SURVIVABILITY ENHANCED RUN-FLAT VARIABLE FOOTPRINT TIRES

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# Survivability Enhanced Run-Flat Variable Footprint Tires

## Abstract

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Report Documentation Page

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Current Run-Flat Technology

Military Run-flat Tire with Insert [1]

Comparison of Conventional Tire to a Stiff Sidewall Tire [2]
Current Run-Flat Technology Issues

- WEIGHT
- LOGISTICS BURDEN
- SHOCK & VIBRATION
- SIZE LIMITATION
- PERFORMANCE

HMMWV Run-flat Insert Special Tool and Installation [2]
Spiral Spring Modeling

Side view of single wire of tire spring

Isometric view of the 10 circular closed springs
Load and Boundary Conditions Applied on the Model for a First Order Foot Print Analysis
Concept #2: Load-Deflection Testing on Prototype Run Flat Tire with Spiral Spring with 0 Psi inflation pressure (185/80R13 Passenger Tire).

Load Deflection @ Four Positions, Wire Only, No Air
Carbon Fiber Reinforced Tire

- Composite Ring-Reinforced tire
- Comprising of carbon, which is encapsulated as composite hoops into the tire tread
- The undertread layer adheres the tire tread to the primed encapsulated composite hoops. Composite hoops will be spaced above belts in the undertread region.
- Carbon fiber is utilized with the binder so that the resulting composite has high modulus and high strength.
Survivability Enhanced Run-Flat Variable Footprint Tire Sectional View
FEA of Inflated Tire
Carbon Fiber Hoop Tire

Carbon Fiber Manufacturing
Testing

Load Deflection

DURABILITY

UNCLASSIFIED
Stress in Carbon Fiber Hoop

Steel Belt Orientations

Mises Stress generated in carbon fiber
Max – 168.4 MPa
Maximum Normal Stress (S33) in the Core Side = 0.9154 MPa

Maximum Normal Stress (S33) in the Tread Side = 0.2417 MPa
Foot Print Area – Smooth Tire

Contact Area (CAREA) = 21.08934 sq inch for half-tire
Total Contact Area = 42.17868 sq inch
Total Foot Print Area (Contact Area + Void Area) = 7.395251 in x 6.571889 in
= 48.600780 sq inch

Maximum Contact Pressure = 0.6612 MPa = 95.89 psi
Average Contact Pressure = 2335/42.17868 = 55.35 psi
Benefits

- SURVIVABILITY
- RUN-FLAT RANGE GREATER THAN MISSION RANGE
- POTENTIALLY NO DEGRADATION IN PERFORMANCE AT ZERO AIR PRESSURE
- UNSPRUNG MASS REDUCTION (ELIMINATE RUN-FLAT)
- REDUCED LOGISTICS BURDEN
- SAFETY (ZERO OR SIGNIFICANTLY REDUCED AIR PRESSURE)
- PERFORMANCE
- POTENTIAL TO BE USED ON VEHICLES THAT DON’T CURRENTLY HAVE RUN-FLATS
Survivability Enhanced
Run-Flat Variable
Footprint Tires

TARDEC
DEVELOPING TOMORROWS
TECHNOLOGY TODAY
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REFERENCES
http://www.army-technology.com/contractors/tracks/runflat/
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