

Soldier Protection System (SPS)

Executive Summary

- The Soldier Protection System (SPS) is a suite of personal protection subsystems intended to provide equal or increased levels of protection against small-arms and fragmenting threats compared to existing personal protection equipment and at reduced weights.
- The SPS consists of four subsystems: soft armor Torso and Extremity Protection (TEP); hard armor Vital Torso Protection (VTP); the Integrated Head Protection System (IHPS); and Transition Combat Eye Protection (TCEP). Each SPS subsystem is compatible with existing personal protective equipment. The Army plans to add SPS to Deployer Equipment Bundles for issue to deploying units rather than issue SPS to individual soldiers at an Army installation.
- The Army made a Full-Rate Production decision for the TEP and a Milestone C decision for IHPS and TCEP in September 2016. The Army plans to make separate Full-Rate Production decisions for the VTP in July 2017 and IHPS in April 2018. The Army plans to make the TCEP available for unit purchase rather than to field it across the Army.
- The Army completed testing the TEP and began testing the VTP subsystem in 2016. The Army completed developmental testing of the IHPS in 2016, and awarded a low-rate initial production contract for IHPS in 2016. The Army will continue testing both the VTP and IHPS in FY17.
- Compared to the current Improved Outer Tactical Vest, the SPS TEP provides similar protection at a reduced weight against the threats tested.

System

- The SPS is a suite of personal protection subsystems intended to provide equal or increased levels of protection against small-arms and fragmenting threats compared to existing personal protection equipment and at reduced weights. The SPS subsystems are designed to protect a soldier's head, eyes, and neck region; the vital torso and upper torso areas, as well as the extremities; and the pelvic region. Soldiers can configure the various components to provide different tiers of protection depending on the threat and the mission.
- The SPS consists of four subsystems:
 - VTP consists of front and rear hard armor torso plates (either the Enhanced Small Arms Protective Insert (ESAPI) or the X Threat Small Arms Protective Insert (XSAPI)), along with the corresponding hard armor side plates (Enhanced Side Ballistic Insert (ESBI) or the X Threat Side Ballistic Insert (XSBI))
 - TEP consists of the soft armor Modular Scalable Vest (MSV) with provision for adding the Ballistic Combat Shirt (BCS) for extremity protection, the Blast Pelvic Protector (BPP) for pelvic and femoral artery protection, and a Load Distribution System (LDS) for the capability



- to redistribute the weight burden from the shoulders to the hips
- IHPS consists of a helmet, with provision for adding a mandible and/or visor, as well as for mounting an applique to the outside of the helmet for additional ballistic protection
- TCEP consists of either ballistic spectacles or goggles to protect the soldier's eyes as well as provide the capability to transition from light to dark and dark to light in one second or less to enhance the soldier's vision in varying combat conditions

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- The Army initially plans to add SPS to Deployer Equipment Bundles for issue to deploying units rather than issue SPS to individual soldiers at each Army installation.

Mission

Units with soldiers wearing the SPS will accomplish assigned missions while concurrently protecting themselves against injury from a variety of ballistic (small-arms and fragmenting) threats.

Major Contractors

- TEP LRIP Vendors/Designs (Multiple vendors to stimulate competition and achieve best price through Fair Opportunity awards):
 - KDH Defense Systems INC – Eden, North Carolina (MSV, BPP)

- Bethel Industries Inc. – Jersey City, New Jersey (MSV, BPP)
- Hawk Protection – Pembroke Pines, Florida (MSV, BPP)
- Short Bark Industries – Venor, Tennessee (BCS)
- Carter Enterprises Industries Inc. –Brooklyn, New York (LDS, BCS)
- Eagle Industries Unlimited – Virginia Beach, Virginia (BCS)
- IHPS Vendors (developmental testing awardees):
 - 3M/Ceradyne – Costa Mesa, California
 - Gentex – Simpson, Pennsylvania
 - Revision Military –Essex Junction, Vermont
- VTP LRIP Vendors:
 - BAE Systems – Chandler, Arizona (XSAPI, ESBI, XSBI)
 - 3M/Ceradyne – Costa Mesa, California (ESAPI)

