Overview of Sandia National Laboratories Robotic Demil Projects

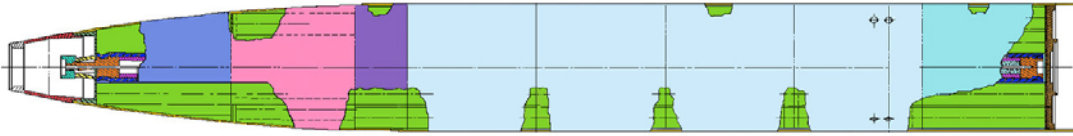**Walter Wapman,**

Sandia National Laboratories

May 16, 2007

Presentation Outline

- **MLRS Warhead Download Workcell**

    – **Warhead Disassembly System**

    – **Grenade Removal System**

    – **Fuze Removal System**

- **Hawthorne CBU Download Workcell**

- **ADAM 155mm Projectile Download Workcell**

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MLRS Warhead Foam Packs and Hardware

Grenades

644 grenades in a warhead. 375,000 warheads to demil

2

8

Spacer Rings

Caps

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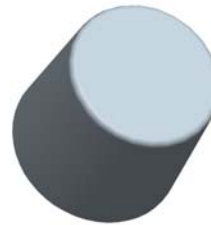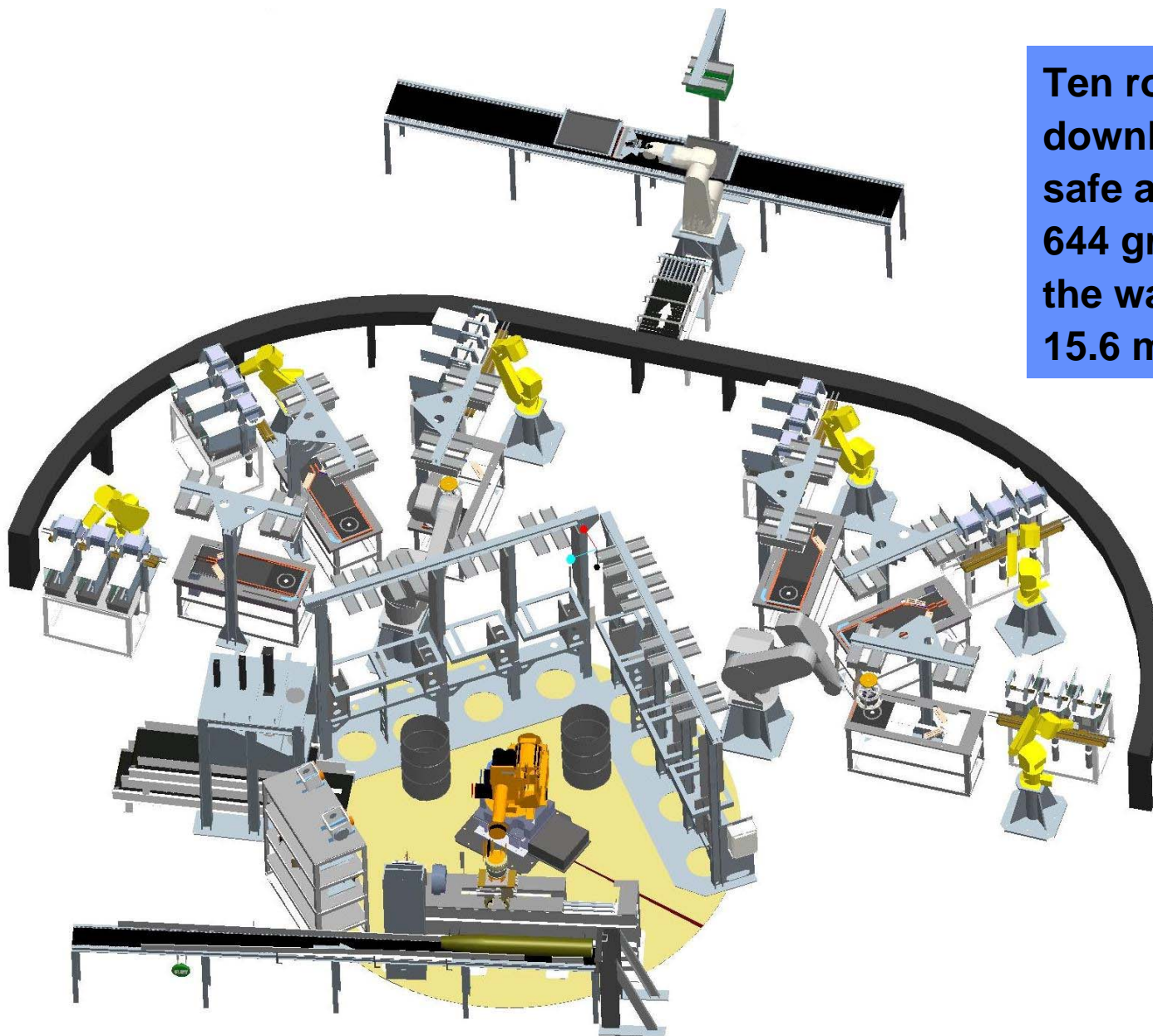
Automated MLRS Warhead Download Workcell

Ten robots will download, inspect, safe and package 644 grenades from the warhead every 15.6 minutes.

