



(Photo by Dick Stouffer)

DUANE BURNETT'S

# SKYOTE

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"SKYOTE — A SMALL 20' wingspan biplane that I just can't keep right side up. Oh, it's stable enough and easy to fly, but the urge to do aerobatics is too compelling. To just tool along straight and level is not in its breeding!"

The design of this fantastic little flying machine emanated from the fertile mind of O. E. "Pete" Bartoe, Jr., spawned through the circuitry of a Hewlett-Packard calculator and pages of a 1930's biplane design handbook. Pete's nostalgia for helmet and goggle flying led him to purchase a de Havilland D.H. 82 "Tiger Moth" which he flew for six years in the Rocky Mountain area and off to Blakesburg, Iowa for the annual AAA Fly-In each year. Pete laboriously practiced aerobatics in his Moth, an airship not given to graceful maneuvers in the sky without considerable effort.

After flying a Bucker Jungmeister and Doug Rhinehart's Rose Parakeet, Pete's urge to write a final chapter in the ultimate state of the art of single place biplane design overpowered his good sense. With my encouragement and Brad Davenport's practical aircraftmanship, the Skyote design took shape in the form of sketches on placemats at many lunches and finally 25 sheets (31" x 42") of engineering design/working drawings, produced by many calculations, and a computer-run stress analysis of the complete airframe. The structural design parameters were to stress the aircraft to 9 G's positive and

6 G's negative before anything would stretch, i.e. Part 23 FAR. The wing design was rediscovered in a duster's junkyard at Greeley, Colorado, i.e. the Naval aircraft factory at Philadelphia, circa 1930s. To explain, Pete's comment after carefully looking over an uncovered N3N wing, "Now, that's the proper way to build a fabric covered wing, metal all the way except the skin." He swept the Skyote's wings 7 degrees for added stability and CG considerations.

All four wing panels, each with an aileron, are identical except for the opposite handing requirement and strut load pickup points, required by the inner plane strut matching. A beefy top wing center section carries flight loads around a gas tank, which it encases, with a .050 thick stiffened aluminum bottom shear plate and streamlined stainless steel "X" wires on three sides all being stabilized vertically with 4130 chromemolly cabane struts. The fuselage and tail structure are 4130 tubing with the typical mahogany plywood former and spruce stringer turtledeck. Spruce stringers form the fuselage shape, some being curved by glue lamination. The 38" chord airfoil is a modified NACA 2412.

The gear stands high to clear the swept lower wing tips. The bungee shock struts go into action with a full 4 1/2" of travel on the rough fields for which it was designed. A single Super Cub bungee on each side does the job. The wheel brake system is 600 x 6 Cleveland disk type.

The positive lines of the fuselage forward of the cockpit are formed by rolled aluminum sheet to the stainless steel firewall, anchored with machine screws and

silver plated nut plates. The fuselage profile converges on straight forward to a spun aluminum nose bowl ingeniously cut and rematched to form a vertical oval. This forward section locks to itself, top half with bottom half, and solid to the firewall with small Lions quick fasteners. The balance of the fuel supply is between instrument panel and firewall in a 61/2 gallon tank.

The cockpit is surprisingly roomy for a 593 pound airplane. Top swung rudder pedals with toe brakes and aluminum heel slide provide positive ground handling along with a rudder-connected, steerable 6 x 2 Scott tail-wheel.

Ailerons are ball-bearing hinged and connected by a full ball-bearing linkage driven by a torque tube to the lower ailerons. The top ailerons are slaved from the bottom ailerons with a vertical steel tube forward of the aileron's hinge line so that it also serves as the systems static counter balance. The long lever arm joy stick has a short side-to-side throw which allows for plenty of knee clearance. Rudder, elevator, aileron control pressures are well balanced and very light. "Controlling this machine is not like stirring peas," as I once heard an Englishman describing the feel of the controls of a Spitfire.

Some first reaction comments are: "It's sure setting high and the gear is narrow, isn't it?" Setting high, as I mentioned, gives good ground clearance to both prop and wing tips, and the gear width is 25% of the wingspan, a recognized standard. Forward visibility in level flight is quite good since the top cowl line slopes away fast to the nose, placing the horizon well above the nose. The top of the cowl has only a 6 degree upsweep in the three point position. Dragging a wing tip will not get an aileron because of the steep wing angle required to touch the tip on the ground, even when the aileron is fully deflected.

The gear action, even though it is soft, allows no ground wandering or darting tendency. Any rollout correction can be administered instantly because of positive aileron, rudder and elevator control right down to 20 mph. It just doesn't run out of any control on the rollout.

