



USING ADDITIVE MANUFACTURING TO MITIGATE THE RISKS OF LIMITED KEY SHIP COMPONENTS OF THE ZUMWALT- CLASS DESTROYER

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LT Xiao Wang

LCDR Jim Whitworth



Background

Zumwalt-class destroyer (DDG 1000) is a three-ship program that represents the pinnacle of state-of-the-art technology.

Because of technologies, intellectual properties, and scale economies, DDG 1000 is in a sole-source, or limited sources, acquisition environment.



Research Questions

- **How should the government structure PBL contracts that will incentivize the use of AM?**
- **If the government decides to insource, what are the considerations in make-or-buy decisions?**
- **How can the DDG 1000 program leverage the capabilities of AM for its existing and future requirements?**



Analysis Conducted

- **Current applications of additive manufacturing technology on military platform**
- **Future additive manufacturing capabilities**
- **Cost Effectiveness of Performance Based Logistic Contract**
- **Outcome based logistic contract**
- **Interface Management / Configuration Management to accommodate future system upgrade and expansion**

State of AM

GE is a leader in AM technology:

- **The LEAP engine contains 3D-printed fuel nozzles**
- **The nozzle reduced the requirement from 18 subtractive manufactured parts to one**
- **Using AM in the Advanced Turboprop Engine eliminates 845 parts**





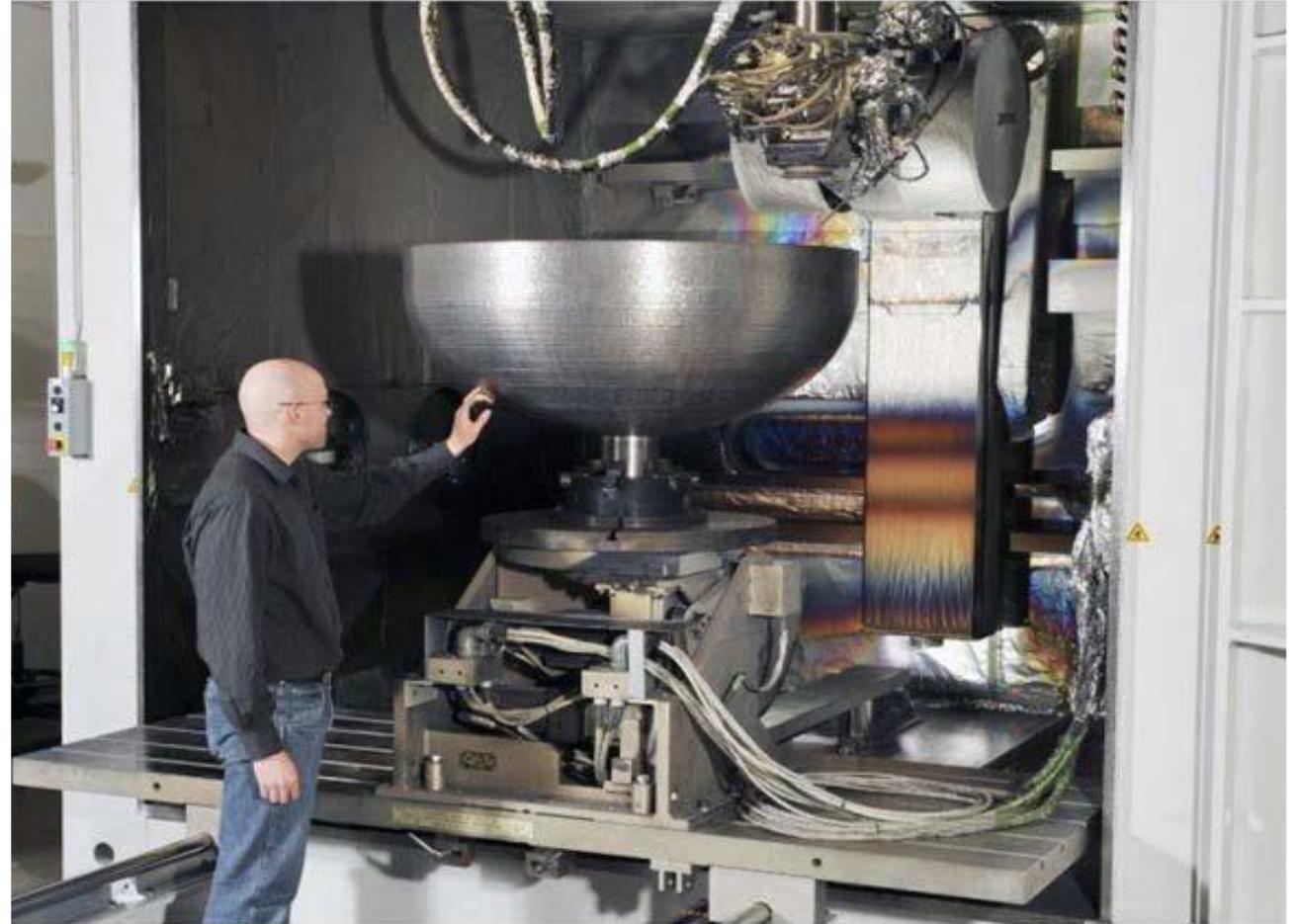
State of AM

- **AM technology is used for low-demand vehicle parts by Mercedes-Benz**
- **Traditional steel hatches on commercial ships have been approved for replacement with fiber reinforce plastic**
- **Raytheon accelerated its experiment using 3D-printed parts in the Trident II D5 missile**

State of AM

Sciaky's Electron Beam Additive Manufacturing:

- Manufacture parts from eight inches to 19 feet
- Alter material composition mid-process
- Lockheed Martin is using this technology (this figure is from their Littleton, CO facility)





Proposed Solutions

In order to take advantage of the capabilities and potential that AM offers, the government needs to structure performance-based arrangements that will help to extract innovation, motivation, and collaboration from its contractors.



Proposed Solutions

Insourcing does not address all the challenges and complexity of supporting complex defense systems.

Government entities have certain limitations and constraints for ensuring that parts meet specifications.



Proposed Solutions

AM can improve competition and lower the risks associated with a limited supplier base by adding a second competitor, lowering the nonrecurring costs, eliminating the need for an economy order quantity, and achieving cost savings.