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COVER PHOTO: Miss Terri Green poses with Terry Aldrich's Waterman Aerobile of Senta Maria Airport. On real plane, entire swept flying wing could be removed when fuselage was driven as a car. Photo by Aldrich.

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There will be a 1971 Spokane Internats—and that's a story in itself

BOB KING, alias Robert F. King, Brigadier General Washington Air National Guard, Assistant Adjutant General, Air, is quite a guy. His letter of July 17, to “all concerned” with the Spokane Internats, that this two-year-old meet would be held again on July 10-11, 1971, proves it.

“On the basis of U.S. Weather Bureau climatological records, these dates should assure optimum conditions for a model airplane competition,” he wrote us all. “Consideration is being given to making next year’s Internats a three-day program instead of two. Many persons have suggested this.”

Knowing King, S.A.L., can’t repress a benevolent chuckle. The events that occurred during the 1970 affair last June were wild. This is an ambitious undertaking, requiring the kind of coordinated logistics which only the Navy can swing (Navy's chores with the bigger, longer, heavily attended Nats are much tougher—though Navy can swing the manpower) and Plymouth flawlessly exhibited in the past at their own Internats in Detroit, which followed a nationwide elimination tied in with their dealers, The Washington ANG had this thing organized like clockwork.

The meet began on Saturday. Out at the field, where Voodoos—the real ones—took off in pairs for their electronic war-games practice, there was a neatly organized trade show, in a spotless hangar. Bleachers lined the taxi strip. Governor Evans, whose boys are modelers, was due to address the crowd, Fyron jobs zipped back and forth in front of the stands—but the action was strangely subdued.

Way out on the field, the Pattern event crated performed occasional, lonely antics. In those vast open areas even a busy meet gets swallowed up. And it was overcast, chilly, and somewhat windy. We weaker souls took refuge in guest trailers, drowned ourselves in coffee, and talked shop. For New York this would have been a raw April day.

That night a banquet was scheduled at the Ridpath Motel for the Hall of Famers—Korda and Lewis couldn’t get there, which made the writer a still colder specimen, whereas the flying field looked half empty, the hall seemed crowded with all the modelers in the world. There was action in Spokane, that’s for sure.

So on Saturday afternoon the governor, who was to fly in after a commencement address at a major University, was running late. The stands, of course, were empty. Would the meeting take place in the hangar? No. Where then? So a press conference was set up and, wouldn’t you know it, the packed conference room, TV, radio and all, was taken over by hard-hitting reporters who bugged the patient governor about conservation, parks, and campus disturbances. It took nervy Jerry Kleinberg to give the governor a chance to talk about modeling and his boys.

On Sunday, as we jetted out to feed our own Monday morn press, a driving rain was sweeping all before it. Misery! Someone asked the modelers if they couldn’t speed up results—not knowing what was involved in finishing some events. You know modelers? Many of them vowed never again to leave sunny California. There followed a dejected notice by mail that in view of their excruciating pain (our words), there would be no Spokane Internats in the future. Bob didn’t know his modelers. Take away a contest? Never!

So here’s Bob delightedly telling us that: “It would seem that in its short life, the Spokane Internats has acquired a faithful and vocal ‘alumni association’ of sizeable proportions.” And that: “Such local support is deserving of reciprocity of the Washington ANG.”

For the writer there’s quite a story behind this. It was on a nasty Saturday morning, three years ago that we had written an editorial on the Navy’s threat to drop the Nats because of lack of genuine youth participation. While AMA took care of that with a wow of a Delta Dart program held on the NAS involved, and all is now peaceful and light. Bob King happened into a library, noted a copy of AAM, an educational war-games practice, there was a neatly organized trade show, in a spotless Bee Bleachers lined the hangar, TV, radio and all, was taken over by hard-hitting reporters who bugged the patient governor about conservation, parks, and campus disturbances. It took nervy Jerry Kleinberg to give the governor a chance to talk about modeling and his boys.

The Camp Murray program was started, with kids to visit, receive instruction, fly models, A $1,000,000-plus program was designed and pursued with school authorities and government in the far Northwest. Tremendous interest was generated—there would be facilities, tools, the works. A beautiful building, and King’s personal magnetism and incredible dedication made the dream seem a shoe-in. Well he got part, not all, of what he wanted—but don’t count him out. On top of all this, he dreamed up the Spokane Internats, to draw crucial attention to the real significance and size of the modeling movement, and all its social values to youth. It would be nice if you guys join this fight and, if possible, get to Spokane next July. It’s part of a bigger thing. It should not be provincialized. Why not National Air Guard support for a program which includes kids—little ones and “big ones” both. More support is one constant ballyhoo.

Why this editorial? Well, it’s about something a thousand times more important than that stupid intermagazine spat over who really sponsored with what motel, you-know-which contest in the southwest. King is a man with a mission—one in a million, He produces. He keeps promises, Now Bob knows we favor his getting behind the kids, working with them in the Camp Murray concept, promoting Delta Dart things in the inner city—and we’d like that to catch fire nationally.

“Knowing how you feel about such things (as Bob knows, we don’t flip over any man-only contest, not after all these years), I don’t suppose the attached pronouncement will excite you,” he writes, referring to the 1971 Spokane Internats. “You promised comments on this subject. Please don’t forget.”

Bob promised us something too at that Spokane banquet. That was never to give up his crusade. That’s a hell of a lot to ask of any man. He won’t. Go to Spokane. Get behind any youth-promotional thing in your own city, school, shopping center, hobby shop, or your own club, whether or not Spokane is out of the budget. Let’s keep faith with this man.
RELIABILITY PLUS!
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Barry Goldwater—modeler

Men from all walks of life have in the past and are still building Cleveland-designed models. You can imagine the thrill when I received a letter from an old modeler, Barry Goldwater, United States Senator from Arizona. Needless to say, I feel very honored to have him as a C-D fan for many years, even though unknown to me until the receipt of the following letter:

"First of all, I doubt that there are many people in this country who have made more kitted models than I have, I have flown over one hundred different types and am constantly finding old ones that have been out of manufacture for years,

"I am looking forward to the Great Lakes Trainer coming out again. In fact, I would like to have one sitting out at the field right now, as it has been a long time since I have felt wind on my face; that little airplane was the best,

"I am glad you have started the foundation. Things like that are long overdue in this field. In fact, I am trying my best to get the Smithsonian to start the Astronautical and Aeronautical museum going."

—Ed Packard, Cleveland, Ohio

Beyond the Delta Dart

Three cheers for the editorial in the July issue. You have clearly and succinctly presented what I believe to be our hobby's most serious problem today. As an old timer and an unabashed free flight enthusiast, I fear that we will lose a wonderful hobby if large numbers of today's young people are not given an opportunity to progress through easy steps of free flight flying.

The Delta Dart program is a wonderful start—but, as you so aptly questioned, where do they go from there?

Although there must be steps in between, I have taken some heart at the spreading interest in the so-called 1/4 A size powered models using the .020 engine. The relatively low cost, the more modest building space needed, the easier portability and the much smaller field requirement all seem to point to this size powered model as the direction to go to make such flying available to a larger segment of our younger population.

—Phil Milam, Atlanta, Ga.

Infamous Q, pollution culprit?

Reading "You Said It" on the GHQ engine and not bragging about the age limit on model builders, I have a tale of the GHQ...

In 1935, for some reason or other, I won the Manitoba Provincial Model Airplane contest and a trip to Toronto. Some fellows were there from Akron, Ohio that year to show us the gas jobs. They flew all right, glide angles about 1 to 5, but that gas engine—Brown Jrs. Oh, boy! They were hard to get, but after a year a buddy and I saved the $21.50. With the duty it came to $39.37—I still remember trying to get it out of the Post Office.

In January of 1935 it was ready to go. My father was (and is) a great man—"Finish the plane and then start the engine." He just didn't know general headquarters.

Out to Stevenson's Aerodrome at 32 degrees below, I remember trying to start that old buzzard in the Old Winnipeg Flying Club hangar, with plenty of expert help. It didn't run.

We took the engine out—set it up in the middle and the tone-keying button in the upper right corner.

As with the Delta Dart, available kits and sponsored events will be needed in order for this to catch on. I am convinced that this size gas model should receive the full support of all those interested in saving free flight flying.

—Stanley Johnson, Whittier, Calif.

Ultimate status symbol

I got a real kick out of Hannan and Barrera's "Field Kit for a Free Flyer." Free flighters are not the only ones who suffer feelings of inferiority and rejection at the field, though. Among RC'ers a similar status gap exists between those who thumb dual-axis levers on fancy boxes and those of us who (because of eccentricity or impoverishment, or both) still push a simple button on a simple-looking box.

Now that some propo manufacturers have a battery-test button on the faces of their transmitters, we single-channel nuts can indulge in a little status-enhancing deception of our own. The procedure is as follows: Put the guts of your simple tone transmitter in a larger, appropriately ped, vinyl-covered box, with the on-off switch on the face of the transmitter except the switch and the button is non-functional, except perhaps to your psyche.

Since purchasing two control sticks would put quite a hole in the budget, these can be simulated by simple aluminum rods that protrude through large square holes cut in the face of the transmitter. This carries the deception a step further by pegging you as a perfectionist who demands nothing less than the best in precision—provided by open-gimbal sticks!

—Phil Milam, Atlanta, Ga.

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—Phil Milam, Atlanta, Ga.
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THE EIGHTH ANNUAL WRIGHT Brothers Memorial RC Championships were held in excellent Air Force facilities, but the weather ranged from perfection on Saturday to high winds and spotty showers on Sunday. Sponsored by the Western Ohio Radio Kontrol Society, this meet drew contestants from around the country. Its ten scheduled events included Class A Jr./Sr.; Class A Open; Class B; Class D N & E; Scale; Formula 1; FAI Pylon; and a special event, Biplane Pattern.

Competition in the pattern events was pretty evenly divided. Pattern was flown using six-minute short patterns on Saturday, with four flights per contestant. Four flight lines were set up, using the NATS arrangement of two lines on each of two complexes. At each complex, a numerical display system, visible from all over the area, indicated the next flier up and kept fliers constantly informed of their flight positions. This assured

(Continued on page 63)
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NEW! **RANGER 42**

The Versatile Almost-Ready-To-Fly Fun Model

For Single or Multi-Channel Radio Control; Also Free-Flight

Span 42"  
Length 31"  
Area 240 sq. in.  
Weight 26-36 oz.

Can be flown 8 ways:
1. Single Channel Radio, Rudder Only
2. Single Channel Radio, Galloping Ghost
3. Two Channels, Rudder and Elevator
4. Three Channels, Rudder, Elevator, Engine Throttle
5. Four Channels; Rudder, Elevator, Engine Throttle, and Ailerons
6. Free Flight

Full explanation of each method given in plan.

**FEATURES:**
- One-piece molded Wing, high-lift
- One-piece molded Stabilizer
- One-piece molded Vertical Fin
- Molded Fuselage, completely assembled with firewall, nose gear, plywood floor, side rudder, and main landing gear block already installed
- Complete fittings — nuts, bolts, hinges, nuts, screws, blind nuts, washers, eyelets, retaining springs, etc.
- Complete plans, with step-by-step Illustrations
- Instructions on Operating Radio Control Models

**SKYLANE 62**

Semi-Scale Beauty in a Great Flying Model!

DELUXE — Includes New Fittings

For Single Channel — Escapement, Servo or Pulse

Span 42"  
Area 244 sq. in.  
Length 35"  
Weight 92 oz.

For .06 Engines

**FALCON 56**

DELUXE — Includes New Fittings

For 10 Channels or Proportional

Span 56"  
Area 540 sq. in.  
Length 43"  
Weight 305 oz.

For .09-.19 Engines

**SKYLARK**

The Versatile Almost-Ready-To-Fly Fun Model

For Single or Multi-Channel Radio Control; Also Free-Flight

Span 56"  
Area 540 sq. in.  
Length 43"  
Weight 305 oz.

For .09-.19 Engines

**FALCON 56**

DELUXE — Includes New Fittings

For Single Channel — Escapement, Servo or Pulse

Span 56"  
Area 540 sq. in.  
Length 43"  
Weight 305 oz.

For .09-.19 Engines

For Twin Engine Use Two .01's or .02's

**Zeta GOLDBERG MODELS INC.**

CHICAGO, ILLINOIS 60608
Tips for Performance

Exploring rubber-power flying models the direct way, using a 49¢ ready-to-fly balsa job.

BILL HANNAN

ALTHOUGH RUBBER IS one of the oldest forms of model aircraft power, it remains one of the least understood. By employing a simple "flying laboratory" approach, much of the mystery can be eliminated. Here we shall try to prove that learning can be fun.

The first requirement is a simple, dependable aircraft. Several brands of ready-to-fly models are on the market, but a North Pacific Sleek Streek was chosen because it is widely available in hobby shops, supermarkets, and some drug stores. If this brand cannot be found, another may be used. Other slightly more complex aircraft, such as Delta Darts, are suitable also.

The Sleek Streek is assembled according to package directions, with the following exceptions: (1) Two pieces of masking or clear tape are applied across the wing center section. This prevents the wing panels from popping out of the wing mount in the event of a hard landing; (2) After being correctly aligned, the fin and stabilizer are glued into their slots. These changes are not intended to hop up the model, but are merely to make it more rugged and able to withstand the rigors of hard testing.

Equipment and Materials

In addition to the model itself, the following items will prove useful: stopwatch, mechanical winders, needle-nose pliers, wire cutters, 1/32" diameter music wire and sandpaper. Also needed are tape, glue, different sizes and types of rubber, different sizes and types of props, rubber lube, oil and thrust washers. It is not absolutely necessary to have all of the above items, but the more that are available, the more extensive can be the experiments. Briefly, the purpose of each item is as follows:

Stopwatch: To determine how changes affect a model's performance, a means of comparison is needed. Judging slight improvements by eye is difficult and best inaccurate. Measuring the actual time in the air from launch until touchdown is a much better system. If a stopwatch is not available, a regular watch with a sweep second hand will do.

Winder: This is a basic tool for rubber-powered model flying, since winding by hand is slow, tiresome task. Some modellers prefer to wind by hand and can offer good reasons for doing so, but they are in the minority. Winders can be purchased commercially, or they may be converted from hand drills, by attaching a suitable winding hook. If you construct your own, make certain that the hook is securely attached, so that it will not work loose under a strong pull. Winders differ in ratio; that is, for each turn of the hand crank, the hook will revolve a given number of times. The hand drill conversions usually have about a 4 to 1 ratio, while the small commercially-made units have a 16 to 1 ratio.

Needle-Nose Pliers, Wire Cutters: These tools are used to fashion propeller hooks, for when propellers are changed.

Music Wire: One length will provide enough material for many prop hooks.

Sandpaper: Use to reduce the weight of the heavy blade, if a prop is found to be out of balance. It may also be used to smooth and lighten the entire model, if desired.

Tape: Use to reinforce the wings and for emergency repairs.

Glue: Use for assembly and repair purposes.

Rubber: Several sizes and types of rubber strand are manufactured. Try at least a small quantity of every available size. If the local hobby store does not stock different types, try a mail-order source. For long run tests, rubber should be stored in a air- and light-tight container.

Propellers: The ready-to-fly model comes equipped with a prop, but, in addition, obtain one or more different types. For example, the North Pacific Sleek Streek, features a scaled-down version of the same prop design, and the plastic nose piece can be directly interchanged with the larger one. Other brands of plastic or wooden props in the four- to six-inch diameter range should be obtained, if possible, for test purposes. Some props left over from small kits also would be suitable. The more types on hand, the more prop/rubber combinations can be tried.

Rubber Lube: A real must for rubber-powered models, rubber lube will allow any given motor to accept more turns and will extend its life. Commercially-prepared lubes are available at low cost, or castor oil may be used. Do not use common motor oils, which will attack rubber.

Oil: While motor oil cannot be used to lube rubber, do use it or sawing machine oil on the prop shaft bearing. A single drop is enough, since an excessive amount is apt to work its way down the shaft and onto the rubber.

Thrust Bearings: Some ready-to-fly models do not feature thrust bearings. After a time, the plastic prop hubs wear down and friction increases. To prevent this, use antifriction washers or sequins are placed between the prop and prop shaft bearing. Some experts instead use Teflon washers, which do not require lubrication.

Notebook and Pencil or Pen: Any
small notebook or tablet will to record test results for future reference. The simple form we used is illustrated, but you may wish to design your own.

Last, but not least, find a willing assistant to help with the experiments. If it can be another modeler, both will benefit greatly and perhaps they share the supplies.

Testing Procedure

All tests should be performed under calm conditions, since wind can adversely affect flight performance and cause inconsistent results. Early mornings and late afternoons generally the quietest times.

First flights should be performed according to the manufacturer's instructions, hand wound, and with the standard prop and rudder. Primarily, this is to be certain that the balance is correct. If necessary, shift the wing along the fuselage or, in the case of a model which does not have a movable wing, add clay ballast at either the nose or tail, as required. Check also for warps. Sometimes during shipment a panel will become twisted or bent. By breathing heavily on the affected part and bending it a little beyond the desired position, a warp can usually be corrected. Be aware, however, that it may return, especially if the temperature changes.

Once satisfied that the model is flying reasonably well, try timing a few flights. Our initial timed flights were performed using the manufacturer's recommended 170 turns, hand wound. Bear in mind that individual models will vary in performance ability, depending upon the weight of the balsa from which it was made, length of time the model has been on the dealer's shelf (which can affect rubber condition), etc. Caution: A poor choice can handicap the model's true potential and, conversely, a thermal can boost duration. Neither presents a true picture of what the model is likely to do under average conditions. The number of flights per test is a matter of choice, but at long last three or four are suggested.

