



# *Application of Safety Technologies in Tactical Vehicles*

*Acquisition Technology and Program  
Deployments & Operations  
Military Training  
Task Forces*

*Joint Military Vehicle Safety Working Group  
(JMVSWG)*


**6 Mar 08**


- “Explore the potential application of the new automotive safety technologies in existing and future tactical vehicles.” From presentation at the DSOC, 14 Sep 07.
  - Goal: tactical vehicle mishap reduction



# *Vehicle Safety Technology Systems*

- **Collision Avoidance/Mitigation**
  - Adaptive Cruise Control or Active Braking
  - Roll Stability Control
  - Electronic Stability Control
- **Collision Warning – provide timely alert (audio, visual, or seatbelt)**
  - Forward collision warning
  - Lane departure warning
  - Side blind spot warning
  - Intelligent Forward View/Driver Vision Enhancers
  - Rear back-up sensors and cameras
  - Drowsy/Distracted driver monitoring
  - Inertial Measurement Unit (IMU) or Rollover Alert Device (RAD)
- **Occupant Protection/Survivability**
  - Front and airbags
  - Motorized seat belts – haptic warning, slack removal
- **Event Data Recorders – deters aggressive driving, crash reconstruction, improve driver training**
- **Others devices, i.e. fire suppression, seat enhancements**

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- **Joint Military Vehicle Safety Work Group**
    - All Services
    - Representatives from training, safety, and acquisition community
  - **Solicited input from other organizations (technologies previously assessed or in – progress)**
    - Program Manager – Future Combat Systems
    - Program Manager – Tactical Vehicles
    - PM JLTV
    - PM - Joint Combat Support Systems

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- Working Group reviewed and assessed 21 safety technologies for application into tactical vehicles
  - US Army Program Manager, Joint Combat Support Systems (JCSS) has a continuous process called Expedited Modernization Initiative Procedure (EMIP) that addressed the same objectives as the Working Group
    - Vendors present their technologies at an EMIP forum for assessment and evaluation
    - EMIP has reviewed and assessed 27 safety technologies
    - Working Group considered 10 safety technologies that have not yet been evaluated by EMIP
  - PM JLTV has identified many safety technologies for inclusion into purchase description for evaluation and potential input into Capabilities Development Document (CDD)



Technology Description	Working Group* Assessed	EMIP Assessed / strength of potential 1=weak, 5=strong	Legacy Vehicle PM integration status	Legacy Vehicle PM Comment	Under JLTV Purchase Description (PD)
Forward Collision Warning (FCW)	Yes – 3.0	Yes - 5	Not under consideration for most vehicles	Exists only on M915 (Eaton VORAD System)	Yes
Lane Departure Warning (LDW)	Yes – 2.8	No	Not under consideration	Vehicle integration issues	Yes
Side Alert Warning	Yes – 2.8	Yes - 5	Not under consideration	Vehicle integration issues	Yes
Driver Vision Enhancer (DVE)	Yes – 4.0	Yes - 5	Integration capable for HMMWV and FHTV. Priority dependant	Not planned for M915 or FMTV	Yes – front and rear
Rear Cameras/Sensor Alert Devices	Yes – 3.8	Yes - 5	Not under consideration		Rear DVE provides this capability
Distracted Driver Alert	Yes – 2.6	No	Not under consideration	Space constraints	Only as part of the LDW technology
Rollover Alert Device	Yes- 3.2	No	Not under consideration	Demo on HMMWV	Yes
Adaptive Cruise Control	Yes – 2.4	No	Not under consideration	Only M1117 has vehicle interface	Under consideration
Rollover Stability Control	Yes – 3.8	Yes - 5	Not under consideration, however Work Directive in progress to develop test plan	Vehicle integration issues	Yes

