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RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE LA DÉFENSE
THE FRENCH I.M. POLICY
10 YEARS AFTER
NDIA/NIMIC - 2003 IM&EMTS
DGA

THE FRENCH I.M./MURAT POLICY
10 YEARS AFTER

Patrick Kernen & Patrick Lamy

DGA/INSP/IPE

(National Explosive Safety Authority)

SUMMARY

- THE FRENCH MURAT POLICY
  - HISTORICAL BACKGROUND
  - APPROACH & SPECIFICITIES
- THE ENFORCEMENT OF THE POLICY
  - THE LABELLED MUNITIONS
- THE ADVANTAGES AND NECESSARY IMPROVEMENTS
- THE WAY AHEAD

THE FRENCH MURAT POLICY

- **HISTORICAL BACKGROUND**
  - **GENERAL POLICY ESTABLISHED IN 1992**
  - **POLICY IN LINE WITH STANAG 4439**
    - **“MURAT/IM requirements shall be considered in all Munition design, development and replenishment activities”**
    - **“MURAT will have to be introduced into service at the appropriate level”**
    - **“New technologies have to be developed and considered for all new Programs”**

THE FRENCH APPROACH

- **WHILE S3 ASSESSMENT**
  - **Refers to a specific use and life cycle**
  - **Is only valid for well defined environments**
- **IM/MURAT ASSESSMENT SHOULD**
  - **Improve Interchangeability/Interoperability**
  - **Help cross-procurements**
  - **Make extension of life duration easier**
  - **Increase the confidence level in the risk assessment**

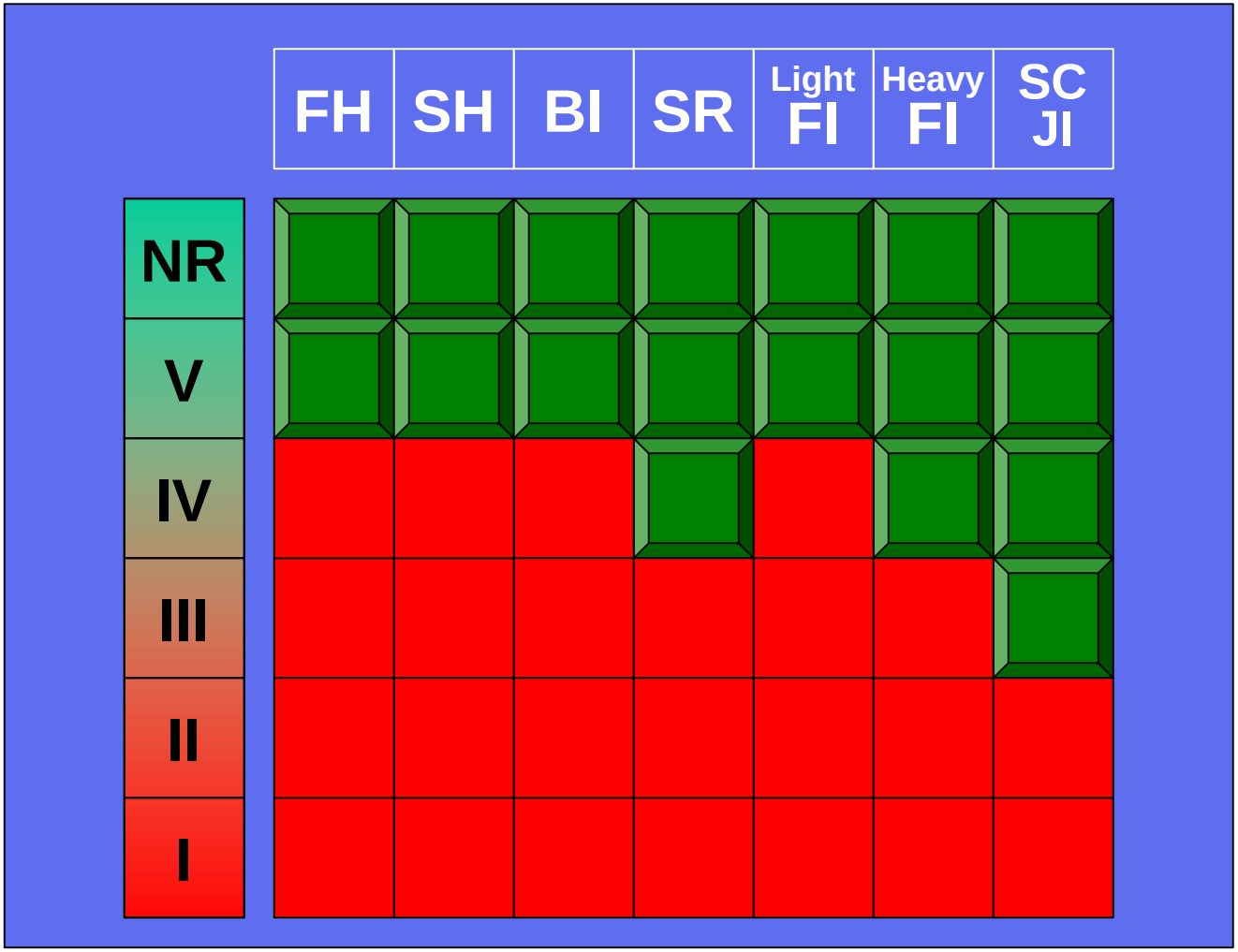
THE FRENCH APPROACH

- **MURAT ASSESSMENT**
  - **IS AN EVALUATION OF THE INTRINSIC SAFETY LEVEL (IMness) OF THE MUNITION, INDEPENDENTLY OF ANY SPECIFIC APPLICATION**
  - **IS BASED ON POSSIBLE REACTION MECHANISMS GENERATED BY MOST PROBABLE STIMULI/THREATS**
  - **SHOULD DEMONSTRATE THAT WORST POSSIBLE THREAT PARAMETERS ARE COVERED**

