

The leading international partner for Explosives and Propellants

IM Melt Cast Compositions Based on NTO



2010 IMEMTS, October 11-14<sup>th</sup>, 2010, Munich, Germany

#### Unique Know-How, Multifaceted Range





The leading international partner for Explosives and Propellants



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#### **Presentation Outline**

- Introduction
- •Strategy
- Development Work
  - Ontalites
  - Aluminized Ontalites
- Conclusions



#### IM Melt Cast Compositions based on NTO Introduction





#### The hazards exhibited by Ammunition have been illustrated over the decades by Ammunition accidents

#### Camp DOHA

On July 11th, 1991, a defective heater in M992 ammunition carrier loaded with 155mm artillery shells caught on fire 56 soldiers wounded

102 combat vehicles destroyed (Included 4 M1A1 tanks)20 buildings damaged14 millions\$ of munitions destroyed

there is a need for safer Ammunition, that is why:

The drive towards Insensitive Munitions is an increasing priority especially in the NATO countries

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## One of the keys to get Insensitive Munitions is to work on the Explosive and its Formulation



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### Work on the Explosive or its Formulation

use of less sensitive Nitramines -I-RDX<sup>®</sup> (RS-RDX) or RS-HMX

use of less sensitive Explosives

-TATB (Triamino Trinitro Benzene) -NTO (3-Nitro-1,2,4 Triazol 5-one) -FOX 7 (1,1-Diamino 2,2-Dinitroethylene) -FOX 12 (N-Guanylurea Dinitramide)

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#### Work on the Explosive or its Formulation



Cast cured Melt cast Pressed

depending applications and available means.

There is a need to develop IM Melt Cast compositions

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# Solution depending the ammunition and its application



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## Main Requirements to be taken into account:







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#### Solution Cast compositions based on NTO

#### Two main families:



#### NTO/TNT/Al/Wax (Aluminized Ontalites)

Replacement product for Tritonal; higher critical diameters than Ontalites

Adapted formulations have been studied in order either to decrease the critical diameter and/or tailor (improve...) the performance

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#### **∜**Ontalites

**Detonation velocity** 

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#### Performance (as determined by CHEETAH computation)



Series Performance improved by 7 NTO content or partial replacement of NTO by RDX

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#### **∜**Ontalites

#### **Functional characteristics**

#### **Critical diameter**

Composition	Critical	
	Diameter (mm)	
NTO/TNT 65/35	20-25	
	(d=1.78)	
NTO/TNT/RDX 60/35/5	15-20	
	(d=1.79)	
NTO/TNT/RDX 55/35/10	15-20	
	(d=1.79)	

## Partial replacement of NTO by RDX leads to reduced critical diameter

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#### **Solution**

#### Sensitivity characteristics

Characterization as EIDS according to AOP 39

Сар	No detonation
GAP	No go at 70 mm
Susan	Pressure < 27 kPa
Friability	dP/dt < 15 MPa/ms
Bullet impact	No explosion
External fire	No violent reaction
Slow cook off	No fragment throw

Stand Composition B do not pass most or all EIDS requirements

Solutions of the second second

Scompositions with RDX added expected to pass (to be confirmed)

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#### Soluminized Ontalites



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#### Solution Aluminized Ontalites

**Detonation velocity** 

Performance (as determined by CHEETAH computation)



Series Performance improved by partial replacement of NTO by RDX

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IM Melt Cast Compositions based on NTO Aluminized Ontalites



#### **Functional characteristics**

#### **Critical diameter**

Composition	Critical
	Diameter (mm)
NTO/TNT/Al/Wax 40/30/20/10	51-63
	(d=1.71)
NTO/TNT/RDX/AI/Wax 34/30/6/20/10	45-50
	(d=1.70)
NTO/TNT/RDX/AI/Wax 28/30/12/20/10	40-45
	(d=1.71)



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## Partial replacement of NTO by RDX leads to reduced critical diameter

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#### Solution Aluminized Ontalites

Sensitivity characteristics

Characterization as EIDS according to AOP 39

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STNT, Composition B and Tritonal do not pass most or all EIDS requirements

Aluminized Ontalite has been proved to fulfill EIDS requirements

Compositions with RDX added expected to pass (to be confirmed)

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#### Conclusions

Based on available Explosives and processing technologies, standard formulations may be replaced by adapted Insensitive ones.

Melt cast technology with NTO as main explosive offer attractive solutions.

Service Formulations may be tailored to the application, either in performance or in insensitivity. Addition to some extent of Nitramine has been shown to be effective, and allows compromises.

Source were described as the set of the set



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### -C. COLLET from SME

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### Thank you very much for your attention

## **Questions ?**

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