# The Effect on Firearms Identification by Tubb's *Final Finish*™ Treatment

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***ABSTRACT***

***Lead-lapping of newly manufactured rifle barrels is employed by some manufacturers to remove any roughness and gross toolmarks from the original rifling process. The current (2019) version of David Tubb's Final Finish™ product consists of a series of jacketed bullets coated with boron nitride and a set of detailed instructions for the specific purpose of enhancing the quality of a rifle barrel's bore. The accompanying promotional literature also claims improved accuracy and higher muzzle velocity as a result of the Final Finish™ process. For this study, a well-used World War I vintage '03 Springfield rifle with its original 4-right, .30-'06 barrel was subjected to the Tubb Final Finish™ process. Test-fired bullets were collected prior to and after each 10-bullet shooting sequence. Each bullet was scanned with the Evofinder™ device. Test-fired bullets from each group could easily be matched among themselves, and with the exception of the last group of test-fired bullets, could not be matched to the previous group of test-fired bullets. The patterns of striae on land impressions following the completion of the Final Finish™ process were more numerous and more pronounced than those on the pre-treatment bullets. No increase in muzzle velocity was found as a result of this process. Before and after accuracy tests were not carried out due to this rifle only having open sights. The important take-away for the firearm examiner from these tests is that even a single step in the Final Finish™ process renders the subject firearm a different firearm insofar as traditional firearm identification. The use of this product leaves no obvious evidence in the bore of the firearm that such a procedure has been applied.***

## Introduction-Background

A number of products have appeared over the years designed to "freshen" rough or corroded bores, or to "improve" existing bores using somewhat similar methods. Historically, these have been referred to as "fire-lapping" for the reason that they all employ a coating on one or more bullets which are fired in the usual manner. This author's first encounter with this procedure was in 1993 when an Idaho company, called LBT (Lead Bullet Technologies) and now long out of business, offered their "fire-lapping" compound. This product appeared to consist of a fine particle size of silicon carbide (SiC) dispersed in an oil designed to be smeared on the bearing surface of lead bullets prior to being discharged in the firearm whose bore was to be "improved". This writer gave a paper on the use and results for this product at the 1994 AFTE meeting in Indianapolis, IN **[1]**.

This technique was revisited nine years later with another AFTE presentation in Philadelphia, PA, in 2003, entitled "A New Glock in 60 Seconds" **[2]**. This presentation was an outgrowth of the substantial difficulty in matching bullets from 9mm Glock pistols. It was found that placing 1 to 2 drops of *Permatex*™ valve-grinding compound - a thick, glycol-based mixture containing silicon carbide- on the nose of a full metal-jacketed bullet, then carefully inserting the cartridge in the pistol's chamber and discharging it resulted in relatively easy-to-match bullets. **Figure 1a**, **1b**, **1c** and **1d** have been reproduced from that 2003 AFTE presentation. For less than $4 at that time, a police armorer would have sufficient material to render several hundred department Glock's suitable for later identification purposes if a department Glock was subsequently stolen or discharged in officer-involved shootings. At least one Arizona law enforcement agency was contemplating doing this until they were advised by the manufacturer that it would nullify the warranty on the department's Glock pistols. There's even more to this story: this writer was urged not to submit this presentation for publication in the AFTE Journal (name withheld) for fear that criminals would use it to alter the bores in their pistols following their criminal use of same. In retrospect, it seems highly unlikely that criminals who use firearms subscribe to the AFTE Journal, thus this very belated article.

Ashely Northcutt, formerly of the Mesa Arizona Police Crime Laboratory, went far beyond this writer's simple demonstration during her enrollment in the 2007 NFEA class. Using the same basic *Permatex*™ procedure, she found that identifiable bullets were produced after treatment with *Permatex*™. Moreover, these new striae arrays persisted for at least 900 rounds **[3,4]**.

