

Active Protection System (APS) for Abrams and Bradley



The Army tested the TROPHY Active Protection System (APS) installed on Abrams M1A2 System Enhancement Package version 3 (SEPV3) tanks in FY22 to inform an urgent materiel release (UMR). The TROPHY APS intercepted most of the incoming threats and the Abrams tank base armor provided adequate force protection.

The Army tested the Elbit Iron Fist – Light Decoupled (IFLD) APS installed on Bradley A4 from 2QFY22 to 4QFY22 to inform the UMR planned for FY26, pending funding. Performance has improved since Phase I in 2018. IFLD continues to face effectiveness deficiencies. The Army is working to address these deficiencies and intends to repeat some of the testing to verify the fixes.

SYSTEM DESCRIPTION

The TROPHY and IFLD APS include hard-kill systems designed to detect, identify, track, and destroy incoming enemy threats causing its early detonation, or divert the enemy threat. The TROPHY APS adds approximately 5,000 pounds to the Abrams SEPV3. The IFLD APS adds approximately 1,780

pounds to the Bradley. The Army has prepositioned TROPHY APS kits for installation on Abrams SEPV2 and SEPV3 tanks. The Army intends to have prepositioned IFLD kits for installation on Bradley A4.

MISSION

Army units use TROPHY APS-equipped Abrams main battle tanks to disrupt/destroy certain

classes of enemy fire while safely maneuvering across a full range of military operations.

Army units use Bradley vehicles equipped with the Iron Fist APS to provide protected transport of soldiers and provide over-watching fires to support dismounted infantry in order to disrupt/destroy enemy military forces and control land areas.

PROGRAM

The Army has procured TROPHY and fulfilled two directed requirements signed in October 2016 and March 2018.

The Army is procuring IFLD APS under the directed requirement signed in October 2016. The Army intends to field one Armored Brigade Combat Team with 138 Bradley A4 Fighting Vehicles (125 M2A4s and 13 M7A4s) equipped with IFLD. The UMR decision is planned for FY26, pending funding.

» MAJOR CONTRACTORS

TROPHY APS

- General Dynamics Land Systems – Sterling Heights, Michigan
- DRS/Rafael – St. Louis, Missouri

Iron Fist – Light Decoupled APS

- BAE – San Jose, California
- GD-OTS – Williston, Vermont
- Elbit Land Systems – Ramat Hasharon, Israel

TEST ADEQUACY

TROPHY APS

The Army conducted TROPHY APS Phase III testing with Abrams SEPv3 tanks in FY22 at Army Test Centers in accordance with DOT&E-approved test plans, and observed by DOT&E. Testing was adequate

to assess operational effectiveness and survivability. The test scope focused on verifying performance envelope and capability demonstrated with Abrams SEPv3 tanks equipped with APS. Testing included 39 live fire tests with inert and live threats fired against a fully functional Abrams SEPv3 tank. Some of the scenarios included operationally stressing conditions (i.e., background clutter, concrete walls, vehicle elevation, gunfire, nearby vehicles, and turning turrets). Test results will inform an update to the DOT&E classified report initially published in June 2020.

Iron Fist – Light Decoupled APS

The Army completed Phase I Iron Fist APS testing on Bradley A4s in FY18. Poor performance led to a significant redesign of the system prior to entering Phase II.

The Army conducted Phase II effectiveness and survivability testing from February through September 2022 in accordance with the DOT&E-approved test plan, and observed by DOT&E. Testing involved firing operationally realistic live and inert threats at Bradley A4s equipped with IFLD. The focus of effectiveness testing was on evaluating performance of the optics and radar systems to detect, track, and intercept incoming threats in realistic operational conditions to include rain, mud, and urban clutter. Survivability testing focused on identifying vulnerabilities to the Bradley A4 vehicles after countermeasure intercept with live threats. The

Army conducted a Soldier Touch Point (STP) in September 2022 at Aberdeen Test Center to gain critical insights. DOT&E was part of the team that developed the objectives. DOT&E did not approve the STP developmental test plan, as DOT&E was not assessing the IFLD in the STP. DOT&E did observe the STP. Numerous programming and calibration changes made to IFLD during testing prohibit DOT&E from making an effectiveness, suitability, and survivability assessment on production representative systems. The Army intends to repeat Phase II effectiveness and survivability testing with production representative systems prior to the Limited User Test in FY25. This testing will leverage Phase II effectiveness and survivability testing where appropriate.

PERFORMANCE

» EFFECTIVENESS

TROPHY APS

TROPHY APS effectively detects, identifies, tracks, and intercepts most of the incoming threats in basic range conditions and engagements. The system, as installed on SEPv3, demonstrated similar capabilities and deficiencies as the system installed on SEPv2. Final assessment of the performance of the TROPHY APS-equipped Abrams SEPv3 tank will be detailed in a 2QFY23 classified report.

Iron Fist – Light Decoupled APS

IFLD APS has demonstrated improved performance to detect, identify, track, and intercept incoming threats in basic range conditions and engagements over Phase I results. IFLD continues to face effectiveness deficiencies. The IFLD system tested in Phase II was not production representative due to numerous software and calibration changes made by the contractor during effectiveness testing. Details on the effectiveness deficiencies identified in Phase II will be in DOT&E's classified report planned for FY25 after completion of Phase III testing.

» SUITABILITY

Iron Fist – Light Decoupled APS

Senior non-commissioned officers participating in the STP provided suggestions to improve effectiveness and the human-machine interface to the evaluators and program. The Bradley Commander should have the means to select and place protection zones in a standby mode as they load and unload dismount

soldiers. The IFLD APS should provide alerts to the crew on near misses to allow the crew to target the threat.

» SURVIVABILITY

TROPHY APS

The survivability of the TROPHY APS-equipped Abrams SEPV3 tank is proportional to the operational effectiveness of the TROPHY APS to search, detect, identify, track, and intercept the incoming threats. Survivability is dependent on the capability of the Abrams base armor to absorb the threat by-products' impacts generated after a successful intercept. The Abrams SEPV2 and v3 base armor configurations provide adequate force protection against the threat and countermeasure debris generated by a successful intercept.

Iron Fist – Light Decoupled APS

The Army completed Phase II survivability tests of live threats against Bradley equipped with Iron Fist in August 2022. Bradley's lighter main armor (compared to Abrams) will require a more

efficient APS intercept capability than TROPHY in order to prevent residual threat penetration of the Bradley hull. The survivability analysis to include results of modeling and simulation is ongoing. DOT&E plans to write a survivability report in FY25, after completion of Phase III testing.

RECOMMENDATIONS

The Army should:

1. Repeat the Phase II IFLD APS effectiveness, and survivability tests after finalizing software changes to improve system effectiveness and survivability. This testing should leverage Phase II testing where appropriate.
2. Consider incorporating the senior non-commissioned officers' recommendations from the STP into the production representative Iron Fist – Light Decoupled.
3. Consider prior recommendations from the Abrams SEPV2 equipped with TROPHY APS DOT&E classified report published in June 2020.