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Department of Defense
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

**DEVCOM AVMC SRD RAM -
Logistics Engineering Laboratory
December 2025**



LOGISTICS ENGINEERING LABORATORY (LOGLAB)



Go-to place for software engineering supporting Logistics/Supportability

Government sustainment think-tank

- LogLab is a collaboration between logistics and software engineers
 - Influence design for sustainment – design with sustainment in mind
 - Identification of gaps related to logistics and supportability
 - Assessment of sustainment improvements and technologies
 - Provide data accessibility support

Team includes:

- DEVCOM AvMC – Systems Readiness Directorate (SRD) – Reliability, Availability, Maintainability (RAM), Logistics Engineering branch



Logsim – discrete event simulation



What is discrete-event simulation?

- Software engine which keeps track of a system timeline and events occurring along the timeline.
- Method to use computing power to handle complex situations – situations where using equations alone break down and can no longer adequately assess.

History

- Discrete-event simulation was invented in 1946 by physicists trying to understand the behavior of neutrons.
- By the 1970's, discrete-event simulation was widely used by tech giants and government agencies such as IBM and the Naval Air Missile Test Center.
- Discrete-event simulation is not new!

Today

- What's new is simulating Army Aviation operations to analyze, learn, and pinpoint the variables which drive sustainment – both availability and affordability.
- What's new is creating a feedback loop showing how aircraft design decisions made today will impact sustainment 10-20-50 years down the road when these new aircraft are flying and being supported.



Combining discrete-event simulation and software engineering is a trusted and efficient method to analyze extremely complex problems



Logsim acquisition analysis



LOGSIM O&S COST MODELING

1.0 Unit-Level Manpower (AMCOS)

- Unit-Level Maintainers based on direct MMH and MOS

2.0 Unit Operations (OSMIS)

- Fuel costs based on flight hours flown using burn rates and/or cost per flight hour

3.0 Maintenance (ASAP, OSMIS, FEDLOG)

- Depot-Level Repairables, Spares, Consumables used based on reliability, flight hours, and missions flown
- Depot Maintenance based on depot MMH

4.0 Sustaining Support (FMSWEB)

- Support and Test Equipment used

5.0 Continuing System Improvements

- Hardware/Software Upgrades frequencies, durations, costs

RAM-C DOCUMENTATION

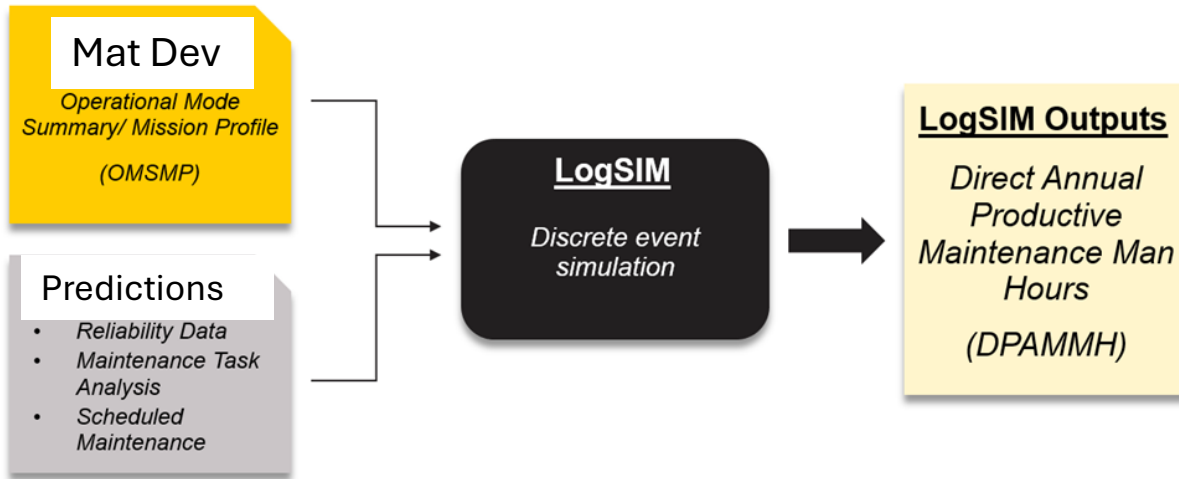
R&M Requirements and Feasibility

| FLRAA Draft CDD v22 | | | | Feasibility Results | |
|---------------------|--|--------------|-----------|---------------------|--------------|
| Parameter | Units | Threshold | Objective | Predecessor Systems | M&S Analysis |
| | | | | | |
| T2 | Materiel Availability (A _M) | % | | | |
| T2 | Operational Availability (A _O) | % | | | |
| T2 | Achieved Availability (A _A) | % | | | |
| T3 | Mean Time Between System Abort (MTBSA) | Flight Hours | | | |
| T2 | Limited Maintenance Operating Period (LMOP) | Flight Hours | | | |
| | | Days | | | |
| T3 | Field Level Maintenance Ratio (MR _{Field}) | MMH /FH | | | |
| T3 | Sustainment Level Maintenance Ratio (MR _{Sustainment}) | MMH /FH | | | |
| T3 | O&S Costs | \$K | | | |
| T3 | Cost Per Flight Hour (CPFH) | \$ | | | |

LogSIM analysis has been included in major acquisition documentation, such as; RAM-C, LCSP, CLA/CDA, Etc.



