

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE



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August 5, 1988

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File: Tech. Monthly Reports

FROM: W.H. Coleman, II

ILION R & D AND TECHNICAL
MONTHLY REPORTS
JULY 1988

Constructive suggestions, ideas and criticism are welcomed by all
report contributors.

CONFIDENTIALIlion, New York
August 2, 1988

TO: W. H. COLEMAN, II

FROM: L. B. BOSQUET/T. C. DOUGLAS *LD*NEW PRODUCTS DEVELOPMENT MONTHLY REPORT - JULYCURRENT PRODUCTSEKSTROM-CARLSON CHECKERING MACHINE - Monteau/Hickey

Work is progressing satisfactorily on the program to have Synermation complete the "INSERT CHECKER" routine which will provide the capability to program both fore-end and stock patterns. A sub-routine, "EDIT EKSTROM", has been received and tried. A "display execution error" message shows up when an attempt is made to re-edit a program. Contact was made with Synermation and it will be taken care of in the final version of the software. In the meantime, re-editing can be accomplished by ignoring the error message. The Model 11-87 fore-end pattern is being programmed using the above routines to verify whether or not they will work. If successful, the SP-10MAG checkering patterns will be worked on next.

The new cutter motors were received from Air Turbine Technology and have been installed in the Ekstrom-Carlson machine. They are running very well but are much noisier than expected. Six are being returned to the manufacturer for modification to quiet them to acceptable levels. In the meantime, noise enclosures are being designed and will be installed on each head. It is expected that these motors will prove to be a significant improvement in terms of cost, quality and throughput.

The need to access and revise the Programmable Application Logic (PAL) on the Allen Bradley 7320 controller has been addressed. It has been decided to contract the work directly with Ekstrom-Carlson. Electrical drawings of the changes we require are being prepared and will be sent to Ekstrom as soon as they are ready.

In anticipation of the need for additional checkering capacity in the future, a monetary requirement was included in the 1989 capital forecast. The availability of a sum of capital this year, coupled with the need, has moved this up in priority. Quotations have been received and project economics are being prepared in anticipation of having a project written and circulating around the first of August.

CONFIDENTIALSNIPER WEAPON SYSTEM - Douglas

On July 28th, the U. S. Army approved First Article testing of Model 700 M24 SWS and released Remington for production of the original contract 500 systems. They also awarded Remington the 1988 option for an additional 500 systems with a contract value of \$1950M, bringing the total awarded contract to \$4450M.

The delivery schedule was revised as follows:

Oct. 25, 1988 - 100	Sep. 22, 1989 - 150
Dec. 21, 1988 - 100	Dec. 20, 1989 - 150
Mar. 29, 1989 - 150	Mar. 20, 1990 - 100
Jun. 23, 1989 - 150	Jun. 30, 1990 - 100

The second mandrel for the Remington 5R, 11.25 inch twist GFM produced SWS barrels has been run, producing barrels with excellent dimensions. This mandrel experienced some "bugging" problems and contact with the vendor is being made to determine if it is mandrel related or material related. These barrels are being made into guns for accuracy testing. It will be necessary to purchase military M118 ammunition to fully test these barrels. John Rogers has been contacted to find a source for the ammunition.

M/11-87/1100 FORE-END - Powers

Quotations from three vendors for a new design fore end support have been received. This part is intended to replace our current fore end/barrel support and eliminate the need for the reinforcing patch in the fore end. A purchase order has been placed with Square Stamping for prototype supports. They should be available for test by the end of October.

BOSTOMATIC CHECKERING MACHINE - Monteau/Hickey/Inserra

One of the systems being looked into for expanding the memory of the Bostomatic checkering machine has the potential to provide faster and more trouble free changeover from pattern to pattern by storing the programs and downloading the on command. A quote for a fileserver has been received in the amount of \$18,025. Installation and training are an additional \$500 per day. To assist in the evaluation of the proposal, arrangements are being made for a demonstration.

To help increase the float capabilities of the cutter heads and reduce the amount of touch-up required, the nose piece and follower shoes have been redesigned and are on order. The nose piece number is C-TS-7517 and the follower shoe is C-TS-7516. They will be installed and evaluated when they are available.

