PSA, LORA, and COMPASS

Overview and Discussion

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Unclassified

Outline

- ✓ **PSA, LORA, & COMPASS**
  - Overview
  - Conducting a LORA
  - Concepts and Processes
- ✓ **Using COMPASS**
  - Developing a Model
- ✓ **COMPASS 7.3**
  - Work done since 7.2.2
  - Future Efforts
- ✓ **Lessons Learned**

PSA, LORA, & COMPASS

Process and Tool

LORA Overview

- ✓ **Level of Repair Analysis (LORA)**
  - Analytical Methodology used to establish the maintenance policy at which an item will be replaced, repaired, or discarded
  - Determines cost effective maintenance concept of a system
  - Recommendations based upon economic and non-economic factors

LORA Overview

- ✓ **Supports development of maintenance policy**

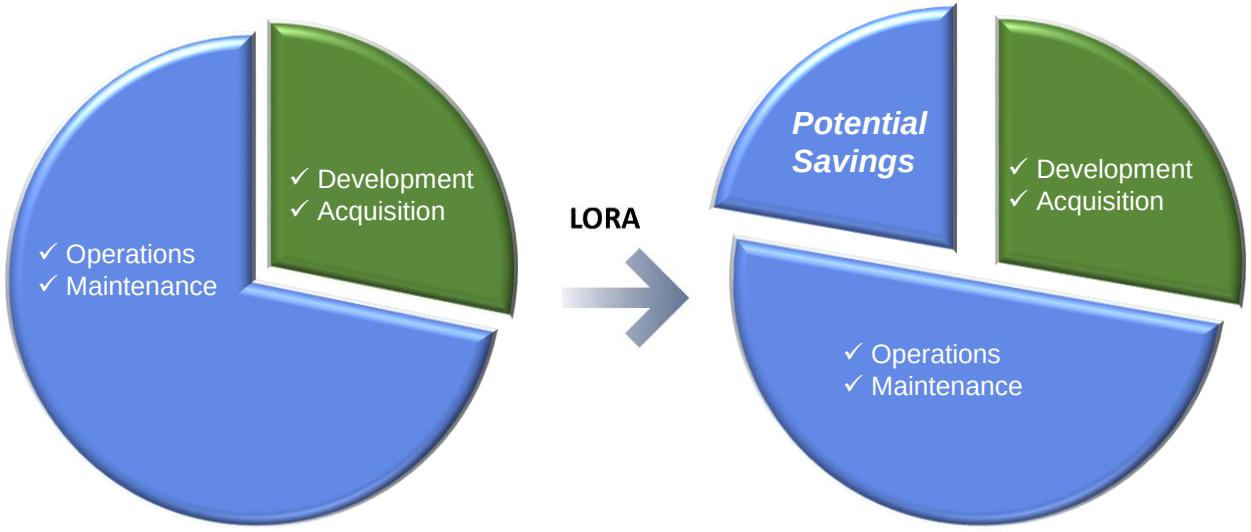
- ✓ **Utilizes Multiple Data Sources**
  - LPD
  - FMECA/FTA
  - MTA

- ✓ **Results**
  - Optimized balance between Operational Availability and Maintenance Cost
  - Drives the Product Support Strategy and Product Support Package

LORA continually influences and supports decisions.

Why Conduct a LORA

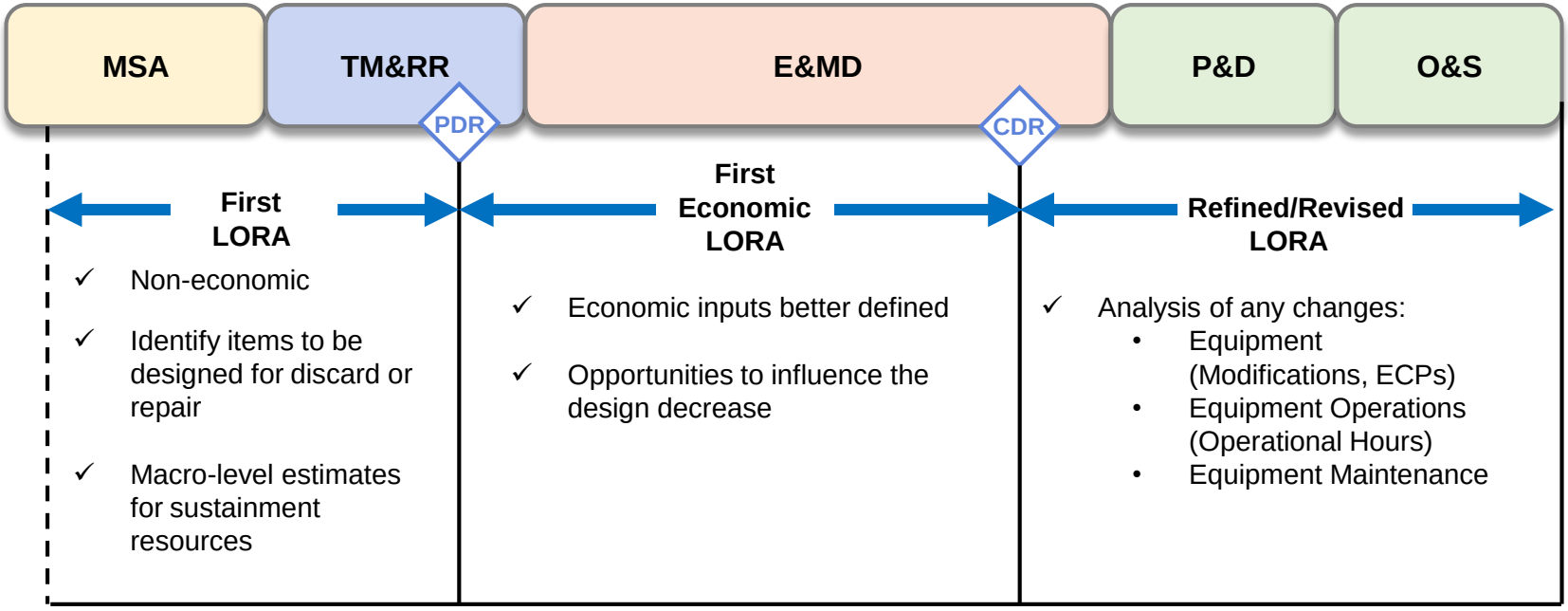
- ✓Operations and Maintenance typically accounts for most of Total Ownership Cost (TOC)
- ✓LORA optimizes life cycle logistics support cost
  - Logistics Footprint
  - Design Influence and Optimization
- ✓Savings from a properly conducted LORA can be in the millions of dollars



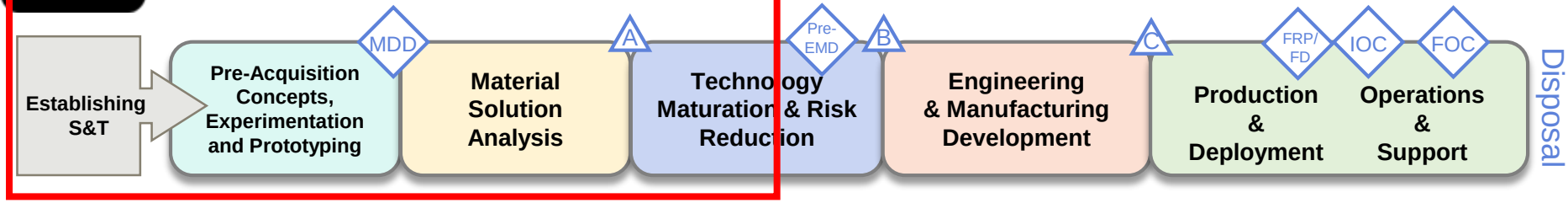
Frequency of a LORA

"Starting the LORA process early in a system's development, and continuous evaluation throughout its life cycle, can ensure a LORA influences the systems' design and the maintenance planning… After the system has been fielded, follow-on analyses should be scheduled that include the use of field feedback data. The extent and detail of LORA should be tailored to the life cycle phase of the program."

