



45th Annual NDIA Fuze Conference



Mechanical Packaging of the EX 433 Proximity Fuze for Submunitions



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Abstract		
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MK 45 MOD 4
Gun Mount

EX 3 Submunition
w/ EX 433 Proximity
Fuze



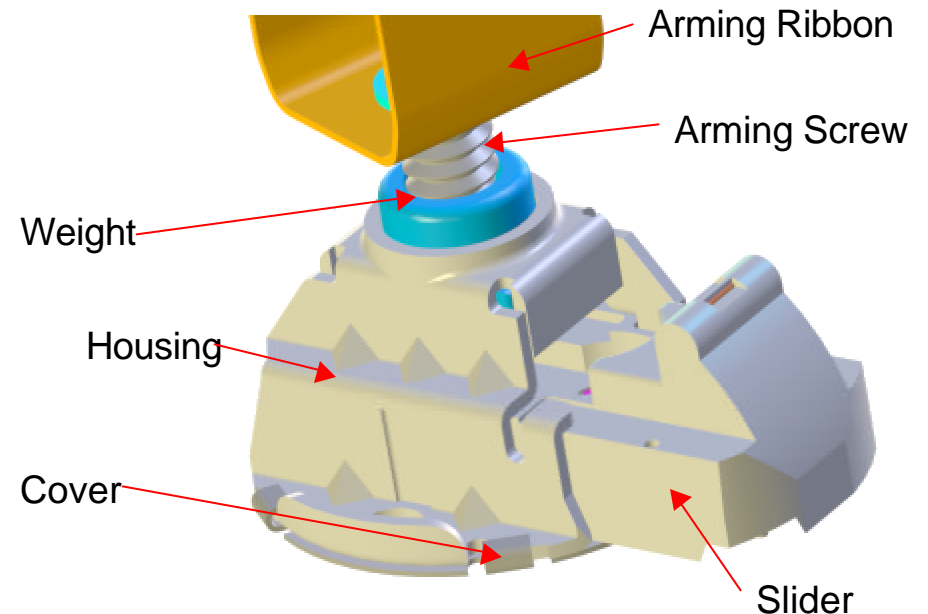
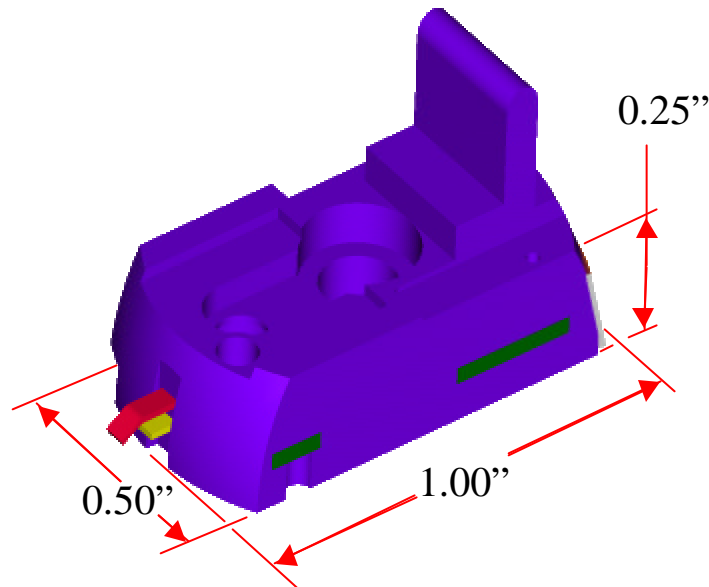
ERGM: Extended Range Guided Munition





M80 PIP Objective

- To package the electronics and mechanical components of the Proximity Fuze in the shape and size of the current M234 SD Slider for the M80 Submunition for ERGM
 - One-for-One replacement of current Slider

