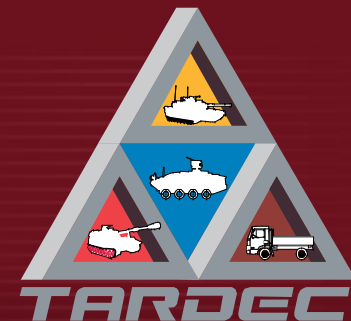




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Proposed FY09 ATO-D: Improved Mobility and Operational Performance through Autonomous Technologies (IMOPAT)

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D.TAR.2009.04 Improved Mobility and Operational Performance through Autonomous Technologies (IMOPAT)



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360/90 Day/Night
Near-field Sensor Coverage



Soldier Monitoring
& State

Advanced
Crew Stations



Integration Platform
With IV System



**Integrate, Enhance, Demonstrate
360 LSA/Assist-Mob/Soldier Monitor & State
to Maximize Soldier-System
360 LSA and Mobility Capabilities
(Secure Mobility)**

Schedule & Cost

MILESTONES		FY09	FY10	FY11	FY12
M&S and Field Experiments Local 360 SA - Task Analysis - Integrate Detection Algorithms - Integrate Digital Recording - Integrate Dismount System		▲	▲	▲	▲
			4	5	6
Improved Mobility - Soldier Task Balancing - Assisted Mobility			4	5	6
Soldier Monitor/State CS System - Sensor Integration - Algorithm Integration - Integration Technique			4	5	6
Total	TARDEC NVESD ARL-HRED NSRDEC				

Purpose

Enable indirect vision (IV) based Soldier-systems (manned/unmanned/Soldier) to move quickly and safely while maintaining 360 local situational awareness (LSA) to enhance operational performance.

Product

- Advanced Crew Stations integrated with 360/90 Day/Night LSA, Assisted Mobility, and Soldier Monitoring / State technologies to improve Soldier performance.
- Quantitative understanding (performance levels) of future indirect vision operations for the movement and security of Soldier-systems at a platoon and below level when utilizing:
 - Assisted mobility
 - LSA system with aided target cueing
 - Digital video recording of 360/90 with intelligent tagging
 - Soldier monitoring and state based crew station (CS) design

Payoff

- Improvement in Vehicle & Soldier Survivability, Vehicle Lethality/Self-Defense & Control along with Greater Survivability/Lethality for Dismount Soldiers
- Two Mounted Soldier ability to maintain 360 LSA with IV
- One Mounted Soldier ability to move vehicle (manned or unmanned) quickly and safely with IV
- Data and Information to feed programmatic decisions
- Risk reduction for FCS

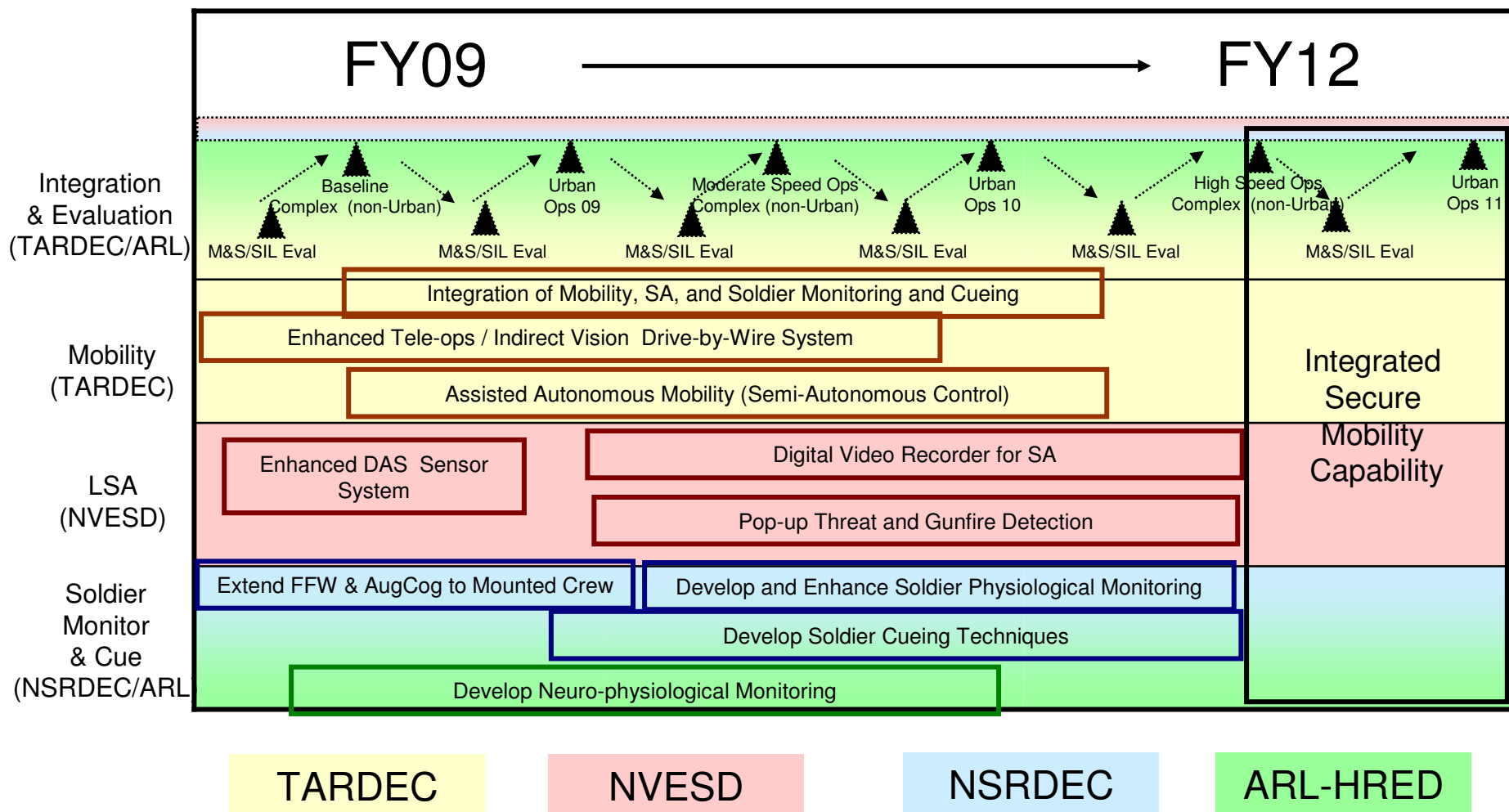
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Development Plan and Progression



