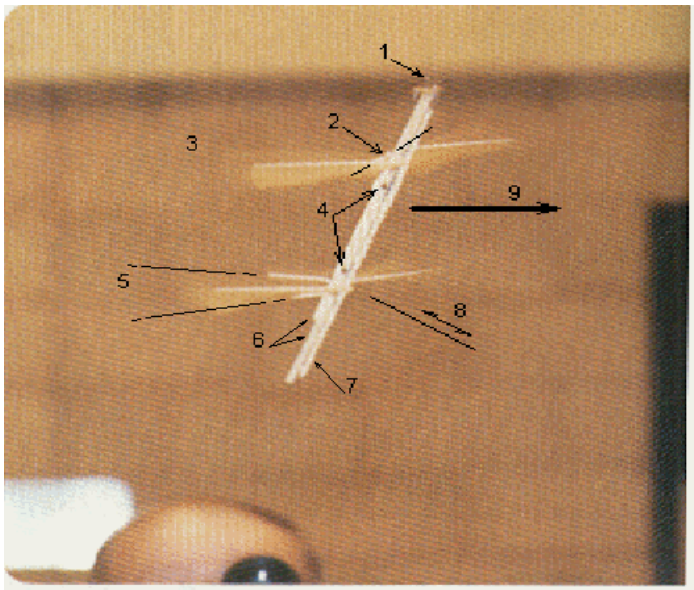
A SLOPING-STROKER

Flight Picture

This model is not climbing! It was flying more or less horizontally (9), although the body points up at around 60 degrees. That is to try out a sloping stroke plane - which is perpendicular (8) to the body and so inclined, in this flight, at about 60 degrees forwards/downwards.

It felt strange holding the model nose-up yet launching horizontally.

Various stroke slopes were tried out. The model was flown underpowered, so that it would hardly climb when the stroke plane was vertical and not at all when at 60 degrees. The best climb seemed to be at about 30 degrees slope, though the improvement was small.



To drive the wings in different configurations, the body has two sticks (6), pivoted to semi-rotate through 140 degrees, relatively. Through both sticks at various stations (4) there are tubes (even more, now) for plugging the wings into at variable incidences. Apart from miniscule body-roll inertia, aerodynamic "action and reaction" ensures that the wings all flap through 70 degrees. In the set-up here, the starboard wings are in the bottom stick, the port in the top. All are caught in the up/back stroke (3), (I think). Other configurations are available for counter flapping or for diagonal flapping (= rocking).

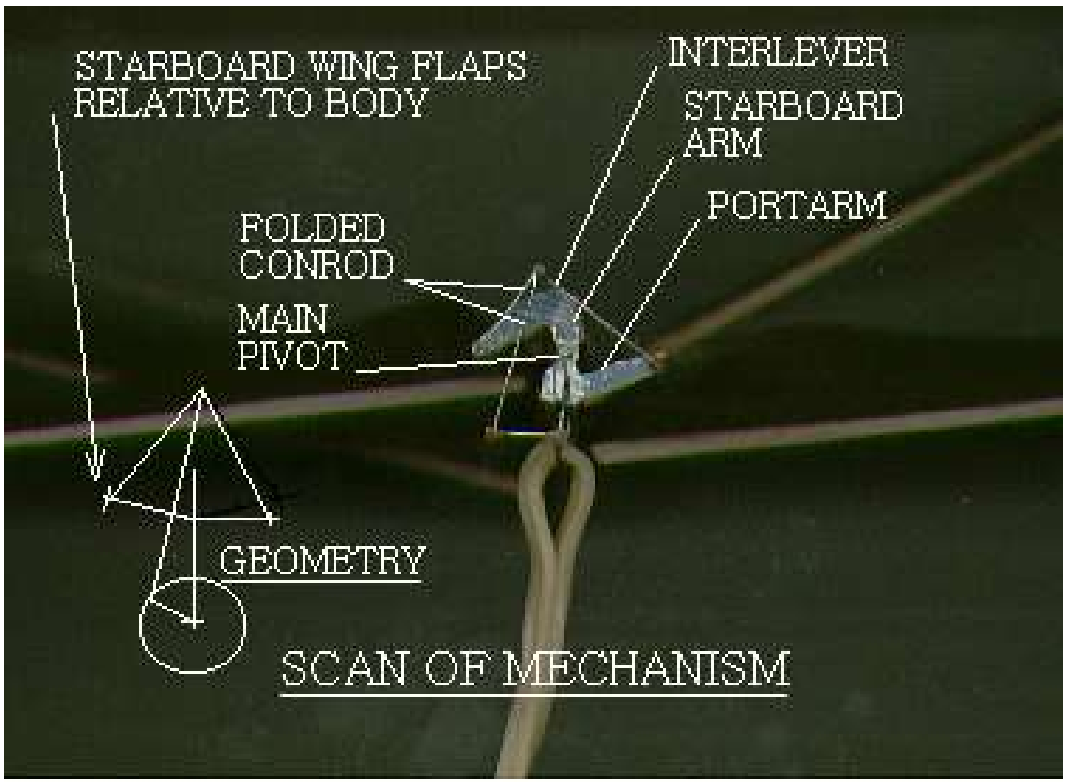
So far, the wings have all been similar, quarter-elliptic. The span is 170mm.

To avoid clashes, the port wings are mounted slightly ahead of the starboard. Also to avoid clashing, the root rib needs to be swept out towards the TE at 30 degrees. (However, the plugs are mounted at the quarter-chord and the forward portions of the root rib are not swept, so there are still annoying limitations to the incidences due to the ribs' fouling the sticks. Next time, the plugs will be at the LE's.)

By setting the front wings at negative incidence and launching nose-up, a suitable root AoA can be found. Here, the front root rib appears to be at about -40 degrees (2) but its outward "sweep" probably makes it look less than it is. For stability, the rear wings required a greater negative incidence - and the differential was found to increase with greater negative incidences. (I can't remember where the CG was.) There is considerable difference (5) in the hind's settings here, probably to correct roll (or maybe the port one is just shaking loose - the paper is at an odd angle. They kept falling off!) They appear to average slightly under -60 degrees.

Although the wings are well separated here, they have sometimes been moved closer together, even to just overlapping. Flight seemed stable at all settings and does not require a stabilizer.

The mechanism is mounted well forwards to allow a long motor (7). It consists of a "folded conrod", which brings the flap axis close to the crank axis. The arrow (1) points to the (just visible) joint in the conrod. This is guided in an arc by an interlever, pivoted on the far arm (just visible, foreshortened), which is fixed to the lower stick - as are the crank bearings. The "little end" pivots on the near (starboard) arm, mounted on the top stick. The links were proportioned to give fairly equal mechanical advantage at each end of the stroke, but the flap is asymmetrical; the strong down stroke lasts for 240 degrees of crank rotation, while the up, 120. That weak upstroke meant that the model wouldn't flap before launch, until the lift acted.



Eventually, I hope to make the model hover - like a biplane hummingbird - or even with just two wings.

PS But I never have! John Mack, April 2004.