



Toward New French IM General Purpose bombs

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(a) EURENCO
(b) SAMP
(c) DGA

UNIQUE KNOW-HOW



MULTIFACETED RANGE

1. NEW CONCEPTS : GP-B, IM-B, ILCD-B

2. IM ASSESSMENT (IM-B)

1. Sympathetic Detonation
2. Fast Cook-off
3. Slow Cook-off

3. IM SIGNATURE

1. NEW CONCEPTS : GP-B, IM-B, ILCD-B

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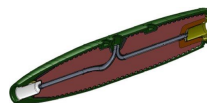
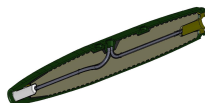
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New concepts general architecture

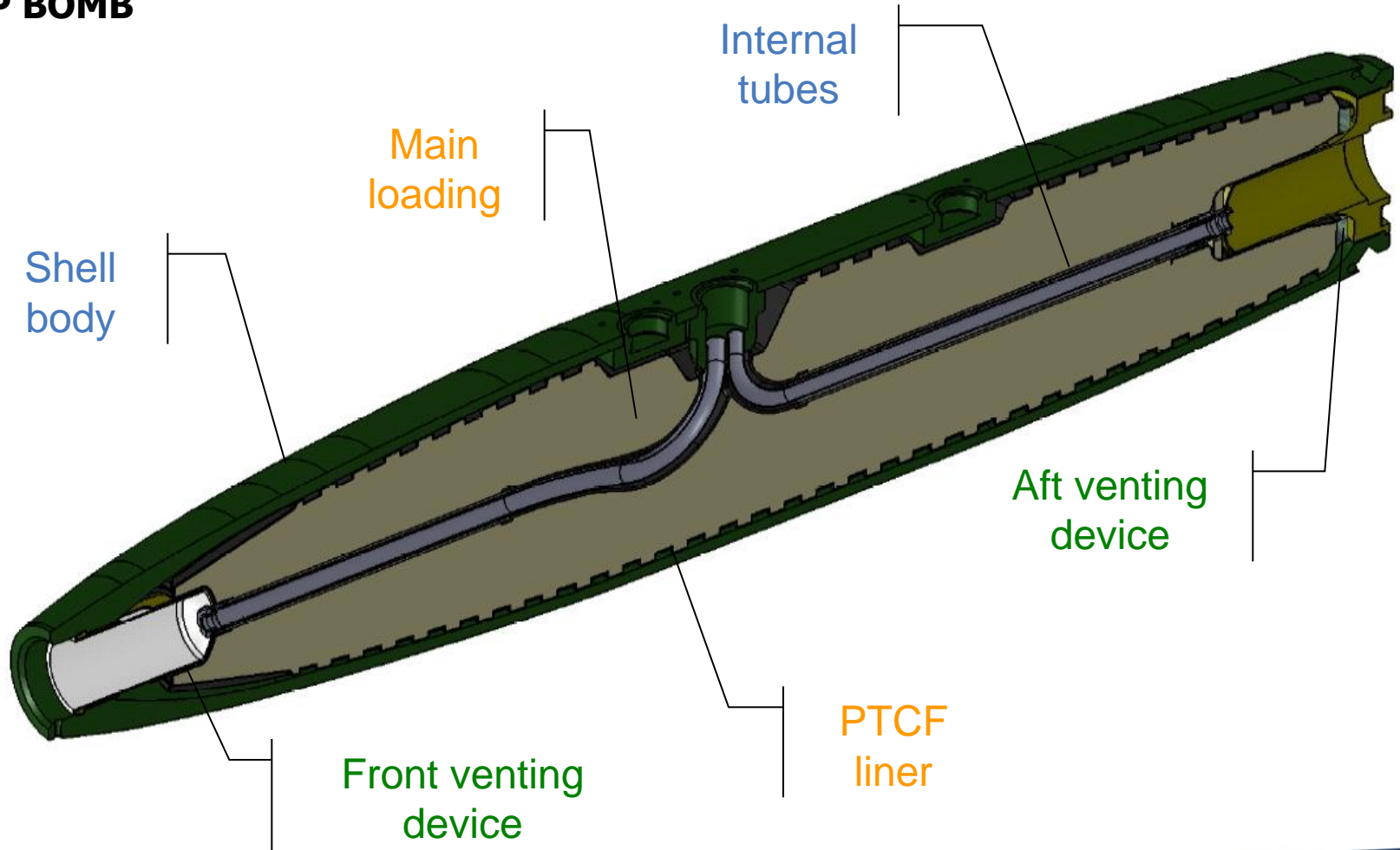
- **Bomb body dimensions and weights meet AOP-12/MK-82 requirements**
- **Intumescent painting (IM and ILCD-B)**
- **Venting devices**
- **PTCF liner**
- **Explosive loading**



