1. **Research Title:** Low-Cost Wafer-Scale Mid-Wave Infrared Detectors and Focal Plane Arrays

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**

Electro-Optics, Physics, Materials Science, Electrical Engineering
Ph.D. level

4. **Objectives:** Develop low cost, size, weight, and power (C-SWaP) mid-wave infrared (MWIR) detectors and focal plane arrays (FPAs) using lead and mercury chalcogenides.

5. **Description:** There is a growing demand for low C-SWaP MWIR detectors and FPAs for military and commercial applications. C-SWaP reduction can be achieved by using inexpensive materials for a detector's active elements, fabricating FPAs at wafer-scale, and eliminating the need for cryogenic cooling. Our primary goal is to utilize polycrystalline lead and mercury chalcogenides (PbS, PbSe, PbTe, and HgTe), which can be deposited on CMOS compatible substrates, to develop detectors operating at or near room temperature. The main tasks in this effort will include (i) investigating novel approaches to synthesize MWIR materials, (ii) fabricating single element detectors and FPAs based on both photoconductive and photovoltaic architectures, (iii) and investigating techniques to mitigate 1/f noise and carrier sweep-out. In-depth device testing and understanding of the role of granular polycrystalline structure in detector performance will also be key parts of the technical work. The goal is to develop single pixel detectors as small as 12-30 µm with noise equivalent power (NEP) of 100 fW/Hz$^{1/2}$ or better at a temperature in the 240-300 K range.

6. **Research Classification/Restrictions:** This research is unclassified. U.S. Citizenship required.

7. **Eligible Research Institutions:** Universities (DAGSI)