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MULTI-HEAD CHECKERING SOFTWARE - Monteau/Hickey

American Bay Limited is making excellent progress in converting the GE 4020 software to run on our Compaq 386 PDs. Bob Turner has sent in several discs which have been tried out. A known program is being trial loaded to determine what debugging is necessary and where in the software the bugs are. If everything works correctly, the net result will be a tape for a pistol grip. Work is also progressing on the "wrapped pattern" and "CKEdit" routines as well as bringing all the various sub-routines together and making them user friendly. Bob is also adding "tool up", "tilt", various other moves and plotting capabilities to the package. The best estimate for completion of this work is late third or early fourth quarter.

TOOL DESIGN - Monteau

Investigation has been started into replacing the Bruning Model 870 blueline print machine. The initial investigation has been centered around an ammonia-less system. This would eliminate the need for ammonia lines coming into the print room and the potential hazards involved. Quotes have been received on the Bruning PD-404 and PD-778. Arrangements are being made to rent a PD-778 on a trial basis for three months, with the option to purchase at the end of the period.

SMALL PARTS FMS - Baszczuk

There has been little activity on this project the past several months due to more urgent priorities.

A process to machine Model 11-87 and Model 870 breech bolts on the FMS is being developed. A test program was developed by the NC group to determine whether or not the T10 machines can hold the required tolerance between the inside of the locking block slot and the bolt face using the "B" load fixture. 100 breech bolts were machined and inspected. Initial review of the test results indicates the dimension can be held.

It may be necessary to review the feasibility of putting the breech bolts on the FMS due to increases in production schedules which will tend to make the set-ups long duration. This may be contrary to the best utilization of the equipment.

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N/C SHOP - Sanzo/Rankins/Jones/Kozakowski

In addition to assistance being provided on the SP-10MAG shotgun, the NC Shop supports the activities of the Technical Section and provides support to Production. Items currently being worked on include:

- o Programming is underway for the fabrication of five aluminum magazine followers for the NEAR. A completion date has not been established yet.
- o Tool paths have been described for producing bayonet adaptor sleeves for a proposed military version of the Model 870. Fixtures and blanks have not been started yet.
- o A follower rest purchased for the Mori Seiki CNC lathe has been installed and the electronics have been wired. Debugging of the system is underway.
- o The fixture, programs, and the cutters necessary to produce developmental fore-ends for the proposed SP-MAG-10/12 shotgun are ready for try out.
- o A program to produce developmental bolts for the above shotgun has been written. Bolts are expected to be complete August 19.

FMS MODELING - Findlay

Re-modeling is complete on the M/1100 LT-20 receiver, but detailing to check this modeling work has yet to be done. This work has been delayed due to cantilever scope mount design and detailing work as well as the 22 project detailing. It is estimated that a detailed and completed model will be turned over to the N/C and ATO groups by August 30th for tool path generation.

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NEW PRODUCTS - 1988 CATALOG

PARKER - Murphy

The primary effort in the previous month was directed towards resolving barrel assembly brazing; the critical path item of the Parker program. Highlights of last months activity are as follows:

- o An error was uncovered in the barrel strength calculations. Recalculating factors of safety has shown that there is no need to heat treat Parker barrels. Without this requirement, brazing becomes a more straightforward operation. AAA Industries in Chicago will be brazing set-up assemblies on Monday, August 8, and pending successful results, the balance of the prototype barrels will be brazed on Friday of that week.
- o A tensile test was done on the current lot of Parker GFM barrels. In addition, one sample that was subjected to simulated brazing temperatures was tested. The results all confirm that the calculated factors of safety are conservative and that actual Parker barrels should be stronger than predicted.
- o A new fore-end design was successfully prototyped. The new design is an improvement over the old in that the ejector springs are not cocked by the ejectors bearing on the breech face, (as with the Win. 21). In addition, the new fore-end is more easily assembled in assembled to the gun contrasting the earlier design.
- o The Design Acceptance Test procedure is nearly finalized.
- o A comprehensive schedule outlining the design acceptance testing will be developed following successful barrel brazing.

Other Business:

- o Kolar will submit a quotation for a brazing fixture.
- o Kolar will submit a quotation for a stock drill fixture.
- o I have sent an old Parker parts list to Kolar to update reflecting the new parts so we can assign part numbers.

