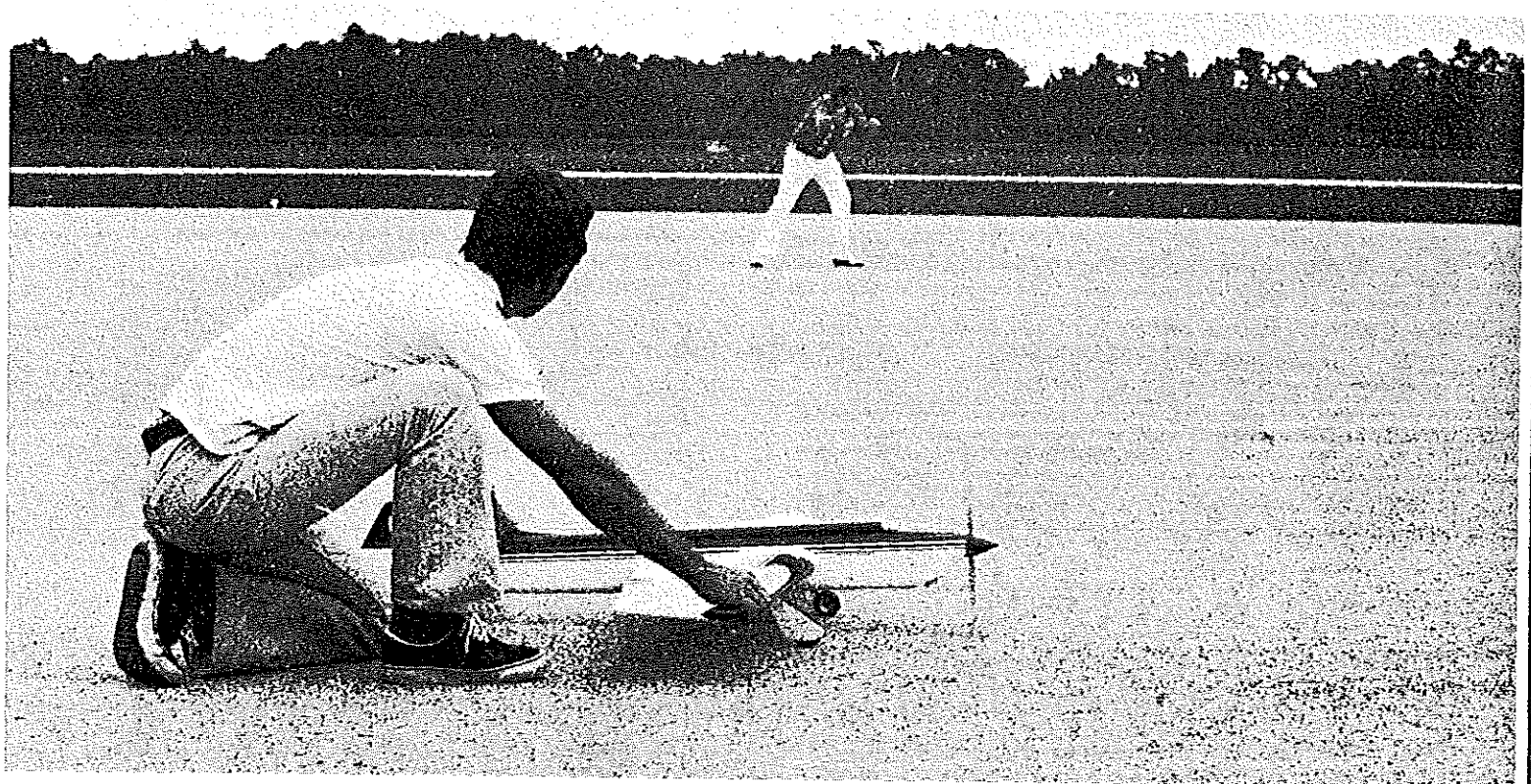
#193

Winner of the World Championships at Utrecht, Netherlands, Les discusses his approach to design, flying, and a host of other important factors.

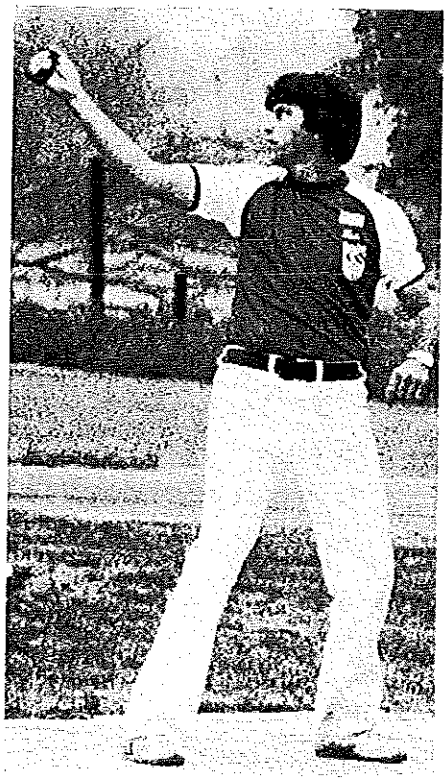
MC DONALD'S



Introduction by Kent Rogers
Interview by Wynn Paul and Vince Schnetzer

SINCE LES McDONALD designed the first Stiletto in 1970, it has become one of the most popular competition stunters in recent years. Where once the most heard question at a contest was "Hey buddy, is that a Nobler?" now you hear "Is that a Stiletto?" about as often.

