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THE ENGINEERING EVALUATION

ON

THE INDIVIDUAL WEAPONS

FOR

THE SMALL ARMS REPLACEMENT PROJECT - ASR 48.8

DEFENCE TRIAL DIRECTIVE 8/513

VOLUME TWO

PART TWO - PROGRAMME AND PREPARATORY ACTIVITY

PART THREE - ACCURACY AND ENDURANCE TESTS

EDE PUB 17/85  
(VOLUME 2 OF 3)

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ENGINEERING DEVELOPMENT ESTABLISHMENT

THE ENGINEERING EVALUATION

ON

THE INDIVIDUAL WEAPONS

FOR

THE SMALL ARMS REPLACEMENT PROJECT - ASR 48.8

DEFENCE TRIAL DIRECTIVE 8/513

VOLUME TWO

PART TWO

PROGRAMME AND PREPARATORY ACTIVITY

This Part details the actions and investigations taken prior to the commencement of the testing phases of the trial.

This Part has the following Annexes.

- |         |  |
|---------|--|
| ANNEX A | - EDE Engineering Evaluation Programme for Trial 8/513 |
| ANNEX B | - Preliminary Action: Receipt of Stores                |
| ANNEX C | - Characteristics of Test Weapons Systems              |
| ANNEX D | - Critical Examination                                 |
| ANNEX E | - Preliminary Firing and Comments                      |

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PART TWO

ANNEX A

ENGINEERING EVALUATION PROGRAMME

This Annex contains the EDE Engineering Evaluation Programme for Defence Trial 8/513.

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ANNEX A TO  
PART TWO TO  
EDE 17/85

ENGINEERING EVALUATION PROGRAMME

1. This Annex contains the EDE Engineering Evaluation Programme for Defence Trial, 8/513.
2. The programme details the type of test, the test instructions and the results and remarks required.
3. The programme also determines the sequential format of the Trial Report. All subsequent parts and annexes of the report will follow this programme.
4. This programme covers both the Individual Weapon (IW) and the Light Support Weapon (LSW). The LSW will be reported on in a subsequent EDE report.

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ANNEX A

DEFENCE TRIAL 8/513  
SMALL ARMS REPLACEMENT PROJECT  
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## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)		SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)		
1	EDE	Receipt Action (Trials Directive Dia 2.2.3)	8/3 Var	8/3 Var	4							a. Accountability of all trials stores including location. b. Adequacy of packaging and preservatives of weapons.	
2	EDE	Weapon Characteristics Dia 2.2.3										Complete proforma attached in Weapon History Book.	Note this must be carried out prior to previous serial.
3	EDE	Critical Examination Dia 2.2.1	8/3 Var	8/3 Var	4							a. Inspection results magpart- icle/visual inspection results of bolt, barrel, receiver. All other information to be recorded in the Weapon History Book. b. Establish a master gauging record. c. Record on Video. d. Measure: (1) firing pin protrusion. (2) firing pin energy. (3) Trigger pull. (4) Headpace. (5) Bore/Chamber. (6) Unsupported case length. (7) Cocking Effort. e. Note time and tools necessary for: (1) Complete disassembly/assembly. (2) Field strip/assembly. (3) Changing magazine. (4) Determine adequacy of handbook manuals etc.	

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## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation			Ammunition Requirement					Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 Link (h)	Blank (i)	Trace (j)	Other (k)			
4	EDC	Preliminary Firing Dia 2.2.2	8 x 1W 3 x Var	8 x 1W 3 x VAR	4	3550	750	1300 150 Link Blank	100	Drill 150	a. Establish safe loading firing, unloading drill for each weapon type. b. Proof if necessary. c. Conduct firing for evidence of project- ile metal parts separation. d. Obtain: (1) MOVs. (2) Cyclic rate. (All gas settings) e. Check zero. f. Check functioning of weapon with blank ammunition. g. Determine efficiency of extraction in event of a: (1) Misfire. (2) Separated case. (3) Failure to unlock. (Gas port closed) h. Determine robustness of round after repeated loading and unloading and fire under recreation. Note a full magazine will be used with the top round only subjected to this test. i. Ejection path firing both LH/RH on all gas settings using both belt and magazine where applicable using one of each type of weapon, total of 5 weapons.	Video of correct procedure for record.  Recover test projectiles photo and inspect.  Record type of lube and gas settings.  Determine cyclic rate with blank ammunition. Actual firing programmes will be used so as to enable duplication of any test.  All data will be recorded in the daily firing records and Weapon Log Books.    No of loadings obtained for Fig H.   Record on Video and Log Book.	* Noise impulse activated counter required.  Ammunition usage not including (1) 1W - 50 Ball (Fig C, D, E) 5 Trace (Fig C) 50 Blank (Fig F) LSW 50 Ball (Fig C, D, E) in Mag 50 Ball/Trace mix in Link (Fig C, D, E) 50 Loose Blank in Mags (Fig F) 50 Linked Blank (Fig F)  Ammunition usage for (1) only using one of each type of weapon. 680 Ball (Loose) 200 Ball and Trace (Linked)

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## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation					Ammunition Requirement			Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 LI10 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
5	EDC	Accuracy and Dispersion Phase I	3 x 1W 1 x Var	3 x 1W 1 x Var	2 x LSW	7500					<p>a. After Zeroing: From the fixed test fire ball rounds at a torso target at the following ranges:</p> <p>1W ..... 100, 200, 300, 400, 600 m</p> <p>LSW ..... 100, 300, 600, 800 m</p> <p>b. Three diagrams each of 10 rds are to be fired a/s for each Infantry wpn. Three diagrams each of 30 rds will then be fired in 3 rd bursts.</p> <p>c. The LSW will fire 3 x 30 rd diagrams in 3 rd bursts.</p> <p>d. For wps that have a variable gas setting accuracy diagrams will be repeated as follows:</p> <p>1W ..... 400 and 600 m</p> <p>LSW ..... 600 and 800 m</p> <p>e. Firings should be under good firing conditions, including temperature, visibility and minimum cross wind (1.5 m/sec). Two wipers are to be fired before each diagram.</p> <p>f. At 25 m fire 10 rds for Yaw and 20 rds for Cyclic Rate all gas settings.</p>	<p>a. Firets used.</p> <p>b. Firing conditions (climate).</p> <p>c. Random firing order used.</p> <p>d. Co-ordinates of each group.</p> <p>e. Position MPI to point of aim.</p> <p>f. Preliminary analysis of accuracy and dispersion of both 1W and LSW for each range/mode of fire for entry in Weapon History Book.</p> <p>g. Gas settings used.</p> <p>h. Ammunition and wpn temperature.</p> <p>i. Record firings in daily firing records.</p> <p>j. Cyclic rates and Yaw card results.</p>	

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FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (WATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms) (1)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
6	EDC	Endurance IW D14 2.7 Proc 42261 ASR 48.8	3	3		54300					On completion of Serial 5 each wpn will fire the following Cycles at 400 m. Cycle 1. Cold Accuracy Check, 3 x 12 rd s/s diagrams at 1 shot/min. 2. 10 rds for Yaw and Cyclic rate. 3. Fire: 30 rpm for 3 min immediately followed by: 10 rpm for 10 min immediately followed by: 4. 10 rds auto for Yaw and Cyclic rate. 5. Hot accuracy check 3 x 12 rd s/s diagrams. Force cool for 15 min. 6. Fire: 20 rds s/s at 40 rpm 80 rds at 40 rpm (alternating between 15 s/s and 5 auto) 20 rds automatic 20 rds s/s at 40 rpm. Force air cool for 15 min. 7. Repeat Cycle 6. 8. Repeat Cycle 6. 9. Repeat Cycle 6. 10. Repeat Cycle 6 omit cooling. 11. Hot Yaw/Cyclic rate: 10 rds auto. 12. Hot accuracy check 3 x 12 rd s/s diagrams. Force air cool for 15 min. 13. Carry out 60 functioning and trigger manipulations. GAUGE/INSPECTION 14. Cold accuracy check 3 x 12 rd s/s diagrams at 1 shot/min. 15. 10 rds auto for Yaw and Cyclic rate.	1. The daily firing records will be used to record each Serial/Cycle. 2. All malfunctions, breakages, replacements, and stoppages will be recorded in the Weapons History Book as they occur. 3. Weapon and Ammunition Temperatures will be recorded as detailed in firing programme.	

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## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)		SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)		
(a)	(b)	(c)											
6 Contd											a. Contd (1) There is a 100% increase in dispersion from that measured in test Serial 5. (2) There are more than 20% 850's b. Weapon Inspection/Gauging to be carried out as indicated. c. Components are to be replaced only when they become unserviceable or a risk to safety. d. Firings will be continued until all series are completed or until the weapon is a risk to safety.		

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FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms) (1)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 LI10 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
7	EDC	Endurance LSW D14	-	-	2	-	38				<p>a. On completion of Serial 5 accuracy, each LSW will fire the following Cycles at 400 m.</p> <p>CYCLE</p> <p>1. Barrel Y Cold Acc 3 x 30 rds 2. Barrel X 50 rpm 200 rds Change Barrel 3. Barrel Y 50 rpm 200 rds Change Barrel 4. Barrel X 50 rpm 200 rds Change Barrel 5. Barrel Y 50 rpm 200 rds Change Barrel 6. Barrel X 50 rpm 200 rds 7. Barrel X Hot Acc 3 x 30 rds 8. Barrel X Cold Acc 3 x 30 rds 9. Barrel X 100 rpm 200 rds Change Barrel 10. Barrel Y 100 rpm 200 rds Change Barrel 11. Barrel X 100 rpm 200 rds Change Barrel 12. Barrel Y 100 rpm 200 rds 13. Barrel Y Hot Acc 3 x 30 rds 14. Barrel Y Cold Acc 3 x 30 rds 15. Barrel Y 50 rpm 200 rds Change Barrel 16. Barrel X 50 rpm 200 rds Change Barrel 17. Barrel Y 50 rpm 200 rds Change Barrel 18. Barrel X 150 rpm 300 rds 19. Barrel X Hot Acc 3 x 30 rds</p> <p>Cycles 20 to 38 are the same as for Cycles 1 to 19 except for barrel allocation. For Barrel X read Barrel Y and vice versa.</p> <p>Cycles 39 to 114 are a repeat of Cycles 1 to 38.</p>	<p>Repeat the inspection criteria as detailed in Serial 3 after each rd Hot Accy check.</p> <p>The daily firing records will be used to record each Serial/Cycle. All malfunctions, breakages, replacements and stoppages will be recorded.</p> <p>Results for check firings will be as per Serial 5.</p> <p>Weapon and Ammunition temps will be recorded.</p>	

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## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms) (1)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
7 Contd		(c)									c. The endurance series is to be fired until such time as with a cold barrel. (1) There is a 100% increase in dispersion from that measured in initial accuracy. (2) There are more than 20% BS0. d. Weapon inspection/gauging carried out after each hot check firing. e. Between series the barrel is to be allowed to cool to ambient. Forced air cooling may be used if convenient. f. Components are to be replaced only when they become unserviceable or could give rise to a safety problem. g. Firings will be continued until all series are completed or until the weapon becomes unserviceable or a safety risk. h. At convenient times between series carry out functioning and trigger manipulations so as to give a mean of 40 such manipulations for each 1 000 rds fired.		
8	EDC	Accuracy and Dispersion Phase II for IW/LSW	3 x IW 1 x Var	3 x IW 1 x Var	2 x LSW	7 500					To be carried out as per Serial 5 after completion of endurance series.	As per Serial 5.	
9	EDC	Flash Smoke and Sand D14 2.12	1 x IW 1 x Var	1 x IW 1 x Var	1 x LSW	2 200	600				e. Flash: The following methods will be used: (1) Photographic measurement. (2) Human observation. Firings will consist of 1 x 20 rd cycles fired continuous and 1 x 20 rd in 5 rd bursts at 10 sec intervals. Barrels will be new and old both hot and cold.	Area of Flash, Colour and Intensity. Human Observation. Determine if Flash is significantly greater or less than control wpm. Note: Trace may be used in 1W's if considered necessary.	Note: photograph of Flash is to be done at night or in suitably constructed box which will allow for photographic means. For detail refer D14 2.12.2. Human Observation must be done at night.

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Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (m)	Remarks (n)		
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)					
9 Contd															
						</									

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## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms) (1)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
10 Contd	(a) (b)	(c)									1.c. (Contd) Limitations in number of microphones available may require certain positions to be covered by separate firings. d. In still, dry conditions (eg wind velocity less than 1.5 m/s and rh below 60%), fire 5 ball rounds single shot and record the noise levels for each round on magnetic tape. e. Repeat sub-para d with 5 tracer rounds (LSW only). f. Repeat sub-para d and e with ammunition preconditioned at $52 \pm 2^\circ\text{C}$ for at least 12 h. g. Repeat sub-para d, e and f as required to cover the different microphone arrays, until adequate readings are recorded from each microphone position stipulated. 2. TOXICITY a. A standard toxicity box (approximately $2\text{ m} \times 1\text{ m} \times 1\text{ m}$ ) is to be used. The weapon is to be mounted inside with the muzzle, including flash eliminator, outside but with the gas-port inside. Arrangements are to be made (rubber gloves fitted in the side of the box and perapex sides or windows) to allow weapon handling, magazine changing and weapon firing without escape of gas. b. The box is to be fitted with a fan to circulate the gas and a suitable direct reading analyser to determine the % CO content of samples of gas obtained from the box using an appropriate pump or aspirator (details are given in D14) c. From each weapon 1W, LSW mounted in the box fire 20 ball rounds single shot and measure the % CO content. d. Repeat sub-para c but with 100 ball rounds automatic.		

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			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 Li10 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
10 Contd		(c)									2. (Contd) e. Repeat sub-para c but with Ball, Tracer mix (LSW). f. Repeat sub-para d but with Ball, Tracer mix (LSW).		
11	EDC	Design Safety D14 2.15	1 x IW	1 x IW	1 x LSW						The Weapon will be subjected to thorough visual and dimensional examination covering: a. Mechanical safety. b. Applied safety.	Report on design characteristics of applied and mechanical safety.	
12	EDC	Recoil D14 2.16	1 x IW 1 x Var	1 x IW 1 x Var	1 x LSW 25						Each Weapon will be fired from a ballistic pendulum as per D14 2.16. Grenade firing to be included.	Visual record (Video) recoil energy of each wpn.	Temp of rounds to be at 20°C.
13	EDC	Ancillary Items D14 2.17 Proc 42261	3 x IW 1 x Var	3 x IW 1 x Var	1 x LSW	1008	600	540 Loose 60 Linked			Bayonet: Effect during firing on WP1 of IW. Each wpn will fire 3 x 12 rd a/s diagrams followed by: 3 x 30 rd auto diag in 3 rd burst. Blank Firing: Fix Blank Firing Attachment (BFA) to the weapon and fire 20 M193-type blank rounds in each of the following weapon attitudes: a. Weapon horizontal. b. Weapon vertical, butt down. c. Weapon vertical, muzzle down. d. For LSW use both modes of feed. e. Note. Only one weapon of each type to be used for this test. f. The maximum length of hanging ammunition belt which the weapon can fire will also be determined, on all gas settings.	Relationship of WP1 with bayonet to WP1 without.	Break up of ammo IW 1440 Ball 240 Blank LSW 120 Linked 60 Blank Loose 60 Blank Linked Note. Bayonet attached accuracy can be shot using endurance wps during Phase 1 accy and diag.

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FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
14	EDC OCL	Mechanical Stresses During Transit D14 2.20	1 x 1W 1 x Var	1 x 1W 1 x Var	1 x LSW	100	20				At end of test: Visual inspection weapon functioning. Report on handling and operating safety result of check firing.		
15	EDC MRL	Compatibility with Solvents Liquids and Lubricants D14 2.22	1 x 1W	1 x 1W	1 x LSW						Report on any changes noted in the components of weapons and on their handling and functioning safety.	Note: Extra furniture will be required. Special ammunition (inert) may be required during immersion tests.	
16	EDC MRL	Sighting Systems D14 2.24	1 x 1W 1 x Var	1 x 1W 1 x Var	1 x LSW						Refer D14 2.24.	Note: Any additional sights available will also be tested.	
17	EDC	Kinematics D14 2.3	1 x 1W	1 x 1W	1 x LSW	200	200	400			This test will only be conducted if required.		
18	EDC	Barrel Obstruction D14 2.15 Proc 42261	1 x 1W	1 x 1W	1 x LSW	10					a. The weapon is to be placed on a mount with a remote firing device. b. An ultra-rapid cine camera is to be placed at right-angles to the weapon. A cardboard half cylinder is to be placed longitudinally above the upper part of the weapon. c. Using one of the weapons in each instance, the barrel is to be obstructed: (1) With a bullet positioned so that its rear face is level with the forward edge of the gas-port.	a. Mount test layout. b. Cine camera. c. Type and position of obstruction in bore. d. Effects of firing: (1) Film. (2) Cardboard half cylinder (3) Damage to weapon. (4) Fragments. (5) Assessment of effects on firer (if he had been there) or neighbouring personnel.	Note: As results will be destructive weapons used should not be required for further tests.

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## ENGINEERING EVALUATION PROGRAMME

## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement			Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BUL (h)	Blank (i)	Trace (j)	Other (k)		
(a)	(b)	(c)								(1)	(m)	(n)
18 Contd										<p>c. (Contd)</p> <p>(2) With a bullet positioned so that its rear face touches the tip of the bullet of chambered round.</p> <p>(3) With water in the bore.</p> <p>d. The weapon is to have a ball round chambered and fired. The cine-camera is to photograph the effects and the card-board cylinder is to record fragment details.</p>		
19	EOC	Cook-off and Barrel Heating D14 2.19 Proc 42261	1 x IW	1 x IW	1 x LSW	Up to 8 000	Up to 6 000			<p>a. The weapon is to be mounted in a partially enclosed firing shelter with ambient air temperature between 10°C and 32°C. Arrangements are to be made to avoid any toxicity hazard. Thermo-couples are to be mounted in the area of the chamber, trigger, hand-guard and muzzle.</p> <p>b. Barrels are to be inspected visually (by bore-scope) and measured before firing and after firing.</p> <p>c. Initially 290 rounds (Ball for IW; Ball; tracer mix for LSW) are to be fired single shot at a rate of 60 rpm finishing by leaving a round chambered and other rounds in the magazine. Note time to cook-off of that round and any subsequent round.</p> <p>d. If no cook-off occurs, repeat sub-para c with a larger number of rounds until cook-off does occur. If cook-off occurs, reduce the number of rounds until cook-off no longer occurs.</p> <p>e. When the number of rounds to cook-off has been established fire 2 further firings as confirmation.</p>	<p>a. Test arrangements.</p> <p>b. Thermo-couple and ambient air temperatures.</p> <p>c. Barrel measurements and visual inspection.</p> <p>d. Number of rounds in each firing.</p> <p>e. Cook-off times noted.</p>	

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Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
20	EDC	Grenade Launch D14 2.25 Proc 42261	1 x 1W	1 x 1W		100				Grenades Mecar 100 off	a. Fix the 1W in a mount at 10°D with elevation. For each type of bullet-trap grenade that firing be presented for test by Wpn 3, fire under precautions inert grenades as follows from the muzzle using a Ball round: (1) 2 using Ball rounds at ambient. (2) 2 using Ball rounds conditioned at 52°C. (3) 2 using Ball rounds conditioned at -49°C. b. If required by Wpn 3, repeat sub-para a, firing inert grenades but with the 1W butt resting on a concrete base. c. Conduct 3 firings per 1W to determine recoil energy using ballistic pendulum method.	a. Effect of firing the different grenades including cine-filming. b. Distance at which grenades impart. c. Inspection of 1W after firing grenades.	Note: Accuracy firings may be required in test grenade-sighting system. No live grenades.
21	EDC	Sand and Dust Firing During Exposure D14 2.10.4.2	2 x 1W	2 x 1W	1 x LSW	560	200				a. Clean and lubricate each test weapon. Load 7 magazines per 1W and 200 LSW per LSW (Ball for 1W; Ball; tracer mix for LSW), fit the first magazine to the weapon and make ready to fire with the dust cover closed. Cover the remaining magazines with plastic bags. b. Place each weapon and all its magazines in a standard test chamber with a motorised fan and pour in a sand and dust mixture. Full details are given in D14. c. Expose the weapon to the sand and dust mixture for an initial 30s then, while continuing the exposure to the sand and dust mixture, fire the Endurance Series 2 (140 rounds for 1W; 200 rounds for LSW) as detailed in Test Serial Nos 6,7. d. If there is a stoppage, clear it using normal immediate action drills. If it cannot be so cleared stop the test. Note carefully timings between malfunctions, also time during which the bolt remains open (to remedy malfunctions, change magazine).	a. Test arrangements. b. Sand and dust mixture and rate poured into box. c. Malfunctions, stoppages and their rectification. d. Test limitations on such rectifications (because of interface of hand openings in test box and weapon controls -- cocking lever etc). e. Chronological record through-out test including: (1) Total duration of test. (2) Time between stoppages. (3) Time to rectify each stoppage--including time bolt open. f. Rate of fire on automatic.	



DEFENCE TRIAL 8/513  
SMALL ARMS REPLACEMENT PROJECT  
PHASE 1  
ENGINEERING EVALUATION PROGRAMME

FIRING TRIALS

Test Serial No	Test Agent (b)	Test Title (c)	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (1)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
22	EDC	Mud DIA 2.18.6	2 x IW	2 x IW	1 x LSW	Up to 1 800	Up to 600				a. Clean and lubricate weapon and cover the muzzle with adhesive tape. With a full magazine, feed one round into the chamber and apply safety catch on the closed bolt. b. The weapon is to be submerged and agitated in a mud bath for 30s. Congested parts are to be cleaned without disassembling the weapon and the tape is to be removed from the muzzle. c. Carry out test sequence as per DIA 2.18.6	a. Test arrangements. b. Mud compositions used. c. Malfunctions, stoppages and attempts to overcome them. d. Attempts to fire with clean magazine. e. Rate of fire on automatic.	
23	EDC	Water Spray DIA 2.18.7	2 x IW	2 x IW	1 x LSW	2 400	600				a. Each weapon is to be mounted in a water spray facility as described in DIA. b. The weapon is to be fired (Ball for IW; Ball; Tracer mix for LSW) as shown in the 'water spray test' table in DIA with the weapon horizontal. c. During firing the spray of water is to fall over the entire weapon at a rate of approximately 60 - 7.5 cm/h. d. All firings are to be from a mount under precautions.	a. Spray totals and timings. b. Water and air temperature during firings. c. Rate of fire on automatic.	
24	EDC	Salt Water Immersion DIA 2.18.3	1 x IW	1 x IW	1 x LSW	500	500				a. Prepare a saline solution of 20% salt (sodium chloride) to 80% water by weight. The salt should not contain more than 0.1% sodium iodide or more than 0.2% impurities. b. Disassemble, clean, lubricate and reassemble the weapon, load with a full magazine (Ball for IW; Ball; Tracer mix for LSW) and apply safety catch. c. Submerge each weapon in the saline solution together with a spare full magazine or belt box (Ball for IW; Ball; Tracer mix for LSW) for 60s. (Immersion tank as in DIA.)	a. Details of saline solution. b. Details of any damage, from corrosion, including colour photographs. c. Stoppages and malfunctions. d. Effects of lubrication if normal testing has to be stopped.	Note: This test will tie weapon up for at least 10 days. Refer DIA 2.18.3.1.



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ANNEX A

DEFENCE TRIAL 8/513  
SMALL ARMS REPLACEMENT PROJECT  
PHASE 1  
ENGINEERING EVALUATION PROGRAMME

FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms)	Results Required (n)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
24 Contd		(c)									d. On removal from the solution, retract the bolt, hold the muzzle downwards and allow salt water to drain from the bore. e. Fire from the weapon the Endurance Series 1 detailed in Test Serial No 6 for 1W (150 rounds, and LSW 400 rounds), using the magazine or belt box on the weapon and further unconditioned magazines and belt boxes. f. Place the other conditioned magazine on the weapon and submit the weapon, without any cleaning or lubrication, for 24 h to the storage schedule for the temperature and humidity test. g. Repeat sub-para e. h. If firing malfunctions occur because of seizure of parts or built-up of rust, then the normal testing is to be stopped and attempts made to fire: (1) After lubrication and manipulation without disassembly. (2) After field stripping and additional lubrication. j. Each weapon is to be immersed once only.		
25	EDC	Sand Drag  D14 2.18.5	2 x 1W	2 x 1W	1 x LSW	920	350				a. Test weapons to be dragged 20 times or until weapon fails to fire or after 3 consecutive drags. 1A is necessary to fire as in D14 2.18.5 1W to fire 30 rd mag 20 s/s 2 x 5 rd burst. LSW 1 belt in belt box containing 50 rd linked Before test for proof of functioning. Weapons to be fired after each drag: 1W 5 rd s/s 5 rd auto LSW 5 rd burst x 3	a. All stoppages and malfunctions to be recorded. b. All case ejection paths both s/s and auto. c. Details of how the weapon is supported and any deviation from test instructions, as layed out in D14 2.18.5.	Note: LS weapon to be loaded with magazine/belt boxes.

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DEFENCE TRIAL 8/513  
SMALL ARMS REPLACEMENT PROJECT  
PHASE 1  
ENGINEERING EVALUATION PROGRAMME

## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) Dia Redraft 1980. Defence Trial 8/513 Small Arms) (1)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)		SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)		
26	EDC	Low Temperature Dia 2.14.1	2 x 1W (d)	2 x 1W (e)	1 x 1SW (f)		2 400 (g)	600 (h)				a. Temperature of climatic chamber. b. Problems encountered during handling and firing such as: (1) Increased loading forces. (2) Increased mechanical power required. c. Results of check firing: (1) Dispersion. (2) Velocity. (3) Yaw. (4) Rate of fire on automatic.	
27	EDC	High Temperature Dia 2.14.2	2 x 1W (d)	2 x 1W (e)	1 x 1SW (f)		2 400 (g)	600 (h)				As for Test Serial No 26.	
28	EDC	Temperature and Humidity Dia 2.14.3	2 x 1W (d)	2 x 1W (e)	1 x 1SW (f)		4 000 (g)	1 000 (h)				As for Test Serial No 26.	

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ANNEX A

DEFENCE TRIAL 8/513  
SMALL ARMS REPLACEMENT PROJECT  
PHASE 1  
ENGINEERING EVALUATION PROGRAMME

## FIRING TRIALS

Test Serial No	Test Agent	Test Title	Number of Weapons and Allocation				Ammunition Requirement				Test Instructions (NATO Small Arms Test Manual AC/225 (Panel III) D14 Redraft 1980. Defence Trial 8/513 Small Arms) (1)	Results Required (m)	Remarks (n)
			1W A (d)	1W B (e)	LSW (f)	SS109 Ball (g)	SS109 L110 LNK BLT (h)	Blank (i)	Trace (j)	Other (k)			
29	EDC	Icing and Freezing	2 x 1W	2 x 1W	1 x LSW	240	600				a. Two adjacent conditioning chambers are to be used. (1) Firing chamber containing water spray with geared motor (as in D14). (2) Storage chamber. b. Each weapon with a full magazine or belt box fitted (Ball for 1W; Ball; tracer mix for LSW) is to be placed in the water spray apparatus, then loaded ready for firing and the safety catch applied; the muzzle will not be covered. The weapon will be sprayed for 15 min while being rotated. The firing chamber is to be kept at 2°C, the spray water pressure is to be limited to 2 atmospheres. c. The weapon is then to be removed from the spray apparatus and with the muzzle down, is to be shaken hard 3 times to expel water from the barrel. d. The loaded weapon together with an additional full magazine or belt box which has not been sprayed, are to be conditioned in the storage chamber at -10°C for at least 2 h. e. During these 2 h the firing chamber is to be brought to -10°C and kept at that temperature for at least one h. f. The loaded weapon is to be taken directly from the store chamber to the firing chamber and an attempt is to be made to fire without any further preparation, 10 rounds single shot, 10 rounds short bursts and 10 rounds automatic. g. If trouble-free functioning is not achieved, a further attempt at firing is to be made with the conditioned, but not iced, magazine. h. For LSW, b is to be repeated but with loose belt of 200 rds.	a. Timings, temperature and degree of spraying. b. Rate of fire on automatic. c. Particular problems due to icing. d. Photographic and Video.	

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PART TWO

ANNEX B

PRELIMINARY ACTION: RECEIPT OF STORES

This Annex contains the actions and comments on receipt of the Individual Weapon Systems, COLT and STEYR. The following figures are included in this Annex.

FIG 1 COLT PACKAGING

FIG 2 STEYR PACKAGING

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ANNEX B TO  
PART TWO TO  
EDE 17/85

PRELIMINARY ACTION: RECEIPT OF STORES

REFERENCE: A. EDE ENGINEERING EVALUATION PROGRAMME - SERIAL 1

1. This annex contains the actions and comments on receipt of the Individual Weapons Systems, COLT and STEYR.
2. For each weapon a Weapon History Book was initiated which included the following information:
  - a. weapon system characteristics, spare parts and cleaning kit,
  - b. daily firing records,
  - c. barrel gauging and history,
  - d. weapon system gauging,
  - e. record of stoppages,
  - f. breakages, repairs and replacements,
  - g. accuracy results,
  - h. notes.
3. The major components/assemblies were numbered for identification. The weapons were colour coded according to which aspect of the serial they belong; white for accuracy/dispersion and endurance, orange for adverse conditions.
4. Photographs of the packaged weapons as received from 3AQUA were taken.

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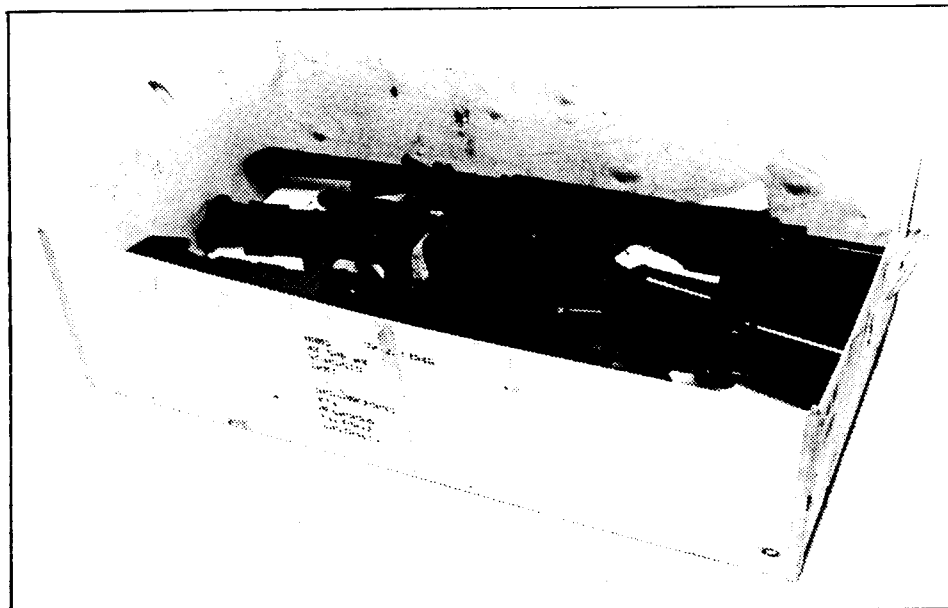


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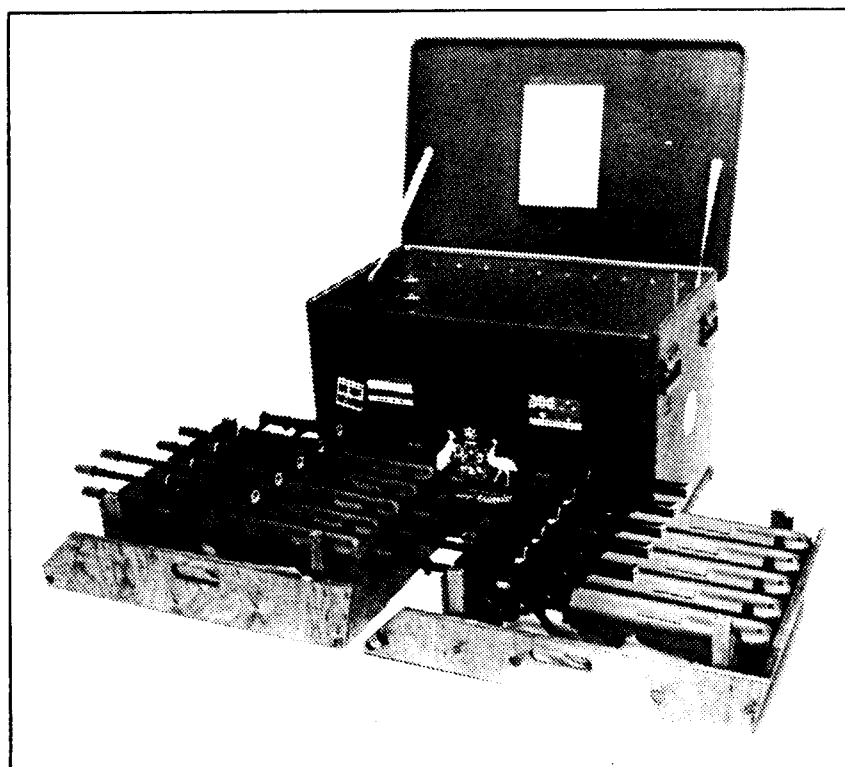
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ANNEX B



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FIG 1 COLT PACKAGING



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FIG 2 STEYR PACKAGING

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5. No comments can be made on the packaging and conditions of the weapons from overseas as they were received by 3AQU in the first instance.

6. As can be seen from the photographs (figures 1 and 2), the packaging of the STEYRS is superior to the COLTS. The STEYR transit boxes are sturdily constructed and each weapon locates securely in its own cradle.

7. The COLTS appeared to be placed into their boxes without restraint or securing provisions being provided.

8. Some improvement in this area would be required if it is the standard of packaging for overseas transit.

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PART TWO

ANNEX C

CHARACTERISTICS OF THE TEST WEAPONS SYSTEMS

This Annex describes each weapon system's characteristics.

This Annex also contains:

FIG 1 COLT STRIPPED  
FIG 2 COLT WEAPON AND ACCESSORIES  
FIG 3 STEYR STRIPPED  
FIG 4 STEYR WEAPON AND ACCESSORIES

Appendix 1 WEAPON DESCRIPTION - STEYR AUG

Appendix 2 WEAPON DESCRIPTION - COLT M16A2

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ANNEX C TO  
PART TWO TO  
EDE 17/85

CHARACTERISTICS OF TEST WEAPONS SYSTEMS

REFERENCE:     A.    EDE ENGINEERING EVALUATION PROGRAMME - SERIAL 2

1.        This Annex describes each test weapon system's characteristics.
2.        A proforma was produced in order to detail the characteristics of each weapon system.
3.        Copies of this proforma are included in this Annex and weapon descriptions are included in Appendixes 1 and 2.
4.        Figure 1 through to Figure 4 show the weapons stripped to show components and accessories supplies with each weapon.

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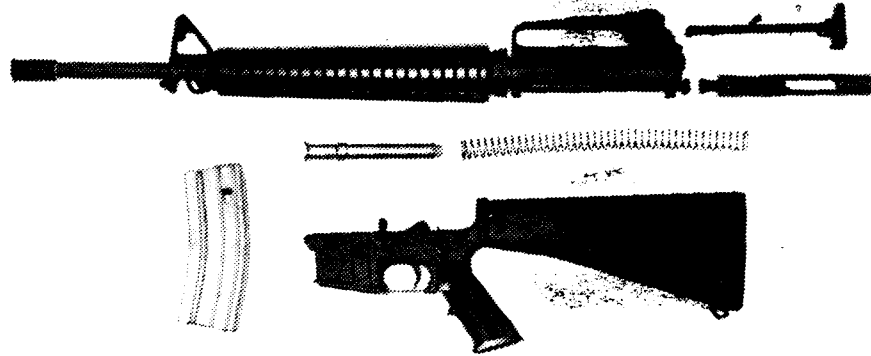
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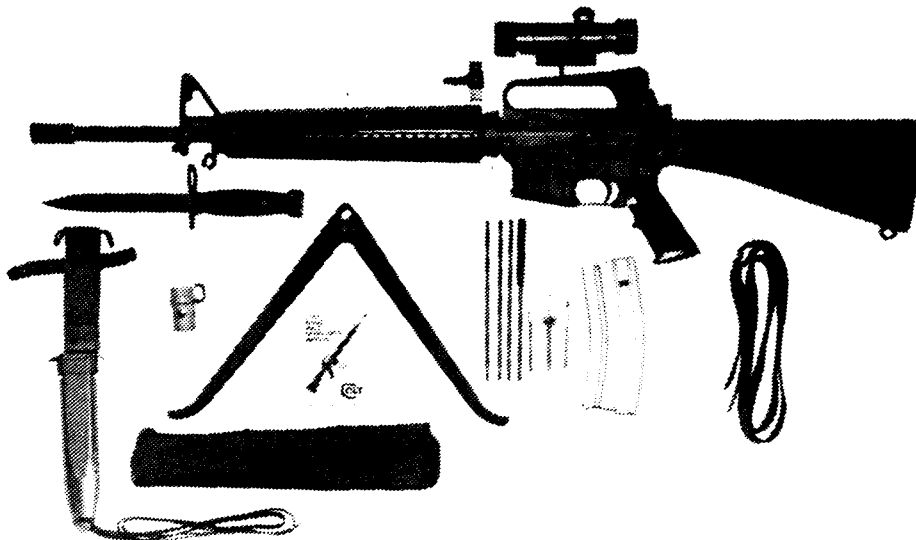
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FIG 1 COLT STRIPPED



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FIG 2 COLT WEAPON AND ACCESSORIES

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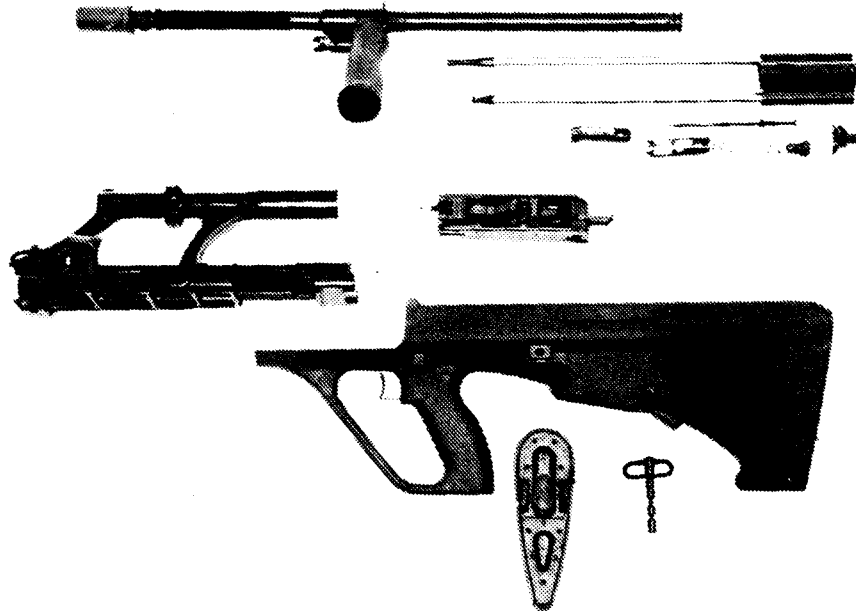
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FIG 3 STEYR STRIPPED



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FIG 4 STEYR WEAPON AND ACCESSORIES

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ANNEX C

SECTION 1 - WEAPON SYSTEM CHARACTERISTICS AND ACCESSORIES

1.	TYPE OF WEAPON:	ASSAULT RIFLE M16A2
2.	MANUFACTURED BY:	COLT FIREARMS USA
3.	DATE OF MANUFACTURE:	
4.	CALIBRE: Nominal:	5.56 mm
5.	MUZZLE VELOCITY:	990 m/s
6.	MUZZLE ENERGY:	1.745 kJ
7.	SYSTEM OF OPERATION:	Direct gas action. Gas piped direct from barrel to bolt carrier which provides chamber and gas cylinder to operate rotating bolthead through a cam groove. (LJUNGMANN System)
8.	TYPE OF FEED:	Direct feed by bolt from magazine.
9.	LOCKING SYSTEM:	7 locking lugs on rotating bolt engaging with barrel extension.
10.	SAFETY DEVICES:	
	a.	Mechanical (1) 4 mm rearward travel of carrier before bolt unlocks. (2) Firing pin cannot strike primer until bolt is locked. (3)
	b.	Applied: Selector lever prevents movement of trigger.
11.	COOLING SYSTEM:	Air cooled by direct radiation.
12.	TRIGGER AND FIRING SYSTEM:	Dual sear (primary and secondary) with additional sear for autofire.
13.	TRIGGER PULL:	3.6 single 4.5 auto kg. Stages: One
14.	CONTROL OF RATE OF FIRE:	None (Closed gas system)
15.	PROVISION FOR SS/BURST DEVICE/AUTOMATIC FIRE:	S/S - Yes. Auto - Yes. Burst Device - No

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16. DIRECTION AND DISTANCES OF EJECTED CASES a. Offhand: 1.5 m - 3 m, between 2 and 3 o'clock.  
b. Prone: 1.5 m - 3 m between 2 and 3 o'clock.
17. POSITION OF FEED OPENING: Underneath receiver forward of trigger guard.
18. PROVISION OF EJECTION OPENING: RHS of receiver with cast block for case direction for left handed firers.
19. PROVISION FOR FORWARD ASSIST: YES By striking plunger on RHS of receiver.
20. PROVISION FOR EJECTION OPENING COVER: YES Spring loaded cover opens automatically with movement of the carrier.
21. POSITION OF BRECH BLOCK ON CEASING FIRE WHEN:  
a. Magazine or belt is empty: Rearwards. (Manual holding open device provided.)  
b. Magazine or belt is not empty: Forward locked and ready to fire.
22. TYPE OF FLASH ELIMINATOR: 4 apertures with no opening facing downwards.
23. SIGHT:  
a. Type of Foresight: Vertical square post, flat top with vertical adjustment.  
b. Type of Backsight: Flip aperture with elevation and windage screws.  
c. Graduation of Backsight: 100 to 800 m.  
d. Sight Radius: 510 mm.  
e. Method of Adjustment Elevation: Screw. Lateral: Screw.  
f. Provision for Optical Sight: Yes. Screws on to carry handle.  
g. Provision for Night Sight: Yes. Screws on to carry handle.

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ANNEX C

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24.	BARREL:	a. Mass: 1112 g.
		b. Length: 375 mm.
		c. Method of Changing and Time Required: Not normally removed.
25.	BORE/RIFLING	a. Number of Grooves: 6
		b. Width of Grooves: 1.87 mm
		c. Depth of Grooves: 0.0572 mm.
		d. Pitch in Turns/Inch: 1 turn in 7" or 1 turn in 178 mm.
		e. Direction of Twist: Right Hand
		f. Form: Rectangular
		g. Method of Rifling: Button drawn rifling.
		h. Plated Chamber: YES      Bore: YES      Other: Bore and chamber hard chrome plated. Bore = 0.0004" Chamber = 0.003" to 0.0015".
26.	MASS OF WEAPON WITHOUT MAGAZINE OR BELT:	2.75 kg
27.	OVERALL LENGTH OF WEAPON:	With butt extended 847 mm. With butt retracted 765 mm.
28.	RATE OF AUTOMATIC FIRE:	Cyclic rate 700 -> 950 rpm -> Max rds/min 150 -> 200
29.	METHOD OF FILLING MAGAZINE OR BELT:	10 rd clip with charger.

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30. MAGAZINE/BELT: a. Description: Aluminum double column curved 30 rds. (Unsatisfactory - plastic magazine by Thermold Plastic used for engineering evaluations.)

b. Capacity: 30 rds 20 rds

c. Mass Empty 111 gram 81 gram

d. Mass Filled: 480 gram 327 gram

e. Feeding LH: N/A RH: N/A Underneath

31. TYPE OF AMMUNITION: 5.56 mm x 45 mm SS109

32. PROVISION FOR BAYONET: YES Type: Knife Type M7.

33. PROVISION FOR GRENADE FIRING: YES Type Available: M203 rifle grenade or bullet trap type.

34. TYPE AND POSITION OF MOUNTING:

a. Bipod: Yes. Clips on underneath foresights around barrel.

b. Tripod: N/A.

35. LIMITS OF:

a. Traverse: Bipod: One position only 90° to barrel.

b. Elevation: Bipod: Not adjustable.

36. CLEANING KIT PROVIDED: YES Type: Rod with bore and chamber brushes and patches.

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ANNEX C

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SPECIAL FEATURES: M16A2 carbine comes with retractable butt and has a lighter barrel.

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SECTION 1 - WEAPON SYSTEM CHARACTERISTICS AND ACCESSORIES

1. TYPE OF WEAPON: ASSAULT RIFLE, STEYR AUG A1
2. MANUFACTURED BY: STEYR - DAIMLER - PUCH
3. DATE OF MANUFACTURE: \_\_\_\_\_
4. CALIBRE: Nominal: 5.56 mm
5. MUZZLE VELOCITY: 930 m/s
6. MUZZLE ENERGY: 1.763 kJ
7. SYSTEM OF OPERATION: Gas operated short stroke. Vented piston.
8. TYPE OF FEED: Direct feed by bolt from magazine.
9. LOCKING SYSTEM: Rotating bolt locking design with 7 locking lugs.
10. SAFETY DEVICES:
  - a. Mechanical (1) 6 mm rearward movement of carrier before bolt unlocks.
  - (2) Firing pin cannot strike primer until bolt is locked.
  - (3) Drop safety prevents sear release.
  - (4) Bolt cannot go into battery if barrel is not fully locked into body.
  - b. Applied: Safety button type preventing movement of trigger.
11. COOLING SYSTEM: Aircooled by radiation.
12. TRIGGER AND FIRING SYSTEM: Dual sear (primary and secondary) with additional sear for auto rate of fire.
13. TRIGGER PULL: 4 kg first pull, 7.5 kg second pull. Stages: Two stages: First stage S/S, Second stage Auto.
14. CONTROL OF RATE OF FIRE: By gas regulation 3 setting Normal Adverse and one setting which is for grenade firing

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15. PROVISION FOR SS/BURST DEVICE/AUTOMATIC FIRE: S/S Yes Auto Yes Burst No
16. DIRECTION AND DISTANCES OF EJECTED CASES a. Offhand: 2 m - 2.5 m between 2 and 3 o'clock.  
b. Prone: 2 m - 2.5 m between 2 and 3 o'clock.
17. POSITION OF FEED OPENING: Underneath butt behind trigger guard.
18. PROVISION OF EJECTION OPENING: Above feed opening on either RHS or LHS slightly upward.
19. PROVISION FOR FORWARD ASSIST: YES Small button on cocking lever.
20. PROVISION FOR EJECTION OPENING COVER: YES None. Interchangeable cover provided to alternate closure for left handed firers in conjunction with left ejection bolt.
21. POSITION OF BREECH BLOCK ON CEASING FIRE WHEN:  
a. Magazine or belt is empty Rearwards.  
b. Magazine or belt is not empty Forwards. (Manual hold open provided for cocking handle.)
22. TYPE OF FLASH ELIMINATOR: 5 horizontal apertures with no opening facing downwards.

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ANNEX C

23. SIGHT: a. Optical Sight: Standard on all weapons 1.5 x magnification zeroed for 300 metres with circular reticle which permits aiming off for different ranges. Zeroing adjustment provided.
- b. Provision for Night Sight: Yes.
- (1) Type of Foresight: Rectangular post with iridescent paint - dot.
- (2) Type of Backsight: Square U with iridescent paint dot on each side.
- (3) Graduation of Backsight: None
- (4) Sight Radius: 193 mm
- (5) Method of Adjustment: Elevation: None      Lateral: None
- Note: (1) to (5) are Short Range Night Sight.
24. BARREL: a. Mass: 1.330 kg with gas plug and handle.
- b. Length: 508 mm.
- c. Method of Changing and Time Required: Press button and turn (8 seconds).
25. BORE/RIFLING a. Number of Grooves: 6
- b. Width of Grooves: 1.8 mm
- c. Depth of Grooves: 0.055 mm
- d. Pitch in Turns/Inch: 1 in 178 mm, 1 in 7"
- e. Direction of Twist: Right hand.
- f. Form: Modified Metford with tapered bore towards the muzzle.
- g. Method of Rifling: Cold swaging.

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h. Plated Chamber: YES      Bore: YES      Other: Hand chrome plated bore & chamber.  
Bore = 0.010 mm      Chamber = 0.010 mm

26. MASS OF WEAPON WITHOUT MAGAZINE OR BELT: 3.6 kg.

27. OVERALL LENGTH OF WEAPON: 790 mm.

28. RATE OF AUTOMATIC FIRE: Cyclic rate 680 = 850 rpm. Max rate = 150 rpm.

29. METHOD OF FILLING MAGAZINE OR BELT: By hand or using 30 rd magazine filler.

30. MAGAZINE/BELT: a. Description: Tinted green transparent plastic, double column with level indicators.  
b. Capacity: 30 rds or 42 rds.  
c. Mass Empty 103 gram 160 gram  
d. Mass Filled: 482 gram 700 gram  
e. Feeding LH: N/A      RH: N/A      Underneath.

31. TYPE OF AMMUNITION: 5.56 x 45 mm SS109

32. PROVISION FOR BAYONET: YES      Type: Fieldknife including all type that fit M16A1.

33. PROVISION FOR CHENADE FIRING: YES      Type Available: Bullet trap type or M203 grenade launcher with alternative barrel and will accept first generation rifle grenade with special launching cartridge.

34. TYPE AND POSITION OF MOUNTING:  
a. Bipod: Yes. Detachable clip on type - including wire cutters.  
b. Tripod: None.

35. LIMITS OF BIPOD:  
a. Traverse: Bipod: One position only 90° to barrel.  
b. Elevation: Bipod: N/A

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ANNEX C

UNCLASSIFIED

36. CLEANING KIT PROVIDED: YES      Type: Oiler, wire and bristle brush, wick & holder and cleaning string.
37. SPECIAL FEATURES: Optical sighting system is used on this weapon with open sights for night shooting and emergency.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
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APPENDIX 1

WEAPON DESCRIPTION - STEYR AUG

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APPENDIX 1 TO  
ANNEX C TO  
PART TWO TO  
EDE 17/85

WEAPON DESCRIPTION - STEYR AUG

1. GENERAL

1.1 The 5.56 mm AUG is gas operated with three settings on the gas regulator. It has a turnbolt locking action, quick-change barrel and integral telescopic sights. The AUG fires from closed bolt position. It is provided with a pull through trigger system which allows a speedy change from semi-automatic to automatic firing and vice versa. It is equipped with a thirty-round magazine. Any 5.56 x 45 mm cartridge within specification VTL 1305/40-1 can be used.

1.2 A bayonet can be mounted on the barrel.

2. GENERAL DESCRIPTION

2.1 Barrel Group

The barrel group consists of barrel, barrel handle assembly flash suppressor, bayonet attachment (on option), gas piston assembly, gas piston spring and gas regulator. The bore has six grooves of 1 in 7 twist. The bore and cartridge chamber are cold forged and chromium plated. After forging the outer contours of the barrel are machined. The flash suppressor is suitable for launching rifle grenades.

