National Institute of Standards and Technology
U.S. Department of Commerce

# Improving Testing of Body Armor Through Harmonization of Standards

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# Discussion Topics

- What is harmonization?
- Why harmonize standards?
- Harmonization of body armor standards:
  - Partners
  - Overview
  - Starting Point
  - Activities
  - Benefits of harmonization
  - Lessons learned
  - Timeline and Future plans

Source: www.policemag.com

Source: www.globalsecurity.org

# What is harmonization?

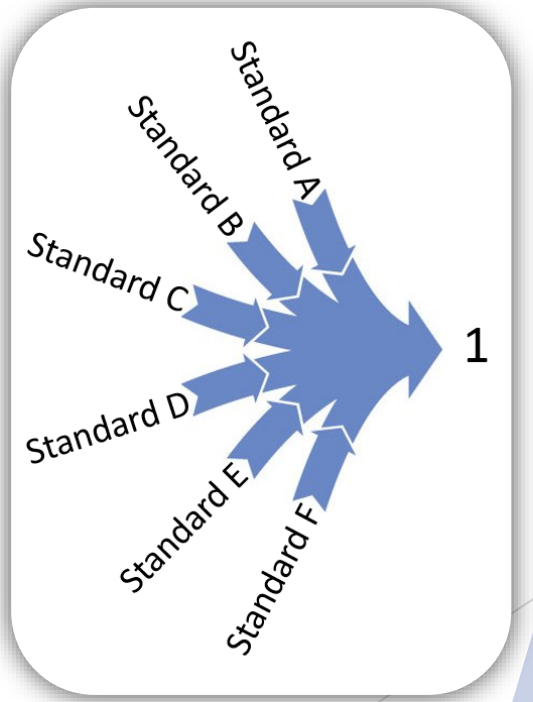
In general:

- Bringing or coming into agreement
- Causing (two or more things) to be combined or to go together in a pleasing or effective way
- Being in consonance or accord
- Playing in harmony

# What is harmonization?

In standards:

- Process whereby differing standards are examined by stakeholders with the intent of identifying commonalities and differences and converging on an agreed upon standard



# Why harmonize standards?

Some reasons to harmonize include:

- Reduce differences in methods and requirements
- Simplify process of meeting requirements
- Reduce costs of compliance
- Reduce complexity of testing, inspecting, and auditing
- Remove or reduce barriers to trade

# Harmonization of Body Armor Standards: Partners

3 United States (U.S.) Federal Agency Partners:


Army Program Executive Office – Soldier (U.S. Department of Defense)


National Institute of Justice (U.S. Department of Justice)


National Institute of Standards and Technology (U.S. Department of Commerce)

# Harmonization of Body Armor Standards: Overview

- Body armor has effectively protected US law enforcement officers & soldiers for decades

Soft armor for handgun protection


Hard armor plates for rifle protection

Photo: www.usarmor.com

# Harmonization of Body Armor Standards: Overview

- Law enforcement officer gunfire deaths[1]:
  - 1970's: Average of 127 shot and killed each year
  - 2008 – 2017: Average of ~52 shot/killed each year
  - 2018: 31 as of June 19
- Standards and test methods are vital to ensuring protection afforded by body armor

Reduction in gunfire deaths attributed to body armor & improved trauma care

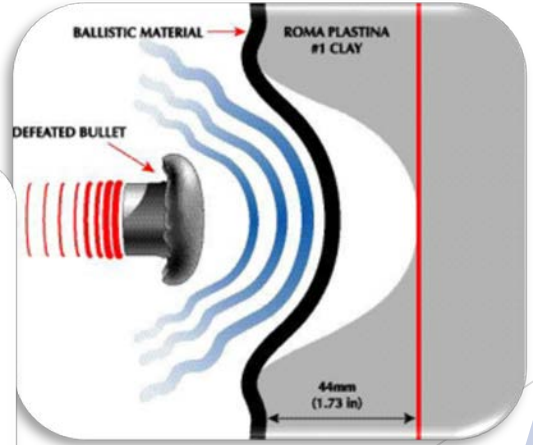
1 Source: National LEO Memorial Fund, http://www.nleomf.org/facts/officer-fatalities-data/causes.html

