

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington



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Ilion, New York  
March 29, 1988

TO: W.H. COLEMAN, II

FROM: L.B. BOSQUET/T.C. DOUGLAS *LD*

NEW PRODUCTS DEVELOPMENT MONTHLY REPORT - FEBRUARY

CURRENT PRODUCTS

SYNTHETIC LONG STOCK - MODEL 700 RS - Smith

The Model Shop prepared ten stocks with the vendor's proposed bedding block design. Testing by the Research Test and Measurement Lab indicated that the proposed blocks had no adverse effects on accuracy. Three, five shot groups were fired from each rifle. The average group size with Rynite stocks and the proposed bedding blocks was 1.911 inches. The same actions assembled in walnut stocks yielded group sizes averaging 1.939 inches. The vendor has been released to build a mold to produce the bedding blocks and will supply parts to Ilion to repair the stocks on hand. Parts are expected to be available about the first of May.

The test lab has completed testing on Arylon stocks. The stocks passed all phases of the test. The question to be answered now is weight. We need to get the weight below 2 lbs. DuPont TSL has sent a sample of 20% glass-reinforced Arylon to Harding for molding and will ship a sample of 10% glass-reinforced Arylon as soon as it is ready. The molding of stocks using these samples will be done early in April.

We are still awaiting formal quotes from Six-Enterprises and from American Plastics. When we receive them and the stock samples we will be able to finalize a report to the Firearms Product Team for their recommendation.

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SNIPER WEAPON SYSTEM - Snedeker

The rifle used for the Fungus test has completed the test and has been returned to Remington. No harmful effects were noted by the contract tester.

The two systems that were drop tested at Dayton T. Brown, Inc. were returned to Ilion for Targeting and Accuracy testing and passed the test. There was no damage sustained by either Rifle as the result of the drop testing although one of the carrying cases ( at -45 deg.F.) sustained a minor amount of internal damage and the case vendor has been notified that corrective action is required. These two systems have now been returned to Dayton T. Brown, Inc. for the Transportation/Vibration and Rain/Moisture testing scheduled for the second week of April after which they will be returned to Ilion for the final Targeting and Accuracy testing.

A second rifle has been sent to D.T.Brown for the repeat of the Salt Fog test. D.T.Brown will repeat the Salt Fog Test at no expense.

The deployment kit parts exhibited signs of rust after the 96 hour Salt Fog test and Remington is recommending changes in the finishes to be supplied on the parts involved.

The five guns that completed 5000 rounds of endurance testing by the Government at Aberdeen, were shot for accuracy at Ilion and all passed. These rifles will now be shot to a total of 10,000 rounds at Aberdeen.

Five scopes have been returned to Leupold & Stevens for the completion of the scope testing which is scheduled for the middle of next week at Leupold & Stevens.

M/11-87/1100 FORE-END

A program is currently underway to redesign the fore end to eliminate a persistent cracking problem. Our personnel at S & K have proposed alterations to the fore-end. They are: remove the fiberglass reinforcing patch and corresponding undercut and stop the finger groove cut about two inches from the rear of the fore-end. 100 prototypes of this configuration are being made for test in conjunction with a test of a new metal finish.

CONFIDENTIALFLEXIBLE SMALL PARTS ASSEMBLY - Baszczuk

The assembly machine fixture modification, designed by Technical to align both side plates in the fixture nest at the riveting station, was installed the first week in March. This has corrected the problem of mis-aligned side plates on assembled trigger housings and eliminated the need for 100% inspection and manual alignment of the housings by the machine operator.

Approximately 31,700 Model 700 trigger housings have been produced on the flexible assembly machine which was turned over to Production in December, 1987. Minor problems are still being encountered and are being identified and corrected as they occur. The process engineer assigned to the machine has not been available to help in the day-to-day trouble shooting due to his continued involvement in the TARP program.

MODEL 870 POLICE - Franz

Complaints have been received from two law enforcement agencies that their Model 870s stem occasionally during the high cyclic rates used in training (five shots in less than three seconds). These malfunctions do not occur at normal rates of fire. Two shotguns that were said to malfunction regularly were returned by the Idaho State Police. Both guns would stem on occasion. This was confirmed in high cyclic rate feeding tests using dummies. High speed movies showed that the carrier rebounds down after the feeding round hits the top of the barrel extension. The carrier eventually recovers due to the force exerted by the carrier dog follower spring. It was felt that a heavier spring would minimize this condition. The Model 11-87 carrier latch spring could be used as a direct replacement for the carrier dog follower spring and yield a gain of approximately two pounds in working force.

