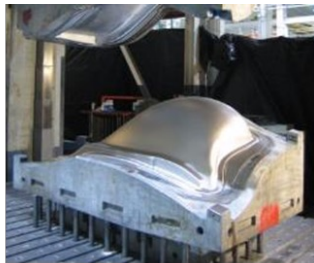




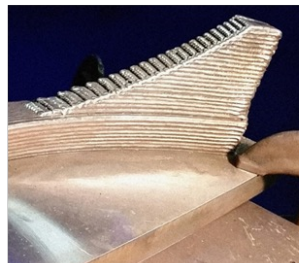
An **advanced engineering** services provider  
addressing **business challenges** by developing  
tailored engineered **technical solutions**



Materials  
Joining



Forming



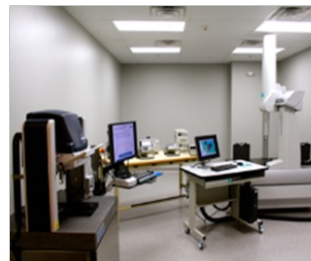
Additive  
Manufacturing



Structural  
Integrity



Inspection



Testing &  
Characterization



Advanced  
Automation

**\$27 Million** Annual revenues  
across range sectors

**160+ Staff** Working together  
to find solutions

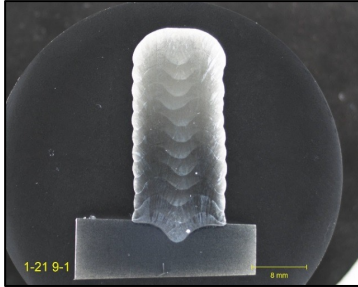
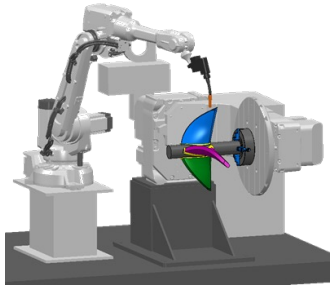
**\$40+ Million** In state-of-the-art  
capital equipment



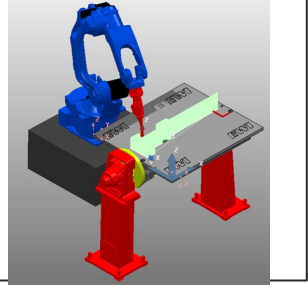
Ron Aman, Ph.D. [raman@ewi.org](mailto:raman@ewi.org)



