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BKB FLIGHT REPORT NO. 2

I flew the BKB for my 2nd, 3rd, and 4th flights on October 26. Three ~~changes had been made.~~ Things were different than in the case of my 1st flight. Witold had changed the aileron gearing to reduce the amount of adverse yaw, the towline length was doubled to an approximate length of 400 feet, and I asked the tow pilot to reduce engine power about 150 RPM until the BKB was airborne.

The flights were much better in all respects than the first flight had been. I felt that I had adequate control at all times. Unusual motion in pitch occurred in each take-off but I was able to control the flight path with increasing precision until in the 4th take-off I felt I had sufficient control to experiment with the pitch control. However, I was unable to gain any further understanding of the peculiar (and alarming) intermittent diving tendency observed during the first 5 or 10 seconds of each flight. It probably results from a combination of towline loads, tow plane wash, and ground effect. I am absolutely convinced it is not pilot induced.

The air was smooth on the 26th and the aero-tows were uneventful. I was able to experiment with steady changes of tow position right and left and I reinforced my previous opinion that control power measured in absolute terms is quite low compared to conventional gliders. I was unable to position the BKB as far outboard as the tow plane wing tips. The glider is amazingly steady on tow in still air.

Off tow I repeated the lateral control experiments and convinced myself that ailerons without coordinated rudder produce zero roll rate at all speeds. Two exceptions: at about 100 MPH a slight steady roll reversal was noted, and with airbrakes fully deflected a small positive roll response occurred. The bank angle transient accompanying a step aileron deflection produces a very strong illusion of pendulous stability. It appears as if the rolling velocity is opposed by a bank angle term.

The ineffective ailerons have no adverse effect on flight path control once the pilot has mastered the trick of controlling roll rate with the rudder pedals. The wing tip rudders are very powerful roll rate controls and are effective throughout the speed range. They are the only controls that give the pilot any feel of hinge moment. Large deflections are not possible at high speed but roll rate appears to be nicely ratioed to pedal forces at all speeds. Suprisingly enough, the dynamic response

in roll to rudder deflection appears to be precisely first order; that is, roll rate rises asymptotically to a steady value following a rudder step with no discernible oscillatory motion. The roll time constant must be less than half a second and roll control is crisp and precise. This is also true when the tip rudders are deflected symmetrically as airbrakes but then the pilot controls roll rate by removing a rudder pedal deflection. This type of control was sufficiently novel to me that I was unable to do it smoothly.

One of several questions in my mind about the BKB is why the roll control through the rudder pedals doesn't peter out at high speed. If the rudders are developing roll rate by yawing the glider and exploiting roll-due-to-yaw, this effect should get quite weak at low angle of attack and reversed at negative lift. Furthermore, if the rudders are spoiling lift over the wing tip to produce roll rate, what response will they have at negative lifts? The only way to find out is to roll the BKB on its back and see if right rudder will produce a left roll!

Once the pilot has adapted to the very sensitive elevator gearing, pitch control is excellent except for the unusual motion immediately after take-off and in rough air. Lazy eights banked over-vertical and loops are performed with ease. No erratic response was noted during these maneuvers which were a delight to perform. Trim airspeed range of these flights was 40 to 100 MPH.

Landings are for me the most critical aspect of flight in the BKB. I don't like the limited drag control and the visibility down and to the sides can be quite a problem. Flight path control on the landing approach could be greatly improved with just a little more variable drag. The drag polar is pretty abrupt and it is possible, though not very elegant, to dive off excess altitude.

My technique in the flare was to do nothing and it worked perfectly. Someday it would be fun to make a very high speed approach and float the length of the field in the ground effect but for the present I am quite content to set up a steady glide aimed at a decent spot on the strip and freeze the controls. There is a flare but it is all done by ground effect. Landings were made with speed brakes open and closed at touchdown.

In summary, I continue in my belief that the BKB is dangerous to fly during the learning period. I now know that it is reasonably safe to fly after learning the novel techniques required but, since it is a single place glider I see no safe way to acquire the initial training.

Therefore I conclude:

1. There is no safe method of checking out a new pilot in the BKB.with its present characteristics. A two place trainer would provide a solution to this problem.

2. Changes required to ensure a reasonably safe solo check out are at least the following:

   a. Provide a lateral control system that will give a positive steady state roll rate without use of rudder pedals.

   b. Reduce friction and change gearing on elevator control. Possibly increase feel spring strength. Goal here is to reduce sensitivity of pitch control and to make the stick feel more respresentative of the glider response.

   c. Increase variable drag such that the pilot can command 500 FPM descent at 60 MPH. Bekas type speed brakes would satisfy this requirement.

I also recommend that all check out flights be flown with a 350 feet or longer towline and the tow plane thrust should be reduced during the BKB take-off.

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