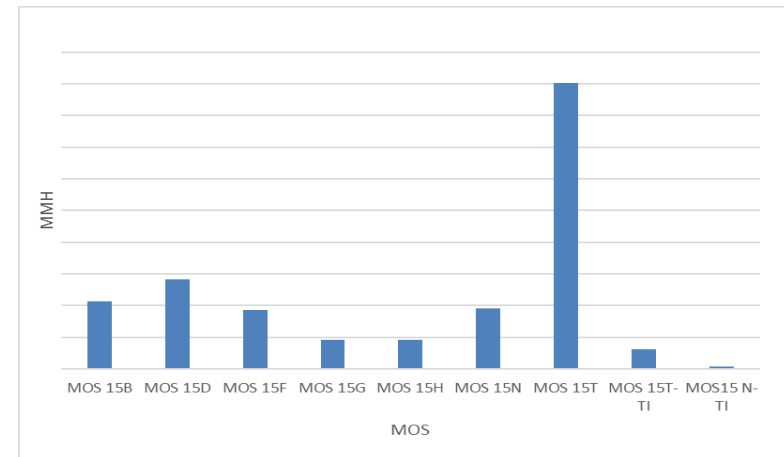
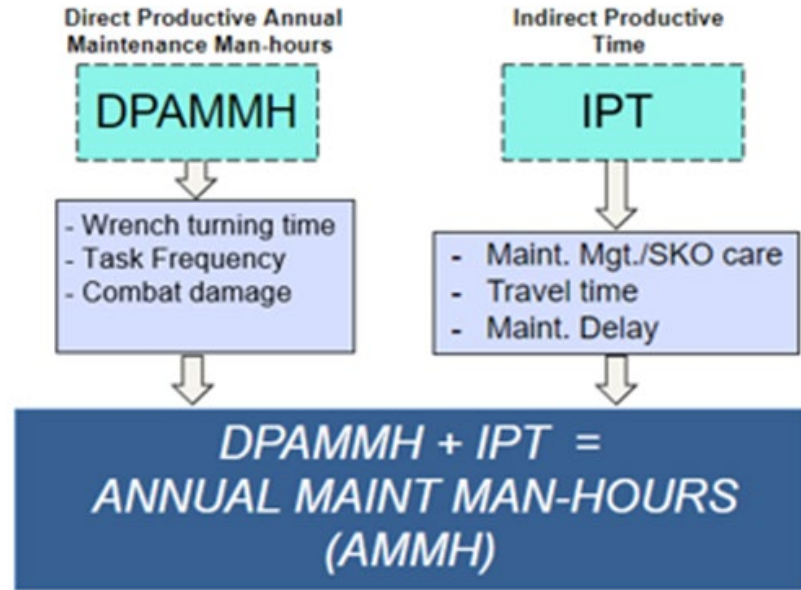
Marc documentation



MARC is a Department of the Army program that establishes the manpower criteria or standards used to determine Minimum Mission Essential Wartime Requirements (MMEWR) to perform Combat Support (CS) and Combat Service Support (CSS) functions—both maintenance and non-maintenance—for sustained combat operations.

Historically, MARC studies have been completed by third parties, requiring significant time and financial resources. The LogLab was able to provide an initial MARC assessment, quickly, in order to meet requirements for BOIP feeder information.

MARC Studies AMMH Calculation

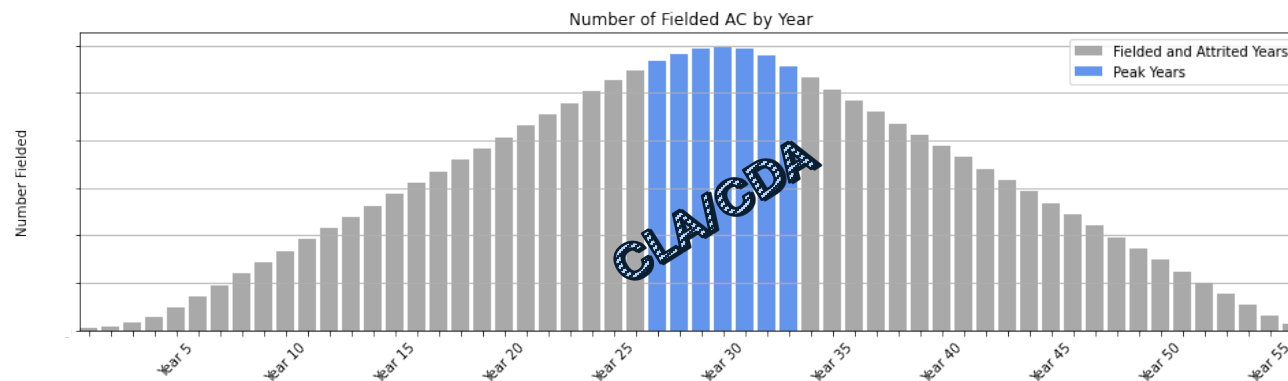




LogSIM Depot-level Model example assumptions



- **1,000+ Aircraft**
 - 25-year lifecycle
 - Reliability and MMH – Vendor Predictions
- **56-year Simulation**
 - Draft fielding schedule
 - Aircraft are added and removed from the simulation at different periods based on when they are initially fielded
 - Peak Years are Years 27-33
- **Each aircraft records 9,500+ FHs**
 - 13,000,000+ total flight hours are generated across the entire fleet
- **Aircraft operate based on pre-defined scenarios derived from OMS/MP**



