



MINISTÈRE DE LA DÉFENSE

IMEMTS

Interest and cost of the Muratisation of munitions of the French Army

April 24-28, 2006

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DÉLÉGATION GÉNÉRALE POUR L'ARMEMENT



Outline

- Introduction
- Principles of the cost benefit analysis
- Muratisation of generic munitions
- Lifecycle
- Assessment of the consequences
- Trends
- Conclusion



Purpose

- General purpose : to run an analysis on the interest but also the costs associated to the Muratisation of the munitions of the French Army :
 - taking into account the operational needs as well as the user constraints,
 - likely to point out orientations for a future national doctrine together with the main actors : EMAT, DCMAT, STAT, DGA(SASF, SPART, DET, IPE), IMEMG, MSIAC
- Particular purpose of the presentation : to present the methodology used to run cost benefit analysis



Principles of the Cost-Benefits analysis

- This analysis consists in solving an economical equation including :
 - Whole lifecycle for each type of munitions,
 - Intrinsic costs related to these munitions,
 - Risks encountered at each step of the lifecycle,
 - Financial consequences potentially related to a reaction of ammunitions within their operational environment :
Human & equipment damages
 - Comparison between « reference » and « Murat » ammunitions.

« *Costs/benefits = Intrinsic savings + Potential savings - Costs* »

Muratisation of generic munitions


- Muratisation assessments based on :
 - Estimated signature of existing munitions,
 - State of the art of « MURAT » technologies

Famille xxx

Detailed description of Munition

- Propulsive charge : propellant, case, ignitor, etc.
- Military warhead : high explosive, architecture, etc.
- Logistical case : type (G21...), materials, thickness, parois, walls

Identification of the munition



Murat technologies

- Energetic materials
- Architecture of munition
- Packing

	INCENDIE	ECHAUFFEMENT LENT	IMPACT DE BALLE	REACTION PAR INFLUENCE	ECLAT LEGER	ECLAT LOURD	IMPACT CC
NR							
V	P		P		P		
IV							
III	T	T	T	T		P	P
II	T	T	T	T			
I	T	T	T	T			

Signature Munition « Réf »
(Example as an indication)

	INCENDIE	ECHAUFFEMENT LENT	IMPACT DE BALLE	REACTION PAR INFLUENCE	ECLAT LEGER	ECLAT LOURD	IMPACT CC
NR							
V	P	T	P _t		P _t		
IV	T						
III	T	P	T	C	P _t	P _t	
II	T	T	T	P			
I	T	T	T	P			

