PROGRESS REPORT

4/17/47

PRE-PILOT TEST
of
1 - M/721 - 30-06 Cal.

Period: 2/21/47 - 4/4/47
Project: FD-721-1 W.O. #71106
Previous Progress Reports: None
Prepared by: W. E. Leek

INTRODUCTION

This report covers the testing of one Pre-Pilot M/721 - 30-06 Bolt Action Rifle, and was conducted to ascertain whether the functional qualities inherent in the model guns still existed in the first pilot guns made according to production standards. It was also felt that any discrepancies encountered in the functioning of this gun could be corrected in production before a large number of pilot guns were made. The strength of this weapon has never been determined and it was considered desirable at this time to subject the gun to severe strength tests.

OBJECTIVE

1. To determine the gun's Functional Performance.
2. To determine the gun's Overall Strength.
3. To determine the strength of the Barrel.
4. To determine the strength of the Action.
5. To determine the strength of the various component parts of the Bolt as follows:
   a. What is the strength of a carburized Bolt Head?
   b. What will happen during firing if a Bolt Head is 1/4 brazed to the Bolt Body?
   c. Will a brazed Bolt Handle withstand the full force of: (1) A cartridge containing 2.0 grams of proof powder? (2) A standard cartridge?
   d. What effect will abnormal pressures have on a Bolt Head which has not been tempered?
   e. What will happen if the brazed joint between the Bolt Head and Bolt Body fails to hold during firing?
   f. What will happen during firing if a Bolt Head is 1/2 brazed to the Bolt Body?
   g. Will the head space advance during proof firing if the Bolt Head contains dead soft lugs?
   h. Does the Bolt Head, during firing, impart enough impinging force upon the Bolt Body to break the brazed Bolt Handle?
   i. Determine the strength of the Extractor to withstand (1) abnormal pressures, (2) defective ammunition.
   j. Determine the strength of the Ejector to withstand (1) abnormal pressures, (2) defective ammunition.

WORK PROGRAM

The Routing Ticket with Ammunition Schedule attached dated 1/21/47 (Functional and Strength Test) for M/721 Pre-Pilot Bolt Action Rifle was used. In general, the test included functional firing of five hundred rounds of standard

ammunition in addition to special tests to determine the strength of the Barrel and Action at sub-zero temperatures and when being subjected to ammunition developing extremely high pressures. Other special tests were designed to test the Bolt by purposely introducing errors in heat treatment, head space and brazing, to determine the maximum strength to be expected under these conditions.

CONCLUSIONS

The results of this test show that:

1. The gun's Functional Performance is excellent.
2. The gun will withstand a pressure developed by .72 grams of proof powder above the normal* proof loading.
3. The Barrel used in this test:
   - a. Will withstand pressures developed by 3.5 grams of proof powder.
   - b. Will withstand (except for erosion) all types of defective ammunition.
   - c. Will withstand the pressure developed by firing a proof load, its bullet contacting an additional 220 grain bullet located inside the barrel.
   - d. Will withstand the forces set up by firing under extreme maximum head space conditions.
   - e. Will (after filling the muzzle end of the bore by pushing the barrel 3 times a distance of 15" into dry sawdust) with a normal round, discharge the sawdust from the muzzle without damage to the barrel.
   - f. Will, without damage to itself, withstand the force from a normal round to push out a jammed cleaning patch located 6" in front of the chamber of the barrel.
   - g. Will bulge if a round is fired into the bore which contains a lodged bullet located 6" in front of the chamber.
   - h. Will fracture at its muzzle if a round is fired into the bore which contains a lodged bullet in the muzzle end of the barrel.
   - i. Will completely fracture from the chamber section in the forward end of the receiver to the muzzle if the middle bore section of the barrel is filled with a 6" column of lead.
4. The Action used in this test:
   - a. Will withstand any loading of proof powder.
   - b. Will withstand all types of defective ammunition.
   - c. Will withstand any pressure developed by firing a live round into a "plugged" barrel.
   - d. Will withstand forces set up when firing under extreme maximum head space conditions.
   - e. Is stronger than the Barrel and therefore its maximum strength can not be determined under these conditions.
5. a. The rim of the carburized Bolt Head sheared when using a shell containing .52 grams of proof powder above the normal proof loading.
   - b. The 1/4 brazed Bolt Head came loose from the Bolt Body after firing three rounds, two of which were above proof loading.
   - c. (1) A brazed Bolt Handle will not withstand the full force developed by a cartridge containing 2.0 grams of proof powder.
   - (2) A normally brazed Bolt Handle will not withstand the full force developed by a standard round.
   - d. The lugs on a Bolt Head that have not been tempered will not upset under loadings of .42 grams of proof powder above a normal proof loading.
   - e. There is no evidence of the Bolt Body moving rearward with sufficient force to break the brazed Bolt Handle (when the Bolt Head is not brazed to the Bolt Body).

*Normal proof loading contained 2.78 grams of proof powder.

f. There is no evidence of the Bolt Head containing 1/2 braze to the Bolt Body, of separating from the Bolt Body during the firing of four proof rounds.

g. The head space advance of a Bolt Head containing dead soft lugs was .018" after firing one proof load and an additional .0005" after firing the second proof load.

h. There is no evidence of enough inpinging force upon the Bolt Body to break the brazed Bolt Handle.

i. (1) An abnormal pressure developed by 3.1 grams of proof powder will swell the head of the shell case sufficiently to bind the Extractor between the shell and the inleted Bolt Head. Removal of the shell head will damage the Extractor.

(2) Defective ammunition containing split heads will anneal the Extractor, rendering it incapable of good functional performance.

j. (1) An abnormal pressure developed by 3.1 grams of proof powder causes the Ejector to set back into the Bolt Head preventing it from returning to its normal position. An abnormal pressure developed by 3.2 grams of proof powder caused the Ejector to penetrate the Ejector Washer.

(2) The Ejector will withstand defective ammunition.

EXPERIMENTAL DETAILS

Experimental Details are on file with the Test Group and may be had upon request.

The Receiver as tested shows Rc 41/41 (within specification)- 8640 Material.
The Bolt Head as tested shows Rc 37/39 (" ")- " "

RECOMMENDATIONS

It is recommended that:

1. The M/721 and M/722 Bolt Action Rifles continue to be manufactured under specifications as follows; Receiver - Rc 37/42; Material 8640; Induction Harden Front and Rear; Oil Quench; Temper - 650/700°F.; 30 min. Bolt Head - Rc 40/45; Material 8640.

2. The M/721 and M/722 Bolt Action Rifles be advertised as containing exceptionally strong Actions and ideally suited for hand loading as well as for normal shooting.

W. E. Leek/ac