Activity

- While the SPS consists of four subsystems (TEP, VTP, IHPS, and TCEP), the development, testing, and production/fielding of the four subsystems are on different timelines. The Army made a Full-Rate Production decision for TEP and a Milestone C decision for IHPS and TCEP in September 2016, and plans to make separate Full-Rate Production decisions for the VTP in July 2017 and IHPS in April 2018. The Army plans to make TCEP available for unit purchase rather than to field it across the Army. Each SPS subsystem is compatible with existing (legacy) personal protective equipment (for example, soldiers can use existing hard armor plates in the new MSV). The Army is testing SPS ballistic performance in accordance with DOT&E-approved LFT&E test plans.
- The Army completed TEP testing in July 2016, to support the TEP Full-Rate Production decision. TEP testing included:
 - IOT&E of the TEP in March 2016, at Fort Hood, Texas, to assess the impact of the TEP on soldier mobility and subsequent mission effectiveness.
 - A series of first article and sub-system level live fire testing of the TEP from January through July 2016. Sub-system level testing included testing of the MSV with currently fielded hard armor plates, and testing of the MSV/hard armor subsystem against foreign threats. Testing also included a series of blast testing events to characterize the performance of the TEP and current hard armor plates when subjected to blast events. The Army also conducted flash heat and fire threat testing to evaluate the TEP's ability to protect an individual from burns resulting from a flash fire.
 - The Army used data from first article testing to model the ability of the TEP to protect the wearer from serious injury from fragments perforating the TEP.
- The Army began VTP testing in December 2015, with first article testing of the ESAPI hard armor plates. Shortly thereafter, the Army halted further ESAPI testing because test personnel found deficiencies in the plates while conducting physical characterization of the plates prior to starting

ballistic testing. Following a period of corrective action, the vendor resubmitted the ESAPI plates for first article testing, which occurred from July through August 2016. The Army conducted first article testing of the ESBI, XSBI, and XSAPI hard armor plates in May 2016. The XSAPI plate did not meet the ballistic requirements. The Army is waiting for the vendor to complete corrective actions and resubmit the XSAPI for another first article test. XSAPI resubmission is unknown at this time. The Army will continue VTP testing in FY17.

- The Army completed a third round of IHPS developmental testing in April 2016. The Army awarded a low-rate initial production contract for IHPS in September 2016. The Army will continue IHPS testing in FY17.
- The Army conducted technical and user testing of TCEP in FY16. The Army will continue TCEP testing in FY17.

Assessment

- IOT&E results indicate that some soldiers had trouble aiming their weapons when wearing the BCS and LDS with the MSV while in a prone firing position. Additionally, some female soldiers experienced restricted upper-body movement due to ill-fitting and uncomfortable BCS.
- The SPS TEP met its ballistic requirements against the threats tested.
- Compared to the currently fielded Improved Outer Tactical Vest, the SPS TEP provides similar protection at a reduced weight against the threats tested.
- Wearing body armor reduced the peak overpressure behind the armor during blast testing, but additional investigation is needed to understand how the pressure data can be analyzed and correlated to injury.
- TEP modeling required extrapolation of test data to estimate performance, which added uncertainty in evaluation of TEP performance for those conditions. The use of a broader range of fragment masses to more fully represent a threat would: provide additional test data to support future modeling efforts; make such extrapolation unnecessary; and improve confidence

in the modeling results and subsequent conclusions made about TEP performance.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY16 Recommendations. The Army should:
 1. Improve the design of the LDS so it does not interfere with the wearer's ability to properly aim a weapon. The Army should also provide BCS sizes and designs that correctly fit all female soldiers and are comfortable to wear.
 2. Continue to improve its body armor blast testing and analysis procedure. Improvements should include determining whether results can be correlated to injury.
 3. Use a broader range of fragment simulators to more fully represent the expected threat environment and to then more fully characterize TEP performance.
 4. Quantify the uncertainty associated with its modeling estimates and assess the impact of that uncertainty on the evaluation of TEP performance. This should include additional end-to-end testing of an actual threat (not just representative fragments) against the actual TEP as represented in the model.

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