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Customer Success Is Our Mission

Supportability Lessons Learned with Line Replaceable Modules

NDIA
System Engineering Division

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DoD Directions for Life-Cycle Support

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- Reduce operating and support (O&S) costs for deployed weapon systems
- Minimize the logistics footprint for deployed weapon systems

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One Way to Get There

- Design into our weapon systems lower value Line Replaceable Units (LRUs)
- Line Replaceable Modules (LRM) is one solution
- I will discuss some considerations/issues of implementing LRMs

LRM vs. LRU

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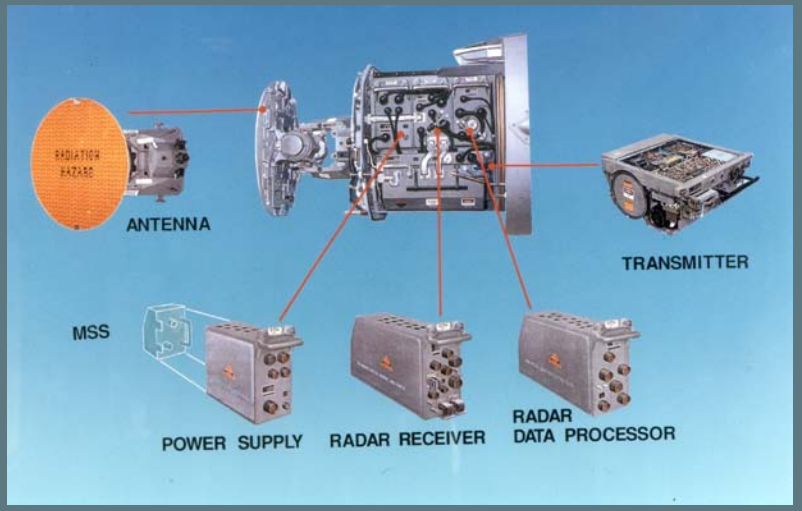
Line Replaceable Module

Line Replaceable Unit



LRM is more cost effective, light weight and easier to remove/replace

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Environmental Design Considerations

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- Vibration
  - Shock mounting approach
- Temperature
  - Operating temperature requirements
  - Not-in-use requirement (non-mission use)
- ESD
  - Prevent ESD damage due to any environmental factors

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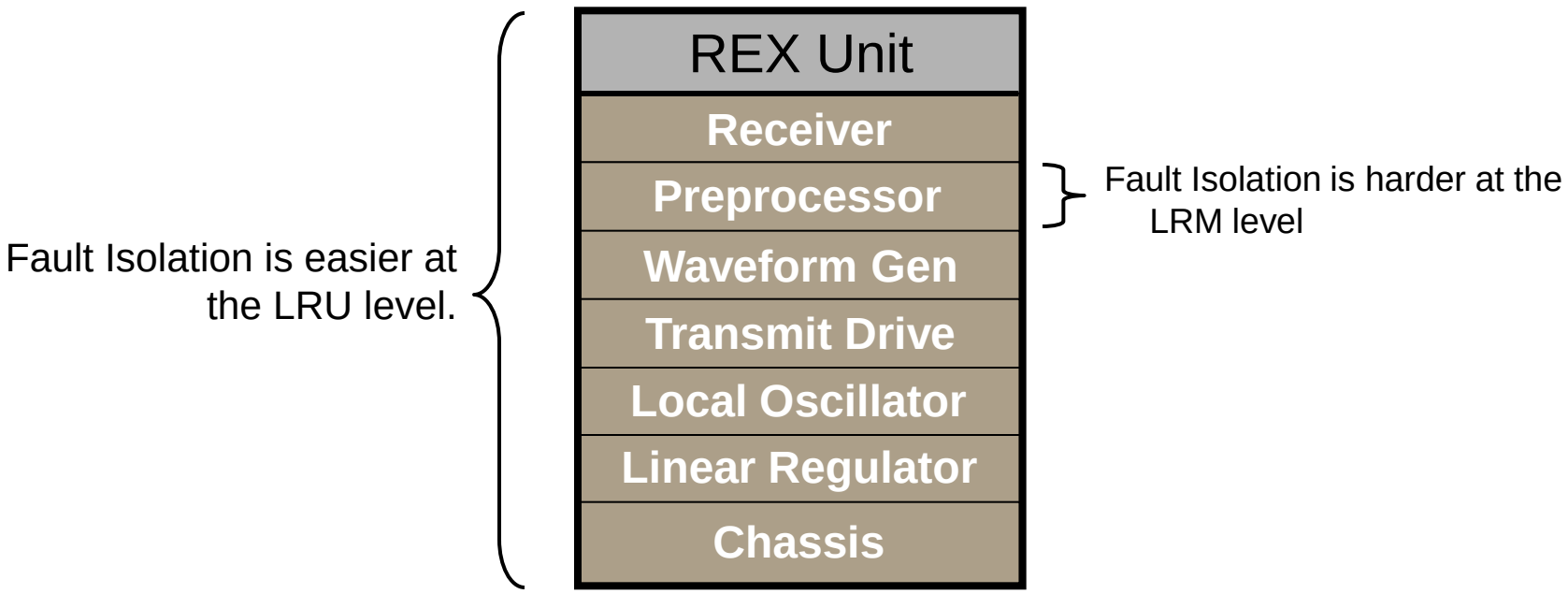
BIT Design Considerations

