

## WHITE PAPER

SAIE-ESO  
6 March 2015

SUBJECT: Camp Minden - Propellant Stabilization

### FACTS:

- Diphenylamine is added during propellant manufacturing to prevent auto-ignition of the nitrocellulose.
- Propellant is tracked by lot numbers. A quantity of propellants, which is manufactured or assembled by one producer under uniform conditions and which is expected to function in a uniform manner, is designated and identified by assignment of a lot number (LOT). All materiel comprising a propellant lot must be homogeneous. A code number is systematically assigned to each LOT at the time of manufacture, assembly or modification that uniquely identifies the particular LOT.
- In a closed, airtight container the stabilizer depletes very slowly. However, every propellant LOT depletes at its own rate as a function of the nitrocellulose production LOT.
- The Army's standard practice is to monitor propellant stability by taking a master sample at time of LOT manufacture and requiring samples of that LOT from various storage sites be sent for analysis.
- The procedures Explo Systems, Inc., used at Minden:
  - Placed mixed propellant LOTs in containers (i.e., bags, boxes, fiber drums), many of which were opened and exposed to weather that will cause the stabilizer to deplete faster.
  - Did not maintain manufacture LOT identity so that a containers may contain propellant grains of different stability levels.
  - Did not create or maintain a homogenous mixture. For a typical limited statistical sampling plan to work a homogenous mixture of propellant grains is needed.

### DISCUSSION:

Although it is possible to implement a propellant stability program for Minden the difficulties associated with doing so are tremendous:

- The lack of homogenous mixtures means each container (bag, box, or drum) needs to be treated as a separate LOT (new LOT); and there are an estimated 150,000 containers at Minden.
- The "level of confidence" that a single grain taken from a LOT would be representative of the entire LOT would be low.
- To increase the level of confidence multiple samples of each new LOT would be have to be taken, or a stabilizer analysis method (e.g., Near Infrared Spectroscopy) that analyzes multiple grains would need to be used.

- Due to the non-homogeneity of the containers, severely depleted propellant can generate local thermal hot spots. Each container would have to be monitored for unusual temperature increases.

#### REASONABLE ASSUMPTIONS:

- The resources required to establish the relative stability of the M6 at Camp Minden will be significant, including personnel, equipment, facilities and expendable supplies.
- Sampling may indicate that some of the propellant has lost stabilizer making continued storage hazardous.
- Procedures for emergency destruction, as well as routine destruction, of propellant that has lost stability will be needed.

#### CONSIDERATIONS:

- The rate of depletion of the stabilizer in the M6 at Camp Minden is unknown.
- If the relative stability of the stabilizer levels of each new LOT is established, they would need to be tested periodically until disposal to establish a stabilizer loss rate and identify each LOT that needs immediate disposal. Re-establishing the stability level of the M6 at Camp Minden may provide additional options for its final disposition, including reuse.

Prepared by: J. C. King, 703-697-5564  
Approved by Hew Wolfe, DASA(ESOH)