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CANADIAN POLICE RESEARCH CENTRE

CENTRE CANADIEN DE RECHERCHES POLIÉIÈRES

TR-01-97
**Evaluation of Gun Lubricant
Operation at Low Temperatures**

Bosik Consultants Limited

TECHNICAL REPORT
November, 1995

Submitted by:
Staff Sergeant Robin Gomes
Royal Canadian Mounted Police

NOTE: Further information
about this report can be
obtained by calling the
CPRC information number
(613) 998-6343

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EXECUTIVE SUMMARY

With the acceptance of the semi-automatic pistol within the Canadian police community, concern about weapon lubricants surfaced because of the extreme climatic temperatures. Of particular concern was the function ability of the weapon at very cold temperatures. As a result, lubricants were subjected to a number of tests at -40 degrees Centigrade.

This report addresses the test results. Of the products tested, four have been found to be suitable for the application required in cold weather situations. No recommendation is being made as to a preference of one particular product over another. Each agency will have to determine what product is suitable to their specific element situation.

SOMMAIRE

L'utilisation par les policiers canadiens du pistolet semi-automatique a provoqué des craintes concernant la lubrification de l'arme à cause des différences extrêmes de température dans notre climat, particulièrement la capacité de fonctionner de l'arme par temps très froid. On a donc mis à l'essai des lubrifiants à -40 degrés Celsius.

Le présent rapport traite des résultats obtenus. Parmi les produits mis à l'essai, quatre ont été jugés convenables pour lubrifier l'arme par temps froid. Aucune recommandation n'a été faite pour favoriser un produit plutôt qu'un autre. Chaque service de police devra décider quel produit lui convient le mieux.

Subject
Objet

**Report on Evaluation of Gun Lubricant
Operation at Low Temperatures**

Please find attached the completed report, "Report On the Evaluation of Gun Lubricant Operation At Low Temperatures" from Bosk Consultants, who did the lubrication evaluation for the RCMP.

We have evaluated the results of the report and are making the following comments of the four (4) lubricants that the testing found suitable.

1. **EEZOX**

Eezox Incorporated
P.O. Box 772
Waterford, CT. 06385
Phone: 203-447-8282
Fax: 203-447-3484

Advantages:

in an oil form that will seep into pin holes and hard to reach places,

dries after a few hours but leaves a lubricating film that will not come off on clothing if its carried as a concealed weapon.

**Rapport sur l'évaluation de
lubrifiants d'armes à feu
Fonctionnement à basse température**

Vous trouverez ci-joint le «Rapport sur l'évaluation du fonctionnement de lubrifiants d'armes à feu à basse température » de «Bosk Consultants », qui a mené cette étude pour la GRC.

Nous avons étudié les résultats présentés dans le rapport et nous souhaitons émettre les remarques suivantes sur les quatre (4) lubrifiants jugés convenables.

1. **EEZOX**

Eezox Incorporated
C.P. 772
Waterford, CT. 06385
Tél.: 203-447-8282
Télé.: 203-447-3484

Avantages:

se présente sous forme d'huile et pénètre aisément dans les interstices et dans les endroits difficiles à atteindre,

seche en quelques heures, mais lorsqu'on se sert d'une arme dissimulée, laisse une pellicule qui ne part pas sur les vêtements.

**Report on Evaluation of Gun Lubricant
Operation at Low Temperatures**

Disadvantages;

they do not have bilingual labelling on their product yet.

2. **G-96**

Morse Distributors Limited
2003 Alberta Ave.
Saskatoon, Sask. S7K 1S2
Phone: 306-374-2727
Fax: 306-374-6101

Advantages:

in an oil form that will seep into pin holes and hard to reach places.

it has bilingual labelling on the product.

3. **MPC - FP-10**

Muscle Products Corporation
#307- 2225 West 8th Avenue
Vancouver, BC V6K 2A6
Phone: 604-736-7983
Fax: 604-730-8390

SHOOTER CHOICE - FP-10

Fisher Marketing Ltd.
196 Brabourne Rd. S.W.
Calgary, Alberta T2W 2W3
Phone: 403-238-5253
Fax: 403-238-5253

**Rapport sur l'évaluation de
lubrifiants d'armes à feu
Fonctionnement à basse température**

Désavantages:

L'étiquetage n'est pas encore offert en format bilingue.

