TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

State of the Art Session 1 – Private Personal Vehicles (Autonomous)

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UGVs in the Current Fleet

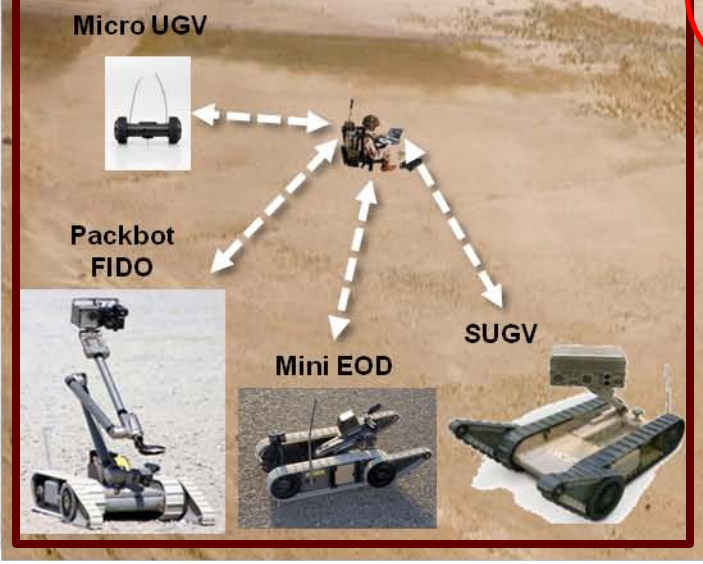
Sustain:
+ Trust and Confidence
+ Reduced Operator Workload
+ Expanded Missions

beyond tele-op

Improve:
- Modularity
- Interoperability
- Collaboration
- Autonomy

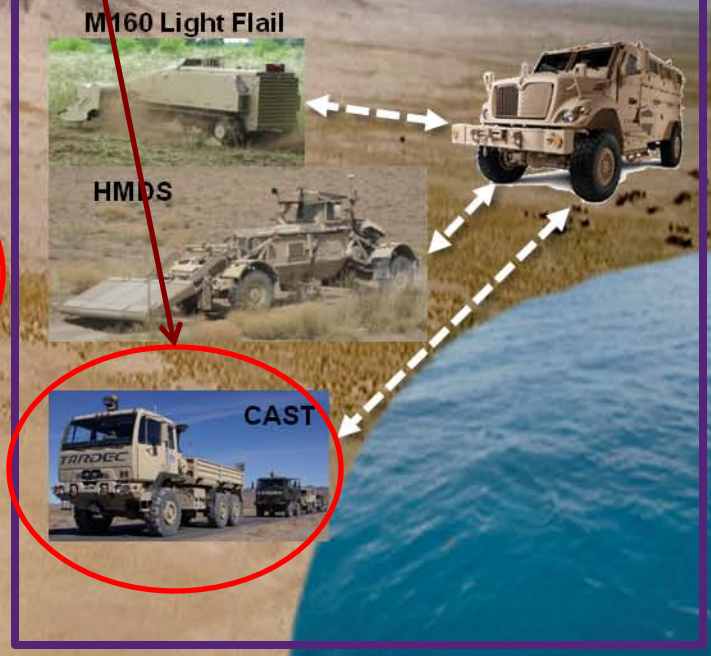
Each class comes w/ duration, mobility, comms & safety limitations