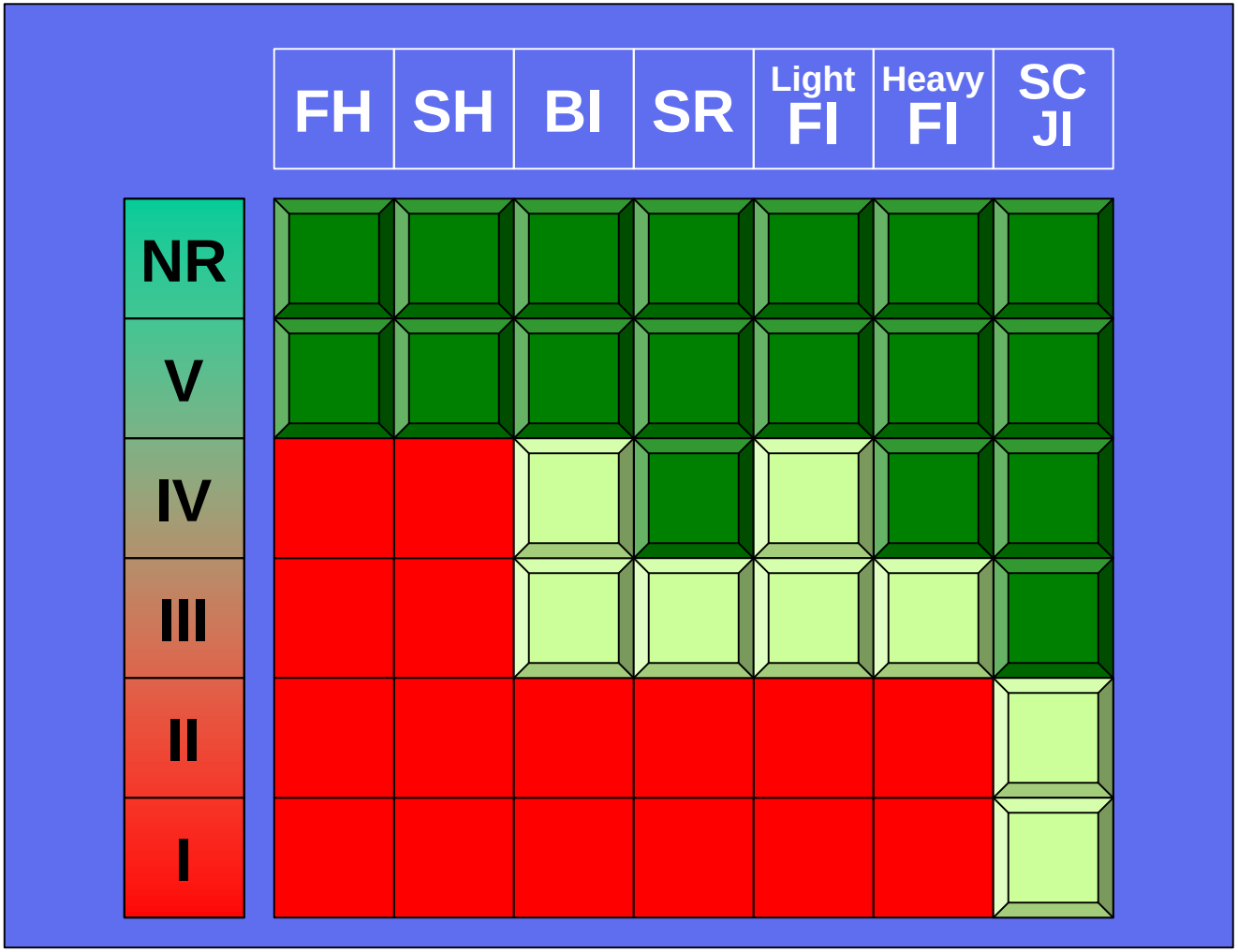
THE FRENCH APPROACH

- **MURAT SIGNATURE**
  - **IS COMPARED TO REFERENCE IMness LEVELS FOR A POSSIBLE ASSIGNMENT OF A "MURAT LABEL"**
- **MURAT Labels (★, ★★, ★★★)**
  - **Are defined to help common understanding**
  - **Allow an adaptation of requirements to**
    - ➢Required level of performance
    - ➢Operational use and financial constraints
    - ➢Available technologies