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- o Pete will begin manufacturing fore-end tips for the splinter fore-end (with 2 degree draft).
- o Pete will set-up existing lock bases and add a 2 degree draft.

A meeting was held with Process Engineering and the Custom Shop to formalize a procedure to transmit the Parker to the plant. Several questions were answered regarding the need for part numbers, drawing format, material and heat treatment recording, and Remington Standards as they relate to the Parker. Concerning the question of incoming component inspection, legal input is needed to help determine exactly what inspection is required. A meeting will be scheduled with legal to resolve this issue.

The first draft of the Parker owners manual has been done on the Technical Publishing System and has been reviewed. The benefits of this system are becoming apparent as the corrections and modifications are being made. The show Parker has been requested from Marketing and will be used for photos employed in making illustrations for this manual.

MODEL 700 CLASSIC .35 WHELEN - Bosquet

The Production Sample was approved at the July Product Team meeting and full release for invoiced shipment has been forwarded to the warehouse. No further reporting will be done on this item.

MODEL 700 MOUNTAIN RIFLE CALIBER ADDITIONS - Bosquet

The Test and Measurement Lab has completed their testing and evaluation of the three short action caliber additions to this model. The trial and pilot has been accepted and the warehouse has been given an interim release to ship product. Release for invoiced shipment will be formally requested and a Production Sample will be presented for approval at the August Product Team meeting.

CONFIDENTIALNEW PRODUCTS - 1989 CATALOGSP-10 MAGNUM - Rowlands/Bauman/Lewis/Verdura/Murphy

One gun has successfully completed a 50,000 round dry cycle test. The only part to fail was the firing pin retaining pin, which in the dry cycle mode gets impacted directly by the hammer-driven firing pin. Under actual firing conditions this does not occur. A fire control crud test still has to be conducted. The hold up is the need to determine the composition of the crud. Input from the Legal Group is required.

The SP-10 Mag. will be furnished with only a modified and full choke tube. These will provide nominal pattern densities of 65% and 75% at 40 yards with 1 3/4 ounce steel BB ammo. Additional testing is being conducted at Ilion to verify our latest choke tube designs and also to determine if the point-of-impact of six barrels meets Remington specifications.

The choke tube wrench is being redesigned to include an integral pilot instead of the separate plastic part. This design will significantly strengthen the wrench teeth and also eliminate the objectionable sharp surfaces of the plastic pilot. An improved heat treatment is also being considered. Prototypes of this wrench design will be sent on the Alaskan field trip.

Six guns are being built for an Alaskan field trip to be conducted by Dick Dietz in early September. Some of the guns are being assembled from refurbished parts from the twelve gun test. The guns will have to be shipped by August 29.

Lou Ferreira has been supplied with five guns for the packaging drop test. One gun has been sent to Wilmington for photographing for the 89 catalog. Process Engineering will supply twenty guns for the November gun writers seminar.

The back-up design of a feeding and extraction system that will invalidate the Ithaca Patents has been assembled. Alterations to the carrier need to be made to eliminate an intermittent trap shell condition. Layout work is currently being done to determine the extent of the modifications required to prevent the shell from the magazine interfering with the extracting shell.

The first meeting of the Design Review Team was held May 26. An overview of the review process was presented and the team members were shown the SP-10 Mag. cut-away gun and the improvements compared with the Ithaca Mag-10 were discussed. Sub teams were assigned to examine the firearm from a systems approach using a form of failure mode analysis and report back their findings.

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Drop testing of the proposed packaging was successfully accomplished on July 21 and. The insert molding vendor is due to be on the plant the week of July 25 and it is expected that an order will be placed by the 29th. Twelve week delivery still appears to be valid. Choke tube wrench design has been finalized.

Tool design completion remains at about 90% and tool build is currently at about 35%.

Product structures have been entered into the MRP system and have been verified. Process records are being released as the tool design is completed.

Checkering patterns have been transmitted and are being programmed. Pending completion of the "INSERT CHECKER" routine for the Ekstrom-Carlson machine, the stock will be programmed on the Bostomatic. Locators for checkering the stock and fore-end are available.