The Stiletto came at a time when stunt was being flown with slightly-bulky jet types on tricycle gear or as semi-scale World War II fighters. Of course, there were Noblers and Ares flying also, but almost none of the 70's airplanes are still around except the Stiletto. Its sleek, sanitary appearance set it apart and may be the reason for the plane's popularity. It has been campaigned by others such as Remel Cooper, Dennis Duval, Kenny Stevens and Randy Smith.



Vince Schnetzer launches the Stilleto for Les at the Tropic Aeros Annual Airshow for Muscular Dystrophy. Note how slim the fuselage appears, thanks to treatment of color scheme.

The first Stiletto and the ones that followed through 1974 were 35 size and all were powered by the popular O.S. Max. Quite often stunt fliers will save a new plane for a major meet to get a competitive edge. The big Southeasterns at Winston-Salem, N.C., saw both Les and New Yorker Gene Schaffer bring out new planes. Les had the new Stiletto 700 powered by an S.T. .46 with a foam wing and molded balsa stab. The contest weather was a bit unsettled and Les had to fly one round in gusty condition while his second round was in steady wind. Both his flights were filmed and it is almost impossible to tell what the wind conditions were. The big Stiletto upset Schaffer for the win. As a matter of fact, of four Stilettos flown at the Southeasterns, three won trophies.

The second appearance of the new Stiletto 700 was at the 1975 Lake Charles Nats. Les placed second to the old master, Bob Gieseke, by one point. Not bad considering Gieseke was the reigning world champ at that time.

Nineteen seventy-five was also the year for selection of the FAI team. The site was Dayton, Ohio, and the weather was horrible. The big powerful Stiletto flew four smooth, accurate patterns and just missed third place, but did have the most consistently high scores in all four rounds.

In the following weeks Les returned home and started building two new models —a lighter, sleeker version of the 700 and a somewhat smaller 660 sq. in. airplane.

The remainder is history. With the decision of Bob Gieseke to compete as a defending champ, Les would be allotted the number three team spot. On July 11, 1976, after three days of hard-fought competi-

STILETTO 660

tion, Les McDonald, flying his Stiletto 660, was crowned Control Line Aerobatics World Champion.

Two stunt fliers that have spent considerable time talking with Les are Wynn Paul and Vince Schnetzer. Wynn certainly needs no introduction as anyone even remotely interested in precision aerobatics knows he's a top flier and the moving force behind PAMPA. Vince, on the other hand, is just getting started in competition aerobatics and has just completed the first Stiletto 660 from *Model Aviation* plans.

Recently both Wynn and Vince discussed many items of interest with Les and the following interview evolved. It answers some questions never before published and contains some good information for the fledgling contest flier.

When competition is evenly matched appearance becomes vital, Les thinks. One must create his own advantages; important elements are configuration and markings as in the text.

Wynn: *Up until the 1975 season, your Stilettos were for .35 engines. What prompted the switch to the larger airplane and what were the big factors in design?*

Les: I think I made the decision to give the .46 model a try during the second finals round at the 74 Nats. I can still remember watching my little 10-in. prop spinning its brain out trying to crawl across the top portion of the square eight in dead calm. Driving back to Miami, I reasoned a larger motor will turn a larger prop; a bigger prop pushes more air; pushing more air makes the airplane go forward better and constantly going forward is kinda neat in the square eight. Working with this logic, I started thinking about enlarging my current design about 15% and installing a .46. It didn't take long to realize this wasn't such a hot idea and the new model would have to start from scratch.

On paper I really lose my head sometimes and the next several weeks were spent drawing the neatest looking thing you ever saw—two Veco 19's in a ship that made an F-16 look like a boxcar. Anyway, I chickened out and began sketching something a little more conventional. While actually designing what eventually became the Stiletto 700, my main concern contered around the mandatory use of .018 lines and roll or yaw the larger diameter prop might create. Most people flying .46 models the season before were using over 750 sq. in. wings and I was certain I could get away with less if I could keep the weight down. As it turned out I ended up using a Control Specialties foam job with a wide chord for pitch stability and 700 sq. in. to carry the heavy lines. To dampen possible yaw problems, I built the fuselage relatively deep with a moderate size fin. I never did have any problems with yaw on that airplane but roll had me in total grief. That thing was super critical on tip weight and it wouldn't even consider flying with anything longer than an 11-in. prop. I struggled all spring and finally reached a compromise.... I felt confident with the big Stiletto but I knew I could build something better.

Wynn: *What was the reason for going to a smaller plane still in the .46 size?*

Les: I wanted a smaller plane that looked big. By using a high aspect ratio wing and stab, long fuselage with trim paint the full length, I think I achieved what I was looking for. Actually, the 660 isn't that small—from tip to tail it's almost 47 inches long. I still feel the larger airplanes look more impressive in the air and talk going around about small airplanes flying more accurately is pooh poohed. In fact, I fly on shorter lines than a lot of guys do with their .35 models.

I had hoped a slightly smaller wing would cut through the bad air European flying sites are notorious for. Werwage and I talked many times about recent championships, in Belgium flying in an ampitheater on a hilltop, in Finland flying in downtown Helsinki and, even though I had seen photos of the Utrecht circles, I was certain there would be some trees, flags or something to disturb the air. As it turned out, the air did get bumpy at times but never unmanageable.

