CLOUD NINER (Reprinted from the September and October 1991 issues of RCM) #1102

By John Hunton with Bill Winter

PART I

On a windy Sunday afternoon at the Northern Virginia R/C field I stumbled upon the making of a unique TV tape. AMA's Doug Pratt was taping the ordinary looking orange and white model with Bill Winter at the microphone, and Bernie Stuecker (NVRC's busiest instructor) who was flying the model to a strange script.

Bill Winter and I had collaborated in the presentation of his 1947-88 R/C Special design. I had built that model for the article and to use in fun-fly competitions. The Special has wing flaps for enhanced flight maneuvers. Having recently restored and flown a full scale classic Stinson "Gullwing", I was appreciative of an airplane with a large speed range between V-max and V-stall, a wide performance envelope. The model I was watching, with its wide and nearly full span flaperons, had the widest speed range of any model I had ever seen.

With a large six foot span, and powered by a good .40 borrowed from a Quickie 500, the model had superior speed, excellent climb angle, and could be slowed to a seeming hover. It could do everything in a small box of air space. It was a short coupled cabin taildragger, with rather large empennage and powerful control surfaces. The stab was low and the nose high, a bit like a Stik. The wing had a thick, semi-symmetrical airfoil. The large area/low wing loading enables this model to glide and soar very well.

Bill said that it was just being used to examine how a new "Super" transmitter could be easily used in a foolproof way by ordinary pilots (as well as hot shots) to expand all around enjoyment of typical "Sunday" airplanes.

We agreed that I would make the new Mark II model, document it on paper, and work with Bill and Bernie to thoroughly test the model, then have another outstanding fun-fly model to compete with. Bill suggested a .65 (K&B Sportster), and allowed installation of split flaps, in addition to the flaperons, to maximize short field landing capability. My preliminary aerodynamic analysis of the design showed a top speed of 88 mph and a stall speed of 21 mph with the flaperon down (full down flaperons are not used as in gliders because strong aerobatics require both up and down "aileron" movement be available), therefore the flaperons permit a wide variation in envelopes, even during one flight. Adding the large split flaps to the calculation, stall speed drops to 15 mph. This is good contrast between high and low ends.

In working with Bill on his R/C Special, I was intrigued with flying a model with good handling characteristics, and an expanded performance envelope. Upon flying flaperon Cloud Niner (Mk-1) I knew this was a winner. With light overall weight, and considerable wing area, this combination of power to weight ratio provides for a short take-off run and steep climb out angle, with the flaperons angled. It also has an unusually steep landing approach with both the flaperons and split flaps down, and is excellent for tight field or fun-fly type operation.

It is really something to begin a flight covering the sky with wide, high speed loops, rolls, Cuban Eights, etc., then to head into the wind, go to idle, drop flaps, and hover. Then it's also something to have the capability to take this relatively large model with flaps down, and be able to turn or loop within its wingspan.

There is another vital aspect, the use of washout, not only in the method of construction which assures several degrees, but also the wing twist is magnified greatly when flaps are down for the low speed regime, where washout is essential. This is accomplished by not having the flaperons extend to the wingtip. *(Winter: not only are the tips kept clear of the flaperons --- which vary wing incidence by their up and down movements --- but by running the trailing edge of the double tapered tip from the flaperon TE at neutral upwards to the intersection of the flaperon spar and tip rib. A near full symmetrical section is created at the tip. The resulting "twist" is much greater than commonly used. This single feature permits the plane to do its "pretzel" maneuvers in complete safety close to the ground. Any snap potential is eliminated. With practice, the Cloud Niner can be flown in the STOL mode. Additionally, ultra high-G maneuvers in turns can be pulled without danger of high speed stalls which can cause the plane to tumble.)*

At high speeds, washout provides for reduced pressure differential at the wingtip, thus minimizing drag producing tip vortices. At the low speed end of performance, washout improves stall propagation characteristics by insuring that the wingtip will continue to fly, although stall has begun at the wing root. The model will not drop a wingtip at stall, but will hang on and mush, and be controllable at all times. This characteristic is particularly important when using flaperons where, in an ordinary model, the stall may be violent.

