REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington PETERS

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FROM: F.H. Smith

Extractor Pull Test

A test vehicle was built which would allow us to capture a 30-06 casing, load a breech bolt assembly, less ejector, suspend a bar from the bolt handle, and drop a weight at various heights, pulling on the extractor-case engagement trying to dislodge the extractor.

The test was designed to determine at what height a 2-1/2 pound weight could be dropped and either disengage the extractor from the rim of a case, or pull the extractor through the rim of a case. We wanted to determine how the Model 700 and NBAR designs compared to competitor's designs (bolt actions).

Competitor's guns used included: Winchester Model 70, Ruger Model 77, Browning, Colt Sauer, Weatherby Vanguard, Smith & Wesson Model 1500, and Sako.

The test was conducted by engineering in the Research gun room. The results of the test were:

- M/700 - a 3 lb. 13 oz.* weight dropped from 19", extractor pulled through the rim of the case. Extractor set back under shroud by test.
- NBAR - current design using a 2-1/2 pound weight, extractor pulled off at any height.
- Winchester M/70 - a 2-1/2 pound weight from 15", extractor pulled through rim.
- Ruger M/77 - a 2-1/2 pound weight from 17 in., extractor pulled through rim. Extractor upset by test.

- Browning - weight of bolt assembly pulled the extractor off the rim.
- Colt Sauer - a 2-1/2 pound weight from any height, extractor pulled off the rim.
- Weatherby Vanguard - a 3 pound 13 oz.* weight from 19"**, extractor stayed on.
- Smith & Wesson M/1500 - a 2-1/2 pound weight from 17", extractor pulled off rim.
- Sako - a 3 pound 13 oz.* weight from 19"**, extractor stayed on.
- NBAR 1 - (1st design bump set) a 3 pound 13 oz.* weight from 16", extractor pulled off rim.

Conclusions

- Sako and Weatherby bolts and extractors are of the same design and this test shows them as having the better holding ability. They stayed on the rim under maximum test conditions and showed no signs of failure or fatigue.
- M/700 and NBAR 1st design showed next best performances, however, the M/700 extractor did set back under the shroud and would no longer be functionable.
- Smith & Wesson and Ruger were next in performance, however, the Ruger's extractor shows signs of failure.
- NBAR (current) and Colt Sauer were next with neither staying on the rim under any loading.
- The Browning's extractor system was the last in performance, under this type of testing.

Recommendations:

- A determination should be made as to which condition is desirable. Is it better to pull off under loading, or to pull through the rim?

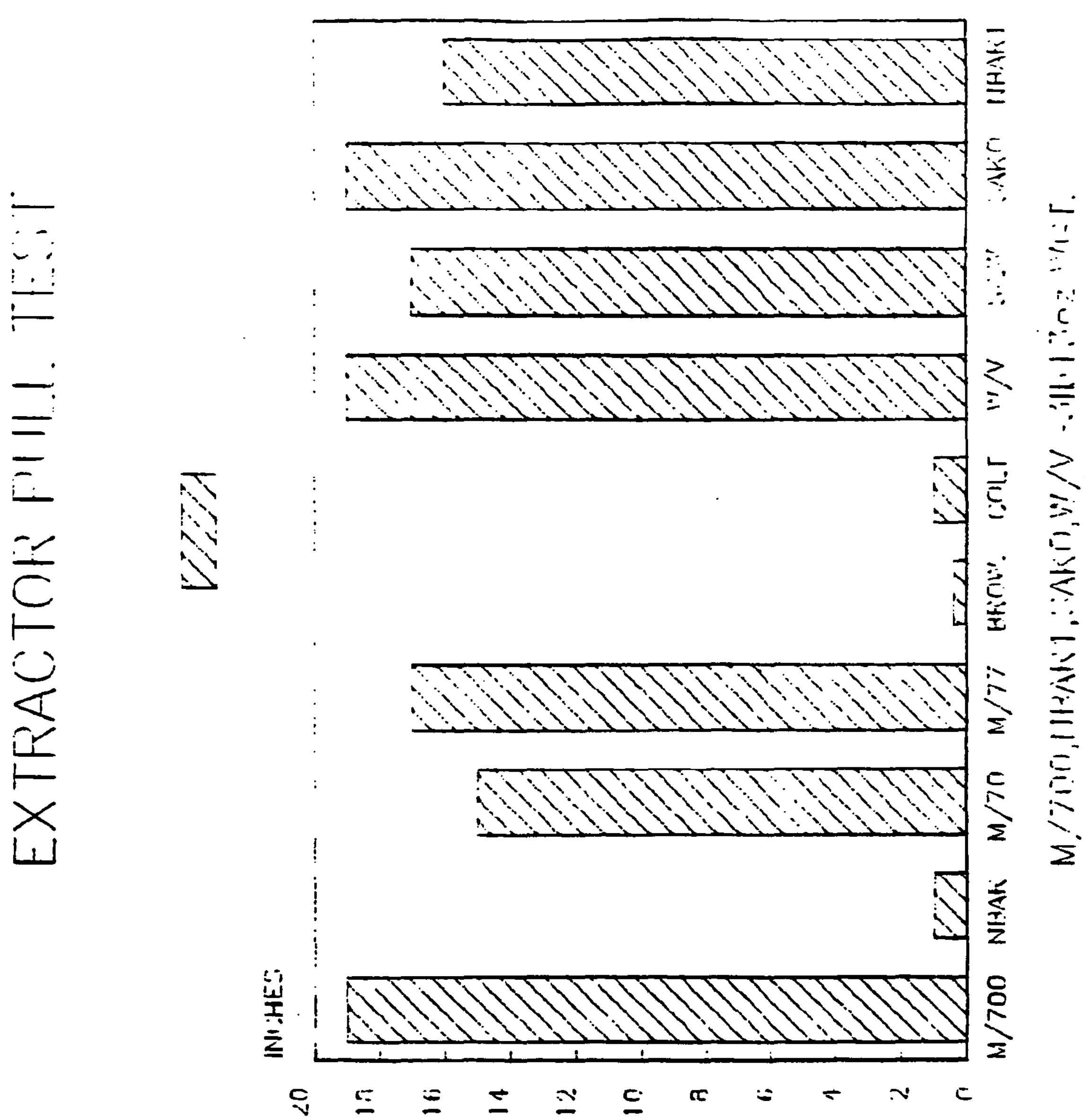
Recommendations - cont'd.

- What of the Colt, Browning and NBAR extractors? The Colt and Browning systems obviously work but does this test show them to be undesirable?

- The NBAR extractor system is currently in the Test Lab for testing. The results of that testing and the analyzing of this test should give us a direction, and answers to the above questions.

FHS:sps
Attach.

Note: * 3 lb 13 oz. weight was needed to disengage some extractors
** 19" was maximum height that 3 lb. 13 oz. weight could be dropped from.


EXTRACTOR PULL TEST
INCHES
20
18
16
14
12
10
8
6
4
2
0
M/700
NHAK
M/70
M/77
BROW.
COLT
W/V