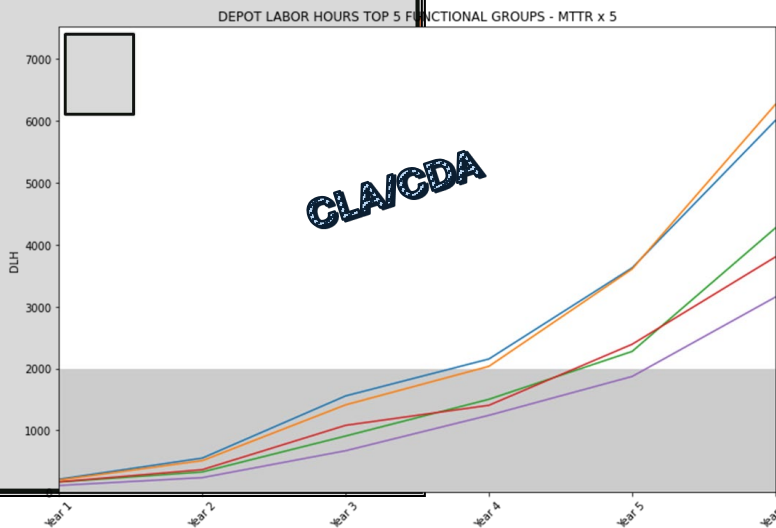


Depot level aviation modeling

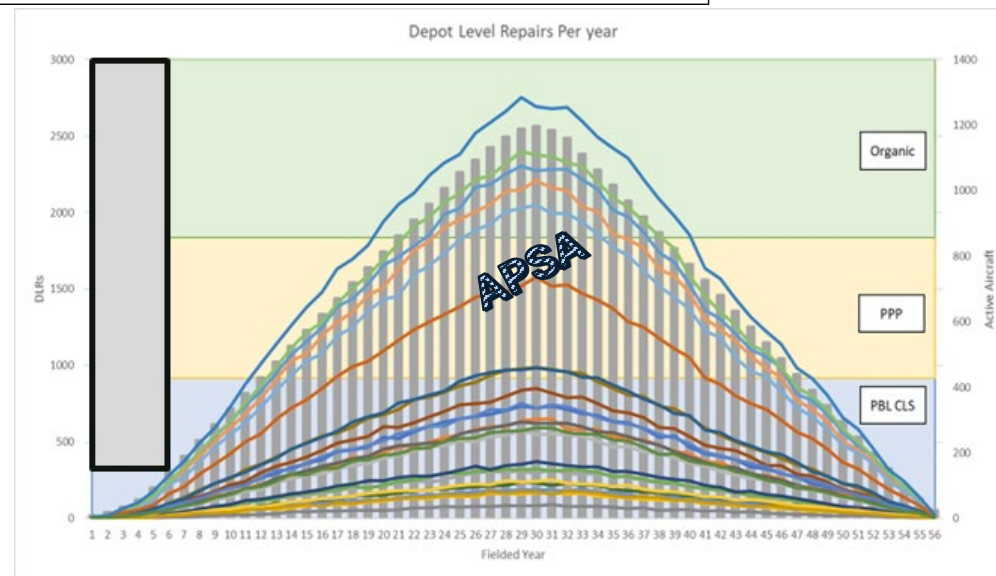
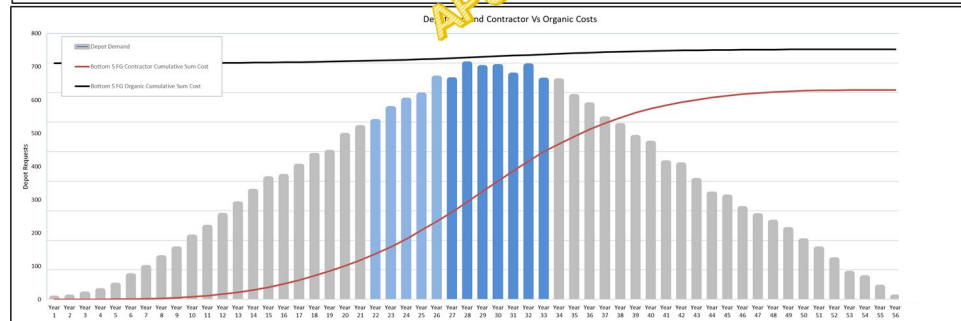
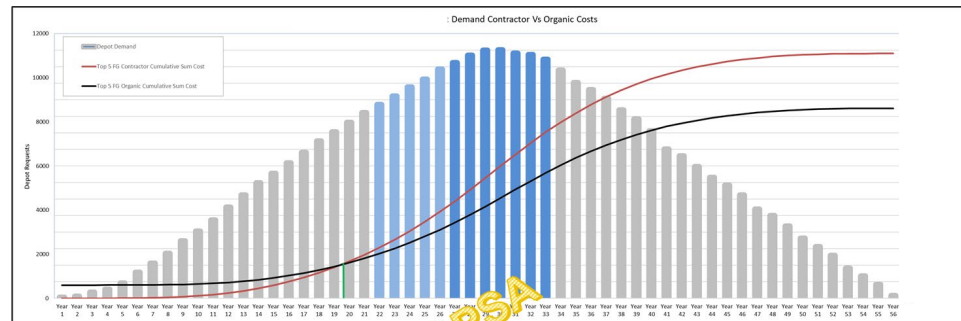


