

The Mechanics of Fly Casting 4

By Bob Bolton

Since the last article was written, I had the opportunity to test some more fly rods. Figure I below shows the new data. I tested rods from a little Orvis bamboo up to a Orvis tip-flex 8 weight and found their work capacity followed along with their rating. I was surprised at the stiffer Orvis bamboo rod. It was not a sissy by any stretch and sort of went against what I had come to believe about bamboo. It was only about ½ ounce heavier than the 6 weights on either side – truly competitive in every sense of the word. The most important thing to learn

about this plot is that it only applies to “comfortable” casting with a full 70 degree arc cast, a straight wrist, and no shooting. There are techniques to lengthen and shorten casts which I will cover in this paper, but the concept of “comfortable” or a cast the just “feels” good is shown here in some quantitative measure.

I also included the energy requirements for several fly lines at several distances. This gives a feel to what weight and length of line would contribute to the "comfort" level of the cast.

Rod Work Capacity at Max and Min Comfort Levels - Straight Wrist Cast

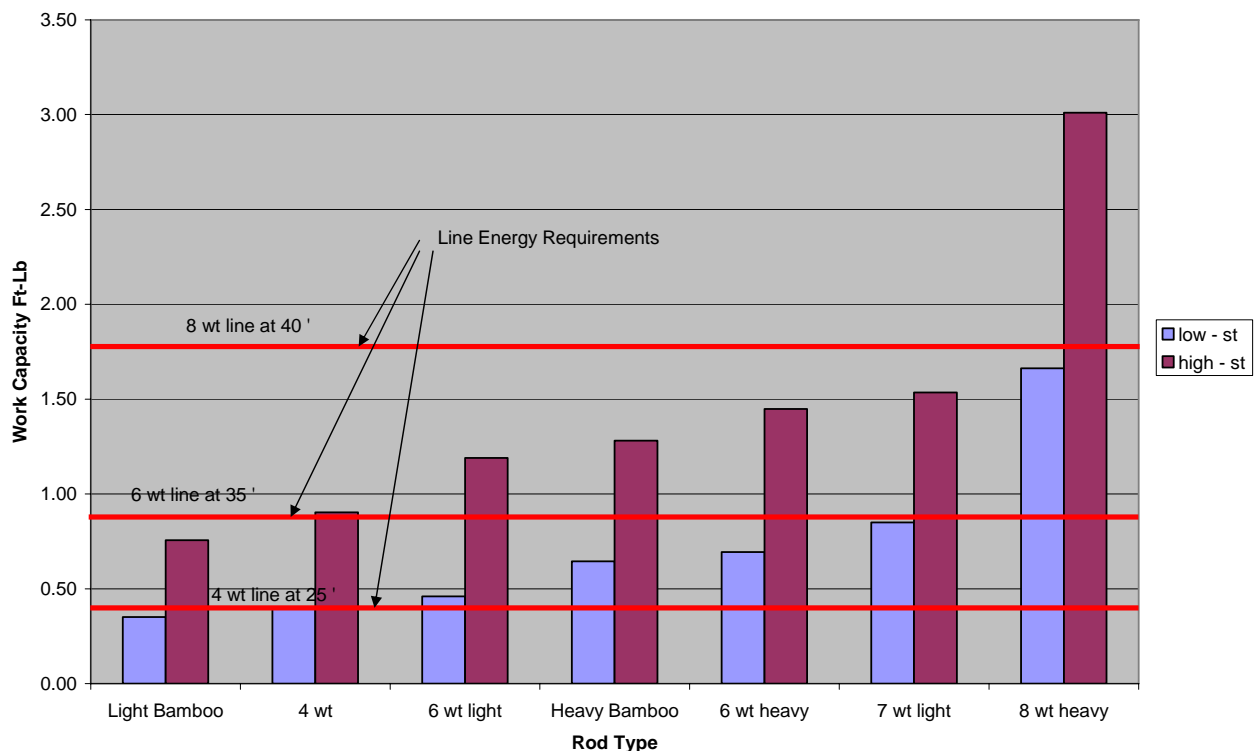


Figure I.