2. **G-96**

Morse Distributors Limited
2003 Av. Alberta
Saskatoon, Sask. S7K 1S2
Tél.: 306-374-2727
Télééc.: 306-374-6101

Avantages:

se présente sous forme d'huile et pénètre aisément dans les interstices et dans les endroits difficiles à atteindre,

l'étiquetage bilingue.

3. **MPC - FP-10**

Muscle Products Corporation
2225 8th Avenue O., bur. 307
Vancouver, CB V6K 2A6
Tel.: 604-736-7983
Télééc.: 604-730-8390

SHOOTER CHOICE - FP-10

Fisher Marketing Ltd.
196 Route Braboume S.-O.
Calgary, Alberta T2W 2W3
Tél.: 403-238-5253
Télééc.: 403-238-5253

Report on Evaluation of Gun Lubricant Operation at Low Temperatures

This product is available from two (2) sources. The Shooters Choice FP- 10 failed the Lubricant Pre-screening because it was of the old MPC-FP-10 formula. The enclosed letters from Muscle Products Corporation and Venco Industries verify this and Shooters Choice FP-10 in stock is of the new formula.

Advantages:

- in an oil form that will seep into pin holes and hard to reach places.

Disadvantages:

- They do not have bilingual labelling yet.

4. MIL COMM TW25B

Mil-Comm Products Co., Inc.
P.O. Box 43278
Upper Monclair, NJ 07043-7278
Phone: 201-743-5404
Fax: 201-743-7139

Disadvantages:

- This grease will remain in a localized area were applied and will not seep into pin holes and hard to reach places.

Rapport sur l'évaluation de lubrifiants d'armes à feu Fonctionnement à basse température

Ce produit est offer-t par deux (2) entreprises. Comme on a utilisé l'ancienne formule du FP- 10 ,de MPC, le FP- 10 de «Shooters Choice » n'a pas passe le « préclassement ». Les lettres ci-jointes de «Muscle Products Corporation» et «Venco Industries» le confirment. Par ailleurs, *Shooters Choice » a maintenant la nouvelle formule du FP-10 en stock.

Avantanes:

- sous forme d'huile, pénètre aisément dans les interstices et dans les endroits difficiles à atteindre.

Désavantages:

- l'étiquetage n'est pas encore offert en format bilingue.

4. MIL COMM TW25B

Mil-Comm Products Co., Inc.
C.P. 43278
Upper Monclair, NJ 07043-7278
Tel.: 201-743-5404
Télec.: 201-743-7139

Désavantages:

- Cette graisse reste à l'endroit où on l'applique et ne pénètre pas dans les, interstices et dans les endroits difficiles à atteindre.

**Report on Evaluation of Gun Lubricant
Operation at Low Temperatures**

- In some of the tubes of grease there is a separation of the product. A clear oil separated out from the white grease. Therefore the product must be mixed before using.

There is no bilingual labelling on the product yet.

**Rapport sur l'évaluation de
lubricants d'armes à feu
Fonctionnement à basse température**

- Dans certains tubes de graisse, le produit est séparé en une huile claire et une graisse blanche. Le produit doit donc être mélangé avant de l'utiliser.

- L'étiquetage n'est pas encore offert en format bilingue.



C/M R.H. Russell, m.c.
Armourer Technician/Technicien-armurier

VENCO

INDUSTRIES, INC.

16770 Hilltop Park Place
Chagrin Falls, OH 44023-4500 U.S.A.
Phone: (216) 543-8808 • Fax: (216) 543-8811

FACSIMILE COVER SHEET

DATE: September 25, 1995

FAX NO: 216-543-8811

FROM: Gerry Doerr

TO: Bob Russel

COMPANY: RCMP

FAX NO: 306-780-7782

PAGES: 1 (Including Cover Page)

MESSAGE:

Dear Bob:

Thank you for your time and consideration regarding Venco Industries Shooter's Choice FP-10 Lubricant Elite.

Venco Industries does not alter or modify the FP-10 as we receive it from Muscle Products Corporation in Butler PA. Since we carry the name of FP-10 Lubricant Elite, from Muscle Products, we are under a contractual agreement not to alter or change the formula in any way.

Venco Industries received our first Improved Formulation of the FP-10 on June 22, 1995. Tracing down the samples for RCMP testing indicated that you would have received the old formulation vs. the new.

