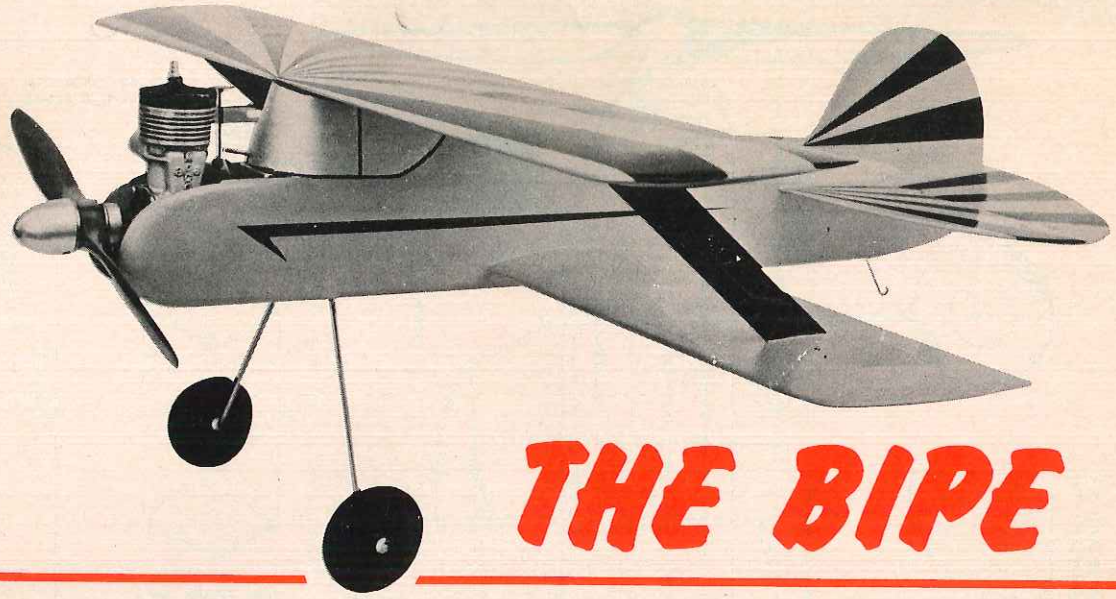

# THE BIPE

**By HAL deBOLT . . . The Bipe was first designed in the early forties as a compact, simple, control line biplane which wouldn't use up too much precious balsa wood in its construction. WW-II was a challenging era for modellers, especially C/L modelers who were just learning the basics of this new form of flight.**

• It has been said many times before, free flight was king prior to WW-II. We all thought that F/F was great, of course, and enjoyed it very much. The War killed F/F and served as the stimulus that the embryonic control line movement needed. Obviously, with the phase practically dead, F/F saw little development during the war years. However, with the shift of interest toward C/L, there came rapid development in that phase, especially with so much to be learned about the radical, new method of flying. The excitement came from the modelers who were learning more about it each day, or so it seemed. This could easily be where our favorite query, "What's new?" originated. In those days, you asked the question, and really did get a thrilling answer!

There was all sorts of action within the Patuxent Model Engineers during the war, as their primary interest was control line. This was a progressive club; its members created new C/L designs prolifically, and flew them with equal fervor. It had to be progressive and innovative, with C/L so new, there had been only a few kits manufactured, and the war had stopped what production there was.

With the C/L phase so new, the emphasis was toward what we would label "trainers" today: something which you could learn to fly with, enjoy the excitement of, and bring home in one piece . . . along with a handful of busted props. The Patuxent sailors *(Also known as the Navy Patuxent River Model Engineers, the first Navy model hobby group. wrf)* put together various sorts of "designs" for this purpose, some were OK, and others simply did not cut the mustard.

By this time your author was an accomplished C/L pilot, having learned the basics with a Stanzel "Tiger Shark," and some other thing he had created with which to learn more about "U-Control." So, the urge for something different kindled more investigation into the aerodynamics of C/L designs. No thought was given to creating a design which would appeal to others, or be commercially viable.