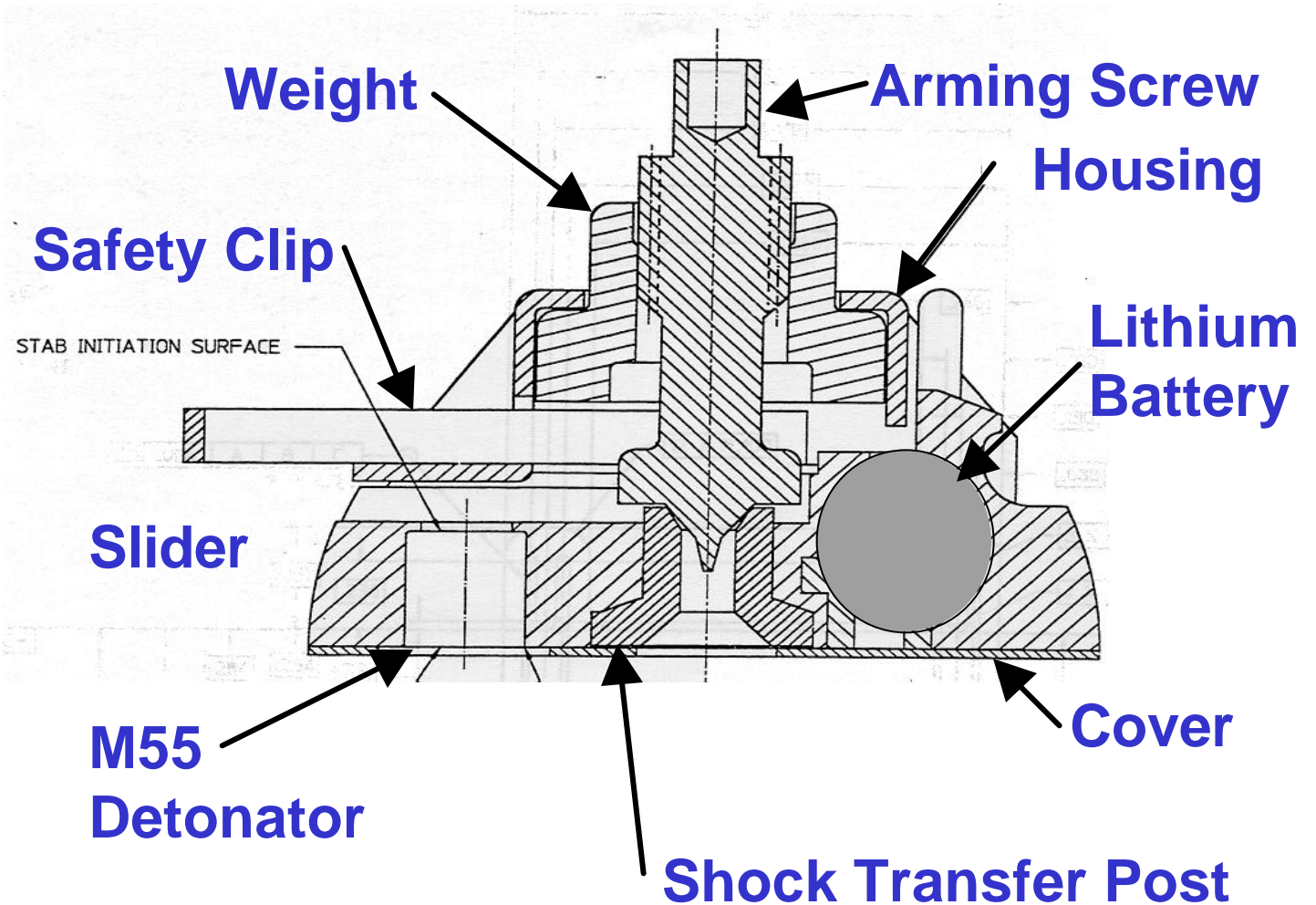




M234 Self-Destruct Fuze



M80 w/
M234

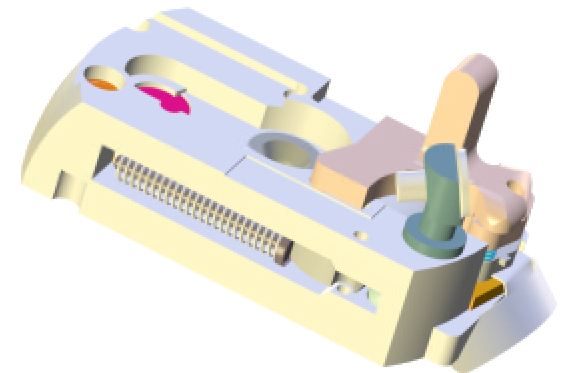
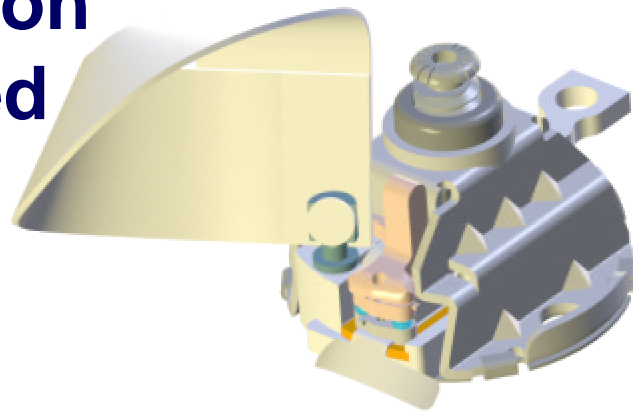