The model, of course, can be built without the split flaps and with standard ailerons or flaperons and still be an excellent flier. Dependence on aileron control will predominate at high speeds, while near stall (with flaperons and/or flaps down) the rudder must be used more. C.A.R. provides excellent controllability throughout the whole flight regime.

Bill Winter's design notes:

At any climb angle where the plane is still "flying on the wing" (enhanced here by the leverage of the big stab) good lift with a good L/D is a most desirable factor. At climb angles between say 60 degrees and the vertical, the weight of the plane is hanging on the prop critically until at zero airspeed the prop is supporting 100% of gross. A top of the line .60 can have more thrust in ounces than the gross weight --- you know what that means.

Cloud Niner depends on a different range of props than you may be used to for Sunday flying. The .40 Mk I did well on its (original!) Top Flite 11 x 5 wood. The .65 MK II does best with a 12 x 6 Master Airscrew. Lower pitches and larger diameters result in larger disc areas which decrease the loading on the prop as we near brute thrust versus weight in strenuous vertical maneuvering. The props specified provide it with a good bite for those tight box shenanegans. (Note: The .65 Sportster is timed to run well on larger propellers. More on those propellers in the flying segment.)

New type wingtips had a favorable effect on stalling, improved roll rate, and aileron response because of less area at the tips and new aileron design. Similar tips were proved in full scale by people like Ballanca, Wittman with his West Wind et al., the General Aristocrat, etc.

On Cloud Niner, the airfoil at the tip root varies to the extreme tip by progressively more streamlined sections, or nearer to true symmetric sections. This variation in bottom camber allows bringing up the rear of the tip ribs at greater washout angles to meet the tip T. E.: The top surface holds the same contour of the main wing. These tips cannot normally be stalled. The plane will fly on the tips, especially with the flaperons down, which adds enormous washout.

Why cabin and not low wing? It is generally agreed that a high wing is easier to fly and more stable at rigging and dihedral angles (equivalent) of a comparable low wing. It is possible to blend more easily a high order of stability with an element of neutral stability, a bit of "stay where it is pointed" without getting into handling trouble. Thus, it is highly stable spirally with 2 degrees dihedral.

The cabin also distributes side area favorable for good turn traits and spiral stability --- automatic turns are often possible at various points of speed and degrees of bank and turning radii in various configurations. And, with flaps down, this lateral area is best distributed if the nose profile is kept high, and the aft end low. This is why so many sport models have straight, flat bottomed fuselages. Such layouts tend to have a rolling axis that holds the nose up in a turn.

Adverse yaw (tendency of the nose to swing away from the direction of turn when using aileron only) is eliminated by providing adequate vertical tail area. Insufficient vertical area would enable the nose to swing toward the down aileron side of the aircraft. Differential aileron travel (more up travel than down) can help but has drawbacks. For example, the Ercoupe utilized a 2½ to 1 ratio of up to down aileron travel to neutralize down aileron drag. Cloud Niner has slight aileron differential through mechanical means, the aileron bottom horn being a bit aft of its hinge line.

This fixed set-up was carried through from Mk-I to Mk-II before it was realized that a bit of critical aileron power is lost for going accurate consecutive rolls. This is also true when transmitter available aileron differential is used. Also, when these big flaperons are used in the down position, with more down aileron still needed, large yaw forces result. When the nose is held high, with flaperons down and ailerons in use, control response is normalized by using C.A.R. With C.A.R. the rudder compensates for diminished aileron effectiveness with flaperons down.

The Cloud Niner has beautiful turn traits. If the natural turn characteristics of a model are not good, the model is deficient. It is normal to use a bit of elevator to tighten the turn, but if you have to decrease or remove the amount of up held, and to use aileron to force down the outer wing, and then to have to use up elevator again to recover from a developing dive --- either in turning or in straight flight --- you are forced out of your game.

