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TECHNICAL NOTE 115: TECHNICAL ASPECTS OF ARMALITE A2 FRONT SIGHTS

I. BACKGROUND – ARMALITE A2 FRONT SIGHTS

Prior to introduction of the new ArmaLite AR-10 A4 carbine (**P/N: LE10A4CBA2F**) the need arose for an enhanced A2 front sight that was capable of targeting with multiple rear sight options mounted on an AR-10 A4 upper receiver. (Figure 1) While pursuing the new front sight design ArmaLite performed an extensive evaluation of A2 front sights that are available for AR style firearms. Thorough targeting was performed on AR-10 models to validate the ArmaLite A2 front sights on both A2 and A4 upper receivers and to evaluate "F" height front sights on ArmaLite M-15 models. This Tech Note discusses ArmaLite's findings in hopes of providing clarity and useful data on A2 front sights that are frequently debated among AR shooters and enthusiasts.

Figure 1: AR-10 A4 Carbine, featuring an A2 front sight and detachable carry handle

ARMALITE TERMINOLOGY GLOSSARY:

POI: Projectile's **P**oint **O**f **I**mpact on the target

Deck Height: Vertical distance from the front sight deck cutout to the center line of the bore (See Figure 2)

Sight Radius: The distance between the front and rear iron sights (See typical dimension in Figure 1)

A2 Front Sight: Standard front sight on the M-16 & AR firearms that is either pinned or clamped onto the barrel and features a front sight post adjustable for elevation

Aperture Height: Vertical distance from the center of the rear sight aperture to the centerline of the bore

A2 Upper Receiver: Upper Receiver that features an integral carry handle and rear sight

A4 Upper Receiver: Upper Receiver that features a 1913 flat top rail that can accept a detachable carry handle or other rear sights as an attachment

A2 front sights, which feature a vertically adjustable sight post, were designed to be used in combination with an M-15 A2 upper receiver with integral rear sight or an M-15A4 upper receiver with a detachable carry handle. Due to its adjustment range A2 front sights are also effective when used with flip up style rear sights installed on an M-15A4 upper receiver, as the front sight can be moved upwards and downwards to bring the bullet POI to target center.

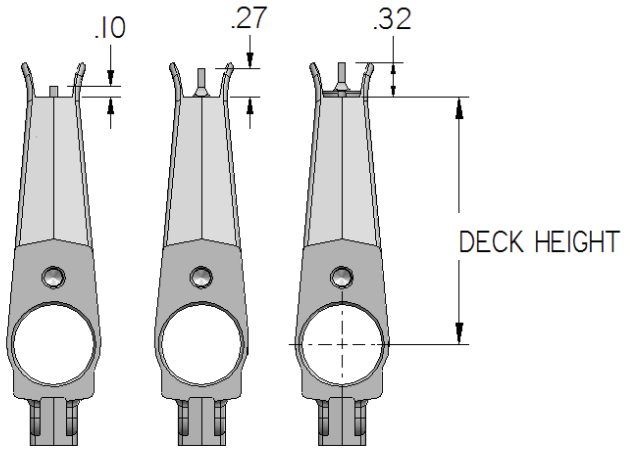

Figure 2: Adjustment range in a standard ArmaLite A2 front sight (Left to Right; Minimum Post Height, Optimal Post Height, Maximum Practical Post Height)

Figure 2 above details the amount of adjustment that is possible in a standard ArmaLite A2 front sight (0.22”). While the front sight post can extend higher than pictured in Figure 2, once the post is extended over the front sight wings it becomes much more difficult to align with the rear sight and target correctly. In addition, such extreme elevation of the post leaves it unprotected by the wings and subject to damage.

Table 1 helps to put in context how much 0.22” adjustment in the front sight post height can affect the bullet POI. At 25 yards, with the adjustment allowable in the front sight, the POI can be adjusted up to 11” vertically on a carbine with an 18” sight radius, assuming perfect shooting conditions. As the distance to the target increases the maximum POI adjustment also increases at the same ratio.

Sight Radius (in.)	Distance to Target (yards / in.)	Front Sight Adjustment (in.)	Point of Impact Vertical Adjustment (in.)
18	25 / 900	0.22	11
18	50 / 1800	0.22	22
18	100 / 3600	0.22	44

Table 1: Adjustment Range in an M-15 with an A2 front sight at multiple distances

Front Sight Adjustment = ((POI Adjustment) / (Distance to Target))*(Sight Radius) ***Equation 1***

Equation 1 is helpful in calculating iron sight adjustment for your firearm. Once the target distance and sight radius are measured and recorded, these values can be entered into Equation 1 to calculate how much vertical adjustment is needed to move the bullet POI vertically. Equation 1 is applicable for both front and rear iron sights as only the adjustment direction changes between the two. Below is an example of using this equation:

Target Distance:	50 yards (1800”)
Sight Radius:	18”
Initial POI:	5” low

Sight Adjustment: $(5 \div 1800) \times (18) = 0.05$”
(Either the front sight can be raised 0.05” or the rear sight lowered 0.05”)

Further information on iron sight MOA adjustment is included in **Tech Note 100: AR-10 and M-15 Iron Sight Adjustment**

II. ARMALITE A2 FRONT SIGHT DESIGN

With the addition of the new ArmaLite front sight, ArmaLite now offers both M-15s and AR-10s with an A4 upper receiver and an A2 style front sight. In order to include the ArmaLite AR-10 carbine (**P/N: LE10A4CBA2F**) which features an A4 upper receiver with an A2 type of front sight, the standard front sight had to be redesigned to target correctly. This was due to the difference in receiver size and consequently aperture heights between AR-10 A4 and A2 upper receivers.