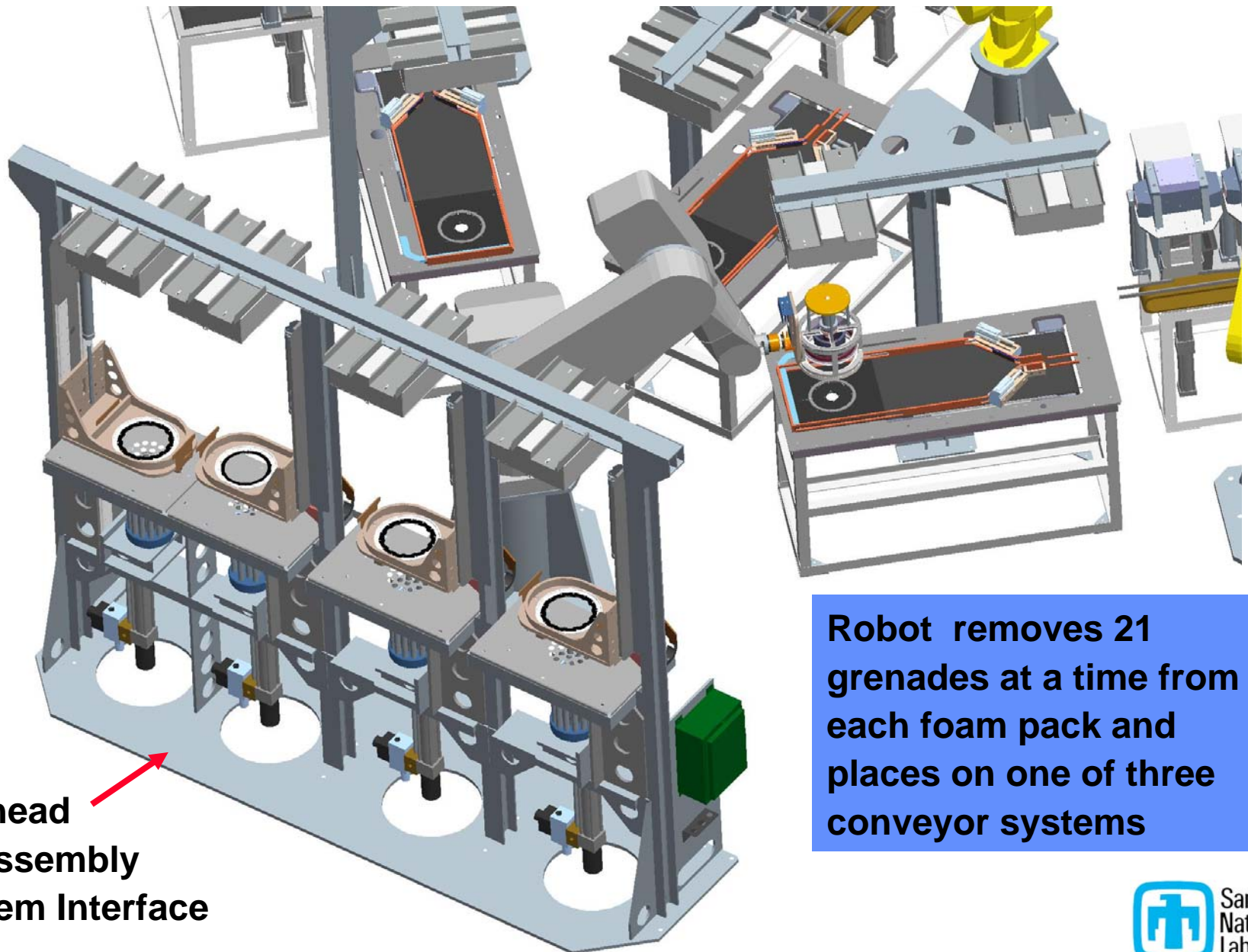Sandia National Laboratories

Warhead Disassembly System

1. Chipless machining partitions the warhead into foam packs.

2. Robot distributes foam packs for grenade unloading.

Grenade Removal System #2 Interface
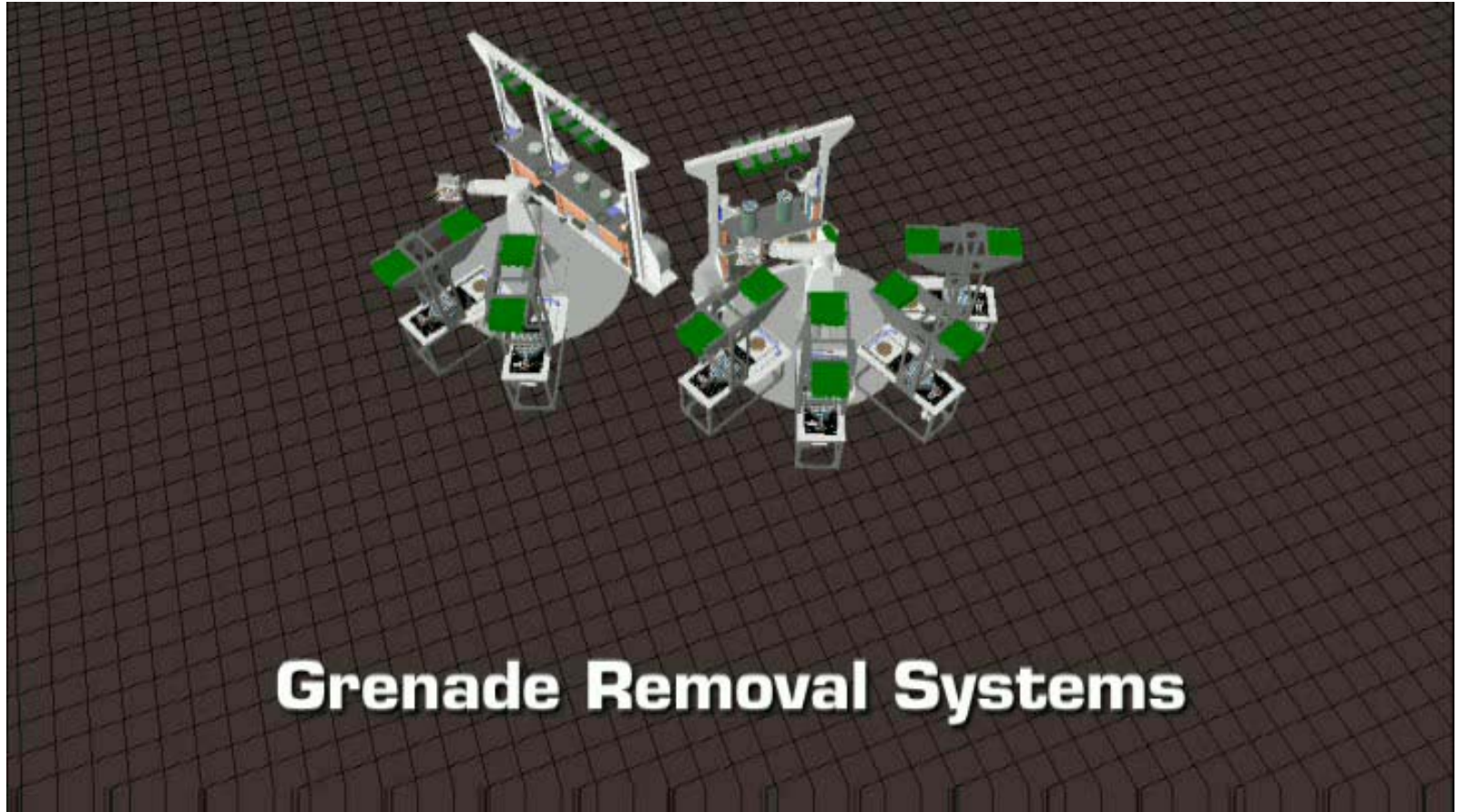
Grenade Removal System #1 Interface

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Grenade Removal System #1

Robot removes 21 grenades at a time from each foam pack and places on one of three conveyor systems

