Shock Aspects of Lightweight Artillery on Mounting Electronics

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Primary Electronic Systems Applied to Artillery

- Computer
  - Data Input
  - Digital Communications
  - Ballistic Computation
  - Peripheral Control
  - Data Display(s)
  - Mission Processing
- Sensors
  - Inertial Navigation and Weapon Pointing Unit
- Power Supplies

General Firing Environment

- QE/Charge combination
  - Low QE/high charge
  - High QE/High charge
- Excitation short duration
- Recoiling mass acceleration
  - Longitudinal dominant
  - Primary low frequency
- Weapon Structure
  - Deflection stores and releases energy
  - Low to high frequency
  - Low to high accelerations

General Towing Environment

- Towing configuration
  - Folded
  - Unfolded
- Road Condition
  - Paved
  - Unimproved
  - Cross country
- Excitation over long duration

Requirement During Weapon Development

- Shock/Vibration Environment Electronics subjected to part of trade-off matrix
- Built into system
- Example M777A1 155mm Towed Howitzer

Retrofit Existing System

- Existing shock/vibration environment on weapon a given
- Little if any modification to function, structure, or loadings
- Built onto system
- Example: L118 105mm

  Towed Howitzer

Retrofit on US M119A2 105mm Howitzer

- Desire Digital Fire Control capability
- Compatible for full range of operation under normal and emergency conditions
- Structure / function “it is what it is”