If the model is equipped with a propeller free-wheeling device, as are Sleek Streets and Delta Darts, conduct an instructive test by timing the model with the free-wheeler locked up, by means of tape or string. Note the effect on the glide.

Next apply some rubber lube to the stock rubber band, and note how it alters the feel even while hand winding.

Winding

When using a mechanical winder, models are usually wound from the front. However, with simple stick models, we prefer to wind from the rear, since it is easier to remove the rubber and inspect the rubber loop to the fuselage hook. The procedure is as follows: have a helper grasp the prop firmly, while you stretch the rubber loop to about three or four times its normal length with the winder. While cranking in the turns, walk slowly toward the model until a point near the rear hook location is reached. The safe number of turns will have to be learned by experience, and a few strands of rubber will be broken while a feel for it is developed. Charts which list the safe number of turns that can be used for different sizes of rubber bands have been published. The mathematically inclined may study one or more of the charts, but none is a substitute for experience. Rubber is inexpensive when compared to glow fuel or rocket motors, so don't be afraid to sacrifice a few strands in the interest of education!

It should be understood that individual batches of rubber differ in quality, regardless of brand, and results can be expected to vary. The big advantage of testing rubber on simple models is that a blown motor is unlikely to do much damage. By contrast, a fractured band in a scale job is almost bound to extract a few bits of structure and tissue in the process!

Another important point to remember: count the number of turns as they are put in, so that results can be duplicated. Usually only the turns of the winder's crank are counted, as don't bother computing how many actual turns are being put in. It is merely a matter of multiplication to find the actual number of turns for scientific comparison. Warnings such as these are usually omitted, as a prime rule in rubber power model circles is never talk to a man while he is winding!

Any reference to breaking in rubber motors has been purposely omitted, as another subject of conjecture and controversy. Suffice it to say that the properties of a motor change somewhat after it has been wound several times. This too becomes evident as you go along. After a stock motor or two has been used up, make new ones from rubber strands. With any given size of rubber, the power can be altered by altering the length of the loop. A short loop produces greater power, but it cannot hold as many turns as a longer loop. The knot should be securely tied to the rubber band, since it is difficult to tie a knot in slippery rubber.

Note that when changing rubber or loop sizes, the balance of the model may be affected, and suitable adjustments will be required. Also, greater amounts of power will usually alter much more than just the models' duration. A model, which is docile with low power, may turn into an unmanageable beast when more "zap" is applied. Thus simple practice in adjusting the model's flight sur-

**DATE: OCT. 4, 1969**  
**CONDITIONS: CALM**

**MODEL: NORTH PACIFIC "SLEEK STREEK"**

**COMMENTS: STOCK PROP, STOCK RUBBER**

**HAND WOUND, 170 TURNS**

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**STOCK RUBBER, 240 TURNS, WINDER WOUND**

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This wing slinger is a humdinger. Climb is fantastic and glide is all non-thermaling.

ED MAZAN

THE AUTOGIRO WAS invented by Juan de la Cierva of Spain. Although Cierva designed numerous successful conventional aircraft he constantly searched for means to make air travel safer. In the early days of aviation, pilot error was the most common killer, since fixed wing aircraft often stalled and crashed. Cierva finally envisioned an aircraft with a freely rotating wing which could be completely independent of speed. In 1923 the autogiro was born.

Using a conventional aircraft, Cierva replaced the fixed wings with a free-spinning rotor mounted off the fuselage on a tripod pylon. The autogiro proved its safety characteristics. No stalls or spins marred its performance. Most important was its ability, upon engine failure, to descend almost vertically at a rate roughly comparable to that of a parachute.

The autogiro is not a helicopter. Their only likeness is the rotor, and their flight characteristics differ greatly. Autogiro lift is accomplished by a free-floating rotating rotor not connected to engine, while forward thrust is derived from a conventional motor and propeller.

Our model autogiro is a semi-scale design based on the recent full-scale Umbaugh autogiro. The ship is made of light or medium-weight solid balsa. It requires a large fuel tank because, in still evening air, the autogiro is capable of reaching fantastic altitudes nearly overhead, yet descending only yards from the point of launching.

Construction

Fuselage: The fuselage is carved from a unit of four separate solid balsa blocks, glued together from 1" sq. light weight balsa, cut to proper length Blocks 1, 2, and 3, as indicated on plans. Arrange the blocks in proper order, glue and allow a reasonable time for drying. Cut Block 4 to length from medium weight balsa, 1x2" in cross section. Using the X method, find the center of each block's end. Through these bottom ends, insert 1/16" dia. wire rotor shafts (see plans).

After inserting and firmly gluing the shaft in Block 4, cut an oval pylon cap from 3/4" plywood. Drill a 1/16" dia. hole through the cap and glue it to the top of the pylon Block 3. Now glue assembled Block 4 to the previously glued unit of Blocks 1, 2, and 3.

Allow the glued unit to set overnight, then bend the rotor shaft back 15 degrees from a vertical position. Use the joint line between Blocks 1 and 2 as the horizontal base line for measuring the angle with a paper template.

In the fuselage bottom, hollow out wells for 3/4" plywood landing gear platforms. Glue the well areas and insert plywood for nose and main landing gears. Cut the engine firewall from 3/4" plywood and glue into position, aligning carefully. The engine must be mounted with the thrust line at zero degrees. Add dummy air ducts, carved from 3/16" sheet balsa, to each side of the pylon. The fuselage can be carved and sanded to shape and cross section. Glue the 1/16" plywood stab platform to the fuselage and check alignment. This platform, along with the stab chocks, will key the entire tail assembly.

Stabilizer and Rudders: Cut the stab from 3/16" sheet and sand leading and trailing edges round. All edges of all flying surfaces must be sanded round, since no special airfoil sections are used. Outboard rudders are cut from 1/16" sheet and the edges sanded. The mid-rudder is cut from 3/32" sheet. After it has been shaped, cut trim-tab and insert two soft aluminum hinges as shown. Trim-tab is located only on midrudder. Glue rudder and stab assembly, checking alignment. Attach 3/4" sq. balsa chocks to bottom of stab with glue. A 3/4" sq. balsa incidence block is added at the bottom of the stab, near the landing edge.

Rotor Hub and Arm Assembly: Cut (Continued on page 73)
A COLORFUL PAGE in aviation history is occupied by the Waterman Aerobile, or “flying automobile.” Many of flying’s pioneers dreamed of an airplane that could drive through the streets like an automobile or soar cross-country on its wings. Two men, Molt Taylor and his Aerocar and Waldo Waterman with his Aerobile, came close to making that dream a commercial success. A limited production of the Aerocar was undertaken during the 1950’s.

Mr. Waterman, a capable aircraft designer, worked actively for over 20 years on his craft, flying a total of six. The final version, first flown in 1957, is modeled here.

The full-scale Aerobile carried three passengers. It had a one-piece 38-ft. detachable wing. Power was a Tucker automobile engine, driving the propeller, or the wheels if on the ground. Top airspeed was 120 mph, landing speed 45 mph. As an automobile, it had a top ground speed of 70 mph and was licensed for highway operation in California.

The model is a little larger than 1/7 scale, having a 67-in. wingspan. It weighs 7¾ lb. and is powered by a K&B 45 RC engine, turning in an 11-in. dia. pusher prop. The J. Roberts three-line control system provides engine throttle control. A battery-powered electric motor drives the wheels to demonstrate its automotive characteristics. The working headlight is controlled by a switch on the instrument panel.

The model is quite stable, although a little less weight or more power could be used. One unusual flying characteristic, caused by the line leadout location, should be mentioned. To avoid spoiling the scale effect by having leadout supports below the wing or by locating a bellcrank inside the cabin, the wires exit directly from the wing leading edge, well above the center of gravity. This causes the model to fly with a noticeable bank into the turn, which adds to the scale effect in slow level flight, but decidedly unnerves old control-line pilots.

How Terry Aldrich came to model the Aerobile is a story in itself. His job as a
professional photographer took him from California to Virginia. While there, he visited the Smithsonian Institution, in Washington, D.C. Out back, in a storage shed, he spotted the Aerobile which Mr. Waterman had donated in 1959. The Aerobile, like many other museum items, is awaiting its turn to be restored and put on display.

The Institution has the full-size copyrighted plans, which the serious scale enthusiast might want, although they contain little additional detail. Copies are available for about $2.00 each by writing directly to the Smithsonian Institution, Washington, D.C. Missing from these plans is the center of gravity location. Terry contacted Mr. Waterman, who supplied this information.

The story of Mr. Waterman, his flying automobiles, and his other contributions to aviation is told in Paul R. Matt's Historical Aviation Album, Vol. 3, ($2.98, P.O. Box 33, Temple City, Calif.). This book also contains plans for a version (1937) of the Aerobile, earlier than the one featured here.

Construction

There are some minor variances between the model pictured and the finished plan. The electric motor wheel drive is omitted from the plan. Elimination of motor and batteries should solve the weight problem mentioned earlier. Those who want to add this feature should not expect their scrap piles to contain the same parts as ours did, so ingenuity must be used. The simple pencil and headlight switch also are eliminated to save weight; however, the penlight bulb still should be cemented into place in the headlight block for scale effect. The control line exit points were moved to the bottom of the leading edge, placing them a little closer to the CG and out of sight. A demountable wing, as originally used, is not recommended, or shown. The problem of disengaging control linkages was hard-

Three-views available from Paul Matt (address given in article). Note the 4½ degrees washout in each wing panel. This and the sweep back gave the Aerobile its remarkable in-flight stability.
Axles are 1/4" piano wire running inside full length tubing. The wheel pants, with axles epoxied into place, are the only means used for wheel retention. The short tubing between wheel pant and fuselage on the nose wheel must not be attached to the fuselage and should have 3/32" clearance to allow some movement. The axle brace is 5/32 brass tubing soldered to the brass axle housing and epoxied to the fuselage.

The Aerobile's cockpit is rather Spartan. All instrument panels and the steering wheel are flat black. The front seat is a single semi-bucket type, while the rear seat is a bench type, seating two persons. These can be made of balsa. Note that there is a door on the right side only, and the rear cabin strut is slanted instead of vertical.

The motor mounts are spaced for the K&B 45 RC. Spacing (width) for the builder's engine should be verified and altered if necessary. The airscoop of carved balsa is a working one and allows some air circulation through F-6 and around the engine. The engine on the model was exposed, although the plans show the scale outline in the event the builder wants to install a screen around the engine. The carved balsa scale prop is replaced for flying by a regular 10-6 pusher prop. Concealed rubber bands hold the removable engine top block in place, although screws into the motor mounts would work nicely.

Last version of real plane sold with the Smithsonian Air Museum in Washington, D.C. It licensed as motorcycle for road use!
For the most points in Scale and optimum performance in Stunt, retractable landing gears are becoming a necessity!
The survey considers both old and new commercial systems.

HOWARD McENTEE
Photos by Frank Pierce

RETRACT GEARS have been on the market for over ten years, yet they have not become popular. Although they enhance performance, added weight and cost, plus possible unreliability, have prevented wide acceptance. However, the 1969 World Championship RC Stunt win of Bruno Giezendanner focused attention on them because of improved performance. The 1970 competition season may be the “Year of the Retractables.”

They do reduce drag, although no figures on drag reduction for typical stunt planes have been seen. Most stutters are sleek, with low drag, except for that fixed tricycle landing gear! Those who have flown RLG (retractable landing gears) say the way planes go through tough maneuvers with the gears folded is a revelation. Observers can see a plane lurch forward when the LG retracts!

The RLG field divides into three distinct types: electrically-driven systems with motors built into each wheel unit; pneumatic systems which also have a power unit for each wheel; and non-power-equipped wheel units. External servos are applied to work one or more of these, and almost any servo can trigger the units which have their own built-in power or pneumatic.

Switches or valves require only a few ounces of operating power at the most. It is practical to operate electric systems from a special amplifier hooked to an unused control on a multi-digital system. Or simply link the switch or valve to the throttle (or other) linkage.

Wheels-down seldom is used unless the engine is in low throttle. For takeoff, arrange the linkage so that the throttle, or the linkage itself, goes 80% of the way to wide open, then advance it the remaining 20% to actuate the retracting switch or valve. The wheels can be dropped at any desired lower throttle position.

For RLG’s that have no built-in power or spring assist, standard servos should be avoided. Needed here is a rotary-output servo that can provide 180 degrees rotation of the output disk (Fig. 11). While most LG units have internal locks that take all landing shocks off servo and linkage, these locks may not always work. If the gear goes down, for example, but fails to lock, a serious load can be put on the servo gearing and even the motor. Any shock is taken entirely by the servo output disk and, possibly, its shaft. If these are sturdy enough, no harm can be done to the servo.

Many servos do not have enough throw to operate RLG’s directly, and some may lack necessary power. Most landing gear servos now marketed (EK Products, BK Model Products, Kato Model Aircraft, Royal Products, Kraft, Pro-Line, and Orbit) have the desired angular rotation and sufficient power. With careful attention to attaining friction-free linkage, and with shorter LG
logs and smaller wheels, one possibly could operate a trike RLG system from a single such servo. However, it is preferable to utilize one servo for the nose gear—this leg is often longer and heavier than the main gears—and another servo for the two mains.

Each of the servo systems has its pros and cons. Generally, pneumatic units are larger, and sometimes heavier, than electric units. Those that work from engine pressure require no added power. However, newer systems that work from compressed gas must carry this gas in an extra container. Such systems generally operate on Freon gas, widely used as a refrigerant. Some modelers have found that in cool weather several operations of the system can cause it to "freeze" to a modest extent. RLG systems normally operate only once at the beginning of a flight and once at the end, so this may not be a great problem.

The lightest-weight 450-mah nickel-cads recently introduced by Gould are ideal, alkaline pencells probably could be used satisfactorily too. Electrical noise could bother digital receivers. The only electrical RLG's in this survey have capacitors across the motor brushes and low-resistance radio frequency chokes in the motor leads. Modern digital equipment systems are not as sensitive to such interference as the early ones, which probably is why all-metal retract units were used, whereas they might have upset early digital receivers.

Even the best-engineered systems can develop bugs. The average RC'er can do things to equipment that the designers never thought of! Probably the best way to check the various retract systems is to "Ask the man who owns one." Attend the larger Stunt contests, observe how they behave, and ask the users for recommendations.

**Unit Descriptions**

The BK units work on such a simple principle that sketches of the action (Fig. 2) are included. BK RLG's have only two moving parts, yet give smooth and positive action. Bill Bertrand introduced this scheme of operation back in 1965; sketches appeared in AAM (Ref. 8). BK has simplified the arrangement mechanically. In Fig. 2A the 'l's indicate one extreme of motion—gear either up or down and locked. Operation is as follows: the semicircular block slides down and away from its lock pin, then moves the gear through 90 degrees to the opposite stop pin and the block slides diagonally upward until it locks the action again. Thus, a continuous servo pull unlocks, moves the gear leg 90 degrees, and relocks—exactly the same going either up or down.

The BK units are constructed of heavy 44" linen phenolic. Bearings are holes in ¼" aluminum channel, which also provides mounting. LG legs have two-turn coils of 5/32" music wire and a slight offset bend. However, they are left...
Royal Products BK special.

Selectronics CAS System.

Nelson Model Products Rowan.

Techniques KDH German units.

Never Fail retractable gears.

Wing Mfg. Posttract nose unit.

BK Model Products main gears.

Royal MK and 180-degree power servos.

English Micro Mold gear from Bob Holman is unusually simple. Torsion bar mounted.

P.M.W. power unit, ram, airborne cylinder and P-40 gear on left and P-51-type gear at right. No spring assists.

Editor's old DMECO units were modified. Nose gear was bolted to engine's backplate. A sequential system.

THE CLETUS BROW SYSTEM, no longer marketed, has seen much use by prominent flyers. Each unit has a bent frame of thin sheet aluminum, which holds the operating cylinder and the gear leg mechanism. Nose gear is steerable and in a two-leg type utilizing 3/32" wire. The legs lock solidly when down, pneumatic pressure holds them up. As noted above, the wing gear units are based upon the mechanism, but the locking feature with gear retracted has been eliminated. A small valve supplied to control pressure bled from the engine crankcase to the cylinders. As with similar pneumatic units, if the engine stopped during flight, spring pressure, assisted by wheel weight, was expected to force the gear down and lock it.

THE DMECO ELECTRIC UNITS were simple and rugged; nose and wing units were almost the same, easily convertible from one to the other. A rugged aluminum extrusion formed the frame and metal gears were utilized. Limit switching was built in. The motors always rotated in the direction; and the current drain of a single unit could rise to 1 amp or more when raising the wheel. Therefore, switching was arranged to move the wheels in sequence; one was almost completely moved before the next in line started. Cycling was so rapid that it looked as though all the wheels moved together. Some users had trouble with the gears getting out of sequence—one up and two down, for instance. Thus, some installed separate batteries (Ref.
1) and altered switching to move all wheels together.

The remedy for these rugged and simple units is to install each small motor in the Orbit PS-4 servos. The larger motor used in their PS-3 servos can be adapted, but requires much filing on the case. Order these motors from the factory, specifying long shafts (shafts are cut short for servo use.) With these lower-drain motors, all servos could be operated together, keeping the battery within reason and eliminating the larger motor used in their PS-3 servos.

These RI units have adjustable coil spring assist. The nose gear requires about ¾" linkage movement for full abse well. Spring-assist is featured on wing units and is adjustable to stunt length and wheel weight. The units afford positive locking, extended and retracted. They require about one inch of servo movement. Units are right- and left-handed, wires are bent for wheels. Spring-assist is featured on MK units.