2.2 Housing Group (with telescopic sight)

2.2.1 The housing group consists of receiver assembly, telescopic sight unit, barrel locking plunger unit, cocking handle unit and front sling swivel assembly. The receiver housing is a high pressure aluminium die casting. The breech bolt housing, barrel bushing and bolt carrier guide tubes are fixed into the receiver housing. Barrel and breech bolt carrier are guided by the housing assembly.

2.2.2 The optical sight has a centre ring reticle of which the internal diameter is 6 mils and the external one is 12 mils. Its magnification is 1.5. The scope, integrated into the receiver group, covers an angle of 150 mils. The telescope adjusting screws (windage and elevation) must be adjustable by the rifleman himself or the armourer respectively.

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APPENDIX 1

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2.3 Gun Lock

2.3.1 The Gun Lock consists mainly of breech bolt carrier, breech bolt, locking piece, firing pin and cocking piece.

2.3.2 The breech bolt is of a turnbolt locking design with 7 locking-lugs. The breech bolt carrier is guided by the bolt carrier guide tubes.

2.3.3 The bolt group can be converted to the left ejection by interchanging the breech bolt.

2.4 Butt

2.4.1 The butt consists mainly of body, safety, receiver locking slide, trigger mechanism and butt plate. Further, there are two recoil buffers built into the body.

2.4.2 The trigger is of a sliding action. After releasing the safety catch the pull through trigger allows a quick change from semi-automatic to automatic firing.

2.4.3 Two ejector windows are provided for right side and left side ejection.

2.5 Trigger Mechanism

2.5.1 The trigger acts through the trigger rod and sears onto the cocked hammer. The released hammer energy is transferred onto the firing pin which ignites the primer.

2.5.2 All parts of the hammer mechanism are made of plastics with the exception of rear sling swivel assembly, pins, springs and bolt catch.

2.6 Magazine 30/40

The double columned magazine is made of transparent plastics and holds 30 or 40 rounds.

2.7 Cleaning Set

The cleaning set can be placed into the stock. It consists of 5 parts: the cleaning cord, wick holder, wire brush, bristle brush and the oiler.

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APPENDIX 1

2.8 Sling Assembly UNCLASSIFIED

2.9 Blank Firing Attachment

2.10 Accessories

Spare magazine 30 rounds with special magazine box for 2 magazines, spare magazine 40 rounds.

2.11 Special Housing

Various aiming devices can be mounted onto the special housing, eg, image intensifiers, 6-powered scopes, infrared night vision systems.

2.12 Bayonet Complete

2.13 Bipod With Wire Cutters

3. IDENTIFICATION MARKS

3.1 Barrel

Weapon number, proof mark and calibre.

3.2 Housing

Weapon number, proof mark and acceptance mark.

3.3 Bolt Carrier

Weapon number.

3.4 Butt

Short designation of weapon name, name of the factory and country of origin.

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APPENDIX 1

4.

TECHNICAL DATA

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Length of Barrel	16"/407 mm	20"/508 mm	15.35"/621 mm
Calibre	5.56 mm (.223)	5.56 mm (.223)	5.56 mm (.223)
Overall length	27"/690 mm	31"/790 mm	35.4"/ 900 mm
Weight of weapon without magazine	approx 7.2 lbs/3.3 kg	approx 7.9 lbs/3.6 kg	approx 10.8 lbs/4.9 kg
Weight of magazine empty	approx 0.3 lbs/0.13 kg	approx 0.3 lbs/0.13 kg	approx 0.3 lbs/0.13 kg
Chamber and barrel bore	cold forged and chromium plated	cold forged and chromium plated	cold forged and chromium plated
Length of twist and direction	7" right/178 mm	7" right/178 mm	7" right/178 mm
Number of grooves	6	6	6
Theoretical rate of fire	approx 680 rds per min	approx 680 rds per min	approx 680 rds per min

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APPENDIX 2

WEAPON DESCRIPTION - COLT M16A2

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APPENDIX 2 TO  
ANNEX C TO  
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WEAPON DESCRIPTION - COLT M16A2

1. GENERAL

1.1 Description

The M16A2 Colt Rifle is a lightweight, air cooled, gas operated, magazine fed, shoulder weapon. It is capable of semi-automatic or automatic fire. The Rifle accommodates the US Model M7 Bayonet-knife. The Rifle is easily opened to expose the working parts for inspection and cleaning. A brief description of the major components of the Rifle follows.

2. GENERAL DESCRIPTION

2.1 Receiver and Barrel Assembly Group

2.1.1 Barrel Group

The barrel group consists of the barrel and barrel extension assembly, the hand-guard cap, the front sight group, the flash suppressor, barrel nut and slip ring assembly, and the left and right handguards. The front sight group is comprised of the forward sling swivel assembly, the front sight and gas tube assembly, and the front sight post which is adjustable vertically for elevation. The handguards have heat resisting inner shields.

2.1.2 Upper Receiver Group

The upper receiver group contains the upper receiver, bolt carrier assembly, forward assist assembly, charging handle, ejection port cover assembly, and the mounting provisions for the barrel assembly. A carrying handle forms the top of the upper receiver. The rear sight, which is adjustable for windage and elevation, is housed in the handle where provision is also made for a telescope sight to be attached.

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APPENDIX 2

2.2 Lower Receiver and Buttstock

2.2.1 The lower receiver and buttstock assembly consists of the lower receiver, the pistol grip, lower receiver extension, and buttstock. The lower receiver contains the trigger, fire control selector, bolt catch, disconnect, automatic sear, and magazine catch. The receiver extension, which is the mounting device for the buttstock, contains the buffer assembly and the action spring. The receivers are made of aluminium alloy, durable yet light in weight while the buttstock and pistol grip are made of high impact plastic material.

2.3 Bolt Carrier Assembly

The bolt carrier assembly consists of the bolt carrier, key, bolt assembly, firing pin, firing pin retaining pin, cam pin, extractor assembly and ejector. The rotary bolt locking action is one of the mechanical features of the rifle. The bolt and barrel extension contain locking lugs which engage and lock the bolt firmly to the barrel extension. The initial force of the cartridge explosion is absorbed by the barrel, barrel extension, and bolt.

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APPENDIX 2

3. Technical Data

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Weight:

M16A2 Rifle - Empty (without magazine and sling)	7.4 lb	3.39 kg
Sling (Silent)	0.4 lb	0.18 kg
Loaded Magazine (30 rd)	1.2 lb	0.51 kg
M16A2 Rifle with Loaded 30 rd magazine and Sling	8.6 lb	3.9 kg

Length:

Overall with flash suppressor	39.6 in	1.0 m
Barrel	20 in	0.51 m
Barrel with flash suppressor	21 in	0.53 m

Mechanical Features:

Rifling, RH, 6 grooves, 1 turn in	7 in	177.8 mm
-----------------------------------	------	----------

Method of Operation

Gas

Type of Breech Mechanism

Rotating Bolt

Method of Feeding

Magazine

Cooling

Air

Ammunition:

Calibre	5.56 mm (cal .223)
Type	Ball, blank, dummy and tracer

Cyclic rate of fire

700 to 950 rds/min

Muzzle Velocity (approx)

3250 ft/sec      991 m/s

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PART TWO

ANNEX D

CRITICAL EXAMINATION

This Annex contains details of the critical examination of the trial weapons.

The following figures and tables are included:

FIG 1	PLOT OF WEAPON BORE MEASUREMENT (EDE)	M16A2 : C1
FIG 2	PLOT OF WEAPON BORE MEASUREMENT (EDE)	M16A2 : C2
FIG 3	PLOT OF WEAPON BORE MEASUREMENT (EDE)	M16A2 : C3
FIG 4	PLOT OF WEAPON BORE MEASUREMENT (EDE)	STEYR : S1
FIG 5	PLOT OF WEAPON BORE MEASUREMENT (EDE)	STEYR : S2
FIG 6	PLOT OF WEAPON BORE MEASUREMENT (EDE)	STEYR : S3
FIG 7	PLOT OF WEAPON BORE MEASUREMENT (3AQAU)	M16A2 : C1
FIG 8	PLOT OF WEAPON BORE MEASUREMENT (3AQAU)	STEYR : S1
TABLE 1	PROOF MARKS AND SERIAL NUMBERS	
TABLE 2	STRIP/ASSEMBLY TIMES	

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ANNEX D TO  
PART TWO TO  
EDE 17/85

CRITICAL EXAMINATION

REFERENCE:      A.    EDE ENGINEERING EVALUATION PROGRAMME - SERIAL 3

1.            This Annex contains details of the critical examination of the trial weapons.
2.            All serial numbers and proof marks were noted. The proof mark of the COLT was the letter C. The STEYR's proof mark was BH9.
3.            Table 1 shows how the components were proofed and numbered.

TABLE 1    PROOF MARKS AND SERIAL NUMBERS

System	Item	Serial No	Proof Mark
Steyr	Barrel	✓	✓
	Receiver	✓	✓
	Bolt Carrier	✓	x
Colt	Barrel	x	✓
	Receiver	✓	x
	Bolt Carrier	x	✓
	Bolt Head		✓

Both barrels were marked to indicate a 1 in 7 twist of rifling.

4.            All relevant spring force/displacement curves have been obtained and are recorded in the Weapon History Books.
5.            For the field strip/assembly, no special tools are necessary. The complete strip/assembly requires the full amount of tools in the Armourer's Tool Kit as described in each system's Maintenance Manual shown in this Annex.
6.            The field strip is described in both User Manuals. The complete strip/assembly is described in the Maintenance Manual.
7.            The times for both strip/assembly operations were noted and have been tabulated in Table 2.

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ANNEX D

TABLE 2 - STRIP/ASSEMBLY TIMES

Operation	Time Taken (mins)	
	Steyr	Colt
Complete Strip	20	25
Complete Assy	30	25
Field Strip	1	2.25
Field Assy	1	1.5

8. The manuals for both systems have not shown any discrepancies as such at this stage of the trial.

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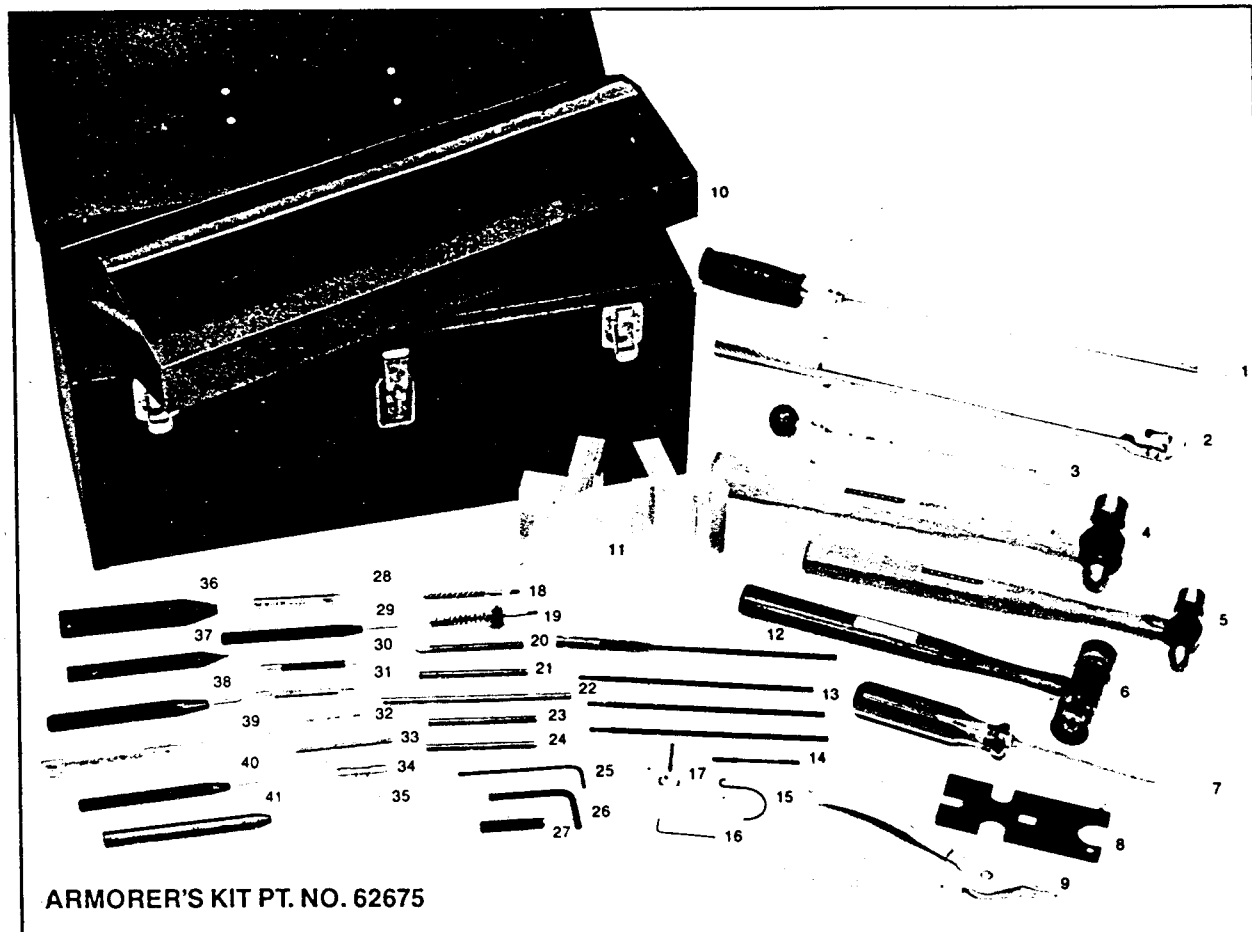
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ANNEX D



ARMORER'S KIT PT. NO. 62675

COLT'S ARMORER'S KIT CONTAINS THE NECESSARY TOOLS FOR INSPECTION, MAINTENANCE AND REPAIR

MAINTENANCE AND REPAIR ON THE MODEL M-3 BIPOD AND THE MODEL M-7 BAYONET CAN ALSO BE PERFORMED WITH THIS KIT.

Part No.	Description	Part No.	Description
1	94162 Wrench, Torque-Limiting, 1/2" Sq. Drive	23	62689 Setter, Punch, (.094 Dia. Pin)
2	94147 Handle, Wrench, Flexible	24	62688 Setter, Punch, (0.78 Dia. Pin)
3	94161 Wrench, Torque-Limiting, 3/4" Sq. Drive	25	94160 Wrench, Hex Socket, Screw (Key, Socket Screw)
4	94149 Hammer, Ball Pein Machinist's 16 oz.	26	62698 Tool, Pivot Pin Detent Installation
5	94148 Hammer, Ball Pein Machinist's 8 oz.	27	62699 Wrench, Front Sight Adjusting
6	94150 Hammer, Soft Face, W. Plastic Tips	28	94154 Punch, Pin, Drive, (3/32 dia.)
7	94157 Screwdriver, Hand, Flat Blade, Mechanics	29	62697 Punch, Pin, Drive, (.075 dia.)
8	62696 Wrench, Combination	30	94152 Punch, Pin, Drive, (1/16 dia.)
9	94151 Pliers, Retaining Ring, External	31	62680 Punch, Pin, Bolt Catch Pivot
10	91414 Box, Tool, Steel	32	62679 Gage, Firing Pin Protrusion
11	62695 Vise Jaws, Barrel Removal	33	62693 Tool, Alignment, Barrel Nut
12	62704 Handle Assembly, Cleaning Rod, 5.56 MM	34	T-27921 Gage, Headspace (Field) (Colt)
13	62705 Rod Section, Cleaning 5.56 MM	35	62694 Tool, Reflector, Chamber
14	62687 Swab Holder Section, Cleaning Rod 5.56 MM	36	62682 Punch, Pin, Starter, Taper Pin
15	62672 Depressor, Front Sight Detent	37	62683 Punch, Pin, Taper, Insertion
16	62673 Depressor, Pivot Pin Detent	38	94146 Punch, Center
17	94158 Socket, Wrench, Hex Bit, W/Short Bit	39	94156 Punch, Pin, Drive, (1/4 dia.)
18	94144 Brush, Cleaning, Bore 5.56 MM	40	94155 Punch, Pin, Drive, (1/4 dia.)
19	94145 Brush, Chamber Cleaning	41	62715 Tool, Swaging Rivet
20	62692 Setter, Punch (W Flat)		
21	62691 Setter, Punch, (.125 Dia. Pin)		
22	62690 Setter, Punch, (.094 Dia. Pin)		

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ARMY UNIVERSAL ASSAULT RIFLE  
SPECIAL ARMOURER TOOL KIT FOR AUG

Troop Material Maintenance

Part No a	Designation b	Quantity c	Test Specification d	Test extent e	Test method f
W250-HA 1002  N009-ABUS85/30, 5 x 18  DIN1041-300  -  -  -	A. <u>TOOLS</u>				
	TOOL BOX: empty, 3 compartments, 420 mm lg, 200 mm wide, 150 mm high, of steel plate.	1	sample	2%	measures
	PADLOCK: cylindrical, w 2 keys, 5 mm handle-D, 17-19 mm interior handle width	1	sample	2%	operation
	FITTER'S HAMMER: 300 g	1	DIN	2%	
	PIN PUNCH: 2 mm Ø, octagonal	1	DIN sample	2%	
	PIN PUNCH: 2.5 mm Ø, octagonal	1	DIN sample	2%	
	PIN PUNCH: 3.8 mm Ø, octagonal	1	DIN sample	2%	

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ANNEX D

ARMY UNIVERSAL ASSAULT RIFLE  
SPECIAL ARMOURER TOOL KIT FOR AUG

Troop Material Maintenance

Part No a	Designation b	Quantity c	Test Specification d	Test extent e	Test method f
DIN3113-AK9-CV	FORK RING WRENCH: span 9 x 9 mm, dodecagonal, ring bent mat CV	1	DIN	2%	
DIN3113-AK19-CV	FORK RING WRENCH: 19 x 19 mm span, dodecagonal, ring bent, mat CV	1	DIN	2%	
DIN911-3-CV	HEXAGONAL PIN WRENCH: span 3 mm, handle length 63 mm, mat CV	1	DIN	2%	HR <sub>C</sub>
-	SCREWDRIVER: blade 3.5 mm wide, 0.6 mm thick, 100 mm lg, plastic handle	1	DIN sample	2%	
-	SCREWDRIVER: blade 6 mm wide, 150 mm lg, 1 mm thick, plastic handle	1	DIN sample	2%	
-	TORQUE WRENCH: 315 mm lg, 0.05-5 kpm, plug-in connection 9 x 12 mm without inserting tool	1	sample	20%	Torque ± 10%
C116-731/10-41	SOCKET FORK WRENCH: span 14 mm w plug-in connection 9 x 12 mm	1	sample	2%	HR <sub>C</sub>
C116-731/10-9	SOCKET FORK WRENCH span 9 mm, plug-in connection 9 x 12 mm	1	sample	2%	HR <sub>C</sub>

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ANNEX D

ARMY UNIVERSAL ASSAULT RIFLE  
SPECIAL ARMOURER TOOL KIT FOR AUG

Troop Material Maintenance

Part No a	Designation b	Quantity c	Test Specification d	Test extent e	Test method f
-	CENTRE DRILL: 60 degrees, 2.5 mm Ø, shape A, DIN 333, mat HSS	1	DIN sample	2%	
-	PUNCH: octagonal, shank Ø 10 mm, length 120 mm	1			
DIN5258-A140	FLAT PLIERS: 140 mm lg, mat tool steel	1	DIN	2%	
-	STEEL WIRE BRUSH: 4 rows, undulated, bundle length 25 mm brush length 130 mm, total length 270 mm	1	sample	2%	visual
DIN338-1, 6-HSS	TWIST DRILL: 1.6 mm Ø, cyl short, DIN 338, mat HSS	1	DIN	2%	
DIN338-2, 1-HSS	TWIST DRILL: 2.1 mm Ø, cyl short, DIN 338, mat HSS	1	DIN	2%	
DIN338-3, 2-HSS	TWIST DRILL 3.2 mm Ø cyl short, DIN 338, mat HSS	1	DIN	2%	

ARMY UNIVERSAL ASSAULT RIFLE  
SPECIAL ARMOURER TOOL KIT FOR AUG

Troop Material Maintenance

Part No a	Designation b	Quantity c	Test Specification d	Test extent e	Test method f
(DIN338-8-HSS)	TWIST DRILL: 8 mm Ø, cyl short, bit ground to R4, mat HSS	1	DIN sample	2%	visual
-	HAND DRILL CHECK: for twist drill with 1-3.5 mmØ	1	sample	2%	operation visual
	<u>B. FIXTURES AND SPECIAL TOOLS</u>				
R019-WSK-5263	CLAMPING JAWS: for guide tube of slide piece body	1	drwg	10%	measures HR <sub>C</sub>
R019-WSK-5265	PIPE WRENCH: with tommy bar for muzzle flash hider	1	drwg	10%	measures HR <sub>C</sub>
R019-WSK-5276	PIPE WRENCH: for lock spring	1	drwg	10%	measures HR <sub>C</sub>
R019-WSK-5292	POINTED MANDREL: for mounting of retaining spring	1	drwg	10%	measures HR <sub>C</sub>
R019-WSK-5296	MOUNTING BOLT: for magazine catch	1	drwg	10%	measures HR <sub>C</sub>
R019-WSK-5297	SET HAMMER: for the rivetting of the guide rod	1	drwg	10%	measures HR <sub>C</sub>

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ANNEX D

ARMY UNIVERSAL ASSAULT RIFLE  
SPECIAL ARMOURER TOOL KIT FOR AUG

Troop Material Maintenance

Part No a	Designation b	Quantity c	Test Specification d	Test extent e	Test method f
R019-WSK-5300	RIVET RECESS: for piston compl	1	dwg	10%	measures HR <sub>C</sub>
R019-WSK-5301	MOUNTING CONE: for gas piston ring	1	dwg	10%	measures HR <sub>C</sub>

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ANNEX D

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ANNEX D

9. The weapons were thoroughly inspected at 3AQAU before the trial began. The details of the QA DIV tasks are listed in the Trials Directive 8/513.

10. EDE was equipped with the bore gauging equipment and bore inspection and video equipment.

11. The bores were measured and checked against the manufacturer's dimensions and tolerances.

12. Examples of the bore graphs, figure 1 through to figure 6 are shown in this Annex.

13. These dimensions were checked at various times during the trial and results are on record at EDE.

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ANNEX D

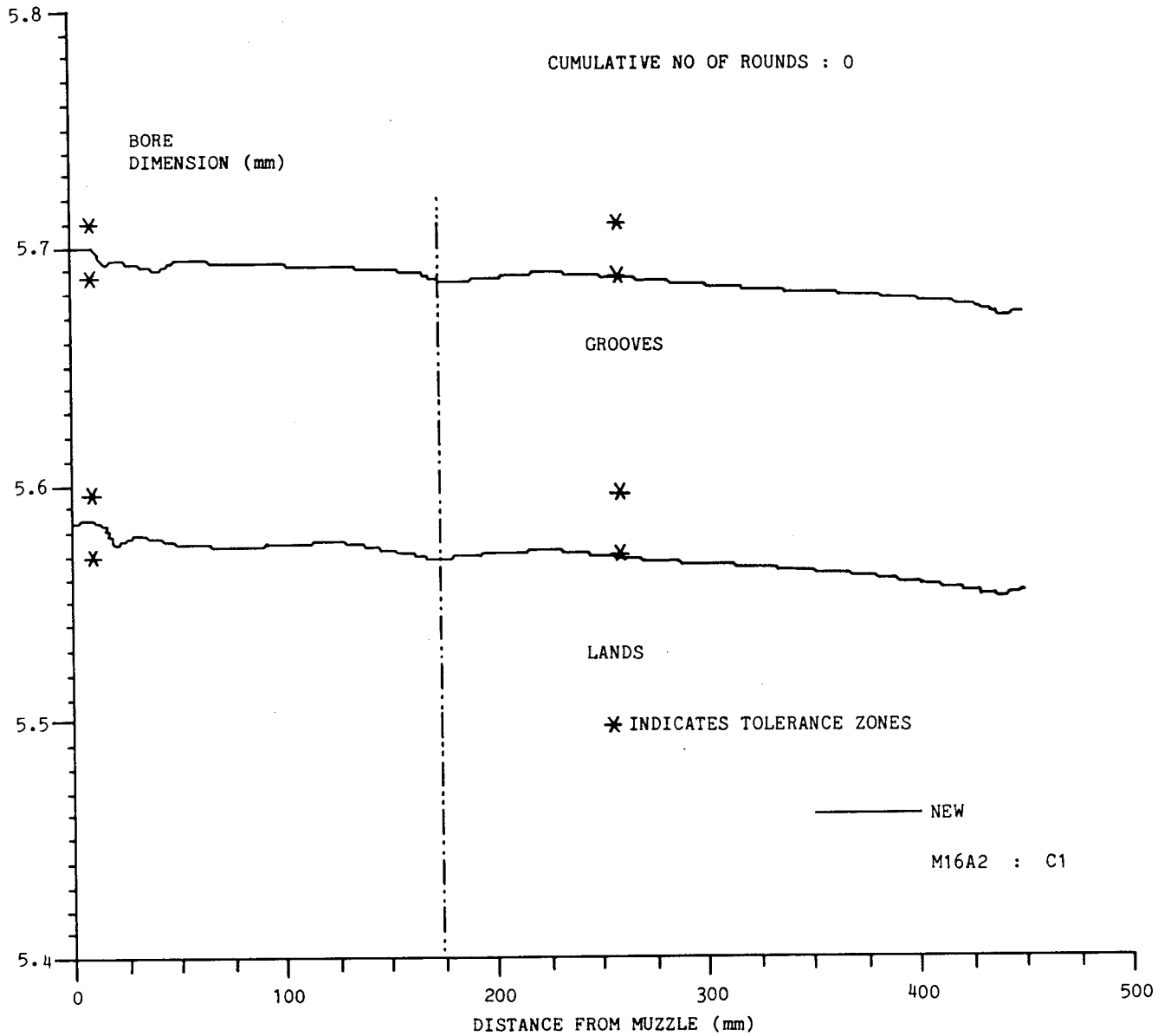


FIG 1  
PLOT OF WEAPON BORE MEASUREMENT

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ANNEX D

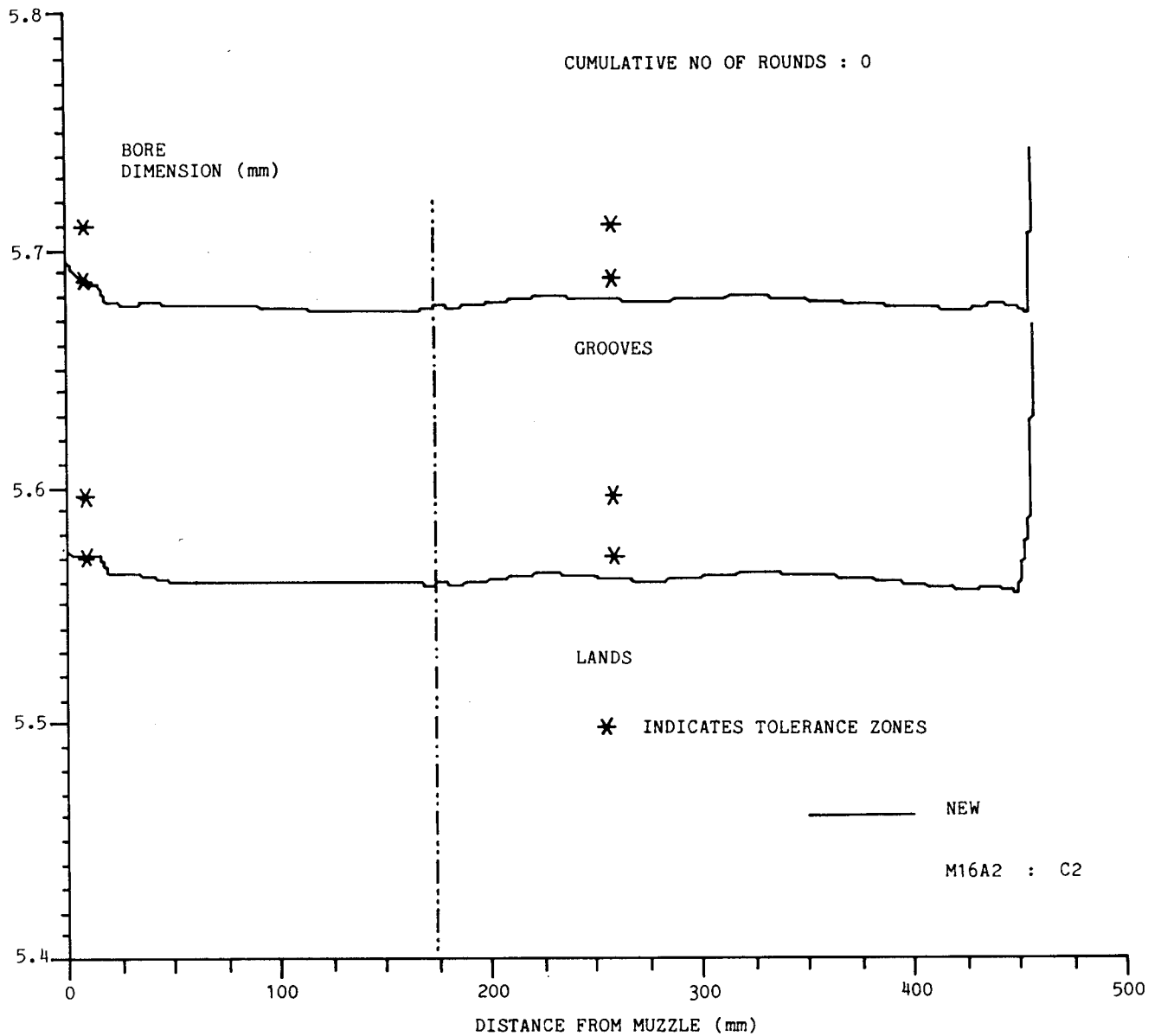


FIG 2  
PLOT OF WEAPON BORE MEASUREMENT

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ANNEX D

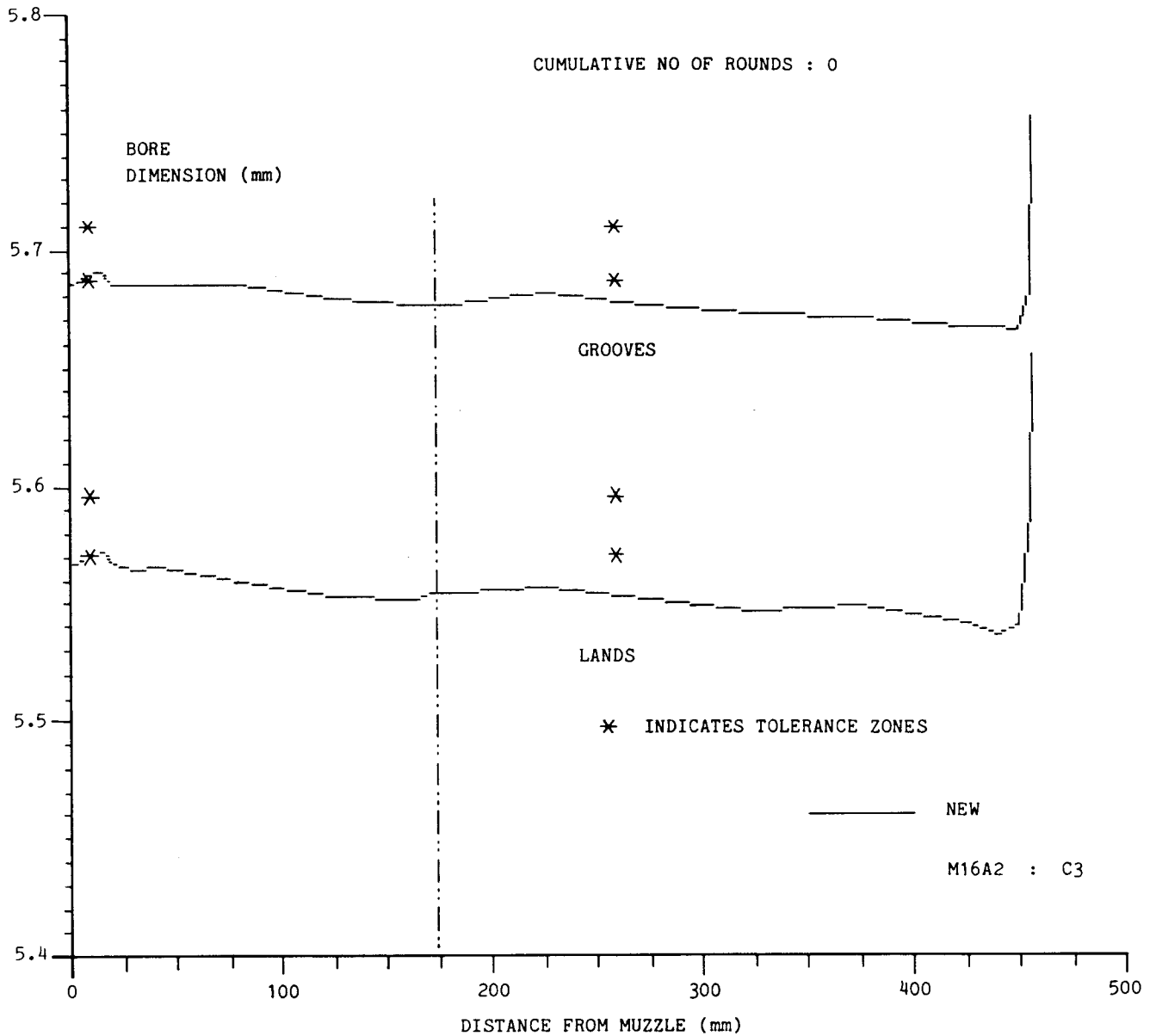


FIG 3  
PLOT OF WEAPON BORE MEASUREMENT

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ANNEX D

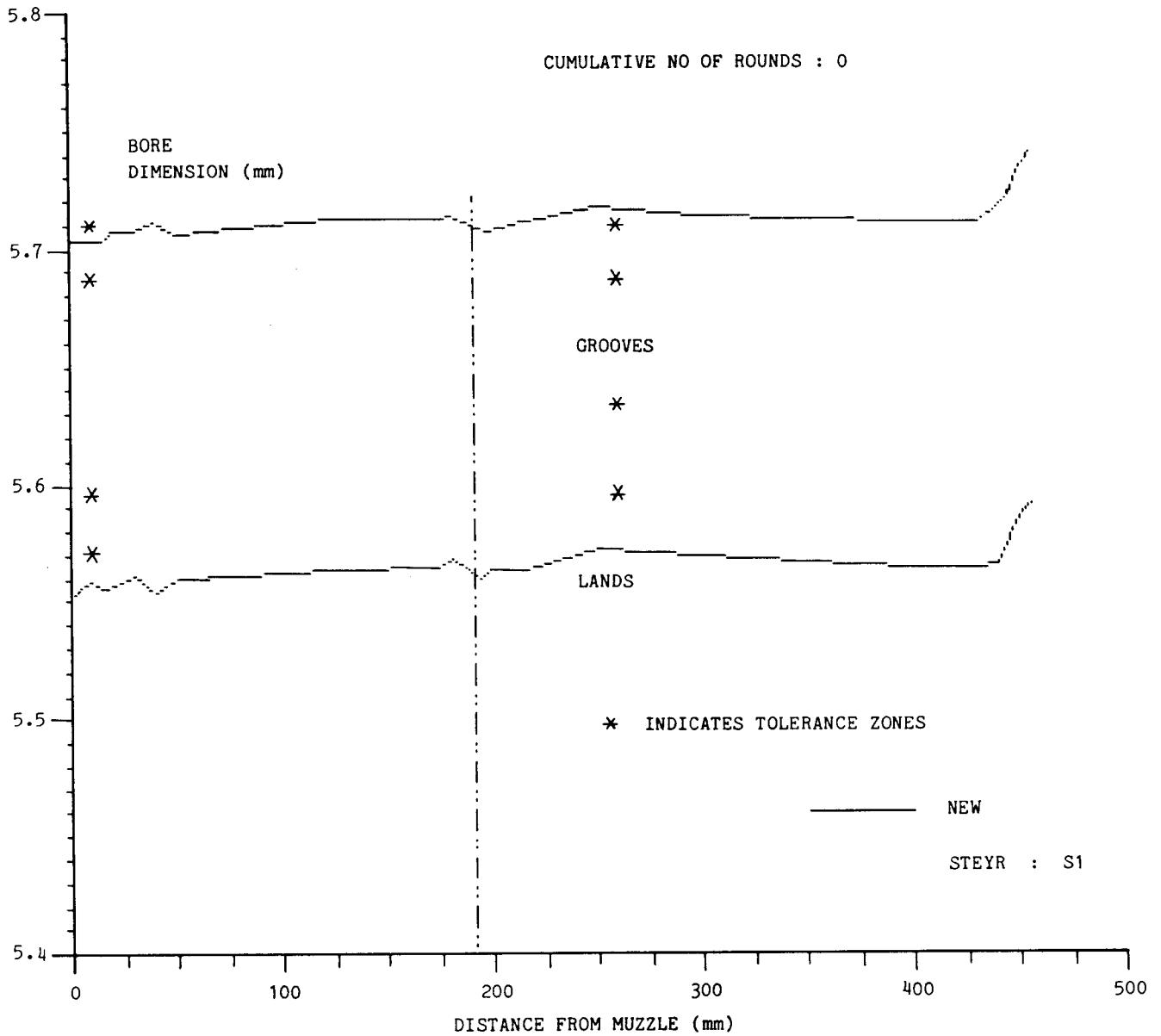


FIG 4  
PLOT OF WEAPON BORE MEASUREMENT

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ANNEX D

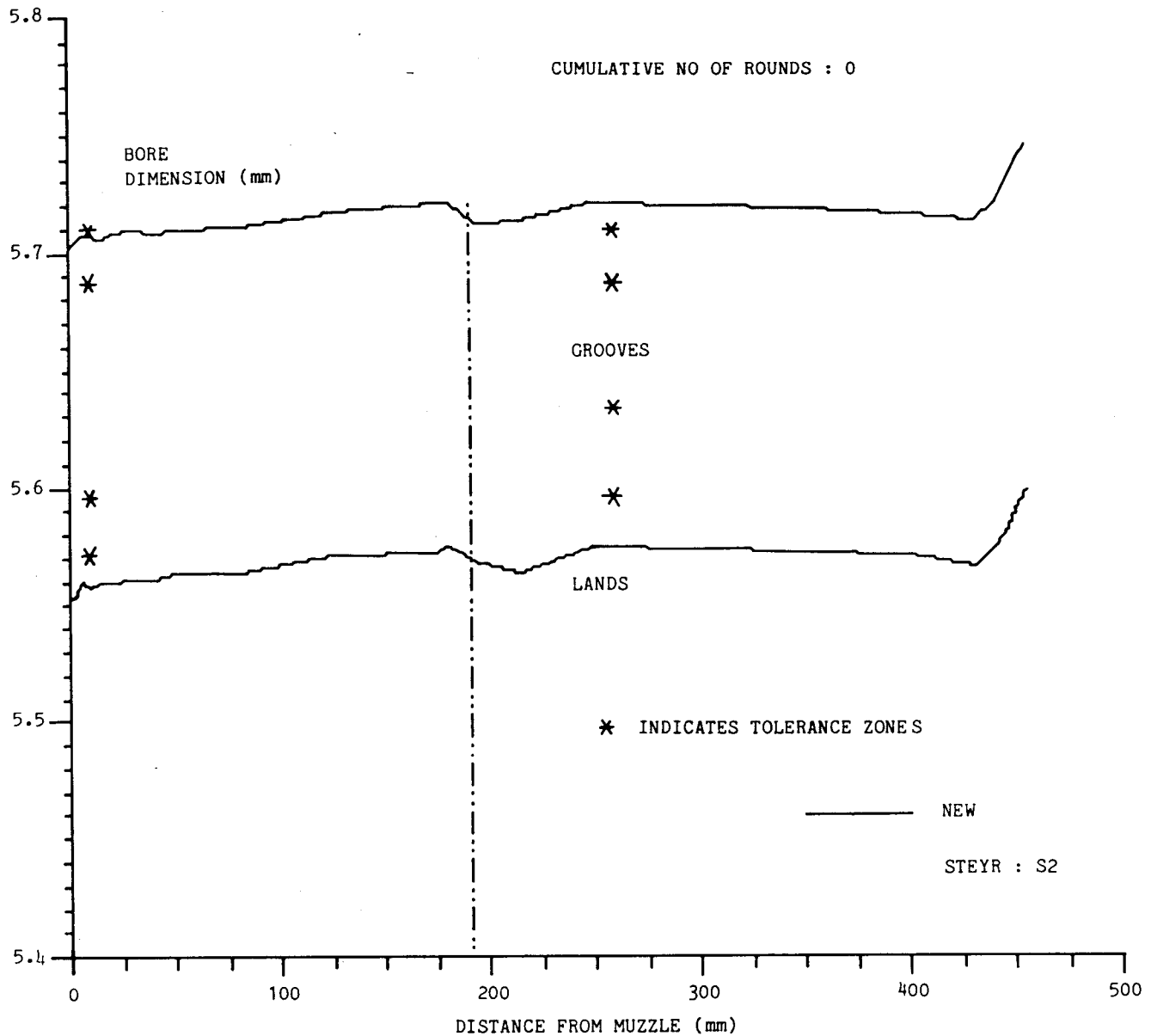


FIG 5  
PLOT OF WEAPON BORE MEASUREMENT

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ANNEX D

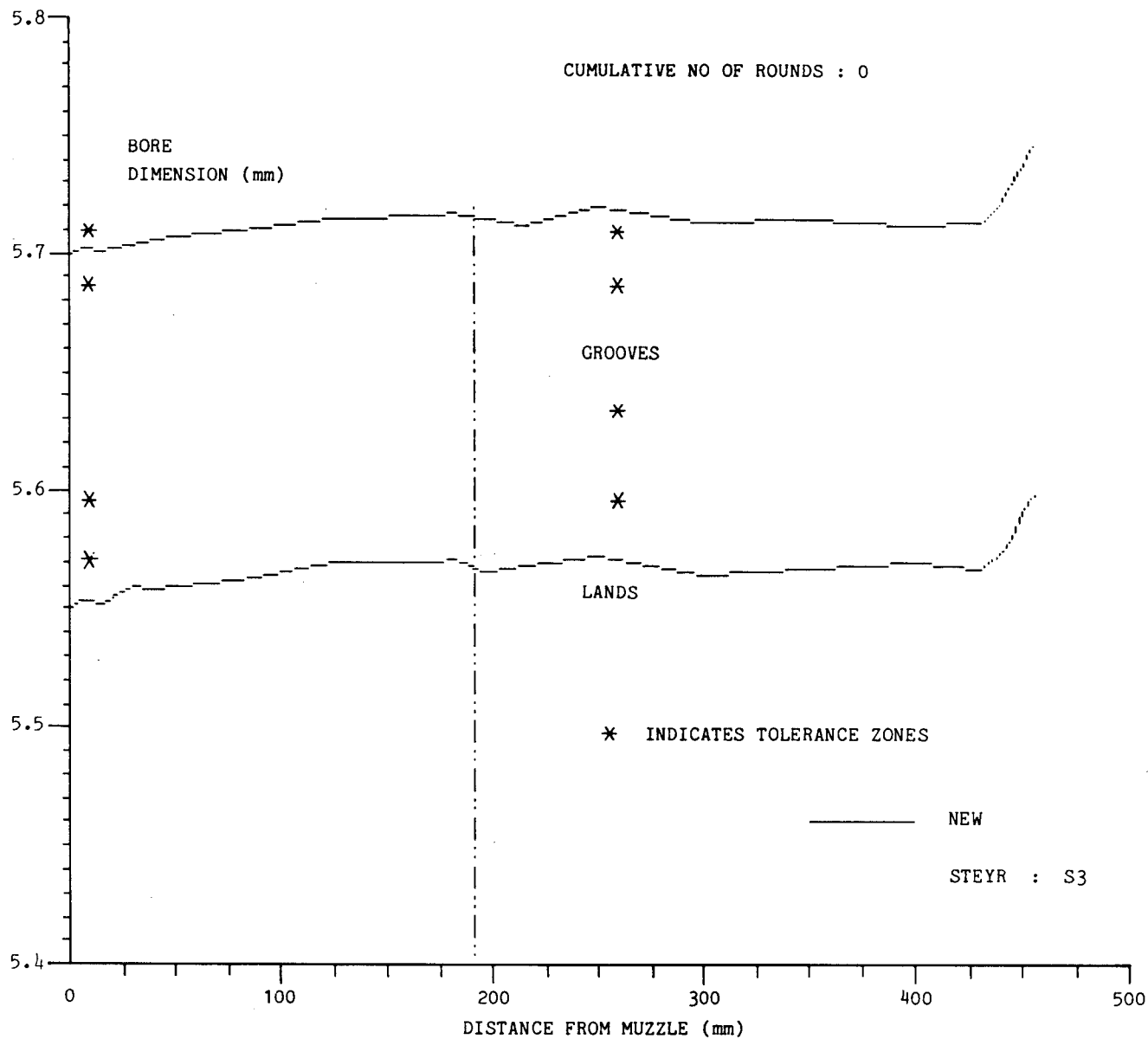


FIG 6  
PLOT OF WEAPON BORE MEASUREMENT

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ANNEX D

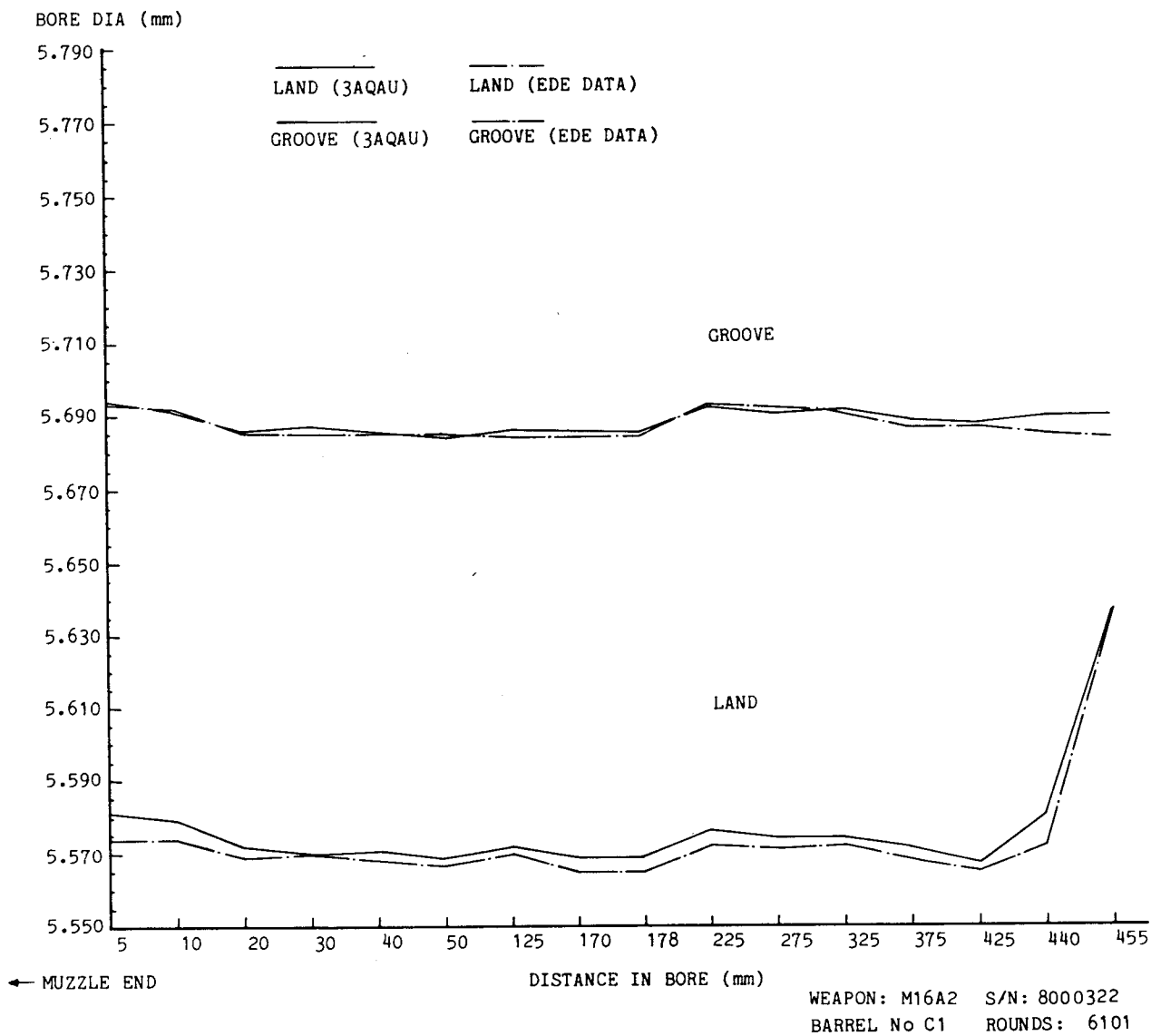


FIG 7  
PLOT OF WEAPON BORE MEASUREMENT (3AQUA) DATE 7/1/85

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

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ANNEX D

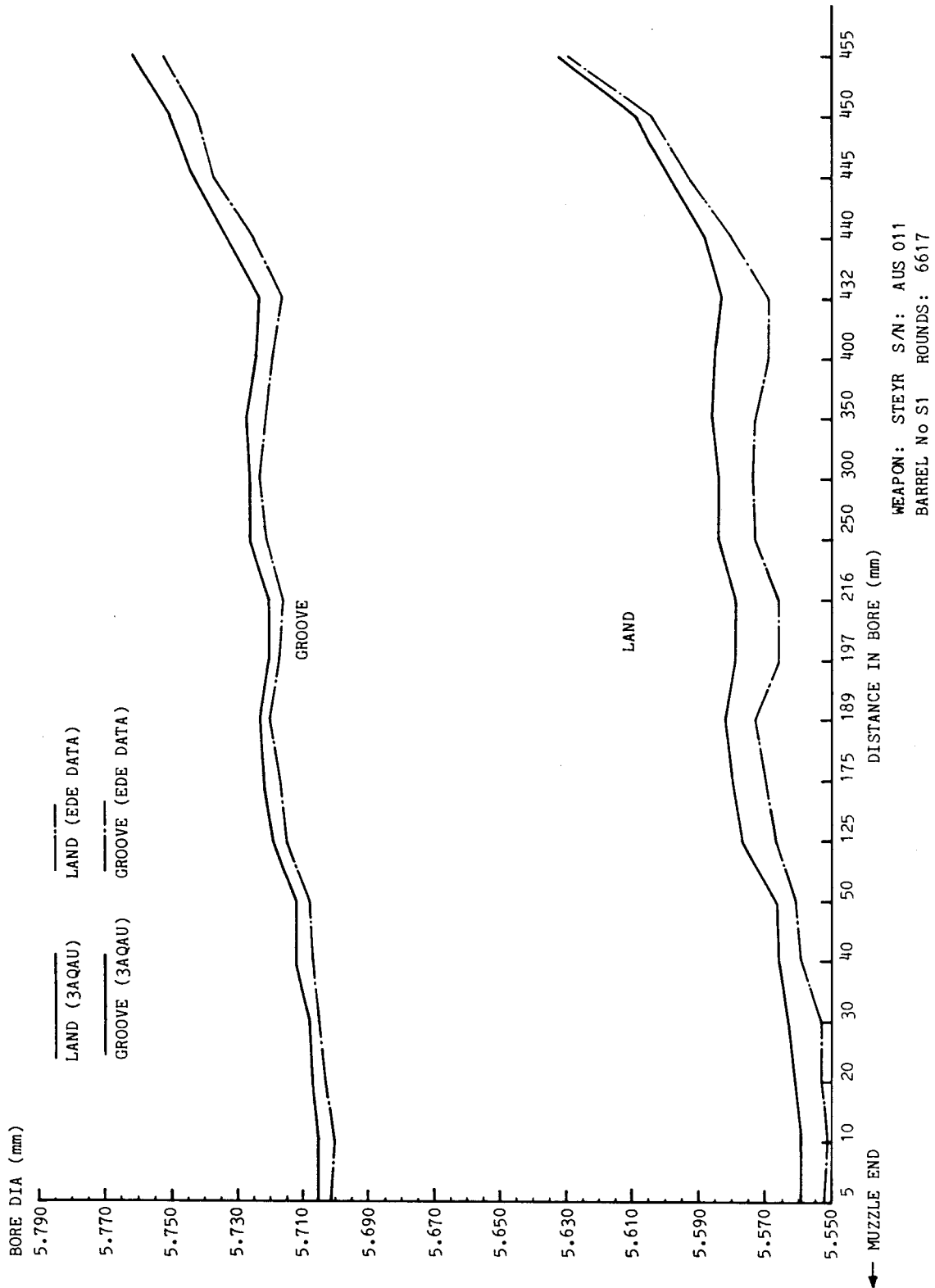


FIG 8  
PLOT OF WEAPON BORE MEASUREMENT (3AQU) DATE 9/1/85

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PART TWO

ANNEX E

PRELIMINARY FIRING AND COMMENTS

This Annex contains a brief summary and results of the Preliminary Firing of the COLT and STEYR weapon systems.