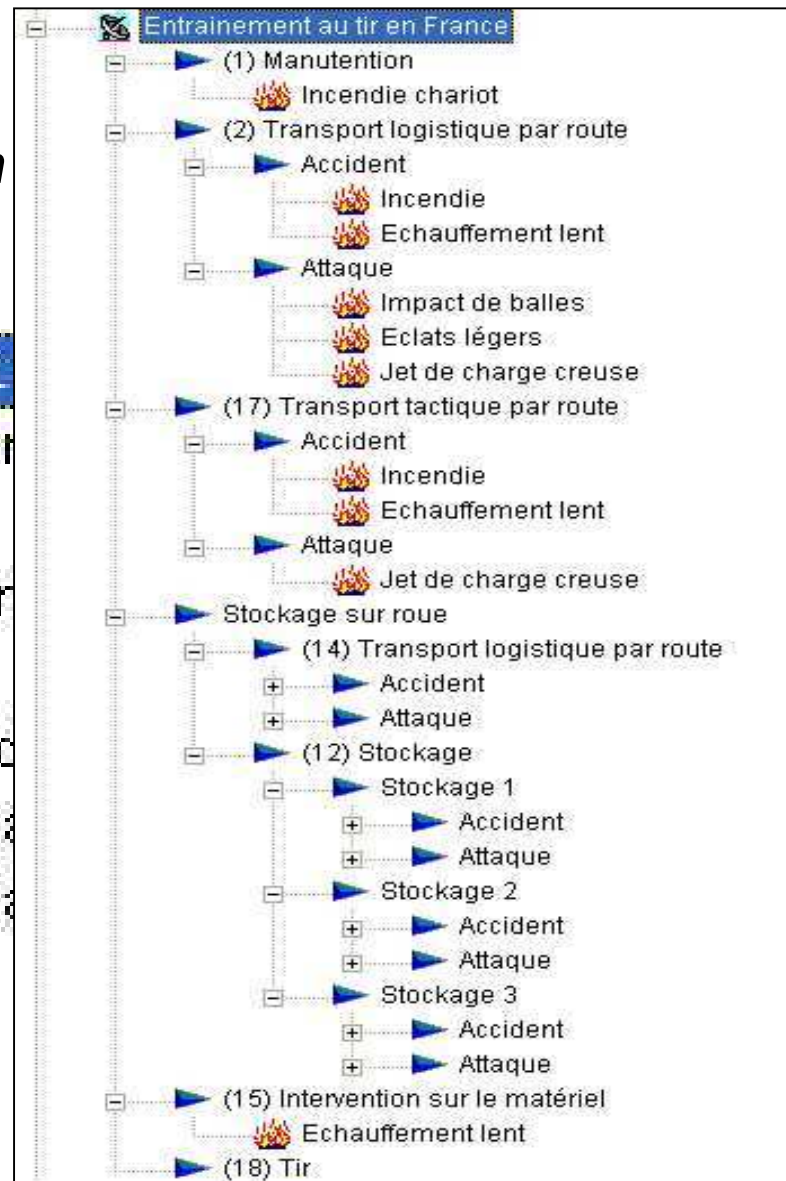
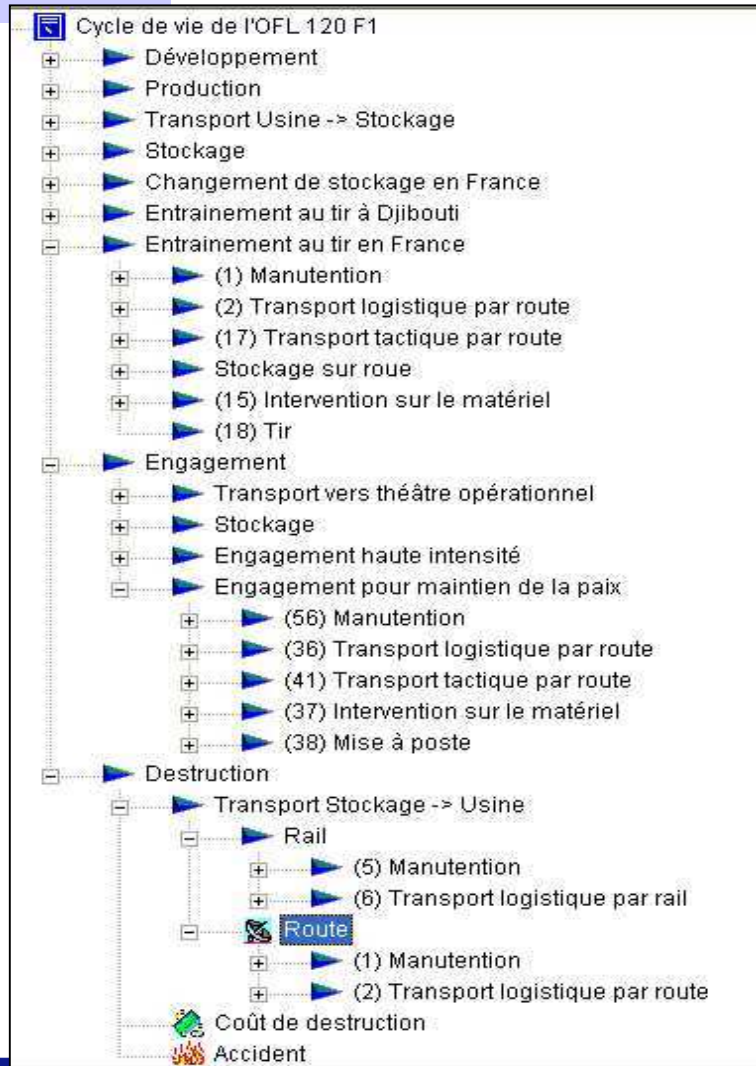
Signature MURAT « Warhead MURAT »
(Example as an indication)

	INCENDIE	ECHAUFFEMENT LENT	IMPACT DE BALLE	REACTION PAR INFLUENCE	ECLAT LEGER	ECLAT LOURD	IMPACT CC
NR							
V	P	T	P _t		P _t		
IV	T	P					
III	T	P	P _t	C	P _t	P _t	
II	T	T	T	P			
I	T	T	T	P			

Signature MURAT « Propellant + warhead MURAT »
(Example as an indication)



Lifecycle



Assumptions on occurrences

- Using international databases :
 - related to « accidents » and « attacks »,
 - adapted to the operational context.

