GVSETS
GROUND VEHICLE SYSTEMS ENGINEERING &
TECHNOLOGY SYMPOSIUM & MODERNIZATION UPDATE

NDIA
Michigan

A PERSPECTIVE ON GVSC CREWSTATION DEVELOPMENT AND ADDRESSING FUTURE GROUND COMBAT VEHICLE NEEDS

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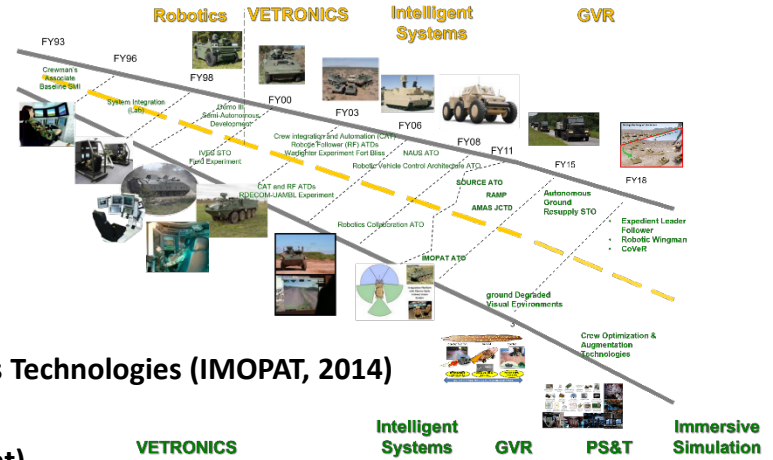

Introduction

- Interaction of Soldiers with Advanced Combat Vehicle Systems
- 7 key impact factors:
  - **Advancements and adaptation to emerging technology**
  - **Increased proliferation of information**
  - **Changing tactics and requirements (crew size impacts, use of robots)**
  - **Standardization of software and hardware**
  - **Unique shock and vibration requirements**
  - **Vehicle weight impacts on mobility, crew volume**
  - **Survivability and safety (under armor operations)**

Past Crew S&T Activities

- Crewman's Associate (CA, 1994)
- Vetronics Technology Testbed (VTT, 2001)
- Crew integration & Automation Testbed (CAT, 2004)
- Robotics Collaboration (RC, 2008)
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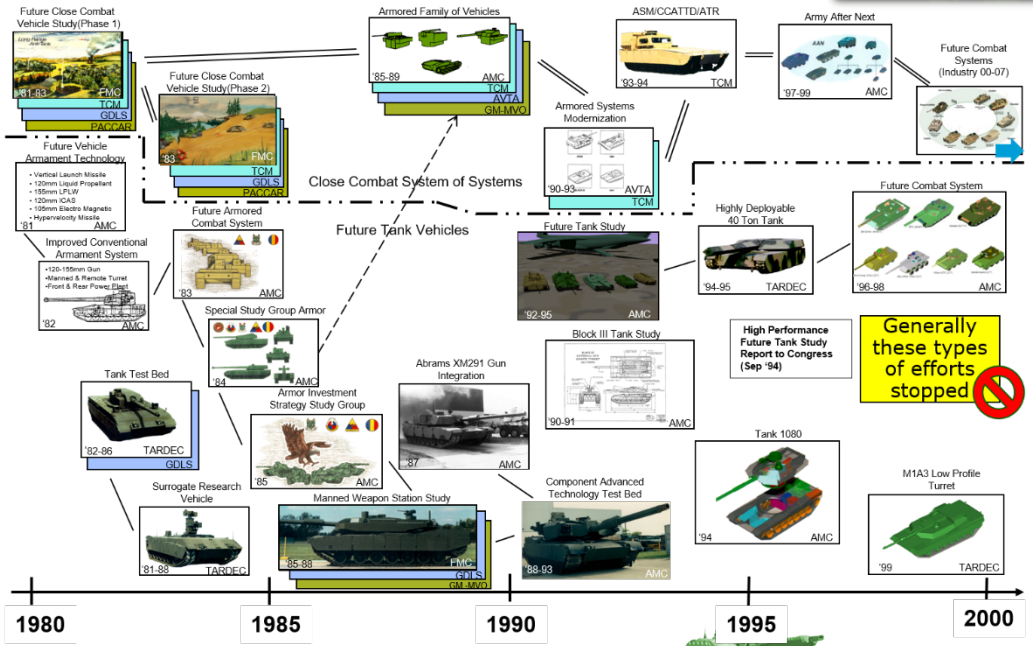
- Crew Optimization and Augmentation Technologies (COAT, 2018-current)



A PERSPECTIVE ON GVSC CREWSTATION DEVELOPMENT AND ADDRESSING FUTURE GROUND COMBAT VEHICLE NEEDS

Crewman's Associate (CA, 1994)

- Baseline Abrams M1A2 (1994)
- M1A2 (SEP) (1998 technology - 3 man crewstation)
- Future Main Battle Tank (2005 technology - 2 man crewstation)
- Informed by Rotocraft Pilot's Associate ATD
- Monterrey Technologies Incorporated - design

Design Principles

- Hands on primary controller
- All critical information in the primary vision zone
- One step functions
- Consistent Mental Model
- Intelligent placement of cursor (bump cursor)
- Minimize "drag and click" (difficult on the move)
- Automated data entry (reduce use of keyboard)

Vetronics Technology Testbed (VTT, 2001)