# Harmonization of Body Armor Standards: Overview

Performance Requirements

Resistance to complete penetration by a projectile

Limited behind-armor blunt force trauma

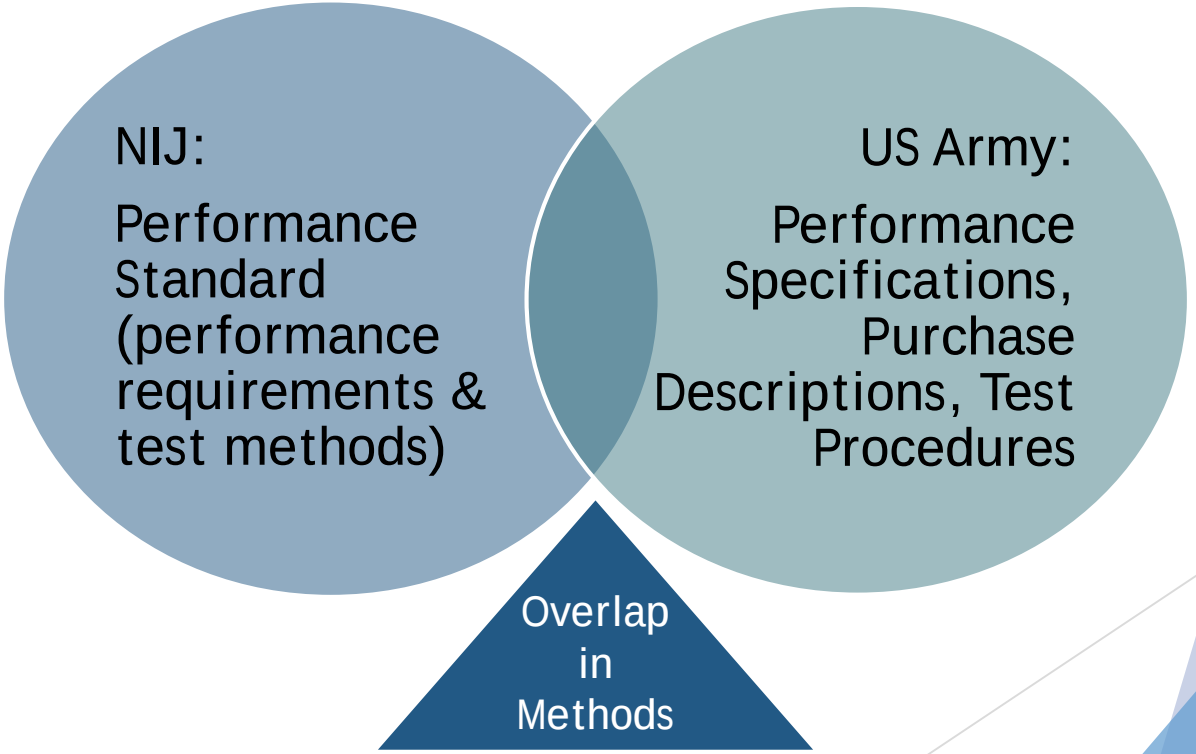


# Harmonization of Body Armor Standards: Overview

Test Item on Clay Backing


Resultant Behind-armor Backface Deformation

# Harmonization of Body Armor Standards: Starting Point



# Harmonization of Body Armor Standards: Starting Point

- Multiple methods for assessing same characteristics or requirements
- Questions from oversight bodies, including the U.S. Dept. of Defense Inspector General, Government Accountability Office, and National Research Council
- Multiple methods can lead to:
  - Different test results
  - Increased testing costs
  - Increased likelihood for error
  - Increased questions from stakeholders

