

CONFIDENTIALIlion, New York
September 29, 1988TO: W. H. COLEMAN, II
FROM: L. B. BOSQUET/T. C. DOUGLASNEW PRODUCTS DEVELOPMENT MONTHLY REPORT - SEPTEMBERCURRENT PRODUCTSEKSTROM-CARLSON CHECKERING MACHINE - Monteau/Hickey

Progress continues to be made toward getting the Ekstrom-Carlson checkering machine ready for production. The revised version of the sub-routine, "EDIT EKSTROM", has been tried and appears to be working as does the "INSERT CHECKER" routine. The feed rate and rotational problems associated with this part of the software have been corrected as has the editing function. Investigation is continuing into determining the cause of a positioning problem which has shown up in the latest version. Synermation has been contacted and made aware of the problem. Synermation is also still working on providing the capability of creating unchecked "islands" in the middle of a pattern.

The six cutter motors returned to Air Turbine Technology for modification have been received and tried. Noise level readings were taken and were still found to be unsatisfactory. A report indicating these findings has been sent to Air Turbine Technology along with one motor which runs at an acceptable level (76 dba). The long term goal of this effort is to reduce the noise level in the checkering area to the point that hearing protection is not required.

Although the motors are continuing to perform well, an investigation has been started looking into what may be a weak spot in their design - bearing life. Four motors have been sent back to the manufacturer due to bearing failure. Several different bearing designs are being looked into.

We are still waiting for information from Ekstrom-Carlson relative to having them make the necessary changes to the PAL (Programmable Application Logic) to separate the "A" and "B" drives.

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. Information has been forwarded to Industrial Engineering for the preparation of a project.

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 GPM produced SWS barrels has been run, producing barrels with excellent dimensions. Two rifles are ready for testing. Ammunition has been obtained. Initial testing will be 200 yard accuracy from the machine rest. This test will be fired when a break occurs in the firing of the production rifles.

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 them 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. A demonstration of the system will be arranged to help in the evaluation of the proposal.

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. Both have been received and will be installed and tried during October.

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 was on the plant August 25 to give us an update on the project. Work is progressing with the "wrapped pattern" and "CKEdit" sub-routines. He has begun the process of refining some of the routines and putting them into a "user friendly" format which will greatly simplify the steps involved in developing a checkering program. Late third or early fourth quarter is still a realistic goal for the completion of this program.

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MULTI-HEAD CHECKERING IMPROVEMENTS - Monteau

There is an on-going program aimed at improving the dependability of the equipment, quality and throughput of the process, and the environmental quality of the checkering area. Two of the items currently being pursued are noise reduction and machine improvements. The goal is to reduce the noise level to the point that hearing protection is no longer needed in the NC checkering area. One contributor to the higher than desirable level is the hydraulic package associated with each machine. To bring the readings into the acceptable limits, noise enclosures are being designed and built. Work on these enclosures is about 50% complete.

A second area being worked on is the improvement of the "Z" and "TILT" drive units. Bushings and wear plates are on order and will be installed as soon as they are received.

TOOL DESIGN - Monteau

All information needed for the preparation of a project to replace the Bruning 870 print machine with a non-ammonia whiteline printer was supplied to Industrial Engineering on September 12. A three month rental with an option to purchase is being proposed. If approved, this will eliminate the use of ammonia and its' potential hazards.

Three people attended surface design training September 26 and 27. This was the last of the currently scheduled training on the Compaq 386 Personal Designers in the Tool Design Group, however training is an on-going experience and efforts will be made to take advantage of appropriate courses as they become available.

FMS MODELING - Findlay

Re-modeling of the M/1100 LT-20 receiver has to be done once again due to poor interpretation of the drawing. It is estimated that a detailed and completed model will be turned over to the N/C and ATO groups by October 15th for tool path generation.

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

Prototype tooling for the redesigned fore-end support intended to replace our current fore-end/barrel support has been completed, and two advance parts have been received. It will be necessary to make a small change to the parts before testing can begin. We previously hoped to eliminate the need for reinforcing patch in the fore-end, but testing has proven that this is not currently feasible.

CONFIDENTIALNEW PRODUCTS - 1988 CATALOGPARKER - Murphy

The primary effort in the previous month was directed towards building prototypes for test. Highlights of last months activity are as follows:

- o The ten prototype barrel assemblies brazed in August are in the process of being finish machined and fitted to the frames. Synchronously, two of the new assemblies were sent to Bruce Dewey of Altec to develop a radiograph procedure to inspect the quality of the braze joint. In addition, we sent an old Parker barrel as well as a Winchester Model 21 barrel assembly for Mr. Dewey to draw comparisons with. Mr. Dewey completed his study and an advance copy of the radiograph procedure was fax-ed to Kolar so they could inspect the balance of the barrel assemblies at a local shop. A formal report on the inspection procedure will follow from Fred Schmidt.

