RY19-7

1. **Research title:** Shock propagation using distributed sensors
2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:**
   a. Computer Science and Statistics
4. **Objectives:** Measure the relative change atmospheric pressure and rate of shockwave propagation using n-distributed barometric sensors. Sensors will vary on polling rates, resolution and report data asynchronously. The effort will determine the number of sensors required to detect improvised explosives and calculate yield and make additional inferences based on the characteristics of reported data. Results will include optimal sensor configurations and error propagation calculations due to sensor characteristics.
5. **Description:** Explosive yield can be calculated using the overpressure generated from the propagating shockwave by applying the equation below.

$$\Delta p = 2410\left(\frac{m}{V}\right)^{0.72}$$

   In warfare scenarios, the placement of IEDs is highly unpredictable. This technique enable DOD to use distributed weather stations, ad-hoc devices and other network-enabled sensors to detect IEDs, conduct battle damage assessments and characterize explosives post-detonation.

   The effort investigates the viability of sensors with varying specifications, dynamic distributions and asynchronous data transfers to generate operationally relevant information. The techniques would apply to additional sensor modalities (especially those generated with mechanical vibrations) and will add knowledge to improve resiliency of DOD assets in hostile operating conditions.

6. **Research Classification/Restrictions:** None. Shockwave propagation is well-understood. The novelty is applying physics understanding to distributed sensors.
7. **Eligible Institutions: Any**

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