When Gordy sent out the quiz, purely by coincidence he included the picture below in his message. The picture is relevant to the quiz.

a) I have taken the liberty of indicating roughly the line launch direction on the picture.

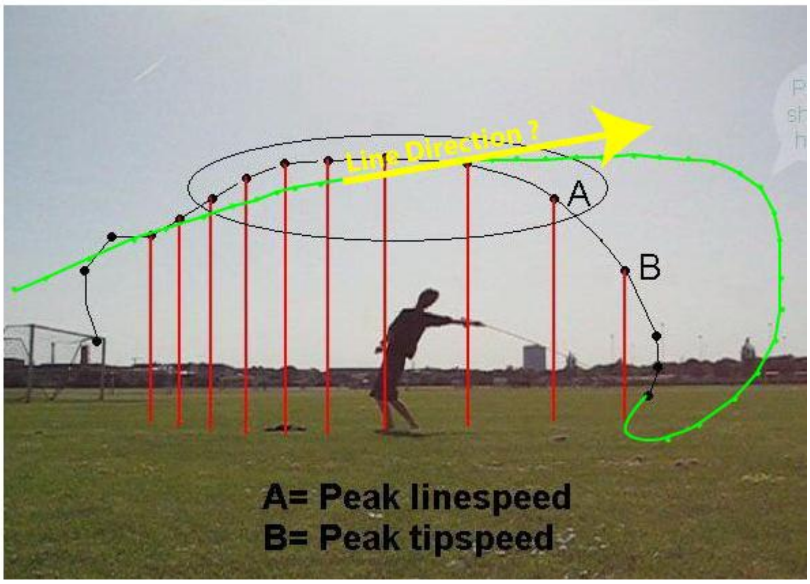
b) Note that in order to build up colossal speed line speed the follow-through after line launch is enormous.

c) Even at the instant shown the effective line mass location is likely to be somewhere behind the arrow and that together with the force exerted by the rod tip determined line direction.

d) Note where max line speed and max tip speed are said to have occurred (A and B respectively). Both occurred after the line was launched.

e) After the "effective mass" of the line has reached its maximum velocity both the rod tip speed and elements of the line close to the rod may travel faster than the remainder of the line without contributing to the cast.

f) The effect of (e) on the cast is negative (wasted energy), it would be better if the rod tip could be stopped sooner with perfect damping to avoid the (sensibly) slack line occurring. Unfortunately this is a consequence of rod flexure and the technique required by humans to generate high tip/line speeds.




The wonderful video link http://vimeo.com/16361323 sent by Aitor beautifully illustrates how even with a stiff rod slack appears as soon as the first elements of the fly line overtakes the tip ring and that remains until tension on the rod leg restores order.

In the picture some of the line was energised at right angles to the cast direction causing slack line until the fly leg overtakes the rod and quoting Paul Arden "sucks it up". Only after that can the line apply force (tension) to the rod tip and cause the forward travelling loop to "stabilise". The cast would be more efficient if line energy did not have to be used for "sucking up".

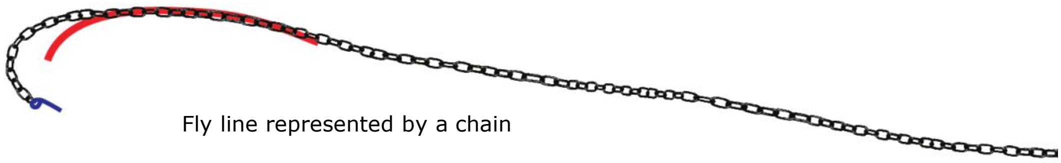
The velocity of the effective line mass determines the direction of the line and the distance that it might travel (I have to say effective rather than just "line" to exclude that portion of line that is pulled out of alignment and contains no useful energy). This and not rod tip speed is the determining factor.

Maximum rod tip velocity in this instance and in most cases is irrelevant. Increase in tip speed after line launch is due to rapid loss of rod loading and the associated transient loss of tension close to the rod tip.

Nothing that happens after line launch contributes useful energy to the line. The cast per se is complete. The rod leg and final layout of the line can however be altered after the cast.