At first glance these wing units look like RLG's, distributed by Royal Products, and are almost entirely plastic. The means of control is by a Cushionaire knee-action steering motor geared to the wheel strut to fit the KDH unit. Another style RLG unit by KDH, intended to retract two wheels rearward, is fine for pylon racers. New Mini units will soon be available in the MK design, but about 20% smaller all around.

MK makes two difficult, highly-geared servos, one for both wing units, and one for the nose unit. Those servos are quite compact, have 180-degree rotation and built-in limit switches. Switching is such that the main gear servo moves about halfway, then causes the other servo to move. With two wing gear units and three-in. Lo-bounce wheels, maximum current drain of this one servo was 175 ma, which came as the gear neared up on 2.4V. There is no spring assist.

Closer examination shows that all parts which support the wheels are amply strong, and the units should stand up well. Spring-assist is featured on wing units and is adjustable to stunt length and wheel weight. The units afford positive locking, extended and retracted. They require about one inch of servo movement. Units are right- and left-handed, wires are bent for wheels. Spring-assist is featured on MK units.

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Spinks Akromaster

60-powered model has all the fine aerobatic abilities of its full-size counterpart. Lines are simple and easy to duplicate.

ROBERT SCHULTHEIS

AFTER LAST SUMMER'S air show at Rockford, a flying buddy told me about a slick white aerobatic ship he'd seen. Not too good at names, he called it a Schlitz or Schmitz Akromaster. Well, I like planes such as Chipmunks, Zlins, and Vaks, so this was natural for me. Then AAM (Feb, 1970) published a detailed article and a beautiful scale three-view of the Spinks Akromaster. I was hooked!

The bomber I was building was set aside, and I started drawing this pretty ship with its perfect RC Class III proportions. Except for the 520-sq.-in. wing area, the Akromaster has all the right moments. The only curve in the whole plane is on the top of the fuselage. The symmetrical wing, as experience and other flier's comments indicate, makes for better aerobatic models. The real plane used the semisymmetrical NACA 2413. The tail group is scale size. A few builders may question the area, but those doubts are completely dispelled after the first flight. That little stab and big elevator do a fine job.

Another unusual feature is a fuselage six inches wide. Try to put that in an old multicrane! I usually start the motor with the plane inverted on someone's knee or in a cradle, but it can be started right side up. Holding that wide oily fuselage requires a hand like Wilt the Stilt's, but it can be done.

Construction

Start with 3/16 x 4 x 36" medium balsa sheet, add 3/16 x 2 x 17" doublers and 3/16 x 1 x 17" stiffeners. A piece of sheet about 3/4" long must be added at the tail. The 3/16" tail doubler will hold all this construction together. Mark former locations on the sides. Then, with sides stacked together, jig saw and cut to shape.

(Continued on page 71)

NEW PRODUCTS CHECK LIST

FRANK PIERCE

Breiten Products/Right-angle wire bender. Precision tool permits accurate bending of 5/32" or 3/16" wire to smooth radius. Also available, coil-bender attachment for forming your own landing gear. Price, under $7, depending upon wire gauge size. Details, write Breiten Products, 100 E. Byrd St., Appleton, Wis. 54911

Model Engineering/Wing carrier. Great for 'wagons or family sedan, heavy-duty brackets have no-slip surface, keep up to six wings up and out of the way. Quick to install, quick removal when not in use. $9.95/set. Model Engineering, 3655 Calumet Rd., Decatur, Ga. 30034

Dynamic Models/Race car heat-sink. Gets rid of heat in enclosed engine applications and adds note of handsome realism. Variable efficiency, sink can be used with asbestos washer for winter applications if desired. $4.95 including washer. Dynamic Models, 13309 Saticoy St., North Hollywood, Calif. 91605

AAM's own/Far-out insignia. Show your true feelings for your favorite mag. Sport the Great AAM Bird roundel on your fuselage, field kit, car window. Instant-stick plastic, no water necessary. 3" diameter, 25c. Also Tenderfoot insignia, great for dressing up Delta Darts, 15c. Order direct from American Aircraft Modeler.
Cleveland Model and Supply Co./Hundreds of plans. Where else can you find 1½" scale plans for GeeBee racer or detailed miniature drawings of rare early birds? Cleveland is now merchandising complete line of plans from '30's and '40's kits. Catalog provides complete listing.

Cleveland Model and Supply Co., 4506 Lorain Ave., Cleveland, Ohio

Rexco/Permabond. New semi-contact high-strength adhesive has many modeling applications. Sets firm in less than a minute, joins woods, nylon, metal, plastics, with either similar or dissimilar bonding. No heat or catalyst required. Complete data sheet provides details. In several convenient sizes. Rexco Corp., 45 W. 47th St., New York, N.Y., 10036

Min-X/Audio-tac. Audio tachometer operates on two 9V cells, provides accurate calibration of engine. Peak out engine, tune Audio-tac to same note and read rpm's from calibrated dial. $24.95. Min-X Radio, Inc., 8714 Grand River, Detroit, Mich., 48204

Marlow Engineering/Shark rubber-powered. One of a line of new lite-weight, built-up rubber-powered ROG's and gliders, kit provides detailed plans, all material, plus detailed instructions. For the successful Delta Dart graduate. Marlow Engineering, 6850 Vineland Ave., North Hollywood, Calif., 91605

Dumas/Evolution trainer. Shown in kit form, model can be flown in three configurations. Add wing-tip extensions and fly as 75" span, 09-powered RC trainer. Remove gear, add power pod and fly as thermal. Or fly as hotar 48" span sport plane. $19.95. Dumas Products, Inc., Box 6093, Tucson, Ariz., 85716

J. W. Coler/New WW II aerobooks. Two new ones from Kookabura publications in Australia provide details on planes used in film Battle of Britain, and development of Hawker Hurricane. Both well detailed with lots of pix and three-views. Well printed with good color. $1.95. John W. Coler Publications Corp., 7506 Clybourn, Sun Valley, Calif., 91352

American Aircraft Modeler 29
Tordon

Attractive non-scale Formula II winner at '69 Nats is also a fine small-size pattern plane.

JACK SABINE and BRUCE LUND

TARDON II WAS conceived at 20,000 feet over Mexico, while Jack Sabine and I were returning from the 1969 Mexican Nationals. Jack had just won the Open Pylon event with his "Tardon." In Spanish, Tardon means slow or pokey. Surprisingly, some of the local Mexican contestants had come over to ask what it meant—seems our dictionary was for Castillian, rather than Mexican, Spanish. Thinking ahead to the Nationals to be held in Philadelphia, we realized that Tardon needed modifications to fit the recently revised AMA rules. Should new wings be built to meet the 1¾-in. rule, or should a completely new plane be designed? The frontal area of Tordon could be reduced by placing the cowls down on the wing like a Rivets, and the wing could be moved up closer to the thrust line. We decided to modify the winning Tardon.

The 1969 Nationals were only days away when the redesigned plan was ready for testing. The first flight was all right, or perhaps even more than, a modeler could desire. The ship handled like a dream, and no trim changes were necessary. The only problem was with the pilot, who has a habit of dancing or shuffling his feet during a test flight. Jack was a nervous wreck, but the Tardon made a perfect three-point deadstick landing on our 240-ft. strip.

This plane is fantastic. It demonstrated its high speed capability by qualifying at the Nets with a hot 2206. Yet, with the engine killed it glides in for landing like a sailplane. It shows no tendency to fall off on a wing during low speed turns and, with the limited elevator throw, it will not stall.

With full-throttle, the stability is phenomenal. It flies the pylon course well, but as with any high-aspect ratio wing, well-thought-out streamlining is essential. Fuselage profile shows careful designing.

Formula II planes with 600 square inches are fairly large. Because of the drag of the longer wing, well-thought-out streamlining is essential. Fuselage profile shows careful designing.

Jack Sabine displays the fantastically quick pylon turns.
Proposed Channel Changes: The FCC has proposed changes for the 72.75-73.75 MHz range so that two of the present spots would be shared with other model users and two new channels assigned to non-aircraft operation. A special frequency coordinating committee is being named in California to get the industry ready to incorporate the three new channels proposed for aircraft. Many modelers are concerned about the lack of frequency space for model airplanes.

Careless Frequency Control: In the Crescent City R/C Club's newsletter, "The Flyaway 11," Ron Romeo reports "two planes shot out of the air as the result of carelessness with the frequency clothespin. The plane in the air had the pin in both cases, and in both cases the guilty party was an experienced flyer." Unfortunately, such a situation is much too common. Most clubs have ground rules to prevent simultaneous operation of transmitters on the same frequency. Some use a colored flag on the transmitter to signify frequency, but, of course, it's not always easy to observe what colors are flying. Most clubs use a clothespin system, requiring the acquisition of an appropriate-colored pin and affixing it to the transmitter prior to turning it on. Other clubs impound transmitters, even during regular weekend flying.

The problem of frequency control will always be with us, human nature being what it is. But it is difficult to insist on everybody following the rules and washing out some hapless individual's hard-earned pride and joy. Is it enough to say, "Gee, I'm sorry!" Personal and financial responsibility is assumed for the careless wiping out of other kinds of property such as automobiles. Why shouldn't such responsibility extend to the club? Obviously, clear-cut operational ground rules and clear evidence of fault must be established before judgment can be made. What do you think?
**R/C GEORGE SIPPOSS**  
Specialist Correspondent  
**R/C CAR RACING**  

Tires: The latest fad in tires is spongies. Since some sponge tires behave better than others, the best types are semihard closed cell neoprene rubber. They are responsible for an approximately 10% decrease in lap times and for more control.

Engines: The most popular engine is still the Vega 19. An air cleaner must be used on the carburetor intake (see diagram), as well as a fuel filter. The latest fad is to machine off the cylinder head fins so that a flat aluminum plate can be mounted with the six head screws. Machined "velocity stacks" can be attached for a more authentic look. Such an item is available from Dynamic Design.

Wing attachment method by Michaelis allows the wings on one of his large scorers worked, and Kurwi 68 Universal prototype. Tires: The latest fad in tires is spongies, engines: The most popular engine is still the Vega 19. A jet cleaner must be used on the carburetor intake (see diagram), as well as a fuel filter. The latest fad is to machine off the cylinder head fins so that a flat aluminum plate can be mounted with the six head screws. Machined "velocity stacks" can be attached for a more authentic look. Such an item is available from Dynamic Design.

**R/C HOWARD MCENTIE**  
Specialist Correspondent  
**GLIDERS and FAI**  

Wing attachment method by Michaelis allows impact release but easy assembly.  

the fuselage. However, with a few modifications to the installation, the idea becomes quite practical (see sketch). Guides inside the fuselage ensure proper wire placement. A slit end allows the clevis to pull loose in the event of loosing or loss. This may rain on the fuselage, but a new one is easily installed.

Father of the Kurwi: Dale Willoughby, during a trip to Germany, visited Kurt Wilhelm, who designs and kits the Kurwi gliders. Wilhelm's Flying Cucumber has a unique fuselage shape and was built to test a V-tail installation on the kit model of a glider. Although he has a complete woodworking shop in the basement, Wilhelm does much of the building work, including fiberglass fuselage manufacture, in his apartment. Epoxy was used for fuselage work. A lifetime model plane builder, Kurt seldom has time for flying any more, what with a full-time job and the great demand for Kurwi kits.

Computerized Scoring: Pencil and paper task by dedicated modelers' wives (or girlfriends) may come to an end, if more clubs follow the lead of the League of Silent Flight, for their August Soaring Tournaments at Livermore.
**C/L BILL BOSS**

General Correspondent

**SPORT and SCALE**

Slo-Moe: This all-purpose plane was designed by Bob Sylvia, for use in slow combat, balloon busting, and as a stunt trainer. With a little extra work on the control system and an engine change, it also could be used in the Profile Carrier event. The plane has been flown by Bob and several of his fellow club members (Suffolk Wings, Long Island, N.Y.) since 1964. An excellent flyer, it has garnered many awards in slow combat and balloon busting at local contests. It has been successful against the most combat jobs.

Bob's plane features two innovations: a diamond-shaped airfoil and a two-piece fuselage. Both of these make for easy construction and great strength at the wing-fuselage joint. In addition, the plane can be built with standard sizes of bolts. The list of materials is simple: leading edge, 1/2" sq. two wing spars, 3/16 x 3/8"; trailing edge, 1/16 x 1 1/2" sheet; tail assembly, vertical rudder, elevator ribs, 1/8" sheet, 3/32" plywood doublers; and a 3/8" or 1/2" plank for the fuselage; 1/16" sheeting for center wing planking. Miscellaneous items for landing gear, control system, hardwood engine mounts, plywood bellcrank mount, etc., also are required.

The diamond-shaped ribs (12 required), because of their long flat bottoms, can be pinned to any smooth flat surface. Therefore, alignment of all ribs, spars, etc., is easy. Space the two center ribs in relation to the fuselage thickness, since the fuselage halves must fit in properly between them.

After the wing is constructed, cut out fuselage halves and notch both halves at the proper locations to accept the wing's leading and trailing edges, and top and bottom wing spars. Cut the nose of the fuselage to size for the chosen engine (19 to 35).

Next, cement fuselage halves into place between the two center wing ribs. Install doublers and engine mounts. Cut out and install rudder, stabilizer and elevator assemblies. Install bellcrank mount (1/8" plywood) in inboard wing sections. Landing gear, outboard wing weight, and tailskid complete the basic construction. Sand, cover and paint.

The Slo-Moe has great stability, maneuvers well, and will take rugged handling from the novice. In the hands of the experienced flier, it gives an excellent performance.

Bob will provide detailed construction drawings to those that want them. Write Bill Boss, care of AAM.

**Pacifier-Type Fuel Tanks:** This item appeared in "Modelling's Liveligest Monthly Fishwraper" (newsletter of the San Jose Aero Modelers). Marv Wenzel, Technical Editor.

U.S.S. Middlesex is pride of N. J. club. Group has excellent community relations.

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**C/L JOHN BLUM**

Specialist Correspondent

**CARRIER and STUNT**

Stunt or Precision Aerobatics: This column has provided a warm response from modelers who have flown aerobatic models. It is always surprising that so many build great stunt models, yet are not interested in competition. However, reasons for this attitude are not hard to understand! Rules changes are only part of the solution. By presenting ideas and theories received from all levels of interest, we hope to spark common reaction toward bettering the event.

By this time, rules change may have eliminated appearance points. Al Sugar comments that "in the Chicago area, the appearance of the ship is the only determining factor." He and four other stunt flyers will not participate in the event until it is run under FAI Stunt rules.

Bill Noyes, in the SCCA Newsletter, suggests that all Southern California contests go straight FAI rules in Stunt. Certain events in the St. Louis area promote the same philosophy. It's your event; consequently, it'll be what you make it. . .

California Stunt Modeler Jim Mayfield's new stunt model incorporates ideas evolved from his wide experience. It also meets coming muffler requirements—thus the exposed engine head and muffler, since muffled engines run somewhat hotter.

Other design characteristics, based on careful observation of what produces a winning combination of appearance and flyability, are: (1) swept-back rudders, which make inside corners appear round, while vertical rudders combined with straight fuselage make corners appear square; (2) the placement of the bubble canopy, which creates the illusion of the plane's pivoting around corners; (3) the straight fuselage, which emphasizes the straight sides of square maneuvers and level flight; and (4) a color scheme.
Mayfield's new stunter is designed for mufflers and maneuver-appearance effects. Jim feels the future trend in stunt design will be away from the jet look and toward a more functional design. He cites Bob Olaske's Nebler as an example. The model shown will be powered by a Fox 35 with muffler. Its weight of approximately 43 oz. is good for the 52-in. span at 560 sq. in.

Keeping the lines tight: William Watkins handles the problem of slack lines during periods of takeoff and flight by use of a spring-loaded bellcrank. The bellcrank mounting platform is usually located between two wing ribs, with a pushrod to the elevator for up and down control. The sloped platform allows the bellcrank bolt to slide within the opening. The curved slot in the bellcrank permits a guide bolt to maintain horizontal alignment of the bellcrank in operation. The bolt also slides within the platform slot.

Also mounted to the platform is an auxiliary crank from which a pushrod is affixed to the rudder. When the model is at launching position, the spring causes the bellcrank to move toward the outboard wing, thus activating the auxiliary crank and creating offset in the rudder. As the model reaches maximum speed, the centrifugal force increases, the model moves away from the pilot, extending the spring and allowing the rudder to return to a neutral position. An alternate position of the auxiliary crank is indicated and makes reference to high-speed and slow-speed for clarity. This concept could be adapted to Navy Carrier with a few modifications.

Ray Willman adjusts throttle on Class I Rossi-powered carrier model, a Guardian. The event requires a minimum number of officials. The only equipment used, other than several stopwatches and a speed chart, is a pylon structure, painted red, white, and blue. A painted pole could be used but the pylon adds a little class to the event.

Here are the rules: (1) Any kind of model may be entered, excluding plastic RTF, but no speed models. (2) Highest score from one flight is winner. (3) Select any one of three color zones before takeoff and advise judges. (4) When ready, signal for timers to start timing. (5) Hold model at required altitude (color zone) for required number of laps. (6) The number of laps is determined by the event and the number of officials.

Junior Speed Event: For those who have a problem getting junior fliers to enter contests (and who doesn't?), here is an event that will bring them out in droves. This particular event was initiated in Cleveland and has been flown there for as long as I remember. It was the brainstorm of Chuck Tracey, Aviation Editor of the Cleveland Press and perennial model aviation leader in that city.

