

The Tekne Group, Inc.
Bosik Consultants Limited, Ottawa



Royal Canadian
Mounted Police

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



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PROGRAM PARTICIPANTS



- **JOINT U.S. AND CANADIAN STANDARDS DEVELOPMENT**
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 - JOSEE MAILLETTE
 - *BOSIK CONSULTANTS LIMITED (BCL)*
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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

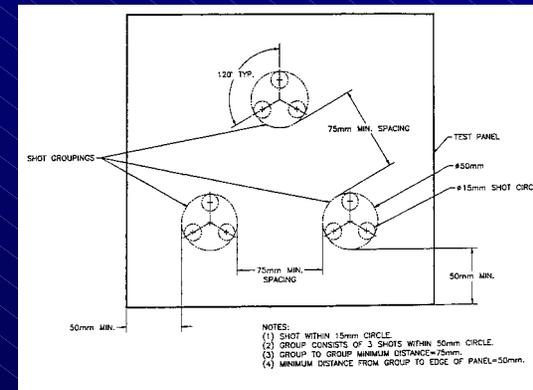
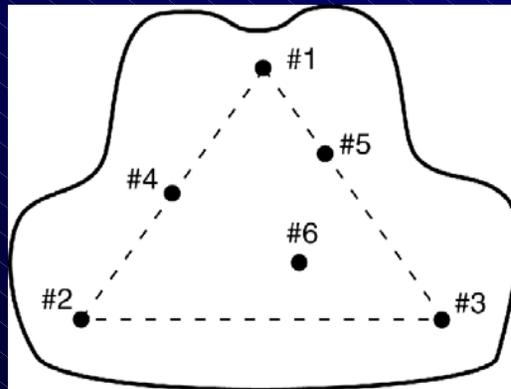


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➤ DEVELOP TEST METHODS AND PROCEDURES

▪ 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*

PROGRESS



➤ 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*



**Royal Military
College of Canada**

WEAPONS SELECTION



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- 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

WEAPONS CHARACTERIZATION



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➤ ATTRIBUTES MEASURED

▪ BALLISTICS

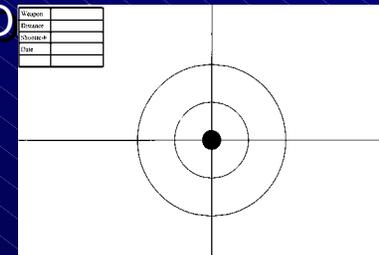
- *VELOCITY*
- *RATE OF FIRE*
- *BURST AND FULL AUTOMAT*

▪ IMPACT BALLISTICS

- *AIMED BURST IMPACTS (3 SHOT BURSTS)*
- *SNAP FIRED BURST IMPACTS (3 AND 9 SHOT BURSTS)*
 - *SHOULDER, AIM, FIRE IN LESS THAN 2 SECO*
- *5 METER (16.4 FT) RANGE*