Parts removed from M234

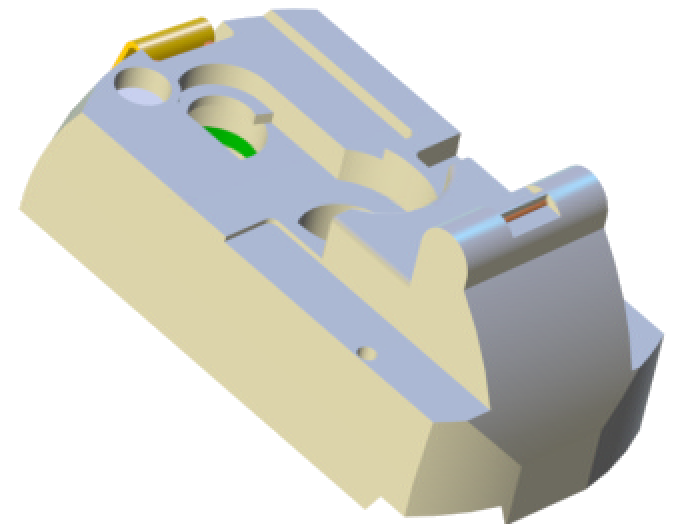
- **Battery Activation System removed**

- Spring
- Lever (hammer)
- Pivot
- Spiral Ribbon Assy
- Ball



- **Shunt and Safety Pin removed**

- **Battery Cover removed**



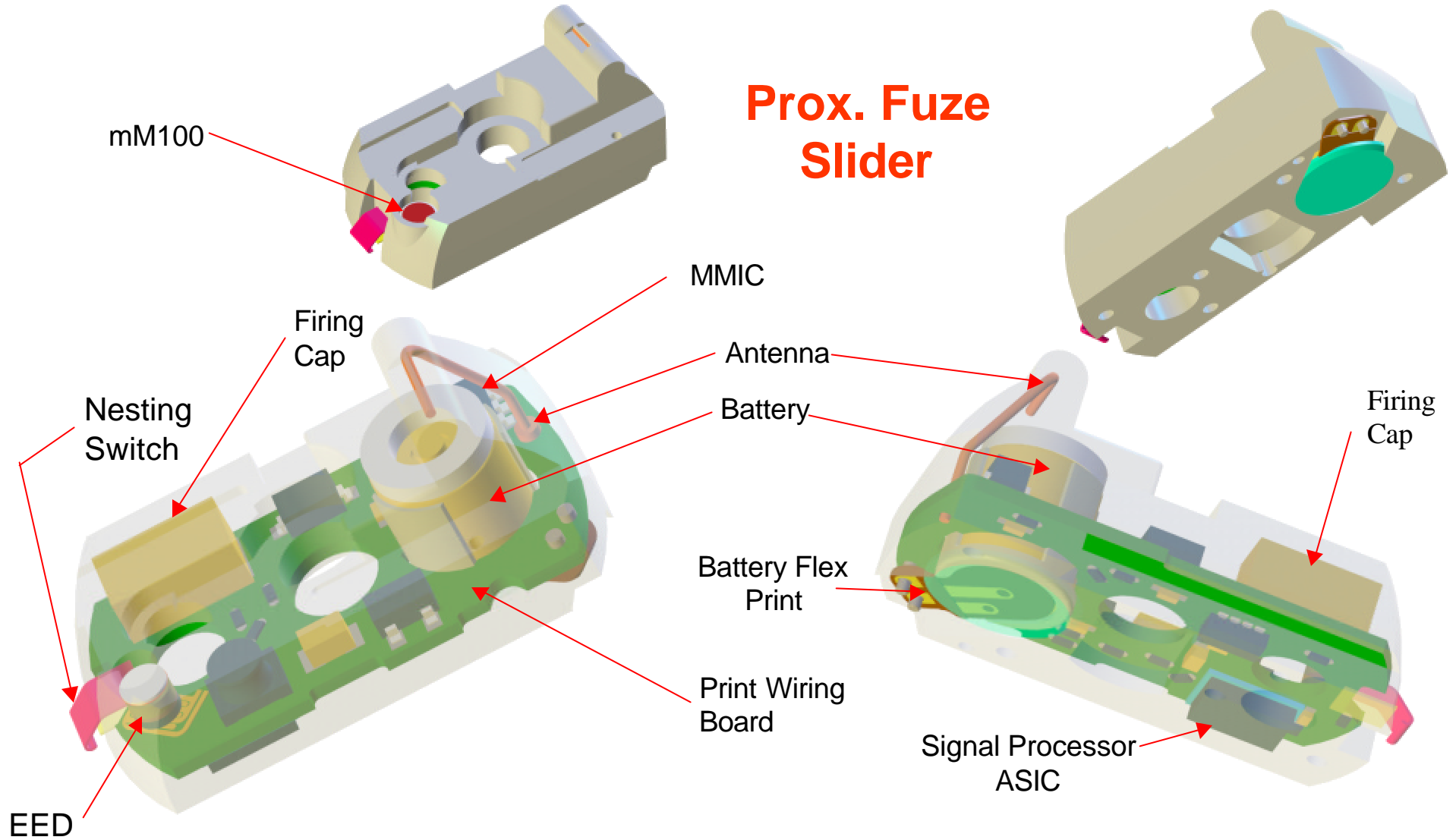



Functions

- **Primary Mechanical Safety And Arming Features of the M234 SD Fuze Retained**
 - Impact Firing System is now the backup
- **Prox Fuze electronics will use two timers**
 - Separation Timer
 - Ensures proper event sequence
 - Battery activation and unnesting
 - Self-Destruct Timer
 - Provides the current cleanup capabilities of M234 SDF
 - Self-Neutralization or Self-Destruct



