710 Dry Cycle
6/16/00
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PURPOSE

This report covers a dry cycle test of the 710 bolt / firing pin / fire control to 5000 cycles as requested by Test Lab Work Request # TLW 0010AE.

PROCEDURE

The procedure outlined in TLW 0010AE was followed. A Model 700 dry cycle fixture was modified to cycle the Model 710. Two guns were selected for testing: a Model 700 bearing serial number E6327227 and a Model 710 test gun marked "A15" and bearing the serial number XC1130. Both guns were not new. The Model 710 had already been fired 301 times. The barrels on each gun were cut to about three inches and the stocks were removed. The actions were each cycled repetitively to 5000 rounds. At each 1000 round level, headspace was checked, trigger engagement was measured using the Microvue equipment, and pictures were taken of four critical wear areas. The guns were cleaned and lubricated at each 1000 round level, and the parts were photographed again.

RESULTS

One part failure occurred on the Model 710. When the gun was disassembled after 2000 rounds, the bolt assembly pin was found broken in half. The pin was replaced, and the replaced pin was found broken when the gun was disassembled at 4000 rounds. The pin was again replaced. When the gun was disassembled after 5000 rounds, cracks were developing on the bolt assembly pin. The cracks developed on the top and bottom of the edge of the firing pin clearance hole through the pin. Four cracks could be seen: short, wide cracks on one side of the pin and longer hairline cracks on the other.

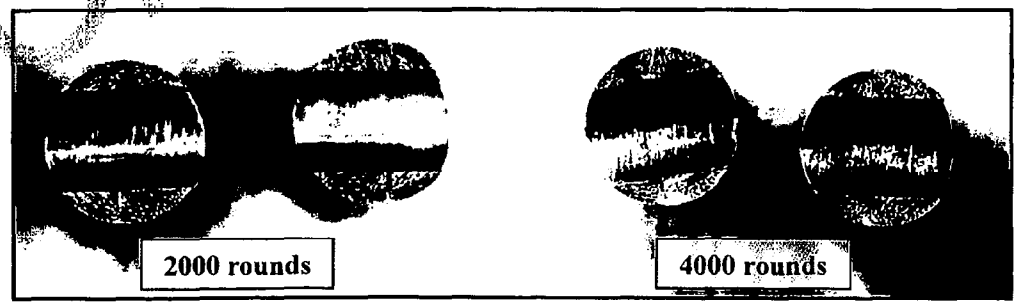

Figure 1. Fracture surfaces of bolt assembly pins.

Bolt assembly pins from three long-term Model 710 rifles were examined. One rifle had been fired 10,000 rounds. Its pin had a single crack that was much smaller than the cracks in the 1000-cycle pin from the dry cycle test. The cracks in the 1000-cycle pin could be seen without magnification, but the crack in the pin from the 10,000-round gun could not. Pins from two 5000-round guns were examined and no cracks were found.

The cracking of the bolt assembly pin seems to be caused by a situation that occurs only when the gun is dry-fired. When the gun is dry-fired, the firing pin strikes the back of the bolt head with all of its energy. Without a cartridge in the chamber, the bolt head is free to bound forwards until the tolerance in the bolt assembly pin fit is taken up. The bolt head is then stopped by an impact between the bolt assembly pin and bolt and between the bolt assembly pin and bolt body. These events do not occur when a live round is discharged. When a live round is fired, the firing pin never reaches its full-forward position. Firing a round also places a high pressure on the bolt face, further preventing it from bounding forwards.

Breakage of the pin does not seem to render the gun inoperable or unsafe. The broken pins in the dry-cycle gun were not found until the end of the cycle level being tested.

Table 1 contains the measured values of headspace and trigger engagement.

Cycles	*Headspace (in)*		*Engagement (in)*	
	710	*700*	*710*	*700*
0	min	+0.007	0.0210	0.0164
1000	min	+0.008	0.0212	0.0166
2000	min	+0.008	0.0217	0.0172
3000	+0.001	+0.008	0.0234	0.0180
4000	+0.001	+0.008	0.0216	0.0181
5000	+0.001	+0.008	0.0209	0.0181

Table 1. Measured Headspace and Trigger Engagement.

Headspace grew by about 0.001 inch in each gun. In the Model 700, trigger engagement grew steadily, increasing 0.0017 inches over the duration of the test. Trigger engagement in the 710 varied more erratically. The maximum engagement measurement differed from the minimum value by 0.0025 inches, however at no time did it fall below the .020 inch minimum specification.

Pictures were taken of four areas in both guns: the firing pin head, the cam surface the firing pin head rides upon, the bolt lugs and the sear.

Two areas of the plastic bolt plug on the 710 showed noticeable wear. The non-bolt-side firing pin head ear displayed considerable flattening. This can be seen in Figure 2.

