NAVSEA
WARFARE CENTERS
Indian Head EOD Technology Division

Energetic Obsolescence Risks

CAD/PAD Industry Summit
October 2015

Log-Line

A variety of ingredients and propellants have been implicated as potential supply risks over the last three years. The Cartridge Actuated Devices / Propellant Actuated Devices (CAD/PAD) Propellant Obsolescence Team has been documenting and quantifying these risks.

Outline

- What makes a risk?
- How do we classify our energetic risks?
- What are some trends that we're seeing?
- What specific issues have we dealt with?
- How can government and industry help each other?

Obsolescence Risks

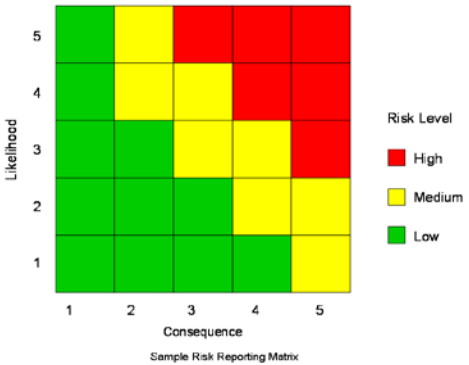
- Material unavailability
  - Supplier(s) goes out of business or decides to stop making material
  - Stockpiles of a material are depleted/deteriorated
  - Raw ingredients become unavailable
- Regulatory
  - Materials are an environmental or health hazard
  - Processes are no longer allowed
- Technical knowledge base depleted
- Overwhelming Expense

Obsolescence Risks

Risks may be identified through many means:

- News articles can warn of:
  - New platform extensions that could affect platform supportability
  - Regulatory changes
- Communication within the cross-functional team and Industry
  - Manufacturing challenges
  - Specification challenges
  - Ingredient availability
  - Supply chain issues
- OSD Critical Energetic Materials Working Group

Defining Risk Scope



- Once a risk is identified, determining its impact is critical
  - How many different items and platforms are affected?
  - What timeframe is available to mitigate the risk?
  - Are there any clear, easy to implement alternatives?

Solutions

- When a change to the risk status of a material is identified, such as a plant closure announcement, parties with known uses for the material are notified
- Options for addressing the problem include:
  - Stockpile the material
  - Develop or qualify a second source for the material
  - Develop or qualify an alternative material
  - Develop or qualify an alternative item
- IDIQ contracts and CRADAs are valuable tools for enacting solutions in partnership with industry

Typical Propellant Replacement Project Structure

- Project Initiation
  - Identify platform needs and possible solution
  - Determine systems requirements and qualification strategy
  - Set up contracts or CRADAs as necessary
- Phase I (Design Feasibility)
  - Develop/Engineer replacement item or material
  - Conduct analyses to support changes (Ballistic, Structural, HERO, etc.)
  - Perform materials tests as necessary to investigate design margins
  - Build and test item at temperature margins, as well as especially high risk environments if needed
  - Identify technical gaps / Hold PDR / Make go-forward decision
- Phase II (Design Verification)
  - Incorporate necessary changes to the design
  - Build and test items using environments to prove out the design changes and lower risk in Qualification
  - Identify technical gaps / Hold CDR / Make go-forward decision
- Phase III (Qualification)
  - Review production process for qualification prior to build
  - Finalize and review qualification test plan
  - Conduct suite of qualification tests to prove out the engineering acceptability of the item for fleet use
  - Design Certification Review / Release to Service

Anecdotal Trends

- Regulatory pressure to lessen environmental impact is increasing, particularly in Europe
- More and more energetic ingredients and materials are only available from Outside CONUS (OCONUS) suppliers.
- Some CONUS suppliers may have reprocessed raw materials that have been purchased from China
- Communication between organizations is still very limited.
- There is growing support within the DoD for addressing energetics obsolescence

REACH

- European Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals
- Defines the health and environmental risk of all chemicals produced, transported, and imported in the European Union. Applies to all EU countries
- Candidate List – contains all chemicals considered as high risks to public safety
- Authorization List – Chemicals banned for production or use within the EU without express authorization
- Restricted List – Chemicals that may be used only within certain rules
- Chemicals are generally at high risk of EPA restriction

Butarez

- Carboxyl Terminated Polybutadiene (CTPB) Binder used in a variety of legacy propellant formulations.
- Last produced at Phillips Chemical Company in 1997
- Most stockpiles have run out or are no longer usable
- The Joint Programs Office has been supporting propellant replacement efforts

Lead Azide

- Used as a detonating compound to initiate secondary explosives in a variety of CAD/PAD items
- Stockpile used for decades has been mostly depleted and is experiencing aging issues
- CONUS and OCONUS suppliers have become available
- European environmental regulations may prevent some CAD devices from being fielded.
- “Green” alternative DBX-1 has been qualified by the Navy. Two efforts to qualify cartridges are underway:
  - JL42 Fire Extinguisher Cartridge
  - ACES II Drogue Severance Assembly

R45M

- Hydroxyl Terminated Polybutadiene Binder material used in Rocket Propellants
- Sole-Source Supplier has added reactors and replaced its wipe-film evaporator
- Material requirements for successful propellant properties are not as well understood as previously thought
- Additional material research and a possible second source are being pursued

Phthalates

- Several phthalates are banned by REACH. EPA restrictions on phthalates have been tightening
- Primarily used as plasticizers in commercial plastic products, but are used in some of our propellants.
- Also used in some PVC components.
- Phthalates most often used in CAD/PAD items:
  - Dibutyl Phthalate (DBP)
  - Di-ethyl Phthalate (DEP)
  - Bis(2-ethylhexyl) phthalate (DEHP)

Other types of risk

Material	Risk / Solution
XU-238	Sole Source, Low demand – Government team is developing synthesis method
Black Mag	Stockpile – Energetic replacement strategy being pursued for affected items
RDX	Sole Source – One domestic source remains; OSD is pursuing mitigations
Lead Styphnate	Regulation – A “green” replacement has been developed and can be introduced to affected items
HNS	Sole/Foreign Source – Updating Specification and investigating 2nd Sources

Specifications

- Out of date specifications can negatively affect supply of usable material
  - Obsolete Tests
  - Extraneous or redundant requirements (overspecification)
  - Under-specification
- Some efforts are underway to revise material specifications
  - HNS
  - R45M

Communication

- Government and Industry need to work together to make sure that problems are identified early enough to prevent acquisition issues.
- Regular communication is recommended to help address individual issues. We have already implemented this in some cases.
- Government and Industry can jointly develop solutions to obsolescence issues.
- A quarterly telecon with industry is proposed to foster communication between the CAD/PAD office and interested parties.

CAD/PAD Technology Roadmap