Many model pilots dislike having to turn right, especially in right-hand landing patterns into small fields like ours. The plane seems to get its nose down, picks up speed, and reuires much more fussing when an approach gets out of the groove. Many reasons are given for this "phenomena". My belief --- realizing that these problems occur under power, not power off --- is that gyroscopic precession may be the chief culprit. In left-handed power turns gyroscopic precession is an upward force, whereas in a right-handed turn, precession is a downward or diving force. Cloud Niner turns beautifully to both sides. Climb rate is slightly better in left-hand turns.

Roll characteristics of a high wing cabin model with dihedral could not be expected to duplicate those of a low wing pattern model which is arranged compactly around its rolling axis. With its good lateral stability characteristics, and good power from the .65 to pull it through, consecutive axial rolls can easily be performed by Cloud Niner. Rates of near 2 seconds per roll are possible with Cloud Niner, depending on throws.

The nose-up entry should be barely visible; the stick movement being no more than 1/8" (stick length on the 7SP extended to maximum). The blip of down as the ship comes to inverted is miniscule, as is the blip of up as the plane continues on through the next upright position. The small blips of up between rolls reproduce the roll entry used on the first roll of the series. C.A.R. has proven quite beneficial for up to five quality consecutive rolls, the percentage of rudder deflection to aileron being in the 50 degree to 75 degree range.

For best responses, the engine must tach a minimum of 11,500 rpm swinging a 12 x 6 Master Airscrew. When tached to that number the plane will hold a 45 degree climb (or better) from take-off with no wind. The figures given were measured at near sea level, at 75 degrees, and "comfortable" humidity. If your environmental or altitude conditions create problems in duplicating these specs, you may have to match plugs and fuels, and perhaps compensate with prop selection.

C.A.R.'s roll-boost effect is not helpful in things like wing-overs, or rolls. C.A.R. properly used is an on and off thing. C.A.R. is highly beneficial when flaperons and/or flaps are down; the effect of C.A.R. now helps to maintain crisp turns and accurate headings especially at low speeds. With full flaperons only, Cloud Niner is still smoothly controllable through turns when slow-flighting on throttle set to just maintain altitude, where this airplane remains on the step, level as a platform. It is a sure show stopper, and you will love what C.A.R. can do then. With, say, from 25% to 50% power and flaperons down, you can begin a turn at any range from low to moderate bank angles and set the transmitter on the ground. Both test ships continue to do 360s at altitude until you terminate the sequence. Also, you can set an aileron or rudder trim and hold circling flight when riding lift — one of my favorite pastimes.

All I can add is that it works. Bill Winter's Cloud Niner design has a good, solid "feel". although it is Bill's philosophy to perfect stability and handling characteristics, and to fly in the best L/D (lift to drag) performance area, it is another philosophy to push this performance to its limits, Find out where these limits are in the second part of this article, and how to build the Cloud Niner. ☐

PART II

The basic Krackerjac design began with discussions with Hal deBolt back in the early 1950s. These discussions led to two basically similar designs, the deBolt Live Wire series and Winter's Krackerjac. Both have high nose and low rear fuselage side areas to improve inherent turn characteristics. Both designs were kitted in various forms over the years. From the beginning, Bill Winter departed from the typical flat bottom airfoil for better penetration and inverted characteristics. Hal deBolt went full symmetrical in his Over and Under, the first kit capable of 360 degree steering when inverted. The basic Krackerjac has been improved over the years to simplify construction and tweak performance. This latest Krackerjac iteration, the Cloud Niner, adds new dimensions to sport flight with large ailerons which can be drooped (flaperons) for higher lift, and also split flaps for short field take-off and landing capability. Two contemporary products are featured with the design in this article, the economical K&B Sportster .65 for power, and a modern Airtronics expanded capability transmitter.

CONSTRUCTION

Built-up balsa construction is used to produce a nice, light take-off weight of 7½ lbs. fully equipped. Another pound or two from using other materials can significantly reduce performance and cause tail heaviness, correctible only with nose ballast and still more weight. With its generous wing area, however, the Cloud Niner will remain a good performer even if built heavier, within reasonable limits.