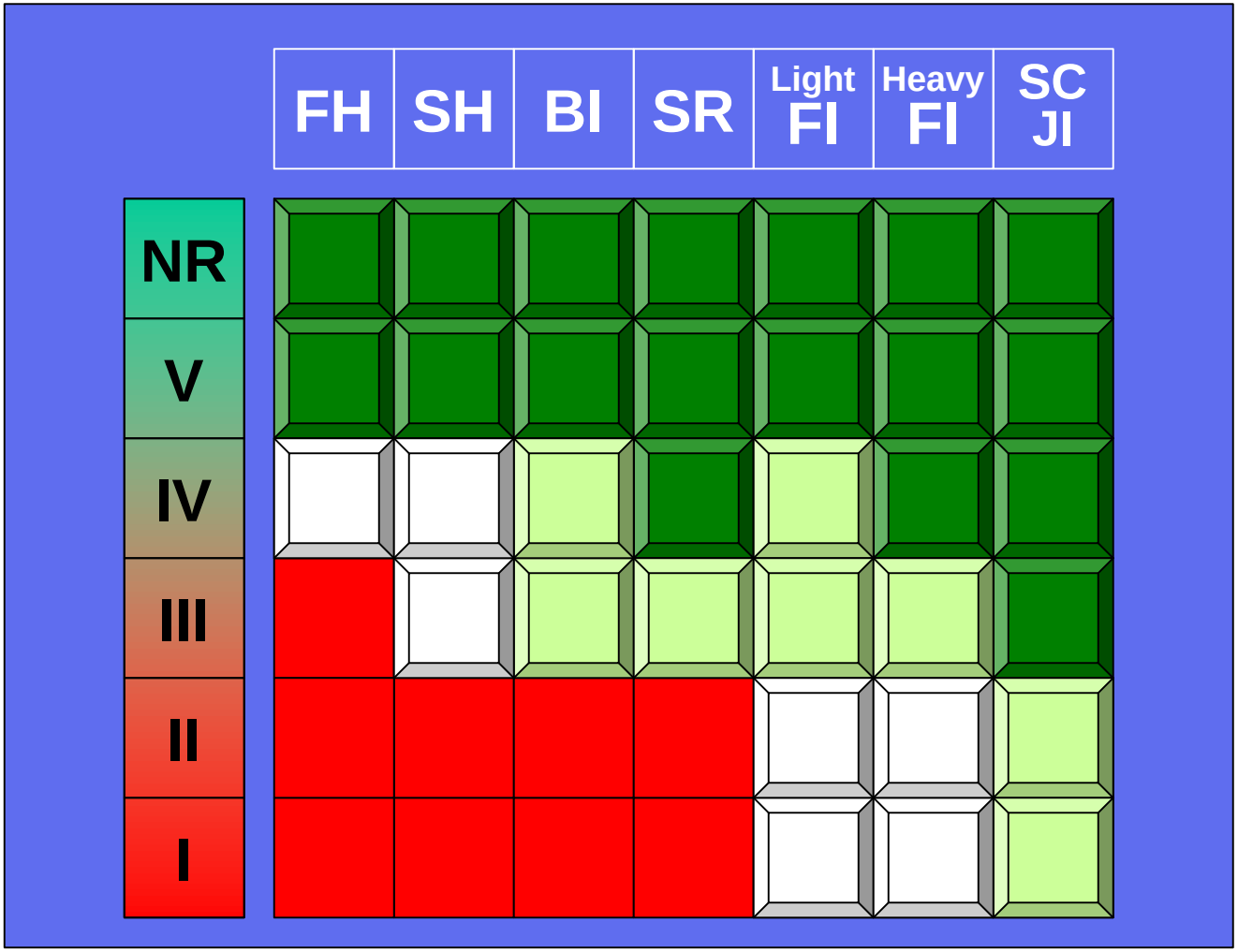
MURAT ★★★ LABEL



MURAT ★★ LABEL



MURAT ★ LABEL



ASSIGNMENT OF LABELS

- **Assignment of MURAT LABELS is under the responsibility of the “Inspecteur de l’Armement pour les Poudres et Explosifs” (IPE) acting as NATIONAL (EXPLOSIVE) SAFETY AUTHORITY**

ENFORCEMENT OF THE POLICY

- **First MURAT developments were for munitions to be onboard the CVN Charles de Gaulle**

- **Since 1993/1994, MURAT goals are more and more considered in new programs**

ENFORCEMENT OF THE POLICY

- **Since 1998, IPE is also NATIONAL AUTHORITY for MUNITION SAFETY QUALIFICATION : validation of the good taking into account of safety in the Program**
- **For MUNITION SAFETY QUALIFICATION, MURAT requirements should be clearly defined and justified in the Program Mission Need Specification**

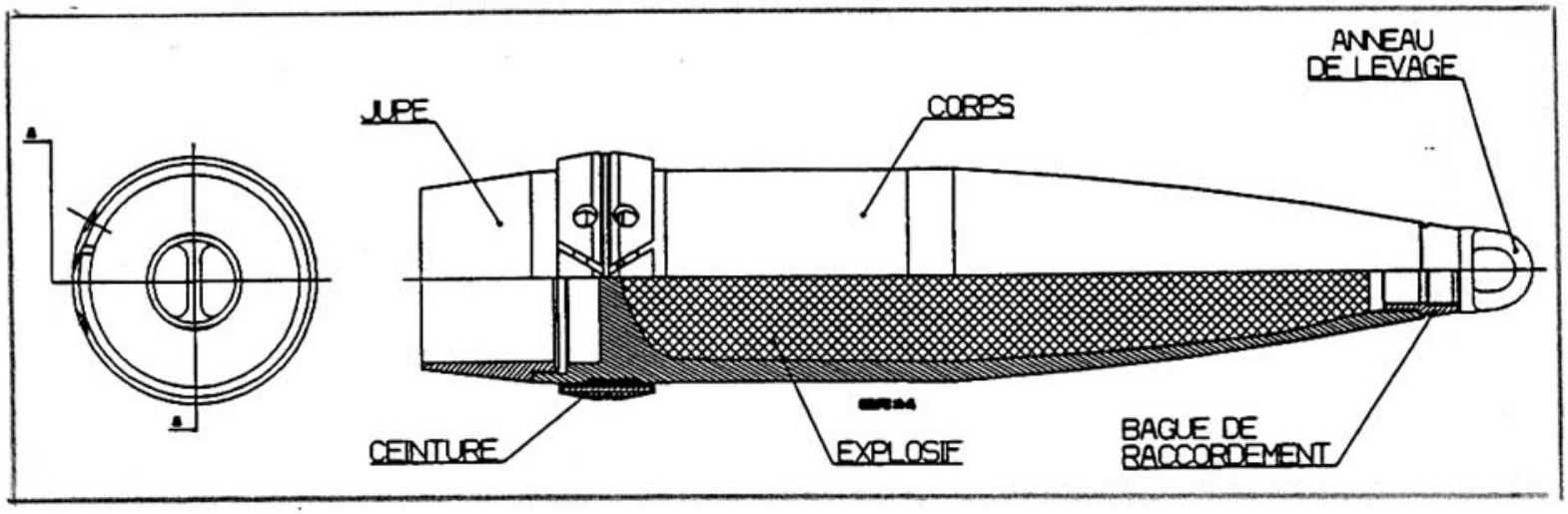
ENFORCEMENT OF THE POLICY

- **TO DATE, 6 LABELS WERE ASSIGNED BY IPE**
  - **155 mm Artillery Shell → MURAT ★**
  - **155 mm GP modular charge → MURAT ★**
  - **250 lb Penetrator Bomb → MURAT ★ ★**
  - **Explosive Reactive Armor → MURAT ★**
  - **VT1 M01 Air Defense Missile → MURAT ★**
  - **Apache Cruise Missile → MURAT ★**

155 mm ARTILLERY SHELL (GIAT ind.)

- **Comp. XF 1353 (NTO 65%, TNT 35%), EIDS**
- **Configuration : 20 palletized without fuze/gun cartridge**

Figure 1 (Shell)

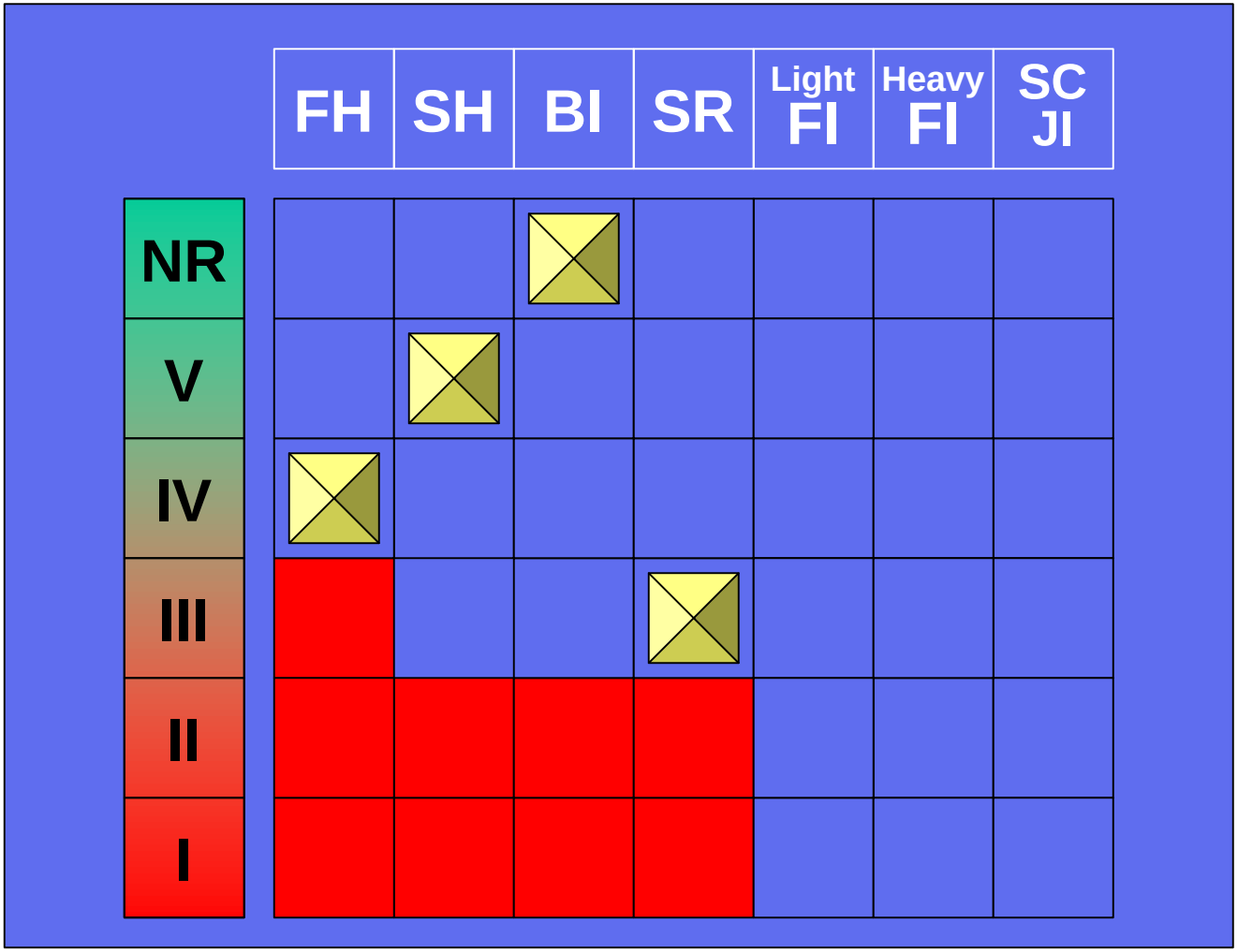


155 mm ARTILLERY SHELL

- **Bullet Impact :**
  - **4 tests → 4 NR**
- **Sympathetic Reaction :**
  - **Tests and/or (DYNA 2D) Modeling config.**

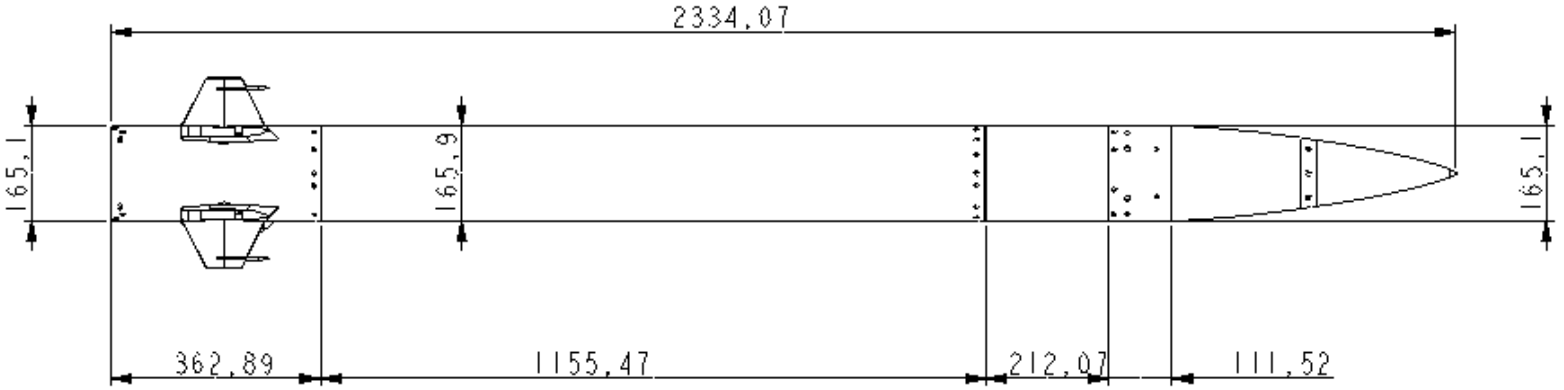
Shells separated by 15 mm → Type IV (670 MPa)
Shells separated by 30 mm → Type IV (727 MPa)
10 lb test vehicle separated by 50 mm → Type IV (770 MPa)
Shells separated by 85 mm → Type III (900 MPa)
Gap test (with PMMA) → Type III (1500 MPa)
Heavy FI on test vehicle → Type III (3460 MPa)
Nominal functioning → Type I (4460 MPa)

155 mm SHELL SIGNATURE → ★



VT1 M01 MISSILE (THALES)

- **WH : 4.5 Kg HBU 88A (RDX 88%, HTPB 12%)**
- **RM : 31.5 Kg TPH 8313 (AP 82%, RDX 4%, Binder)**
- **Case : graphite epoxy**

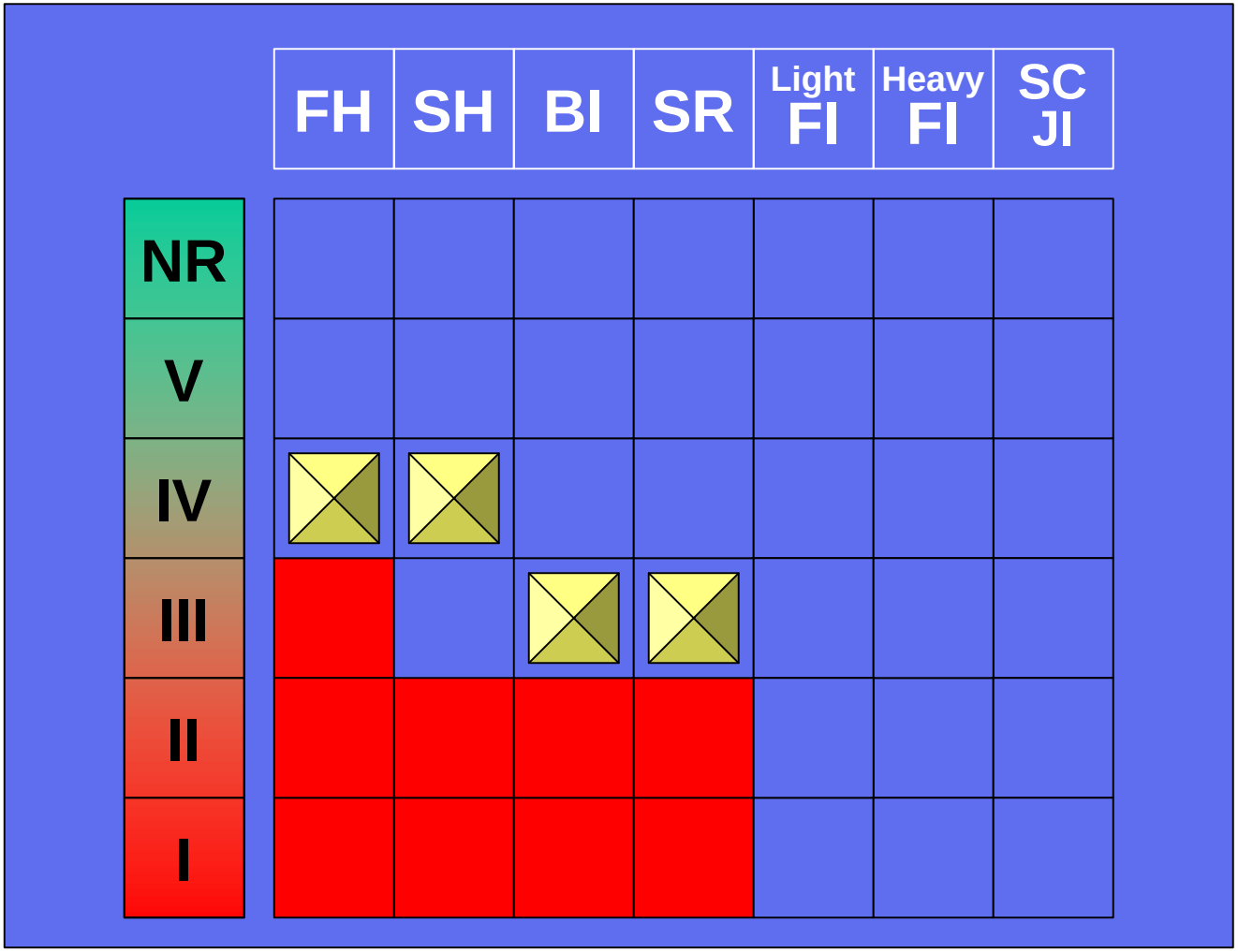


VT1 M01 MISSILE (THALES)

- **Bullet Impact :**
  - **Friability → 17 MPa/ms**
  - **Test on (more confined) test vehicle**
    → 9/10 Type III
- **Sympathetic reaction :**
  - **Test with 4 AUR (without igniter) and 2 inert**
    → TNT eq 8 Kg => no SR

VT1 M01 MISSILE

VT1 Missile SIGNATURE → ★



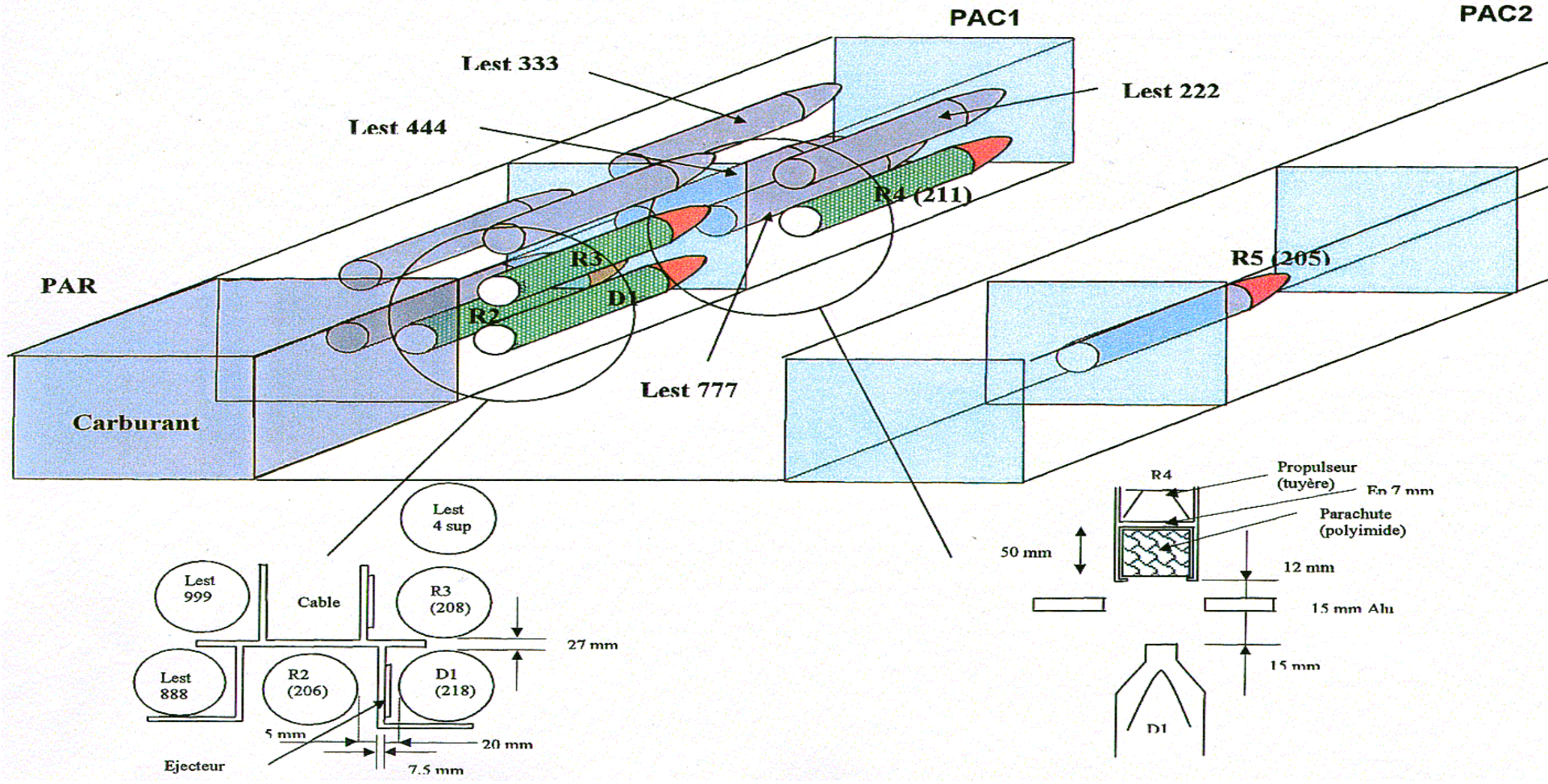
APACHE MISSILE (MBDA)

- 10 KRISS sub-munitions
- WH : 7.1 Kg B 2211 / V 350
- RM : 7.8 Kg TPH (AP 68%, Al 20%, Binder 12%)
- Metallic Case : NCDV16

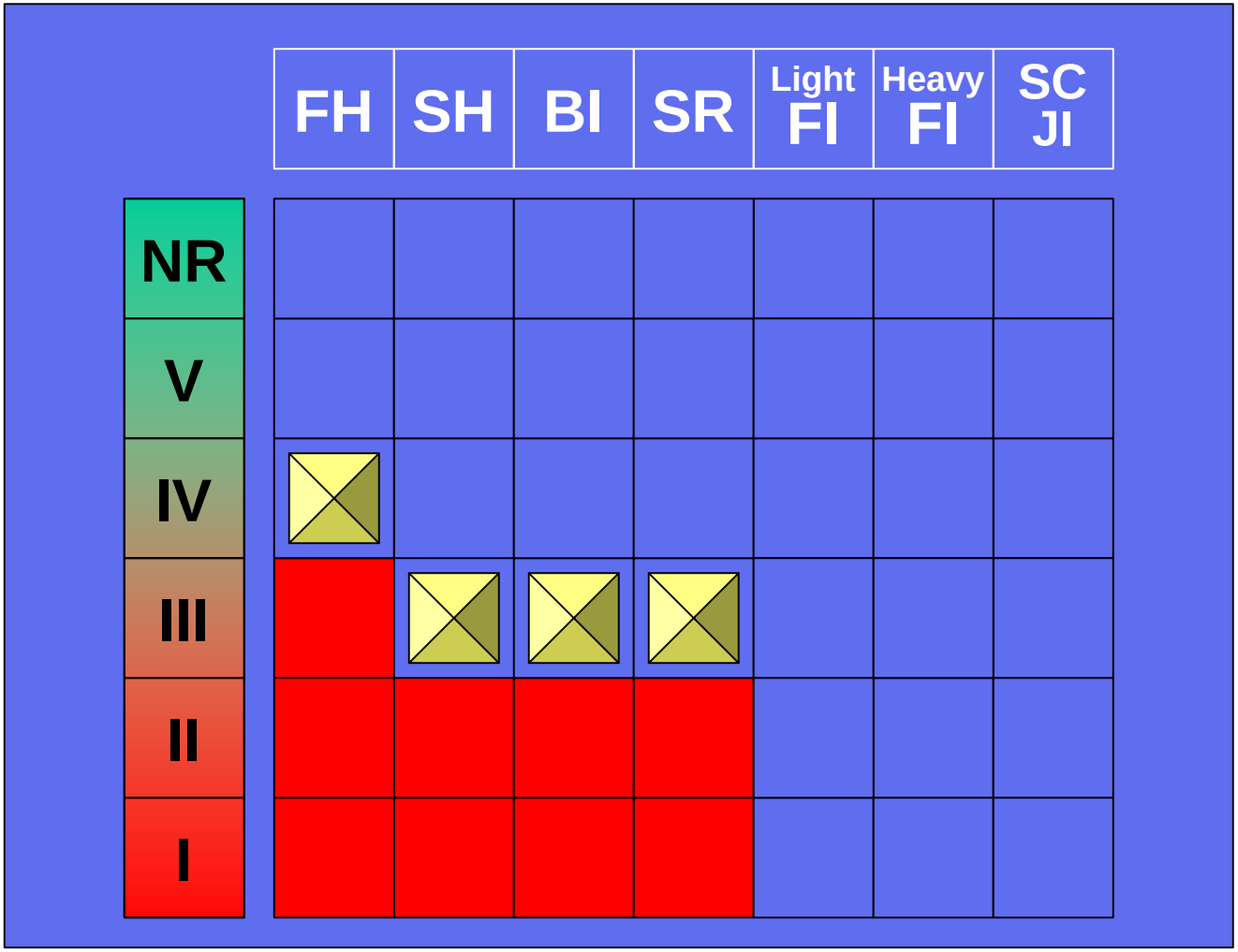
- Analogy with MAGIC Missile
- 10 lb test vehicle testing
- No SD of sub-munitions within a Missile
- No SD of sub-munitions of adjacent Missiles

