

1. **Research Title:** Robotic Nondestructive Inspection for Confined Spaces
2. **Individual Sponsor:**  
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3. **Academic Area/Field and Education Level:** Mechanical Engineering, Material Science and Engineering, Computer Science, Electrical Engineering, Physics, or related field (MS or PhD)
4. **Objectives:** Integrate material evaluation capabilities with novel robotic platforms including, but not limited to small-scale or soft robots.
5. **Description:** Nondestructive material characterization commonly relies on surface-based sensors (e.g. eddy current, ultrasound, thermography, etc.) to interrogate a component for damage or defects. These inspections are commonly done either manually or using large 6-axis robotic systems with rigid fixturing. Thus, accessing and inspecting obscured surfaces, confined spaces, and complex geometries is difficult or impossible with current nondestructive evaluation technologies. In contrast, small-scale and/or soft robotics capable of navigating confined spaces and performing nondestructive inspections would enable assessment of previously unreachable areas; however, additional research is needed to realize this potential. To this end, this topic seeks proposals which implement physics-based models or experiments to investigate the integration of nondestructive inspection capabilities with small-scale and/or soft robotic platforms. Relevant research challenges of interest include, but are not limited to, sensor-robot integration, novel sensor development, robot development, navigation for confined spaces, and other aspects of robotic locomotion and control. In each of these cases, access-restricted structures and power management should also be considered.
6. **Research Classification/Restrictions:** Unclassified and Unrestricted. Eligible for Public Release. Open to U.S. Citizen Students Only.
7. **Eligible Research Institutions:** All DAGSI Institutions
8. **PA Approval #:** Distribution A. Approved for public release: distribution unlimited. AFRL-2023-4243