# Harmonization of Body Armor Standards: Starting Point

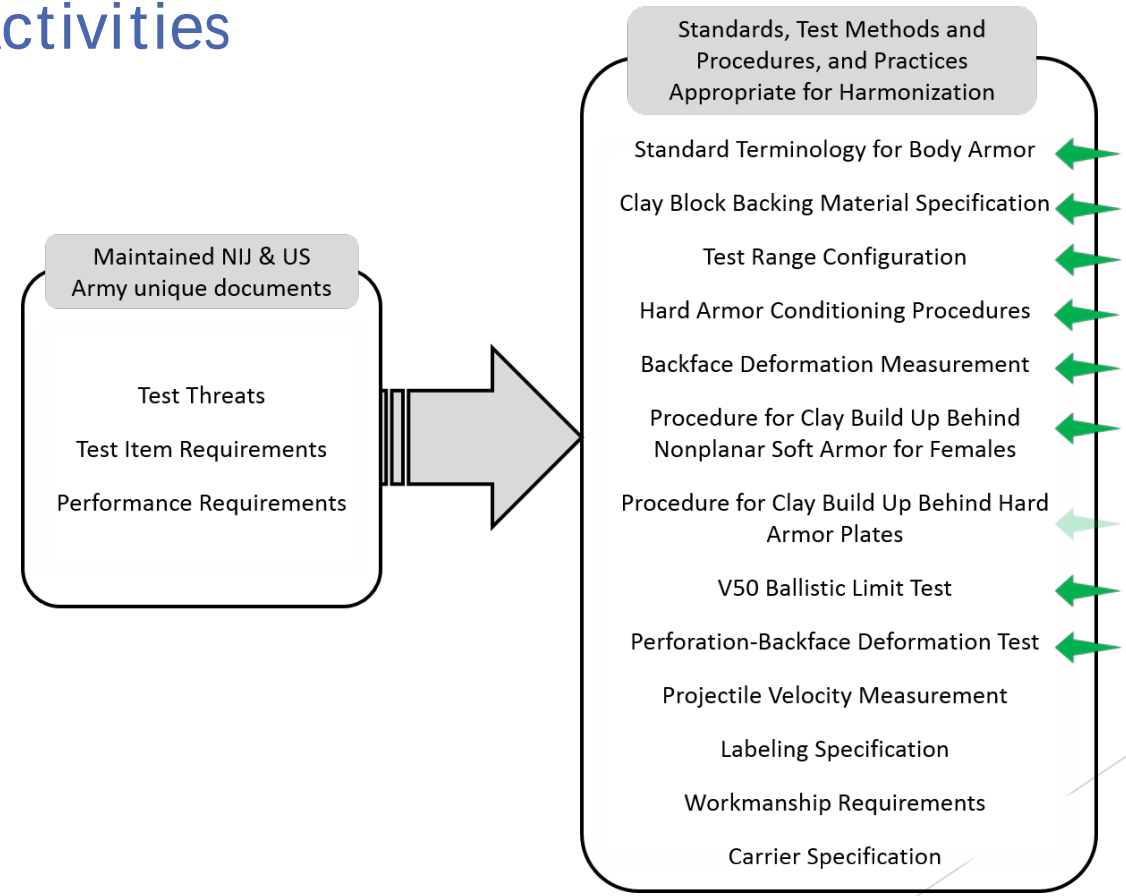
- Examples of multiple method issues:
  - Clay backing preparation and verification
  - Pre-conditioning of test items
  - Methodology for measurement of backface deformation
  - Ballistic test range configuration

# Harmonization of Body Armor Standards: Activities

- Understand and assess current methods in use
- Harmonize methods, where possible