The event requires a minimum number of officials. The only equipment used, other than several stopwatches and a speed chart, is a pylon structure, painted red, white, and blue. A painted pole could be used but the pylon adds a little class to the event.

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Add fun and a challenge to racing events with this colorful pylon. Text tells how.
Marty Thompson won Design Craftsmanship award at Boeing contest with this Nordic.

For very light kites, Bill uses nylon thread unravelled from model-covering cloth—about 3 oz. strength wound on a 2-in., spool attached to a 16-to-1 gear ratio rubber winder—reels them in fast. One of Bill's kites of the conventional crossed-stick Eddy type has wires at the center of the horizontal stick which permit the sides to fold back harmlessly when the wind becomes too strong, or when reels are not ready. Flying scale kites are an intriguing idea. A free-wheeling prop could act as a forward prop to provide the required stability. Bill tells about flying kites into thermals! It seems a fellow could learn much about thermals—size, strength, etc—by towing a kite back and forth through them. If the flying-site problem continues to intensify, maybe we'll be forced to adopt kites. Bill says one of the best store-bought kites is the one-dollar Sting-A-Bees by Gayla Industries.

Big Boeing Bash: Fifteen-year-old Richard Sironen of Seattle won the $1500 college scholarship award as grand prize in the Boeing Management Association contest held near Seattle on June 20-21. He took first place in Towline Glider, Cargo, and Indoor Hand Launched Glider, second in Outdoor Hand Launched Glider, third in Indoor Easy Begin. Bill Fisher, a CT man from Tacoma, and stunt flyer Marty Thompson of Livermore, Calif., were close on his heels. The meet included RC and Rocket events in addition to FF, Indoor, and CT, and also a special award for Design Craftsmanship. Flying facilities were excellent, weather superb. Fifty-nine contestants, aged nine to eighteen, came from six states and Canada to participate in the 17 events. Contestants said it was an especially well-organized and well-run meet and Boeing was delighted, plans a repeat in 1971.

Blast-Proof Rubber-Powered Models: Enough energy is stored in the rubber motor of a big Unlimited Rubber model to lift an automobile three inches. That when motor dissipates during winding, as it surely will sometime, weeks of effort are destroyed, along with a possible trophy. Bill Meuser, a Chief Engineer (AAM, April 1970, page 38) showed how the motor can be inserted into the fuselage after the motor is wound. A variation of this theme (see drawing) employs a winding-tube inserted into the fuselage during winding. This system saved Andy Foy's Unlim from a recent meet, and George Xenakis made a similar arrangement with his Westphalides. The plastic tubes used are golf bags, available at sporting goods stores. One 1/2 in. diam., 34 in. long, and #2 ideal for large models. A cardboard tube taped liberally with electrical tape is fine for smaller models. The prop must be detachable from the front motor hook, and the hook must have a place for the winding tube to hold it while it is being transferred from wind to prop. Sounds complicated? Not really, and much less so than building a new fuselage!

Kites — Free-flight: What is a towline glider or tow if it isn't a kite? Mostly. Indoor builder Bill Bigge builds kites that are a cross between indoor microfilm model and outdoor Unlimited Rubber model. Bill, who learned about free-flight from kite flying, and Bill has demonstrated that being a free-flyer puts him one-up on the traditional kite fliers. Bill won the Best Kite Award at the Smithsonian's Annual Kite Carnival in 1967, 1968, and 1969, and this year was an award for Best Airplane-Type Kite Originator of the Carnivals was Paul Gorber, recently retired from a lifetime with the Smithsonian aviation museum. Paul developed commissioner kites for the Army in World War II and some oldies will remember his book, Building and Flying Model Aircraft of 1928 at about this time of the Nellie-pusher era.

Washington, D.C. area is a hotbed of kite-flying activity, with contests sponsored by the Maryland Kite Society, the National Park Service, a group at the University of Maryland, and the D.C. Airmen's Clubs, in addition to the Smithsonian. Someone must have reasoned that if kite flying is so darned fun there must be something left. They found one, and for a time the police were actually busting people for the criminal and vile act of kite flying!

Bigge's latest endeavor features lightweight indoor-model-type construction and forward fin— conducive to stability, as pointed out in J. K. Querterm's article in the 1957-58 Model Aeronautic Yearbook (Frank Zietz, Model Aeronautic Publications). Its predecessor was a similar tandem-wing affair which began life as an Outdoor Unlimited Rubber class model but which, according to Bill, "was much happier as a kite."
Frank Ebka developed the AMA Racer/AMA Sig Cub, building a truly flying model too often beyond the ability of the beginner. Now, based on the AMA Sig Cub, the AMA has published a booklet, "A Community Model Airplane Program," which deals with establishing a program for young beginners.

For the past two years, members of the Willamette Modelers Club, Inc., have sponsored such a program at the local Boys' Club. A long-term project which lasted 20 weeks, it attracted and interested about 60 youngsters to the wonderful world of model airplanes. The program went on, in 1969, to prepare members for competition in the AMA-HIAA-Navy Air Youth Program. This year the Willamette Club hosted its own meet, open to anyone under 16.

Much was learned by applying basic aeromodeling experience to basic aircraft and by planning a program well in advance to prevent anticipated difficulties. Club members also learned some important things about working with groups of youngsters. For a successful program, the following suggestions are invaluable:

1. If the program goes beyond the Sig Cub phase, and it should, have a limited number of modelers for each instructor. Six or eight boys asking questions and wanting help for an hour and a half is about the limit at any one time.

2. Schedule meetings regularly and at the same location each week.

3. Provide for some type of competition after each phase of construction. For example, when the Sig Cub is finished, hold an informal contest to check adjustment and other flying techniques pertinent at this level.

4. Have some long-term goals, such as the AMA-HIAA-Navy Program in 1969, to culminate the year's activities.

5. Enroll only youngsters who can display at least basic reading skills. We also stipulate that boys be eight years old, but prefer them a year or two older. Requiring a small investment of 50 cents or a dollar by the youngster helps ensure his taking care of the equipment and supplies.

6. Require that all building for the program take place at the meeting site. However, encourage youngsters to try constructing other models on their own. Suggest that they be equal to their current building level.

7. Have a beginners' ten week session and then an advanced section for those who successfully complete the beginners' phase.

Next month, a week-by-week outline for setting up such a program will be given.

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**F/F BUD TENNY**

Specialist Correspondent

**INDOOR**

New York Club Checks In: The Pan American Model Aero Club has 26 active members, all employees of Pan American Airways. The club meets monthly and is adding indoor flying to their regular CL and RC activity. The emphasis is heavy on Indoor Stunts because of drifty conditions in the hangars where they fly. However, the club co-sponsors two indoor meets annually, at locations where flying conditions permit other events. For more club information, write Dan Wanser, 514 Beach 45 St., Far Rockaway, N.Y. 11691.

Light indoor model joints use the least glue but must have perfect joints as shown.

**Balbo Wood Joints:**

The recurring question about indoor models is how to make strong, tight joints in balsa wood. Two basic principles are involved: proper fit between the pieces and proper choice of glue. Proper fit means that the two pieces of wood must touch all along the joint, with no open spaces left to fill up with glue (see sketch). Glue which fills the cracks adds weight out of proportion to the added strength.

Almost any commercial model or household cement (except special plastic cements) is good for balsa; however, it must be slow-drying. Joints in wood get their strength from glue which soaks deep into the fibers and holds them all together. Fast-drying glue hardens without penetrating, thus only the top surface of the wood is involved in the joint.

For ultralight indoor models, so little glue is needed that it is made very thin and applied with a hypodermic needle to control the amount applied. Use dope thinner with a little ammonium nitrate added to thin out the glue; then experiment with scraps of balsa to get the right mixture for proper drying speed. The same material can be used on heavier models. A small, pointed brush is used to apply the glue. Coat the parts before joining, set them in place and let the first coat dry. Add several more coats of the thin glue. This makes stronger joints with less weight.

Let's have club information. Write F/F Tenny, Box 545, Richardson, Tex. 75080

Dan Domina, a strong Paper Stick competitor, watches his model climb for altitude.
Since you put your best into what you make.

MODEL SPECIFICATIONS:
.09 TO .15 ENGINE, 40 INCH WING SPAN, 320 SQUARE INCH WING AREA, MEETS 1/4 MIDGET RACING SPECIFICATIONS.

KIT INCLUDES METAL COWL, FULL COLOR DECALS, QUALITY MACHINE CUT BALSA, PRICE $21.95

VINTAGE AIRCRAFT
FROM OUT OF THE PAST...

Write for new Catalog
P.O. Box 454
Boca Bay, Oregon
Small Orbit transmitter requires practice to appreciate wheel steering, left-hand throttle and shift controls. Several bodies are available for Dynamic’s car.

Orbit “Cobra” with Dynamic Porsche 917

George Siposs

Back in the early days of radio control, Orbit Electronics, with Bob Dunham at the helm, was one of the pioneers. Reed or digital proportional, those black transmitters could be found in the hands of many early RC pilots.

In response to the terrific upsurge in RC car activity Orbit again has pioneered, this time with a set designed specially for cars and with features that reflect an in-depth understanding of human engineering. It is aptly called the Cobra. (Remember the world-beater Cobra-Shelby race cars a few years ago?) Its concept was influenced by the MATS and Toledo shows, where the number of cars convinced even skeptics that a new era in racing has arrived.

Our Cobra was one of the early production models, complete in every respect but not supplied in a fancy box. It was installed in a Dynamic ¾ scale car, the battery fully charged overnight, and then tested on one of Southern California’s popular tracks. The system’s frequency is 27.045 (red). This is of no real consequence because the set comes with a set of four spare crystals, and the transmitting frequency can be changed by simply unplugging and replacing the crystals. Thus, during a typical race, a car can be assured of a spot in the starting lineup instead of being “married” to a frequency. A full set of flags is available, so that the set can be completely changed over and complying with regulations in a matter of seconds.

Our transmitter is black with a checkered design and has no unnecessary embellishments. This no-nonsense design is meant to take abuse during a hard-fought race day. The transmitter has a meter, and the on-off switch is out of the way where it cannot be tripped accidentally. The three-spoke design steering wheel is much easier for beginners to learn to use. The wheel allows more feel and resolution than a gimbaled stick. Steering trim is electromechanical and is in an easy-to-reach location above the wheel.

The left hand holds (actually cradles) the transmitter and, thus, the left index finger finds the spring-loaded throttle lever very easily. Below the throttle is another lever, used for cars which have a shiftable gearbox or torque converter. The center position of this lever has a spring detent to locate neutral.

Located in a slanted position on the upper edge of the transmitter, the antenna is automatically in a vertical position when the transmitter is held most conveniently. This assures maximum power output and is not a hazard to nearby drivers who stand elbow to elbow while racing.

The layout inside the transmitter is uncluttered, the PC board sits neatly (Continued on page 76)

Torque converter has effect of infinitely variable gear ratios from infinity (which is out of gear) to 6.6 to 1, fully engaged. Decoupling in a spin takes practice; you must be quick. Drag race starts are nifty; can lay a strip of rubber spinning the tires. Akerman steering system is fully adjustable.

In addition to all-plastic transmitter, two most significant features of this radio are interchangeable crystals shown at left—an essential feature for serious racing. Another feature is super-fast PS-3 servo with very thick gears, as shown. Incidentally, while NiCd’s are used with receiver, the dry transmitter battery seemsly lasts forever.
MORE THAN SEVEN THOUSAND were built, yet it doesn't stand out as one of the major types in the history of military aviation. Produced as both a bomber and a fighter, it entered service before Pearl Harbor and remained operational to the end of the Second World War. Yet few, aside from those who flew the Douglas A-20 or one of its many variations, remember the type as anything more than a familiar light twin that did many jobs well, but never did anything really spectacular.

Perhaps because of its origins the Havoc or Boston, or whatever you want to call it, is something of an under-appreciated airplane. It began as the Douglas Model 7A, a company project intended to be the U.S. Army Air Corps' first twin-engined attack bomber. The original 7A never was completed, but the 7B flew for the first time late in 1938, at more than 300 mph—quite a speed for bombers in those days. It was not only fast, but it also was unusually well-armed, with eight .30-cal. machine guns in the B version and an additional four in the solid nose of the A version.

While the airplane looked highly promising to the USAAC, the first orders came from the French who contracted for 380, highly modified in light of what had been learned in the Spanish Civil War. Known as the DB-7, fewer than half of those ordered were delivered to France before that country fell to the Germans, and hardly any of those planes got into action. By a variety of routes, a large number of them came to the Royal Air Force, where they were pressed into service as trainers, bombers and fighters, including some of the first radar-equipped night fighters.

Because of the desperate need for night fighters to hold off the German He-111s, Ju-88s and Do-217s, the British tried novel ideas, including trailing a bomb behind the Pandora version of the Havoc I, in hopes of dragging it into low-flying bombers. More practical was the Turbinlite, a monster searchlight grafted onto the nose of a Havoc in place of the far more graceful solid or clear nose. The intention was to light up enemy aircraft so that they could then be shot down by single-engined fighters. Before the system was fully developed—if, indeed, it ever could have been—airborne intercept radar came into being and the bulky light was replaced by strange collections of antennas.

All the while the British were enthusiastically using the trim Douglas fighter/bomber, the U.S. was moving ahead with its plans. The first A-20A's were ordered in July 1939, and deliveries commenced in 1940. By 1941, as the war in Europe gained intensity and U.S. entries neared, orders for the machine poured in from not only the USAF and the RAF, but also from European governments-in-exile who were fighting from British bases.

As the airplane saw more action, it was continually modified. Armament was increased, as was the bomb load. To handle the rapidly increasing weight, the original Pratt & Whitney R-1830 Twin Wasp engines of some 1100 hp. were replaced by Wright R-2600 Cyclones of 1600 hp. Early problems with directional stability were corrected by enlarging the vertical tail, thus changing its original highly tapered form to the more familiar squared-off shape.

By 1942, substantial numbers of A-20's were being sent to the USSR, some of them for the Soviet Navy's use as torpedo bombers. In all, nearly 3000 went in the airplane-hungry Russians. Most of these planes were A-20G's with heavy...
batteries of guns in the nose, which made them highly effective against tanks and other heavy ground targets.

The RAF's successful use of modified bombers for night-fighting purposes did not escape the notice of the USAAF, and about 270 A-20's were converted into what was then the Army's heaviest fighter plane, the P-70. The first of these carried four 20-mm cannon in a special package under the fuselage. The P-70 was used primarily to train pilots who eventually were assigned to the North.

(Continued on page 58)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-20—first production version for USAAF; Wright R-2600-7 engines; 59 converted to P-70, 1 to XF-3, 2 to YF-3.</td>
<td></td>
</tr>
<tr>
<td>A-20A—143 built with R-2600-3 engines.</td>
<td></td>
</tr>
<tr>
<td>A-20B—1 A-20A tested with three power turrets.</td>
<td></td>
</tr>
<tr>
<td>A-20C—948 built with Wright R-2600-11 engines.</td>
<td></td>
</tr>
<tr>
<td>A-20D—47 A-20A similar to RAF Boston III, Wright R-2600-23 engines.</td>
<td></td>
</tr>
<tr>
<td>A-20E—1 A-20A, one 37 mm cannon, two power turrets.</td>
<td></td>
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<tr>
<td>A-20F—2850 built with Wright R-2600-23 engines.</td>
<td></td>
</tr>
<tr>
<td>A-20G—412 as A-20G with 1700-hp Wright R-2600-29 engines.</td>
<td></td>
</tr>
<tr>
<td>A-20H—450 built as A-20G with bomber nose, 169 to RAF as Boston IV.</td>
<td></td>
</tr>
<tr>
<td>A-20K—439 built as A-20H with bomber nose.</td>
<td></td>
</tr>
<tr>
<td>A-20L—1 A-20A built for U.S. Navy.</td>
<td></td>
</tr>
<tr>
<td>B-3—prototype, fighter nose, P&amp;W R-1830 engines.</td>
<td></td>
</tr>
<tr>
<td>B-3A—prototype, fighter nose, P&amp;W R-1830 engines.</td>
<td></td>
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**Dimensions**

<table>
<thead>
<tr>
<th></th>
<th>Havoc I</th>
<th>P-70</th>
<th>A-500-45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wingspan</td>
<td>61' 4&quot;</td>
<td>61' 4&quot;</td>
<td>61' 4&quot;</td>
</tr>
<tr>
<td>Length</td>
<td>48' 11 1/2&quot;</td>
<td>47' 7&quot;</td>
<td>48' 0&quot;</td>
</tr>
<tr>
<td>Height</td>
<td>15' 10&quot;</td>
<td>17' 9&quot;</td>
<td>17' 7&quot;</td>
</tr>
<tr>
<td>Wing Area</td>
<td>465 sq. ft.</td>
<td>465 sq. ft.</td>
<td>465 sq. ft.</td>
</tr>
<tr>
<td>Empty wt.</td>
<td>11,400 lbs.</td>
<td>16,030 lbs.</td>
<td>17,200 lbs.</td>
</tr>
</tbody>
</table>

**Performance**

<table>
<thead>
<tr>
<th></th>
<th>Havoc I</th>
<th>P-70</th>
<th>A-500-45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top speed</td>
<td>295 mph</td>
<td>329 mph</td>
<td>317 mph</td>
</tr>
<tr>
<td>Service ceiling</td>
<td>25,800'</td>
<td>28,250'</td>
<td>25,000'</td>
</tr>
<tr>
<td>Range</td>
<td>996 mi.</td>
<td>1040 mi.</td>
<td>1025 mi.</td>
</tr>
</tbody>
</table>

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American Aircraft Modeler 41
Douglas BOSTON/HAVOC

42 November 1970
Over 7000 of the Douglas A-20 were built for the RAF, USAF, and many governments in exile who were fighting from bases in England. Armaments, details, and missions varied in seemingly endless combinations. When, in 1944, production halted, the A-26 (a larger, faster brother) began rolling from the Douglas line.
Some New Billing Boat Kits From Kayeff

All With Planked Hulls

Denmark's Finest Sail Boats

Kiwi - Yawl

Viking Ship Kit, Complete. This exciting new kit by Denmark's Finest Models features planked hardwood hull, and is an authentic reproduction, scaled down to 26" long by 6½" wide. - $16.00


Excellent quality construction kit. 22½" long by 19½" high, includes ribs, plank, and fittings. Cloth for sails. Complete kit, including fittings - $11.00.