The K&T five station NC machining center has been installed in the FMS area (bldg. 60) and a K&T technician is on the plant to perform the set-up, alignment and initial power-up. Following this, a second technician will be here to perform the final set-up and machine acceptance run-off. This will probably take place the second week of August.

The tooling cubes for the interim method of processing the barrel extension, gas piston lug and receiver were shipped on July 27. Locating and clamping needs will be reviewed when the cubes are available. Three people attended programming school and are ready to start writing the programs for the interim process.

Trial and pilot machining of several components has been started. Progress is being monitored in a weekly trial and pilot meeting. Minutes of each meeting are issued.

A request has been received to provide twenty guns for a writers seminar to be held November 9 thru 12. These guns should be assembled by the middle of October so that they can be field tested prior to the seminar. To accomplish this, the Model Shop and NC Shop are providing assistance in fabricating parts or assemblies for which the production tooling may not be available in time.

TURKEY CHOKE TUBE - Murphy

Kolar Arms will attempt to develop a Turkey choke tube. Any tube developed by Kolar will undergo final Design Review and Design Acceptance Testing by the Ilion Technical Section.

CONFIDENTIALSLUG GUN SYSTEM - D. Findlay

The objective of this program is to improve the accuracy of the Model 11-87 and Model 870 12 guage Deer Guns through the use of a barrel mounted scope system and a rifled choke tube. The goals of the program are to achieve five shot groups of three inches or less using Remington, Winchester and BRI Sabot slugs.

Successful testing is complete on ten design acceptance choke tube samples which were shot 1,000 rds. each. The tubes were tested for turn out, seizing (diameter growth), and accuracy at 50 yards. The test samples exhibited no diametrical growth over the course of the test for any of the tubes. The rifled tubes tighten to around 100 in-lbs of torque during shooting rather than loosening. The current wrench design can remove a tube at this torque level with some effort. A new design choke tube wrench is being developed to aid the customer in taking out the tube and improve it's teeth strength, but the current wrench design is not unacceptable. Lastly, testing indicated group sizes of 3.0 inches and under for the Remington and Winchester 2 3/4 inch slugs. The data for the 3 inch Remington slug is suspect, showing average groups of 4.75 inches. The design acceptance testing of the full cantilever system will eliminate the device and all shooting will be from the shoulder. We feel that this will give a truer picture of the 3 inch Remington performance. We expect that the 3 inch load will also approach 3 inch groups. The BRI slugs showed a 50% improvement, from 4.25 to 2 inches with the rifled tube. As a result of this testing, design acceptance has been given and rifled choke tubes will be transmitted to the plant. This transmittal will take place in combination with the cantilever scope mount system, pending it's successful design acceptance testing. Samples of the rifled choke tube system have been turned over to marketing for catalog preparation.

Design work has been finalized on the cantilever and a scope mount base design has been chosen for design acceptance testing. A Tasco scope mount has been selected for the design acceptance testing over a modified NBAR style mount due to its shorter product introduction time. The NBAR modified design remains an alternative and will be pursued as a cost reduction item next year. Design acceptance samples are being fabricated and should be complete by the middle of August with testing complete by August 30. Drawings for estimating were turned over to Process Engineering July 25 to begin process development work with. Catalog samples are being prepared and only lack checkered trap walnut stocks, before being turned over to marketing. These stocks are currently being done in the custom shop.

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MODEL 700 SYNTHETIC ARYLON STOCK - Smith

The synthetic stock offering for 1989 will be made from Du Pont Arylon. This stock will replace the current stocks made from Rynite and the right hand fiberglass stocks from Brown Precision. The Arylon stocks will be made in Lee Six's current mold. The options will be as follows:

- BDL only
- long action
- short action
- magnum barrel channel
- varmint barrel channel

Visited Culpepper Plastics on Thursday July 14th to see sampling of the mold using 10%, 20%, & 30% Arylon material and to see Culpepper's facilities (see letter dated 7-19). 10% fiberglass filled Arylon material will not be a candidate for use in this project. 20% samples were sent in and will be tested for strength at a future date, initial transmittal will be for the 501 Arylon (30% fiberglass filled).

Phil Harper is drafting the contract and will be sending Lee Six a copy for his approval and signature by August 1. Marketing has decided not to go for the exclusivity on the stock so no major hurdles remain.