Three basic factors will have a large bearing on determining if you will meet the design weight: wood selection, glues used, and covering materials. First, select wood with care for both straight grain, and uniform density. Try not to compromise on wood selection for the sake of convenience. Order more wood than you need so you can make good selections. Second, use cyanoacrylate glues where possible rather than aliphatics, and use epoxies sparingly. Third, think hard about covering and finishing materials. Although some heat shrink covering materials tend to need some maintenance by tightening, they tend to be lighter than materials requiring doping or painting. Even wheel selection can add ounces. Ounces, like calories, can kill you.

To adhere templates, use a spray adhesive such as 3M contact cement. This material will peel off easily if not left to cure too long.

Fuselage:

The roomy flat bottom box fuselage could be built in many ways. The method described here allows considerable work to be done on the major components before assembling them.

Build the front of the fuselage square in each side view and in top view. Important engine offsets will be added later. Rough out the sheet parts of the fuselage sides, bottom, and top. Glue these parts together on wax paper over a flat workboard. Sand the surfaces of the sheet sides, particularly the joints, flat on both sides before assembly. Remembering that there are a left and a right fuselage side, lay out the side framework on the side sheets. Be sure that the bottom line of the fuselage sheeting is straight. Now align the bottom longeron accurately with this bottom edge and glue into place. Install the top longeron and wing saddle. The verticals can now be installed. Use firm wood for the longer verticals. Fill in with balsa sheet where noted. Go ahead and cut out the cabin holes and stabilizer slots using a good backing board to keep your cuts clean.

Cut the bottom sheet to shape, then the landing gear plywood. Grain of the bottom and the top sheets run lengthwise to improve structural integrity for rough landings. The bottom sheet should extend to the outside of the sides. Cut the cross members to accurate length and glue them on. The cross-grain doubler behind the landing gear block can be added next.

Cut out all formers, firewall (do not install yet), nose ring, landing gear plate, and the fairleads. Before fuselage assembly, the major parts can be coated on the inside with fuelproof (butyrate used on prototype) dope if desired. Assemble the sides to the bottom using a small triangle to keep the sides vertical. Install the main cabin former (3) to keep everything square. Install blind nuts in the landing gear mount plate and the firewall. Install the gear plate but not the firewall. Install the fuel tank suspension parts and R/C equipment mounts. Install sheaths for elevator and rudder. A third sheath can be installed to route the antenna wire. This makes for a very neat installation. Install the top nose parts and, then, using the angles indicated, sand the required offset and downthrust into the front of the fuselage. Now the firewall can be installed.

Empennage:

It will become very important to keep the wood members for the empennage very light. The main spar, however, must be rock hard for safety. Leading edges can be medium, and cross pieces medium. Build the empennage over a flat workboard. Sand assembled surfaces flat first, with a sanding block, then taper as required. Re-glue any open joints.

Wing:

To help eliminate warps, the wing assembly will be completed as much as possible while it is pinned down. Stack saw all ribs, if possible, for basic uniformity. Pin the bottom main spar directly over wax paper over the plan. Prop the rear spar up as shown, then pin it down. Block up the tip portion of the lower main spar and rear spar. Install all ribs except at the center section. Install the top spars, then the rear part of the leading edge including the tip. Use temporary spacer blocks if you wish. Glue on the remaining part of the leading edge. True the ribs with a long sanding block. Install the top leading edge sheet, trailing edge, cap strips, and all root and tip sheet except for the parts at the plywood main spar joiner. The wing panel can now be removed from the workbench. Install the bottom sheet and stop here.

You are now at the point where the wing has a little torsional flexibility left in it. Straighten any remaining twists, then install the spar webs. Installation of these members completes the structural "D" tube and makes the wing stiff. Install the remaining wing parts including the servo mounts. If the tip looks twisted, don't worry. Twist is automatically built into the wingtip to improve stall performance.

Build the other wing panel to the same point. Now I suggest that you sand the wing panels with a nice long sanding block. If you do all of the work possible on the unjoined panels they will be much easier to deal with than the assembled wing.

