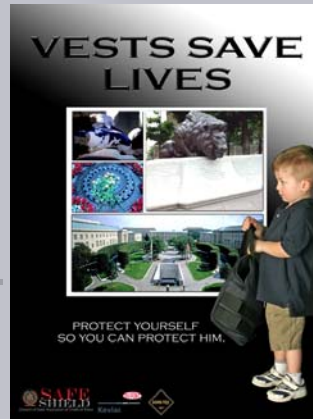
- 2007 was one of the deadliest years for the U.S. law enforcement community since 1989
 - 28 %increase in officer fatalities
 - 33 %increase in those killed by gunfire
- Between 1980 and 2001 approximately 1,200 officers have been killed in the line of duty. More than **30 percent** could have been saved by body armor.
- Since 1987, over 3,000 individuals have been saved by their vest.

Preliminary statistics compiled by the National Law Enforcement Officer Memorial Fund show that 2007 was one of the deadliest years for the U.S. law enforcement community since 1989. There was a 28 percent increase in officer fatalities compared to 2006. The number of officers killed by gunfire increased at a more staggering rate of 33 percent. Since 1974, the number of law enforcement deaths had been steadily declining with the exception of 2001

Research has shown that between 1980 and 2001 approximately 1,200 officers have been killed in the line of duty. More than 30 percent could have been saved by body armor. The save percentage is even higher when evaluating felonious assaults involving firearms

Ballistic Vests: Fit, Coverage Care and Maintenance

FBI studies show that the risk of sustaining a fatal injury for police officers who do not wear body armor is 14 times greater than for officers who do.



FBI Studies shows that the risk of sustaining a fatal injury for police officers who do not wear body armor is 14 times greater than for officers who do. This is not only the result from hostile encounters but also motor vehicle and motorcycle accidents, falls ,fires, and explosions.

- **Officer ignited during foot pursuit**
- **VA State Trooper Vehicle Pursuit/Accident Example**
- **Train Explosion**

Ballistic Vests: Fit, Coverage Care and Maintenance

- **Vest Wear Policies**
 - **Mandatory Policy Advocates:**
 - National Law Enforcement Policy Center
 - IACP Model Policy
 - **Agency/Supervisor Responsibilities**
 - Provide NIJ Standard 0101.06 compliant armor to officers
 - Promote maximum body armor use
 - Routine and regular inspections of armor

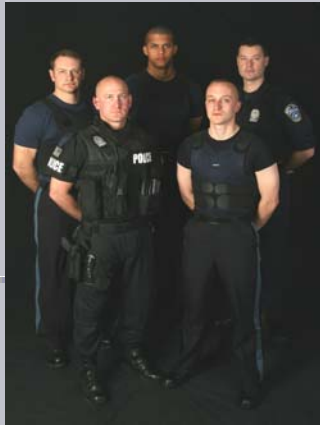
Vest Wear Policies

Given the general acceptance that body armor's effectiveness, it is imperative that parties associated with the issue due everything in their power to promote maximum body armor use

National Law Enforcement Policy Center: advocates a mandatory-use policy for all uniformed officer engaged in field activities

IACP Model Policy advocates that all uniformed and plain clothes officers engaged in field activities both on and off duty are required to wear their vests.

Ballistic Vests: Fit, Coverage Care and Maintenance



Vest Fit and Coverage Issues

- Improper fit
 - Discomfort through reduced mobility
 - Reduced ballistic coverage

According to LEOKA data, from 1996 to 2007, 119 officers were killed as a result of ballistic penetration in areas not protected by their armor

Issues:

Comfort: The need for comfort is crucial because an uncomfortable officer will stop wearing armor. Three ways body armor creates discomfort:

Reduced mobility

Increased weight

Heat build-up

Fit and Coverage: Improper fit leads to discomfort and reduced ballistic coverage.

Individualized attention to proper fit will help alleviate a number of the comfort and coverage issues. Measurements are the key to getting a proper fit and the right amount of coverage in regards to the ballistic vest.

- Lack of standards and training for persons performing this job function
- A policy needs to be implemented within the vest manufacturing industry requiring all employees to complete a certification program.

Ballistic Vests: Fit, Coverage Care and Maintenance

■ Breakdown of Vest Failures

- 34% (41 officers) armhole or shoulder area
- 15% (18 officers) between the side vest panels
- 16% (19 officers) above the vest
- 13% (16 officers) below the vest

The Federal Bureau of Investigation annually tracks extensive data on Law Enforcement Officers Killed and Assaulted (LEOKA). These reports provide specific information on area of injury, caliber of weapon and if body armor was used. From 1996 to 2007, 119 officers were killed as a result of ballistic penetration in areas not protected by their armor. The breakdown of the failures are as follows:

- 34% (41 officers) armhole or shoulder area
- 15% (18 officers) between the side vest panels
- 16% (19 officers) above the vest
- 13% (16 officers) below the vest [2]

Unfortunately, these are only a portion of verified cases of vest failures due to fit since the number of documented cases for disabilities or injuries is not known. The FBI only provides specific analysis on felonious deaths and not injuries resulting from assaults.