ACCIDENT : Les hypothèses pour la synthèse des risques

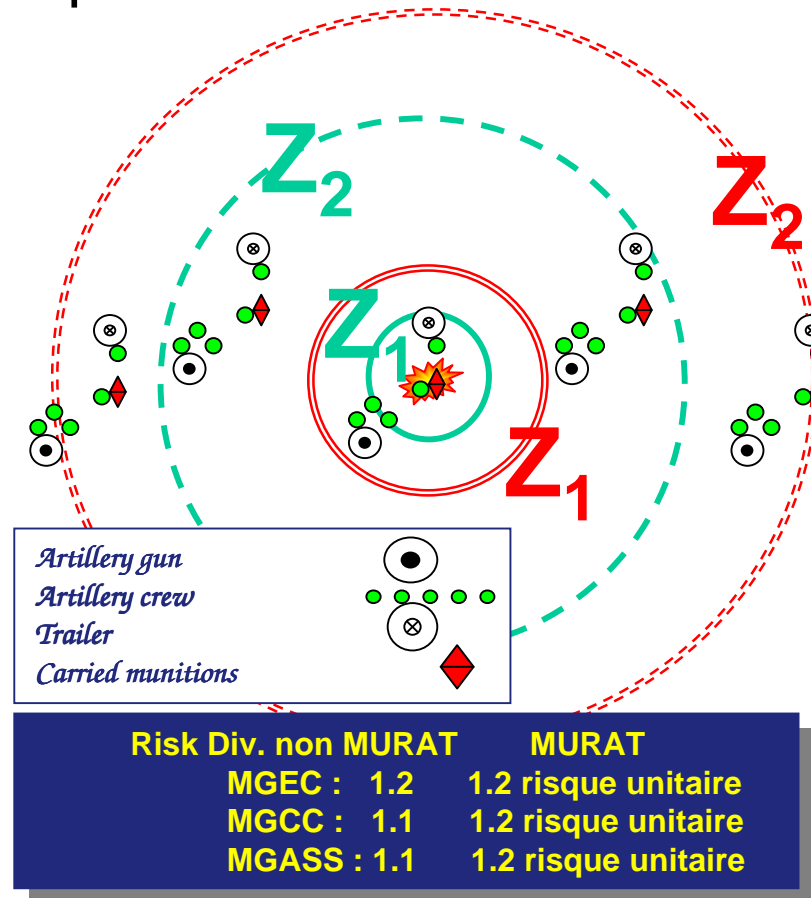
Catégorie	Risque	Description	Détail	Unité	Probabilité de l'événement			
					France	Djibouti	TOE	Combat
Stockage	Accident	Feu	munitions	/an	2,00E-05	6,00E-05	2,00E-04	2,00E-04
		Echauffement lent	échauffement proche	/an	2,00E-05	6,00E-05	2,00E-04	2,00E-04
		Transit	feux adjacents (bateau)	/an	/	1,00E-06	1,00E-06	/
			Temporaire	/an /site	3,00E-05	/	/	/
Transport	Route	Echauffement lent	échauffement proche	/an /vhl	1,00E-02	3,00E-02	1,00E-01	1,00E-01
	Accident	Accident de la route	camion et feu	/km /vhl	5,00E-08	1,50E-07	5,00E-07	5,00E-07
	Rail	Accident de train	train et feu	/km /train	5,00E-09	/	/	/
	Bateau	Feu de bateau	apparition de feu	/ traversée	/	2,00E-08	2,00E-08	/
Manipulation	Chargement	Accident	chariot élévateur et feu	/an	7,00E-04	2,10E-03	7,00E-03	7,00E-03
	Accident	chargement		/an	1,00E-04	1,00E-04	1,00E-03	1,00E-03
Production	Fabrication			/an	3,00E-03	/	/	/
Démilitarisation	Destruction			/an	3,00E-03	/	/	/