Wynn: *What airfoil do you use?*

Les: I've always used a constant 18% airfoil with 2 inches of leading-edge sweep on the Stilettos regardless of aspect ratio and area. I work in a hobby shop, not for

NASA, so I just fiddle around sketching until it looks like it will work. If it does, I'll stick with it.

On the 660 I changed to an 18% root, 20% tip for two reasons. First, I wanted to carry more tip weight with less wing for added line tension and, second, I hoped to gain some small boost in lift without enlarging the flaps at the tip.

Wynn: *Why do you favor the type control hookup you use?*

Les: Get ready for a surprise, then look at the plans. It only took me 20 gallons of fuel to figure out the ⅔-to-1 setup isn't the trick way to go on a high aspect ratio wing. I can really get into this control thing, so let me explain why. Seven of 10 Stilettos I've built in the past six years have used the ⅔-to-1 control hookup—the first was my 1973 version published in the June '74 issue of *Model Airplane News*. Until the '73 model, I had been flying O.S. 35 powered jobs in the 44-48 oz., 600 sq. in. range and using the standard Nobler pushrod/control-horn hookup.

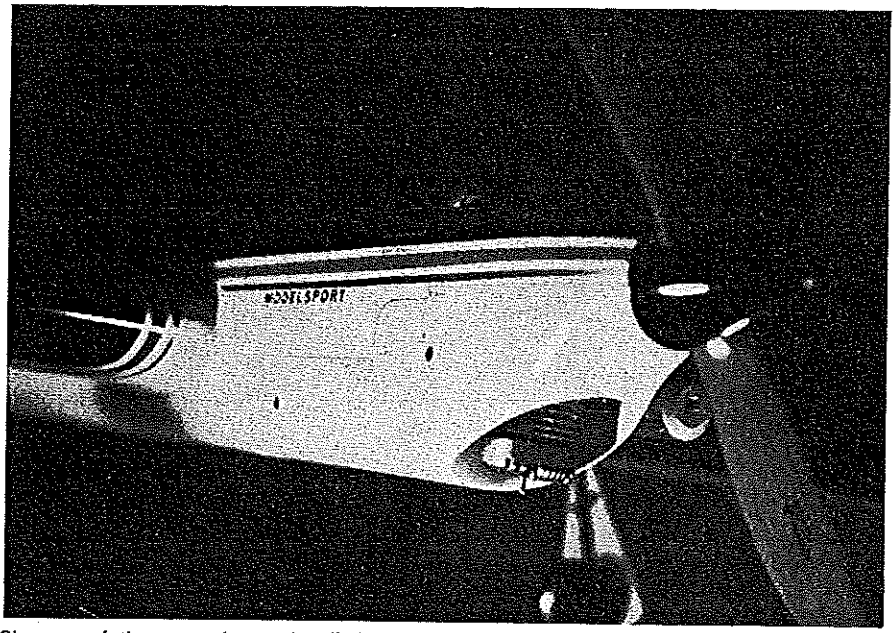
They all flew reasonably well except, in a square corner at 45 degrees, the models seemed to pivot on a point about halfway between the hinge line. I could learn to live with the funny corner but it had a bad side effect, a loss of speed which was intolerable. I had always been impressed by Werwage's USA 1's ability to fly smoothly at a constant speed and in Trinidad in 1972 Bill explained to me his theory behind the ⅔-to-1 controls. After trying it on my '73 ship, I became aware of what he meant when he called it "power steering." Bill had stressed the importance of lightweight for the full benefit and two advantages were apparent. My new model would now pivot on a point closer to the CG and by moving the flaps less, a lot of drag was eliminated. I finally had my constant speed through all the maneuvers.

In many years of flying stunt models I've learned one thing for sure: You must compromise and the ⅔-to-1 system is no exception. It just doesn't work well on the 660. The culprit is the long skinny wing. Any minute correction in the controls caused the ship to change direction, kinda like driving your Chevy backwards at 60 mph. I've tried everything—nose weight, thin elevators, closer line spacing at the handle—but I'm not going to be satisfied until I cut into the aft fuselage and slow down the elevator movement. Anyway, the plans show the corrected system I'm using on my '77 airplane. It takes a harder twist of the wrist but it goes where you point it and drag from the added flap deflection is easily overcome by a good .46.

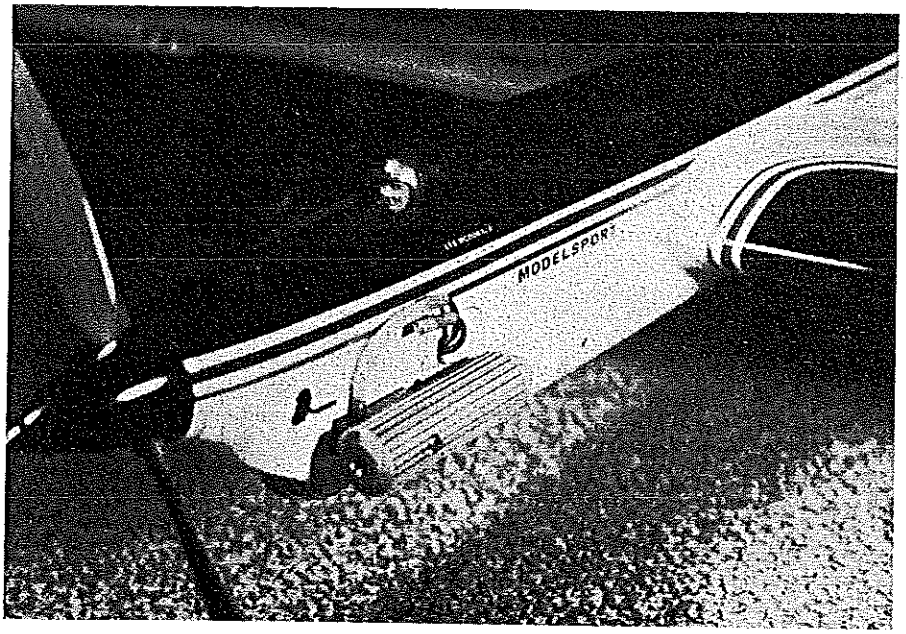
Wynn: *Is the airplane's appearance really that important?*