Currently, research is being conducted to identify potential areas for increased coverage that will enhance protection without decreasing task performance.

The problems are only exacerbated when analyzing the female vest. Accommodating the female figure presents a unique set of design challenges that could result in protective and functional sacrifices. However, recent developments have minimized perceived flaws by using specific stitching techniques to reduce seams.

Ballistic Vests: Fit, Coverage Care and Maintenance

Female Specific Vests

- Precise fit versus standard sizes
- Pleating
- Specific vest covers



Improvements:

Female Specific Vests

- Goal is to provide the safest and most comfortable body armor for women taking into account anatomical differences
- **Precise fit vs standard sizes:** typically measurements are taken then a standard (small, medium, large) vest is selected and minor adjustments are made. New techniques involve utilizing specific measurements to create vest panels specific to a body shape.
- **Pleating** is now used to create the breast cups to eliminate the use of seams keeping the material uniform.
- **Vest specific vest covers** are also being made to complete the precise fit. In the past a vest was slightly tailored to an officer's measurements but then the panels were placed in a standard size and design cover limiting the desired results in regard to fit.

Ballistic Vests: Fit, Coverage Care and Maintenance

Benefits of Outer Vests



- Increased Coverage
- Increased Comfort
- Reduces Lower Back Strain



Outer Vests: Standard in Europe for years.

Benefits

- **Increased coverage:** it is estimated that the coverage area for a mid-size outer vest is almost double that of an inner vest. Concealable vests are limited in their design capacity. Outer vests maximize ballistic protection
 - Increased protection around the arm pits, neck, stomach, and groin
- **Increased comfort:** the flexibility in design options leading to lighter-more breathable design options.
- **Reduces lower back stress:** outer vests allow for the distribution of weight from the gun belt from the lower back and hips to the chest and shoulders
 - Detachable carriers that attach to the vest to re-distribute equipment from the gun belt
 - Attaching the vest to the belt to help lift it off of the shoulders and reduce the strain on the lower back.

- Lower back problems account for 15-35% of all early retirements.
- The cost of early disability is estimated at 165% of an officer's salary.

Fremont City California

- Proposed outer vest to help alleviate back injuries from the inequitable distribution of weight caused by the duty belt.
- Utilized the MOLLE system allowing for equipment to be placed on the vest directly.
- Officers have reported a reduction in back strain and increased vest usage due to the additional comfort and convenience yielded by the outer vest.

Outer vests are now being produced in a variety of colors and can be color matched to a specific uniform color to blend with the uniform shirt.

Ballistic Vests: Fit, Coverage Care and Maintenance

Technological Developments

Spectra II Shield

- 20% greater ballistic performance than standard Spectra fiber
- High resistance to chemicals, water, and UV light
- 60% greater strength than aramid fibers

Kevlar XP

- 10% lighter in weight
- 15% reduction in backface deformation when using a .44 magnum bullet

Developments and Technology

Kevlar XP: Provides increased ballistic and trauma protection in a more comfortable body armor solution

- 10% lighter in weight
- 15% reduction in backface deformation (blunt force trauma resulting from the gunshot) when using a .44 magnum bullet
 - 11 layers but consistently stops bullets within the first 3 layers. The remaining layers absorb the energy of the bullet, resulting in less trauma.

Spectra II Shield:

- 20% greater ballistic performance than standard Spectra fiber based offerings, which is already 15 times stronger than steel but light enough to float.
- High resistance to chemicals, water, and UV light.
- 60% greater strength than aramid fibers.

Ballistic Vests: Fit, Coverage Care and Maintenance

Care and Maintenance

- Officer Responsibilities
 - Routine inspections of body armor for signs of damage and cleanliness
 - Dirt and perspiration can erode ballistic panels
 - Never use dry cleaning solvents, harsh detergents, or bleach on body armor
 - Proper Storage
 - UV light and sunlight will damage ballistic capabilities

Officers should be responsible and held accountable for the proper storage, maintenance and care of their soft body armor. Agencies must ensure that officers are receiving and reviewing care instructions so they are properly informed on how to maintain their vests.

- Routine inspections of body armor for signs of damage and cleanliness
- Dirt and perspiration erode ballistic panels. Officers shall be responsible for cleaning their armor according to the manufacturer's instructions. Never use dry cleaning solvents, harsh detergents, or bleach on body armor. Vests should be washed by hand with mild soap and water and hung to dry inside.
- Proper Storage: Vests should never be stored where it is exposed to sunlight. UV light and sunlight will damage ballistic capabilities.