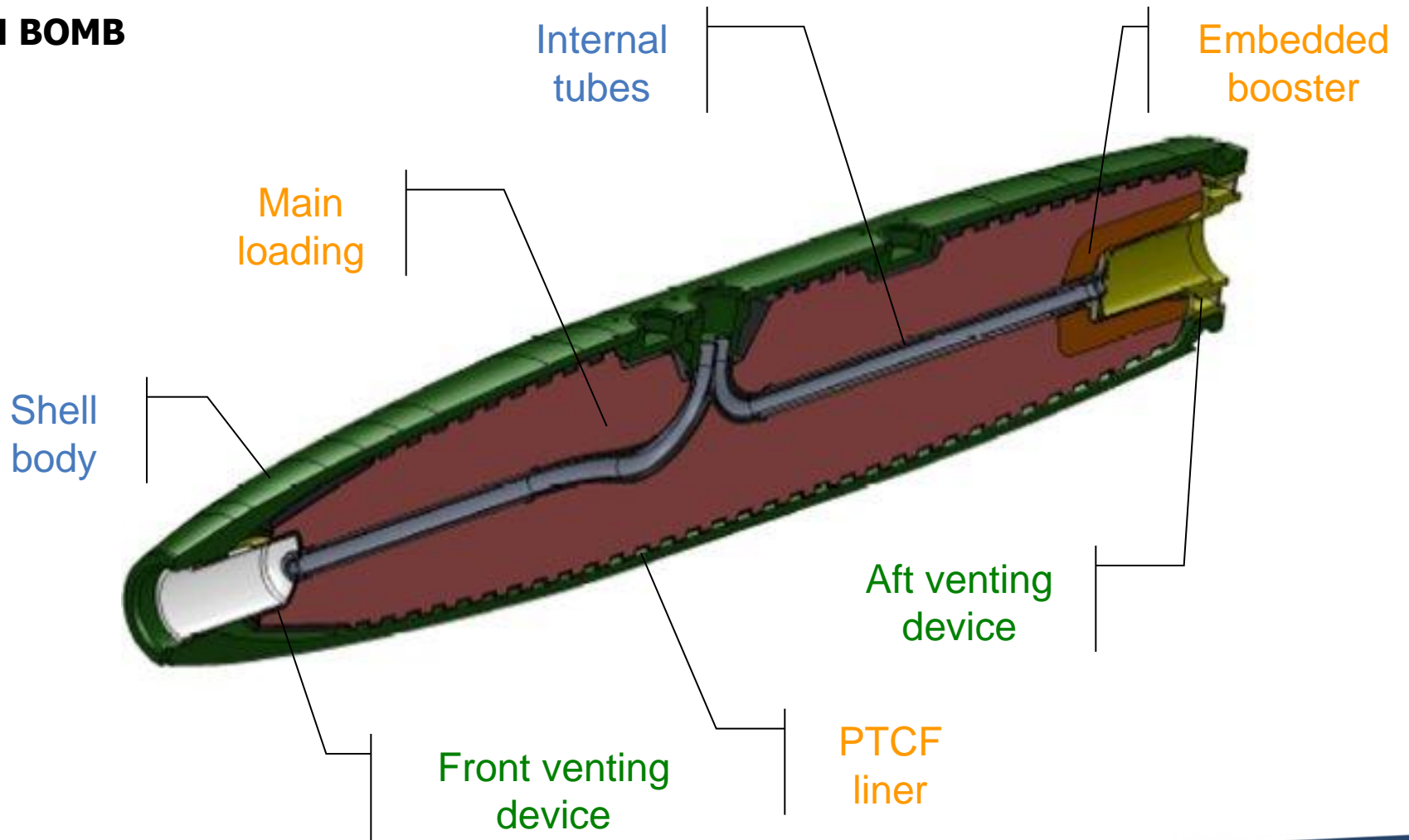


	GP-B	IM-B	ILCD-B
Main Filling	B2258B	B2268A	B2274A
Main Ingredients	RDX/AP/AI/HTPB	RDX/NTO/AI/HTPB	RDX/AI/HTPB
Embedded Booster	/	B2273A	B2273A
Main Ingredients	/	HMX/HTPB	HMX/HTPB

GP BOMB



IM BOMB

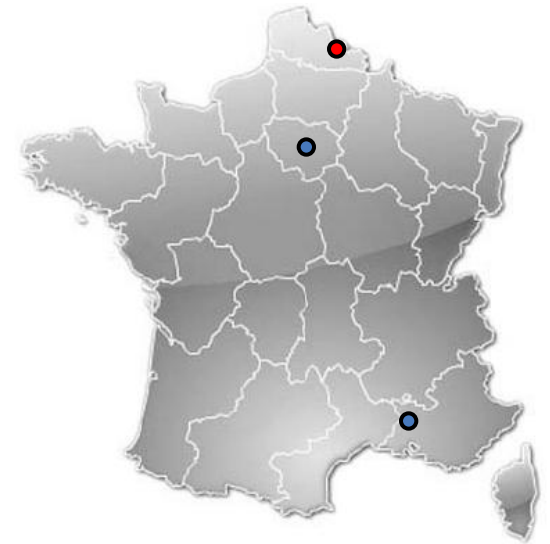


ILCD BOMB

- **On-going patent application**
- Steel structure,
- Venting devices,
- Intumescent painting,
- PTCF liner for calibrated fragments
- Main loading Explosive B2274A,
- Inert loading,
- Total gross weight : 210 kg

PRODUCTION OF DEMONSTRATORS

- **SAMP produced 12 MK-82 empty bodies including**
 - External body,
 - Modified closing plate with embedded aft fuze liner,
 - Front fuze liner,
 - Internal tubes,
 - Venting devices designed to break under internal pressure during thermal solicitations
- **Explosive Filling by EURENCO**
 - 8 off IM-B demonstrators including PTCF liner,
 - 4 off ILCD-B demonstrators including PTCF liner.