Major Components Layout





Battery

Nesting Switch

mM100



Battery

Nesting Switch

mM100



MK45 MOD4

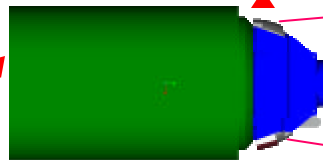
Direction of Flight



ERGM



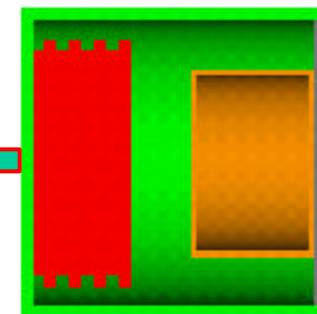
EX-3



Slider



Prox. Fuze Battery



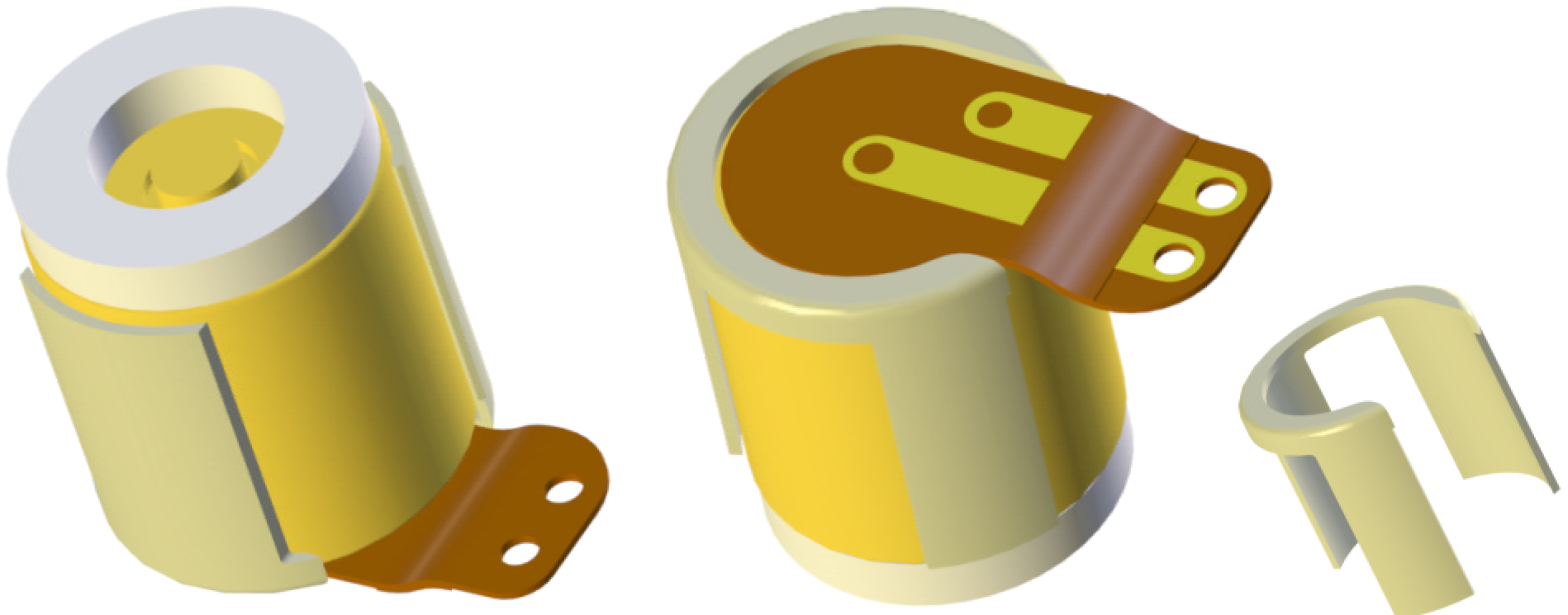
Force

Battery slides during Set Back



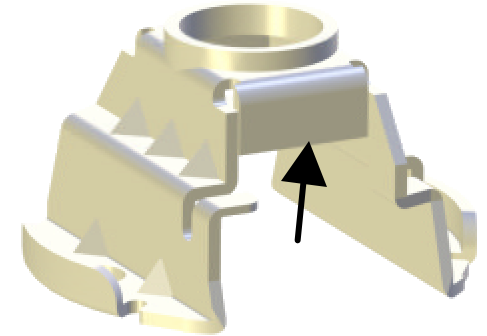
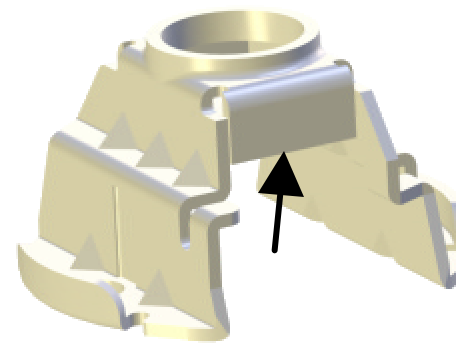
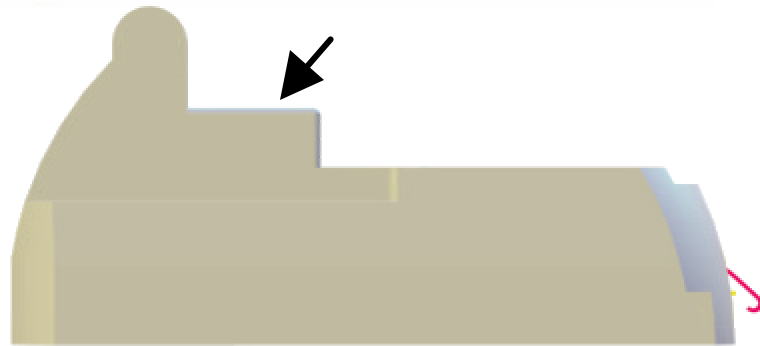
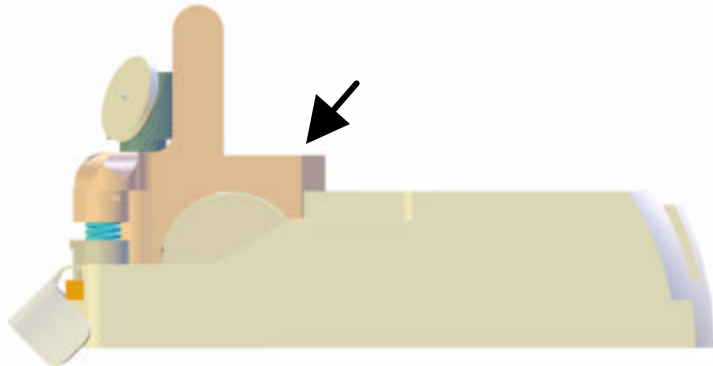
Battery