Man-Transportable

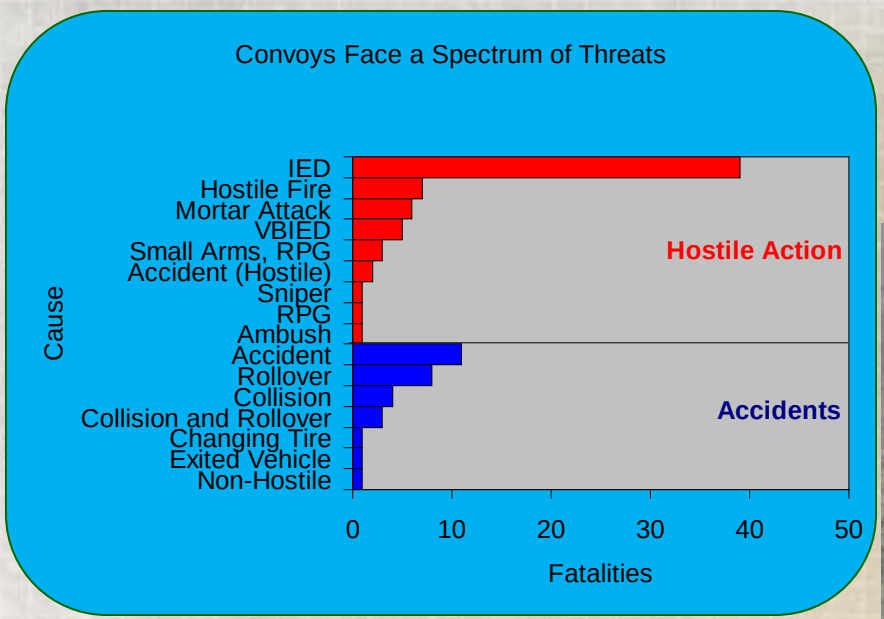


Vehicle-Transportable

Self-Transportable & Appliqué



Robotic Convoy Operations



~1 in 8 Casualties Attributed to Convoy Missions in Iraq and Afghanistan

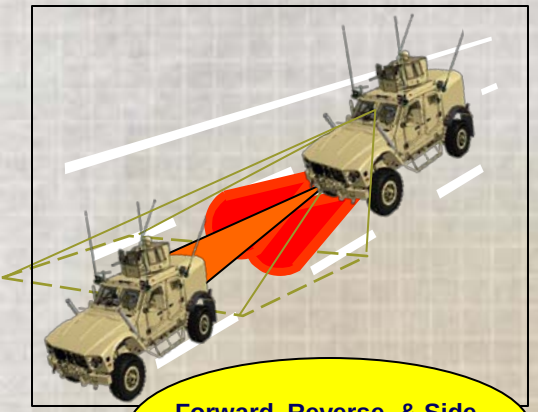
Convoy Active Safety Technologies (CAST)

Driverless technology for military trucks

Occupant Centric Platform TECD Active Safety / Crash Mitigation

OCP Active Safety Demonstrators

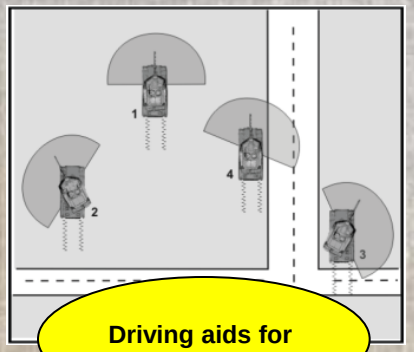
(AMAS-Based Component Set)



Forward, Reverse, & Side Pre-Crash Warning and Collision Avoidance

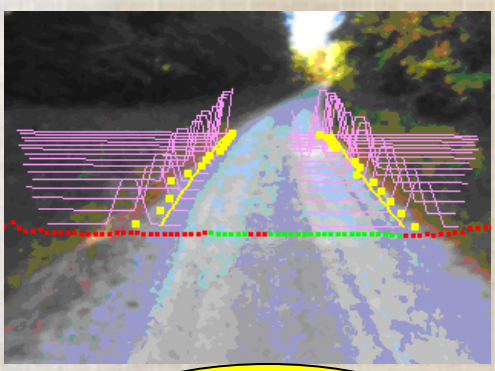
OCP Phase1

OCP Phase 2



Driving aids for Improved Mobility

360° Situational Awareness, Decreased Fatigue, Decreased Collisions and Rollovers, and Improved Vision under all Visibility Conditions.



Unintended Roadway Departure Warning/Prevention

Improved SA and operator workload reduction

Motion Based Cueing for Pop Up/Close-In Target Detection

Provides SA to Soldiers immediately prior to dismount.

