Further Testing of New Graphite Spray for Decarb/Scale Protection

I still have several tests to run with the graphite spray for decarb/scale protection—somewhat jokingly refer to as “Bellagraph Approach”, Bellashield” or “BellaCarb”. I developed it, so I get to name it!

Most of the following tests performed will determine how to clean-up the Darts. My first test will be going straight to garnet blasting for removal of protective layer.

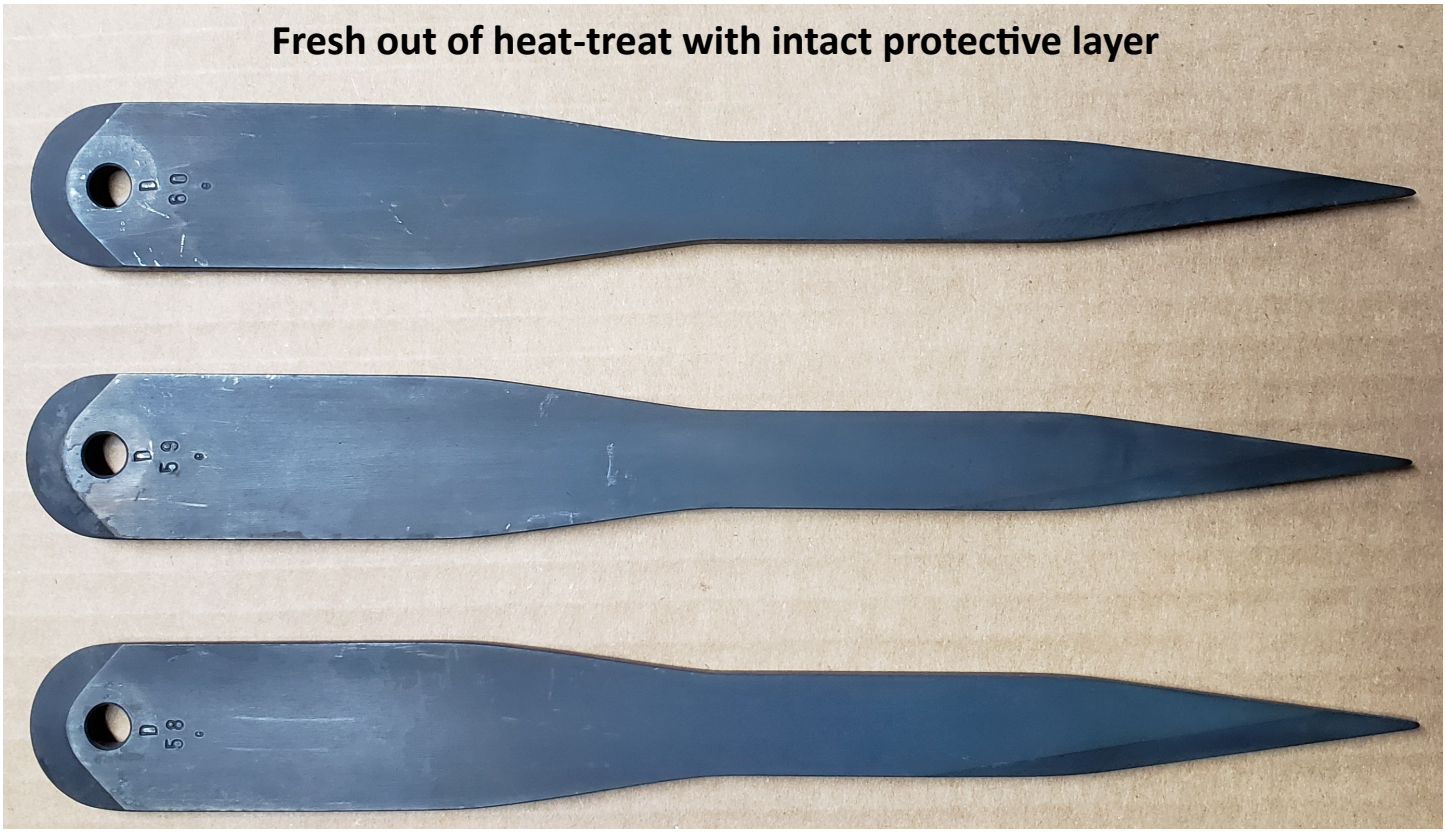
The second test will be spraying the graphite onto a scrap piece of O1 tool steel, heat to red hot with a torch, then quench and see if it still provided protection in the presence of an open flame. I am highly dubious of the outcome, but I have to try.