I've wheeled it on pavement in a direct crosswind of 30 mph and managed quite well with a cross controlled correction right down to tail wheel contact. The upwind wing can be held quite low without raising the downwind wheel off the ground because of the long strut travel. In doing a power OFF full stall landing, you have to be rounded out at the right elevation above the ground because after breaking the glide and rotating to a three point attitude, it soon quits flying because of the relatively high angle of attack in the three point attitude. Likewise with this positive angle you can use plenty of brakes "to haul her down full" if necessary. The elevator will keep the tail wheel planted.

One cool, still morning loaded with 3/4 fuel, 25 pounds of baggage, myself, parachute and some heavy clothes, I was trying the Skyote out in a newly-mowed alfalfa field at 5300' elevation. After a couple practice landings when I had stopped and turned around in 300' from touchdown, I decided that with a 5' fence on each end I could get in and out of this field with 500' between fences. That same cool morning with 25 pounds of baggage and full of fuel, the Skyote climbed to 12,000 msl from 5300' field elevation in 30 minutes — the last 1,000' taking 9 minutes. Of course at Oshkosh '78 near sea level, it's performance was fantastic. On that trip from Boulder, I delighted in taking off at the lower elevations starting a climbing 360 degree turn and having 1000' over the gas pump. The Skyote is presently fitted with a high altitude climb prop, McCauley Klip-Tip 72-43, that will let the engine rev to 2700 at 6000 msl flat out in level flight. The C-90-8F in that mode thinks its a hundred

horsepower, and will true out at 115 mph. I cruise at 2500 rpm which allows me to plan cross country flights at 100 mph even. The C-90-8F is lighter than the C-90-12 and the Continental 0-200 by several pounds because of the lighter accessory case, no starter, generator, etc.

There is no inverted fuel or oil system on my machines and at this point I have no intention of putting one on N102DB. After watching Bob Hoover fly it, I have decided I've got a long way to go before I need an inverted system. Bob has taken quite a liking to this design and doesn't hesitate to express himself either by demonstration or verbally. Last Labor Day weekend at Ft. Collins, Colorado he practiced 20 minutes, then opened the show both days with a snap roll on takeoff followed by most of his "big iron" maneuvers. He gets a 16-point roll and an 8-sided loop without losing power. When I asked him later how he managed that, his answer was, "Oh, I just keep the forces enough positive to maintain fuel flow." The Aero West publication's comment was, "The Confederate Air Force came to Ft. Collins, but Bob Hoover steals the show in a 90 hp Skyote."

The Skyote is in no sense an unlimited competition aerobatic airplane but it does do all the classic maneuvers quite well. And, in the hands of a practiced pilot, should win some "hardware" in the sportsman category. I personally am not an aerobatic pilot and I really did not build this airplane for my own stunting pleasure, but I have a hard time keeping it right side up. As a result of its ability, not mine, I'm keeping plenty of altitude, looking around a lot and slowly learning aerobatics by trial and error. At this writing, I have 120 hours total on the airplane and if it has any bad habits, I haven't discovered them.

Map management in any open cockpit is a chore but I've managed to dead reckon from Boulder to Oshkosh and back (totalling 1900 miles) in two easy days each way with seven gas stops. Then from Boulder to Tallequah, Oklahoma (totalling 1200 miles) in two easier days each way with four gas stops. The range of this open cockpit airplane need not be long for the simple reason it's not merely for transportation. I think of it as ambling cross country from town to town with a destination in mind. It's fun to stop often, especially at out-of-the-way places. Dead reckoning navigation at 500 to 1000 feet above the ground is an exciting challenge with no end of interest and excitement. At 500' one day in eastern Colorado, four military jets in tight formation passed directly under me. We were all so low over the wheat fields, that what appeared to be four jets tucked in tight, really turned out to be two jets and two crisp black shadows against the golden wheat stubble. 12½ gallons of fuel will get me 150 miles with a 30 minute reserve — that's far enough between stretches. I feel more comfortable with 120 mile legs in case of headwinds or other adversity.

For those who think of an aircraft as a compromising composite of materials all combined to take advantage of the best qualities of each, the Skyote with its steel, aluminum, wood, fabric and dope, is, in a nostalgic sense, just the right combination of materials and design to produce a proper flying machine.

**About the Author:** Duane L. Burnett began pre-Air Force Cadet flying in 1944 while in a civilian training detachment at Mississippi State College. Almost all of his nearly 2000 flying hours, all non-military, are either in light planes or gliders, over a time span of 35 years. The Skyote is his first plane built from plans and followed two restorations — a 1942 Aeronca L-3B artillery spotter and a 1953 PA-18 Piper Super Cub. The Super Cub was formerly a Colorado Civil Air Patrol mountain search plane.