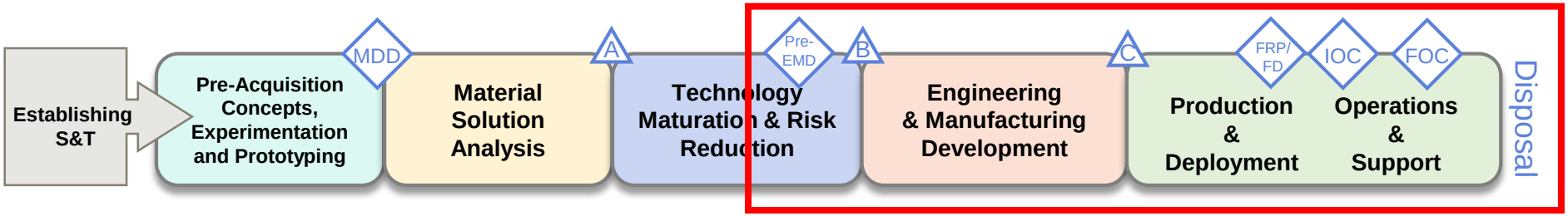
– Product Support Analysis, MIL-HDBK-502A



Objectives are Phase Driven

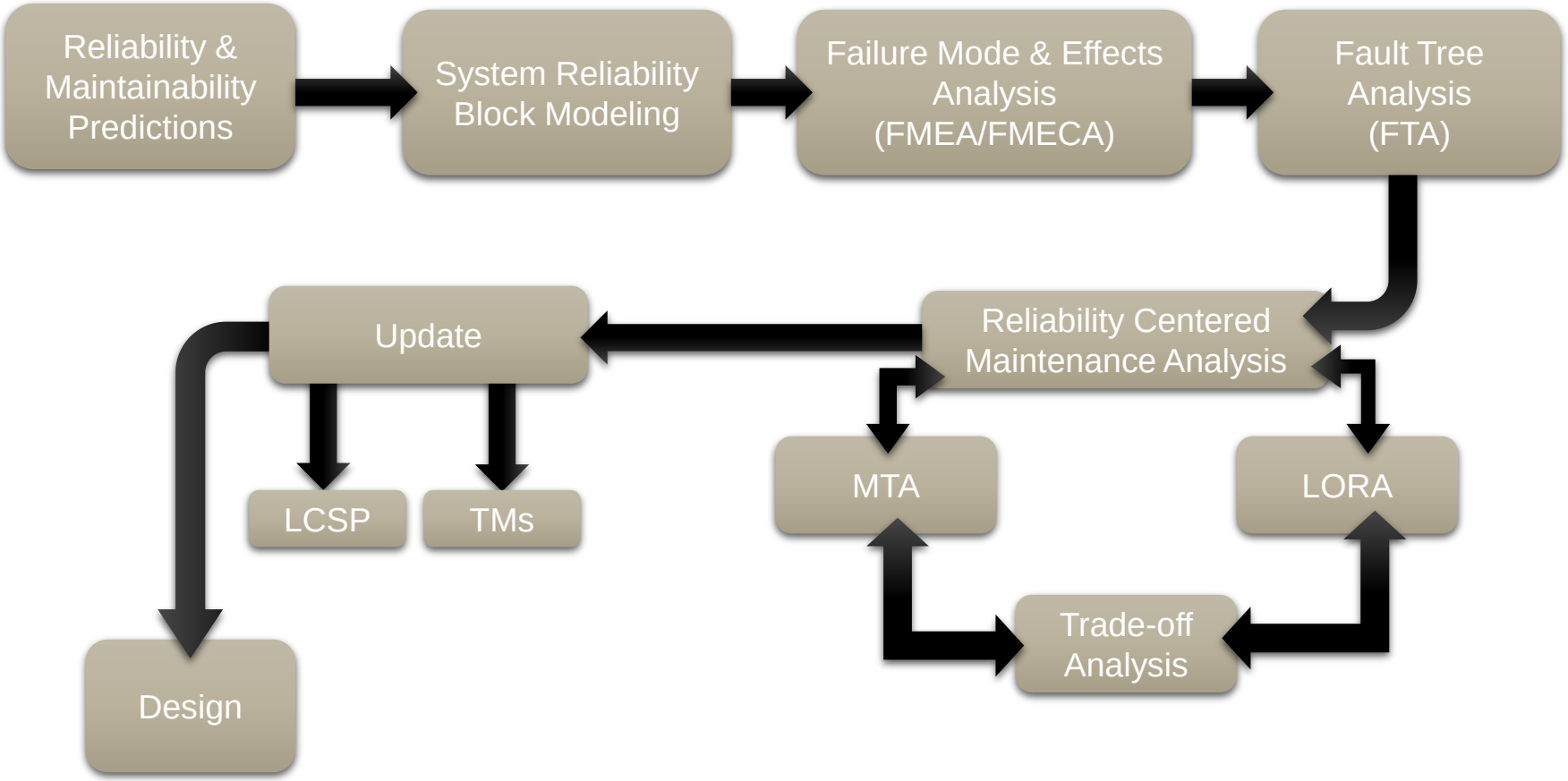


- ✓ During design phases, LORA shows consequences of various maintenance configurations by evaluating the non-economic factors and the high-level cost of logistics support for each alternative
- ✓ LORA measures the cost of failure frequency and failure duration (downtime), and thus influences the design for more cost-effective alternatives
- ✓ Potential problems with operational availability, life cycle maintenance costs, etc., are identified and avoided



- ✓ After design is approved, LORA minimizes the requirement for spares and support resources
- ✓ The approved maintenance plan *anticipates* future equipment repair workloads, and ensures the availability of proper parts, trained technicians, support equipment, tools, and facilities
- ✓ A properly constructed and funded maintenance structure minimizes downtime durations affordably

