

Subclass Characteristics in a Gamo Air Rifle Barrel

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ABSTRACT

In recent casework a Gamo, caliber .22 air rifle was received, showing subclass characteristics in its barrel. A high degree of correspondence was found between striations present in the different lands of the same barrel.

Introduction

In a world where the firearms examiner is asked every day to compare marks, one main question arises: “How rare are these marks?” To be able to answer this question we should take a look at the firearm producing these marks and in an ideal world even at the tools producing the firearm. If, for instance, the grooves of a rifled barrel are produced with a broach that does not wear at all, chances are that the grooves in all barrels produced with this broach will show similar marks resulting from this tool. The same marks will be transferred to the bullet, because the movement of the bullet is parallel to the direction of the broach that produced the grooves. As a result, bullets which are shot through these barrels will show similar marks in the groove engraved areas. Seeing matching striations in such a case would not result in a high evidential value because there are multiple barrels which would produce the same striations. This type of mark is referred to by the AFTE Theory of Identification as subclass characteristics [1]. In normal production lines the tools will wear while being used. So similar marks can only be present in other barrels when the marks run along the complete length of the barrel. When marks in the barrel will not run along the entire length of the barrel they will not be present in the previously or consecutively produced barrel [2]. Overall, the lands of barrels can be considered to be safe and free of subclass characteristics, because normally the surface structure of lands are the result of circular machining motions, such as drilling and/or reaming. Here, the movement of a bullet is perpendicular to the direction of the tool, resulting in random striations which will vary from barrel to barrel. The words “overall” and “normally” already indicate that marks in lands will not always have a high evidential value. An example of an air rifle where the lands and the resulting land engraved areas show subclass characteristics will be shown in this article.

Materials and method

In recent casework, a caliber .22 air rifle and a fired .22 pellet were received. The air rifle was produced by Gamo, model Hunter 440, serial number 04-1C-124506-01. Comparisons between the striations present in the pellet and the test fires from the air rifle showed a lot of similarity between the striations present in different land engraved areas. To assess the presence of subclass characteristics in the barrel of the Gamo air rifle, additional casts from both ends of the barrel were produced. The twelve land engraved areas of two fired test pellets (A and B) were compared to each other. Apart from this, two casts from the muzzle side of the barrel were compared to each other, to the test fires and to the casts from the back end of the barrel.

Results

The results of the comparisons between the pellets and the casts from the muzzle side of the barrel can be seen in **Photos 1 and 2**. **Photo 1** shows the comparisons of one land engraved area from pellet A to the twelve successive land engraved areas of pellet B and to one of the ‘land engraved areas’ of the barrel cast. **Photo 2** shows the comparisons of one ‘land engraved area’ from cast A to the twelve successive ‘land engraved areas’ from cast B.

It can be seen in **Photo 1** that there is some variation but also a lot of correspondence between the striations present in the different land engraved areas in pellet A and B. When comparing the corresponding striations with the barrel cast it can be seen that these striations are a direct result of the striations present in the barrel. In **Photo 2** it can be seen that a part of the striations present in each land in the barrel are also present in the other eleven lands. Some striations are present in every land, while others can only be seen in a few of the

