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OCTOBER 1948

25 CENTS

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- 5. Most complete gas model stock in America.
- 6. Competent understanding of your modeling problems.
- 7. No "minimum" orders. Any order is welcome.
- 8. FREE Coil, condenser, etc., etc., with gas motors. 29 ITEMS WORTH OVER \$7.00 AT NO EXTRA COST. SEE BOX ON LEFT.
- 9. FREE rubber wheels, knife, etc., etc., with every plane. 12 ITEMS WORTH \$3.50 AT NO EXTRA COST. SEE BOX ON LEFT.
- 10. FREE membership in "Modelcrafters of America," the club that keeps you up to date on gas modeling and SAVES YOU MONEY ON YOUR PURCHASES.
- 11. FREE illustrated 24 page catalog



ESTABLISHED  
1931

America's Hobby Center is  
the country's **LARGEST** motor  
and gas model headquarters.

**LARGEST**  
HOBBY MAIL ORDER FIRM  
IN AMERICA  
1948

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ON OPPOSITE PAGE

#### ENGINES

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Anderson Spitfire	(Cl. D)	24.95
Arden .099	(Cl. A)	12.50
Arden .099BB	(Cl. A)	15.50
Arden .199	(Cl. A)	18.50
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Burgess M-5	(Cl. E)	75.00
Cannon 300	(Cl. B)	19.75
Cannon 358	(Cl. C)	21.50
Contestor	(Cl. D)	11.95
DeLong 30	(Cl. B)	15.50
Dennymite	(Cl. D)	6.95
Forster 29	(Cl. B)	14.85
Forster .305	(Cl. C)	14.85
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Ohlsson 23	(Cl. B)	9.95
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#### JET ENGINES

Dyna-Jet	24.50
Dyna-Jet Redhead	35.00
Mini-Jet	35.00

## SPECIAL! BARGAIN!

# COMPLETE FLYING OUTFITS

### CHOICE OF U-CONTROL OR FREE FLIGHT

**\$10<sup>00</sup>**

CHOICE OF



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CHOICE OF



THOR



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CHOICE OF



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PHANTOM



FREE-FLIGHT  
BANSHEE

OR



U-CONTROL  
SKYSTREAK

**42 ITEMS WORTH TWICE OUR COMBINATION PRICE!**

#### HERE IS WHAT YOU GET:

- Your own choice of 6 well-known engines, all guaranteed by the manufacturer and America's Hobby Center.
- Your own choice of either a U-Control SKYSTREAK plane (precarved fuselage, wings—A. J. Walker Patents—easy to build and fly) or 50" Free-Flight BANSHEE plane.
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- Large Tube Cement.
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- Ignition Slide Switch.
- Metal Battery Box.
- 3-Way Spark Plug.
- Champion Spark Plug.
- Bellcrank.
- J Mounting Bolts.
- Wiring Lugs.
- Speed Indicator.
- Presto Engine Start.
- Wrench.
- Plug Gauge Set.
- Motor Cover.
- 50 pg. Book: Gas Engine Theory.
- 150 pg. Control-Liner or Construction Book.
- Insignia.
- Flight Log.
- Complete Engine Instructions.
- Complete Plans For Building Plane.
- "Pro" All-metal Knife.
- No. 70 oil.
- Coll Holder.
- Bubble Canopy.
- Sandpaper.
- Membership in Modelers of America.
- 4 Mounting Nuts.
- Engine Adjustment Chart.
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- 24 Page Giant Catalog.

\* INCLUDED IN U-CONTROL ONLY.  
Ohlsson Rotary Valve engine included in \$12.50 unit for \$1.00 extra.

**WHAT MORE CAN YOU NEED!**

It isn't often that you get a chance to buy, at less than half price, your choice of either a U-Control or a Free-Flight Outfit with your own choice of six well-known engines. Everything carries the famous America's Hobby Center guarantee.

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Thousands of these units have already been sold. They have met with enthusiastic reception because they represent a value unheard of before in the modeling field. The price is so low that we cannot sell to dealers. You really save from \$10 to \$12 by buying the complete packaged unit—everything is engineered by experts for a perfect flying combination.

**YOU WON'T GET ANOTHER BARGAIN LIKE THIS SOON!**

*Buy with confidence at A.H.C. where Your interests come first!!*

#### 2 MARVELOUS CATALOGS

We have two fine, large catalogs for you. One is FREE, the other costs you 10c (stamps or coin). Hundreds of illustrations, thousands of items. Special articles on selecting your plane and engine, flying, trouble shooting, etc. Gas—Rubber—Solids—Planes—Cars—Accessories.

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# EXTRA! EXTRA! ENGINE PRICES DROP!

## CLASS A, B or C ENGINES NOW ONLY \$4.95

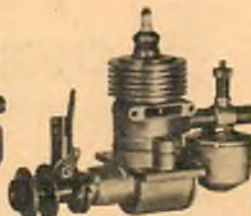
4 CHAMPIONS  
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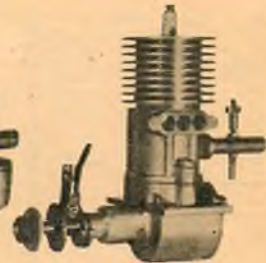
BUZZ 19  
CL "A" \$4.95



BUZZ 29  
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BUZZ 35  
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BUZZ 60  
CL "D" \$9.95

Ideal for both ignition  
and Glo-plug operation

### BIGGEST NEWS IN YEARS!!

We are the largest model motor headquarters in the world. We have sold over 200,000 model engines (made by 117 different manufacturers) in the last 15 years. We know engines. When we were approached by one of America's largest companies in this field and offered the exclusive agency for the sale of the BUZZ, we knew we had the biggest bargain ever offered to the American Modeler.

### WHO MAKES THESE ENGINES?

The BUZZ Engines are manufactured by a company that for years has been the world's largest maker of automobile replacement pistons and other precision gasoline engine parts. Thousands of gas engines and parts were made during the war by this company for the War Dept. for use in walkie-talkies, field generating sets, etc., etc. Since the war, thousands of gas engines have been made for scooter, lawn mower and other industrial uses. When we say unconditionally that the BUZZ engine is well engineered and well constructed, will give you plenty of good service, this is no idle boast, but a fact!

### NOT A CLEARANCE SALE!

As the owner of a BUZZ Engine, you are sure that you will always have available full service for your engine, as well as replacement parts. You will never have an "orphan" engine on your hands. We guarantee service and parts for your engine for at least five years.

### PRECISION ENGINEERED!

Despite its low price, the BUZZ Engines have been engineered to the last decimal point. Pistons and cylinders have been carefully furnished by a special patented process within .0002 of an inch. All bearing surfaces are made of selected materials and finished with the most costly care and equipment. Even a Champion Spark Plug is included. Every BUZZ Engine is indeed a jewel of precision engineering.

### FULLY GUARANTEED!

With each and every engine is included a full 30-day written guarantee against defective parts and workmanship. You take no chances with BUZZ Engines. In addition, service and replacement parts are guaranteed for at least five years.

## FULLY GUARANTEED

Factory assembled—  
ready to run—  
including Champion Spark Plug

BUZZ A, B or C \$4.95  
BUZZ 60 (CL. D) \$9.95

THE BEST BUY  
IN  
ENGINES  
EVER

YOUR CHOICE  
OF  
BUZZ  
A, B or C  
\$4.95  
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SERVICE  
& PARTS  
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Guaranteed  
FOR  
5  
YEARS!

100 MODEL ENGINES  
AT LOWEST PRICES EVER!

NOT A CLEARANCE SALE  
Orders accepted  
up to 1,000,000 engines

### NO SALES TO DEALERS

Due to low price, none sold to dealers.  
All the savings are passed on to you.

Engine prices are introductory only. Effective  
Jan. 1, prices will be increased 100%.

### HIGHEST QUALITY AT LOWEST PRICES!

Do not judge the BUZZ Engines by their low prices. It is true we make very little money on each engine sold. But because many, many thousands of these engines have been produced by the latest modern processes, the cost has been reduced so that they can sell at the lowest prices ever seen.

### PRECISION ENGINEERING OFFERS:

- \* Construction and materials that permit use of engines in boats and cars as well as airplanes.
- \* Complete Instructions.
- \* Streamlined for cooler operation and longer life.
- \* Easier to start.
- \* Steady, consistent running.
- \* Lightest weight engines ever made in relation to power produced.
- \* All wearing surfaces especially finished for longer wear.
- \* Requires shorter break-in period than any other engine.
- \* All metal tank that takes any fuel.
- \* Invertible and runs in either direction.
- \* Replacement parts available and interchangeable.
- \* Runs on easy-to-get oil mixed with ordinary gasoline. No hard-to-get and dangerous chemicals needed.
- \* Smooth, velvet power that never lets you down.
- \* Last but not least, we maintain an inspection and testing department where your engine gets the last word in care not only before it is shipped, but where it can receive expert attention if anything goes wrong after you own it.

### NOW YOU CAN AFFORD THE BEST!

#### SPECIFICATIONS

	A	B	C	D
Displacement	.199	.299	.350	.610
Bore	.66	.812	.880	1.00
Stroke	.562	.562	.562	.777
Horsepower	1/7	1/6	1/5	1/4
RPM	7,500	8,000	8,500	9,000
Propeller	8"	10"	11"	12"
Weight (ozs.)	4	4 1/2	4 1/2	9

### COMPLETE ACCESSORY UNIT

Sold only with each BUZZ Engine  
Coil-Condenser-prop-switch high tension wire-ignition wire-coil holder-battery box-wrench-  
presto engine starter, No. 70 oil.

ONLY \$2.49

## NEW! BUZZ CO<sup>2</sup> \$4.95

complete with refillable tank & charging unit.

Modelers have long wanted a CO<sup>2</sup> engine they could fly indoors or outdoors. It's here, now—the Buzz CO<sup>2</sup> engine with the refillable tank. Not one, but five flights per Standard capsule! Only 2c per flight instead of 10c or if you use the giant CO<sup>2</sup> capsule, your flights cost you only 1/3 of a cent each! The Buzz CO<sup>2</sup> is the new size—large enough for easy handling and good flights, small and light enough to give you full rpm and power without waste. The 3/16" bore and stroke is designed for maximum economy with maximum power.

The Buzz CO<sup>2</sup> is machined to microscopic tolerances, made of the finest materials for your lasting satisfaction.

Giant CO<sup>2</sup> Capsule & Adapter \$2.00 (good for 100 flights — we recharge for only 30c)



photo exact size

### HOW TO ORDER

Send payment in full and we prepay postage and insurance, or send \$1.00 and we ship C. O. D. Collect, same day.  
IMMEDIATE SHIPMENT GUARANTEED

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COME IN AND SEE US DEMONSTRATE THE BUZZ. SEE OUR DISPLAY OF THOUSANDS OF MODELS, KITS AND ACCESSORIES.

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- \* POWERFUL
- \* ECONOMICAL
- \* PRECISION BUILT
- \* FREE FLIGHT OR U-CONTROL
- \* 3/16" bore & stroke; .0052 cu. in. displ.; speed range 2,000 to 6,000 rpm.
- \* FLIES 18" to 24" models and up.
- \* Weight only 5/8 oz. ready to fly.



## SPIN-PROOF ERCOUCPE

**I**N a "We Fly" article (*Air Trails*, July, 1948) author Robert Arentz stated that an Erco Coupe stalled out and spun straight in on its nose. Investigation discloses that there was no evidence of a spin in conjunction with the incident which Mr. Arentz reported.

Mr. Arentz says that this was an unintentional error and that the aircraft was in a nose-down power spiral, and not a spin.

No one ever collected the \$5,000 posted by Fred Wieck, Erco Coupe designer, for spinning the plane. *Air Trails* continues to hold the Erco Coupe in the same high regard it did in July, 1946, when the airplane was the subject of a "We Fly" article. In this article *Air Trails'* technical editor Alexis Dawdyoff wrote, "In the final analysis, the Erco Coupe has so much in favor of it from the standpoint of safety, flying simplicity, and performance that it can easily be called one of the finest achievements in aviation design. Its safety features will cut down considerably the accident rate, while its flying simplicity will be responsible for a great many more people taking up aviation."

Engineering and Research Corp. (builders), Sanders Aviation Inc. (distributors), and the Civil Aeronautics Administration all state that the Erco Coupe is spin-proof. So do we.

—THE EDITORS



### Plane Talk

Sirs:

Although not a licensed pilot, I have been flying as a passenger for many years, during which I have had a certain amount of "informal dual" from pilot friends and from charter pilots, beginning as far back as the De Havilland DH4B and the Curtiss Oriole of 1920 with K-6 motor, the ancestor of the Curtiss "Conqueror."

Latterly, of course, I have ridden in the 65-hp puddle jumpers and also the late-comers in the four-seaters, viz., the Voyager and Navion.

I have not yet had the good fortune to fly in the Bonanza and have been greatly intrigued by Bob Arentz' pilot's report on it. He seems to take the reader right into the cockpit for a little "informal dual." His "pilots' jargon" is not too far over the heads of non-pilot readers of my type, while his occasional use of the simile or the metaphor to clarify a point lifts his story on the Bonanza above a dull recital of facts. Should I catch a Bonanza on some charter flight or sight-seeing hop, I think I'll know what to look for.

Your interesting magazine covering all phases of aviation keeps one up to date on developments and as an early day rubber-band and gas modeler, even those departments interest me. I deplore the emphasis on control-line flying, however, feeling that the problems of inherent

stability and the uncertainties of free-flight models are much more fascinating.

Your "De Havilland Story" brought back a nostalgic remembrance of a flight over the top of Long's Peak in a DH4B in 1920 with Lieut. Kenneth N. Walker, an old friend who, becoming a Brigadier General in World War II, was lost over Rabaul.

R. H. PEARSON

Quincy, Ill.

### Model Matters

Sirs:

I would like to see a new department in *Air Trails* that is devoted to photographs of models by modelers the world over.

With the photos sent in by the model builders, there should be some facts about the model such as, how it flies, how many coats of dope were applied, how long it took to build it and many other things the sender wants to tell about it.

JAMES HIVNER

Elizabethtown, Pa.

Sirs:

I am a fervid modeler and an ardent follower and fan of your magazine. Each month seems to drag by as I impatiently wait for the next issue of *Air Trails*.

*Air Trails* seemed to be getting better with each issue (if better than perfection exists), and being in Trieste where materials but no kits are available, in my opinion, one of the best things that ever happened was the incorporation of full size plans in your magazine.

In view of the fact that most readers' columns contain a majority of gripes and destructive criticisms, and being a realist myself, I think it only fair to have taken a little time and sent you this well deserved pat on the back.

T/5 DICK SCHERER

APO 209

# MODEL BUILDERS



To get peak performance and utmost dependability from your Midget Model Plane or Car equip its engine with Dependable Champion "V" Spark Plugs.

Champion "V" Plugs are backed by the same research, engineering and precision manufacturing as their larger counterparts and embody many of the same patented and exclusive features.

Champion "V" Plugs set new world's records of 130.87 M.P.H. in a plane at Los Angeles and 116 M.P.H. in a car at Kansas City. Those records speak volumes for the performance and dependability of Champion "V" Spark Plugs.

## FOLLOW THE EXPERTS

DEMAND NEW  
DEPENDABLE CHAMPIONS  
FOR YOUR MODEL ENGINE

### A SIZE AND TYPE FOR EVERY ENGINE

	V	V-2	V-3
Hex	1/2"	3/8"	3/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	3/32
Weight, Grams	8	3 1/2	2 1/2

Champion also makes "types V-R-1 and V-R-2" for specially designed racing engines.

CHAMPION SPARK PLUG COMPANY  
900 UPTON AVE. TOLEDO 1, OHIO





*You Can Build*  
**A BETTER  
MODEL**

Built-Up  
Flying Models

*with*  
**PLASTIC WOOD**

**PLASTIC WOOD** molds right into the lines of your model. Won't chip, crack or split! Handles like putty...hardens into wood. Can be carved, sawed and sanded. Ready to use. Takes dope or paint.

**YOU'LL WANT** Plastic Wood Solvent, too! Makes a perfect filler when mixed with Plastic Wood. Solvent removes Plastic Wood from tools and hands. Solvent is also used as a dope thinner!

**FREE BOOKLET**

"Slick New Tricks for Building Better Model Planes." Ask your local model dealer or write Boyle-Midway Inc., 22 E. 40th St., New York 16, N. Y.



Swell  
for patching  
broken balsa!  
Tube or Can

T.M. REG.  
U.S. PAT. OFF.

**PLASTIC WOOD**  
A CELLULOSE FIBRE FILLER



The new  
**STANDARD**  
IN CONTROL  
FLYING!



**CONTROL LINES**

by Matt Sullivan, well known controller

The modeling world is making the Pylon Brand lines its standard for all control line flying--the reasons are obvious!

Pylon Brand lines are doubly insured against damage--they're spooled and they are shipped in boxes the dealer uses for storing and display. For your convenience one line is colored, so you can tell at a glance which one is "up". Fine copper wire is supplied, too, to serve the end fittings.

**2-50' lines 50¢-or-2-70' lines 65¢**

Available at your dealers' in all the listed sizes, labelled for price, dia., length and A.M.A. Rules FULL TEST!

.008 ins. dia. .012 ins. dia.  
.010 ins. dia. .014 ins. dia.  
.016 ins. dia.

The finest grade of straightened coated, steel wire. Pylon Brand lines cannot be equalled in the model field for price, quality or convenience of use!

DEALERS: Contact your jobber now or write to nearest Pylon Brand jobber's name.

**Sullivan Products**

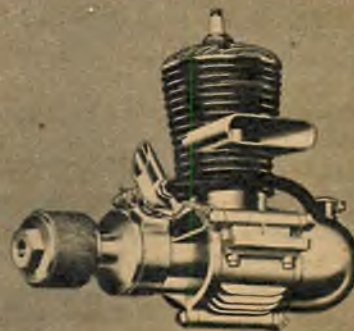
2078 SIMON ST., PHILADELPHIA 24, PA.



# Showcase

**Atwood's Latest →**

More than two years in the development, the new Triumph "49" and "51" engines are now being marketed by Atwood Mfg Co. (147 Pasadena Ave., S. Pasadena, Calif.). Each weighs only 8½ ounces. Glow plug version of each sells for \$17.50; ignition type for \$19.75. Triumph features new type ignition point setup. Points can be adjusted in few seconds with screw driver. Rotary valve fuel induction.



**← How You Fueling?**

A new fuel on your dealer's shelves these days is the "Octolene" and "White Magic" brands blended by California Chemical Co. (N. Sacramento 15, Calif.). Octolene is an accelerated fuel for glow plug operation; White Magic is for standard ignition. Developed by George Cooley, outstanding California race car and airplane speedster. He is now a field technician for CCC's test division.



**Windy City Props →**

Fairly recent entries in the prop field are the Top Flite and Power Props made by American Hobby Specialties, (2645 S. Wabash Ave., Chicago 16, Ill.). The Power Prop is a thin, medium-narrow affair for speed and contest flying; Top Flite is a sturdy wider bladed prop for stunt and sport flying. Lacquered and balanced, they sell for 35¢. Diameters range from 7" to 14", pitch from 3½" to 12".



**← Little Fellow**

Mighty handy is this new screw driver set from X-acto Crescent Products (440 4th Ave., New York City). It's the #70 interchangeable set and consists of an aluminum handle with locking chuck and 5 hardened steel blades in following sizes: .040, .055, .070, .080, and .100. Jeweler's type, it is specially adaptable for model work. Set comes in wood and plastic stand for safe keeping. Price of unit is \$1.50.



**Wakefield Winner →**

In production by The Megow Co. (Philadelphia 22, Pa.) is Dick Korda's winning Wakefield model which captured the famous Lord Wakefield trophy for America with a record time of 43 min., 29 sec. The \$1.50 kit makes into a model of 44" wing span, 36" length, with 5" chord and wing area of 200 sq. in. Fuselage cross section is 11.859 sq. inches. Simple boxcar fuselage. The wing is polyhedral type.





# Showcase Shopping

For items presented here try your nearest hobby or photo shop. Write to the maker for address of a retailer handling the product if you can't locate it. Prices and specifications are subject to change.

## Flying Box Car →

You can fly like a veteran says Ricks Mfg Co. (4947 Anaheim-Telegraph Rd., East Los Angeles 23, Calif.) speaking of the \$5.95 Box Car model. It's a Class C job and was designed by a model club as a trainer for beginners. To assemble you need only a tube of cement and a bottle of dope. All parts come band-sawed to size and shape. All hardware included. Ship is stable and highly maneuverable.



## ← Simple Shooting

Featuring a hinged back and removable cone for ease in loading, and an automatic shutter operated by conventional lever-type release, the Ansco Shur Shot camera reduces picture taking to its simplest terms. Gives eight pictures on #120 roll, 2 1/4" x 3 3/4". Takes anything from 6 ft. to infinity. Horizontal and vertical view finders. Single meniscus lens and single leaf shutter. \$5.18, with tax.



## Beech Beauty →

Scientific Model Airplane Co. (218 Market St., Newark 2, N. J.) has developed this control-line scale model of the famous Beechcraft. Wing span is 24 in., length is 21 in. Takes engines up to .49 displacement. Kit includes carved balsa fuselage finished inside and out, aluminum cowling ready to attach, formed landing gear, rudder and stabilizer cut to outline. Full size easy-to-read plans. \$5.95.



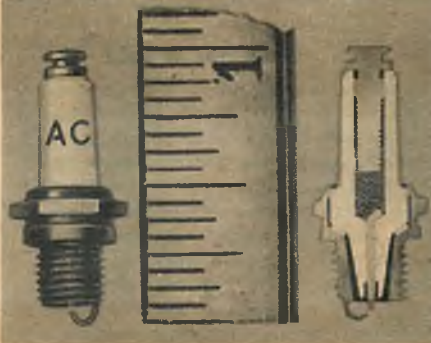
## ← Engine Killer

The problem of effectively stopping glow plug engines is answered by the new "Shutter-Off" made by Austin-Craft (431 S. Victory Blvd., Burbank, Calif.) which retails for 75¢. Suitable for glow plug, diesel or standard ignition, device leans down fuel supply before it stops. Fits an Austin-Craft timer in a jiffy. Again available is the A-C Baby Timer, very light precision-built timer for small jobs, \$1.50.