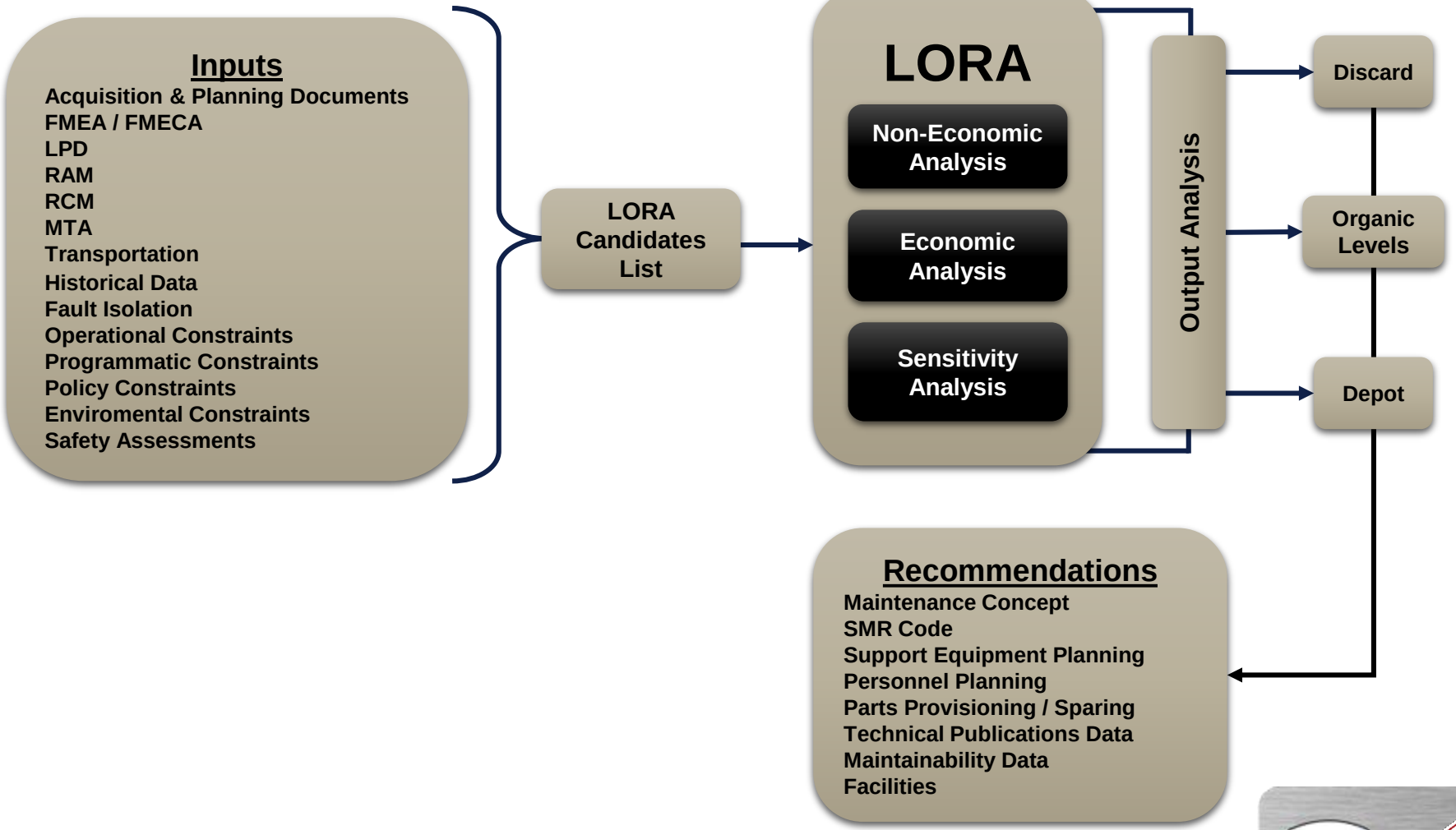
PSA and LORA



Adapted from SAE GEIA-STD-0007-B

LORA is a part of ongoing Supportability Analysis activities.

LORA Process



COMPASS and LORA

- ✓ **Requirements**
  - Operation Requirements
- ✓ **Policy**
  - Support Environment

- ✓ **LORA/COMPASS Input**
  - Availability Target
  - Operating Hours
  - Number of Systems
  - Echelons authorized

LORA and FMECA

- ✓ **FMECA**
  - Identification of critical failure modes to mission success

- ✓ **LORA/COMPASS Input:**
  - Failure Mode
    - LRU and SRU
    - MTBF

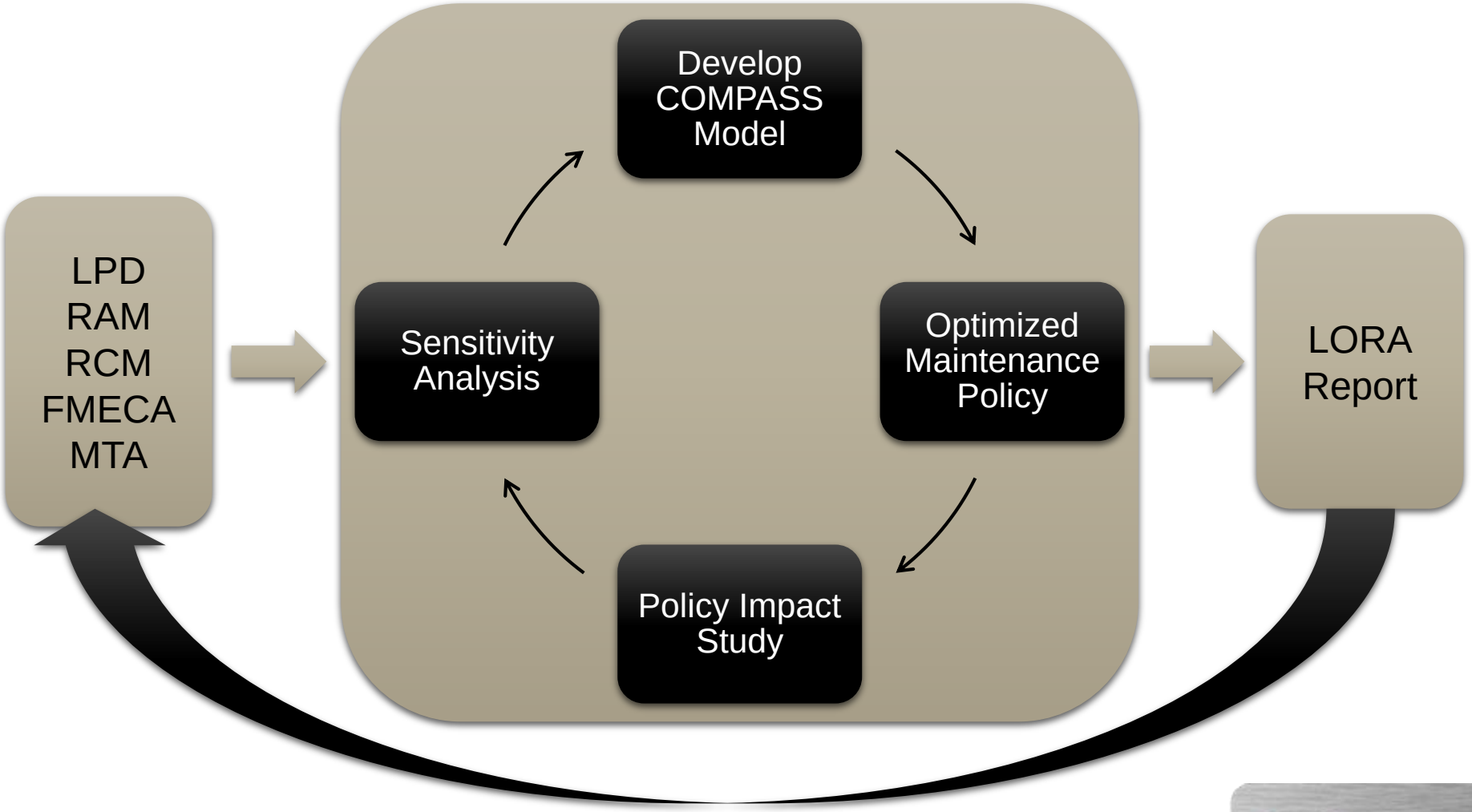
LORA and MTA

- ✓ **MTA**
  - Analysis of task requirements

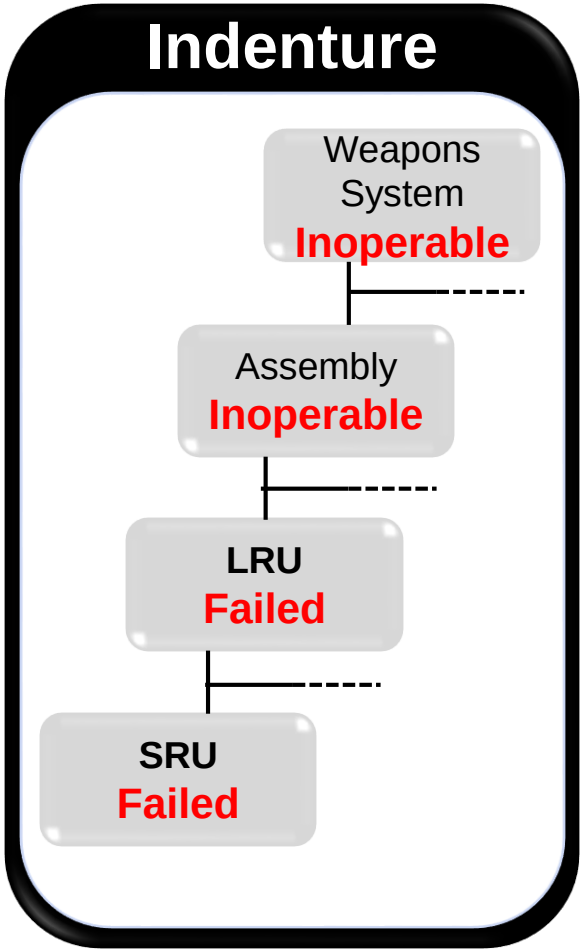
- ✓ **LORA/COMPASS Inputs:**
  - Special Equipment
  - Personnel
  - MTTR