Les: No other toy airplane event lets the builder/flier express himself more than precision aerobatics. At any contest attended by fliers of equal ability, you must create your own advantages, and a good looking ship certainly helps. Quite possibly, had Werwage flown his big USA 1

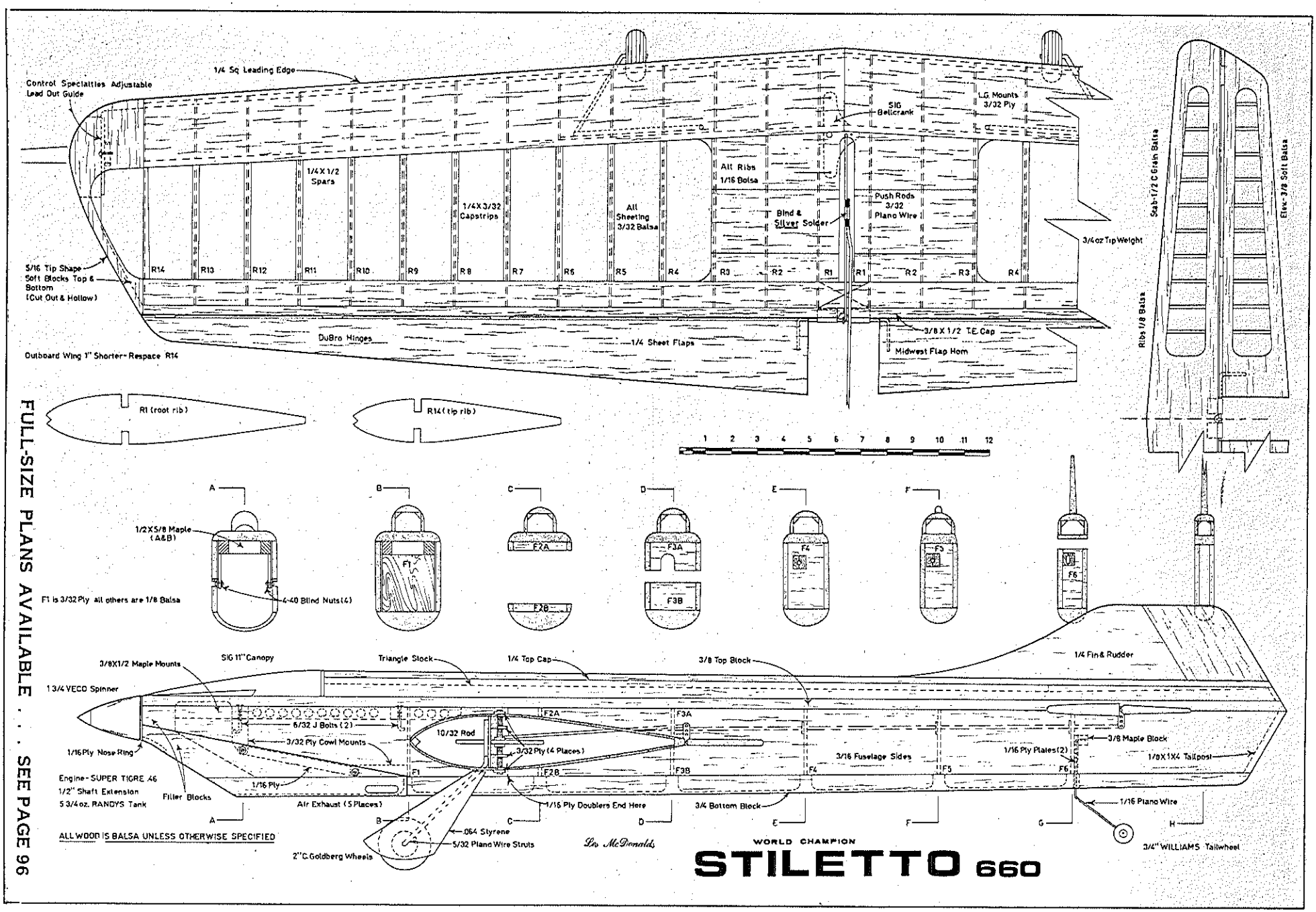
Les McDonald, the Stilleto 660 and the world champion awards. From left to right: The Steve Wooley Cup, the FAI Gold Medal and the UHU World Cup. The .46-powered ship weighs 54 ounces.



Close-up of the nose shows the distinctive treatment of the Supertigre .46 installation. The separation lines of the engine compartment hatch no more conspicuous than decorative lines.



The Adamisin muffler is modified for cooler operation—hence tapered hole in front. Held in place by single 4-40 screw. Also shown is the manifold pressure hook-up to the fuel tank.



FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 96

Neat lettering is always impressive. But take cheer; you can do as well with this dry transfer lettering. Flying his '77 model, Les already is concentrating on the FAI team selection.

in Holland, he would, once again, be the current world champion. In Switzerland, the week following the WC, we talked at great length about how a model should look for the Internats. For several days a lot of the conversation was incoherent because, after months of hard work, we decided some fun and rest were in order. Anyway, if I remember correctly, we both agreed the 660 fit the bill, so let me point out some features.

The fuselage is long and appears very slender, although it really isn't because of the dark blue top section. This gives me lateral area without looking bulky. The red and gold trim follows the thrust line to enhance the square stuff, but notice they end at the stab. By doing this, the model's pivot point is just about centered on the trim and will give the illusion of a tighter corner. If you don't believe me, hold a straight object between your fingers at the center and rotate it 90 degrees, then move your fingers forward a small amount and repeat the 90 degree move. See what I mean?

The forward placed canopy and "Jaws" cowl give the profile a directional jet-age look. Looking at the top view, the wing, stab and trim follow the same angles, plus the wing and stab tips match to give the overall view symmetry. Line length, engine sound and personal appearance also contribute to the overall effect.

Vince: *Are there any special items about the construction of the Stiletto 660?*

Les: Anyone that has built a full-bodied, flapped stunt ship from a kit or plans should be able to handle the job. In fact, it's one of the few stunters published recently that doesn't require any specialized techniques or equipment. Everything used can be obtained from the smallest of hobby shops with the possible exception of the fuel tank. An easy solution, if you can't obtain a big tank, is to splice together two smaller ones.

Of course, weight must be kept to a minimum but don't lose your head, because strength has a place somewhere on the priority list also. My 660 weighs 54 ounces and seems happy there but I'm sure it could be built under 50 ounces by going easy on the paint.

A fillet of Sig Epoxylite around the wing leading edge on the inside of the fuselage will prevent those agonizing little stress cracks, and be sure the tank compartment is sealed with epoxy. For some added strength, I cover the nose and cowl with lightweight silk, and don't forget the area over the horn wires on the flaps and elevators; they can use a little silk also.

If you fly with a stooge, build in a good attach point. I use the tailwheel strut so I anchor the ply tailwheel mounts to the fuse sides with gauze saturated in Titebond.

The only place wood grain selection is ultra important is for the stab. Make sure it's good straight grain and very firm. The completed stab/elevator assembly with covering should weigh about 2¼ ounces.

Vince: *Why use a flat airfoil on the flaps?*

Les: Two reasons: first, it's very easy to sand in a twist when shaping the flaps and, second, the flat airfoil section is more sensitive around neutral which helps the model groove a little better. Think about it.

Vince: *What methods do you use when installing the controls?*

Les: After my '75 Nats accident, caused by a broken leadout, I started putting a little more thought into the loads generated by the larger airplane. At first, I figured steel chain would do the job for leadouts while some one inch water pipe could be used for pushrods. The added weight could be compensated for by using a .60 engine, 15-in. prop, rebuilt EZJust handle and a movable rudder. A two-tone green paint job seemed appropriate but, when I discussed all this with my wife, she threatened to move out so I turned my attention to more subtle improvements.

The Sig nylon bellcrank looks to be the strongest on today's market, held to the wing with 10/32 rod. I am now ready for any pull-test with "whataya mean again" scales. On the bellcrank end of my leadouts I use an .045 piano wire loop wrapped and soldered with low temperature silver solder to the Perfect brand cable. At the other end I simply loop the cable around an eyelet, wrap and solder. To avoid corrosion, use rosin flux and be very careful not to overheat the cable. Long life in the system is guaranteed by good horn bushings. I use 5/32 brass tube soldered into the horn and then slip a piece of ⅛ over the pushrod. Make sure there isn't any slop in the flaps and just a little in the elevators. To be sure the retaining washers never come off, cut a small groove all the way

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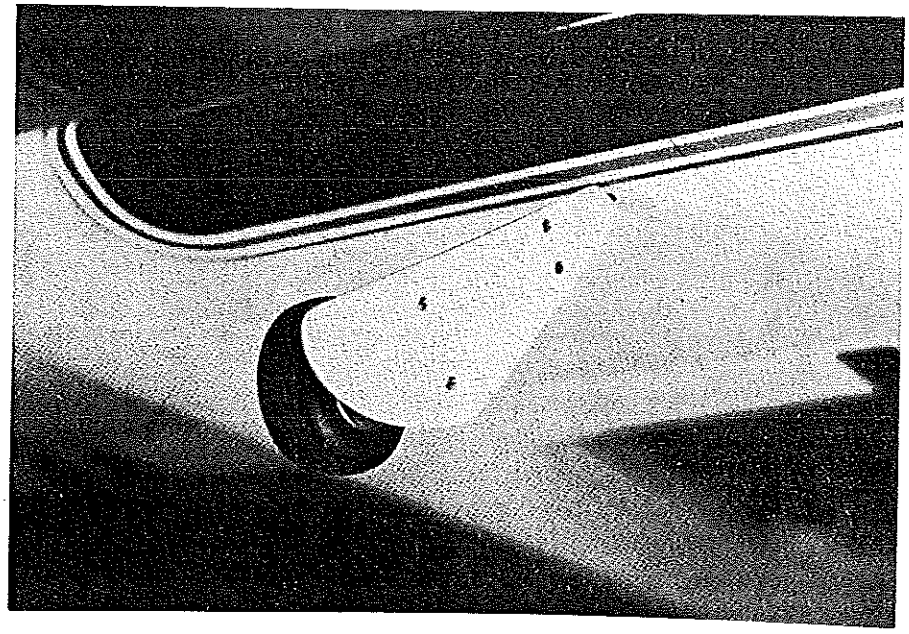

Distinctive landing gear strut covers are made from styrene, held in place by 2-56 screws.