PRODUCTION OF DEMONSTRATORS



Production of PTCF liners



IM-B before casting

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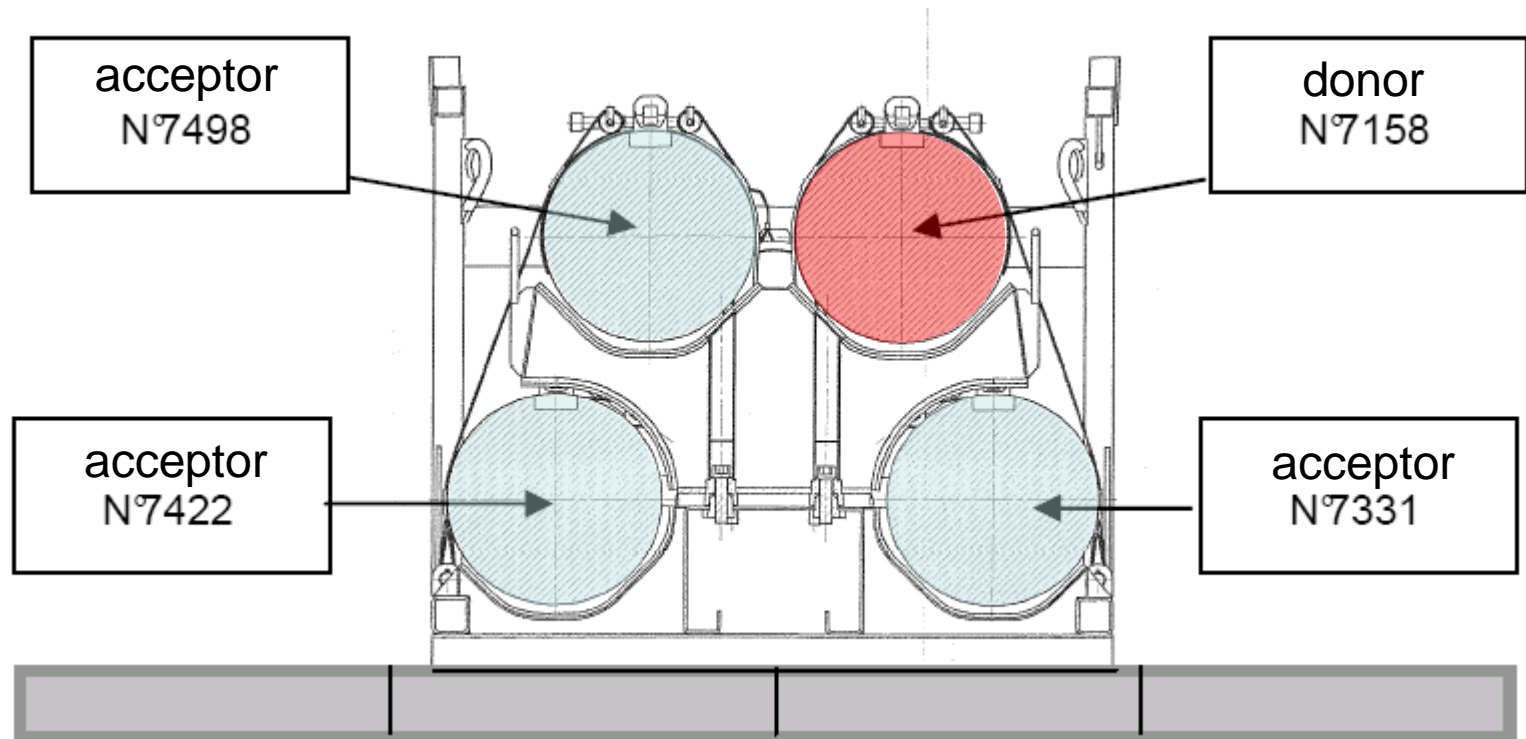
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SYMPATHETIC DETONATION

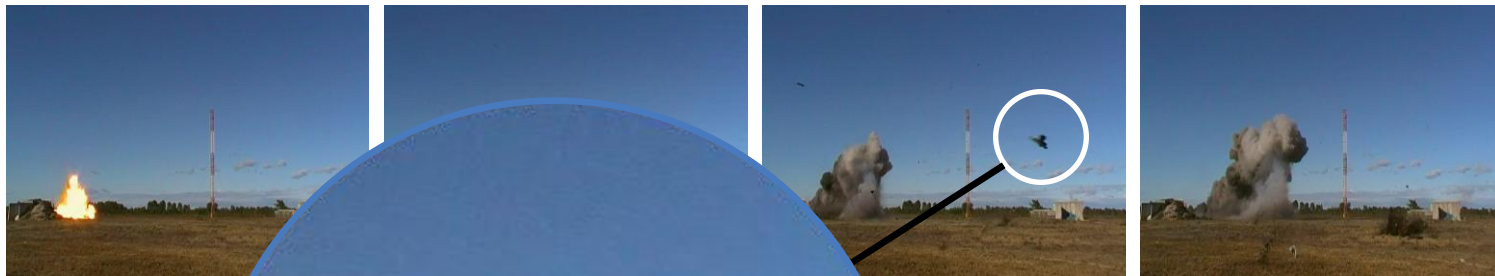
- IM-Bomb – B2268A
- Configuration : bombs in BLU-111 type pallet x4
- One donor and three acceptors
- 4 Witness plates
- High speed cameras
- Overpressure sensors
- Donor initiated by a mock-up fuze including RDX based booster