I apologize for any problems that might have arisen due to the improved reformulation of the FP-10.

Please feel free to contact myself if I can offer any further assistance.

Sincerely,



Gerry Doerr
National Sales Manager



MPC FAX Transmission

Muscle Products Corporation

112 Fennell Drive, Butler, Pa 16001

Phone: 800-227-7049 (412) 283-0567 FAX: 412-283-8310

George C. Fennell, L.E. - Executive Vice President, Technical Dir.

TO: Bob Russell

Subject: Firepower FP-10 CLP

Company: RCMP

Date: 9-25-95

Dear Bob,

This is to certify and clarify that there is no difference in formulation of the Firepower FP-10 CLP provided to Venco Industries, Muscle Products Canada, or any other vendors in the marketplace.

Formulation and blending is rigorously controlled to meet Defense Logistic Agency criteria.

Approximately 6 months ago a formula change occurred which improved the cold weather characteristics of the FP-10. It is very likely that the FP-10 you received from Venco Industries was made prior to this change, due to the fact that the first shipment of drums of the "improved" FP-10 to Venco did not occur until June of 1995.

I hope this helps to rectify this situation. If I can be of further assistance in this or any other matter, please do not hesitate to give me a call. Thank you for your attention to this matter.

Sincerely,

Muscle Products Corporation

George C. Fennell, L.E.

Executive Vice President / Technical Director

TOTAL PAGES (INCLUDING THIS SHEET): 1

Manufacturers of Firepower FP-10 Cleaner, Lubricant, and
Preservative for weapons and weapons systems

**REPORT ON THE EVALUATION
OF GUN LUBRICANT
OPERATION AT LOW TEMPERATURES**

FOR :

**RCMP
ARMOURER SECTION
RCMP TRAINING ACADEMY
REGINA, SASKATCHEWAN**

BY:

**BOSIK CONSULTANTS LIMITED
6460 OLD MILL WAY
MANOTICK, ONTARIO
K4M 1C1**

**NOVEMBER 1995
BCL FILE NUMBER: 95196**

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1. INTRODUCTION

The following report outlines the results of tests performed at the National Research Council of Canada(NRCC) Ballistics-Laboratory by Bosik Consultants Limited in Ottawa, Ontario.

The purpose of the testing was to determine for the RCMP the best gun lubricants to be used in the harsh, cold Canadian climate.

The list of gun lubricants were received as the result of a request for supply sent by the RCMP in September, 1995. The list shown in Appendix A demonstrates the candidate lubricant names and manufacturers.

The scope of the testing included three phases:

- 1) Lubricant Pre-Screening Testing,
- 2) Low Temperature Analysis Of Lubricants,
- 3) Lubricant Wear Test.

2. LUBRICANT PRE-SCREENING

The purpose of this task was to determine from a simple test what lubricants would not likely be suitable (or be least suitable) at low temperature.

2.1 PROCEDURE

To conduct this test, each lubricant was placed between two sheets of flat steel plate (approximately 1.5" x 3.0") and allowed to soak at -40 deg. C. The lubricated surfaces of the steel plates were previously finished using 320 grit sand paper, and thoroughly cleaned prior to applying the lubricant. The lubricant was applied using the instructions provided by the product description. After cold soaking was complete, the shear force necessary to move the two sheet relative to each other was determined by using a spring scale, displaced by a threaded and guided moving head (See Figure 1.0). While applying the shear load, a normal load (dead weight) of 10 pounds was also applied so that the surfaces had some normal load. During the loading, the maximum force necessary to move

one plate relative to the other was noted and recorded. After the reading was taken, the plates were returned to the cold chamber and again allowed to soak for approximately two hours and the test repeated. Three readings were eventually taken for each lubricant type. The results for each reading, the mean and the coefficient of friction based on the mean were determined for each lubricant and recorded in Table 1.0

Those lubricants that hardened, and require more resistance to separate, were noted and eliminated from the next phase of testing.

Three samples of each lubricant were tested in this task-to provide a minimal statistical base.

2.2 RESULTS

The results are shown in Table 1.0 below.

The rankings were based on the lowest average reading for the three tests and then is based on the smallest maximum reading for the three tests.

