Combat Oil-Based Reservicing Apparatus (COBRA)

F-22 Oil Team / United States Air Force Academy

C1Cs Hanani Doña, Max Haas, Kai Hurst, Alison Peckham, Jaime Snyder, Aaron Staiger, and C2C Xavier Rico

Dr. Ioan Feier / Department of Mechanical Engineering

INTRODUCTION

Mission: Support F-22 operations by decreasing downtime by enabling aircraft oil servicing in austere environments.

Agile Combat Employment: Demands rapid dispersion and sustainment-focused, reducing F-22 downtime and increasing flexibility in resource-constrained ops.

Figure 1: F-22 Oil Servicing

METHODS

- Conducted research with P&W, Lockheed, maintainers, SPO, AFRL, and pilots.
- Developed detailed optimization models in CATIA, SolidWorks, and Excel.
- Constructed prototypes, tested on F-22 Raptor, and iterated to the final design.

OVERALL OBJECTIVE

Problem: The current oil cart is too large to be effectively transported by the F-22, forcing the aircraft to land where the cart is available, reducing its operational range in support of Agile Combat Employment.

Solution: The concept proposed is a portable widget system designed to quickly, reliably, and safely re-service the F119 engine oil of the F-22.

Figures 2 & 3: Legacy system and COBRA

ACCOMPLISHMENTS

- Enabled five successful F-22 engine-on servicing operations
- Validated widget reliability in simulated combat at 44,000 ft and 8.5 Gs
- Demonstrated usability with both maintainers and pilots

FUTURE PLANS

- Patent pending; IP protection underway
- Final design validated
- Expand fielding through operational evaluation
- Scale to 300+ operational units
- Optimize volume and packing efficiency
- Enable storage via material/chemical advancements

CONCLUSION

What we achieved: Validated, operationally ready system

Why it worked: Compact, efficient, and user-friendly design

What's next: Scalable solution positioned for large-scale deployment

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