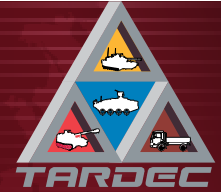
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Partners / Responsibilities



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TARDEC

- Develop Enhanced Indirect Vision Drive / Tele-operation Systems
- Develop Assisted Autonomy Systems
- Develop Warfighter Machine Interfaces
- Integrate and Evaluate
 - Vehicle LSA Systems (NVESD)
 - Soldier Monitoring & State Classification Systems (NSRDEC/ARL-HRED)
 - Assisted Mobility (Other TARDEC Programs)
 - Dismount LSA Systems (NSRDEC)
- Perform SIL and Vehicle/Field Experiments



ARL-HRED

- Define and Develop Experimentation Plans
- Work with TARDEC on Indirect Vision Drive and Assisted Autonomy Systems
- Provide HFE Support for Systems Development and Integration
- Develop Information Flow Requirements and Algorithms for Mobility and LSA
- Work with NSRDEC on Soldier Monitoring and Workload Management Systems



NVESD

- Enhance DAS Sensor Systems / Threat Detection Algorithms
 - Pop-Up Targeting and Gun-Fire Detection (before/during/after shot)
- Develop Digital Vehicle LSA Recording and Cueing System



NSRDEC

- Enhance and Transition Mid-Maturity Dismount Soldier Monitoring Systems from Augmented Cognition Program
- Develop/Enhance Low-Maturity Soldier Monitoring System
- Work with ARL-HRED on Soldier Monitoring Systems
- Develop Dismount LSA System