2.3 CONCLUSIONS

As a result of the prescreening the following lubricants were found to be suitable for further evaluation:

EEZOX, G96, MPC-FP-10, MIL-COMM. TW25B, Kleen Bore TW25B, and Shooters Choice High Tech Grease.

The following lubricants were not evaluated further:

Outers Gun Oil, Shooter's Choice FP-10, Plenty 0 Patches, Rusty Duck, Shiloh Creek Gun Oil, Accufoil, Break Free CLP, Break Free GMX, and Outers Gunslick Tri-Lube.

Based on the results, it is seen that a substantial difference does exist among the lubricants at 40° C. For example, the force necessary to move the plates lubricated with Accufoil (coef. friction = 0.36) was more than double the force required to move the plates lubricated with MPC FP-10 (coef. friction = 0.15). It is noteworthy that all of the lubricants appeared to have an increased friction at low temperature. The same test performed at room temperature, and unlubricated, resulted in the maximum shear force of 1 pound, or a co-efficient of friction of 0.1. This is less than any of the lubricated, low temperature results.

TABLE 1.0 - PRE-SCREENING TESTING

SAMPLE NUMBER	SAMPLE NAME	TEST 1 (lbs)	TEST 2 (lbs)	TEST 3 (lbs)	IAVERAGEI (lbs)	FRICTION COEFFICIENT	IRANKBY AVERAGE	IRANKBY MAXIMUM
1	ACCUOIL	3.5	3.4	3.8	3.6	0.36	15	15
2	BREAK FREE CLP	2.5	2.6	2.8	2.6	0.26	12	12
3	BREAK FREE GMX	2.5	2.1	2.2	2.3	0.23	9	10
4	EEZOX	1.9	1.5	1.8	1.7	0.17	4	3
5	GMS	1.9	1.5	1.8	1.7	0.17	5	4
6	KLEEN-BORE TW258	1.8	1.5	1.4	1.6	0.16	2	2
7	MIL-COMM TW268	2	1.8	1.8	1.9	0.19	6	5
8	MPC FP-10	1.5	1.4	1.7	1.5	0.15	1	1
9	OUTERS GUN OIL	2.1	2.1	1.9	2.0	0.20	7	8
10	OUTERS TRI-LUBE	3	2.7	2.8	2.8	0.28	13	14
11	PLENTY O PATCHES	2.4	2.2	2.3	2.3	0.23	10	8
12	RUSTY DUCK	2.5	2.5	2.4	2.5	0.25	11	11
13	SHILOH CREEK GUN OIL	2.9	3.1	2.9	3.0	0.30	14	13
14	SHOOTER'S CHOICE FP-10	2.5	2.1	1.9	2.2	0.22	8	9
15	SHOOTER'S CHOICE HIGH TECH GREASE	2.2	1.7	1.2	1.7	0.17	3	7

RANK IS BASED ON THE LOWEST AVERAGE READING FOR THE THREE TESTS AND THEN IS MADE ON THE BASIS OF THE SMALLEST MAXIMUM READING FOR THE THREE TESTS.

** INDICATES THE LUBRICANT WAS CHOSEN FOR FURTHER TESTING

3: GUN PERFORMANCE AT LOW TEMPERATURE

The tests were done to evaluate the performance of various firearms lubricants when used at -40 ° C. The tests were performed using three types of firearms that were soaked at -40°C for three hours.

The three firearms used in the testing were a Smith and Wesson full size 9mm, a Smith and Wesson compact 9mm and an MP5 semi-automatic.

The six lubricants evaluated in the testing were;

EEZOX, G96, MPC-FP-10, MIL-COMM. TW25B, Kleen Bore TW25B and Shooters Choice High Tech Grease.

All testing occurred at the NRCC Ballistics Laboratory in Ottawa, currently operated by BCL. The guns were fired by SGT. Brian Ross, N.C.O. UC Armourer Section, of the RCMP stationed in Richmond, Ontario.

In order to ensure a minimum statistically valid sample, three guns were tested for each lubricant type and gun type.

Those lubricants that caused a gun malfunction were eliminated from any further testing. Those lubricants that allowed proper function at -40 °C were evaluated for their lubrication (anti-wear) properties in the next task.