| Functional Group | Total DLR | DLR/PeakYr | Total DLH | DLH/PeakYr |
|------------------------------|--------------|--------------|--------------|--------------|
| V21-Environmental Control | [Greyed out] | [Greyed out] | [Greyed out] | [Greyed out] |
| V23-Communications | | | | |
| V24-Electrical Power | | | | |
| V25-Equipment & Furnishings | | | | |
| V26-Fire Protection | | | | |
| V27-Flight Controls | | | | |
| V28-Fuel System | | | | |
| V29-Hydraulic System | | | | |
| V30-Ice & Rain Protection | | | | |
| V31-Ind/Rec Systems | | | | |
| V32-Landing Gear | | | | |
| V33-Lighting System | | | | |
| V34-Navigation | | | | |
| V45-Health Awareness System | | | | |
| V46-Integrated Display | | | | |
| V49-Airborne Auxiliary Power | | | | |
| V52-Doors | | | | |
| V53-Fuselage | | | | |
| V54-Nacelle | | | | |
| V55-Empennage | | | | |
| V56-Transparencies | | | | |
| V57-Wing | | | | |
| V62-Rotor System | | | | |
| V63-Drive System | | | | |
| V71-Power Plant | | | | |
| V72-Engine | | | | |
| V73-Engine Fuel & Control | | | | |
| V77-Engine Indicating | | | | |
| V78-Engine Exhaust | | | | |
| V91-Aircraft Wiring | | | | |
| V99-Electronic Warfare | | | | |
| Total | | | | |

CLA/CDA



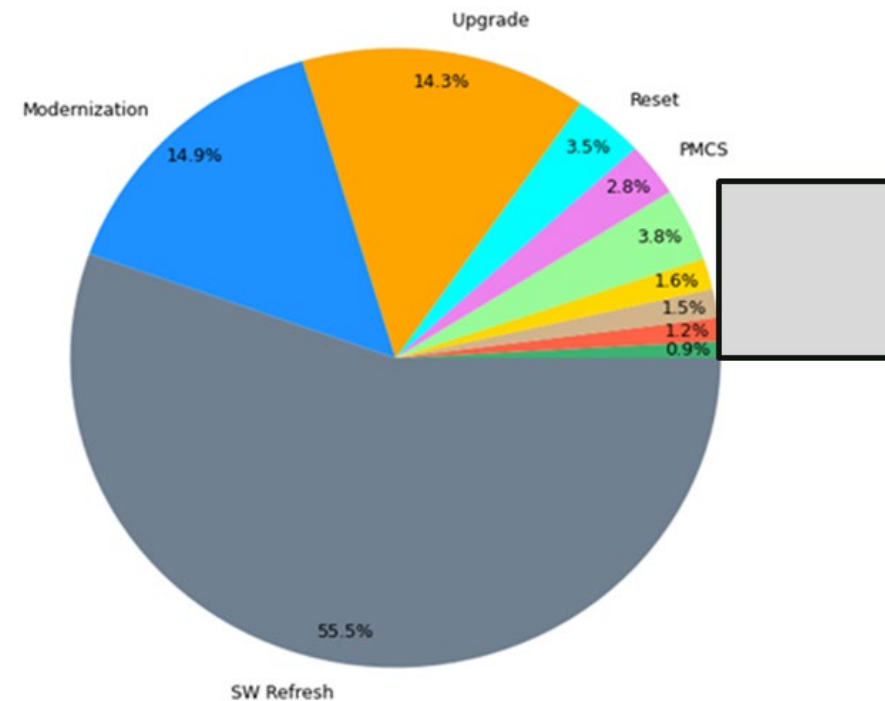
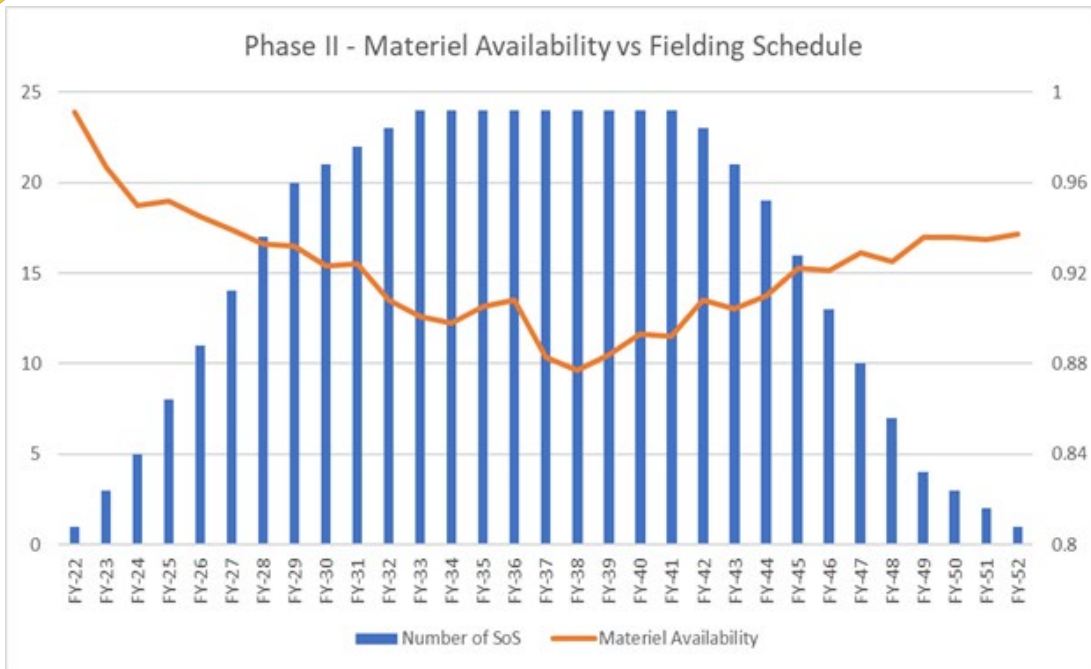
CLA/CDA