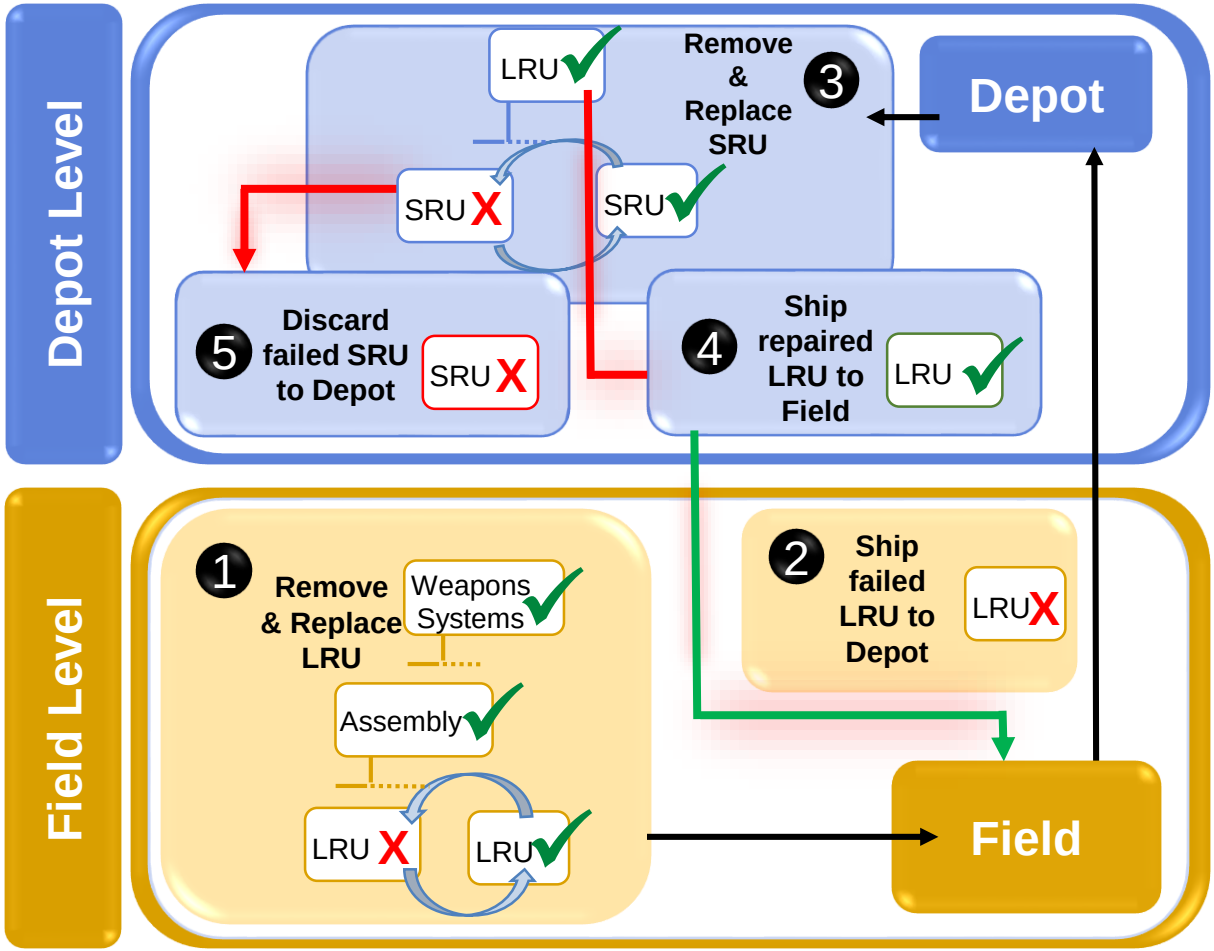
- ✓ **LORA/COMPASS Output**
  - Optimal echelon for replacement action
  - Placement of Special Equipment and Personnel

