Sliding Rigger Physics

People often mistakenly believe that the Rowperfect simulates a sliding rigger boat. The explanation below was sent to us by Cas Rekers when I wondered whether fixing the seat would achieve the equivalent of a sliding rigger boat.

"As far as simulation of the sliding rigger boat with just the seat fixed, I'm afraid you are wrong. Remember it is all about masses moving relative to the common center of gravity of boat plus rower. In a normal racing shell the moving masses are: The rower (e.g. 87.5kgs on one side), and the boat plus oars (for the Rowperfect taken at 17.5kgs) on the other side, the ratio of masses then is 87.5/17.5 equals 5.This means that with a traveling length of 60cm on the slide, the rower moves 10cm relative to the common center of gravity and the boat 50cm. Assuming this movement is a perfect sinus at a stroke rate of 30 strokes per minute that would cause a fluctuation of the boat speed relative to the common center of gravity of plus and minus 0.7m/sec. In practice this is higher. Nolte measured at the 1981 World Championships on average of the 5 sliding seat finalists from -1m/sec. to +1.15m/sec.

"In a sliding rigger boat, the situation is quite different; there we have the combined mass of rower plus the shell of the boat and the seat (roughly11kg in a single) versus the remaining 6.5kg of moving stretcher/rigger/oar, so a ratio of around 15. Assuming that the center of gravity of the rower is at rest with respect to the boat, this ratio would mean a fluctuation of the boat, (now coupled to the heavy rower) relative to the common center of gravity of only 4cm, generating a fluctuation in boat speed of plus and minus 0.06m/sec. In practice this fluctuation will be higher because by bending the knees and pulling the heels towards oneself, the center of gravity of the legs moves also with respect to the boat, so does also the center of gravity of the upper body. The total displacement of the center of gravity of the body relative to the boat however is definitely a lot smaller than in case of a sliding seat. In practice Nolte actually measured plus and minus 0.26m/sec. If you would just fix the seat of the Rowperfect, you would have an infinite mass of (rower + seat + mother earth) against a mass of 17.5kg, in this case simulating just the oar rigger combination. In view of the above, for a good simulation of a sliding rigger boat, one would need to increase the weight of the seat to around 11kg, and to decrease the weight of the stretcher/flywheel main frame to around 6.5kg.

Regards,

Cas Rekers."