Depot Level modeling has been utilized by multiple customers: Informing CLA/CDA and APSA activities.



Availability modeling



- The LogSIM tool provides estimates for Key System Attributes (KSAs) such as A_O and A_M
- The tool can also be used to inform decisions against these metrics
 - For Example: What is the impact to A_O and A_M if the fielding strategy changes?
 - **Additional excursions developed** for OPTEMPO increases, Reference Task Force (RTF) changes, Fully Mission Capable Requirements, etc.
- The LogSIM tool can pinpoint downtime and resource drivers to provide the PM with insight and opportunities for system improvement



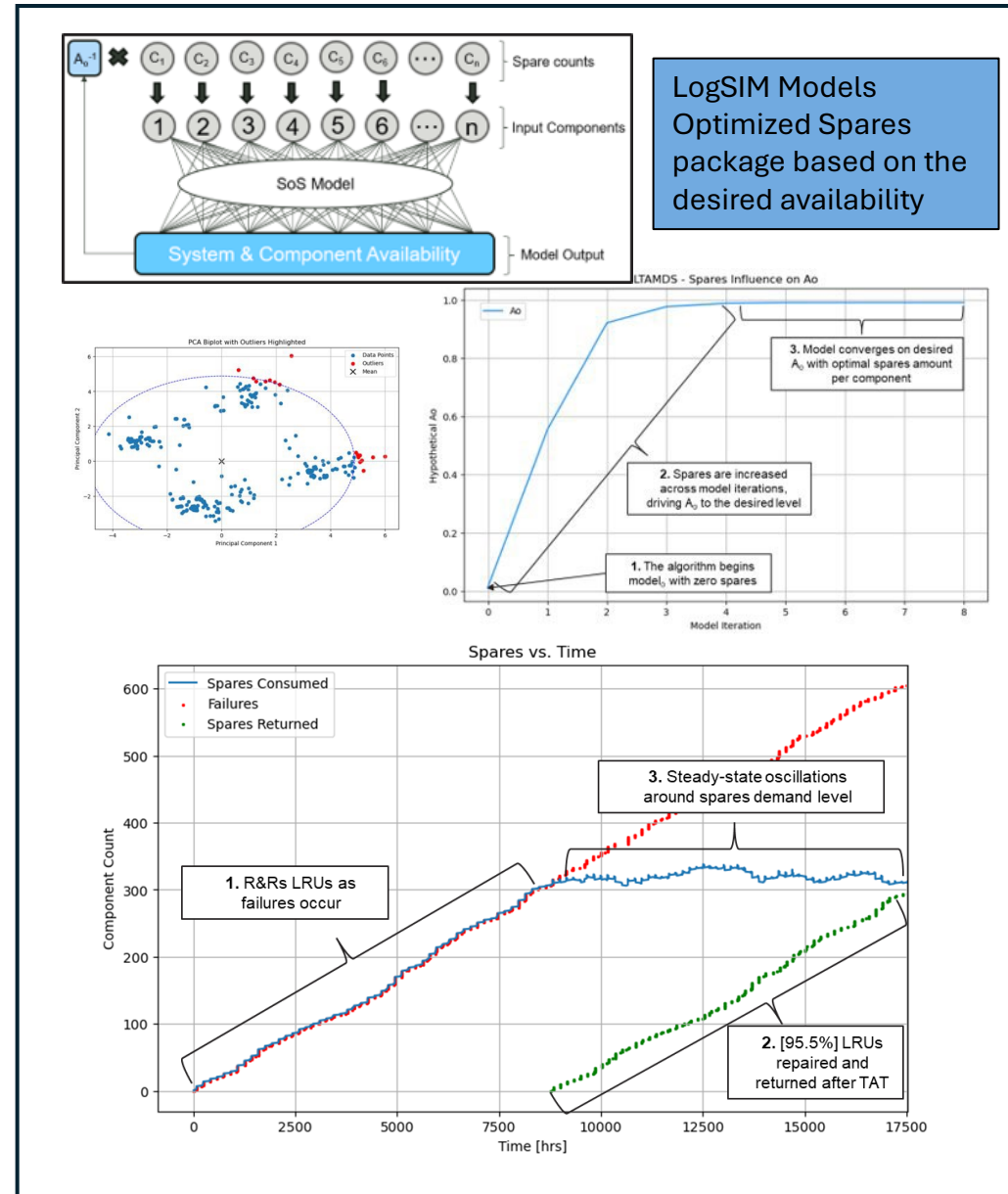
Spares package development



Spares Package Example: Driven by reliability and OPTEMPO

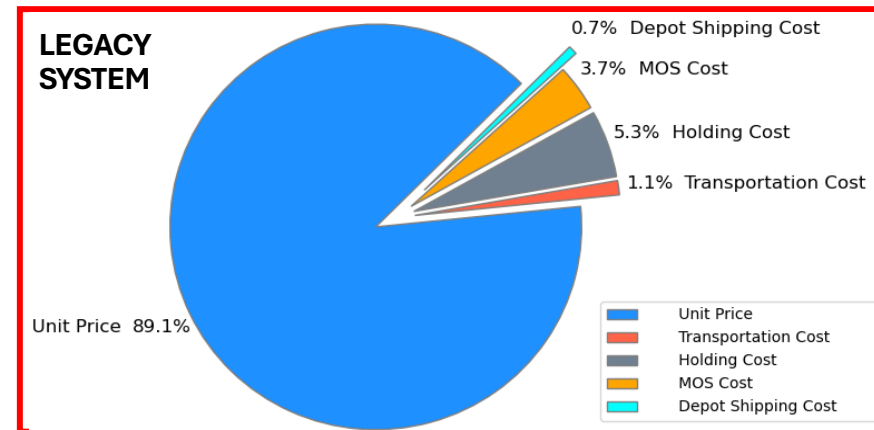
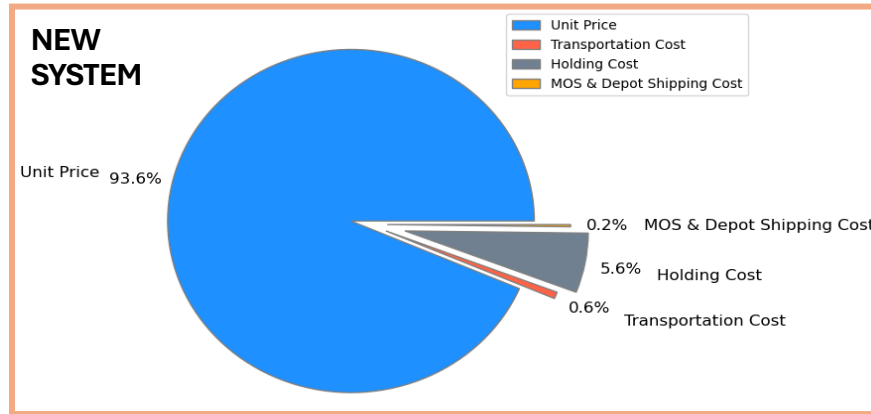
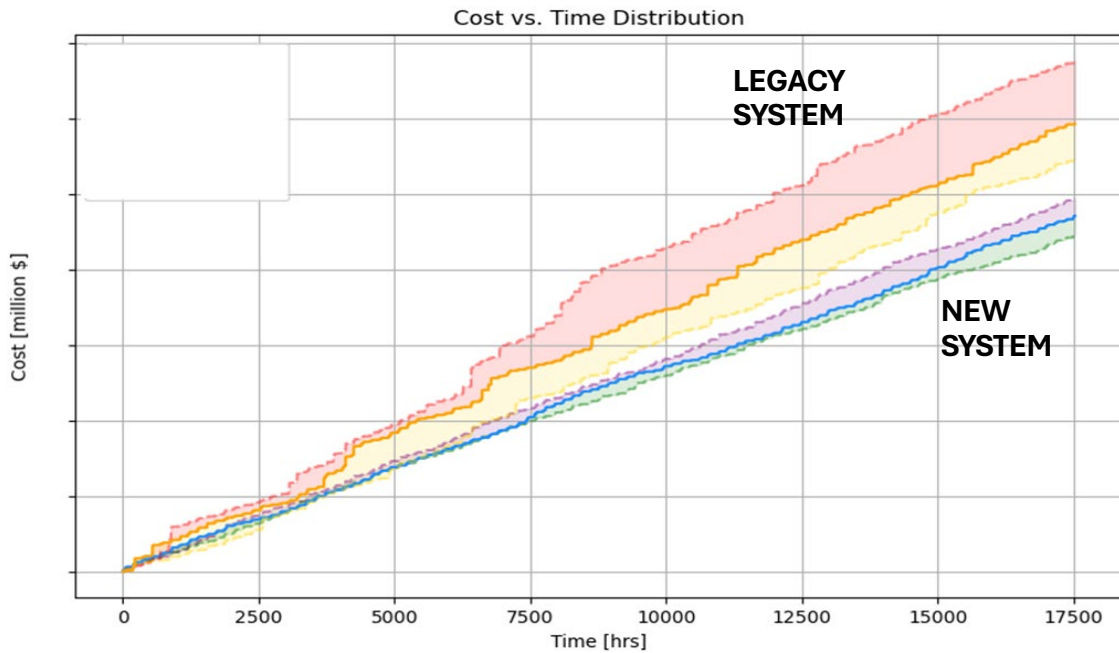
| EOC and IFCN Relay Spares Recommendation | | | | | | |
|--|--|----------------|---------------|---------------------------|-----------------------------|----------------|