LORA Process



Failure Modes





Using COMPASS

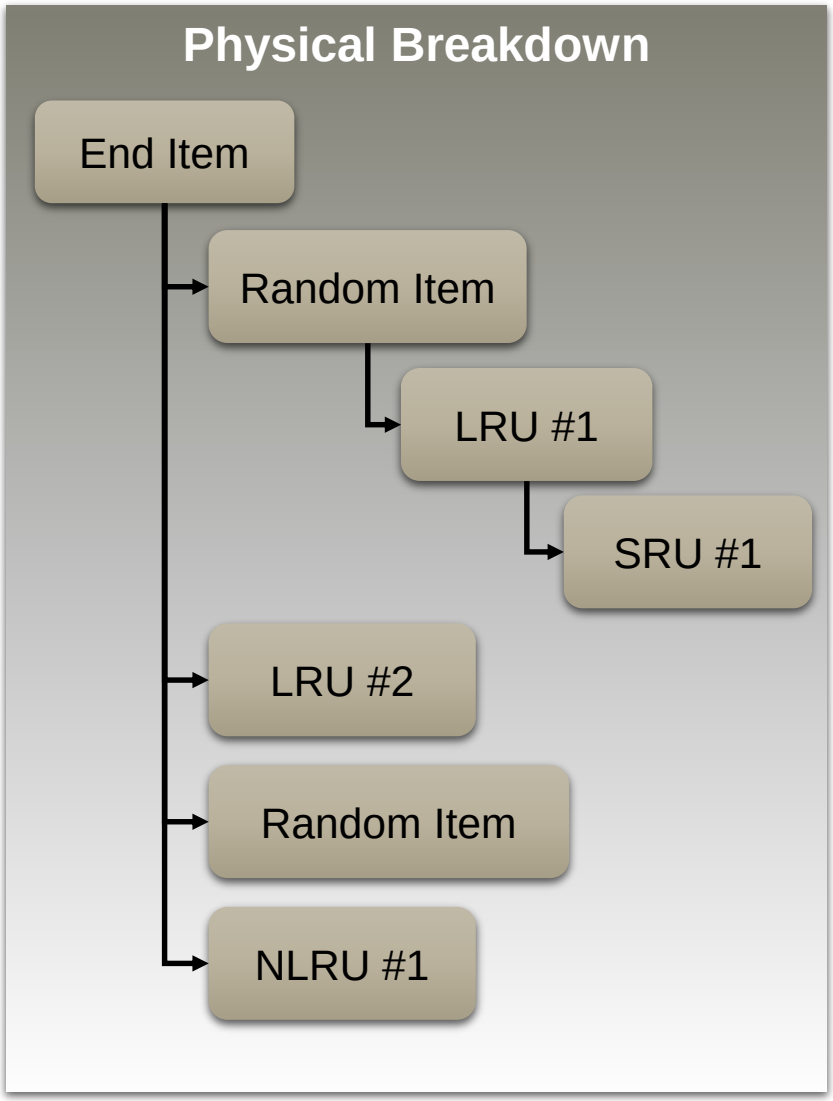
Designing a LORA Model

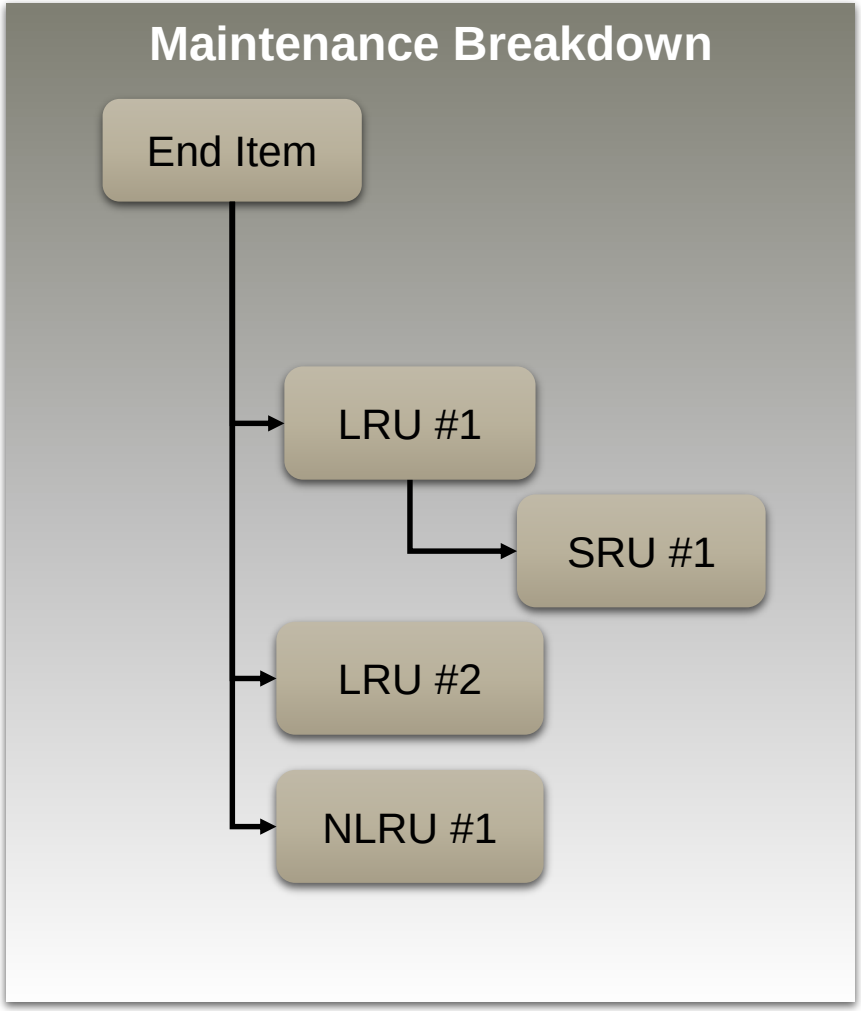
LORA Candidates

- ✓ **Identify LORA candidates**
  - Considerations
    - Availability Impact
    - MTBF
    - Unit Cost
    - MTTR
    - Support Resources Required
      - Equipment
      - Personnel

Considerations will vary between programs.

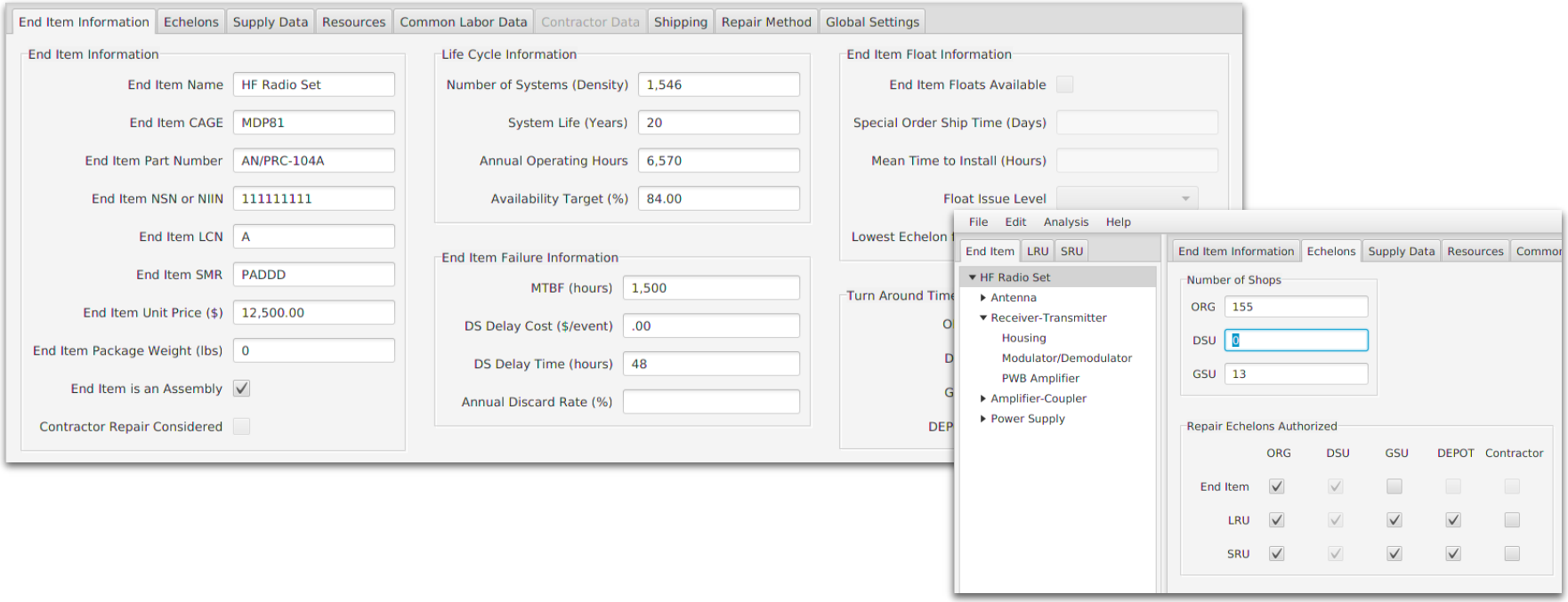
Maintenance Breakdown Concept





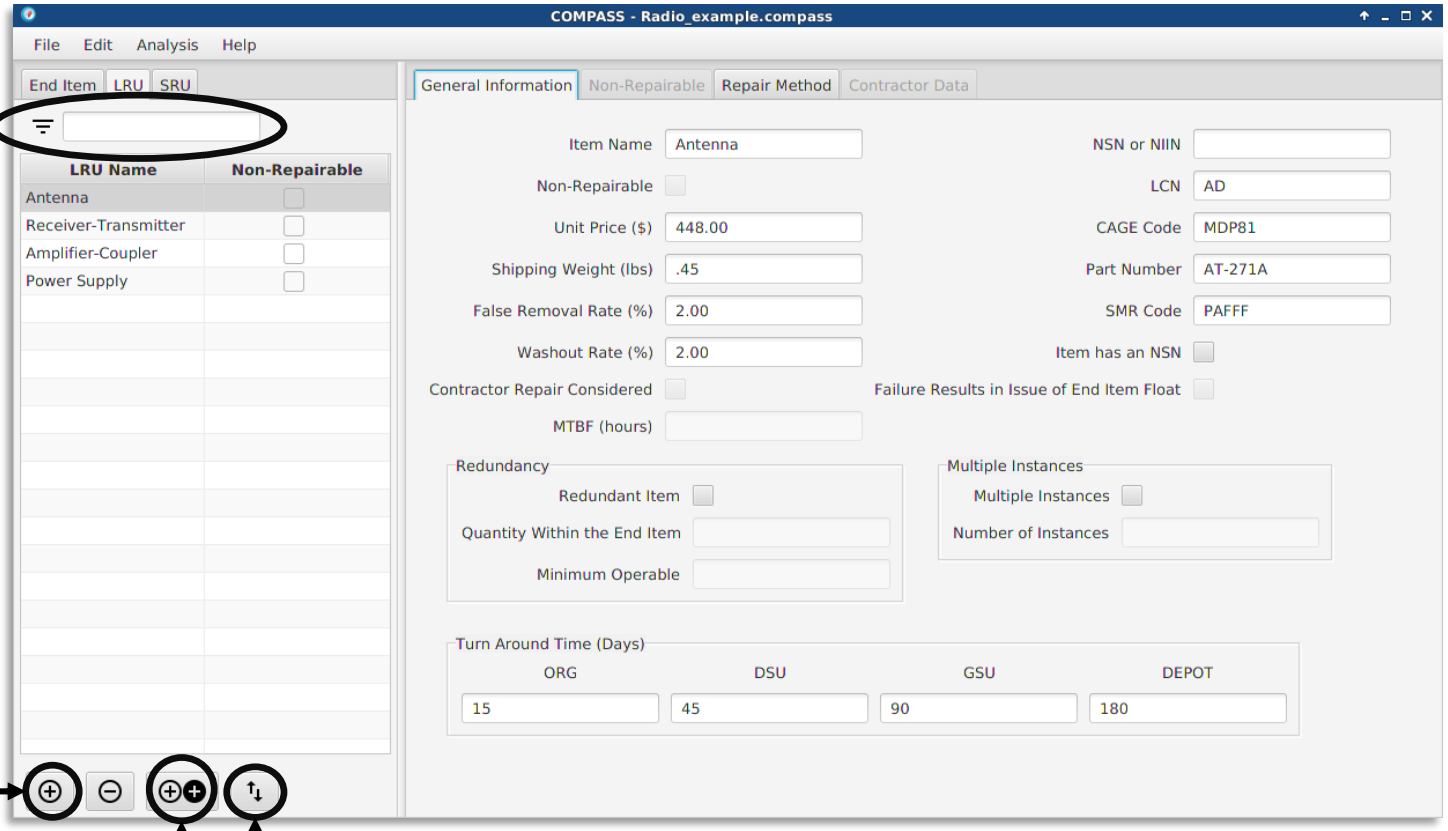
End Item and Support Environment

- ✓ **Populate End Item Physical Item Info**
  - Unit Price, Repair Methods
- ✓ **Populate Support Environment Information**
  - Echelons Info, Supply Data, Labor, Shipping