This Annex also contains the following:

TABLE 1 RATES OF FIRE, MUZZLE VELOCITIES

APPENDIX 1 JUMP TEST

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ANNEX E TO  
PART TWO TO  
EDE 17/85

PRELIMINARY FIRING AND COMMENTS

REFERENCE: A. EDE ENGINEERING EVALUATION PROGRAMME - SERIAL 4

1. This Annex contains a brief summary and results of the Preliminary Firing of the COLT and STEYR weapon systems.
2. The weapons were functioned and fired in order to determine correct and safe procedures in handling, loading, firing and unloading.
3. All of these procedures have been recorded on video. The ejection paths of the weapons were also recorded on video.
4. Muzzle velocities were recorded as were cyclic rates of fire and are shown in Table 1.

TABLE 1 RATES OF FIRE, MUZZLE VELOCITIES

WEAPON	MUZZLE VELOCITY m/s	RATE OF FIRE RPM	
		NORMAL	ADVERSE
STEYR	922	795	833
COLT	922	782	N/A

5. The STEYR gas system has three gas positions; normal (low), adverse (high) and grenade launch position. In grenade launch position, the weapon will not self load.
6. A problem arose during the trial during firing programmes and stripping in that it is difficult to change the gas setting of the STEYR.
7. The area in which to remove or change the gas setting is limited and the tab or lug of the piston head seems too small. A person with large fingers would have trouble in adjusting or removing the gas piston.

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ANNEX E

8. The STEYR User Manual suggests the use of a spent case or the butt retaining pin as a tool to change the setting.

9. The COLT M16A2 uses a unique closed gas system, the propellant gases being taken from the barrel gas port directly to the bolt carrier by a tube.

10. The carrier incorporates the chamber and cylinder where the bolt head operates as a piston working in a cam groove to provide locking and unlocking.

11. The carrier contains gas exhaust holes in the direction of the ejection opening when the bolt has unlocked. Debris is sometimes ejected through these holes into the firer's face.

12. This system reduces the mass and movement of the working parts and disturbance of the aim, but requires special manufacturing techniques and testing since once assembled no gas adjustment or simple exchange of worn barrels is possible.

13. In the event of a failure or stoppage, namely failure to extract (FX) or failure to eject (FJ), a correct procedure was adopted. This procedure or Immediate Action (IA) was:

- a. Hold working parts to the rear.
- b. Remove the source of feed.
- c. If FJ remove the fed round and the spent case.
- d. If FX guide bolt forward in order to locate extractor over the rim of the case. Attempt to manually operate the working parts to extract the case.
- e. If unsuccessful, a cleaning rod is necessary to remove the case. This should be used as quickly and safely as possible.

14. Where temperatures of the weapon were high, a waiting period of five minutes was in order to avoid the possibility of a cook-off even though it was apparently a fired case.

15. The STEYR AUG is a true "Bull Pup" design in configuration. It has a straight through reaction of the barrel with the firer's shoulder and the centre of gravity of the weapon behind the pistol grip ensuring the maximum rigidity during firing.

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E-3

ANNEX E

16. It has a number of unique design features.
- a. The use of plastic materials for the trigger mechanism components - sears, bents, hammer etc, bump safety, all self contained in a plastic frame. Only the springs and axis pins are metal. The main form of the furniture (body) being also plastic and not acting as a load bearing component in the conventional sense.
  - b. The body, or load carrying component, becomes a central component of forged aluminium, providing the carrying handle integral with the telescopic housing for the sight and a receiver into which all the functional components mate, including the working parts, barrel and furniture. This design provides a simple, perfectly interrelated relationship between all the components without complicated machinery.
  - c. The most interesting design of the receiver is that it produces a common sleeve for the interlocking of the barrel and breech block on a single common axis which in turn is parallel to the operating rod axes to which the breech block is related by its carrier. This permits not only simple manufacture but assembly and disassembly in seconds, including removal of the barrel when required and perfect, simple control of the working parts.
  - d. In addition, because of this design feature, if it is required to exchange the telescopic sight for another type, such as one of higher magnification or a nightsight, the receiver can be changed over with the alternative sight in place without any loss of zero due to the common tolerances of the axes.
  - e. The question of hard extraction of the small tapered 5.56 mm fired case has also been considered in the chamber design of the STEYR barrel. The fired cases, always tend to produce a pressure ring where the base of the case joins the shoulder of the inside propellant cavity; this is the main point of stiction in the chamber.
  - f. The STEYR chamber has been relieved for a short distance near the base of the case thereby reducing the stiction at this point when the barrel contracts after firing. The STEYR fired case is therefore characteristically apparently slightly bulged at the shoulder end due to this increase.

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ANNEX E

- g. The success of this design became apparent under adverse conditions and the alternative of being able to remove the barrel in seconds to remove a fired case with the blade of a bayonet avoids the use of a cleaning rod.
- h. The cleaning rod method had to be used on many occasions with the COLT when the extractor pulled through the rim of the case.

17. The zero of both the COLT and STEYR systems was initially checked at 100 metres. Due to the height of the line of sight of both systems, relative to the axis of the bore, bearing in mind that both systems required their sights to be zeroed for 300 m, it was found that the results were inaccurate due to the relationship of the cross over point between the trajectory and the line of sight at this range.

18. All the test weapons were therefore rezeroed at 300 metres before the commencement of the endurance trial.

19. It was found important when teaching the endurance shooters to use the STEYR telescopic sight, with the circular reticule, to make them look at the aiming point on the target and let the eye instinctively find the centre of the reticle rather than as with iron sight or normal post graticules, placing the sight on the aiming point.

20. The circular reticle is by far the most accurate method of aiming because:

- a. It makes the most use of the eye's capacity as an instrument to find a centre.
- b. It ensures an infinite sight base, which is the main object of a telescopic sight, and which is lost with cross lines etc, when the shooter starts to point the graticules rather than viewing the target aiming point selected. This was successfully demonstrated to the users on numerous occasions with remarkable improvement in their shooting ability.

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APPENDIX 1

JUMP TEST

This Appendix contains the following figures and tables.

FIG 1 INTERMEDIATE SHOT POSITIONS ~ COLT M16A2

FIG 2 INTERMEDIATE SHOT POSITIONS ~ STEYR AUG

TABLE 1 JUMP TEST RESULTS

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APPENDIX 1 TO  
ANNEX E TO  
PART TWO TO  
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JUMP TEST

1. This Appendix details the results of jump tests performed.
2. The weapons were boresighted and spotted onto the intermediate target. Three shots were fired and the MPI of the shots was measured to obtain the difference between the MPI and the boresight spot.
3. These results are shown in TABLE 1.

TABLE 1 - JUMP TEST RESULTS

COLT	STEYR
1.33 MILS positive	1.17 MILS positive

4. Figures 1 and 2 show the PLS print-out for these tests.

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Appendix 1

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SHOT POSITIONS AT TARGET

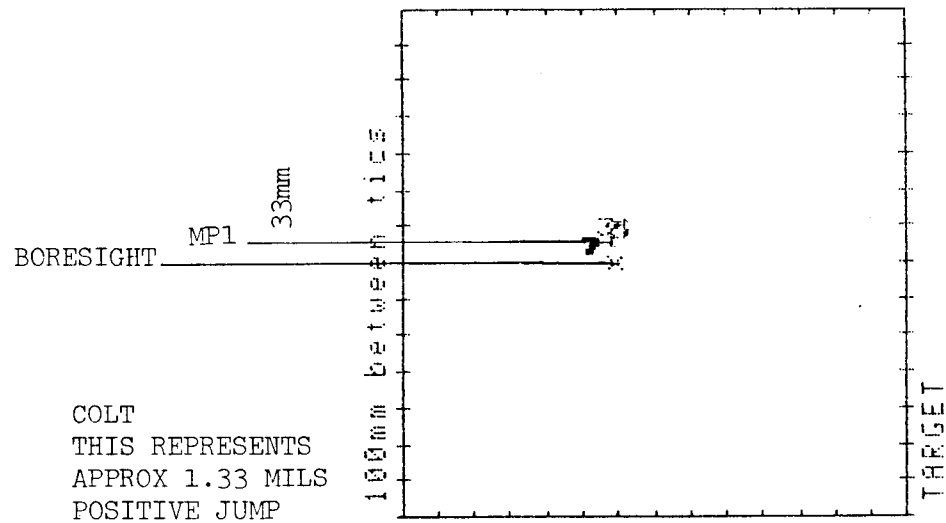


FIG 1 IMMEDIATE SHOT POSITIONS - COLT M16A2

INTERMEDIATE SHOT POSITIONS

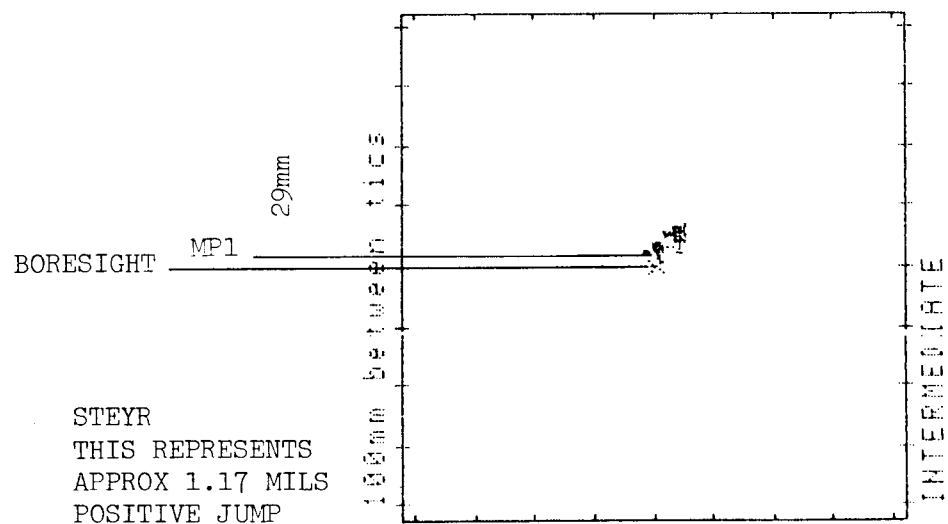


FIG 2 IMMEDIATE SHOT POSITIONS - STEYR AUG

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ENGINEERING DEVELOPMENT ESTABLISHMENT

THE ENGINEERING EVALUATION

ON

THE INDIVIDUAL WEAPONS

FOR

THE SMALL ARMS REPLACEMENT PROJECT - ASR 48.8

DEFENCE TRIAL DIRECTIVE 8/513

VOLUME TWO

PART THREE

ACCURACY AND ENDURANCE TESTS

This Part contains details of both phases of Accuracy and Dispersion Tests and the Endurance phase of the trial.

It also contains methodology and graphical representation of results. The following Annexes are included.

- ANNEX A                    - Accuracy and Dispersion - Phase 1
- ANNEX B                    - Endurance
- ANNEX C                    - Accuracy and Dispersion - Phase 2

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PART THREE

ANNEX A

ACCURACY AND DISPERSION - PHASE 1

This Annex contains results for the Accuracy and Dispersion part of the trial (Phase 1) and comments on sighting and zeroing problems. The following figures and appendixes are included.

FIG 1 MPI CORRECTLY POSITIONED IN ZEROING CIRCLE  
FIG 2 STEYR IN MOUNT  
FIG 3 METHOD OF HOLDING STEYR BARREL GRIP  
FIG 4 COLT IN MOUNT  
FIG 5 METHOD OF HOLDING COLT BARREL GRIPS  
FIG 6 SARP - IW MEAN RADIUS VERSUS RANGE FOR SINGLE SHOTS  
FIG 7 SARP - IW MEAN RADIUS VERSUS RANGE FOR 3 ROUND BURSTS  
FIG 8 VIEW THROUGH STEYR 1 x 4 SCOPE  
FIG 9 STEYR OPTICAL SIGHT  
FIG 10 FAULTY COLT MAGAZINE CATCH

APPENDIX 1 EFFECT OF BAYONETS ON ACCURACY  
APPENDIX 2 ACCURACY OF COLT AND STEYR VARIANTS

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ANNEX A TO  
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ACCURACY AND DISPERSION - PHASE 1

REFERENCE: A. EDE ENGINEERING EVALUATION PROGRAMME - SERIAL 5

1. The aim of this initial stage of the evaluation was:
  - a. To zero the weapons and comment on any problems involved.
  - b. To establish the basic accuracy at single shot and dispersion of automatic fire at the ranges to be fired according to the programme.
2. The STEYR is fitted with an optical sight of 1.5 magnification. It has a circular reticule in the centre of which the firer places his selected target which becomes his aiming point. At 300 m his aiming point will be in the centre of the reticule as the sight is zeroed for 300 m. Zeroing should therefore be carried out preferably at 300 m when the line optical centre of the reticule can be used.
3. Zeroing at shorter ranges becomes less accurate as either a special target aiming point has to be produced, as is suggested for 100 m, see Fig 1, or approximate elevation has to be carried out as suggested in the handbook for shooting at alternative ranges.

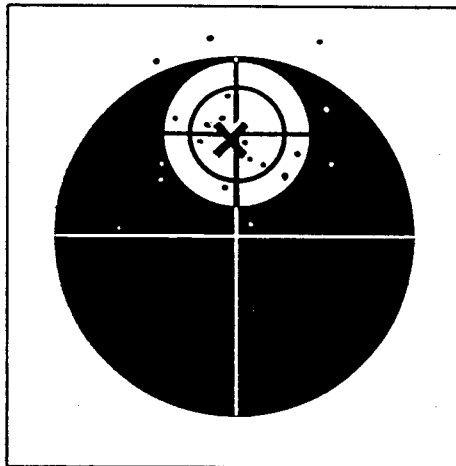


FIG 1  
MPI correctly positioned in zeroing circle.

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ANNEX A

4. The COLT is fitted with iron sights consisting of:
- a. A battle sight with a large aperture for use between 0 and 200 m. This therefore is not an accurate sight for zeroing at a specific range.
  - b. Normal sight is graduated for 300 m with a long range aperture capable of being adjusted accurately for ranges from 300 to 800 m. Therefore the minimum range for which this can be accurately zeroed is 300 m. At shorter ranges, in particular 25 m, a special aiming point must be produced.
5. It was established during this phase that attempts to produce a zero at 25 m to ensure a perfect point of aim at 300 m were unsatisfactory due to other factors occurring at 25 m such as cross of trajectory and line of sight and or weapon jump.
6. It was apparent that two-eyed shooting was normally possible with the STEYR optical sight giving a wide field of view whereas in the COLT iron sight this was limited. In addition the STEYR optical sight provides a sight base equivalent to the range of the target because of the circular reticule which uses the target as its aiming point. The COLT iron sight base is limited to the distance from the foresight to the aperture.
7. The accuracy diagrams consisted of:
- a. 3 x 10 round single shots,
  - b. 3 x 24 round in 3 round bursts.

The weapons were mounted in a mechanical rest. This rest and the method of retaining the weapons are shown in Fig 2 through to Fig 5.

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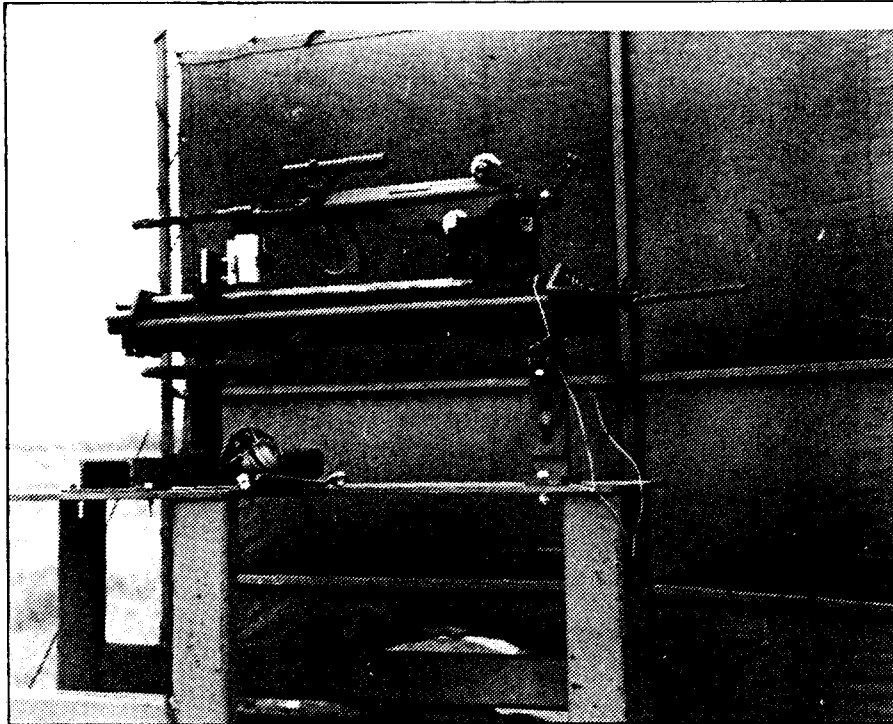
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ANNEX A



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FIG 2 STEYR IN MOUNT

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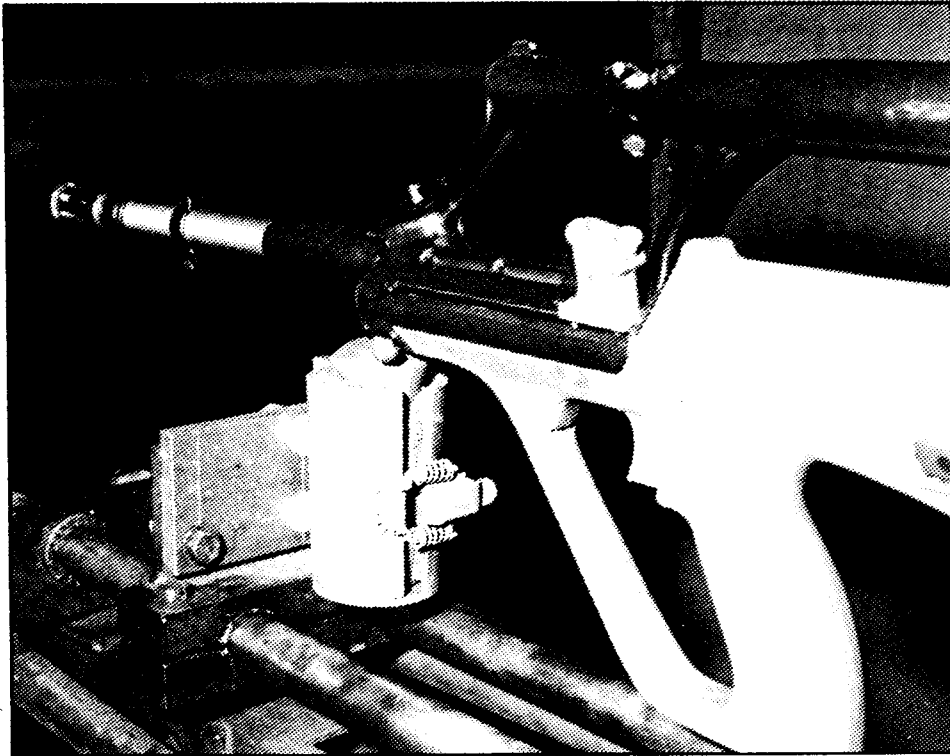
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ANNEX A



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FIG 3 METHOD OF HOLDING STEYR BARREL GRIP

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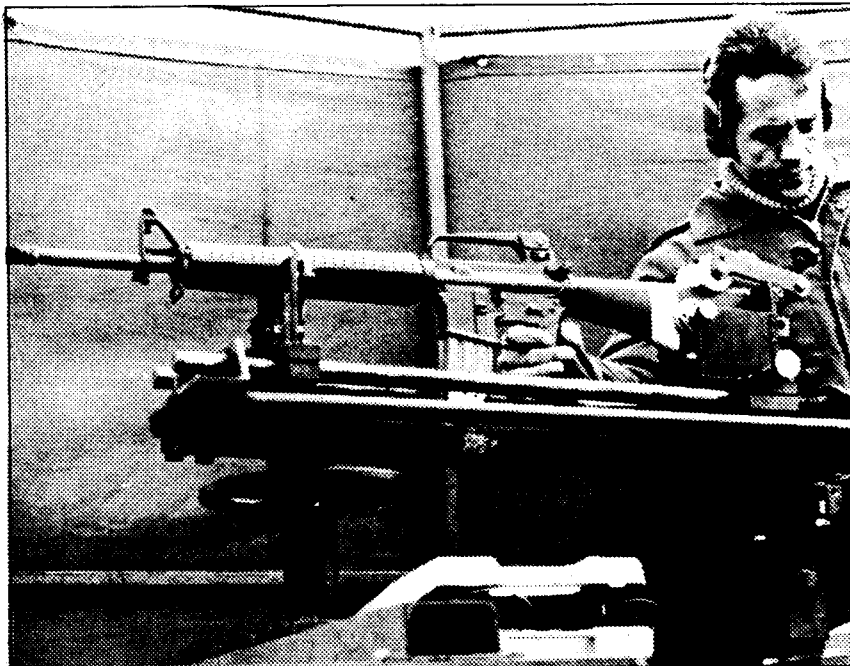
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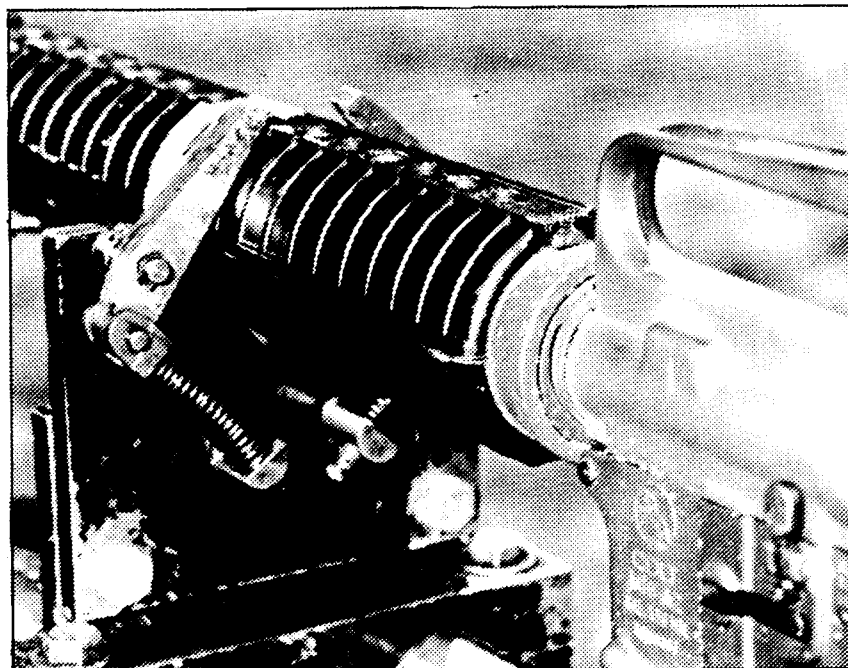
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ANNEX A



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FIG 4 COLT IN MOUNT



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FIG 5 METHOD OF HOLDING COLT BARREL GRIPS

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ANNEX A

8. Figure 6 shows a comparative display of weapon mean radius per range and rounds fired.
9. From this graph, it can be seen that the weapons behaved fairly much alike until at 600 m where the STEYR was fitted with the 1 x 4 scope.
10. Figure 7 shows results of the three round bursts.

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ANNEX A

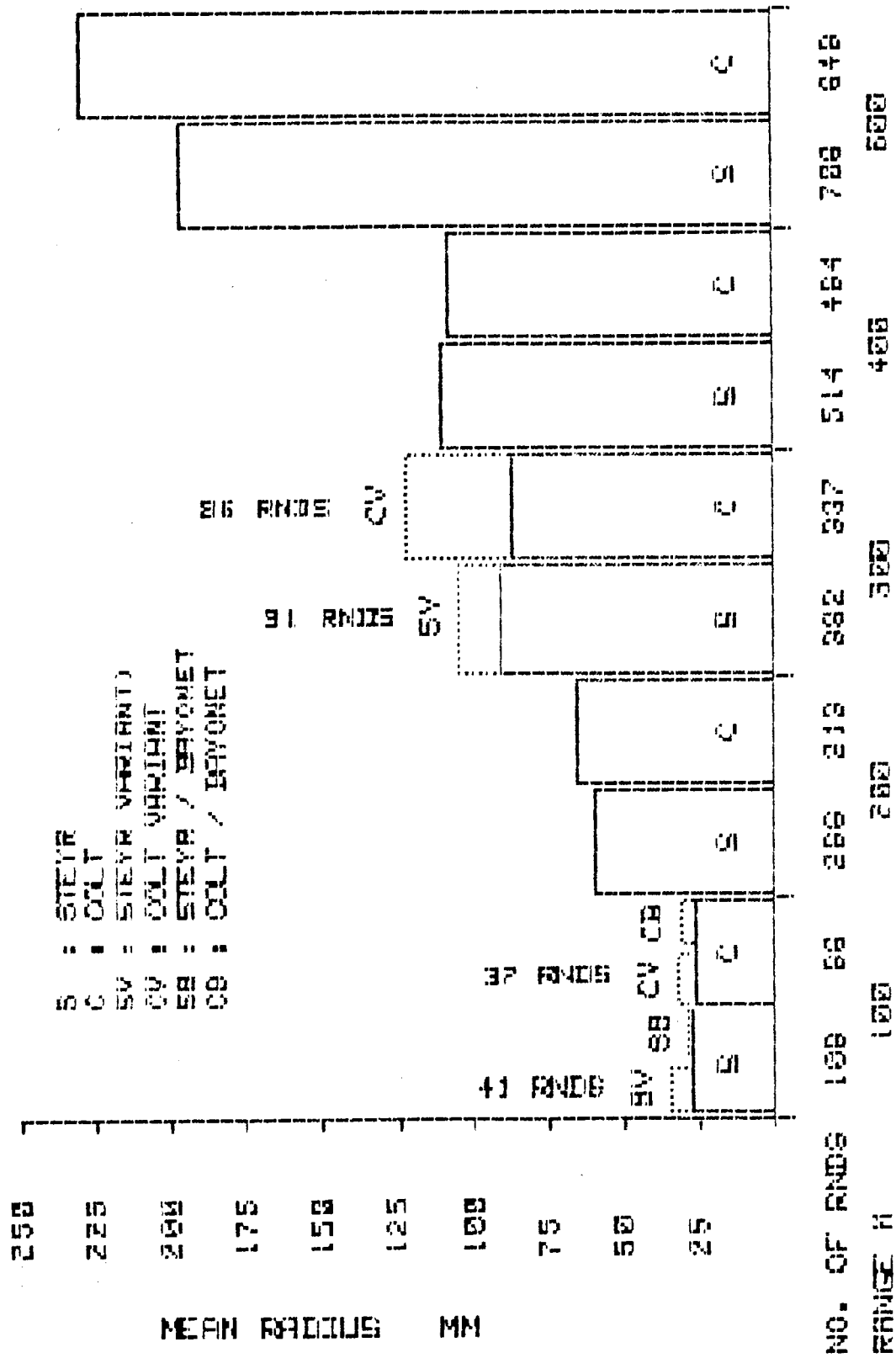


FIG 6 SARP - IW MEAN RADIUS VERSUS RANGE FOR SINGLE SHOTS

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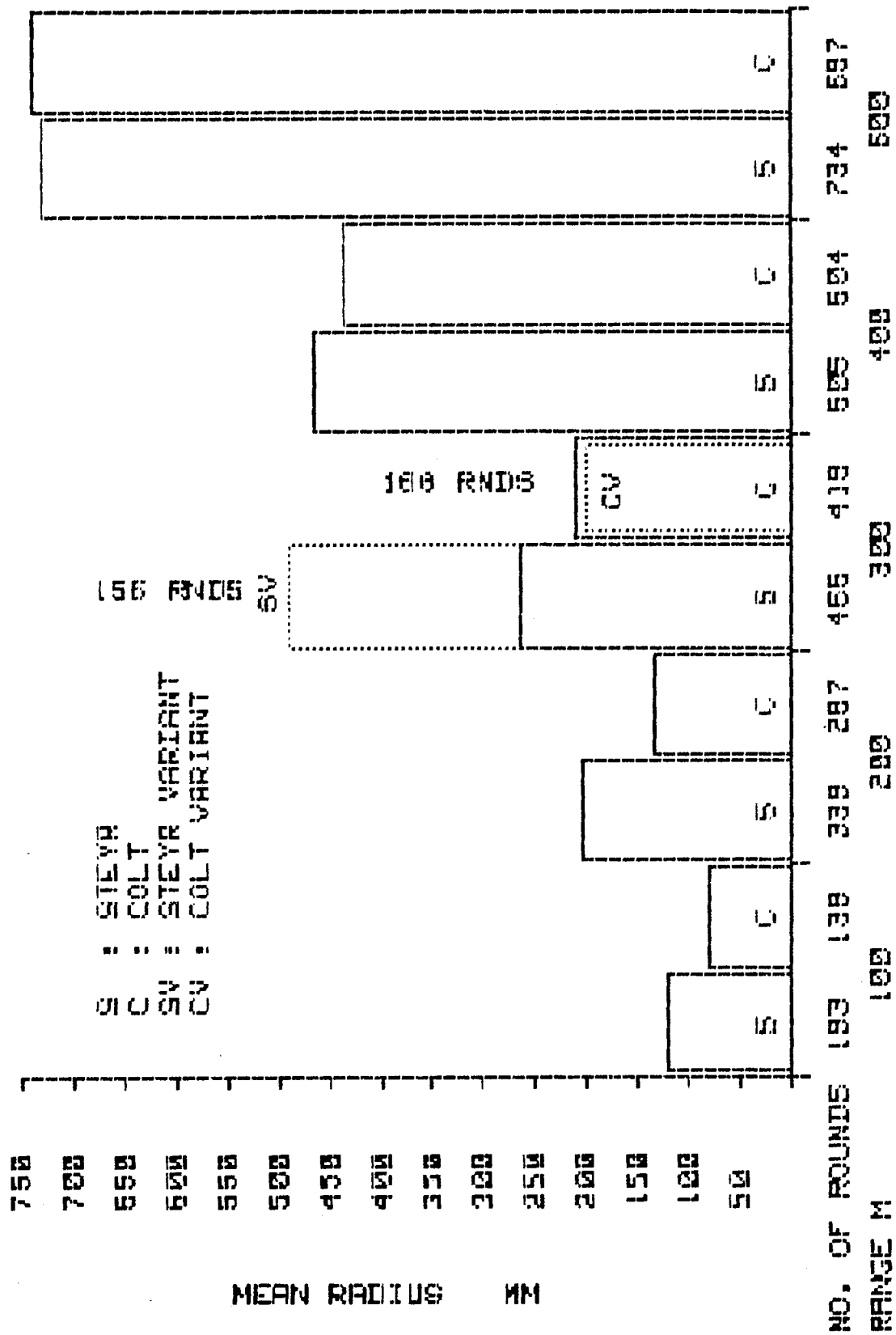
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## ANNEX A

FIG 7 SARP  $\sim$  IW MEAN RADIUS VERSUS RANGE FOR 3 ROUND BURSTS

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ANNEX A

11. The STEYR 1 x 4 Scope (see Fig 8) has three chevron markings of 3, 5 and 7 (hundred metres).



FIG 8  
VIEW THROUGH STEYR 1 x 4 SCOPE

12. A group mean radius of approximately 200 mm was produced. The firing conditions at the time were bad with wind gusts of 9 - 13 m/s at 90°. Thus the aiming off as in Fig 8.
13. Better results would be expected under more favourable firing conditions.
14. The COLT had a sighting drawback at the longer ranges of 400 and 600 m. The foresight post is too wide at these ranges and it obliterates the target. (Standard Torso Target of 1120 mm x 560 mm).
15. The rear sight of the COLT has a range drum which moves the peep hole up and down according to range.
16. A grub screw is located adjacent to this drum and it had worked loose.
17. This affected the operation of the range drum and it had to be checked and retightened on occasions during the trial. After moving from

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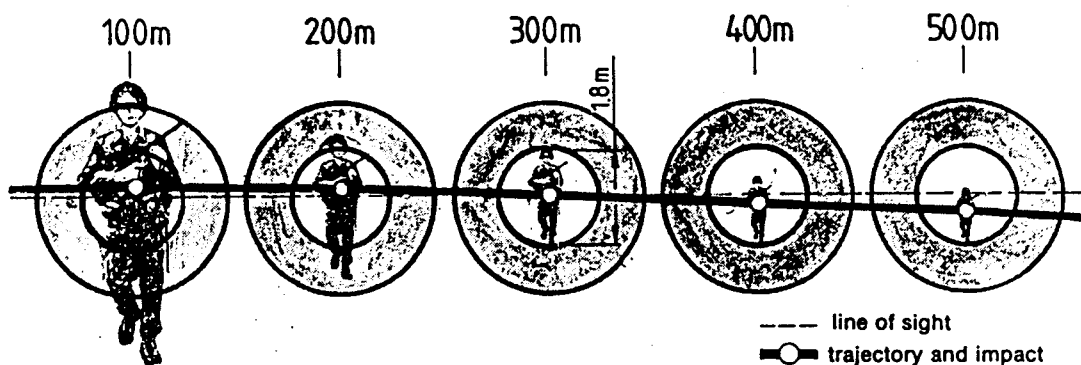
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ANNEX A

one range to another, beyond 300 m, it was essential to alter the range drum to ensure the correct fall of shot due to the angle of descent.

18. The STEYR does not possess this problem as a change in the sight picture is all that is necessary in order to determine range (Fig 9).

This drawing will show you how to aim with the optical sight:



The ring-reticle, combined with the flat trajectory that guarantees that any target inside of the ring will be hit to a distance from 0 — 300 m without any adjustments, makes it possible for the shooter to aim quick and efficient and he will fire instinctively. When firing to distances over 300 m also no adjustments are necessary; just the point of aim is to be changed in a very simple way (as shown in the drawing).

FIG 9  
STEYR OPTICAL SIGHT

19. During this phase, the COLT, CI, would not lock the magazine (metal). The problem was pinpointed to a faulty magazine catch.

20. The catch stud had stripped at one end thus allowing the catch to change its overall dimension. This resulted in the catch not locating in the window or recess of the magazine. (See Fig 10.)

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C1 Magazine Catch

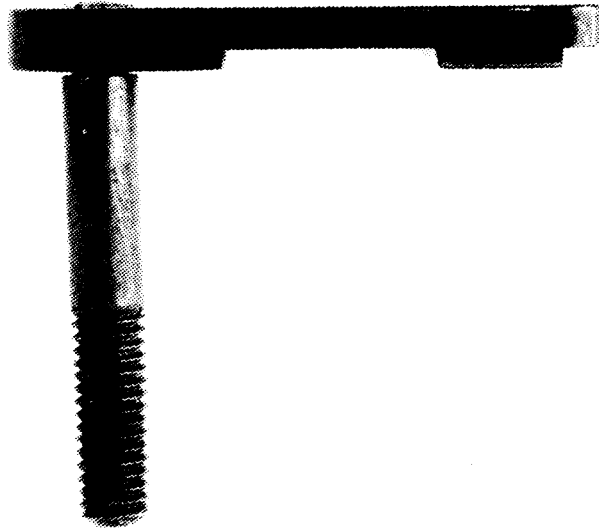


FIG 10  
FAULTY COLT MAGAZINE CATCH

21. It was decided that, for the endurance phase, plastic magazines would be used in the COLTs.

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APPENDIX 1

EFFECTS OF BAYONETS ON ACCURACY

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EFFECTS OF BAYONETS ON ACCURACY

1. The weapons were fired with bayonets fitted at 100 m for single shot accuracy.
2. The results of these accuracies are incorporated into Fig 6.
3. As it can be seen from Fig 6, the STEYR was not affected by the bayonet whilst the COLT showed a decrease in accuracy in the order of approximately 25%.
4. The bayonet must be correctly fitted, especially to the STEYR. The screwed collar that the STEYR bayonet mounts on must be secured but not overtightened to avoid puckering of the barrel.
5. The STEYR bayonet front mounting-ring must be located behind the flash eliminator grooves to ensure correct flash elimination and gas discharge.
6. From practice, the COLT bayonet was easier to mount and the securing lugs operated more smoothly than the STEYR bayonet.
7. No results are available for accuracies when fired in three round bursts.

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APPENDIX 2

ACCURACY OF COLT AND STEYR VARIANTS

This Appendix contains the following table.

TABLE 1 - COLT VARIANT

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APPENDIX 2 TO  
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PART THREE TO  
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ACCURACY OF COLT AND STEYR VARIANTS

1. From Fig 6, it can be seen that the variants showed an increase of mean radius to the extent of 23% for the COLT and 21% for the STEYR at 100 m single shot.
2. At 300 m single shot, the variants were 15% and 40% less accurate for the STEYR and the COLT respectively.
3. The 300 m three round burst accuracies from Fig 7 shows the STEYR to increase its mean radius by 109% whilst the COLT became marginally more accurate by 4%.
4. The COLT variant used was not in fact an M16A2. It is suspected that it was an M16A1E1.
5. There are a number of components common to both the M16A2 and the M16A1.
6. Table 1 shows these components and to which weapon they belong.

TABLE 1 - COLT VARIANT

<u>M16 A1 COMPONENTS</u>  BARREL UPPER RECEIVER ASSEMBLY  A. REAR SIGHT B. FORWARD ASSIST. C. NO CASE DEFLECTOR.
<u>M16 A2 COMPONENTS</u>  HAND GUARDS PISTOL GRIP FORESIGHT BLADE

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### PART THREE

#### ANNEX B

#### ENDURANCE

This Annex contains details regarding the endurance phase of the trial such as accuracies, weapon temperatures, original STEYR extraction problems, stoppages, breakages and failures. The following form part of this Annex.

FIG 1 WIND VELOCITY FOR 180 mm DEFLECTION AT 300 m - SS109 PROJECTILE  
FIG 2 SARP IW - HOT ACCURACIES 300 m  
FIG 3 SARP IW - COLD ACCURACIES 300 m  
FIG 4 SARP IW - HOT ACCURACIES 300 m (COLT M16A2 C1)  
FIG 5A COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 1842 ROUNDS  
FIG 5B COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 1842 ROUNDS  
FIG 5C COLT M16A2 C1 BARREL GRAPH AT 1842 ROUNDS  
FIG 6A COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 5030 ROUNDS  
FIG 6B COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 5030 ROUNDS  
FIG 6C COLT M16A2 C1 BARREL GRAPH AT 5030 ROUNDS  
FIG 7A COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 10271 ROUNDS  
FIG 7B COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 10271 ROUNDS  
FIG 7C COLT M16A2 C1 BARREL GRAPH AT 10271 ROUNDS  
FIG 8 SARP IW - HOT ACCURACIES 300 m (COLT M16A2 C2)  
FIG 9A COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 1297 ROUNDS  
FIG 9B COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 1297 ROUNDS  
FIG 9C COLT M16A2 C2 BARREL GRAPH AT 1297 ROUNDS  
FIG 10A COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 4448 ROUNDS  
FIG 10B COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 4448 ROUNDS  
FIG 10C COLT M16A2 C2 BARREL GRAPH AT 4448 ROUNDS  
FIG 11A COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 7594 ROUNDS  
FIG 11B COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 7594 ROUNDS  
FIG 11C COLT M16A2 C2 BARREL GRAPH AT 7594 ROUNDS  
FIG 12A COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 8599 ROUNDS (WHEN BSO OCCURRED)  
FIG 12B COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 8599 ROUNDS (WHEN BSO OCCURRED)  
FIG 12C COLT M16A2 C2 BARREL GRAPH AT 8599 ROUNDS  
FIG 13 SARP IW - HOT ACCURACIES 300 m (COLT M16A2 C3)  
FIG 14A COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 1395 ROUNDS  
FIG 14B COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 1395 ROUNDS (TARGET)  
FIG 14C COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 1395 ROUNDS (INTERMEDIATE)  
FIG 14D COLT M16A2 C3 BARREL GRAPH AT 1395 ROUNDS  
FIG 15A COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 4750 ROUNDS  
FIG 15B COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 4750 ROUNDS  
FIG 15C COLT M16A2 C3 BARREL GRAPH AT 4750 ROUNDS  
FIG 16A COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 10131 ROUNDS

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FIG 16B COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 10131 ROUNDS  
FIG 16C COLT M16A2 C3 BARREL GRAPH AT 10131 ROUNDS  
FIG 17 SARP IW - HOT ACCURACIES 300 m (STEYR AUG S1)  
FIG 18A STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 2246 ROUNDS  
FIG 18B STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 2246 ROUNDS  
FIG 18C STEYR AUG S1 BARREL GRAPH AT 2246 ROUNDS  
FIG 19A STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 6617 ROUNDS  
FIG 19B STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 6617 ROUNDS  
FIG 19C STEYR AUG S1 BARREL GRAPH AT 6617 ROUNDS  
FIG 20A STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 11056 ROUNDS  
FIG 20B STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 11056 ROUNDS  
FIG 20C STEYR AUG S1 BARREL GRAPH AT 11056 ROUNDS  
FIG 21 SARP IW - HOT ACCURACIES 300 m (STEYR AUG S2)  
FIG 22A STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 2544 ROUNDS  
FIG 22B STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 2544 ROUNDS  
FIG 22C STEYR AUG S2 BARREL GRAPH AT 2544 ROUNDS  
FIG 23A STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 4644 ROUNDS  
FIG 23B STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 4644 ROUNDS  
FIG 23C STEYR AUG S2 BARREL GRAPH AT 4644 ROUNDS  
FIG 24A STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 9933 ROUNDS  
FIG 24B STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 9933 ROUNDS  
FIG 24C STEYR AUG S2 BARREL GRAPH AT 9933 ROUNDS  
FIG 25 SARP IW - HOT ACCURACIES 300 m (STEYR AUG S3)  
FIG 26A STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 2429 ROUNDS  
FIG 26B STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 2429 ROUNDS  
FIG 26C STEYR AUG S3 BARREL GRAPH AT 2429 ROUNDS  
FIG 27A STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 5710 ROUNDS  
FIG 27B STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 5710 ROUNDS  
FIG 27C STEYR AUG S3 BARREL GRAPH AT 5710 ROUNDS  
FIG 28A STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 10640 ROUNDS  
FIG 28B STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 10640 ROUNDS  
FIG 28C STEYR AUG S3 BARREL GRAPH AT 10640 ROUNDS  
FIG 29 SARP IW - COLD ACCURACIES 300 m (COLT M16A2 C1)  
FIG 30 SARP IW - COLD ACCURACIES 300 m (COLT M16A2 C2)  
FIG 31 SARP IW - COLD ACCURACIES 300 m (COLT M16A2 C3)  
FIG 32 SARP IW - COLD ACCURACIES 300 m (STEYR AUG S1)  
FIG 33 SARP IW - COLD ACCURACIES 300 m (STEYR AUG S2)  
FIG 34 SARP IW - COLD ACCURACIES 300 m (STEYR AUG S3)  
FIG 35 TYPICAL YAW CARD PATTERN  
FIG 36 COLT BSO PATTERN  
FIG 37 NORMAL STEYR MAGAZINE  
FIG 38 KNIFED FULLERING ON STEYR MAGAZINE  
FIG 39 BROKEN STEYR FIRING PIN  
FIG 40 BROKEN STEYR FIRING PIN

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TABLE 1 WEAPON ENDURANCE TEMPERATURES  
TABLE 2 WEAPON RELATED STOPPAGES  
TABLE 3 MAGAZINE RELATED STOPPAGES  
TABLE 4 COLT FAILURES  
TABLE 5 STEYR FAILURES  
TABLE 6 COLT BREAKAGES  
TABLE 7 STEYR BREAKAGES  
TABLE 8 WEAPON INCIDENTS  
TABLE 9 HIT PROBABILITIES (Ph)

APPENDIX 1 STEYR - COCKING PIECE/SAFETY SEAR

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ANNEX B TO  
PART THREE TO  
EDE 17/85

ENDURANCE

REFERENCE:     A.    EDE ENGINEERING EVALUATION PROGRAMME - SERIAL 6

1.        This Annex contains details regarding the endurance phase of the trial.
  2.        The endurance firings comprised of:
    - a.    Cold accuracies.
    - b.    Cold rates of fire.
    - c.    Endurance cycles.
    - d.    Hot rates of fire.
    - e.    Hot accuracies.
    - f.    Dry manipulations.
- in that order.
3.        All the accuracies were limited by firing conditions of a cross-wind of 3 m/s or its equivalent.
  4.        A wind chart was made up in order to determine this equivalent when certain conditions existed. (See figure 1.)

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5. Figure 2 and figure 3 summarise the accuracy results.
6. The cold accuracy, figure 3, shows the STEYRS to exhibit a relatively flat trace from the start to the finish of the endurance.
7. The COLTS deteriorated rapidly between 5000 and 7000 rounds losing their barrel accuracy life.
8. Figure 2 shows the hot accuracies. Again the COLTS began to perform badly at between 5000 and 7000 rounds with COLT C2 losing its accuracy at a faster rate than the other COLTS and eventually one BSO at around 8600 rounds.
9. The STEYRS behaved in the same manner as that of the cold accuracies.
10. Figures 4 to 34 detail the results for each particular weapon from this phase. The weapon analysis sheets show the information received from the PLS for shootings at the start, the middle and the end of this phase. With these analysis sheets, a barrel graph is also presented for the corresponding stages of the trial. It is interesting to note the barrel condition of weapon C2 which produced the BSO. From the barrel graph, Figure 12C, there is no obvious fault or defect in the barrel.

