On the 'Wing... #114

Aka-bee's 'Wing

This past summer and fall were filled with a number of exceptional experiences. The real highlight, however, was our involvement in Hidemi Akaba's flying wing project. Hidemi, known to his fellow American glider pilots as Aka-bee, approached us early in the development process, inquiring about a spar system for his endeavor. Following months of construction, and a couple of months of re-construction, Aka-bee flew his 'wing successfully. Although originally conceived as a slope soarer, it was quite a success at the Seattle area Soaring Society's flat land site, 60 Acres.

The exceptional part of the 'wing is the center section. Aka-bee actually made a female mould for this part of the project! The resulting component is a work of art. The skin is a fiberglass shell, with plywood bulkheads added. The servos are mounted at the outboard wing junction, the battery pack and receiver near the center. The upper skin is in two layers. First there is a layer which bonds the ribs and other structural components, as the bottom skin. Much of this layer is cut away for access to the radio equipment, wing alignment pins, etc. There is a lip near the leading and trailing edges which serves to hold the second layer, the outer skin, in place. No tape is need to make a smooth surface. Nylon screws are used to assure this outer skin stays in place during flight.

On the field, Aka-bee's 'wing assembles from three pieces: the center section and two wing panels. The main wing rod is roughly parallel to the quarter chord line of the wing, while the alignment pins are perpendicular to the wing centerline. For flying, a wing panel is slid onto the main wing rod, then the alignment pin is pushed into its receptacle in the wing. The pin has a 90 degree bend at its inner end, such that the pin is pushed in, then rotated for locking. Since all four servos are mounted in the center section, connecting the control cables is relatively easy.

In June, we finally managed to coordinate our schedules and see Aka-bee's 'wing take flight. It was truly beautiful, but not free of problems.

In its initial configuration, the 'wing had a tendency to sideslip in turns. This sometimes lead to the wing yawing so much it would end up sliding toward the ground like a javelin. There was also a tendency to tip stall. Luckily, Aka-bee had included drag rudders in the design from the very beginning. When in trouble, opening the drag rudders simultaneously immediately damped the yaw and allowed controlled flight to continue, albeit with some loss of altitude.

An additional problem was one of visibility. Although the span is a large 100 inches, at a distance it was difficult to determine the actual attitude of the aircraft, and even more difficult to catch adverse or proverse yaw. Even more dangerous, however, was the tendency for it to disappear.

These two problems were eventually eliminated, or at least minimized, through addition of winglets. This was a difficult decision for Aka-bee, as he wanted very much to retain a true "flying wing," i.e.; no vertical surfaces. Still, he had the foresight to include a winglet mounting method during the original construction, so adding the winglets was not a difficult project.

Flutter frequently reared its ugly head, especially on launch, but also during high speed flight. To reduce flutter, the flexible wings were reinforced with carbon fiber between the wing spars and the trailing edge. Since the wings were sheeted with balsa, Aka-bee also added a layer of fiberglass to the exterior, with the grain running diagonally. Not only was this an easy thing to do, it also placed the 'glass on the outside of the structure, where it could provide the most strength. At the same time, efforts were made to tighten the elevon hinges. Some play still remains in the wing rod system, as there is no way to tighten the connection.

With the improved visibility offered by the addition of winglets, flight testing began providing legitimate feedback. Flight characteristics continued to improve as the CG was moved aft, the tow hook was relocated, and radio mixing was reorganized.

By August, the 'wing was flying well and had been thermalled several times. Bill was going out to 60 Acres each weekend, often spending the entire day flying our own planes and watching Aka-bee's 'wing cruise the skies. August was also the month Aka-bee was told he was being transferred back to Japan in early September.

Hidemi is now working in the aerospace division of Fuji Heavy Industries, makers of Subaru automobiles. He is assigned to the unmanned vehicle section, and is working on a remotely piloted helicopter. This is an RC helicopter which weighs more than 650 pounds, including 220 pounds of payload. These machines are used in Japanese agriculture to apply insecticides and other chemicals.

Summer is now just around the corner again, and we already see a vacancy in the air and feel Aka-bee's presence missing at the field.

If you have a tailless project which may be of interest to readers of *RC Soaring Digest*, we'd very much appreciate hearing from you.

Hidemi Akaba's RC Flying Wing Sailplane

Configuration, initial	No fuselage, no vertical surfaces; wing only
Configuration, final	Winglets added
Span	100 inches
Root chord	10 inches
Tip chord	4 inches
Sweepback	18 degrees at LE
Wing section	EH 1.5/9.0
Weight	40 ounces, approximately
Wing loading	8.2 ounces/ft^2
Controls	Elevons and split drag rudders Four servos, mixing
Appearance	Horten-like