## Here's a Plug →

A new type spark plug for model engines has been developed by engineers of AC Spark Plug division of General Motors at Flint, Mich. Plug has patented aluminum oxide insulator. A copper-glass seal, which seals the center wire hermetically and permanently, prevents compression losses and overheating which results from passage of hot gases around center wire. Thread sizes are 1/4"-32, 3/8"-24.



It's New! It's PDQ!

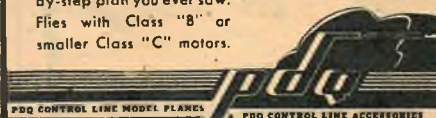


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### New Drone →

Newest development from Drone Engineering (851 Anna St., Elizabeth, N. J.) is the ball-bearing Drone Diesel of .297 cu. in. disp. and selling for \$14.95. Engine is lighter in weight with new 1-piece cylinder-crankcase casting. Both radial and lug mounts are built in. Outwardly head looks the same, but it's now recessed on the inside and offers variable compression by means of interchangeable head gaskets.



### ← Air Info

One of the most informative collections of aeronautical and marine data to come this way in ages is James C. Fahey's victory edition of "Ships and Aircraft of the U.S. Fleet." Known in technical circles as "the little blue book," Mr. Fahey's compilation of Navy planes and ships is a noted reference manual. 246 views, 96 pages. \$1 postpaid from 2033 Rhode Island Ave., N. E. Washington 18, D. C.

### Breezy Story →

New miniature wind velocity meter for accurate readings up to 60 mph is an item of special interest to gliding and model fans. Alnor Velometer, Jr. is calibrated to provide direct reading of air velocity in either feet per minute or miles per hour without timing, calculations, or reference to tables and charts. Manufactured by Illinois Testing Laboratories (420 N. LaSalle Street, Chicago 10, Ill.). Weighs 8 oz.



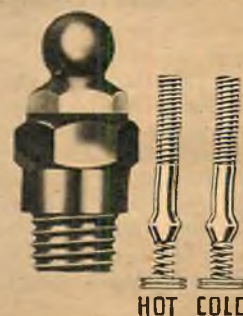
### ← Sea Story

Ever get a hankering to try your hand at something different? This Grand Banks ship model offered by All-Star Models (6627 N. Keota Ave., Chicago 30, Ill.) is reason enough to try a somewhat different hobby. Construction closely follows that of full scale sail boats and its performance is equally authentic. Over-all height is 30 inches, length is 21 inches. True scale plastic fittings included. \$3.00.



### Glow Hot or Cold →

New wrinkle in glow plug engine operation is introduced by Micro-Bilt (Danbury, Conn.) with unveiling of interchangeable hot and cold elements for the long or short type Arden glow plug. This now permits experimentation enabling modelers to determine which type of element works best for them. Two hot or two cold elements come in a package for 85¢. May be used as replacement for worn elements.





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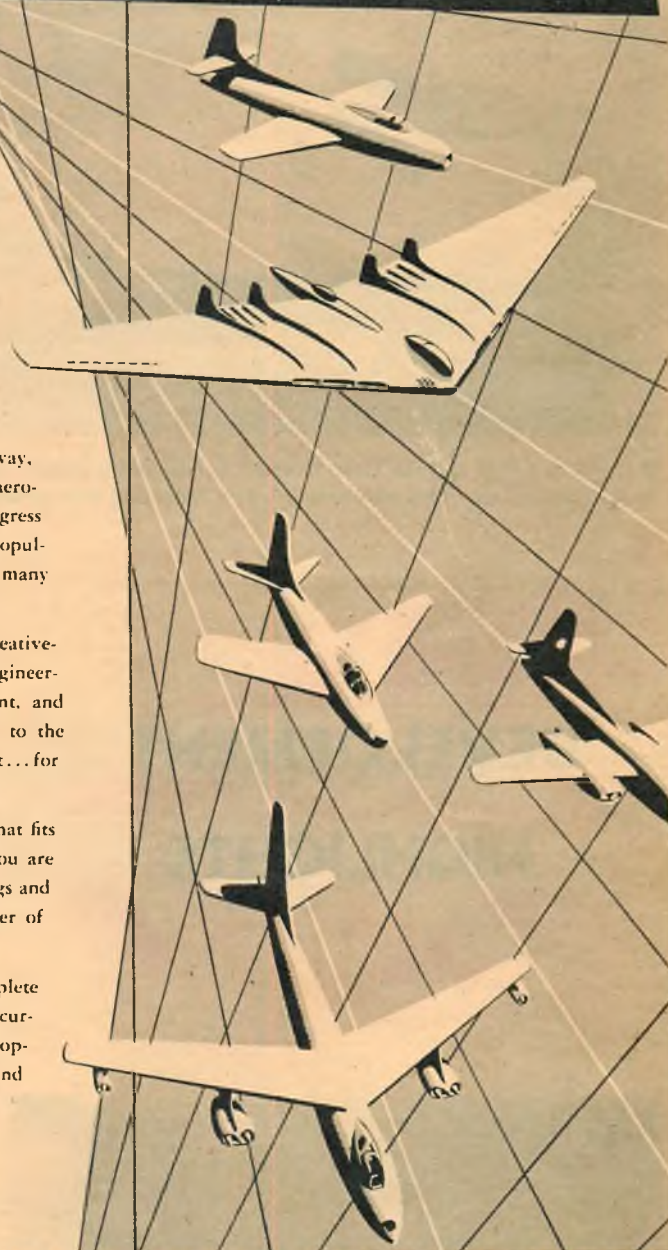
Right now there are more aeronautical engineering projects under way, and scheduled for the future, than ever before. Opportunities for the aeronautical engineer grow greater, grow broader, day by day. Spectacular progress in aviation is being ushered in by Flying Wing design, jet and rocket propulsion, gas-turbine engines, sonic and super-sonic speeds, atomic power, and many other still-secret developments.

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## DEVELOPMENT HIGHLIGHTS



● Combined Martin-Westinghouse project is this Stratovision B-29 which acts as aerial relay station for television programs. Modified bomber flies at 25,000 feet picking up programs with tail antenna and rebroadcasting from nose antenna over area 525 miles in diameter. Future plans call for Martin 202's.



● Edo-modified Grumman Widgeon is unofficially designated the "Petulant Porpoise." Lower hull can be removed and different one bolted on as part of Navy-NACA water and flight tests. Project designed to increase hydrodynamic and aerodynamic efficiency of flying boats. Hull shown is copy of XP5M-1.



● Improved landing control is gained for Ercole by this new tail assembly. Area in slipstream from the propeller has been reduced. Effect of tail area in power-on stall is then lessened. Extra elevator up-travel obtained discourages pilot from gliding so slowly that he has no elevator travel left to flare his landing.



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# Air Notes

## AVIATION TODAY AND TOMORROW

By John Forney Rudy

**BACK IN '28:** When Air Trails was getting underway with its first issue in October, 1928, final preparations were being made by Major Carl Spaatz, U.S. Army Air Corps, with Capt. Ira C. Eaker as relief pilot, and a crew of three, to set a refueling endurance record in the Fokker transport, 'Question Mark.' Twenty years later the Air Force is again refueling-in-flight and having a number of B-29's modified as flying tankers at Boeing's Wichita plant.

**PROGRESS WITH THE PATENTEES:** The aeronautical inventors are at it again—extensible plane wings, air-cooled explosion turbines, wheel spinners, automatic wheel chocks.

The extensible wing, as envisioned by Michael Gliwa of Chicago, can be extended by the pilot in case of emergency to increase the lifting and sustaining area of the wings thereby allowing gradual descent of the plane.

The explosion turbine provides power without any of the conventional parts used in internal combustion engines. Power is developed by explosion of fuel within rocket tubes twisted into a spiral formation and embedded within a conical rotor. The force and velocity of the explosions forcefully straighten out its path and cause the rotor to rotate.

The wheel spinner is a device with small pockets attached on each wheel. A nozzle supplied with fluid and controlled by the pilot fills the pockets to set wheels in motion prior to landing.

Martin J. Madison of Baltimore has devised an automatic double chock for each wheel of a plane, coupled to the landing gear, and actuated by a torque tube controlled by the pilot. Adapted to carrier planes where roll of the vessel necessitates chocking back and front of wheels, the invention also permits conversion of plane wheels to skis or vice versa in mid-air.

**RUBBER TO THE RESCUE:** Rubber is invading the field of aeronautics today as aluminum did two decades ago. Latest use of rubber in planes is an electric heating pad to prevent accumulation of ice in water-contaminated gas, developed by U. S. Rubber Co. as a cold-weather aid for aircraft engines. The pad, made of electrically-conductive rubber, supplies heat to a dehydrator which removes water from fuel by a filtering process.

**STAR SHOOTING:** After more than two years of secrecy, the military has permitted 'automatic celestial navigation', or the aiming of guided missiles by use of stars, to leak out. So far the new method is the only known one that avoids disruption of flight by radio wave 'jamming.'

Take the word of scientific navigators that the new navigational method is the closest known approach to absolute accuracy in direction of missiles. The method works by machinery incorporated in the missiles which, like navigators, takes constant bearings of stars and other celestial bodies and applies its findings to the course.

**WARNING NET:** Canadian and U. S. military scientists have gone much farther than you'd think in planning a 'radar fence' along the northern rim of North America to give early warning of an approaching attack force. While such a system has already begun, planning now is how to speed completion of the system.

**HIGH COST OF TAXI:** Insurance costs for light-planes will not come down until private flyers reduce the largest percentage (63%) of all claims for losses, those of taxiing and landing accidents. To get such losses down, Flight Safety Foundation suggests that landings or taxiing on unfamiliar areas be discouraged, that soft spots, ditches, mud holes and unusual ground configurations be marked, and that taxiing be done slowly using S turns.

**HULLISH TRICK:** Sometime ago we wrote not to rule out the large flying boats. To add strength to that statement it is now possible to disclose that Navy tests with a small experimental amphibian with interchangeable hulls have been very successful in leading to increased hydrodynamic and aerodynamic efficiency of large flying boats.

The experimental plane, called the 'Petulant Porpoise' by some, is testing three types of hulls. Thousands of dollars are being saved since engineers are able to test hull designs before actually starting construction of full-scale craft.

**HIGH JUMPERS:** AF will soon be using a dozen specially built supersonic bail-out trainers. Pilots will be trained in the new plane to bail out at supersonic speeds at altitudes from 35,000 to 65,000 ft.



# Air Notes

## AVIATION TODAY AND TOMORROW

By John Forney Rudy

**FASTEST FIGHTER:** The F86A will be in quantity production soon. A total of more than 330 such planes, which are to have a one-hour endurance at top speed of 660-780 mph, will be built for AF by North American. Six .50 caliber guns, rockets, light bombs, and other armament will probably make the F86A the most powerful and fastest fighter in the world.

**DREAM STUFF:** Tongues are wagging in the lightplane industry about the Boeing L-15 scout liaison plane now testing by AF. Reports persist that it is the answer to the personal plane owner's dream since it will land at speeds of less than 25 mph and will take off and clear a 50-ft. obstacle in less than 600 ft., will cruise at 95 mph, and even more important, has been stalled out with full flaps and full power at speeds of less than 14 mph.

**FAST TALK:** Official statements that the XS-1, the parasite fighter carried aloft in the belly of a B-29, had exceeded the speed of sound came only after many aviation writers had already known but were fearful to disclose the information.

The designed speed of the XS-1 is about 1,017 mph at 40,000 ft., and about 1,700 mph at 80,000 ft. Its actual test speed is still highly secret, but you can take your choice between the speed of sound (763 mph at sea level under standard conditions) and the designed top speed of 1,700 mph at 80,000 ft.

**ALL THE ANSWERS:** Airline reservations have been a bogey to commercial operations for many years, but new and unusual devices and methods are slowly eradicating this headache. One of the newest devices is the 'Intelix' by International Telephone & Telegraph. An electromechanical unit installed in an airline's central reservation system, it records and reserves space automatically so that it is possible for any person within the system to learn from the device the number of seats sold or available on any leg of any flight at any time.

**THE LOCKHEED LOOK:** There's a new Shooting Star in the skies, the F-80C, with a more powerful turbojet that will add about 100 mph to its former 550-mph speed. Increased fire power and other still secret advances in development and design are embodied in the new plane.

**PROGRESSIVE TIMES:** Despite the fact that Congress appropriated the money for, and the aircraft industry has begun work on, 4,262 new military planes, it will be at least 18 months and as long as two years before all are completed, and in that period jet power advancement is expected to make the first 2,000 planes built this year obsolete.

Planes now coming from the drawing boards are all being powered with jets and gas turbines. While the conventional piston engine is almost nearing the end of its development cycle, the new power plants are just beginning theirs.

The new power plants have raised an entirely new set of aeronautical problems—strength, maneuverability and stability must all be reassessed for each new plane.

Altitudes have almost doubled for military tactics, roughly from 30,000 to 60,000 ft., not to mention doubling of speeds. You'll be hearing more and more about new hydraulic and electrical systems that can withstand the low temperatures of high altitudes; the cooling of engines; thin wing construction needed for supersonic speeds; the increasing complexity of control and accessory equipment; more precise navigational devices and fire power.

Publicity wise, you'll hear even more about the money needed, for it's going to take billions for even a moderate size military air force—two billions next year, 3½ billions by 1951, or about 6½ billions in the next five years.

Out of all of this military program will come scores of new and strange developments adaptable for both military and commercial aviation, even for lightplanes. Some scientists now predict that developments in the next three years will surpass the aggregate of the last 20 in aviation.

**WASHINGTON PROPWASH:** A new Pratt & Whitney engine is planned for installation in the B-50C that may bring its range to 10,000 miles . . . The giant turboprop bomber, B-52, is said to be in mock-up stage at Boeing . . . AF, taking a page from Navy, is experimenting with catapults as a means of getting hot jet fighters into the air without long take-off runs . . . YB-35 Flying Wing may have its already long range pushed into the sensational class with utilization of a variable discharge turbine that reduces fuel consumption one half.





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**TRAIN IN MIAMI -- AIR CAPITAL OF THE WORLD**





OCTOBER 1948



BY SLICK GOODLIN  
AND  
BOB CONSTANT

A THRILLING ACCOUNT OF EARLY EXPERIMENTS WITH  
RADIO-CONTROLLED JETS AS TOLD BY THE TEST PILOTS

## Phantom Flyers



**T**HE twin-engined Tigercat was in trouble!

Like an electric wave, the feeling went through the crowd of newsmen gathered on Cherry Point Airport below—something had gone wrong!

Those crazy gyrations, those dives and zooms, those abrupt push-overs and sudden pull-ups—they weren't part of the show, that much was plain. The word spread like wildfire around the Marine Air Base:

"The Tigercat's in a jam!"

"The wheels won't come down!"

"The gear is stuck!"

"They're trying to snap it loose!"

Base personnel augmented the crowd on the airfield as they rushed to the scene. They focused their eyes on the Tigercat. Few of them noticed a smaller ship, a Hellcat, flying close to it.

For a half hour, the two aircraft contorted as one through a series of violent gymnastics. Then the order to clear the field was given.

The Tigercat was going to belly-land!

Crash trucks were alerted and fire crews were strategically deployed. Flushed with excitement, spectators pushed and crowded against each other.

They watched the big ship make its approach. It came over the fence. They held their breaths. They saw it settle. Lower, lower, until its props nicked the asphalt. Lower, until gradually the huge fans churned into the runway tossing large bites of pavement into the air. Amidst a shower of sparks, the great belly made contact. The ship slithered down the runway and came to a stop askew in a cloud of dust—its props bent, its under-fuselage scratched, but otherwise intact.

A concentrated sigh, mixed relief and admiration, escaped the crowd. Newsmen surged forward to snap and interview the skillful pilot. This was something extra, the unexpected which always makes a reporter's duties interesting. Many of them almost reached the plane before they suddenly stopped and sheepishly re-traced their steps.

In their excitement, they had forgotten one important fact. *The Tigercat, sitting there on the runway, was, and had been, absolutely pilotless!*

It had been but little more than a year before that the AAF had assigned to Bell Aircraft Corporation the task of devising and perfecting a system for flight-testing tactical aircraft via remote control. It was a difficult, complex assignment but Bell Aircraft accepted.

The project was labelled MX-536. Its purpose was to safeguard the lives of test pilots by developing a mechanical device that could fly an airplane as well as collect data.

An overwhelming problem, when one considers that the heart of any remote-control operation, relative to aviation, is the automatic-pilot—one that can be relied upon to operate outside of a forty-five degree range of a pre-set altitude. To clarify this, let us assume that an aircraft, flying level on auto-pilot, is suddenly subjected to a violent updraft which causes it to bank at an angle of forty-five degrees or more from the horizontal. What happens? In accordance with a definite law of physics, the automatic-pilot (actually the gyroscopes that control it) will fall over, "tumble" in aviation nomenclature, and become useless. It can dangerously affect the safety of the aircraft, for a





● Bob Constant, above, piloted the YP-59 jet-propelled mother ship in the Bell remote control experiments. Slick Goodlin, below, had exciting safety pilot's job for robot plane.



● Navy's first twin-engine service type aircraft flown by remote control was this Tigercat F7F-3 drone.





tumbling gyroscope wavers erratically and its effects upon the aircraft can readily be imagined when one realizes that this spinning mechanism is directly connected, through servos, to the controlling surfaces. This is the reason why modern airliners never operate on automatic-pilot in turbulent regions.

Bell engineers solved this first problem with an original invention which they called the Rate-Automatic-Pilot, an engineering feat in its own. The new device could operate through a 360-degree range without "tumbling" and was the major contribution of MX-536, for without it the project would not have been possible.

For the experiment, two YP-59's, America's first jet-propelled aircraft, were selected—one to serve as the robot aircraft, the other to serve as mother or control aircraft. A third component, a modified Army truck, served as the ground-control station. The three units were respectively nicknamed "The Reluctant Robot," "the Mystic Mistress" and "Kiwi's Cockpit."

If one does not delve too deeply into radio theory, the principles of its operation, as applied to Project MX-536, are easily explained. Radio transmissions from the mother aircraft and/or ground-control station were received by the robot ship through a multi-channel radio receiver. Each channel represented some particular function, such as *Wheels Up* or *Wheels Down*, and was filtered to receive one tone only. Now, let us assume that channel *One* represented the *Wheels Up* function and was filtered to receive nothing but a "bleep." When the ground (or air) controller selected *Wheels Up* on his mechanism, he was actually causing his radio to transmit a "bleep" on the same frequency that the robot's radio was tuned to. Channel *One*, being the only one filtered to receive this tone, immediately picked it up and, in so doing, a vibration was set up closing an electrical circuit that operated a motor which brought the wheels up. Another channel, we could say, was filtered to receive nothing but a "bloop," and so on for every necessary operation. The same principle applied to the flight-control surfaces except that the various functions were relayed to the automatic-pilot unit.

Mounted atop the standard control-column of the mother aircraft was a miniature control stick, approximately two inches in length, that could be moved in any of four directions to produce a corresponding motion in the robot ship. There was also a tiny switch on the mother ship throttle that activated the throttle in the robot in the same direction that it was moved. Switch forward in the mother ship moved the robot throttle forward. A specially constructed switch-panel was installed on the left side of the cockpit in the mother ship. In it were a number of push buttons, labeled according to the function that each performed. For example, to raise the robot's gear, simply press the button marked *Gear Up*.

The ground-control truck contained gear identical to that in the mother ship. The switch-panel, miniature stick and throttle were installed on the arms of a swivel chair mounted atop the truck. From this position, the ground-controller could easily follow and direct the robot's flight around the airport.

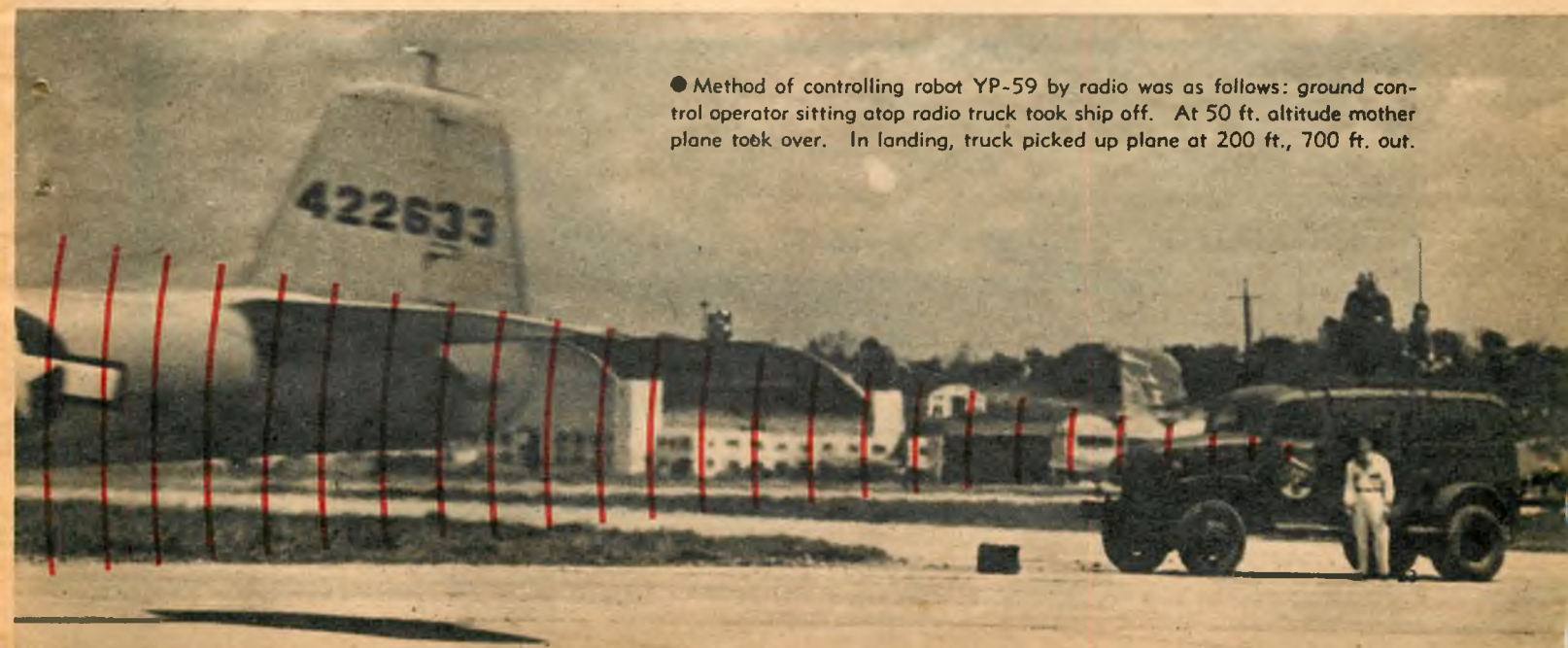
Television and Telemetering were elected as the media through which data could automatically be transmitted from the robot to the ground.