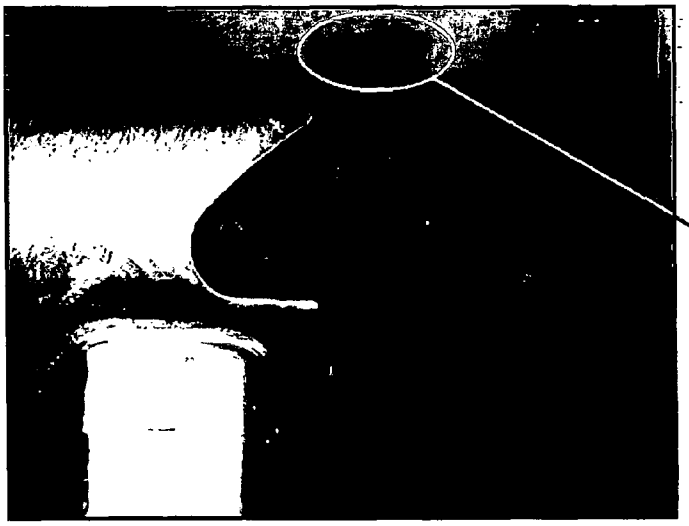

Figure 2. Deformed area on 710 bolt plug.

Deformation of the plastic bolt plug also occurred at the bolt-side front corner. This area of deformation may be seen in Figure 3.

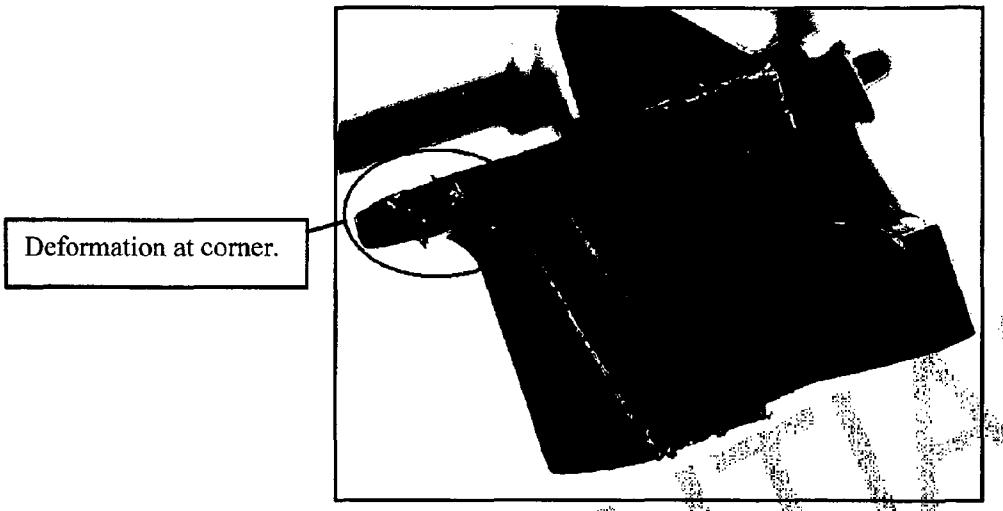

Figure 3. Deformation at corner of 710 bolt plug.

No areas of remarkable wear could be found on the Model 710 receiver insert.

Very little wear was seen to occur on the bolt heads of either gun. Figure 4 contains pictures of the Model 700 bolt lugs before and after the test. The amount of wear shown in the before and after pictures is almost identical.

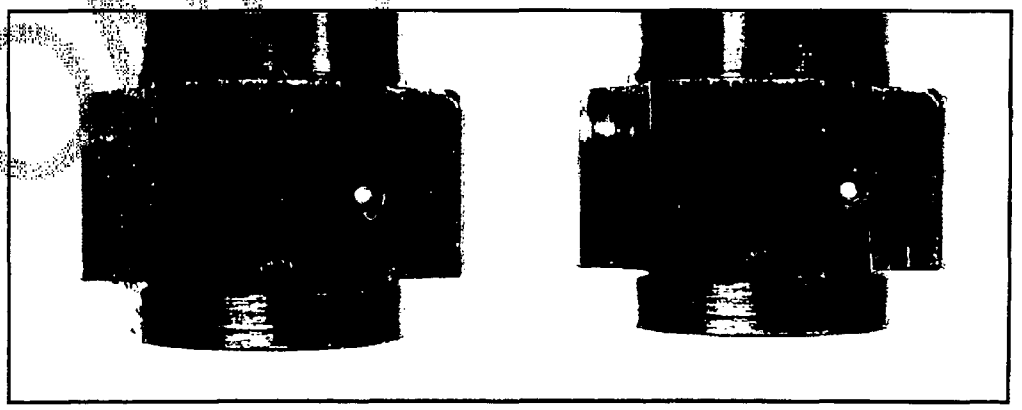

Figure 4. 700 bolt lugs, before test (left) and after 5000 rounds (right).

Figure 5 contains pictures of the Model 710 bolt lugs before and after the test. Only a slight amount of wear can be seen between the before and after pictures.

Figure 5. 710 bolt lugs, before test (left) and after 5000 rounds (right).