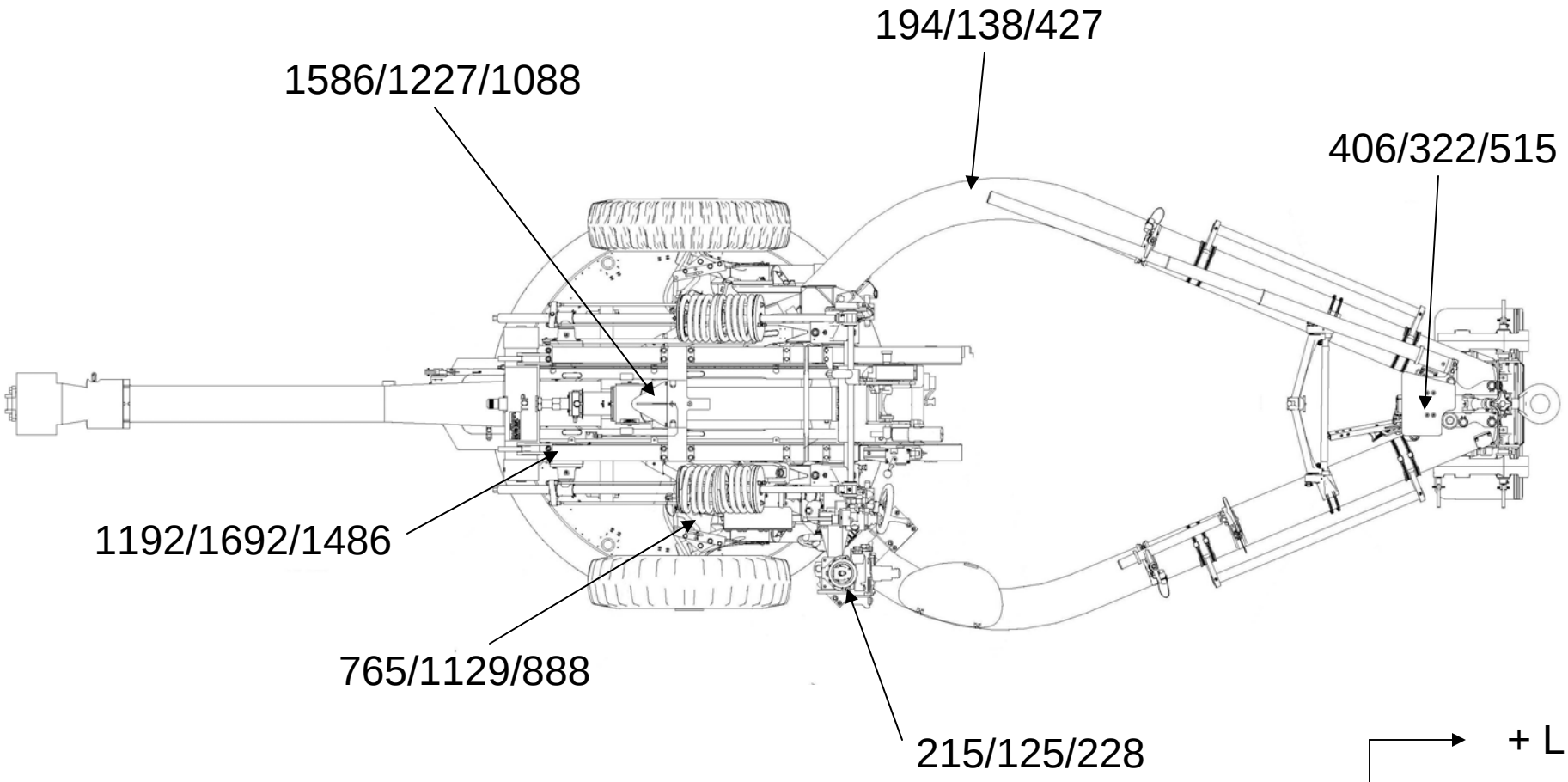
M119A2 Howitzer Firing

300 mils

800 mils

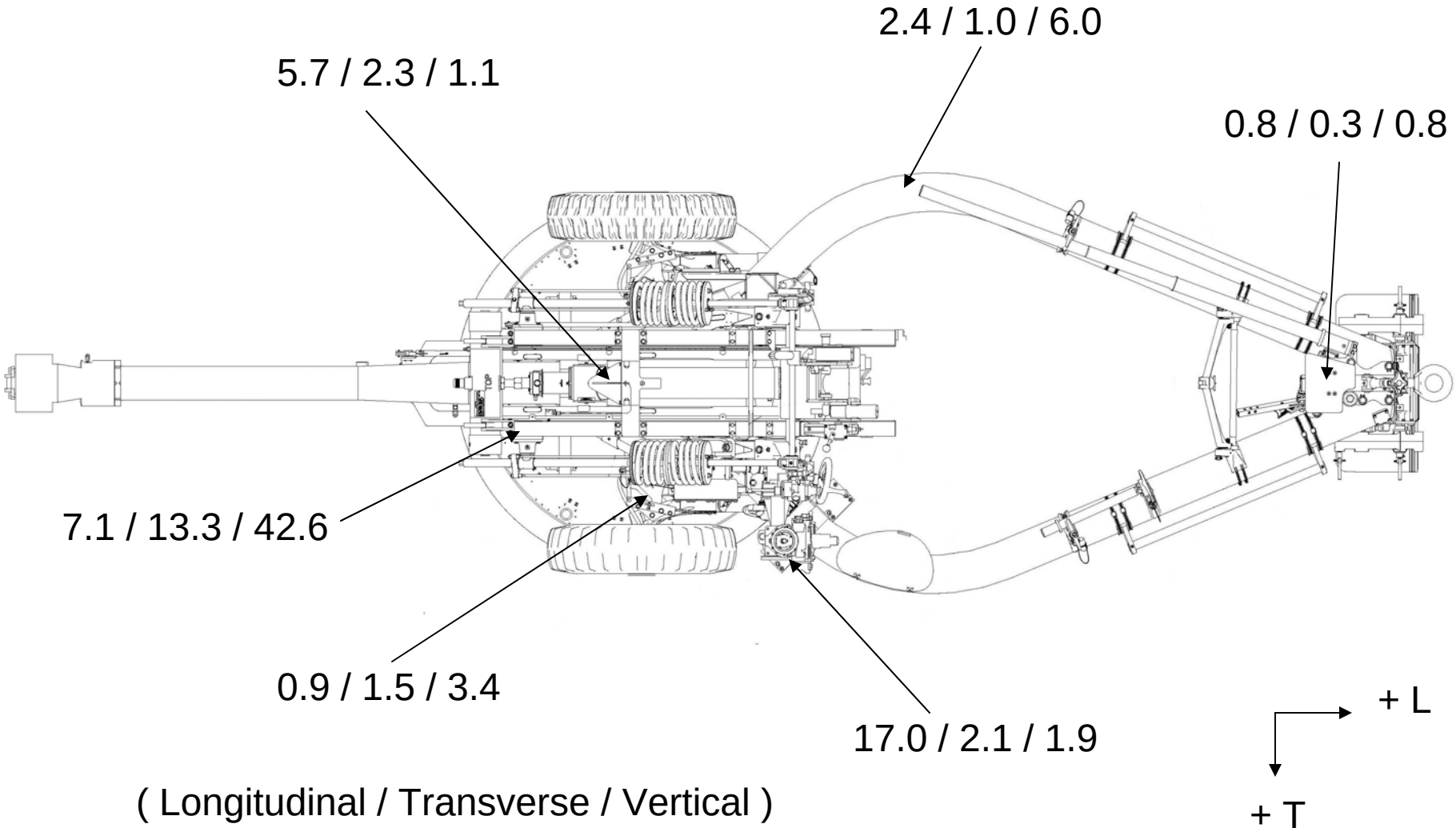
1244 mils

Shock Levels (G's)



(Longitudinal / Transverse / Vertical)

Power Density Levels (G^2/Hz)



(Longitudinal / Transverse / Vertical)

Electronics Options For Retrofit Applications

- Subsystem/Component Isolation
  - Alignment maintenance
  - Size/Weight implications
  - Non-interference of weapon controls/operation
- Component hardening

Summary

- New Weapon Development
  - Must be part of trade-off mix
  - Limits/drives structure and material selection
  - Limited opportunities
- Retrofit to Existing Weapon
  - Base Weapon largely “is what it is”
  - Limited parameters to adjust for compatibility
  - Greatest number of opportunities

Brief Info

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