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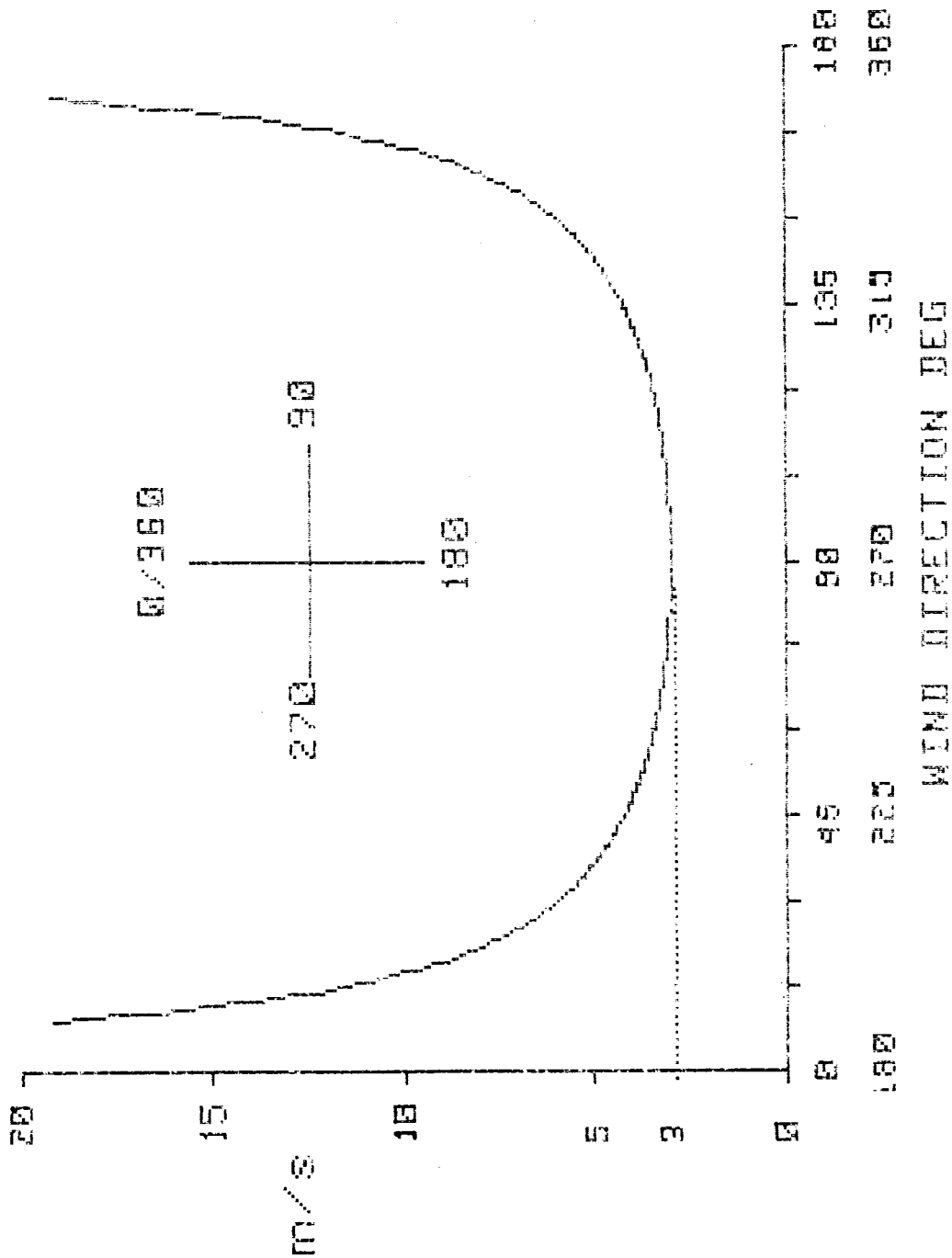


FIG 1  
WIND VELOCITY FOR 180mm DEFLECTION AT 300m  
SS109 PROJECTILE

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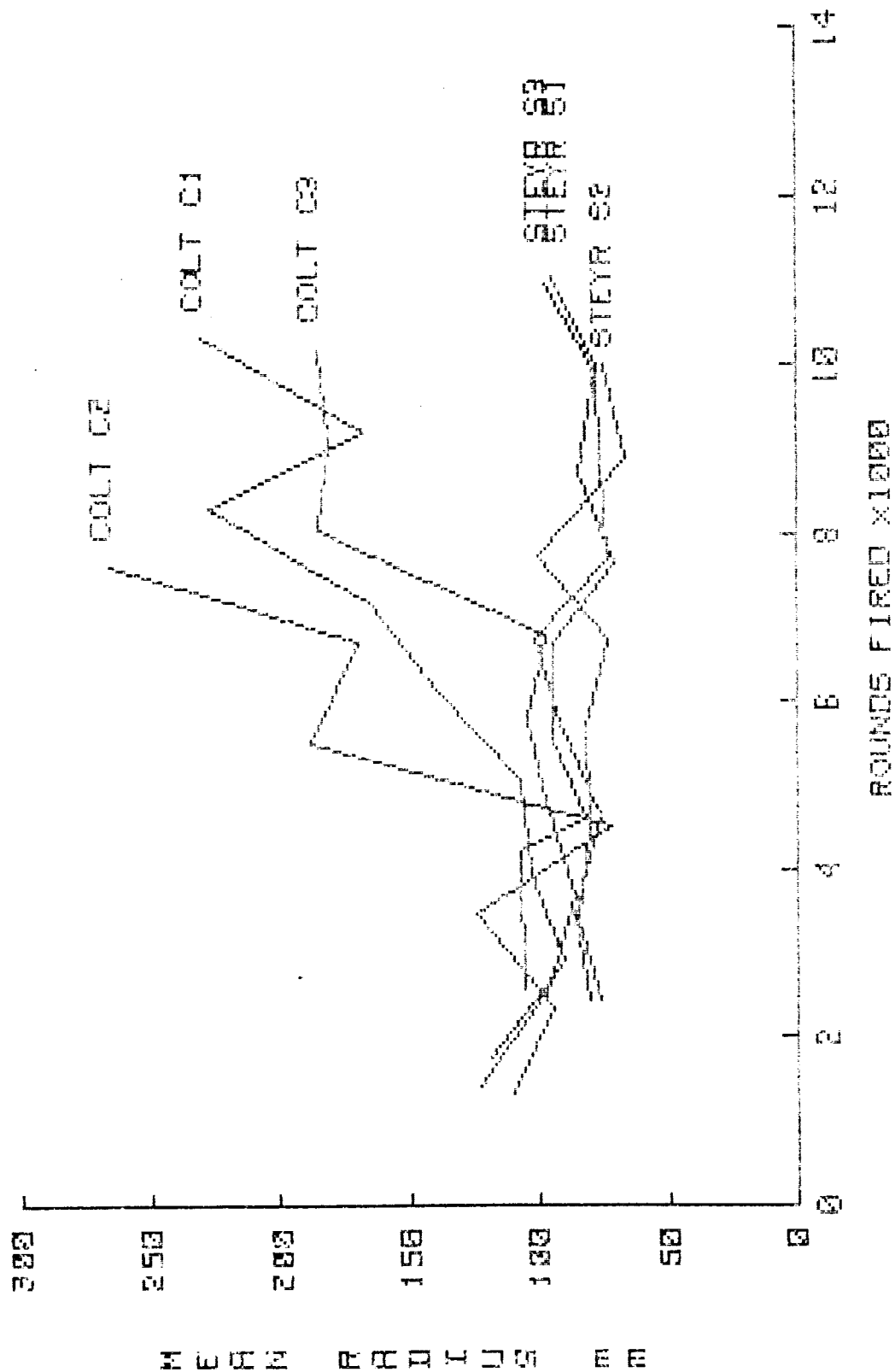


FIG 2  
SARP IW - HOT ACCURACIES 300 m

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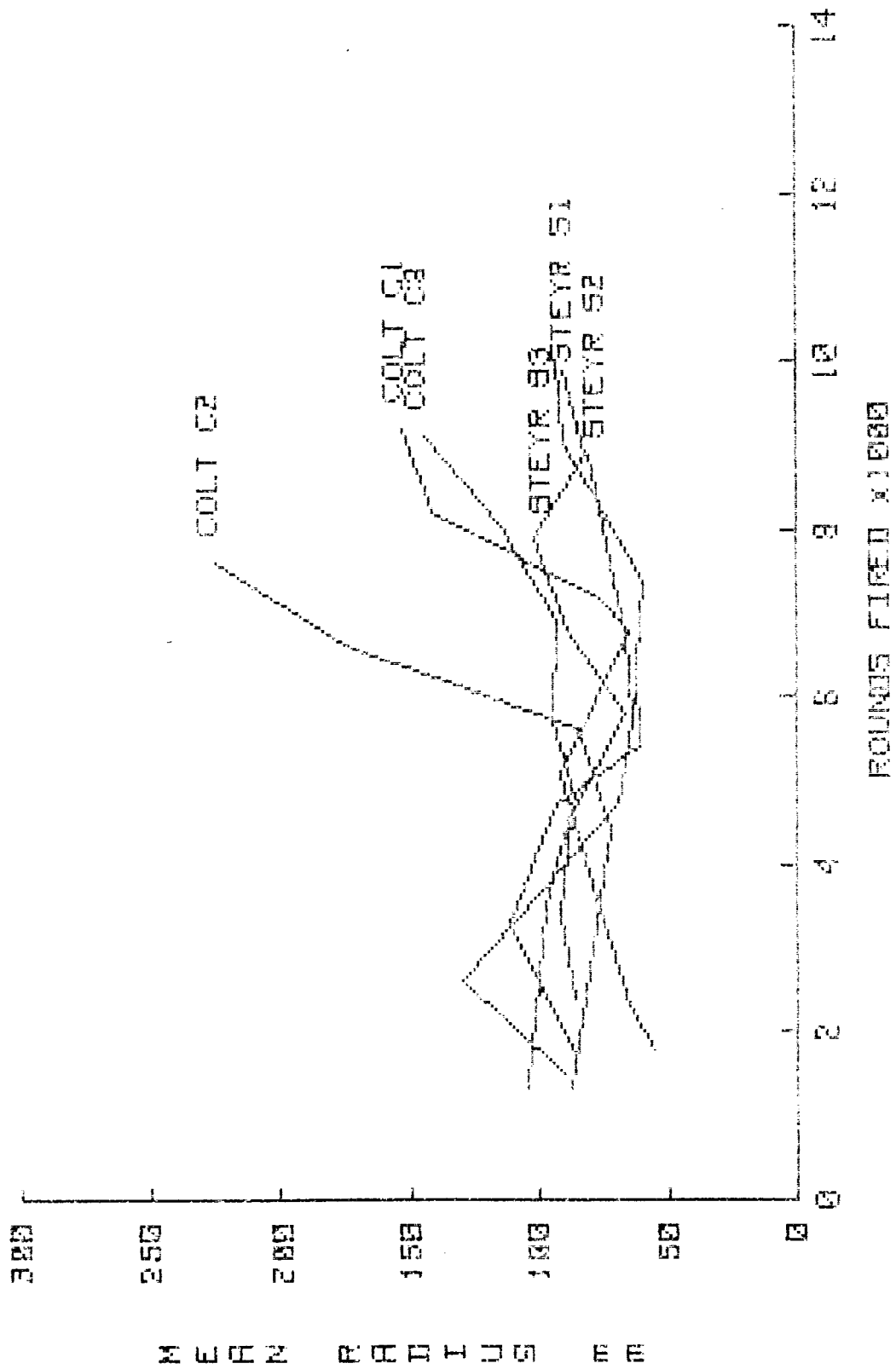


FIG 3  
SARP IW-COLD ACCURACIES 300m

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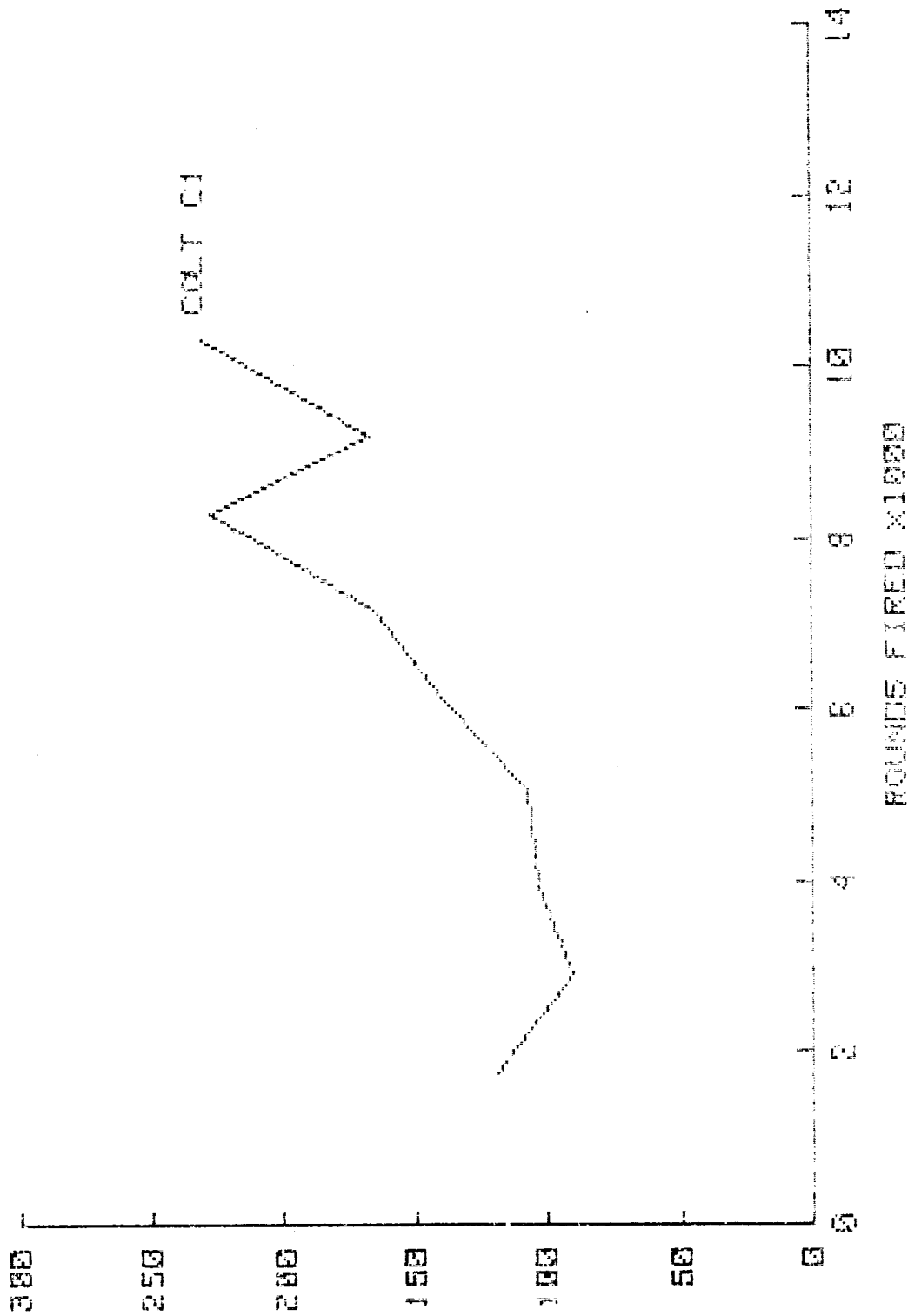
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FIG 4  
SARP IW-HOT ACCURACIES 300 m (COLT M16H2 C1)



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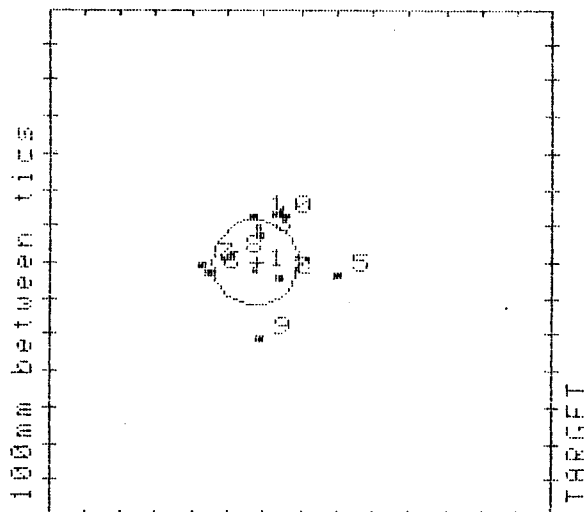
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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C1	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	15:40:17
FIRING DATE ->	13/11/84	CYCLE ->	12-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 METRES	RTCM Address ->	#2
INTERMED POA ->	380 mm above T-bar	TEMPERATURE ->	14°C
RANGE Sens A ->	300 metres	WEATHER COND ->	OVERCAST
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	9 to 10 m/s 35°		
NUMBER OF SHOTS	10		

#### SHOT POSITIONS AT TARGET



#### INTERMEDIATE SHOT POSITIONS

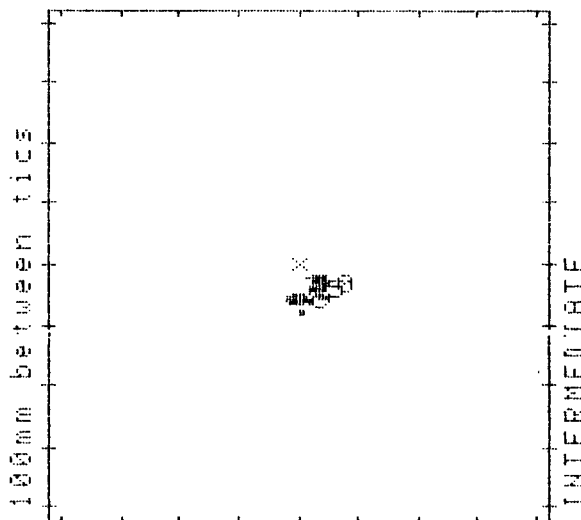


FIG 5A COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 1842 ROUNDS

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<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot No</u>	<u>Horiz (mm)</u>	<u>Vert (mm)</u>	<u>Vel (m/s)</u>	<u>Energy (J)</u>	<u>Horiz (mm)</u>	<u>Vert (mm)</u>	<u>Vel (m/s)</u>	<u>Energy (J)</u>
1	4	-60	921.6	1699	-119	-18	680.4	926
2	7	-59	920.8	1696	-58	-42	665.5	886
3	-3	-52	907.8	1648	-107	79	669.8	897
4	7	-50	915.9	1678	-113	100	652.5	851
5	23	-60	907.8	1648	108	-35	668.1	893
6	-6	-59	923.3	1705	-250	-28	669.8	897
7	-10	-56	903.9	1634	-263	-4	668.1	893
8	-3	-55	906.2	1643	-185	19	677.3	917
9	7	-77	919.1	1690	-106	-205	667.2	890
10	-1	-49	917.5	1684	-129	126	670.7	900

ACCURACY

MPI from POA	<u>Intermediate</u>	<u>Target</u>
X Position	3 mm	-122 mm
Y Position	-58 mm	-1 mm

SIZE OF GROUP

Extreme horizontal spread	33 mm	371 mm
Extreme vertical spread	28 mm	332 mm
Size of group	61 mm	703 mm
Extreme spread	34 mm	372 mm

MEASURES OF DISPERSION

SD of X	9 mm	104 mm
SD of Y	8 mm	94 mm
Mean radius	10 mm	118 mm
Group SD	9 mm	99 mm

AMMUNITION

Mean velocity	914 m/s	669 m/s
SD of velocity	7 m/s	7 m/s
Fastest round	923 m/s	680 m/s
Slowest round	904 m/s	652 m/s
Gross difference	19 m/s	28 m/s
Mean bullet energy	1672 J	895 J
SD of energy	26 J	20 J

FIG 5B COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 1842 ROUNDS

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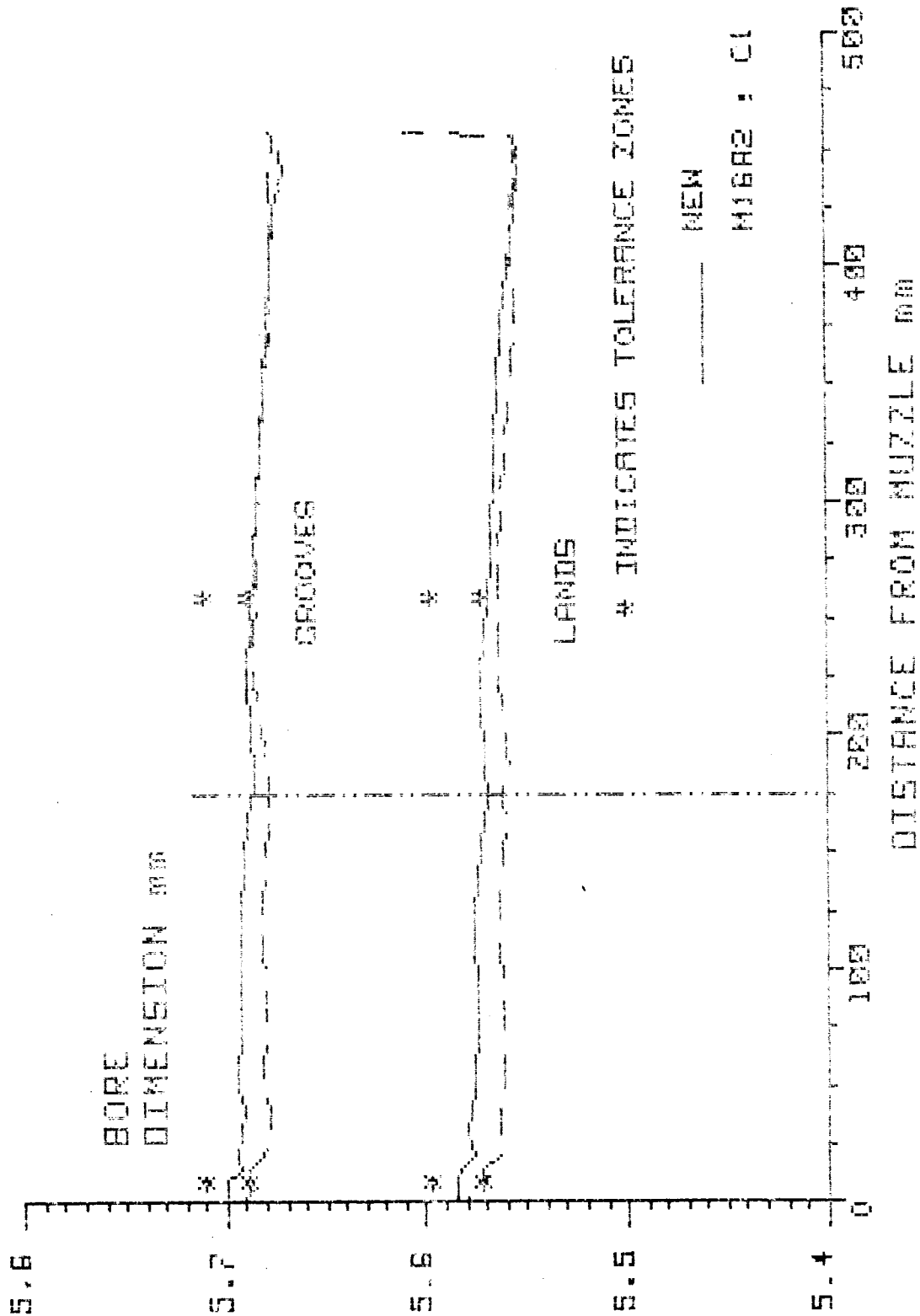


FIG 5C  
COLT M16A2 C1 BARREL GRAPH AT 1842 ROUNDS

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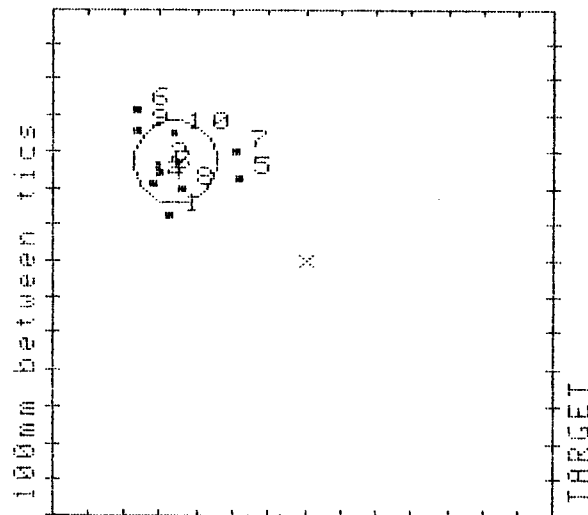
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PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	PETER T
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C1	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	15:49:40
FIRING DATE ->	4/12/84	CYCLE ->	48-3 ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	440 mm above T-bar	TEMPERATURE ->	14°C
RANGE Sens A ->	300 metres	WEATHER COND ->	RAIN SLEET SNOW
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	5 m/s 92°		
NUMBER OF SHOTS->	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

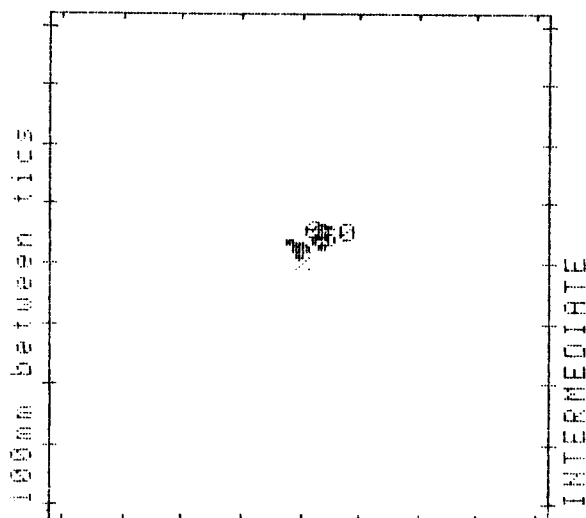


FIG 6A COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 5030 ROUNDS

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<u>Shot</u> <u>No</u>	<u>INTERMEDIATE</u>				<u>TARGET</u>			
	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	-4	15	929.9	1729	-378	129	665.1	885
2	-5	26	935.0	1748	-404	267	665.1	885
3	-4	24	929.1	1726	-395	243	665.9	887
4	-7	23	932.4	1739	-422	216	668.1	893
5	12	23	928.2	1723	-181	233	661.2	874
6	-14	36	939.2	1764	-460	422	664.6	883
7	7	31	935.0	1748	-187	301	667.7	892
8	4	19	936.7	1755	-340	198	675.1	911
9	-3	32	925.7	1714	-467	358	654.9	858
10	4	32	930.7	1733	-364	353	662.1	877

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	-1 mm	-360 mm
Y Position	26 mm	272 mm

SIZE OF GROUP

Extreme horizontal spread	26 mm	286 mm
Extreme vertical spread	22 mm	292 mm
Size of group	48 mm	578 mm
Extreme spread	29 mm	337 mm

MEASURES OF DISPERSION

SD of X	8 mm	101 mm
SD of Y	7 mm	87 mm
Mean radius	9 mm	115 mm
Group SD	7 mm	94 mm

AMMUNITION

Mean velocity	932 m/s	665 m/s
SD of velocity	4 m/s	5 m/s
Fastest round	939 m/s	675 m/s
Slowest round	926 m/s	655 m/s
Gross difference	13 m/s	20 m/s
Mean bullet energy	1738 J	884 J
SD of energy	16 J	14 J

FIG 6B COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 5030 ROUNDS

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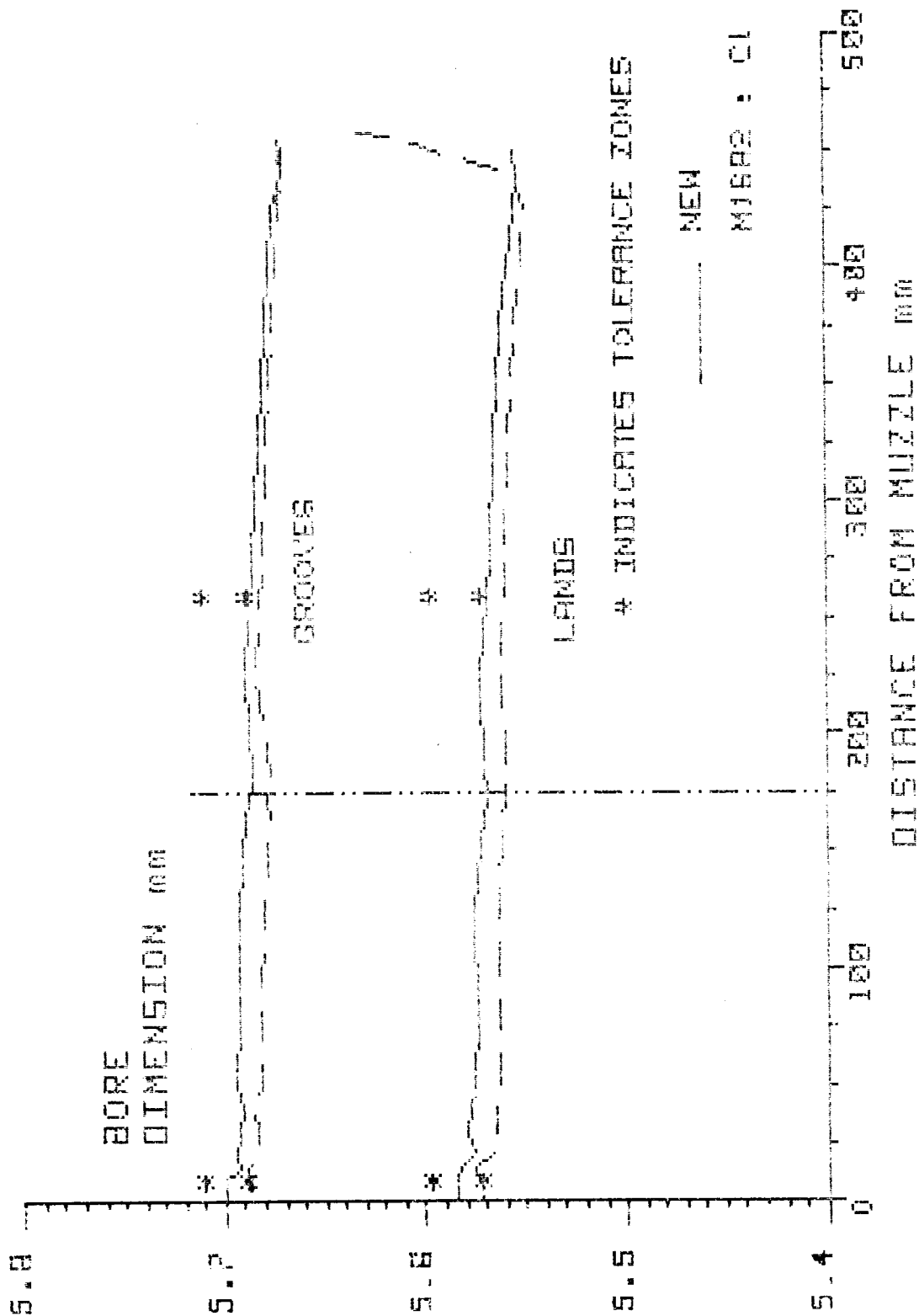


FIG 6C  
COLT M16A2 C1 BARREL GRAPH AT 5030 ROUNDS

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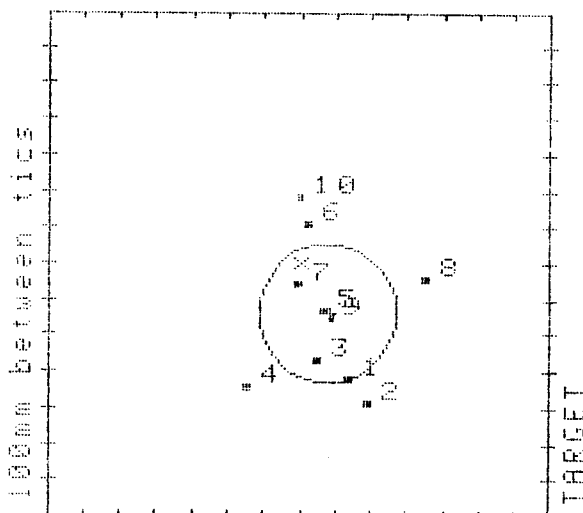
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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	M16A COLT C1	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	14:56:40
FIRING DATE ->	20/2/85	CYCLE ->	110-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	725 mm above T-bar	TEMPERATURE ->	23°C
RANGE Sens A ->	300 metres	WEATHER COND ->	FINE
POA AT TARGET ->	900 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	5-6 m/sec 9°		
NUMBER OF SHOTS->	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

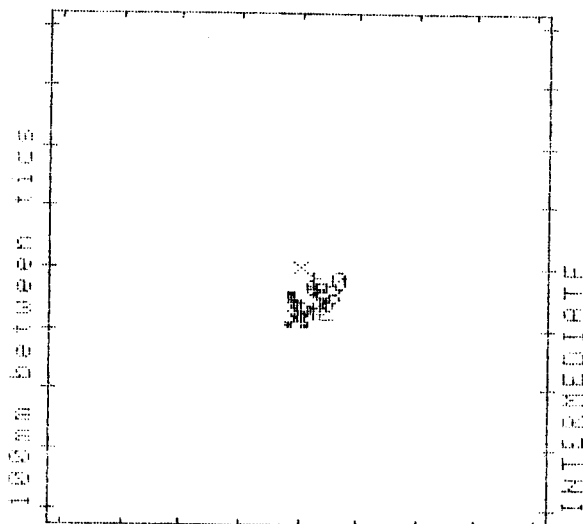


FIG 7A COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 10271 ROUNDS

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<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	4	-83	916.7	1681	144	-320	687.2	945
2	11	-89	920.8	1696	192	-382	680.0	925
3	-2	-84	924.9	1711	56	-263	680.4	926
4	-16	-89	932.4	1739	-145	-336	656.6	862
5	-2	-71	922.4	1702	68	-131	677.3	917
6	-10	-50	922.4	1702	29	116	686.8	943
7	-2	-62	907.8	1648	-7	-53	669.4	896
8	19	-64	915.1	1675	351	-40	674.2	909
9	5	-74	923.3	1705	91	-151	676.0	914
10	-10	-43	911.0	1660	3	186	671.1	901

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	0 mm	78 mm
Y Position	-71 mm	-137 mm

SIZE OF GROUP

Extreme horizontal spread	35 mm	497 mm
Extreme vertical spread	46 mm	568 mm
Size of group	81 mm	1065 mm
Extreme spread	50 mm	598 mm

MEASURES OF DISPERSION

SD of X	10 mm	132 mm
SD of Y	16 mm	193 mm
Mean radius	16 mm	192 mm
Group SD	14 mm	165 mm

AMMUNITION

Mean velocity	920 m/s	676 m/s
SD of velocity	7 m/s	9 m/s
Fastest round	932 m/s	687 m/s
Slowest round	908 m/s	657 m/s
Gross difference	25 m/s	31 m/s
Mean bullet energy	1692 J	914 J
SD of energy	26 J	24 J

FIG 7B COLT M16A2 C1 AMMO AND WEAPON ANALYSIS AT 10271 ROUNDS

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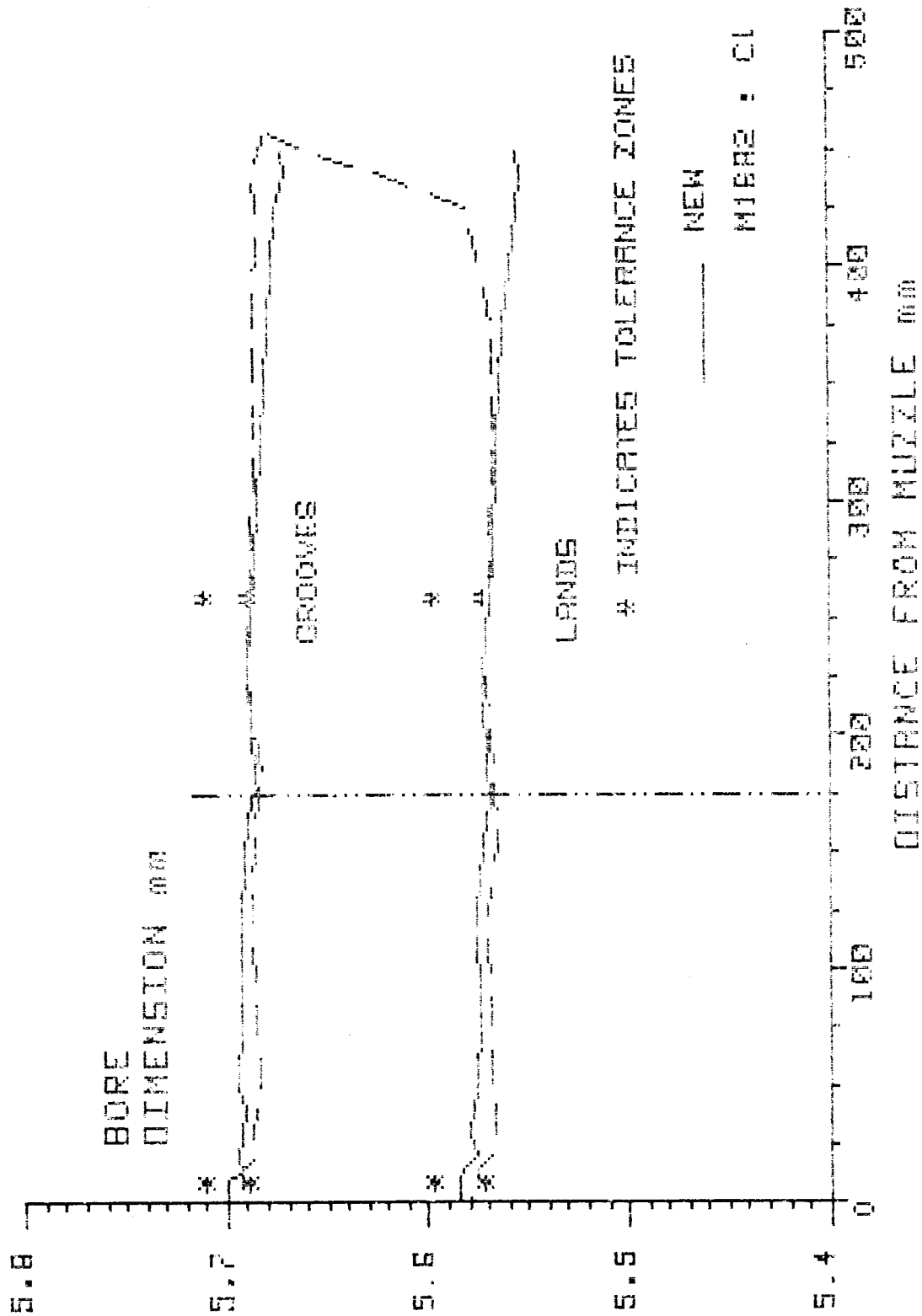


FIG 7C  
COLT M16A2 C1 BARREL GRAPH AT 10271 ROUNDS

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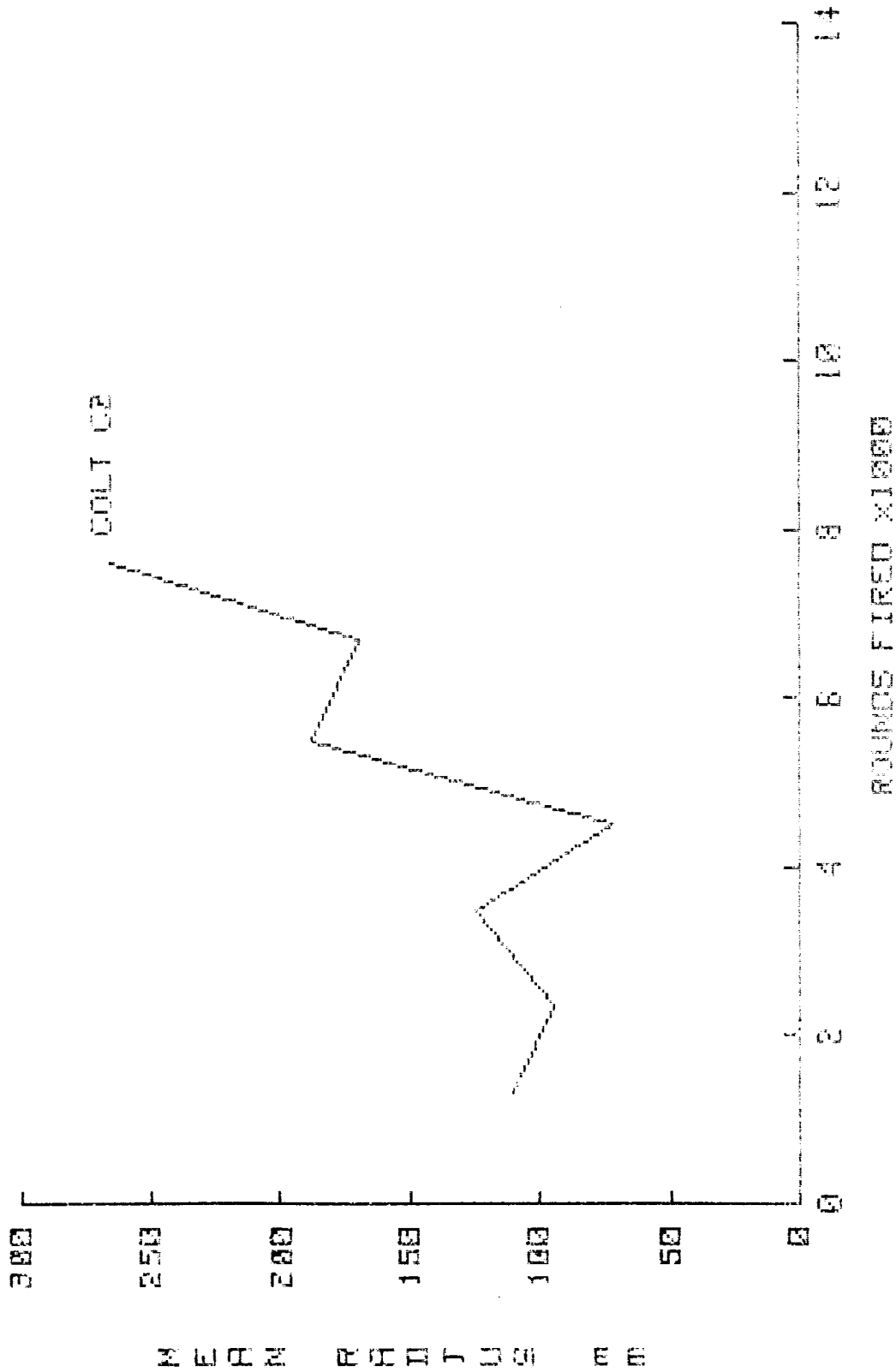


FIG 8  
SARP IW-HOT ACCURACIES 300 m (COLT M16A2 C2)

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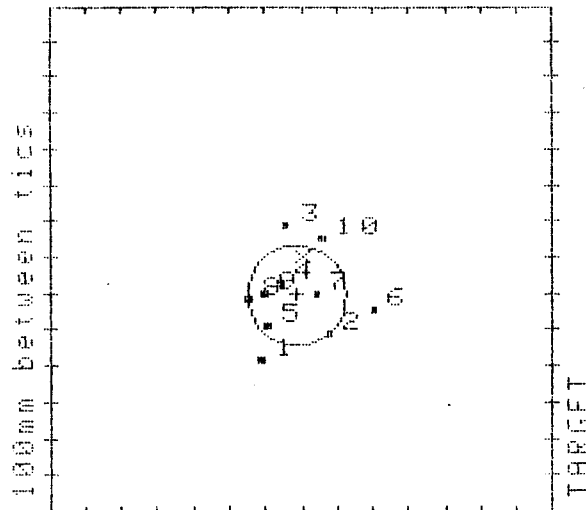
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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C2	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	12:20:58
FIRING DATE ->	14/11/84	CYCLE ->	12-2
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	320 mm above T-bar		
RANGE Sens A ->	300 metres		
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST	TEMPERATURE ->	15°C
WIND CONDITIONS->	3-4 m/sec 39°	WEATHER COND ->	OVERCAST
NUMBER OF SHOTS->	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

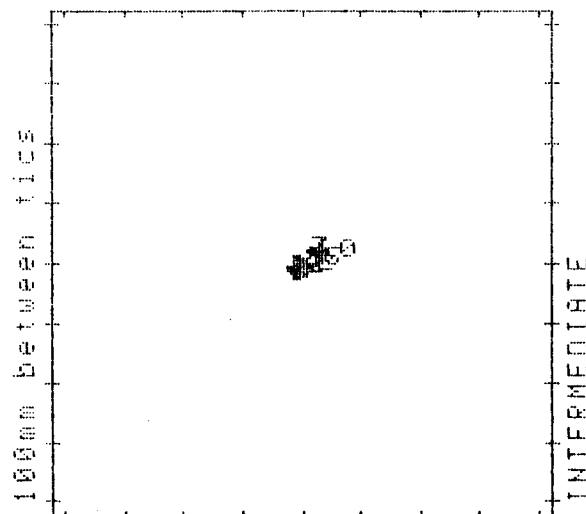


FIG 9A COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 1297 ROUNDS  
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<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	-8	-18	952.2	1813	-103	-281	698.4	975
2	5	-14	955.7	1827	84	-208	695.1	966
3	-5	10	943.5	1780	-41	89	685.8	941
4	-5	-3	930.7	1733	-53	-71	679.5	923
5	-10	-12	935.0	1748	-91	-186	675.5	913
6	16	-8	933.3	1742	208	-145	669.0	895
7	1	-5	928.2	1723	51	-97	665.5	886
8	-16	-6	932.4	1739	-141	-112	676.0	914
9	-14	-7	938.4	1761	-96	-100	682.7	932
10	1	6	930.7	1733	59	53	672.9	906

ACCURACY

	<u>Intermediate</u>	<u>Target</u>
MPI from POA		
X Position	-3 mm	-12 mm
Y Position	-6 mm	-106 mm

SIZE OF GROUP

Extreme horizontal spread	33 mm	349 mm
Extreme vertical spread	28 mm	370 mm
Size of group	61 mm	719 mm
Extreme spread	33 mm	375 mm

MEASURES OF DISPERSION

SD of X	10 mm	109 mm
SD of Y	9 mm	112 mm
Mean radius	11 mm	138 mm
Group SD	9 mm	111 mm

AMMUNITION

Mean velocity	938 m/s	680 m/s
SD of velocity	9 m/s	11 m/s
Fastest round	956 m/s	698 m/s
Slowest round	928 m/s	666 m/s
Gross difference	28 m/s	33 m/s
Mean bullet energy	1760 J	925 J
SD of energy	36 J	29 J

FIG 9B COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 1297 ROUNDS

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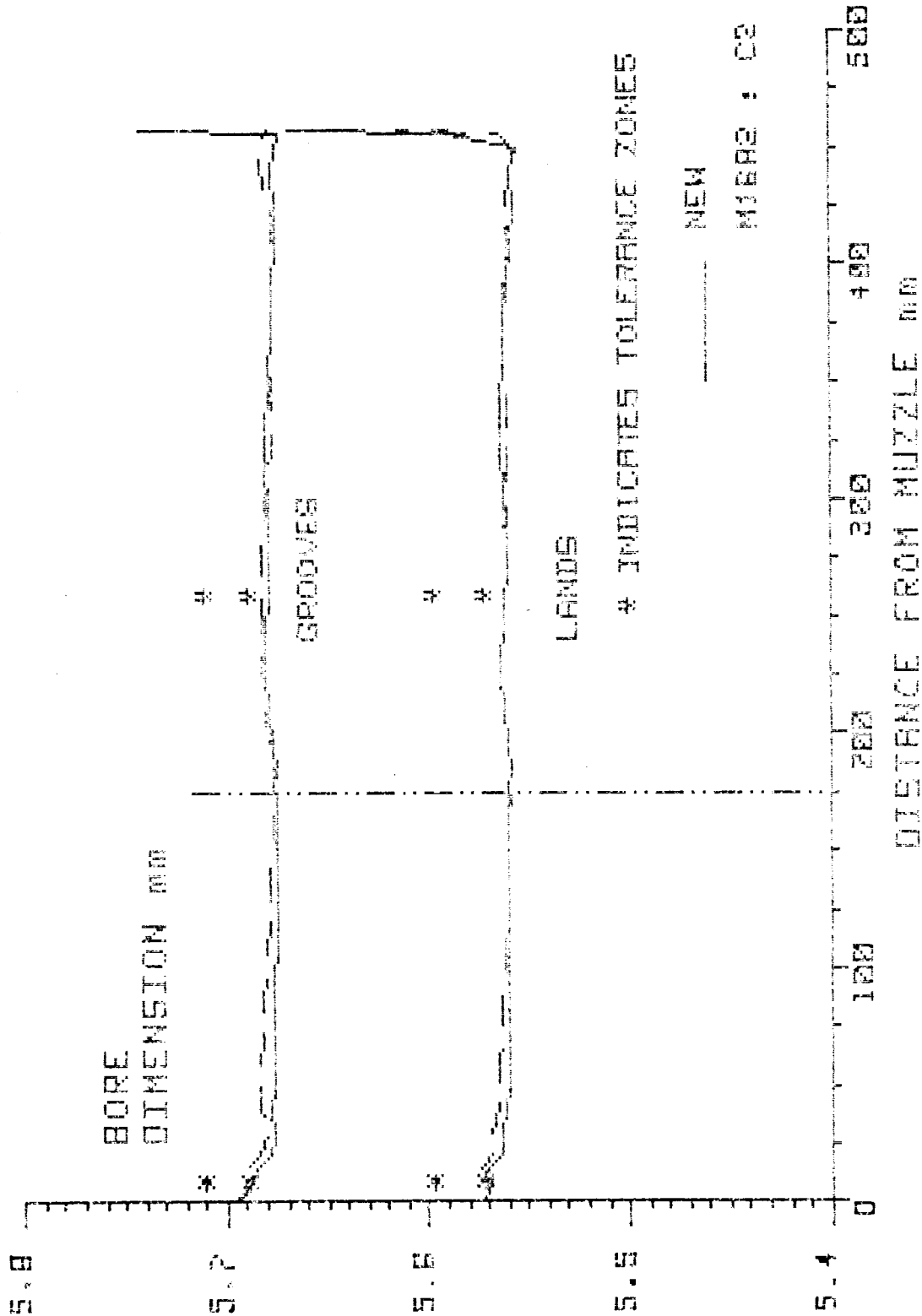


FIG 9C  
COLT M16A2 C2 BARREL GRAPH AT 1297 ROUNDS

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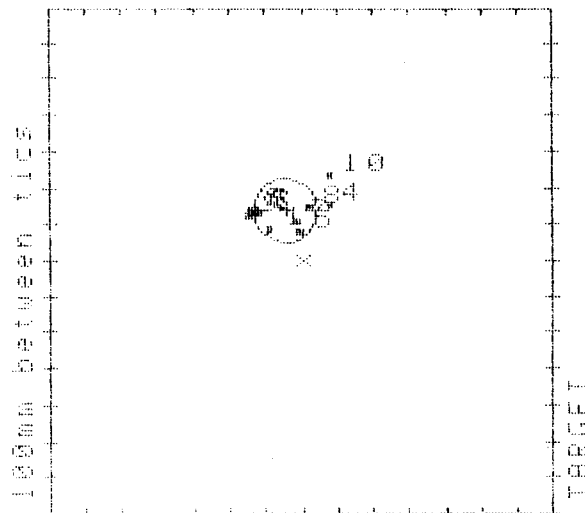
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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C2	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	13:58:34
FIRING DATE ->	5/12/84	CYCLE ->	48-3
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	430 mm above T-bar	TEMPERATURE ->	15°C
RANGE Sens A ->	300 metres	WEATHER COND ->	OVERCAST
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	4-5 m/sec 5°		
NUMBER OF SHOTS->	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

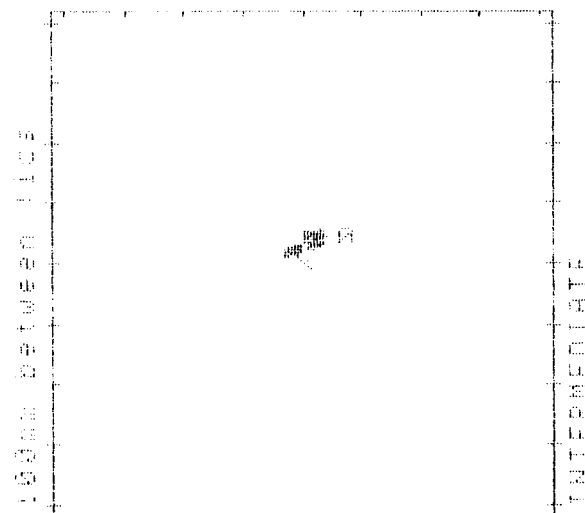


FIG 10A COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 4448 ROUNDS

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~~UNCLASSIFIED~~<sup>B-21</sup>

ANNEX B

<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	-22	14	937.5	1758	-87	91	660.0	871
2	-24	19	943.5	1780	-137	140	679.1	922
3	-22	21	962.0	1851	-112	135	675.1	911
4	-6	29	968.3	1875	83	158	690.0	952
5	-15	18	939.2	1764	-1	83	667.7	892
6	-25	18	935.0	1748	-130	143	667.7	892
7	-14	18	947.8	1797	-12	114	679.5	923
8	-13	20	948.7	1800	24	151	678.6	921
9	-22	19	937.5	1758	-139	131	672.0	903
10	-5	25	936.7	1755	86	234	661.2	874

ACCURACY

MPI from POA

Intermediate

Target

X Position	-17 mm	-42 mm
Y Position	20 mm	138 mm

SIZE OF GROUP

Extreme horizontal spread	20 mm	226 mm
Extreme vertical spread	15 mm	152 mm
Size of group	35 mm	377 mm
Extreme spread	22 mm	248 mm

MEASURES OF DISPERSION

SD of X	7 mm	89 mm
SD of Y	4 mm	42 mm
Mean radius	7 mm	88 mm
Group SD	6 mm	70 mm

AMMUNITION

Mean velocity	946 m/s	673 m/s
SD of velocity	11 m/s	9 m/s
Fastest round	968 m/s	690 m/s
Slowest round	935 m/s	660 m/s
Gross difference	33 m/s	30 m/s
Mean bullet energy	1789 J	906 J
SD of energy	43 J	25 J

FIG 10B COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 4448 ROUNDS

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B-22  
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ANNEX B