Pirate Racing Yacht

Approx. 24½" long, 33" overall height. Mast 27" high. Excellent quality wood construction kit including plate, ribs, and planking. Detailed instructions and plans. Complete with sails, metal keel, and fittings - $10.00.

Bluenose. 35½" long, 27" high. Beam 5½" with all fittings - $52.00.

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Santa Maria. 21½" long, 17½" high, 5½" beam. With fittings - $41.00.

Danmark Training Ship. 35½" long, 23½" high, 5½" beam. With fittings - $75.00.

Wasa Warship from 1628. 23½" long, 23½" high. Complete with fittings - $41.00.

Norske Love Norwegian Lion. 40½" long, 36½" high. With fittings - $101.00.

From Billings:

Denmarks Finest Models

"KRABBNKUTTER"
German Shrimp Boat
The newest kit in an ever growing list of easy but challenging kits. This one makes a 20 inch long model with planked hardwood hull, brass fittings; all gear, included, dip nets.

KIT, COMPLETE with fittings — $27.00


VEDETTE — Model of a luxury power launch, about 30" in length, makes a beautiful display piece. Planked hull construction. Complete with fittings — $19.00.


VIKING SHIP (DMI) — Beautiful model of authentic Viking Ship, About 20" in length, complete with sail and decorative side mounted shields — $6.00.

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See Your Hobby Dealer... or send $1.00 for Colorful Catalog. Dozens of beautiful models; some advertised in recent issues of this magazine. If dealer does not stock, send check or money order for direct, prompt shipment. California orders must add 5% sales tax. Satisfaction guaranteed.
WORLD ENGINES R/C
RECOMMENDED SERVICE EXPERTS

WORLD ENGINES
DIGITAL

SERVO NOTES
The S-4C replaces the S-4, S-4A, S-3
series and works with Controlaire
M.A.N., 0.5, Digital Systems. The 5-48
is a 55th and costs $35,000 for 72 MHz and $25.00
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and costs $275.00
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w/2 servos and Tx nickel cadmium + Charger (assem.) $199.98
OS 3 Ch. Digital Propo w/3 servos and Tx nickel
and costs $275.00
OS 2 Ch. Digital Propo w/4 servos and Tx nickel
cadmium + Charger (assem.) $275.00

SERVICE EXPERTS
The service experts listed in this advertisement
are for the most part, people who have been
working with Digital and other kit systems
in the various areas maintained. They have all
put together an M.A.N. System from a raw kit and
have agreed to stock parts that are compatible
with World Engines Systems. They have been
given schematics of basic Engine Systems and
current O.S. Digital Proportional Systems. Many of
these service experts service other makes of
R/C equipment other than our own. Consider these
people for repair work or fa help in matching up
our flight packs.

WORLD ENGINES R/C
INCORPORATED
969 ROSSABEACH CINCINNATI, OHIO 45236
To the PR men involved, it was the biggest National Model Airplane Championships ever. Among contestants and officials, the consensus was that this was the best Nats ever. Producing the combination of biggest and best took some doing—good planning, innovations, excellent personnel, and a few breaks—including fine weather.

The statistics are impressive. One thousand, one hundred and forty-nine contestants, plus 395 mechanics. That compares with 1,074 contestants and 428 mechanics at Willow Grove (Pa.) in 1969 and 1,184 contestants and 217 mechanics at the previous Glenview Nats in 1966. There were 1,050 contestants entered in advance, by mail, for the 1970 Nats; 99 more registered at Glenview on late entries.

There were more events than ever before—42 this year, compared with 38 in 1969. The increase was accommodated without increasing basic Nats staff and facilities, although the workload went up for the AMA people directly involved.

The event breakdown by category: Control Line—18, Free Flight—13, Radio Control—5, Indoor—5. Great Weather. A short storm cut off RC Pylon qualifications about an hour early one day, but the weather otherwise did not interrupt flying—although winds during the first two days made Free Flight retrieving tough. It was always hot, sometimes windy. But one glorious day for Free Flighters the weather was so good that, despite hundreds of flights with dozens of mixes, there were no lost models—practically all stayed on the field, and events closed early because all flights were in, including some seven and nine flight flyoffs.

RC Scale had two great half-days of excellent weather—a total of ten hours shared by the 28 entrants who actually flew. Many got in four flights—highly unusual for Nats—and all could have had that many. Truly spectacular was the fact that two B-36 entries (that's twelve engines!) got in five flights between them, without mishap. Even so, RC Scale was won by a single-engined Spirit of St. Louis. It was the first Nats for builder-flyer Ed Ellis (Dearborn, Mich.) so the old pros took a back seat.

Single-engine entries dominated the RC Scale event, taking the top five trophies. But Ken Drummond (Oriental, Ohio) won the Best Scale Flight Achievement award with his B-36 which dropped bombs with amazing accuracy—including one less than ten feet away from the judges.

Ken and Walt Burgin (Ottumwa, Iowa) (Continued on page 56)
NATIONAL CHAMPIONS

Grand Champion
Bucky Servaites, Dayton, Ohio
Junior
Marty Thompson, Livermore, Calif.
Senior
Brian Webster, Manchester, Tenn.
Open
Bucky Servaites, Dayton, Ohio
Control Line Category
Danny Bartley, High Point, N.C.
Free Flight Category
Bucky Servaites, Dayton, Ohio
Indoor Category
James Richmond, Oak Brook, Ill.
Radio Control Category
Larry Levanard, Northbridge, Calif.
AMA Club Team
Chicago Aeronuts (Charles Markos, Richard Lyons, James Richmond, Charles Sotich and Robert Watson)
Nats Team
USAF Champions (Robert Adair, Keith Trostle, Hoyt Hawkins, Burt Dugan and Philip Beale)

PERPETUAL TROPHIES & SPECIAL AWARDS

Tulsa Glue Dot (high time achievements of each country)
Aldo Gilder (top points awarded to each club)
Westwood (high scores in each country)
Willard Coach (remote control)
Tulsa Glue Dot (high scores in each country)
Hoffman Memorial (high points awarded to each country)
Jim Walker (high points awarded to each country)

1970 NATS SPONSORS

Approximately 600 awards were provided through the contributions of the following:


NATS ENTRIES

<table>
<thead>
<tr>
<th>Event</th>
<th>Jr. Entries</th>
<th>Sr. Entries</th>
<th>Open Entries</th>
<th>Total Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Line</td>
<td>22</td>
<td>28</td>
<td>132</td>
<td>182</td>
</tr>
<tr>
<td>Free Flight</td>
<td>24</td>
<td>45</td>
<td>120</td>
<td>189</td>
</tr>
<tr>
<td>Indoor</td>
<td>112</td>
<td>107</td>
<td>751</td>
<td>970</td>
</tr>
<tr>
<td>Radio Control</td>
<td>8</td>
<td>11</td>
<td>17</td>
<td>36</td>
</tr>
</tbody>
</table>

NATS ENTRIES

Jr. Sr. Open Total

Open

1. Bucky Servaites 114.49
2. B. Servaites 116.38
3. B. Servaites 118.02
4. B. Servaites 120.91
5. B. Servaites 123.01

Junior

1. Bucky Servaites 116.49
2. B. Servaites 118.38
3. B. Servaites 120.29
4. B. Servaites 122.91
5. B. Servaites 125.01

Senior

1. Bucky Servaites 118.49
2. B. Servaites 120.38
3. B. Servaites 122.29
4. B. Servaites 124.91
5. B. Servaites 127.01

Saturday

1. Bucky Servaites 116.49
2. B. Servaites 118.38
3. B. Servaites 120.29
4. B. Servaites 122.91
5. B. Servaites 125.01

CONTROL LINE

1/2 A SPEED

Junior mph
1. Bucky Servaites 96.51
2. B. Servaites 99.21
3. B. Servaites 102.91
4. B. Servaites 105.61
5. B. Servaites 108.31

Senior mph
1. Bucky Servaites 98.51
2. B. Servaites 101.21
3. B. Servaites 103.91
4. B. Servaites 106.61
5. B. Servaites 109.31

Open

1. Bucky Servaites 118.49
2. B. Servaites 120.38
3. B. Servaites 122.29
4. B. Servaites 124.91
5. B. Servaites 127.01

A SPEED

Junior mph
1. Bucky Servaites 118.49
2. B. Servaites 120.38
3. B. Servaites 122.29
4. B. Servaites 124.91
5. B. Servaites 127.01

Senior mph
1. Bucky Servaites 120.49
2. B. Servaites 122.38
3. B. Servaites 124.29
4. B. Servaites 126.91
5. B. Servaites 128.81

Open

1. Bucky Servaites 130.49
2. B. Servaites 132.38
3. B. Servaites 134.29
4. B. Servaites 136.91
5. B. Servaites 138.81

B SPEED

Junior mph
1. Bucky Servaites 160.49
2. B. Servaites 162.38
3. B. Servaites 164.29
4. B. Servaites 166.91
5. B. Servaites 168.81

Senior mph
1. Bucky Servaites 162.49
2. B. Servaites 164.38
3. B. Servaites 166.29
4. B. Servaites 168.91
5. B. Servaites 170.81

OPEN STUNT WINNERS

Keith Trostle exhibited in the Air Show. His original design has Focke Wulf Tu 135 looks

CONTROL LINE

1/2 A SPEED

Junior mph
1. Bucky Servaites 96.51
2. B. Servaites 99.21
3. B. Servaites 102.91
4. B. Servaites 105.61
5. B. Servaites 108.31

Senior mph
1. Bucky Servaites 98.51
2. B. Servaites 101.21
3. B. Servaites 103.91
4. B. Servaites 106.61
5. B. Servaites 109.31

Open

1. Bucky Servaites 118.49
2. B. Servaites 120.38
3. B. Servaites 122.29
4. B. Servaites 124.91
5. B. Servaites 127.01

A SPEED

Junior mph
1. Bucky Servaites 118.49
2. B. Servaites 120.38
3. B. Servaites 122.29
4. B. Servaites 124.91
5. B. Servaites 127.01

Senior mph
1. Bucky Servaites 120.49
2. B. Servaites 122.38
3. B. Servaites 124.29
4. B. Servaites 126.91
5. B. Servaites 128.81

Open

1. Bucky Servaites 130.49
2. B. Servaites 132.38
3. B. Servaites 134.29
4. B. Servaites 136.91
5. B. Servaites 138.81

B SPEED

Junior mph
1. Bucky Servaites 160.49
2. B. Servaites 162.38
3. B. Servaites 164.29
4. B. Servaites 166.91
5. B. Servaites 168.81

Senior mph
1. Bucky Servaites 162.49
2. B. Servaites 164.38
3. B. Servaites 166.29
4. B. Servaites 168.91
5. B. Servaites 170.81

JET SPEED

Junior mph
1. Bucky Servaites 160.49
2. B. Servaites 162.38
3. B. Servaites 164.29
4. B. Servaites 166.91
5. B. Servaites 168.81

F/AI SPEED

Junior km/h
1. Bucky Servaites 100.23
2. B. Servaites 102.12
3. B. Servaites 104.01
4. B. Servaites 106.91
5. B. Servaites 108.81

November 1970
Danny Bartley, a Senior age class entry, did some very fast Speed flying to become the Control Line Category Champion. B Proto model shown—146.40 mph Sr., first.

Ed Sensenbaugh’s Carrier II Guardian in foreground is powered by a Supertigre III ABC engine and 8-10 prop.

Left, Senior Stunt flight just beginning by Miss Dawn Cosmillo—original design. Right, the Roselle-Frye team maintained their superiority in C Speed, and this year they also won B. II engine is original, similar to TWA.

Lots of man-hours went into the PT-19 Cl Scale model of AMA VP Bill Boss. Three years in construction, it placed 5th.

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Hello!

These are busy, busy, busy times! The reception of our Commander R/O Packs continues to be utterly fabulous. The demand is increasing, which pleases us greatly, because it indicates that you have found that they combine the simplicity of installation with operational and maintenance, with the sophistication in reliability, the high efficiency aspects. This is indeed a new age that any manufacturer has offered these very adaptable, versatile units which are completely designed to work as systems. These are no longer any hodgepodge of unrelated components which are put together with baling wire and a prayer.

The wings have undergone development and testing for well over two years. The airfoil as used is especially designed for use in fuel economy, provides great flexibility with high strength, and has 2 bead which provides exceptionally light weight at the same time.

They were developed by Owen Kampen, and Owen is well known for the flyability of his planes. The wing will work as is, or the modifications with your order for the constant chord wings. Both the Citabria and Dick's Dream use constant chord.

We are listing below all of the components that are required for an ultra light weight installation, and you can select your handful of pleasure to fit your application.

**COMMANDER MICRO GEM RECEIVER**

The Micro Gem is available in two models. This is a proven design of which thousands are in satisfactory use throughout the world. The receiver measures 1 1/2 x 1 1/2 x 1 1/2 inches. Weight of the bare receiver less hook-up wires is 2 ounces. With light weight hook-up wires it is .7 ounces. Operation is on 2.4 volts with phenomenal range. The two models are the DE, which has a double switch to feed into the Adams style actuator, and the SB, which is designed for the Bentel style of actuator only.

No. 12K2—Commander DE Gem Rx $31.50

No. 12K3—Commander SB Gem Rx $30.75

(Both available all 27 MHz except 27.255.)

**COMMANDER R/O TRANSMITTER**

The foregoing receivers are compatible with our Commander Pulse Transmitters. Requires 9 volt battery of any type M1603 type.

No. 11K1—Commander R/O Tx $42.50

(Available all 27 MHz except 27.255.)

**SUN ROUTE**

Non-rechargeable 1 1/2V. Good for 60-90 minutes with Gem and Bentert. Only 3 grams.

No. 10K2—Sun Route 1.25V. Only 3 grams.

**MALLORY MS76 SILVER OXIDE**

Non-rechargeable 1.2V. Good for 60-90 minutes with Gem and Bentert. Only 3 grams.

No. 10K2—Mallory MS76 Oxide 1.2V. Only 3 grams.

**50 BUCK BUCKET**

Rechargeable 1.25V. Only 3 grams.

No. 10K2—50 Rechargeable 1.25V. Only 3 grams.

**MA BUTTON NICAD**

Rechargeable 1.25V. Only 8 grams.

No. 10K2—1.25V. Only 8 grams.

**24V/1000 PACK**

Two of above 1000 cells stacked for 24V pack with tab, Model 63/64 x 1/2".

No. 10K2—24V/1000 Pack $3.65
RUDDER ONLY PULSE IS:

- FULLY PROPORPORTIONAL!
- LIGHTEST—2.5 oz. for Baby
- LOWEST COST—Packages include ALL batteries; airborne pack uses nickel cad batteries for reliability and dependability; need only recharging.
- SIMPLER—only one moving part, noise free
- VERSATILE—arrange to suit your particular installation. You can go up in size or down in size. You can even go anti-micro and mini, and not obscure your transmitter or basic model. Simple changes of battery and actuator allow a variety of installations. Motor control can be easily added to larger units.
- EASY to install
- GREAT for Beginners—CHALLENGING to the pros.
- FUN!

WITH ALL BATTERIES!

COMMANDER R/O PULSE PACKAGES

Ideal for Beginners and Sport Flyers

Now available in four sizes!

The Commander R/O packages contain the Commander DE 2.4 superhet receiver, Commander Pulse Transmitter, Adams actuator, the equipment of your choice, and nickel cads, wired with on-off switch. AND each package saves you $10.00 over buying components separately.

The R/O Packages are available in four sizes to fit most sporting needs from the smallest to the larger aircraft or boats. Ready for installation, completely wired and tested. The Baby is for .010 to .020 jobs. The Twin Baby is for .030 to .050 jobs. As above, except uses Twin Baby actuator. Airborne weight is 2.9 ounces. The Standard uses the Single Adams for more power for .049 to .07 size. Uses larger capacity nickel cad batteries. Airborne weight is 4.5 oz. The Stomper uses the Twin Adams actuator for up to .15, can be boosted for use with .19. Airborne weight is 4.9 oz.

ACE FOAM WINGS

Here are the 35" span foam wings that were the hit of the Atlanta, Oklahoma City, and Toledo trade shows. Ideal for twin size models in two configurations—constant and tapered. The airfoil is especially designed for small aircraft, and is semi-symmetric.

They were developed by Owen Kampen, working in conjunction with the late Dick Adams.

The constant chord section is 35" span, center 5 1/2", which tapers to 4", and has a total area of 166.25 square inches. Weight is just over 3 oz.

Wings come in two pieces of 17.1 oz. They may be easily epoxied for the correct dihedral. May be used unfinished or finished with a polyurethane varnish, or striped with Monokote for trim.