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**Figure 1a**

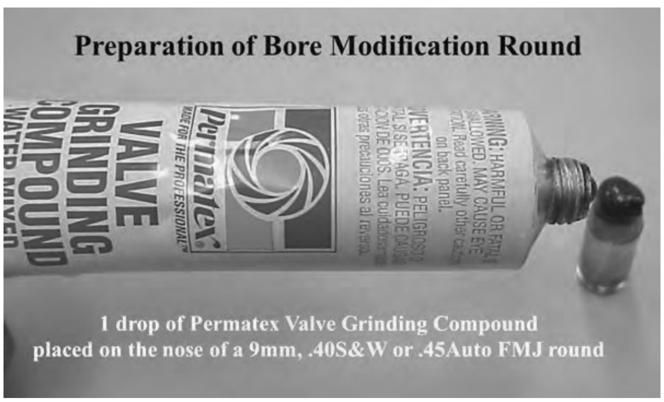


**Figure 1b**

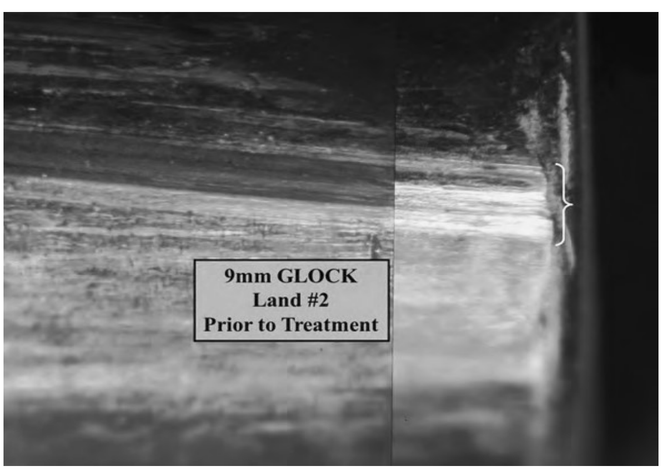


**Figure 1c**

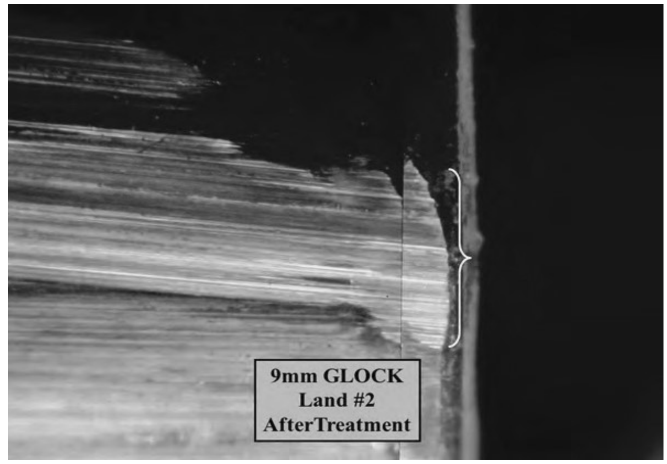


**Figure 1d**


**Figure 2**


**Figure 3**

A number of other bore treatment products had appeared by 2009. These were evaluated by this writer and several members of the Phoenix Police Crime Laboratory, culminating in an article in the Summer 2009 issue of the AFTE Journal **[5]**. Conventional optical microscopy was used to illustrate the effects, or lack thereof, on the striae patterns on fired bullets. Two events have prompted a brief re-visitation of this subject: 1) the coating on the Tubb *Final Finish*™ product has changed from aluminum oxide (corundum) to cubic boron nitride (cBN) and 2) accessibility to an *Evofinder*™ device has offered a much-improved view of the land impressions on pre- and post-treatment bullets.

Boron nitride is a synthetic compound formed from boron and nitrogen. It exists in several crystalline forms. The cubic form is next to diamond in hardness. The commercial name for this abrasive is *Borazon*™. David Tubb markets kits containing 50 bullets with five levels of cBN coating. These are packaged in five, 10-bullet sets, to be handloaded and fired in a specified order. Loaded cartridges are also available in rifle calibers from .204 to .45-70 (5mm-11.6mm) and pistol calibers from 9mm to .45-caliber (11.5mm). **Figure 2** shows the contents of the .30-caliber (7.62mm) kit purchased by the author. The letters 'B' through 'F' in the lower portion of this figure relate to groups of test-fired bullets (to be described later) collected after the discharge of each set of the *Final Finish*™ bullets. **Figure 3** provides a comparison of one of the *Final Finish*™ bullets with a traditional copper-jacketed bullet of the same caliber and weight. The reader can find additional information regarding this and other products at **references 6** and **7**.