Warhead Disassembly System Interface

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Grenade Removal Operations

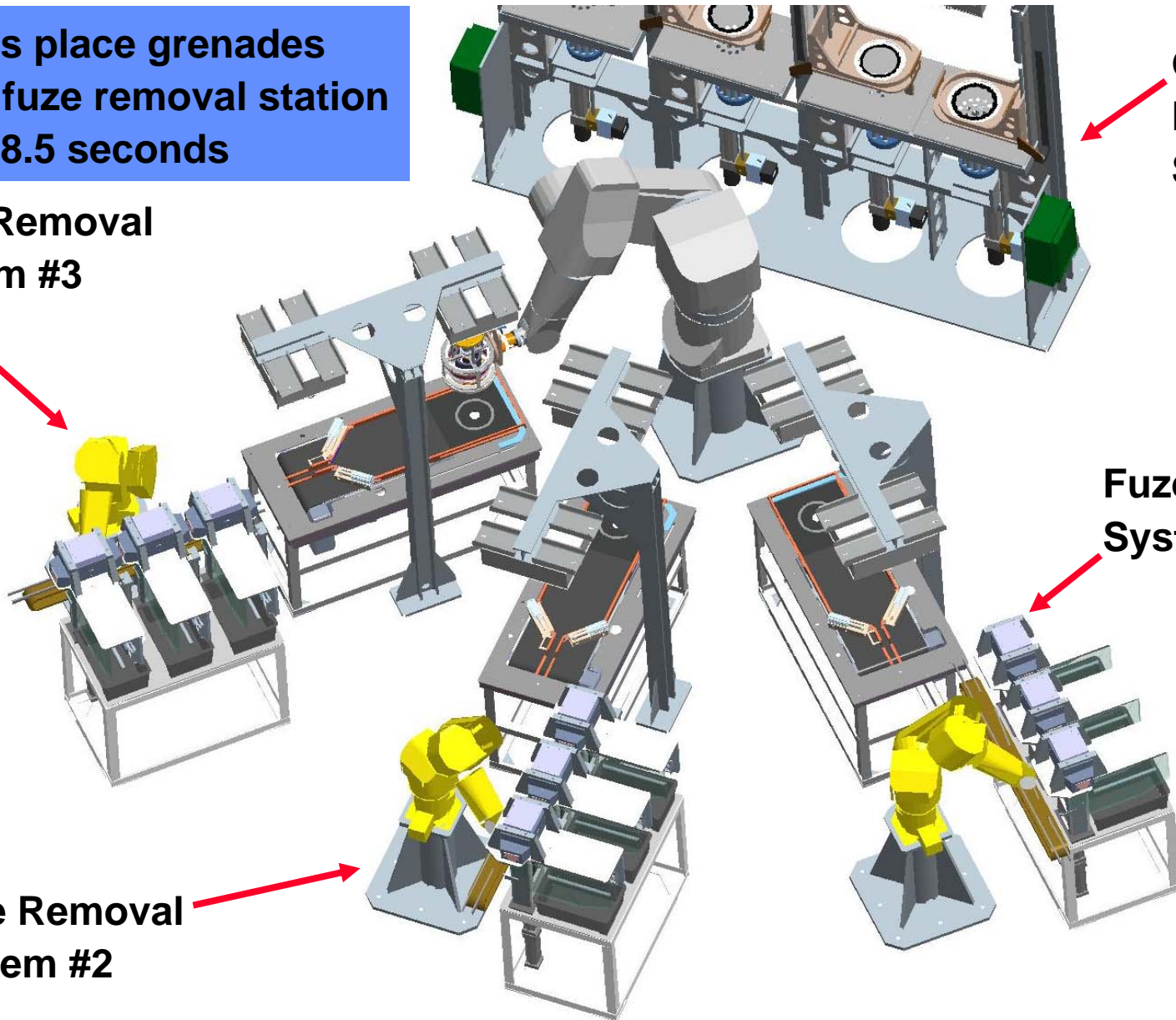Grenade Removal Systems

Fuze Removal Systems 1 - 3

Robots place grenades into a fuze removal station every 8.5 seconds

Fuze Removal System #3
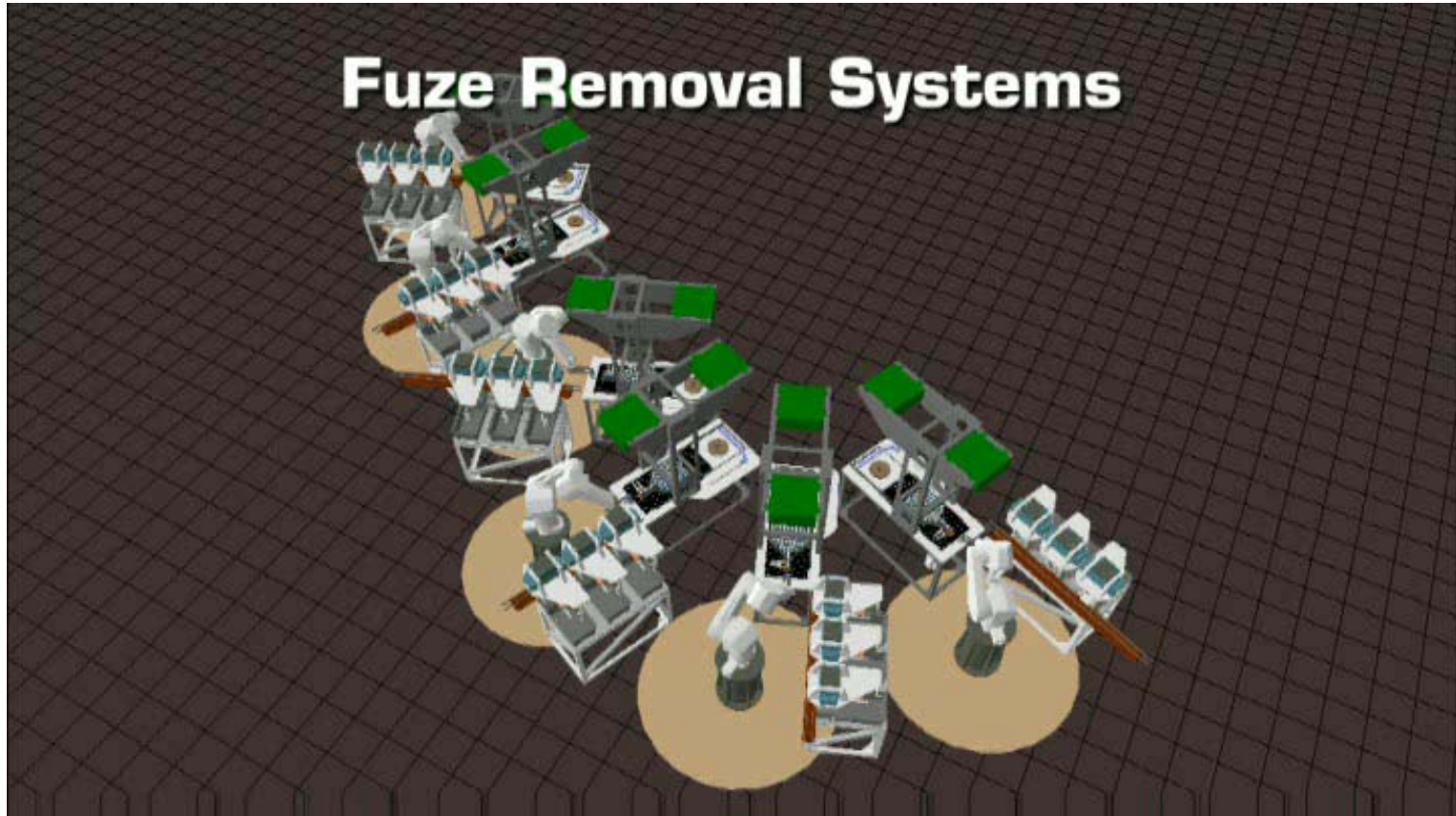
Grenade Removal System #1
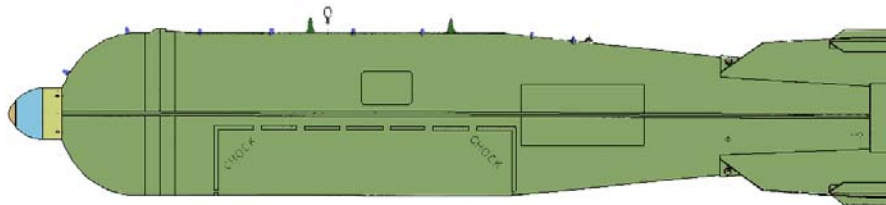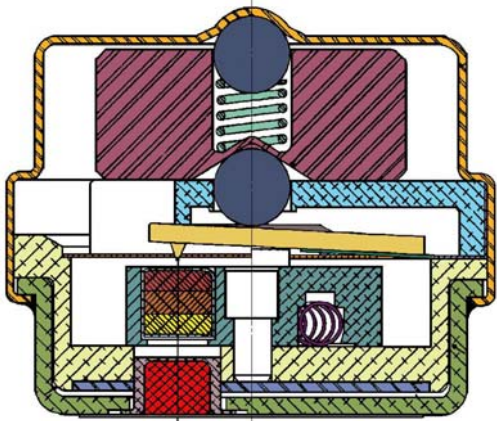
Fuze Removal System #1