At that time, biplanes were a rarity in free flight, and nothing was known of them in control line. Yet, when this experienced free flight designer looked at the design needs for C/L, the basic characteristics of a biplane seemed to be a good solution. Remember, the available power in those days was anemic. The required ignition system was heavy, and its size could use much precious balsa. The cost alone did not make the balsa so precious, but its lack of *availability* likened it to Gold! You really had to scratch for every piece you got.

As a designer facing such problems, the advantage of the great wing area offered by a biplane was attractive. If you had high weight, and little power, aerodynamics said to use wing area as a substitute for the lack of power. The idea seemed sound, and the thought of building a "two winger" probably clinched the decision. The only problem was that there was no design data readily available for biplanes, simply nothing to use for reference.

The Patuxent River Test Center came to the rescue. Our division library had some aircraft engineering books, and there were a couple of biplanes kicking around the dark corners of a hangar . . . Study it all, and one could assume the basic design factors for a double winger.

The effort which went into the Bipe design would be an interesting lesson in using aerodynamic principles. The additional factors which come into effect when additional wings are used, include wing gap, stagger, and decalage. Probably the paramount consideration is wing gap, for it can have a direct, negative effect on wing efficiency. Assuming one wing to be directly above the other, 1-1/2 chord widths of gap is required to obtain 100 percent efficiency from both wings (i.e. no interference between the two wings). Reduce the gap to one chord width, and the efficiency drops to 80 percent. Stagger is a sneaky way to reduce the gap effect. If the wings are not placed directly above each other, there should be no interaction to speak of. If this is true, then any amount of stagger used in a design should be advantageous in this respect.

Decalage is the preset difference in the angle of attack of the two wings. One wing is given a greater angle of incidence than the other. If you were to aim for 100 percent biplane efficiency, you would find the necessities cumbersome to use, especially in a practical control line model.

As this was an INITIAL investigation into the use of a biplane for control line flying, the way in which the laws were juggled to obtain a useable model (which did not violate any rules) is of interest. Today, things might be done differently because we have *experience* to draw on, without it, however, you had to follow the known rules just to be "safe". Remember that "in the beginning," there were no aerodynamic laws, no one could set them down on paper. The laws were created by experience only. Even today, new experiences can alter or add to the laws, as has already happened when aircraft reached the sonic range. However, at this time, and for our purposes, things are now fairly settled.

The Bipe design was an attempt to create a desirable craft while staying within the rules of that day. First priority was the need to design a compact control line model, a large wing gap would negate that design objective. Secondly, cabane struts are a perfect

pain, the use of a "cabin" instead is so much more practical. Hence, you see the use of 100 percent wing stagger in this design which theoretically allows much smaller wing gaps, and eliminates the need for cabane struts.

The proper use of decalage can enhance longitudinal stability. The law says that if you fly the *forward* wing at a higher angle of attack than the aft wing, then the *forward* wing will stall first. Thus, the forward wing will lose lift while the aft wing maintains it. In that case, the center of lift automatically moves rearward tending to pivot the nose downward at approximately the center of gravity, or control pivot in this case. Once the nose comes down, the forward wing gets its lift back, and you are flying safely once more.

Note that the Bipe uses two degrees of negative incidence in the rear wing for this purpose. Negative incidence can be used in this case because the airfoil used for both wings commences lifting at about four degrees negative. At two degrees negative, that rear wing is still providing lift, which will increase drastically when raising the nose, and increasing the angle of attack. Remember, at this point in C/L development you only concerned yourself with right-side-up maneuvers, as up to that time no one had flown inverted!

Along the way, we saw a demonstration of this stability factor. One of the Patuxent modelers was flying a Bipe, when somehow he lost an entire half of the horizontal tail. Flown without it, the only apparent difference was a bit of control response sluggishness when performing a loop.

One thing that you can do when talking about something which happened in the beginning is see how things have changed. Is everything really better today? Remembering that the first Ukies were designed by "freeflighters," some of the thinking had to be influenced by what they knew to be fact from their limited experience.