\*Includes PM Future Combat Systems assessment

# Findings

Technology Description	Working Group* Assessed	EMIP Assessed / strength of potential 1=weak, 5=strong	Legacy Vehicle PM integration status	Legacy Vehicle PM Comment	Under JLTV Purchase Description (PD)
Electronic Stability Control	Yes – 4.0	Yes - 5	Not under consideration, however Work Directive in progress to develop test plan	Vehicle integration issues	Under consideration
Front or side air bags	Yes – 2.6	No	Side Air Bags under evaluation for some vehicles		No current requirement but PD does not prohibit
Motorized Seat Belt	Yes – 2.5	No	Not under consideration	Vehicle integration issues	Integrated into Rollover Alert PD
Event Data Recorder – Data	Yes – 3.4	No	Not under consideration		No
Event Data Recorder – Camera	Yes – 2.5	No	Not under consideration		No
Quick Release 5 point seat belt	Yes – 4.7	Yes – 5	Tested and not pursued	3-point system adopted	Minimum of 5 point seat belt
Fire Suppression – Cabin (active)	Yes – 4.0	Yes - 5	Integrated or development underway into most HMMWV and FMTV only.		Yes
Fire Suppression – Engine (active)	Yes – 3.8	Yes - 5	Tested not pursued for HMMWV. In production for M1117. In development for FMTV	M915 and FHTV placing priority on fuel tank fire suppression	Yes

\*Includes PM Future Combat Systems assessment

Technology Description	Working Group* Assessed	EMIP Assessed / strength of potential 1=weak, 5=strong	Legacy Vehicle PM integration status	Legacy Vehicle PM Comment	Under JLTV Purchase Description (PD)
Back up beepers	Yes – 2.5	No	Integrated in M915 and FHTV only		Yes
Enhanced air conditioning system	Yes – 3.1	Yes - 3	Integrated in HMMWV, M1117, M915 and in production for FMTV		Yes
Automatic Tire Pressure (CTIS)	Yes – 3.7	Yes - 5	Available as an option kit on HMMWV, M1117, FMTV and are in production. Integrated in FHTV and M915.		Yes
Seat Enhancement (air-ride)	Yes – 4.0	No	Not under consideration for HMMWV and M1117. In production for some FMTV. Integrated in FHTV and M915.	Applicable to line-haul vehicles only.	No
Active Alert Seat Belt	No	Yes - 3			
External Fire Suppression – Fuel tank and tires	No	Yes - 3	Solicitation in DRAFT for M915		
Seat Enhancements - ballistic	No	Yes - 5			
Traction Control	No	Yes – 3			Yes


\*Includes PM Future Combat Systems assessment




# Findings

Technology Description	Working Group* Assessed	EMIP Assessed / strength of potential 1=weak, 5=strong	Legacy Vehicle PM integration status	Legacy Vehicle PM Comment	Under JLTV Purchase Description (PD)
Armor Protection	No	Yes - 5			
Anti-Lock Braking System (ABS)	No	Yes - 5			Yes
Lighting (NVG)	No	Yes - 5			
Head Restraints	No	No			Yes
Run Flat Tire Technology	No	Yes - 5			
Emergency Egress Window	No	Yes - 5			
Integrated voltage monitor	No	Yes - 3			
Heat Barrier Package	No	Yes - 5			
Recovery under Fire	No	Yes - 1			
Safety Wheel Nuts	No	Yes - 5			
Torque Rear Axle	No	Yes - 5			
Self Sealing Fuel System	No	Yes - 5			
Tire Pressure monitor	No	Yes - 5			

\*Includes PM Future Combat Systems assessment

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- **Army has the continuous EMIP process to review new technologies**
  - **Many new technologies cannot be integrated into legacy vehicles**
    - Lack of on-vehicle electronic infrastructure
    - Space claims
    - Vehicle body structure limitations
  - **Funding remains a challenge (future and legacy vehicles)**
  - **Different technologies more suited to different vehicle types than others, i.e. HMMWV or line haul trucks**

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- **DSOC fund detailed Epidemiologic Analysis required to determine conditional probabilities for lowering hazard risk and injury severity for tactical vehicles**
    - **Provide analysis to DSOC, PMs, and acquisition community**
  - **DSOC explore the potential for a DOD-wide Expedited Modernization Initiative Procedure (EMIP) process**
    - **Develop a system life-cycle analysis process to review safety technologies and present to ATP TF and DSOC**



# Discussion



# Back up slides

# Two Methodologies to Assess Safety Device Potential

## • Assessment by mishap hazard statement (root cause)

Rank Order	Hazard Statement	Percent occurred in mishap
1	Personnel operating vehicles under NVD/NVGs may lose visual acuity, increasing the risk of driving into obstacles, collisions, running off the roadway, or loss of control	12.1%
2	Taking evasive actions to avoid vehicles, pedestrians, objects and obstacles in roadway may result in loss of vehicle control or collisions	8.1 %
3	Fatigued personnel may have degraded mental abilities and physical skills that cause critical errors and accidents	6.9 %
4	Drivers may pull into the path of vehicles causing others to have insufficient time to react resulting in loss of control/collisions	5.3 %
5	Intentional violations of vehicle regulations and laws, such as driving under the influence, speeding, failure to yield/stop, and improper passing increase the risk of accident	5.0 %