Fuze Removal System #2

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Fuze Removal Operations

Fuze Removal Systems

Cluster Bomb Unit (CBU) Assembly and Issues
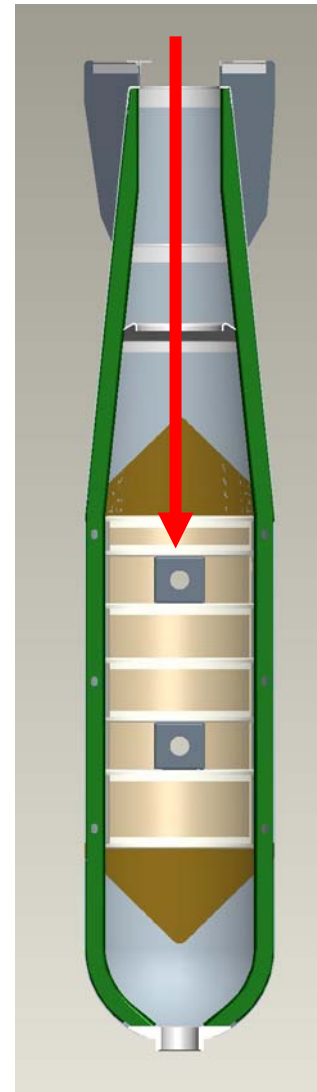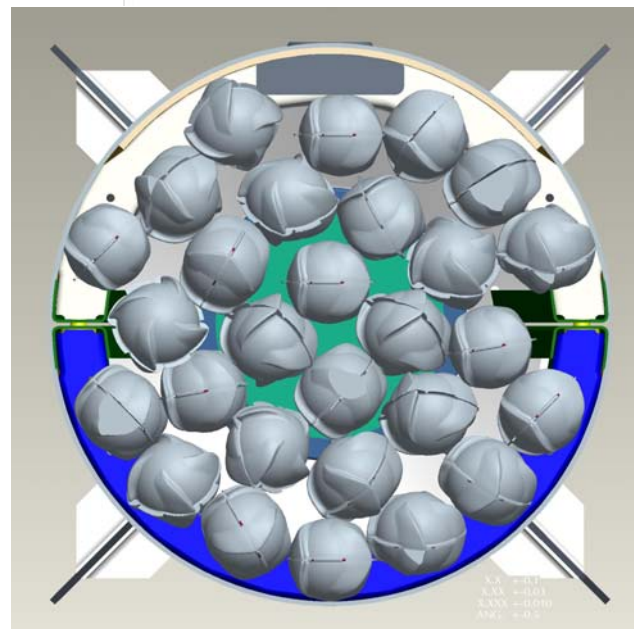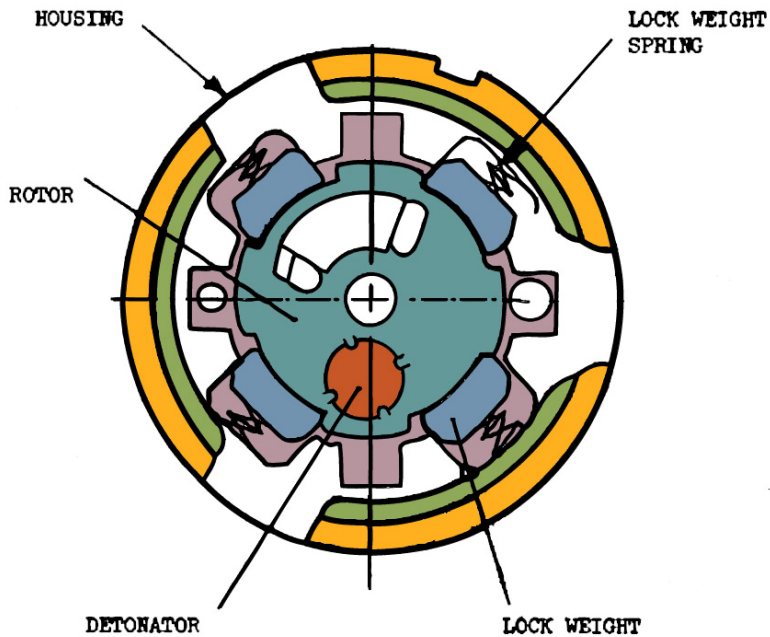
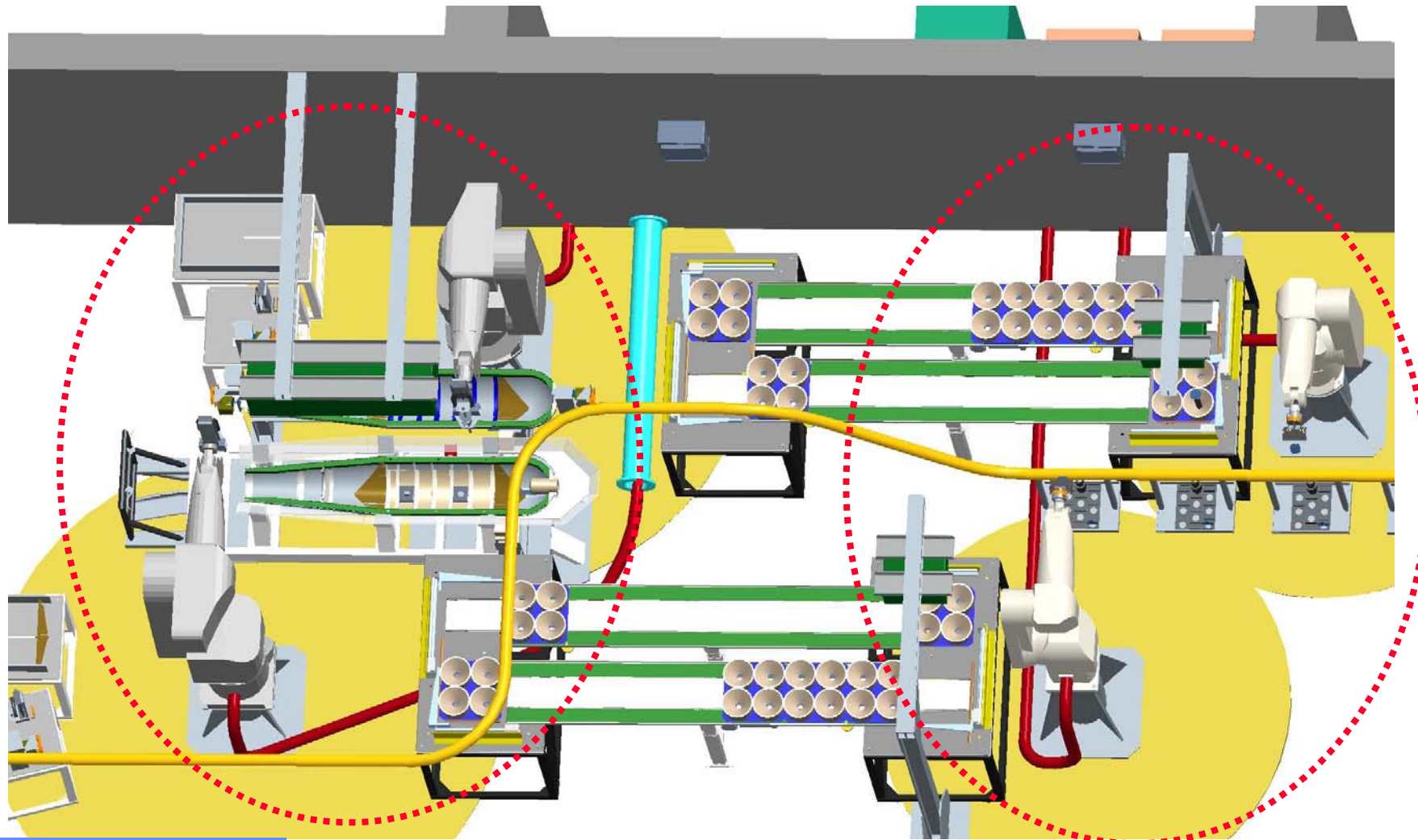HOUSING

LOCK WEIGHT
SPRING

ROTOR

DETONATOR

LOCK WEIGHT

Figure 2-5. BLU-63/B, BLU-63A/B, BLU-86/B, and BLU-86A/B

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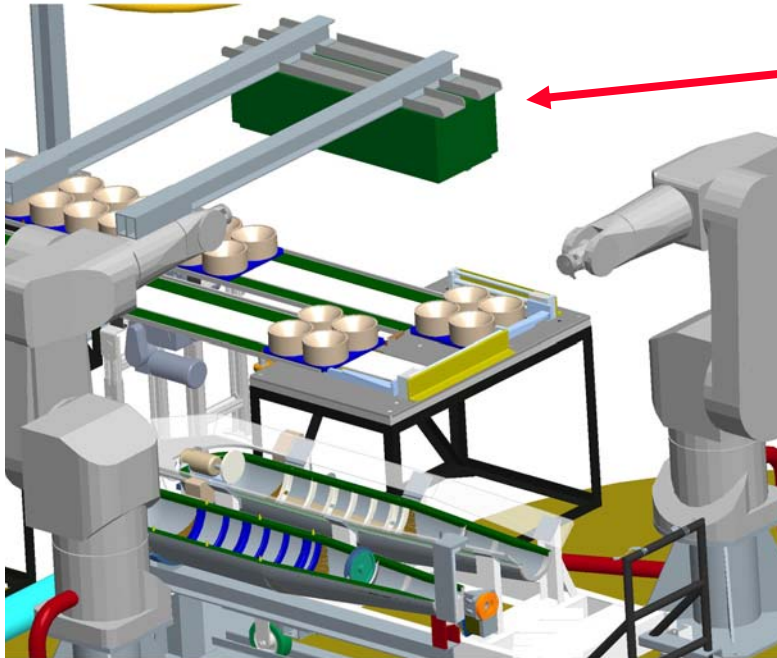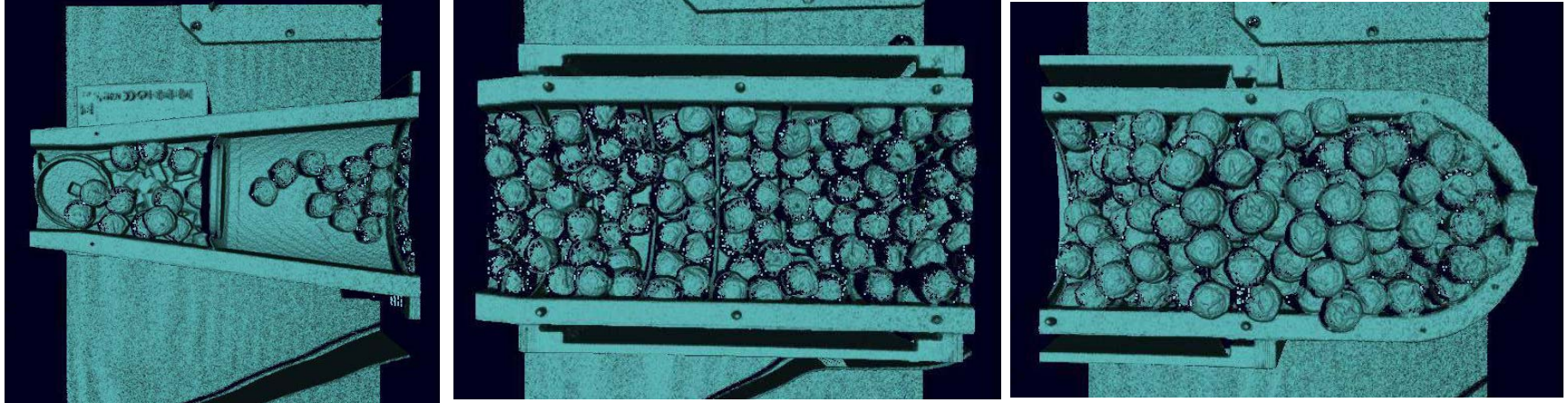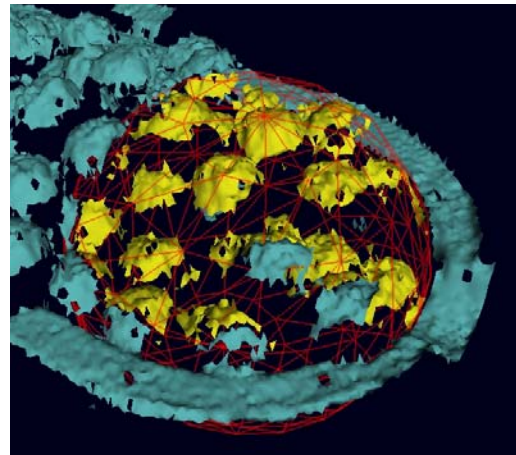
CBU Download Workcell