The third test will be sanding the graphite surface and spraying on another coat. I will then bake the Dart at 400° F, to see if the temperature is high enough to bake it onto the blade. I will test this by wiping it with lacquer thinner after baking. If it comes off, I’ll accept that a higher temperature is required.

I have already determined that wiping the originally heat-treated Darts with lacquer thinner had no effect. I also know that, if it works, it will literally be slick. Who knows, some throwers may find that to be an advantage.

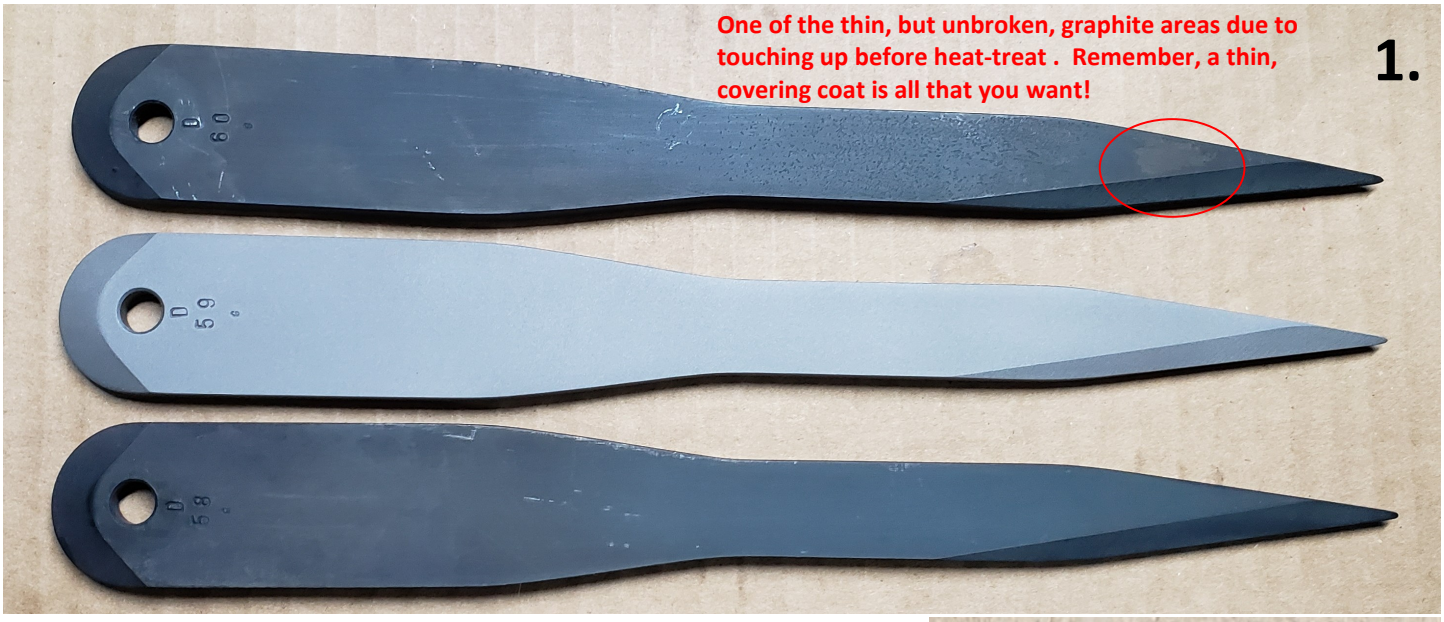
The final test will be to try soda-blasting. I want to see if this approach can remove the graphite layer while maintaining the surface texture of the Dart from before the graphite coating.

Below are the three Darts after the original heat-treat, showing intact graphite layer.



