Non-Lethal Weapons (NLWs) are weapons, devices, and munitions that are “explicitly designed and primarily employed to incapacitate targeted personnel or materiel immediately, while minimizing fatalities, permanent injury to personnel, and undesired damage to property in the target area or environment.” – DOD Directive 3000.03E
Could this …

Novel flash bang
developed by Sandia National Labs in 2008
Taken from *Wired*

… stop this?

Iranian protestors storm the US Embassy in Tehran in 1979
Taken from *The Daily Telegraph*
To assess the technical maturity of a NLW, combat developers must compare the NLW’s capabilities to requirements.

 Measure of Performance (MOP): Am I doing the thing right?

 Measure of Effectiveness (MOE): Am I doing the right thing?
NATO created a framework for NLW effectiveness in the 2000s.

Several DOD groups contributed to this framework.
Assess the **physical performance of the NLW** (e.g., brightness, loudness)

- **Pro**: Straightforward to measure in lab
- **Con**: Does not assess how the NLW will affect the targeted personnel
Assess the physiological response of the targeted personnel to the NLW (e.g., vision obscured, hearing threshold shift)

- **Pro:** Begins to assess effect on target
- **Con:** Does not assess how target will behave
Assess the behavior of the targeted personnel after deployment of the NLW (e.g., keep throwing rocks, stop climbing fence)

- **Pro:** Assesses behavior of target
- **Con:** Difficult to measure in lab
1. What is the **scenario**?

2. What are the **constraints** of the scenario?

3. What **actions** could individuals take that are **relevant** to the scenario?

4. What **metrics (MOEs)** describe whether a weapon can suitably influence those actions?

5. What **experiments** must be done to acquire those metrics?

6. What **field data** are available to estimate those metrics?
1. What is the scenario?

For example:

Non-combatant Evacuation Operation (NEO)
Taken from *MPM-NLWS CONOPS (2011)*
2. What are the constraints of the scenario?

A. What is the goal of the mission?

B. What are the Rules of Engagement?

Rules of Engagement (ROE) are “directives issued by competent military authority that delineate the circumstances and limitations under which US forces will initiate and/or continue combat engagement with other forces encountered.”

– DOD Dictionary of Military and Associated Terms
3. What actions could individuals take that are relevant to the scenario?

Relevant actions must

A. Potentially thwart the goal of the mission and

B. Be within the window-of-opportunity of the weapon
4. What **metrics (MOEs)** describe whether a weapon can suitably influence those actions?

**For example:**

**Rock Throwing Behavior:**
- Miss distance?
- Binary hit or miss?
- Number of hits?
- Time to first hit?
5. What experiments must be done to acquire those metrics?

**Internal Validity**
Fewer Uncontrolled Factors
May Not Generalize Well to Real World

**External Validity**
More Uncontrolled Factors
Generalizes Well to Real World

Taken from Grier, *MORS Test & Analysis Techniques* (2013)
6. What **field data** are available to estimate those metrics?

- Analysis of similar operational situations
- Effects of similar weapons that have been fielded

Flash bang thrown during 2005 Camp Bucca riot
Taken from Rey, *YouTube* (2007)
Limitations & Opportunities

- Behavioral experiments and field data collections can be resource-constrained
- DOD Instruction 5000.02 supports modeling & simulation as a cost-effective approach to test & evaluation
- The IDA Effectiveness Framework could also include questions to guide modeling & simulation of NLW systems
Shelley Cazares, Ph.D.
Institute for Defense Analyses
703 845 6792
scazares@ida.org
www.ida.org

Distribution A: Approved for public release; distribution is unlimited.