A complete instrument panel, painted white, was installed in a brilliantly illuminated compartment just aft of the pilot's cockpit and televised, by means of an automatic television camera, to a receiver screen in the ground-control station. A permanent record of the entire flight could then be obtained by an ordinary motion-picture camera in front of this television screen.

Designs were also made for the installation of a second television camera in the pilot's cockpit, so that in nolo (pilotless) flight a ground controller could not only see the instrument panel of the robot ship but he could see the countryside over which it was flying.

Telemetering was a method of obtaining strain data, developed largely by Princeton engineers. It consisted of tiny strain gauges installed at various points along the structure where stress data was desired, tail, assembly, wing root, etc., and bulky receiver equipment installed inside the ground-control station. For each strain gauge there was a correspond- (Turn to page 98)

● Method of controlling robot YP-59 by radio was as follows: ground control operator sitting atop radio truck took ship off. At 50 ft. altitude mother plane took over. In landing, truck picked up plane at 200 ft., 700 ft. out.







# HOW FAST CAN WE FIGHT?

WILL THE NEW JET FIGHTERS AND BOMBERS RUN AWAY FROM THE  
OPPOSITION'S GUNS? CAN WE BOMB AT SUPERSONIC SPEEDS?

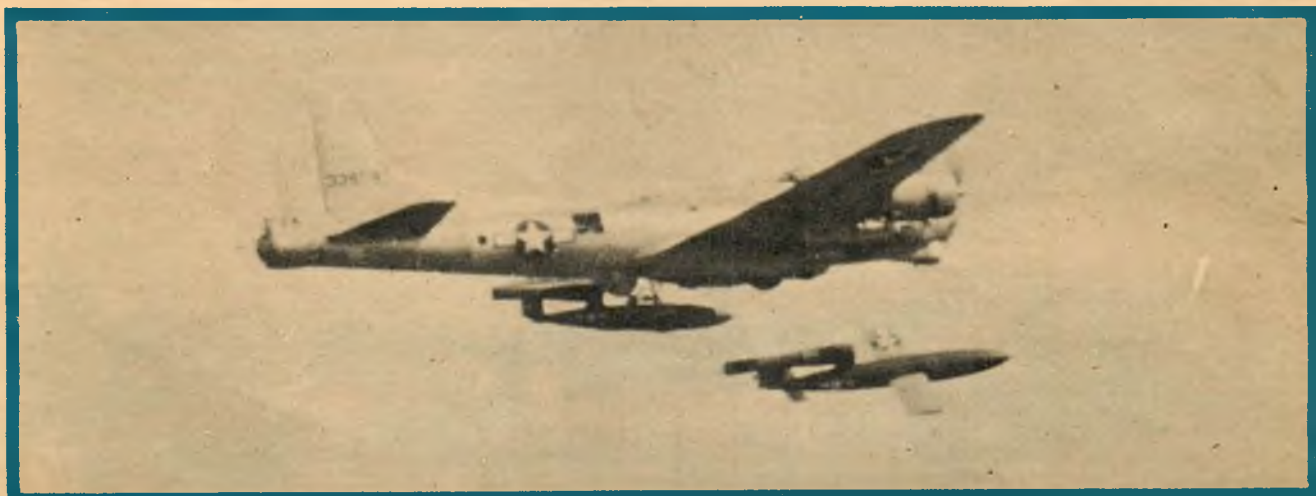
BY JAMES L. H. PECK

**A**MERICA'S new jet air force has taken wing. We have 500-mile-per-hour bombers and 600-mile-per-hour fighters in the air. Supersonic fighters are ready. Yet the business of an air force is fighting, and how we are going to fight at trans-sonic and supersonic speeds is one of our most baffling tactical problems.

Fighters show promise of catching up with their own bullets. The bombers actually outspeed their missiles, and bombardiers cannot make their eggs behave properly during drops because these bombs were designed in accordance with prewar ballistics. Even the fast moving aerial rockets behave queerly when

launched from jet fighters. Science is being hard pressed to develop weapons that will keep up with our atomic-age speeds.

The bombs with which the AAF and RAF blasted German industry into impotence and the Japanese mainland into submission were not radically different in shape—although some were larger in size—than those we used in World War I. The machine gun armament with which our fighters shot the Luftwaffe and the Japs out of the sky to gain air superiority was only slightly improved over the guns used in 1917. Nearly a quarter of a century had elapsed, and the planes themselves had





undergone radical changes, but the weapons they fought with were not improved in proportion.

The Mustang and Thunderbolt cruised around 300 mph. Today's standard P-80's and P-84's cruise at 500 mph. Within a year, new craft will add another 200 mph to their cruising speeds. In order to appreciate what these increases will mean to the man behind the gun, let's see what happens to a burst of gunfire. Consider the caliber .50 machine gun—with which we won the last war and are arming today's jet fighters. Between the time a bullet leaves the gun and either hits or misses the target, it is subject to five actions or forces. The propellant force is the push behind the projectile plus the forward speed of the airplane at the time of firing. At the World War II combat speed of 300 mph, about one-fifth of the bullet's total velocity was contributed by the air speed. Today's 500-mile speeds complicate matters because that figure was based on an effective range of 1,200 feet. We cannot operate that close at 500-mile combat speeds.

One of the most ticklish problems is that of target discrimination. The best weapon is of little avail if you use it to shoot down your own planes. During the last year of the war, some of the hottest pilots experienced trouble in recognizing aircraft at high speeds. Trans-sonic combat will be considerably more taxing—a little too much so for human perceptions. One expert said, "The closing speeds at which two fighters like the Panther approach and flash by one another is something in the neighborhood of 1,300 miles per hour. You might not even see the other ship as the two pass at this speed, let alone recognize it, aim and fire your guns."

By means of radar, we can identify targets and aim guns. But IFF (Identification of Friend or Foe) radar was far from infallible during the last war, and it will require some doing to make it simple and positive enough for the automatic character of trans-sonic combat. What the technicians are aiming toward is a combination IFF, computer, and radar-gunlaying device that will be so quick on the trigger that it will start shooting before the pilot even sees his target.

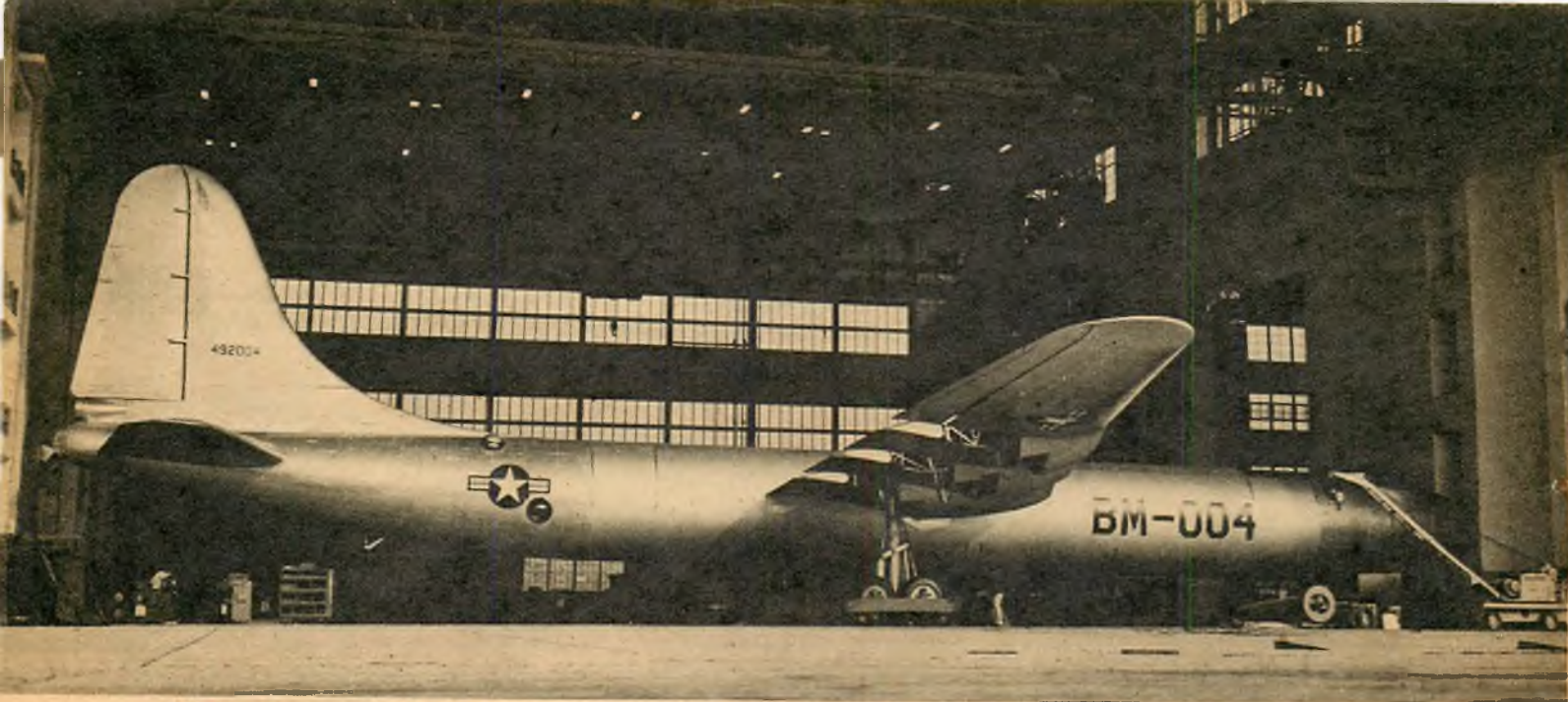
The second factor is the airplane's movement. When one is in the proper position, the bullet travels along the line indicated by the gunsight. The least slip or skid, however, imparts a sidewise movement to the bullet which is not accounted for in the ballistic design of the sight. At the old effective range of 1,200 feet, a 10-degree skid causes the bullet to miss by 26 feet. There is still another aspect to airplane movement. The new jet fighters will undergo far greater accelerations in dives and turns than did the wartime craft. During a sharp pull-out or turn, the wings deflect proportionately because of the imposed loads. Wing-mounted guns are thus moved out of alignment by the wing's bending. One method of eliminating this deflection is the mounting of all guns in the nose of the plane. This we are doing in the P-80 and P-84 (with the additional advantage of concentrating the fire power so as to produce a more compact cone of fire against the target).

Air resistance is a third influencing factor. At wartime speeds this effect was negligible, but this is no longer true. Air resistance increases in proportion to the square of the velocity. The faster plane speeds add a greater velocity, thus increased resistance, regardless of the range. At the 1,200-foot range, resistance slowed down wartime .50-caliber fire to about two-thirds its initial velocity—which is taking out a lot of the bullet's punch.

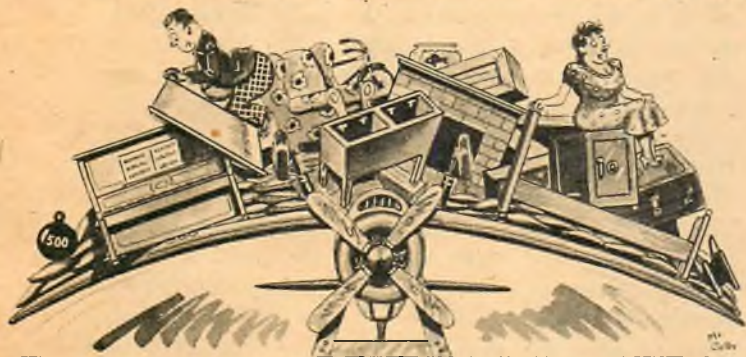
Gravity pulls bullets downward, their fast flight notwithstanding. The caliber .50 bullet drops 16 feet the first second, but only 4 feet the first half of that second. Since the bullet travels the normal 1,200-foot range in less than a half second, its drop is not great. Such as it is, this can be corrected by elevating the guns slightly in their mounts. Beyond 1,200 feet, the bullet's drop is much more rapid and corrections must be made in firing.

The fifth action is that which results from the cone of dispersion. Bullets fired from any one gun do not go through the same hole even in a stationary target, because of the vibrations of both gun and airplane. They scatter over an area of several (Turn to page 116)





● B-36 sidles into specially built structure equivalent to 8-story building for static and dynamic tests. Next occupant may be C-99.



# PLANE BUSTERS

BY DOUGLAS J. INGELLS

THEY THROW ON EVERYTHING BUT THE KITCHEN SINK IN THE STRUCTURAL TEST LABS AT WRIGHT FIELD

**A**T THIS very moment, one of the world's largest aircraft—a B-36 superbomber—is cracking up. Even as you read these lines the giant plane's skin is twisting itself free of rib structures. The huge tube-like fuselage is crumbling. The four-story high rudder is bent and distorted like a pretzel. Soon, the whole \$1,000,000 airframe will break into a thousand pieces!

Ironically, man who labored so hard and so long to create this winged leviathan is now working doubly hard trying to tear it apart. Why? It's really not as absurd as it sounds.

As airplanes of greater speed, weight, and carrying capacity are designed, increasing demands are made upon materials and structures. The designer wants to create an airplane which will be strong enough to meet any and all emergencies. The pilot wants an airplane which is sufficiently light in weight to be highly maneuverable and fast with a good load-carrying capacity. Consequently, every airplane is a compromise between lightness and strength. This means that every new airplane must be tested not only to determine its flight characteristics but also to make sure that it is structurally sound and strong enough to endure the strains of flight. The technical name for this phase of an airplane's life is Static and Dynamic Testing.

"If you want to get untechnical about it," laughs one who is in charge of such tests, "we're all a bunch of plane busters. Our job is to find out how much weight and force any given part of an airplane's frame structure can stand. We wreck it."

Of course, this sounds like an expensive way to have fun, especially when you're playing around with an airplane like the B-36. But engineers who do their "wrecking" systematically and scientifically will tell you that the tests have paid off by putting us years ahead in the knowledge of aircraft structures.

They don't hesitate to tell you that applied "know-how," the result of thousands of Static and Dynamic Tests on all types of airplanes through the years, is what makes flying as safe as it is today.

For instance, you're sitting in the plush seat of a modern airliner when suddenly the little warning light up front flashes on—*fasten safety belts*. The hostess calmly tells you the plane is heading into some slightly rough weather. Soon a wing whips up. The tip waves at you. How can this thing stand such treatment?

Engineers who built it know just how much strain and stress this airliner can take because of the static tests and the dynamic tests which it had to undergo. They know because they piled shot bags on the wings



and they pulled and pushed and twisted and jerked and yanked and contorted every inch of aluminum skin and frame until it broke. They know how much the structure itself can stand. And they know that it can "weather" any thunderstorm—even a hurricane—because the force they applied (the force it took to rip the plane apart) was greater than the gusts and turbulence of any storm on record. They'll give you big odds that your airliner won't disintegrate. The results of thousands of static and dynamic tests are your insurance policy that the airliner's not going to come apart under flight stress and strain.

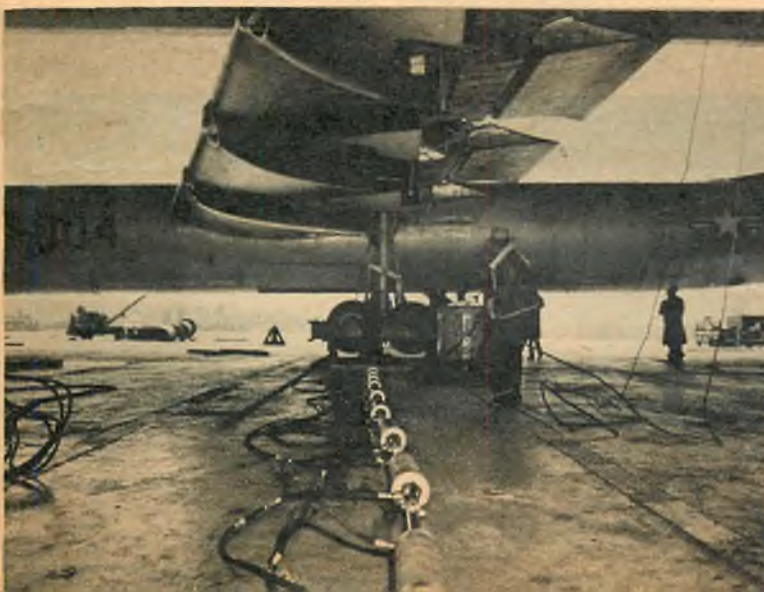
It's the same story with our fighter planes, bombers or any other type of aircraft from helicopter to glider. That's why the giant B-36 is today resting in a specially prepared cradle in the big Static Test Hangar at Wright Field undergoing what engineers claim is the static test to end all static tests.

The task of getting it there, alone, is indicative of the man-size job and intensive planning behind the static

● Old method of simulating flight loads was to pile 10-lb. canvas bags of shot on various parts of the airframe. System was slow.



● Ten surplus landing gear units were hooked up as hydraulic chain to pull 90,000-pound B-36 into hangar on special dollies.



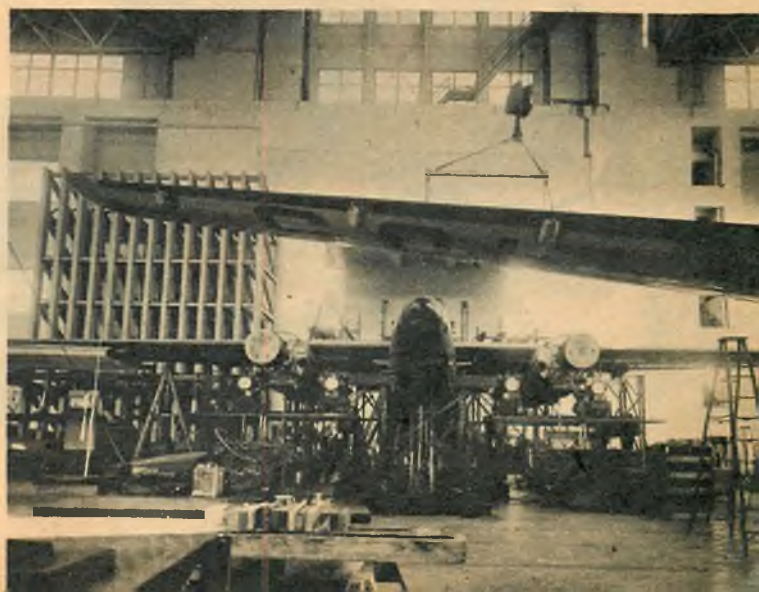
test. It took half a hundred workmen three-and-a-half hours to move the 45 tons of airframe inside the giant building (the largest of its kind in the world) where the tests are being run. It will be a year or more before the plane comes out. And when it does the once proud giant will come out in pieces on trucks, or maybe even, shovels—just so much scrap metal for the junk pile probably slated to be turned into pots and pans.

According to A. M. Van Marter, who is general foreman of the Structures Test Laboratory charged with the B-36 "wrecking" project, the painstaking task of testing every inch of the framework of the superbomber is the biggest job Air Forces experts have ever tackled. In all probability it is the biggest job they will ever be called upon to perform because engineers, looking into the future, predict that the B-36 is the last of the really big giants. Beyond it, the size of any bomber which might be larger seems impractical in the light of scientific advancement and the improvement of new jet and rocket propulsion means. The atom bomb, as far as bombing potentialities and destruction is concerned, has virtually made the predictions axiomatic.

Further proof is the fact that the "plane busters" built a special hangar at Wright Field for this particular job. It was laid down, contracted for and built before the first B-36 rolled off the Consolidated-Vultee assembly line. It's a towering structure, about as high as an eight-story building. There's no similar structure anywhere in this country, a good indication that this is to be the big test and the final one, although it may be that the larger C-99, counterpart cargo version of the B-36 will get the "works" in the same building.

Right now all attention is centered on the B-36. Complications started the day they tried to get the superbomber inside the test hangar. In itself this was a big engineering job. Hydraulic power, such as that used to raise and lower the landing gears, was the force utilized to pull the 90,000-pound airframe inside. Ten surplus landing gear units were hooked together in a chain-like arrangement and the plane moved on special dollies—fifteen feet at a time—into its shelter. Then a huge crane (150-ton lifting capacity) (Turn to page 104)

● In Wright Field structural test laboratory this bomber will "get the works" as the wing deflection is calibrated in inches.