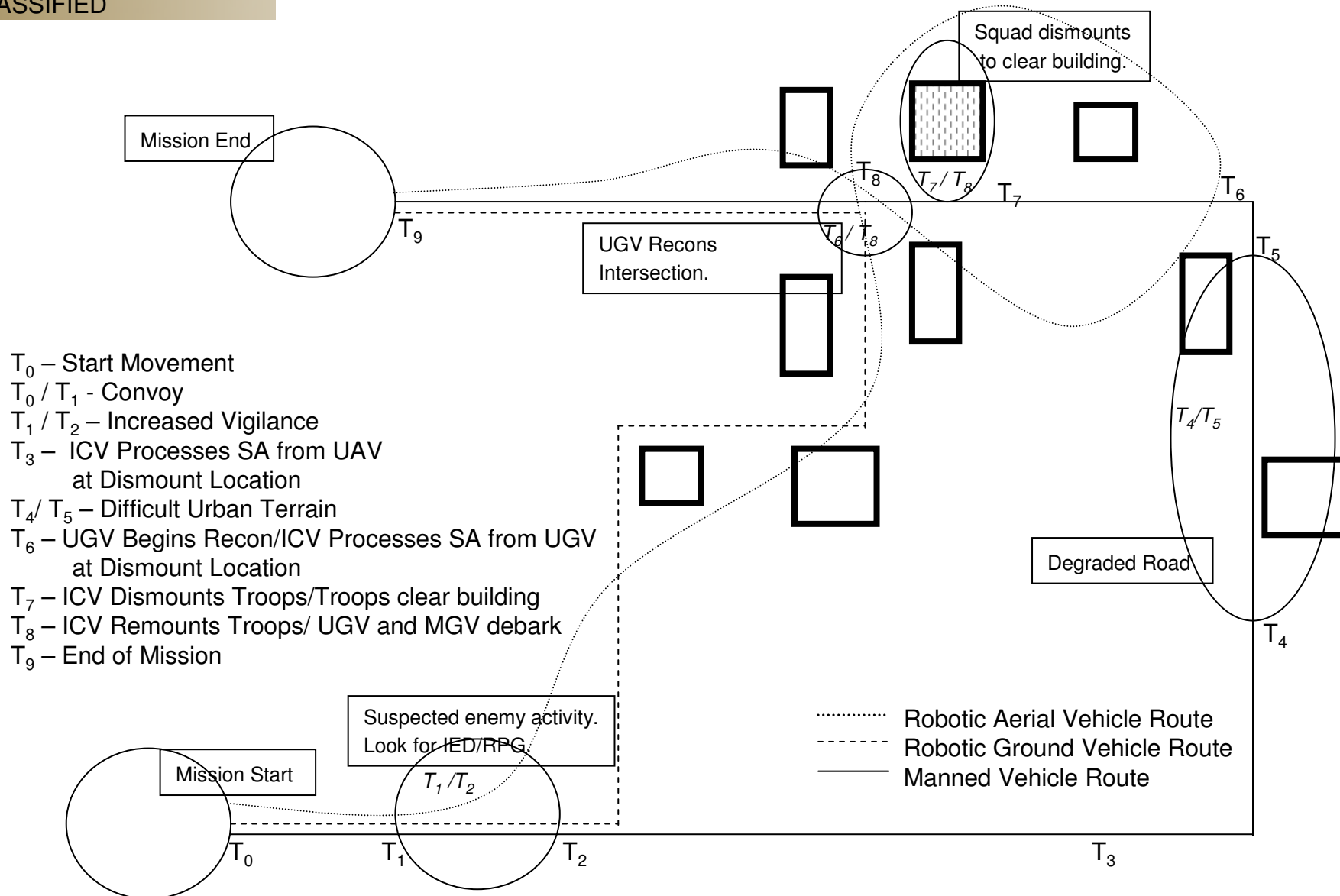
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Urban Engineering Evaluation Test Scenario



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Evolution of TARDEC's Intelligent Ground Systems Programs



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Manned Platform



Crew-integration and Automation Testbed
(CAT)

Unmanned Platforms



Crusher



eXperimental
Unmanned Vehicle
(XUV)



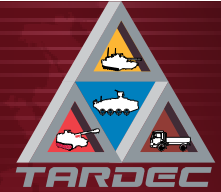
Talon



gMAV



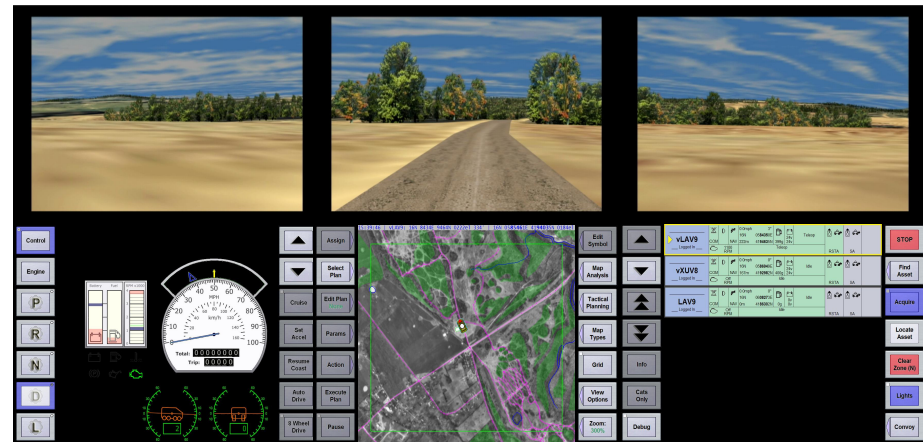
CAT Crewstations



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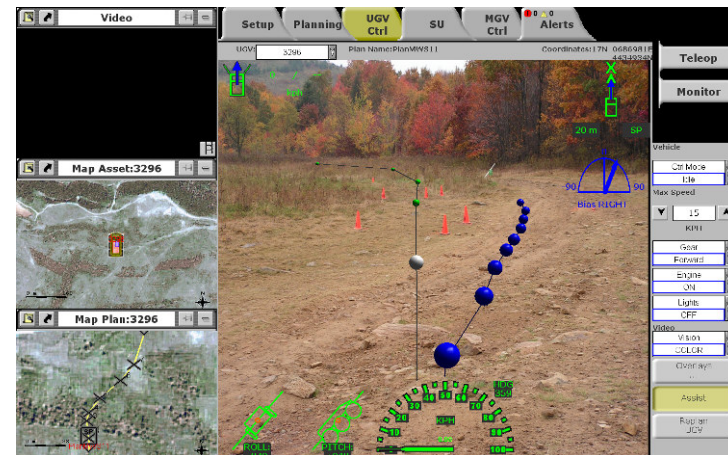
Common Crew Surrogate