Nuclear application braze joints allow for approximately 40% void, (evenly dispersed), and our Parker barrel assemblies should meet this standard. We will also have a bond superior to the original Parker and the Model 21 that we used for comparison.

- o The stock drilling fixture has been designed by Tim McCormack and Kolar and is being fabricated. Timely agreement on it's design was not achieved and this may delay the start of testing.
- o Don Mainland is interested in purchasing some older Remington equipment to facilitate the manufacture of production Parkers. I am assembling a list of available equipment and Don is assessing his needs. I expect a visit from Don sometime in the future conclude this business. Rather than have Remington ship our equipment to Kolar, this time I envision selling any equipment outright. This is a business decision that needs to be addressed.

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- o A schedule outlining the design acceptance testing has been developed. The key dates are as follows, (however these dates do not reflect delays caused by brazing):

Braze	August 15
Prototype Metalwork Delivered to Remington	September 30
Stock-Ready for Test	October 7
Test Complete	November 11
First Production Metalwork Delivered to Remington	January 89

Other Business:

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

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

Feed-back from the Alaskan field trip indicates that the participants liked the look and feel of the guns. There were some extraction problems encountered during field testing that are similar to those experienced at Ilion with the new 10 ga. experimental steel ammo. The problem has been identified as incorrectly formed shell head rim angles. Personnel at Lonoke are aware of the problem and are in the process of modifying their tooling to produce shells that meet SAMMI specs.

Some of the investment castings and MIM parts are out-of-tolerance on some dimensions. In the majority of cases the surfaces are not critical and the part print dimensions will be adjusted to allow acceptance of the parts. Surfaces that are critical will be adjusted by reworking at Ilion. Our intent will be to minimize or eliminate any mold tooling modifications that might potentially delay delivery of production parts.

Barrel extensions have now been manufactured from both 4137 Mod. and 4140L alloy steel. Dimensional stability of the 4137 Mod. material was far superior to the 4140L material during heat treatment. An additional grind operation was required to bring the warped 4140L parts back into spec. Therefore 4140L will be eliminated as an alternate material for the barrel extension.

An intentional gun abuse test was performed on two guns that had 4137 Mod. barrel extensions that were completely heat treated to Rc 41-46. The barrels of both guns were subjected to an estimated chamber pressure of 55000 p.s.i. Neither of the barrels failed. In both cases a portion of the bolt locking lug sheared off...allowing the bolt to move rearward to vent the high pressure gas. The receiver side-walls bulged and cracked at the shell stop pivot pin hole...allowing the front of the fire control to tip down. Examination of witness paper that surrounded the guns during the test indicated that a gun operator would not have sustained any major injury.

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 has verified that the point-of-impact meets Remington specifications. Marketing has requested that #4 lead shot be shot from these choke tubes. If one of the tubes provides a "full" pattern, then that tube will probably have a dual purpose marking on the tube. If neither tube meets this performance, one more tube will have to be developed to provide "full" performance with #6 lead shot.

CONFIDENTIALSP-10 MAGNUM (cont'd.)

Final parts have been received from the model shop for the alternate feed system design and it 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. Work also needed to be done to redesign the extractor system. This redesign work is complete and new extractors need to be made by the model shop before the gun can go into test.

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.

Tool design completion remains at about 90% and tool build is currently at about 35%. It is expected that all outside tool design will be completed by the end of the month. Of the design remaining in-house, 70% are an "insurance policy" in the event that the casting vendor cannot perform an adjusting operation on the carrier. This block of design will be deferred until all other 10 gauge design is done.

Product structures have been entered into the MRP system and are being verified. About 85% of the Process Records have been updated and released for typing. Shop Floor Routers are being entered as the Process Records are released.

S&K has trial and pilot quantities of both stocks and fore-ends ready for sanding and finishing operations. Thirty or forty sets (stock and fore-end combination) will be expedited through finish for the writer's guns and should be shipped to Ilion the first week in October. The fore-end checkering pattern has been programmed, debugged and is ready to run. The pistol grip pattern has been tried and needs to be mirrored for the other side of the stock.

Operator training has taken place on the K&T machining center and controller maintenance classes are continuing. Joe Inserra will be attending a machine maintenance course in October and will then train Remington personnel in-house.

CONFIDENTIALSP-10 MAGNUM (cont'd.)

We have been notified by K&T that the permanent tooling for the machining center will be ready for run-off at their plant the latter part of October. A successful run-off will negate the need to run trial and pilot over the interim fixturing and will provide the final step in the acceptance of the complete turnkey package.

With the exception of five investment cast parts and the components made by the MIM process, all purchased parts are available in trial and pilot quantities. Most of them have been processed and are ready for final assembly. Barrels have been started and are at the turn operation and receivers are at FMS. Programming of the trigger plate for FMS is underway. The "A" loading has been completed and tried - the "B" load programming is well along and "C" load tool packages are being set up and specified so that programming can be started.

