# Contained Burn - Tactical Demilitarization Demonstration (TaDD)

**R. Robert Hayes**

**El Dorado Engineering, Inc. – May 2007**

# Outline

- Contained Burn Technology
- TaDD Project
  - Design
  - Permitting

# Key Advantages of Contained Burn

- Pollution Control
- Relatively Simple Permitting

# Elements of Contained Burn

- Containment vessel
- Feed system
- Ignition source
- Pollution control system
- Controls

# Pollution Control System

- Tailor system to chemistry of waste
- Gas cooler/cooling air reduces temperature
- Cyclone captures sparks, ash
- Filtration
  - Bag house plus HEPA
  - Wet or dry scrubbing
- Carbon filter
- Fan and stack provide draft

# Recent Applications

- Subscale test unit
- Continuous production units
- Batch unit for tactical rocket motors

# Subscale Test Unit: Batch

# Subscale Test Unit: Batch

# Continuous System: Vessel

# Tactical Rocket Contained Burn

# PROJECT DIVIDED INTO 5 PHASES
## Targeted at Shillelagh Missile

- Phase I: Preliminary Design - Current Contract
- Phase II: Final Design - Current Contract
- Phase III: Install
- Phase IV: Test
- Phase V: Upgrade Surrounding Facilities for Production

# TaDD TEAM

**CLIENT: CRANE NSWC**
**SITE: HWAD – Day and Zimmerman**

- **El Dorado Engineering (EDE)**
  - Design
  - Site safety plan
  - RCRA permit
  - Installation
  - Training

<u>Subcontractors</u>

- **Tetra Tech**
  - Air Permit Assistance
- **Safety Management Services (SMS)**
  - Safety
- **Mangi Environmental**
  - NEPA

# Rocket Motor Study

- Based on calculations of gas generation and burn temperature
  - All motors under 20 lbs. should be feasible
  - Calculations used conservative assumptions
  - All motors under 50 lbs. should be considered
- Larger or multiple tank design might allow 200 lb MLRS disposal

# Rocket Emissions- General

- Double base
  - Burns cleanly
  - Lead compounds filtered efficiently
- Al/AP:
  - $Al_2O_3$: filtered effectively
  - Chlorinated compounds, HCl, removed by wet or dry scrubbing
- Contained burn units permitted as Subpart X, miscellaneous units

# System Elements

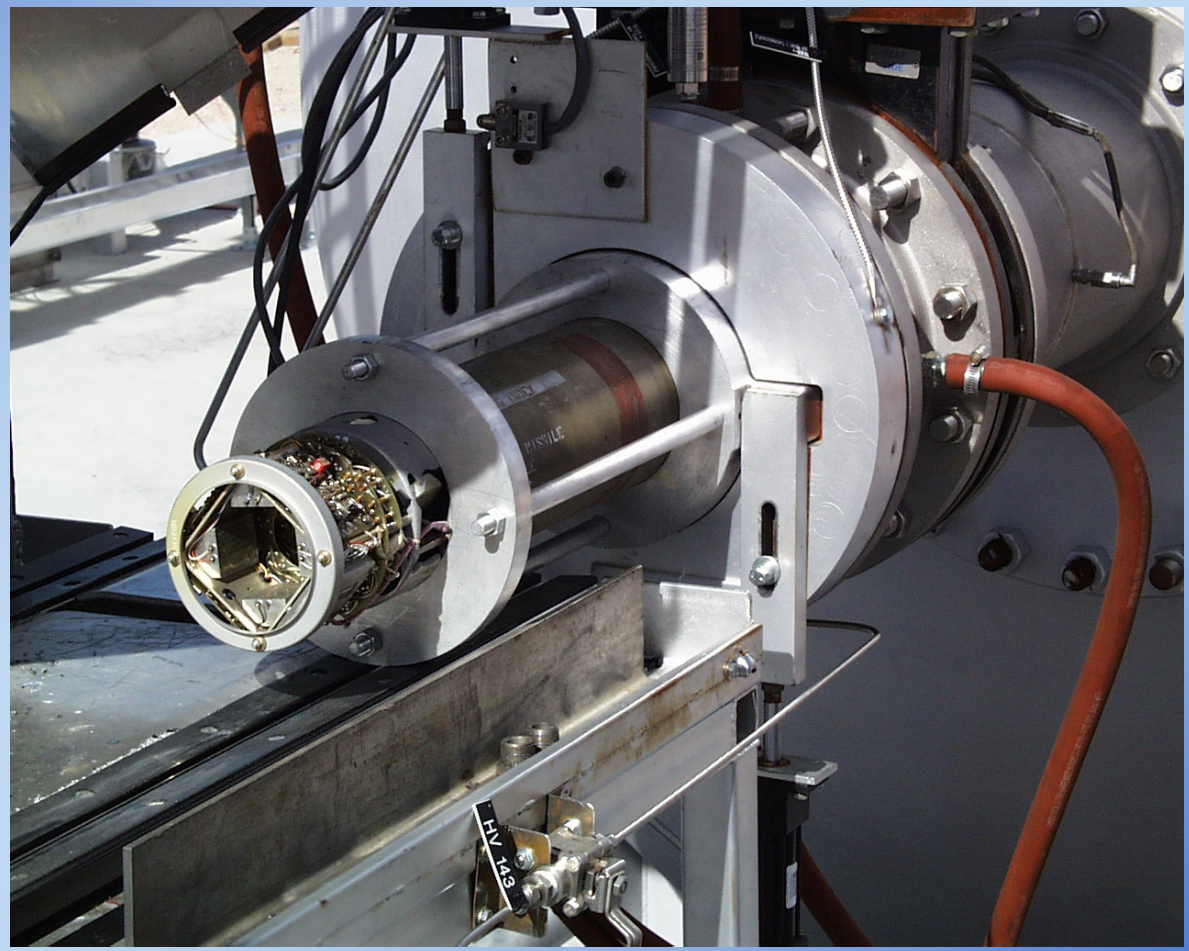
- Storage Areas/Prep. Bays
- RM Feeder/Cooling Chamber with Fume Hood
- Missile Holder
- Gas Conversion Chamber
- Gas Holder
- Baghouse and HEPA filters
- Stack/Fan
- Control Center