Six has agreed to build his own set of gages if we provide him with a set of drawings.

This offering gives us first use of Arylon as a stock material and will replace the Brown Precision and Choate stocks for 1989, however the question of long range supply of synthetic stocks has not been answered and the determination of us developing a mold with a Mountain Rifle outside configuration also has not been answered.

MODEL 870/1100 LIGHTWEIGHT RESTYLE PROGRAM - Lewis/Verdura

All specifications for these models have been reviewed and agreed on. The complete drawing package has been transmitted. The process records and item masters have been completed. The product structures are being worked on and are nearing completion.

At the June Product Team meeting it was decided to keep the specifications for 1989 the same as currently offered. They will remain the same until the fourth quarter of next year. All lightweights produced in the fourth quarter of 1989 will be to the restyle specifications and the guns will be carried in the 1990 catalog. Further work on this item has been put on hold at this time.

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MODEL 7400-4, 7600-6 CONSOLIDATION - Lewis/Verdura

Process records, item masters and product structures have been written and are ready to issue. Activation of the product structure will be put on hold until 1989.

The consolidation of these models has been deferred to 1990.

MODEL 700 CLASSIC .300 WEATHERBY MAGNUM - Martin

The Model 700 Classic offering for 1989 will be the .300 Weatherby Magnum. This will be a synergistic offering from Firearms and Ammunition. Lonoke has provided Ilion with chamber drawings and reamers. Ilion will provide Lonoke with three pressure barrels and one complete firearm for their ammunition development. Ilion will have five more completed rifles awaiting shipment of pilot run ammunition for Design Acceptance Testing.

Proof loads have been developed by Ilion. Accuracy has been shot using Weatherby ammunition. The bullet weights of 150 grain and 180 grain tested 1.65 inches and 1.35 inches respectively. 260 rounds of 190 grain Remington ammunition is expected in early August.

Chamber tooling and gaging has been designed and placed on order from advance prints to assure their being available in time to run the trial and pilot.

MODEL 870 FUNCTIONAL IMPROVEMENTS - Lewis/Verdura

Twenty-five of the new Delrin ejector bases have been sent to Aberdeen Proving Ground for liquid compatibility testing. This test must be passed on any future military contract for shotguns. A report has been received on the results of the tests and is being evaluated to determine a path forward.

Process records and structures are complete and are on the system except for police versions which use the new ejector system. Police structures will not be activated until successful completion of trial and pilot.

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MODEL 1100 MAGNUM RETROFIT BARREL/STEEL SHOT - Franz/Powers

The Test & Measurement Lab report has been approved and distributed. The design has been transmitted.

M/1100 12 ga. Steel Shot Barrel Specifications

Gauge: 12
Barrel Rollmark: 2 3/4 inch Magnum and 3 inch Magnum
Steel Only
Orifice: one .088 in.
One Choke Tube:
- Name: Remington Long Range Steel
- 80% patterns at 40 yds. (w/2 3/4" Magnum 2's)
- constriction: same as current full tube
- material: VascoMax 250 Maraging Steel
- titanium nitride finish
Barrel Lengths: 26 and 30 in.
Barrel Finish: Standard polish Black Oxide finish.

The barrel hang tag has been reviewed by Marketing and the Litigation Support groups.

We just recently discovered we have a problem marking the titanium nitride coated tubes in the plant. It is possible that the solution used on the stainless steel choke tubes is harmful to the titanium nitride coating, causing the tubes to show some corrosion. The marking experts have been contacted to provide an expeditious solution to the problem. One tube with titanium nitride coating and one tube with black oxide coating will be tested in the salt spray cabinet. If it is determined that the titanium nitride coating is not significantly better than black oxide, then it might be prudent to change to the black oxide coating to eliminate any potential marking problems.

CONFIDENTIALNEW PRODUCTS AND PROCESSES - 1990 AND BEYONDNEW .22 AUTOLOADING RIFLE - Smith/Jackson/D.Findlay, Sr.

This program will complement the present family of .22 autoloaders, M/552, N-66, and N-77. The new autoloader will be designed around an existing barrel and magazine box to allow the remainder of the parts to be sourced with minimal machining and finishing operations required. The wood stock version of this gun must be price competitive with the Ruger 10-22.