RC Technique/Myers

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Knowing that the servo should be moving smoothly between limits that you have set on the internal potentiometers, any sticking, intermittent action, or unequal speeds in the two directions must be caused by defects within the servo. The device is also useful when building, for a "manual" position on the switch transfers control of the servo to a knob on the front panel. This allows you to examine your installations for interferences or binding while you are still at the workbench with the necessary tools to deal with the problem.

Finally, after servicing a servo, it is always a good idea to set it on automatic cycling for a few minutes to let any new problems appear. It's surprising the trash that can collect inside a freshly-repaired servo. Chief among the culprits are bits of steel that are attracted to the magnet in the servo-motor. The Ace Servo Cycle provides both positive and negative control pulses, and the instructions include an extensive list of the proper pulse for various manufacturers, so you should be able to service practically any servo on the market.

A modification that I found useful was the addition of a 5-terminal soldering lug, which makes the addition of pigtails for new servo types a simple matter. I used this scheme on the output side only, to avoid the "short circuit" problems that would be generated by a group of parallel-connected exposed-pin plugs on the battery-pack side.

For the folks building servo-reversers, use R = 100K, C = .1 MF. R_T is whatever it has to be to center the servo. Start with 1 Meg and work down.

George M. Myers, 70 Froehlich Farm Rd., Hicksville, NY 11801.

Stiletto/McDonald

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around the pushrod where the washer will be applied. Next, cut a small section from the washer and, with pliers, gently compress the washer into the groove and then solder.

The pushrod fairleads should be made from plywood and just loose enough so the pushrod can move freely. Allowed too much freedom in the fairlead, the pushrod will rattle. This isn't good because it's hard to look cool when the airplane sounds like it's falling apart.

Vince: *How do you set up your engines?*

Les: Building the engine is simple. Getting it to run exactly the way you want it to is another story. One of the best running engines I ever had was never even disassembled for cleaning so I build motors "maybe yes, maybe no" style.

After the engine is disassembled, I wet sand the inside of the case with 320 so the sleeve will slide easily into position. Drilling the spray bar hole, tapping for a muffler mount and other changes to the outside should be done at this point. I relocate the needle valve just ahead of the stock arrangement so it passes through the center of the venturi about ⅝ in. above the centerline. This allows the motor to run a bit faster inverted. I'll explain this later. For venturis, obtain a set from Bob Wilder, 2010 Boston Street, Irving, Texas 75061. One each of a .260, .270, .275 and .280 will be a good variety.

I drill out the mount holes and file the lugs so I can shift the engine around for offset, if I need it while I'm trimming. I have a really space age method for fitting the ring. Push it into the sleeve, square it up with the piston, remove the piston and start looking. If, when you hold it in front of a bright light, you can see any gaps between the ring and sleeve, rotate the ring a few degrees at a time and keep checking. If you can't detect any "light leaks" carefully box up the parts and send them to me because you've got a first class fit. Anyway, I just keep going through rings until I find one that fits well. Always bear in mind the sleeve might not be perfectly round so if different rings keep showing a gap in one position of the sleeve, try another sleeve. The end gap should be about .006, which isn't much considering a sheet of paper is usually about .003. After deciding which ring and sleeve I'm going to use, I carefully deburr the inside of the ring and piston land with an Xacto knife.

The new Supertigres use a full circle crank with an aluminum stuffing band that has been known to fly off when the engine is grossly overheated. The only actual case of this I know of was a Sunday RC incident which I refuse to discuss further. The engine seems to run the same with it or without it so you decide. I remove the thing because of Murphy's Law. The only part I substitute is the front bearing. I replace it with a Consolidated EL-7-ZZ with the rear shield removed. Last year I had an engine that just wouldn't run long enough. On a test stand I noticed what seemed to be quite a bit of fuel coming out from under the drive washer and, by simply installing a plastic shield in the bearing, I picked up 15 seconds running time.

Just to make sure everything is okay, I run my engine about 15 or 20 minutes on the bench. This also allows me to tighten the head and backplate screws while the motor is warm.

It should take about 20 flights to decide if the engine is worthwhile. When it's right, you'll know it.

Wynn: *What procedures do you follow when trimming a new airplane?*

Les: Trying to get a new model trimmed is a hassle. The degree of hassle depends on

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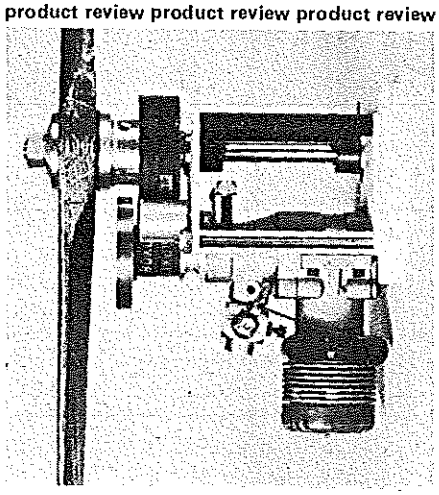