First Test: Graphite Spray Cleanup

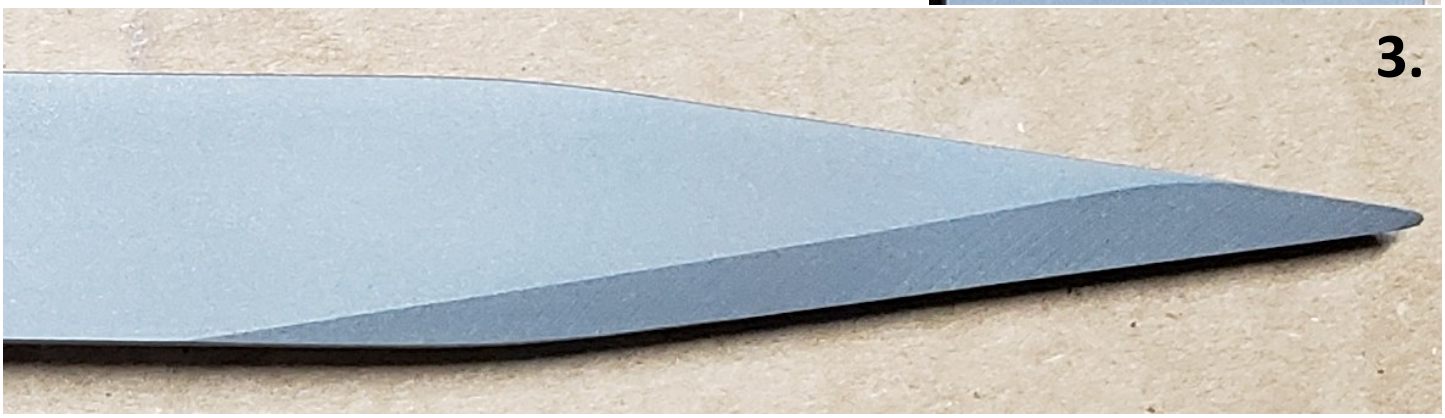
In the past, we had to hit the Darts with the 120 grit (upon occasion, 60 grit) belt to remove any minor blemishes before garnet-blasting—the final finish. After admiring my work for as couple of days, I decided to see if they cleaned up with just garnet blasting, skipping the belt-sander. The results are below.



1. D59G <u>after</u> 80 grit garnet blasting, compared to <u>before</u> (D58G and D60G after heat-treating).
2. Close-up of handle bevel and serial number.
3. Close-up of tip showing sharp bevel line, due to lack of need to use the belt-sander for clean-up.

The Bottom Line

Once blasted, I found no hint of minor scale or decarb. There is little difference in the final result, relative to my old decarb powder and clay, but the effort that goes into it is significantly reduced. The surface was as clean as when I sprayed the graphite onto the for heat-treating. The clean-up time has been reduced and the result may, *may* be cleaner looking. The last is a subjective statement based on my excitement regarding how well this actually worked.

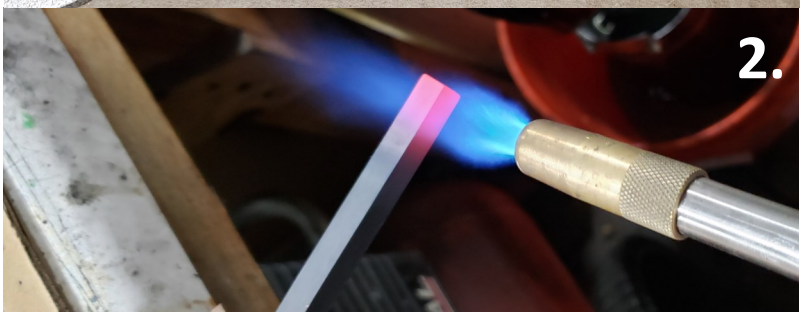


Second Test: Preventing Decarb and Scale in a Propane Forge

Although we don't use propane for hardening any more, I wanted to see if the graphite layer could be maintained in the presence of a direct flame. My test shows that it can, under the conditions presented. That does not necessarily mean the process can provide decarb/scale protection to the intense flame of a forge, but it does suggest that further testing should be performed. Since we have no desire to test this capability further, it falls to anyone who would like to benefit from the possible use of graphite as a protection against decarb and scale in a propane forge. This test proves that it might work! Any takers?

Steps for this test:

1. Spray a thin coat of graphite onto one end of a scrap piece of O1 tool steel.
2. Heat to non-magnetic with a propane torch. Periodically remove from heat, exposing to more oxygen, then re-heat.
3. Quench—post-quench shown. Graphite appears to be intact.
4. Clean with 220 grit and test hardness—very hard! No signs of scale or decarb.



Third Test: Applying a New Coat of Graphite and Baking

I performed this test just for fun. I wanted to see if there would be any bonding to the surface of the steel at a temperature of 400° F. So, I first wiped down the Dart with lacquer thinner. No effect!