- Requires a small nub to be molded into the plastic or a feature on the Battery
- Flex Print connection to Print Wiring Board
- Weight may be added to increase activation energy





Taller Slider



- **Slider height increased to allow maximum room for Battery**

- **Tab on front of M234 Housing has been shortened**



Battery

Nesting Switch

mM100



Nesting Switch

- **Description**

- Replaces the function of the Shunt on the M234 SDF
 - Self-Destruct timer
 - Room needed for Antenna, Battery, & electronic components
- Prox. Fuze Sensor off line until submunitions dispensed
 - Reduces power consumption until M80's dispensed
- Closed while the submunitions are nested in the payload

- **Allows Self-Destruct time to be reduced from 3 minutes to 60 seconds - desired by Marines**

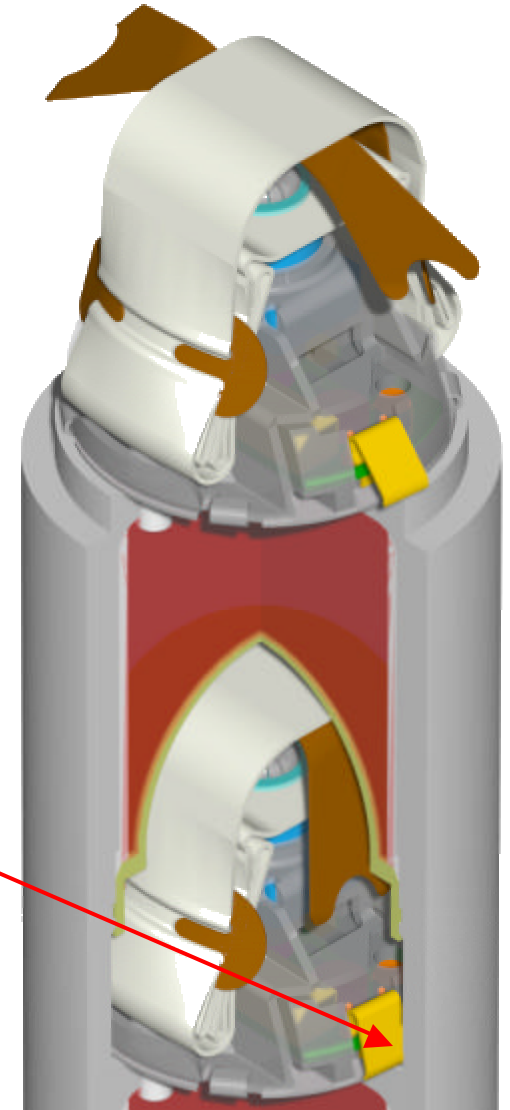
Nesting Switch

Nesting of grenades closes switch contacts

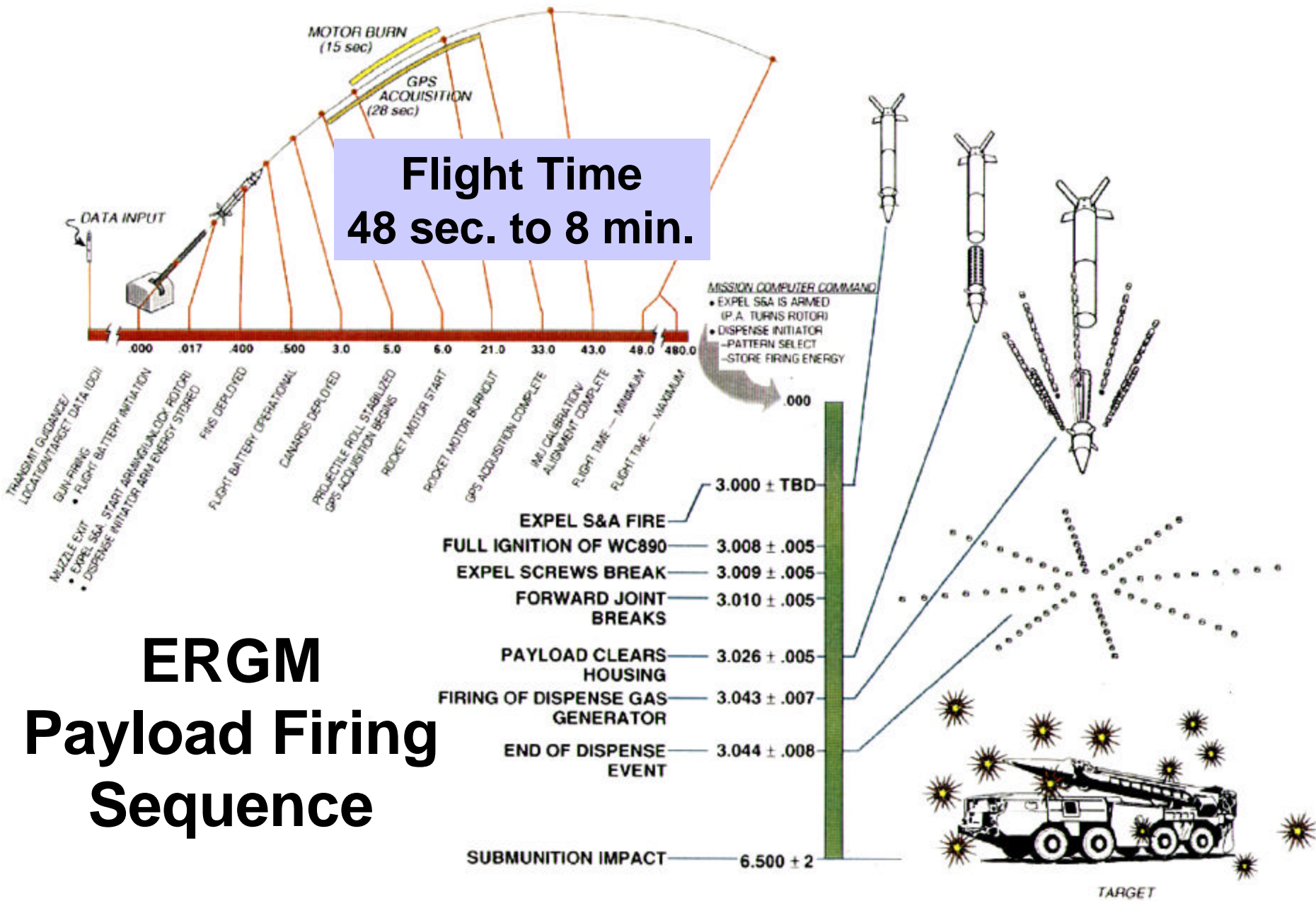
- **Fault Tree Analysis**
 - Shows the use of the Nesting Switch to be as safe as the Shunt
- **Safety Analysis**
 - Lone Star Army Ammunition Plant Concurs