# General Process Description

- Rocket Motor Preparation
- Removal/ Installation of Rocket Motor
- Remote Firing
- Pollution Control Sequence

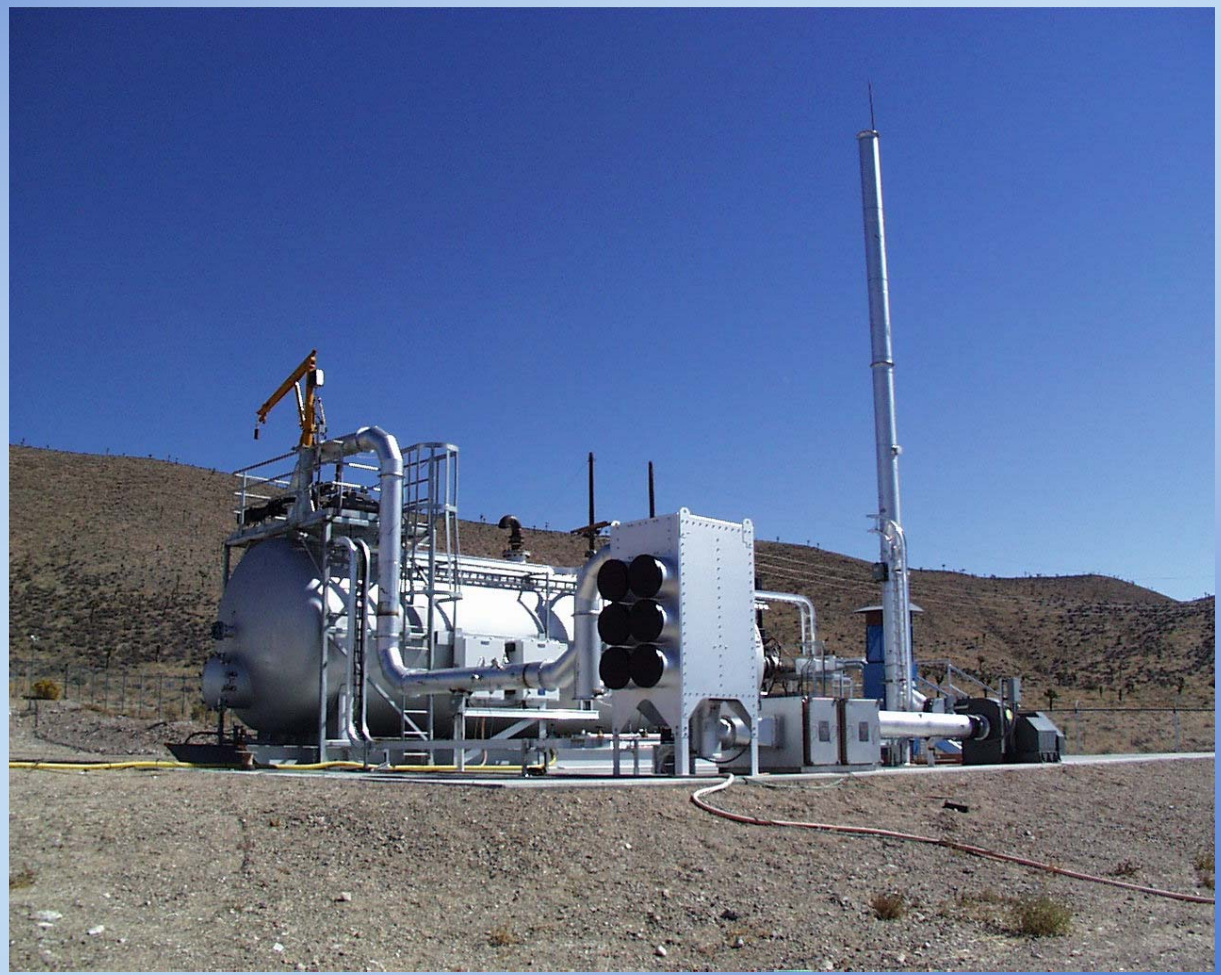
- Target:  40 rockets per 8 hour shift

# Shillelagh Missile in Fixture

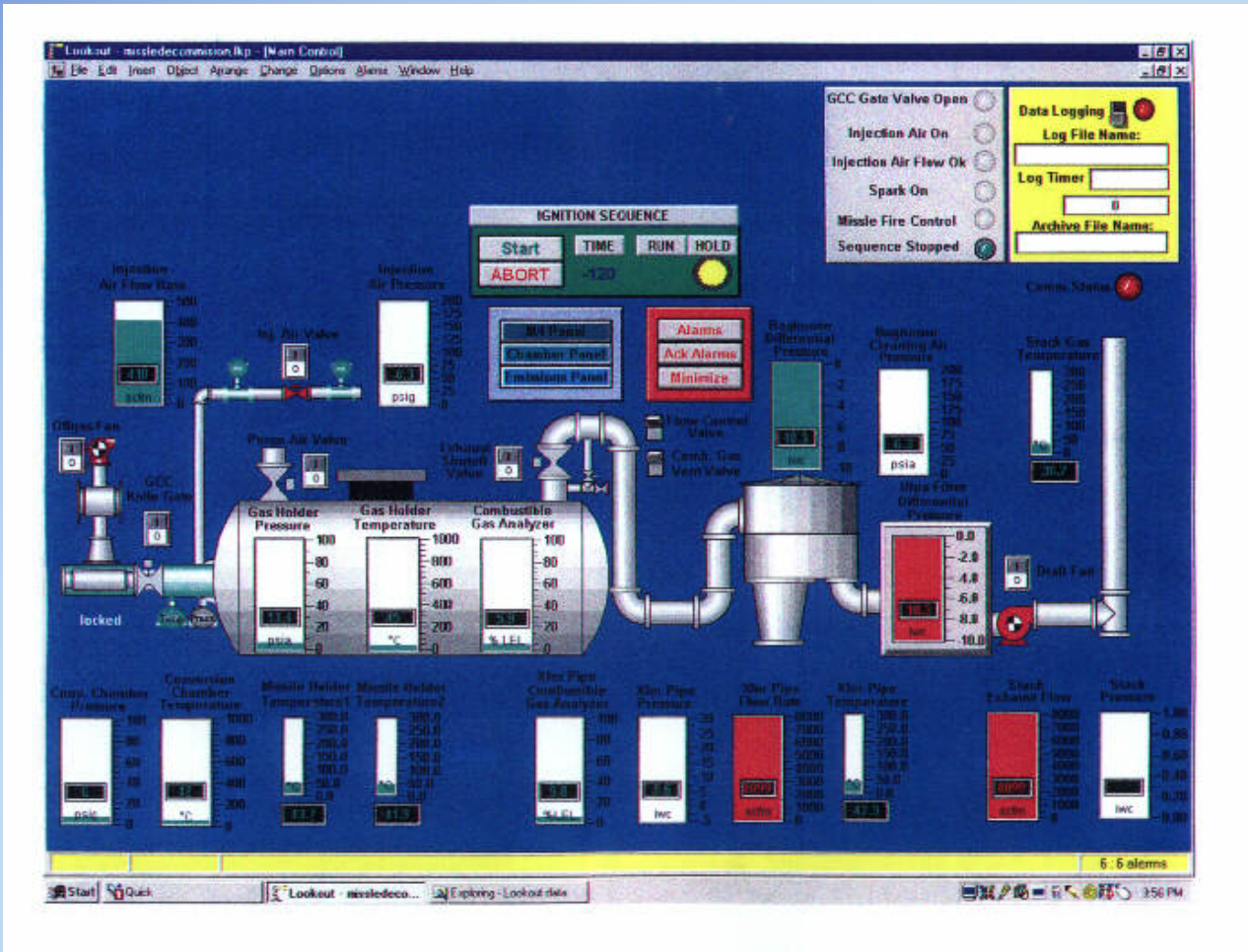


# Valve Retains Rocket Gases

# Gas is Filtered Prior to Stack



# PLC System Controls Batch Unit



# PROGRESS

- Air Permit Complete
- RCRA Permit Complete
- Design Complete
- Site Safety Submittal Complete
- NEPA Complete
- On Time - Under Budget

# PERMITTING

- To date very successful
- General approach – family of double base rocket motors
- Avoided costly tests and analyses

- RCRA
  - Recognized net decrease in emissions
  - Simple Class 2 modification
- Air
  - Demonstrated no net increase of emissions
  - Simple Modification
  - No additional risk assesment or modeling required

# PROJECT DIRECTION

- This project was directed at the Shillelagh
- Funding - Phases III-V currently postponed
- High interest in applicability for MLRS

# POSSIBLE FUTURE MLRS TESTING AT ABERDEEN

# Conclusion

- Contained burn: versatile, inexpensive, proven
  - Air bag propellants
  - Military propellants, explosives
  - Commercial energetic wastes
  - Contaminated trash
- Applicable to smaller and medium sized rocket motors
- Further study and development recommended for larger rockets (MLRS)