| SystemType | Element | Total Failures | Per EOC/Relay | Spares per ORG Shop (PLL) | Spares per DEPOT Shop (ASL) | Initial Spares |
| IFCN Relay (B-Kt) | INVERTER, 1KW | | | | | |
| IFCN Relay (B-Kt) | MISSION SERVER | | | | | |
| IFCN Relay (B-Kt) | SFP TRANSCEIVE, 1000BASE-T | | | | | |
| EOC | PRINTER | | | | | |
| EOC | MISSION SERVER | | | | | |
| EOC | KIV-77 | | | | | |
| IFCN Relay (B-Kt) | SINGLE 2.5" SSD, 2 TB CAPACITY | | | | | |
| EOC | IFF-PDRS | | | | | |
| IFCN Relay (B-Kt) | MONITOR, AVTECH RA35 | | | | | |
| IFCN Relay (B-Kt) | NATO DEPAC KG-250X | | | | | |
| EOC | SINGLE 2.5" SSD, 2 TB CAPACITY | | | | | |
| IFCN Relay (B-Kt) | TIME SERVER | | | | | |
| EOC | DELL 3280 WORKSTATION | | | | | |
| IFCN Relay (B-Kt) | VIDEO DISPLAY | | | | | |
| EOC | SWITCH CISCO 9300-48 Port | | | | | |
| EOC | ROUTER CISCO 8300 | | | | | |
| EOC | SFP, 1000BASE-T | | | | | |
| EOC | C-TIP | | | | | |
| EOC | ENCODER-DECODER, COMMUNICATIONS EQUIPMENT (DVCU) | | | | | |
| EOC | FZ-40 Laptop | | | | | |
| IFCN Relay (B-Kt) | PACSTAR SWITCH (PS444-02) | | | | | |
| EOC | MEDIA CONVERTER CHASSIS- RED | | | | | |
| IFCN Relay (B-Kt) | TIMING UNIT BROADSHIELD S/W | | | | | |