To join the wing panels, tack-glue a 1" dihedral block to the main spar at the tip break. Pick out a good flat surface, tape center section part plan to it and cover it with wax paper. Set the wing panels in place over the plan. It is important for proper alignment to tack glue a support under the rear spar at the root. Slip the main and leading edge joiners into place and epoxy them. Now the remaining center section parts can be installed and the sheet sanded.

If you choose to install the split flaps, prepare for this by removing the bottom sheet in the proper area. Thin the bottom rear spar by 3/32". Cut the split flaps from 3/32 plywood. Drill a large hole in the center of each flap for lightening. Cut away for flap actuators made from aileron links which are soldered together at the center after final flap installation. Hinge the flaps with a pair of pinned hinges epoxied to the flap and wing. Remove covering material before epoxying hinges. Prepare flaps for 60 degree movement. Spray interior of flap area with fuelproofer at final assembly.

Nose and Engine Assembly:

The new K&B Sportster 65 engine has a feature which helps greatly in finishing the nose of the model: the cylinder can be removed from the engine by simply removing the four head screws. Then you can remove the cylinder and the piston. Also remove the carburetor assembly. Now turn the crank to bottom center and do not move it again. Stuff a protective rag into the top of the engine. Mount the partial engine assembly to the motor mount, then to the firewall. Provide the proper clearance required for your particular spinner and mount a temporary spinner ring to the engine shaft. Now build the entire nose cowl to the engine, firewall, and nose ring. Shape the cowl, then cut it to clear the upper engine parts. Part the cowl at the firewall. You can now finish and shape the inside of the cowl.

Mounting the Cowl:

Cut four hardwood screw blocks to length and pin them inside the cowl. Carefully run a light bead of CA glue on the blocks, then position the cowl to the firewall. Remove the pins then remove the cowl. Presuming the blocks have adhered to the firewall, they can now be firmly glued in place. Drill for and install toothpick reinforcers through the blocks into the firewall. Drill for mounting screws and install. Finish final exterior shaping of the cowl.

Final Assembly:

Install the landing gear. Fit the horizontal stabilizer to the fuselage, being careful to align it to the horizontal and level with the wing. Cut out for the fin. Mount the wing temporarily to check square. To fit the wing accurately to the fuselage, apply masking tape to the wing bottom, then lipstick to the tape. Mount the wing then remove it. Remove material from the wing saddle where you see lipstick and repeat the process. This procedure is called "letting in" and is used by master gunsmiths to fit gun barrels accurately to stocks.

Finishing:

Sand the entire model with a sanding block, then sand by hand with fine paper being careful not to cause indentations with fingertip pressure. After prolonged deliberation on which material to cover the prototype with, it was decided to use Coverite Permagloss. The following procedures insure first-rate results with your Permagloss.

After shaping and fine sanding the model, it can be considered almost ready to cover. The remaining step is to apply Coverite's "Balasrite" to all surfaces being covered. Balsarite is a material with unbelievable fill capabilities. The covering material really sticks to it with application of heat. One coat will generally do it. Use two coats where oil will be a problem. Fine sand the Balsarite before covering. The secret to working with Permagloss is to start a panel by tacking it in the center and working outward, pulling it tightly in all directions as you go. Try to keep overlaps to less than one inch. Work overlaps toward the seams to minimize bubbling. Use a dark and contrasting color on the bottom of the wing as a minimum for trim. Black Baron clear gloss polyurethane was sprayed over the final covered prototype for an attractive finish.

The model should now be ready for R/C systems installation.

Radio Information:

To take full advantage of the Cloud Niner's flight capacities, you will need a "super" radio with at least 7 channels and the ability to mix various channels together. The radio used in our aircraft is the Airtronics Module SP7 system. However, you can use any radio that will provide the mixing and functions required. In our aircraft we used two servos for aileron/flaperons, and one servo for each of the following: rudder, elevator, throttle, and flaps.