Nested Submunitions

Nesting Switch compressed by stacked submunition



**Flight Time
48 sec. to 8 min.**



ERGM Payload Firing Sequence



Accident Scenario

- **Assumption:**

- The accident in some way has activated the Battery and the electronics are powered up
 - Drop, Accidental Expulsion

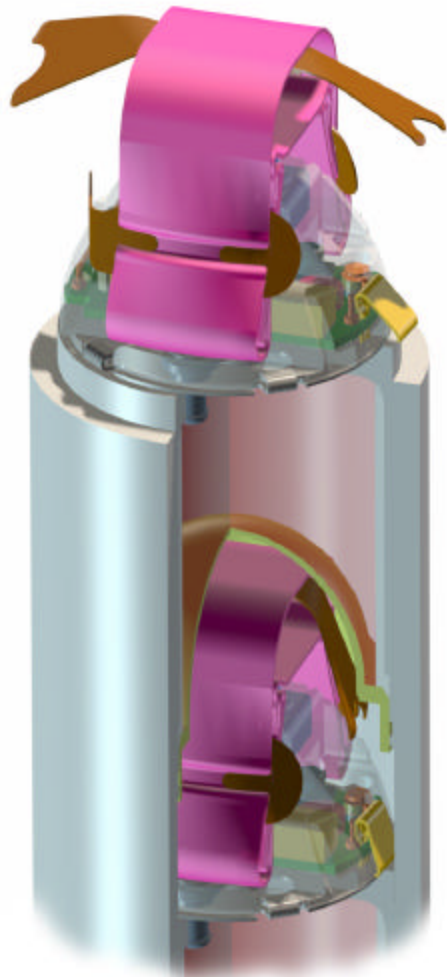
- **Safety Logic:**

- The Signal Processor IC will compare the Nesting Switch condition and Separation Timer (Battery activation time)
 - If the Nesting Switch is opened within 30 seconds of Battery activation the Prox. Fuze will safe itself
 - If the Nesting Switch is closed in the nested state and the Battery has been activated for 10 minutes the Prox. Fuze will safe itself

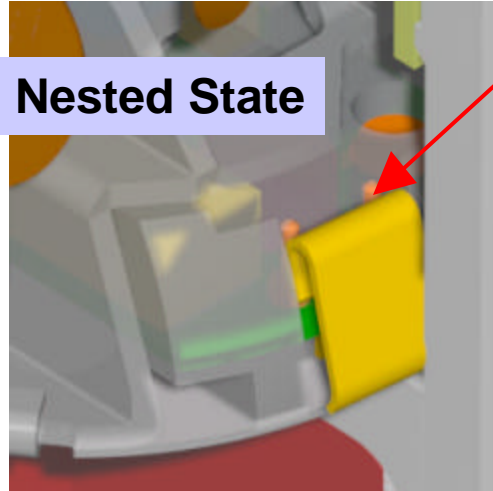
*** Point Detonate Safety Issue still a concern**