| IFCN Relay (B-Kt) | PACSTAR SERVER (PS451) | | | | | |
| EOC | TIME SERVER | | | | | |
| EOC | NATO DEPAC KG-250X | | | | | |
| IFCN Relay (B-Kt) | 10/100TX TO 100FX MEDIA CONVERTER | | | | | |
| EOC | 25GBBASE-CU SFP28 Cable 1 meter | | | | | |
| EOC | SWITCH CISCO 9300-24 Port | | | | | |
| IFCN Relay (B-Kt) | PACSTAR ROUTER (PS447-01) | | | | | |
| IFCN Relay (B-Kt) | SMART DC PDU | | | | | |
| IFCN Relay (B-Kt) | ENCRYPTOR (KG-250) | | | | | |
| EOC | 4k Rugged Network Adapter | | | | | |
| EOC | XPHUB-8M | | | | | |
| EOC | PACSTAR Server PS451 | | | | | |
| EOC | FIREWALL | | | | | |
| EOC | MFIF Cable (PWR/DATA to CTIP) | | | | | |
| EOC | BROADSHIELD S/W TIMING UNIT | | | | | |
| EOC | CISCO 10/25GBASE-CSR SFP28 MODULE FOR MMF | | | | | |
| EOC | CABLE ASSY, XPHUB, EXT ETHERNET, 8.0 FT | | | | | |
| EOC | LIGHTNING PROTECTION FILTER | | | | | |
| EOC | PDRS MOUNTING BASE | | | | | |
| EOC | HAD KIT, RAPTOR, USB ADAPTER, MONO | | | | | |
| EOC | GPS Antenna | | | | | |
| EOC | KVM | | | | | |
| EOC | RACAL RAPTOR HEADSET | | | | | |
| EOC | ENCRYPTOR (KG-250) | | | | | |
| EOC | 10/100TX TO 100FX MEDIA CONVERTER | | | | | |