On M-15s, the aperture height (above the centerline of the bore) for a detachable carry handle mounted on an A4 receiver is 2.62”. For an M-15 A2, the aperture height for an integral rear sight is 2.58”. The difference between these two heights is only 0.04”, and can be easily compensated for by the elevation adjustment available in an A2 front sight.

However, on AR-10s, the aperture height (above the centerline of the bore) for a detachable carry handle is 2.77” and for an AR-10A2, the aperture height is 2.57”. The difference between these two heights is 0.20”, an amount which cannot be compensated for by the elevation adjustment available in an A2 front sight. Thus, a new, higher, A2 style front sight is needed for AR-10A4 style firearms. If a standard front sight was used on an AR-10 A4 upper receiver the sight post would have to be nearly fully extended to target. (Figure 3) With the front sight post fully extended there would be little room for adjustment left in the sight to align correctly with the rear sight.

Figure 3: Sight Picture of a Standard A2 Front Sight installed on an AR-10 A4 upper receiver

Aperture heights were also measured for three common rear flip up sights mounted on an M-15 A4 upper receiver. The measurements revealed that there is no uniform value for aperture height in rear flip up sights for use on AR style flat top firearms, as this height varied as much as ±0.03". In addition, AR manufacturers may not adhere to the exact tolerances on the MIL-SPEC 1913 rail drawing. Differing rail thickness will affect how rear flip up sights install in relation to the top surface of the rail thereby affecting their aperture height from the centerline of the bore. Without a standard rear aperture height it is crucial to have a wide range of adjustment in the front sight in both the upwards and downwards direction.

Rear Sight	Aperture Height (in.)
Detachable Carry Handle (M-15)	**2.62**
M-15 A2 Upper Receiver	**2.58**
Detachable Carry Handle (AR-10)	**2.77**
AR-10 A2 Upper Receiver	**2.57**
Flip Up Rear Sight #1	**2.62**
Flip Up Rear Sight #2	**2.60**
Flip Up Rear Sight #3	**2.59**

Table 2: Rear Sight Aperture Heights

In designing the new ArmaLite A2 front sight, it was vital to include at minimum the adjustment range (0.22") possible in the standard A2 front sight, while insuring that the sight post is protected by the front sight wings. Figure 4 (below) depicts the adjustment range possible in the new ArmaLite front sight.

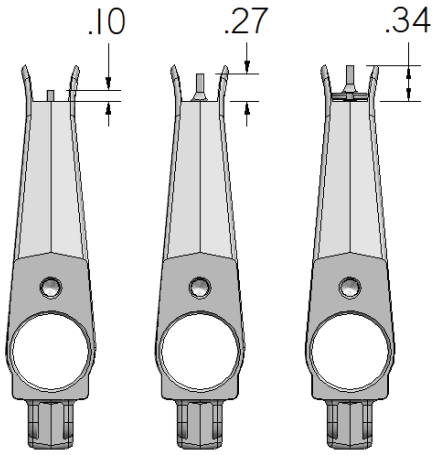

Figure 4: Adjustment range in the new ArmaLite A2 Front Sight (Left to Right; Minimum Post Height, Optimal Post Height, Maximum Practical Post Height)

Unique to the new ArmaLite front sight is the "AR" and crosshairs marking on the crossbar. (Figure 5) The standard A2 front sight does not have these markings. This differentiation will help the user determine whether or not he has the correct front sight on his firearm.

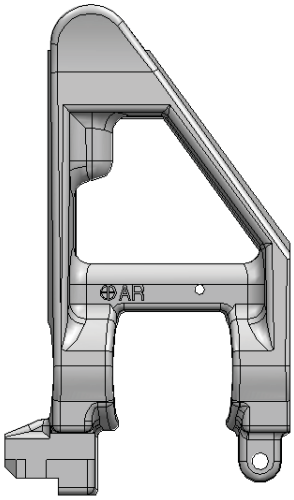

Figure 5: ArmaLite Front Sight Marking

III. STANDARD ARMALITE A2 FRONT SIGHT

The standard A2 front sight will target correctly when used with rear sights installed on either an M-15 A4 or A2 upper receiver. This is due to the fact that the aperture height for rear sights used on A4 and A2 upper receivers varied at most by 0.04". This difference can be accounted for through the front sight adjustment range, while still leaving room for further adjustment if needed.