The second dry cycle test was completed. Two carrier latch springs and one carrier dog follower spring were tested. Both springs took a set of approximately 1.5 lbs. over the test. Spring number one went 50,000 cycles. Spring number two broke at the third coil from one end between 30,000 and 40,000 cycles. At no time during this testing did any of the current carrier dog follower springs break. I feel that we may be trading one set of problems for another if we go through with this change. We do not have a lot of complaints with the gun as is. The spring change alone will not guarantee that the gun will not stem low because there are other factors that effect this as well. These results need to be reviewed further to determine the path forward on this program.

CONFIDENTIALBOSTOMATIC CHECKERING MACHINE - Monteau/Hickey

Available memory has been exhausted but can be expanded to 4000 feet by adding a 5 1/4 inch dual drive floppy disc unit at a cost of \$3750. Before proceeding, checkering requirements will be re-evaluated to be sure that additional memory is still desirable on this machine.

EKSTROM-CARLSON CHECKERING MACHINE - Monteau/Hickey

Work continues to get this piece of equipment to the point where it can handle long stocks, short stocks and fore ends. A purchase order was issued to Synermation, Inc. on March 8 for completion of the "INSERT CHECKER" routine which is needed in order to write checkering programs for this machine. Completion is expected by the end of May.

A more economical cutter motor, designed to Remington specifications, has been placed on order with Air Turbine Technology. This motor has been designed to fit both the Bostomatic and the Ekstrom-Carlson equipment.

The need to access and revise the Programmable Application Logic (PAL) on the Allen Bradley 7320 controller has been addressed. A quotation has been received from Ekstrom-Carlson and information on commands has been requested from Allen Bradley.

In anticipation of the need for additional checkering capacity in the future, information was requested from Ekstrom-Carlson on their new equipment. That information has been received and is being reviewed.

MULTI-HEAD CHECKERING SOFTWARE - Monteau/Hickey

Two approaches are being taken to remove the multi-head checkering software from the GE 4020. The first is through a contract with Synermation, Inc. to provide software which is compatible with the Computervision CAD system. Synermation has not been successful to date.

The second is a contract with American Bay Limited to convert the software to run on the COMPAQ 386 personal designers. This approach is progressing very well and may be completed within the next month. The net result of these two approaches is the same; disposal of the GE 4020 and associated peripherals as well as the elimination of service contracts amounting to \$40,000 annually.

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ASSISTANCE TO THE PLANT - Baszczuk

The plant has requested the assistance of A.R.Baszczuk at the S&K facilities in Lexington, Missouri. He has been at S&K on two occasions recently to provide technical assistance in identifying and correcting problems which have caused the wood to become a major constraint to meeting company goals. It is expected that he will be at S&K for the next six months.

TOOL DESIGN - Monteau

A new approach to the design of checkering fixtures for the multi-head machines has resulted in a cost avoidance of between \$55,000 and \$60,000. This was accomplished by designing fixturing for the Model 700 Mountain Rifle which allows both long and short action stocks to be checkered using the same fixture. This approach has eliminated the need for twenty-four fixtures at approximately \$2475 each.

The first of two trigger pull adjustment machines is in de-bug. This device was designed to provide a means of setting the trigger assemblies on the SWS to a tolerance of plus or minus four ounces as specified in the contract. Its use may also be applicable to regular production guns using the Model 700 trigger assembly and should increase throughput at assembly.

SMALL PARTS FMS - Baszczuk

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

A process to machine Model 11-87 and Model 870 breech bolts on the FMS is now approximately 90% complete. A review of the test NC program and tooling package needs to be completed. Assistance from the NC group is needed to finish this project and provide the prototype testing.

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NEW PRODUCTS - 1988 CATALOG

PARKER - Murphy

A Parker meeting was held with Kolar on March 22 in Racine to discuss the program status and to refine our path forward. Several questions were decided and a hard and fast schedule to produce test guns was assembled and bought on to by Marketing, Research, Kolar and the Custom Shop. Among the issues resolved:

- o The ejector redesign. A design was agreed to and prototyping has been started.
- o Trigger linkage alterations. Set screws have been added to limit travel of the linkage. One prototype is complete. Testing in advance of the design acceptance test will be started in the first week of April with this action and an original Parker barrel.
- o Kolar is not satisfied with the trigger linkage. Although they agree it is satisfactory for our Parker, Kolar feels it can be improved and will pursue a redesign on their own. Kolar understands Remington may or may not be interested in the results.
- o Marketing will put Kolar in touch with a Parker collector to resolve A-1 Special dimensional questions.

Barrel assemblies remain the critical path item for development (See attached schedule). In addition to the efforts outlined on the attached schedule, strength tests are being performed on heat treated Model 870 barrels to verify our selection of heat treatment.