Components for the twenty guns for the writers are progressing nicely. Barrels have been completed. Receivers will be complete around October 7. Trigger plates are being machined in the NC Shop and should be ready for assembly by October 14. Assembly of these guns should take place about mid-month so that some field testing can be done prior to shipping the guns to Texas for the seminar November 9 through the 12th.

TURKEY CHOKE TUBE - Murphy

Design Acceptance Testing by the Ilion Technical Section of 15 tubes from Kolar Arms is complete. The 3 inch Kolar tube provides the shooter with approximately a 5% increase in pattern percentage versus the standard Full choke tube. The 3 inch choke tube will be made from our current stainless steel material and will be coated black due to the fact that they protrude 1 inch from the muzzle. The design has been transmitted to the plant.

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 have been started.

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.

CONFIDENTIALSLUG GUN SYSTEM - D. Findlay

The objective of this program is to improve the accuracy of the Model 11-87 and Model 870 12 gauge 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.

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. Catalog samples have been prepared and sent out for photography to the ad agency. Design acceptance samples are in test and testing should be complete by the end of September. Preliminary results show group sizes of 2.5 to 3.5 inches with a 95% confidence level shot from the shoulder with this new shotgun system (rifled choke tube, high comb stock, cantilever scope mount, and scope).

An engineering estimate will be complete by the end of the month. It will be turned over to Industrial Engineering for development of economics so that a project can be prepared and funding approved. Quotations are being requested on components that will be purchased from the outside.

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

A sample of stocks with recoil pad and grip caps assembled were received from Culpepper the week of 8/29 for possible acceptance. Two stocks were returned to Culpepper with noted corrections to be made :

- the fit of the grip cap is not acceptable, gaps under cap and material chipped away.
- glue showing around grip cap and recoil pad and glue did not hold either part to the stock
- parting lines not removed as agreed upon
- texture of stock not uniform throughout stock
- rear take down screw hole needs to be larger in dia.

CONFIDENTIAL

MODEL 700 SYNTHETIC ARYLON STOCK (cont'd.)

The art work on the grip cap looked good and these noted areas can be/will be corrected as assured by Lee Six. A second sample, with corrections, was do to be run the week of 9/19 with these stocks to be sent to Remington for possible approval.

As soon as we approve the stocks, a Trial & Pilot run of 200 stocks will be started.

Lee Six has received the contract and is reviewing it with his lawyers.

All phases appear to be a go at this time with production just around the corner.

18 Rynite stocks , samples from the project , were sent to Employees' Sales and sold for \$45 each. This money was credited back to Research under w/o # 481152 , \$810.

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 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 has been received and needs accuracy testing. The drawings and parts list are being readied for transmittal.

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. Approval prints have been received from JGS on the chamber tools. Delivery of the tooling could be in mid October.

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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. 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.

MODEL 1100 MAGNUM RETROPIT 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
 Shells - Steel Shot
 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.

Transmittal has been completed. We just recently discovered we have a problem marking the tube after it has been coated. Samples sent to our marking equipment vendor were returned and sent to the Chem & Met lab for salt spray along with a tube that was marked first and then coated. Results of five hours of salt spray indicate that the coating first and then marking process is NOT acceptable. The marking first and then coating process IS acceptable but we would like a better marking before the coating is applied. The marking equipment vendor currently has heat-treated tubes to develop an optimum marking which will show clearly under the coating.

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NEW PRODUCTS AND PROCESSES - 1990 AND BEYOND

NEW .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.

D.S.Findlay Sr. was in the plant on August 16th and 17th. We reviewed progress of the program and status of some of the components, to date 12 components have been detailed and built/being built, with 5 more having been detailed or being worked on by the C.V. group. Tom Plunkett is surfacing the stock and its 98% complete, this was not an easy task and Tom with Dave's help has done a great job.

The housing has been detailed and when reviewed for corrections, a copy will be sent to Bill Marks for review of moldability using graphite. A number of parts are being or have been made in the Model Shop. Design work still remains on the magazine box and spring.

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.

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.

Initial testing of the KFC prototype gas-assisted recoil gun has begun. This prototype is currently operating with all

CONFIDENTIALNEW CONCEPT SHOTGUN (cont'd.)

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 have centered on recoil pad materials and possibly using some type of "hydraulic" damping unit in the stock. Testing of recoil pad materials from DuPont, the EAR Co. and Rogers Corp. is temporarily complete. More testing of the Rogers material is planned when new samples arrive. Recoil pad materials and testing data have an immediate application for plant purposes also. We are having a prototype mold made by a vendor for prototype pads made from DuPont Elvaloy 50D. Samples due by mid-Nov.

Two preliminary design reviews have been done. They have provided valuable direction for the project. First generation prototype design is now progressing and CAD/CAM work will begin at Ilion and EDL in Nov. The action system is still intended to be gas-assisted inertia.

NEW BOLT ACTION RIFLE - Martin

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 and detailing has been completed 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 September.

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

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NEW BOLT ACTION RIFLE (cont'd.)

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 currently being shot 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.

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.