ATAQUE : Les hypothèses pour la synthèse des risques

Catégorie	Risque	Description	Détail	Unité	Probabilité de l'événement			
					France	Djibouti	TOE	Combat
Stockage	Attaque	Impact de balle	grosse balle	/an	1,00E-06	1,00E-05	1,00E-04	/
		Impact de fragment	grenade	/an	1,00E-06	1,00E-05	1,00E-04	/
			missiles/bombes	/an	/	/	3,00E-04	/
		Charge creuse	RPG (< 84-mm)	/an	1,00E-06	/	1,00E-04	/
Transport	Route	Impact de balle	grosse balle	/an	1,00E-06	1,00E-05	1,00E-04	/
	Bateau	Attaque		/traversée	/	4,00E-06	4,00E-06	/
	Attaque	Impact de fragment	grenade	/an	1,00E-06	1,00E-05	1,00E-04	/
			missiles/bombes	/an	/	/	3,00E-04	/
Charge creuse		RPG (~ 50-mm)	/an	1,00E-08	1,00E-07	1,00E-06	/	
		RPG (< 84-mm)	/an	1,00E-07	1,00E-07	1,00E-05	1,00E-04	

Assessment of the consequences after an aggression on munition

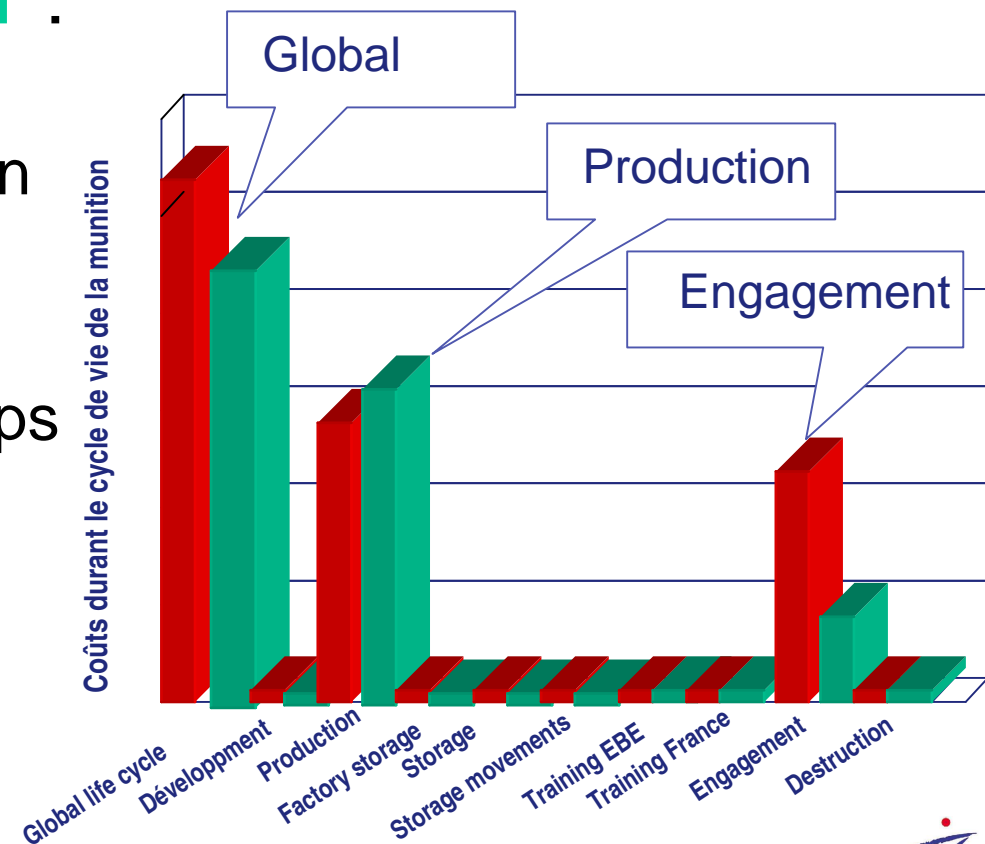
- Engagement phase





Results (Example for information)

