Issues with Light, Short Bullets in a Point Forming Die

Lead air gun slug dies, and other pressure-sealing synchronized ejector point forming dies, require filling the ogive or nose cavity to generate pressure. Attempting to make too light a bullet means insufficient mass of lead to fill the nose cavity. This can cause the following problems:

1. Damaged base punch.

Pushing the base punch too deeply into the point form die puts the end of the punch in the reduced diameter ogive area, which swages or rolls the punch end. You can determine exactly how far the base or external punch can go into the die with safety by holding the die in one hand and gently inserting the external punch with the other.

When the punch encounters resistance, it means the end of the punch has contacted the start of the ogive. If you use a marker pen to put a line on the punch just where it enters the die mouth, this will tell you the limit of punch insertion when you are swaging a bullet. Any further insertion into the die will roll the end of the punch. A flat end punch might be restored by taking a light cut across the end. A hollow, cup, or dish base punch might also be restored by carefully recutting the edge (shortening the full diameter portion of the punch). A rebated boattail punch will likely be ruined, but might be used by cutting the end shorter. This makes the step wider and the cavity shorter.

A symptom of the damaged RBT base punch is that the bullet may stick in the punch. The rolled over edge grasps the swaged lead "tail" on the bullet, and some lead flashing will extrude around the step or rebate edge.

2. No weight adjustment or extrusion / variable weights.

Unless the lead is fully pressurized, it cannot flow through the bleed holes. A weight that does not allow any full diameter contact with the base punch cannot be pressurized. Also, the base punch may go so far into the die that it covers and blocks the bleed holes. You can hold the punch alongside the die and see how the punch would project from the die mouth with the punch tip aligned at the bleed holes. This will give you an idea of how far the punch can go into the die, although trying it in the die by hand (not using the press!) is a better test. The bleed holes are normally right below the beginning of the ogive inside the die.

3. Incomplete or rough nose and end shape.

Short cores which do not allow full pressurization do not flow to fill the available shape in the die cavity, which can result in partially-filled noses and bases. This is often blamed on the lead wire cutter for not cutting the ends squarely, but that is normal for a core cutter. It always has a "shear angle". The pressure of swaging the core will normally flatten and extrude the lead regardless, except if lubricant is trapped in the angled space. Try using a "dry" core and see if it comes out square. If not, it is likely just the length of core being too short for the particular shape of die.

4. Undersized bullets

If the core is too short the bullet will be pushed fully into the ogive and past the cylinder or shank portion of the die. This means that the largest diameter of the bullet is now somewhere in the ogive curve. Not only will the punch probably be damaged, but the bullet will be too small in diameter. A longer or heavier core would extend into the full diameter portion of the die. Make a bullet that is "too heavy" by a considerable amount, just to check the diameter. If it is OK, the other bullet was simply made too short and light for the die.

Making Longer Bullets with the same weight:

1. Use a deeper or larger hollow base.

This lets you use the same die and internal (synchronized) punch, assuming the required length can be achieved by displacing more lead in the base area.

2. Use a larger diameter and/or deeper hollow point

This lets you use the same base punch, or combine the large HP with a larger hollow base, to gain more length with the same weight. This requires a new insert for the ejection punch, which is limited to the maximum diameter of the pin itself, and that is limited by the ejection pin hole size in the die itself. However, for the maximum weight reduction without replacing the die, you can use what would normally be a flat nose punch insert, but extended into the die cavity. Synchronization is not required other than adding the hollow point projection depth to the sync length, since the full diameter of the ejection punch can project any arbitrary distance into the die cavity.

3. Use a die with the same ogive shape but a larger meplat (flat end)

If the ogive (nose) curve is restricted to a specific requirement, then perhaps using a larger ejection pin to shorten the ogive, either by itself or in combination with a larger HP and HB shape, will give you enough length in the same weight. This would require a different die and ejection punch, possibly a different external (base) punch as well. Typically a flat end bullet would use an ejector pin of the same size as the meplat, and a hollow point would typically use a reduced diameter tip or projection on this pin. The die would of course need an ejection pin hole that fits the larger ejection pin. If the base shape is not changed then an existing base punch of the same caliber can be used.

4. Use a die with a longer ogive

If you change from a 2-S ogive to a 4-S ogive, the ogive is longer for the same volume. It may be enough to allow the use of your desired lighter weight provided the bullet will still fit and stabilize in your particular gun. This does require a new die set although the same base punch could be used if the diameter is the same as the previous die. A longer ogive radius does not necessarily require a longer ogive in the axial direction: if two different curves are truncated (cut off) at the same distance from the cylinder or shank of the bullet, the one with the sharper curve will hold less volume and make a lighter bullet. If the ogive curve is continued to the centerline of the bullet, then the shorter ogive radius will also have a shorter axial length.

5. Pre-form a hollow base or nose in a cylinder shaped core, and use a polymer filler ball.

First, obtain a core swage die or a LSWC-1 die in a slightly smaller diameter (for example, if your point forming die is .250 diameter, you might use a .248 diameter pre-forming die). Order it with a large hollow point punch at least half the length of your bullet (at the desired weigh).

Second, obtain a supply of "Bullet Balls" (polymer spheres) which will fit into the cavity. Place a ball in the cavity and form the bullet in the point forming die. The hollow cavity is typically the base. The ball displaces lead and produces a longer bullet for the same mass of lead. This technique is used when a hollow base is not acceptable. The base can be flattened, or made into a RBT shape, if the ball is seated deeply enough so there is sufficient lead behind it.

Physics and reality only allow a narrow range of adjustment for weight versus length in a given caliber and nose shape. The combination required to achieve any arbitrary weight/length ratio may or may not be acceptable for other reasons. In some cases, there will be no practical solution other than to use a heavier projectile. But a combination of solutions may each contribute just enough length to make a light weight core fill the ogive and leave enough shank to make a good projectile.