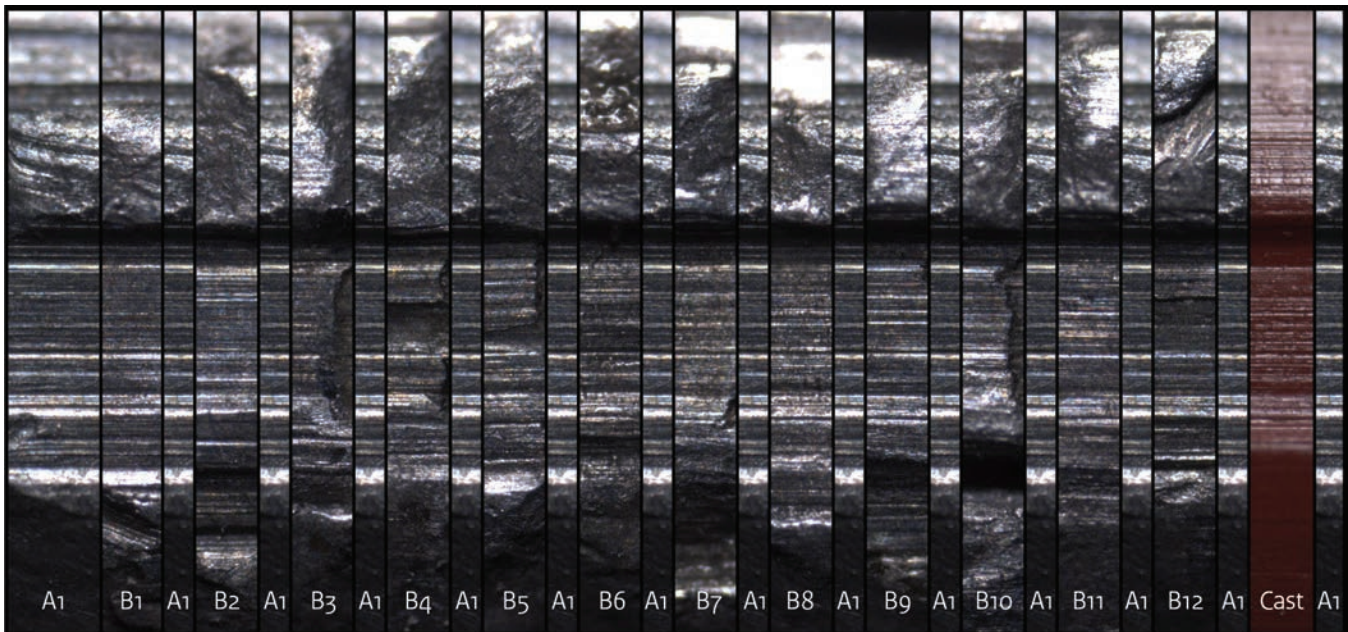


Photo 1: The comparisons of one land engraved area from pellet A to the twelve land engraved areas from pellet B and to the barrel cast.

