Portable Cold Spray Repair System

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Objective:
• Develop a multifunctional end effector system that can be integrated with several different robots to enable the Navy to more efficiently perform shipboard repairs

Vision:
• Design, fabricate and deploy a multifunctional end effector system that can be quickly adapted to several different repair technologies and integrated with a robots that are used by the US Navy

Approach:
• Use commercial off-the-shelf technologies (COTS) where possible for mapping, surface preparation, repair, inspection and machining/finishing
• Use COTS quick disconnects
• Existing technologies and technologies under development such as scanning, plasma blast, laser ablation, portable cold spray and ultrasonic/eddy current inspection
• Develop prototype integrated control system for the selected technologies
• Common power supply, control computer and gas supply
• Demonstrate technology in a shipyard
Portable Robot
- Robotic Technologies of Tennessee (RTT)
- Magnetic track portable robot
- Developed for welding
- LIDAR surface scanner

Quick Disconnects for hardware (PSU/ARL)
- Designed and demonstrated connectors for:
  - LIDAR scanning for workspace mapping
  - Plasma blast coating removal
  - Grinding surface preparation
  - Cold spray surface repair

Common Power Supply
- Designed and fabricated a common power supply
- Only need one power cable

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RTT example of LIDAR scan
Produces Point Cloud
Plasma Blast

- Partnering with Atmospheric Plasma Solutions
- Plasma blast removes coatings without the use of abrasive media or chemicals
- Utilities: Requires only compressed air and 240VAC power

https://apsplasma.com/coating-removal/

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Grinding and Cold Spray

- GI Squared Rotation Activated Grinder to be used for additional surface preparation
- Uses COTS battery powered grinder, modified by GI Squared to be turned on/off by robotic wrist motion
- No electrical connection to robot required

GI² cordless grind attached to the robot
Cold Spray

- Partnering with VRC Metal Systems for cold spray application
- PSU and RTT have established relationships working with VRC on past projects
Continued Development

• Developing support technologies
• Working on robot programming to support repair technologies
• Looking at additional equipment
• Designing support equipment
  • Gas Supply
  • Utilities
  • Common power supply
• Looking for input