Optionally Manned Vehicles

X-by-wire kit

Autonomy kit

Electronic Architecture

Driving functions only

2 modalities

Human in vehicle

(i.e. shared driving)

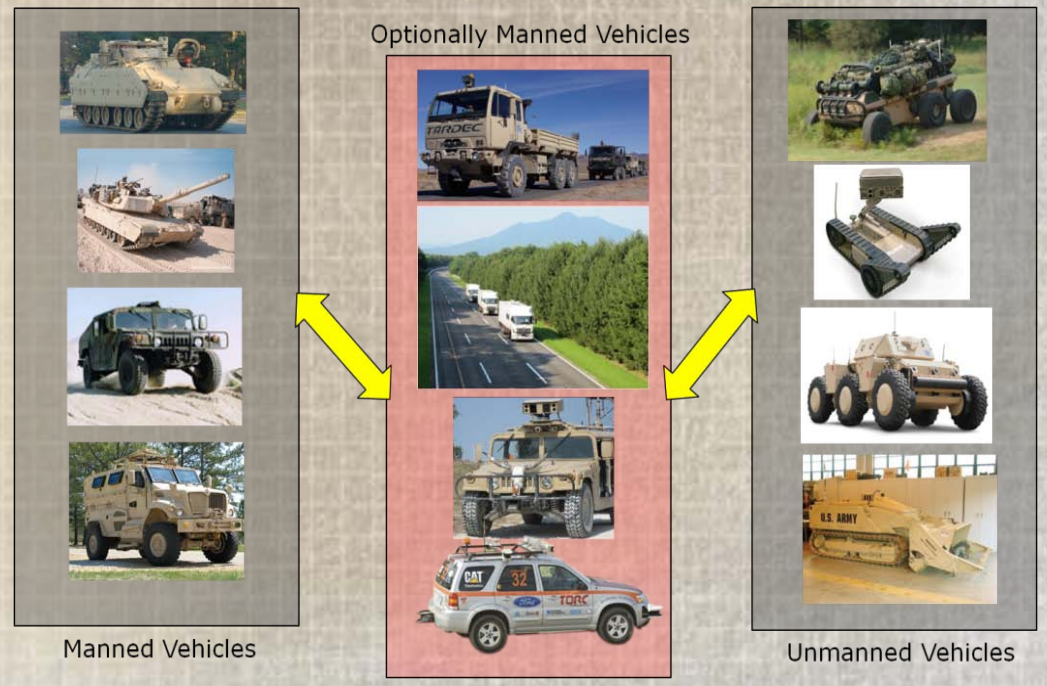
Human NOT in vehicle

(i.e. remotely operated)

invariant across all missions for OMV

Mission Payloads

OMV can be driven by a soldier;
OMV can drive a soldier;
OMV can be remotely operated;
OMV can be autonomous



Optionally Manned Vehicle Taxonomy

Capability	Description	Comments
System Off	Current fleet, no intelligence or additional external sensors	All manned vehicles
Driver Warning	Additional sensors being added to monitor activity immediately around Vehicle. Info Task is shared	Blind-side detectors, collision warning, roll-over warning, V2I and V2V
Driver Safety	By-wire hardware being added w/ additional sensing. Info task shared and Control task occasionally taken by Vehicle for safety reasons	At this point, by-wire kit (brake, throttle, gear and steer) is integrated into the vehicle
Optionally Operated (Auto-Pilot)	Human still in vehicle but can 'willingly' give up control so that he/she can perform other tasks (autonomy kit first needed)	Under certain conditions, 'distracted driving' is the preferred mode of operation
Optionally Manned	All of the previous capabilities plus the additional feature of the vehicle being operated w/o a driver present and a OCU (e.g. convoying, perimeter security)	Includes emergency modes; Chauffer and Ambulance where I, C and R are Vehicle tasks

Work being done by OEMs

Military Specific

Initial Capabilities

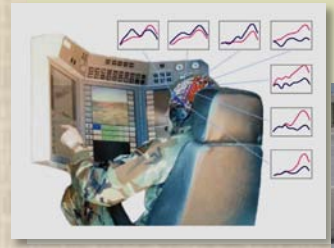
Semi-Autonomous Convoy (Leader/Follower)