The Rod Flex Myth

I am about to gore a sacred ox. When you finish reading this you will either say I am completely nuts or you will make a realization. That realization might be that a lot of this full flex, tip flex hype is just that – hype. You may realize that what is happening in your favorite rod is not at all what you thought. Try this. Go outside with your favorite rod and find a horizontal limb on a tree that is about 10 feet off the ground. Throw your line over it and grab hold of the end (Figure II.). Now walk out about 20 feet or so holding on to the end of the line and letting some line off your reel until you can stand with the line tight and the rod in the

position you would normally start your cast. This would be canted about 30 degrees back. Now trapping the line under your index finger on your casting hand and holding the end of the line in your other hand, bend the rod as if you were casting a line. As you bend the rod you will feel the force in your hand increase and you will feel the twisting moment that the line is putting on the rod increase. Keep bending until you feel this is about the feeling you have when you start your reel cast. This is what casters would call “loading” the rod. Most people will feel the rod is properly loaded when the deflection at the tip is about 2 to 3 feet. That is, if you were to hold the rod still and release the

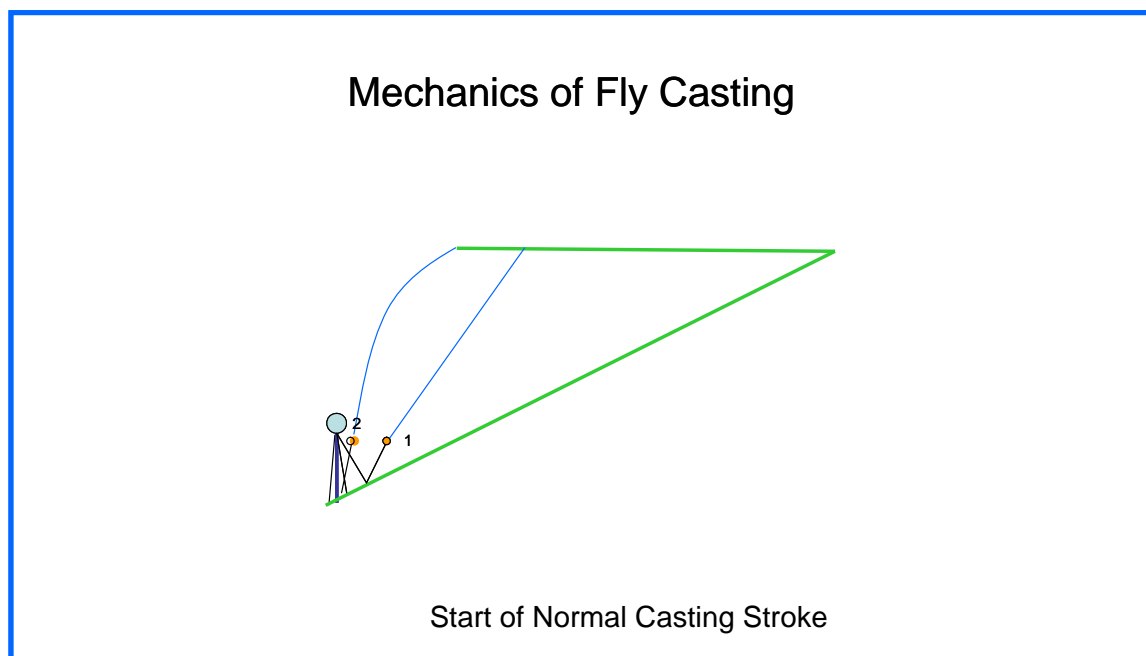
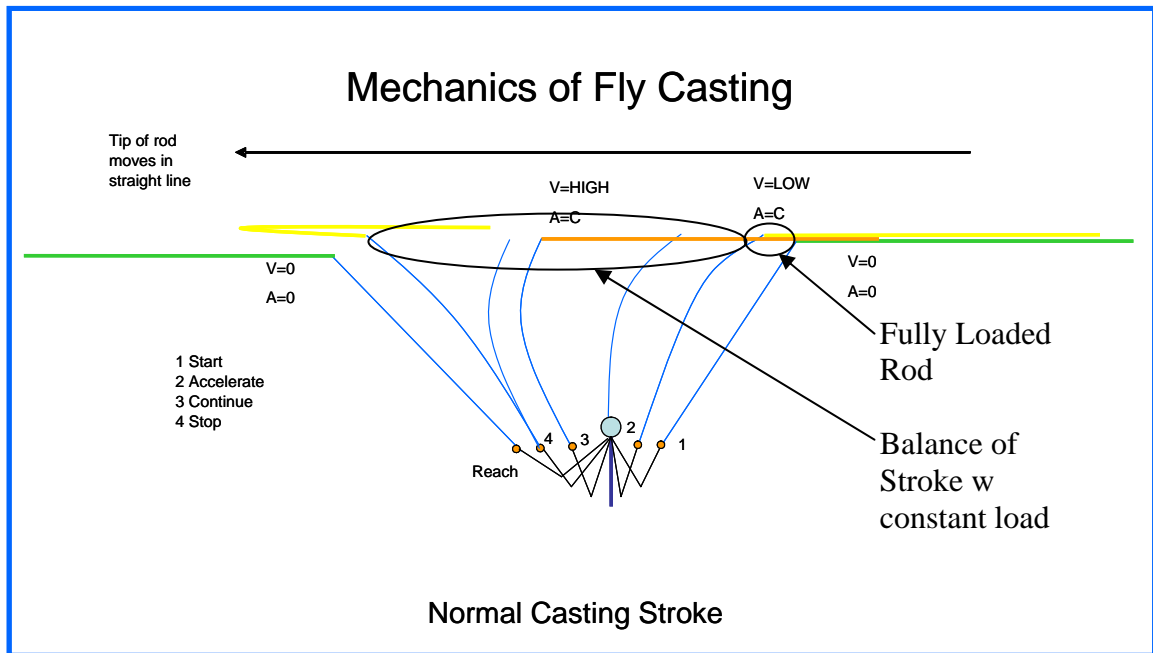