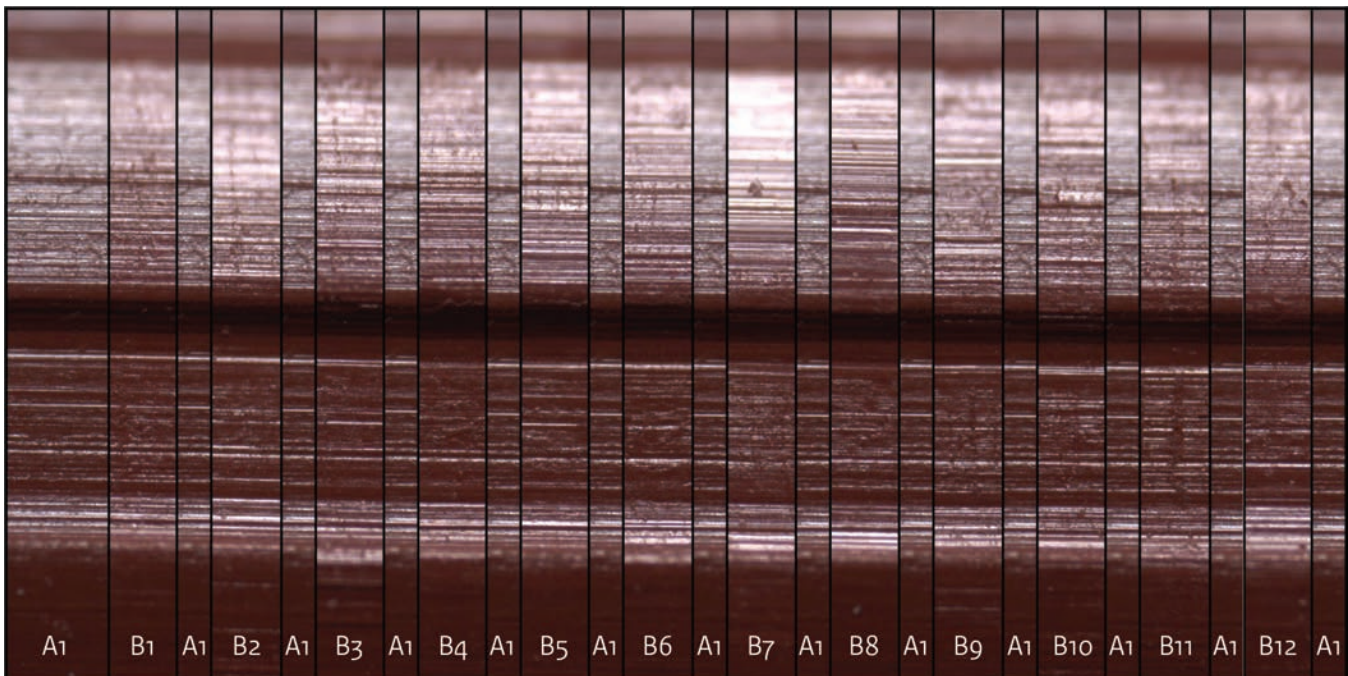


Photo 2: The comparisons of one 'land engraved area' from barrel cast A to the twelve 'land engraved areas' from barrel cast B.

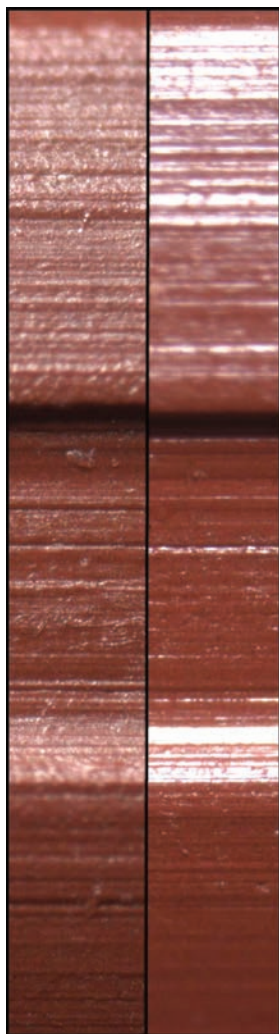


Photo 3: The comparison of the same ‘the land engraved area’ from the casts from the muzzle (left) to the back end (right) side of the barrel.

lands. The parallel movement of the bullet along the striations present in the lands explains the correspondence seen between the striations present in the different land engraved areas and in the lands of the barrel. The striations which show subclass characteristics from land to land also run along the entire length of the barrel (**Photo 3**).

Discussion

The striations in the different lands from the barrel and in the resulting land engraved areas in the pellets show a high degree of correspondence. Similar striations are seen in similar locations in each land. This type of subclass carry-over suggests that the barrel might have been rifled in a button swaging process. In this process a button, bearing the preferred

rifling characteristics, is forced through the softer barrel. This is a fairly quick and inexpensive method of rifling in which the button can be used for the rifling of a large number of barrels [3]. The grooves of the button have presumably been made with the same tool, resulting in similar striations in all its grooves, explaining the similarities within the different lands of the barrel. The observation that some of the gross striations present in the lands of the barrel run along its entire length indicates that not only similar striations are present in the different lands from this barrel, but that they might also be present in other consecutively produced barrels.

The presence of subclass characteristics in the barrel influences the evidential value of the resulting striations. Similar marks can be expected in other barrels. The resulting evidential value of the corresponding striations is the result of different parameters, such as the durability of the button during the process of consecutively rifling and the total number of barrels rifled with this button.

References

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