Cold Spray for Additive Manufacturing

**Research Objective**

- To model, design, and develop cold spray as a qualified process for depositing coatings, low cost dimensional repair, and production of near-net shape parts in order to alleviate logistical burdens on high cost restoration, lack of viable repair processes, and long lead times for replacement of metal components.

**Challenges**

- Address limitations in materials capabilities for additive manufacturing using the advantages of cold spray as a low temperature, powder-based process.
  - Corrosion/thermally sensitive substrates and feedstocks are key cold spray applications.
  - Multi-component deposits, functional grading.
- Develop powder feedstock production processes and specifications tuned for cold spray process to further the mechanical capabilities of deposits.
- Provide extensive materials characterization data to support qualification of repaired and near-net shaped components.

**ARL Facilities and Capabilities Available to Support Collaborative Research**

- Full suite of cold and thermal spray capabilities.
  - Large-scale industrial spray systems for development of cutting edge research and applications.
  - Portable spray systems to design and test repair in the field.
- Extensive resources and tools for spray/impact modeling, process development, materials characterization, and mechanical testing.
- Over 30 years of experience modifying cold spray systems and techniques to maximize the performance of additive manufactured parts.

**Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration**

- Powder synthesis, processing, and characterization experimentation and expertise.
- Modeling of multi-particle impact phenomena to predict and design material properties in deposits.
- Sophisticated automation for cold spray processing.

---

**Cold Spray Repair of Magnesium Components:**

- Main, Intermediate and Tail Gearboxes for UH-60:
  - 80% W 20% Cu deposit cold sprayed & annealed.
  - Cu deposit on Al.

**Mechanical properties of cold sprayed deposits**

**Single particle impact model compared to deposit**

**Particle velocity measurements by TECNAR DPV2000 system**

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED