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NATO Insensitive Munitions Information Center












Cost Benefit Analysis Studies of the Introduction of Insensitive Munitions: Is IM Cost of Ownership Cheaper?

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TSO Warheads & Fuzes

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CBA Studies of the Introduction of IM

- Introduction
- Brief Description of CBAM
- Cost Benefits Analyses:
  - 1st Study: Short Range Air-to Air Missile
  - 2nd Study: 155-mm Artillery Munition
- Conclusions

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Introduction

- **June 2001: NIMIC organized the Costs & Benefits Analysis Workshop**
  - Definition of a set of requirements for a Cost Benefit Analysis Model
  - Development of a promotion methodology of IM to the Stakeholders
- **2002-2003: Development & Validation of the CBAM**
  - Code development
  - Validation studies
  - Release of the code to the NIMIC Nations (May 2003)

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Cost Benefit Analysis Model - CBAM

- **CBAM is primarily a tool to help calculate the cost differences of introducing IM into service**
  - **i.e. compares the cost of ownership of IM vs. Non-IM over the whole of the life of a munition**
- **It can also be used to calculate the cost of ownership of a munition**

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Description of the Model

- **CBAM calculates cost differences by:**
  - **Aiding in the creation of a life cycle for a munition type**
    - **Life-cycle Tree creation component**
  - **Providing a structured method for compiling cost data**
    - **Modules to account for cost differences arising from:**
      - **Risk Assessment**
      - **Direct cost**
  - **Calculates cost by means of a Monte Carlo Simulation**
    - **Takes into account the uncertainties**

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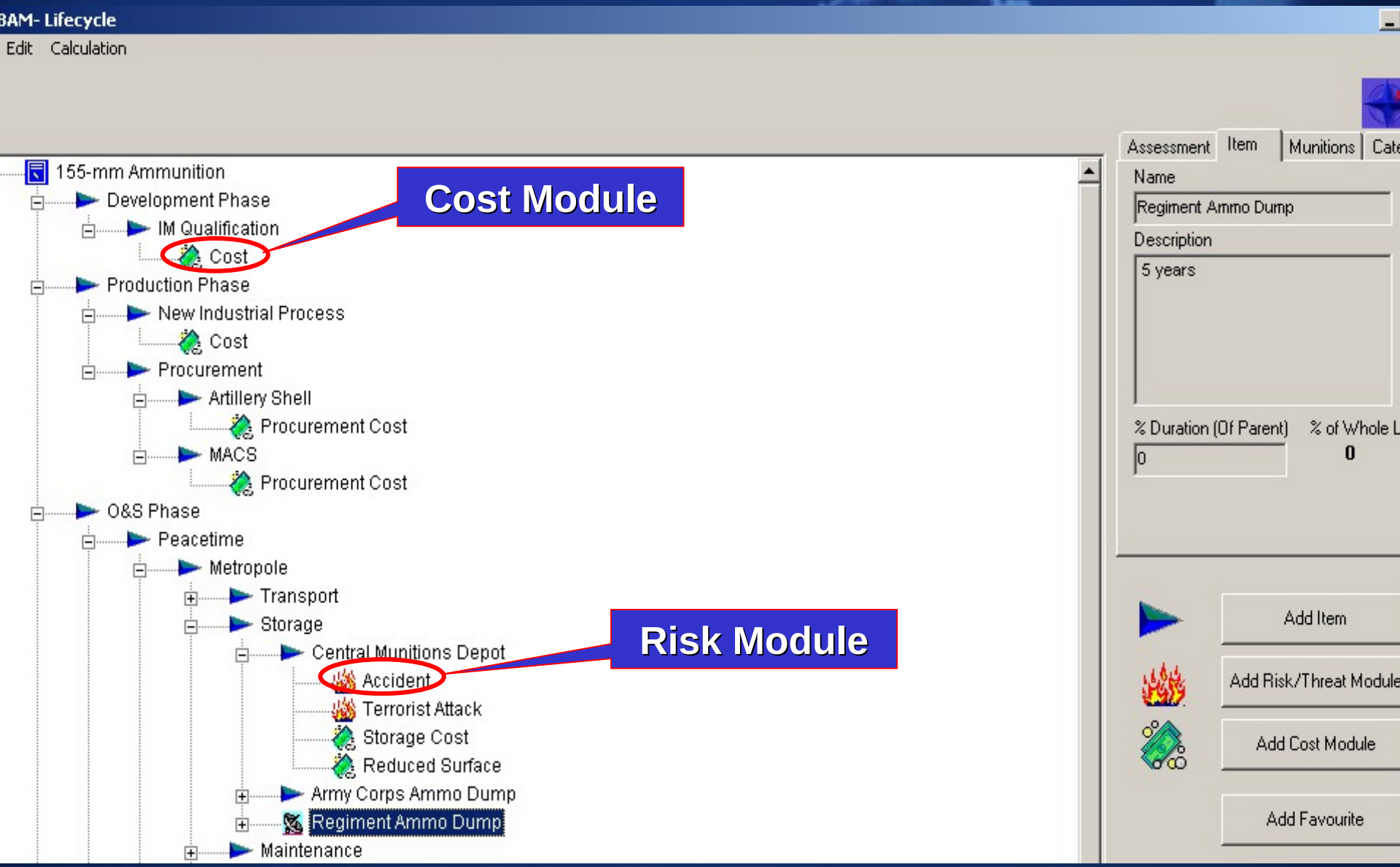
Life Cycle Component



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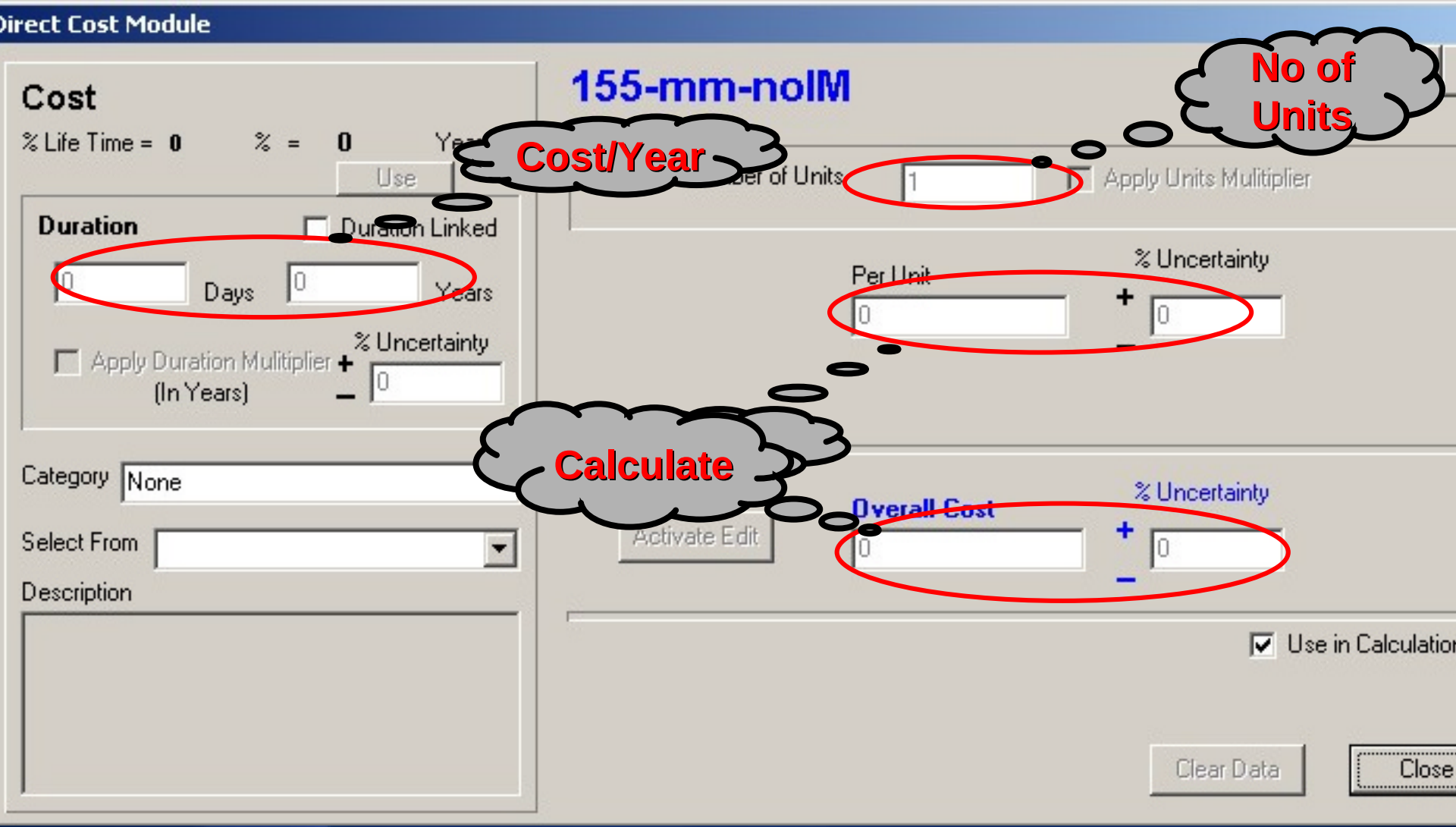
Cost Module



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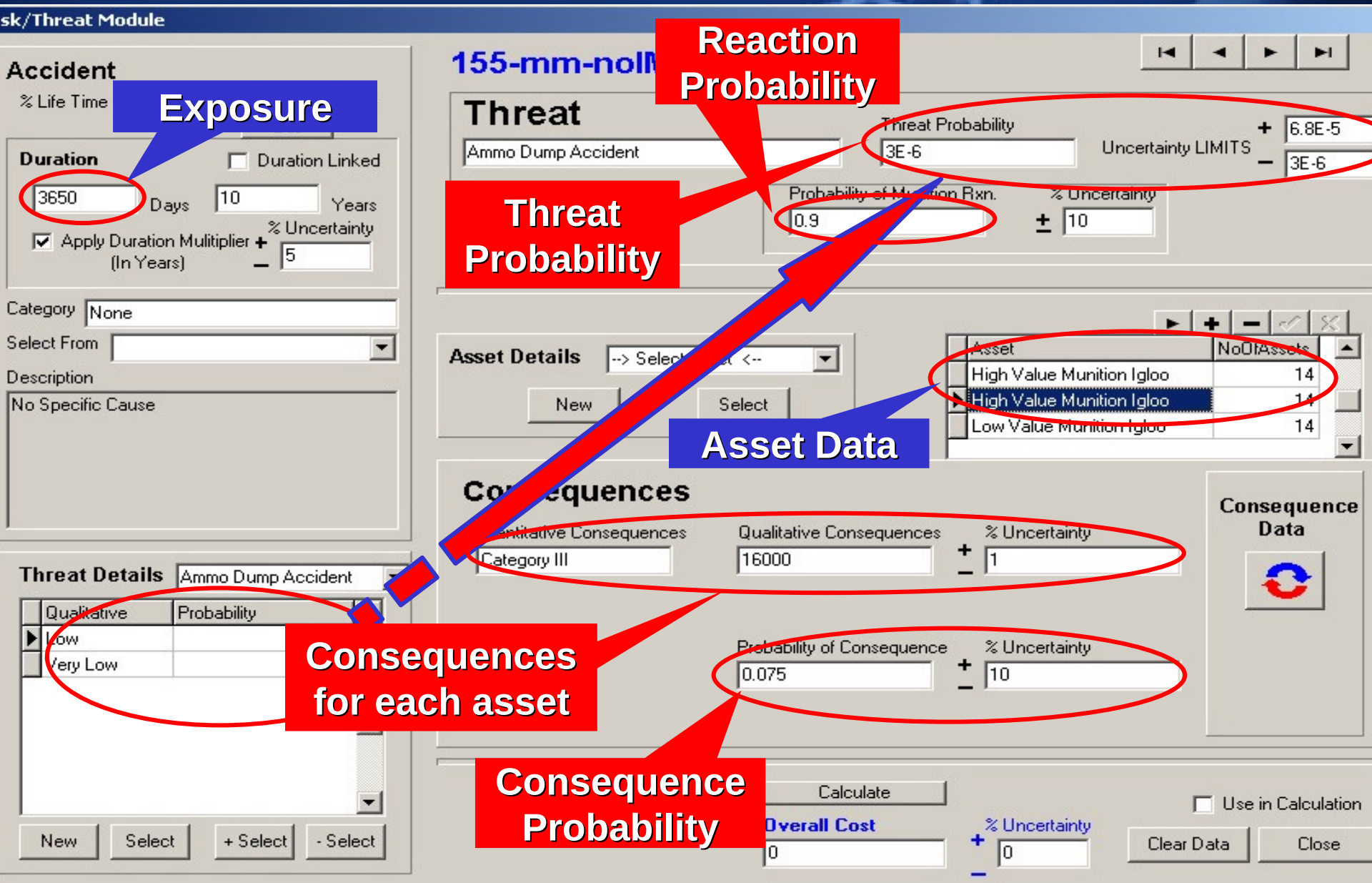
Risk / Threat Module



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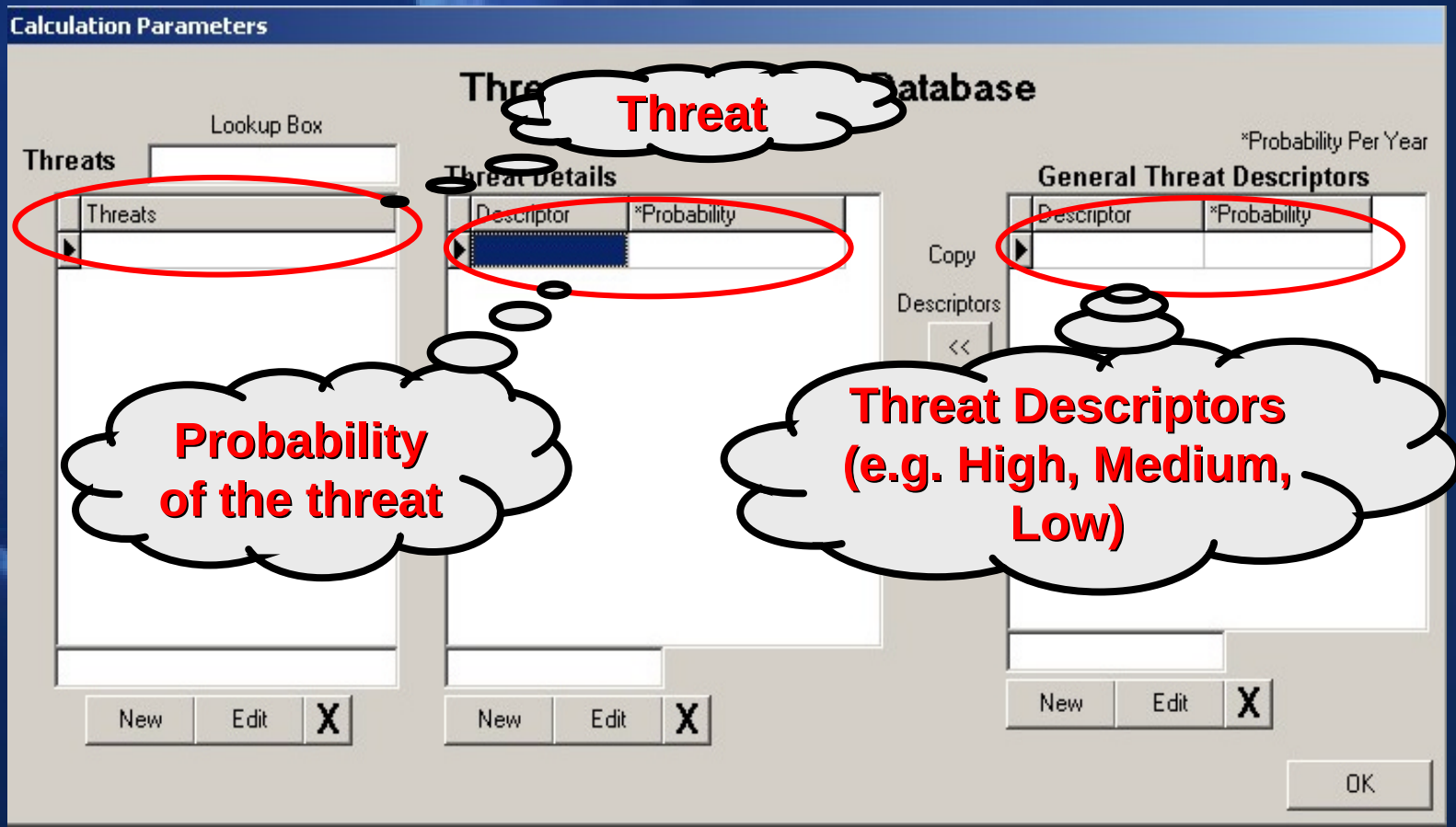
Threat Database

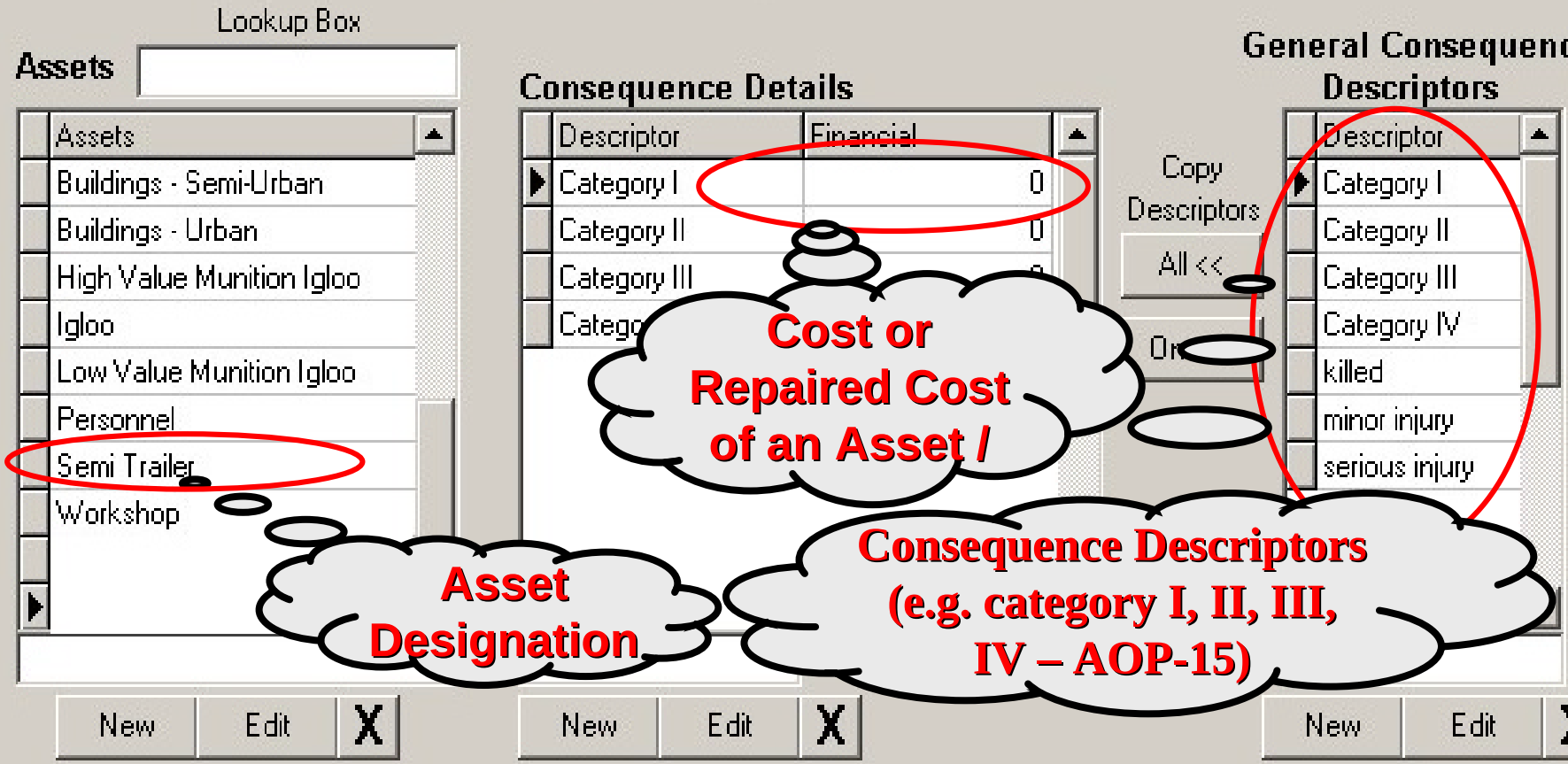
- **Threats and Probability Database**
  - Threats and the probability of experiencing a threat



Asset & Consequences Database

alculation Parameters

Assets and Consequences Database



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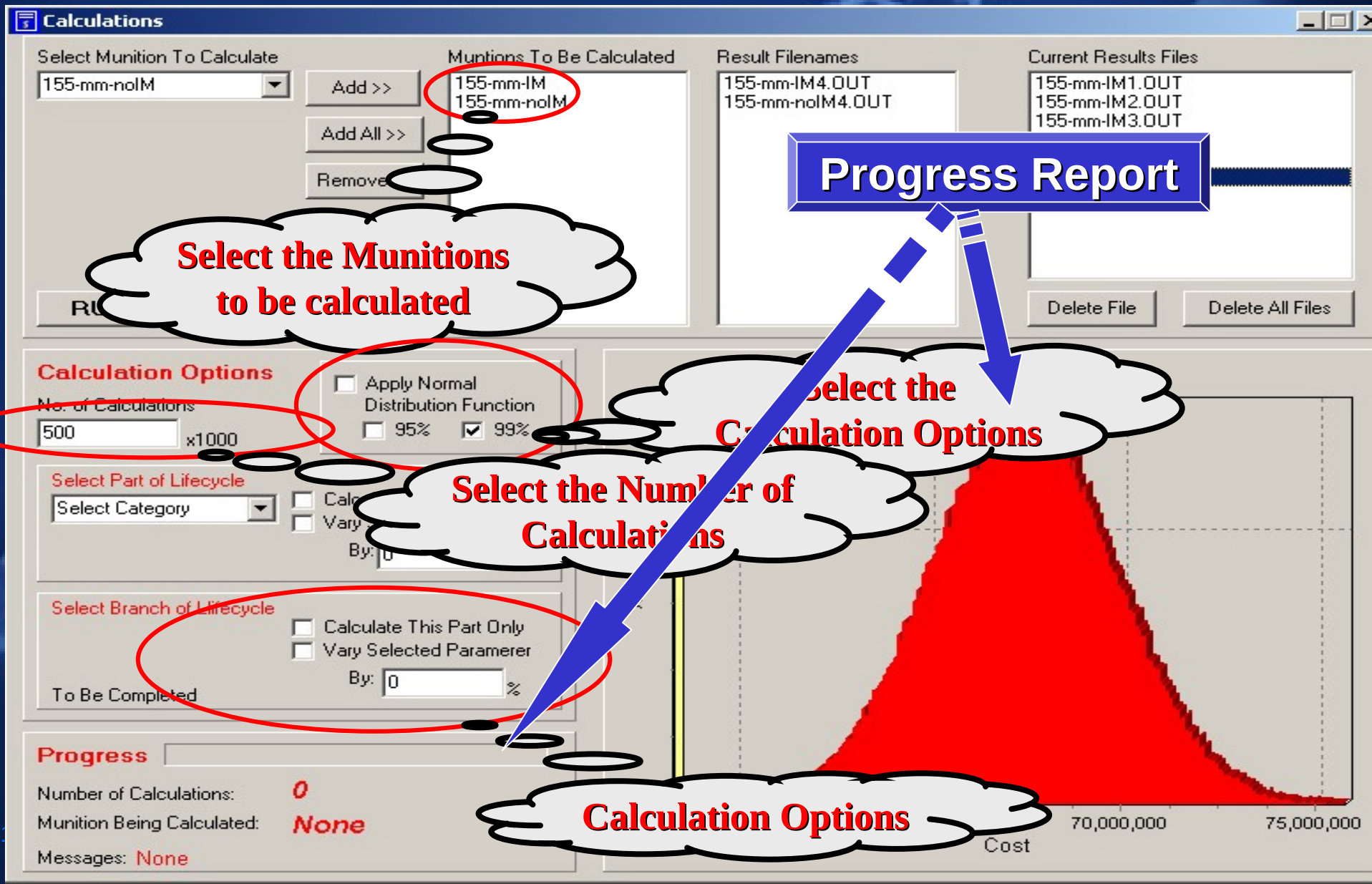
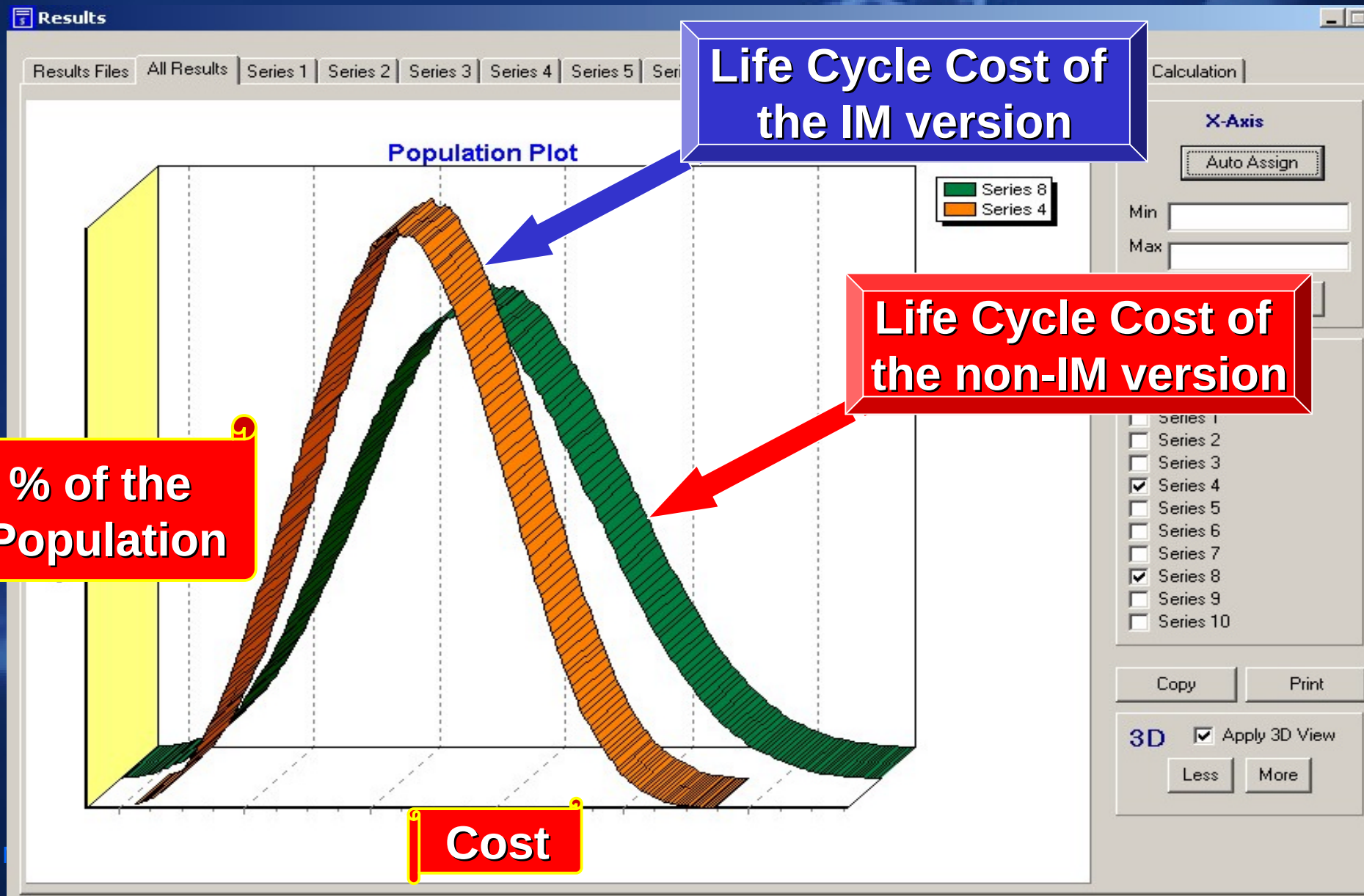
Calculation



Results


Results
Results Files
All Results
Series 1
Series 2
Series 3
Series 4
Series 5
Calculation
Population Plot
Series 8
Series 4
X-Axis
Auto Assign
Min
Max
Series 1
Series 2
Series 3
Series 4
Series 5
Series 6
Series 7
Series 8
Series 9
Series 10
Copy
Print
3D
Apply 3D View
Less
More
Life Cycle Cost of the IM version
Life Cycle Cost of the non-IM version
% of the Population
Cost

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1st Study: Short Range Air-to-Air Missile

- **Why:**
  - High-value munition on a high value platform
  - Data availability in NIMIC
- **Life Cycle (cradle-to-grave sequences):**
  - Peacetime (~24 years):
    - Storage (~ 90 % of the life cycle)
    - Transport (road, rail, sea and air)
    - Maintenance
    - Training
    - Disposal
  - Crisis (6 months)
    - Deployment, operational training, etc
  - Conflict (1 month)
    - Platform vulnerability, Airbase and Ammo Dump vulnerability

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SRAAM: CBA results

IM extra-cost: ~ + 0.6%

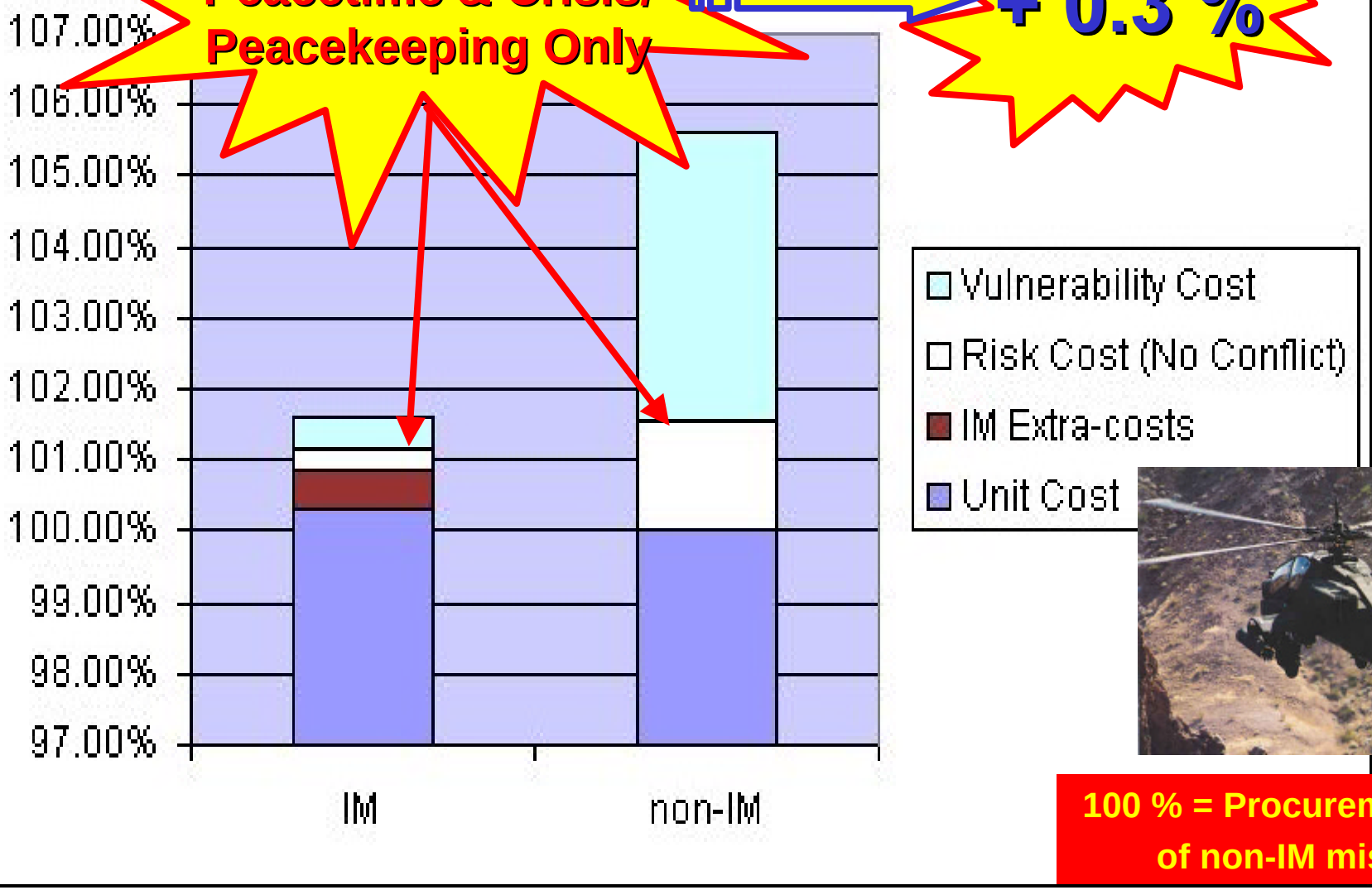
IM Unit Cost: ~ + 0.2%

100 % = Procurement Co of non-IM missiles

SRAAM: CBA results

IM LCC Benefits: Peacetime & Crisis/ Peacekeeping Only

+ 0.3 %



100 % = Procurement Co of non-IM missiles

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SRAAM: CBA results

IM LCC Benefits:

+ 4.0 %

+

70 missiles

100 % = Procurement Co

of non-IM missiles

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SRAAM Cost Benefit Analysis: Lessons

- **Main lessons (Small and High value missile – High Value platform)**
  - **Limited benefits in transport**
    - **No. of missiles transported limited by the volume**
    - **Consequences of accidents limited (low NEQ)**
  - **Limited benefits in peacetime storage**
    - **Peacetime storage adapted to HD 1.1**
    - **Consequences of accidents limited (low NEQ)**
  - **Main Benefits in Operations:**
    - **Training**
    - **Crisis and Peacekeeping operations (Armed helicopter)**
    - **Reduced vulnerability of Air Bases**
    - **Reduced vulnerability of helicopters (Note: 1 or 2 % reduced vulnerability is enough to get significant cost-benefits)**

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2nd Study: 155-mm Artillery Ammunition

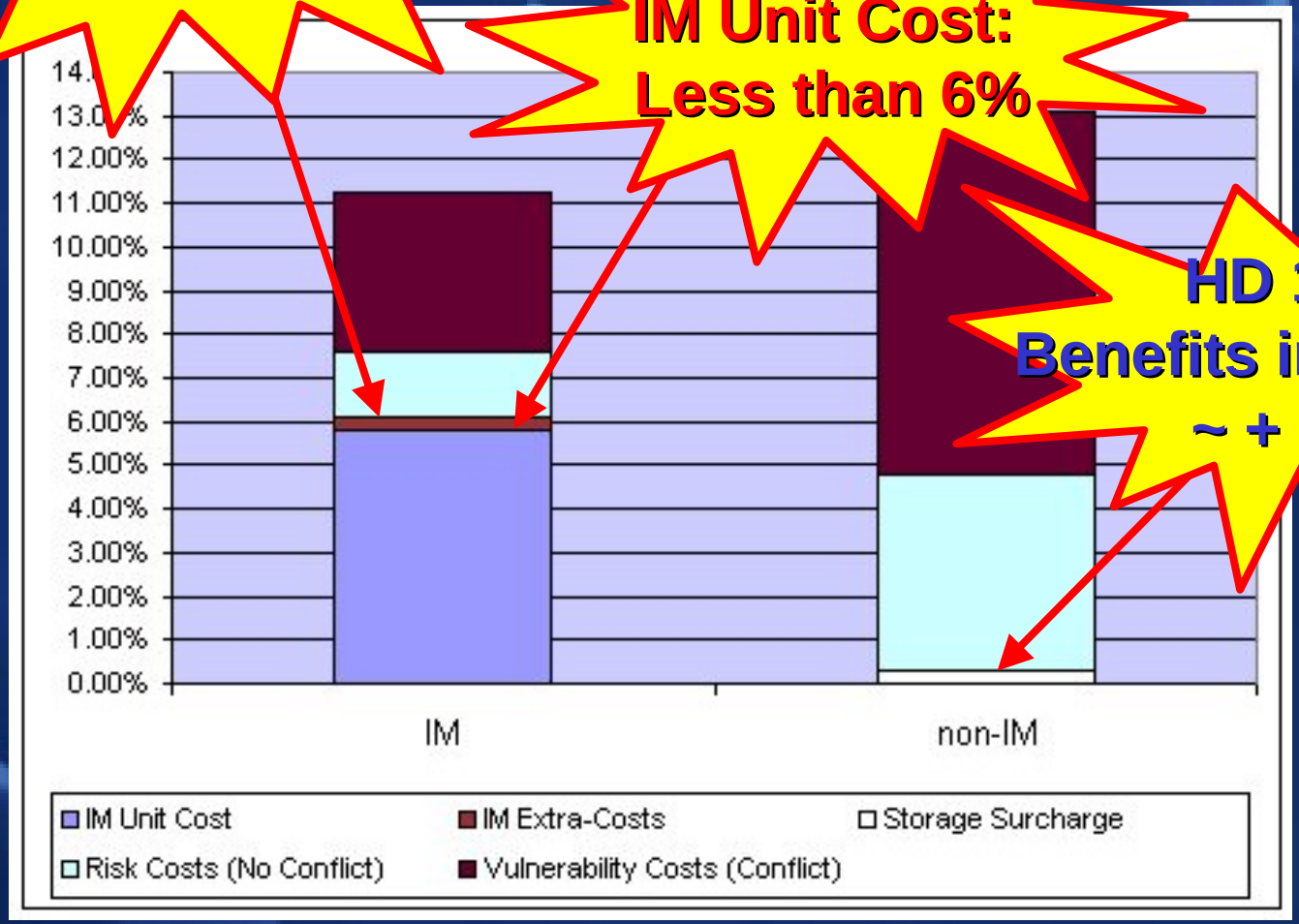
- **Why:**
  - Low-cost munition on a relatively low-cost platform
  - Data availability in NIMIC
- **Life Cycle (cradle-to-grave sequences):**
  - Peacetime (~24 years):
    - Storage (~ 90 % of the life cycle)
    - Transport (road, rail, sea and air)
    - Maintenance
    - Training
    - Disposal
  - Crisis (6 months)
    - Deployment, operational training, etc
  - Conflict (1 month)
    - Platform vulnerability, Land base and Ammo Dump vulnerability

155-mm Artillery Ammunition: results

IM extra-cost: ~ + 0.3%

IM Unit Cost: Less than 6%

HD 1.2.3 Benefits in Storage: ~ + 0.3%



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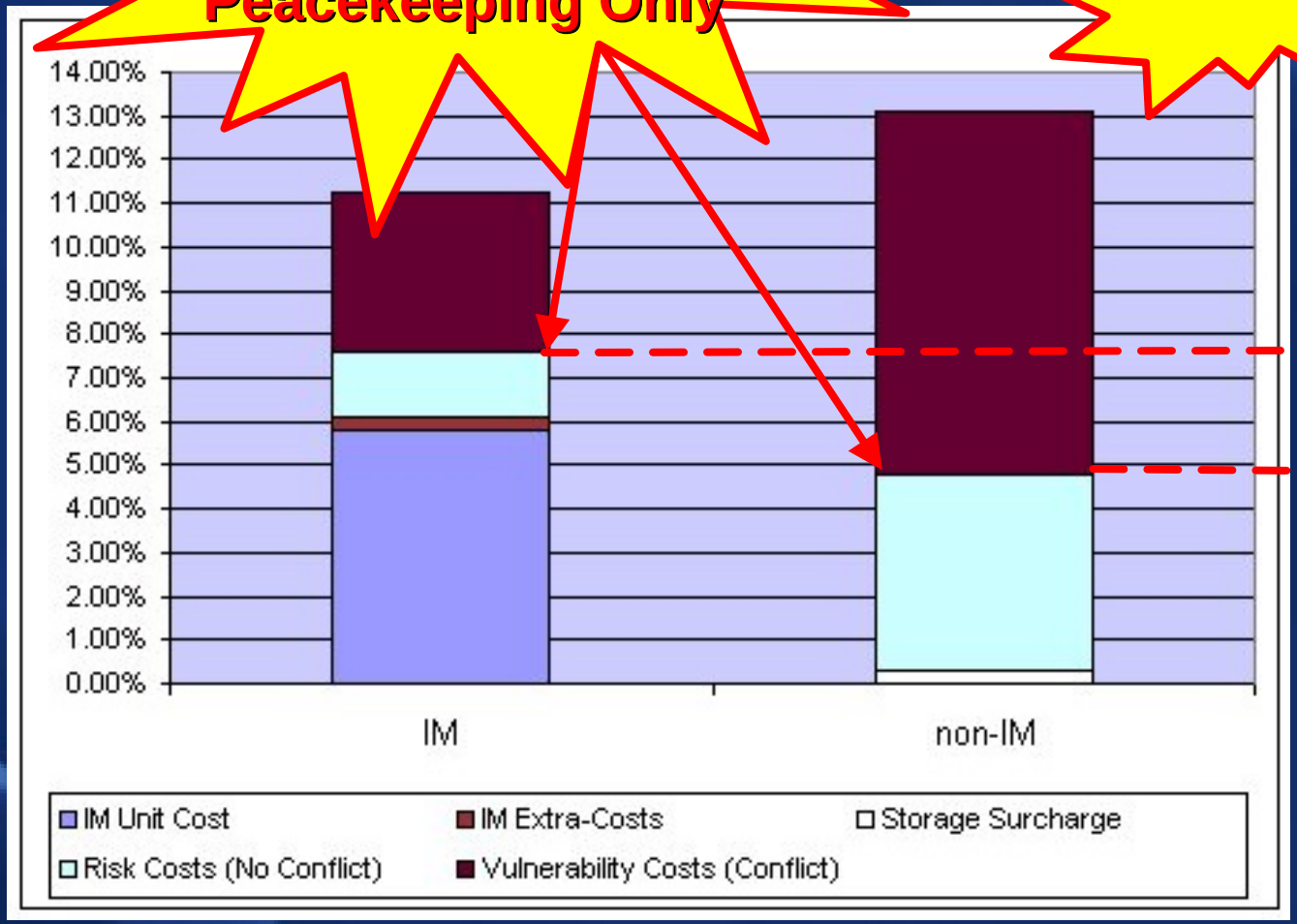
155-mm Artillery Ammunition

IM LCC Benefits: Peacetime & Crisis/ Peacekeeping Only

+ 3 %



IM Benefi
- 2.5%

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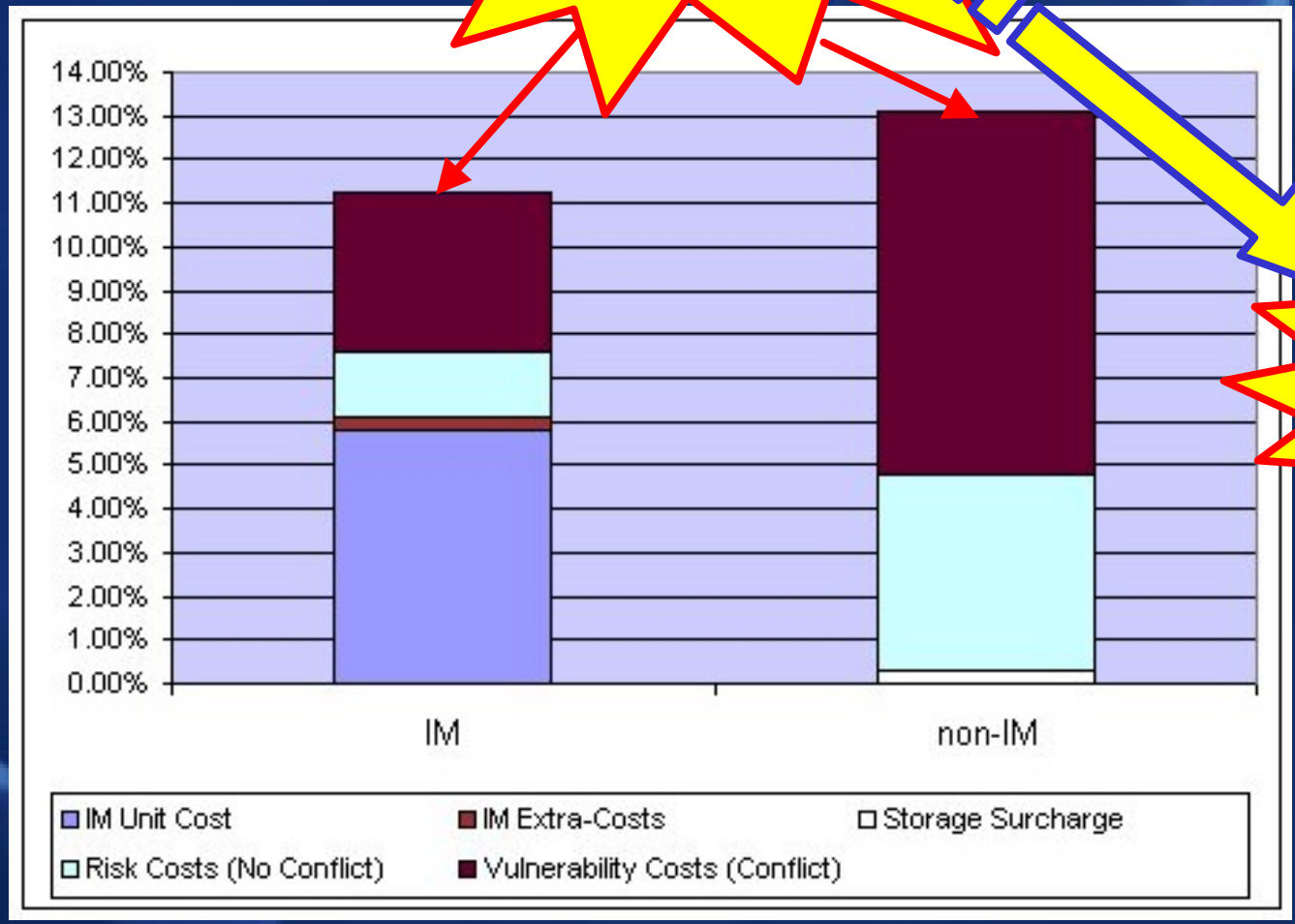
155-mm Artillery Ammunition

IM LCC Benefits:



~ 2.0 %

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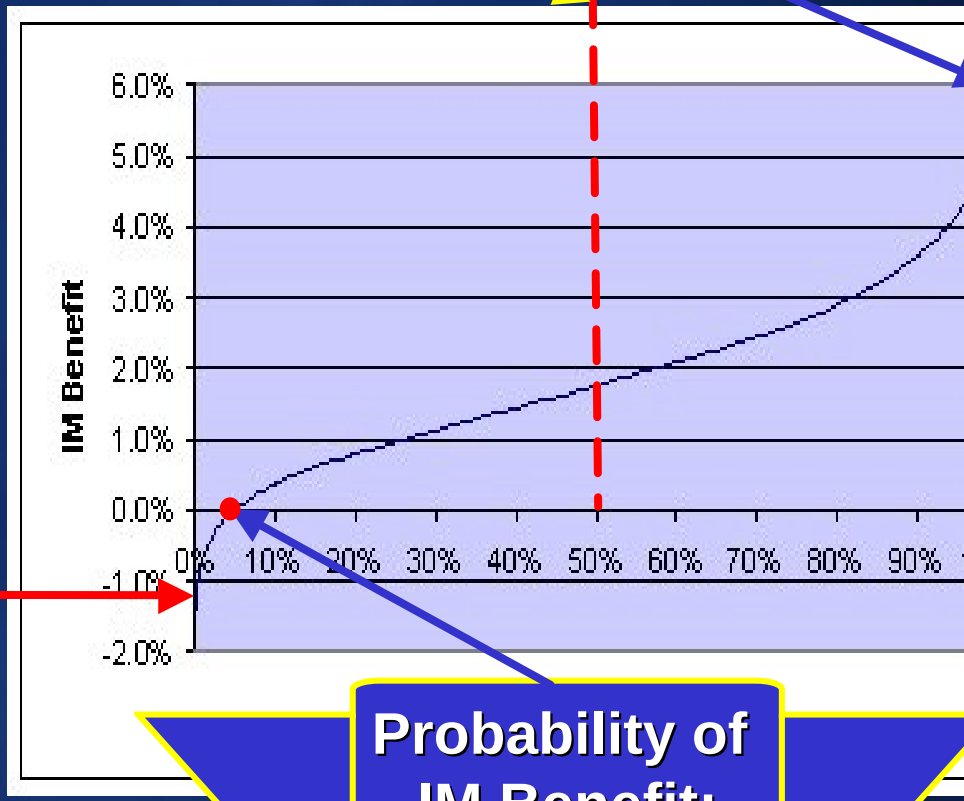
155-mm Artillery Ammunition

Results presented earlier are mean value (Monte Carlo - linear distribution)

Max. Rate of Retu
IM Investment:
~ 200 %

Probability of having a benefit:

- Variability of the input data (exposure, threat probability, munition reaction probability, consequence probability)
- Monte Carlo Runs



Min. Rate of Return
IM Investment:
> 75 %

Probability of IM Benefit: 95.5 %

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CBAM/CBA Studies: Capabilities & Limitations

- **Too many uncertainties may give a meaningless result**
- **Some IM benefits are not financial:**
  - **The increased flexibility in operations**
  - **The reduced logistics**
  - **Some consequences of accidents, such limited access to zones where UXOs have been spread**
  - **Operational, Health & Safety, Environmental and Political Benefits**

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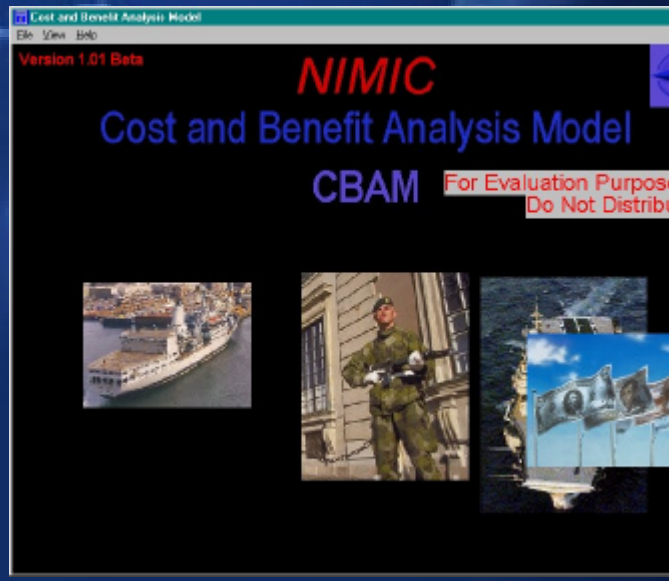
Future of CBAM



- **Any comments, recommendations, requirements for the Model are welcome**

- **Future ?**
  - **Tool development and testing is now completed**
  - **A β-version has been released early March 2003 to a limited number of testers**
  - **Additional improvements before distribution:**
    - **life saving probability**
    - **Direct difference cost calculation (IM and non-IM version)**
  - **CBAM 1.0: May 2003**

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Conclusions

- **Storage benefits:**
  - Peacetime: very limited
  - Conflict or Crisis: medium to high
- **Transport benefits:**
  - Munition dependent
  - Nation dependent (exposure factor)
- **Benefits in operations (crisis or conflict)**
  - Reduced platform vulnerability
  - Reduced ground base vulnerability
- **Transport accident: political consequences?**

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Any Questions?

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