Open dispenser and unload

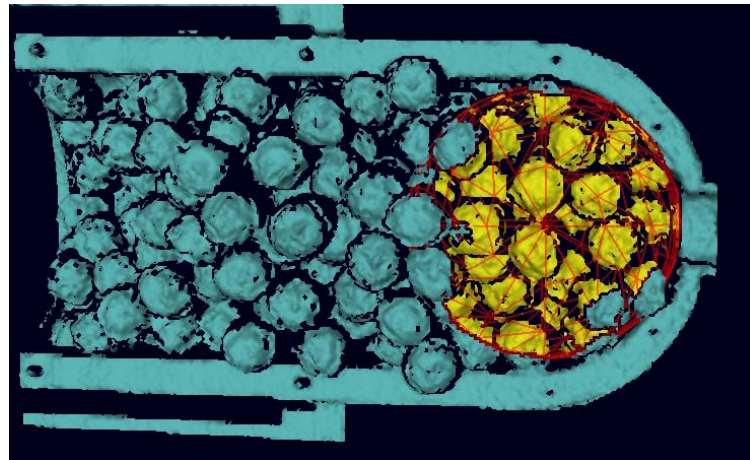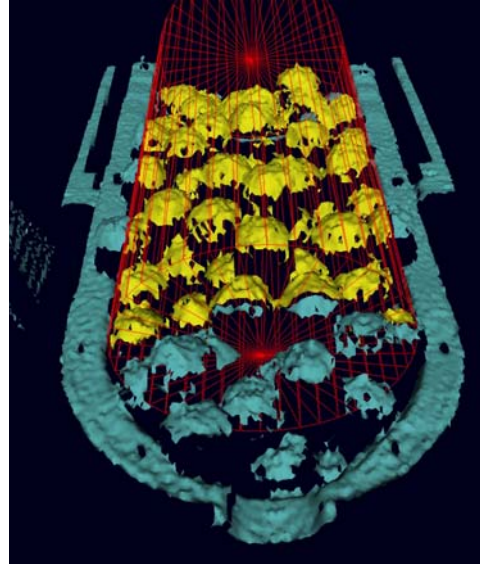**Orient bomblet and place in Fixture Separation Station**

Sandia National Laboratories
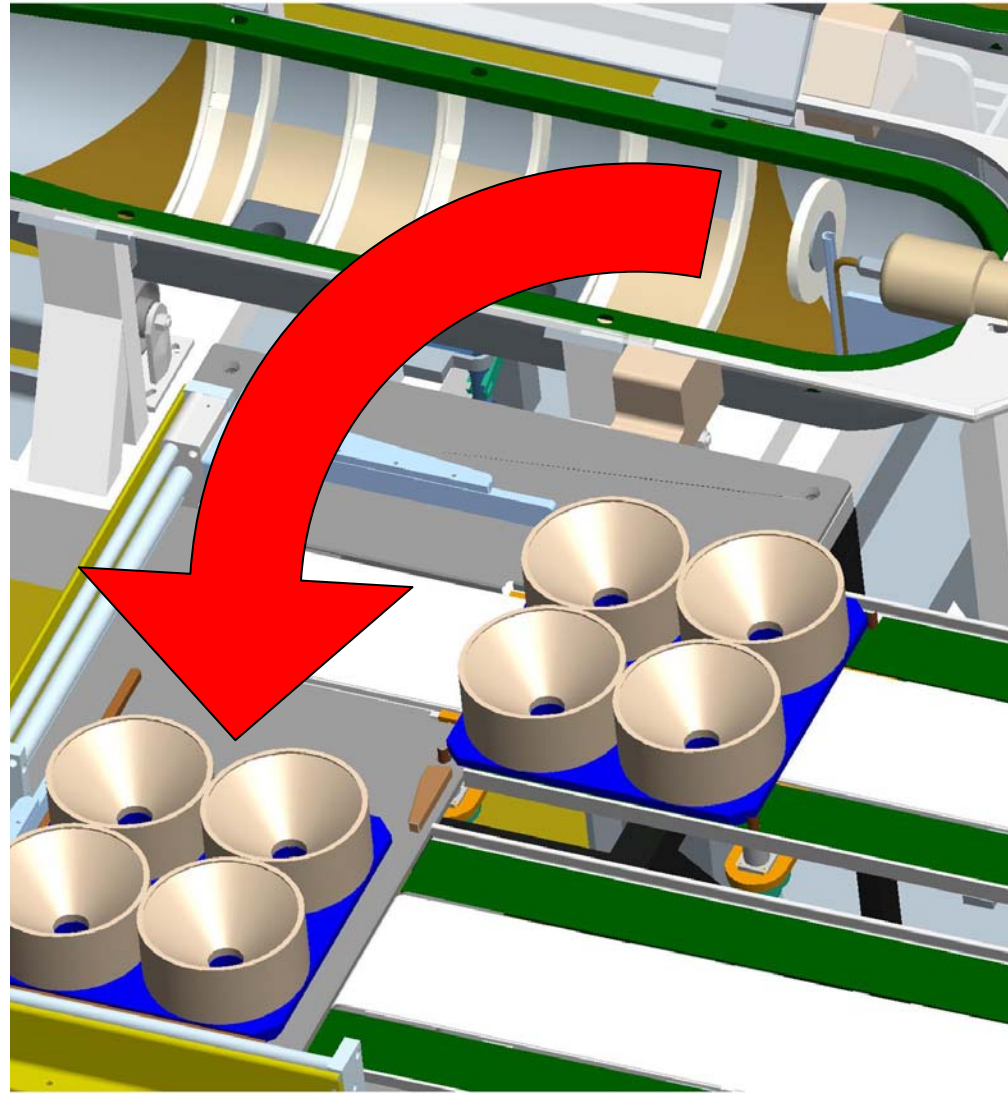
3D Laser Scan of dispenser