Warfighter Machine Interfaces



Mission Module Workstation



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Modeling and Simulation System Integration Labs



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Motion Based Simulation

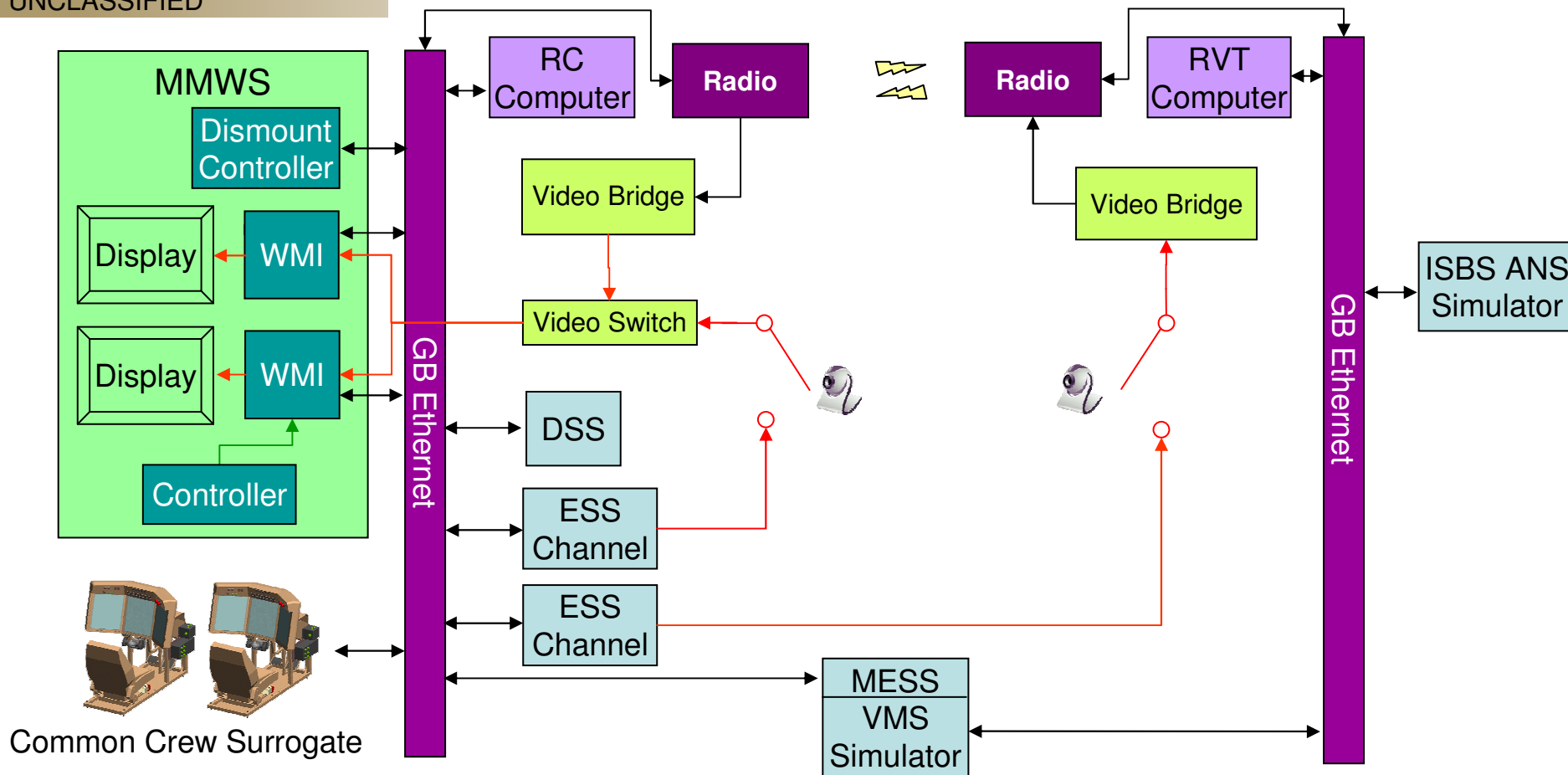


System Integration Lab



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= Video Equipment
 = Shuttle PC
 = cPCI SBC
 = Network
 = Other