SYMPATHETIC DETONATION



SYMPATHETIC DETONATION



Massive fragment

SYMPATHETIC DETONATION



SYMPATHETIC DETONATION

CONCLUSION

- Large fragments of each of the acceptors recovered
- Arr. 200 kg of NEQ recovered
- Peak TNT pressure equivalent to one donor detonation
- Detonation of the donor, No Detonation of the receivers
- → **type III reaction.**

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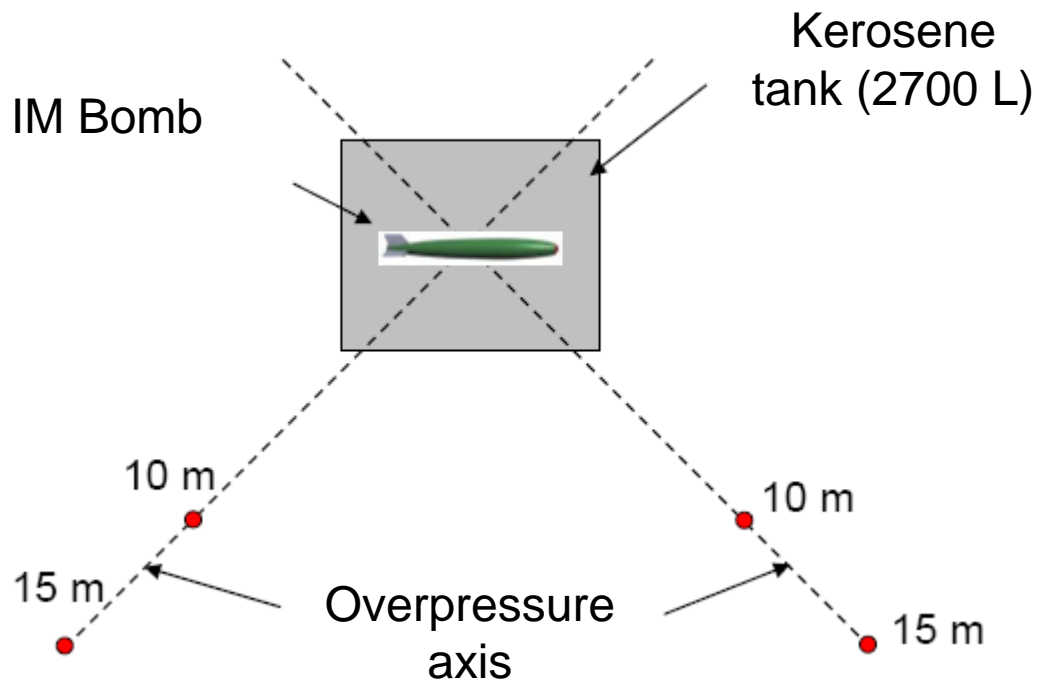
FUEL FIRE

- **IM-Bomb – B2268A**
- **Testing performed acc. STANAG 4240 recommendations**
- **Body equipped with**
 - Conical Fin assy BSU33
 - Front nose plug MXU735
 - FBM21 fuze + SAPP
- **Main loading : 80,2 kg**
- **PTCF liner**
- **Kerosene fire**



FUEL FIRE

- **Overpressure sensors**



FUEL FIRE

- Intumescent treatment damaged on purpose : hardened testing configuration
- Simulate multiple mounting / dismounting operations from aircraft bomb ejector



