

# **Aged Armour Study: Naturally Aged and New Armour Testing**

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Contract Report

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# Progress Report (Final Deliverable)

Prepared by: Christopher Withnall

<b>Project Title:</b>	Aged Armour Study: Naturally Aged and New Armour Testing	<b>Time Period:</b>	Jan 2012 to Feb 2012
<b>Progress Report No.</b>	R12-07 (Testing of 50 New Armours)	<b>Date:</b>	Feb 1, 2012
<b>Contract No.</b>	W7701-061933/001/QLC	<b>Task No.</b>	TA-51 (10208LD)

## ***Tasks Accomplished in Time Period***

In this initial time period of work the following activities have been accomplished:

1. Fifty new back armour panels have been tested in 10-shot V50 (.357 Magnum JSP). These were all manufactured by Pacific Safety Products as per procurement specification G.S. 1045-177. This specification is similar to NIJ Level II for soft body armour.

## ***Background***

Anti-ballistic soft body armour worn by Canadian police is certified to an accepted test method to demonstrate its bullet resistance. Most police forces accept that new armour bearing certification to the NIJ 0101 standard will provide sufficient protection from small arms handgun fire expected in the line of duty. However, the continued ability of that armour to resist bullet perforation as it ages remains largely unknown.

The environmental conditioning tests of the new NIJ 0101.06 address age degradation by ensuring that new armour designs can manage the rigours of service and remain bullet proof for a long time. These tests subject ballistic panels to heat, humidity and tumbling and are well-documented to expose weaknesses in some contemporary high-tensile fibres. However, it is not clear that they are effective against more traditional materials. Can a protracted time in a hyper-stressed environment really simulate years of regular wear and tear?

To help answer this question, this current study is a ballistic evaluation of aged soft body armour used in-service by police compared to similar new armour subjected to the NIJ 0101.06 environmental conditioning protocol. Aged armour of similar design, size and age has been obtained from the RCMP. New copies of that armour made to the same specification and by the same manufacturer have been purchased. Some of this new armour has been subjected to the NIJ 0101.06 environmental conditioning protocol, and some remains in new condition. Equal numbers of aged, new and conditioned armour will be V50 tested and the results compared.

In the first progress report (R12-01) fifty back panels of RCMP field-returned armour panels were tested in 10-shot V50 and the results reported. Testing of the 50 conditioned armour will be completed under a separate task authorization.

## ***Test Method***

The following testing method has been followed:

- Each panel has been tested in a 10-shot V50, requiring a minimum 5 perforations and 5 stops within a 40m/s range. Up to 15 shots are allowed to achieve this.
- Individual V50 has been calculated as the arithmetic mean of the above qualifying ten shots.
- Overall V50 has been calculated as the mean of the individual V50 scores. In the final reporting overall 50% complete perforation risk will also be calculated by binary logistic regression of the overall population dataset.

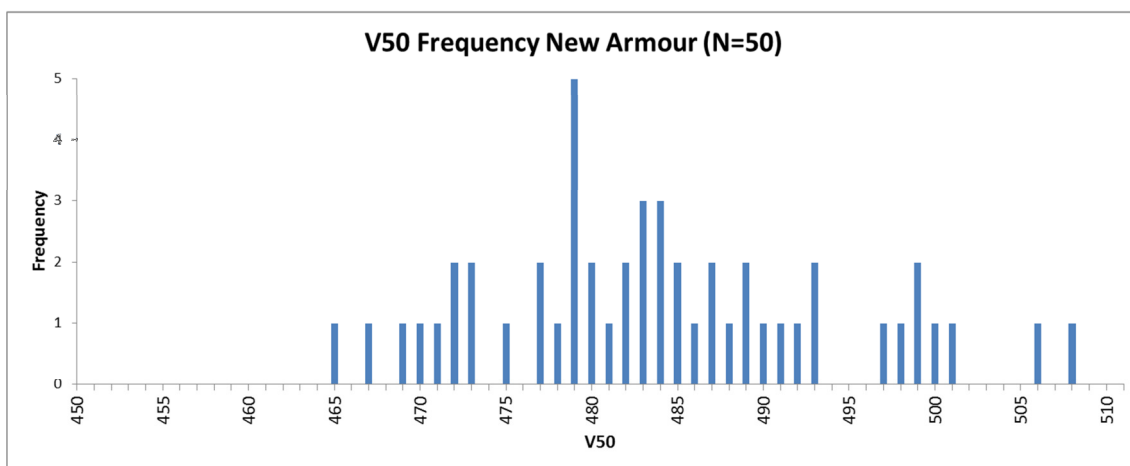
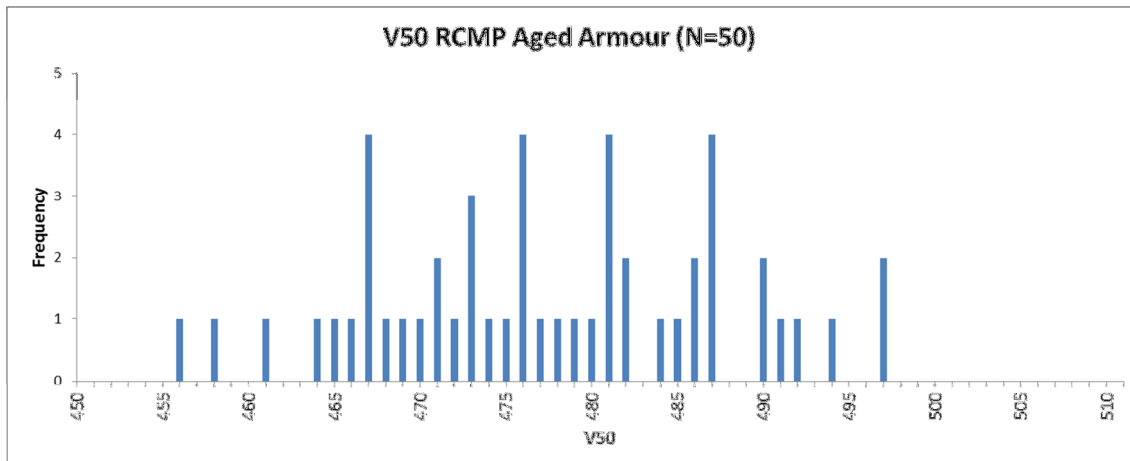


### Test Results of 50 RCMP Panels and 50 New Panels

The following table summarizes the V50 results from the 50 naturally aged rear panels and the 50 new panels purchased from Pacific Safety Products. These data include the overall lowest complete perforation (LCP) and highest partial perforation (HPP), or stop. The overall V50 of new panels was 483.7 m/s compared with 477.0 m/s for the aged panels. These results are significantly different at the 95% level ( $p= 0.00052$ ).

	Aged RCMP Armour			NEW Armour		
	V50	LCP	HPP	V50	LCP	HPP
	m/s			m/s		
Max	496.7		512.0	508.0		517.0
Min	455.2	446.0		464.6	453.0	
Mean	477.0			483.7		
Std. Dev.	10.0			10.1		
Median	476.4			482.6		

In the histogram chart below, the distribution of V50 scores is presented for the RCMP aged armour and the new armour.



### ***Project Schedule***

This project is now completed. These results will be analyzed further and compared with the results from 50 new conditioned armour panels under a separate Task Authorization (TA-53) within the standing offer.

### ***Financial Status***

The project was completed successfully within the project budget.

