Sometimes despite our best efforts, a bomb will go off. We need to be pro-active in protecting our high-value targets against such events. The ***Blast Mitigation*** thrust area will focus on basic research needed to develop novel materials and structures to mitigate blast effects. The research thrust areas chosen initially do not encompass the entire scope of mitigation but have been selected after conversation with a number of researchers in the field as potentially the most promising and, in some cases, offering short-term improvements to structural integrity. Our approach includes development, characterization, and modeling of novel heterogeneous materials (including particulate, layered and functionally graded materials, and sandwich compositions) and their response when subjected to extremely high strain rate blast loading. An integral part of the thrust is the understanding and modeling of structural response, including nonlinear shock propagation, progressive collapse, and various loading scenarios such as external and internal blast, fragments, and fire. Efforts are also aimed at hardening structures: coatings for structural protection during blast; self-healing materials; and smart protective structures.

In the ***Explosives Detection Sensors*** thrust area, we have looked at a combination of advanced concepts for wave-based and chemical-based sensing for both close-in and standoff applications. In the ***Explosive Detection Systems*** thrust area we are examining the use of novel reconstruction and image processing algorithms and multi-sensor fusion strategies to provide optimal information about complex threat scenarios such as those found in the screening of airport passengers and luggage or in the surveillance of critical areas such as subway platforms, urban traffic, within a sports arena or a shopping mall. In both of these thrust areas (and in general for all the thrusts) we have based our assessment of the gaps in the existing fundamental science via several mechanisms. In addition to reviewing literature on the subject, we have consulted colleagues in academia, the national labs, federally-funded research & development centers, and industry. We have attended focused research meetings on topics of relevance (i.e. the Gordon Research Conferences on Explosive Detection and on Energetic Materials). These assessment activities will be ongoing as we determine fruitful areas of research for counter-IED initiatives.

In summary, in all the thrust areas, the "best of the best" were selected from within the NEU and URI proposal teams. It is intended that in future years we will reach out to others in the academic community who can add their novel ideas to the critical mass of fundamental science being conducted from within the Center. We are mindful that the outcome of some of the research may not bear significant fruit in terms of long range impact on the DHS mission. However, we will be cognizant of both the successes and failures of our research and report on both aspects so that future research won't have to "reinvent the wheel." It is expected that though the Center's research will evolve, it will maintain a basic focus relevant to the overall DHS mission. What follows is a summary of all the research projects that will comprise the first year research work plan for ALERT.