A comprehensive design acceptance test program is being developed in conjunction with the Test Lab and will be circulated upon its completion.

MODEL 700 CLASSIC .35 WHELEN - Bosquet

Trial and pilot assembly has been delayed due to some re-work found to be necessary on the stocks. Assembled guns should be available for design confirmation testing in April. After successful completion of testing, a production sample will be selected and release for invoiced shipment will be requested.

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MODEL 700 MOUNTAIN RIFLE CALIBER ADDITIONS - Bosquet

Trial and pilot assembly was scheduled to begin in March, however, the stocks have proved to be a constraint to meeting this date. When trial and pilot assembly is complete, a production sample will be selected and release for invoice shipment will be requested.

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

A solution to the persistent feeding problem has been developed. Parts are being modified and the 12 gun test should resume the week of March 28. Minor modifications to the investment casting tooling for the shell stop, carrier, and slide will be necessary. The MIM tooling for the carrier dog will also require modifications.

Back-up designs are being developed that will invalidate the three Ithaca patented mechanisms that we are using in the current design. If it becomes necessary to implement this contingency, it will add an estimated six months to the schedule.

The second round of patterns were shot using STEEL BB (1-3/4oz) ammunition and have been evaluated. These results contradict previous testing. An examination of the ammunition will be done to check for consistency of pellet count from shell to shell.

Drop testing of the proposed package design will take place when guns are available from the twelve gun test.

Of the estimated 7000 hours of tool design required for this project, 80% have been completed and are being built. There are approximately 1000 hours of design which have not been assigned to date. Plans have been made to contract the remaining work with outside design houses.

All item masters and product structures have been submitted and will be verified as soon as they are put up on the system. Work on process records is continuing.

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 the checkering operation have to be provided.

A purchase order was issued for a Milwaukee-Matic 1015 manufacturing center with a five pallet handling system on March 7. This machine will perform several cuts on the receiver, and will machine the barrel extension and gas piston lug. The acceptance run-off and delivery of this equipment is scheduled for July.



CONFIDENTIALMODEL 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. It is anticipated that the ammunition will be available early in the second quarter.

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

The Test & Measurement Lab report has been approved and distributed. The Product Team set the following specifications at the last meeting:

M/1100 12 ga. Steel Shot Barrel Specifications

Gauge: 12

Barrel Rollmark: 2 3/4 and 3" Magnum Steel Only

Orifice: one .088 in.

One Choke Tube:

- Name: Extra Long-Range Steel Shot
- 80% patterns at 40 yds. (w/2 3/4" Mag. 2's)
- constriction: same as current full tube
- material: VascoMax 250 Maraging Steel
- black oxide finish

Barrel Lengths: 26, 28 and 30 in..

Barrel Finish: Black Matte Finish

It was decided by the Product Team that an information hang tag will be attached to the barrel. A draft of the information to go on this tag is included. Drawings still need to be changed and part numbers assigned before transmittal can take place.

TURKEY CHOKE TUBE - Powers

All pattern evaluation work has been completed. All data supports the previous testing which indicates that "Greater than Full" choke performance is not achievable in the standard bore configuration. Further development work on this program by the Ilion Technical Section has stopped.

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.

Twenty-one design acceptance choke tubes were received from the screw machine vendor on February 19th. These tubes, made from VascoMax 250 maraging steel, will be heat treated and sent to Cation Corporation for the addition of the rifling. Completed tubes are expected to be ready for testing by March 30th.

The initial testing of the cantilever scope mount system was very good. There were concerns that the cantilever mount would oscillate when fired, thereby interfering with quick follow-up shots. Strain gage measurements indicate that the mount does oscillate, but the oscillations cease well before the shooter can recover from the recoil of the gun. It was also determined that a synthetic buffering material placed under the rear of the cantilever, between the receiver and the cantilever dampens the oscillations approximately twice as fast as a free cantilever. The buffer also serves a secondary purpose of supporting the free end of the cantilever if downward pressure is placed on the cantilever. The MIM scope ring design will be altered to provide for better clamp coverage, and the ring positions on the cantilever mount have been altered to provide optimum eye relief adjustment to the shooter. Prototype parts reflecting these changes are being made in the Model Shop and it is anticipated that the next series of testing will start in mid-April.

MODEL 870 FUNCTIONAL IMPROVEMENTS - Lewis/Verdura

Twenty-five of the new Delrin ejector bases have been sent to Aberdeen Proving Ground for liquid compatability testing. This test must be passed on any future military contract for shotguns.