4 x damaged zones : **no intumescent protection**

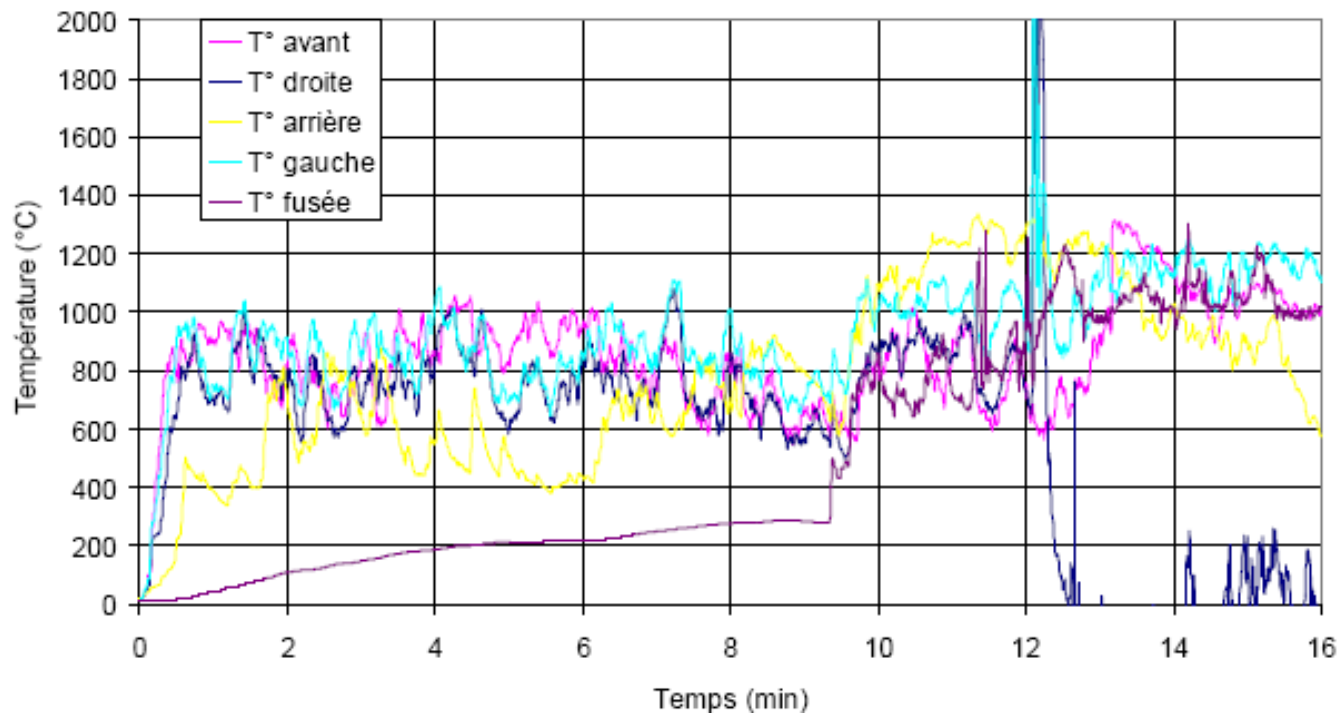
FUEL FIRE

Measurements :

- 5 thermocouples : 4 around the bomb body and 1 against SAU
- Steel Witness plate in the tank dimensions 1800 x 500 (Lxl, mm)
- 2 Cameras 25 fps