LogSIM models have successfully defined spares packages at varying levels of complexity

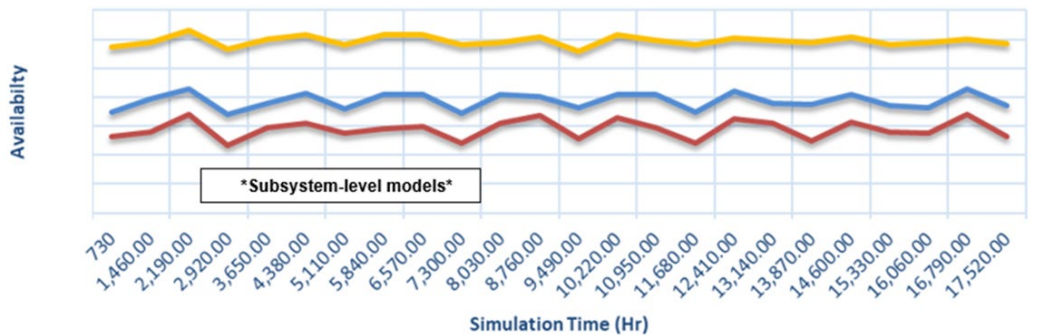




BUSINESS CASE ANALYSIS



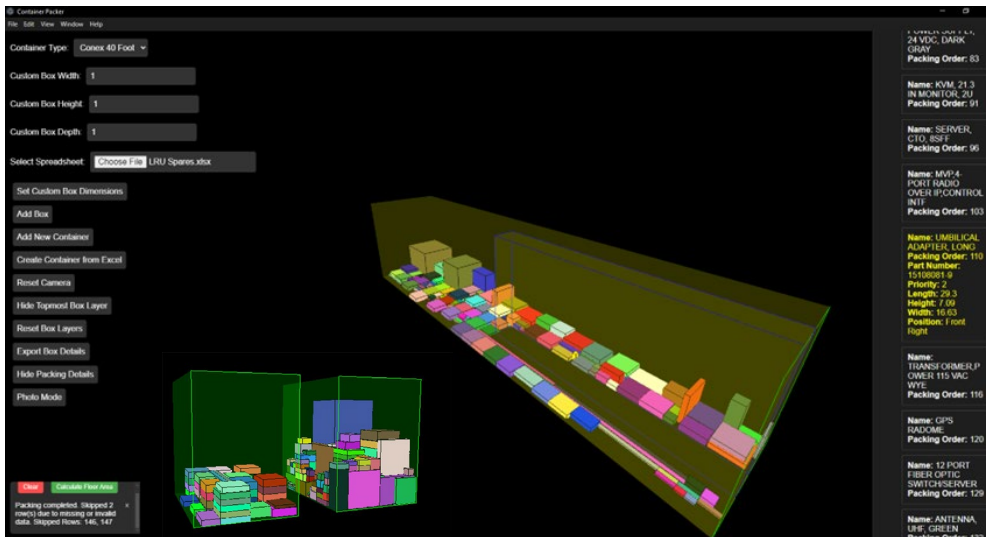
Operational Availability: New vs Legacy System



- LogSIM models were utilized to conduct a Business Case Analysis (BCA)
- Tool can be utilized with varying levels of data and can be customized to meet customer needs



SOFTWARE DEVELOPMENT CAPABILITIES



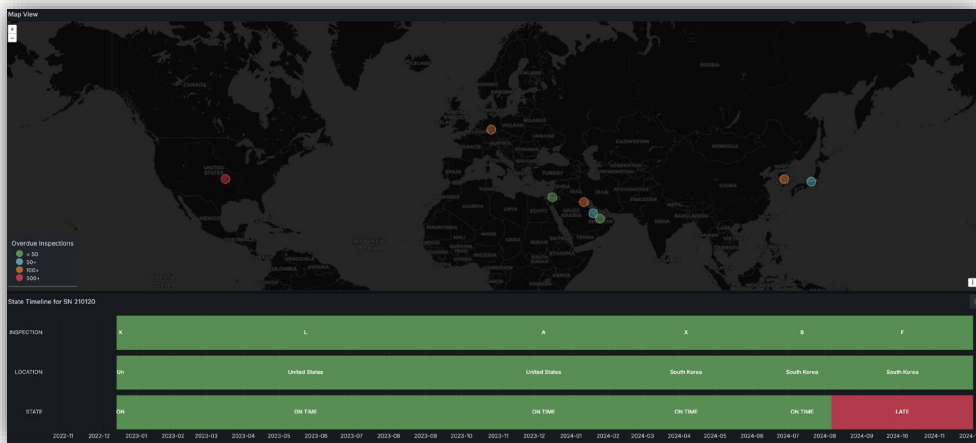
The LogLab provides software development support for unique tools:

- **Packing Optimization Tool**

- Optimizes the organization and packaging of containers based on the list of materials and their priority
- Tool developed iteratively with regular feedback from PM

- **Munitions History Program (MHP) Tools**

- The LogLab has developed a tool that reads MHP data and calculates inspection dates based on requirements
- Tool provides a dashboard for visualizing lot numbers and whether they are meeting inspection requirements
- Provides timeline of serial number inspections/issues.





LOGISTICS ENGINEERING MODELING - CUSTOMERS



- **FLRAA** (60M+47F and V-280)
 - A_O , O&S costs, CARD (O&S), MDO, MR, spares facilities sizing/storage
 - A_M , life cycle costs, depot costs/loading, data rights costs and triggers, source selection strategies
 - Acquisition documents:
 - RAM-C, LCSP, PSAR, BCA, CRLCMP, CLA/CDA, APSA
- **ITE** (T901)
 - A_O , O&S costs, MR, CDRL assessments
 - A_M , Depot-level model
- **Enduring Fleet** (AH-64E, UH-60M, CH-47F, V-22)
 - Individual baselines and mixed aircraft models
 - CAB, Transitional, MUMT
 - Overhauled part analysis
- **Navy UJTS** (64E+ITE, 58D)
 - A_O , A_M , MR, O&S costs, MFOP
 - Acquisition documents:
 - RAM-C, LCSP, BCA, CLA/CDA, APSA
- **AIAMD, MRC, SHIELD, STARE, FMS Customers** (System of System Missiles)
 - A_O , A_M , O&S costs, RTF Structure