- Fault detection vs. fault isolation
  - Harder to isolate to LRM



BIT Maturity: higher development costs → lower support costs

Maintainability Design Considerations

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- Accessibility for maintenance
  - Installation trades
    - New platform
    - Major modification to existing platform
  - Access to module for testing and R/R
    - Access points for testing
    - Space to open covers/doors
    - Room to attach cabling and hoses
- Special Tooling/Support Equipment

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Unique Identification (UID)

- Total Asset Visibility (TAV)
- Pedigree of the weapon system
- Real-time information
- History of the item (how many times it has come back, maintenance history, repair history, FRACAS)
- By tracking at the LRM level, faster trends, design implementation, and design changes are identified (as long as it is the same format/fit/function)

Storing

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- Storing
  - Less storing space required for LRMs due to smaller size
  - Under 250 lbs can utilize overnight express shipping
    - Less docking space required
    - Less time to transport
    - May reduce the need of special storage containers (i.e.; ISOPODS)
  - Reduce the footprints in supply

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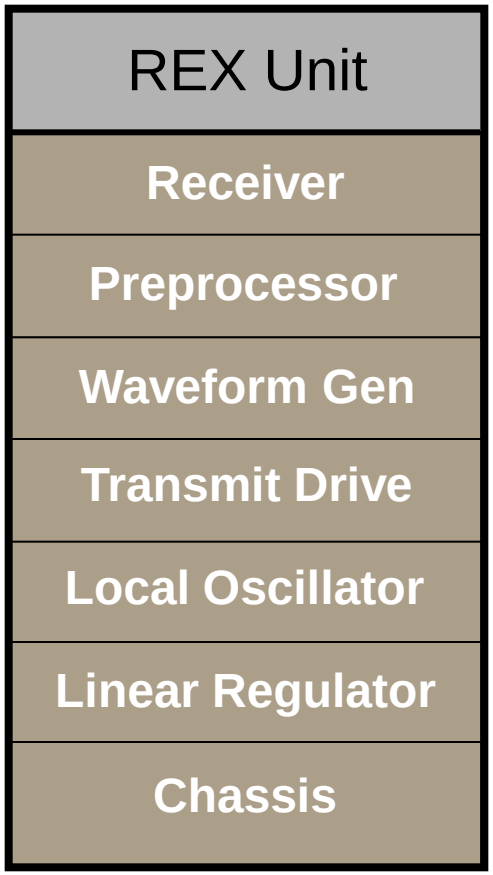
Sparing

- Spare the high failure LRMs vs. LRUs
  - Quantity based on weighted failure rates
- Spare testing



MTBF	
16,300	Much higher quantity to spare at LRU level
190,000	
79,000	Higher quantity in spares for these 2 LRMs
75,000	
88,000	
93,000	
202,000	
332,000	

LRM delivers much less redundant supply – Supply more representative of the actual failure items.

Summary

- Therefore LRMs can significantly reduce the logistics footprint due to fewer spares quantity and smaller physical dimensions of each spare.
- Reduced O&S cost can be achieved due to:
  - Decreased MTTR (Mean Time To Repair)
  - Requires less manpower effort to accomplish remove/replace
  - Minimized spare investment based on reliability at the lower level (LRM) of the weapon systems
  - Less special support equipment
  - Reduce shipping cost and faster shipping turnaround time