Jim Walker was "Mr. U-Control," and he pointed the way for the rest of us. For whatever reason, Jim commenced C/L flying in a counter-clockwise direction, and did it successfully. Naturally, everyone else followed his trend, because after all, he should know . . .

However, in those days, if you were a freeflighter, you were awfully concious of what was called torque effect. If a model started into a left turn under power, it seldom recovered. This torque was believed to be a strong force. Note that the Bipe was flown CLOCKWISE. If you needed to keep the model tight against the end of the lines, it seemed obvious to let torque help you do it. Thinking further, it seemed absurd to design the model so that it would stay out there, and then add some more yaw to compensate for the torque. Obviously, for whatever reason, counter-clockwise became the standard, but you have to wonder if those clockwise designs might not have been just a bit more efficient.

Speaking of Jim Walker, he kept a tight rein on his "U-Control Patent" which many thought was not valid. But who was to argue with "The Man"? The Bipe was like all other kits of that day, only the location of the control was shown, not the system itself. In a sneaky way the *size* of the control horn was indicated, but that was all you got. Of course, you always had the positive direction, "Locate your favorite control here!"

What is your favorite fuel tank, a wedge, a hopper, a pressure tank, something else? What is the best brand you have found? In the Bipe's time, those descriptions would have fallen on ignorant ears. Buying a store-bought tank was unheard of, you either used the *excuse* for a tank which came with the engine, or you made your own. At least the Bipe drawings showed how to make a tank that might work. Actually, a major handicap in C/L was fuel tanks. DMECO developed and produced one of the first, it was a tall, square metal type which featured a "swivel pick up," and it worked!

Blind nuts? You would have to have been kidding! If you did not use wood screws, you had to make a "nut plate" as the drawings show. Hinges? Again you would be dreaming . . . You used a dowel for the elevator leading edge, wrapped some strips of tin can around it, and pinned it to the stabilizer.

There were some encouraging signs though . . . Matty Kania of the Patuxent group devised a hinge which pointed the way. Matty found some .003 thick *spring steel* shim stock, and with it devised the first strip hinges. The edges of the stabilizer and elevator were slitted, and the narrow, steel strips were inserted. They were then pinned in place. These "springs" also offered a self-neutralizing feature for the elevators, thought to be useful whenever the lines might go slack. Hey, these hinges worked fine, and probably *only* the scarcity of the thin, spring steel shim stock kept from becoming very popular. Of course, the basic idea did not die, and years latter, with the availability of polypropylene ("the living plastic"), strip hinges proved very successful, and became popular.

Yes, the years did change things, but mostly with improvements. Some of it got lost along the way, and other things are still with us, like using a bellcrank and those steel lines. . .

It should be pretty obvious that the Bipe was a most unexpected, and very successful design. It was not a pretty airplane, yet its stark appearance proved attractive, and its performance cinched its acceptance by other modelers. What was not immediately obvious was its extreme ruggedness, which was most important in those early, learning days. Often, you could cartwheel one end over end, and put another prop on, and fly. The original Bipe was most unusual as it survived thousands of flights, suffered through several engines, had its wire gear fatigue off, and wound up flying from a hand launch with belly landings. Other designs just did not have that kind of stamina in those days.

Attracked by its virtues, a number of Patuxent people built and flew Bipes with equal success. Enthused by this success, the designer went through a number of variations on the theme. One less successful variant featured extreme streamlining, including a cowled engine, which was frowned on in those days. Another version was strongly "beefed-up," and powered with a Hornet racing engine. This one was a real snorter, and would darn near pull your arm off on the long, seventy-foot lines. It was aptly named the "Brute" before we were done with it. The bottom line is that we really did have FUN with the Bipes. . .

In the early forties, model construction in general was not much more than an elaboration of the original "stick and tissue" structures. While such a structure still provides about the lightest way to go, and is sufficient in strength for flight, it will not take much abuse. This method can also be tedious to assemble. It did not take much control line flying experience before it was realized that these models needed a more rugged structure, plus, simplicity would be desirable.

Check out the Bipe structure, it does not look much different from what is used today, does it? Now understand, this method was brand new at the time, and while my memory is vague in this area, it could be that the Bipe was the first aircraft to use these ideas.