**Procedure**

In accordance with the *Final Finish*™ instructions, a modest handload was prepared for the *Final Finish*™ bullets by the author using *Reloder 7*™ powder loaded in .30-'06 cartridges for firing in a .30-'06 rifle with a 22-inch, 4-right barrel. "Modest" here means less than full-power loads for these 175gr (11.3g) cBN-coated bullets. **Figure 3** lists the powder charge, the calculated muzzle velocity, and calculated peak pressure for this handload. By way of comparison, the maximum operating pressure for this rifle is approximately 60,000 pounds per square inch (4137bar), and at this peak pressure level, the 175gr (11.3g) bullet can be launched with a muzzle velocity of approximately 2800 feet per second (853m/s). The rifle used in this study is depicted in Figure 4. A *Labradar*™ unit (also shown in **Figure 4**) was used to obtain the actual muzzle velocity values and to evaluate in-flight bullet stability **[8]**. Any changes in the individual characteristics induced by the discharge of the *Final Finish*™ bullets was evaluated as follows: slightly oversized bullets, handloaded in .30-'06 cartridge cases, were used to insure deep engagement by the lands of the test rifle as well as contact with the grooves. The bullets employed were *Hornady*™ 123gr (8g), .310-inch (7.87mm) diameter full metal-jacketed bullets, *Hornady* product 3147. An 8.0gr (0.52g) charge of *Alliant 2400*™ powder plus kapok as a filler to keep the powder charge in place was used to recover specimens from the author's water recovery tank. This load, in the .30-'06 rifle, produced a muzzle velocity of approximately 1000 feet per second (305m/s).

The complete bearing surfaces with the pre-treatment and post-treatment test-fired *Hornady*™ bullets were scanned with the *Evofinder*™ device. Views of individual land and groove impressions were compared after each of the 5-step treatment process.


**Figure 4**

**LABRADAR MUZZLE VELOCITY RESULTS**
40.0gr *RELODER-7*™ WINCHESTER LRP
TUBB *FINAL FINISH*™ 175gr .30-CALIBER BULLETS
10 SHOT AVERAGES

**SET 1 AVG. = 2473fps±18fps**
**SET 2 AVG. = 2514fps±40fps**
**SET 3 AVG. = 2480fps±16fps**
**SET 4 AVG. = 2470fps±32fps**
**SET 5 AVG. = 2495fps±27fps**

**Table 1**

**Results**

The *Labradar*™ results for the first set of 10 bullets (the most abrasive of the five sets) revealed the bullets to be stable in flight and to have an average muzzle velocity of 2473fps±18fps (754m/s±5.5m/s). A Sierra 175gr TMK bullet launched with the same powder charge yielded a muzzle velocity of 2418fps (737m/s). Average muzzle velocity values varied very little for each of the five, 10-shot treatment groups. The results are given in **Table 1**.

Before the application of the first 10-shot treatment, six test-fired *Hornady*™ bullets were collected and inter-compared. These bullets were designated as Group A. All six bullets showed good reproducibility and could be easily matched at land impressions 1 and 3. **Figure 5** provides an *Evofinder*™ 3D view of a matching land impression and the adjacent groove impression for two pre-treatment .310-inch (7.87mm) *Hornady*™ bullets. This particular land impression possessed the best markings of the four lands. **Figure 6** shows a comparison between one of the pre-treatment Group A *Hornady*™ bullets depicted in the previous figure and a test-fired *Hornady*™ bullet from Group B collected after the initial series of 10 boron nitride-coated bullets were fired through the rifle. An inspection of this figure will quickly reveal that the striae that could easily be matched in **Figure 5** have not survived the first *Final Finish*™ treatment, and a whole new array of much coarser striae appear in this same land impression as a result of this treatment. However, the nearby groove impression displays considerable surviving agreement. See the yellow parallelogram in **Figure 6**. Note: The bore of the rifle was cleaned with solvent and tight-fitting cotton patches before the post-treatment, test-fired *Hornady*™ bullets were collected. This procedure was carried out after each series of ten *Final Finish*™ bullets.