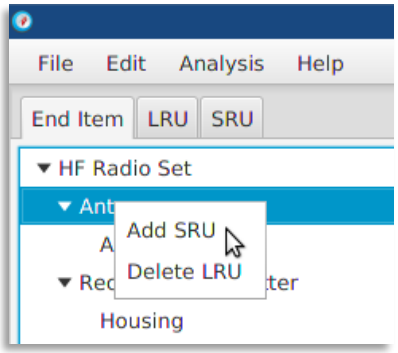
LRU Data Population

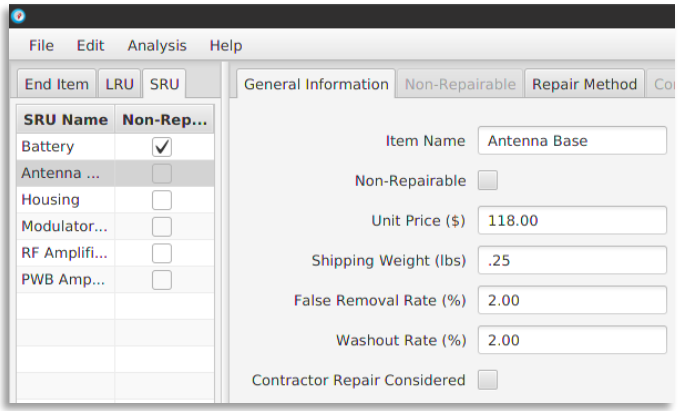
- ✓ **Create LRU**
- ✓ **Populate Item Information**

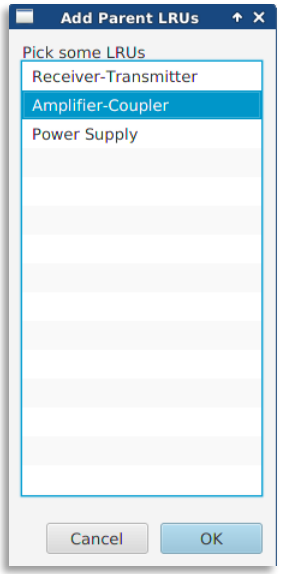


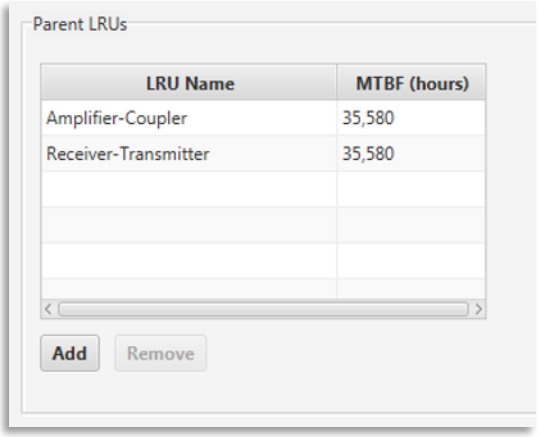
SRU Data Population

- ✓ Create SRU
- ✓ Populate Item Information
- ✓ Define Parent LRU and Associated MTBF



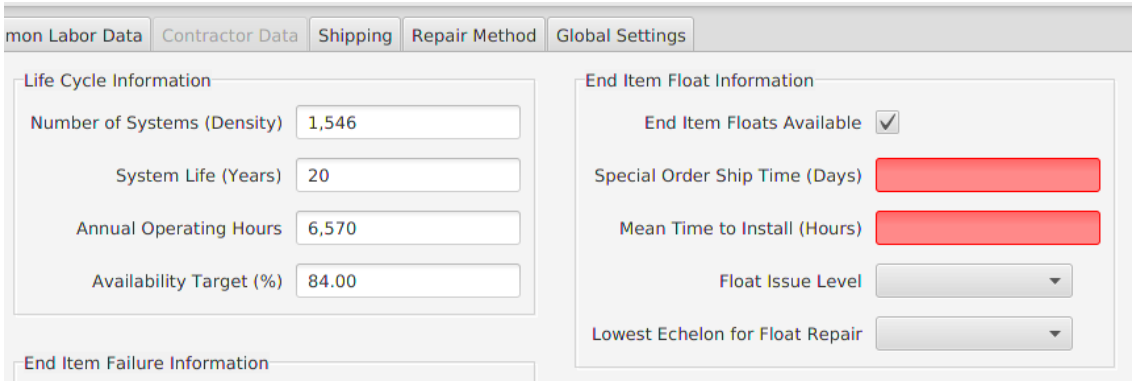


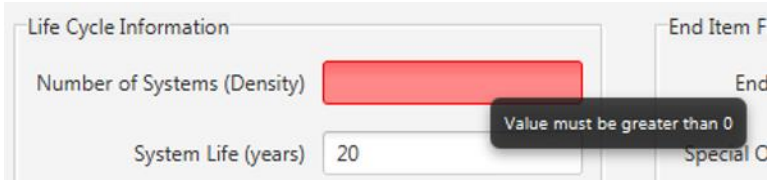


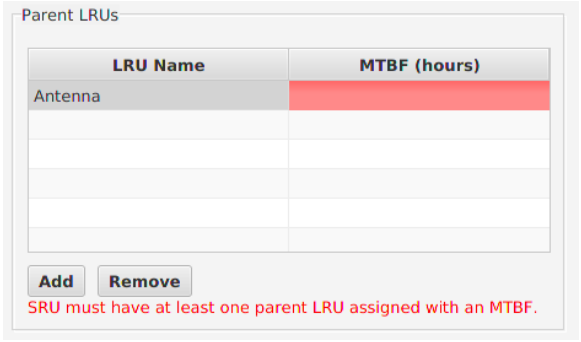


Validating the Model

- ✓ **Validation occurs in the GUI**
- ✓ **Required fields are flagged in red**
  - Hover over a red field will display the reason
  - Red text describes issues