Prop Drive for Big Airplanes: Specifically designed to accept 60-size engines, Du-Bro prop drive will fit any engine with ¼ in. shaft and will easily power airplanes weighing as much as 30 lbs. This development is a definite breakthrough. RPM range is 600 to 6000 depending on engine and prop used—20-, 22-, and 24-in. wood props available from Grish Bros. Applications are myriad. For example, large scale models (there is a movement afoot aiming for a ¼-in. Scale event), or ultra-big old-timers and other models whose large cowls—as well as overall size and weight—made them all but impossible. The huge Bud Nosen scale kits (and similar) obviously will benefit greatly. Slow, powerful flight will prove especially realistic. By gearing down—a double belt drive is utilized—an effective boost in thrust is realized by the big propellers which, being sensibly related to the size of the craft, achieve truly effective performance levels. Price is $100.00, less engine and prop. **Du-Bro Products Inc., Wauconda, IL 60084.**

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how well the airplane is designed and built. A straight, light construction job will fly reasonably well right from the start. My WC Stiletto is hanging on the wall right now with the leadouts, tip weight and nose weight it had within its first 50 flights. Don't get me wrong, I've moved those leadouts and changed tip weight a million times trying to eliminate funny wiggles or to get more line tension. I honestly feel the basic set-up of the airframe can be done within several weeks and the real key to top performance is the engine-prop-tank combo.

One thing I've found that really helps, before trying to sort out a new ship, is flying a model that has already been trimmed and I'm familiar with. It helps shake out the cobwebs between my fingers after a building project.

I start out with a half ounce of tip weight, no nose weight, and with the leadouts in the center of the adjustment. During the first few flights I do only two things other than verify that the engine will run a full seven minutes reliably. Tweak the flaps, if needed, to get the wings parallel to the ground, and adjust the leadouts so the model is flying with the lines perpendicular to the fuselage. Next, I start checking the square corners and add some nose weight if it feels jumpy. By the time I start flying full patterns, I still haven't changed tip weight. I usually don't until I've tried several different props since their effect on roll is so great.

Up to this point, if I've done things right, the ship is flying pretty decent. It might roll a little here and there, or get a bit loose, but I'm getting through the pattern with some confidence. If the outboard wing isn't dropping on hard inside and outside corners, I start adding tip weight. If it is, I'll take some out. Tip weight is a necessary evil, at least on my designs, and can't be worked out during one flying session. As the weather changes, so does the effect of tip weight. I reach some sort of compromise over a period of time. From here on out, with the exception of a few minor tweaks and adjustments, I start working with the front end.

It seems as though I've built hundreds of fuel tanks—every kind you can think of—and I always end up with the basic uniflow/muffler pressure arrangements. All my tanks are one inch deep with the fuel pick up in the center. By putting the spray bar at ⅝ in. above the mounts the airplane will fly about one-tenth of a second faster per lap inverted. This really helps in the eights since it gives the model some momentum before entering the second inside loop, where they all seem to slow down.

If I have a really good motor, I can get through the entire pattern running at a constant four-cycle with lap times around 5.2 seconds on 62-ft. lines (measured from eyelet to eyelet).

Flying on the shortest lines you can get away with is certainly desirable. It requires less horsepower and gives the pattern that locked-in appearance. The vertical eights are a good indication for selecting line length; if the bottom loop seems hurried, or the ship drops below the five-foot level, your lines are probably too short.

A little research will show all the 1976 USA team members—with the exception of Werwage—were flying on reasonably short lines. Werwage was flying on proportionally long lines simply because he had a 40-oz. model powered by a chain-saw engine.

To get good constant speed in the maneuvers I experiment with props. The .46 is so versatile I've used everything from a narrow 11/6 to a paddle blade 13/6. I'm not a prop man but I do mess around with a few things. Sanding in more airfoil at the tips gives some added line tension but also adds a tendency to speed up in consecutive maneuvers. A slight ellipse in the tip planform lets the prop unload for a smoother square corner at the expense of some line tension, and rounding the leading edge gives vertical power but slows down the model in a tight turn. Of course, every prop will react differently to changes but, in my experience, this seems to be the pattern.

If there's some deep, dark secret to trimming, I sure haven't found it. Burning fuel in great quantities seems to be the only way to work it out.

Wynn: *Can you give the novice any tips on flying the pattern?*

Les: Shapes, intersections and bottoms are the three things a judge looks for. Consistently nailing the bottoms at five feet only comes from hours of practice and when you blow one everybody knows—the spectators, the judges, your mother and your boss. I know this from experience because I've heard the quiet "ugh" that comes from the crowd as I try to regain composure.

Shapes are probably the most important. The only way I know of to get them right is to draw imaginary lines using the ground as a base. It's very important to position your body just before starting a maneuver; any change in stance during a particular maneuver will usually be reflected in your lower score. I feel it's best to center the maneuver directly in front of you. If you're sideways, you will get a distorted view of what you're doing. This is especially important in the overhead eights, vertical eights and cloverleaf, since your stance is the only reference you can work from.

For intersections I use some reference point outside the circle. It could be anything that's stationary—a tree, the corner of a building, etc. I also use this same type of reference for the vertical segments in the square stuff. There are sections of the pattern you can help the airplane through by some subtle whipping.

Several years ago, I finally realized all stunt models slow down enough in certain maneuvers to get soft on the lines. The second square eight and the first loop of the cloverleaf are the most common trouble

spots. Giving the handle a slight pull straight back while the model flies across the top sections of the eight will help keep the nose up.