# NSRP Robotic Arc Directed Energy Deposition (DED) Additive Manufacturing (AM) for Shipbuilding

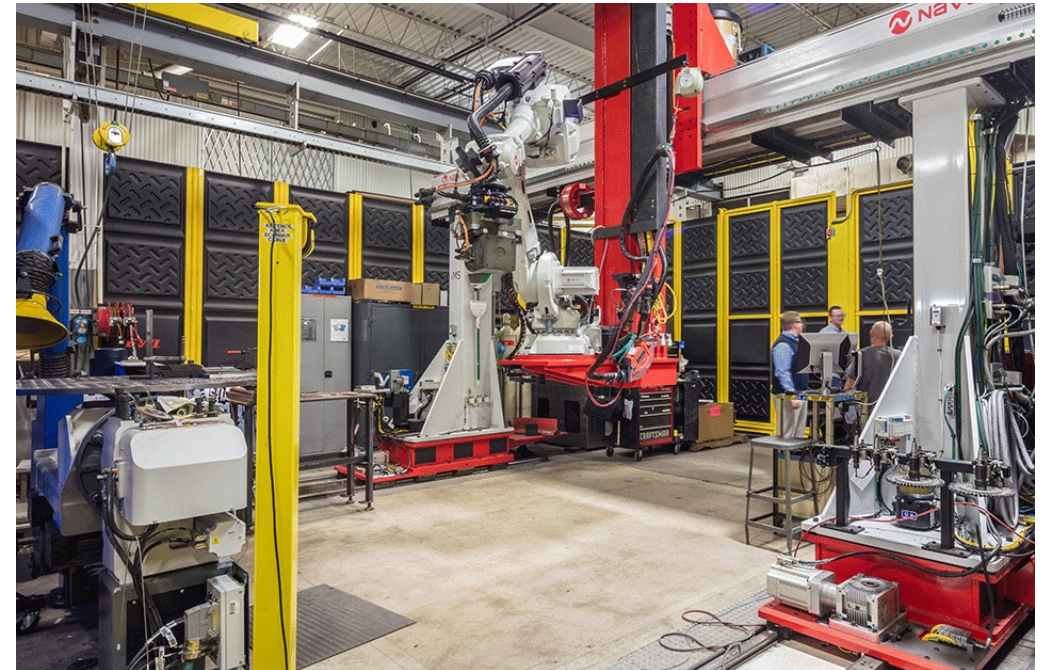
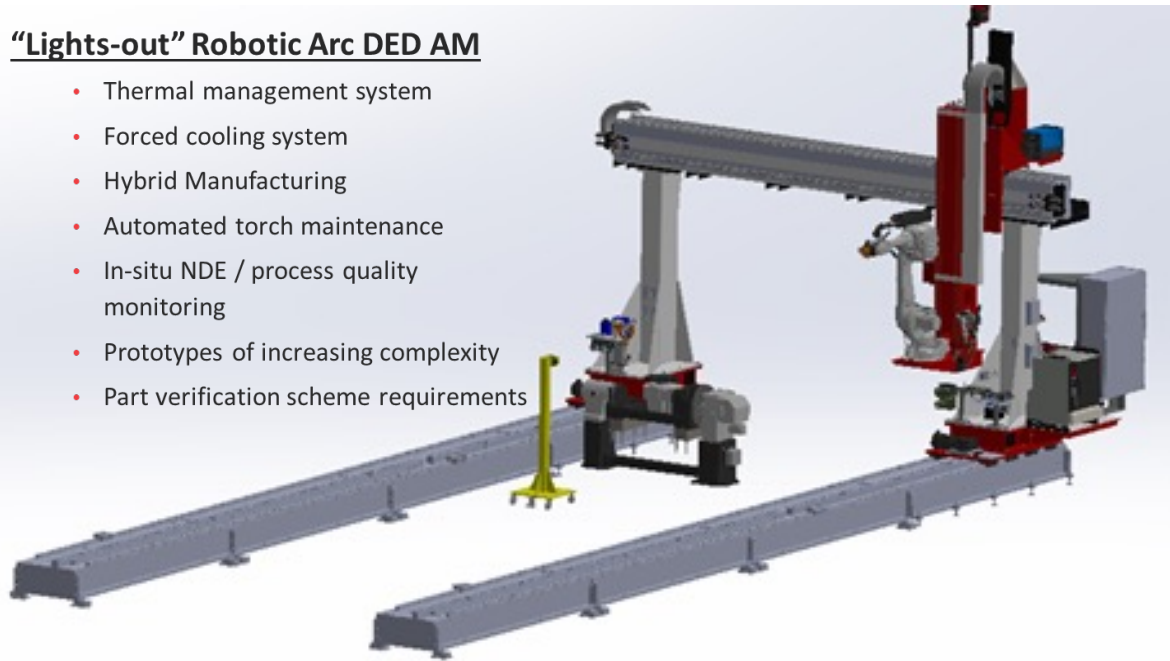


**Project Team**  
EWI – Project PI  
Navus Automation  
Austal USA  
NSWCCD  
ABS



## “Lights-out” Robotic Arc DED AM

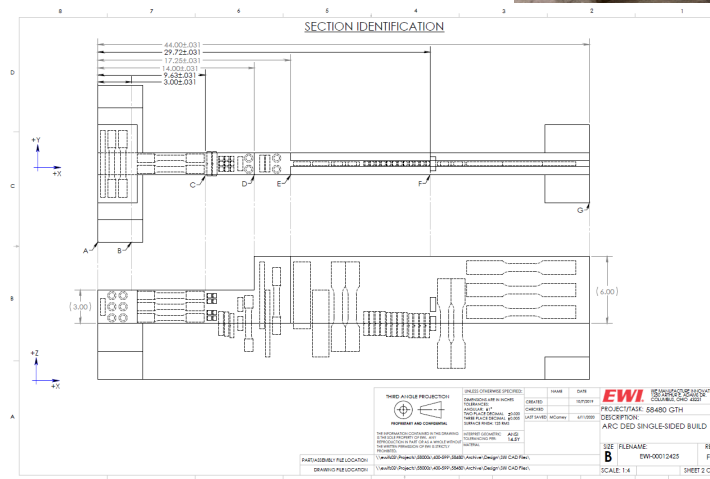
- Thermal management system
- Forced cooling system
- Hybrid Manufacturing
- Automated torch maintenance
- In-situ NDE / process quality monitoring
- Prototypes of increasing complexity
- Part verification scheme requirements



Navus Gantry @ EWI switching from Lincoln Welding head to PushCorp Spindle

# NAVSEA DED AM Procedure Qualification

- Portfolio of DED AM procedure qualification schemes
  - Standard qualification build (SQB) design
  - Nondestructive evaluation (NDE) requirements (VT, PT, MT, RT, UT)
  - Specimen test matrix
  - Procedure Qualification Record form
- Specimen types
  - Tensile
  - Bend
  - Metallographic
- Specimen locations
  - Deposit metal
  - Interface/heat affected zone
- Specimen orientation
  - Wall: X, Z
  - Block: X, Y, Z



SS-FS-IBP-SQB

Deposited SQB