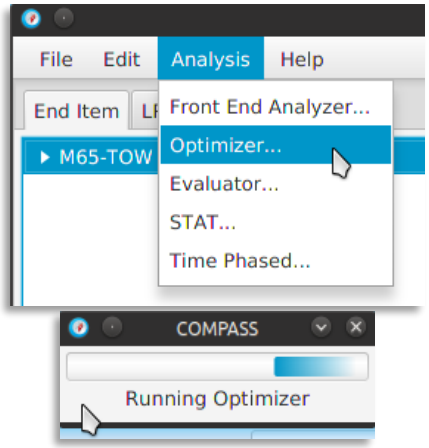


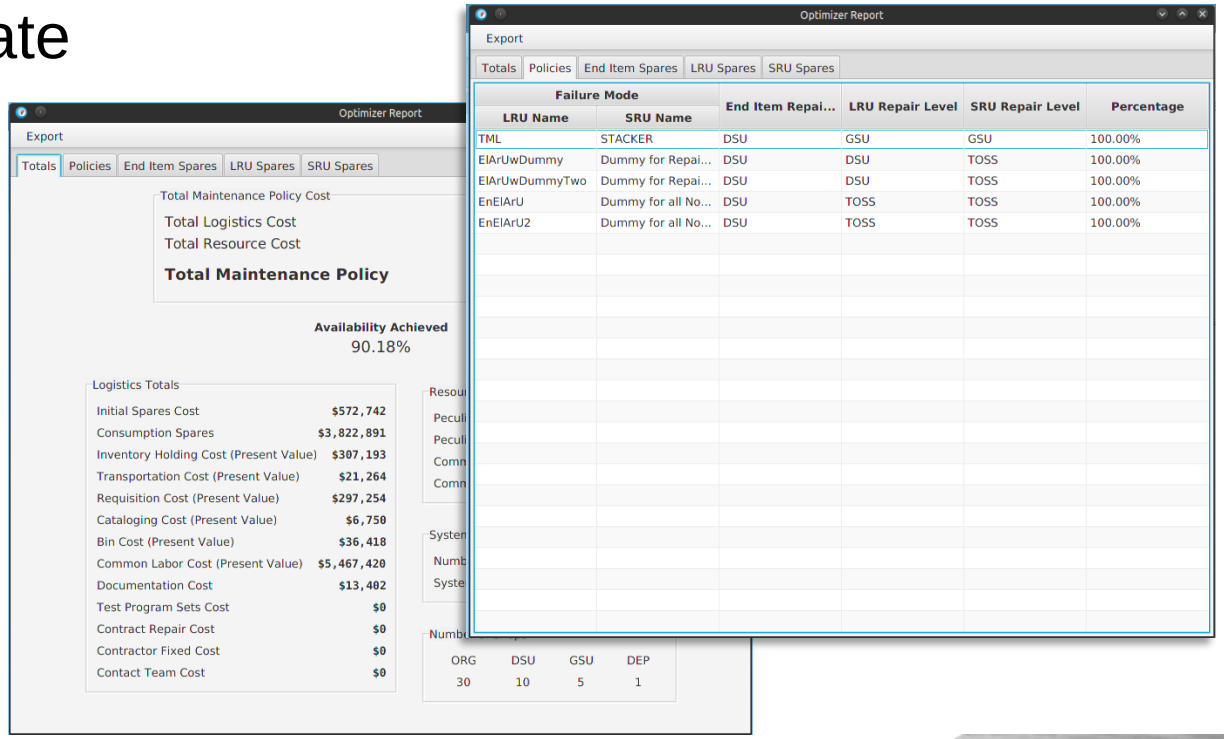




Optimization

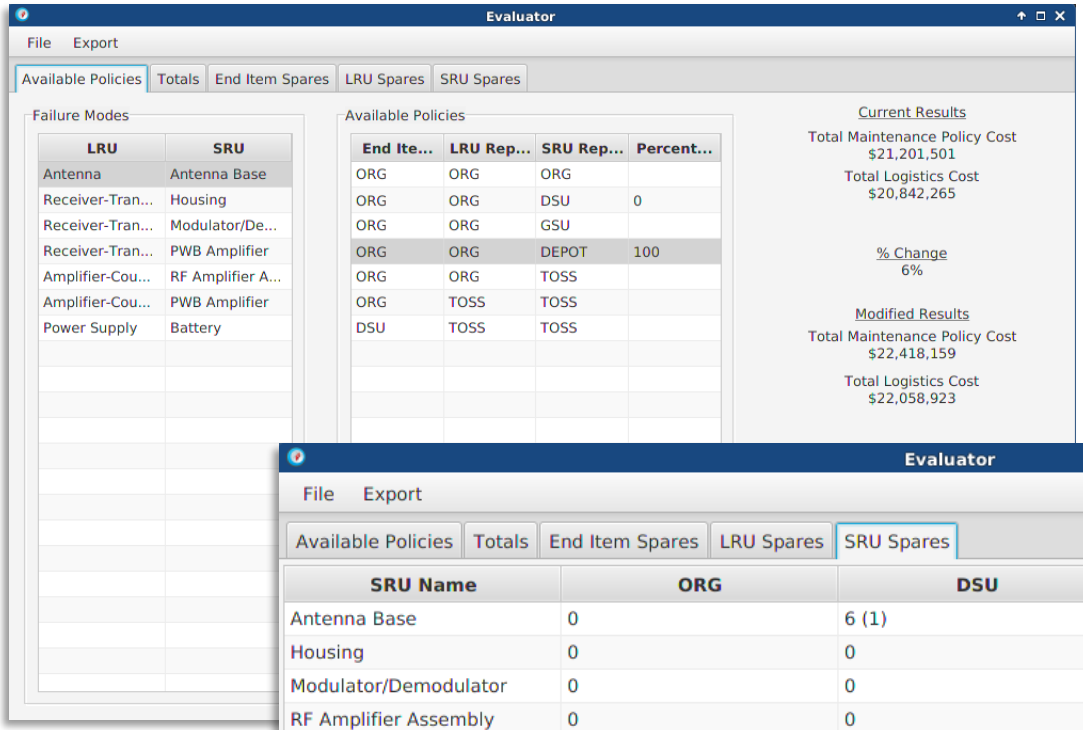
- ✓ **All required fields must be populated**
- ✓ **Selected from Analysis Dropdown**
- ✓ **Optimization Results**
  - Policy per Failure Mode
  - Cost Estimate

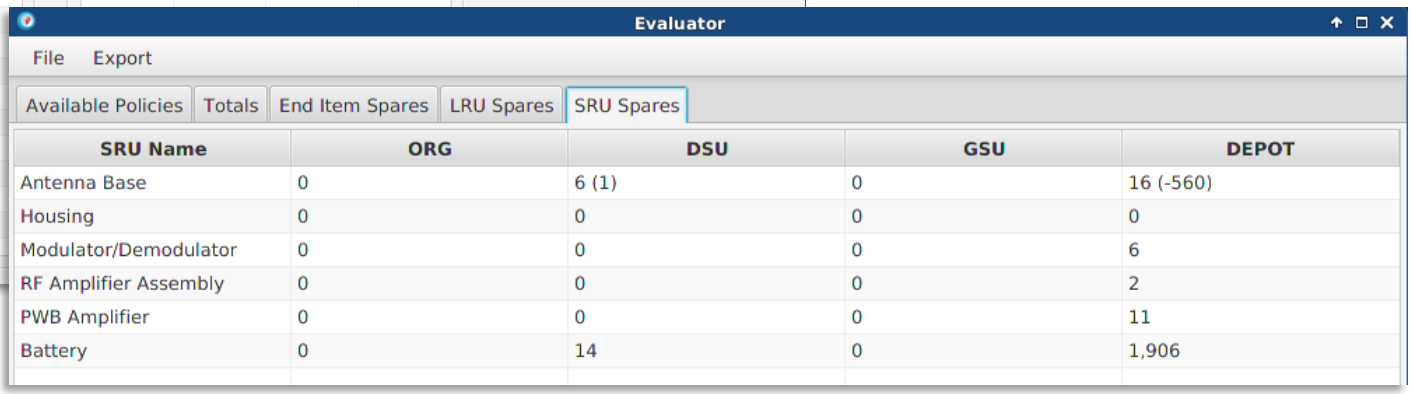




Evaluator

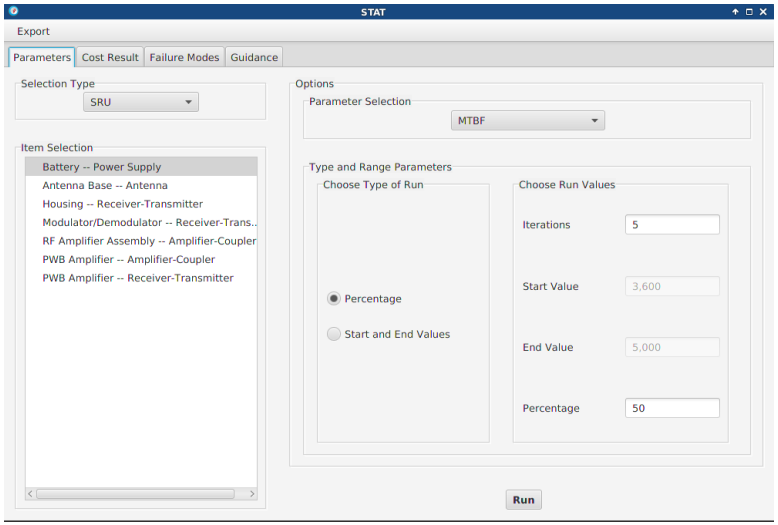
- ✓ **Evaluate non-optimal Policies**
- ✓ **Measure Maintenance Policy effects**