Collision Avoidance


Driver Assist/Driver Monitor


Vehicle Dynamics Management


Intelligent Remote Control/Tele-operation




Prognostics/Diagnostics


Robotic Missions

Navigation
Mobility
Re-plan

Recognize
Predict
Respond

HUMAN INTENT

ENVIRONMENT

ENVIRONMENT	HOSTILE	BENIGN
STRUCTURED	• Convoying (fuel/H_2O) • Convoying (maneuver) • **Base security** • **Check point inspection** • **EOD** • **C-IED/Route Clearance** • Persistent surveillance	• **Convoying (e.g. CONUS)** • **Logistics warehousing** • Sea-basing • **Transportation** • **Base security**
UN-STRUCTURED	• **Disaster Clean-Up** • **Engineering** • **EOD** • **C-IED** • **RSTA** • Persistent surveillance • Wingman	• **Range clearance** • **Soldier training** • **Decoys** • **Mining** • Natural disasters (e.g. Hurricane Katrina) • Rescue robotics

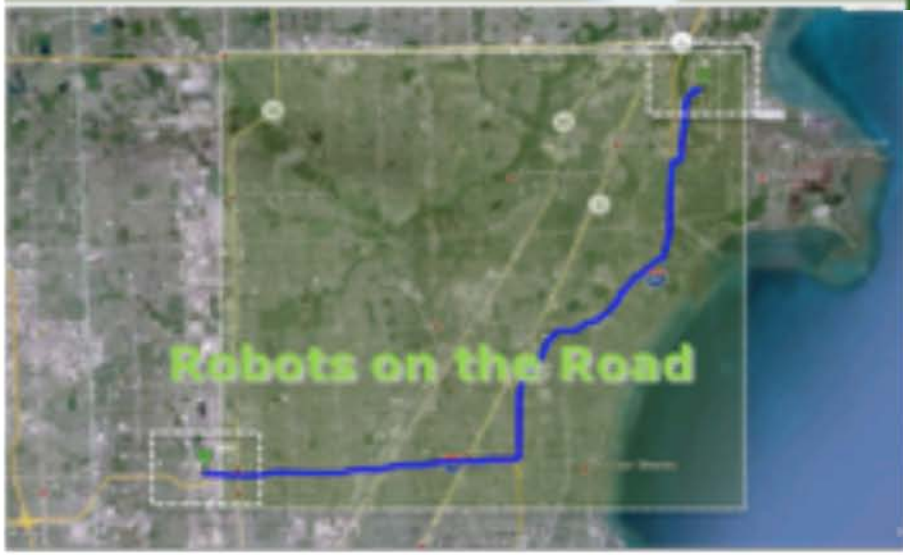
6.1 / 6.2 S&T Challenges

COTS Technology
Large ROI

EHI Risk Matrix

*Current Missions in **BOLD***

ARIBO = Living Lab

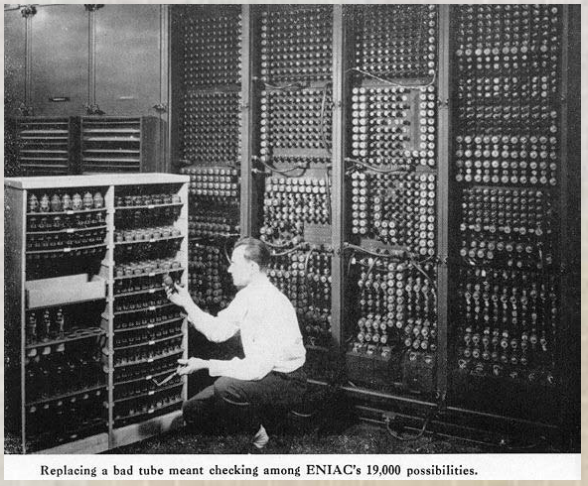


ARIBO


ARIBO
Personnel Transit
Convoy Logistics
Medical Logistics
Airfield Ops
Range Clearance
Warehouse Logistics
Seabasing

Feed the Roadmap

The US DoD has played a unique role in seeding technology development


Replacing a bad tube meant checking among ENIAC's 19,000 possibilities.

