

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington



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*File -
New Bolt Action
Rifle*

February 25, 1985

TO: J.W. Bower
R.S. Murphy

FROM: K.L. Calkins

RE: "Devil's Advocate" Report on NBAR Project

Here is a list of my observations, comments and questions concerning the NBAR project. I have grouped the items into general categories, however some items may fall into more than one category.

Design related:

- Pulling the trigger on the current design causes a clockwise rotation at the sear, meaning the firing pin head engagement surface is forced upward against the firing pin head. This motion means that in order for the sear to move, we must overcome the force of the firing pin spring, moving the firing pin assembly rearward. Though the distance the firing pin assembly moves is small, it is still necessary to overcome the spring and associated frictional forces. I believe this condition is a contributor to the relatively stiff trigger pulls the prototype guns exhibit. In the M/700 design, the sear does not move against the firing pin head when the trigger is pulled.
- My force analysis indicates that the trigger pull is more sensitive to different coefficients of friction than it is to the sear/trigger engagement angle. Friction is relatively uncontrollable in this situation, especially when the gun is out in the field. This design is also basically non-adjustable, so there is little way to compensate for frictional forces.
- The fact that the firecontrol is not adjustable will discourage some shooters from buying the gun.

*7
Sears 1/2
adjustment.
Needs to be
20.7*

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Design related: - cont'd.

- It will be much easier for people to tamper with the sear/trigger engagement surfaces because they are readily accessible when the stock is removed. If our goal is to make our guns more "foolproof" or "tamperproof," then we are not accomplishing this by giving people easy access to key engagement surfaces.
- By eliminating the "chins" of material from the receiver underneath the sear and trigger pin holes, it is possible for the drill to break through the bottom of the receiver. In best case now there will be only .022 of material there. This will look visually bad, cause sharp burrs and could weaken the support of the bolt lock and bolt stop. Breaking through could cause the drill to skew, thereby throwing off the hole. Or the pin may tend to wobble or come loose.

Other kinds of scope mounts won't work with our built-in mounts. This may discourage some potential buyers who either have mounts and don't want to buy another set, or don't want to buy Remington mounts.

The flat bottom and sides of the receiver and the shape of the firecontrol area's components may present a problem if owners want to glass bed their rifle. I understand this is a problem with the Ruger M/77 which has a flat-bottomed receiver. Once the bedding material has hardened it is reportedly difficult to remove the barreled action because of the receiver's shape. If this is the case with our rifle, it may deter some buyers.

The current design does not have a positive detent on the safety.

Prototype related:

- One of the prototypes has a sear spring so weak it cannot even support the sear's weight. *Problems making prototype spring in the Model Shop.*
- On at least one prototype the trigger engagement surface of the sear has been altered. This affects the position of the sear and trigger and the engagement between the sear and firing pin head. This makes for an entirely different set of conditions than what was designed.
- There is no list of specific modifications made to the parts of each gun. There is no way of knowing what has been altered on each gun or to what extent.
- The guns were assembled without a drawing for certain parts. Examples would be the safety connecting rod and the safety spring. Without a drawing, there is no guarantee that the parts are the same for each gun. This is another variable added in.

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Prototype related - cont'd.

- None of the guns have all-wood stocks. The cobbled-up stocks have already cracked at proof. I suspect these stocks may adversely affect the testing. Also, the guns need to be tested in wooden stocks to see how the wood itself holds up.

None of the guns have all of the design in them. None have bolt locks or detachable magazine boxes. Absence of these things will have an impact on the testing. I can't give any evaluation of them, either, because no prototype has them.

Testing related:

- There is no provision in the testing outline for any kind of debris test. I think a debris test would be valuable. Perhaps we should have a test along the lines of some of the tests performed for court cases. There are at least two areas I think should be looked at; between the receiver and the top of the sear, to see what happens if something lodges there, and between the sear and trigger in the safety rotor area.
- In some areas the testing outline states how many of the guns will be tested. However, for the blanked primer, dry cycle, trick, environmental, drop/jar-off, and ultimate strength tests there is no indication of how many guns are to be tested. I believe these tests should be performed on more than just a one gun sample.
- No mention was made in the test outline of taking headspace after proof. This should be done as a matter of standard procedure.
- The test outline makes no mention of what conditions the guns will be in when trigger pull and safety on/off force tests are performed. It should be stated whether the guns are to be dry or oiled, and if oiled, then what with. Lubrication could make a big difference in these tests.
- I question the validity of the trigger pull test since all of the rifles have been "tuned" by hand to work well. They have been modified in ways that a production rifle wouldn't.
- I question the validity of the safety on/off force test for the same reasons stated above. The triggers and sears have been lapped to help keep the safety rotors from binding. I doubt this would occur on production. Also, none of the guns have bolt locks or safety detents, both of which would affect the safety on/off force. Forces measured without these components wouldn't be accurate or representative of the complete design.