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 870/1100 LIGHTWEIGHT RESTYLE PROGRAM - Lewis/Verdura

Work on these models has been limited to programming the checkering patterns for the pistol grip of each stock. Fore end patterns are being worked on. Design requests have been issued to design and build locators for the checkering operation. Specifications are being reviewed to ensure that all criteria are met.

CONFIDENTIALNEW PRODUCTS AND PROCESSES - 1990 AND BEYONDNEW BOLT ACTION RIFLE - Martin/Jackson

A design review of the proposed receiver design has revealed a design flaw which could compromise lock-up strength of the receiver. The current NBAR receiver design has been discontinued. A meeting has been set up for the 4th and 5th of April with members from the Marketing group, Technical Section, and the FMS Process Engineering Section to define the path forward in regards to strength, styling, and manufacturability. The benchmark for strength will be the standard M/700 receiver. All efforts are being directed to continue testing the other phases of the design by using the M/700 receiver until a new receiver design can be determined.

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).

The initial test was fired using free-floating barrels as requested by D.C. Brennan. Additional testing of a four gun sample using Remington's conventional barrel bedding system was shot. These results indicated that additional testing with the Remington bedding system is warranted. A test is being set up to reshoot the rifles using standard Sportsman 78 stocks with fore end bedding pressure. In addition, D.C. Brennan has requested that the original test be reshoot using their shooter. They will be on site April 12th through the 15th. The guns will be disguised for both of these tests so that the shooter(s) will not know which rifles they are shooting in order to reduce any potential bias. The results of these tests will determine if it is warranted to continue with this program.

CONFIDENTIALSHOTGUN BARREL AUTOMATION - Baszczuk

The Pilger tests to produce sample cold form shotgun barrels with finished bore and chamber and partially finished outside contour has been delayed from April to the first part of July 1988. This delay is due to an extremely busy production schedule at the Sandvik Corporation in Arnprior, Ontario where the tests will be run. The quotes for new mandrel tooling and Pilger roll die alterations are also late. They are now expected around April first. This should allow sufficient time for fabrication without further delaying the tests.

Approximately 75 feet of both C-1035 and AISI 4130 ERW tubing is due. This is enough to produce about 50 barrels for evaluation from each material.

NEW 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. This layout is for a new gun and would not be used to alter a M/11-87. Computer simulation data has been used to provide a guide for altering a KFC M/250 for conversion to gas-assisted recoil operation. The layout and detail drawings are completed and in the model shop for prototyping. These parts should be ready by mid-April. A prototype inertia spring will be made by a vendor, completion date is uncertain.

The high speed movies of the Browning A-500 have been processed and evaluated. These have shown that we are in need of new high speed movie equipment. A Minor Construction Notice has been approved and a purchase requisition written for the necessary equipment. The purchase order has been received by the vendor and delivery expected by the end of April.

Recoil reduction efforts will center on recoil pad material/design and possibly using some type of "hydraulic" damping unit in the stock. A M/11-87 will be sent to "The Shooter's Emporium," by the end of March, for retrofitting a hydraulic recoil reduction device. Samples of a new material from the EAR Co. will be received by the end of March for evaluation.

CONFIDENTIALNEW .22 AUTOLOADING RIFLE - Smith/Jackson/D.Findlay, Sr.

This program will replace the present family of synthetic stock autoloaders, the N-66 and N-77. The current process is over 25 years old and uses special equipment and molds which are nearing the end of their useful life. 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 gun must be price competitive with the Ruger 10-22.

D.S. Findlay Sr. and I spent March 14th reviewing the design on the C.V. system. We cleared up some potential interference areas between the sear, disconnecter, and striker. We also moved components about pivot points to check for possible trouble spots. A list was made of work remaining to be done by Remington and Guilford Engineering.

## Remington:

- computer model
- housing group
- styling
- extractor design
- ejector/magazine latch
- extend magazine box to 10 shot
- alter model per above interferences & rebalance sear
- possible contact with Ram-Line for magazine box design work

## Guilford Engineering:

- receiver design (synthetic, extruded alum.)
- last shot hold-open
- torsion springs

To date we have completed the following from our list:

- extractor design: add use the current M/552 extractor this allows us to go to a double extractor system if need be by adding the M/572 left extractor.
- ejector design: designed a torsion spring ejector/magazine latch combined system.
- altered model per our discussion and rebalanced the sear.
- extended mag. box to a 10-shot design
- Tom Plunkett is working on the stock design and has given me a outline of the stock. I'm currently working on the trigger housing and some styling.

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.

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ELECTRO-CHEMICAL RIFLING - Lewis

A Part II on this project has to be submitted. Quotes are needed from Cation Corporation and estimated testing costs are needed from the Test Lab.