The next set of 10 *Final Finish*™ bullets (Set 2) was followed by four of the *Hornady*™ bullets and designated Group C. All four of the .310-in. (7.87mm) diameter bullets in this group could easily be matched among themselves at each of the four land impressions. Comparisons of test-fired bullets from this group (Group C) with those from previous Group B once again exhibited multiple changes in the land impressions. Some striae in the land impressions of the B Group survived, but others had disappeared. It may be debatable among examiners as to whether the correspondence between land impressions shown here (known to be from the same land) rise to the level of an identification. **Figure 7** represents such a comparison. The adjacent groove impressions, on the other hand, show considerable agreement and have been enclosed in the yellow parallelogram. A land impression width has also been taken and reported in the aqua-blue entry.

As the coatings on the Tubb *Final Finish*™ bullets became less abrasive with Sets 3, 4 and 5, many of the striae in the land impressions from a previous set of bullets survived after the discharging of the subsequent sets of *Hornady*™ bullets. **Figure 8** provides a rather satisfactory 'match' for Land 4 between a bullet from the last set (Group F) and the previous set (Group E). Finally, **Figure 9** illustrates a rather good striae 'match' at Groove Impression 4 between a pre-treatment bullet from Group A and a bullet from final Group F. However, no arrays or patterns of matching striae were observed in the four land impressions.

## Summary

The very first set of Tubb *Final Finish*™ bullets completely changed the striae patterns in all four land impressions.

The 'new' striae were more numerous and more pronounced than those on the pre-treatment bullets.

The later groups of the Tubb *Final Finish*™ bullets with their finer abrasive cBN coatings produced fewer changes in the land impressions.

This product applied to this rifle did not polish or smooth the surfaces of the lands; rather they became somewhat rougher.

Striae patterns produced on test-fired bullets by contact with the grooves in this rifle survived the complete treatment process showing that the boron nitride abrasive had little or no effect on the metal constituting the grooves.

No increase in muzzle velocity was found as a result of this process.

Before and after accuracy tests were not carried out due to this rifle only having open sights.

## References

[1] Haag, L.C. (1994). Fire Lapping. AFTE 1994 Seminar, Indianapolis, IN

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[3] Northcutt, A. (2007). Glock Barrel Modification: A Feasible Method to Facilitate the Identification of Fired Bullet., NFEA Class 0701

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[5] Haag, L.C., et al. (2009). Bore Lapping Compounds and Their Effects of Traditional Firearm Identification. AFTE Jour. 41(3). 232-245

[6] www.DavidTubb.com

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[8] Haag, L.C. (2019). The Labradar Device as a Forensic Tool. AFTE Jour., 51(4). 198-219