Computers (ENIAC)

Networking (ARPANET)

Dwight D. Eisenhower National System of Interstate and Defense Highways

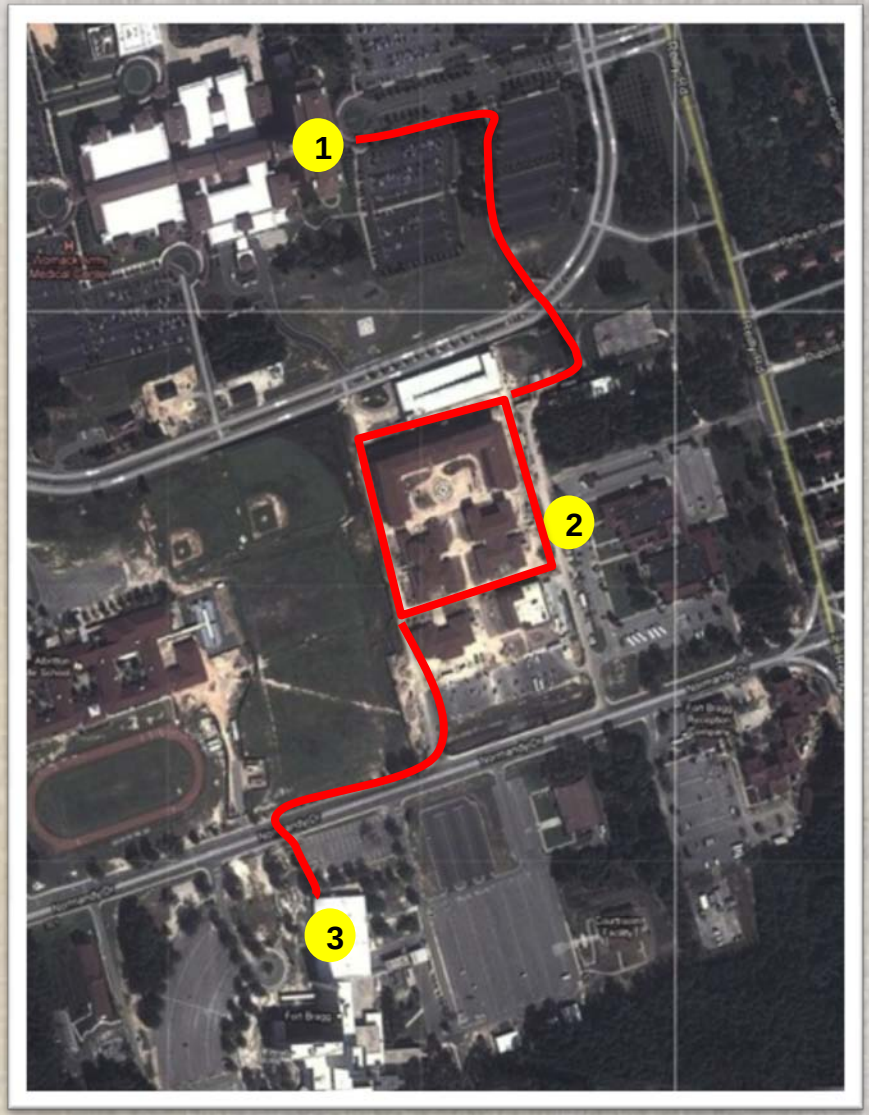
GPS

Automated Vehicles


Fort Bragg
Home Of
The Airborne
And
Operations Forces

Connect Womack Medical Center to the Warrior Transition Barracks and the Soldier Support Center.

- 20 vehicles moving soldiers to 400 appointments per day




FORT LEONARD WOOD

Practical to Tactical Apps:

1300 students get bused to lunch everyday FROM **ONE** training range.

- 25 buses needed
- 13 buses available
- **Not Enough Drivers**

2 Ideas!

1 Driver for a dozen trucks/buses

Convoy Active Safety Technology (CAST)

TARDEC

LOCKHEED MARTIN

Estimated Impact:

- Training time = + 975 hrs/day
- Cumulative Training Time = - 2 days/mo
  - 9 weeks to 8 = - $325,000 (rough est.)
- NON-Value added time = - 950 hrs/day
- Driver Time = - 39 hrs/day (7,800/yr)
- Fuel Savings = 8,000+ gal/yr

Take the food to the soldier…

Potential Annual Savings:

$505,000

** Napkin Calculation

2011 | 2012 | 2013 | 2014 | 2015

Strategy – Teaming - Feasibility Study

CONOPS

Fort Bragg WTB

Fort Leonard Wood

West Point (USMA)

Detroit ITS 2014


TWVS ATO
GLASS CERAMIC
TRANSPARENT ARMOR
TARDEC
HERMIT
TARDEC

Questions?