APACHE MISSILE

APACHE MISSILE



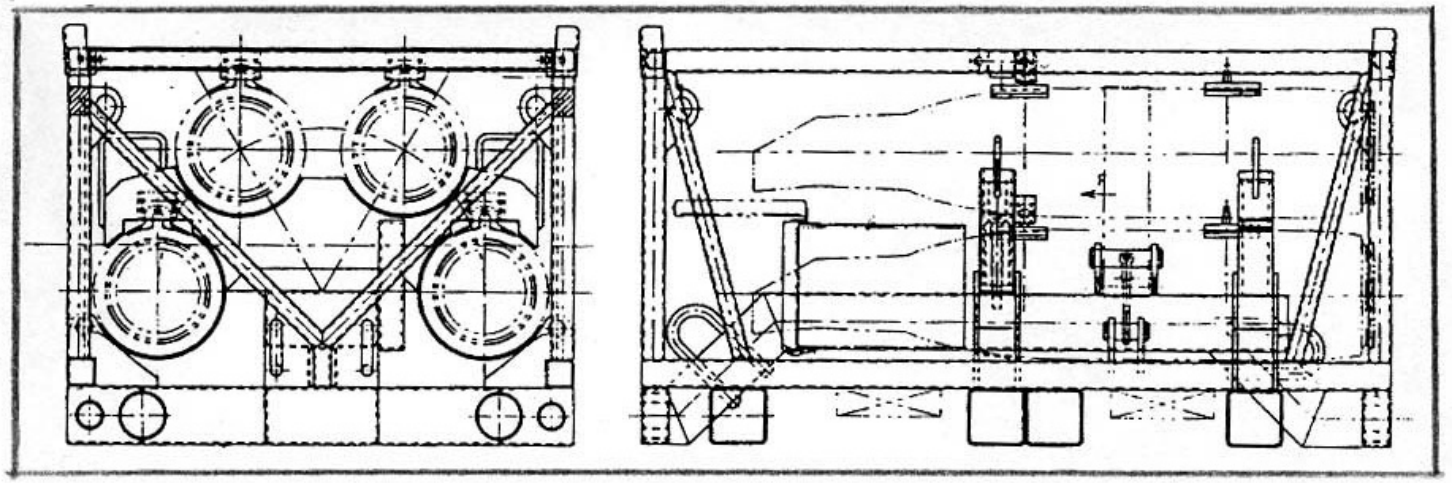
APACHE Missile SIGNATURE → ★



250 lb BOMB (MBDA/SNPE)

- B 2214 (NTO 72%, HMX 12%, Binder 16%)
- Booster : HMX 86%, Binder 14%
- Intumescent coating / venting systems
- Without fuze

Figure 3 (Palettized bombs)