# Two Decades of AIR PROGRESS

## AIR TRAILS "FIRSTS"

● Among the many outstanding features inaugurated by *Air Trails* during its twenty-year history is the "We Fly" series of test pilot stories which have achieved considerable prominence in the world of aviation. A.T.'s "Youth in Aviation" section did much to stimulate interest in aeronautical training during the war; its post-war series of articles on leading aviation schools continues that theme. *Air Trails* has scored with early stories on German jet-propelled ships, Russian rocket planes, flying wings, and supersonic flight. It was first with all-out support of control-line flying and for years has been noted for its contest-winning and record-holding model designs. In the free-flight field *Air Trails* directed national attention to low-wing gas models. It has given comprehensive treatment to engine and kit models. Its Airmen of Vision and Air Pix competitions draw numerous entries.



**T**WENTY years ago—when *Air Trails* was young—who dared predict the breath-taking advancements in aviation that were to come?

Well, a few farsighted proponents of air travel did prophesy international networks of airlines.

Some military men visualized fleets of bombers and accompanying pursuit planes making sweeps around the globe.

A handful of engineers were seriously considering rocket-powered aircraft.

But what did the average man say? Ocean-spanning passenger aircraft—long range fighters—mammoth bombers—rocket ships? Fantastic! Sunday supplement stuff!

You think you wouldn't have been laughed at back in '28 if you spoke of jet propulsion, hands-off across the sea flights, channel wing aircraft, parasite fighters?

Then let's have your ideas of what aviation will come to by 1968. Who will be flying where, how fast, and in what, twenty years from now?

But this is 1948, not 1968, so let's pause and review the amazing progress man has achieved in his never-ending quest to master the air. It is unfortunate that the most rapid strides during the 1928-48 period were made when the best brains of this and other countries were pressed into service devising means of destruction from the air instead of concentrating on peaceful aeronautical advancements.

If you talk with the engineers they will tell you that the past twenty years produced the greatest progress in the following fields all vital to aeronautical advancement: power plants, metallurgy, production methods, science of aerodynamics, and aircraft fuels.

The most powerful engines of 1928 were the 9-cylinder, air-cooled Pratt and Whitney Hornet and the Wright Cyclone, each developing in the neighborhood of 500 horsepower. Compare those to today's four (Turn to page 102)

AS AIR TRAILS STARTS ON ITS TWENTY-FIRST YEAR WE STOP TO SUM UP THE PROGRESS OF AVIATION IN THE LAST TWO DECADES. THE NEXT TWENTY YEARS ARE SURE TO MAKE THE LAST TWENTY LOOK LIKE THE DARK AGES OF AVIATION



# Development Highlights



One of the Air Corps' latest acquisitions is this Ford-Stout XC-3 all-metal monster powered by three Wright J-5 engines. Observers claim tri-motored planes are most economical type.

(Right) Doris Day and Anita Grannis, newspaper women, hitch-hike 125 miles from Philadelphia to Washington in 19½ hours to catch air-mail-passenger plane and fly back in 1½ hours.



(Above) Will he do it? By refueling his ship, yclept "Question Mark," thrice daily while in flight, Major Carl Spaatz, U.S.A., intends to stay in the air above San Diego for 10 days.

(Right) Wasp-powered Boeing fighters of 95th pursuit squadron flying at high altitude. Based at Rockwell Field, San Diego, squadron is attempting to set new altitude records.



A meteoric dash! Said to be the first public flight in an aeroplane driven by rockets was this take-off by Fritz von Opel at Frankfurt recently."



# BLIND FLYING BY EAR



NOW THAT THEY CAN'T THINK UP ANY NEW INSTRUMENTS THE

SCIENTISTS ARE STRIVING TO ELIMINATE A FEW BY THIS METHOD

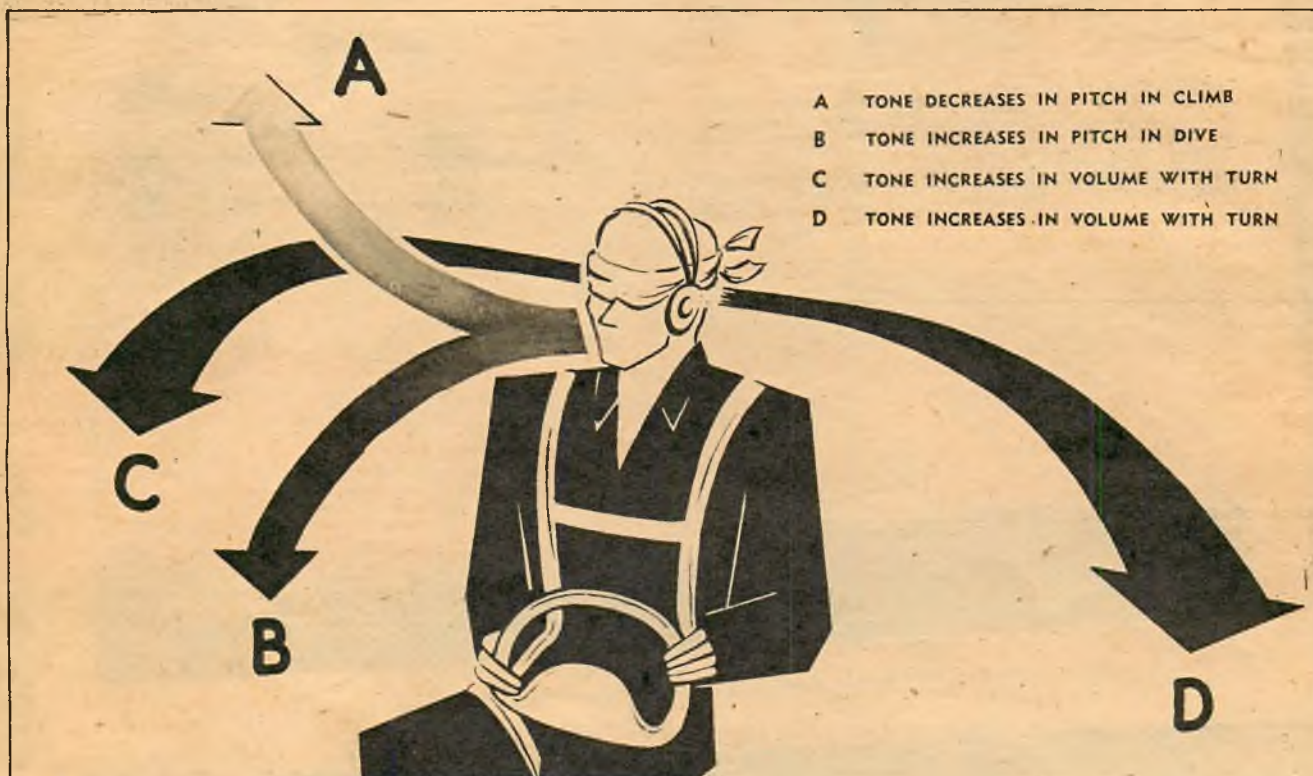
BY GEORGE L. EATON

THERE was a time when the early-bird pilot could hang a plumb bob from the top wing and call it a turn-and-bank indicator, but it would not be out of place today to hang a sign over many a cockpit door reading "Abandon all hope, ye who enter here." For in the name of safety, dials, switches, gauges and buttons have blossomed like June strawberries over the walls and even the ceiling of the cockpit. That the machine is master may be judged by the scientists who now have found the \$128 answer to the \$64 question, "Where can we put more instruments?" Although a pilot's poor eyes are busier than those of a kid at a three-ring circus, his ears—think the scientists—are laying down on the job!

In some of the most interesting experiments ever performed it was proved recently that blind flying can be done by sound signals alone and that a blindfolded pilot

can enter and recover from a spin by listening to signals in his earphones.

In 1943 Captain Luis de Florez (later vice-admiral), then of the Special Devices Division of the Navy's Bureau of Aeronautics, asked the National Defense Research Committee to look into the development of useful blind-flying auditory signals. The NDRC in turn set up a project FLYBAR at the Psycho-Acoustic Laboratory of Harvard University whose basic research since proved so promising that the contract was maintained by the Office of Naval Research. Meanwhile the Special Devices Division contacted a Massachusetts firm to handle field tests of actual blind flying equipment. Then the Psychological Laboratory of Johns Hopkins University embarked on a comprehensive three-year program of basic research to de- (Turn to page 74)





# Mystery AIR FORCE

**FIRST OF THREE PICTORIALS SHOWING EXPERIMENTAL, LITTLE KNOWN AIRCRAFT, DESIGNED AND BUILT DURING THE WAR, WHICH SERVED AS AF'S FLYING LABORATORIES**

**H**AVE you ever puzzled over the gap in the designation numbers of military airplanes? Was there ever a P-58? a B-28? *Air Trails* comes up with the answer on these pages, presenting a number of the more interesting "missing links." Practically all of them are either Experimental or Limited Procurement types and none of them with the exception of P-70 saw active duty. Nevertheless, most served their purpose in the development of service type aircraft. A few proved to be hopeless flops. Several designs never left the manufacturers' drafting boards; an example, the Curtiss XP-71 high-altitude twin-engine fighter with a span of 82 ft. In other cases designations of airplanes were switched, like the Bell XP-45 which became the P-39C.



● Curtiss XP-37. Ancestor of the famous P-40 heralded return of liquid-cooled engine to the Air Forces. Though similar to P-36, had 31' span instead of 28'. Engine 1150-hp Allison.



● Curtiss XP-40Q. Without doubt best looking fighter ever built. Only 3 manufactured. Radiators in wings, revised from P-40N. Wing span 36', engine 1425-hp Allison, speed 425 mph.



● Seversky XP-41. Later Republic, was actually a cleaned up P-35 with flush retractable landing gear and a 1200-hp Pratt & Whitney R-1830 engine instead of 950-hp P & W in the P-35.

● Republic P-43. Predecessor of the Thunderbolt. Was equipped with supercharger and capable of reaching 40,000 ft. 375 mph. Over 300 built. Engine 1200-hp Pratt & Whitney.



● Curtiss XP-42. This was an effort to streamline the radial Pratt & Whitney engine of the P-36 with a special low drag cowl. Plane was only slightly faster than service P-36.

● Curtiss XP-46A. An attempt to improve the P-40 by streamlining the fuselage and using flush fitting landing gear. Wing span 41', engine 1150-hp Allison. Maximum speed 360 mph.







● Republic P-47H. This was a P-47B Thunderbolt from which the Pratt & Whitney radial engine was removed and a 16-cyl., 2300-hp Chrysler liquid-cooled installed. Around 490 mph.



● Lockheed XP-49. The familiar twin-engine Lightning powered by two 12-cyl. Continental liquid-cooled engines developing 1350 hp each. 2/20 mm cannon and 4/50 mg's in nose.



● Grumman XP-50. Ancestor of the F7F Tigercat was turned over to the Navy and designated as XF5F-1. Plane crashed. Span 32'. Engines two Wrights, 1200 hp each. Speed 425 mph.



● Vultee XP-54. Made primarily of magnesium. Pilot seat electrically lowered through bottom of fuselage. Span 53' 10", engine 12-cyl. flat Lycoming of 2300 hp. Top speed 405 mph.



● Curtiss XP-55. Canard fighter. Most radical airplane developed during war. Pusher propeller could be blown off in case of bail out. Span 40' 7", speed 390 mph, engine Allison.



● Northrop XP-56. Flying wing fighter, out of Northrop's stable of flying wings. Powered by a Pratt & Whitney 2000-hp pusher. Magnesium construction, span 43' 7", 490 mph.

● Lockheed XP-58. Two-place fighter equipped with rear power turret. Powered by two 24-cyl. Allison engines of 2600 hp each. A very large plane with span of 70'. Speed 420 mph.

● Curtiss YP-60E. Somewhat similar to the Republic P-47D-25. Wing span 41' 5". Armament six 50-cal. machine guns. Powered by Pratt & Whitney engine of 2000 hp. Speed 400 mph.







● Curtiss XP-62. Developed from the XP-60 series. It was powered by a Wright 2300-hp engine and had a six-bladed contra-rotating propeller. Span 53' 8". Speed was 450 mph.



● Vultee P-66 Vanguard. This is the airplane from which the Japs copied the famous Zeke, it is claimed. 140 were built for Sweden, later kept as trainers here. Maximum speed 340 mph.



● McDonnell XP-67. Twin-engine bat-wing fighter, featuring laminar flow airfoil. Span 55'. Equipped with pressurized cabin. Two 1350-hp Continental engines. Speed 450 mph.



● Douglas P-70. Conventional A-20 attack plane converted as night fighter, for crew of three. Equipped with radar and six 50-cal. machine guns in the nose. Used mostly by the RAF.



● Republic XP-72. A Thunderbolt powered by the 3000-hp Wasp Major engine and dual props. Was to be armed with four 37-mm cannon in wings to chase buzz-bombs. Speed 490 mph.



● Fisher XP-75. Built by Fisher Body Division of General Motors. 24-cyl. 2600-hp Allison engine behind pilot. Span 49'. Two contra-rotating propellers. Maximum speed 400 mph.

● Bell XP-77. All-wood fighter with excellent maneuverability designed to combat Jap Zekes. Span 27' 6". Engine 520-hp Ranger. 1/20 mm and 2/50 machine guns. Speed 330 mph.

● Bell XP-83. Twin jet fighter designed as test bed for GE's J-33 jet engines now used in P-80's. Plane was used by Bell for research work. Wing span 53'. Maximum speed 500 mph.





# Air Progress



## 1894—KOCH TURBINE PLANE

THIS EXTRAORDINARY PROJECT, A LOW ASPECT RATIO TAILLESS MONOPLANE WITH DUCTED FAN PROPULSION, DID NOT PROGRESS BEYOND THE DESIGN STAGE BUT DISPLAYS A REMARKABLE ANTICIPATION OF MODERN CONCEPTS AND PRESENT-DAY JET DESIGN. — INTENDED POWER PLANT WAS A 50-H.P. STEAM ENGINE WITH FLASH BOILER

DUCTED FAN



SECTION THRU FUSELAGE



## 1909—HUTH ANNULAR BIPLANE

AN EARLY APPROACH TO THE CIRCULAR TYPE WING LATER SUCCESSFULLY DEVELOPED BY KITCHEN AND OTHER PIONEERS



NOTE CURIOUS DIHEDRAL AND CATHEDRAL WING EXTENSIONS

## 1910—THE FLYING BOXCAR!

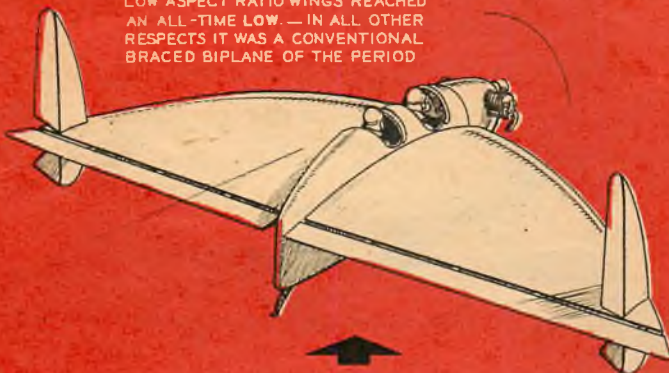
IN THIS FLICK-REINIG "APTEROID" LOW ASPECT RATIO WINGS REACHED AN ALL-TIME LOW. — IN ALL OTHER RESPECTS IT WAS A CONVENTIONAL BRACED BIPLANE OF THE PERIOD

DOUGLAS ROLFE



1911—KITCHEN "DOUGHNUT"— FIRST BRITISH DESIGN BASED ON CIRCULAR, HOLLOW RING, TYPE WINGS WITH RELATIVELY HIGH ASPECT RATIO BUT SMALL OVERALL SPAN.

1912—CEDRIC LEE "DOUGHNUT"— A DEVELOPMENT OF KITCHEN'S DESIGN AND FIRST AIRPLANE IN THE WORLD TO EMPLOY ELEVONS INSTEAD OF CONVENTIONAL CONTROL SURFACES. PERFORMANCE WAS GOOD BUT NOTHING SENSATIONAL



## 1924—TSCHERANOWSKY "PARABOLA"

THIS SCIMITAR SHAPED ALL-WING DESIGN WAS THE OUTCOME OF EXHAUSTIVE SOVIET EXPERIMENTS WITH GLIDERS OF SAME GENERAL FORM.



ELEVONS



RADIATOR

ELEVONS

TWIN RUDDERS

1929 SCROGGS "DART"— A FREAK DESIGN OF THE PERIOD BUT A TYPE OF WING NOW BEING INVESTIGATED BY LEADING DESIGNERS AS THE POSSIBLE SOLUTION TO THE PROBLEM OF SUPERSONIC FLIGHT

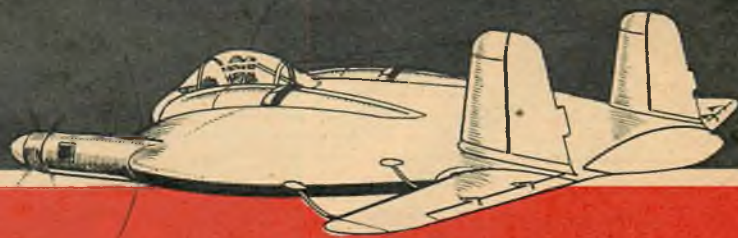
When the details of the Chance Vought experiments with low aspect ratio aircraft were released almost two years ago these strange looking planes were tagged "flying flapjacks" by the press and many people thought they represented a new approach to wing design.

It is quite true that the Chance Vought design introduces a new approach to heavier-than-air flight, but the wing design itself is the culmination of nearly fifty years of experiments with low aspect ratio wings—wings ranging in shape from saucers and doughnuts to rhomboids and innumerable other shapes. Some of these odd wing designs are portrayed here. Apart from the downright freakish designs, most of these strange look-



# Development of the "Flying Flapjack"

BY DOUGLAS ROLFE



1946 CHANCE VOUGHT XF5U-1 — "THE FLYING FLAPJACK"

1942 CHANCE VOUGHT 173 — PROTOTYPE MODEL OF THE XF5U-1. THE CV-173 WAS OF WOODEN CONSTRUCTION; MODERATELY POWERED; HAD THREE-BLADED PROPELLERS, FIXED LANDING GEAR, NO CENTRAL ELEVATOR.

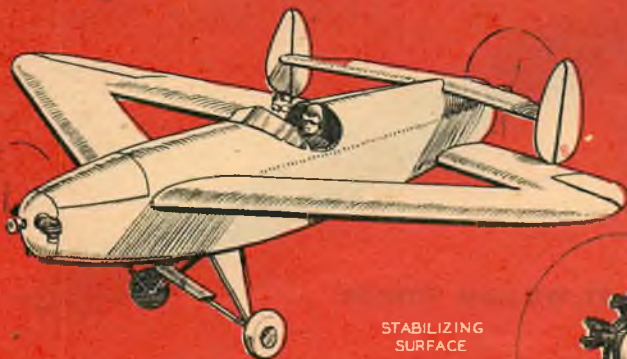


400-H.P. RADIAL ENGINE PRODUCED EXCESSIVE TORQUE IN RELATION TO WING SPAN



1938 — FLYING FLAPJACK ?

THIS U.S. DESIGN LOOKED THE PART BUT, SAD TO RELATE, IT FAILED TO FLY!



1937 — WARREN & YOUNG "RHOMBOID"

A CURIOUS U.S. EXPERIMENTAL LIGHT PLANE. NOTE THE TANDEM PROPELLER ARRANGEMENT.

STABILIZING SURFACE



1935 — PAYEN "FLÈCHE"

AN UNCONVENTIONAL (AND SINGULARLY UNSUCCESSFUL) FRENCH DESIGN WHICH MIGHT HAVE POSSIBILITIES TODAY IF JET-POWERED.

MAIN LIFTING WING SURFACE



1934 — FLYING SAUCER!

DISC WINGS WERE PIONEERED BY CHARLES ZIMMERMANN, NOTED U.S. RESEARCH ENGINEER LARGE-LY RESPONSIBLE FOR THE CHANCE VOUGHT DESIGNS WHICH HAVE REVIVED INTEREST IN THE DISC WING



1935 — CANOVA EXPERIMENTAL "ALL-WING"



1933 — ANTES ANNULAR WING MONOPLANE  
AN AMBITIOUS PROJECT WHICH DID NOT GET BEYOND THE SMALL-SCALE MODEL STAGE THOUGH THESE FLEW WELL

ing aircraft were moderately successful. Many were the result of careful aerodynamic research and take a rightful place in the annals of Air Progress.

Father of the disc wing in this country was Charles Zimmermann, and the present day Chance Vought designs, still experimental, are based on his patents.

With supersonic flight a reality, leading aeronautical engineers are once again studying the properties of the low aspect ratio wing and it is no secret that at the end of the war the Germans were far along with designs based on the "delta" or triangular wing which, jet-powered, can ignore torque problems and has practical possibilities in the field of supersonic flight.





# We Fly THE NAVION

BY WILLIAM WINTER

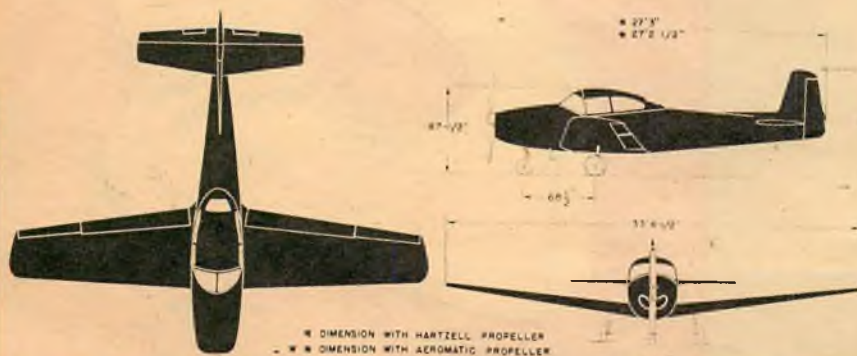
IF YOU'RE A PILOT, DON'T MISS THE OPPORTUNITY OF FLYING THE NAVION, FOR THERE'S A REAL TREAT IN STORE FOR YOU

**I**F YOU are a student or private pilot whose hard-bought flying hours are given to pushing around Cubs, Champions, or similar small ships you have probably watched those trim Navions and Bonanzas and thought, "How I would like to fly one of those babies! What are they like? Are they hard to fly? Could I handle one?"

