Understanding the Thermal...

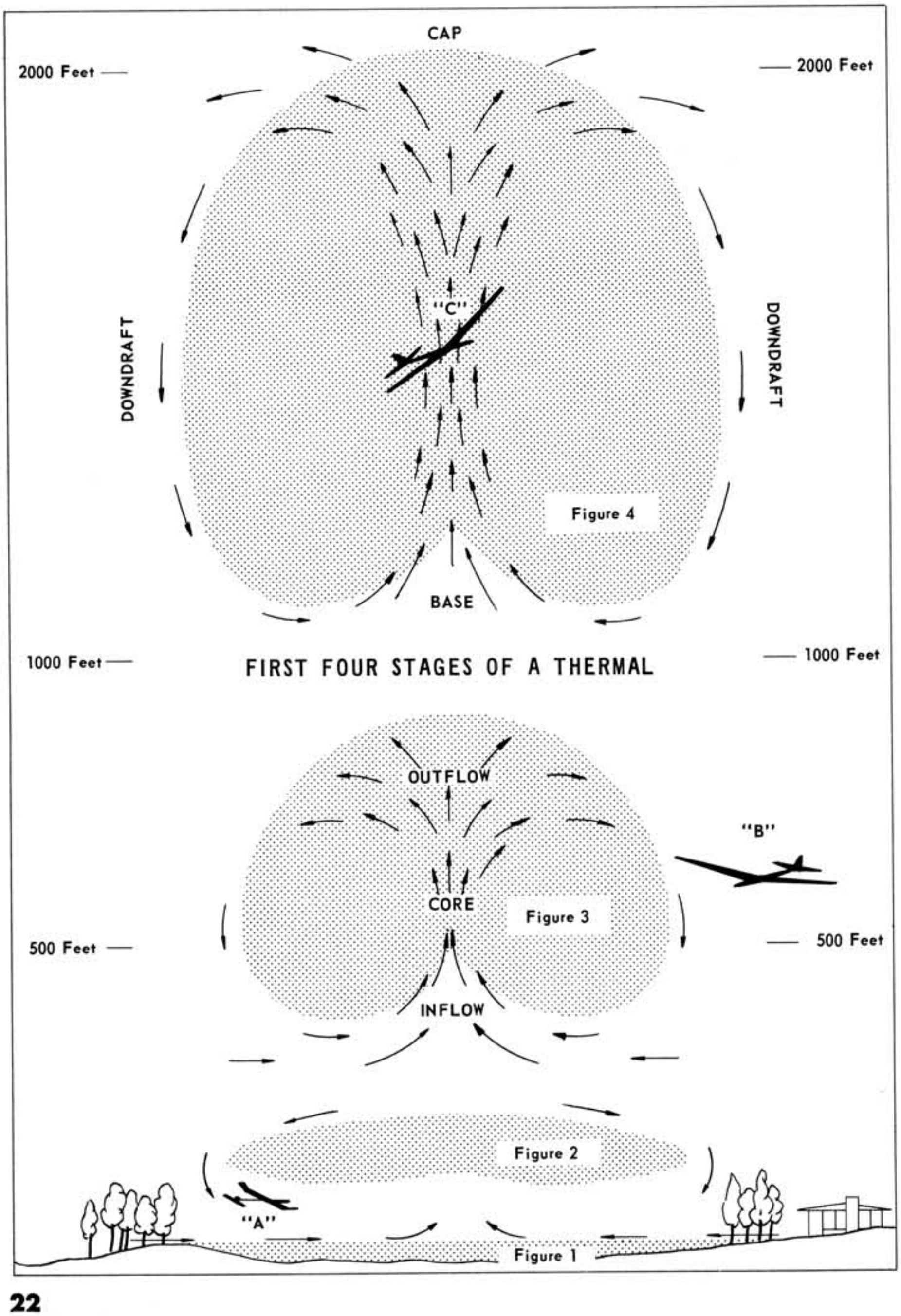
by Carl Lorber

FLYING MODELS *Lightly Loaded*

▲ In searching for information on the thermal phenomenon as it exists in the glide-down altitude range of a model glider, from a one-thousand foot tow-line, I found little data is available. There is considerable information pertaining to thermals for the soaring pilot as he glides above the earth at altitudes above 1,000 or 2,000 feet, and he is offered a working knowledge of the elements that create a thermal, its ever-changing shape as it ascends, visible indications of thermals and proven technique in utilizing the lift in a thermal to allow him to soar. However, little of this information is of any real value to the model glider pilot as he is flying in search of a thermal with less than 1,000 feet of altitude.