3.1 PROCEDURE

The test consisted of the following steps:

1. Clean firearm, ensuring all lubricants are removed.
2. Apply candidate lubricants to three firearms of each type.
3. Place firearms in a sealed plastic bag.
4. Soak firearms at -40° C for three hours.
5. Remove one firearm from plastic bag.
6. Load firearm with a full magazine, with the chamber empty.
7. Fire complete magazine of ammo out of each firearm, noting any stoppage in normal operation.
8. Repeat steps 5 and 6 until all firearms are tested.

3.2 RESULTS

The results of the testing are shown in Table 2.0 below.

TABLE 2 - RESULTS OF COLD TEMPERATURE LUBRICATION LIVE TEST

FAILURE DESCRIPTION

- 1 Did not return to Battery(DNRTB) on second shot. Slide was pulled forward last **1/2"** and fire
- 2 Returned to Battery very slowly after second shot. Could not have fired a double tap.
- 3 Did not return to Battery on second shot.
- 4 Did not return to Battery on second shot.
- 5 Did not return to Battery on fourth shot.
- 6 Prior to first shot it had to be pushed into battery.
- 7 DNRTB after first shot.
- 8 Returned to battery very slowly after second shot.
- 9 DNRTB after third shot.

3.3 CONCLUSIONS

The results indicated that four of the six candidate lubricants had no stoppages during testing, including:

1. EEZOX
2. G96
3. MPC-FP-10
4. MIL-COMM. TW25B

Two of the lubricants caused stoppages during the testing. They were:

1. Kleen Bore TW25B
2. Shooters Choice High Tech Grease

4. LUBRICANT WEAR TESTING

In this task, those lubricants that permitted proper functioning of the guns at low temperature were further evaluated for their anti-wear properties. The purpose of this task was to determine which lubricant(s) provides the best overall performance. Of specific concern for wear is the rubbing action that occurs between the slide and frame of the 9mm hand guns. In the 9mm compact, the slide is made of stainless steel and the frame is an aluminum alloy. For the model 5946 full size gun the materials are both stainless steel.

To evaluate these properties actual gun components (slide and guide) from the two handgun types previously tested were used (shown in Figure 2.0)

The wear was applied using the test device shown in Figure 3.0. A load of ten lbs. was applied to the test rig, as shown in Figure 3.0, to represent the typical load applied to the slide/frame interface during a normal firing of the gun. The slide was cycled 10,000 times to simulate the gun being fired 10,000 times. The gun slide mechanism was lubricated every 250 cycles as per normal gun cleaning practices.

It is assumed that the majority of the firing of the weapon occurs at normal room temperature and hence the wear tests were performed and lubricated at normal room temperature.

Four lubricants were evaluated for this phase, including; EEZOX, G96, MPC-FP-10, and MIL-COMM. TW 258.

For the test purposes only one of each gun type was evaluated for each lubricant type.

The testing was repeated on new firearms with the applied load increased to 20 lbs. Only three lubricants were further evaluated, including; **EEZOX**, G96, and MPC-FP-10

4.1 PROCEDURE

The procedure for evaluating the wear was as follows;

1. The test rig shown in Figure 3.0 was used to apply the 10,000 cycles to the gun mechanism.
 2. The groove in the slide was measured prior to testing using a digital vernier caliper. Figure 4.0 indicated the points of measurement.
 3. The slide and frame were cleaned and lubricated as per the lubricant manufacturers specifications.***
 4. The slide and frame were mounted in the test rig.
 5. The test rig was started and run for 250 cycles.
 6. The slide and frame were cleaned and lubricated.
 7. Steps 4 and 5 were repeated until 10,000 cycles were applied to the test articles.
 8. Steps 2 through 7 were repeated for all of the lubricants and test articles.
-

*** For the **EEZOX** lubricant the lubricating procedure was altered at the advisement of RCMP staff. The recommended procedure for the lubricant is to allow the lubricant to dry completely prior to use, requiring up to 24 hours to dry. To speed up the test procedure the lubricant was applied and wiped dry prior to testing.

The testing was performed on all four lubricants with an applied load of 10 lbs. The testing was repeated on the best three lubricants with an applied load of 20 lbs.

4.2 RESULTS-

Results of the wear test performed at a load of 10 lbs. can be seen in Table 3.0 below. Table 4.0 shows the results of the testing performed with a loading of 20 lbs.