Such airplanes are designed primarily for a different market, corporations and such, whose prime interest is getting places in a hurry. Any four-place airplane that will cruise 150 mph and has such "big plane" features as hydraulically operated landing gear and flaps necessarily costs a pretty penny from the flivver pilot's point of view. From the corporation's view, such an airplane represents an economy in whisking executives to off-the-main-line cities in a fractional part of time required by train.

This is a report on one lightplane pilot's check-out on a Navion. Bill Wagner at the Ryan factory insisted that the check-out would be as easy as falling off a log. Then Bob Hewitt, of Mallard Air Service, Teterboro N. J. Air Terminal, where the flying was done, claimed that they never had needed more than 90 minutes to feel sure that a student could take a Navion around by himself. That includes pilots with hours ranging all the way from 88 on up into the thousands. "It won't take more than an hour," Hewitt said over the phone.

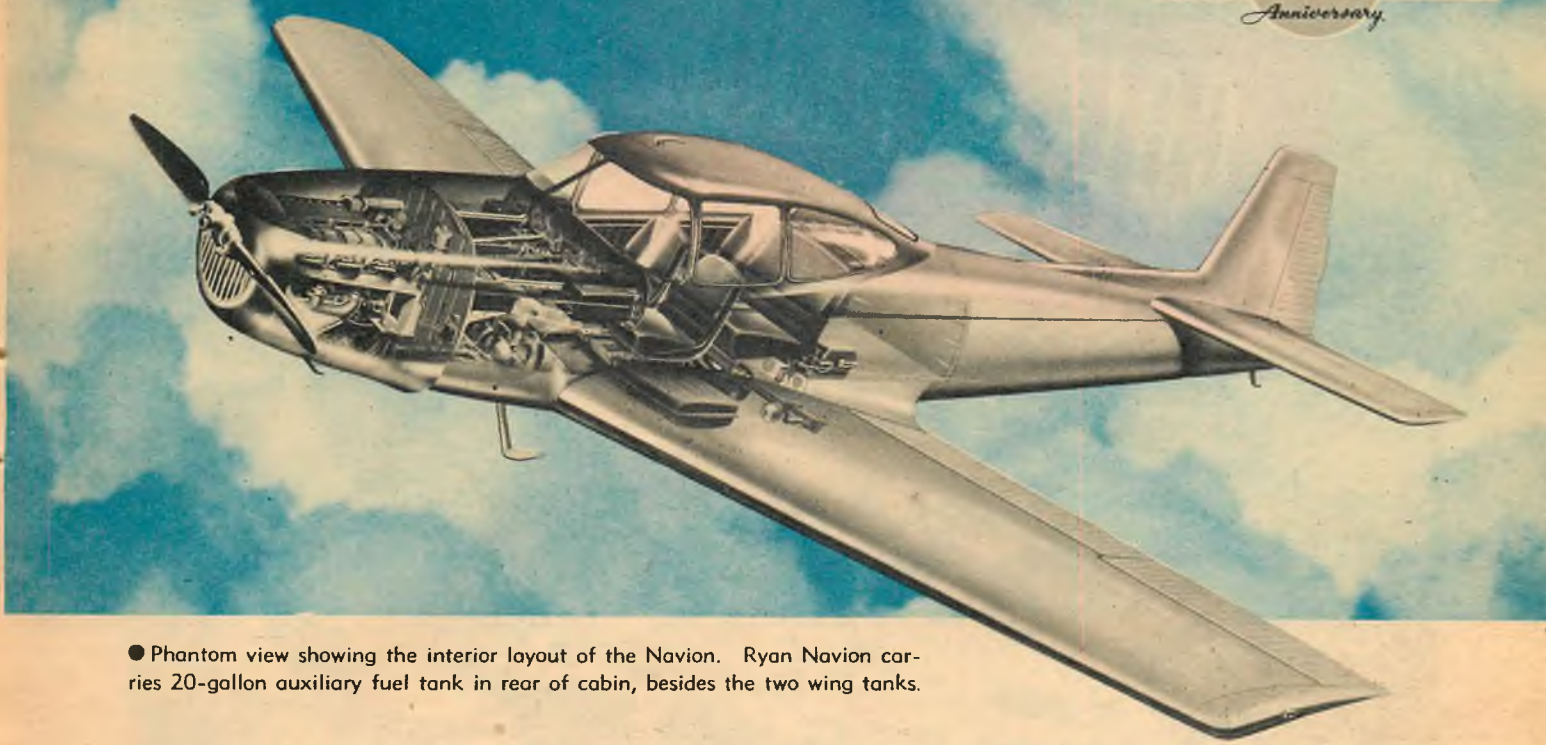
No airplane in this series was flown under such unfavorable circumstances. During the first day's brief session a wind whipped the sock out straight 90 degrees across the runway we had to use. At busy Teterboro only an occasional airplane was flying and even the big DC-4's weren't having smooth sailing. The next day, the velocity was up to 40 with gusts as high as 50 mph.



## SPECIFICATIONS

Span	33 ft. 4 1/2 in.
Length	27 ft. 3 in.
Wing area	185 sq. ft.
Power loading	14.6 lbs/hp
Wing loading	14.6 lbs/sq. ft.
Weight empty	1680 lbs.
Gross weight	2750 lbs.
Cruising speed	150 mph
Range	750 miles





● Phantom view showing the interior layout of the Navion. Ryan Navion carries 20-gallon auxiliary fuel tank in rear of cabin, besides the two wing tanks.

The all-metal Navion was produced first by North American, then taken over by Ryan who improved the 1948 model considerably. The interior has been restyled, and four different completely-painted color schemes are available. Ventilation has been improved, new fuel system installed, various other mechanical improvements made, and the range increased to 750 miles with the addition of a 20-gallon auxiliary tank, in the rear of the cabin, adding to the 39½ gallons carried in the two wing tanks. A most noticeable difference between the two ships is the effect of the new sound-proofing by Ryan.

Entry is from the left front. You have to place your left foot on a step that juts down well below the fuselage, find the hand grip with your left hand, then step up on the wing with your right foot (a placard in the airplane forbids entry or exit when the motor is running).

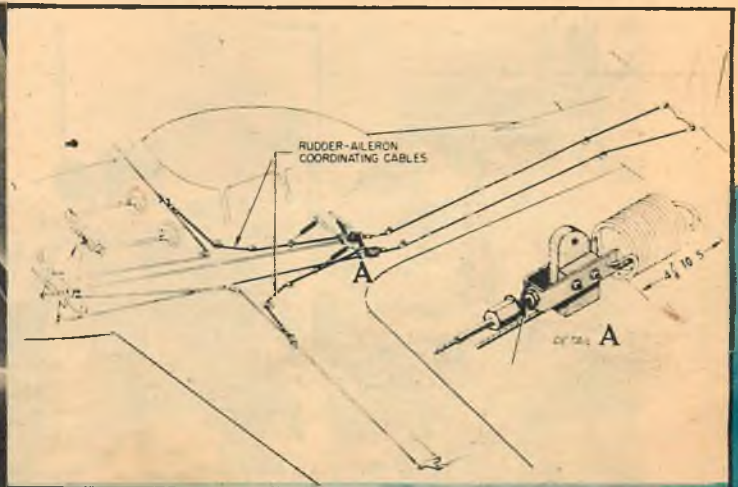
Inasmuch as the Navion represents a genuine attempt at simplification with the automobile in mind, this method of entry is somewhat awkward. This, however, seems unavoidable on low-wing tractor-type airplanes. You step down into the cabin, somewhat like entering the Ercoupe. There is so much room that you don't have to step on the seats. Even for six-foot heavyweights few contortions are necessary. The wide back seat provides the leg room and comfort of an automobile. The front seats are most comfortable. They are adjustable to the extent that the author's gangling legs could not easily operate the pedals when the seat was all the way back.

It is interesting to note in passing that many operators are using Navions for cargo work, both the right front seat and the rear seats being removable to permit up to 650 pounds of freight. (Turn to page 108)

● Instrument panel of the Ryan Navion. Long handle at right operates flaps, one on left is brake. Note excellent visibility.



● Selective two-control system. Rudder pedals become effective by slight pressure on the spring-loaded interconnected hook-up.







**FOR FOURTH IN SERIES OF STORIES ON AVIATION  
SCHOOLS WE HOP OUT TO SOUTHERN CALIFORNIA**

**T**HE product of almost twenty years of firsthand experience in aviation training, Cal-Aero Technical Institute paces the rapid progress of the aircraft industry with engineering and mechanics courses keyed to the latest developments in aeronautics.

Jet and rocket engines are a part of the school's propulsion laboratory. The test cell for running axial and radial flow jet engines is as complete as those found at some of the leading engine manufacturing plants.

Cal-Aero students have been engaged in work on a new type helicopter recently completed for the Air

Force, this in addition to the standard helicopters included in the school's equipment—further evidence of the timeliness of courses.

The curriculum covers latest aeronautical developments. It is continually revised as new aviation trends become evident. Both engineering and mechanics students at Cal-Aero follow a curriculum which parallels actual procedures within aircraft plants.

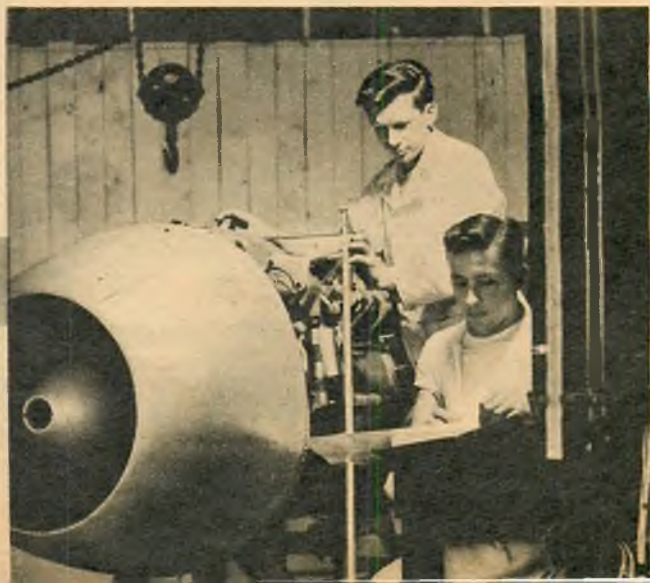
This plan of instruction insures that only essential material is presented to students. It shortens the orientation period when the student, after graduation, reports for work at an aircraft operation, maintenance, or manufacturing firm.

Guiding hand for the program of Cal-Aero since its inception has been Major C. C. Moseley, owner and

● Mechanics students study function and design of automatic pilot with aid of working model as part of A and E course.



● Engineering student and instructor hook up controls of a German Jumo 004 in school's jet and rocket propulsion laboratory.







● Opposite page—Grand Central Air Terminal and Cal-Aero school. Above—New central building under expansion program.

president, who founded the school in 1929. Moseley, veteran pilot and aviation leader, was a fighter pilot in World War I with the First Pursuit Group.

He served nine years as a regular Air Corps officer during which time he was assigned to the Office of Chief of the Air Corps in charge of schools. As an Army pilot he won the first International Pulitzer speed race, setting an American record.

After resigning from the Air Corps to enter private aviation Major Moseley organized Western Air Express, now Western Air Lines. He was later named West Coast manager of Curtiss-Wright Flying Service and has served as a director of American Air Lines and Douglas Aircraft Company.

Cal-Aero was formerly known as Curtiss-Wright Technical Institute and as such gained world-wide prominence. A flight training division was set up within the school structure under the name of Cal-Aero Flight Academies, and during World War II more than 26,000 pilots were trained for Army Air Corps and RAF.

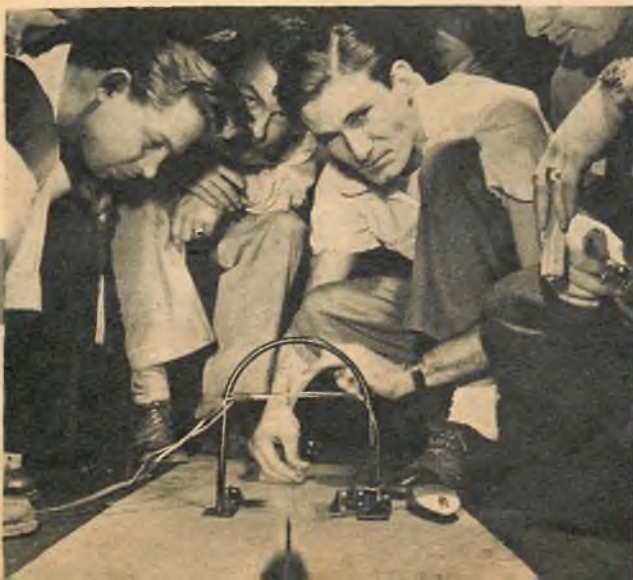
With thousands of flight graduates carrying the name of Cal-Aero to the far corners of the globe, it was a natural move in 1944 when the name of the school was changed to Cal-Aero Technical Institute.

The Southern California technical school made a distinguished contribution to the war effort. In addition to its flight courses it was among the first to be selected for training approximately 7,500 Army enlisted men as mechanics. Since the school began, Cal-Aero also has turned out more than 7,000 civilians as aeronautical engineers and mechanics.

Located in the heart of the Southern California aircraft industry at Glendale, Los Angeles County, Cal-Aero has for a campus its own 200-acre airport, Grand Central Air Terminal. Here in addition to classroom and shop training, students are able to study firsthand the many types of craft flown into this centrally located field.

Grand Central Airport, an affiliate company of Cal-Aero, maintains extensive engine and (Turn to page 85)

● One of Cal-Aero's famous "Fizz Kid" students gets his CO<sub>2</sub>-powered racer underway in jet contest in engineering building.



● Student gets lowdown on Air Force Rotor-Craft helicopter from designer Gilbert Magill. Commercial 'copters are also studied.





1928 20th Anniversary 1948

## AIR TRAILS

# Solo Club

- FLYING IN '28
- MEMBERSHIP CLIMBING
- FOOLISH FABLES

**G**REAT things were prophesied for private flying twenty years ago this month. In that September of 1928, Lindbergh's flight to Paris was hardly more than a year in the past, the depression that hit private flying so hard was a scant year away. But in that brief interlude America went crazy over its first boom in private aviation. The war-surplus Curtiss OX-5 motor was the backbone of the industry, but the early 200-hp Whirlwinds were pushing it hard. With a fourteen-to-one advantage the open-cockpit and wire-braced biplane was kingpin, but the death knell had already been sounded by cabin monoplanes like the Stinson, Curtiss Robin, and Ryan.

Forty-five of the nation's 53 aeronautical manufacturers were turning out airplanes. Commercial production was a sensational 3,781 units, 140% more than 1927's production of 1,565. Over 4,000 private planes were flying in the year that Herbert Hoover was elected president but nobody knows how many home-built crates fluttered around within the borders of their states without need of federal tickets. The flying businessman, the salesman, the doctor, the executive were discovering the airplane. For \$9,000 you could buy yourself a nifty three-place open-cockpit Eaglerock with a Whirlwind. And learn to fly for \$25 an hour.

In that boom year of 1928 *Air Trails* was born. *Air Trails* grew with private flying. Today, its Solo Club has approximately twice as many members—all bonafide certificated pilots who have soloed—as there were private planes in 1928. Because it answers the demand for an organization through which they can voice their opinions, the Solo Club is growing as fast as a thunderhead in the Pennsylvania mountains. Pilots and owners of all ratings and ages have come to look upon it as the voice of the private pilot.

Until now the Solo Club has been in the first swift growing stage. All of us have welcomed the new members that join us each month with their tales of experience and experiences. Now we have (Turn to page 114)

### HOW TO BECOME A SOLO CLUB MEMBER

This club is open only to those who have actually soloed a heavier-than-air craft, either powered or motorless. It does not matter where or when the flight was made. Applicants must furnish the membership committee with a satisfactory proof of their qualification for acceptance. There are no dues. Once a member, always a member.

To obtain sterling silver Solo Club wings and life membership card, send coupon, with 50c, to Solo Club Membership Committee, Air Trails Pictorial, Box 489, Elizabeth, N. J.

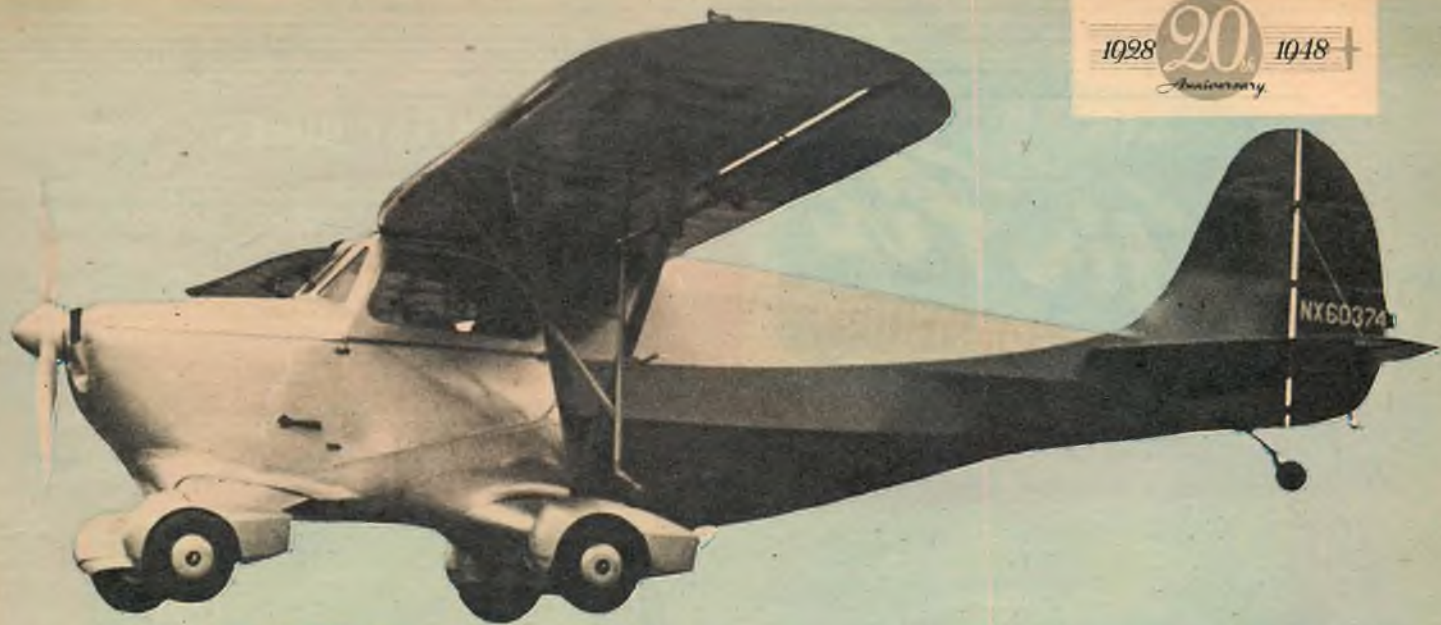
#### Proof of qualifications as a Solo Club Member:

1. CAA Airman Certificate, number and rating.....
2. F.A.I. license and number.....
3. Evidence of: Service in Army, Navy air forces, either as a rated pilot or having received flight training including solo time (attach).

Applicant ..... Age.....

Street..... City or Town..... State.....





# Fulton's Flying Flivver



**T**HE AIRPHIBIAN is another version of the roadable airplane, a different and ingenious one. It was designed and built by Robert E. Fulton, Jr., of Danbury, Conn., (shown at right) descendant of the steamboat inventor. It features an automobile-type front end quickly detachable from the rear fuselage section which can be parked on its retractable support at the airport, while the owner drives into town.

As the supports hold the wings at a negative lift angle, the danger of the rear section being blown away by wind is greatly minimized. Car part of the airplane can be driven on the road at a speed of 45 mph or better. Entire process of converting the Airphibian from plane to car takes seven minutes. Top speed in flight is 125 mph.





# AIR TRAILS *Air Pix* PHOTO COMPETITION

## CONTEST RULES

This competition is open to all photographers—amateur or professional. No distinction is made between either class of entrant. Payment of ten dollars will be made on or before publication to those whose photographs are selected to appear in the Air Pix competition.

