

## M/710 Development Status

Overall the development is progressing as scheduled. Eight engineering evaluation test (EET) actions were assembled and are currently in test. EET is typically the first evaluation of representative firearms, providing a complete system analysis versus individual sub-assembly evaluations. Based on the observations and functional performance of the EET actions, design improvements/corrections are implemented for the subsequent design acceptance testing (DAT).

### EET Observations/Issues:

During the assembly and testing of EET actions the following issues were noted and will require correction for DAT.

#### Receiver Insert Assembly

- Bolt Clearance Diameter undersized - Vendor to build new core at their expense.
- Side Plate assembly pins -- Intended to be press fit into receiver insert, but due to forces acting on the side plate, the pins would not hold. Replaced with screws and nuts to hold assembly together for EET. DAT will have redesigned rivets to capture side plate and receiver insert.
- Safety Pivot pin -- same issue as side plate pins, intended press fit did not withstand forces, replaced with screw and nut for EET. For DAT pin redesigned to incorporate M/700 snap retaining ring to maintain assembly.
- Trigger Adjustment Screw Pockets -- Molded as slot with side plate to cover and retain the screws. Design change to slot depth to reduce loading of side plate pins. Tool alteration required by vendor, at Remingtons expense.
- Safety Detent -- Redesign required due to non-positive "snap" to safe and fire locations. Prototypes received and shipped for heat treatment. Fallback option is current M/700 components/design.
- Receiver Interference Band -- There is a band at the rear of the receiver insert that is of greater diameter than the outside diameter of the receiver insert. This band is intended to provide the interference fit between the insert and the receiver. At the current level of interference, the receiver insert can be easily removed from the receiver. A design change to increase the interference has been issued to the vendor. Alteration required at Remingtons expense.

#### Barrel Assembly

As previously noted, minor improvements to the barrel assembly pressing fixture are required to improve radial alignment of the barrel and receiver. Due to slight misalignment in a few of the EET actions, interference of the trigger assembly and the stock has been noted. In extreme conditions, upon dry firing of the action prior to shooting, the sear stuck in the fired or down position, causing a follow down on the next cycle of the bolt assembly. Alterations were performed to the stocks to eliminate the interference. Corrections to the barrel assembly fixture will be required for DAT assembly.

#### Magazine Box Assembly

In general the magazines are functioning as desired. The rounds load and feed as desired. At this point in the testing only the 125 grain and 180 grain loads have been test fired. Slight modification of the latch surface of the box was required to ensure the box assembly would remain latched during firing. A design improvement to more positively latch the magazine will be implemented for DAT. In an attempt to minimize the cost of the magazine box development, rapid prototyped followers and box bottoms were purchased. The parts produced by rapid prototyping are dimensionally correct but the material is fairly brittle. During testing, numerous followers and box bottoms have cracked/failed. The intent for DAT is to have as designed molded synthetic followers and box bottoms. There have been occasions during testing where the tabs of

the magazine shell (stamped sheet metal) that retain the box bottom deform due to excessive loading during firing. Review of this issue will be required and potentially heat treatment of the magazine shell may be required.

#### Bolt Assembly

The locking lug geometry of the bolt and barrel dictate that the camming surface, for smooth lock up of the bolt assembly, be machined into the bolt head. In the M/700, the cam surface is machined into the receiver. The cam surface as designed and prototyped for EET does not produce a smooth lock up of the bolt assembly. A forward "push" of the bolt handle is required prior to rotation of the bolt assembly into the locked position. Redesign of the cam surface has been completed and a single sample ordered to verify performance. DAT bolt assemblies will include improved cam surfaces.

#### Design Acceptance Test (DAT)

The objective of Design Acceptance Testing is to verify the performance of the design relative to the design intent. In most instances the DAT has been completed prior to initialization of the process development segment of a new product introduction. The M/710 program was presented as more of a process development function than a design oriented program due to the basic bolt action design and targeted manufactured cost. The main objective of the M/710 program is a bolt action rifle manufactured at a cost of \$103 and a Jan. 2000 introduction. To meet the Jan. 2000 deadline, a non-standard development schedule was required. As presented during the Feb. 1999 program review, the DAT portion of the M/710 program was to include as many production manufactured components as possible. The DAT component procurement was to begin in Feb. 1999 and continue through DAT firearm assembly scheduled for June 25, 1999, with DAT to begin June 28, 1999. At this point in the program, it will not be possible to acquire production processed components, therefore DAT will be reconfigured as follows.

#### DAT Rev. #1:

By July 15, 1999, R&D will prototype 15 actions (rifled barrel blanks to be provided by Ilion). The objective of this test will be to verify the corrections/improvements required as a result of the EET.

#### DAT Rev. #2:

This test will be the "formal" DAT as presented in Feb. 1999. Manufacturing will be required to produce as many of the components for this test as reasonably possible, based on vended component delivery. The timeline will have to be generated by Manufacturing, with the Jan. 2000 introduction as a requirement. Assuming DAT Rev. #1 validates the design, DAT Rev. #2 should verify the manufacturability of the components, allowing the production Trial and Pilot (T&P) to follow closely behind.

#### Marketing Samples:

Additional components to provide limited samples for Marketing analysis/catalog photography will be ordered with the DAT Rev. #1 components.

As stated in the opening paragraph, the program is proceeding fairly well. Although there is still a lot of testing to be completed, the guns are functioning as intended. At this time, there does not appear to be any "show stoppers" from a design standpoint. All of the design improvements/corrections noted to date should easily be completed and implemented prior to DAT Rev. #1. Assuming successful results of DAT Rev. #1, timing of DAT Rev. #2 will dictate our ability to meet the Jan. 2000 introduction date.