K&B Sportster .65 Engine Preparation

Our experience with the K&B Sportster .65 has shown that the engine develops excellent power on the low end of the rpm range. Most designers will select a propeller for an engine/fuel combination which will make the engine run at its peak power output rpm. A factor that is not included in the above typical selection process is propeller efficiency, which is generally better at lower rpms. This thought process, along with experiences of our friends on faster models, led us to try a 14 x 6 Master Airscrew on the Cloud Niner. While the engine only turns up 9,300 on 10% fuel, low velocity thrust seems to be increased considerably. The model gets off the ground even quicker, and will climb vertically much farther, so the 14 x 6 Master Airscrew is recommended for maximum performance; also, use the K&B plug for best high speed performance.

Flying Cloud Niner:

Taking off and landing the Cloud Niner reminds one of the movie "Air America" in which the Pilatus Porter takes off in unimaginably short distances and lands on a postage stamp field. In addition to the pleasure of just experiencing the low speed end of flight with this stall-stable, high lift model, however, are the fun-fly capabilities. A typical timed take-off and landing series goes like this: Take off with full up, turn as soon as you break ground, chop power mid-way on downwind, turn in to land, land on wheels (possible because of good prop clearance) and go again. On the ground, another set-up and you now have flaps that go **up** on command for inverted flight or inverted loops, which count twice the score at Northern Virginia R/C fun-fly events. Don't try this unless you have plenty of altitude. Cloud Niner is a very good, stable platform for the Limbo. All of this and it looks realistic.

There is another way to fly Cloud Niner — Bill Winter's way. Most every weekend we typical RC'ers go out to the field and fly. We fly in an element called air which is full of currents that move in all directions, including upward. To 99% of us these currents are distractions from our intended flight path. To the 1% who care what is going on, like Winter and glider pilots, these currents are there to be explored and used. All of Winter's designs are capable of "soaring" (as are other lightly wing loaded models such as Goldberg's Eagle). The concept is this: Put on half flaps to increase lift and to align the fuselage with the wind at low speeds. Set the throttle to just above idle, enough to fly the Cloud Niner at best lift to drag ratio (comfortably over stall), and maintain altitude in calm air. Now go look for lift. Winter flies in large, loose circles, trims the model to perfection, then lets it find the lift itself. Bill says that the properly trimmed model will turn into lift by itself, but I think Bill clues on additional fine points and techniques, he has been doing it since the mid-50s.

Try it. Sometime you will find a boomer and may even be able to rise to a cloud base. This is a real thrill. Cloud Niner is not a specialized sailplane, but by soaring you can extend a flight to a very long time. You are exploring and using the air. There is an art to thermaling just as there is an art to sailing on the sea. Thermaling effectively is a high form of art, one that takes developed skill and experience to do. The Cloud Niner may be the model to soar with the real thermal experts, the Eagles and the Hawks.

Bill says that the Cloud Niner is just a model with a big wing, an extended low speed range, and it has good aerobatic capabilities. I say that Cloud Niner is a completely honest flier that does things other models cannot do. It does them for me, and it can do them for you.

Cloud Niner
Flight Test Procedures:

The following test procedure was used for the prototype. We wanted to test the model thoroughly in all aspects so there would be no surprises either to us or to you. If you are inexperienced, it would be best for someone experienced to take the model up for the first time and trim it. Then you should follow the procedure outlined here to get used to this model in a controlled fashion rather than succumb to pressures at the field to "just fly it" and miss some capabilities.

Airframe preparation: Check C.G. empty; check throws; check control directions; check range.

First flight test: Flaps off; taxi tests, adequate steering both ways, trimmed; take-off, gentle climb to altitude, cruise throttle, trim out.

Control responses: Elevator, rudder, aileron, throttle; initial ground-to-air photo runs; landing.

Adjust trims (zero out all biases).

Flap tests: Take off, climb to altitude, cruise throttle. Flaperon vs. trim (no trim effect on prototype); low speed control; turning radius. Split flap vs. trim (large effect on prototype); low speed control; turning radius. Flaperon and split flap vs. trim (large effect on prototype); low speed control; turning radius; flaperon landing; split flap landing; flaperon and split flap landing.