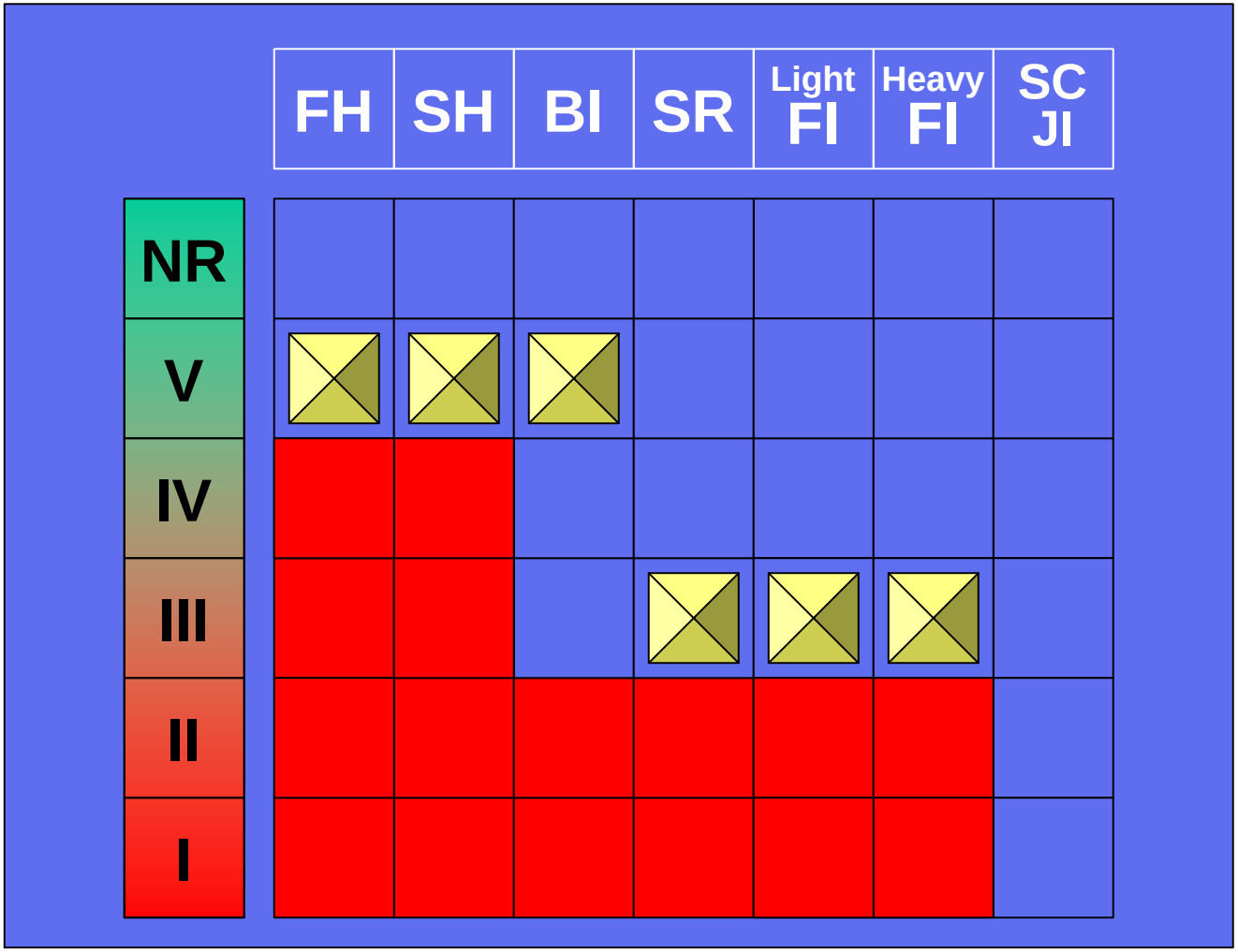


250 lb PENETRATOR BOMB

- **Bullet Impact :**
  - 5 tests (AUR, sections) → 4 NR, 1 Type V
- **Sympathetic Reaction :**
  - No diagonal effect
  - H.F.I. on AUR (2000 m/s) → Type V
  - S.D. Testing on 100 lb Test Vehicle → Type III

	Test Veh.	BOMB
Distance between munitions	0.5	> 0.2
Weight ratio HE/Metal	1.01	0.93
Fragment Velocity (Gurney)	1730	1675
Shock Pressure (in the HE)	106 Kbar	99 Kbar
Shock Duration (in the HE)	2.6 ms	2.3 ms

250 lb BOMB SIGNATURE → ★★



ADVANTAGES & NECESSARY IMPROVEMENTS

- OBVIOUS BENEFITS OF I.M. IN TERMS OF
  - INCREASING PLATFORM SURVIVABILITY
  - DECREASING LOGISTICAL CONSTRAINTS (Handling, Storage, Maintenance)
- MILITARY USERS WANT TO QUANTIFY THOSE BENEFITS
- MUNITIONS DESIGNERS NEED CLEAR REQUIREMENTS

MILITARY USER EXPECTATIONS

- **STORAGE**
  - **NEED : - define specific HD and QDs according to IM signature**

    - allow the “mixing” of various I.M. in the same magazine
  - **☛ : difficulties to evolve national regulations**

    ☛ : specific rules should be established by NATO for field storage

MILITARY USER EXPECTATIONS

- **BENEFIT OF UNIT RISK :**

I.M. → TYPE III to F.H., S.H. and S.R.

- **BLAST (1.1) Hazards**
  - **→ QD based on NEQ of only 1 munition**
- **FRAGMENTS (1.2) Hazards**
  - **→ QD based on NEQ of only 1 munition**
- **THERMAL (1.3) Hazards**
  - **→ QD based on total NEQ of stored munitions**

In France, QDs can be calculated taking into account the greatest of the 3 distances

MILITARY USER EXPECTATIONS

- **OPERATIONAL USE**
  - **NEED : increase operational capabilities by :**
    - ➢ **decreasing risks due to accidental or hostile threats**
    - ➢ **increasing interoperability/interchangeability within national and international Forces**
  - **☛ : standard requirements and assessments need to be internationally defined**

    ☛ : standard signature should be defined for generic uses

MILITARY USER EXPECTATIONS

- **EXAMPLE 1**

250 lb penetrator bomb and Apache missile

- **were developed for French Navy according to S3 requirements for the CVN C. de Gaulle**
- **because of their MURAT characteristics, both meet French Air Force S3 requirements and no additional assessment was necessary**

MILITARY USER EXPECTATIONS

- **EXAMPLE 2**

Transportation of Army weapons onboard Navy vessels

Emergency landing of allied aircraft on CVN Charles de Gaulle

- **possible without further assessment if MURAT signature shows no unacceptable risks for the platform**

MUNITION DESIGNER EXPECTATIONS

- WELL DEFINED REQUIREMENTS
- SIMPLE AND WELL DEFINED ASSESSMENT TOOLS
  - TESTS, INSTRUMENTATION, PASS/FAIL CRITERIA
- TO HAVE THOSE REQUIREMENTS AND ASSESSMENT TOOLS INTERNATIONALLY AGREED

THE WAY AHEAD

- **Within UN, Nations agreed to classify articles using standard procedures and a very simple protocol.**
- **From such a simple assessment, clear rules were defined for Transportation and Storage depending on :**
  - **probability and gravity of risks (HD)**
  - **type of risks (compatibility groups)**

THE WAY AHEAD

- **Such a classification and associated rules should be established by NATO for Munitions based on their IM Signatures**
- **This should be a major challenge for the new NATO CASG (CNAD AMMUNITION SAFETY GROUP)**