The constant chord section may be used with the Dick's Dream with slight modifications on the fuselage (we have plans for these mods, but you must request it). Options works by adding 1/2" strip to the top of the constant section. Taper section may be used with design previously published.

Also lends themselves excellently for the home-built builder who wants a proven and tried airfoil which will provide satisfaction and service.

Fun and light—wet foam; a real breakthrough! Makes planes which are for the Cox Motor—Commander Baby = Baby Twin R/O packages.

No. 13L166—Ace Foam Taper Wing $2.95
No. 13L192—Ace Foam Constant Wing 2.95

COMMANDER CHARGERS

No. 34K4—Commander Baby Charger $4.95
No. 34K5—Commander Standard-Stomper Charger 4.95

NICKEL CAD TX BATTERY PACK KIT

If you are a regular flyer of your Commander system, you have found that the transmitter battery does go down fairly fast. This is because this is a powerful transmitter. If you want to avoid the continuing and also assure yourself with a reliability and dependability on your transmitter that you have your receiver nickel cad.

We have a completely assembled battery which measures 1 3/8" diameter by 2 1/4" long. Has lugs for easy attachment of wires. Made of seven 500 MAH nickel cadmium type batteries. 8.75 volts. W.r. easily to the Commander series of transmitters. Comes complete with charging jack and mounting hardware in kit. Check dimensions of your case for use in other transmitter(s).

No. 38H74—XL-ent K9V Transmitter $10.00 Nickel Cad. Battery Supply Kit

(If you order this at the same time as your Commander Pack, we will install, Request installation on your order, and it will be done without charge.)

PLANE'S JUST FOR FUN!

Easy to build, easy to maintain, and low in cost and upkeep, this new breed is fine for beginners. And more and more of the big plane flyers are joining in on the fun so they keep their hands in—or teach their youngsters.

To help Fun Plane along, Ace is offering two plans now. More later. These are full size with enough details to allow almost anyone with just a bit of experience to build and fly. They are designed specifically for radio gear of no more than 3 ounces—and here’s where the new Commander R/O Baby Twin pack comes in. Just right and proven dependability!

Rudder-Only does allow you much more than simple steering—you can do loops, spirals, Split S, and many more. You can gain or lose attitude simply by widening or tightening your turn.

DICK'S DREAM

This 34" job is designed by Owen Kampen. Named for the late Dick Adams who developed the magnetic actuators. Essentially this is a scaled down Whiz Kid, but has a few features designed especially for this size plane. Easy construction. Plan is full size.

No. 13K29—Dick's Dream Plans $1.00

CITABRIA

This semi scale is a design by Roman Bukolt. Has 34" span and features simple flat construction. Another eye catcher at the Toledo Conference. Full size.

No. 13K30—Citabria Plans $1.00

COMMANDER GALLOPING GHOST

Rudder, Elevator, Motor—One Actuator

No. 11G18—Commander Ghost $110.00

COMMANDER FAST PULS PACK

Rudder, Elevator, Motor—Two Actuators

No. 10G19—Commander Fast Puls $139.00

All 27 MHz frequencies, except 27.255.

Radio Control 301 Higginsville, Mo. 64037
Radio Control

D Pattern Qualifying

Jr.-Sr.-Open Points
1. Jim Kirkland 14140
2. James Edward 14085
3. Philip Knarr 14025
4. James Wherry 14000
5. Larry Leonard 13880
6. Don Coleman 13700
7. Ron Chidley 13660
8. Norman Page 13555
9. Janie Mathes 13550
10. Terry Romelti 13445
11. Donald Lowe 13220
12. James Oddino 13085
13. William Delkow 13025
14. Douglass Hovde 12920
15. Larry Smelley 12800
16. George Hill 12800
17. Allen C. Johnson 12800
18. James H. Kenneally 12800
19. John H. Mullen 12800
20. Robert Stockwell 12800

Sc.-Sr.-Open Points
1. Larry Leonard 13890
2. Don Coleman 13735
3. Ron Chidley 13660
4. James Oddino 13550
5. Don Coleman 13500
6. John H. Mullen 13445
7. Larry Smelley 13220
8. George Hill 13085
9. William Delkow 13025
10. Douglass Hovde 12920
11. Larry Smelley 12800
12. George Hill 12800
13. Allen C. Johnson 12800
14. James H. Kenneally 12800
15. John H. Mullen 12800
16. Robert Stockwell 12800
17. Don Coleman 12800
18. James Oddino 12800
19. William Delkow 12800
20. Larry Leonard 12800

A Pattern

Jr.-Sr.-Open Points
1. Bertken/Smith 210
2. Alvin Sager 190
3. Vernon Smith 180
4. Larry Leonard 160
5. Robert Upton 150

Best Junior

Ken Ehmke

Best Senior

Bryan Sattler

Pylon Formula I

Jr.-Sr.-Open Points
1. Bertken/Smith 210
2. Alvin Sager 190
3. Vernon Smith 180
4. Larry Leonard 160
5. Robert Upton 150

Best Junior

James H. Kenneally

Best Senior

Bryan Sattler

Pylon Formula II

Jr.-Sr.-Open Points
1. Bertken/Smith 210
2. Alvin Sager 190
3. Vernon Smith 180
4. Larry Leonard 160
5. Robert Upton 150

Best Junior

James H. Kenneally

Best Senior

Bryan Sattler

Scale

Jr.-Sr.-Open Points
1. Ken Drummond 1600
2. Donald Miller 1500
3. Richard Graham 1480
4. Robert Upton 1460
5. Larry Leonard 1450

Best Junior

Bryan Sattler

Best Senior

Lois T. Ehmke

Flight Achievement

Kenneth Drummond

Above, Formula I start—Bud Phillips and Bud Faber in foreground. "Sandbagging" at the start was common. Right, it's nice to see RC Pylon togetherness when Lois and Brian Ehmke...
New in RC D Pattern this year, but certainly not new in aerobatic flying is Jerry Worth. Many recognize him for his CL stunt efforts. Larry Leonard cleans up his Formula II Skyvonic with which he placed first. He is the RC National Champion for the second year in a row.

Special thanks go to the Hewlett-Packard Co. and Collins Radio Company for loaning equipment (and training operators) for monitoring radio transmissions and possible interference.

Original model by Robert Eson placed 5th in D Pattern. It is powered by an Enya 60, KO muffler. Groupner plastic prop. Loss holds.

Ron Chidgey named his original D Pattern model "Tiger Tail." It has a foam wing, powered Lee Super 60 power, TP 11-7½ prop.

---

**INDOOR**

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<td>11:13.6</td>
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<tr>
<td>3. Larry Poster</td>
<td>11:18.3</td>
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<td>11:25.0</td>
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<td>13:16.2</td>
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**H.L. GLIDER**

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<td>4. Joe Smith</td>
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<td>5. Bucky Servates</td>
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<td>2. Al Redham</td>
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<td>4. Joe Smith</td>
<td>107.3</td>
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<tr>
<td>5. Bucky Servates</td>
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**SCALE**

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<td>4. Larry Poster</td>
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<tr>
<td>5. Michael Kuykendall</td>
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</table>

[Lowering Lights helped Indoor retrieval. Ed Stoll unhooks Paper Stick model here, placed 4th. Armory had good conditions.]

The most remarkable model was the Ford Tri-Motor Indoor Rubber Scale model by Ful-ton Hungerford. Won new St. Louis Award.
Left, Marty Thompson shows off the style which garnered him the Junior National Championship, VTO launch is of his Torp 40-powered Storduster 900, the beginning of one of the flights which placed him first in Class C. Right, former AMA president C. ©. Wright still competes vigorously in the Nats, FF Scale Antoinette launch shown.

Weighing Wakefield is Chris Matsuno. Pipe-mounted balance rig checks both total weight pylon of Charles Monson’s model. Vintage wing has “PAA” markings.

FREE FLIGHT—Outdoor

| GAS |
|-----|-----|-----|-----|
| Junior | Seconds | Points |
| 1. Michael Talhi | 505 | 500 |
| 2. Leon Cowl | 505 | 500 |
| 3. Brian Weller | 505 | 500 |
| 4. Ken Pender | 505 | 500 |
| 5. John White | 505 | 500 |

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<td>2. J. Oldfield</td>
<td>1000</td>
<td>1000</td>
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<td>3. John J.</td>
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<td>4. Michael Kuehne</td>
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<tr>
<td>5. Charles Molineau</td>
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<td>4. Michael Kuehne</td>
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<td>5. Keith Ogden</td>
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<tr>
<td>5. Keith Ogden</td>
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</table>

A number of Canadians entered the Nats, among them Lint Thomas, left, winding for Unlimited Rubber, and Willard Thompson, right, with A-2 Towline Glider. Peter Allbutt, another Canadian, was A-2 Towline both this year and last.

54 November 1970
**AMA News Extra**

**1970 CONTROL LINE WORLD CHAMPIONSHIPS**

Terrific is a word which describes the kind of flying U.S. team members did in the Control Line World Championships at Namur, Belgium, August 19-23. Our competitors placed first both individually and as a team in Speed and Aerobatics. In Team Racing, Russia swept the field, although America's Theobald/Barr was close behind in fourth, and the team finished second. Word is that Albritton/Marvin likely would have qualified for the Final Race had their first flight not been disqualified for a passing infraction. The official results:

**SPEED:** 1st--U.S.A.; 2nd--Russia; 3rd--France

<table>
<thead>
<tr>
<th>Pl.</th>
<th>Competitor</th>
<th>Country</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
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<td>Jim Nightingale</td>
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<td>Jackson</td>
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**AEROBATICS:** 1st--U.S.A.; 2nd--Czechoslovakia; 3rd--Italy

<table>
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<th>Pl.</th>
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<td>1</td>
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<td>U.S.A.</td>
<td>932</td>
<td>979</td>
<td>945</td>
<td>1,924</td>
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<td>Bob Gieske</td>
<td>U.S.A.</td>
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**TEAM RACING:** 1st--Russia; 2nd--U.S.A.; 3rd--Great Britain

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<th>2nd Heat</th>
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<td>Russia</td>
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<td>Russia</td>
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<td>10:05.3 disq.</td>
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By special arrangement with the publisher this page is produced at the very last minute, just before the magazine is printed, to bring you the latest news concerning current Academy of Model Aeronautics events of national significance.
1970 Nats

(Continued from page 47)

- the other 2-36 entrant also showed excellent start-engine performance. The engines consistently started all six engines in each plane in a minute or less, in contrast to some single-engine engines which missed a turn when they couldn't get started within two minutes.

Interesting from complaint from some RC Scale contestants: they hardly had time to clean up and refuel after one flight before being up for the next.

RC Pattern contestants were generally happy about how their part of the Nats turned out. D Pattern (PAI) contestants got eight rounds of qualification flying in plus three rounds in the finals. A and B Pattern flyers got four rounds.

The shared-time concept for Nats RC, originated by Ed Shippe (Santa Barbara, Calif.), was developed in detail by the overall RC Director. See the July 1970 issue. It proved to be all that was promised, making possible the flying of Pattern, Scale and Pylon Racing on two days instead of three days, thus permitting the addition of A and B Pattern to this year's Nats.

Another innovation for Nats RC was the use of grandstands for Pattern and Pylon flying. It was particularly beneficial for those viewing the climaxing four hours of Pylon flying. Extremely close races, a good view, and loudspeaker commentary provided a tremendous excitement trend and cheering sections roaring constantly. The Pylon event officials did a great job of keeping the action moving constantly.

It was the greatest RC Nats yet, according to both contestants and officials. The main point seemed to be that everyone got a fair shake—that despite the minor inequalities that plague any large massed event flying was still available to fairly determine the winners. A common remark among the losers was that they couldn't blame the system this year.

Outdoor Free Flight benefited from major improvement over previous Nats. For the first time in many years the same crew of officials worked all the events, in contrast to the past when different event directors were used every day. This meant that the event quickly shook down to smooth and consistent operation.

Elimination of the first flight by noon rule of previous Nats proved to be a good thing, provided the event didn't fill up too fast. Fear of getting caught by the latter was effective in avoiding late starts which had been the original cause of instituting the noon rule in other years.

Free Flight, as usual, had the most contestants per event. Ten events had over a hundred entries each, and the three most heavily entered were Gas and HI, Glider and 300, A Gas and HI, Glider and 200, Coupe D'Hiver, a brand new event for this year, with 45 entries.

Score-board-type posting of results in all Free Flight events also contributed to contestant satisfaction. Entrants could view all standings at any time, so avoiding much confusion, uncertainty, and questioning of officials.

AMA HQ developed the special scoreboards which only doubled as event master recorders. As a result of the Nats success they are now being made available to all Contest Directors for general use—they are suitable for all categories of competition. Write to HQ for a sample and prices.

Safety was greatly increased in Free Flight at the 1970 Nats. Despite many years of previous trying, it has always been difficult to get cars parked upwind of the launching area. This year the entire area was surrounded with windbreaks, which generally were consistent in direction and also by officials who kept tighter rein on permissible launching areas.

Indoor had two good days of flying in near perfect draft-free air. As a result, despite a somewhat less than ideal site, performances were excellent. The top entry was 54 minutes 43 seconds flight in the Indoor Stick event—a fabulous achievement in a building with less than 100 feet in ceiling height. Richmond also placed first in three events to become the Indoor Category Champion.

Indoor also had some great hand-launched glider performances, with three entries averaging over one minute. Open Class entrants—Dennis Brezen (Lakewood, Calif.) came out on top with a two-flight total of 128.6 seconds, but Junior Champion Marty Thompson (Livermore, Calif.) was close behind with 118.2 seconds.

An incredible Ford Tri-Motor Indoor Scale model by Fulton Hungerford (Tuscaloosa, Fla.) had everyone amazed. Weighing only an ounce, it lacked nothing in performance. Its true scale construction inside and out—probably the most magnificent example of craftsmanship at the Nats. Its only weakness was in flying performance: otherwise, it was good.

Another unique Indoor model was the 42" Stick entry of Ron Plotke (Mt. Clemens, Mich.). This huge but graceful microfilm-covered model placed third with a 9 minute 22 second flight. It was an outstanding example of intricate cross-trussing and delicate construction techniques.

Scale Racing performances were dominated by the CL Category Champion Danny Bartley (Chicago, Ill.) and the CLN Category Champion Tom Bibb (Santa Barbara, Calif.) who topped 800 points. The next three were equally competitive, all with contesting points behind in the Category Championship race.

Scale Racing, better known as Goodyear, proved to be extremely popular in its first Nats appearance on the official events list. Most contestants had the event had to have a second circle added in order to get all the flights in. Open winner John Burnhart (Chicago, Ill.) was the top placer with a time of 7 minutes 17 seconds.

Combat, as in '69, was extremely crowded with 157 entries, which took every bit of time available to run off, especially in the Open age category which had 84 contestants. Past Nats experience of officials paid off in a smooth running event despite extreme pressure—only minor complaints and disputes were brought to the attention of officials by the most violently contested event at the Nats.

C Speed produced the fastest times of all Nats events, even topping Jet Speed. There were four C Speed flights of over 180 mph, led by the Roselle-Frye team (Dayton, Ohio) performance of 189.40.

Young Danny Bartley stayed right near the top, however, by recording the top C Speed flight of over 186 mph.

Control Line Stunt was treated to some new techniques in judging and event organization. Navy personnel were greatly impressed by the training session in which they were given judging instructions—a naval aviator on the scene remarked that the training was equivalent or superior to military flight instruction. It all paid off, as there were 93 contestants entered.

Carrier events also had more than a hundred contestants to contend with—Profile Control. Unfortunately, the circle layout was arranged for two carrier decks, and when a third couldn't be utilized due to the numbers involved there were problems with model launching and line processing arrangements which drew complaints. Otherwise the event proceeded smoothly.

Bucky Servaite (Dayton, Ohio) was again Grand and Open National Champion this year, as in '69. He also took home the new Free Flight Category Champion trophy. Bucky was the only one competing for Individual Champ who topped 800 points; the next three nearest were in the 700's.

Larry Leonard (Northridge, Calif.) is the 1970 Radio Control Category Champion. The combination was outstanding performance. He was up against tough competition (Continued on page 89)

Indoor Modelers—want results of the December CIAM meeting (with possible rule changes) in a hurry? Send stamped, pre-addressed envelope with request for same to AMA HQ—will be mailed as soon after the meeting as possible.

CONTEST CALENDAR

Official Sanctioned Contests of the Academy of Model Aeronautics


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DU-BRO DURA-HUB

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255S WHEELS 2½" 2.59 pr

275S WHEELS 2½" 2.70 pr

305S WHEELS 3" 3.15 pr

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365S WHEELS 3½" 3.59 pr

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DURA-HUB

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Dura Commander Specifications

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3. "LONG" INCH REACH

2-632 BLIND MOUNTING, STEEL NUTS—40¢

Dura Commander Specifications

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HAVOC
(Continued from page 41)

The U.S. Navy got into the act, briefly and unsuccessfully. Between one and four A-20A's were turned over to the Navy to be tested as BD-1's. An additional eight A-20B's became the Navy's BD-2, but none of them advanced beyond the research and development stage. The BD-1 designation reappeared in the early 1960's on the prototype light plane designed by Jim Bede and eventually marketed as the American "Yankee." Obviously, this was just a coincidence.

Of all the interesting variations of this Douglas airplane, the A-20G was the really important model, accounting for almost 40% of the total production. They all had the 1600-hp Wright R-2600-11 engines, but armament differed considerably. The A-20G-1 had four 20-mm cannon and two 50-cal. machine guns in the nose, a 30 mm 50 cal. machine gun alongside the nose, and a .30 cal. in the cockpit. Later, the four cannon were replaced by four more .50 cal. machine guns. Wing racks for up to 2000 lbs. of bombs were installed on the -20 and subsequent versions, along with a new power-driven rear top turret having two 50-cal. machine guns.