Air tests: Flaps off — turn rate (see loop rate); loop rate (3.0 sec. loop rate); roll rate (2.1 sec. roll rate, better with C.A.R.); inverted flight (do not use flaperons or split flaps); V max (calculated at 88 mph); V min (calculated at 21 mph); climb angle (approximately 45 degrees); descent angle (very shallow). Flaperons on — turn rate (see loop rate); loop rate (2.9 sec. per loop); roll rate (better track with flaps off); V min (calculated at 18 mph); climb angle (improved); descent angle (shorter landing). Flaperons and Flaps — V min (calculated at 15 mph, but seems much slower); climb angle (too slow); descent angle (30 degrees, best for short landing).

Take-off tests (no wind, 85° to 87°, high humidity) — distance flaps off (21 feet); distance flaperons on (19 feet); distance flaperons and split flaps 14 feet). (These tests were done on a grass field.)

Expanded Flight
In an Unusual Regime:

After having become used to the flight characteristics of your Cloud Niner, a new area of flight can be explored — the area between maximum L/D and stall. It takes a very special model to fly in this area, and Cloud Niner can do it well.

With all flaps hanging out you do not have to fear the stall with Cloud Niner. The built-in wing twist (washout) and the additional effected twist from flap deployment combine to produce such good stall characteristics that there is little or no potential for wingtip stall or sudden drop (stall can be forced by accelerating into it, but the loss of altitude is negligible and the addition of power breaks it immediately).

The best L/D (lift to drag) ratio of an airplane is usually some velocity which provides a margin above stall. It is this velocity at which an airplane will glide most efficiently and glide the farthest. It is true, therefore, that if the velocity of an airplane is higher than that for the best L/D, it will glide less efficiently and at a steeper descent angle. This fact leads to landing techniques for typical high drag trainer or intermediate R/C models consisting of flying to a point over the field, regardless of airspeed, rotating, then letting speed bleed off to stall and land.

Although the Cloud Niner is a high wing cabin model and looks similar to many trainers, it is not a high drag model, and the above landing technique will not work unless you have a very long runway. This was the reason for using the split flaps; to increase drag and provide for a steeper glide angle and landing approach.

If an airplane is flown below its best L/D velocity, the glide angle is also steepened. The closer to minimum the flight is, the steeper the glide angle will be. Flight in this area can be related to "controlled descent" approaches used in private aviation for landing a seaplane on glassy water, or a landplane at night; it also equates to carrier type landings.

In full scale airplanes the pilot has reference to indicated airspeed. If a constant airspeed is held, then rate of descent can be controlled with power; more power to flatten the descent, and less power to steepen it. Since there is no airspeed reference in today's R/C models, the only reference we have is attitude or angle of attack. If we hold a constant angle of attack, one which is below maxium L/D yet still above stall, very steep descents are possible and very slow landing speeds will result, with proportionally short rollout.