When I entered the Navy, I had been working in a variety of industries, in reflection, trying to find myself. If nothing else, you have a lot of time for thinking when you are in the service, and after the service, you are usually in a position to pursue just about any career you wish. I made the decision to go where my heart was . . . into model aviation, more specifically, into model manufacturing. The available service time also allowed some advance preparation. With the general acceptance, and the apparent worth of the Bipe, it was decided that this would be the first deBolt Model Engineering Co. (DMECO) kit.

Immediately after leaving the Navy, the necessary meager start was made, setting up a workshop, purchasing all the materials, and all the many details. Fortunately, a good buddy in the Patuxent club was an excellent draftsman. Bernie Millett had kindly produced the needed original drawings while still in the Navy.

When thinking back, it is hard to believe that the first Bipe kits were produced, sold, and delivered in January of 1946. Less than one month after leaving the Navy! There probably is a lesson there . . . when there is a real need, we can accomplish things which would otherwise seem impossible. After that, DMECO progressed well because of "the times", more than anything else. Immediately after the war, it did not

make much difference what sort or type of product you produced, things there in such short supply there was a demand for just about everything. Kaiser even got into the automobile business through this loophole! On top of that, C/L was about to explode, and guys were anxious to get back into modeling; They needed kits, and not many were available.

The Bipe kit was an instant success; as a labor of love, it was top quality all the way, while other offerings left much to be desired. It also was a badly needed type, especially suited for a beginner to control line flying. At $3.95, it fell into the "upper price" category of those times, yet this did not seem to effect its sales. Speaking of price, the Bipe box was jammed full of balsa, and all the other needs. It sure is a sign of *our times* when you realize that the $3.95 would not even buy the *box and plans alone* for the model today!

DMECO was as small an operation as you could visualize, yet the "good times" allowed rapid expansion of production. It was not long before Bipe kits were going out the door in gross lots, and they were seen on flying fields the country over. DMECO produced Bipe kits exclusively for over two years, and before it was replaced with an "improved" design, something close to 50,000 of them had been sold.

It was a couple of years or so after the war before anyone managed to fly inverted with control line. Some modeler did it first on the west coast, and the news traveled like wild fire. Naturally, deBolt had to get with this exciting new style of flying. After much thought and concentration, a design was developed for inverted flight. In the process, the design was patterned after the Navy's Wildcat fighter. As it turned out, the first inverted flying on the east coast was accomplished with this "Wildcat" design. Learning the maneuver did not come as easy as the model design did, it was many crashes before a complete inverted flight could be accomplished.

With no inverted flight ability, the demand for the Bipe slacked off. Something was needed. This demand lead to the "New Bipe" which was really a major redesign. Not only were the airfoils changed to allow inverted flight, the whole structure was re-engineered for lightness, and the use of smaller, more popular engines. The New Bipe was a major improvement, and turned out to be one of the nicest flying and performing designs of the day.

Flying two models simultaneously with control line is a chore, but Walker did it, and deBolt was quick to follow. To be successful, you really do need a model which will fly itself, for there is no way you can concentrate on two planes simultaneously. The stability and ease of flight of the New Bipe made this trick relatively painless.

The last of the Bipe series was labeled the "Super Bipe," and in reality, it had little relation to the original, beyond the use of two wings. This was a larger model, designed around the Drone Diesel engine, and aimed at the performance needed for stunt competition. While the performance was competitive, and in general it was an excellent model, the Super Bipe was never one of my favorites. The Super Bipe lost many of the features of the original Bipe, as the engine was side-mounted to obtain a better fuel tank location, the wing gap was increased to allow a reduction in stagger, and a slimmed-down cabin was incorporated to reduce drag. Even so, its success obviously had its roots in the grandaddy. . .

As an indication that the Bipes have not been forgotten, there is news from the old timer C/L movement that apparently a New Bipe did well in a USA national competition. Then, old friend Ron Moulton of England passes the word that a Super Bipe recently won their national championship. Perhaps they are mellowing with age. . . ●

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