At the beginning of the cloverleaf a few steps straight back keeps the ship tight just as you start the first loop. Just remember to step forward as you exit or you're going to drill some poor judge right in his sunglasses. This would certainly show a lack of class.

A knowledgeable helper can be a real asset since it's so easy to practice "not just right" patterns. Remel Cooper and I usually get together early in the summer for several days of constructive criticism and I feel Cooper has the best eyes in the business.

Vince: *Now that you're World Champion, what are your plans for the future?*

Les: I've already started flying my '77 model and this summer I'll concentrate on the FAI team selection contest. I still haven't won the Nats, so I will keep shooting in this direction, but the Internats will continue at the top of my priorities.

One-third of my life has been devoted to obtaining what I now have, so I'm not about to rust, bust or sag in the middle.

RC Sport/Van Putte

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the runway.

It's also a good idea to get to the airplane as quickly as possible and to shut off the receiver if the engine couldn't be cut. Don't attempt to taxi back to the pit area.

If, by raising the transmitter and pointing the antenna straight up, you still can't regain control of the airplane or can only get momentary control, the engine control should be cut back to idle or shut off. The out-of-control situation may be caused by engine vibration, and reducing engine speed or cutting the engine off may permit reacquiring control of the airplane. Even if the airplane remains out of control, throttling back or shutting off the engine will slow the airplane down and make for a "softer" crash. If control is reacquired by throttling back, the airplane should be landed immediately using the procedures outlined earlier.

What about the engine that suddenly dies or goes sour? If there are trees around the flying site, the airplane should be headed directly toward an open area until it is certain that a landing can be made there before attempting to perform any form of landing approach. My club flies from an abandoned runway that is lined with trees and if a flier's engine dies, he is usually greeted by a chorus of, "Head for the runway!" It's good advice.

Sometimes you may realize that the engine remains running when it is throttled back after going sour. Usually that means it was too lean to be operated at full throttle, but you may still be able to get sufficiently reliable operation at reduced throttle to permit a normal landing.

You may be able to recover an airplane from an emergency situation, but a much better procedure is to attempt to prevent the situation from occurring in the first place. Aside from making sure that the aircraft pushrods, couplers, clevises, horns, servo arms, and all the other things that have to hold together for the airplane to function properly, are in good shape, the best thing the pilot can do is perform tests and preventive maintenance on the receiver and transmitter battery packs and the servos. George Myers has had some good suggestions in his column Radio Technique in past issues of *Model Aviation*, but I'd like to throw in my two cents worth based on personal experience.

A receiver battery pack may have one of the four cells short out internally and it might go undetected until the airplane spirals into the ground due to lack of range. In the older radio systems, two cells drive the servos in one direction while the remaining two drive them in the opposite direction. It is easy to tell when a cell becomes shorted out because the servo will run very slowly in one direction and normally in the opposite direction. In the newer radio systems all four cells drive the servos in both directions and the loss of one cell is more difficult to detect because the servos run nearly as fast in both directions. However, the receiver knows the difference and the result is a significantly reduced effective range of the radio system.

In 1974 I had an Intruder equipped with retracts all ready for the Nats at Lake Charles. One week before I was to leave, it crashed due to a shorted cell in the receiver battery pack. That's when I learned the lesson to check the voltage and capacity of all my battery packs.

After every flight I check battery voltage with an expanded scale voltmeter which puts a load on the system to simulate operation. There are several good ones around for under $25; it's a worthwhile investment. I also use a battery capacity checker periodically to seek out cells, or whole packs, that are beginning to lose capacity. They are also commercially available in a wide price range which depends on how fancy you want to be or how well heeled you are. Another good investment.

Do you own a servo checker? If you have a radio system you do. By carefully, and slowly, moving the transmitter stick and observing servo operation, you can detect the symptoms of bad gear teeth, scratchy feedback potentiometers and oxidized commutators in the servo motors.

Recently I was practicing outside loops and at the end of the third loop, when I released the down elevator, the airplane continued in an outside loop! Fortunately, it came to its senses and I was able to perform an emergency landing without incident. When my heart quit pounding I carefully observed the operation of the elevator servo and was able to find four points where the servo would stop dead, no matter what I did to the transmitter stick. Oxidation had set in on the commutator of the elevator servo motor and caused the motor to go dead when the brushes contacted the oxidation. Needless to say, I replaced the motor.

You can save yourself a lot of grief by carefully checking over the whole airplane. I thought my experiences might bring home the point. Good luck in your preventive maintenance.

This month I have another outstanding excerpt from a newsletter. Jerry Adkins is editor of the MRCA News up in Ypsilanti, Michigan, and he published the following gem (which I have slightly edited):

Did You Ever Compete in Pattern?

Did you ever have a flooded 60 turn your finger into a black pulp? Did you ever go blind while flying a pattern ship through the sun? Did you ever discover the chief pattern judge is the Polish guy who patiently listened to all your ethnic jokes at the bar last night? Did you ever make a perfect touch-down in the spot and have your nose gear fold? Did you ever come home after placing high at the Nats and make a blooper landing with a student's Esquire? Did you ever lose four in a row with a Dirty Birdy and take first with a Contender? Did you ever try to clean a plane after a gear-up landing in a wheat field? Did you ever fly round one after driving all night with no sleep? Did you ever fail to start your engine within the two minute time limit and zero the whole thing, then go back to the pit