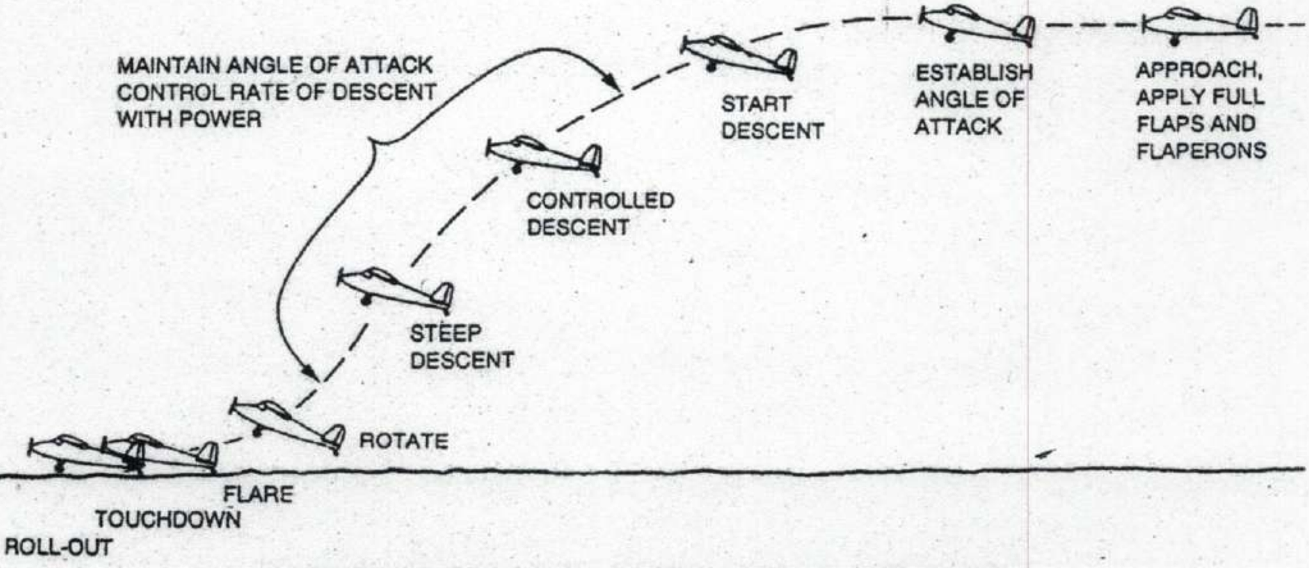
This is the area of flight which is fun to fly in with Cloud Niner. Experiment first at altitude. Fly into the wind, reduce power to idle. Maintain altitude and let airspeed bleed off. Hold a positive angle of attack. The model will slow to near stall, then begin to descend. Experiment with the angle of attack. Note that the more the nose is held up, the steeper the model will descend. The more shallow the angle of attack, the longer the glide. This seems opposite to what we normally experience, up elevator for going up, and down elevator for going down (acknowledging that it is power in the long term that determines whether we climb or descend). When you have established an angle of attack that produces a good and steep descent angle, experiment with adjusting power. Any time power is added, the rate of descent is reduced. This is how you will land when you bring this technique into the landing pattern. Set the angle of attack, then use power to adjust descent angle and to flare for landing. It may seem to be another contradiction to add power to flare to land, but it works. Actually, the model is not really "hanging on the prop" or that near a stall. You will probably have enough elevator and lift to flare with the elevator alone. Or, if you choose, forget the flare and just let it fly in. The model will be flying at such a low forward velocity that the landing will be just fine. It just looks better to flare, and it can be done.

You will have to pay close attention to angle of attack when approaching landing like this, power adjustments may cause some small pitch changes that will have to be compensated for. Using this controlled descent technique, the model will land unbelievable slow. We recommend that you do not try this technique for the first time on a gusty day or with any other typical model. Other models do not fly like the Cloud Niner. Build one and see. □

CLOUD NINER MK II

Designed By:
William J. Winter
TYPE AIRCRAFT
Sport
WINGSPAN
71 Inches
WING CHORD
13 Inches
TOTAL WING AREA
900 Sq. In.
WING LOCATION
High Wing
AIRFOIL
Partial Flat Bottom
WING PLANFORM
Constant Chord w/Tapered Tips
DIHEDRAL EACH TIP
1 Inch (at break)
OVERALL FUSELAGE LENGTH
49¼ Inches
RADIO COMPARTMENT SIZE
(L) 7⅜" x (W) 3-5/16" x (H) 3½"
STABILIZER SPAN
28 Inches
STABILIZER CHORD (incl. elev.)
7⅞ Inches
STABILIZER AREA
212 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Center of Fuselage
VERTICAL FIN HEIGHT
10 Inches
VERTICAL FIN WIDTH (incl. rud.)
7½ Inches (Avg.)
REC. ENGINE RANGE
.60-.65 (K&B Sporster .65)
FUEL TANK SIZE
10 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
6
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
Flaperon, Split Flap
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa & Spruce
Wt. Ready To Fly	120 Ozs. (7 Lbs. 8 Ozs.)
Wing Loading	19.2 Oz./Sq. Ft.



CONTROLLED DESCENT LANDING (WITH CLOUD NINER)