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Cost and Operational Evaluations of Centralized vs. Distributed Class IX Inventories

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Evaluations of Centralized vs. Distributed USMC Inventories

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Background

- United States Marine Corps seeks to improve its logistics operations for repair parts at the Division level.

- Efficiency is measured by reduced inventory at the Divisional Supply Management Units (SMU) and effectiveness is measured by reduced customer wait time.

- The dilemma is between distributed inventory at the SMUs and concentrated inventory at the Defense Logistics Agency (DLA).

- A secondary consideration is what policy the SMU should use to replenish its inventory
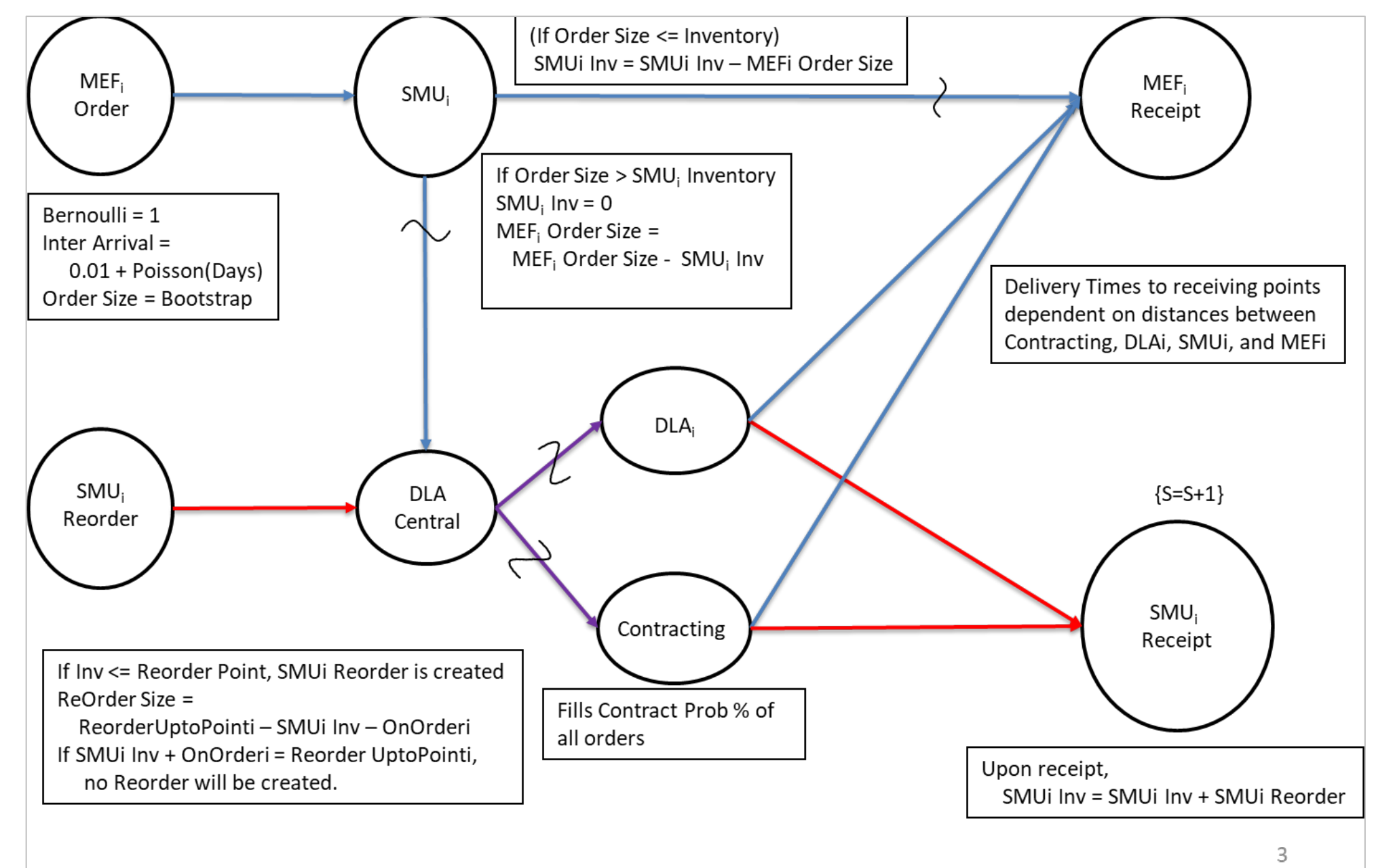
Event graph displaying the supply cycle. Customer units demand items, which are fulfilled by either the SMU or DLA. Eventually the SMU replenishes its inventory
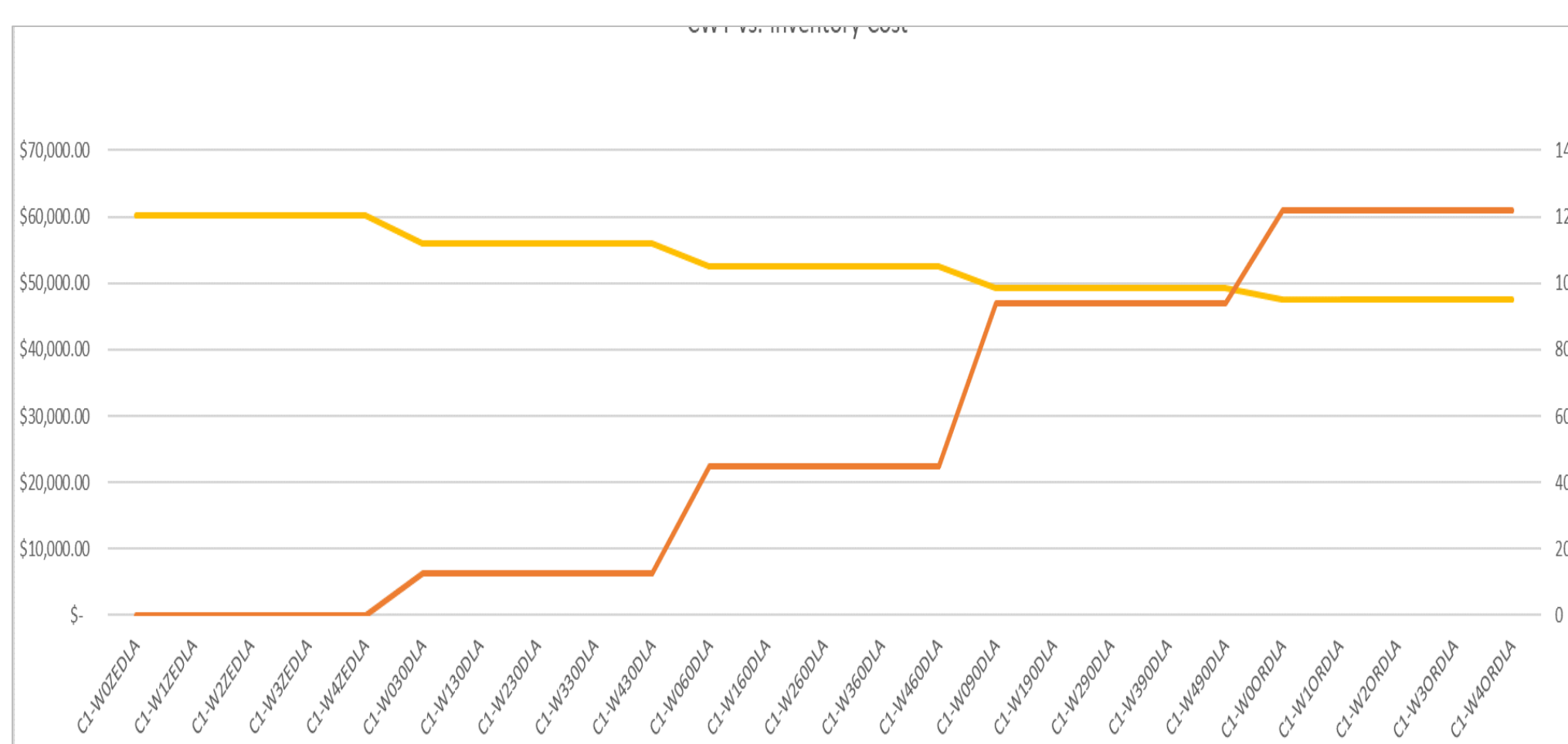