FUEL FIRE - Results

Temperature measured

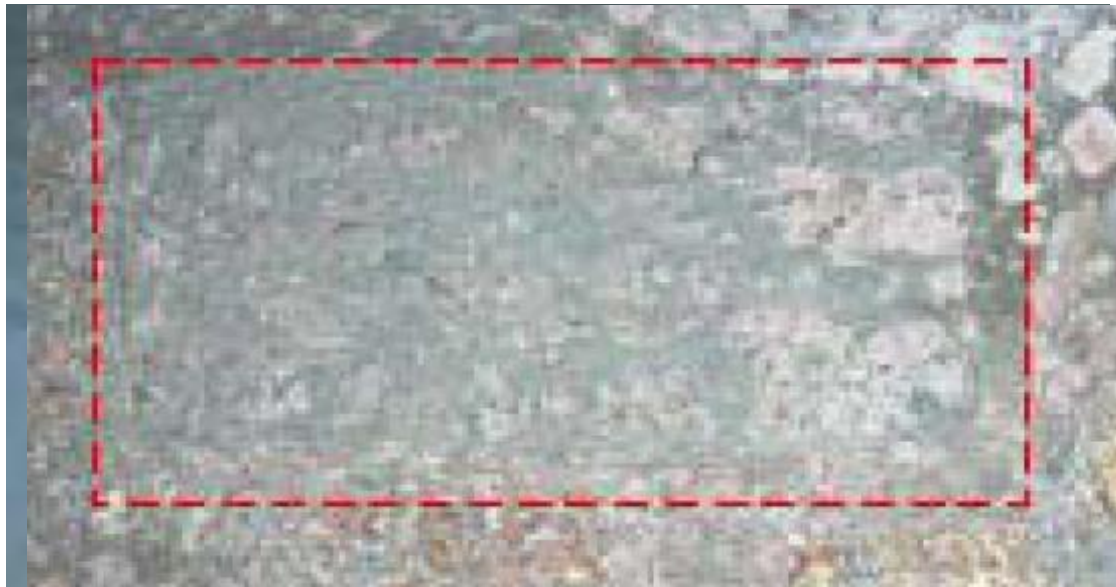


FUEL FIRE - Results



FUEL FIRE - Results

Intumescent painting – Damaged zones



FUEL FIRE

CONCLUSION

- Temperature histories comply with STANAG 4240
- Reaction after 10 min, burning of all energetic materials