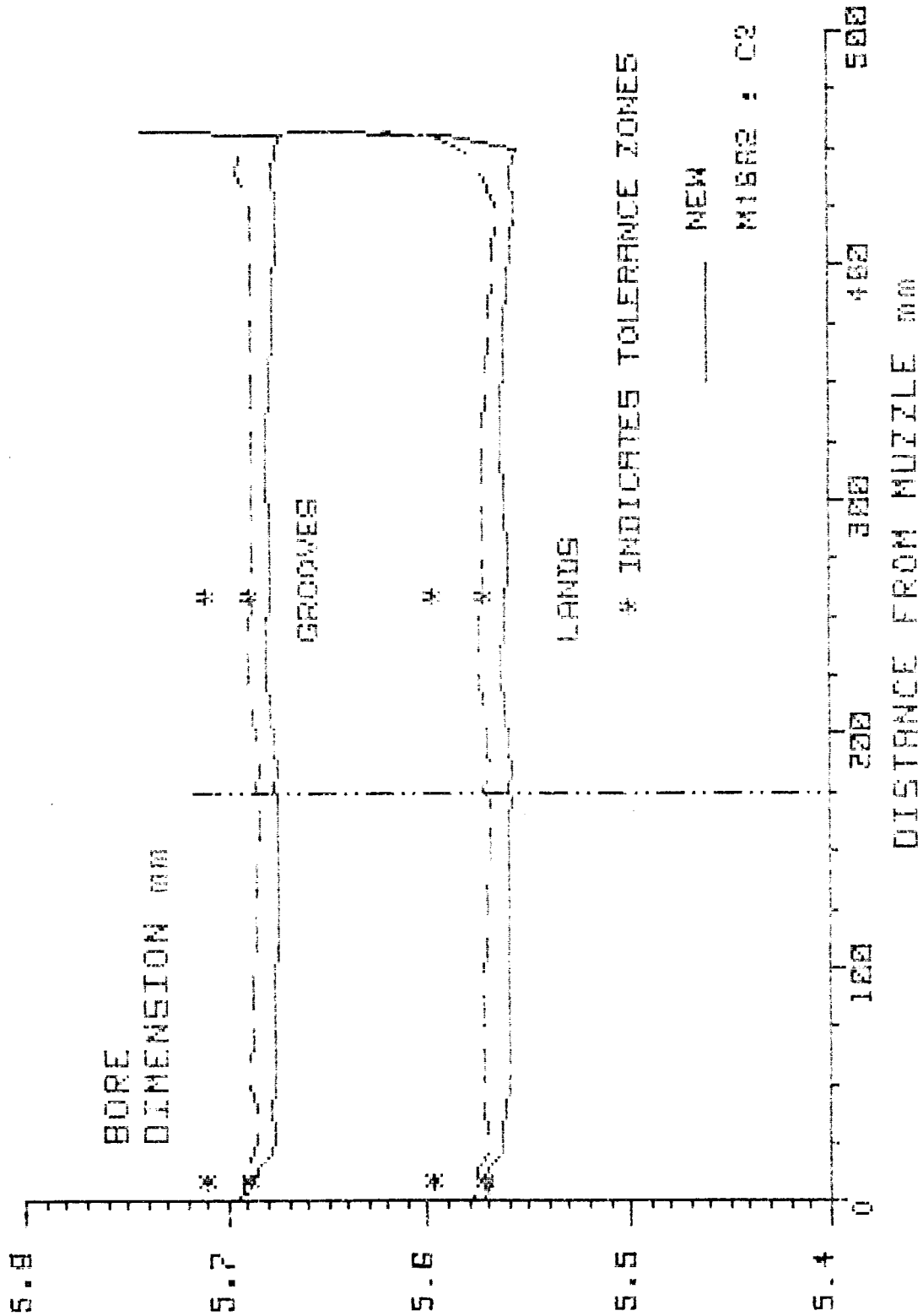


FIG 10C  
COLT M16A2 C2 BARREL GRAPH AT 4448 ROUNDS

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~~RESTRICTED~~



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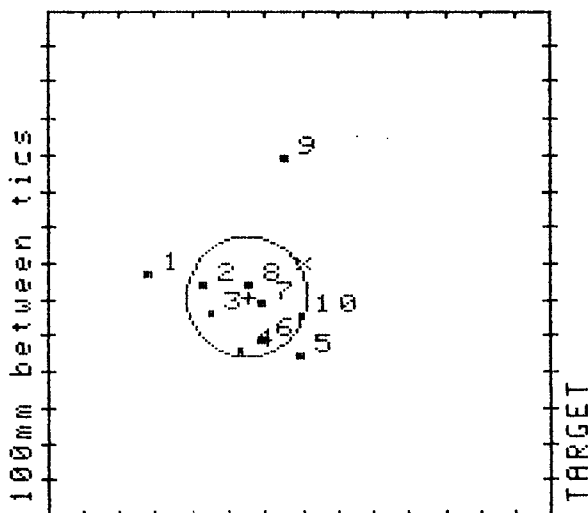
~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY SSS
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C2	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 GRAMS
GROUP TYPE ->	S/S	FIRING TIME ->	10:45:00
FIRING DATE ->	13/02/85	CYCLE ->	91-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	470 mm above T-bar	TEMPERATURE ->	20°C
RANGE Sens A ->	300 metres	WEATHER COND ->	FINE
POA AT TARGET ->	900 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	3 - 4 m/sec 18°		
NUMBER OF SHOTS	10		

#### SHOT POSITIONS AT TARGET



#### INTERMEDIATE SHOT POSITIONS

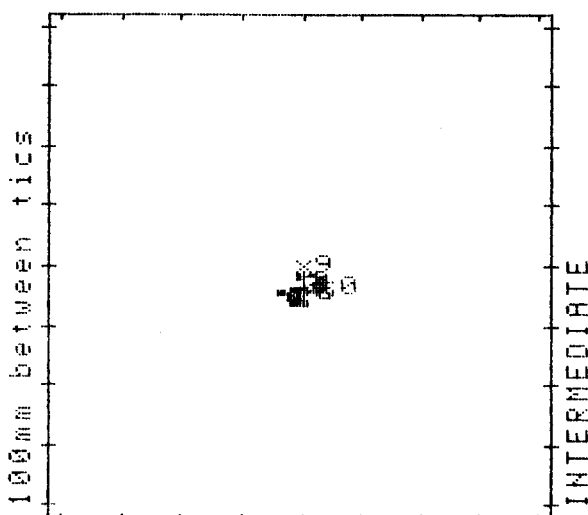


FIG 11A COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 7594 ROUNDS  
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ANNEX B

<u>Shot</u> <u>No</u>	<u>INTERMEDIATE</u>				<u>TARGET</u>			
	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	-31	-42	898.3	1614	-416	-29	664.6	883
2	-16	-44	893.7	1597	-268	-51	661.2	874
3	-15	-52	901.5	1625	-247	-136	671.1	901
4	-10	-59	905.4	1640	-164	-238	677.3	917
5	6	-60	910.2	1657	-3	-250	684.9	938
6	-3	-59	895.2	1603	-109	-208	669.8	897
7	-5	-50	901.5	1625	-102	-106	671.6	902
8	-8	-42	899.9	1620	-145	-52	667.7	892
9	-1	-15	892.1	1592	-49	294	650.4	846
10	4	-53	902.3	1628	4	-145	669.8	897

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	-8 mm	-150 mm
Y Position	-48 mm	-92 mm

SIZE OF GROUP

Extreme horizontal spread	37 mm	420 mm
Extreme vertical spread	45 mm	544 mm
Size of group	82 mm	965 mm
Extreme spread	46 mm	546 mm

MEASURES OF DISPERSION

SD of X	11 mm	131 mm
SD of Y	13 mm	157 mm
Mean radius	14 mm	164 mm
Group SD	12 mm	144 mm

AMMUNITION

Mean velocity	900 m/s	669 m/s
SD of velocity	5 m/s	9 m/s
Fastest round	910 m/s	685 m/s
Slowest round	892 m/s	650 m/s
Gross difference	18 m/s	35 m/s
Mean bullet energy	1620 J	895 J
SD of energy	20 J	25 J

FIG 11B COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 7594 ROUNDS

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B-25  
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ANNEX B

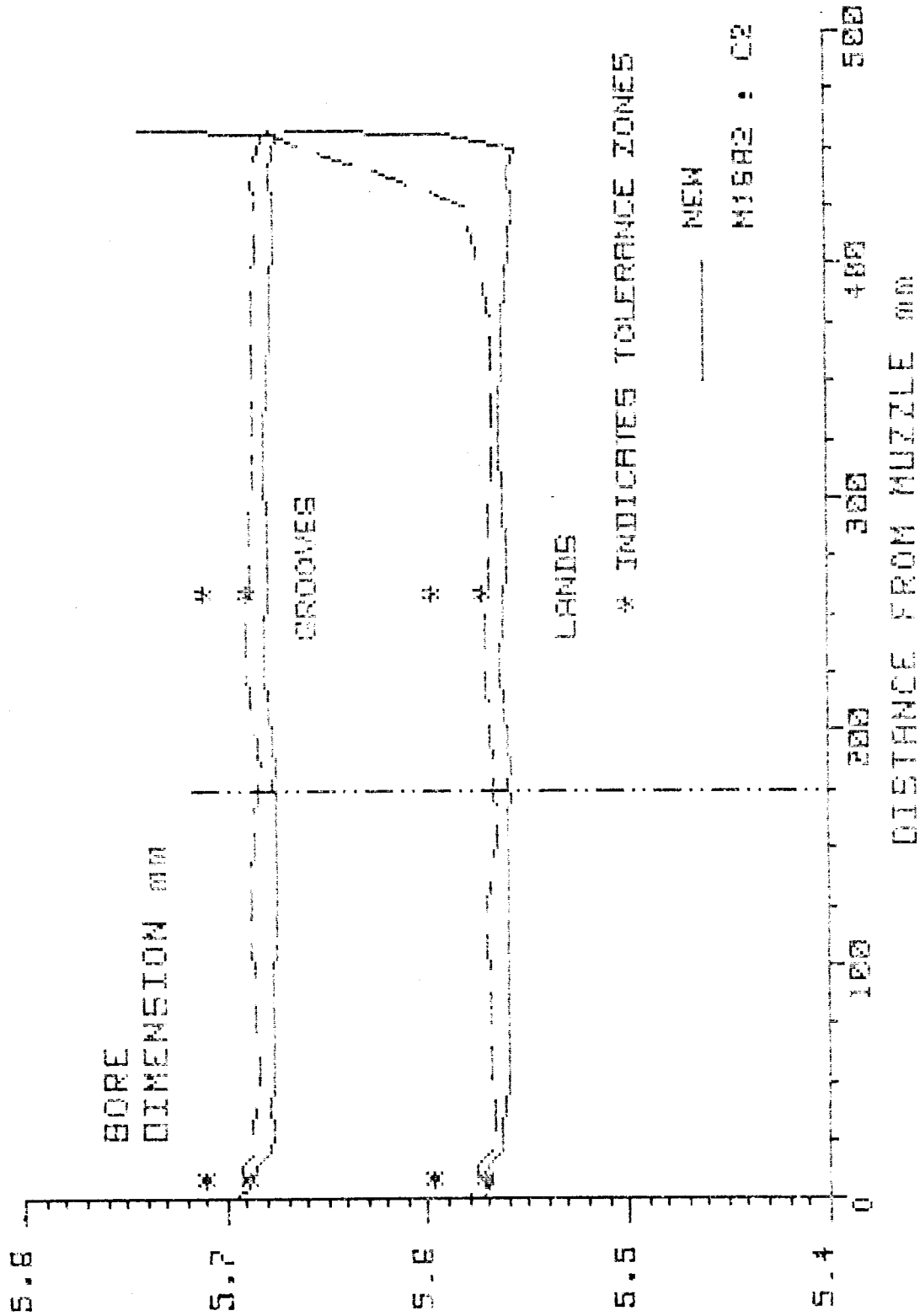


FIG 11C  
COLT M18A2 C2 BARREL GRAPH AT 8599 ROUNDS

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~~RESTRICTED~~

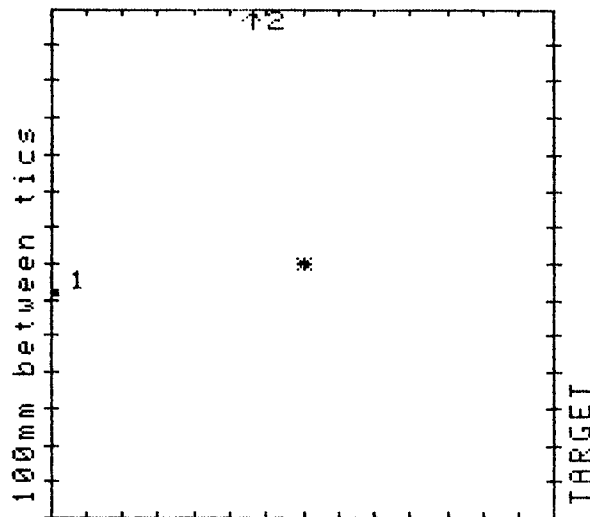
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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S.
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C2	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 GRAMS
GROUP TYPE ->	AUTO	FIRING TIME ->	15:32:21
FIRING DATE ->	14/02/85	CYCLE ->	97 HOT ROF
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	490 mm above T-bar	TEMPERATURE ->	21°C
RANGE Sens A ->	300 metres	WEATHER COND ->	FINE
POA AT TARGET ->	900 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	5 - 6 m/sec 11°		
NUMBER OF SHOTS	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

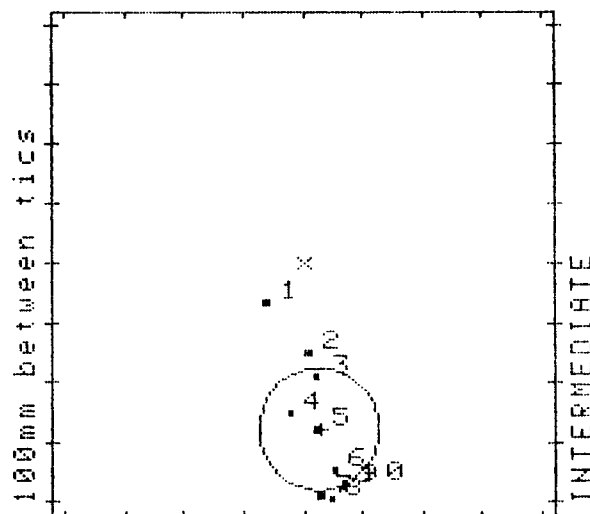


FIG 12A COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 8599 ROUNDS (WHEN BSO OCCURRED)

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ANNEX B

<u>Shot</u> <u>No</u>	<u>INTERMEDIATE</u>				<u>TARGET</u>			
	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	-59	-65	851.6	1451	-685	-78	586.1	687
2	10	-147	886.0	1570	-134	1803	602.2	725
3	26	-188	886.0	1570				
4	-20	-249	907.8	1648				
5	25	-277	914.3	1672				
6	53	-343	913.4	1669				
7	31	-386	973.8	1896				
8	51	-392	850.9	1448				
9	74	-370	905.4	1640				
10	73	-366	919.1	1690				

All shots not detected by both sensors. Treat results with caution!

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	26 mm	
Y Position	-278 mm	

SIZE OF GROUP

Extreme horizontal spread	133 mm
Extreme vertical spread	327 mm
Size of group	460 mm
Extreme spread	345 mm

MEASURES OF DISPERSION

SD of X	42 mm
SD of Y	114 mm
Mean radius	101 mm
Group SD	86 mm

AMMUNITION

Mean velocity	901 m/s
SD of velocity	36 m/s
Fastest round	974 m/s
Slowest round	851 m/s
Gross difference	123 m/s
Mean bullet energy	1625 J
SD of energy	129 J
Cyclic rate of fire	855 RPM

FIG 12B COLT M16A2 C2 AMMO AND WEAPON ANALYSIS AT 8599 ROUNDS (WHEN BSO OCCURRED)

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B-28  
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ANNEX B

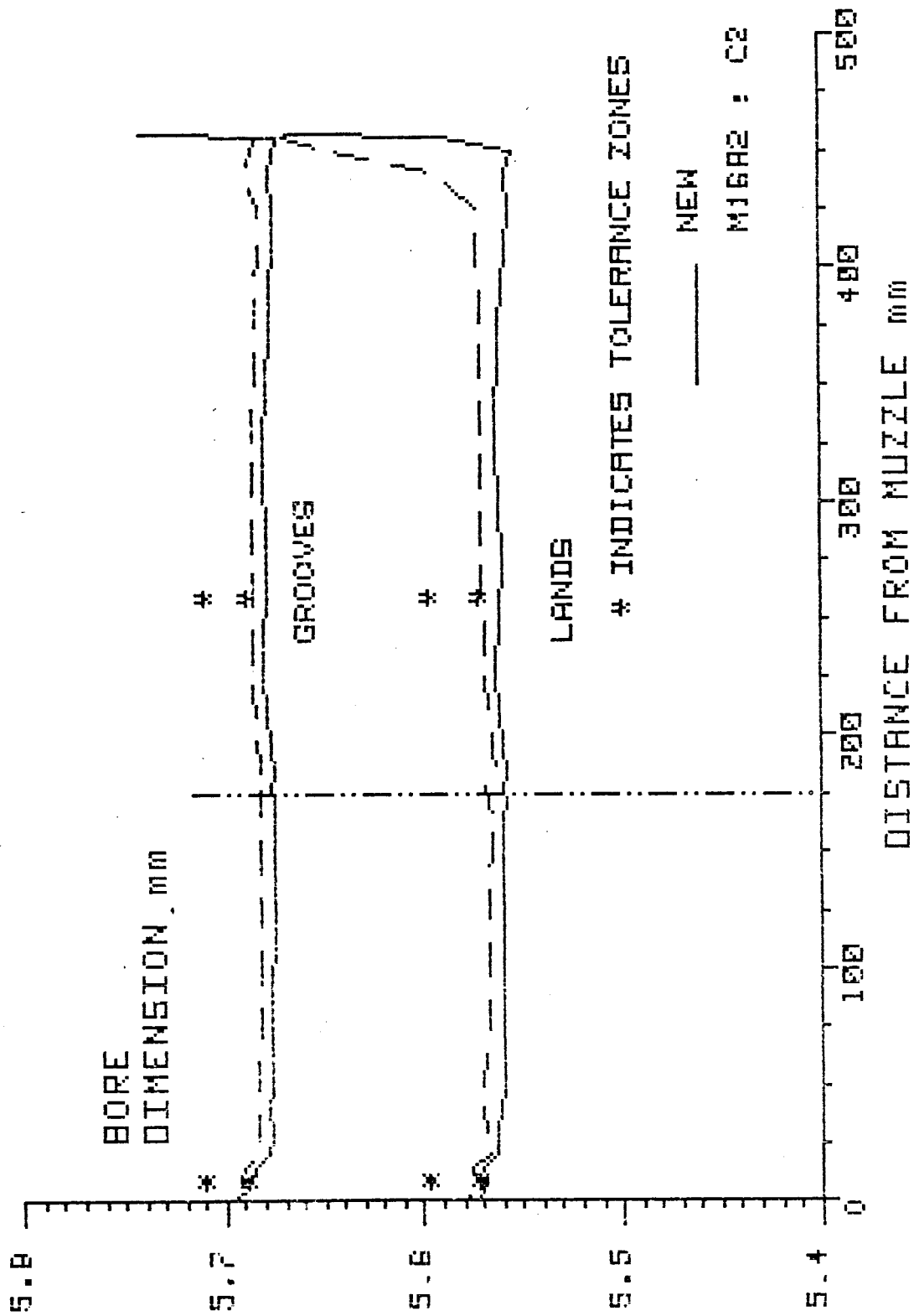


FIG 12C  
COLT M16A2 C2 BARREL GRAPH AT 8599 ROUNDS

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ANNEX B



FIG 13  
SARP IN-HOT ACCURACIES 300 m (COLT M19A2 C3)

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ANNEX B

PROJECT TITLE ->	SARP 300 HOT ACCY	SHOOTER ID ->	MICK S.
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C3	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 GRAMS
GROUP TYPE ->	S/SO	FIRING TIME ->	16:19:53
FIRING DATE ->	18/10/84	CYCLE ->	12-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	23.77 Metres	RTCM Address ->	#2
INTERMED POA ->	600 mm above T-bar	TEMPERATURE ->	15°C
RANGE Sens A ->	300 metres	WEATHER COND ->	3/8ths CLOUD
POA AT TARGET ->	890 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	3 - 4 m/sec 352°		
NUMBER OF SHOTS	10		

FIG 14A(i) COLT M16A2 C3 AMMO AND WEAPON ANALYSIS  
AT 1395 ROUNDS

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ANNEX B

<sup>B-31</sup>  
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<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	-9.3	-68.8	977.5	1911	-115.9	-215.7	671.1	901
2	-9.9	-58.5	962.9	1854	-125.3	-110.0	678.6	921
3	-0.5	-60.3	971.9	1889	-47.6	-134.8	669.8	897
4	2.9	-56.1	963.8	1858	3.9	-76.0	676.4	915
5	-7.4	-56.2	958.4	1837	-107.0	-112.7	660.4	872
6	1.1	-49.1	969.2	1879	-5.9	0.2	679.5	923
7	-10.7	-64.7	972.9	1893	-159.6	-206.3	677.7	919
8	3.9	-47.6	970.1	1882	10.1	11.7	672.9	906
9	-5.5	-50.3	967.4	1872	-117.3	-1.2	670.3	898
10	3.3	-63.7	972.9	1893	28.4	-166.2	678.2	920

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	-3 mm	-64 mm
Y Position	-58 mm	-101 mm

SIZE OF GROUP

Extreme horizontal spread	15 mm	188 mm
Extreme vertical spread	21 mm	227 mm
Size of group	36 mm	415 mm
Extreme spread	25 mm	276 mm

MEASURES OF DISPERSION

SD of X	6 mm	69 mm
SD of Y	7 mm	84 mm
Mean radius	8 mm	96 mm
Group SD	7 mm	77 mm

AMMUNITION

Mean velocity	969 m/s	673 m/s
SD of velocity	6 m/s	6 m/s
Fastest round	977 m/s	680 m/s
Slowest round	958 m/s	660 m/s
Gross difference	19 m/s	19 m/s
Mean bullet energy	1877 J	907 J
SD of energy	22 J	16 J

FIG 14A(ii) COLT M16A2 C3 AMMO AND WEAPON ANALYSIS  
AT 1395 ROUNDS

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B-32  
UNCLASSIFIED

ANNEX B

181015

POSITION : TARGET (100 mm between tic marks)

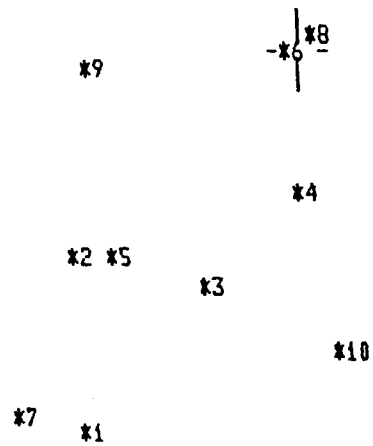


FIG 14B COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 1395 ROUNDS (TARGET)

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

181015

POSITION : INTERMEDIATE (20 mm between tic marks)



\*9 \*6 \*8  
\*5 \*4  
\*2 \*3  
\*7 \*10  
\*1

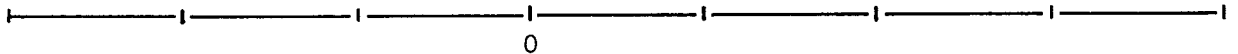


FIG 14C COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 1395 ROUNDS (INTERMEDIATE)

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

B-34

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ANNEX B

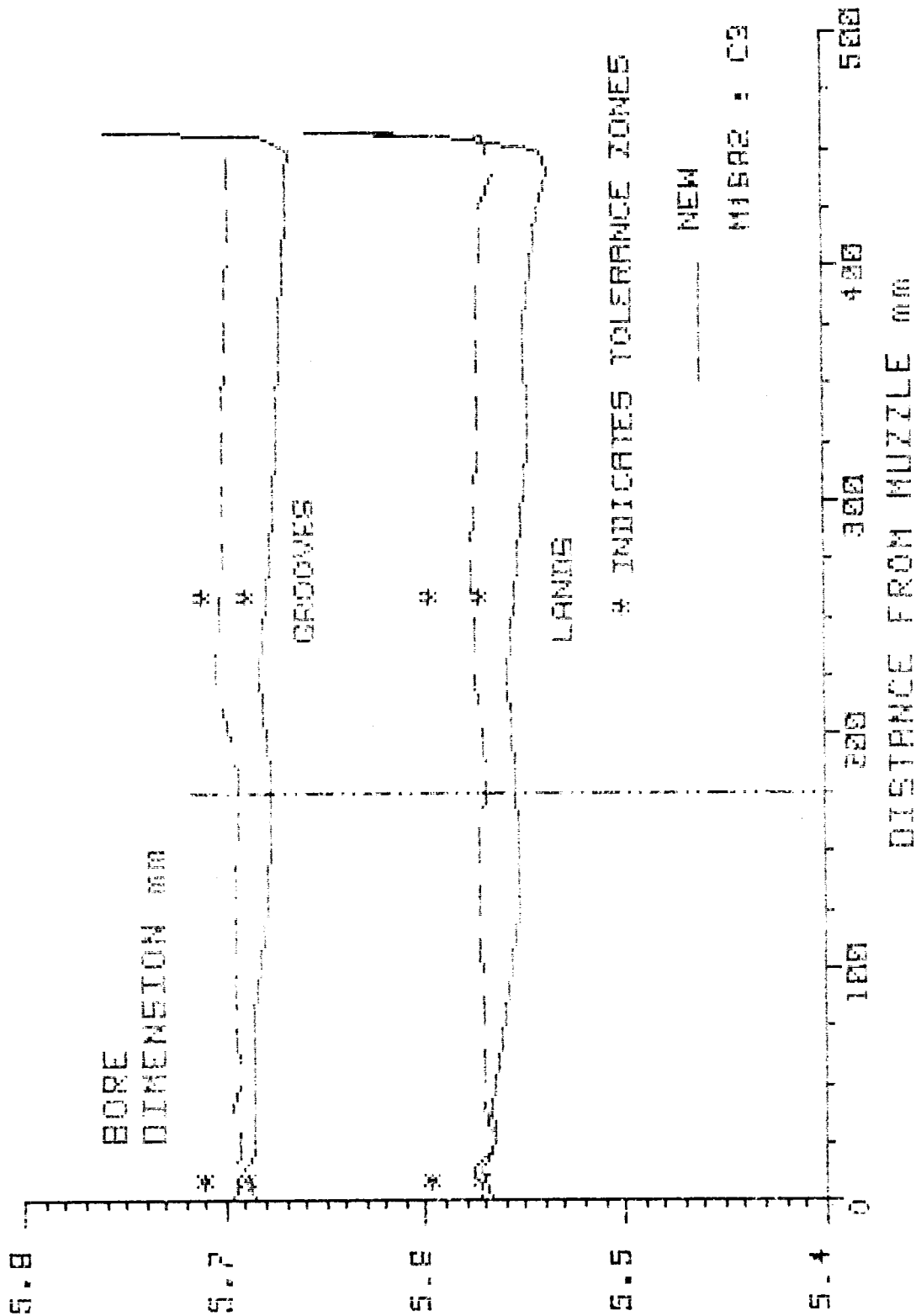


FIG 14D  
COLT M16A2 C3 BARREL GRAPH AT 1395 ROUNDS

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~~RESTRICTED~~

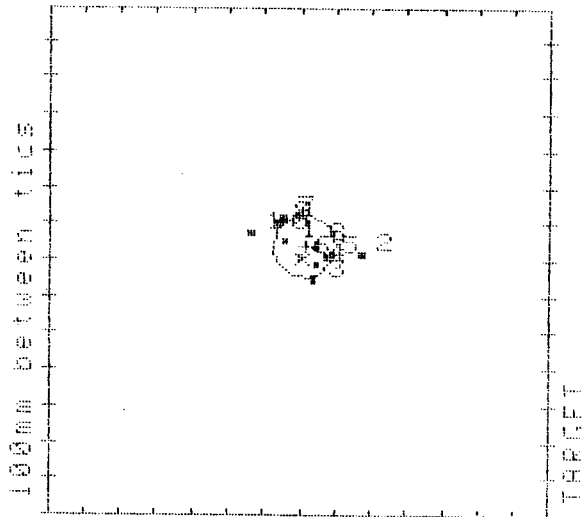
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B-35  
UNCLASSIFIED

ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C3	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	14:03:02
FIRING DATE ->	06/12/84	CYCLE ->	48-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	435 mm above T-bar		
RANGE Sens A ->	300 metres		
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST	TEMPERATURE ->	19°C
WIND CONDITIONS->	6 - 7 m/s 325°	WEATHER COND ->	OVERCAST
NUMBER OF SHOTS	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

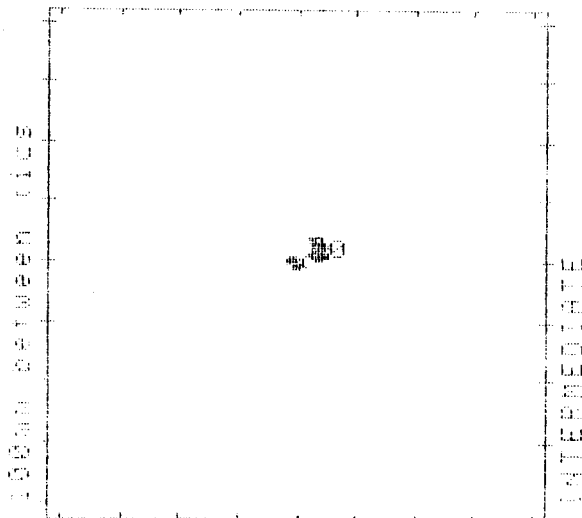


FIG 15A COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 4750 ROUNDS  
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~~RESTRICTED~~

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ANNEX B

<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	-7	2	939.2	1764	-43	55	676.0	914
2	8	-1	932.4	1739	178	16	668.5	894
3	3	-5	929.9	1729	43	-51	669.4	896
4	-2	-4	944.4	1784	50	-10	677.7	919
5	0	-2	944.4	1784	77	10	670.7	900
6	-1	-1	935.8	1751	4	12	674.6	910
7	-6	6	940.9	1771	-48	121	695.6	968
8	5	-1	945.2	1787	47	44	678.2	920
9	-5	7	935.8	1751	-54	106	667.2	890
10	-11	3	947.0	1794	-137	78	685.4	940

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	-2 mm	12 mm
Y Position	1 mm	38 mm

SIZE OF GROUP

Extreme horizontal spread	19 mm	314 mm
Extreme vertical spread	13 mm	172 mm
Size of group	32 mm	487 mm
Extreme spread	20 mm	320 mm

MEASURES OF DISPERSION

SD of X	6 mm	87 mm
SD of Y	4 mm	53 mm
Mean radius	6 mm	86 mm
Group SD	5 mm	72 mm

AMMUNITION

Mean velocity	939 m/s	676 m/s
SD of velocity	6 m/s	9 m/s
Fastest round	947 m/s	696 m/s
Slowest round	930 m/s	667 m/s
Gross difference	17 m/s	28 m/s
Mean bullet energy	1765 J	915 J
SD of energy	22 J	24 J

FIG 15B COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 4750 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

B-37  
UNCLASSIFIED

ANNEX B

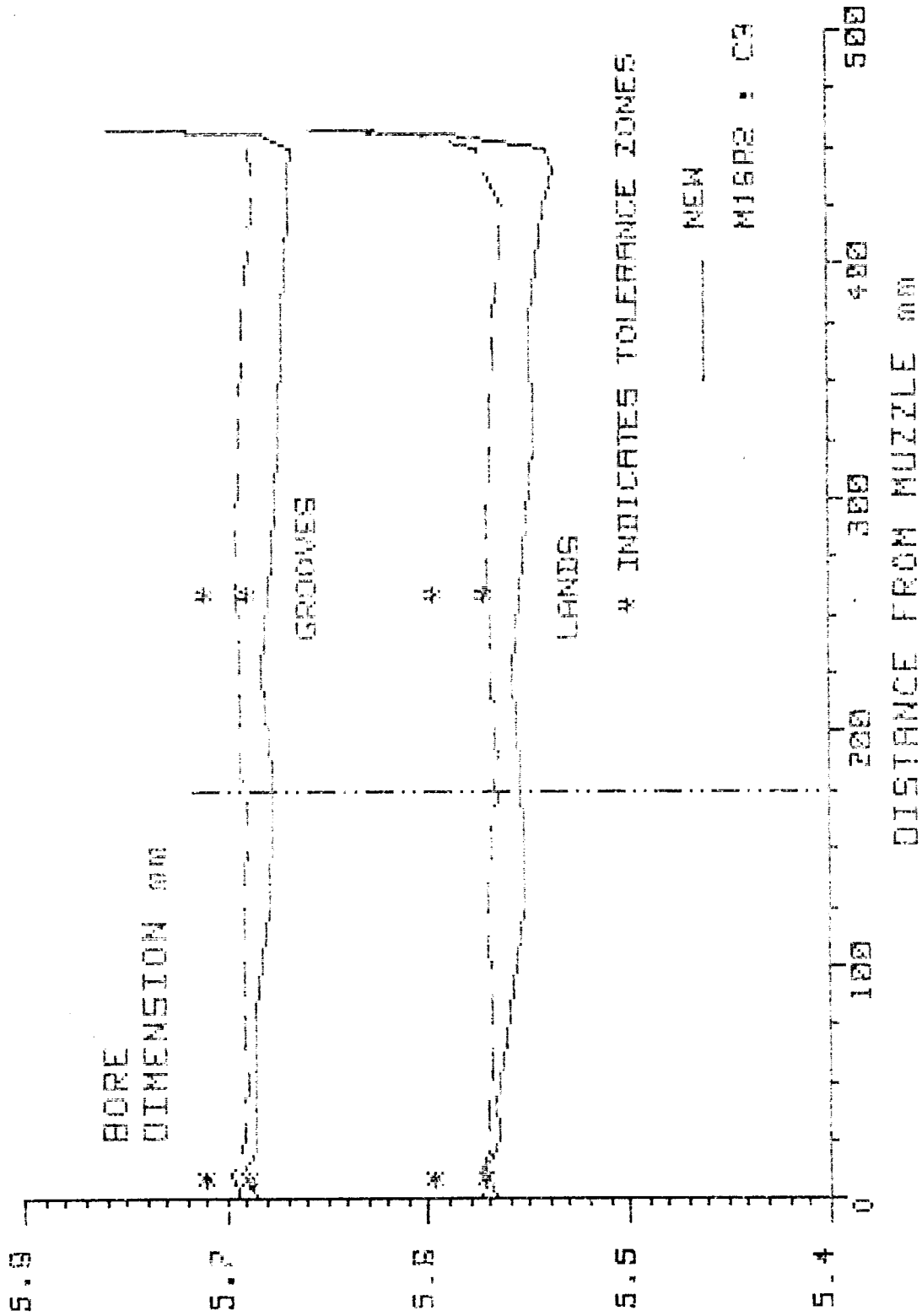


FIG 15C  
COLT M16A2 C3 BARREL GRAPH AT 4750 ROUNDS

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~~RESTRICTED~~

~~RESTRICTED~~

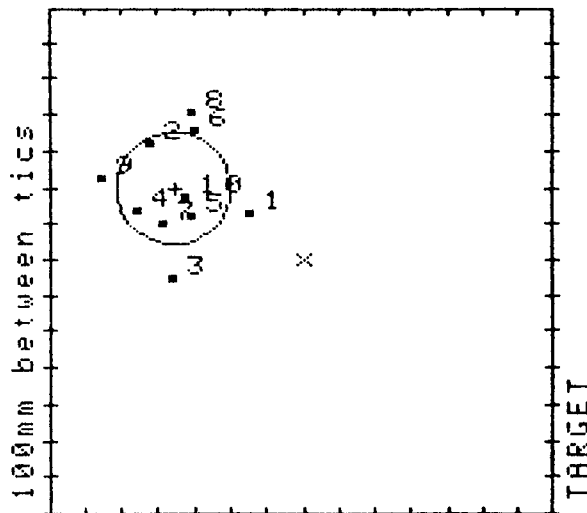
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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S.
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	COLT M16A2 C3	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	11:21:40
FIRING DATE ->	27/02/85	CYCLE ->	110-3 ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	705 mm above T-bar	TEMPERATURE ->	13°C
RANGE Sens A ->	300 metres	WEATHER COND ->	LIGHT RAIN
POA AT TARGET ->	900 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	3 to 4 m/s 70°		
NUMBER OF SHOTS->	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

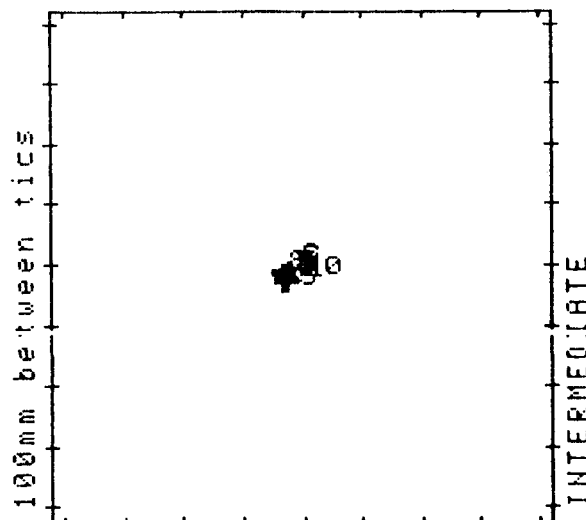


FIG 16A COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 10131 ROUNDS

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~~COMMERCIAL IN CONFIDENCE~~

~~UNCLASSIFIED~~

ANNEX B

<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot No</u>	<u>Horiz (mm)</u>	<u>Vert (mm)</u>	<u>Vel (m/s)</u>	<u>Energy (J)</u>	<u>Horiz (mm)</u>	<u>Vert (mm)</u>	<u>Vel (m/s)</u>	<u>Energy (J)</u>
1	-9	-23	918.3	1687	-145	137	663.4	880
2	-32	-9	906.2	1643	-422	327	669.4	896
3	-28	-39	917.5	1684	-357	-51	671.1	901
4	-36	-24	914.3	1672	-457	141	671.1	901
5	-25	-23	911.8	1663	-303	130	676.4	915
6	-27	-2	899.9	1620	-292	363	669.4	896
7	-31	-26	915.1	1675	-383	103	675.1	911
8	-20	1	902.3	1628	-305	413	661.2	874
9	-41	-12	905.4	1640	-552	232	664.2	882
10	-28	-18	919.1	1690	-314	180	671.6	902

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	-28 mm	-353 mm
Y Position	-17 mm	198 mm

SIZE OF GROUP

Extreme horizontal spread	32 mm	407 mm
Extreme vertical spread	40 mm	464 mm
Size of group	72 mm	871 mm
Extreme spread	40 mm	467 mm

MEASURES OF DISPERSION

SD of X	9 mm	110 mm
SD of Y	12 mm	139 mm
Mean radius	13 mm	155 mm
Group SD	11 mm	125 mm

AMMUNITION

Mean velocity	911 m/s	669 m/s
SD of velocity	7 m/s	5 m/s
Fastest round	919 m/s	676 m/s
Slowest round	900 m/s	661 m/s
Gross difference	19 m/s	15 m/s
Mean bullet energy	1660 J	896 J
SD of energy	26 J	13 J

FIG 16B COLT M16A2 C3 AMMO AND WEAPON ANALYSIS AT 10131 ROUNDS

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~~COMMERCIAL IN CONFIDENCE~~

UNCLASSIFIED

ANNEX B

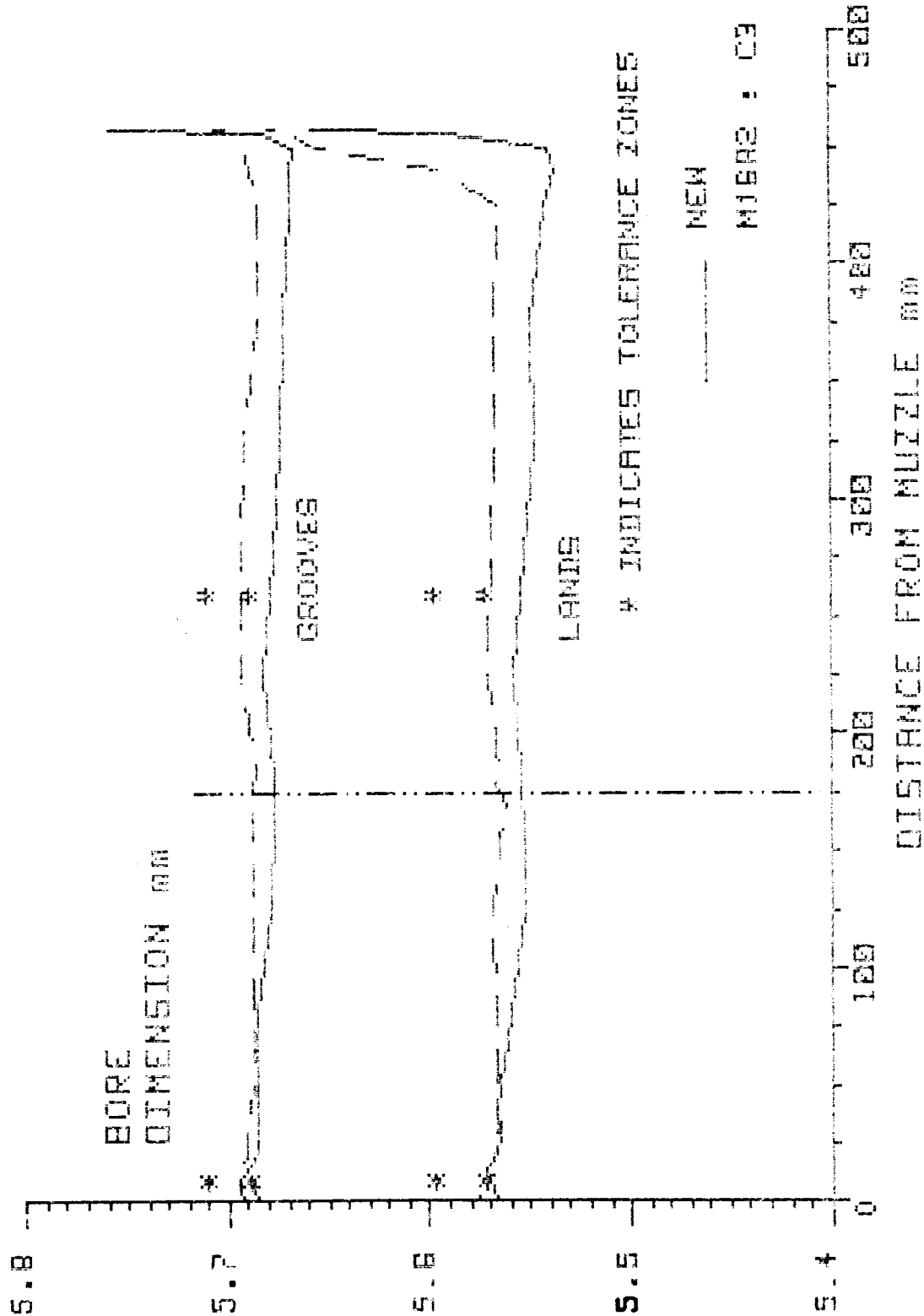


FIG 16C  
COLT M16A2 C3 BARREL GRAPH AT 10131 ROUNDS

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~~RESTRICTED~~

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~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

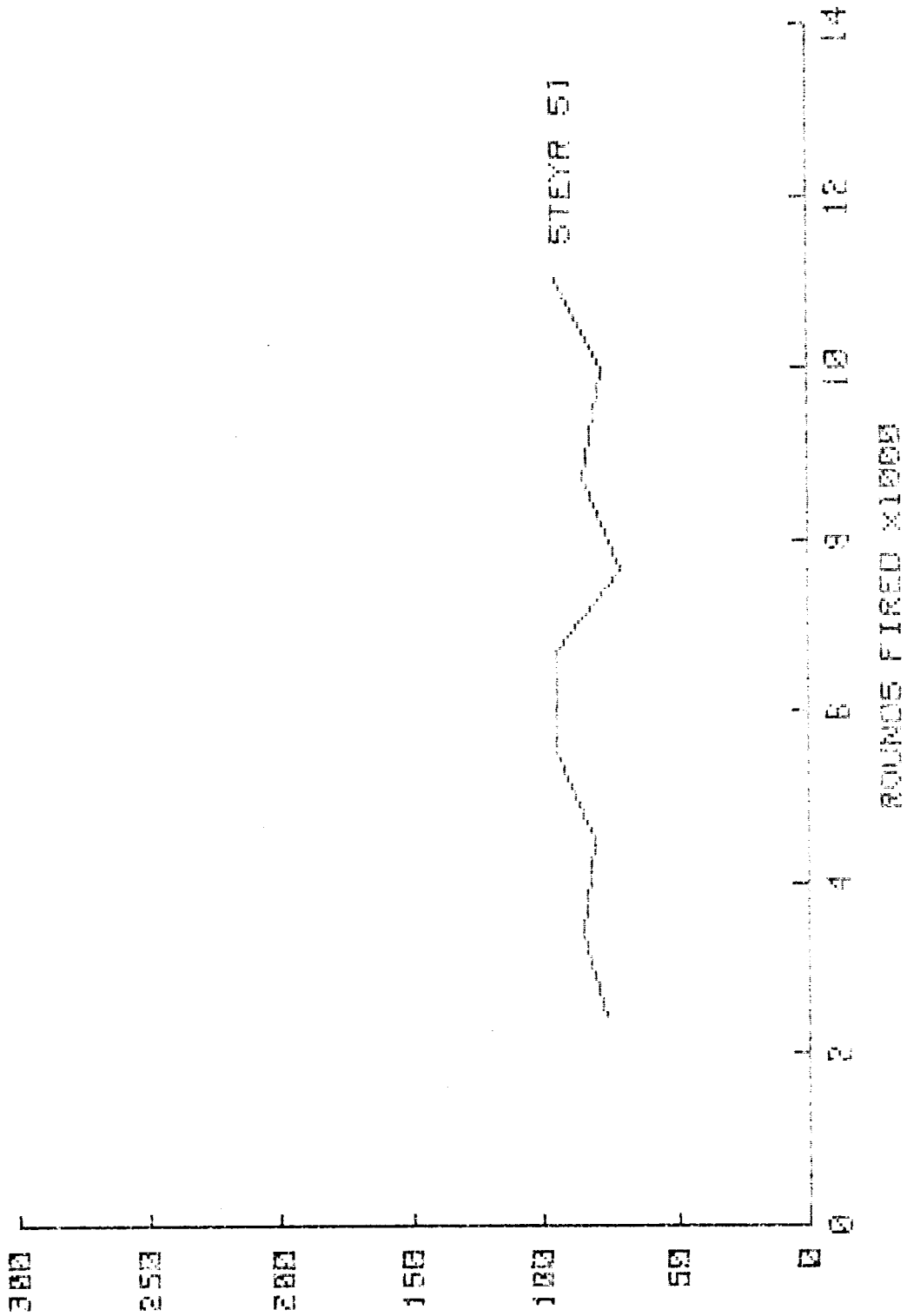


FIG 17  
SARP IW-HOT ACCURACIES 300 m (STEYR AUG S1)

METER ROUNDS

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~~RESTRICTED~~

~~RESTRICTED~~

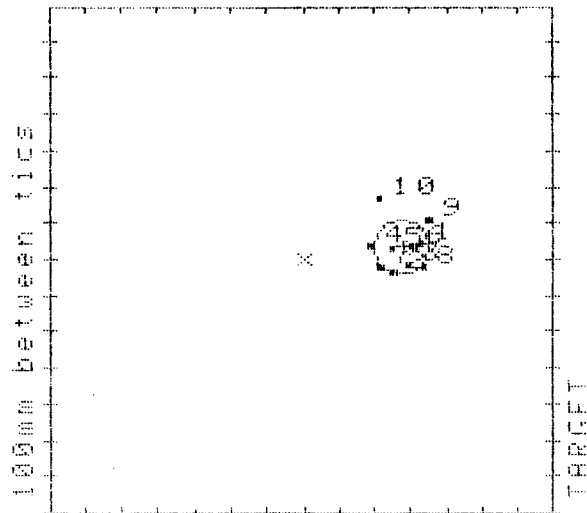
~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	STEYR AUG S1	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	10:22:55
FIRING DATE ->	02/11/84	CYCLE ->	12-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	24 metres	RTCM Address ->	#2
INTERMED POA ->	400 mm above T-bar	TEMPERATURE ->	19°C
RANGE Sens A ->	300 metres	WEATHER COND ->	OVERCAST
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	2 to 3 m/s 167°		
NUMBER OF SHOTS->	10		

#### SHOT POSITIONS AT TARGET



#### INTERMEDIATE SHOT POSITIONS

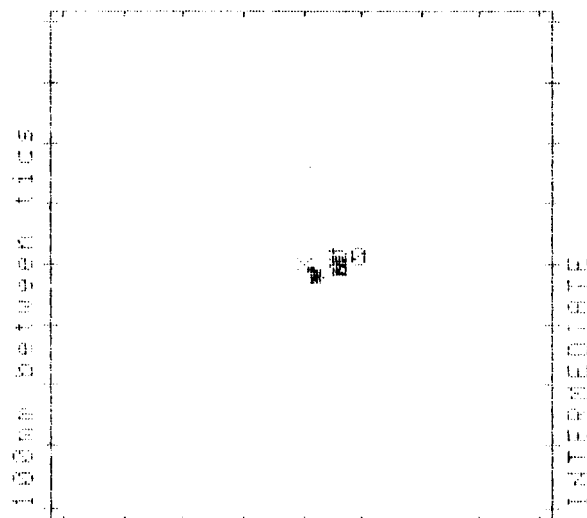


FIG 18A STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 2246 ROUNDS

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ANNEX B

<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	30	-18	944.4	1784	331	47	683.6	935
2	23	-26	940.1	1767	259	-36	679.1	922
3	24	-23	947.0	1794	293	-9	685.4	940
4	18	-20	949.6	1803	191	41	682.2	931
5	23	-21	947.0	1794	249	29	676.4	915
6	26	-22	947.0	1794	307	37	690.0	952
7	19	-25	940.1	1767	223	-20	678.2	920
8	30	-25	946.1	1790	336	-21	693.7	962
9	29	-12	948.7	1800	351	113	683.1	933
10	16	-8	940.1	1767	218	171	677.3	917

ACCURACY

	<u>Intermediate</u>	<u>Target</u>
MPI from POA		
X Position	24 mm	276 mm
Y Position	-20 mm	35 mm

SIZE OF GROUP

Extreme horizontal spread	14 mm	160 mm
Extreme vertical spread	18 mm	208 mm
Size of group	32 mm	368 mm
Extreme spread	22 mm	226 mm

MEASURES OF DISPERSION

SD of X	5 mm	56 mm
SD of Y	6 mm	65 mm
Mean radius	6 mm	74 mm
Group SD	5 mm	61 mm

AMMUNITION

Mean velocity	945 m/s	683 m/s
SD of velocity	4 m/s	6 m/s
Fastest round	950 m/s	694 m/s
Slowest round	940 m/s	676 m/s
Gross difference	10 m/s	17 m/s
Mean bullet energy	1786 J	933 J
SD of energy	14 J	15 J

FIG 18B STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 2246 ROUNDS

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B-44  
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ANNEX B