Cost (orange curve, left axis) and CWT (yellow curve) for several policies. A policy is determined by the (RO, ROP) combination. In general there is an inverse relationship between CWT and cost

Simulation Model

- Based on time-phased demand data collected at MEF I, we develop a simulation mimicking the requisition-supply cycle.

- SMU's inventory replenishment dictated by two parameters

  1. RO: inventory level that triggers replenishment

  2. ROP: "up-to-level" of replenishment

- We vary (RO, ROP) to determine SMU effective inventory management policies and the value of DLA involvement.

Results

- Primary MOE: customer wait time (CWT)

- ROP is proxy for inventory cost

- Having DLA manage all inventory significantly decreases the SMU's cost, but the average CWT can be 2-4 times greater than policies than maintain a reasonable SMU inventory

- An ROP of 2 months worth of inventory keeps CWT low without keep an excessive amount in inventory
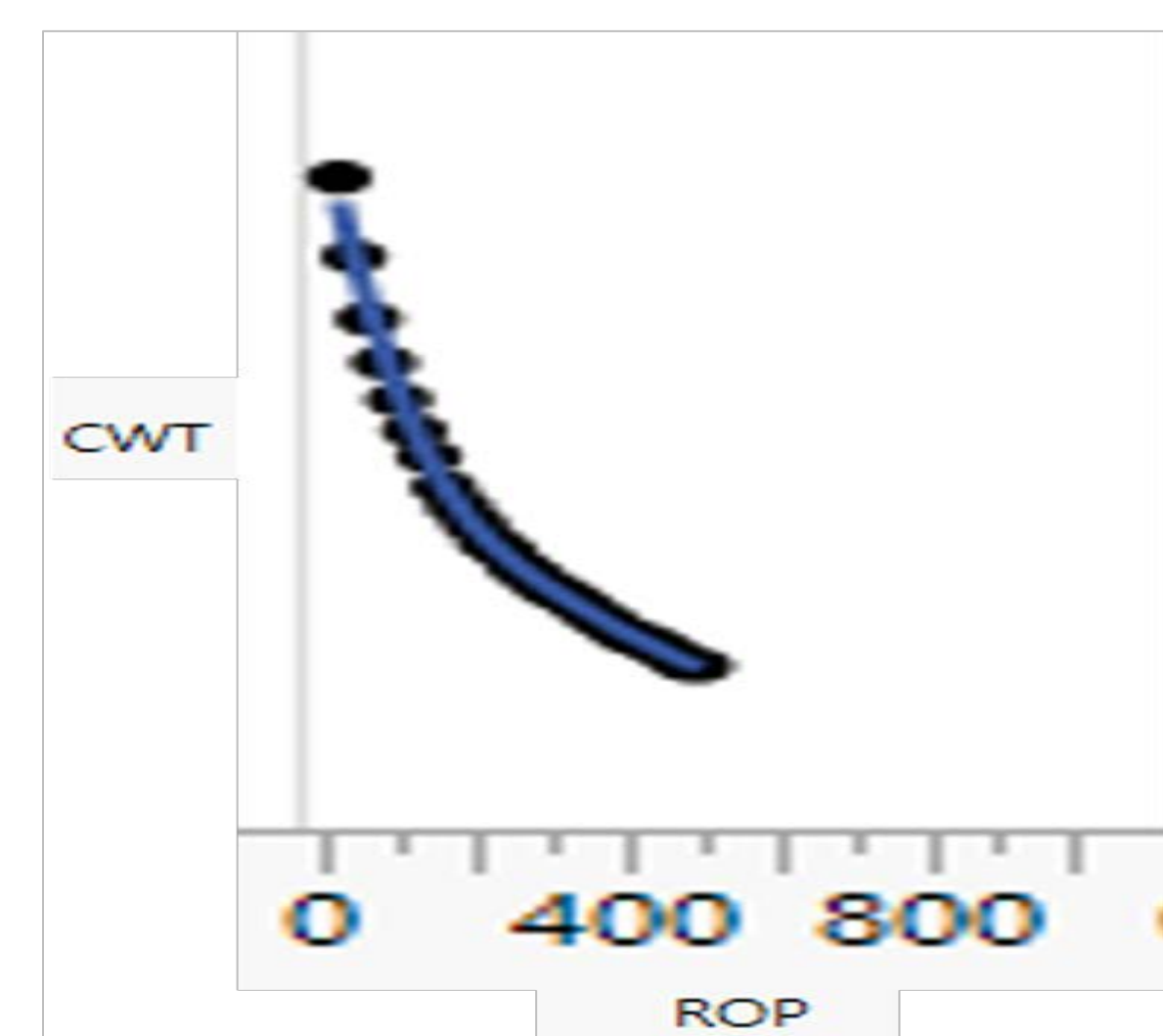
Customer wait time vs. ROP. ROP translates directly to the current SMU inventory level. The higher the SMU inventory, the more quickly the SMU can fulfill orders

Conclusions

- ROP could be reduced, thus saving inventory costs, while maintaining acceptable CWT.

- Set RO to ~20% of ROP

Suggestions for Future Work

- Incorporate transshipment so that demand can be fulfilled from another SMU rather than DLA

- Model DLA in higher fidelity

- Track inventory holding cost more explicitly

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