I have composed the accompanying illustration from data derived from soaring textbooks, manuals, articles, conversations and my own personal experiences.

We realize that the sun's energy heating the surface of the earth can cause the air adjacent to the ground to become warmer and less dense (see figure 1). This air being less dense than the surrounding air can be easily distributed by a breeze, causing it to break away from the earth and form an ascending "bubble", (see figure 2). This condition can exist in all regions from tropical to artic.



Once the warm air bubble breaks free from the surface and starts to ascend, a partial vacuum is created and cooler air will flow in from all directions to replace the area once occupied by the bubble, this condition is particularly evident on a warm day when a cool breeze can be felt coming from a different direction than the prevailing wind.

As the bubble ascends, it grows in size, mixing with the air it travels through, it starts to develop a "core" or center where the air is ascending at a greater rate than the bubble. The currents ascending through the core reaches the "cap" or top of the bubble and colliding with the much cooler air is forced outward. This is called the "outflow". The partial vacuum at the base of the bubble created by the currents in the core is known as the "inflow". This venturi effect creates a system of descending air around the bubble, thus completing the condition we know as a thermal (see figure 3).

Our thermal quickly takes on a "donut shape" as it leaves the ground and begins to ascend. The donut shaped bubble expands quickly to great proportions as it ascends in the next thousand feet. The currents in the core may ascend so quickly that the bubble cannot keep up and the bubble will take the shape of an elliptical donut, stretching several thousand feet high (see figure 4).

The currents in the core eventually reach an altitude where condensation takes place, often forming a cumulus cloud above the core. This cloud will usually last for ten to fifteen minutes, and if it is not soon fed by another thermal, it will start to decay and disappear.

At aircraft station "A" on the drawing we find a model glider at the altitude comparable to the A/1 and A/2 free-flight launch heights. These models are light and trimmed to a near stall

(Continued on Page 49)

Thermal

(Continued from Page 22)

condition and will drift with the wind over the field. If a thermal should lift during this time, the model is susceptible to the slightest air currents and will follow the thermal inflow directly into the core where it will rise to the cap and be propelled out of the thermal by the outflow.

If an R/C glider at station "B" is allowed to circle and drift in the same manner, it too will find the core without the help? of the pilot. If it is flown straight in any one direction from station "B" you have a small chance of gliding through the area occupied by the thermal core. It becomes evident why free-flight gliders have such an excellent record for finding thermals at less than 200 feet.

In station "C" an R/C glider pilot will experience a strong lift that will carry his model several thousand feet up in a matter of a few minutes as the aircraft ascends through the core of the thermal. However, if the model is large enough, or with the help of magnifying glasses, you can watch as your model reaches the cap where the rate of ascent will reduce to a slow climb as the glider will ascend with the thermal. In this area above the rising thermal, the currents may give the illusion that the entire sky is lifting, but if you fly straight in any one direction, you will soon come to the downdraft portion of the thermal. Learning to fly in this outflow area will take practice and technique with the disadvantage of the model being at least a mile away from the pilot making visibility difficult. If you consider that the free-flight glider altitude record stands at 7,755 feet, it would seem that we have a long way to go before we reach the point where we can "aid" the model glider in a thermal with our radio control system.

Keep this drawing in mind as you search the sky for lift, noting that as you approach the center of the thermal, you will go through the downdraft area first, then a moment of smooth air, with a gentle lift. As your model approaches the core it will slow and the nose will come up. If you are a little off center of the core, the wing nearest the core will lift, causing the model to bank away from the lift area. It is difficult to enter a thermal at the cap as the flow is away from the center in all directions and will cause the model to slow, reducing penetration. If this area is encountered, pull the nose down a little, until the model begins to rise. Entering a thermal from this base, it will accelerate as it enters the inflow, and a nose-up attitude will not slow it down. In the core it is advisable to bank at 45 degrees and make tight, accurate turns with no slipping or skidding and you will find that you are going upward at a tremendous rate.