= Video
 = TCP/IP
 = USB
 = Wireless

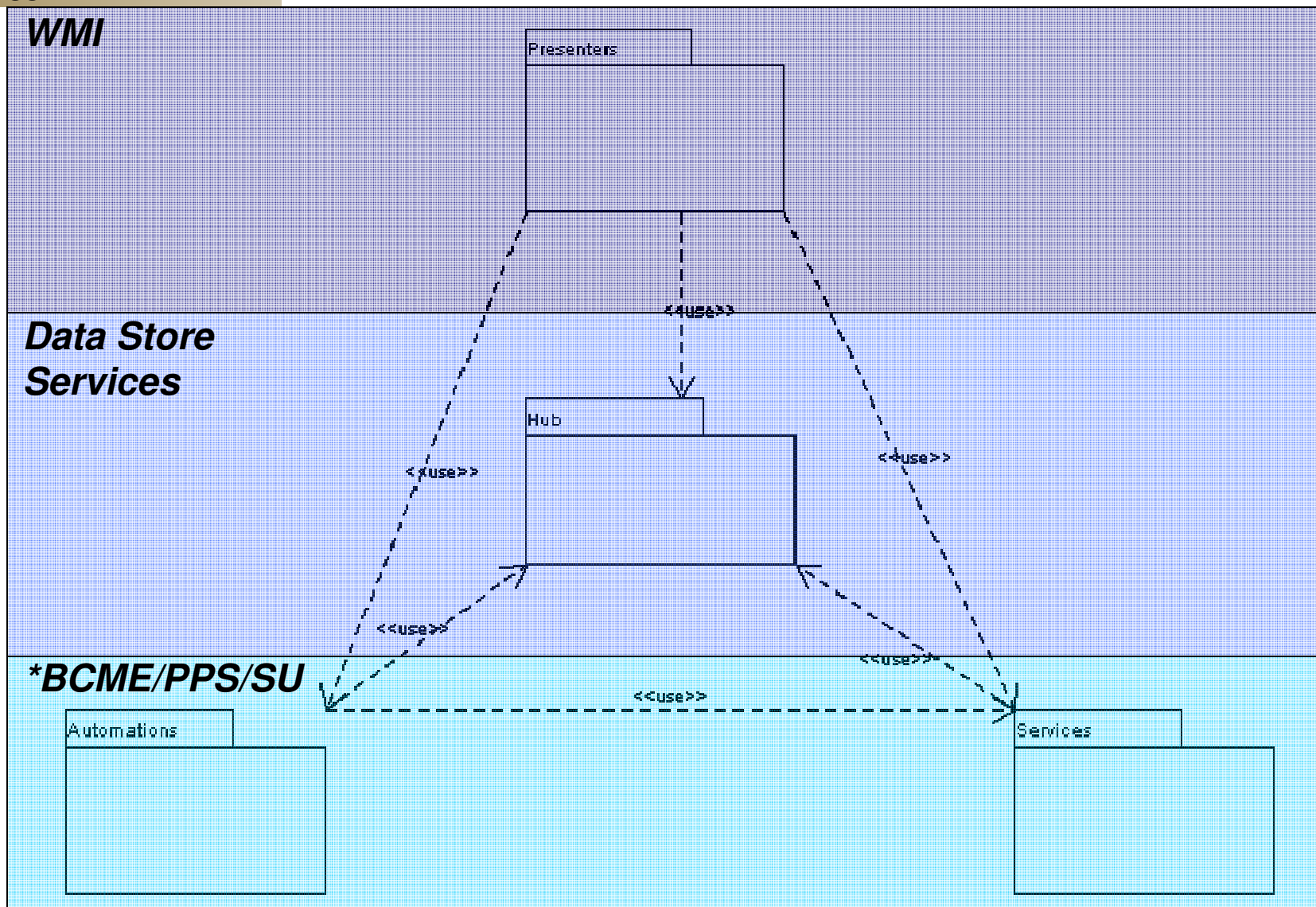
WMI = Warfighter Machine Interface
 MMWS = Mission Module Workstation
 ISBS = Intelligent System Behavior Simulator
 DSS = Decision Support System
 ESS = Embedded Simulation System

MESS = Master Embedded Simulation System
 ICS = Integrated Computer System
 VTI = Vetronics Technology Integration
 ANS = Autonomous Navigation System
 VMS = Vehicle Management System

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Technology Feeder SW Service Architecture