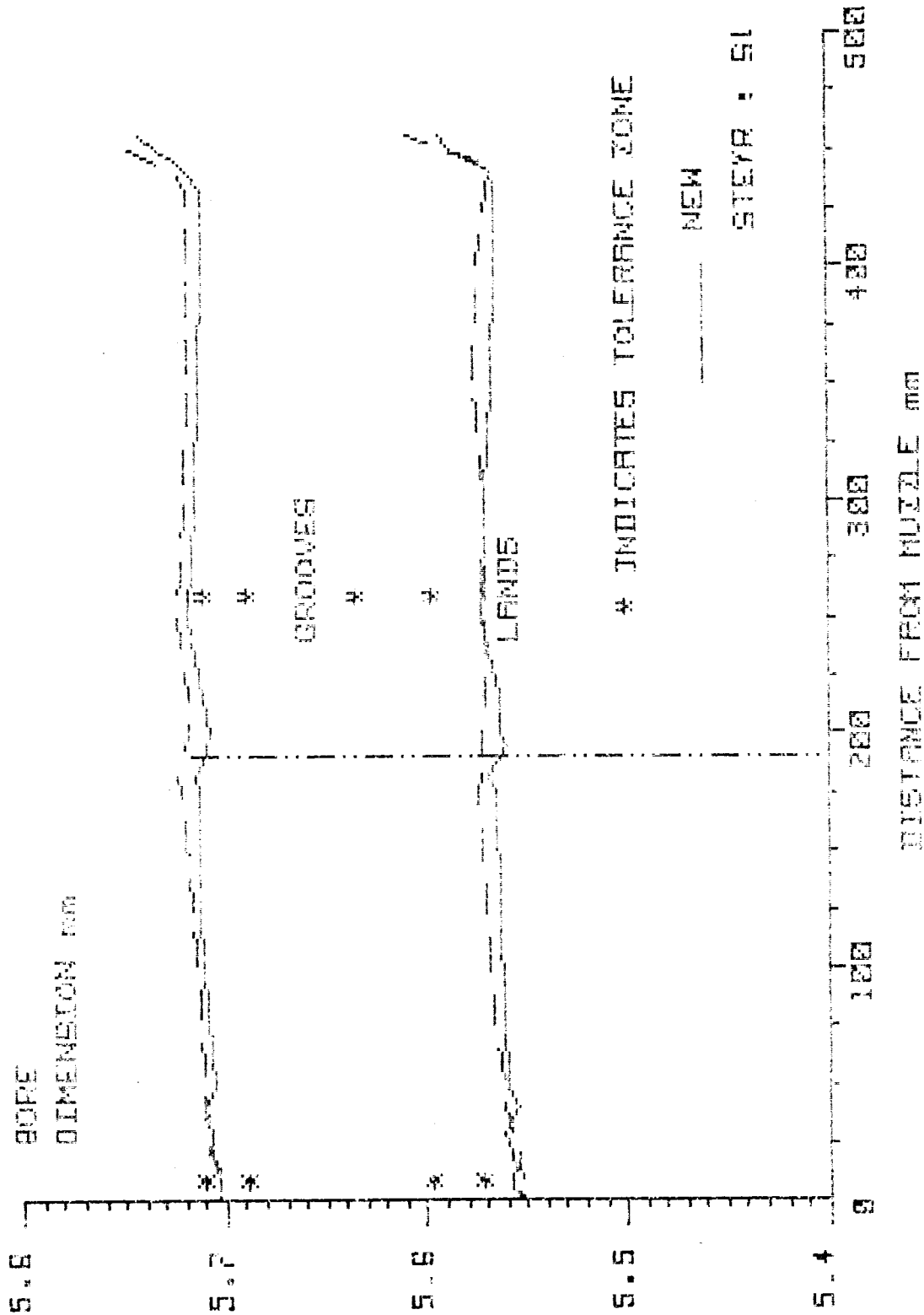


FIG 18 C  
STEVR AUG 51 BARREL GRAPH AT 2246 ROUNDS

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~~RESTRICTED~~

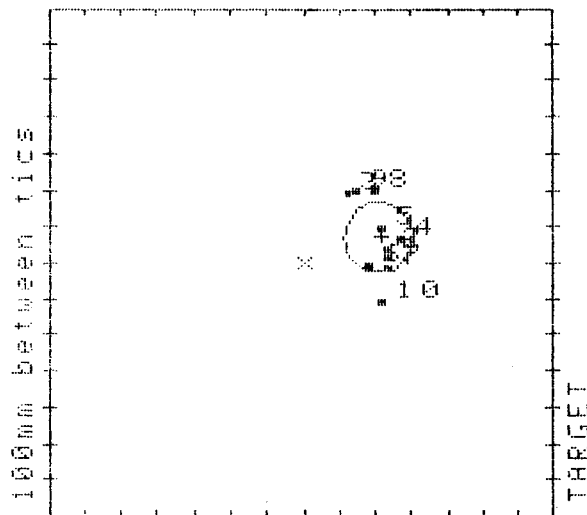
~~COMMERCIAL IN CONFIDENCE~~

~~B-45~~  
UNCLASSIFIED

ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	STEYR S1	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	14:56:13
FIRING DATE ->	11/12/84	CYCLE ->	61-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 METRES	RTCM Address ->	#2
INTERMED POA ->	450 mm above T-bar	TEMPERATURE ->	20°C
RANGE Sens A ->	300 metres	WEATHER COND ->	4/8ths CLOUD
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	3-5 m/sec 320°		
NUMBER OF SHOTS->	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

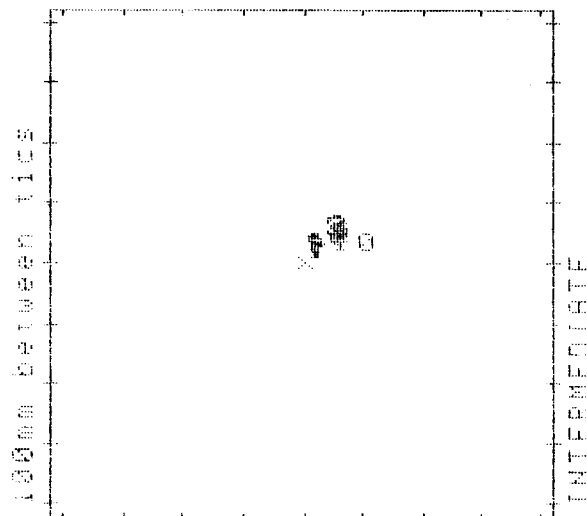


FIG 19A STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 6617 ROUNDS

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B-46  
UNCLASSIFIED

ANNEX B

<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	23	29	920.0	1693	237	19	668.1	893
2	25	29	940.9	1771	237	37	679.5	923
3	17	41	934.1	1745	131	196	678.6	921
4	30	31	935.0	1748	272	72	682.2	931
5	25	32	939.2	1764	226	99	686.3	942
6	21	23	935.8	1751	188	-2	680.0	925
7	23	26	934.1	1745	235	-7	689.1	950
8	19	45	933.3	1742	198	198	680.0	925
9	14	44	931.6	1736	151	202	677.7	919
10	22	16	934.1	1745	224	-106	681.3	928

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	22 mm	210 mm
Y Position	32 mm	71 mm

SIZE OF GROUP

Extreme horizontal spread	15 mm	142 mm
Extreme vertical spread	29 mm	308 mm
Size of group	44 mm	450 mm
Extreme spread	29 mm	316 mm

MEASURES OF DISPERSION

SD of X	4 mm	43 mm
SD of Y	9 mm	104 mm
Mean radius	9 mm	95 mm
Group SD	7 mm	79 mm

AMMUNITION

Mean velocity	934 m/s	680 m/s
SD of velocity	6 m/s	6 m/s
Fastest round	941 m/s	689 m/s
Slowest round	920 m/s	668 m/s
Gross difference	21 m/s	21 m/s
Mean bullet energy	1744 J	926 J
SD of energy	21 J	15 J

FIG 19B STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 6617 ROUNDS

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~~COMMERCIAL IN CONFIDENCE~~

B-47  
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ANNEX B

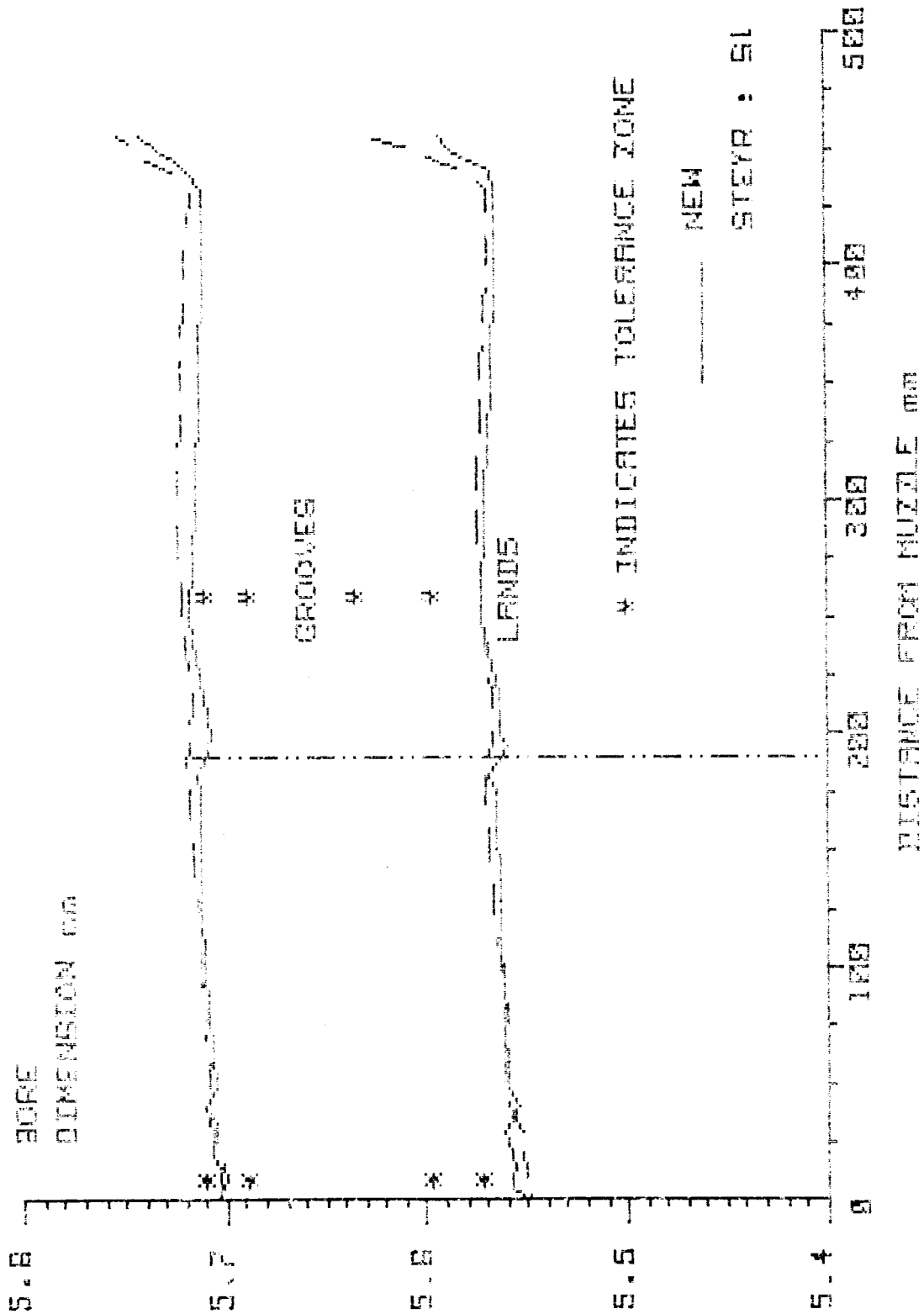


FIG 13C  
STEYR AUG S1 BARREL GRAPH AT 6617 ROUNDS

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~~RESTRICTED~~

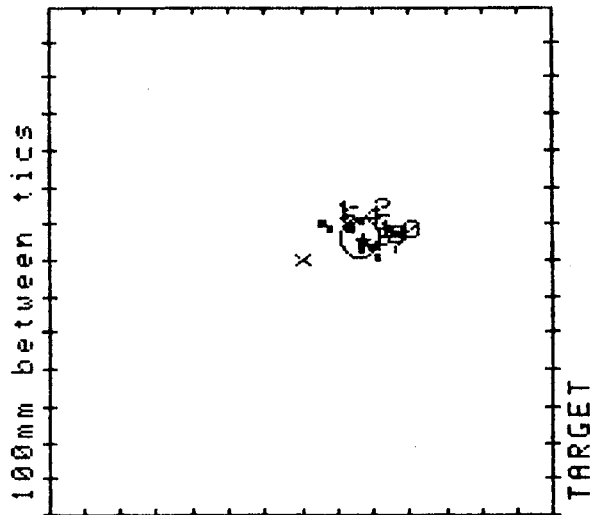
~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	STEYR S1	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	11:17:36
FIRING DATE ->	21/02/85	CYCLE ->	110-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	740 mm above T-bar		
RANGE Sens A ->	300 metres		
POA AT TARGET ->	900 mm above T-bar		
FIRING POSITION->	REST	TEMPERATURE ->	22°C
WIND CONDITIONS->	2-3 m/sec 351°	WEATHER COND ->	FINE
NUMBER OF SHOTS->	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

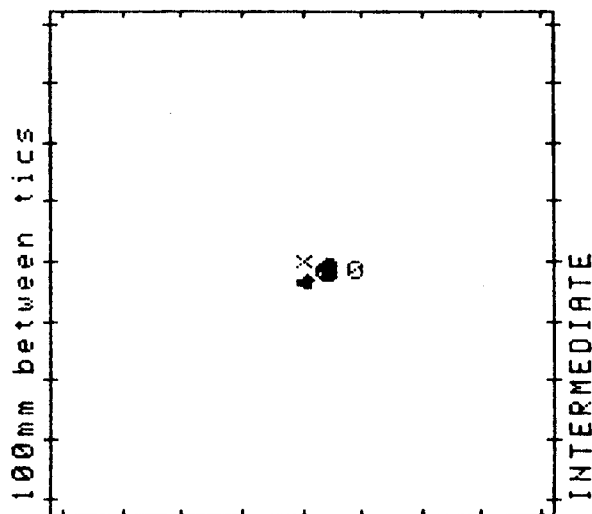


FIG 20A STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 11056 ROUNDS

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ANNEX B

<sup>B-49</sup>  
UNCLASSIFIED

<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	1	-35	912.6	1666	63	104	663.4	880
2	12	-27	910.2	1657	172	114	665.1	885
3	9	-37	920.8	1696	173	31	676.9	916
4	6	-30	908.6	1651	143	91	672.9	906
5	12	-32	906.2	1643	198	39	669.4	896
6	-1	-32	916.7	1681	82	92	674.2	909
7	10	-33	906.2	1643	218	11	668.5	894
8	10	-30	899.9	1620	209	40	654.5	857
9	12	-38	919.1	1690	218	42	697.0	972
10	10	-35	916.7	1681	177	51	669.8	897

ACCURACY

MPI from POA

Intermediate

Target

X Position

8 mm

165 mm

Y Position

-33 mm

62 mm

SIZE OF GROUP

Extreme horizontal spread

13 mm

156 mm

Extreme vertical spread

11 mm

103 mm

Size of group

24 mm

258 mm

Extreme spread

14 mm

181 mm

MEASURES OF DISPERSION

SD of X

5 mm

55 mm

SD of Y

3 mm

35 mm

Mean radius

5 mm

55 mm

Group SD

4 mm

46 mm

AMMUNITION

Mean velocity

912 m/s

671 m/s

SD of velocity

7 m/s

11 m/s

Fastest round

921 m/s

697 m/s

Slowest round

900 m/s

655 m/s

Gross difference

21 m/s

42 m/s

Mean bullet energy

1663 J

901 J

SD of energy

24 J

30 J

FIG 20B STEYR AUG S1 AMMO AND WEAPON ANALYSIS AT 11056 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

B-50  
UNCLASSIFIED

ANNEX B

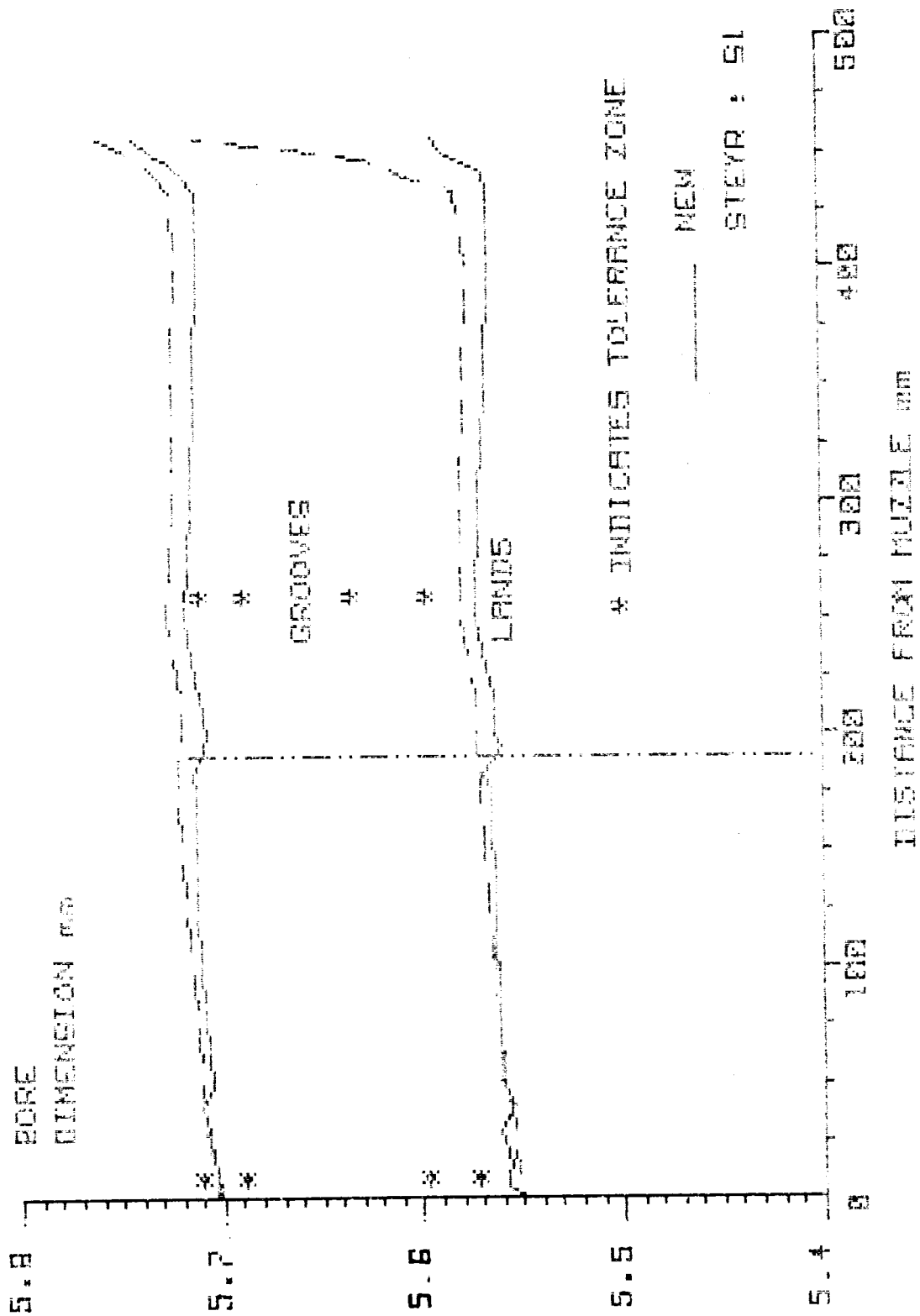


FIG 20C  
STEYR AUG S1 BARREL GRAPH AT 11856 ROUNDS

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~~RESTRICTED~~

~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

B-51

UNCLASSIFIED

ANNEX B

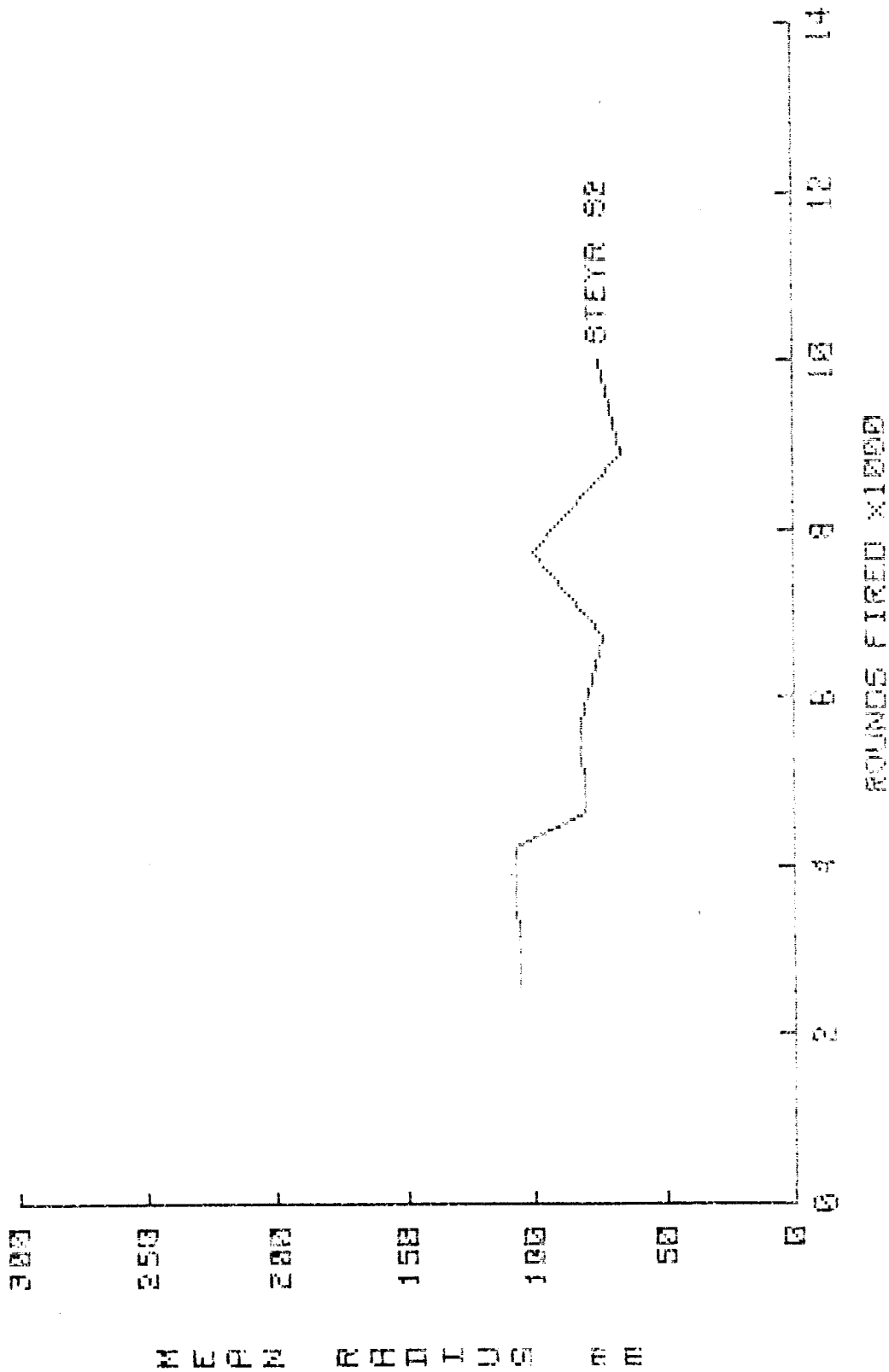


FIG 21  
SARP IW-HOT ACCURACIES 300 m (STEYR AUG S2)

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~~RESTRICTED~~

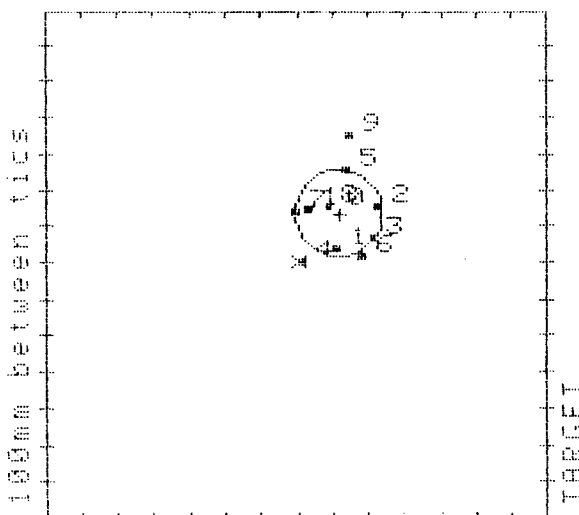
~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY SSS
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	STEYR AUG S2	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 GRAMS
GROUP TYPE ->	S/S	FIRING TIME ->	14:37:08
FIRING DATE ->	07/11/84	CYCLE ->	24-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	24 metres	RTCM Address ->	#2
INTERMED POA ->	410 mm above T-bar	TEMPERATURE ->	21°C
RANGE Sens A ->	300 metres	WEATHER COND ->	FINE
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	3 - 4 m/sec 324°		
NUMBER OF SHOTS	10		

#### SHOT POSITIONS AT TARGET



#### INTERMEDIATE SHOT POSITIONS

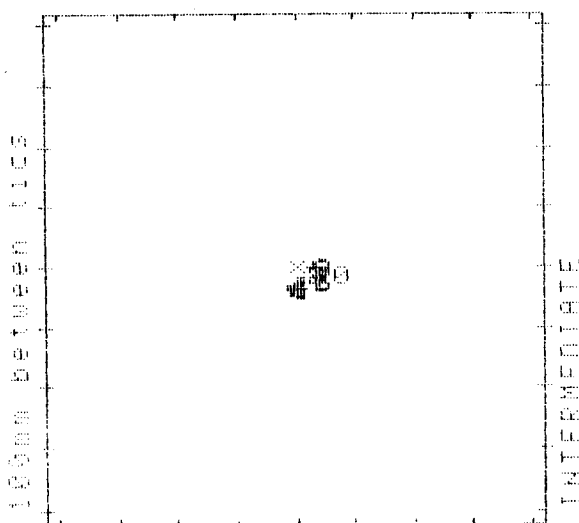


FIG 22A STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 2544 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

B-53  
UNCLASSIFIED

ANNEX B

<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	5	-46	917.5	1684	112	40	655.8	860
2	13	-34	926.6	1717	228	158	681.8	930
3	11	-41	919.1	1690	217	72	671.1	901
4	-4	-44	920.8	1696	16	1	671.1	901
5	6	-26	916.7	1681	139	259	663.8	881
6	11	-47	926.6	1717	188	17	660.8	873
7	-8	-35	925.7	1714	-6	140	664.6	883
8	1	-33	913.4	1669	93	157	671.1	901
9	9	-20	929.9	1729	147	350	670.7	900
10	0	-33	921.6	1699	33	149	658.7	868

ACCURACY

<u>MPI from POA</u>	<u>Intermediate</u>	<u>Target</u>
X Position	4 mm	117 mm
Y Position	-36 mm	134 mm

SIZE OF GROUP

Extreme horizontal spread	21 mm	234 mm
Extreme vertical spread	28 mm	349 mm
Size of group	48 mm	584 mm
Extreme spread	28 mm	373 mm

MEASURES OF DISPERSION

SD of X	7 mm	83 mm
SD of Y	9 mm	109 mm
Mean radius	10 mm	122 mm
Group SD	8 mm	97 mm

AMMUNITION

Mean velocity	922 m/s	667 m/s
SD of velocity	5 m/s	8 m/s
Fastest round	930 m/s	682 m/s
Slowest round	913 m/s	656 m/s
Gross difference	16 m/s	26 m/s
Mean bullet energy	1699 J	890 J
SD of energy	19 J	21 J

FIG 22B STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 2544 ROUNDS

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~~RESTRICTED~~

~~RESTRICTED~~  
~~COMMERCIAL IN CONFIDENCE~~  
UNCLASSIFIED

ANNEX B

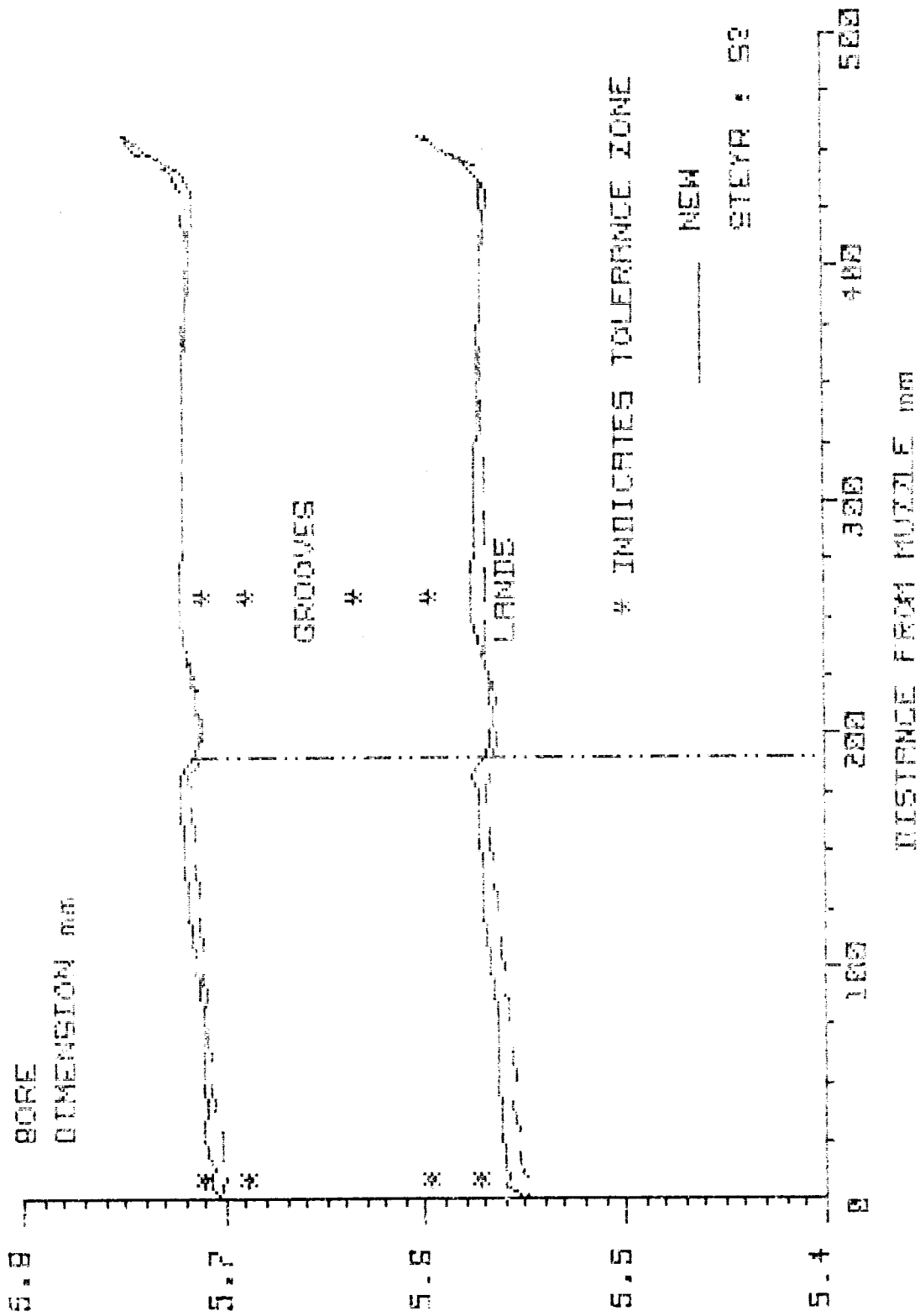


FIG 22C  
STEYR AUG S2 BARREL GRAPH AT 2544 ROUNDS

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~~RESTRICTED~~



~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

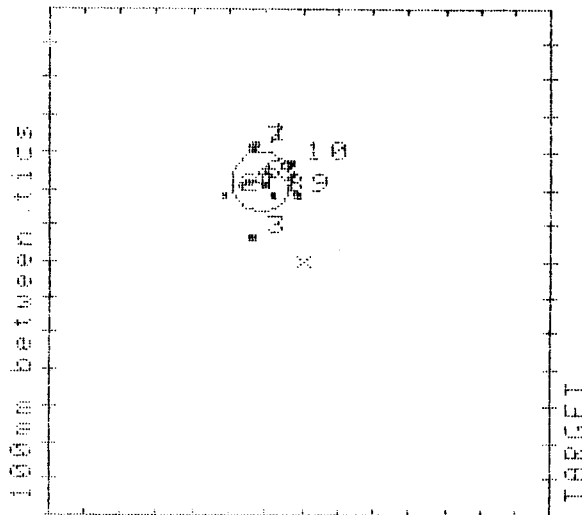
B-55

ANNEX B

UNCLASSIFIED

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S.
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	STEYR S2	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	14:43:36
FIRING DATE ->	05/12/84	CYCLE ->	48-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 METRES	RTCM Address ->	#2
INTERMED POA ->	430 mm above T-bar		
RANGE Sens A ->	300 metres		
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST	TEMPERATURE ->	17°C
WIND CONDITIONS->	4 - 5 m/sec 345°	WEATHER COND ->	2/8ths CLOUD
NUMBER OF SHOTS	10		

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

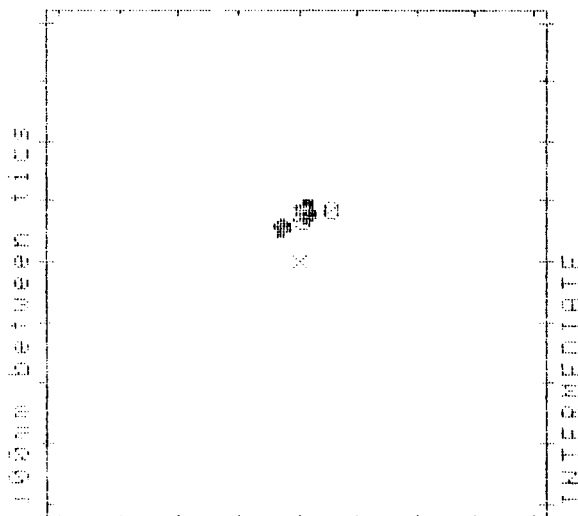


FIG 23A STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 4644 ROUNDS  
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~~RESTRICTED~~

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ANNEX B

Shot No	<u>INTERMEDIATE</u>				<u>TARGET</u>			
	<u>Horiz</u> (mm)	<u>Vert</u> (mm)	<u>Vel</u> (m/s)	<u>Energy</u> (J)	<u>Horiz</u> (mm)	<u>Vert</u> (mm)	<u>Vel</u> (m/s)	<u>Energy</u> (J)
1	-24	67	930.7	1733	-129	323	662.5	878
2	-35	59	932.4	1739	-211	184	661.7	876
3	-28	47	943.5	1780	-136	71	669.8	897
4	-31	61	940.1	1767	-167	217	655.8	860
5	-24	60	933.3	1742	-98	218	674.6	910
6	-31	62	936.7	1755	-141	220	662.9	879
7	-26	70	953.1	1817	-133	317	674.6	910
8	-23	54	951.3	1810	-75	184	672.9	906
9	-16	56	929.1	1726	-12	189	666.8	889
10	-21	65	939.2	1764	-28	276	660.8	873

ACCURACY

MPI from POA

Intermediate

Target

X Position

-26 mm

-113 mm

Y Position

60 mm

220 mm

SIZE OF GROUP

Extreme horizontal spread

19 mm

200 mm

Extreme vertical spread

23 mm

252 mm

Size of group

41 mm

451 mm

Extreme spread

23 mm

252 mm

MEASURES OF DISPERSION

SD of X

5 mm

61 mm

SD of Y

7 mm

74 mm

Mean radius

7 mm

82 mm

Group SD

6 mm

68 mm

AMMUNITION

Mean velocity

939 m/s

666 m/s

SD of velocity

8 m/s

7 m/s

Fastest round

953 m/s

675 m/s

Slowest round

929 m/s

656 m/s

Gross difference

24 m/s

19 m/s

Mean bullet energy

1763 J

888 J

SD of energy

31 J

17 J

FIG 23B STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 4644 ROUNDS

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~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

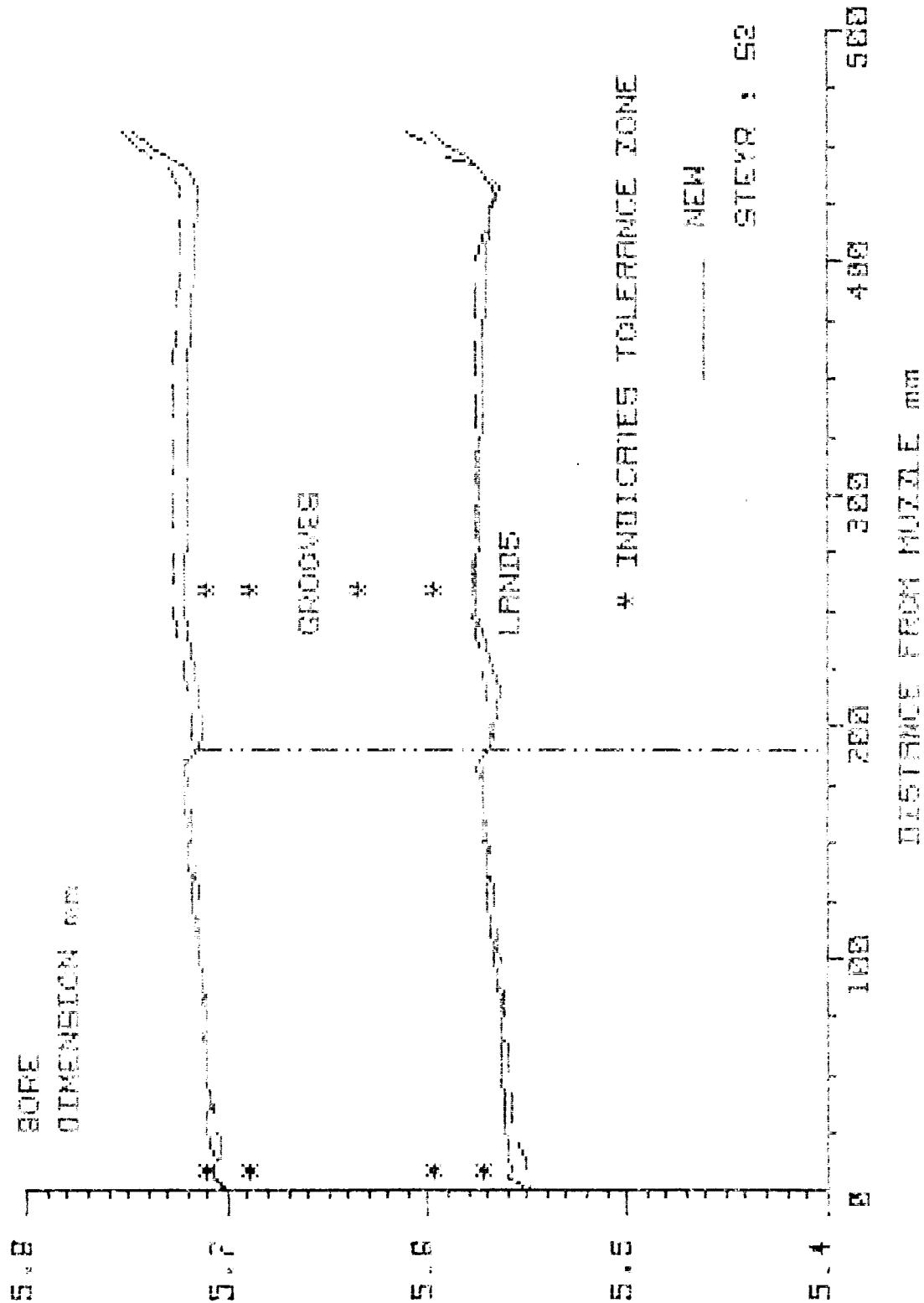


FIG 23C  
STEUR AUG S2 BARREL GRAPH AT 4644 ROUNDS

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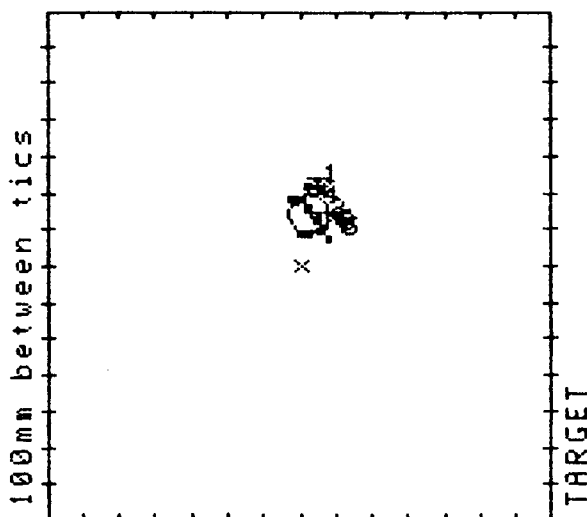
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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S.
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	STEYR S2	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	11:53:42
FIRING DATE ->	21/02/85	CYCLE ->	110-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	740 mm above T-bar	TEMPERATURE ->	23°C
RANGE Sens A ->	300 metres	WEATHER COND ->	FINE
POA AT TARGET ->	900 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	3 - 4 m/sec 320°		
NUMBER OF SHOTS	10		

## SHOT POSITIONS AT TARGET



## INTERMEDIATE SHOT POSITIONS

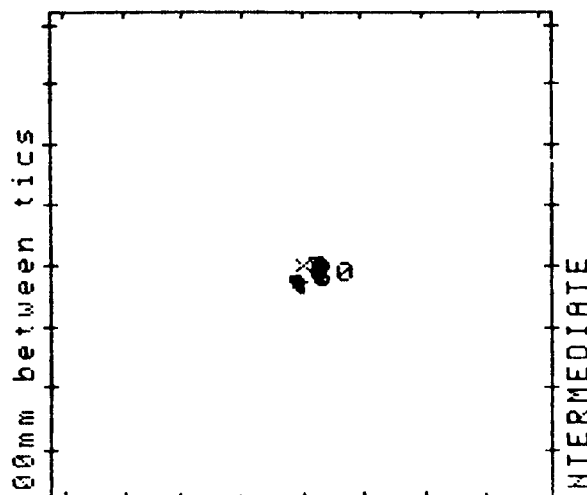


FIG 24A STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 9933 ROUNDS

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UNCLASSIFIED

ANNEX B

Shot No	<u>INTERMEDIATE</u>				<u>TARGET</u>			
	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	-6	-21	913.4	1669	26	220	674.6	910
2	-3	-26	911.8	1663	46	126	672.0	903
3	-11	-20	913.4	1669	-19	189	679.1	922
4	-9	-28	912.6	1666	28	165	679.5	923
5	1	-37	920.0	1693	81	77	689.1	950
6	-1	-32	920.0	1693	62	100	679.1	922
7	-6	-29	920.0	1693	25	94	683.1	933
8	-6	-29	916.7	1681	14	187	684.0	936
9	-9	-26	915.9	1678	-12	177	669.8	897
10	-7	-30	919.1	1690	2	89	669.8	897

ACCURACY

MPI from POA	<u>Intermediate</u>	<u>Target</u>
X Position	-6 mm	25 mm
Y Position	-28 mm	142 mm

SIZE OF GROUP

Extreme horizontal spread	12 mm	100 mm
Extreme vertical spread	16 mm	144 mm
Size of group	28 mm	244 mm
Extreme spread	20 mm	154 mm

MEASURES OF DISPERSION

SD of X	4 mm	32 mm
SD of Y	5 mm	51 mm
Mean radius	5 mm	54 mm
Group SD	4 mm	42 mm

AMMUNITION

Mean velocity	916 m/s	678 m/s
SD of velocity	3 m/s	6 m/s
Fastest round	920 m/s	689 m/s
Slowest round	912 m/s	670 m/s
Gross difference	8 m/s	19 m/s
Mean bullet energy	1679 J	919 J
SD of energy	12 J	17 J

FIG 24B STEYR AUG S2 AMMO AND WEAPON ANALYSIS AT 9933 ROUNDS

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~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

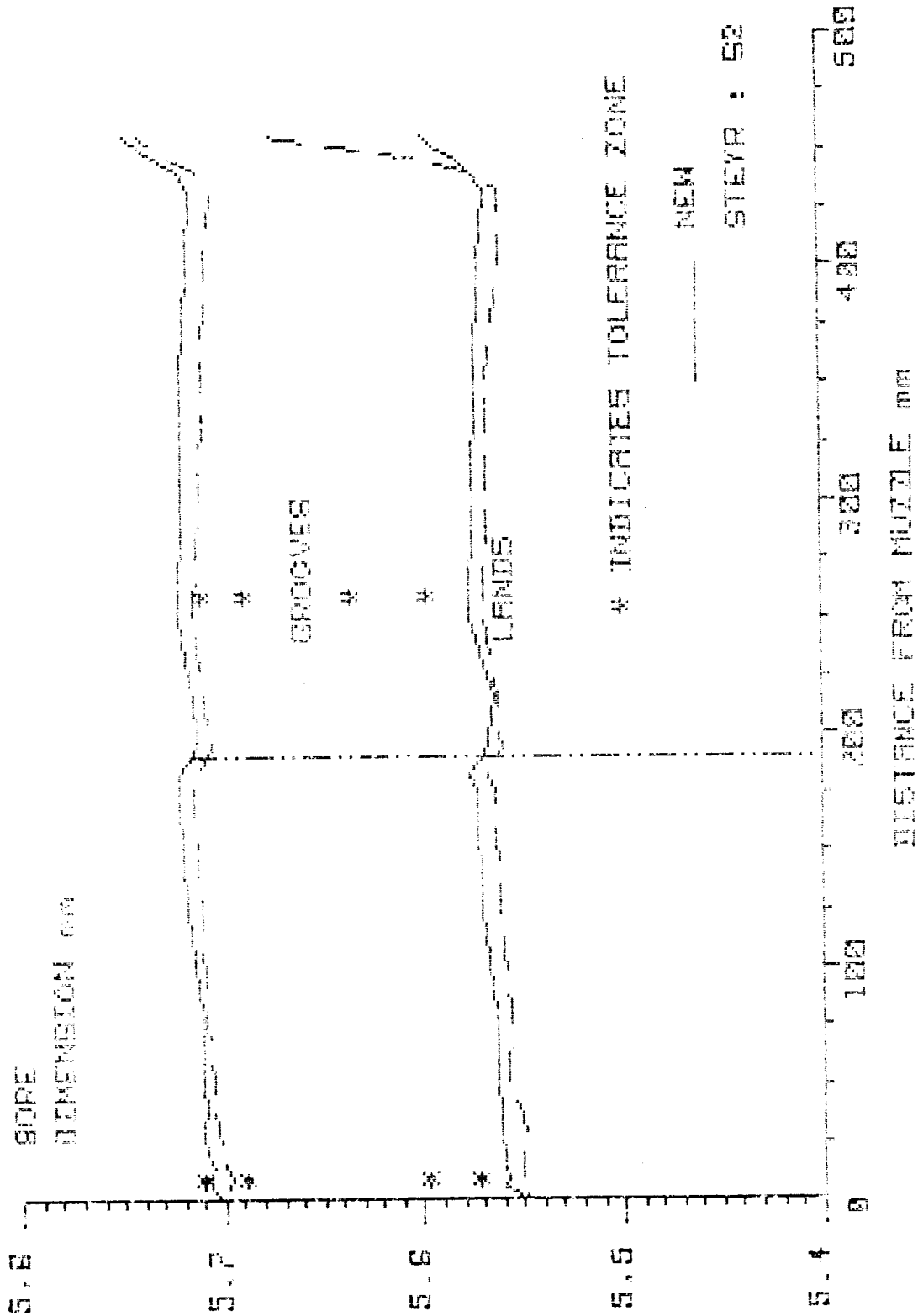


FIG 24C  
STEVR AUG 52 BARREL GRAPH AT 9933 ROUNDS

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ANNEX B

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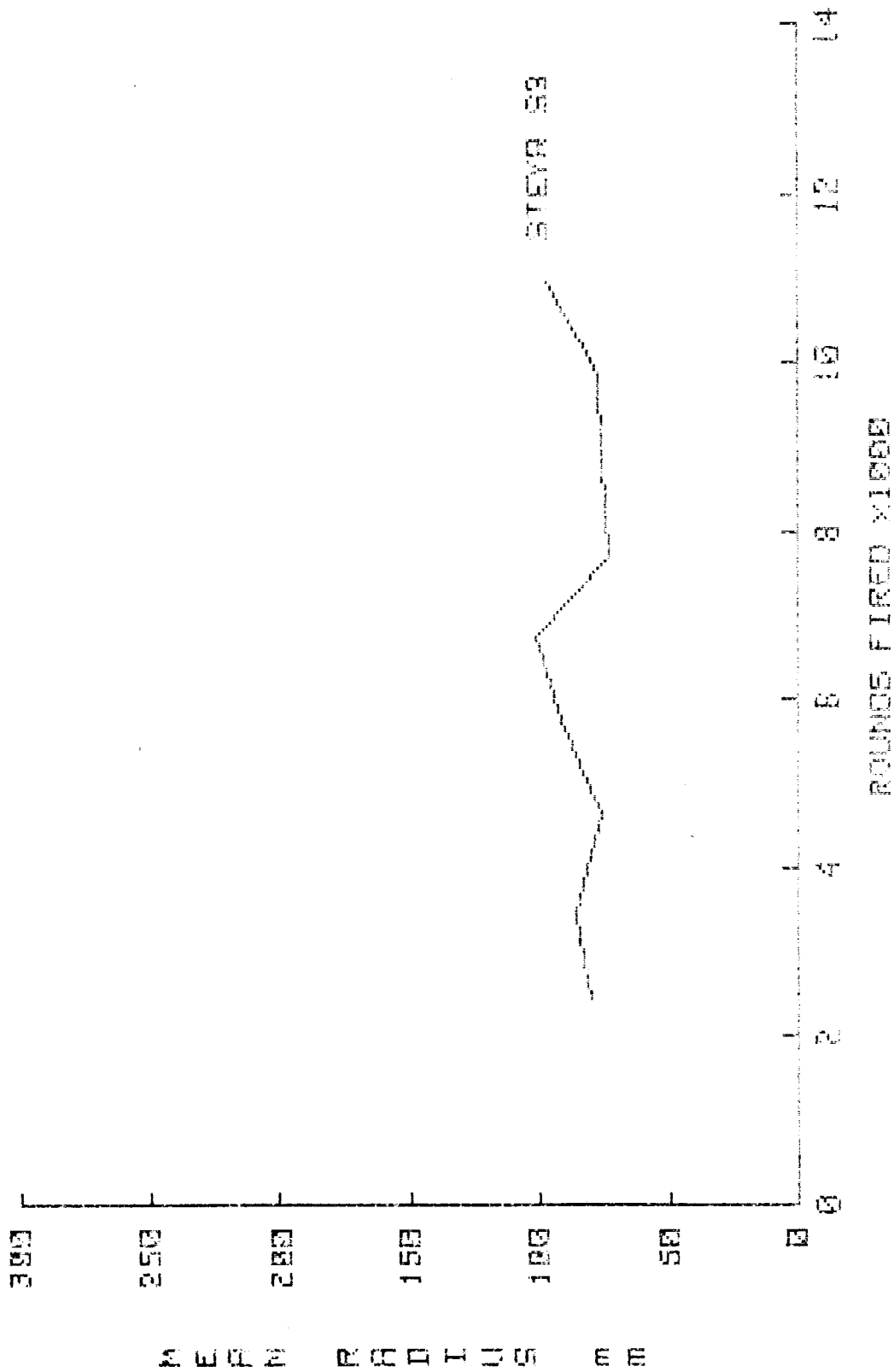