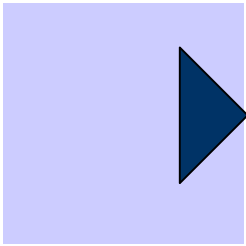
- Comparative analysis of final costs between **non MURAT** & **MURAT** :
 - Final evaluation for the whole ammunition lifecycle
 - Distribution of costs between the various steps of the life cycle





Trends

- Applicable on the four generic ammunitions (OFL 120, OE/OECC 120, OE 155, ERYX missile) & on the basis of the agreed assumptions :
 - « Production » and « Engagement » phases are predominant in the final costs assessments,
 - Potential benefits due to MURATISATION during engagement phase are significant enough to :
 - compensate the production costs and even balance the costs & benefits.



Trends

- Sensitivity studies show :

- that equilibrium point depends on key data (like probabilities of occurrences)
- what are the important sources of cost
- which is the relative part of each risk on the final cost

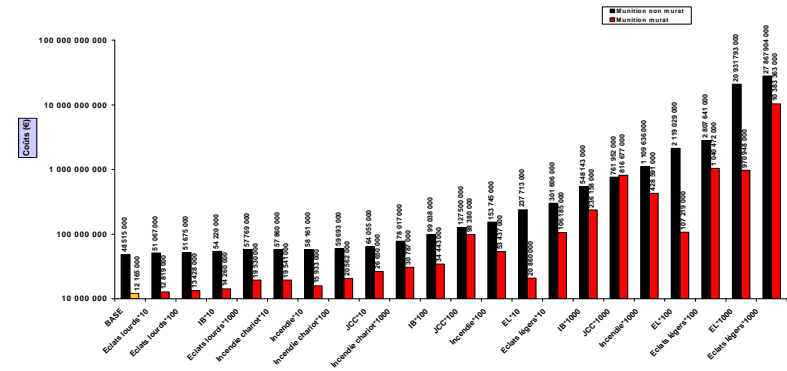


Figure 3 : impact of the risk probability on cost of the engagement phase for the ERYX anti tank missile

Graphe 4-1 : Importance des sous-phases en Engagement

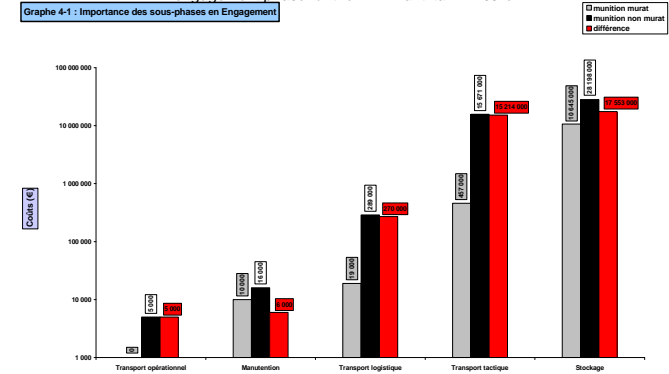


Figure 4 : influence of each situation on engagement cost for the ERYX anti tank missile

Graphe 5-1 : Importance des différentes agressions en Engagement

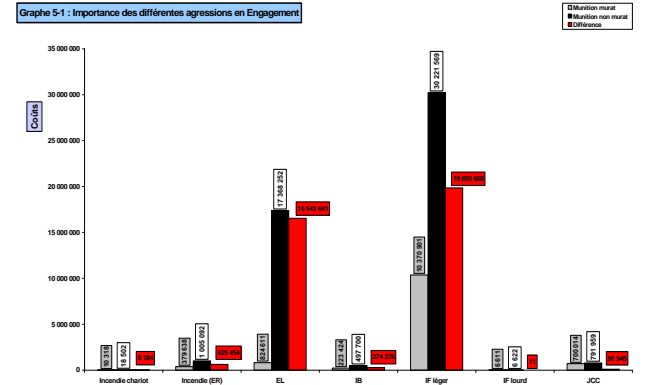


Figure 5 : relative part of the different aggressions or accident on the engagement cost for the ERYX missile



Conclusions and outlooks

- Defining priorities among munitions to be muratised appears potentially fruitful if based on cost-benefits criteria,
- Adapting the MURAT signatures to the effective threats encountered by munitions within operational environments would lead to substantial reductions of costs.



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