4.3 CONCLUSIONS

Based on the information obtained in Table 3.0 two main conclusions can be reached;

- 1) The full size, model 5946 9 mm gun wore less than the compact model,
- 2) The G96 and the MPC-FP-10 lubricants exhibited less wear than the other two lubricants evaluated

When the applied load of 20 lbs, the G96 and the MPC-FP-10 again proved to be the best lubricants for wear resistance.

It was found that increasing the applied load did not have a great effect on the results.

TABLE 3.0 - WEAR TEST RESULTS					
GUN TYPE	WEAR POSITION	LUBRICANT TYPE INDICATED WEAR IN INCHES			
		EEZOX	G96	MPC-FP-10	MIL-COMM. TW25B
	SIDE A				
SMITH AND WESSON	1	0.0005	0.0005	0.0025	0.0005
MODEL 5946	2	0.0010	0.0015	0.0015	0.0000
	3	0.0005	0.0005	0.0020	0.0005
	4	0.0000	0.0010	0.0020	0.0000
	5	0.0015	0.0005	0.0015	0.0000
	6	0.0000	0.0005	0.0015	0.0000
	MAXIMUM WEAR	0.0015	0.0015	0.0025	0.0005
	SIDE B				
	1	0.0010	0.0015	0.0030	0.0015
	2	0.0015	0.0015	0.0015	0.0015
	3	0.0015	0.0010	0.0015	0.0015
	4	0.0005	0.0010	0.0015	0.0010
	5	0.0015	0.0015	0.0020	0.0015
	6	0.0020	0.0010	0.0020	0.0020
	MAXIMUM WEAR	0.0020	0.0015	0.0030	0.0020
SMITH AND WESSON	SIDE A				
COMPACT MODEL	1	0.0140	0.0045	0.0030	0.0070
	2	0.0135	0.0055	0.0035	0.0090
	3	0.0135	0.0060	0.0040	0.0100
	4	0.0130	0.0105	0.0070	0.0125
	5	0.0145	0.0125	0.0075	0.0145
	6	0.0150	0.0135	0.0105	0.0180
	MAXIMUM WEAR	0.0150	0.0135	0.0105	0.0180
	SIDE B				
	1	0.0030	0.0045	0.0035	0.0015
	2	0.0030	0.0050	0.0040	0.0020
	3	0.0030	0.0060	0.0040	0.0035
	4	0.0030	0.0055	0.0050	0.0045
	5	0.0035	0.0060	0.0040	0.0065
	6	0.0045	0.0070	0.0060	0.0095
	MAXIMUM WEAR	0.0035	0.0060	0.0050	0.0065
	MAXIMUM WEAR	0.0150	0.0135	0.0105	0.0180

Revised: Dec 19/95

TABLE 4.0 - WEAR TEST RESULTS APPLIED LOAD OF 20 lbs.				
GUN TYPE	WEAR POSITION	LUBRICANT TYPE INDICATED WEAR IN INCHES		
		EEZOX	G96	MPC-FP-10
	SIDE A			
SMITH AND WESSON MODEL 5946	1	0.0000	0.0005	0.0015
	2	0.0000	0.0000	0.0015
	3	0.0005	0.0000	0.0015
	4	0.0020	0.0010	0.0005
	5	0.0005	0.0005	0.0005
	6	0.0010	0.0000	0.0010
	MAXIMUM WEAR	0.0020	0.0010	0.0015
	SIDE B			
	1	0.0010	0.0005	0.0010
	2	0.0010	0.0005	0.0010
	3	0.0015	0.0005	0.0010
	4	0.0015	0.0010	0.0005
	5	0.0020	0.0005	0.0010
	6	0.0020	0.0005	0.0010
	MAXIMUM WEAR	0.0020	0.0010	0.0010
SMITH AND WESSON COMPACT MODEL	SIDE A			
	1	0.0113	0.0110	0.0075
	2	0.0090	0.0110	0.0075
	3	0.0105	0.0095	0.0100
	4	0.0125	0.0125	0.0150
	5	0.0155	0.0125	0.0160
	6	0.0165	0.0150	0.0175
	MAXIMUM WEAR	0.0165	0.0150	0.0175
	SIDE B			
	1	0.0045	0.0005	0.0084
	2	0.0035	0.0005	0.0084
	3	0.0045	0.0005	0.0084
	4	0.0045	0.0015	0.0084
	5	0.0055	0.0030	0.0086
	6	0.0065	0.0060	0.0087
	MAXIMUM WEAR	0.0065	0.0060	0.0087
	MAXIMUM WEAR	0.0165	0.0150	0.0175

5. CONCLUSIONS

Based on the results of the testing it would appear that the following four lubricants would be most suitable for use by the RCMP in cold climate operation:

1. EEZOX
2. G96
3. MPC-FP-10
4. MIL-COMM. TW25B.

The results of the wear test were not conclusive enough to eliminate any of the four lubricants from use. However, based on the usability of the lubricants it was found that the MIL-COMM TW25B was easier to use than the EEZOX, MPC-FP-10 and G96 lubricants.