1. **The camera box contains a 3D Laser Scanner System, cameras and lights.**

2. **The laser scanner is eye safe and provides cloud data for analysis.**

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Cylindrical and Spherical Data Filters for Data Extraction
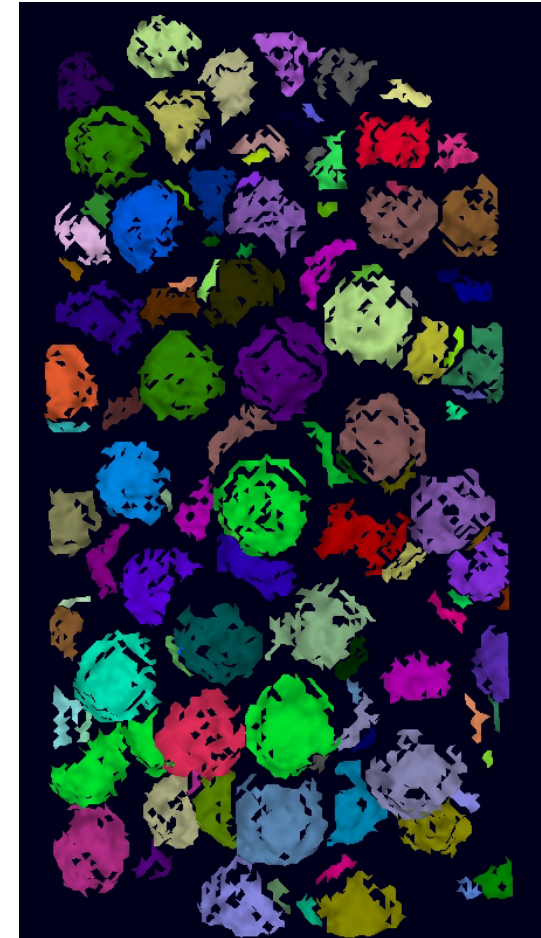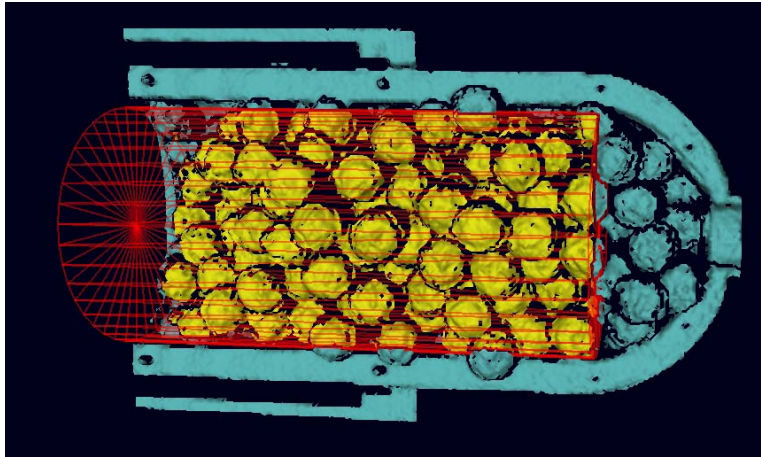
Bomblet Removal Robot

- **Vision system provides x, y, z contact location of next bomblet to remove and dispenser offset location in workcell.**

- **Automated path planning is used to pick up the bomblet based on vision data and bomblet location in dispenser.**

- **Robot places bomblet in one of 4 pallet pockets based on thru beam sensor information**
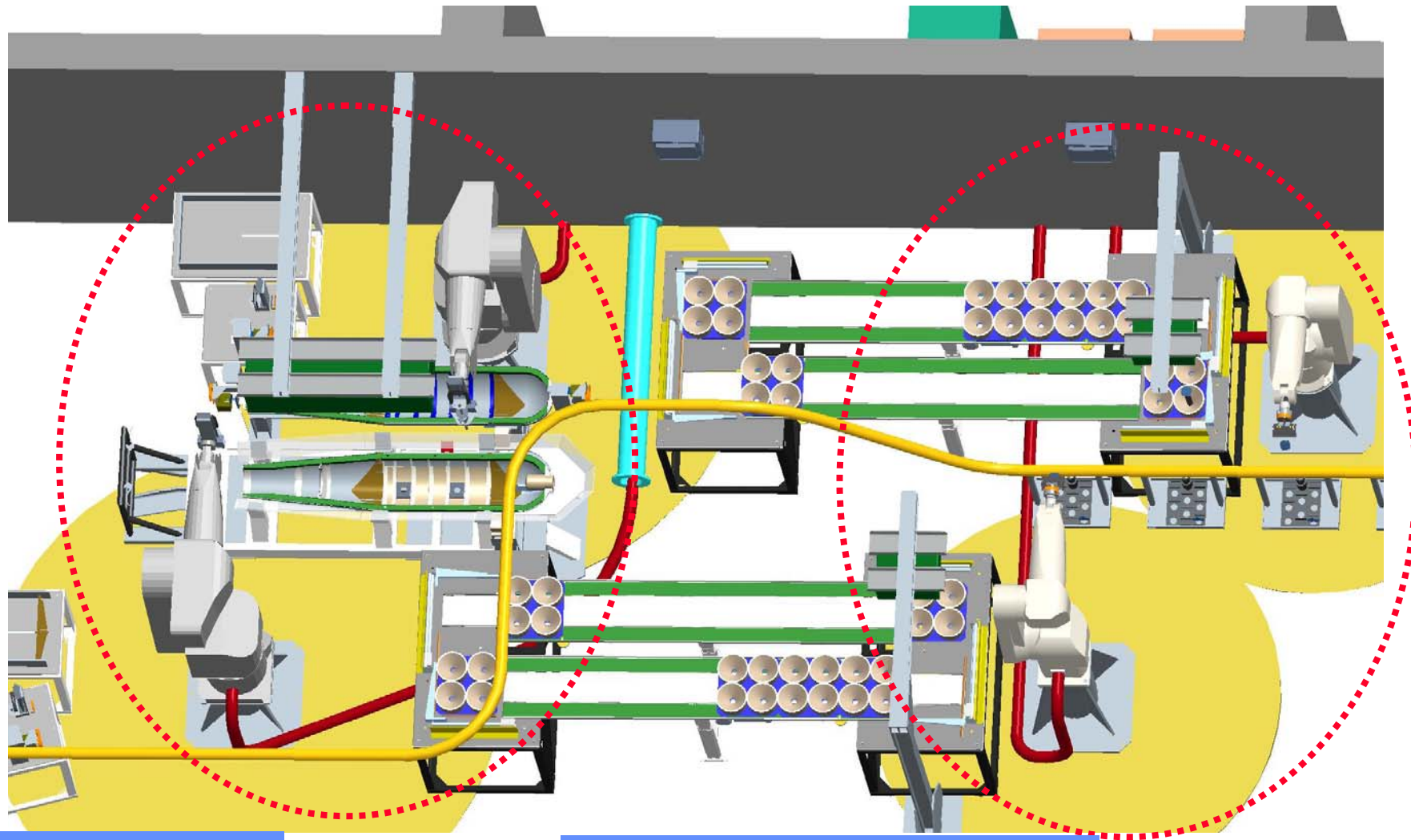
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CBU Unloading Laser Scanner / Robot Integration