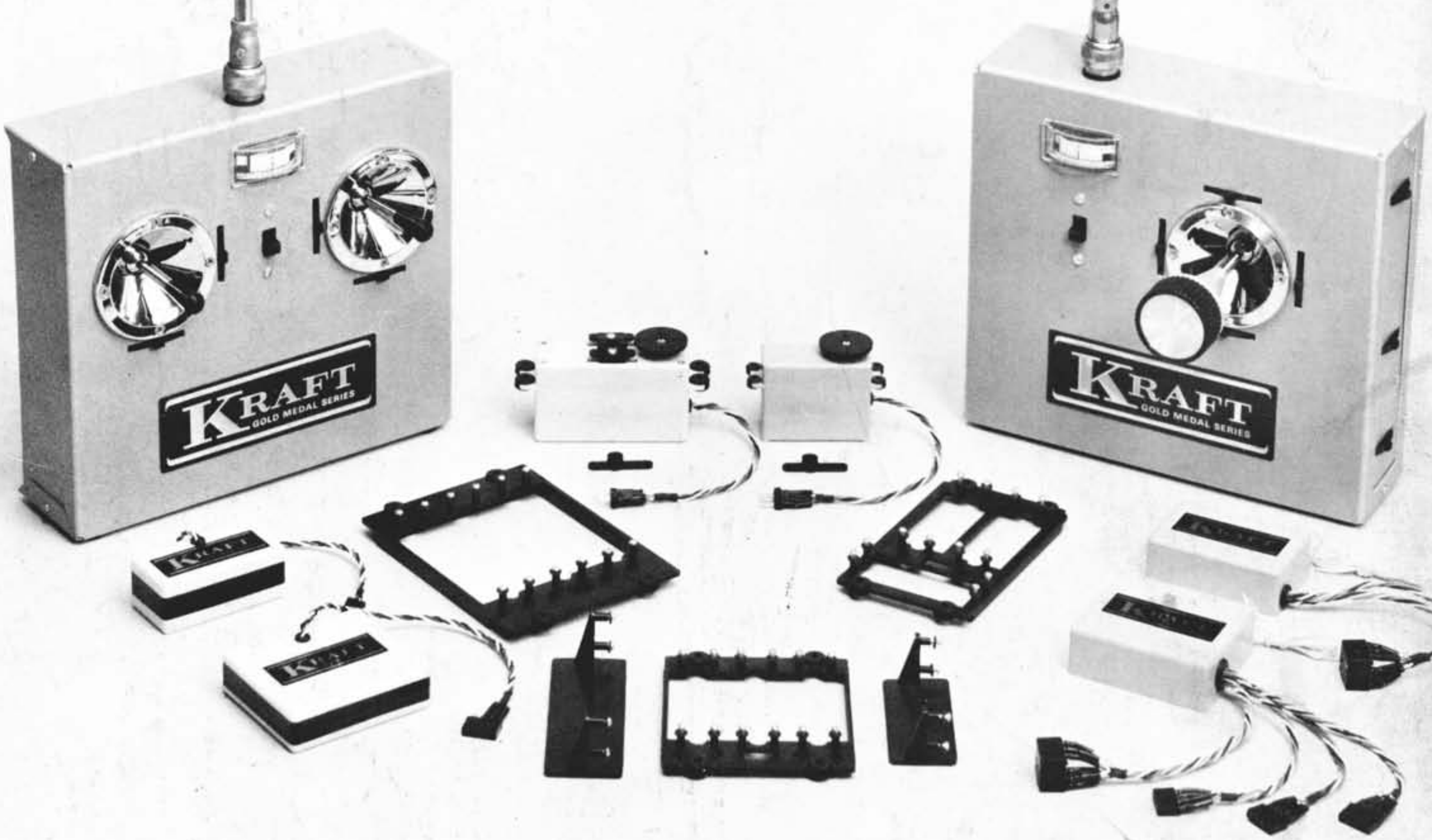
The reader is warned not to develop any fixed ideas of the shape and behavior of a thermal, as each one is uniquely different in size, rate of ascent, and shape. The thermal depicted in this drawing is ascending straight up, because of the limited paper area, whereas in actual practice, it may drift downwind for five miles in a light breeze and ascend only one mile in altitude. Thermals in the southwestern parts of this country have been known to lift so quickly that it forms a donut shaped column from the ground to many thousand feet with updrafts producing a 2,000 foot per minute rate of climb in real sailplanes. In the east, thermals often produce a 1,000 foot per minute rate of climb and possibly even greater for models. We have found that a plowed field, surrounded by trees may produce a thermal every half hour on a hot, unstable day, while in a field not far away, with a grass or crop cover, protected from the wind by a leeward slope (known as a wind shadow) may produce only one thermal late in the same day. Woods are known to produce enough lift to support a full sized glider on a cross-country hop, late in the day, when other thermal activity has ceased. Occasionally an excellent day for thermal soaring is ruined by an over-production of cumulus clouds, cutting off the sun's rays and retarding any further production.