Name	
Address	
Station	
Date	



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

- CLASSIFIED BY RESULTS AS
 - EXPERT
 - EXPERIENCED
 - INEXPERIENCED

- CHARACTERIZATION
 - EACH WEAPON
 - EACH CLASS OF SHOOTER

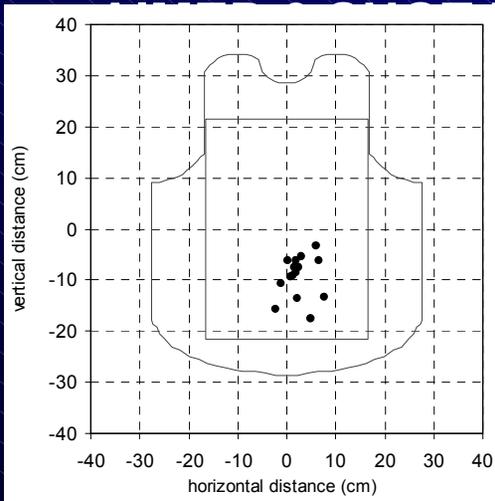


SAMPLE IMPACT BALLISTICS

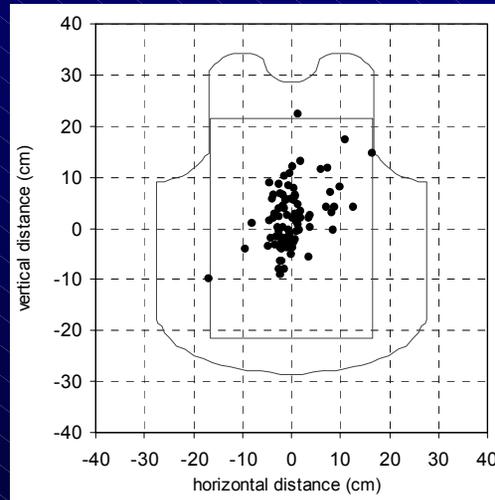


➤ COMPOSITE IMPACT LOCATIONS OF ALL SHOOTERS

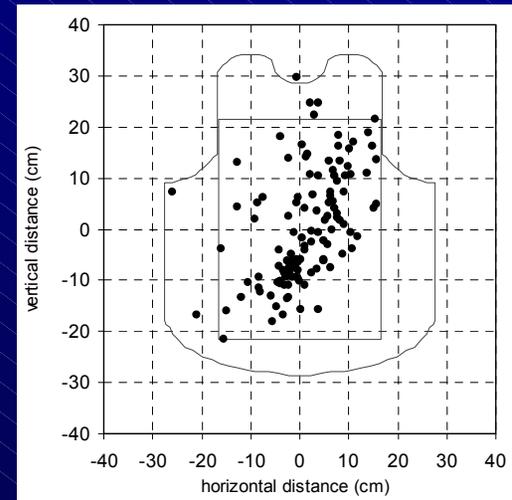
BURSTS AT 5 M



SKORPION



MP 5



AK-47

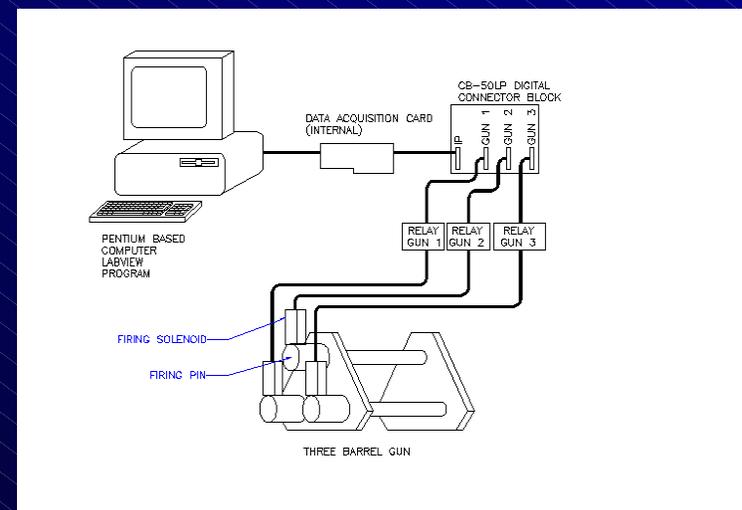
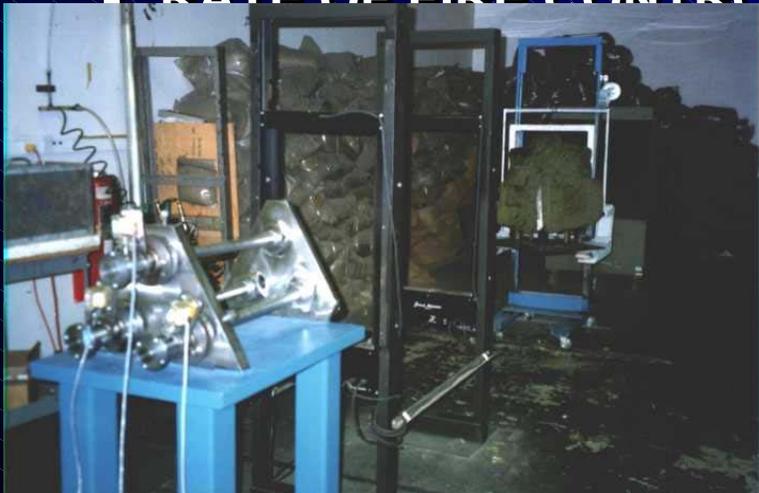
LABORATORY SIMULATION



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➤ 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



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➤ 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*