

Abstract

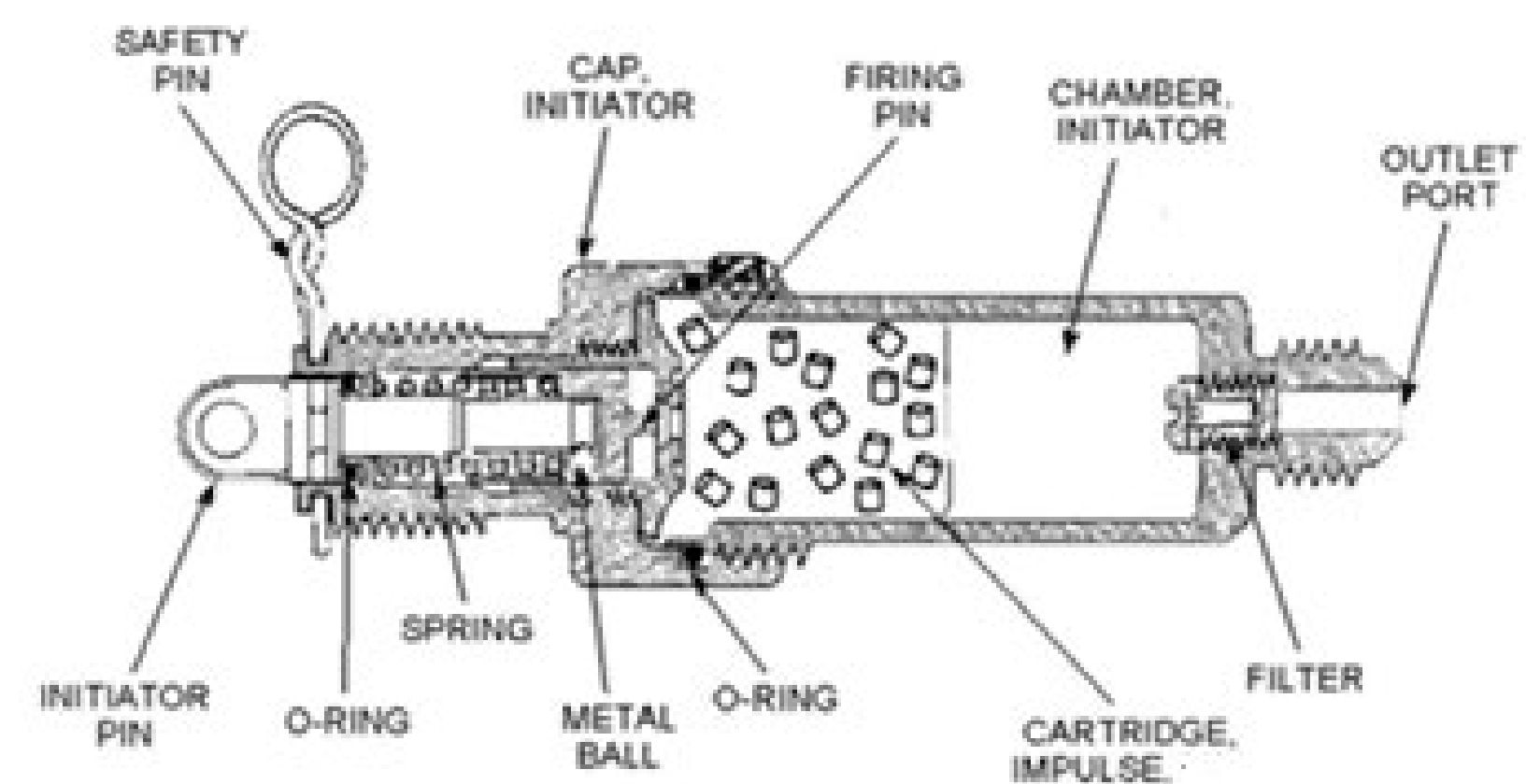
Additive Manufacturing (AM) is a manufacturing paradigm revered by the United States with inspired interest, as the Department of Defense strategizes to revitalize its industrial bases. The Office of Naval Research in collaboration with the Naval Surface Warfare Center Indian Head Division are conducting the Hercules Experimental Smokeless (HES) 5808 AM research and development. The HES 5808 is a critical component of the M91 Impulse Cartridge which is utilized in the AV-8, F-5, F-16 and T-38 Aircrew Escape System. The catalysts for the study are the high rate of defects and constraints of traditional manufacturing (TM). The study objective is to determine the efficacy of the AM methodologies, Direct Ink Write and Digital Light Processing, in relation to the manufacturing of propellant. Moreover, the long-term goal is to field the AM product upon the successful completion of Design Verification Testing and qualification.



Aircrew Escape System

Methods

- A qualitative analysis of the internal and external factors regarding the competitive advantage, performance of the AM methodologies, and barriers to implementation.
- An exploratory case study analysis to identify the benefits and constraints to the warfighter along with an evaluation to determine a feasible acquisition strategy.



Results & Their Impact

What is the value proposition that additive manufactured parts or systems bring to delivering warfighter capability?

There is a direct correlation to the HES 5808 product quality and performance. A higher quality product will lower the risk of performance degradation, in turn, it increases the likelihood of the aircrew survivability.

What acquisition strategies would apply to the additive manufacturing initiative?

