



NIJ's  
Body Armor Testing Program  
8<sup>th</sup> Annual Technologies for Critical  
Incident Preparedness  
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## NIJ's Voluntary Body Armor Testing Program

- In 5 years, from 1966 to 1971 the number of law enforcement officers killed each year in the line of duty more than doubled, from 57 to 129.
- In response, NIJ initiated research to investigate the development of a lightweight body armor that on-duty police could wear full time.
- **In 1972**, NIJ and the Office of Law Enforcement Standards (OLES) published the first *Ballistic Resistance of Police **Body Armor Standard, 0101.00***.
- **Lester Shubin** and **Nicholas Montanarelli**, began researching a fabric called Kevlar<sup>®</sup>, for use in ballistic resistant vests.
- In 1975, NIJ launched a body armor program with a field test of 5,000 prototype armors made of Kevlar<sup>®</sup>.
- The first save occurred 6 months after its implementation and the 3,000th save was recorded this year, in 2006.



# A Timeline of Development

- **In 1978**, NIJ published it's **Body Armor STD-0101.01**
  - backface signature test for blunt trauma
  - and wet testing
- Also in 1978, NIJ established its compliance testing program, administered by NLECTC National.
- **In 1985**, NIJ amended the standard, issuing **STD-0101.02:**
  - angle shots
  - multishots
  - Threat level III-A
- **In 1987**, **STD-0101.03** was published
  - Addressing labeling requirements, acceptance criteria, and backface signature measurement procedures.
- **In 2000**, NIJ issued *Ballistic Resistance of Personal Body Armor*, NIJ **Standard-0101.04.**
  - New threat rounds
  - Changes to BF measurement procedures
  - streamlined the administrative changes.



## U.S. Department of Justice's Body Armor Safety Initiative

- In 2003, a Forest Hills, Pennsylvania, police officer was injured when a bullet penetrated the front panel of his Zylon<sup>®</sup>-based body armor
- The incident was the first NIJ-confirmed case in which any **NIJ-compliant body armor model failed to prevent penetration from a bullet it was designed to defeat**
- In November, 2003, Attorney General John Ashcroft directed NIJ to undertake **Three Primary Tasks**:
  1. **Examine Zylon<sup>®</sup>-based bullet-resistant armor (both new and used)**
  2. **Analyze upgrade kits** provided by manufacturers to retrofit Zylon<sup>®</sup>-based bullet-resistant armors
  3. **Review the existing program** by which bullet-resistant armor is tested to determine if the process needs modification



## Key Findings

- NIJ has issued three status reports to the Attorney General: They highlighted the following:
  - Ballistic-resistant material, including Zylon<sup>®</sup>, can degrade due to environmental factors
  - Used Zylon<sup>®</sup>-containing armor may not provide the intended level of ballistic resistance
    - Of the 103 used Zylon<sup>®</sup>-containing armors tested, sixty (58%) were penetrated by at least one round during a six-shot test series
    - Of the armors that were not penetrated, 91% had backface deformations in excess of that allowed by the NIJ standard for new armor
    - **Only 4 of the 103 used Zylon<sup>®</sup>-containing armors met all performance criteria under the NIJ body armor standard.**
  - **Upgrade Kits** did not perform up to the standards new armor
  - A visual inspection of body armor and its ballistic panels did not indicate whether a particular piece of Zylon<sup>®</sup>-containing body armor had maintained its ballistic performance



## Response to these Findings

- NIJ implemented the **2005 Interim Requirements for Bullet-Resistant Body Armor**
- 05 IR's rely primarily on certifications from the manufacturers of body armor
  - The ongoing ballistic performance of body armor (warranty)
  - Materials of construction (build sheets)
  - Established the NIJ Advisory Notice's (advisories to the field regarding issues with body armor): such as **Zylon<sup>®</sup>**
  - Loss of compliance status



# Continuing the Body Armor Initiative

## Three Primary Tasks

Review the existing program by which bullet-resistant armor is tested to determine if the process needs modification

**Revise the Standard** (ongoing effort)

**Develop artificial aging protocol** (used body armor)

**Conformity Assessment program** (ongoing performance)

- NIST/OLES: National Institute of Standards and Testing: Office of Law Enforcement Standards
- NLECTC National: Administer the Body Armor Compliance Testing Program



# Suggested Revisions to the NIJ BA Std. 0101.05

- Improved ballistic limit testing.
  - Increase the number of samples submitted for testing
- Testing of multiple armor sizes.
  - Male and Female, small to large
- **Interim artificial aging protocol.**
  - Long term artificial aging protocol
- Reduced shot-to-edge distance.
  - From 3 “ to 2”
- Readjusting threat levels (IIA, III, IIIA, IV)



# Artificial Aging Protocol

To evaluate used body armor

- Design a test method to address:
  - Heat/Cold
  - Moisture/ Relative Humidity
  - Wear Resistance/Rough Handling