- No projection of fragment
- No significant overpressure

- → **Type V reaction.**

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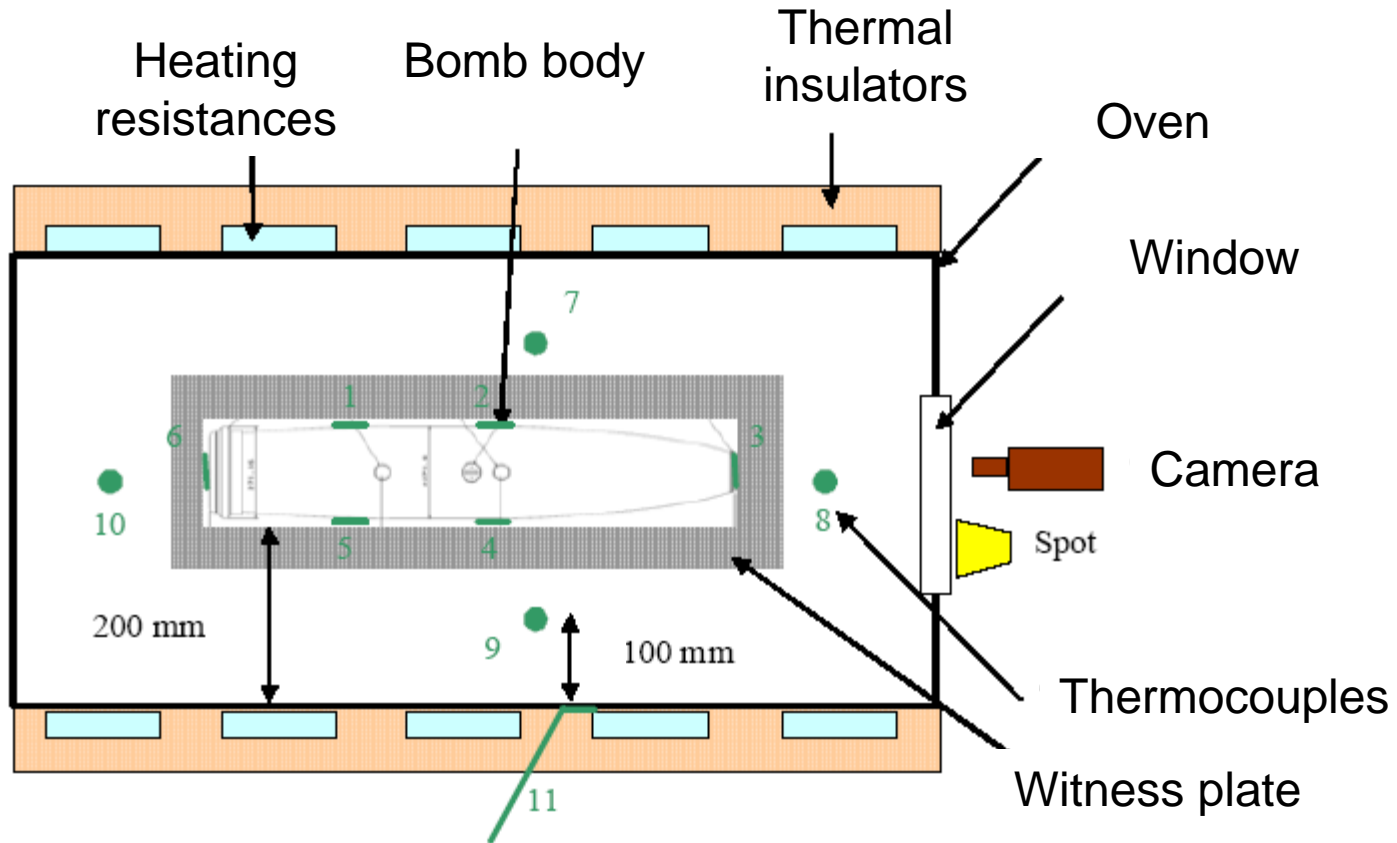
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SLOW COOK-OFF

