

Pitching Around!

by Bill Cavanaugh
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I was experimenting in my basement laboratory not long ago and discovered how to shrink myself to a height of 6 to 8 inches tall, with precision as to my weight and length of time I would be shrunk. The thought occurred to me that I could now do what I have fantasized doing ever since I have been building model airplanes, namely, get into one and actually fly it. So, I dug out of my stuff an old but airworthy glider, an Olympic II, pulled out the radio equipment and modified it with a tiny cockpit, complete with stick, rudder pedals and a bubble canopy. Since the servos, Rx and batteries weighed more than I did in my shrunken condition, I put in a little lead to make up the difference and devised a track that would allow me, in flight, to shift it back and forth to change the c.g. I confided my plans to a flying buddy, and off we went to the field. I took a slug of my formula, shrunk down to size and climbed into the Olympic. My friend winched me up to about 400' and I was thrilled beyond words.

Sailplanes are designed to be longitudinally stable. I could "feel" this when I pushed or pulled the joystick to make a pitch change: the sailplane, when trimmed for level flight, tried to return to its trimmed condition. So, I moved my lead weight a little rearward and as the distance between the c.g. and the horizontal tail decreased, the force required to make a pitch change also decreased. At the point of "neutral longitudinal stability" the sailplane tended to maintain its present attitude instead of trying to return to its trimmed condition. I noticed that the stick force required to make a change was now extremely light, and that resulted in my overcontrolling. When I fly RC, stick forces were not transmitted back to me so I don't have this input. With the lead weight way aft, the pitch attitude got so high that there wasn't enough "down" elevator to prevent or recover from an impending stall. Competition pilots sometimes move their c.g. aft to make their sailplane more sensitive to rising air. The sailplane became super sensitive to control inputs, sometimes described as "squirrely." My Olympic was now dancing all over the sky, so I pushed the lead weight far forward.

Now the plane became very stable and control forces became heavy. Again, I can't feel this when flying RC. The plane now seemed to have a mind of its own and didn't want to change pitch. When I forced it up or down, it fought me and when I got it into a dive, it gained much speed before it headed back up. I kept it out of an oscillating stall condition, but it was now difficult to control, flying through thermals without giving much of a clue that I was in rising air, and became an unresponsive dog.

So I reached down and adjusted the movable weight to somewhere in the middle, and all these competing forces were optimized, not ideal but the best compromise I could come up with. I was now flying around with decent control response and rising air clues, but not on the verge of a stall.

My planned shrink time span was now coming to an end, so I deployed my spoilers and headed back to the field, touching precisely down on a spot that represented a 100 point landing. I

stepped out of the Olympic just in time to unshrink to my normal height and shared my newly experienced aeronautical lore with my flying buddy. He commented that this is great and suggested that I write up my experience for the BASS newsletter. Maybe I'll take another flight later and experiment with roll and yaw.

Notice: This article was inspired by some material on inherent stability in Aviation Safety