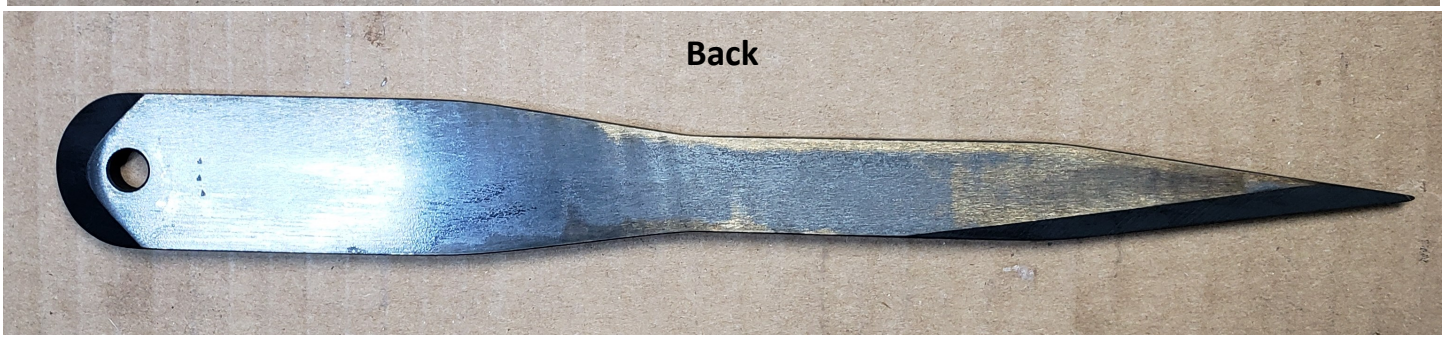
I then wet-sanded the Dart with 400 grit. I was able to remove some, but not all, of the extremely thin layer of graphite. I then applied a light spray of graphite (always a light spray) to the Dart and allowed 15 minutes to dry. I then placed it in the furnace for one hour at the stated temperature.

Upon removing the Dart and rapidly cooling, I once again used lacquer thinner to determine the level of bonding to the surface. The result is shown below. While what was left of the original layer remained, most of the new layer came right off, exposing a straw colored metal surface from the 400° F furnace. This was not really surprising, but since early results were so surprising, I figured it was worth the effort.

Since there was still a sufficient layer of the original graphite on most of the Dart, I decided to use it to test soda-blasting to remove the graphite while maintaining the original surface texture.

You can see below, the straw color where most of the extra layer of graphite was removed with lacquer thinner. Notice the original layer, mostly on the handle, was still in place.

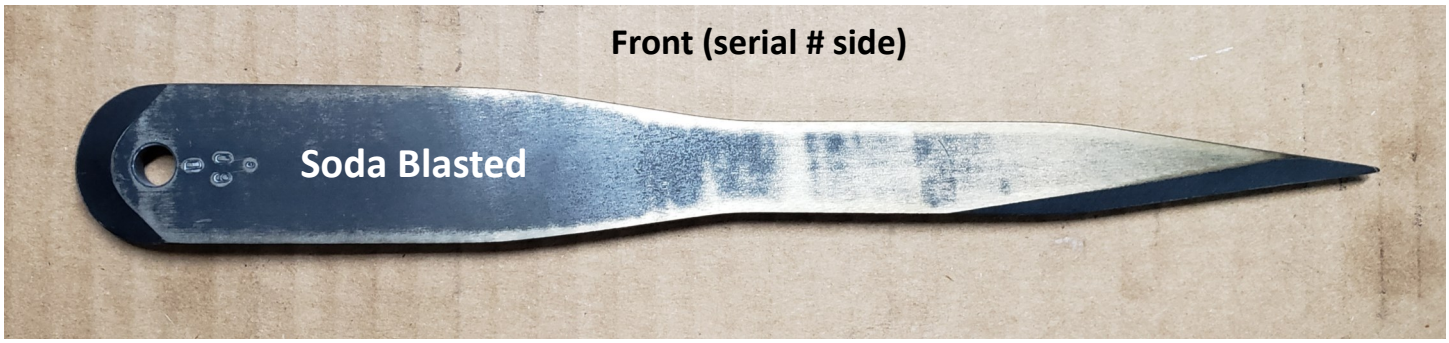
Next stop: Soda blasting!