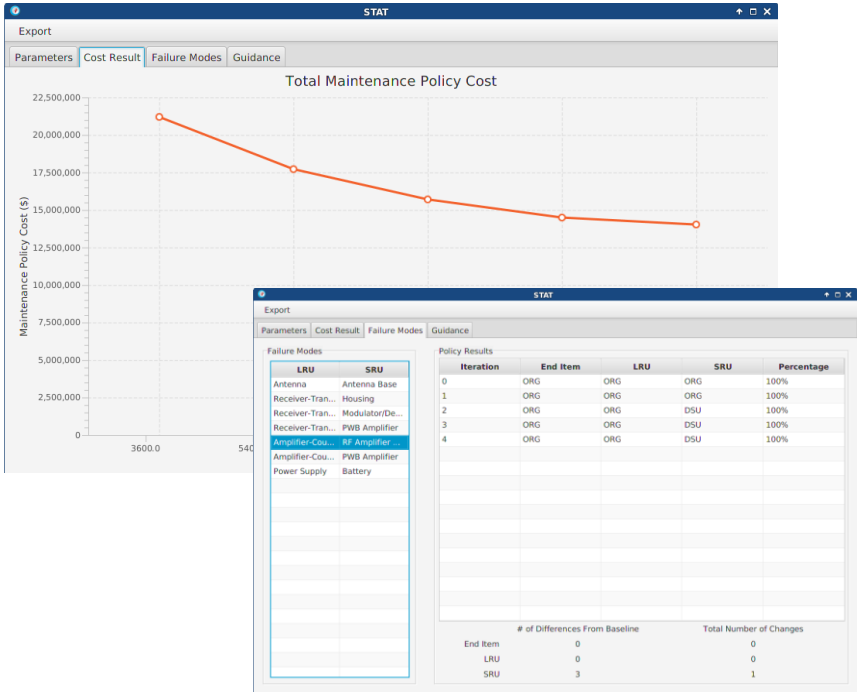




Sensitivity Analysis

- ✓ **STAT**
  - One-Factor-At-A-Time (OFAT/OFT) Methodology
  - Displays impact of a single parameter change
- ✓ **Validation limits are applied**





COMPASS 7.3

Improving Economic LORA

COMPASS 7.3

✓One Year Later

- Assessing User Needs
- Studying COMPASS underlying concepts
- Implementing Improvements to support DoD needs

✓New Features

- Improved Imports
  - SAE GEIA-STD-0007
  - FEA Excel
- STAT Re-Write
  - Improved GUI
  - Guided Assessment
- Core Depot Assessment Candidates

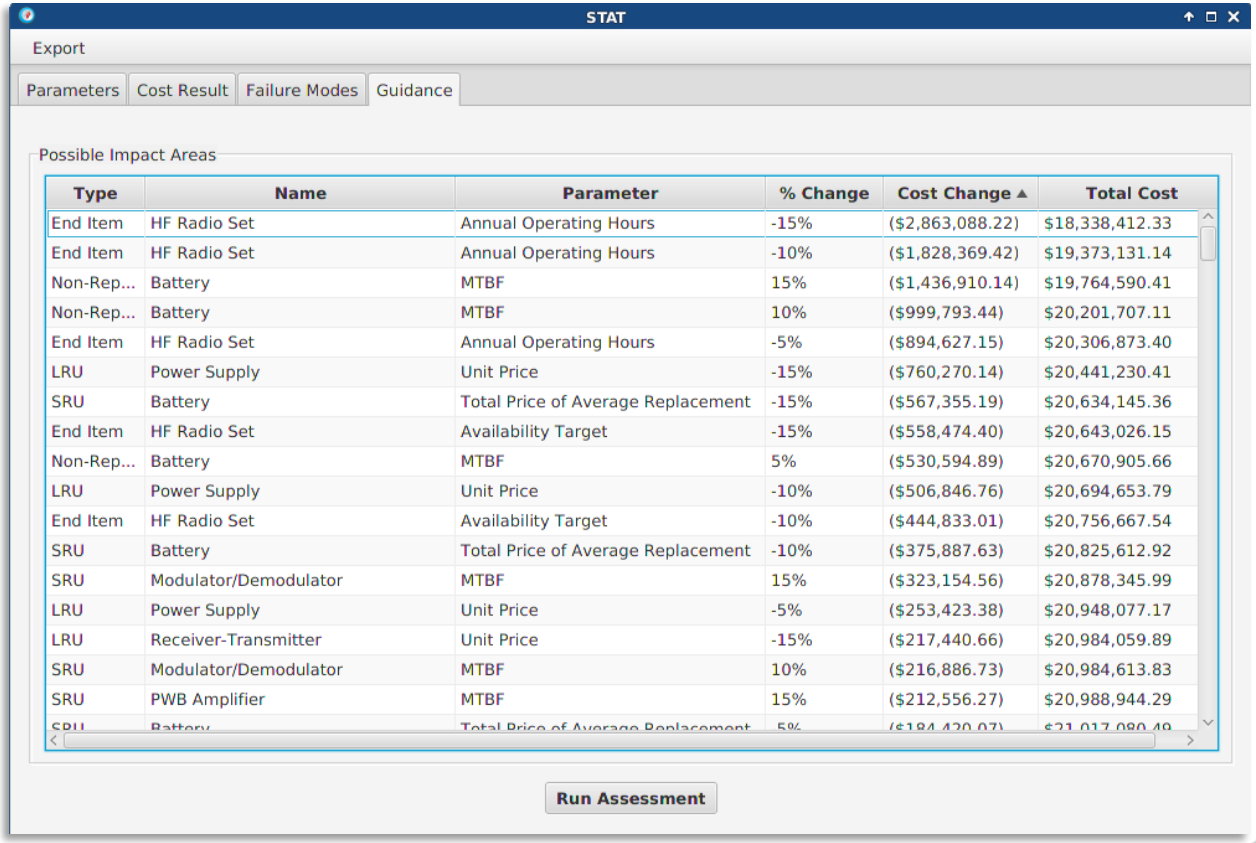
STAT Update

- ✓ **Updated GUI**
  - Proper selections and disabling
  - Improved validation
  - More Data Returned

STAT Rewrite

✓ Guided STAT

- Automated parameter selection
- Sortable results



Type	Name	Parameter	% Change	Cost Change ▲	Total Cost
End Item	HF Radio Set	Annual Operating Hours	-15%	($2,863,088.22)	$18,338,412.33
End Item	HF Radio Set	Annual Operating Hours	-10%	($1,828,369.42)	$19,373,131.14
Non-Rep...	Battery	MTBF	15%	($1,436,910.14)	$19,764,590.41
Non-Rep...	Battery	MTBF	10%	($999,793.44)	$20,201,707.11
End Item	HF Radio Set	Annual Operating Hours	-5%	($894,627.15)	$20,306,873.40
LRU	Power Supply	Unit Price	-15%	($760,270.14)	$20,441,230.41
SRU	Battery	Total Price of Average Replacement	-15%	($567,355.19)	$20,634,145.36
End Item	HF Radio Set	Availability Target	-15%	($558,474.40)	$20,643,026.15
Non-Rep...	Battery	MTBF	5%	($530,594.89)	$20,670,905.66
LRU	Power Supply	Unit Price	-10%	($506,846.76)	$20,694,653.79
End Item	HF Radio Set	Availability Target	-10%	($444,833.01)	$20,756,667.54
SRU	Battery	Total Price of Average Replacement	-10%	($375,887.63)	$20,825,612.92
SRU	Modulator/Demodulator	MTBF	15%	($323,154.56)	$20,878,345.99
LRU	Power Supply	Unit Price	-5%	($253,423.38)	$20,948,077.17
LRU	Receiver-Transmitter	Unit Price	-15%	($217,440.66)	$20,984,059.89
SRU	Modulator/Demodulator	MTBF	10%	($216,886.73)	$20,984,613.83
SRU	PWB Amplifier	MTBF	15%	($212,556.27)	$20,988,944.29
SRU	Battery	Total Price of Average Replacement	-5%	($184,420.07)	$21,017,080.49

Lessons Learned

Understanding LORA

Lessons Learned

- ✓ **Focus on Failure Modes**
  - – End Item → LRU → SRU
  - – Resultant policies are specific to the failure mode
  - – Resultant spares are per item
  - – Supply Action

- ✓ **Importance of Maintenance Perspective**
  - – 3 Level Indenture
  - – Access is not replacement
  - – Focus on Failure Modes

- ✓ **Importance of LORA Community Connection**
  - – Source of software feedback
  - – Making LORA understandable

LOGSA Contact Information

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