Bill Marks, of DuPont, was in May 4 to discuss material selection on selected components. It was decided to look into the use of Graphite filled polymers for the receiver and housing. Bill will work with the Composites group at TSL on this and we will supply him with detailed drawings of these parts as soon as we have them.

D.S.Findlay Sr. reviewed the prints we sent him and made some improvements to the design. The changes are being made to the modeled parts and the layout is being updated and new prints are being sent to the Model Shop.

The receiver and breech-bolt drawings have been detailed and checked and are now being finished. The housing still needs to be updated and detailed.

A parts list will be made and completed prints will be given to Brad Bosquet as soon as he is ready to handle them.

The Test Lab is doing bolt velocities, cycle times, and Pressure/Time curves on N/66's and N/77's. This data will be put in Scott Franz's newly developed "blow-back" computer simulation program to validate the program. Once validated, the computer simulation will be used to refine the operating parameters of the new rifle design.

CONFIDENTIALNEW CONCEPT SHOTGUN - Powers

The computer simulation model for the gas-assisted inertia operated shotgun has been completed and trial runs have been made to determine the system parameters required for optimum performance.

A preliminary layout for a gas-assisted inertia operating gun has been submitted by Dick Rego and Earl Seppala.

Initial testing of the KFC prototype gas-assisted recoil gun has begun. This prototype is currently operating with all loads from standard target to 2 3/4" steel to 3" Magnum. Much more testing is planned, including bolt velocity measurements and extensive high speed movies. Digitizing of preliminary high speed movies is complete. The results of this testing will aid in verification and refinement of our computer simulation.

Recoil reduction efforts will center on recoil pad material/design and possibly using some type of "hydraulic" damping unit in the stock. Preliminary recoil force measurements on both the EAR and DuPont materials is complete. Additional samples of the DuPont material is forthcoming. Also, samples from the Rogers Corp. have been received and will be tested along with the other materials by mid-August. Mike Branger of IPD will be conducting measurements of pad materials by the end of August.

MILITARY SPECIFICATION M/870 SHOTGUN - Findlay

This program is intended to enable the M/870 pump shotgun to meet Mil Spec 3443, which will allow Remington to bid on any future U.S. Government contracts. The most current version of Mil Spec 3443 has been received and is being reviewed.

Design work is 75% complete on a preliminary Class I Mil Spec. 3443 shotgun. Parts for this bayonet adapter and heat shield equipped firearm are being received from the model shop to try two different bayonet adapter designs. A sample of one design is complete with the second undergoing fabrication. Sling swivel mounts have been received from the model shop and also require testing. However, at this point all work has been halted due to higher priority work and completion of this program will be pushed out to 1990 at best.

CONFIDENTIALNEW BOLT ACTION RIFLE - Martin/Jackson

The receiver design will be a standard M/700 receiver with secondary cuts required for the bolt lock and possibly minor cosmetic changes in non-critical areas. We will continue to investigate providing the gun with rings and bases versus the previous integral receiver mounting.

The barrel will be a Custom Shop contour with a Mountain rifle crown. Upgraded iron sights as provided on Custom models. The barrel modeling has been started on the CV system.

The magazine box will have a detachable bottom that will conceal any gaps or mismatch between the box, trigger guard, and/or the stock. First prototypes of the new design have been received for evaluation and test. It is planned to have the testing completed in late August.

The trigger guard, magazine follower, magazine release, and magazine spring have been sent out for quotes.

Testing of a patented new technology rifle barrel is currently underway in a joint program between Remington and D.C.Brennan Firearms, Inc. The Brennan technology claims a 25% increase in accuracy with reduced recoil. However, test results to date show no significant improvement over our current design (at the 95% confidence level). A test is being set up to reshoot the rifles using standard Sportsman 78 stocks with fore end bedding pressure. The results of these tests will determine if it is warranted to continue with this program. This testing has been rescheduled for August.

ELECTRO-CHEMICAL RIFLING - Lewis

An updated quote has been received from Cation Corporation. As soon as the estimated testing costs are available from the Test Lab, an updated economic evaluation will be done and a Part II to the project submitted.