Nesting Switch Concept #1

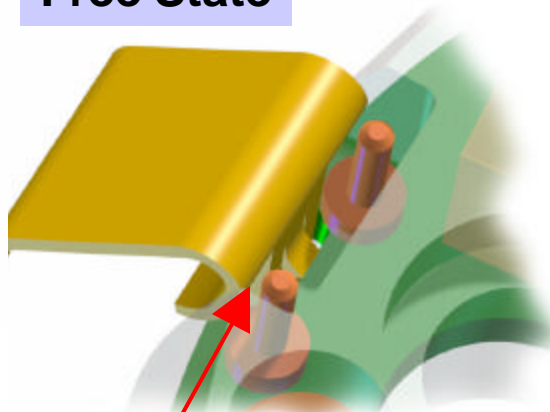


Nested State

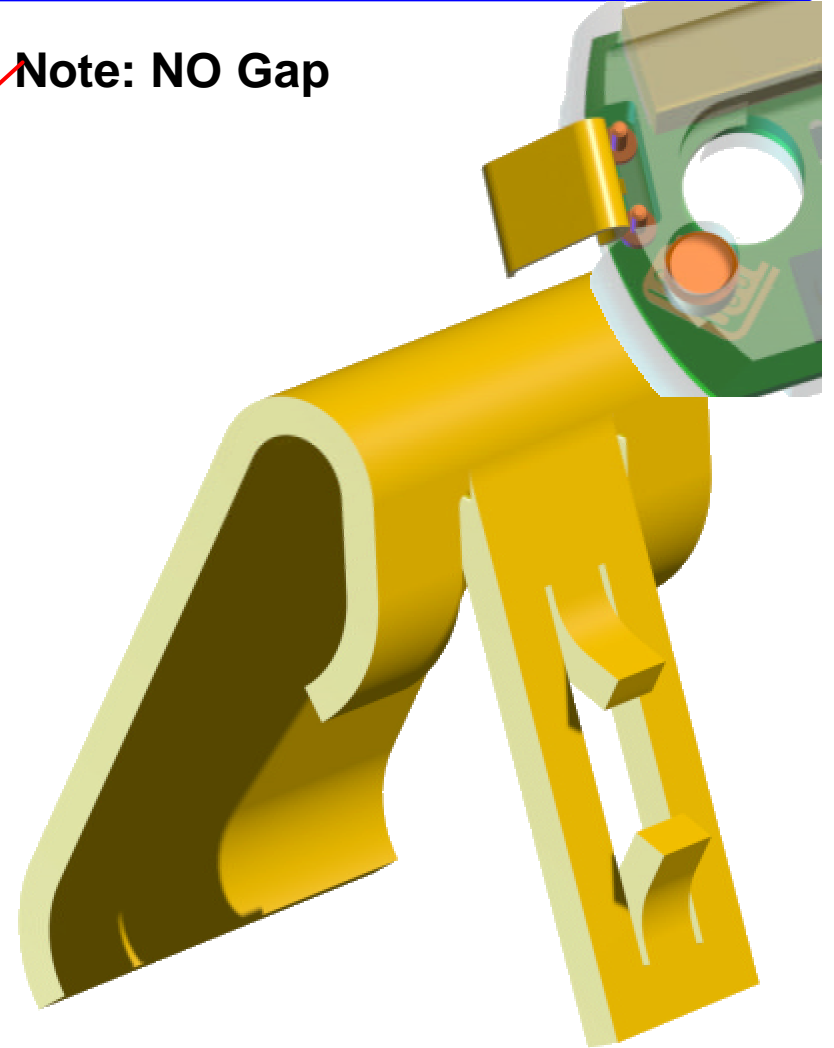


Note: NO Gap

Free State



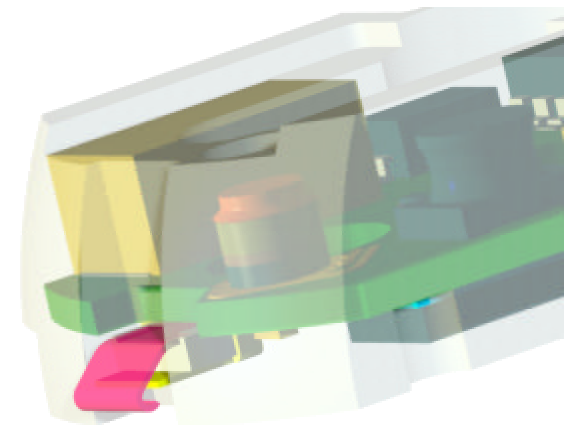
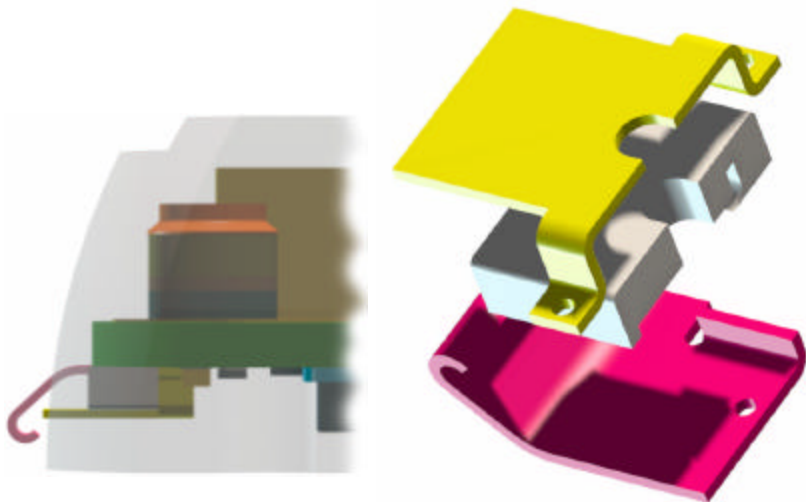
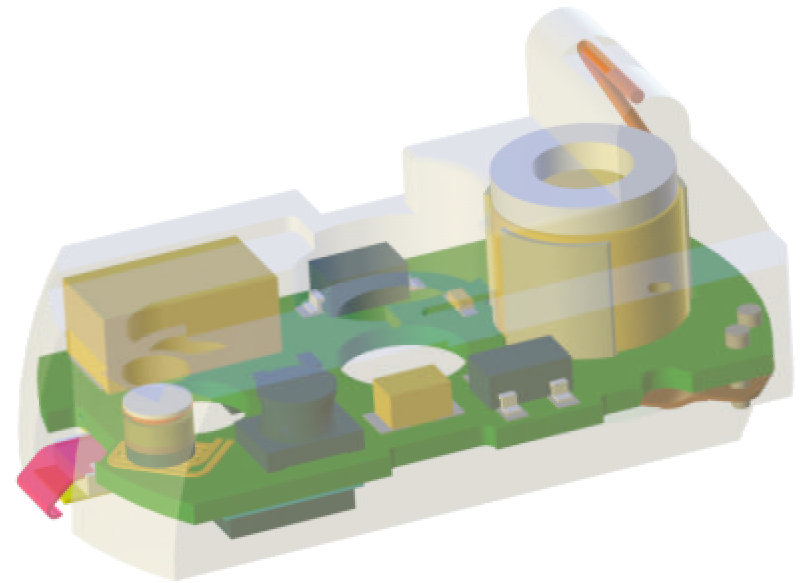
Note: Gap