Figure II.

line, the rod tip would move about 2-3 feet. Notice the force and twist you feel in you hand when the rod is properly loaded. Now repeat the process several times and notice how the force and twist on your hand increases as you approach the loaded position. So we are talking about two things, the feeling in your hand and wrist at the fully loaded position and the feeling you feel as you are getting there. These are not the same. The feeling at the loaded position is a function of the overall stiffness of your rod. It is also, as we have seen before, the overall measure of you rods capability of doing work. The feeling as you are getting there is also a function of the overall stiffness but is somewhat

affected by the taper or flex characteristics of the rod.

So now lets talk about what affects the two feelings. The overall stiffness you feel is a function of the rod material and length and to some degree, the taper. Remembering that the line only feels what is going on at the tip, the only part of the loading that taper can affect is how you get there. And surprisingly enough, all rods are relatively similar in that function. If you carefully measure that deflection on a number of rods, you can see there is some difference. But the difference is more in the marketing than what you will feel in that first 3 feet of your cast. Much more important is the force on the line



from the fully loaded rod and the length of the rod itself. It is the fully loaded force that you will try to maintain through out the remaining 7 feet or so of the cast (Figure III) by increasing the velocity of your movement throughout the cast. It is the length of the rod that determines how long you can maintain that force. In other words, the longer the rod, the longer the casting stroke.

Looking at the displacement and velocity curves (Figure IV), and going the opposite way just to mess with your mind, the loading is from 1 to 2 on the curves. This is the only part of the curve that the deflection shape of the rod really affects. The majority of the

cast energy is controlled by the overall stiffness of the rod and the length of the rod. So when many people refer to a rod as “full flex”, what they may be actually referring to is the overall stiffness of the rod rather than the deflection shape of the rod itself.

Is the ox sufficiently gored? Or maybe I am just nuts.

Shooting Line

The most common method of adding distance to a cast is shooting. The process is so natural that most of us do it without even realizing it. If we look at Figure II and in hand position 4 we normally stop the rod and the rod