First fielding of crewstation

- 2 identical crewstations
- Dedicated driving displays
- 3 multifunctional displays w/ tactile feedback, writeable bezel buttons and touchscreens
- Scout mission, w/ simulated sensors via embedded simulation capability

Leveraged ARL-HRED indirect driving study for FOV & VME

- Sensor placement/viewing angle
- Unity vision
- Maneuverability

Crew integration & Automation Testbed (CAT, 2004)

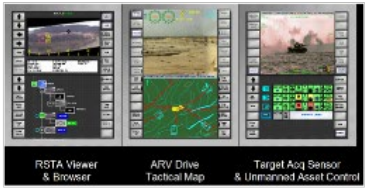
2 Identical Multi-functional Crewstations

Capability

- Fight, Scout, Carrier, and Robotic Control Missions
  - UAV, UGV, UGS and SUGV
  - Any function from either station, crew determined work-split
- Indirect vision driving w/ semi-autonomous capability
  - Waypoints entered through mission planning screen
  - Yoke dedicated to one function, controlled hand-off
- Integrated with MC2 at Ft. Knox

Hardware

- Stryker platform
- Three 20" touch panel displays
- Multifunctional yoke (driving, shooting, robot & sensor control)
- Embedded simulation capability

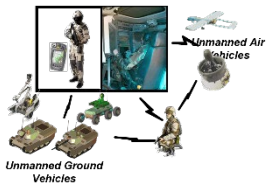


Robotics Collaboration (RC, 2008)

Develop the tools, techniques, & autonomy to maximize mounted and dismounted control of ground and air unmanned systems and optimize Soldier-robot and robot-robot ground and air teams

Featuring:

- Surrogate Mission Module Workstation
- Scalable Dismounted Robotic Controller
- Decision Aids



Focus on **Platoon and below** operations

Improved Mobility and Operational Performance through Autonomous Technologies (IMOPAT, 2014)

Goals:

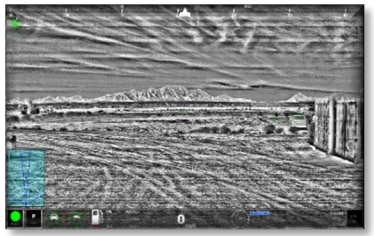
To develop indirect vision / drive by wire systems that provide electro-optic indirect vision based local situational awareness and mobility capabilities at or above the performance levels of direct vision mechanical drive systems, along with enhancing high definition cognition technologies to dynamically manage workload to increase the operational performance of future platforms.

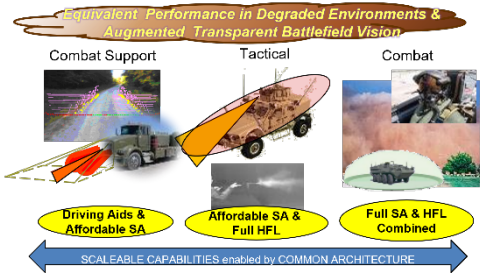
360/90 Day/Night
Near-field Sensor Coverage

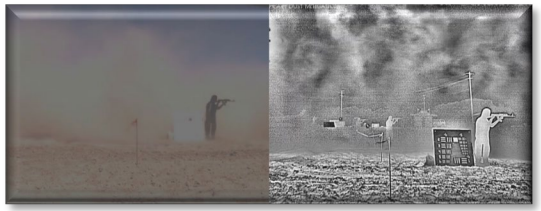
Integration Platform with Electro-Optic Indirect Vision System

Soldier Monitoring & State Classification

ground Degraded Visual Environments (gDVE, 2018)







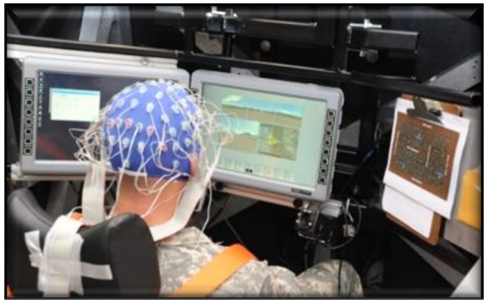
Crew Optimization and Augmentation Technologies (COAT, 2018-current)

- To develop optimized crew interfaces and technologies for manned combat vehicles to maximize Soldier and system performance while reducing crew size
- To develop flexible, adaptive interactions between Soldiers and autonomous mobility technologies and weapon engagement systems to enable robust multi-domain performance
- To provide on-demand, multi-modal, individual-to-collective, vehicle-embedded crew training

Future Direction

Dedicated Crewstation Lab

- Customer Support
- Technology Exploration/Trades
- Monitoring/Data capture
- Connectivity with other Labs/Services
- Mixed virtual and crew experimentation
- Dynamic task allocations & automations
- AI/ML Development & Integration
- AR/VR for WMI development
- Biometrics/individualization
- HMD's
- Task aids/automations



Other aspects to explore

- WMI development and maintenance
- Standardization
- Workload evaluations/simulations
- Training aspects

Conclusion

Balance between customer support and S&T

- **S&T Programs**
  - **Tech push - Difficult to mature S&T products for transition**
  - **Often product is knowledge or data**
  - **Soldier-system interaction is a squishy product**
- **Customer Support**
  - **Each platform has unique requirements and constraints**
  - **Can focus on common thread between platforms (move, shoot, and communicate)**
  - **No guarantee of steady/continued funding**
  - **Government solutions sometimes at odds with vendor profitability**