**Further explanation.**

We can forget the rod and consider only the tip ring. The line can be thought of as a chain of links each of which pulls the next along. So the tip ring pulls only the first link and the remaining links are in turn pulled by the preceding link. Each link of course has mass and density identical to the line element that it represents. Apart from the first and last links the movement of each link is determined by the link that pulls it and also by the link that restrains it. Of course the whole assembly is affected by air, internal friction and gravity.



Fly line represented by a chain

The tip ring must get out of the line's path and if it does so with the minimum of clearance a tight loop will form. The further the tip ring is moved from the line path the greater the legs of the loop will separate. The more convex that the rod tip path is made the wider the loop will be as each element of line is forced to move differently. If a perfect straight line could be achieved each element of line would experience the same acceleration. This is a practical impossibility.

The red line indicated on the chain sketch above shows a "straight line path" taken from a high speed video as do all the other sketches.

Moving the tip ring along different paths and planes and altering the position of the line relative to the casting direction allows you to explore how force is applied to the line.

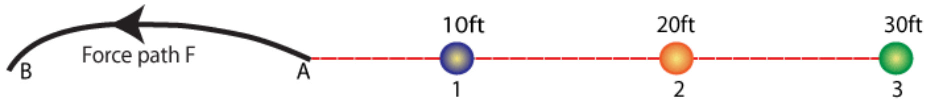
Considering the line's mass to be concentrated at its centre of gravity works quite well for considering straight pulls but less well for curves (all casting strokes made by the tip ring include curves). For curves you need to think of the line as a chain or simply remember that each element of line may be projected in a different direction. Sketch 1 below will hopefully allow you to consider how the direction of force on the line varies according to the length of line used as it is pulled from A to B due to the different relativity of the tip ring and the mass.

Also consider Sketch 2 and how line starting position influences launch direction and compare to the 180 degree rule.

Line profile determines effective mass location in practice and I have attempted to show how that might vary for different line types assuming identical densities throughout.

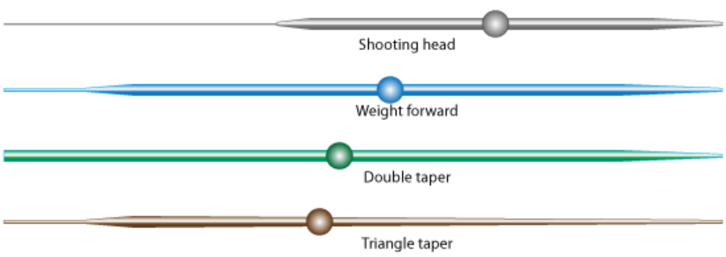
All of the examples will produce different results due simply to the different relationships between the line and the tip ring. You can consider them being cast in any plane you like; only the effect of gravity will change.

Sketch 1 Imaginary line mass centres for 3 different line lengths



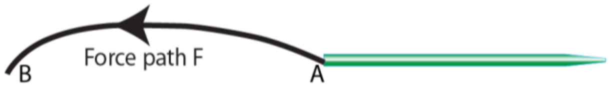

Sketch 2 Imaginary line mass centres for 3 different line attitudes


Sketch 3 Imaginary line mass centres for 3 different line types




Fly lines are moved through a fluid (air) and are subject to drag. The line follows the path of least resistance which causes it to mimic the tip ring path somewhat up to the point of line launch. This applies well to relatively short lines because the line mass is closely coupled to the rod tip and is easily directed. When the line mass is centred further away from the rod tip the line movement is less faithful as it tends to cut corners since the pull is effectively straightened. Thus it is comparatively easy to produce fancy casts at short range but impossible to do so at long range. This also emphasises the importance of ensuring the alignment of back and forward casts, especially at long range because there is little opportunity to change direction when the mass is centred so far away.

Sketch 4 Short DT line




Sketch 5 Long DT line


Sketch 6 Shooting head


Assuming that the stroke length and acceleration etc is good and that the rod can be stopped perfectly at 'B' (without line collision), describe the loop shapes that you think would form in each case.

By thinking about how each element of line is accelerated from its starting position to line launch you can predict how it might behave and therefore how every cast works.

There is the story about the Irishman who was asked by a passing motorist for directions his answer was "Shure if I was going there now it wouldn't be from here".

The man was a great fly fisher who knew the importance of his line being in the right place before he started the cast.