FIG 25  
SARP IW-HOT ACCURACIES 300 m (STEYR AUG 93)

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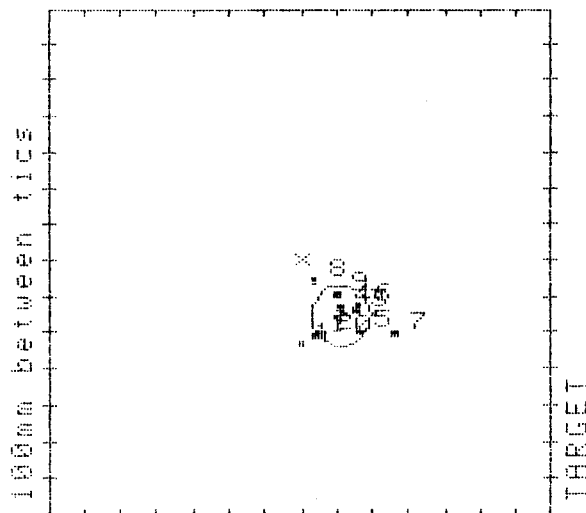
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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY SSS
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	STEYR AUG S3	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	12:17:13
FIRING DATE ->	02/11/84	CYCLE ->	12-3
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	24 metres	RTCM Address ->	#2
INTERMED POA ->	400 mm above T-bar	TEMPERATURE ->	21°C
RANGE Sens A ->	300 metres	WEATHER COND ->	OVERCAST
POA AT TARGET ->	885 mm above T-bar		
FIRING POSITION->	REST		
WIND CONDITIONS->	5 to 6 m/s 178°		
NUMBER OF SHOTS	10		

#### SHOT POSITIONS AT TARGET



#### INTERMEDIATE SHOT POSITIONS

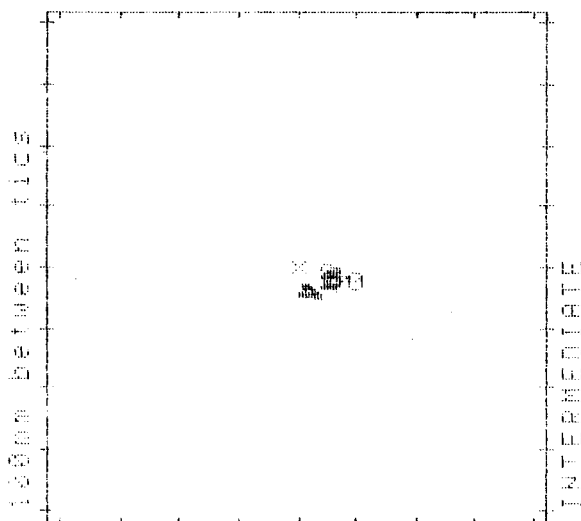


FIG 26A STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 2429 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

Shot No	<u>INTERMEDIATE</u>				<u>UNCLASSIFIED</u>				<u>TARGET</u>	
	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>		
1	11	-43	936.7	1755	6	-227	682.2	931		
2	17	-42	935.8	1751	62	-198	676.4	915		
3	23	-36	946.1	1790	155	-131	678.6	921		
4	23	-35	940.1	1767	112	-125	684.5	937		
5	28	-42	935.8	1751	164	-195	674.6	910		
6	23	-33	941.8	1774	164	-119	669.4	896		
7	35	-45	945.2	1787	270	-202	673.8	908		
8	17	-29	951.3	1810	38	-54	686.8	943		
9	24	-35	944.4	1784	108	-94	686.8	943		
10	22	-42	950.5	1807	37	-204	678.2	920		

ACCURACY

MPI from POA	<u>Intermediate</u>	<u>Target</u>
X Position	22 mm	112 mm
Y Position	-38 mm	-155 mm

SIZE OF GROUP

Extreme horizontal spread	24 mm	263 mm
Extreme vertical spread	15 mm	173 mm
Size of group	39 mm	436 mm
Extreme spread	24 mm	274 mm

MEASURES OF DISPERSION

SD of X	7 mm	79 mm
SD of Y	5 mm	58 mm
Mean radius	7 mm	84 mm
Group SD	6 mm	69 mm

AMMUNITION

Mean velocity	943 m/s	679 m/s
SD of velocity	6 m/s	6 m/s
Fastest round	951 m/s	687 m/s
Slowest round	936 m/s	669 m/s
Gross difference	16 m/s	17 m/s
Mean bullet energy	1778 J	922 J
SD of energy	22 J	16 J

FIG 26B STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 2429 ROUNDS

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~~COMMERCIAL IN CONFIDENCE~~

B-64  
UNCLASSIFIED

ANNEX B

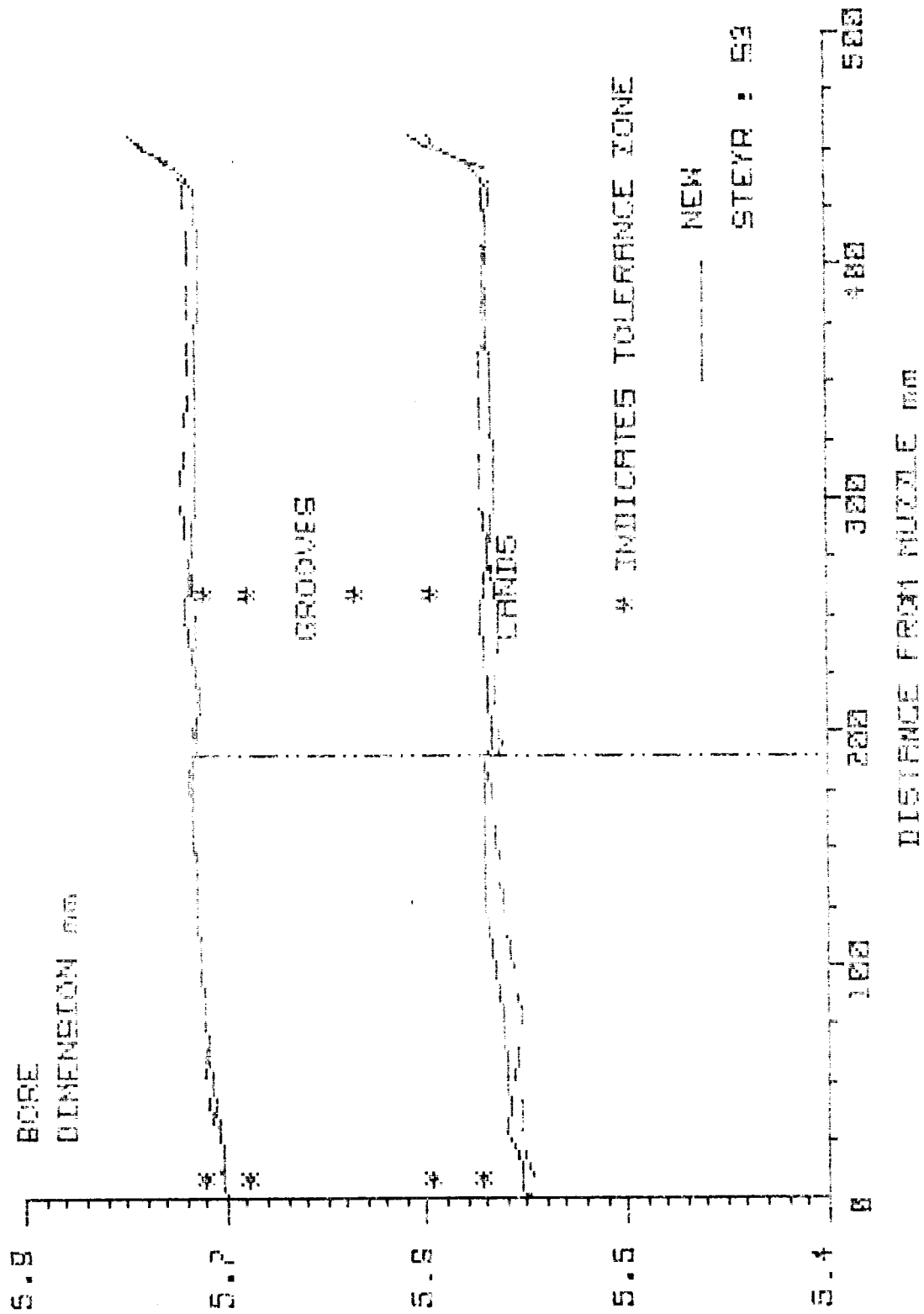


FIG 26C  
STEYR AUG S&S BARREL GRAPH AT 2429 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

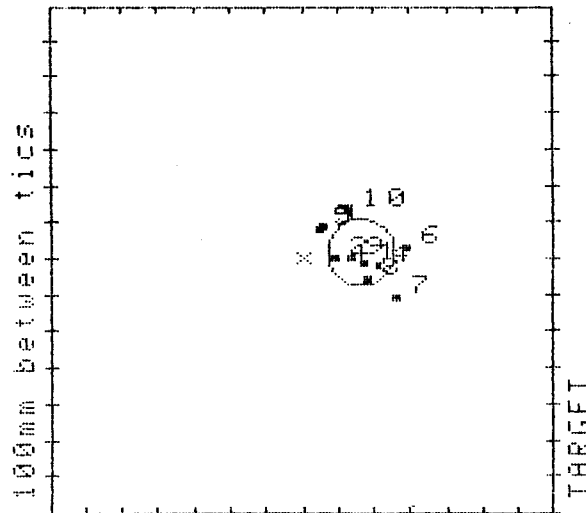
UNCLASSIFIED

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ANNEX B

PROJECT TITLE	->	SARP 300M ACCY	SHOOTER ID	->	CLANCY S.
RANGE ID	->	F2	CALIBRE	->	5.56 mm
WEAPON TYPE	->	STEYR S3	LOT NUMBER	->	13 FNB 83
AMMO IDENTIFIER	->	SS109	PROJECTILE MASS	->	4.000 grams
GROUP TYPE	->	S/S	FIRING TIME	->	14:41:43
FIRING DATE	->	06/12/84	CYCLE	->	48-3 HOT ACCY
SERIAL ID	->	6	RTCM Address	->	#1
RANGE Sens B	->	25 METRES	RTCM Address	->	#2
INTERMED POA	->	435 mm above T-bar	TEMPERATURE	->	22°C
RANGE Sens A	->	300 metres	WEATHER COND	->	4/8ths CLOUD
POA AT TARGET	->	885 mm above T-bar			
FIRING POSITION	->	REST			
WIND CONDITIONS	->	4 - 5 m/sec 2°			
NUMBER OF SHOTS		10			

SHOT POSITIONS AT TARGET



INTERMEDIATE SHOT POSITIONS

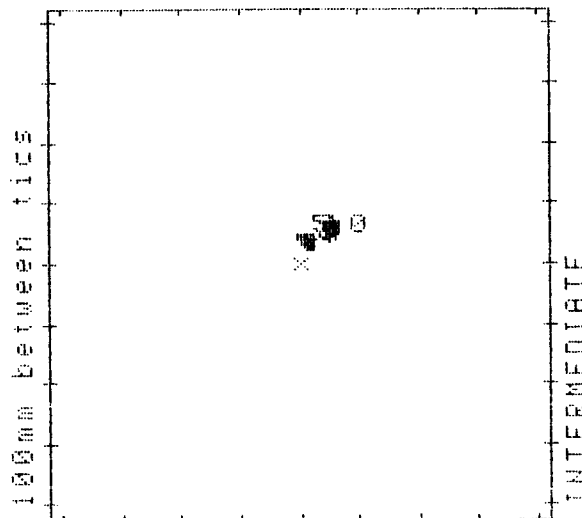


FIG 27A STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 5710 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

B-66  
UNCLASSIFIED

ANNEX B

<u>INTERMEDIATE</u>					<u>TARGET</u>			
<u>Shot</u> <u>No</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>	<u>Horiz</u> <u>(mm)</u>	<u>Vert</u> <u>(mm)</u>	<u>Vel</u> <u>(m/s)</u>	<u>Energy</u> <u>(J)</u>
1	16	40	938.4	1761	180	-11	676.4	915
2	11	35	927.4	1720	97	5	668.5	894
3	5	47	926.6	1717	63	95	667.2	890
4	22	34	935.0	1748	216	-21	673.3	907
5	3	45	935.0	1748	54	87	680.0	925
6	18	38	935.8	1751	292	33	668.5	894
7	22	27	935.8	1751	265	-105	668.1	893
8	18	37	926.6	1717	185	-54	667.2	890
9	16	33	943.5	1780	144	4	669.4	896
10	20	44	936.7	1755	137	132	672.4	904

ACCURACY

MPI from POA	<u>Intermediate</u>	<u>Target</u>
X Position	15 mm	163 mm
Y Position	38 mm	17 mm

SIZE OF GROUP

Extreme horizontal spread	19 mm	238 mm
Extreme vertical spread	19 mm	237 mm
Size of group	38 mm	475 mm
Extreme spread	26 mm	286 mm

MEASURES OF DISPERSION

SD of X	7 mm	80 mm
SD of Y	6 mm	72 mm
Mean radius	7 mm	93 mm
Group SD	6 mm	76 mm

AMMUNITION

Mean velocity	934 m/s	671 m/s
SD of velocity	6 m/s	4 m/s
Fastest round	944 m/s	680 m/s
Slowest round	927 m/s	667 m/s
Gross difference	17 m/s	13 m/s
Mean bullet energy	1745 J	901 J
SD of energy	21 J	12 J

FIG 27B STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 5710 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

B-67

ANNEX B

UNCLASSIFIED

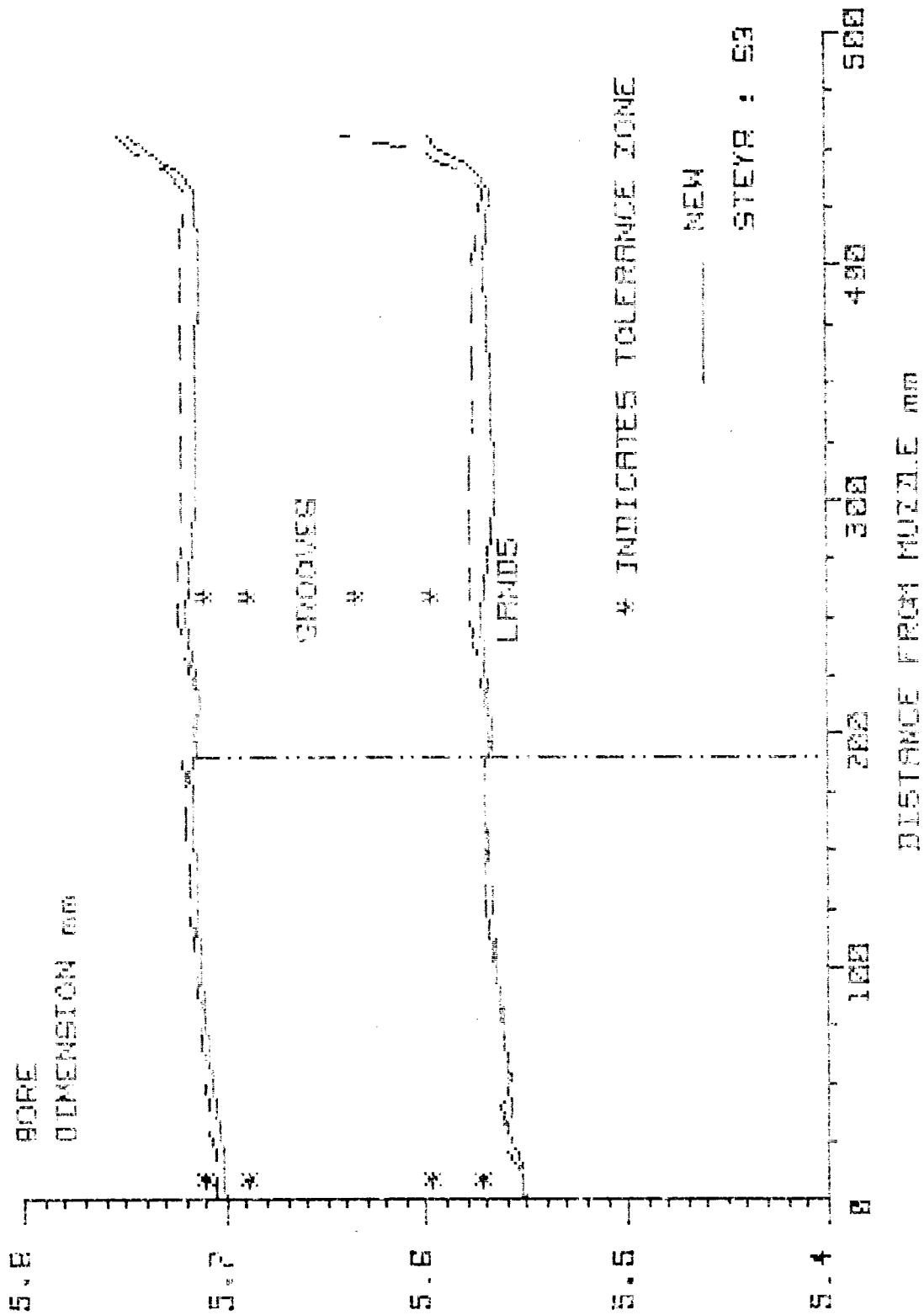


FIG 27C  
STEYR AUG S3 BARREL GRAPH AT 5710 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

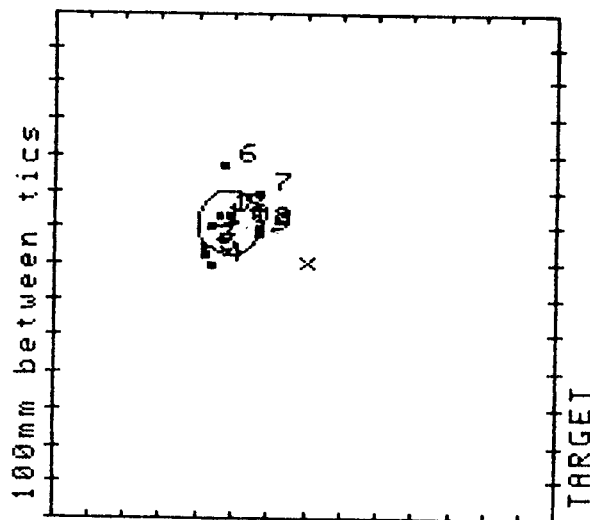
B-68

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ANNEX B

PROJECT TITLE ->	SARP 300M ACCY	SHOOTER ID ->	CLANCY S.
RANGE ID ->	F2	CALIBRE ->	5.56 mm
WEAPON TYPE ->	STEYR S3	LOT NUMBER ->	13 FNB 83
AMMO IDENTIFIER->	SS109	PROJECTILE MASS->	4.000 grams
GROUP TYPE ->	S/S	FIRING TIME ->	16:00:36
FIRING DATE ->	26/02/85	CYCLE ->	110-3 HOT ACCY
SERIAL ID ->	6	RTCM Address ->	#1
RANGE Sens B ->	25 metres	RTCM Address ->	#2
INTERMED POA ->	700 mm above T-bar		
RANGE Sens A ->	300 metres		
POA AT TARGET ->	900 mm above T-bar		
FIRING POSITION->	REST	TEMPERATURE ->	18°C
WIND CONDITIONS->	6 - 8 m/sec 23°	WEATHER COND ->	5/8ths CLOUD
NUMBER OF SHOTS	10		

#### SHOT POSITIONS AT TARGET



#### INTERMEDIATE SHOT POSITIONS

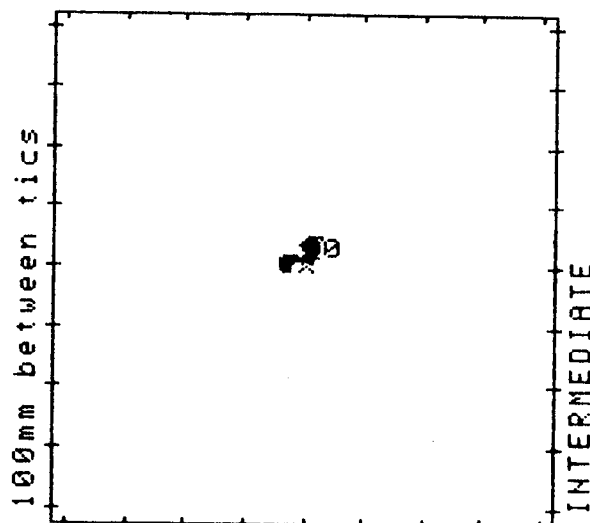


FIG 28A STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 10640 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

Shot No	INTERMEDIATE				TARGET			
	Horiz (mm)	Vert (mm)	Vel (m/s)	Energy (J)	Horiz (mm)	Vert (mm)	Vel (m/s)	Energy (J)
1	-31	10	916.7	1681	-234	137	673.3	907
2	-25	8	906.2	1643	-128	98	668.5	894
3	-34	3	903.9	1634	-283	48	658.7	868
4	-27	-1	899.1	1617	-255	-2	659.1	869
5	-28	2	890.6	1586	-276	24	658.3	867
6	-29	15	903.1	1631	-225	273	667.7	892
7	-18	15	896.8	1608	-127	196	656.6	862
8	-24	10	915.9	1678	-205	138	673.8	908
9	-23	7	907.8	1648	-130	83	665.1	885
10	-32	12	905.4	1640	-260	105	666.4	888

ACCURACY

MPI from POA

Intermediate

Target

X Position

-27 mm

-212 mm

Y Position

8 mm

110 mm

SIZE OF GROUP

Extreme horizontal spread

16 mm

157 mm

Extreme vertical spread

16 mm

275 mm

Size of group

32 mm

432 mm

Extreme spread

20 mm

277 mm

MEASURES OF DISPERSION

SD of X

5 mm

62 mm

SD of Y

5 mm

82 mm

Mean radius

6 mm

89 mm

Group SD

5 mm

73 mm

AMMUNITION

Mean velocity

905 m/s

665 m/s

SD of velocity

8 m/s

6 m/s

Fastest round

917 m/s

674 m/s

Slowest round

891 m/s

657 m/s

Gross difference

26 m/s

17 m/s

Mean bullet energy

1637 J

884 J

SD of energy

29 J

17 J

FIG 28B STEYR AUG S3 AMMO AND WEAPON ANALYSIS AT 10640 ROUNDS

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

~~B-70~~  
UNCLASSIFIED

ANNEX B

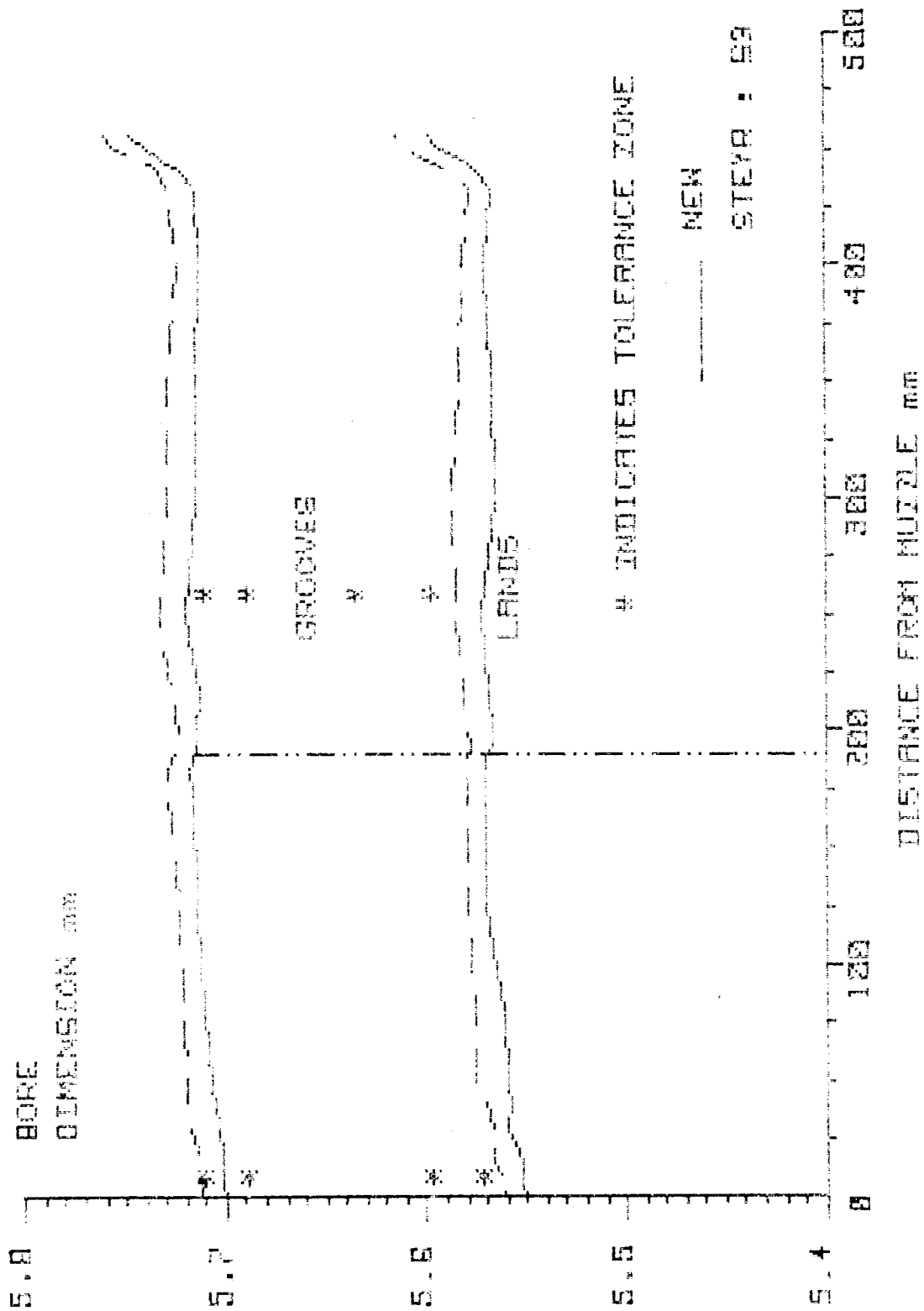


FIG 28C  
STEYR AUG S3 BARREL GRAPH AT 10640 ROUNDS

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~~RESTRICTED~~



~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

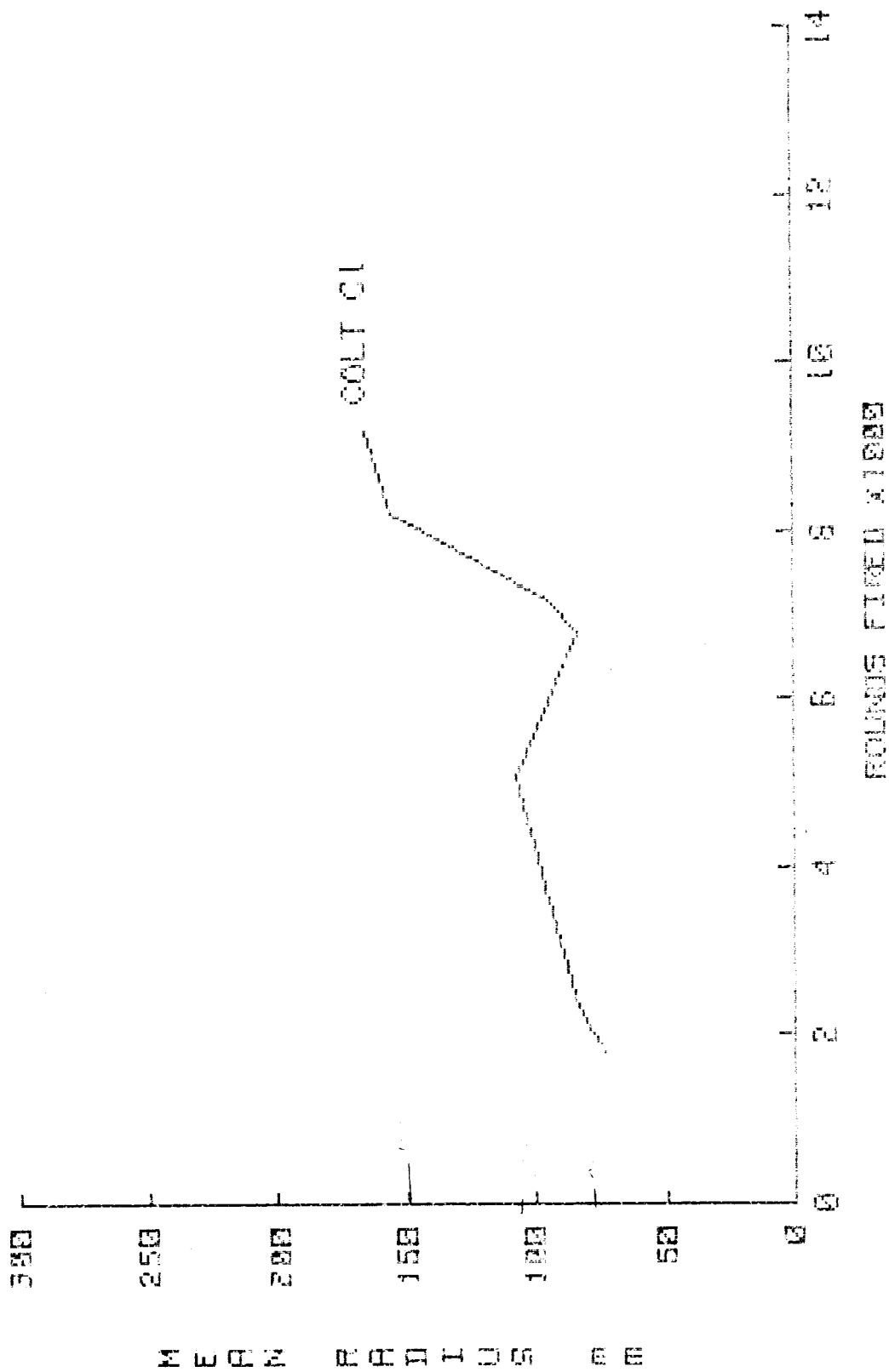


FIG 29

SARP IW-COLD ACCURACIES 300m (COLT M16A2 C1)

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~~COMMERCIAL IN CONFIDENCE~~

B-72  
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ANNEX B

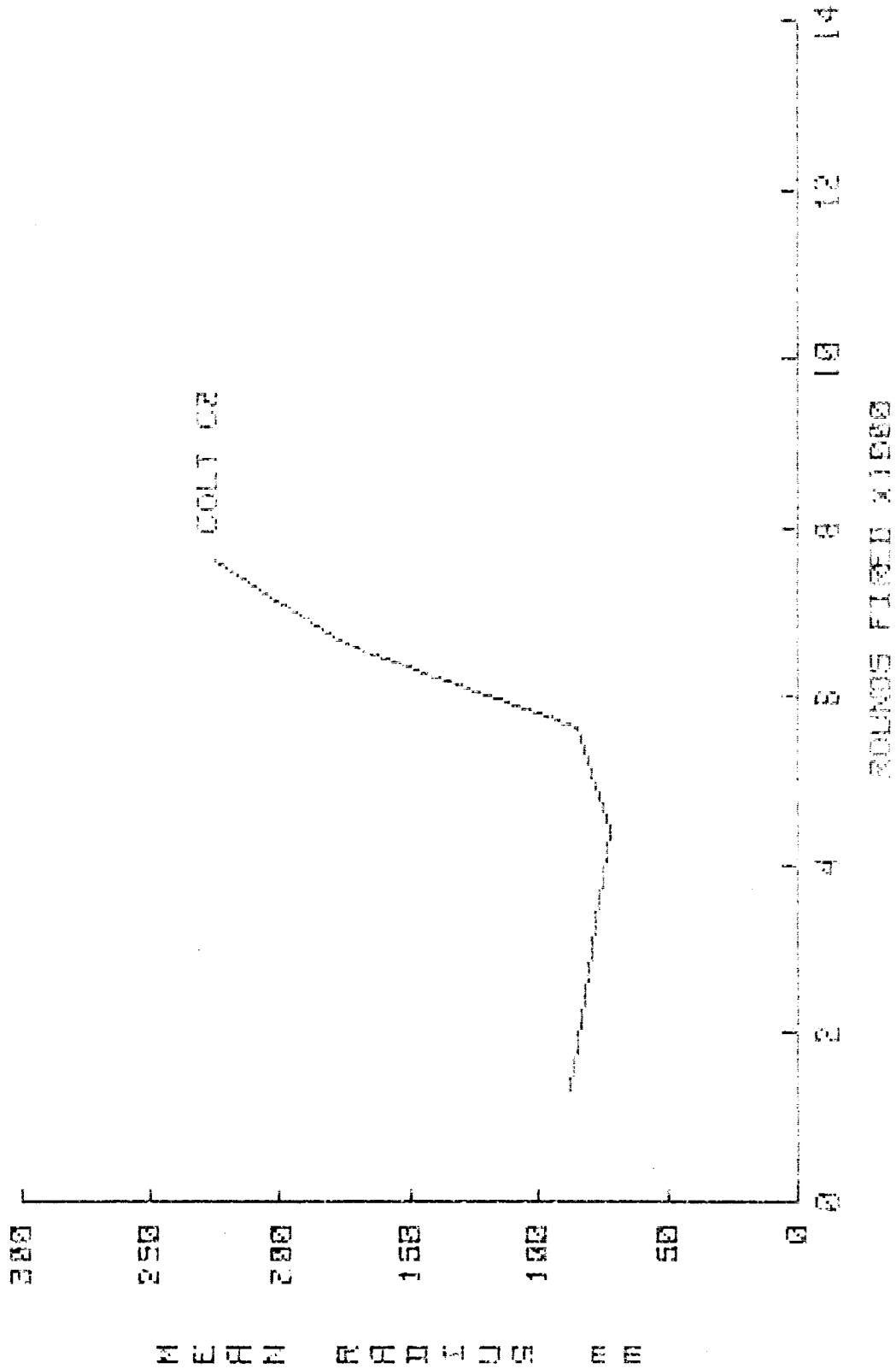


FIG 30  
SARP IW-COLD ACCURACIES 300m (COLT M16A2 C2)

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~~COMMERCIAL IN CONFIDENCE~~

~~B-73~~  
UNCLASSIFIED

ANNEX B

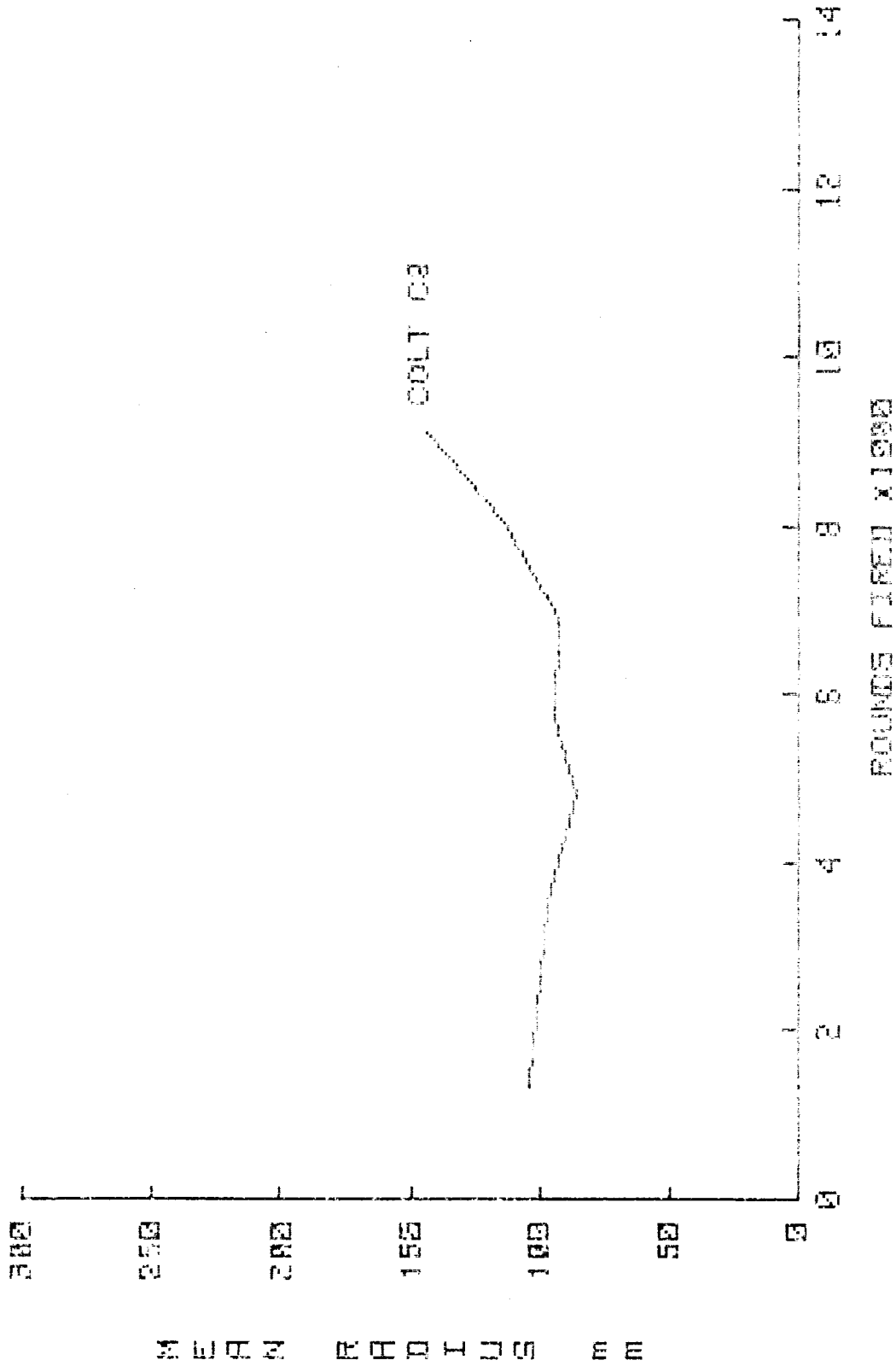


FIG 31  
SARP IN-COLD ACCURACIES 300m (COLT M16A2 C3)

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~~COMMERCIAL IN CONFIDENCE~~

B-74  
UNCLASSIFIED

ANNEX B

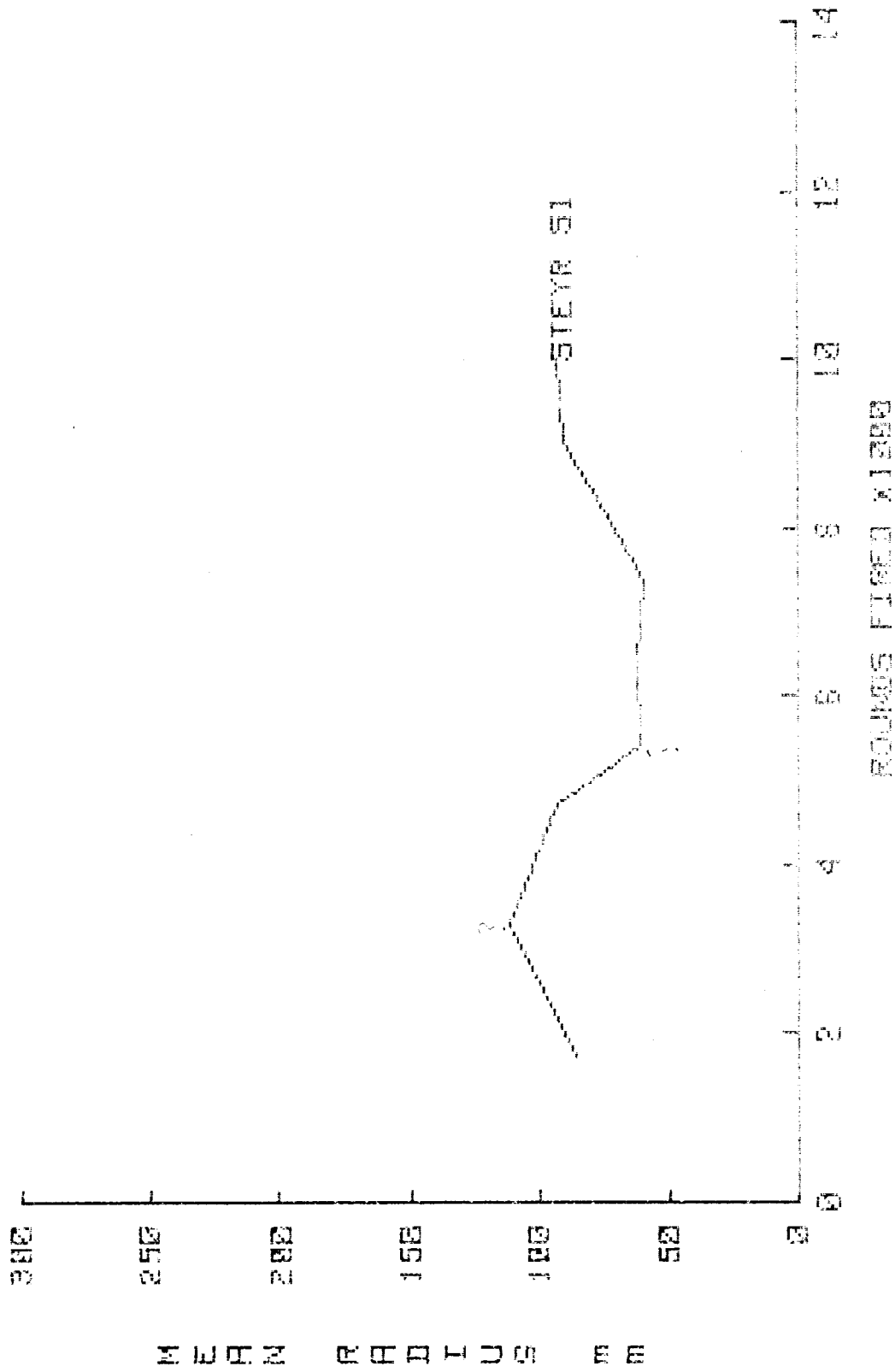


FIG 32  
SARP IN-COLD ACCURACIES 300m (STEYR AUG S1)

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

UNCLASSIFIED

ANNEX B

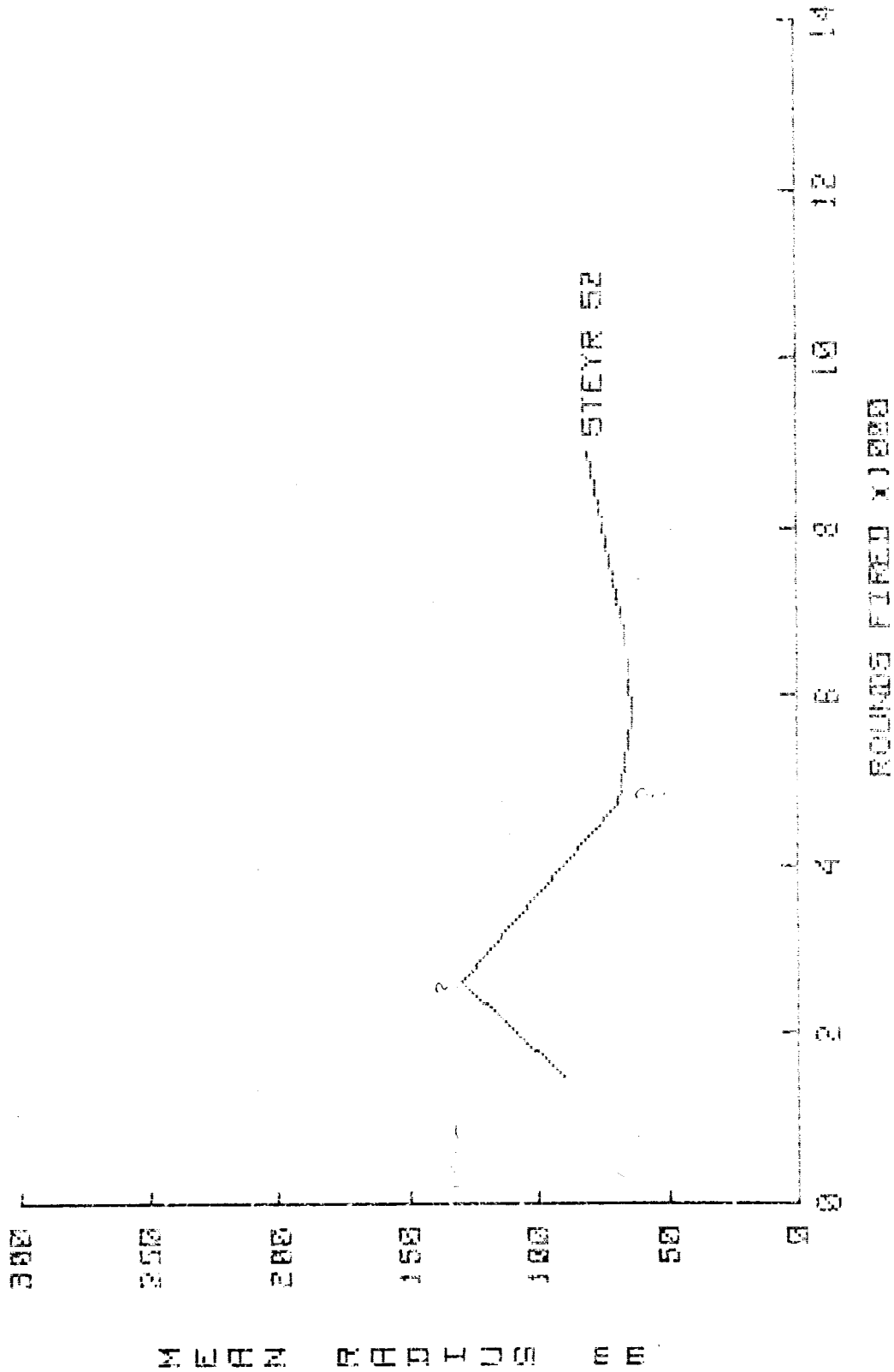


FIG 33  
SARP IW-COLD ACCURACIES 300m (STEYR AUG S2)

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

~~B-76~~  
UNCLASSIFIED

ANNEX B

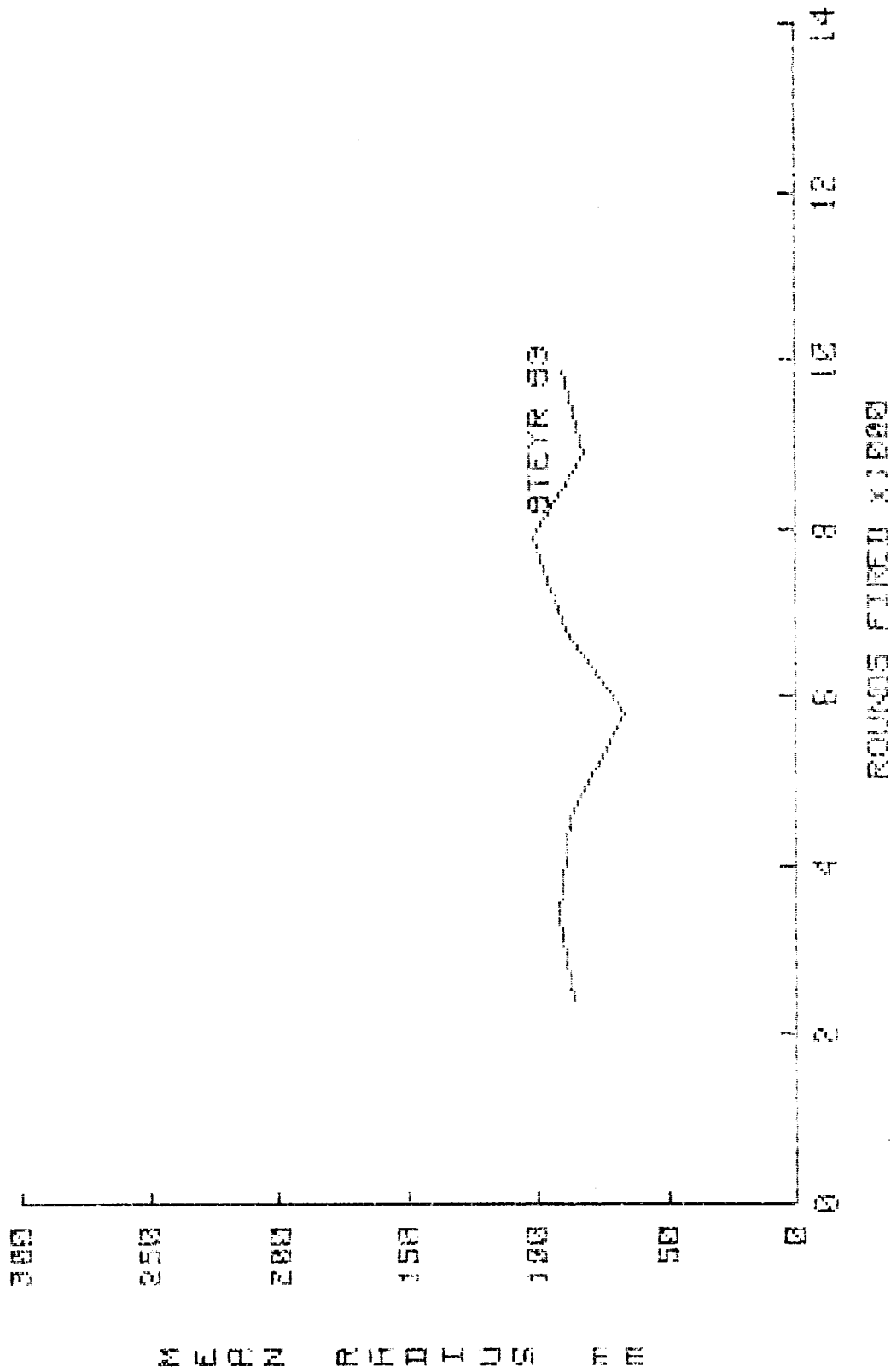


FIG 34  
SARP IW-COLD ACCURACIES 300m (STEYR AUG 93)

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~~RESTRICTED~~

~~COMMERCIAL IN CONFIDENCE~~

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ANNEX B

11. The operating temperatures of the COLTS were always higher than the STEYRS due to the enveloping or covering of the COLT barrels by the handguards.

12. The heat built up for the COLTS could not dissipate as easily as it did for the STEYR, because the STEYR's aluminium upper receiver acts also as a heat sink.