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*surrogate

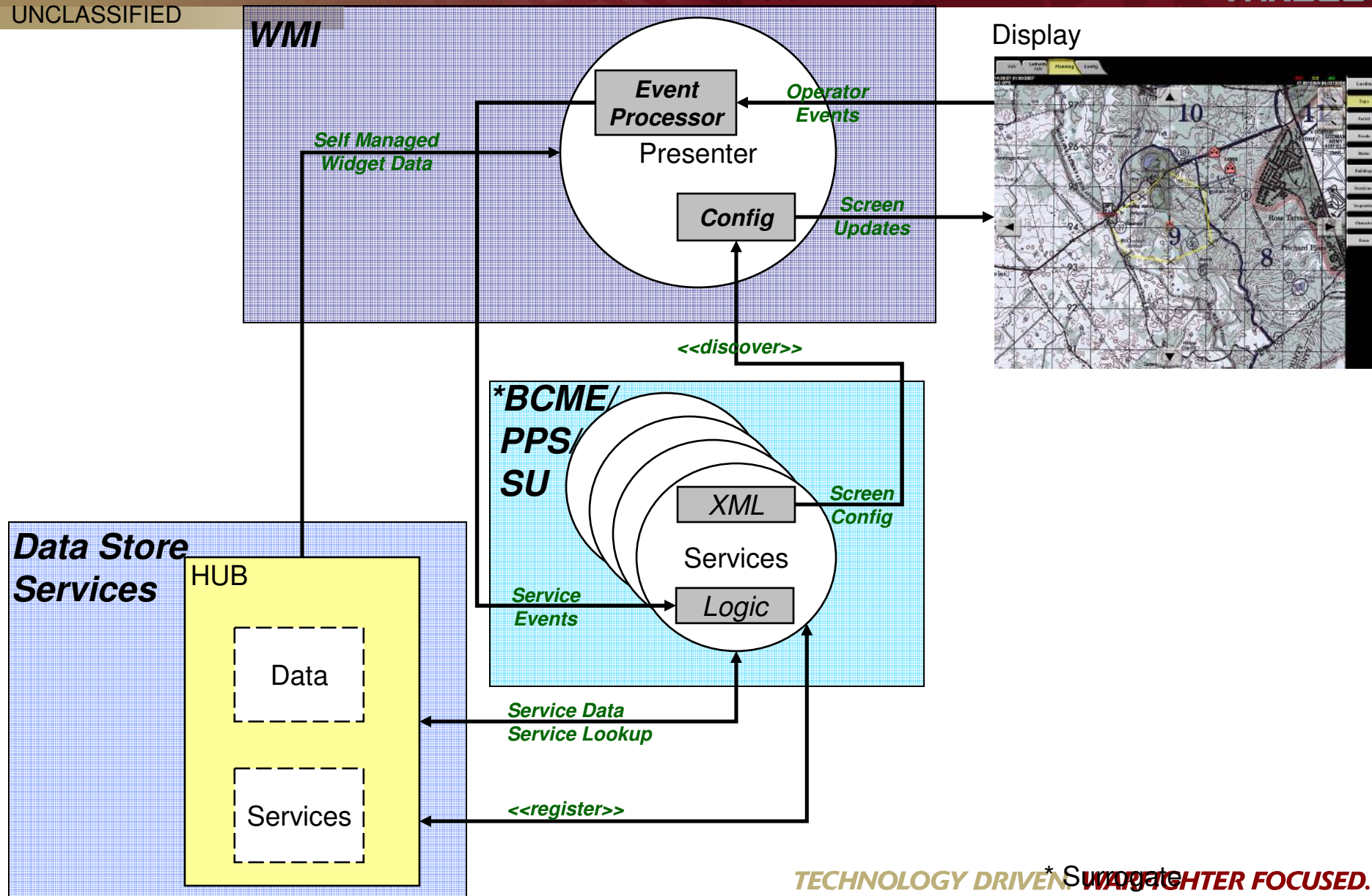
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Technology Feeder SW Service Architecture