By the time the final A-20K was delivered to the USAAF in September 1944, a total of 7385 had been built. And while it was the end of the line for one proud airplane, it was the beginning for its successor, the Douglas A-26 Invader. The newcomer was larger, faster and more capable, with four .50-cal. machine guns in the nose, a .30 or .50 cal. machine gun in the rear cockpit, and a .50 cal. in the belly. The final version of the Douglas airplane, the A-20G, was the really important model, accounting for almost 40% of the total production. They all had the 1600-hp Wright R-2600-11 engines, but armament differed considerably. The A-20G-1 had four 20-mm cannon and two 50-cal. machine guns in the nose, a 30 mm 50 cal. machine gun alongside the nose, and a .30 cal. in the cockpit. Later, the four cannon were replaced by four more .50 cal. machine guns. Wing racks for up to 2000 lbs. of bombs were installed on the -20 and subsequent versions, along with a new power-driven rear top turret having two 50-cal. machine guns.

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that fit into hardwood holders like fixed LG legs. The outer end of each bar wire (wires and struts are 3/32" music wire) is bent to form a pivot point for the molded plastic piece which carries the wire wheel strut; the latter is fastened with two Allen-head set-screws.

Operating links are of 3/32" music wire, furnished in two lengths for each side of the wing, with a coupler, so the length be adjusted to the setup. Couplers then join the smaller wire halves permanently by soldering. A heavy bellcrank formed from 3/32" thick fiberglass-epoxy sheet is pivoted at the center of the wing; one operating link goes in each "ear" of the bellcrank, another link goes to the servo or power unit. The operating links are so arranged that the gears lock when down—link pivot points in the arm in line with bellcrank pivot. When retracted the gears do not lock, so they must be held in this position by the servo or power unit. Wheels should retract toward the center of the wing.

The P.M.W. PR-2 units come mounted on plates of 1/8" thick ply, measuring 2 1/2" x 6 1/2". These plates are attached to the wing's underside and spaced chordwise to allow room for chordwise retraction and a wheel well. The torsion-bar system is utilized, A guide rod must be soldered to the upper end of each strut. Strut and wheel are rotated 90 degrees as the gear moves up and down. The mechanism locks with wheels extended. Operating rods from each wing unit—units are made in right and left—join at wing center with the combined coupler and control horn. Necessary hardware is furnished for both types.

PR-1 units have no metal-to-metal joints; the PR-2 system has several. Plastic bushings are used at other points for isolation to prevent extended runs of metal parts from one wing to other. Rugged and quite simple in design and construction, these units have no spring compensation, so fairly potent operating sources are required.

ROWAN GAS-OPERATED system from Germany includes three quite similar wheel units, a small valve and a bottle of gas. Makers claim 60 to 70 system operations from one tank. Units are interconnected with tough plastic tubing, about 5/32" dia., and screw-on fittings. LG units are extremely simple with few parts: the nose gear unit differs only in having an attached aluminum bracket with linkage provisions for steering. Wheel legs are locked in down, but held up only by gas pressure; a spring in the cylinder forces gear down. All legs are easily adjustable for length and bent for wheels. Gas tank measures about 6" long and 1 1/4" dia.
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"The Fox 15 RC amazes me by how well it runs and how outstanding its carburation is. Idle and power superb. It's the ideal motor for our SIG Aero Sportster, Relic, Fleet Biplane, Stimson L-5, R-C Sport, Beaver and Stits Flutterbug. I recommend the Fox 15 RC for anyone who wants a 15. You can't beat it!"

MAX HESTER - 3 times Nationals RC scale winner... Internationals team member and winner of hundreds of RC scale and pattern contests. 45 years in the RC business. He is plant superintendent for Sig Manufacturing Company.

FOX 15x RC

Bore .590
Stroke .540
Wt. 10 oz.

$14.95

The Fox 15 RC has enough power to fly a full house proportional that will fit in your car or will do an outstanding job with pulse proportional systems.

Nelson Model Products (Rowan's distributor) can supply refillable valve for use with standard can of Freon, purchased locally. Valve assembly will cost about $4; cans of Freon, $2.

WING POST-TRAC UNITS are the only present ones to have a built-in electric motor. Practically the same unit is used for both nose and wing positions. godl gear may be mounted either horizontally or vertically, and is fully steerable. The new Olympic units require only two wires to each gear and have two simple SPDT switches for operation. All gears operate together, but each has built-in limit switches, as well as an electronic noise-shield suppression of electrical noise. They work on 3.5V (not center-tapped). There requires about ten sec. to retract, current running 200 to 350 ma. Several styles of 5/16" dia. wheel legs are available. Plastic dust covers are offered at extra cost. Units lock in any position because of the style of gearing used. Apparently, the maker feels it is sufficiently rugged to take inevitable abuse. Units are mostly plastic, including all gears except motor pinion.

CAS GEAR UNITS operate much on the same principles as the KDH (see Fig. 3) - all-metal and spring-loaded so that extra-powerful servos are not required. They are compact and have smooth action. Main gear legs do not have shock-absorbing coils in the wire, but the nose gear has a five-turn shock coil. All legs are easily replaceable by loosening two set screws. A single ordinary servo (no special 180-degree servo needed) will operate an entire trike gear setup. With spring assist and smooth action, this is possible. About 1 1/16" thrust movement is required for operation. Spring tension is easily adjustable for different wheel weights and a simple ingenious mounting scheme is included. With each gear comes a plate of 3/8" ply-7/8" x 3 1/2" for main gear units, 7/8" x 2 1/2" for nose gear. Plates are printed for RG unit mounting holes and for cutout to clear retracted gear leg and wheels. Holes for wheels of 2 1/4" to 3" dia. are indicated.

RMK SPECIAL GEAR UNITS are intended to operate from RMK special rotary servos, but can be handled by any other adequately powerful servo. Unis are not spring-loaded, so one servo for nose and one for two wing units are probably mandatory. Although from the same maker, they are entirely different in appearance and design from other MK units reviewed. RMK special units also operate on the principle shown in Fig. 3. Main gear units have single 5/16" music wire leg with three-turn shock..."
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On the Scene

(Continued from page 12)

smooth operation with minimum delay between flights. Finalists in D N & E, using a full pattern, competed on Sunday.

Among the 13 entries in Scale was Ken Drummond's six-engine B-36 which had to be seen to be believed. And it flew beautifully! The racing events drew 27 contestants in Formula 1, 1 in FAI Pylon, and 25 in Sport Pylon. Extremely trying wind conditions kept times down and mortality high.

Perhaps the most gratifying event was the FAI Pylon, conducted under the FAI provisional rules. Standard 25/75 fuel (Zero Nitro) used and mufflers were required. Despite high winds, Harold de Bot had the fastest heat of 2:38; which is competitive by any standards. He said: “This is a heck of a good event if they would only get rid of the blanket-blank mufflers!” However, to the sound was beautiful, and the ships even look faster when they are quiet. Zero Nitro sure does save the finish and dollars.

Winners in the events were as follows:

Class A Jr./Sr., James Carlson; Class A Open, Donald Love; Class B, Ted Berman; Class D Novice, M. C. Reed; Class D Expert, Ed Keck. Also: Scale, R. Vandiver; Formula 1, Marvin Kowalewski; FAI Pylon, Maurice Woods; Sport Pylon, Dave Poncey; and Biplane Pattern, Dave Conver. As is customary, a Grand Champion was crowned. Marvin Kowalewski, from that honor with a win in Formula I and places in FAI and Sport Pylon. Meet you here next month!
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Kit D9 — Length 14½"
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For Easy Assembly

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With Fine Quality
Cloth Sails

The use of hardwood throughout, insures an
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rigging in different sizes and colors — Com-
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detailed in step-by-step fashion, showing
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struction and rigging — etc., etc.

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Kit D8 — Length 15½"
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The world-famous World War II Fighter — now amazingly simplified for beginners! Die-cut balsa wing and tail makes assembly just a matter of minutes! NO TISSUE COVERING! Engine and control system installation now a snap for anyone because this kit includes: Aluminum motor mounts, Bell crank and Elevator horn — as well as finished Landing gear, Wheels, British Royal Air Force insignia and assorted Hardware. Plans and instruction are simple and complete.

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CONTROL LINE KIT

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Can be flown with single channel thru full house R/C

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Length 45"  Boom 10¾"  Height 40"

Operates rudder-only on single channel or full house sails

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**LANCER Advanced R/C Stunt Trainer**

Kit 8-33  $24.95

ASSEMBLES QUICKLY AND EASILY. SUPERBLY RESPONSIVE IN FIGHTER.
Smith on C/L
(Continued from page 55)
(The engine size and line length [line lengths are in AMA requirements. See list in end of rules.]
(7) Takeoffs score one to five points, landings score one to five points, (8) Blue zone scores two points, white zone, ten points, red zone, ten points, (9) All laps must be in selected color zone to score points. (10) Failure to stay in selected color zone is an attempt. (11) Three attempts allowed for three official flights. (12) Speed points are mph minus engine displacement.
(13) Models may score up to 50 points for workmanship. CD's are allowed to judge this event (appearance) points.
(14) Landing gear and canopy are required.
(15) Motor run is not to exceed four minutes.
(16) No pressure fuel systems are allowed.
(17) No single line control system may be used.

<table>
<thead>
<tr>
<th>Class</th>
<th>Engine</th>
<th>Line</th>
<th>No. of Laps</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>thru B</td>
<td>550</td>
<td>6</td>
</tr>
<tr>
<td>B</td>
<td>10-36</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>C</td>
<td>401-650</td>
<td>70</td>
<td>8</td>
</tr>
</tbody>
</table>

Seniors and Open: Same as above with the following changes: A line length is 42 ft. and trimmed for five laps.
Class A: Up to 150 in., Class B: 1526-300, Class C: 301-650.
Well, there it is. A few dollars for the pylon and a fun event is all set. To add interest, have contestants fly in several different color zones in each flight. For example: two laps red, two laps blue, and finish with two laps in the white zone. Or give the hot-shot stunt fliers out and have them fly some laps upright, then some inverted or, for real skill, have them loop the bottom of the loops cutting through a preselected color zone. The last should separate the men from the boys! While originally set up as a Sportman event's possibilities are endless. Just be sure to have enough hardware for the winners. That first trophy can be mighty exciting for a Junior in his first contest.

McEntee on R/C
(Continued from page 53)
Colif. (near San Francisco), the services of a large computer in Los Angeles were utilized to tabulate scores and record the order of winners for the three different events run in the two-day meet. A direct phone line was used by Phil Simpson (an avid modeler and glider flyer, also an engineer with Pacific Tel. & Tel.), who was in charge of data processing and handling. These facilities were available through General Electric Computer Time-Sharing Service. The computer also kept track of contestant registration and frequency allocations.

Thermal Detection: While more fortunate glider flyers may utilize thermal sniffers to show where their craft are in rising currents, a much simpler and cheaper method has been devised. Godden, who flies a simple rudder-only glider off a local hill, occasionally had been able to pick up a slope "wave," but it usually was elusive. He then resorted to "Magic Bubble" liquid from the five-and-ten. By dipping the furnished wand in the liquid and swishing it through the air, a long stream of bubbles forms and shows what really is going on in the nearby air...
FLEET BIPLANE

STINSON L-5

NEW BALSA ADDITIONS

BIRCH PLYWOOD

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SIG NYLON PUSHROD

FUEL RESISTANT DECAL SHEETS

SIG "JAP" TISSUE

SIG "FOAM" BOND

SIG "WINGSKINS"

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SIG "JAP NYLON"

SIG "BUBBLE CANDIES"

SIG "BASS WOOD"

SIG "SILKSPAN"

SIG "PRESSURE CRIB"

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SPACE-A GE MODEL POWER...
for Aircraft, Helicopters, Racing Cars, Speed Boats, Ships, Etc.

ENGINE AUGMENTER TUBES to increase engine thrust. #50 @ 70¢ / #150-600 @ $1.50. for Aircraft, Helicopters, Racing Cars, Speed Boats, Ships, Etc.

ENGINE AUGMENTER TUBES to increase engine thrust. #50 @ 70¢ / #150-600 @ $1.50.

FUEL PELLETS: 50-10 60c, 50-20 $1.00, 50-20

ROCKET HT 50 $1.60

CAULI-CAT $1.00

ROCKET HT 50 $1.60

ENGINE AUGMENTER TUBES to increase engine thrust. #50 @ 70¢ / #150-600 @ $1.50.

PAY-LOADER 150 $2.00

FUEL PELLETS: 50-10 60c, 50-20 $1.00, 50-20

ROCKET HT 50 $1.60

CAULI-CAT $1.00

ROCKET HT 50 $1.60

ENGINE AUGMENTER TUBES to increase engine thrust. #50 @ 70¢ / #150-600 @ $1.50.

For use on wood or metal, it gives a textured crackle surface for authentic reproduction of instrument panels. A can shoiid be lost.

Color plates have been added but the main items of interest are the beautiful, clear 3-views. This time they include the Waco UPF-7, Laird Super Solution and the Tissue College. If you're tired of plain ol'd winged things, check the Vought XF5U-1 Flying Flapjack. Nasty!

Note that all of the Mott drawings which have appeared in the HAA series, in Aero Album quarterly, and in previous issues of AAM, over 75 in all, are available in double-size 17 x 22" blueprints for 75 cents a sheet. These enlargements are a treat.

Lowe on R/C (Continued from page 32)

if any. If servos are moving as though under control, then keep that transmitter off, because somebody else is operating. Adjacent frequencies, B close, can jitter things but operation will not be solid.

One additional note: Occasionally a manufacturer delivers a radio set that is erroneously marked in regard to frequency. Over the years, some well-known manufacturers have gotten it wrong, but none were practical models that really flew.

However, Emile's ship is nearing completion, after exhaustive testing and overcoming such problems as blade tracking and servos. The new transmitter and servos are not as yet in place, but Emile reports that the machine has lifted 16 lb on a balanced test stand using a $150. A machinist by trade, Emile spent six months engineering the design before starting work. This machine is said to be computer-designed,

like airplanes? Fascinated by space travel? Be involved—join the National Aeronautical Association!
Planning an Operation?

X-acto tools are just what the doctor ordered for any hobby operation. Anywhere surgically-sharp cutting tools are needed, X-acto gives you 28 blades, saws, punches, gouges, chisels, and routers to choose from. And they're all interchangeable in X-acto handles. X-acto knives and tools are available individually from 65 cents or in handy sets from $2.75 to $60.00. We have saws, pliers, screwdrivers—and a full range of other tools—everything the hobby operator could want.

For more serious operations try our combination Soldering Iron/Hot Knife—$4.00, or our battery-operated Power Drill—$6.95. X-acto tools can be found at leading department, art and hobby stores. Wherever big operators congregate.

Whatever that means, but the results are only as good as the accuracy of the input data. Let's hope that Erna put in the right data and used the right equations...

RC First Aid: OK, so we got shot down, had a glitch, or made an inverted pass and pulled up instead of down and there it lies in a heap—all that work down the drain! Naturally, the first concern is for those expensive innards called the control system. What can be done to determine its status, be it dead, alive or somewhere in between? Jim McNerney, in the DC R/C Newsletter, makes some suggestions.

Don't: (1) Frantically wiggle the sticks to see if it's been killed, (2) Dust it off, fire it up, and go again, (3) Pick up the system by one component, leaving the rest to dangle, (4) Plug a suspect component into a buddy's system. Do: (1) Turn it off (if you can find the switch). (2) Unplug the battery and check for shorts (heat). (3) Check servos and receiver plugs for bent pins, cuts or breaks in wires, etc. (4) Check servos for damaged gears, cases, etc.

If the system seems OK, hook it up and operate, but don't fly it. Take the system home where it can be opened up and every component, such as antenna and wires, servo electronics, checked for integrity. Wiggle components and check for broken ones. If it doesn't work at all and physical damage is evident, the receiver crystal may be broken. Check by wrapping the receiver antenna around transmitter antenna. It should work if a crystal is the problem. If a servo runs to an end, the problem could be a bad output transistor.

If you don't understand the beast, don't tinker with it. Wrap it up and send the complete rig back to the manufacturer. Include a description of what preceded the crash, if equipment failure is suspected.
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| No. 0902 | Flashby — Balsa, all-fins. $1.20 |
| No. 1005 | 0202 — R/C Pattern plan for $59 for new members and $60 for club members. Wing span 54". $5.80 |
| No. 0503 | 051 — Advanced R/C trainer with simplified structure. $2.50 |
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Name: _____________________________
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November 1970
Spinks Akromaster
(Continued from page 38)

The fuselage wing saddle (see drawing). Then drill the 5/16" dowel holes in the rear fuselage plywood before it is glued on. The front saddle can wait until the wing and its saddle finished. Then drill the two holes through both. For added strength, small pieces of 1/8" maple triangle stock are put behind the firewall and onto the sides. The 1/4 sheet top can then be installed. Cut the top at F4 and cement the rear portion. Glue in large blocks. Then plane and sand sides of the fuselage for the 45-degree angle. The top must be rounded to the contour shown on drawing. This template is cut in half, which makes it easier to install. Nylors and sheet with 1/32 balsa. The 1/4" block is held on with two wood screws. Two 5/16" holes are drilled right through the block into fuselage. The result is a more permanent hardwood mounting.