- Test Threats
- Test Item Requirements
- Performance Requirements
- Standard Terminology for Body Armor
- Clay Block Backing Material Specification
- Test Range Configuration
- Hard Armor Pre-Conditioning Procedures
- Soft Armor Pre-Conditioning Procedures
- Backface Deformation Measurement
- Procedure for Clay Build Up Behind Nonplanar Soft Armor for Females
- Procedure for Clay Build Up Behind Hard Armor Plates
- V50 Ballistic Limit Test
- Perforation-Backface Deformation Test
- Projectile Velocity Measurement
- Labeling Specifications
- Workmanship Requirements
- Carrier Specifications

# Harmonization of Body Armor Standards: Activities



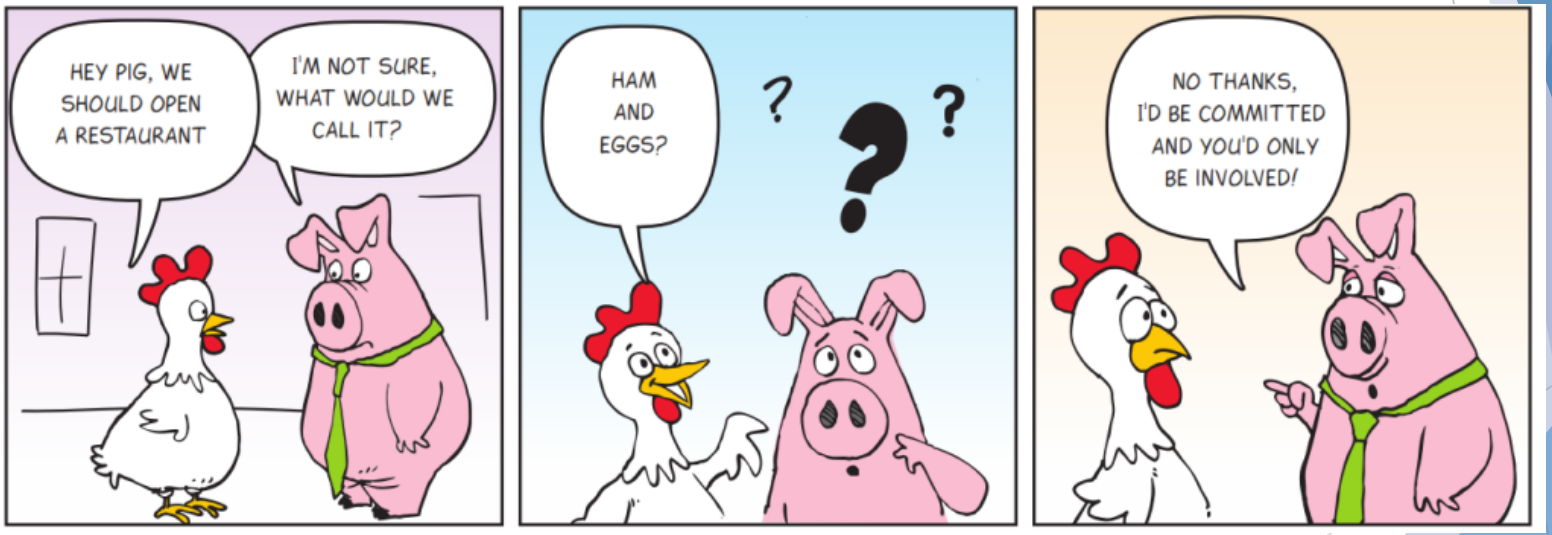
# Harmonization of Body Armor Standards: Benefits

- Involvement of all stakeholders via consensus process in ASTM International
- Standard terminology – speak same language
- Increased quality of testing with decreased costs
- Reduced number of ways of doing things
- Manageable suite of standards
- Predictable revision cycle