The above information will help the newcomers to this fascinating sport and guide them to a more scientific understanding of thermals. Most of us thermal soaring today had to learn nature's secrets through lost aircraft, wive's tales and bits and pieces of conversation picked up at the field. ●

. . . take your pick

6 channels or 4 channels expandable to 5 or 6 channels: 2 stick or single stick: versatile KPS-9 or powerful ultra miniature KPS-10 servos: KB-4B 500 mah standard or KB-4C 225 mah lightweight power packs: servo trays to suit all installations.

The smallest, lightest, and most reliable proportional systems available, backed by the industry's finest service from the world's largest manufacturer of proportional radio control equipment.

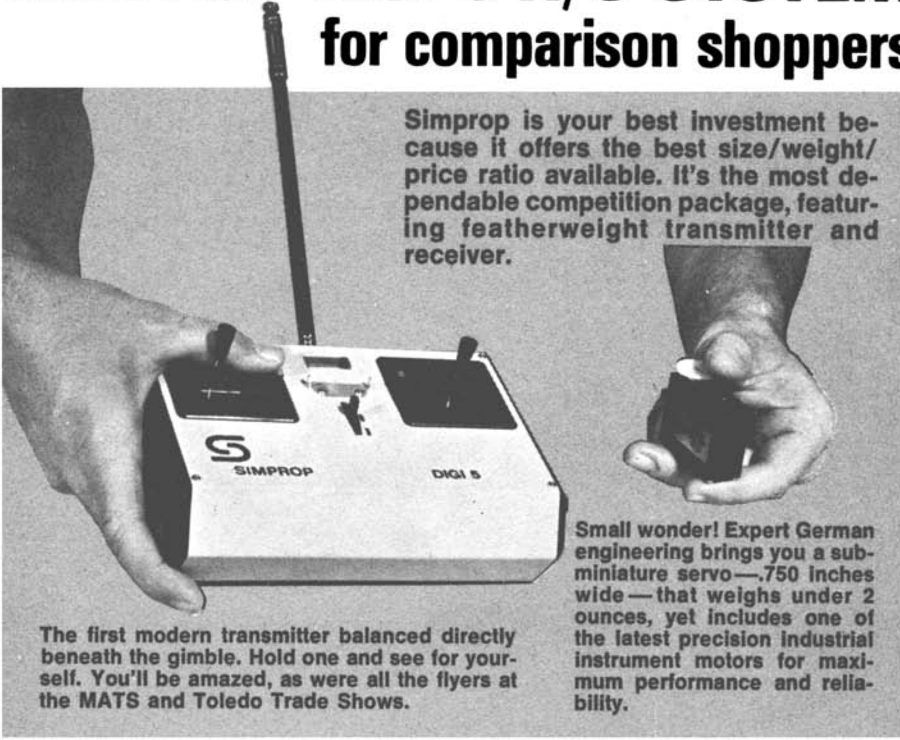


write for free catalog

KRAFT SYSTEMS INC

450 W. CALIFORNIA STREET, VISTA, CALIFORNIA 92083

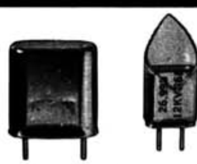
SIMPROP DIGI-5 R/C SYSTEM
for comparison shoppers



SHOP SIMPROP Choose the standard power pack, or the optional, lighter weight power supply unit. You get total reliability throughout that can't be matched at any price.

INTERCHANGEABLE CRYSTALS...A SIMPROP EXCLUSIVE

No comparison here. Only Simprop gives you interchangeable crystals that allow you to change frequencies in the field . . . in seconds. Unmatched convenience for individual flyers, clubs and dealers.



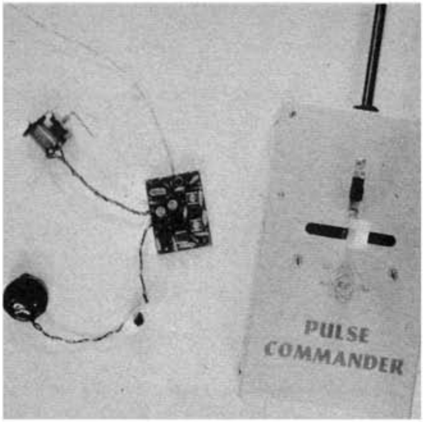
5 CHANNEL SIMPROP R/C System, including four servos, battery charger and one set of interchangeable crystals; 27 MHz only. **$379.95**

Write for complete catalog.
New attractive terms for dealers.