The same standard front sight is also able to target with AR-10 A2 upper receivers with an integral rear sight. This is directly related to the aperture heights of AR-10 A2 and M-15 A2

upper receivers. Table 2 shows an aperture height difference of 0.01" between the A2 upper receivers. Therefore, the adjustment and deck height settings of the standard A2 front sight are also useful for ArmaLite AR-10 A2 models.

IV. "F" HEIGHT A2 FRONT SIGHT

As ArmaLite investigated A2 front sight designs, the opportunity arose to look into "F" marked front sights. U.S. military M4 flat top carbines feature a front sight that has an "F" marking on its crossbar. This marking indicates that it is compatible with a M4 flat top receiver and that the sights' deck height is approximately 0.04" taller than a standard A2 front sight relative to the centerline of its bore. M4 flat top upper receivers combined with a detachable carry handle feature a taller aperture height in comparison to the rear sight in an A2 upper receiver with an integral carry handle. In order to correct for this difference in aperture height, M4 flat top models require a taller front sight that is identified with an "F" marking. The correct "F" deck height that is unique to the M4 is proprietary information and has been reported on various websites as ranging from 0.04" - 0.08". The information that is useful for this Tech Note is that an "F" height front sight features a sight deck height taller than that of a standard A2 front sight.

AR-15 enthusiasts have varying opinions regarding "F" marked front sights and whether or not you need one to target your firearm correctly. By browsing the internet one can find multiple checklists and forums stating that an "F" height front sight is mandatory on your AR-15 A4 style firearm if you want to shoot with iron sights. To meet the demand of the customers many companies simply mark their regular A2 front sights with an "F" but do not alter their deck heights, while others machine the deck higher from the same forging as a standard A2 front sight. Another method seen is to simply install a 0.04" taller front sight post. While these are effective as a simple solution to create an "F" height front sight, both raising the front sight post height and machining the sight deck higher decreases the amount of clearance between the top of the sight post and the front sight wings, which reduces the useful adjustment range of the front sight.

In order to discuss the practicality of using an "F" height front sight on an AR style firearm, ArmaLite evaluated the benefits/drawbacks of using such a sight. Extensive targeting was conducted using a standard A2 front sight and a simulated "F" height front sight with various rear sights that are on the market. With the assumption that an "F" marked front sight is approximately 0.04" taller than a standard A2 front sight, an "F" marked front sight was simulated by raising the front sight post by 0.04" in a standard A2 front sight. The supposed benefit for using an "F" marked font sight is that it allows for the front sight post to extend 0.04" higher in order to align with the detachable carry handle and rear sight mounted on a U.S. Military M4 upper receiver. But if no further adjustment is actually needed, the sight deck of an "F" height front sight will obscure 0.04" of the sight post, and decrease the vertical adjustment range of the front sight. By plugging this decreased adjustment range (0.18") into Equation 1, it is revealed that a 9" POI adjustment range is possible at 25 yards, which is 2" less than the range found while targeting with the standard A2 front sight.

Targeting ArmaLite M-15 A4's with sight radii of 14" and 20" and a standard ArmaLite A2 front sight, confirmed that the front sight post had an adequate adjustment range to target at various

distances. After zeroing the M-15 with each rear sight, the front sight post heights were measured and found to be within ±0.03" of the optimal height setting in a standard A2 front sight. Even while targeting with a detachable carry handle which featured the tallest aperture height, the front sight post was within .03" of the optimal height. If an "F" height front sight would be useful for targeting an ArmaLite M-15 A4 and detachable carry handle, a post height greater than 0.04" from optimal should have been seen in testing. But since this was not the case, if the standard front sight was replaced with an "F" marked front sight, the sight deck would cover roughly 0.04" of the post and decrease the overall vertical targeting range. Testing an M-15 revealed that it is possible to target an M-15 with an "F" height front sight, but the taller deck height in the front sight decreased the adjustment range possible and provided no advantage over the standard ArmaLite A2 front sight.

V. CONCLUSIONS

Hopefully this Tech Note has provided some clarity into the design behind A2 front sights and how they vary for the firearms they are intended for. The highlights of the Tech Note are:

1. The ArmaLite AR-10 A4 carbine model #**LE10A4CBA2F**, features a new ArmaLite A2 front sight design that correctly targets with an ArmaLite detachable carry handle and multiple rear flip up sights mounted on an AR-10 A4 upper receiver. The new front sight, currently introduced on this one specific ArmaLite model, will install and allow any ArmaLite A4 model to use an A2 style front sight.

2. The standard ArmaLite A2 front sight targets correctly across a wide range of ArmaLite models including AR-10 A2's and both M-15 A2's and A4 upper receiver models.

3. "F" height front sights provide no advantage for targeting an ArmaLite firearm. The deck height increase seen in "F" marked front sights is detrimental to the overall vertical adjustment range and sight picture, making the sight less effective than a standard A2 front sight. ArmaLite recommends that the user correctly target their firearm before concluding that it will not target without an "F" marked front sight. When rear sight aperture heights vary as much as ±0.03", requiring a front sight that is only 0.04" higher than a standard A2 front sight is not significant enough to be essential for targeting.

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