13. Table 1 shows a comparison of weapon temperatures in various positions at the end of an endurance cycle.

TABLE 1 - WEAPON ENDURANCE TEMPERATURES

WEAPON	POSITION	TEMP °C
STEYR AUG	Barrel	67
	Rear of Receiver	116
	Chamber	60
	Commencement of Rifling	142
COLT M16A2	Barrel	105
	Chamber	65
	Commencement of Rifling	195

14. These measurements were chosen at random. They were taken for the same cycle, ambient temperature and weather conditions. They are also indicative of all measurements taken during the endurance phase.

15. The COLTS also presented a problem for the firers during the endurance cycles. The handguards became extremely hot, around 50°C, which prevented the firers from holding and taking correct aim of the weapon on the target.

16. Lubrication of the STEYR was critical during the phase. If the weapon is overlubricated, the rate of fire increases dramatically. An indication of excessive lubrication is an ejection pattern of an acute angle to the front of the weapon. The manufacturer's directions regarding lubrication must be adhered to strictly.

17. The hot rates of fire were performed after the last endurance cycle. A yaw card was placed in front of the muzzle and each pattern photographed.

18. Figure 35 and Figure 36 show normal and the BSO pattern on the yaw cards.

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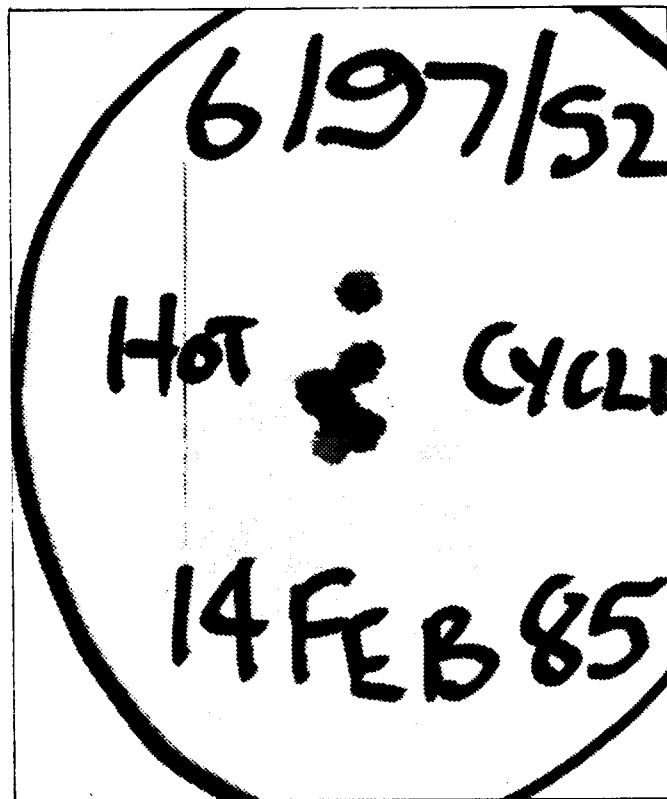
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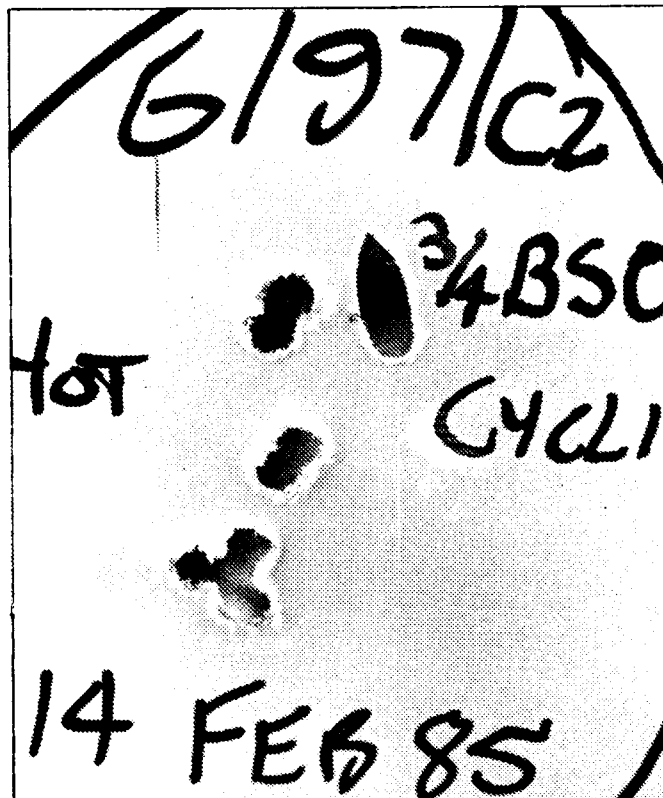
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ANNEX B



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FIG 35 TYPICAL YAW CARD PATTERN



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FIG 36 COLT BSO PATTERN

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ANNEX B

19. The weapons were cleaned, de-coppered, gauged and lubricated after every 1000 rounds in the critical examination stage of the endurance phase.

20. Records of these operations are kept on computer discs at EDE and video tapes of the bores by endoscope have also been kept.

STEYR EXTRACTION PROBLEMS

21. At the commencement of the endurance trial it became apparent that the extractor on the STEYR AUG-A1 weapon systems was not positively engaging and extracting the fired case. This had not been a problem with earlier 1 in 9 twist samples tested by EDE.

22. STEYR were informed of this problem and sent their chief design engineer to investigate. He immediately identified the problem as incorrect rubbers in the extractor spring assemblies; he had in fact brought replacement rubbers with him as he had anticipated the problem.

23. The explanation was, that through an accident of assembly in the STEYR factory, all the weapons received in Australia had been assembled with an extractor rubber spring developed for a specific cold weather arctic trial at weapon operating temperatures ranging from 30°C downwards, and never intended for Australia or any other issue including Austria.

24. The exchange of extractor rubbers in the weapons resolved the problem and DGMAT and DTRIALS were immediately informed with recommendations to modify all the trial weapons.

25. An additional point stressed by the STEYR representative was that we were over lubricating the weapons which had sealed factory lubricated release springs. Additional oiling only increased the cyclic rate of fire which could cause other problems, particularly under adverse conditions.

26. Oiling was discontinued except for one drop on the cam pin in the carrier groove; after which all the weapons performed in an excellent manner.

STOPPAGES, BREAKAGES, FAILURES

27. It must be pointed out here that although parts of both systems were replaced because of breakages, not all of those parts caused malfunctions or stoppages.

28. Table 2 shows details of COLT and STEYR weapon related stoppages.

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TABLE 2 ~ WEAPON RELATED STOPPAGES

SYSTEM	STOPPAGE			
	FJ	FX	FBC	OT
STEYR	9	4	-	1
COLT	11	1	4	-

29. TABLE 3 shows the magazine related stoppages for both systems.

TABLE 3 ~ MAGAZINE RELATED STOPPAGES

SYSTEM	STOPPAGE				
	FF	DF	FBR	BOB	FML
STEYR	4	9	9	1	-
COLT	-	-	16	2	1

30. With the STEYR magazine, most of the feed problems, especially the double feeds (DF) were attributable to a manufacturing problem. *See Figure 37*

31. The fullering, or guide for the rounds, had been scraped or knife cleaned in order to remove any excess plastic caused by a fin between the moulds. *See Figure 38*

32. This de-burring process removed the feeding control of the fullering at the magazine opening causing a double feed.

33. Figures 37 and 38 show sectioned STEYR magazines with and without the de-burred fullering.

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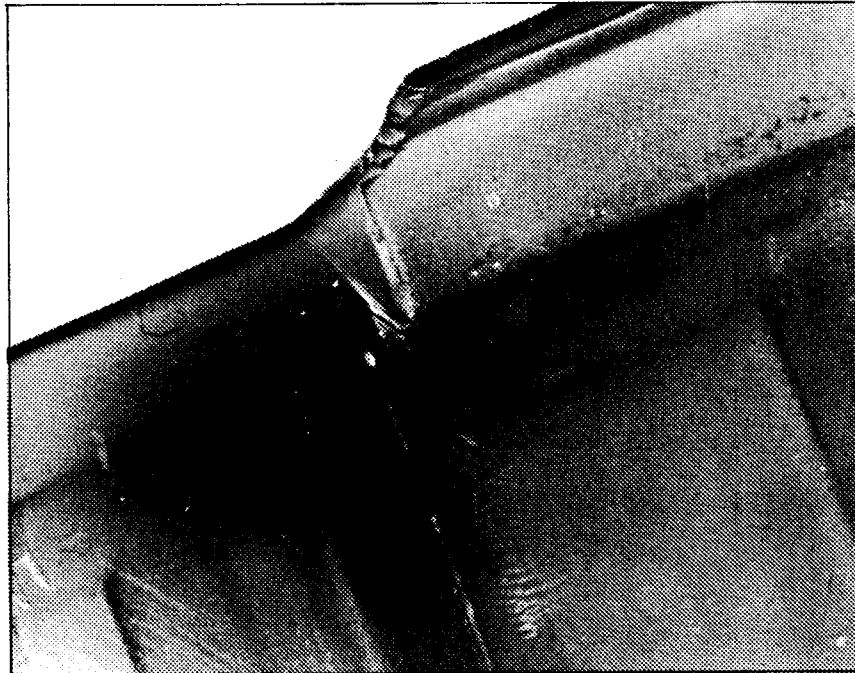
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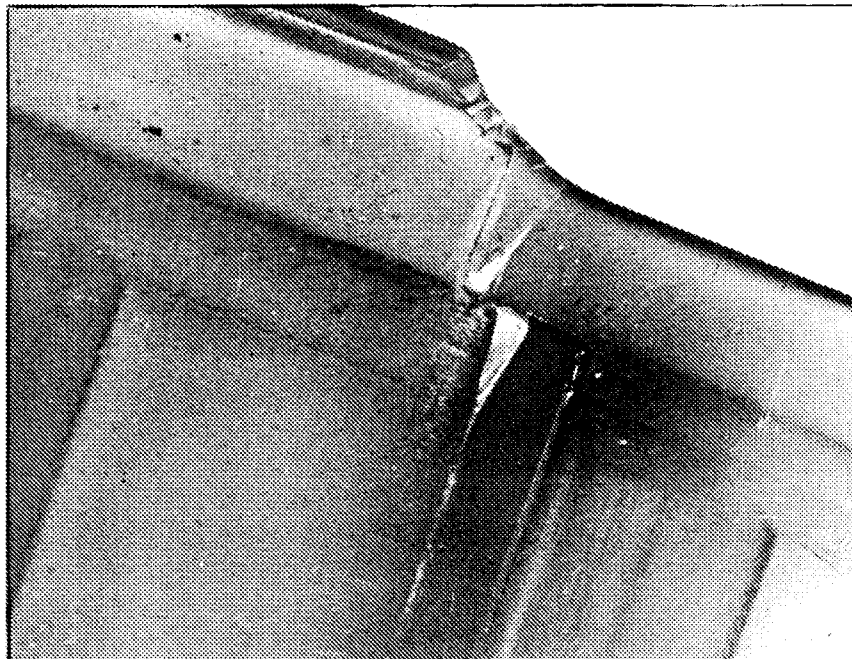
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FIG 37 NORMAL STEYR MAGAZINE



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FIG 38 KNIFED FULLERING ON STEYR MAGAZINE

34.

Table 4 and Table 5 show COLT and STEYR failures.

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ANNEX B

TABLE 4 - COLT FAILURES

Weapon	Item	Item Rounds
C1	Magazine Catch Barrel FX	703 6000 6290
C2	FX FX Barrel	1127 5664 8599
C3	FX Barrel	2861 8000

35. The FX failures are in accordance with the ASR, page B-6, para 17(a) as they could not be rectified within 30 seconds.

36. In all instances, a cleaning rod was needed to remove the stuck case.

37. In relation to Durability, ASR page B-7, para 19, the COLT barrels, which require workshop removal and replacement, failed accuracy durability life at 6000 rounds. They were capable of further firing but one gave a BSO and dispersion increased by 100%.

TABLE 5 - STEYR FAILURES

Weapon	Item	Item Rounds
S1	Spring, Ejector	8976
S2	Extractor Axis Pin	8661
S3	Firing Pin	7785

38. Table 6 and Table 7 show the breakages for each weapon system.

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TABLE 6 - COLT BREAKAGES

Weapon	Item	Item Rounds
C1	-	-
C2	Gas Rings	4468
C3	Extractor Rubber Spring, Ejector Dust Cover	3685 3685 6830

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TABLE 7 - STEYR BREAKAGES

Weapon	Item	Item Rounds
S1	Spring, Gas Piston	4551
	Extractor Axis Pin	4551
	Spring, Gun Lock	5553
	Locking Piece	5553
	Spring, Ejector	8976
	Firing Pin	7978
	Spring, Gun Lock	5075
	Extractor	
	(Damaged by Faulty Primer)	8634
	*Extractor Rubber	9450
S2	*Spring, Extractor	10841
	Spring, Gun Lock	6721
	Extractor Axis Pin	8661
	*Extractor	8661
S3	*Extractor Rubber	9146
	Spring, Gun Lock	8875
	Firing Pin	7785
	Extractor Rubber	9427
	Extractor	10468
	Cocking Piece	10640

- \* Notes (1): Changed because of ejection path becoming erratic: had not caused stoppages or failures.
- (2): Breakages establish component life, but in all cases the weapons continued to function under operational conditions.

39. TABLE 8 is a tabulation of all stoppages, breakages and failures for each weapon used during the phase.

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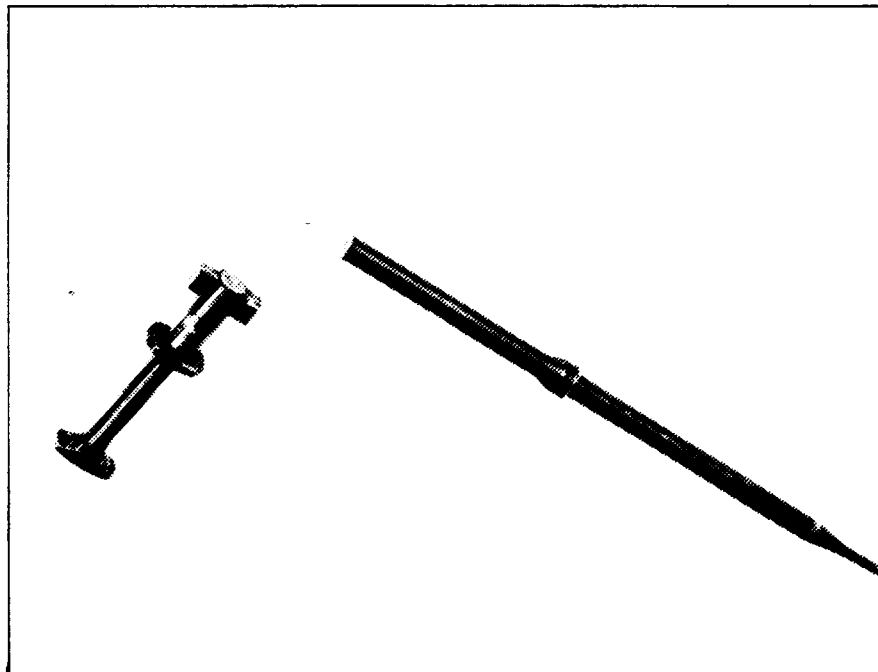
ANNEX B

TABLE 8 - WEAPON INCIDENTS

Weapon	Stoppages	Failures	Breakages
C1	10	3	-
C2	3	3	1
C3	22	2	3
S1	26	1	10
S2	2	1	4
S3	9	1	5

40. The firing pin of weapon S1 had been broken during an endurance cycle. It completed the cycle and, during critical examination, was found to be broken.

41. This is indicated by the mushroomed effect on the fracture. See figures 39 and 40.



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FIG 39 BROKEN STEYR FIRING PIN

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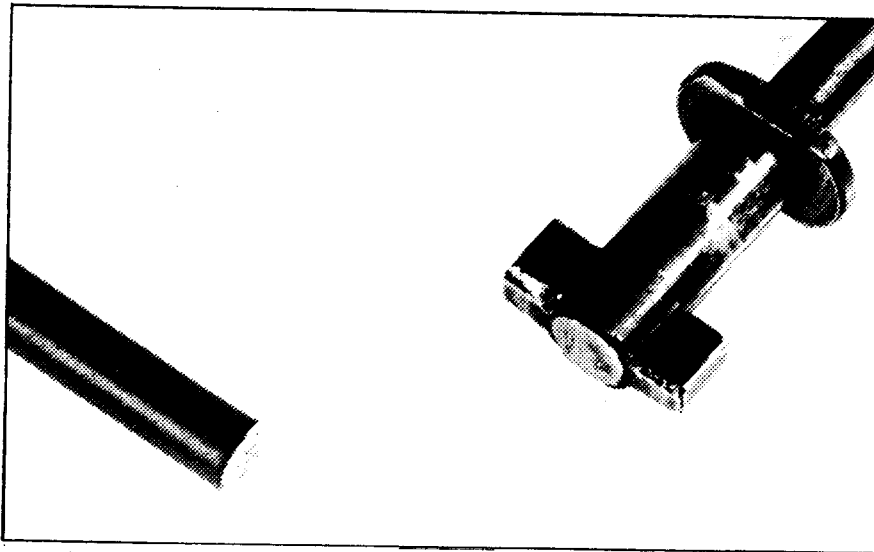


FIG 40 BROKEN STEYR FIRING PIN

42. After each endurance cycle sixty dry hand manipulations were performed. No incidents occurred during these manipulations.

43. TABLE 9 details the hit probabilities for each of the endurance weapons from 6000 rounds to the end of the test.

44. The hit probability,  $P(h)$ , is derived from actual firings of hot accuracies at 300 m. It is computed from the standard deviations for the x axis and y axis.

45. The target size used was 1120 mm high x 560 mm wide. The Effective Range (400 m) requirement is a  $P(h)$  of 95% on this target.

46. For Neutralization Range (600 m) the  $P(h)$  requirement is 95% for a hit of one shot in four on a target 3 m in diameter.

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TABLE 9 - HIT PROBABILITIES P(h)

Weapon	Number of Rounds											
	6000		7000		8000		9000		10000			
C1	Range(m) P(h)	400 91.5%	600 100%	400 79.3%	600 100%	400 64.8%	600 100%	400 92.3%	600 100%	400 64%	600 100%	
C2	Range(m) P(h)	400 77.4%	600 100%	400 81.6%	600 100%							
C3	Range(m) P(h)	400 96.3%	600 100%	400 100%	600 100%	400 83.8%	600 100%	400 86.3%	600 100%	400 73.3%	600 100%	
S1	Range(m) P(h)	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	
S2	Range(m) P(h)	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	
S3	Range(m) P(h)	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	400 100%	600 100%	

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APPENDIX 1

STEYR - COCKING PIECE/SAFETY SEAR

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APPENDIX 1 TO  
ANNEX B TO  
PART THREE TO  
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STEYR - COCKING PIECE/SAFETY SEAR

Report on Damage to Safety Sear

1. In the course of firing the STEYRs on the endurance trial, it was found that on several occasions the weapon failed to go fully into battery thus causing a stoppage. It was also found that the safety sear in the trigger mechanism was being damaged by the cocking piece.
2. An investigation into this problem revealed the following points:
  - a. The gun lock assembly can move in the butt assembly, to the right.
  - b. The cocking piece is loose in the gun lock, and can move left and right.
  - c. The trigger mechanical assy can move in the butt left and right.
3. These conditions can allow the cocking piece to move to the left and catch on the right hand side of the safety sear.
4. This movement to the left is caused by the gas piston and operating rod being on the right side of the weapon.
5. A modification was made to the cocking piece, as shown in Figure 1, and the weapon was fired for a total of 915 rounds, with no marks showing on the safety sear. There were no stoppages recorded after this modification.
6. It would appear that this simple modification eliminates both problems associated with the cocking piece.

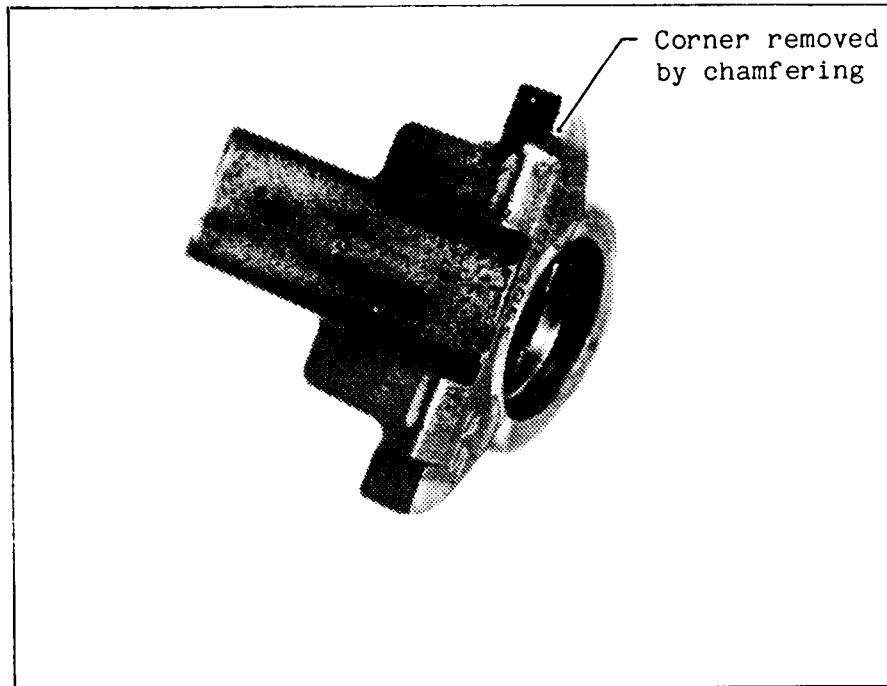
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APPENDIX 1



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FIG 1 STEYR COCKING PIECE

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PART THREE

ANNEX C

ACCURACY AND DISPERSION - PHASE 2

This Annex contains results for Accuracy and Dispersion - Phase 2 of the trial. The following figures are also included.

- FIG 1      SARP - IW MEAN RADIUS VERSUS RANGE FOR SINGLE SHOTS  
            PHASE 2
- FIG 2      SARP - IW MEAN RADIUS VERSUS RANGE FOR 3 ROUND BURSTS  
            PHASE 2
- FIG 3      C1 - BARREL GRAPH AT 10622 ROUNDS
- FIG 4      C3 - BARREL GRAPH AT 10475 ROUNDS
- FIG 5      S1 - BARREL GRAPH AT 11464 ROUNDS
- FIG 6      S2 - BARREL GRAPH AT 10215 ROUNDS
- FIG 7      S3 - BARREL GRAPH AT 11292 ROUNDS

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ANNEX C TO  
PART THREE TO  
EDE 17/85

ACCURACY AND DISPERSION - PHASE 2

REFERENCE:      A.    EDE ENGINEERING EVALUATION PROGRAMME - SERIAL 8

1.            This annex gives results for Accuracy and Dispersion - Phase 2 of the trial.
2.            This phase was performed to determine the effects of the endurance phase on the weapons.
3.            All firings were at 400 and 600 m. The programmes were the same as that of Phase 1.
4.            Fig 1 shows the results of the single shots.
5.            Fig 2 shows the results of the three round bursts.
6.            Comparisons of these figures can be made with Fig 6 and Fig 7 of Part Three, Annex A.
7.            The STEYRS, for the single shot, were not fired using the 1 x 4 scope. Therefore better results would be expected.
8.            The 1 x 4 scope was not available for either the single shot or 3 round burst accuracies of the STEYR at the completion of the trial at 600 m. The normal optical sight for the STEYR which is not effective over 500 m due to the limit of its field of view, was used at 600 m. This explains its inferior dispersion which was caused by an optical limitation of the sight, not the weapon. ASR 48.8 only requires neutralizing fire at this range from the Individual Weapon (IW), which it still satisfies.

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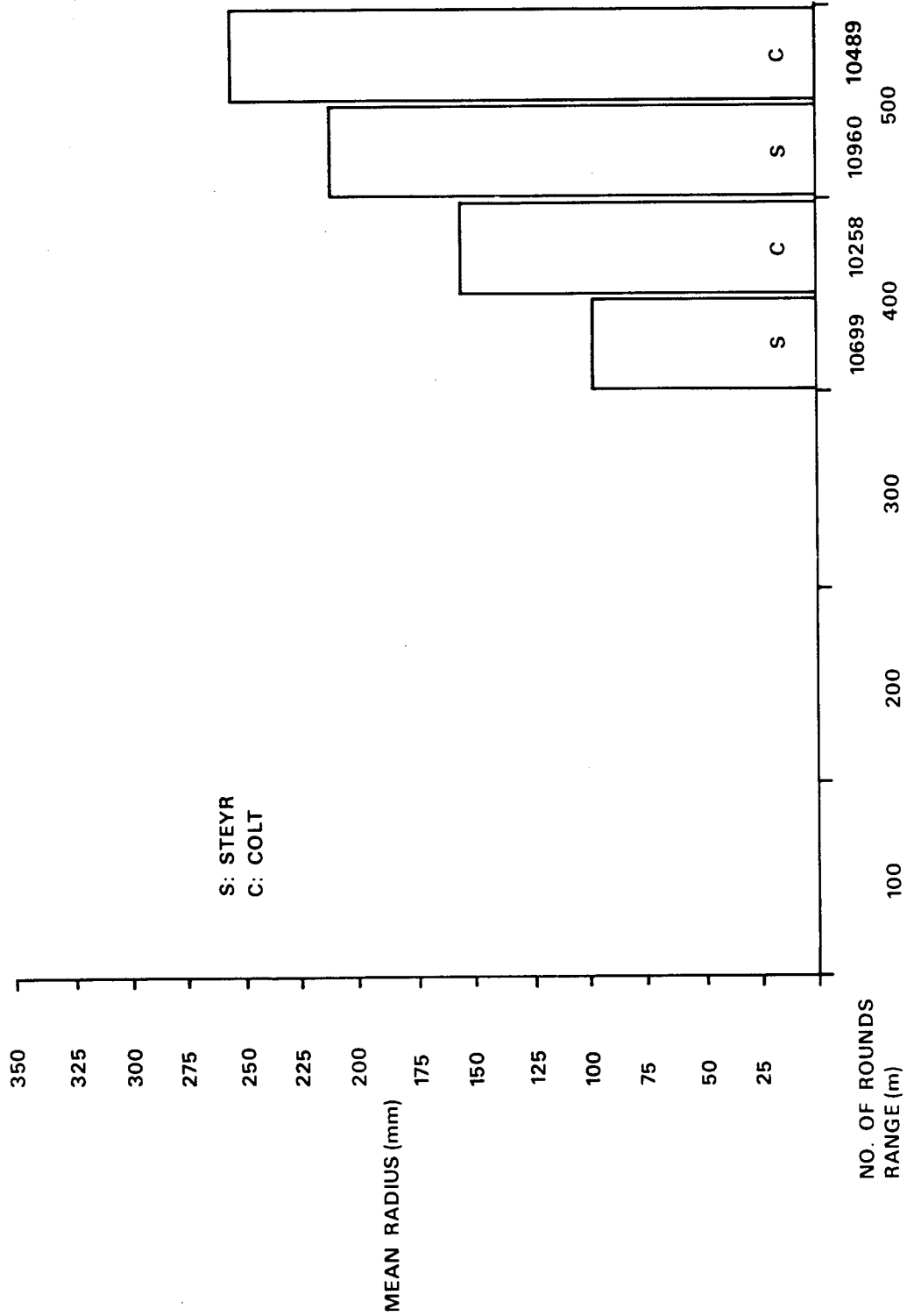


FIG 1: SARP - IW MEAN RADIUS VERSUS RANGE FOR SINGLE SHOTS PHASE 2

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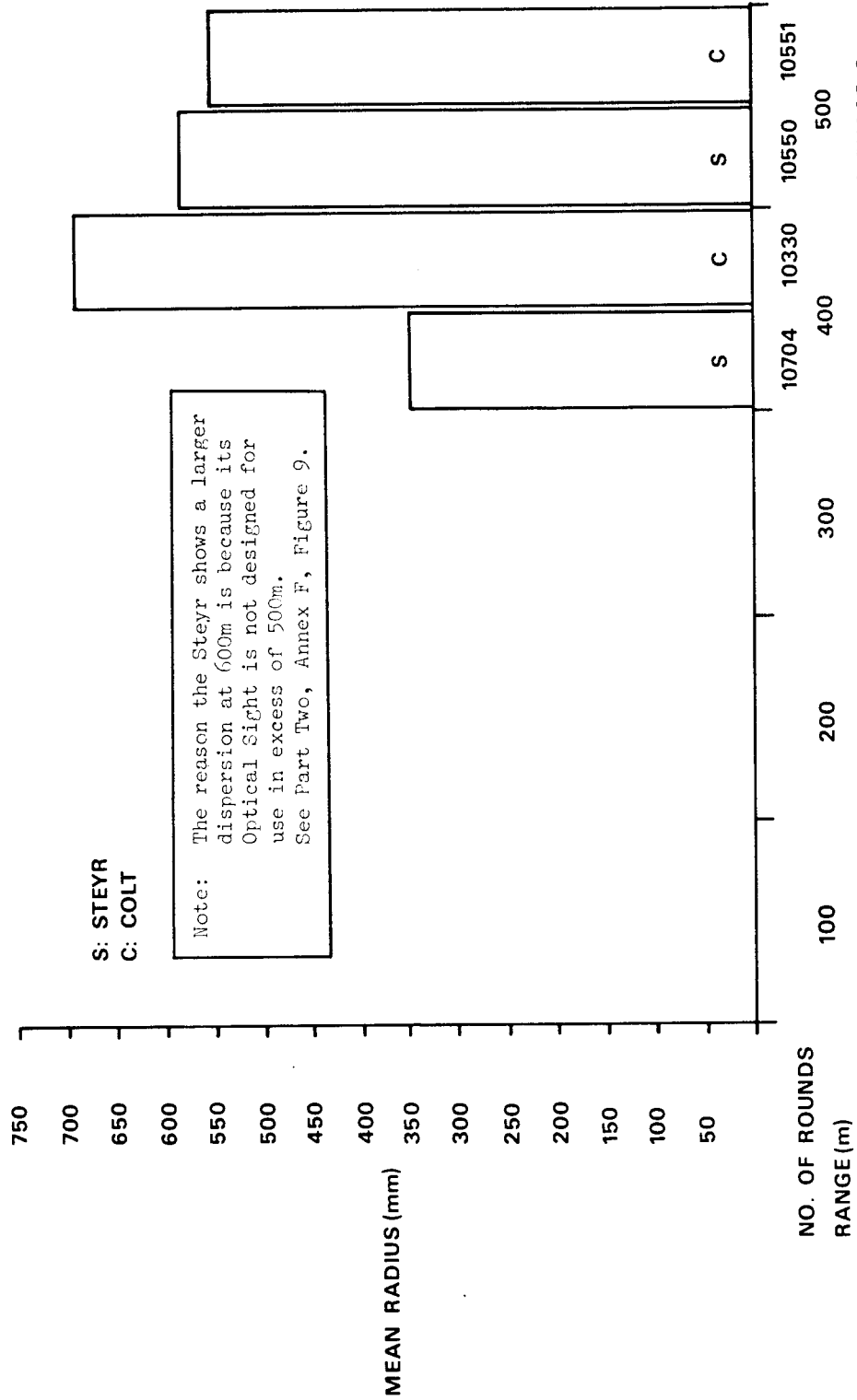


FIG 2: SARP - IW MEAN RADIUS VERSUS RANGE FOR 3 ROUND BURSTS PHASE 2

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ANNEX C

9. Figure 3 to Figure 7 show the barrel graphs of the remaining trial weapons at the end of this phase. From these graphs it can be seen there is no excessive wear.

10. Weapons C1 and C3 show wear at the commencement of rifling. S1, S2 and S3 also show wear at the commencement of rifling.

11. Some plots show the bores to be getting smaller. This is probably due to remaining copper in the barrel.

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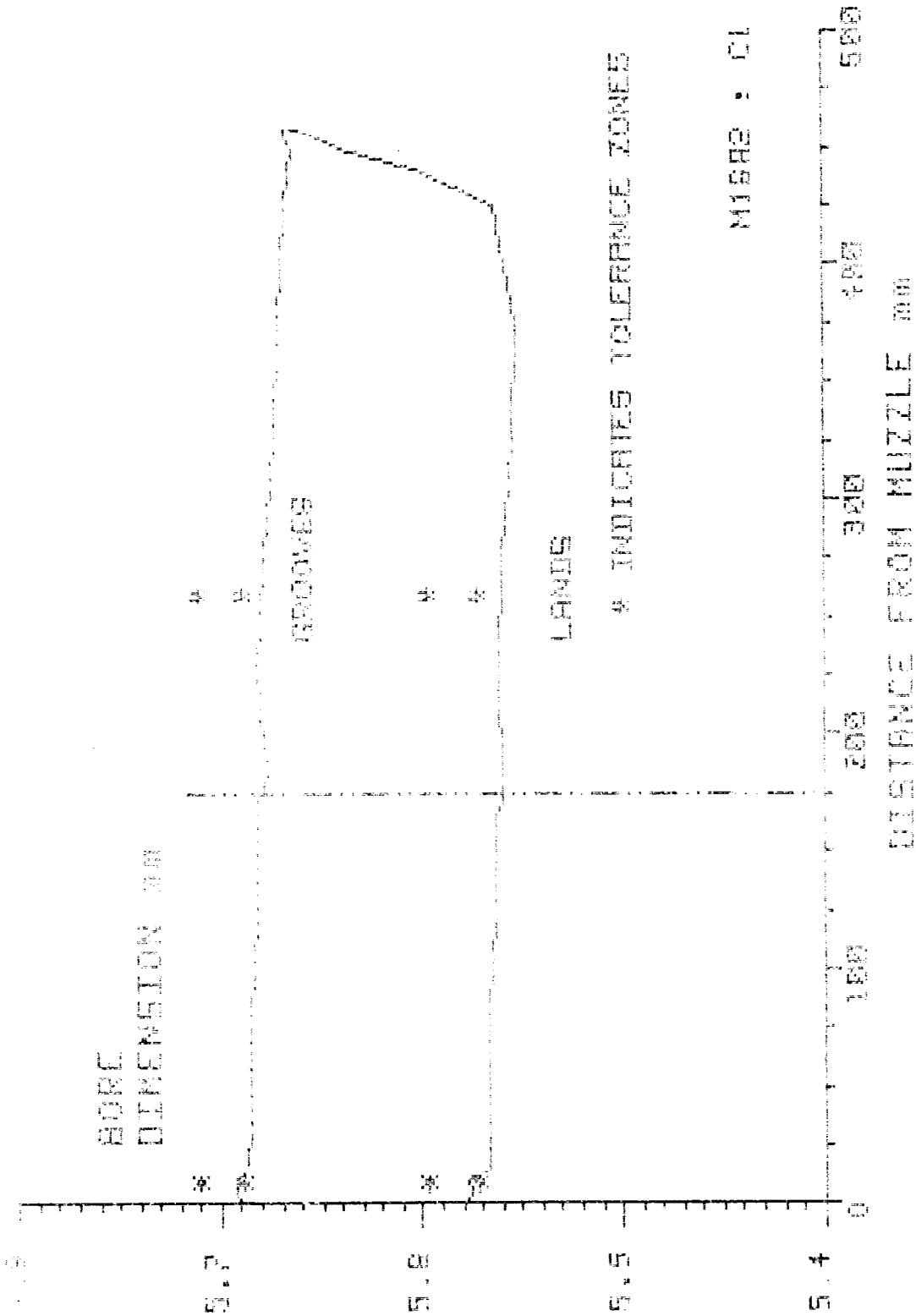


FIG 3 BORE DIMENSION GRAPH AT 17822 ROUNDS

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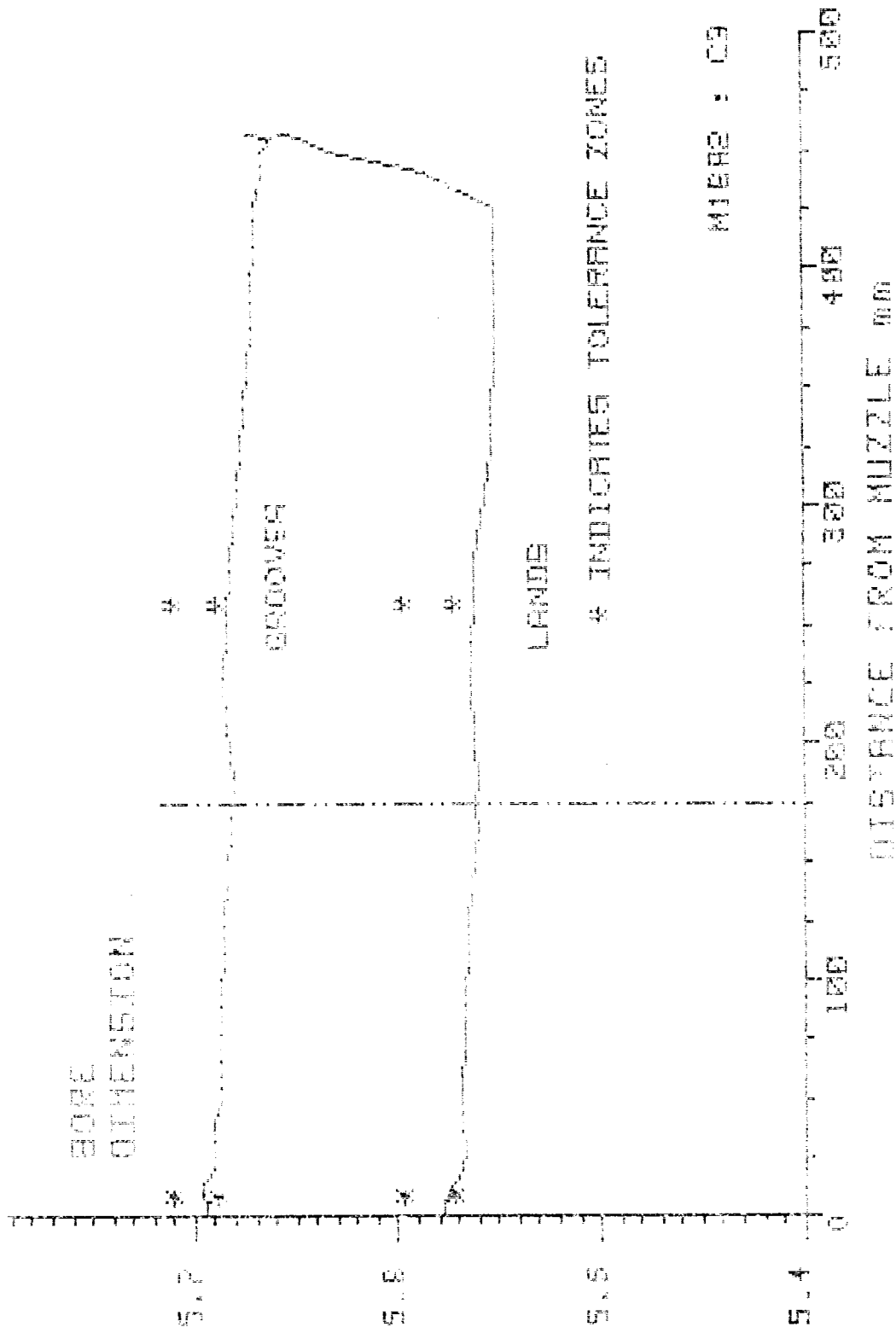


FIG 4  
C9 - Bore Dimension Graph

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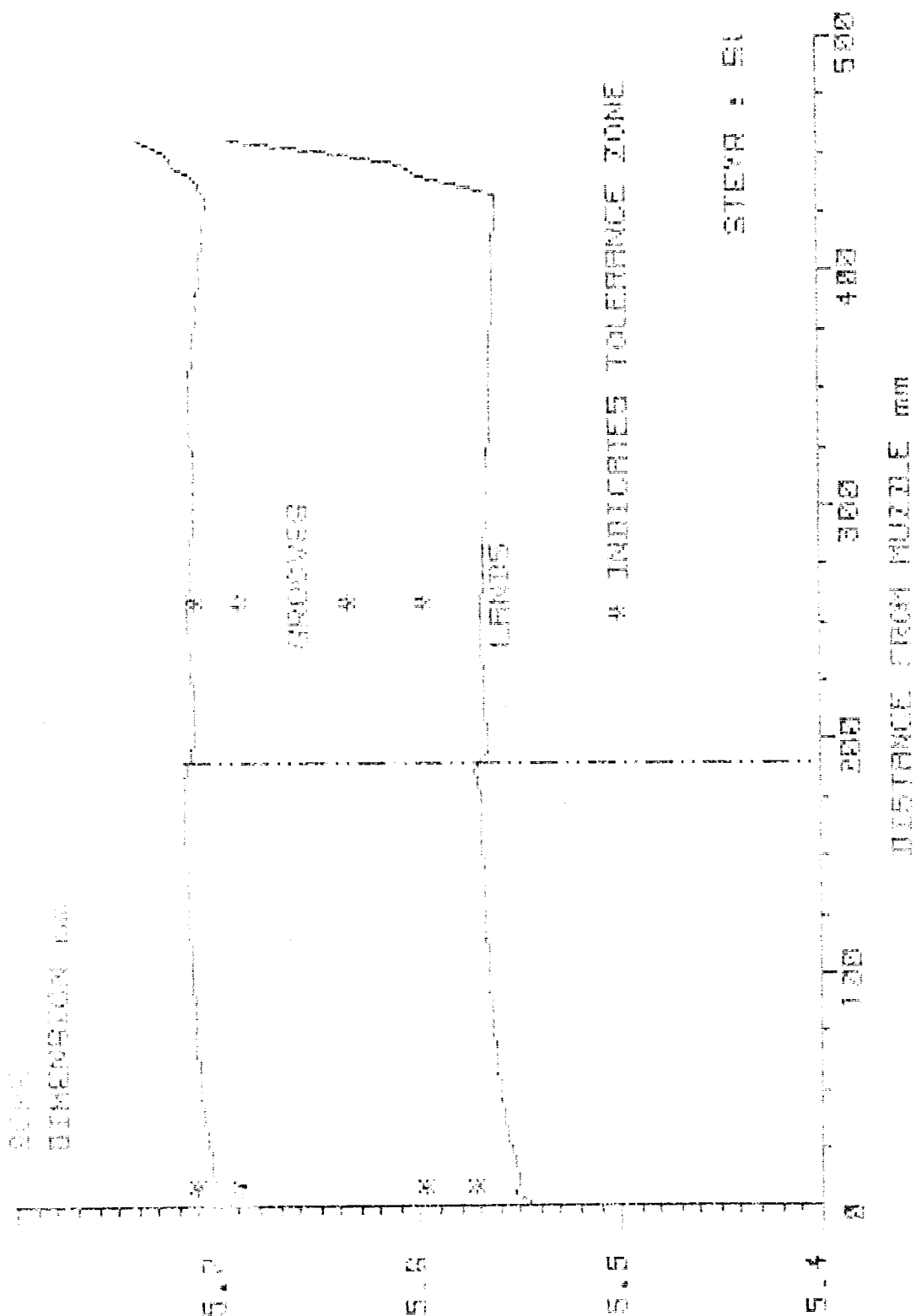
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## ANNEX C

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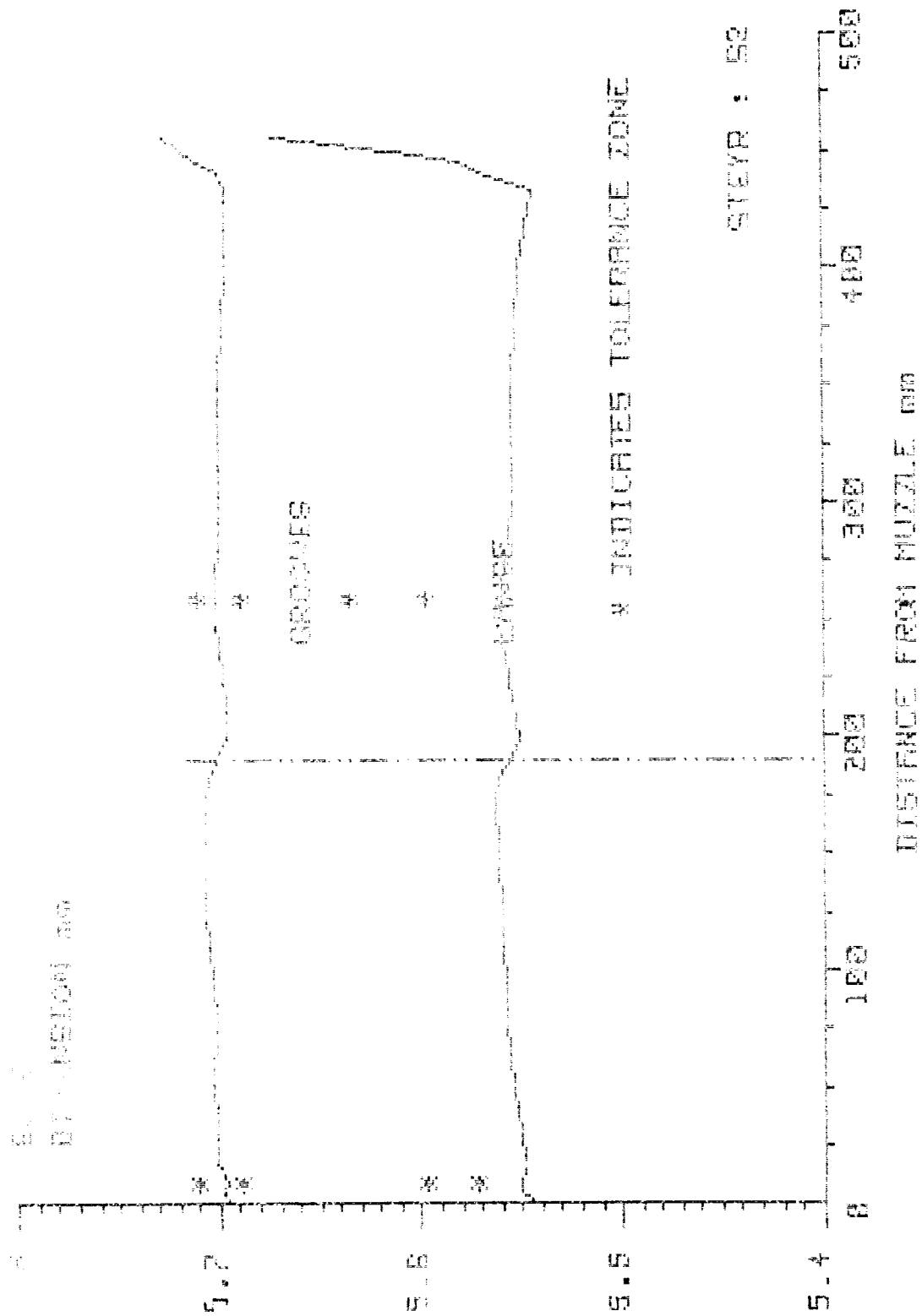


FIG 5  
S2 - GROUPS FORM AT 10015 MM

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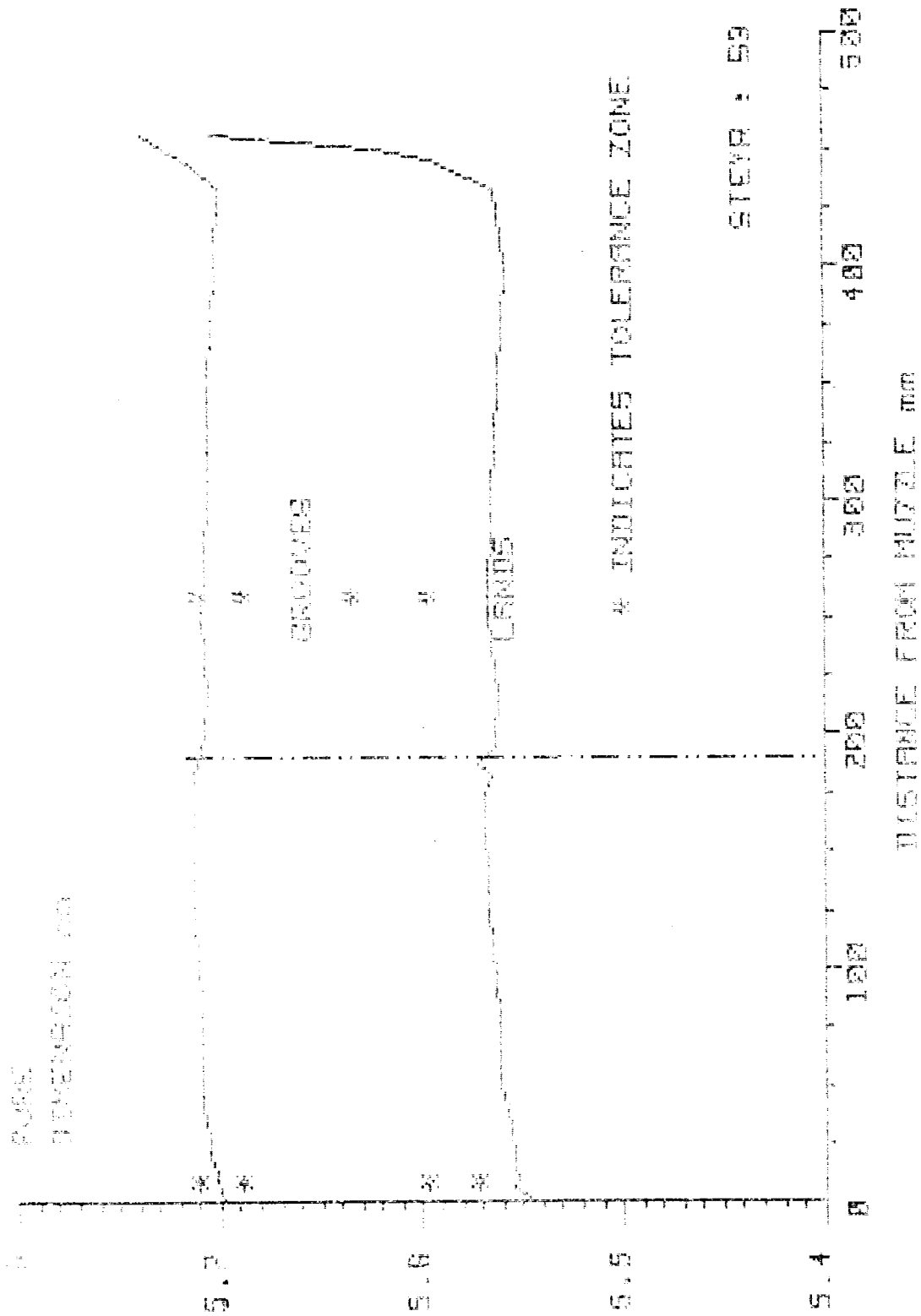


FIG 7  
59 - PAPER GRAPH AT 1:292 POINTS

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16. Abstract The Individual Weapons evaluated were, the COLT M16A2 and the STEYR AUG-A1. The testing was carried out in accordance with NATO D/14 procedures where applicable.  The results clearly demonstrated that from an engineering viewpoint the performance of the STEYR was significantly superior to the COLT in most respects; particularly in terms of endurance and adverse conditions.  The STEYR AUG-A1 is recommended as the system most closely satisfying the requirements of ASR 48.8, and is considered suitable for introduction into service without modification.			

Note: Declassified 25 Jun 19 by Army Headquarters as organisation which assumed originator's responsibilities and functions.