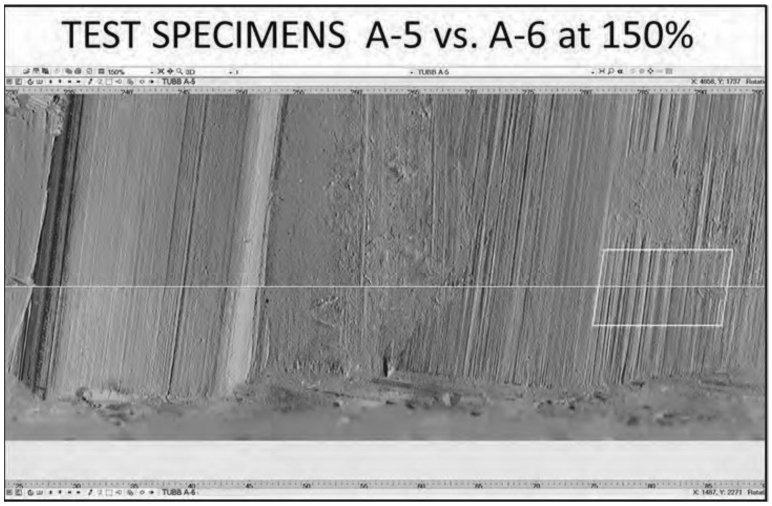


**Figure 5: 3D Image of land 1 and groove 1 before treatment**

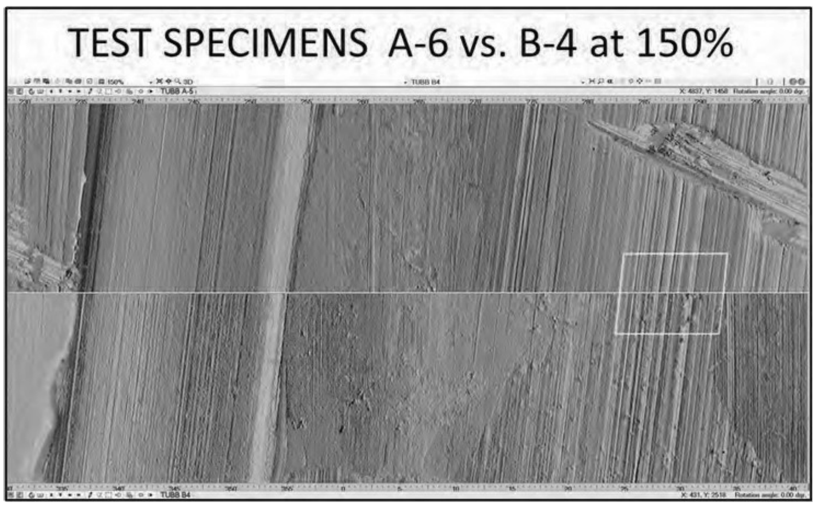


**Figure 6: 3D Image of land 1 before and after the