To Date, there is no Artificial Aging Protocol

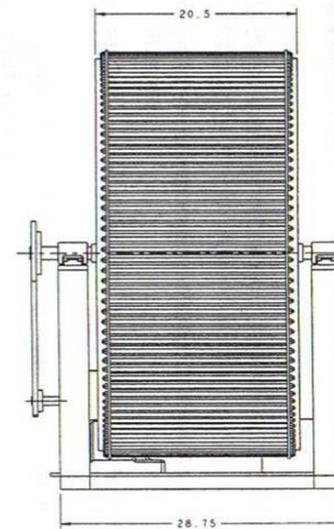
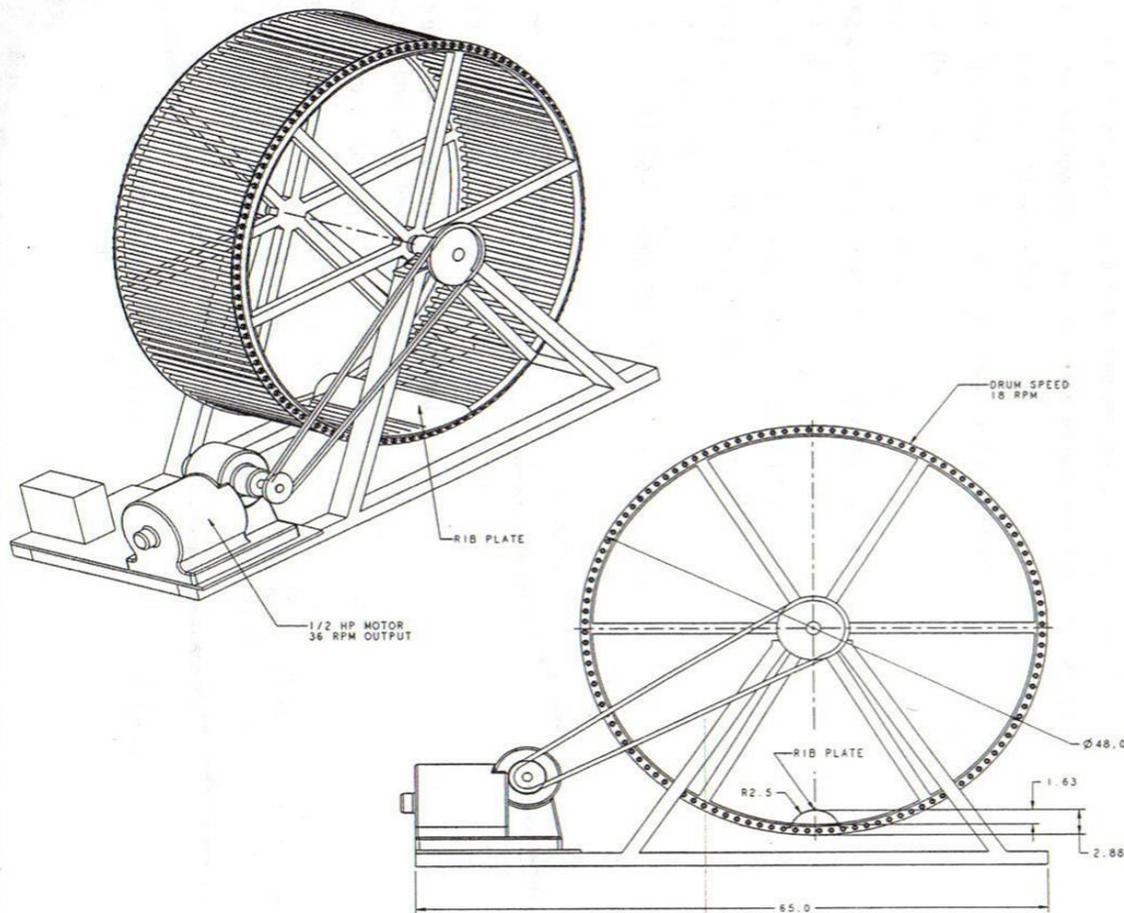


# Interim Artificial Aging Protocol Objectives & Considerations

- To simulate, in **accelerated laboratory manner**, average environmental conditions which ballistic vests experience over stated “service-life” or warranty period
- Necessary to give proper consideration to environments that occur throughout material’s life cycle
- Ensure that material will be neither under or over exposed with respect to environment that it is expected to encounter



# Interim Artificial Aging Protocol



It will be difficult to correlate this method with an exact period of aging in the field



# Compliance Testing to Conformity Assessment

To ensure the ongoing performance of body armor

- Type testing at accredited laboratories (NVLAP & BA HB150)
- Inspection of armor for design requirements (eg. labeling) (build sheets)
- Compliance decision based on type test data and inspection by certifier
- Attestation of conformity – Certified product list
- Surveillance at manufacturing facility – Two track system that give deference to effective **registered (ISO 9000 +BA)** quality management system (sampling program)



## Further Questions?

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- <http://www.justnet.org>
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**QUESTIONS?**