Nesting Switch Concept #2

- The PWB is molded to form the Slider
- The two Nest Switch leaves are molded together
- Then soldered to the Slider Sub-Assembly





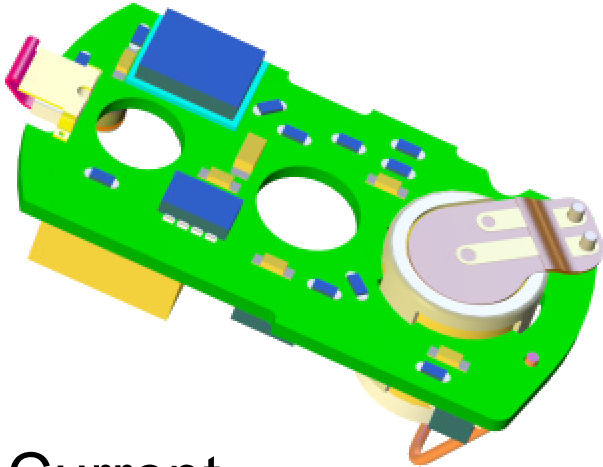
Battery

Nesting Switch

mM100

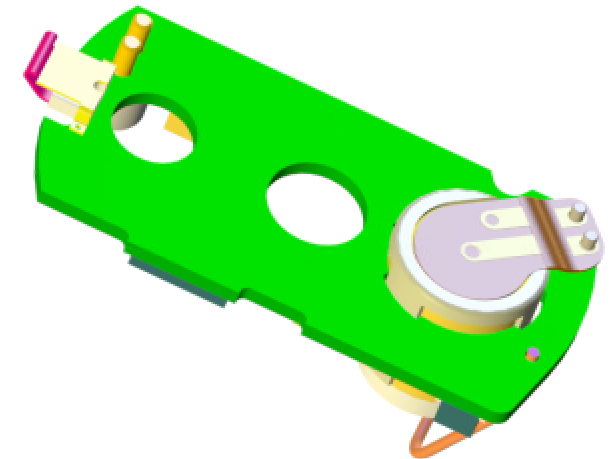


EED vs. mM100

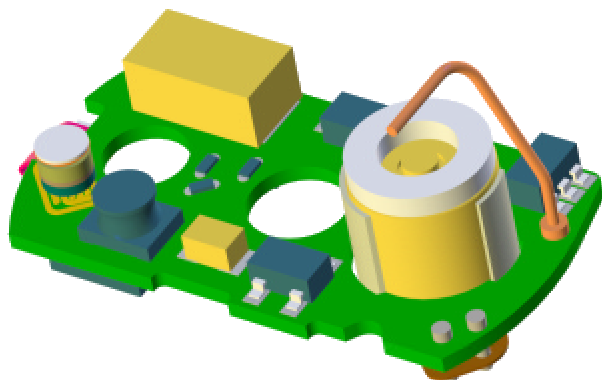


Current
M234 EED
Version

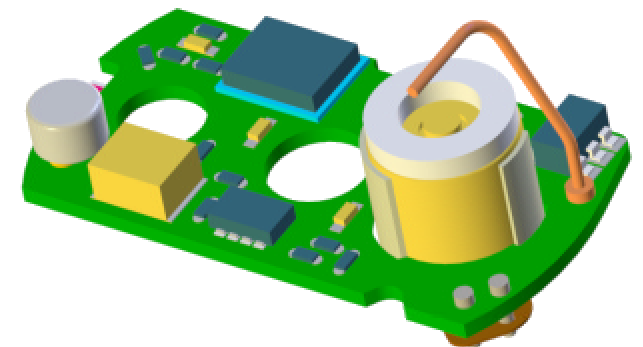
- mM100 design offers
- Reduced component count
 - Reduced component sizes
 - Reduced testing
 - Single sided PWB
 - Reduced PWB costs
 - Increase reliability



mM100
Version



- No impact on battery
- Either Nesting Switch concept





Summary



- **Teamwork**

- Government and Contractor
- Battery, Electronics, and Mechanical Packaging Teams