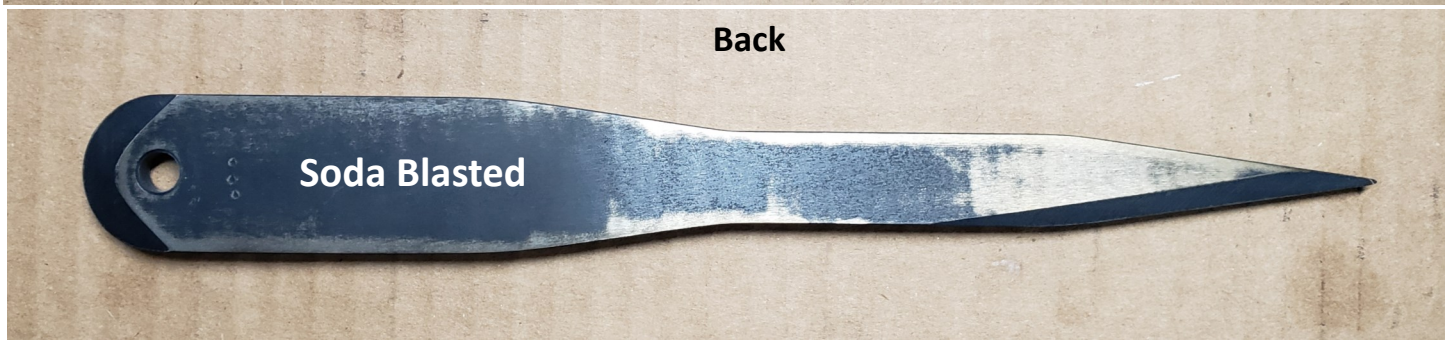


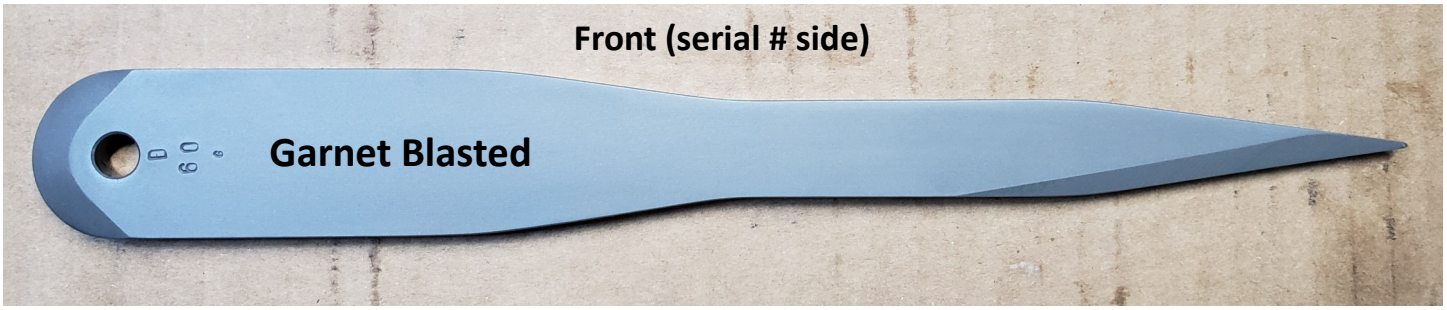
Fourth Test: Soda Blasting to Remove Graphite Coating

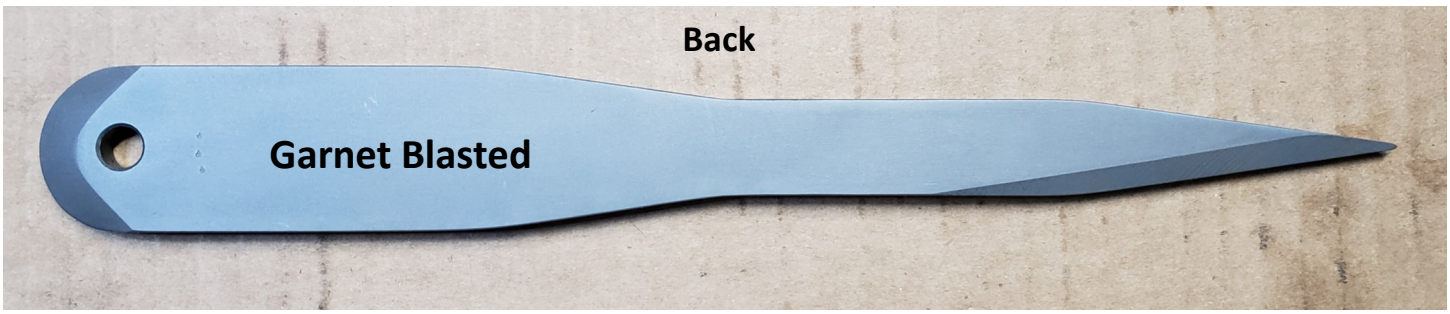
This is the result of blasting with course baking soda at 125 psi. Not a lot! All it did was to dull the remaining graphite, leaving the straw colored steel untouched. When I saw the results, I decided to give up and garnet blast it, like I do to all of my Darts.

We garnet blast because it provides a strong bonding surface for powder coating and makes black oxide appear to be darker.









So, that's where we are at this time. I would appreciate feedback from anyone as to how well this worked for them. I would especially like to hear to get some feedback regarding use in a propane forge. Obviously, I'm talking about knife makers who remove metal to make a knife, instead of hammering steel.