The AM manufacturing of a critical component is considered a major change which will impact the product and assembly identification. Recommend implementing engineering, contract, supply, logistics and configuration management practices in compliance with DFARS 235.006-70, DoDI 5000.93, DoDM 4100.39, DoDI 5010.44, DoDI 5015.02, DoDI 4120.24 and MIL-STD-31000.

What are the barriers to implementation for additive manufacturing based on this case study?

A key barrier is the inability to reduce the logistics footprint. A controlled manufacturing environment is required to produce critical components of the Aircrew Escape System.

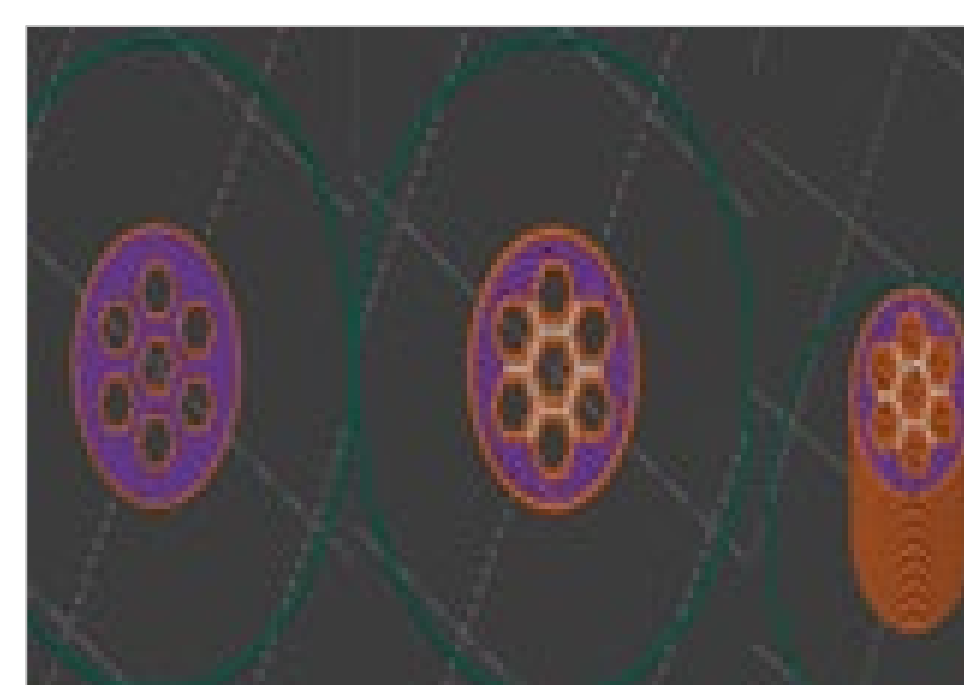


TM: HES 5808 Internal Cracking

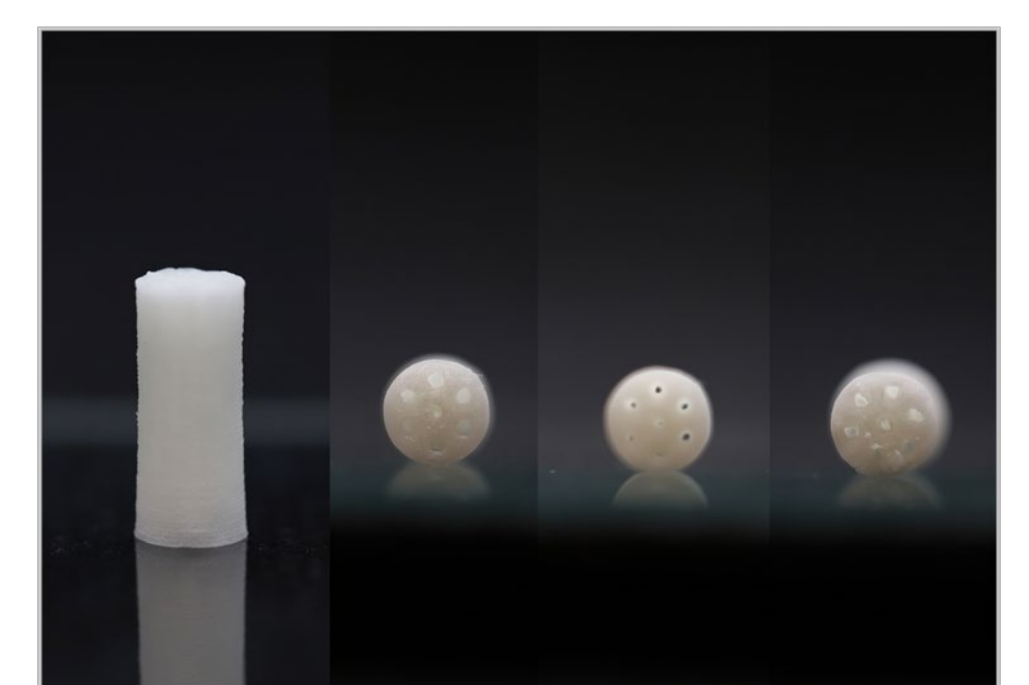
** Circled grain does NOT have internal cracking*



TM: HES 5808 Visible Pits



AM: Slicer Software



AM: Printed Grains