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Testing related - cont'd.

- The live load/unload test makes mention of the detachable box magazine, yet we have no detachable box magazine. This test won't be valid unless the detachable box magazines that the design calls for are used. The test outline is also vague as to whether one magazine should be used for each set of 50 rounds or if several are to be used. This should be clarified.
- I question the value of a field cycle test or an endurance test when all the components of the design aren't in the guns. We need to test the complete design, including bolt locks, detachable box magazines and wooden stocks. Endurance testing a stock cobbled up with "devcon" won't tell us how a wooden stock will perform.
- The test outline should be clarified with respect to the dry cycle test with a trigger "ear" broken. It should state where the ear is broken and how. Whether one ear or both are broken and whether the test is to be run with the ears broken in different places.
- I believe the trick test of the rifle (to get it to fire off safe or to get the safety to "hang") is likely to be invalid or at least inclusive for several reasons. None of the guns have all the fire control components. All lack bolt locks and safety detents and all lack final designs for the connecting rod and the safety spring. All of the rifles have been hand fit and all are likely to be different for this reason. As mentioned before, the trigger and sears have been lapped to help prevent the safety rotor from binding. This would seem to defeat the purpose of a trick test to see if the gun will "hang" safe in the mid (or any other) position.'
- The test outline doesn't specify what kind of oil or how much is to be used on the firecontrol for the environmental test. We should also consider running the test with different lubricants and with no lubricant. I question the validity of this test also for reasons I have mentioned before such as guns not having all of the firecontrol components.
- I question the validity of the jar off/drop test for reasons I've mentioned before. The guns lack several components. They are hand tuned and the stocks are not all wood. For this test, we might also consider making up prototypes to max. and min. specifications.

The next category consists of situations or conditions that could pose problems if they occur. The situations can be created without much bother.

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What-ifs:

- There are two I've already mentioned as part of the debris test - What if debris lodged in the gap between the receiver and the top of the sear and what if debris got in around the safety rotor between the trigger and sear?
- What if the safety spring gets tangled around the safety connecting rod? Could it happen at assembly? Does it pose a problem?
- What if someone removes the trigger spring entirely? The location of the center of mass is such that the part will want to rotate clockwise, in the direction that would cause the gun to fire.
- What if someone removes the gun from the stock and accidentally drops it? With the exposed components, is it more fragile than the current M/700? Should we be concerned about it?

Conclusions:

The current situation of the NBAR project seems to indicate a lack of planning, foresight and control. The design was to have been frozen but wasn't, is still in a state of constant change and is not complete. The prototypes couldn't be assembled as designed, and had to be hand-worked. There are no all wooden stocks for the prototypes to be tested with.

Despite a lack of key components and a completed design, testing is proceeding. Without these items, the testing will probably have to be repeated later, increasing testing time and cost. If the purpose of testing is to prove out the design, then shouldn't all the components of the design be there when it's tested? And shouldn't the guns be assembled as closely as possible to production techniques without hours of hand tuning? The Model Seven should have taught us that not testing the whole design at the same time can be costly.

Recommendations:

I believe a complete reevaluation of the NBAR project is necessary. Items that need to be reviewed include:

- Design Goals - What are we trying to accomplish with this program? Will this gun meet the needs of the marketplace? Can the design problems be solved?

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Recommendations - cont'd.

- Prototypes - Are the current prototypes representative of design? Will testing these prototypes tell us what we need to know about the design? What can we do to insure that we will get good prototypes in the future?
- Testing - Is the current test outline adequate? What can we do to improve it? Will some tests have to be repeated? What can we learn from the testing we've done?
- General - What is our current situation? Where are we going from here? Are we still on schedule? Can the schedule be met?
- Other areas to look at - fabrication, assembly, costs, contingencies.

KLC:sps