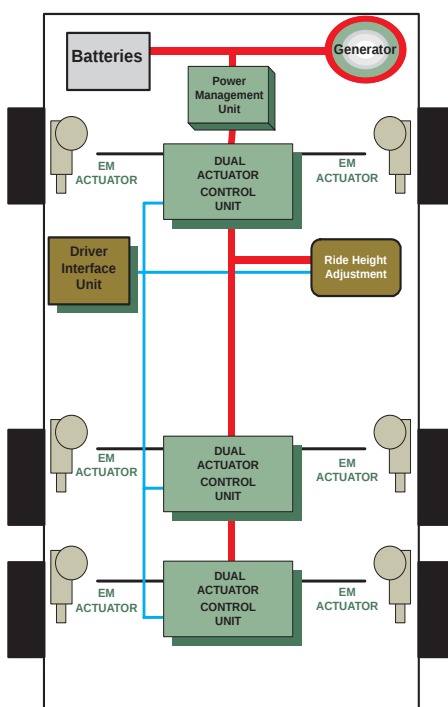


## Electronically Controlled Active Suspension System (ECASS)

*Threefold increase in cross-country speed (both steady state and dash) with a simultaneous five to tenfold improvement in platform stability.*

- Army tests at Yuma Proving Grounds



The ability to minimize, and under some circumstances, eliminate shock loads experienced by the crew and payload when traversing harsh terrain is a major factor in determining mission effectiveness and the survivability of personnel and equipment in a combat zone.

L-3 Electronics Systems (L-3 ES) is leading the development of an electronic suspension system for ground vehicles called, ECASS (Electronically Controlled Active Suspension System).

ECASS improves the off-road mobility and manoeuvrability of both wheeled and tracked vehicles. This substantially increases ground force mission success rates by providing stable mobile platforms for firing weapons, and by enabling troops and vital supplies to be transported faster and safer to where they are needed.

An ECASS-equipped High-Mobility, Multi-purpose Wheeled Vehicle (HMMWV) demonstrated a 'threefold increase in cross-country speed (both steady state and dash), with a simultaneous five- to-tenfold improvement in platform stability', at the US Army's Yuma Proving Grounds (YPG) two-mile, natural desert test course.

ECASS replaces conventional vehicle shock absorbers at each wheel with high bandwidth electro-mechanical actuators that are controlled to impart a near constant force between the vehicle tires and the terrain, thereby reducing ground pressure fluctuations. The actuators maintain a constant vehicle chassis attitude while, at the same time, actively controlling the vertical wheel motions in response to terrain changes. The result is a combination of bump smoothing and active roll, pitch and heave control. In achieving this, the actuators act as both motors and generators, adding or removing suspension energy, as required to achieve a smooth overall response. The ECASS battery/capacitor-based energy storage unit regenerates the absorbed energy that would have been dissipated as heat in conventional shock absorbers and springs, thus increasing overall system efficiency.

A coast-down comparison test over off-road terrain at YPG between an ECASS-equipped HMMWV and a conventional HMMWV showed a significant reduction in rolling resistance with ECASS installed. This translates into an increase in cross-country range for ECASS-equipped vehicles.

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Redundant digital processors, running patented proprietary control algorithms, use motion feedback sensors to determine, in real time, the required force at each actuator to achieve the desired degree of vehicle chassis isolation from terrain disturbances. The quick response time of the system means that no advanced knowledge of up-coming terrain changes is required, thereby avoiding the need for 'look ahead' sensors. As an added side benefit, ECASS can also manage the static ride height of the vehicle to compensate for changes in payload or mission requirements.

### ECASS Value Proposition

#### Mobility and Manoeuvrability:

- Two-to-threefold increase in speed over off-road terrain quickens the tempo of battle for combat forces.
- ECASS maintains a near-constant ground pressure for each tire. This reduces peak suspension shock loads and provides more consistent tire contact to enhance vehicle handling/control over cross-country terrain. In a similar way, for tracked vehicles, ECASS can reduce terrain-induced fluctuations in track tension.

#### Enhanced Survivability and Mission Effectiveness:

- Improved vehicle handling and stability enables more accurate C4ISR and weapon delivery, and active recoil management, which minimizes time between weapon firings.
- Static leveling capability on uneven terrain allows for greater flexibility of launch sites and reduced set-up time.

#### Crew Effectiveness:

- Crewmembers experience six-to-eight times less vibration and shock, thereby reducing soldier stress and fatigue and maintaining soldier efficiency for longer periods of time.

#### Vehicle Safety:

- ECASS can reduce Centre of Gravity height during severe cornering maneuvers to reduce vehicle roll over susceptibility.

#### Reliability/Cost Savings:

- ECASS' ability to minimize absorbed energy from terrain-induced shock and vibration can significantly reduce motion related vehicle and electronics failure rates, protect shock/vibration sensitive munitions and potentially reduce overall life cycle costs.
- Increased payload flexibility without significant degradation in suspension performance can provide opportunities for reducing transportation costs and expanding mission capability.

#### Fuel Economy:

- The ability of ECASS to store and regenerate damping energy reduces vehicle off-road rolling resistance and fuel consumption compared to vehicles with conventional suspension systems.

### ECASS Applications

ECASS can benefit the majority of vehicles, particularly in military and off-road applications. Tomorrow's vehicle designs will incorporate this technology and some of today's ground transportation can be retrofitted to take advantage of the many ECASS benefits. ECASS will soon be found on many tracked and wheeled combatants and mission support vehicle platforms, including:

- Light armoured vehicles
- Armoured personnel carriers
- Medi-vac vehicles
- Fire suppression vehicles
- Light, medium and heavy tactical supply/logistics vehicles
- Unmanned ground combat vehicles.



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