UNIBOFFIN BLOG – SEPTEMBER 2020

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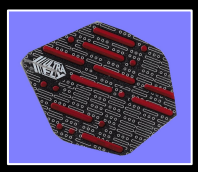
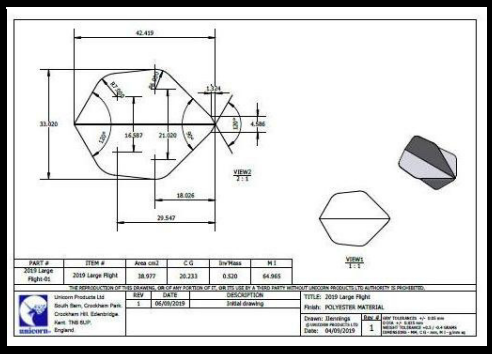
Test Flights



Well hello again, it's been a while! I hope you're coping OK during the Coronavirus crisis. Darts may not seem quite so important just at the moment, but it can nonetheless provide a valuable link to more normal times. Not many sports can be pursued quite so readily at home or, indeed, anywhere (with, of course, appropriate social distancing, etc). With that in mind, Unicorn have still been working hard on new goodies for us all to try in that quest for the perfect dart and set-up.

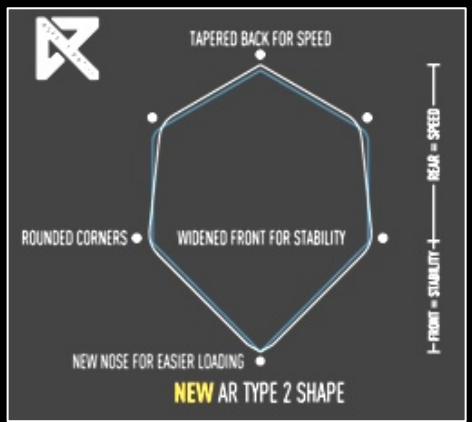
So to some goodies I've been testing, a prototype for which is shown above with drawing below:

Meet Unicorn's new "AR" flight shape! AR stands for "Aspect Ratio", an aerodynamic term for the width or "span" of a wing or other lifting surface divided by its average length or "chord". AR flights are so named because a key point about them is that they come in two sizes of the same shape and hence aspect ratio (1.118, if you're curious). That should make experimenting with set-ups a little bit easier by eliminating one of the variables. But there is more to AR flights than that.



From a purely aerodynamic standpoint, generally the higher aspect ratio wings a subsonic flying thing has, the less power it takes to fly. Which is why gliders and albatrosses (any flavour, Monty Python fans) look like they do. However, requirements for manoeuvrability, wings not falling off, etc, set practical limits on the AR of the wings of conventional aircraft. The AR of dart flights is also practically constrained, albeit by quite different limitations such as the desirability of the flight's trailing edge not poking a player in the eye, glasses, or cheek on drawback. The above drawing shows the new flights have more rounded rear corners, which helps in that regard.

Although those rounded rear corners do also reduce drag somewhat, I personally see that as rather less significant, simply because the drag of a dart flight is not generally all that important. Don't believe me? Try an experiment I've suggested before! Throw a dart and then unscrew the barrel and throw just the shaft and flights. They'll be maybe a tenth the weight and thus have ten times the drag effect, but, for a similar throw, bet you the trajectory won't be so very different.



Truth is, though, that result is so counter-intuitive that reduced drag is probably a more resonant selling point for AR flights than "don't poke you in the eye" (cf marketing graphic on left!)

Incidentally, aircraft wings, where drag really is a major design consideration, can have a "right way up" and hence make use of asymmetric aerofoil sections to lower drag whilst maximising lift and control at stall (the angle above which drag increases quickly and lift doesn't, usually somewhere around 15 degs). Poor old dart flights have to do their best in this area whilst being symmetric and (usually) just made from flat panels.

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Now for the optimal shape or "planform" for a dart flight, which is also quite different to that for an aircraft wing. Subsonically, that is often quoted to be elliptic, a famous example being on the Spitfire (and I'm now going for visit to nerd city because, despite this being a dart's blog and not an aerodynamics textbook, I can't resist the pedantry that it's in fact an elliptic "spanwise lift distribution" that's theoretically optimal).

In comparison, a dart flight must have a low enough span to allow it to be thrown easily and not block following darts too much whilst still having sufficient area and hence lift to stabilise the dart adequately. This means a long chord and therefore a low aspect ratio. The planform can, however, exploit the stability advantages of a rearward centre of pressure (ie lift force). Combined with the desirability of providing consistent behaviour at stall, this is the logic behind delta or near-delta planforms, as on Sigma Pro flights.

The maximum desirable size of delta flights is, however, limited by the aforementioned problem of face impingement on drawback. They are thus only really suitable for use with throws and darts that don't require a lot of stabilisation, which generally means good players using barrels that are shorter and/or lighter (like Sigma Pro 970s, there is method in my madness, honest!).

However, fairly long barrels – say 50mm or more – are now favoured by many pro players, which means we have thus seen more and more of them use large area squarer planform flights like Big Wing or even Big Wing XL, despite the fact that I know this has caused some of them to experience difficulties with face impingement on drawback. There has also been much recent research on the problem of rejected darts (ie bounceouts – see, eg, my July 2019 blogs) which seems to show that the large majority have hit previous darts, a factor which large flights probably aren't helping.

If big flights can bring problems from a practical standpoint, this is where the larger AR Type 1 flight can help by also providing high levels of stability but with reduced obstruction and face impingement. The AR Type 2 provides similar advantages at an area and stability level more similar to a Plus shape, as shown in the graphic on the right.

An additional "aspect" of AR flights is a nose profile which facilitates loading into a shaft, a little innovation from Q very welcome by those of us whose eyesight and dexterity isn't what it was!

So to my sum-up of AR flights. Maybe I'm biased, but I reckon they're worth a try, being nice to use and aiding set-up tuning, especially with regard to dart impact angle. But why don't I just belatedly get with these social media obsessed times and end on some Twitter-friendly hashtags:

#twosizesoneshape #easytuning #dontpokeyouintheeye #orgetinthewayasmuch #nuffsaid!