- IM-Bomb – B2268A
- Testing performed acc. STANAG 4382 recommendations
- Body in logistic configuration
 - Aft and front transport plugs
 - No Fuze
- Main loading : 80,2 kg
- PTCF liner
- Bomb placed in oven

SLOW COOK-OFF



SLOW COOK-OFF



Bomb body

SLOW COOK-OFF - Results



Slotted hole of front fuze liner : venting device interface



Unreacted explosive

SLOW COOK-OFF

CONCLUSION

- Slope of temperature complies to STANAG 4382
- Reaction after 39h after the start of 3.3°C/h at a temperature of 174.2°C
- Almost complete explosive material burnt
- Ejection of logistic plate
- No significant overpressure

- → **Type V reaction.**

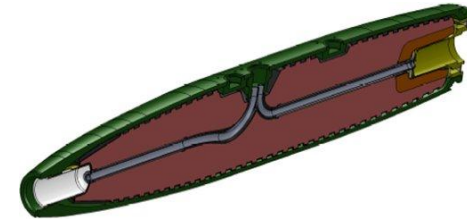
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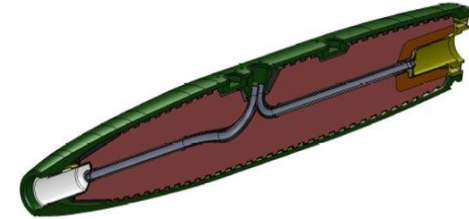
IM SIGNATURE



MK82 IM-B

Threat	Demonstration	Expected reaction	Maximum Reaction STANAG 4439
<i>Fast Cook-Off</i>	<i>Testing</i>	V	V
<i>Slow Cook-Off</i>	<i>Testing</i>	V	V
Bullet impact	across reading with other configurations (standard Mk82 or CBEMS 250) or testing unit experiments	V	V
<i>Sympath. Det.</i>	<i>Testing</i>	III	III
Light fragment	Read across with other configurations	V	V
Shaped charge jet	Read across with testing on 155mm shell configuration	III / IV	III

IM SIGNATURE



MK82 IM-B

Paper "Achieving STANAG 4439 IM Shaped Charge Requirements on 155mm Shells: An Update." B. Nouguez:

- **155mm shell filled with B2268A**
- RCC charge Ø112 mm, Stand-Off 280 mm, Shaped charge jet : 400 mm³/μs² > STANAG

→ **Type IV Reaction**



IM SIGNATURE

GP-B and ILCD-B Expected signatures

Threat	GP-B Expected Reaction	ILCD-B Expected Reaction	STANAG 4439 Requirement
Fast Cook-Off	V	V	V
Slow heating	V	V	V
Bullet impact	IV or V	V	V
Sympathetic reaction	I	III	III
Light fragment	IV or V	V	V
Shaped charge jet	I	I or III	III

IM SIGNATURE

CONCLUSION

- Three concepts designed and IM signatures evaluated
- GP-B not candidate for STANAG 4439 or French Policy MURAT **. However, IM signature should be better than BLU111 due to venting devices
- ILCD-B candidate for STANAG 4439 or French Policy MURAT **. Experimental assessment to be evaluated
- IM-B candidate for STANAG 4439 or French Policy MURAT **.

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A MEMBER OF