The nose is shaped to the outline shown in the Spinks article and on the plans. A rather simple one. Cut and fit the nose block to fit engine, carburetor and throttle linkage. With the engine mounted, check the clearance for spinner. Behind the forward 1/4" plywood saddle on the fuselage, epoxy a piece of hardwood triangle stock. This will ac-
ABS VACUUM FORMED PLASTIC-MODIFIED DEEP VEE
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PATTERNED AFTER OFFSHORE RACING BOATS
$19.95

Revolutionary—Fantastic—First ABS “Almost Ready to Float” boat kit. LOA 28”, Beam 934”, Engines .09-.15-.19
Radio equipment: Single or 2 Channel
FEATURES: Three sealed flotation compartments, radio compartment with waterproof hatch . . . Die-cut Plywood Parts, Ready Formed ABS hull, deck and R/C compartment hatch. Uses standard Octura or Dumas hardware (not included).

The stabilizer and elevator are 7/8” sheet, and the fin and rudder are 1/4” sheet balsa. Hinge as desired. The stab, fitted between two balsa filler blocks, must be set at zero degrees incidence.
A fellow flier helped me cut the foam wing. A piece of trailing edge balsa stock is glued to the trailing edge of the core. The leading edge is a piece of 1/8” sheet rounded off to match the airfoil. The core is then sheeted with 1/16” balsa. Lay out and cut the ailerons. The sheet on front of the aileron is replaced after the angle is cut.
Then mark out the round aileron bellcrank wells, which are cut out with 1/32” music wire in a soldering gun. Remove oversize disk of balsa, insert the hot wire and rotate. The wire cuts a perfect wafer of foam. Then a bellcrank is mounted on a 3/32” ply disk and epoxied in place. Now take a 1/16” piece of music wire, heat the end with a propane torch, and plunge it down through the wing. This makes the pushrod slot. Assemble bellcrank and wire. Do this to both halves and then epoxy together, using glass cloth around the joints.

Both front and back sides of the saddle are 1/8” ply. Glue the landing gear blocks together. Hollow out the wing to the double-decker gear mount and attach it with plenty of epoxy. Cover this assembled saddle with 1/16” ply. Note that the landing gears are mounted across the saddle, one in front of the other. When covering the 3/16” wire gear, make the groove for one forward of center and the other to the rear. When viewed from the side no one will know one landing gear is ahead of the other, and the ground handling is not affected at all.

Two 3/8” dia. dowels hold on the rear wing, and two 10-32 nylon bolts retain the front. I lay the wing a flat piece of 4” sq. Novoply, which is flat and true and makes an excellent work surface. Glue stab and rudder. I buried a Royal Products tail-wheel bracket in the rear of the fuselage, although any combination of 3/32” wire and tubing should work. The rudder has a hole drilled in it to accept the movable arm of the tail wheel.
Radio installation is up to the builder. I used a Kraft with KP-10 servos. Try to keep the weight down.
The entire plane was covered with Super MonoKote, which keeps the weight within reason. For an exact copy of the real plane, follow closely the color scheme given in the AAM article. June ‘69 Air Progress has a color photo of the Spinks and it’s a beauty.
The canopy is vacuum-formed and cemented in place with Walthers Goo. The wheel pants were molded in fiberglass after R.T.V. molds were produced from wooden patterns. A Royal Products needle-nose spinner was used on the front end. Plywood fairings, added to the landing gear, have slots which are staggered to give the appearance of both axles being a common centerline.

Would be nice to say that Spinks flew the first time out, but it didn’t! A loose transmitter antenna caused some range problems. Once the antenna was securely tightened, the plane flew like a dream. It tracks straight and true on level ground and then rises off smoothly at about half-throttle. Push the throttle full forward and the Spinks moves up like a scorched cat. It does fly fast but
is extremely groovy.

As might be expected, the plane flies
inverted with a minimum of down ele-
vator, and the rolls are smooth. The
knife edge also is excellent. It would
seem that the big, wide fuselage might
detract from both knife edge or straight
and level, but it doesn't seem to affect
them and even may help. The small stab
and elevator are more than adequate. I
used a long Rocket City horn on the ele-
vator. The plane enters a spin realistic-
ly but must be completely stalled out. Try a Lomcovak and watch it flip
like a spinning pinwheel.

Try a Lomcovak.

The Spinks lands like it flies—fast.

and bend three rotor arms from 1/16"
and wire. The rotor hub is made from
1/32" sheet brass and galvanized iron,
with a 3/32" dia. hole drilled in its
center. A rotor hub bushing is cut from
brass tubing (1/16" I.D. and 3/32" OD).

Jig up this assembly in an inverted posi-
tion, by inserting the brass tubing into
the hub and spacing the rotor 120
degrees apart. Recheck the assembly's
alignment and then solder into one unit.

After soldering, turn the completed unit
over into the proper position and twist
each arm end up five degrees.

Landing Gear: Cut 1/16" dia. wire
to length and bend to shape. Next, notch
the previously installed landing gear
platforms 1/16" deep and insert wire
flush with the platform's surface. Fasten
the landing gear to the fuselage with
1/32" aluminum landing gear retainers,
which are wood-screwed to the plywood
platform. With soft wire, bind each side
of the main landing gear V and solder.

Final Assembly: This autogiro was de-
signed for 049 engine power. Select one
of the medium-power engines and mount
it to the 5/4" plywood firewall with wood
screws. Keep the thrust line as near to
zero degrees as possible. A \( \frac{4}{5} \)" nylon
pusher prop is used but each blade tip
is trimmed \( \frac{3}{4} \)" to make the diameter
4 1/2".

To install the fuel tank, hollow out
the balsa just below the firewall. The
size of tank needed depends on the fly-
ing field's area. Although the autogiro
can climb to tremendous heights, it de-
sends nearby in still air.
ELECTRONIC WAR SURPLUS
NT-6 WILLARD 6-VOLT STORAGE BATTERY
Rated 2.4 amp hr.
Approx. weight: 1 lb. 1 oz.
Approx. capacity charged: 20 amperehour.

BEGIN INSTALLATION OF THE COMPLETED ROTOR ASSEMBLY
Begin installation of the completed rotor assembly by placing the propeller over the 1/16" dia. rotor shaft, then add the rotor assembly. On top of that, sandwich a ball-bearing between two plain washers. Bend the tip of the shaft with fine wire and solder. The rotor blades should spin freely and be reasonably well-balanced. Balance the blades by inserting and gluing small blocks of lead to the lighter blade tips.

Insert 1/4" hardwood dowels to the rear of the fuselage, and rubber-band the tail unit in place. Check alignment. The center of gravity position is critical in determining the balance on the plane and can be corrected by adding lead weight to the nose or tail.

My model was finished with one coat of black fuelproof dope and striped with yellow markings. Dummy cabin windows were stripped with tape and doped a pale green.

Testing and Flying: After rechecking the alignment of flying surfaces and the center of gravity location, one important adjustment remains before test flying. Tilt the entire rotor assembly to the left (as viewed from the rear of model) and then advance the throttle to full power. To achieve a change in the model's direction, move the rudder control. Bending the shaft to the lighter blade tips.

WHAT A MARRIAGE! Why, the Digit-Migit and our airboat of course. The Digit-Migit at $69.00 represents today's best single-channel power-bend electronic radio buy. Already some of our customers have made mechanical throttle controls working with the extreme ends of the servo travel. For plane, boat and car, these little units really perform. Our airboat is designed for 049 to 09 engines and it can move right out! Made of rugged plastic construction for durability and long life. The airboat sells for $16.85, complete hardware and instructions included. Send your order in today. Money orders or registered checks please.

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BEWARE
The unsuspecting may be zoned by a decal.

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a model's entire flight pattern. Watch, in particular, its effect on turning radius, especially when the model is set up to fly in right-hand circles. Since a change in prop often brings about a change in speed, be prepared for the effect of slight warps or maladjustments to be magnified.

Tardon
(Continued from page 31)

adding 1/16" plywood formers fore and aft. Cut out the cockpit and finish the area under the canopy. After a pilot and instrument panel are installed, epoxy the canopy in place.

Finishing and Painting. The choice of finishing methods is varied. We began with a good sanding; two coats of Hobby-poxy clear; two coats of automotive primer, wet-sanded between and the final finish of two coats of dope, acrylic lacquer. Rub and as desired.

Equipment Installation: When the finish has dried, hinge the control surfaces, making them all move freely. Add the landing gear and tail-wheel. Install a 40 rear rotor with a 2½" spinner.

Because of the long tail-moment, radio equipment must be placed as far forward as possible. Even it may be necessary to lead to the nose. Tardon II weighed in at 12 oz., before balancing. After balancing, it checked out at 5 lb. 3 oz. It is important that the plane balance at the CG than weight in lb.

Control movement is quite important, since most RCers use much. By following the recommended throws on the plan, no difficulties should arise. Remember that higher speeds less throw is just as effective as a large throw at slow speeds.

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Orbit Cobra
(Continued from page 38)

an shelf. Below it, one side, is Eveready battery (#276) whose current consumption was measured at 60 ma. Although not rechargeable, this battery should last for two to three months of hard use. A NiCad battery with charger is available at a slight extra cost.) Voltage between the antenna and battery terminal was measured at .8V. Signal amplitude on a CRT showed .57V from base line to peak. The battery changed merely by removing the back cover (held by two screws) and slipping in a new one.

Throttle and gearshift levers are located on a separate board on the right side in a straightforward manner.

The receiver is the same size as all the others in Orbit's 1970 line, but it does have one significant innovation. All connectors are now much smaller so that the car borne system can be installed easily, with minimum bulk.

The switch is the old reliable sliding type supplied with regular Orbit sets. The battery is square, which made it easier to install than the flat pack. The battery capacity is 500 ma. The receiver batteries, which are NiCads, be charged as usual with the charger supplied in the set. The power plugs are a new triangular polarized configuration.

Servos are based on the new 1970 FS-3D Mark III configuration. While the radio will operate the PS-3 type older radio systems will not operate these new because of the pulse frame rate and configuration. The delivered four lb, thrust the linear output but, when a rotary output is used, more speed (albeit with less thrust) is available. Speed, rather than force, is essential, especially for a car's throttle. We found the servo transit time of 0.6 sec, fairly adequate. Resolution excellent and there was no hint of cross talk or mutual interference.

During a typical car race, the transmitter may be put on the ground (blacktop) and track temperature at times may reach 125 degrees. With mixed feelings we left the transmitter
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on the track for 45 min. under the boiling California sun. The also left standing with the body unpainted, and yet no hint of drift glitches developed. Thinking of our Northern buddies (who may want to operate radio-controlled snowmobiles on ice), we wanted to test the radio in cold chamber but, lacking that, a two-hour immersion in the family refrigerator had to do. Although the servos became a little sluggish, at least they did not act crazy.

Orbit also offers a thick-gear PS-5 car servo. Its gears are strip-proof and operation is very fast. We did not have these during technical testing.

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The Dynamic Car

After testing and examination of the radio, the Editor installed an identical Orbit set with the PS-5 thick-gear fast-action servos in the Dynamic car. The following description of the car is based on several weeks of operation, adjustments, and racing at the RC model car Nationals.

Instructions included with the car describe and illustrate only its basic assembly. Because of the four-wheel independent suspension, torque converter transmission, and four-part frame, the car has numerous parts and requires plenty of screwdriver exercise. Wrenches for Allen head bolts in the kit are supplied. No special tools are needed, but a Dremel Moto-tool is helpful for trimming excess material between the spring suspension cups. The stanchions. Detailed instructions for radio installation, suspension adjustment, and handling setup are not provided. These elements are so individuated as to driver, radio brand, and driving surface that instructions would be useless.

Our installation is unique. Orbit's three-servo side-by-side tray was mounted on hardwood supports and located just behind the front suspension stanchions. The steering has rotary output and is centrally located. The servo on the right (viewed looking forward) is transmission/clutch function and the servo on the left is the throttle function. The steering control arms were lengthened. A separate link from the disk goes to each front-wheel steering. The receiver is wrapped in foam and placed between the front suspension stanchions. The battery pack and on-off switch are positioned beside the motor.

Once the car was assembled, it was operated to break in all parts properly, especially the transmission. Then it was completely disassembled, each part cleaned, and reassembled using Lock-Tite on all screws. The suspension elements the bottom stanchion mounts were not permanently tightened. These are to be adjusted for handling. The universal joint which screws into the transmission was tightened, then drilled for a thin cotter pin. The transmission case was assembled with gasket glue (silicone rubber works well here too) and sealed to retain as much oil as possible. The procedures of break-in, reassembly, and use of Lock-Tite have made this Dynamic car extremely reliable.

Suspension adjustments as follows: front wheels toe-in three degrees, tires flat on the road with control arms perfectly parallel, and a 1/16" thick washer is then inserted under

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The rear stanchion mount. This tilts the entire front end forward to give a castering effect and to provide understeer during hard cornering. It should be adjusted for different racing surfaces—the more slippery the surface, the more tilt. If oversteer (continuous spin-outs) remains a problem, put a strip of plastic electrical tape around the front tire, covering with one layer of tape only the second and third treads in from the outside. This reduces tire bite.

At the rear, the suspension must be set to have the tires flat on the road at all suspension positions. This means equal length control arms. Adjust the rear suspension spring to be quite hard and stiff. The downward travel of the rear suspension must be limited by drilling and tapping a 4-40 bolt hole immediately under the lower control arms on the chassis and just beside the stanchions. A 4-40 roundhead screw in these holes is screwed in from the top, which stops the suspension so that the universal joints are parallel to the road. Not only does this improve handling, but it also eliminates universal joint wear.

Many builders of the Dynamic car have complained that it is not strong enough to withstand the abuse of hard racing and hitting walls or sharp rocks. At the Vital Nationals, I learned from Dynamic that a front nerf bar could be added to protect the front suspension. All the open-wheeled cars used such protection. I also learned that a strong music-pipe connection must be used between servo and steering arms or between steering arms, depending

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1970 Nats

(Continued from page 56)

his year but became a Champ by taking fourth in Pylon I and fifth in D Pattern. The 1969 U.S. World Championship team took the top four D Pattern places, including second place for Jim Edwards (New Albany, Miss.) who won the reserve team's championship last year. Jim Kirkland (Valparaiso, Fla.) took third, Jim Whitley (Decatur, Ala.) was fourth, and Phil Kraft (Oceanside, Calif.) was fifth. The third annual Delta Dart Nats event was again a great success. More models were actually flown than ever before—over two thousand out of many models were built. Over two thousand people pitched in to operate the event which ran during five days of the Nats, including a special day for children of staff personnel. This year the event featured the HIAA-Flyer version of the Delta Dart, with bulk-pack kits produced by member firms of the Pottery Industry Assoc. of America. New simplified pictorial instructions were used to aid construction, and the kits were praised as a major contribution to the current AMA-HIAA Junior Program.

The event was highlighted by local TV, with a reporter building a Dart for the cameras. Miss Model Aviation—Susan Bowie, a cute and cheerful Continental Airlines stewardess—also built and flew a Delta Dart along with the youngsters. One hundred and fifty awards were given to Delta Dart con-
testants—30 per day; 10 for each of three age groups from 8 to 13. Delta Dart was a big effort this year, better supported and organized than ever before.

Scale got a major overhaul in practically all categories this year, with new procedures and scoring forms. As a result, Scale judging was credited with being more consistent and efficient this year: 1000 entries. Control Line had some crowd control and score confusion problems, but otherwise Scale as a whole was a happier Nats category to most entrants. To top off a great week, the AMA Executive Council approved the upgrading of Scale to full Contest Board status, effective immediately, with Claude McCullough (Ottumwa, Iowa) as its first chairman.

Nats week was climaxed by an outstanding Sunday Air Show. The Navy's Air Barons—also dubbed the Red Barons due to their colorful uniforms—put on a great full scale precision flying demonstration which equaled that of the better known Blue Angels Navy team. The Barons' A4D Skyhawks were smaller and more maneuverable, enabling their show to be flown in a much smaller area of airspace.

Both before and after the Barons, modelers flew all types of demonstrations: CL Combat and Racing, Speed and Stunt; RC Sailplane, Pylon Racing, Aerobatics; FF was represented by a great Old Timer flight and a pair of flying saucers. At one time there were at least twelve models in the air simultaneously. About seventy-five modelers took part, and each received a special Nats Air Show medal and ribbon from Miss Model Aviation at the end of the program.

Nats week ended suddenly and spectacularly at the close of the Air Show. As the show ended, Admiral Bernard M. Street, Chief of Naval Air Training, Pensacola, Fla., indicated his pleasure at how well the Nats went and said that the 1971 Nats would be held again at Glenview. This was further confirmed by the new commanding officer for Glenview who took over immediately after this year's Nats. The basic Navy position seems to be that economic and operational problems prevent continuing the former policy of changing the Nats location each year, at least for the present. The next best thing, according to Navy officers, is to do all that's possible to make the Nats at Glenview better than ever so as to make the trip worthwhile for those who might be able to come from far away.

Already discussions are being held to improve on various aspects of the 1970 Nats, with a particular view toward better informing of contestants and spectators as to field activity and also simplification of paperwork, procedures, and processing.

One new aspect of the 1970 Nats was well received—tented. The tent and camping trailer areas were well used and caused no major problems. They greatly relieved the berthing shortage at Glenview, and permitted many to attend the Nats cheaply enough to offset the cost of traveling. The success of this operation has assured its continuance next year.

In a future issue we'll tell more about the great '70 Nats: how it was organized and who contributed to its success. It's a story worth knowing—it took well over a hundred officials and lots of effort.
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