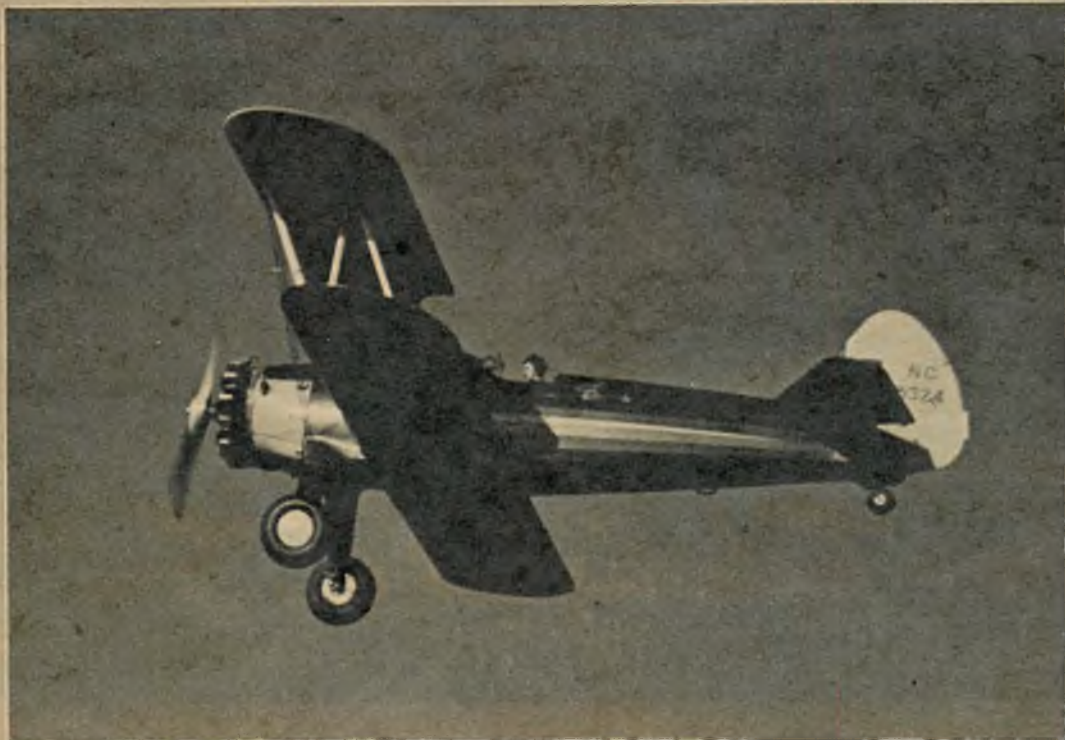
Entries may be concerned with any phase of aviation or aeromodeling. These should be glossy prints not less than 5 by 7 inches in size. Prints should be well wrapped and protected in the mails by stiff cardboard. Entries must be accompanied by the name and address of photographer and sufficient stamps to cover return postage.

Include full data on the subject, camera and film used, exposure, lens setting, and conditions under which the picture was made. Give details concerning equipment for enlargement, printing paper, and all other pertinent information. Air Trails does not assume responsibility for entries. The editors regret they cannot enter into correspondence concerning contributions.



● This excellent hilltop photo of a model builder and his towline glider was made by G. E. Callahan of Chandler, Okla. Mr. Chandler was shooting with an Ansco Speedex camera loaded with Eastman Plux X film and equipped with a red filter. Exposure was 1/100 at f/8 in natural light.





● "Cloudless Skies" is title given by Jim Larkin, Jr., Birmingham, Ala., to his afternoon shot of this ship taking off. Mr. Larkin used a Leica III-B 35 mm and Panatomic X film. Exposure was 1/500 sec. at f/4.5 with a medium yellow filter. Details caught without making plane "stop."



● Don't let the trick pose fool you. Those are models and that chap "leaning" on the prop is below the hill. Giroflex photo by Dr. Sherman W. Schultz Jr., St. Paul, Minn. Made on Plus X film, 1/200 at f/8. Yellow filter used. Defender D55 developer. The paper was Velour Black.





# New Techniques in Towing

INSTABILITY IN TOW WAS LONG A PROBLEM IN GLIDER OPERATION.

METHODS DEVELOPED DURING THE LAST WAR HAVE LICKED MOST OF IT

BY ADAM J. STOLZENBERGER

ONE of the major problems concerning towed flight is the inherently unstable manner in which a glider tends to behave while on tow. The uninitiated observer on the ground may marvel at the seeming ease with which a glider trails along behind a tow plane. In reality, the glider pilot is constantly anticipating the glider's next move and continuously making corrections to maintain his proper position on tow.

If the job of keeping in line is left to the glider alone, it will soon whip up a raging exhibition in gyrating antics terminating with a demonstration of a pure tension failure.

The reason for this unfortunate characteristic of towed aircraft is the lack of trailing stability, an inherent shortcoming in conventional air trailers. In the high tow position (above the slipstream of the towing aircraft) this lack of trailing stability becomes evident more rapidly than in the low tow position.

A detailed analysis as to why gliders react in such an unreasonable manner when led will not be attempted here. However, various methods that have been employed to cope with the perplexing phenomenon will be outlined.

No matter how well a glider on tow is trimmed out with hands off, it will gradually drift out of position, perhaps very slowly at first, but then faster, for as the angle of yaw increases, a restoring yawing moment is rapidly created due to increasing towline tension. This restoring force will eventually cause the glider to take

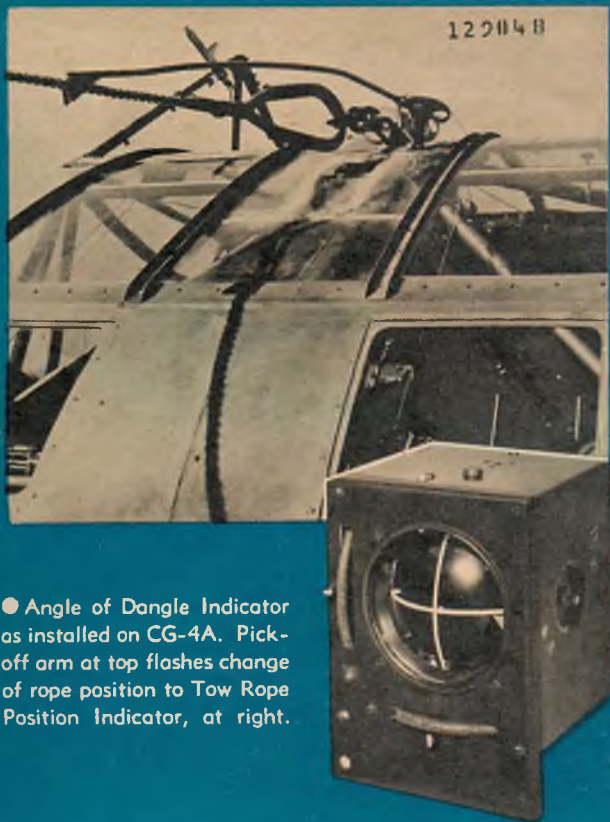
on a new heading toward the opposite side of the tow plane and then repeat the same maneuver but this time its movement will be more pronounced due to the glider's initial lateral velocity while passing the normal tow position. As the glider yaws and rolls from one side of the tow plane to the other, lift is disturbed which only aggravates the situation more by upsetting longitudinal trim. Unless these oscillations are checked by the glider pilot or damped out by some means the resulting motion described by the glider, if viewed from along the line of flight, would be a series of figure eights increasing in amplitude and resulting in anything from a towline failure to a catastrophe.

It is necessary, therefore, for gliders in tow to maintain, within certain limits, the proper position behind the towing aircraft. When visibility is good, the glider pilot is able to achieve this by visual observation of the tow plane, but on long hauls or at night, this becomes very tiresome and during instrument conditions an impossibility.

In order to permit towed flight during instrument conditions, an instrument known as the "Tow Rope Position Indicator" was developed by the Air Materiel Command, Wright Field. This, as the name implies, utilizes the angle displacement of the tow rope as a means of obtaining the glider's relative position with the towing airplane.

This instrument, more commonly known as the "Angle of Dangle Indicator," consists of two moving





● Angle of Dangle Indicator as installed on CG-4A. Pick-off arm at top flashes change of rope position to Tow Rope Position Indicator, at right.



● Taylorcraft TG-6 glider equipped with dihedral bars for bifurcated tow. Installation presents structural difficulties.

● Sketch 1. Rule-of-thumb method for locating attachment points for bifurcated tow. Suitable for conventional gliders.

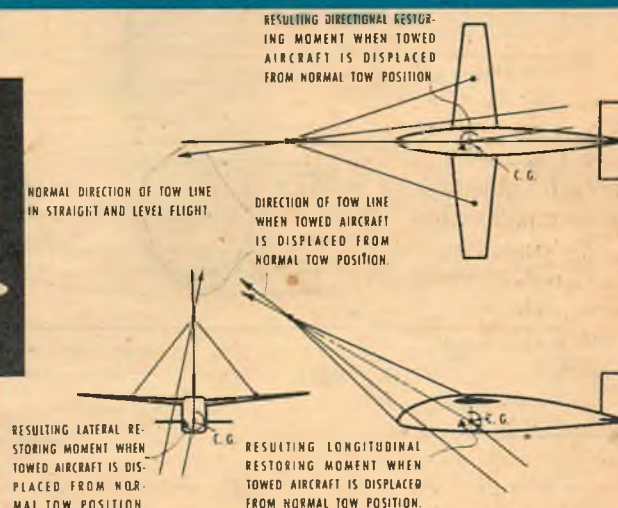
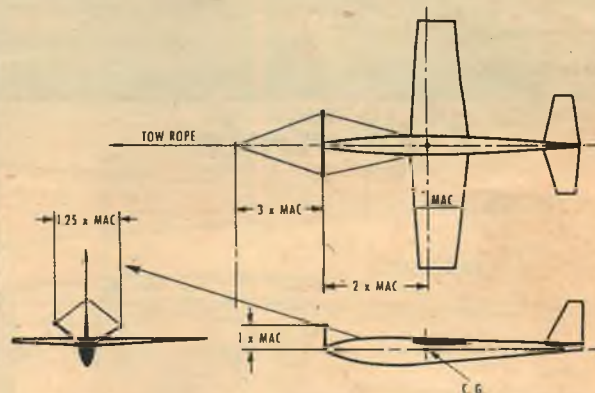


● Model glider with trifurcated tow bridle. This method proved quite successful, does not require additional structure.

● Sketch 2. Shows restoring forces acting on glider in trifurcated tow. Landing in tow was achieved by this method.

cross hairs which indicate the angular movement of the tow rope by means of a direct mechanical pick-off riding on the tow rope and fastened to the nose of the glider. Due to the varying rope catenary caused by turbulent air and rapid descents, those indications require the proper interpretation by the pilot to maintain a position on tow within safe limits. However, with a little training under the hood, the instrument enables towed flight during instrument conditions or when vision of the towing aircraft is obscured. On long hauls under instrument flight conditions, and especially at night, this equipment will not solve the problem of pilot fatigue, night vertigo, and other conditions encountered. These facts and the need for an automatically stabilized pilotless glider led to further investigation by the Air Materiel Command of automatic tow and trailing stability.

The first step was the installation of an automatic pilot in a CG-4A and later in the larger CG-13A gliders. This installation consisted of a modified A-3 type airplane pilot which received trimming signals, along with the tow rope position indicator, from the tow rope angle pick-off. This equipment made auto- (Turn to page 88)





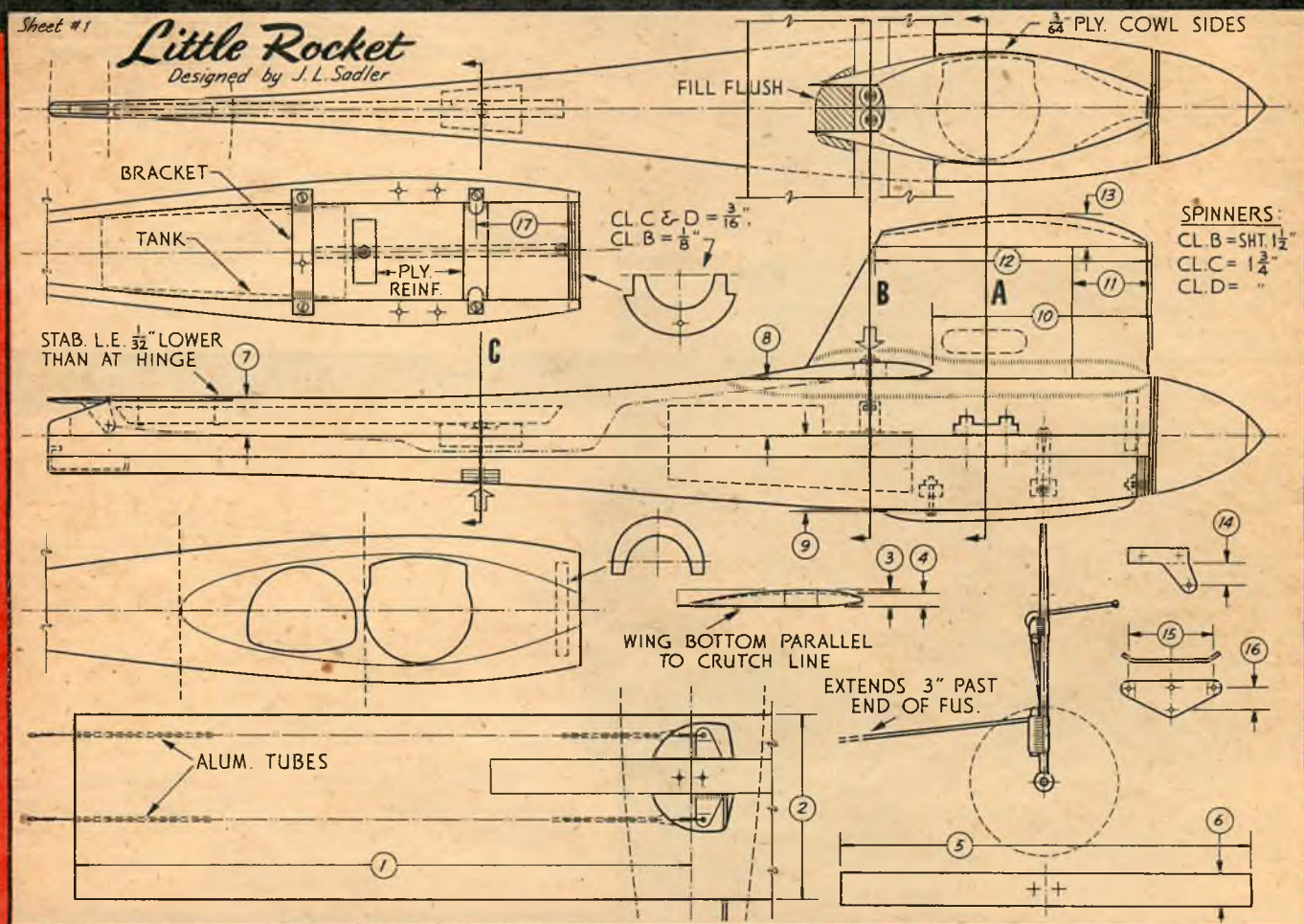
1928 **20<sup>th</sup>** Anniversary 1948



IF YOU THINK YOU'RE SEEING TRIPLE YOU'RE 100% CORRECT—HERE'S THE FIRST "BASIC" CONTROL-LINE SPEED MODEL. IT IS EASILY AND QUICKLY TRANSLATED INTO A CLASS B, C OR D MCCOY-POWERED SPEEDSTER



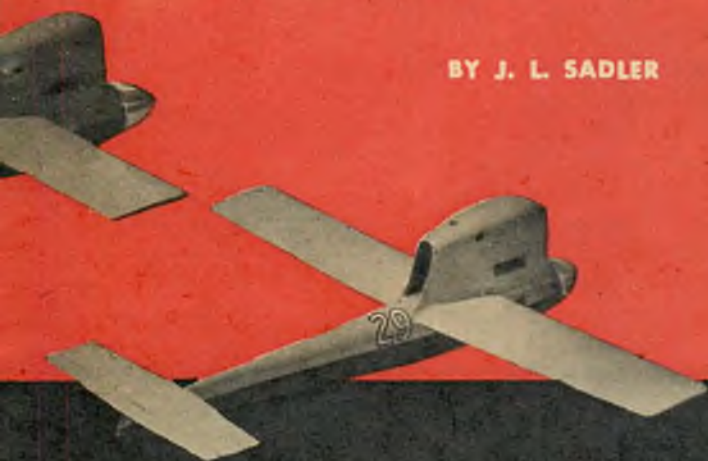
● Dr. J. R. Warden who helped develop the Little Rocket with a Class C McCoy version which has shortened cowl.





# LITTLE ROCKET

BY J. L. SADLER



● Maestro Sadler ponders construction of Class B Little Rocket while Bob Johnson (standing) varies his wind loading with fudge.

THIS "basic" speed model design is a development covering two years in time, involving scores of similar models, and hundreds of flights. The upshot is a sound, easy-to-fly model, as streamlined as any you will find and tougher than most. On one occasion, one of these models was completely finished in four evenings' work: proof enough that the design is not a complex one. Proportions and areas along with construction features are what our experiments indicate as best.

First glance at the plans will reveal that the plane is expressly designed for the glow plug; fuselage bulk is reduced to the minimum requirements of engine and fuel tank. Yet the thin, boom-like body has great strength due to full-length sycamore crutches. We favor sycamore for certain parts because of its toughness, its resistance to splitting, and its uniform grain.

The average model builder is a pretty intelligent chap and we acknowledge this in presenting something unusual in plans: a typical set of drawings and a reference table of dimensions from which he can easily make his own working plans for a class B, C, or D speed model. The models are closely related though not so identical as to permit photographic enlargements or reductions to be used. You will detect what may appear to be differences when scaling up the various model sizes. Stick to dimensions, however, and be guided by the general arrangement of the drawing presented.

Start off with a large sheet of wrapping paper, a pencil and ruler. Lay off center lines, measure off the

dimensions and sketch in the outlines. Develop the side view, using parts of it as patterns for upper and lower body block side outlines and cowl parts. Plot the top view next, using it for top views of body blocks and cowl top. Draw up a grid of  $\frac{1}{2}$ " squares and plot the crutch pattern from the original drawing. Other parts, such as wing, tail, landing gear, are easy to enlarge.

Bandsaw the lower body block and the crutches to outline and prepare a small quantity of Cascamite glue for joining them. Caution: model cement is not a satisfactory substitute here. Before gluing, however, drill the engine bolt holes and mount the bolts from the bottom, soldering the heads against a brass strip tacked beneath each crutch. Gouge out the lower block to clear the crankcase and bolt the engine to the crutches—to space them properly—when gluing the lower block to them. Use "C" clamps and dry glue overnight.

Later the top body block is spot-cemented in place and the spinner backplate is drawn around with a pencil to guide the carving around the nose. Shave away excess material, rasp and sand the body smoothly. Separate the halves and hollow them with a curved gouge. Make a cut-out to permit the top to fit over the cylinder and another to coincide with the bellcrank hole in the wing. Refer to the plans for establishing the exact positions and settings of wing and tail.

At this stage the brass tubes may be mounted, into which the drop-off gear prongs fit. Note the hardwood reinforcement across the bottom. The fuel tank is care-



fully assembled of brass shim stock around a loosely fitted wooden form. After soldering vent, filler and fuel lines in place, test it for leaks. Add plywood reinforcements for the rear skid bolt and the rear hold-down bolt. The front hold-down bracket is shaped of heavy galvanized iron, the nut soldered to it, and is screwed to the crutches. Belly skid of chrome molybdenum tubing and tail skid of steel wire are shaped and permanently installed. The bottom is now virtually complete.

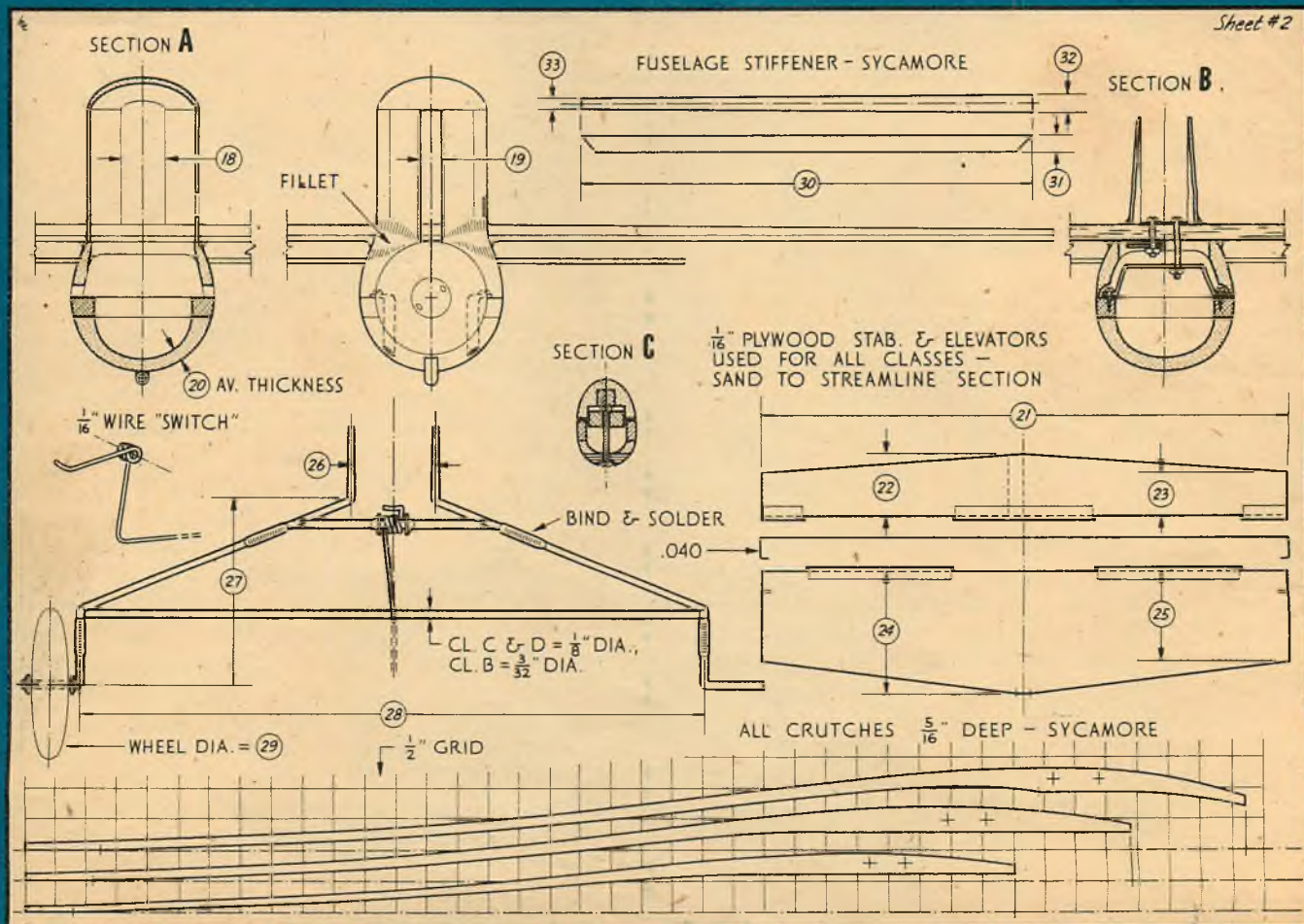
We believe this flat-bottomed wing section to be unsurpassed by any of the double-convex sections for speed and stability. Its efficiency may account for the small wing areas we manage to get by with. In making the wing, use a sound plank of balsa and fashion the section precisely as indicated; the correct chord-thickness ratio is very important. Note the upturning beneath the leading edge. Though the chord is constant, the thickness reduces slightly from root toward the tip. Cut the circular opening for the bellcrank and the span-wise slot for the sycamore spar. Do not be suspicious of the small-sized bellcranks we utilize; the correct ratio is all that matters. Cut the bellcrank of hard

dural such as spinner backplates are made of. (We get two bellcranks out of one backplate.) Groove the wing for the control lead tubes, cement in the tubes and fill the slots with balsa strips. Select a tube size that will permit the .035 steel lead wires to move freely within it.