first *Final Finish*™ treatment**

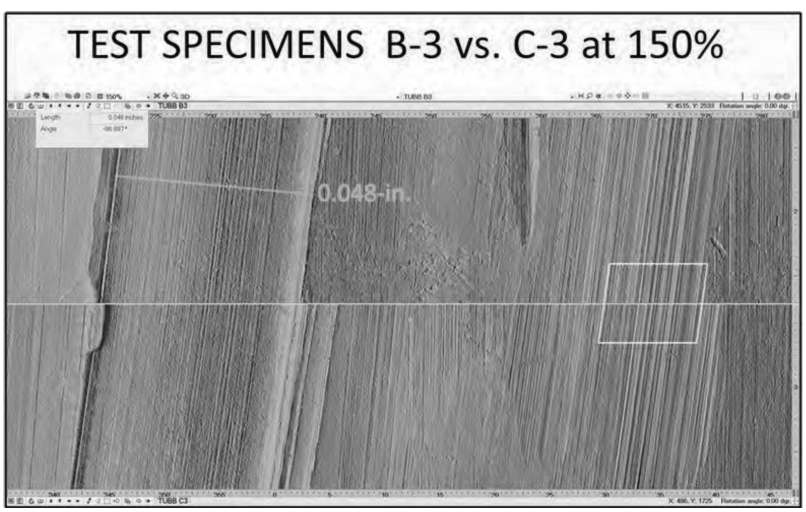


**Figure 7**

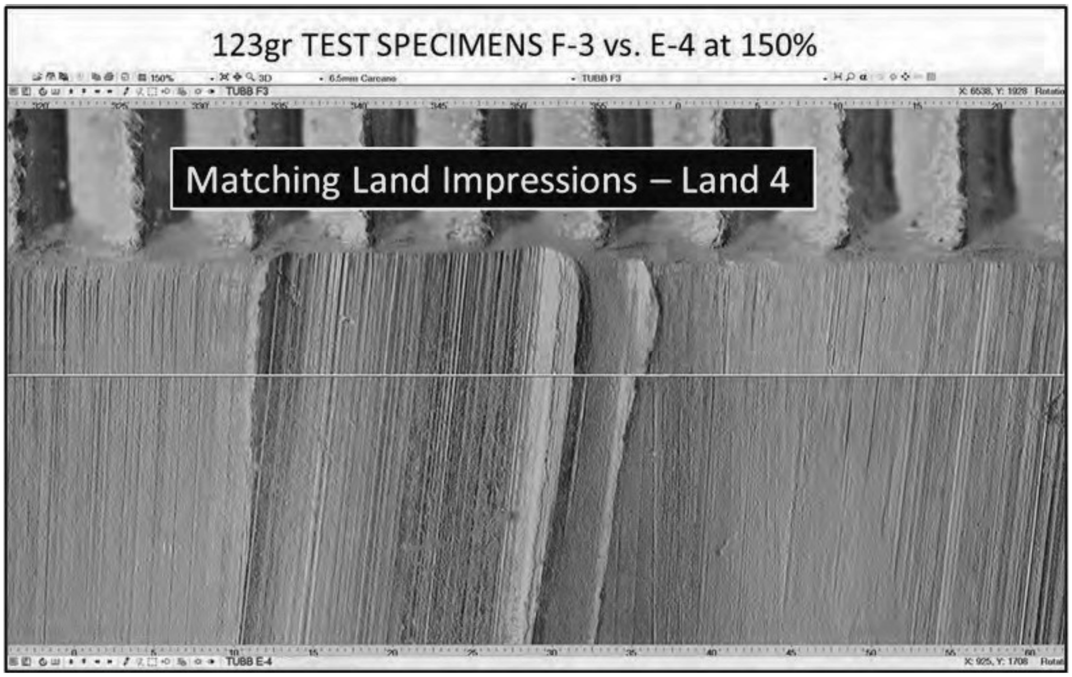


**Figure 8**

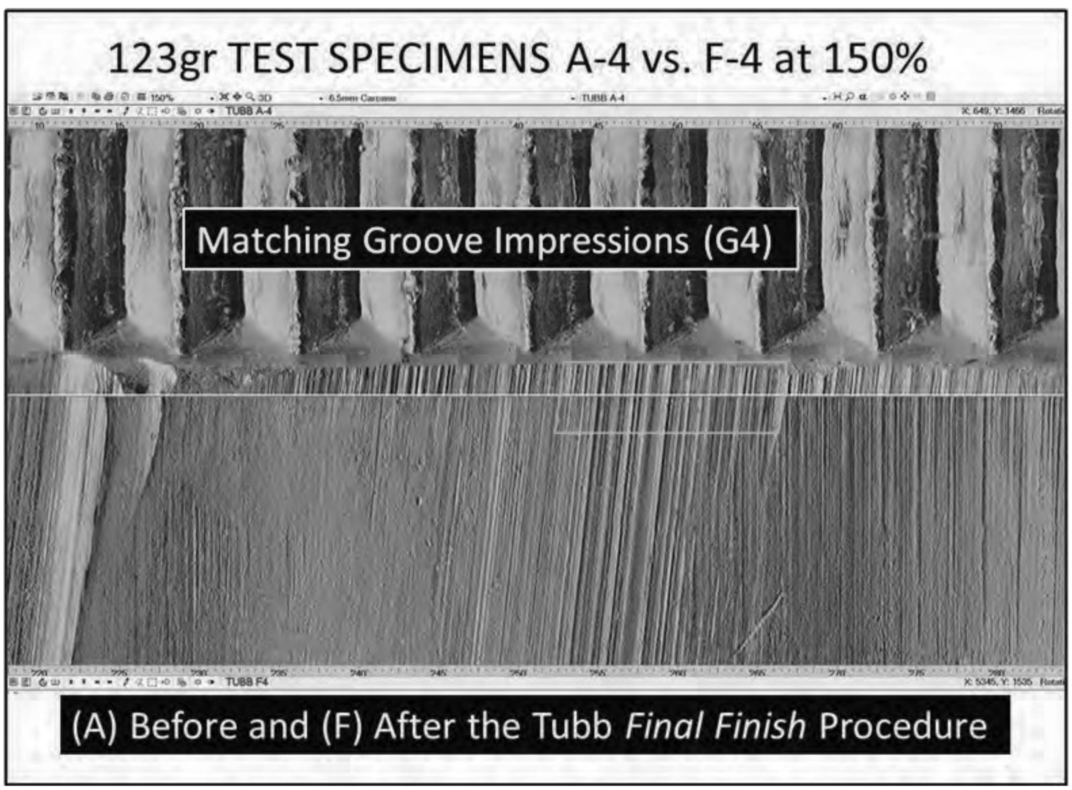


**Figure 9**