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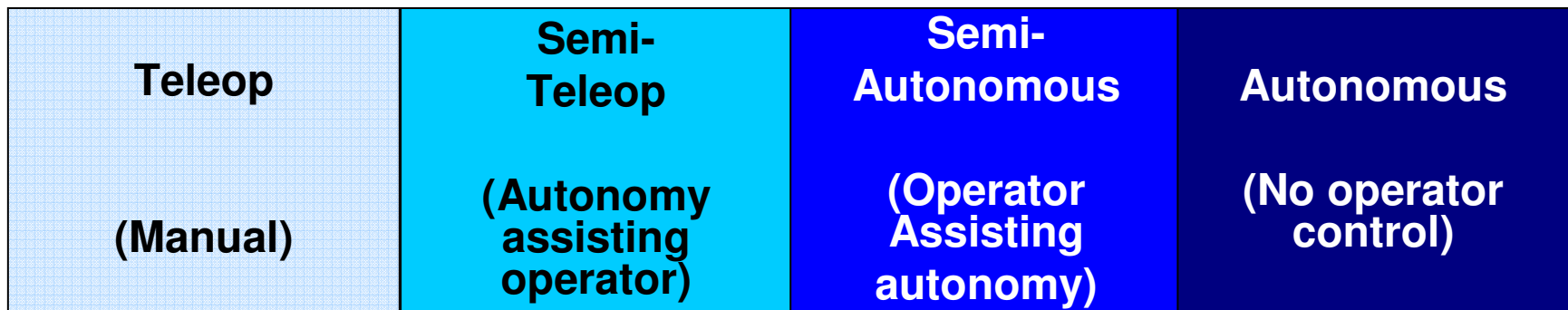
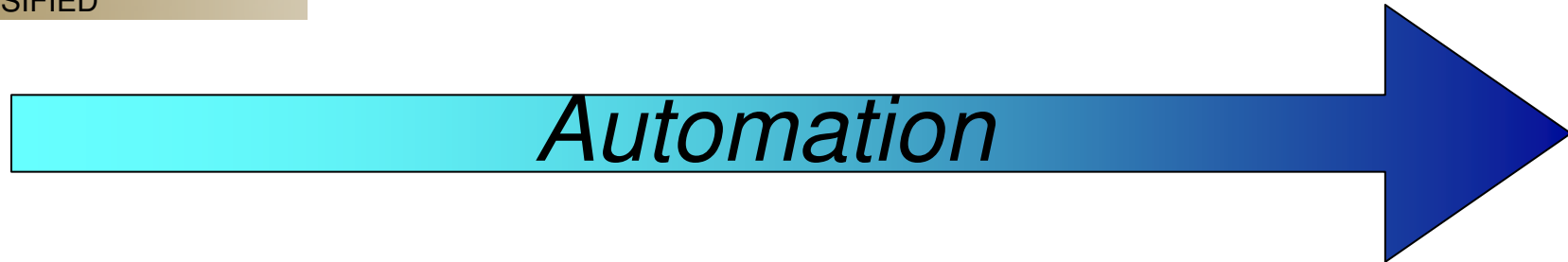
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Technology Feeders Mobility Autonomy



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Focus: Reduce operator intervention time and workload through:

- Increased SA/SU
- Technology Integration
- Advanced WMI
- *Leverage as much as possible from FCS to support RC objectives*

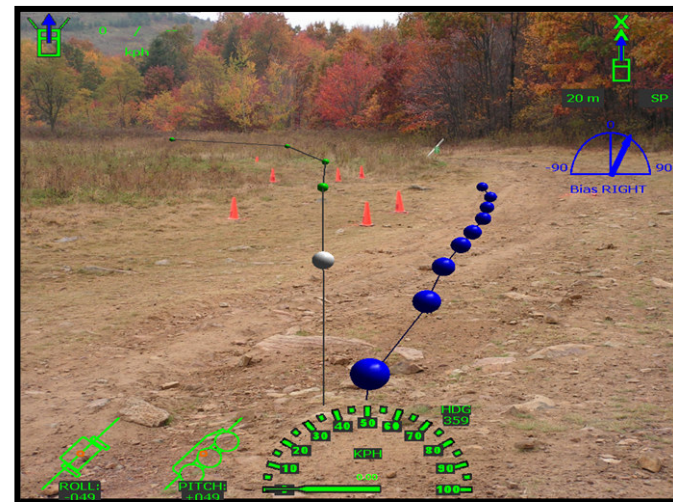
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FY 07 (RC ATO)

- Bias
- Speed Adjust
- Obstacle Overlays
- Apriori Overlays

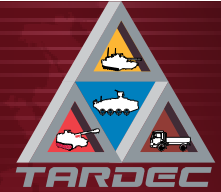
FY 08 (RC ATO)

- Aggressiveness
- Steerable Waypoint
- Confidence
- Long Range
- Safety Push / Clear Map
- Obstacles Map Aid
- Wonder Women





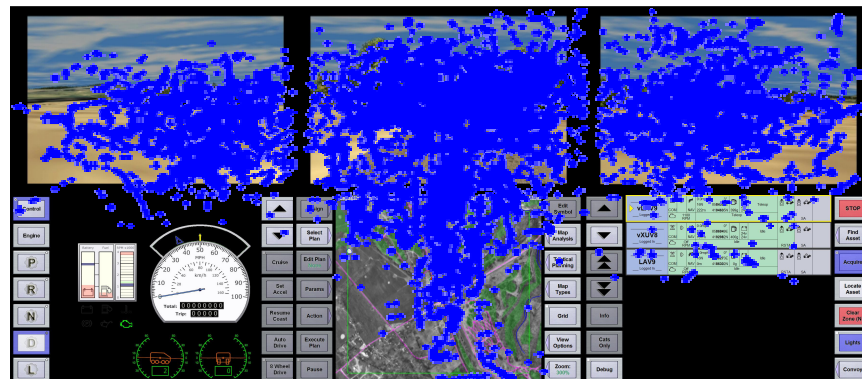
Eye Tracking Pilot Experiment



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2006 Pilot Experiment (TARDEC)

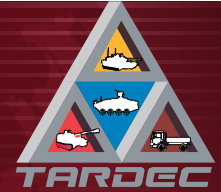
Tracked participants eye-movements and performance in full 6-DOF motion base simulator while executing supervisory control.