Body armor shall be replaced in accordance with the guidelines and protocols established by the National Institute of Justice

Ballistic Vests: Fit, Coverage Care and Maintenance

Care and Maintenance

- Agency Responsibilities
 - Ensure armor is worn
 - Annual inspections of body armor for fit, cleanliness, and signs of damage, abuse and wear
 - Monitor technological advances in the body armor industry that may necessitate a change in armor
 - Assess weapons and ammunition currently in use and the suitability of approved armor to protect against those threats
 - Provide Training on effectiveness, technological advances, proper use and fit.

Agency Responsibilities:

- Supervisors shall be responsible for ensuring that armor is worn and maintained through routine observation and periodic documented inspections
- Annual inspections of body armor should be conducted for fit, cleanliness, and signs of damage, abuse and wear.
 - Does the vest fit properly
 - Does the officer know how to care for the vest properly
 - Is the vest being worn routinely
 - Are there any signs of deterioration
 - Discoloration: sign of exposure to sunlight and ballistic decay
 - Frayed fabrics: distortions in weave or seams coming apart
 - Odors, mildews, excessive body oils: indication of improper care and possible negative affect on ballistic integrity
 - Signs of Damage: cuts, impacts, stains, spills

- Monitor technological advances in the body armor industry that may necessitate a change in armor
- Assess weapons and ammunition currently in use and the suitability of approved armor to protect against those threats. It is recommended that officers wear armor rated for a threat level that is equal to the weapon they carry. This is based on statistics that show a number of officers are fatally wounded annually by their own weapon.
- Provide training programs that demonstrate body armor's stopping power under actual firing conditions and that emphasize its safe and proper use.
- Provide training on a continual basis in regard to proper use, fit, and function as well as technological advances in the body armor industry.

Ballistic Vests: Fit, Coverage Care and Maintenance

- Procurement of Vests
 - Identify the appropriate level of threat for your agency:
 - Service weapon carried by officer
 - Confiscated weapons and ammunition
 - Review police reports to determine types of weapons being used in criminal cases
- Replacement of Vests

Vest Procurement:

Today more than 50 manufactures produce body armor from one or more of the ballistic fibers.

NIJ Standards: Classified into 6 types by level of ballistic protection against standard test rounds.

Identify the appropriate level of threat:

- Service weapon carried by officer
- Confiscated weapons and ammunition
- Review police reports to determine types of weapons being used in criminal cases.

VEST REPLACEMENT:

Armor stock should be tested every 3-5 years to see if replacement is necessary. A list of approved labs to conduct the testing is available by contacting the National Law Enforcement and Corrections Technology Center

- DuPont Study: some armor may lose its efficiency in as little as 3 years but most deterioration occurs in armor over 5 years old.
- NIJ Tests: Concluded that used armor retains its efficiency very well, up to and beyond 10 years.

Both agree age alone does not deteriorate the vests, the degree to which normal usage and storage conditions affect the armor is debatable.

Other factors to consider when thinking of replacing vests:

- Changes in weapon types and ammunition commonly found in the community
- Improvements in body armor technology
- Changing physical characteristics of officers

Ballistic Vests: Fit, Coverage Care and Maintenance

IACP/DuPont Kevlar Survivors Club

- Encourage the increased wearing of personal body armor through documentation of the armor's effectiveness
- Recognize individuals who as a result of wearing personal body armor have survived life-threatening incidents
- Serve the law enforcement community by sharing valuable information relating to these incidents with fellow officers.



IACP/DuPont Kevlar Survivors Club:

The International Association of Chiefs of Police and DuPont started the IACP/DuPont™ Kevlar Survivors' Club® in 1987. Since then, over 3,000 individuals working in law enforcement have survived both ballistic and non-ballistic incidents because they were wearing body armor. The IACP/DuPont™ Kevlar Survivors' Club® consists of officers who have survived potentially fatal and/or disabling injuries through the use of body armor, and pays tribute to those who have the foresight to “Dress for Survival.” The Survivors’ Club goals are:

- Encourage the increased wearing of personal body armor through documentation of the armor's effectiveness
- Recognize individuals who as a result of wearing personal body armor have survived life-threatening incidents
- Serve the law enforcement community by sharing valuable information relating to these incidents with fellow officers.

REFERENCES:

IACP Model Policy: Body Armor (April 1999)

IACP Concepts and Issues Paper: Body Armor (April 1999)

IACP Training Key #367, Soft Body Armor

IACP Training Key #507, Soft Body Armor- An Update

FBI LEOKA Data, 1996-2005