## • Assessment by collision type

Tactical Vehicle Class A mishaps	CONUS		OEF/OIF		Total
Collision Description	Army Combat Vehicle	Army Motor Vehicle	Army Combat Vehicle	Army Motor Vehicle	
OVERTURNED	2	19	14	81	116
RAN OFF ROAD	1	13	7	45	66
GOING FORWARD AND COLLIDED WITH MOVING VEHICLE		2	8	24	34
COLLISION WITH OBJECT OTHER THAN VEHICLE/PEDESTRIAN	1	1	2	15	19

Data Source: USA Combat Readiness/Safety Center

# Technology Survey Consolidation\*

Technology Description	Tactical vehicle application? (% agreement)	Potential for mishap/injury reduction 1=weak, 5=Strong	Vehicle Type L=Light M=Medium H=Heavy	Future and Existing Vehicles (F/E) and comments
Quick Release, 5 point restraint	Y (100%)	4.7	L,M,H	F=6 E=6
Seat Enhancements –air ride	Y (100%)	4.0	M,H	F=6 Line haul vehicles only E=3
Automatic Tire Pressure Central Tire Inflation System	Y (100%)	3.7	L,M,H	F=7 E=2
Forward Collision Warning	Y (100%)	3.0	L,M,H	F=7 Must have over-ride E=4
Driver Vision Enhancer	Y (85%)	4.0	L,M,H	F=6 Requires technical E=4 resources to sustain
Fire Suppression - cabin	Y (85%)	4.0	L,M,H	F=5 E=5
Electronic Stability Control	Y (85%)	4.0	L,M,H	F=5 Some tactical vehicles E=1
Fire Suppression – engine	Y (85%)	3.8	L,M,H	F=5 E=3
Roll Stability Control	Y (85%)	3.8	L,M,H	F=4 Some tactical vehicles E=2
Rear Cameras, Sensor Alerts	Y (85%)	3.8	M,H	F=5 E=3


\* Responses from 7 Army agencies; training, PM FCS, and doctrine offices

## *Technology Survey Consolidation\* – (continued)*

Technology Description	Tactical vehicle application? (% agreement)	Potential for mishap/injury reduction 1=weak, 5=Strong	Vehicle Type L=Light M=Medium H=Heavy	Future and Existing Vehicles (F/E) and comments
Enhanced Air conditioning	Y (85%)	3.1	L,M,H	F=4 Power requirements E=3 difficult to overcome
Side Alert Radar	Y (85%)	2.8	L	F=3 Must have over-ride E=1 needs more analysis
Drowsy or Distracted Driver Alert	Y (85%)	2.6	M,H	F=5 needs more analysis E=2
Rollover Alert Device	Y (71%)	3.2	L,M,H	F=2 May distract drivers E=3 Interfere with crew commo
Lane Departure Warning	Y (71%)	2.8	M, H	F=5 Not applicable to off-road E=2 conditions. Line haul only
Event Data Recorder - data	Y (57%)	3.4	L,M,H	F=6 Good for mishap E=0 investigation.
Front or Side Airbags	Y (57%)	2.6	L,M,H	F=3 , E= 0 Hinders egress
Back-up beepers	Y (42%)	2.5	L,M,H	F=2, E=2
Event Data Recorder – camera	Y (42%)	2.5	L,M,H	F= 6, E=3
Motorized Seat Belts	Y (42%)	2.5	L,M,H	F=3 Limits crew emergency E=0 actions
Adaptive Cruise Control	Y (42%)	2.4	M,H	F=3, E=0 Line haul only

\* Responses from 7 Army agencies; training, PM FCS, and doctrine offices



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- **Detailed Epidemiologic Analysis** required to determine conditional probabilities for lowering hazard risk and injury severity
  - **Military Department CAEs task PMs to explore the cost benefit analysis of safety technologies in reducing accidents**
    - **Assessments require thorough Engineering Analysis against mission requirements**
      - **Cost, weight, and space budgets**
      - **Devices with electromagnetic, radio, radar, or infrared emissions may have tactical impacts**
      - **Some devices will require “combat over-ride” to de-activate based on tactical mission requirements**
    - **For existing vehicles, incorporate aspects of configuration control similar to aviation systems and shipbuilding**
      - **Full systems engineering evaluation and controlled implementation**