



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND – GROUND VEHICLE SYSTEMS CENTER

JTEG Review of Light Weighting Design Study FY17

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DB-03

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PURPOSE/PRODUCT/PAYOFF – LIGHTWEIGHT DESIGN STUDY



Purpose:

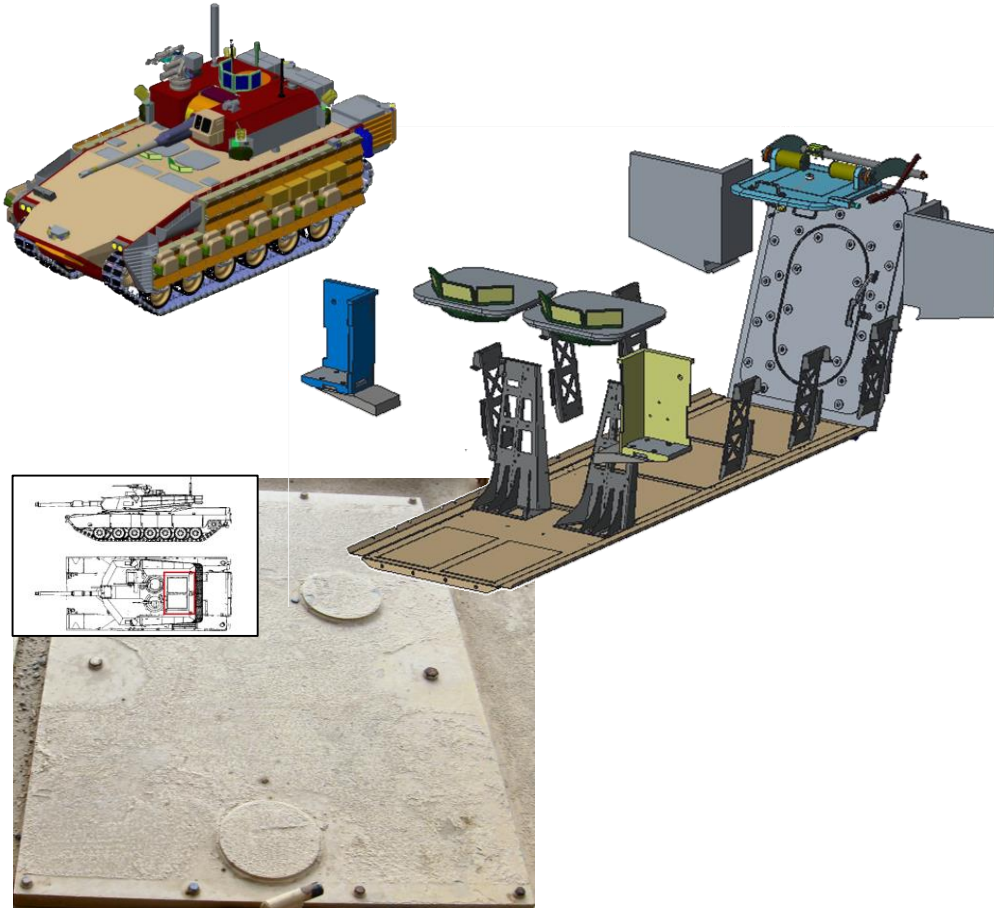
- The objective of this effort is to develop light weight alternative material/design solutions for specific sub-systems. Designs are intended to be included in the NGCV demonstrator.
- Short term demonstration proposed for the Abrams blow off panels.

Products:

- The products of this effort will be light weight material ballistic solutions based on cost effectiveness utilized for the following subsystems:
 - Lightweight Hatch
 - Lightweight access panel
 - Lightweight troop ramp.
 - Abrams blow off panels.

Payoff:

- The payoff for this effort will be lightweight subsystem design approaches that can be incorporated into current vehicle platforms in need of weight savings and the next generation combat vehicle demonstrator.
- Three levels of ballistic material solution, based on cost, for weight savings opportunities.



Schedule

ELEMENTS	FY17	FY18	FY19	FY20	FY21
Generic Design		█			
Generic Prototype			█		
NGCV Design			█		
NGCV Prototype				█	



STATUS – LIGHT WEIGHTING DESIGN STUDY



Overall Performance Status: PPG completed execution of contractual agreements with their subcontractors.

Technical Objective Summary

Performance / Programmatic Measure	Status	Transition Plan / Time Frame
Government Furnished CVP Data	Data Supplied. Performance matrix Reviewed TARDEC	N/A
SOW MOD	Discussion took place to alter current SOW due to NGCV decision point being 2022	Use current Abrams platform to demonstrated weight saving technology / 2020
Generic CVP lightweight Design	Started	NGCV platform Integration 2021
Government Furnished NGCV Data	Planned for 2021	N/A
NGCV Lightweight Design/Part	Planned for 2021	NGCV platform Integration 2022

- Three levels of ballistic material solutions, based on cost, for weight savings opportunities will be integrated into sub-system designs.
 - Initial transition demonstrator will be the Abrams MBT platform turret blow off panels.
 - This demonstrator will be used to leverage capabilities for NGCV platform.

Concepts from NGCV will be redesigned with the methodology/material systems developed under this project for integration into the NGCV platform.



LIGHT WEIGHTING DESIGN STUDY



BACK UP



TECHNICAL OBJECTIVES – LIGHT WEIGHTING DESIGN STUDY



Deliverables

Task 1: CAD Designs:

Phase 1: Development prototype CAD designs for each of the subsystem areas (hatches, access panels, and ramp) with interfaces details to the vehicle.

Phase 2: Subsequent years is the completion of prototype and the final CAD for each of the subsystem areas (hatches, access panels, and ramp) with vehicle interfaces details. .

Task 2: Lightweight Hatch and Access Panel:

Phase 1: Development of performance specifications from baseline determination of ballistic and shock impacts, GFI, and as-supplied material properties.

Phase 2 Structural design, conduct performance and finite element modelling and analysis, subscale manufacturing, perform further validation testing and work towards delivery of one prototype hatch and one access panel.

Phase 3 Delivery of the final validated design and three down selected prototypes of a single hatch design and three down selected prototypes of an access panel design for the integration to the hull structure.

Task 3: Lightweight Ramp:

Phase 1 Development of a performance specification from baseline determination of ballistic and shock impacts, GFI, and as-supplied material properties.

Phase 2 Structural design, conduct performance and finite element modelling and analysis, subscale manufacturing, perform further validation testing and work towards delivery of one prototype ramp.

Phase 3 Delivery of the final validated design and three down selected prototypes of a single ramp design for the integration to the hull structure.

Task 4: Development of a Robust Dissimilar Material Joint.

The purpose of this effort is to build a mechanical joint, comprised of a composite based material along with a metallic based material, designed by TARDEC that is durable enough to withstand a high strain rate event. The joining material would be an adhesive that has been developed in accordance with ARL-ADHES-QA-001 rev 1.0 (ARL-SR-288).

Deliverables

Phase 1 Design and analysis, including finite element modelling, of the joint and adhesive. Adhesive strength studies using laboratory testing to develop the boundary conditions will be performed. Development of a performance based specification will occur.

Phase 2 Continued work on iterative designs and analysis and the construction of subscale parts for destructive validation testing against performance based specification.

Phase 3 Completion of the testing, design and models and the construction of the final prototypes for use and evaluation by the DoD.