CBU Download Workcell
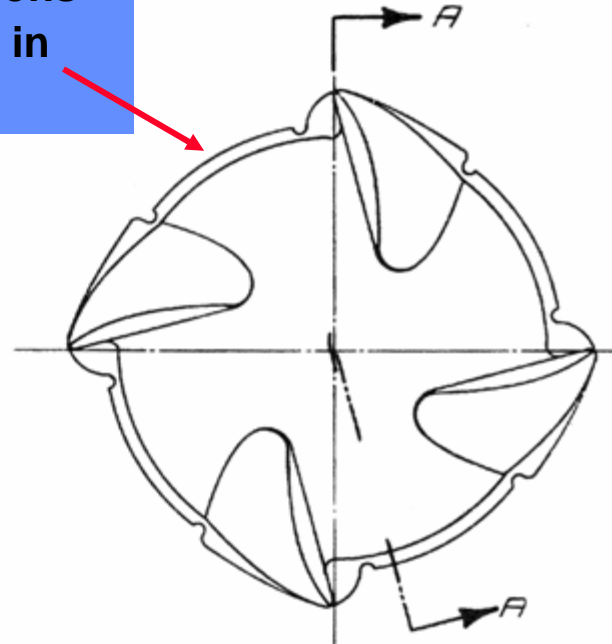

Open dispenser and unload

Orient bomblet and place in Fixture Separation Station

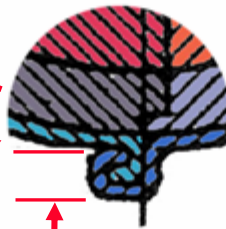Sandia National Laboratories
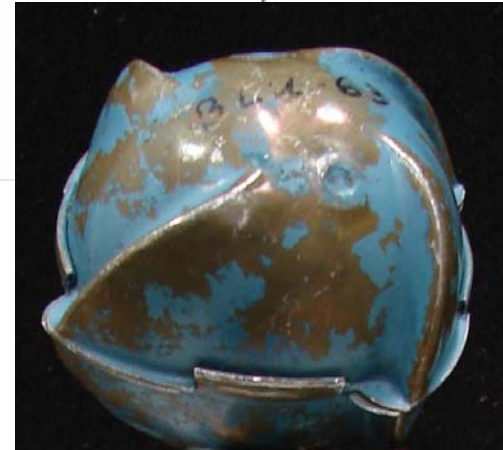
Tab Folding Assembly
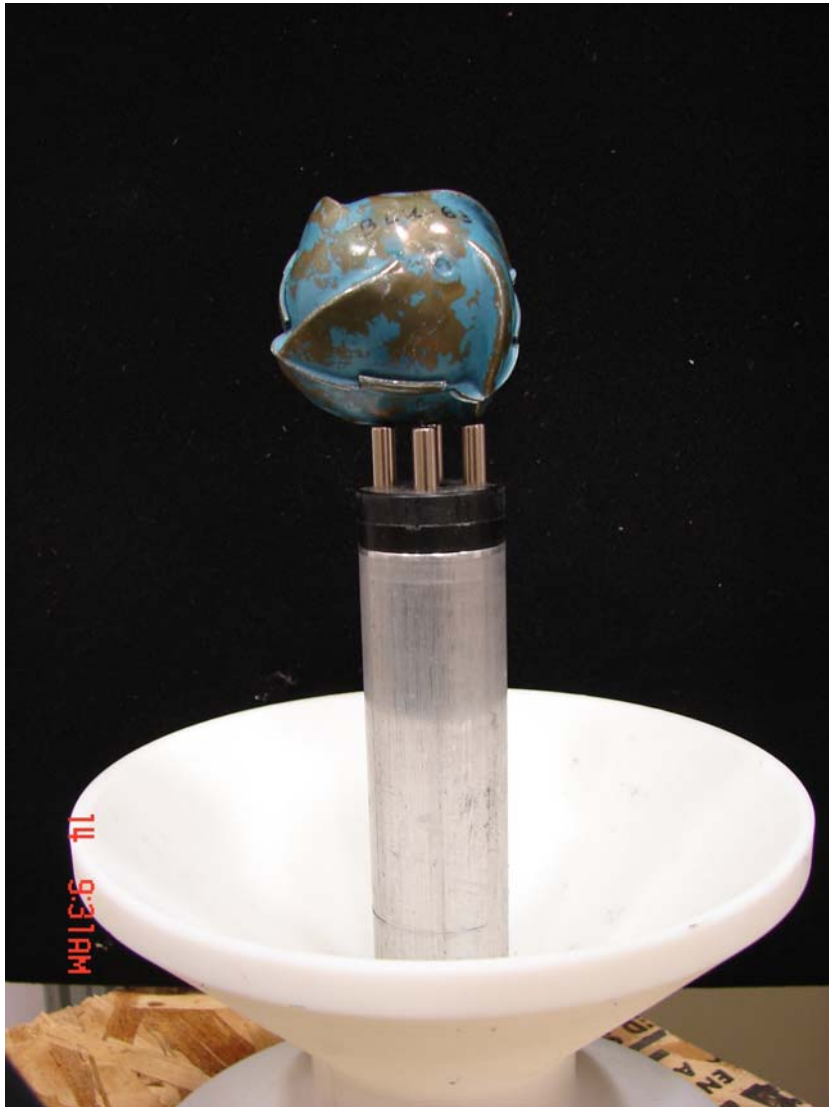
Four tab fold locations approximately 7/8" in length
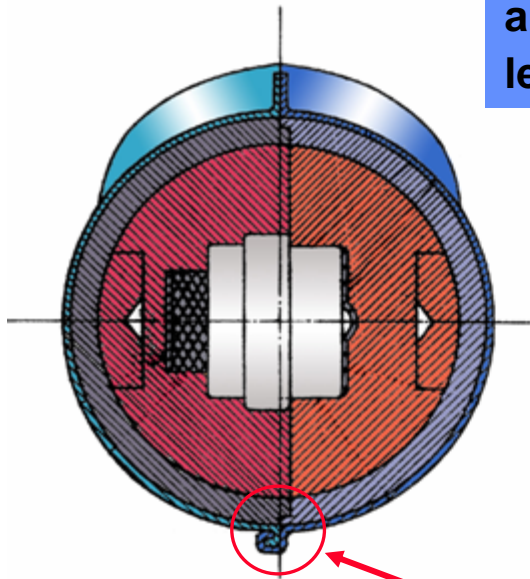
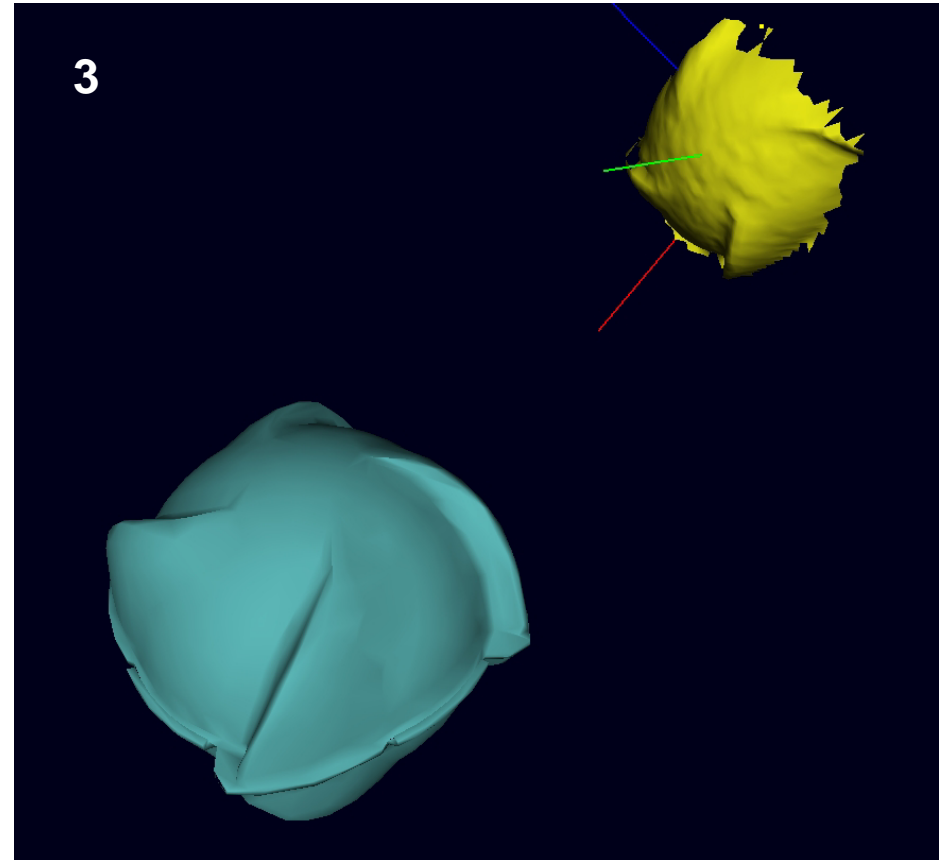Maximum shell thickness is 0.023" and has a maximum yield strength of 34,800 psi.