NELSON MODEL PRODUCTS, INC.
BOX 2027 • DUBLIN, CALIFORNIA 94566 • (415) 828-6350

SIMPROP
R/C SYSTEMS

Designed with the Beginner in Mind



COMMANDER R/O PULSE PACKAGES
Ideal for Beginners and Sport Fliers

Get one of the Ace Commander R/O packages and you get the Commander DE Superhet Receiver, Commander Pulse Transmitter, Adams Actuator of the size you want, along with matching nickel cads, and completed wiring harness, AND you save up to $10.00 over buying singly.

We have the packages as matched sets in three basic offerings to suit your every R/C sporting need from the smallest to the larger sized aircraft. Ready for easy installation.

The Baby Pack is for the .010 and .020 jobs although it can be used with tame .049's. Package has two GE 225 ma BHL nickel cadmium batteries and Baby Adams. With wiring harness and switch, completely assembled.

The Standard uses the LV Single Adams for more power for .049 to .07 size. Is furnished with two GE 500 ma BHL nickel cadmiums. With switch harness, assembled.

The Stomper uses the LV Twin of the Adams line for up to .15 or even .19 size jobs. Comes with two GE 600 ma cylindrical cells. With switch harness, assembled.

(Charging equipment not furnished.)

No. 10G15—Commander R/O Baby pack....$69.95
No. 10G16—Commander R/O Standard Pack 71.95
No. 10G17—Commander R/O Stomper pack 74.95

R/O PULSE MOTOR CONTROL

Now you can add motor control to your Commander RO Packages. May be used for Testor System. The high Pulse Rate Motor Control by Ken's R/C uses four wires to hook up to your pulse installation, and is complete with a three position spring wound escapement to give you high, medium and low motor control on a throttle valve engine.

No. 16K63C—Ken's Motor Control with escapement, $19.95

COMMANDER R/O TX CONVERSION KIT

Conversion kit for the Commander RO transmitter, as described above, complete with instructions, and all components required.

No. 15K62—HPR (High Pulse Rate) Kit for Commander, $2.50

COMMANDER R/O PACK CHARGERS

Transformer isolated chargers designed expressly for the Commander R/O packages come complete with line cord, charging plug and jack and are available in two models—one to fit the Baby Package with its 225 mah nickel cads, and the other to fit the Standard or Stomper Packages with their 500 or 600 mah cells. Each charger will give full charge with 14 to 18 hours of charging time.

Completely wired, tested and ready to go. Simple directions make the chargers a snap to use.

No. 34K4—Commander R/O Baby Charger..$4.95
No. 34K5—Commander R/O S* Charger....$4.95
*S—Standard or Stomper pack

ADAMS AR BABY ACTUATOR

From Adams comes the AR Baby actuator. Results in lower drain for an over-all lighter weight. Plenty of torque for the mini jobs, the AR has only 40 to 50 milliamps current drain on 2.4 to 3 volts, so it can be used with some of the smallest batteries for a tremendous saving in weight.

Uses the same frame and is the same size as the regular Baby, but the secret of the weight saving is in current consumption. Weight of the AR is 17 grams.

No. 14K31—Adams AR Baby Actuator........$8.45

For the modelers who have the regular Baby and want to convert to lower drain coil, it is available separately. Conversion is simple and takes only a few minutes with hand tools.

No. 14K32—Adams AR Coil only..................$4.00

NEW HANDBOOK-CATALOG FOR 1969!
For the Fun Flyer and Tinkerer

Our 1969 Handbook-Catalog is bigger and better than ever. More items for the do-it-yourself, the tinkerer, the fun flier and for the BEGINNER; more products from most R/C manufacturers as well as many Ace R/C exclusives. HANDBOOK section has been acclaimed as the "bible for R/C", "a MUST!" by R/C editors. Price is just $1.00 POSTPAID in USA. This is completely refundable on your first order! And that order also puts you on our mailing list for our R C DATA Service—acclaimed the world over! You can't lose—send your buck on a round trip today. It could be the best dollar you ever spent.

Important: For overseas delivery on catalog or Binder please add 50¢ for additional postage.

ACE RADIO CONTROL • BOX A • HIGGINSVILLE, MO. 64037

NAME ____________

ADDRESS ____________

CITY ________ STATE ________ ZIP ________

QUANTITY	STOCK #	NAME OF ITEM	PRICE	TOTAL

My BankAmericard # ____________

Guaranteed delivery anywhere. Orders over $5.00 sent prepaid. Orders under $5.00 please add 50¢ for postage and packing.