Elevator hinges are made of aluminum tubes and a length of .040 steel wire. Align the tube sections carefully and lap silk or rayon over them to secure them, alternately, to stabilizer and elevator. Pass the wire through the tubes and secure the ends in the stabilizer tips. The elevator horn is made of galvanized iron and is fastened to the elevator with two small brads, which are snipped and crimped.

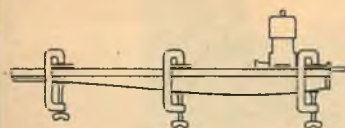
Now the wing and stabilizer may be cemented to the body. Note the hardwood stiffener inside the fuselage top toward the rear. The stabilizer is fastened by two small brads through this piece, the brads being crimped over inside and cement used liberally. Mount the push-rod and adjust it so flippers are neutral when the bellcrank is centered.

A hardwood block is fitted into the upper shell at the rear bolt location. The nut is soldered to a brass strip which is tacked inside this block. (Turn to page 72)





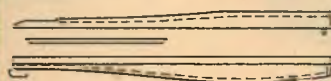
# STEPS IN ASSEMBLY



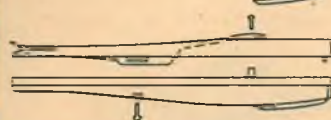
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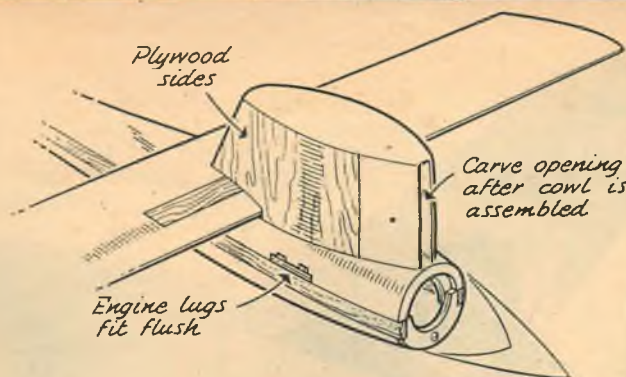
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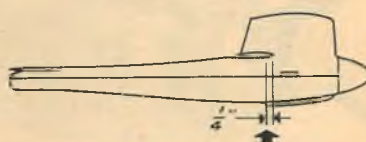
3



4



5



6



● Sadler's fleet of speed jobs. Smallest is modified Bantam-powered Class A. At right, below, is Rocket built by 14-year old. Note compact installation.

## DIMENSIONS

REF. No	"B"	"C"	"D"
1	8½"	10"	10"
2	2¾	3	3
3	7/32	¼	¼
4	5/32	3/16	3/16
5	5	6½	6½
6	½	9/16	9/16
7	7/16	5/8	5/8
8	¾	7/8	1
9	15/16	13/16	15/16
10	3/8	3½	3¾
11	1	1¼	1½
12	3¾	47/16	41/16
13	3/8	½	9/16
14	5/16	3/8	3/8
15	1¼	13/8	13/8
16	5/16	3/8	3/8
17	1¼	15/8	15/8

REF. No	"B"	"C"	"D"
18	5/8"	¾"	7/8"
19	5/16	5/16	3/8
20	5/32	3/16	7/32
21	7½	8½	8½
22	¾	1	1
23	½	¾	¾
24	11/16	2	2
25	13/8	1½	1½
26	11/8	13/8	19/16
27	2¾	3	3
28	8½	10	10
29	2	2¾	2¾
30	6½	7¼	9½
31	3/16	¼	¼
32	3/16	¼	¼
33	5/32	3/16	3/16







# MARTIN MAULER

FAST STEPPING SCALE MODEL OF THE NAVY'S  
NEW TORPEDO-BOMB-ROCKET TOTING AM-1

BY WALTER G. MUSCIANO

THE modern torpedo bomber of today is a far cry from the designs of a decade ago. In the old days it took a three-man crew to operate an "egg layer" because of the lack of speed and adequate instruments. Today, the Martin Mauler AM-1 requires only a one-man crew to launch the 2,000-pound torpedo or release the alternate load of 4,000 pounds of bombs. Armament also includes four 20-mm cannon as well as several rockets. The necessity of a rear gunner was overcome by making a plane that was as fast as or faster than the defending fighter planes. The Mauler is powered with a 3,000-hp Pratt & Whitney Wasp Major engine which drives the craft at 350 mph. In spite of the high speed, long range (1,700 miles) and high ceiling (30,000 ft.) have been obtained. The prototype has a 50-foot span and is 47 feet long.

The designation "A" for attack is a new one for naval aircraft. Heretofore only Army craft were designated as such. The Mauler, along with the Douglas AD-1 Skyraider are the first attack craft in the U.S. Navy. Torpedo bombing is only a small part of the job these multi-purpose designs must fill. Harassing the enemy with their cannon and multiple rockets plus dive bombing makes the Navy's attack aircraft a very important part of our national defense.

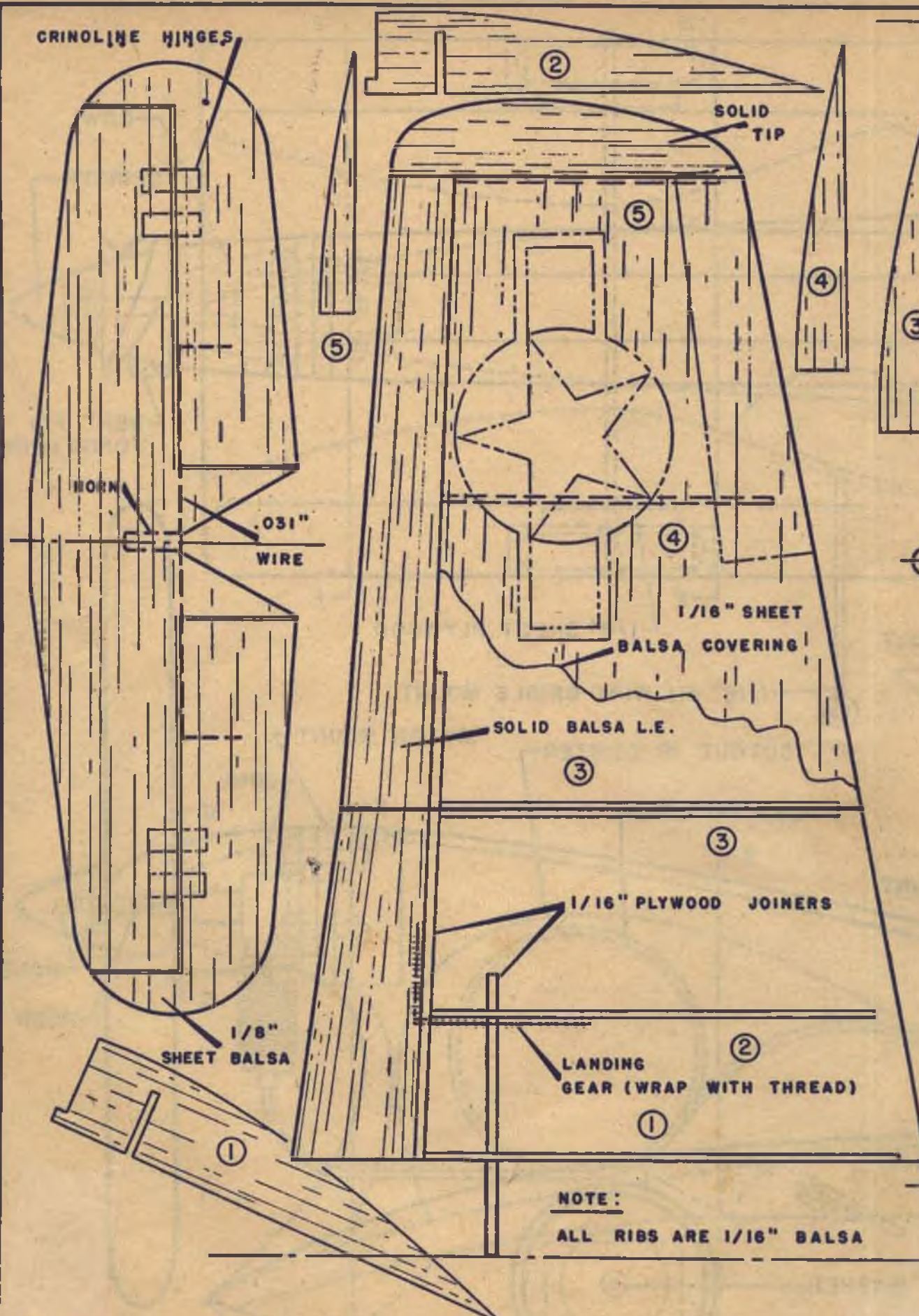
The model is very convenient because of its small size and does not occupy very much storage space. The shortness of the lines allows the model to be flown in a corner lot or even indoors in a "gym" or armory. Electric ignition engines or diesels of .099 to .199 cu. in. displacement can power the model. The original model used electric ignition and its per- (Turn to page 96)

● Mauler may be powered by any engine from .099 to .199 cu. in. displ. Both glow plug and standard ignition engines used.

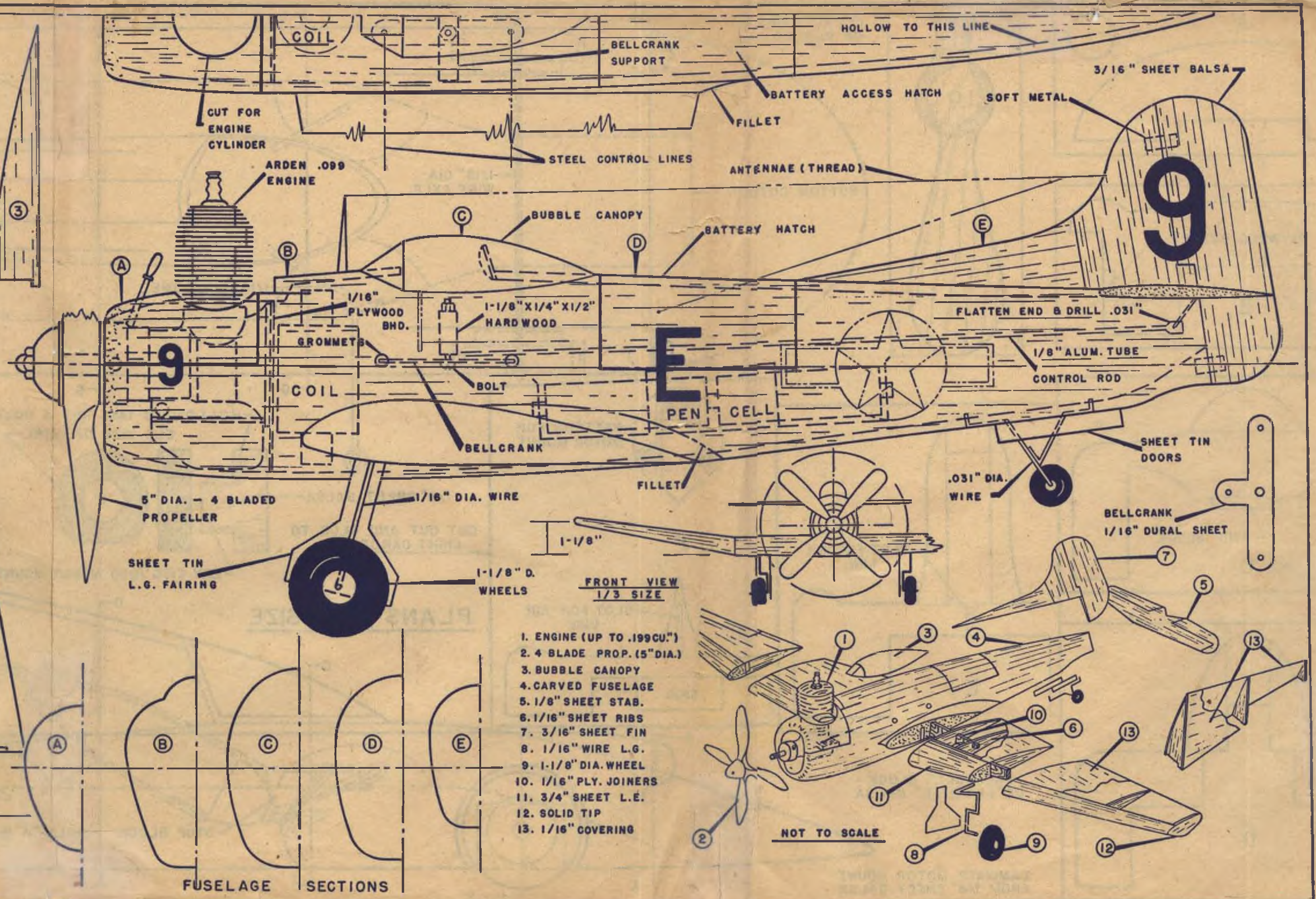
● Adherence to the full size plans will give you a sturdy, colorful control-line speedster, a sure fire winner in any scale event.



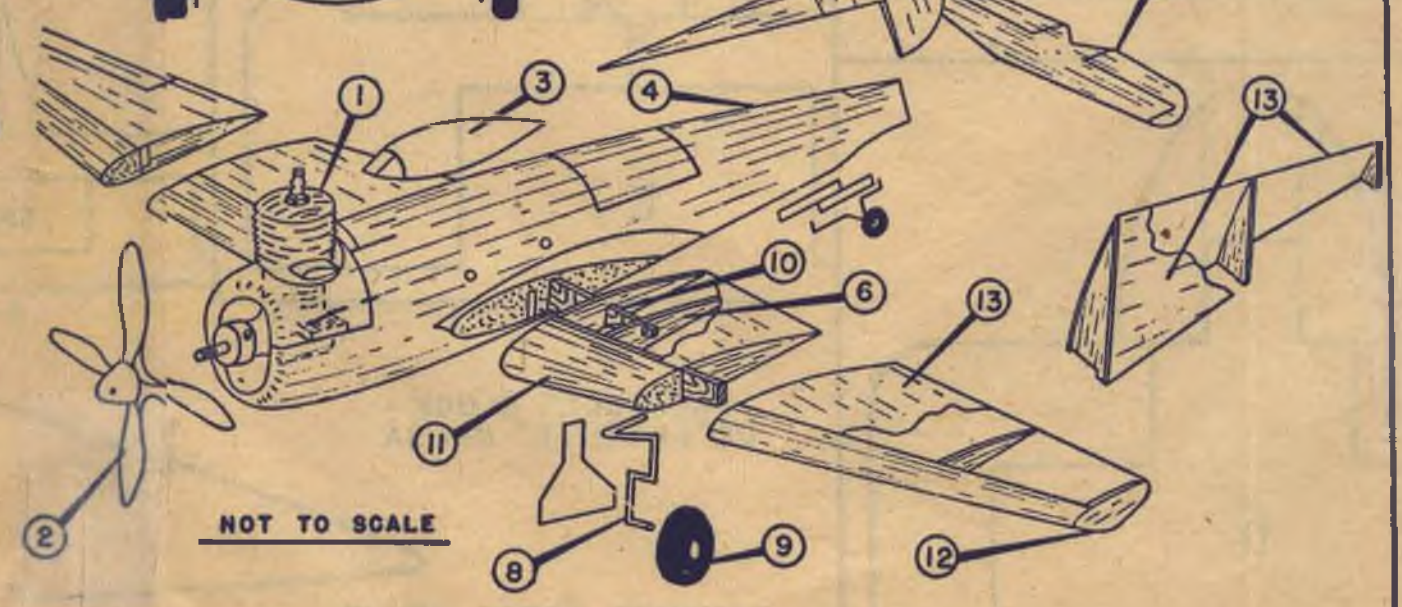




NOTE:  
ALL RIBS ARE 1/16" Balsa

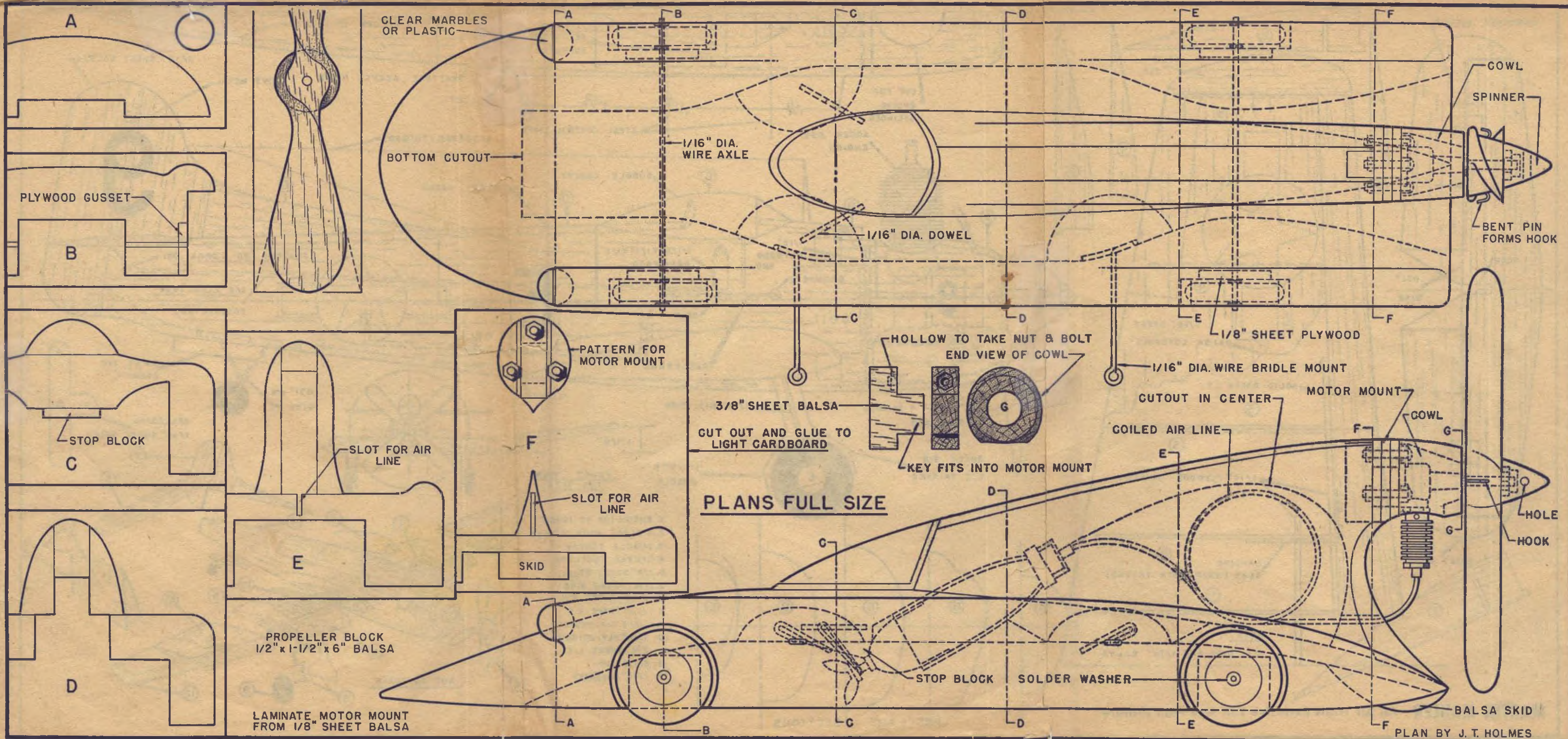


1. ENGINE (UP TO .199CU.)
2. 4 BLADE PROP. (5" DIA.)
3. BUBBLE CANOPY
4. CARVED FUSELAGE
5. 1/8" SHEET STAB.
6. 1/16" SHEET RIBS
7. 3/16" SHEET FIN
8. 1/16" WIRE L.G.
9. 1-1/8" DIA. WHEEL
10. 1/16" PLY. JOINERS
11. 3/4" SHEET L.E.
12. SOLID TIP
13. 1/16" COVERING

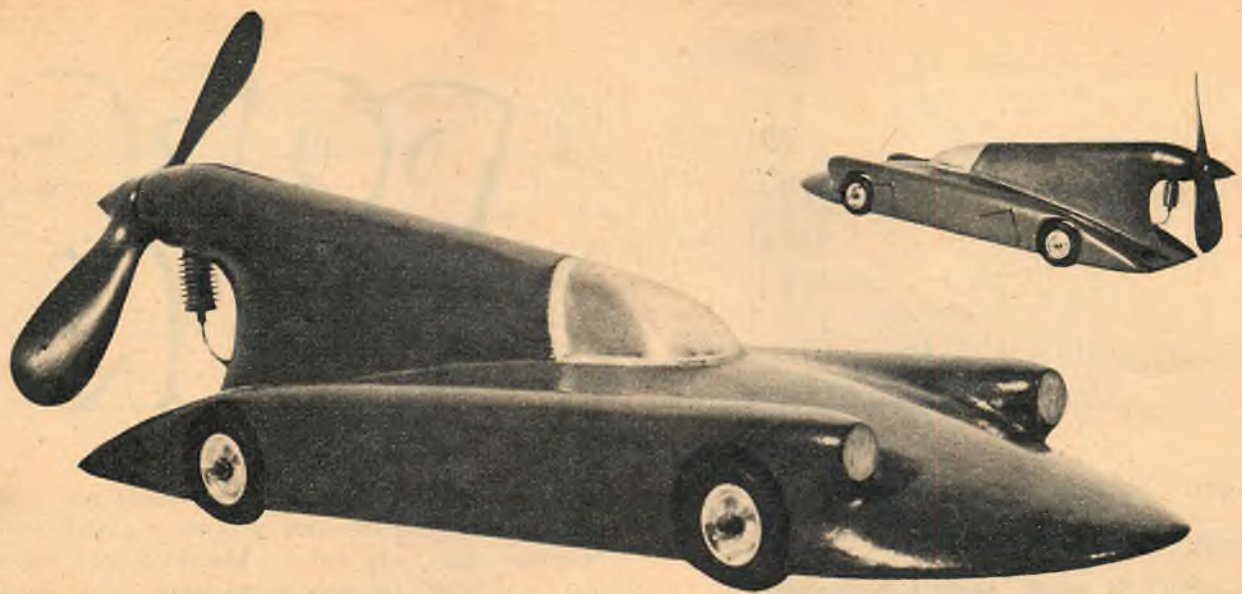


NOT TO SCALE









# Sleek Streak

BY CHARLES H. GRANT

AERODYNAMIC PRINCIPLES APPLIED TO RACING CARS PRODUCE  
THIS SLICK SPEEDSTER FOR GAS OR CO<sub>2</sub> ENGINE PROPULSION

ARE model planes better than racing cars? This question has started many hot arguments that have never been settled to the satisfaction of the parties involved. There is actually great merit, much to learn, and a source of pleasure in both fields of activity. The problem is to sell this idea to both model plane and race car fans.