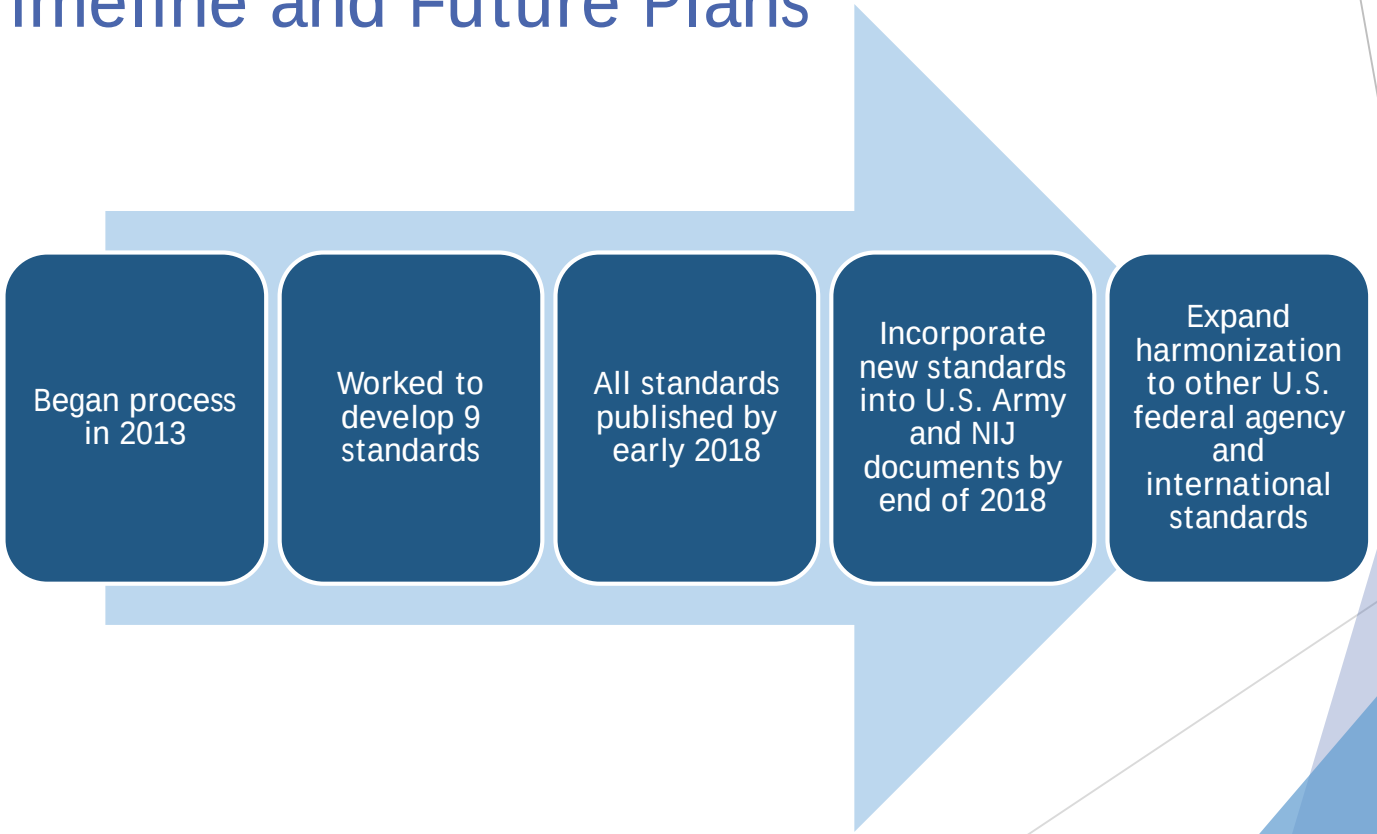
# Harmonization of Body Armor Standards: Lessons Learned

- Consensus process can be tedious, but end result is worth the effort
- Most complicated challenges are relationships, not technical issues
- Coming to consensus requires learning to listen to and value different perspectives
- Being committed and engaged from start to finish leads to greater success

# Harmonization of Body Armor Standards: Lessons Learned



# Harmonization of Body Armor Standards: Timeline and Future Plans



# Wrap Up & Questions

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- Law enforcement officers
- End user stakeholder organizations

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