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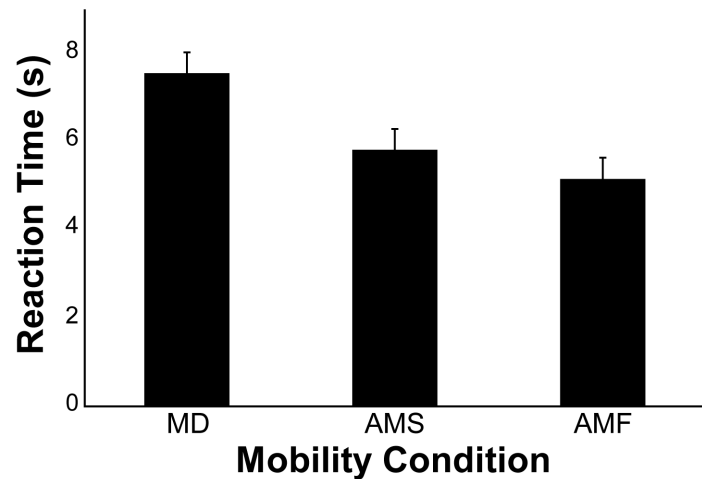
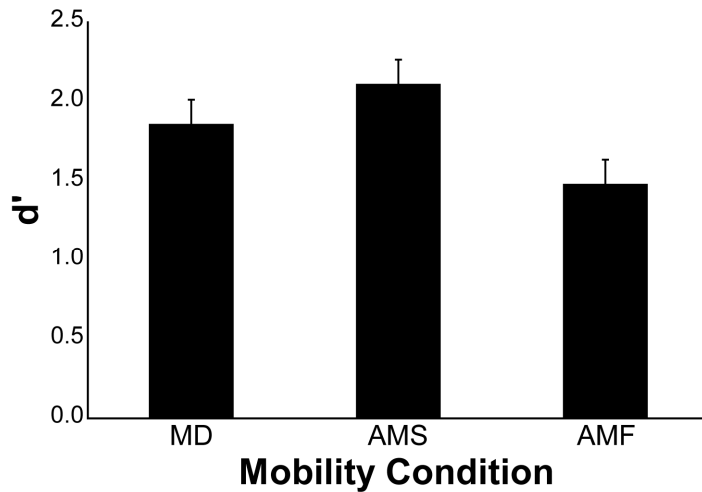


RDECOM-UAMBL Experiment 2006 (RUX06) Soldier Performance/Workload w/Automations



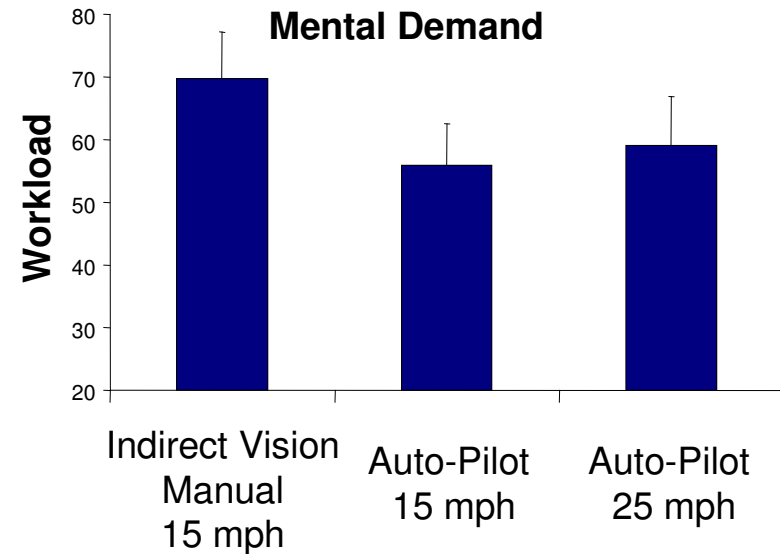
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Local Area 360 SA – Identification Accuracy and Response Time



Planning on Move During Convoy Ops

Condition	Plan on Move (%)
Auto-Pilot 25 mph	49.5
Auto-Pilot 15 mph	54.0
Indirect Vision Manual 15 mph	18.0



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