0.085"

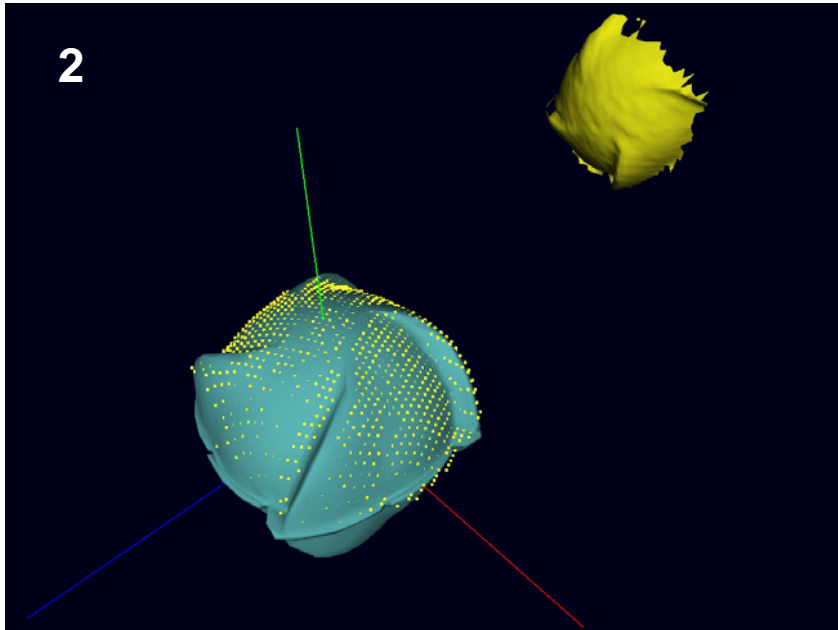Sandia National Laboratories

Raised Positions Are Random and Stable

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Locating & Orienting Bomblet
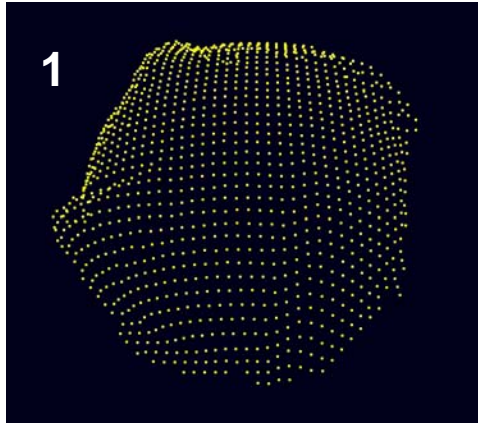
Automated Path Planning for Robot Pick Operation

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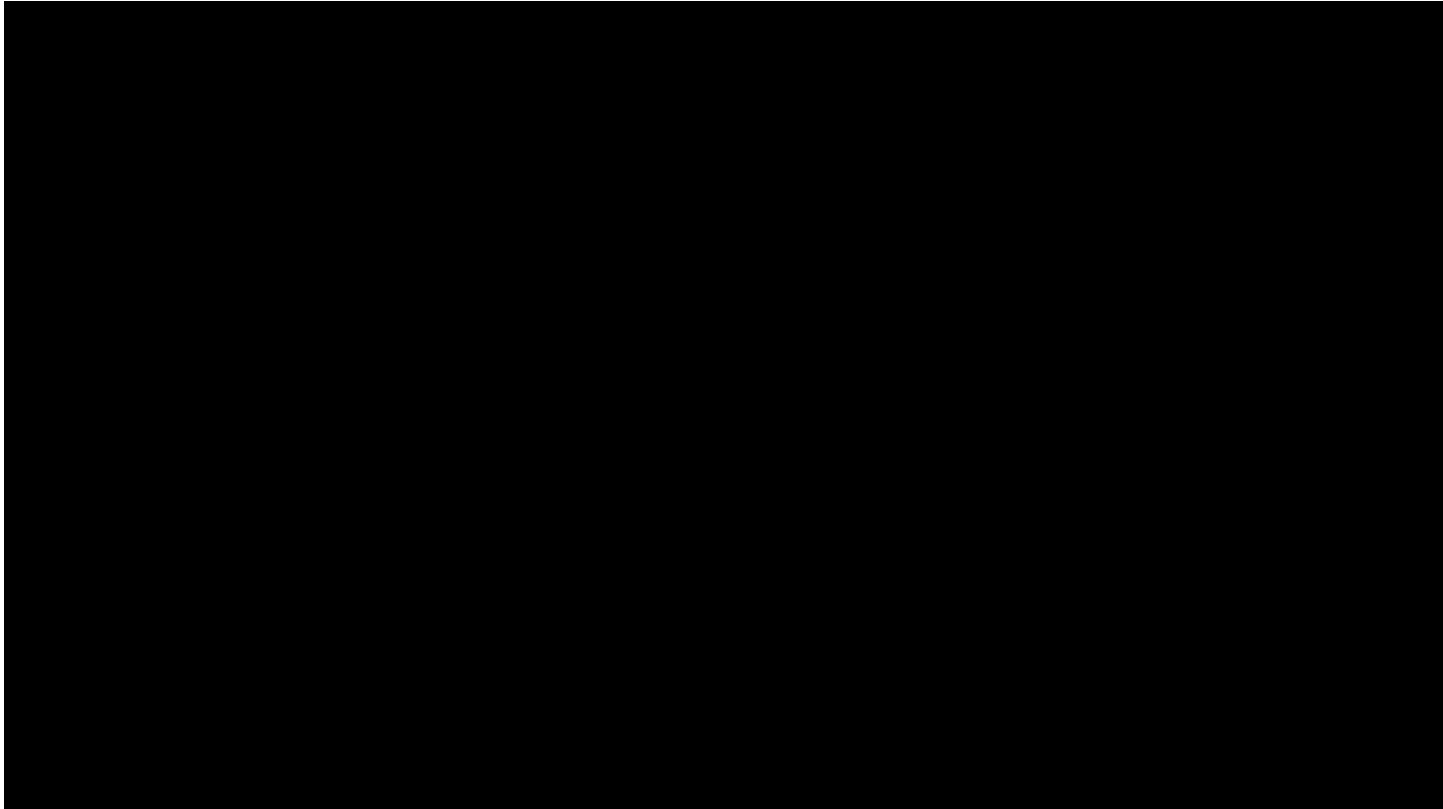# ADAM Projectile Download Workcell

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ADAM Mine and ICM Projectile
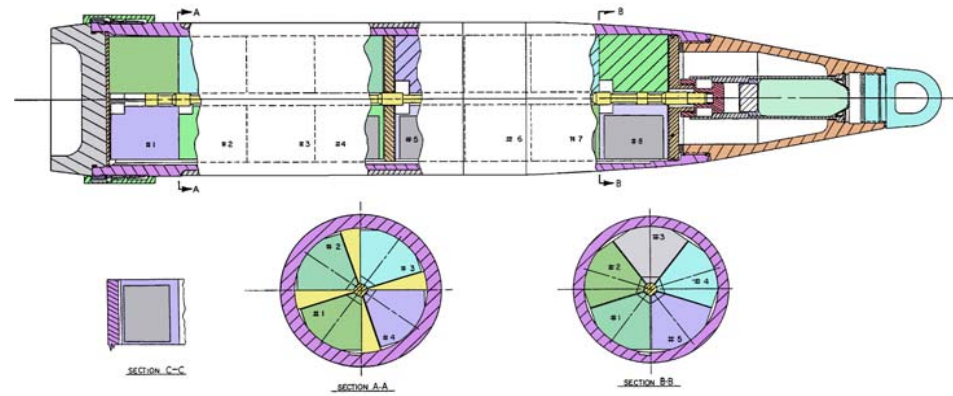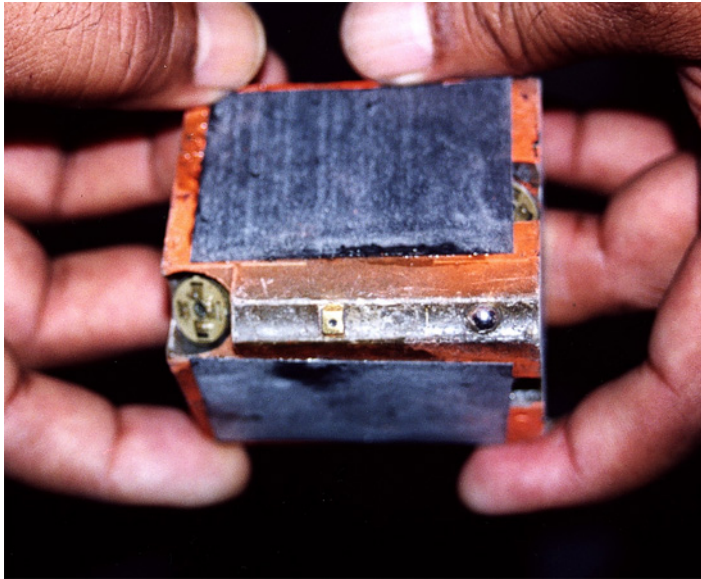
Projectile Download Workcell

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