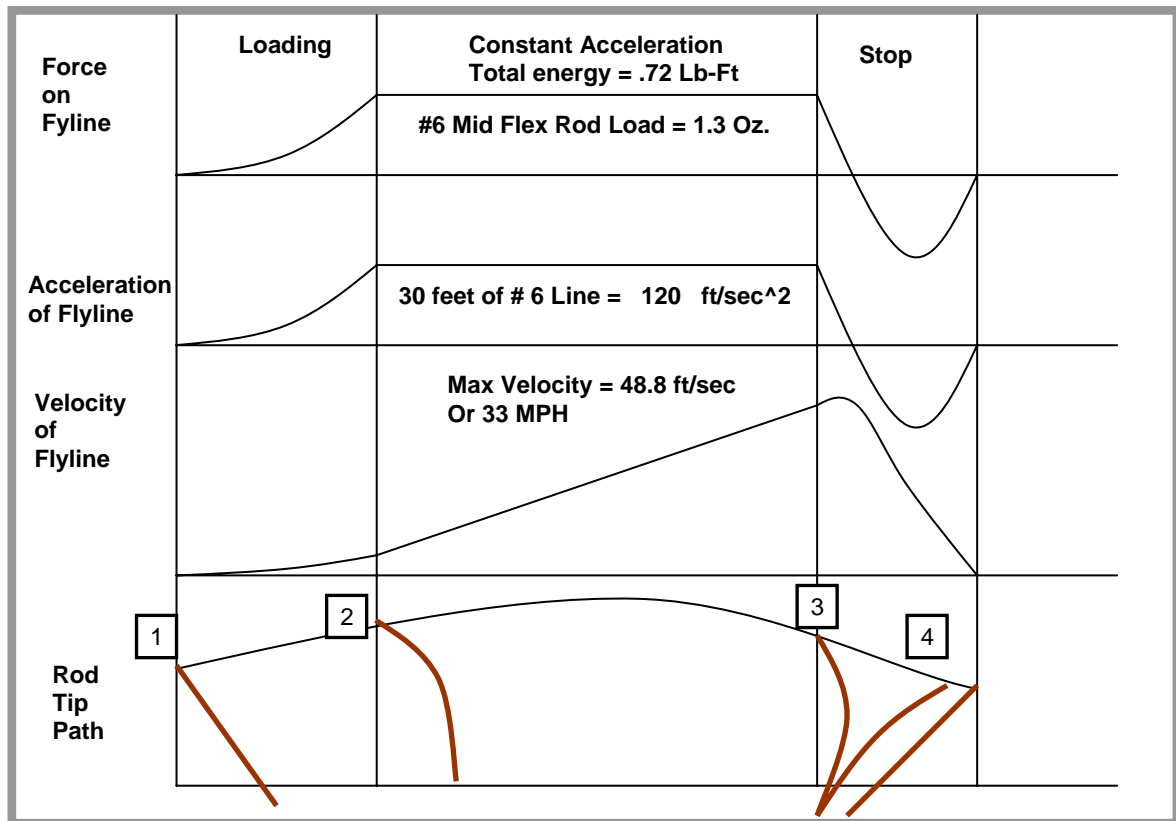


Figure IV.

loading reverses and causes the force on the line to start the loop formation. But if you have a little fly line looped in your hand, and if you let loose of that fly line right as you stop the rod, the moving line will pull that line up through the guides. The loop will traverse downrange until the force required to accelerate the line up through the guides is equal to the force you would have spent stopping the end of the fly line with your rod. This has the added effect of softening the terminal cast and preventing you from having to add a “reach” to keep the leader from springing back towards you. But if you maximize your casting stroke and have about the maximum amount of line carried in the air and you have a whole bunch of line either on the ground, or in a stripping basket, or on the boat deck, you can shoot out 30 or 40 feet of line. As I said, this process is almost instinctive to some degree with all casters to you may not even think of it as a separate process. But it is the most common method of adding distances out past the “comfortable” cast region. Now there is a whole different process for competition long distance casting. That process usually involves increasing the casting stroke length with some rather violent body movement, special lines, and lots of practice. Casts of unbelievable lengths can be made using these techniques but they are best taught by a professional and we won't bother with them here.

Short Casts

When we look at the “comfortable” region on the rod charts in *Mechanics of Fly Casting III*, the obvious point is a lot of casts are made in the “shorter than comfortable” range. And most of us make those casts all the time without thinking of them as uncomfortable. Basically, there are three simple ways to do this. The first is obvious. Don't load the rod as much. The danger in this cast is that you don't feel the line loading the rod and you have difficulty with things like starting the cast before the back cast is finished and like making a soft stop on the forward cast which almost guarantees a tailing loop. But still, it is done all the time.

The second is also obvious. Just shorten up the casting stroke length. Now you can still feel the loading but unless you take the length out of the back cast, you will end up catching the fly line with your too vertical rod. But it is done all the time too.

The third is to loosen up your wrist and use a wrist “flick.” You have heard people talk about straight wrist cast and bent wrist casts all the time. Which one do they like, why do you do one instead of the other? But here is the scoop. Casting from the wrist instead of the elbow has the effect of shortening up the rod (and therefore the casting stroke) without changing the effective arc or the rod loading. It's as simple as that.

Now the truth. Most people use all three methods at once, blended and interchangeably, without even knowing it. But because of the unsettling nature of the process, there is some degree of “discomfort” in it. We do this a lot but we prefer to wind out a cast in the “comfort” zone. It just feels better.

So what do people who cast in this zone all the time do? Ever here people talk about their 2 weight bamboo? How much fun it is?

I will guarantee they are making a lot of these short distance casts. Now they will say they can wind out a long cast if they have too, and they probably can. But they don't prefer

too. You won't see many 2 weights at a distance casting competition, and that's not because the people there are not good casters.

Okay That's Enough

I think that's about all I know. You probably think I am a nut case by now anyway. But remember, this series never promised to teach you to cast. And it never promised to make you a better caster. But maybe, if you are inclined to understand physical things in their scientific light, this will have helped.

Bob Bolton is a retired mechanical engineer. He spent 35 years designing engines for a major automobile manufacturer and now writes technical design manuals on consignment to his own consulting company. In his spare time he hunts birds, fly fishes fresh and salt water, and works on finding fishing sites for handicapped anglers (www.HATofMichigan.org). He has written one book, You Can't Make a Living Tying Flies, in which writes of fishing and hunting in Michigan.