The EEZOX requires a long set time according to the instructions and may not lend itself to proper use in the field.

The EEZOX, the MPC-FP-10 and the G96 were found to have a low viscosity and as a result could be wasted during a normal lubrication. A solution to this problem would be to have a proper applicator built into the lubricant container.

If it is of interest the testing could also be repeated at +40° C, in order to verify that the lubricants are effective at high temperatures. This option can be discussed with BCL for a quotation.

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FIGURE 1.0 - LUBRICANT PRE-SCREENING TEST RIG

FIGURE 2.0 - TEST ARTICLES FOR WEAR TEST

FIGURE 3.0 - TEST RIG FOR WEAR TEST

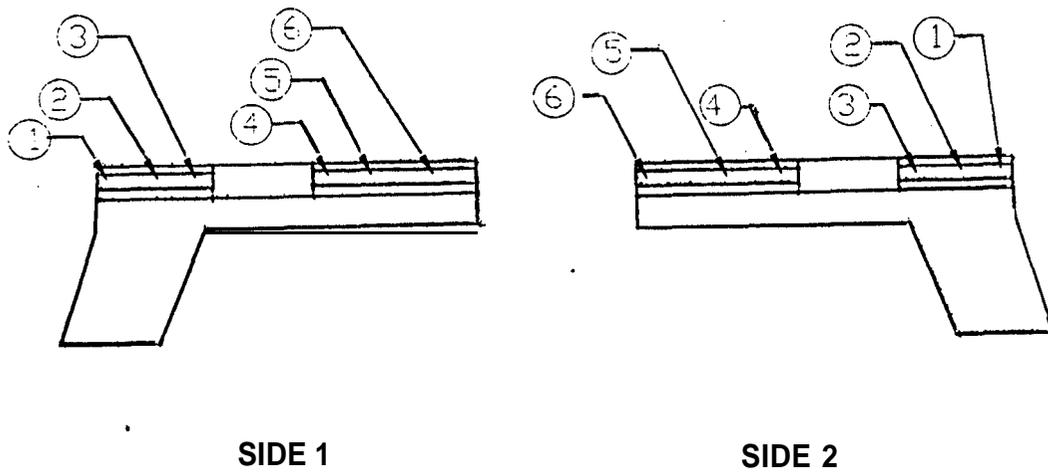


FIGURE 4.0 -WEAR MEASUREMENT LOCATIONS

**APPENDIX A
LUBRICANT LIST**

APPENDIX A - LUBRICANT LIST

	PRODUCT NAME	MANUFACTURER NAME
1	BREAK FREE CLP	BREAK-FREE INC.
2	BREAK FREE GMX LUBRICANT	BREAK-FREE INC.
3	EEZOX GUN CARE	EEZOX, INC.
4	FP-10 LUBRICANT	VENCO INDUSTRIES, INC.
5	G96	
6	KLEEN BORE TW25-B LUBRICANT	KLEEN-BORE, INC.
7	MILTEC-1	ADVANCED PPRODUCT DIST., INC.
8	MPC FIREPOWER FP-10	MUSCLE PRODUCTS CORP.
9	OUTERS GUN OIL	BLOUNT, INC.
10	OUTERS GUNSLICK BRAND TRI-LUBE	BLOUNT, INC.
11	PLENTY "O" PATCHES	PLENTY "O" PATCHES
12	RUSTY DUCK	
13	SHILOH CREEK GUN OIL	SHILOH CREEK
1 4	SHOOTER'S CHOICE GREASE	VENCO INDUSTRIES, INC.
15	THE ACCUOIL LUBRICATION	ACCUPRPO DEALER
18	TW-25B LUBRICANT	MIL-COMM PRODUCTS COMPANY, INC.