JOINT U.S. AND CANADIAN DEVELOPMENT OF TESTING PROCEDURES FOR EVALUATION OF PERSONAL BODY ARMOR PERFORMANCE AGAINST AUTOMATIC WEAPONS

Joint Services Small Arms Systems Annual Conference
Little Rock, AR
August 2001

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<th>Report Date</th>
<th>Report Type</th>
<th>Dates Covered (from... to)</th>
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<td>13Aug2001</td>
<td>N/A</td>
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**Title and Subtitle**

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**Distribution/Availability Statement**
Approved for public release, distribution unlimited

**Supplementary Notes**

**Abstract**

**Subject Terms**

**Report Classification**
unclassified

**Classification of Abstract**
unclassified

**Number of Pages**
12
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BODY ARMOR STANDARDS

BACKGROUND

- **NIJ STANDARD-0101.04**
  - 25+ YEARS OLD
  - FIRST BODY ARMOR STANDARD FOR LAW ENFORCEMENT
  - SIX SINGLE HITS PER PANEL

- **CANADIAN GENERAL STANDARDS BOARD (CGSB) 179.1**
  - NEWLY ADOPTED IN 2001
  - BASED ON NIJ STANDARD
  - OPTIONAL MULTI-HIT PROCEDURE (SPACING AND PATTERN)

- **prEN ISO 14876 PARTS 1 & 2**
  - IN RATIFICATION PHASE
  - BASED ON NIJ STANDARD
SINGLE VS MULTIPLE IMPACTS

➢ SINGLE HIT
  ▪ ISOLATED WITH RESPECT TO TIME BETWEEN IMPACTS
    • ONE ROUND PER TRIGGER PULL
    • TIME INTERVALS BETWEEN IMPACTS - SECONDS OR LONGER
    • INDIVIDUALLY AIMED
  ▪ NIJ STANDARD, OTHERS, BASED ON SINGLE HIT, MULTIPLE TIMES
    • AUTOMATIC WEAPONS BECOMING MORE PREVALENT AS LE THREAT
    • OFFICER WEAPONS AND ASSAILANT WEAPONS
    • TACTICAL AND DUTY ENVIRONMENTS

➢ MULTIPLE (MULTI) HIT
  ▪ GROUPED WITH RESPECT TO TIME BETWEEN IMPACTS
  ▪ CONTROLLED BURSTS OR FULL AUTOMATIC FIRE
    • TIME INTERVALS IN MILLISECONDS
    • LESS CONTROLLED FOR AIM, THUS IMPACT SPACING/PATTERN
RESEARCH PROGRAM

- DEVELOP TEST METHODS AND PROCEDURES
  - TRUE MULTI-HIT IMPACTS
    - TIME RESOLVED FOR AUTOMATIC RATES OF FIRE
    - REPRESENTATIVE SHOT SPACING AND PATTERNS

- STANDARDIZED LABORATORY METHODS AND EQUIPMENT
  - CONSISTENT, AFFORDABLE
  - VALIDATED METHODS, EQUIPMENT, PROCEDURES
  - POTENTIAL FOR INCLUSION IN FUTURE NIJ AND CGSB STANDARDS
AUTOMATIC WEAPONS

IDENTIFICATION AND SELECTION

- RMC LED EFFORT
  - DRAFT REPORT IN REVIEW – FINAL EXPECTED IN FALL 2001

CLASSED BY BARREL LENGTH

- APPROXIMATELY 6 IN. OR LESS (MACHINE PISTOLS)
- APPROXIMATELY 6 TO 12 IN. (SUBMACHINE GUNS)
- APPROXIMATELY 12 IN. OR LONGER (ASSAULT RIFLES)

COMPARISONS MADE BY

- CALIBER
- NOMINAL VELOCITY AND KINETIC ENERGY
- RATE OF FIRE
- ORIGIN, FIRING DESIGN/Mechanism NEGLECTED
WEAPONS SELECTION

- ACQUISITION OF WEAPONS FOR STUDY (RMC)
  - AVAILABILITY BASED – CANADIAN SOURCES

Skorpion Model 61
Ingram MAC-10
Beretta 38A
H&K MP-5
Sterling SMG
M4 Carbine
C7A1
AK-47
C2
ATTRIBUTES MEASURED

BALLISTICS
- VELOCITY
- RATE OF FIRE
- BURST AND FULL AUTOMATIC

IMPACT BALLISTICS
- AIMED BURST IMPACTS (3 SHOT BURSTS)
- SNAP FIRED BURST IMPACTS (3 AND 9 SHOT BURSTS)
  - SHOULDER, AIM, FIRE IN LESS THAN 2 SECONDS
  - 5 METER (16.4 FT) RANGE
SHOOTER INFLUENCES

- TYPED USING PRESCRIBED PROTOCOL
  - FAMILIARIZATION – 3 BURSTS OF 3 SHOTS AT 5 M
  - AIMED BURSTS – 3 SHOT BURST AT 5 M
  - SNAP BURSTS – 3 AND 9 SHOT BURSTS AT 5 M

- CLASSSED BY RESULTS AS
  - EXPERT
  - EXPERIENCED
  - INEXPERIENCED

- CHARACTERIZATION
  - EACH WEAPON
  - EACH CLASS OF SHOOTER
SAMPLE IMPACT BALLISTICS

➢ COMPOSITE IMPACT LOCATIONS OF ALL SHOOTERS

COMPOSITE IMPACT LOCATIONS OF ALL SHOOTERS AIMED 3 SHOT BURSTS AT 5 M

SKORPION

MP 5

AK-47
LABORATORY SIMULATION

- BCL 3-BARREL TEST FIXTURE
  - DEVELOPED FOR CGSB 3 SHOT IMPACT GROUP
  - TEST BARRELS – SELECTION OF CALIBERS, LENGTHS, TWISTS
  - SHOT SPACING AND PATTERN CONTROLLED
  - RATE OF FIRE CONTROLLED BY PC/SOFTWARE
CONCLUSION

- PRELIMINARY RESULTS SHOW
  - SHOT SPACING MAY BE CLOSER THAN USED IN CURRENT TESTS
    • EQUILATERAL VERSUS ASYMMETRIC SPACINGS
  - SHOT PATTERNS IN GENERAL REFLECT
    • TRIANGULAR SHAPES (EQUILATERAL AND ASYMMETRIC)
    • STRAIGHT LINE EQUAL AND VARIABLE DISTANCES
  - TIME BETWEEN IMPACTS CRUCIAL WITH RESPECT TO
    • ARMOR RESTRAINT ON TEST FIXTURE
    • BACKING MATERIAL ELASTIC RESPONSE

- FINAL WEAPONS SELECTION
  - MP5 SUBMACHINE GUN (9 X 19 mm Parabellum)
  - INGRAM MAC 10 MACHINE PISTOL (.45 caliber ACP)
  - BASED ON RATE OF FIRE, ACCURACY, CALIBER/ENERGY
    • CONSERVATIVE CHOICES WITH RESPECT TO SEVERITY OF THREAT TO ARMOR