As a result of the search to find some feature of common interest, the Sleek Streak was conceived. It is a hybrid, combining features of both model plane and race car. You may look at it as a race car driven by an air propeller, without the usual complicated race car

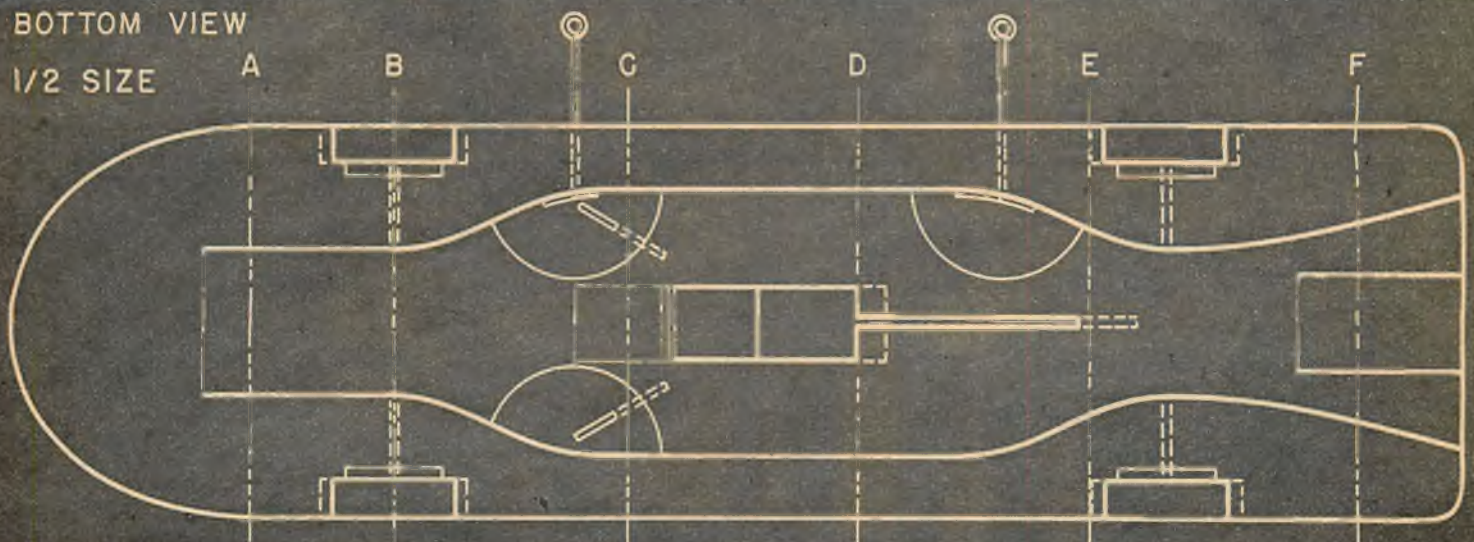
drive mechanism, or as a plane with wheels replacing wings and tail; take your choice.

Whatever you may call it, "speed" is its first name. The air propeller drive gives it a smooth gliding run over the ground that is entirely distinctive from the bouncing, erratic "jack rabbiting" of the common wheel drive race car.

The difficult wheel drive and gear and shaft drive mechanism of the latter is eliminated. In its place a simply mounted Herkimer CO<sub>2</sub> engine, driving an air propeller, is substituted. This provides a construction that is entirely familiar to model (Turn to page 90)

BOTTOM VIEW

1/2 SIZE







● **MODEL AVIATION TWENTY YEARS AGO**

● **CLUB AND CONTEST CHATTER**

● **ACADEMY OF MODEL AERONAUTICS NEWS**

**N**INETEEN TWENTY EIGHT, the year that saw the beginning of *Air Trails*, also marked the beginning of model aviation on a truly national scale.

The year 1928 saw the growth of model aviation to a nation-wide hobby. Interesting is an announcement of the first officially recognized National Contest, which was held at Detroit on June 29 and 30 of that year, under the auspices of the Airplane Model League of America. Only three events were held, and in view of the complexity of today's regulations the rules governing these three events represent the acme of simplicity. All flying models had to be rubber-powered and hand-launched. For the indoor event, distance

from prop bearings to rear hook could not exceed fifteen inches, and the span of outdoor models had to be greater than forty inches. The third event was for non-flying scale; the only requirements were that the models be built by the contestants and that they have a span of exactly twenty-four inches. Prizes included the now familiar Stout Indoor and Mulvihill Outdoor Trophies, trips to Europe, summer camps and the National Air Races at Los Angeles, medals, certificates and \$3,000 in cash prizes. It seems that then, as now, modelers had voracious appetites, since both a banquet and a luncheon were scheduled!

The Wakefield competition began in 1928. First held at Hendon, London, on September 22 of that year, the competition was won by T. H. Newell of Great Britain with a modest best-of-three effort of 52.6 seconds. Performances increased year by year until 1939, when Dick Korda's remarkable 3-flight average of almost 16 minutes retained the trophy for the United States.

● The chap in knickerbockers was called the "Lindy" of a Los Angeles meet. He's engine man Bill (Super Champion) Atwood.







● When the playground commission of Los Angeles dedicated a small piece of land as a junior airport, these Clearwater flyers put on a meet.

Another milestone in model aviation was reached when the Philadelphia team of Bassett and Brown introduced the gas model. It was a sensation! The new field attracted many to aeromodeling, and each succeeding year saw tremendous increases in performance. Far and away the greatest contribution to free-flight gas modeling was the "Zipper," designed by Carl Goldberg and flown with astounding success 10 years later during the 1938 contest season by Goldberg, Alvin Anderson and Dick Obarski.

*Air Trails* has kept in step throughout the years, for in its pages have appeared articles on the ships which have made history. The Zipper was described in *Air Trails*; so were the Clodhopper, the California Champ, the New Ruler and Korda's winning Wakefield model. With such a background, the reader can be sure that we'll follow through with the significant designs of the future.

No history of modeling is complete without the mention of Jim Walker, who made possible the flying of gas models on the corner lot. To Jim can go most of the credit for the rapid strides made in 2-cycle engine design. Control-line flying led to a demand for higher and higher speeds, so that designs of engines and developments of fuels have brought us within sight of 200 mph. Thanks are also due to Ray Arden for the development of the incandescent plug. In the field of speed model design, *Air Trails* has recorded each forward step taken. Frank Greene's article on the subject began a new trend of thought, and was followed by the contributions of such fellows as Newberger, Seidler and Viets.

Outside of the Nationals and the Plymouth contest, the build-up for the Tallcorn meet at Ottumwa, Iowa, on the week end of the 4th of July was the best of the season. A review of the literature sent to flyers, to the model industry (Turn to page 79)

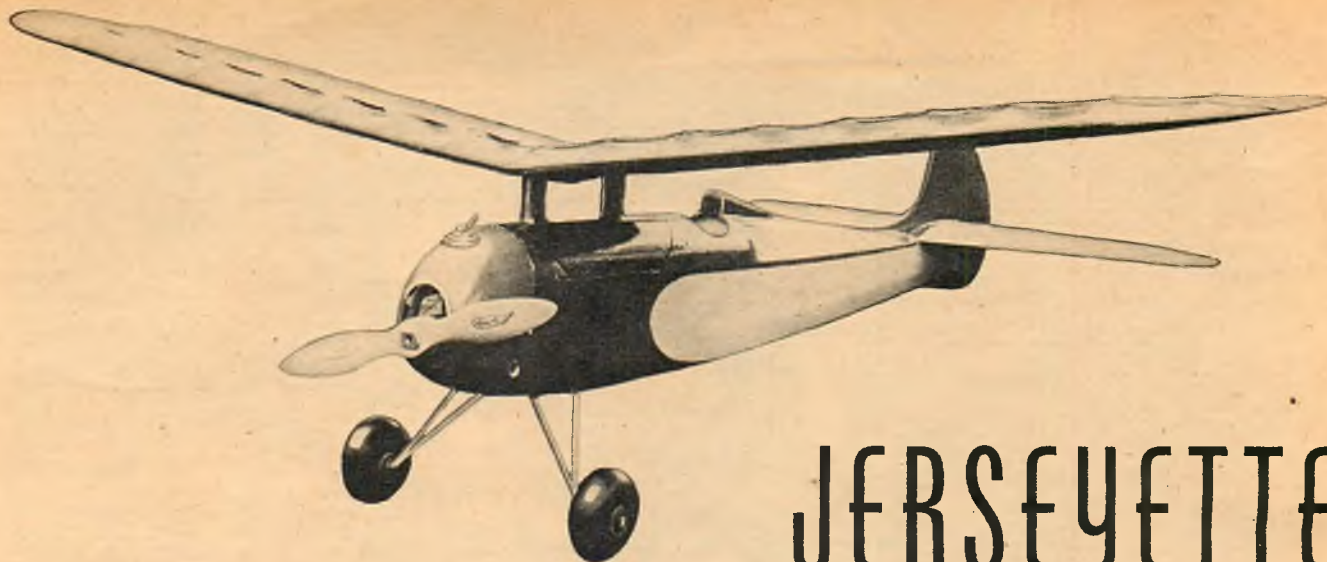


● Back in 1928 scale model builders had easier ships to model—planes had box-like fuselages, fixed gear.

● Carlyle Wright was 16 when this picture was made, following a 17:30 flight with his new twin pusher.







# JERSEYETTE

**THIS VERSATILE DIESEL OR GLOW PLUG POWERED JOB  
MAY BE FLOWN FREE-FLIGHT OR AS U-CONTROL GOAT**

**DESIGNED AND FLOWN BY FRANK EHLING**

**ONE** of the most inventive model builders in the East, Frank Ehling of Jersey City, N. J., comes up with this specially designed diesel or glow plug powered Class A or B free-flight or control-line "goat" model which has been developed for the beginning gas modeler or club novice.

To assist the less experienced flyer, *Air Trails* makes available full size plans for the Jerseyette. Information on obtaining these is to be found on page 96. With the full size drawings are included both floats and skis. The Jerseyette has been flown off land, water and snow with equally good performance.

It would be hard to devise a more conventional type of aircraft model than the one presented here. Designer Ehling has worked to keep construction as simple as possible. He does not claim any world-shattering

records for the Jerseyette. It is an easy model to build and fly, and—important—an easy model to adjust.

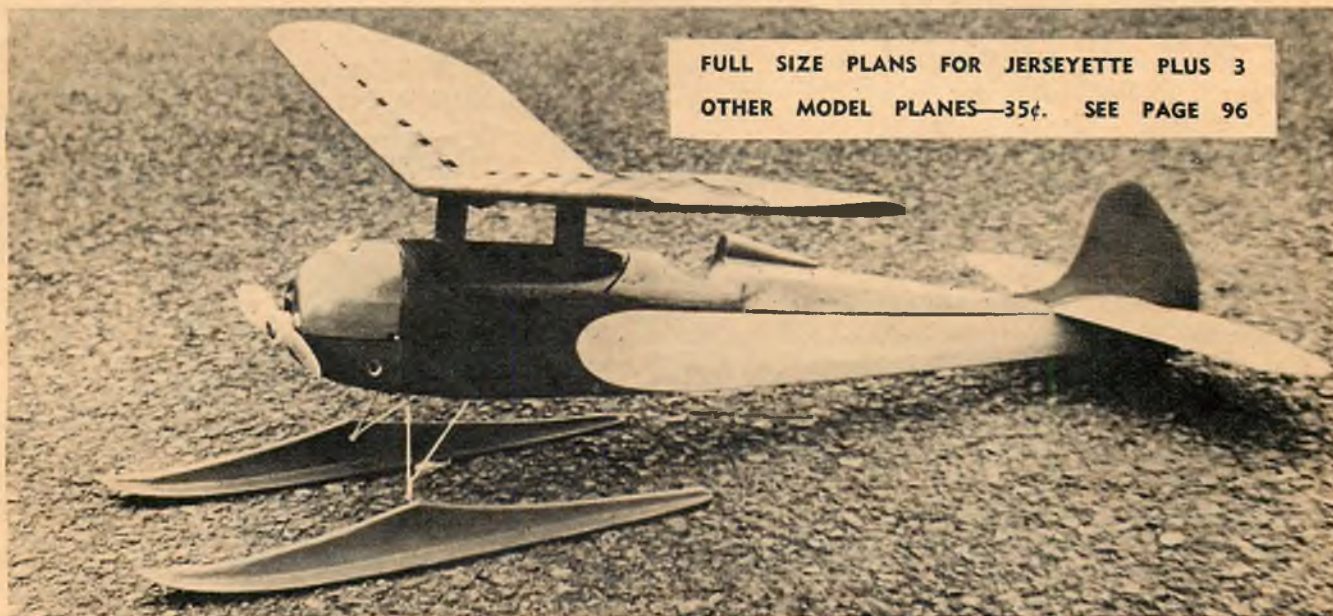
A variety of power plants may be utilized in the model. Any Class A or Class B motor can be chosen. For powering by engines under .20 cu. in. the designer recommends the model be built as light as possible without sacrificing strength. For Class B engines harder woods may be used throughout.

Fuselage is typical box-type construction with addition of rounded formers on top. Formers 2 through 5 are  $\frac{1}{8}$ " sheet stock; 6 through 10 are  $\frac{1}{16}$ " thick.

Pine struts are used to hold wing to fuselage. A removable section of the fuselage acts as a base for the struts—notched on top to fit wing spars and ribs.

A built-up elevator is used for free-flight work; a sheet of  $\frac{3}{16}$ " thick balsa cut to shape serves as a U-

● Here Jerseyette is shown as ski plane. Slight modification is made in landing gear when plane is flown with floats from water.



**FULL SIZE PLANS FOR JERSEYETTE PLUS 3  
OTHER MODEL PLANES—35¢. SEE PAGE 96**



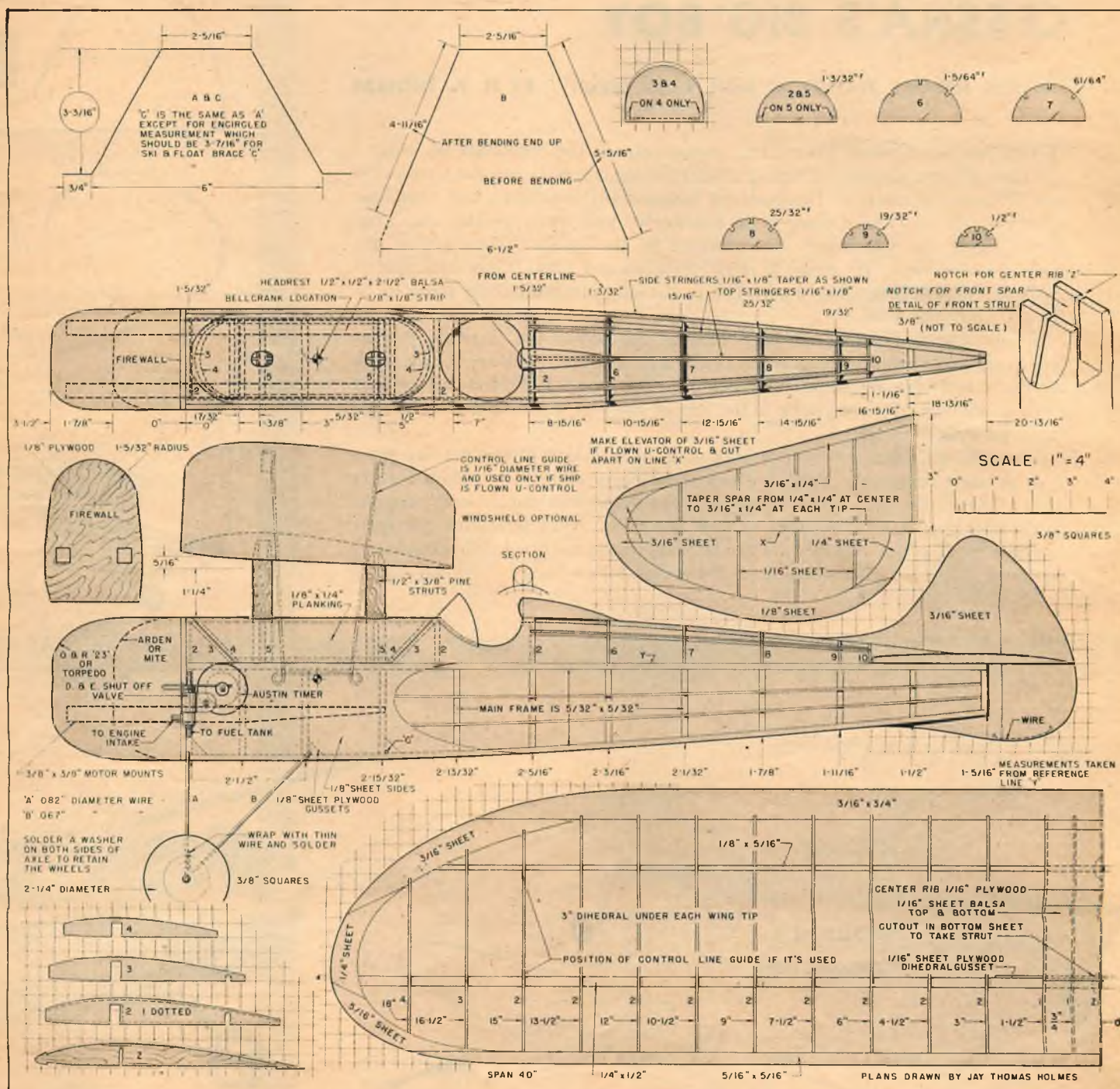
control elevator. The control mechanism is added to the ship in conventional manner with the bellcrank mounted on platform directly at the center of gravity.

Any of the standard methods may be incorporated to cut off the glow plug or diesel engine. Shown is the D-E fuel cut-off mounted with an Austin timer. The same landing gear is used for all types of flying by U-control or free-flight from land or snow. The slight change for float comes with the substitution of brace C in place of B. Wire C is placed directly below the rear wing strut. Landing gear wires should be bound to fuselage cross members and longerons with heavy thread, then given a liberal coating of cement.

Mr. Ehling's first Jerseyette was powered by an Arden .199 engine equipped with a D-E variable com-

pression diesel head. Among the many engines which can fit this simple ship are the Ohlsson & Rice .19 or .23, the Torpedo, Arden .099 or .199, the Mite, Genie, Thor, Buzz, or Bantam—to mention a few. The smaller engines would be for sport-type free flying, the larger ones mentioned are suitable for either free-flight or control-line work.

The size of the cowling will be dictated by the type of engine selected as indicated on the plans. The cowling may be carved from a single block of soft balsa of sufficient size, or it can be built up from slabs of  $\frac{1}{2}$ " thick sheet balsa if the modeler so desires. In either case, a cowling will add much to the appearance of your Jerseyette and will provide protection to the power plant in event of crashes.







## Solid Stuff:

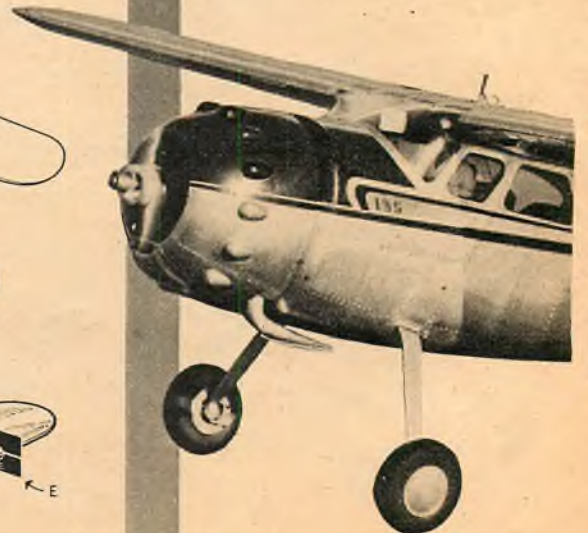
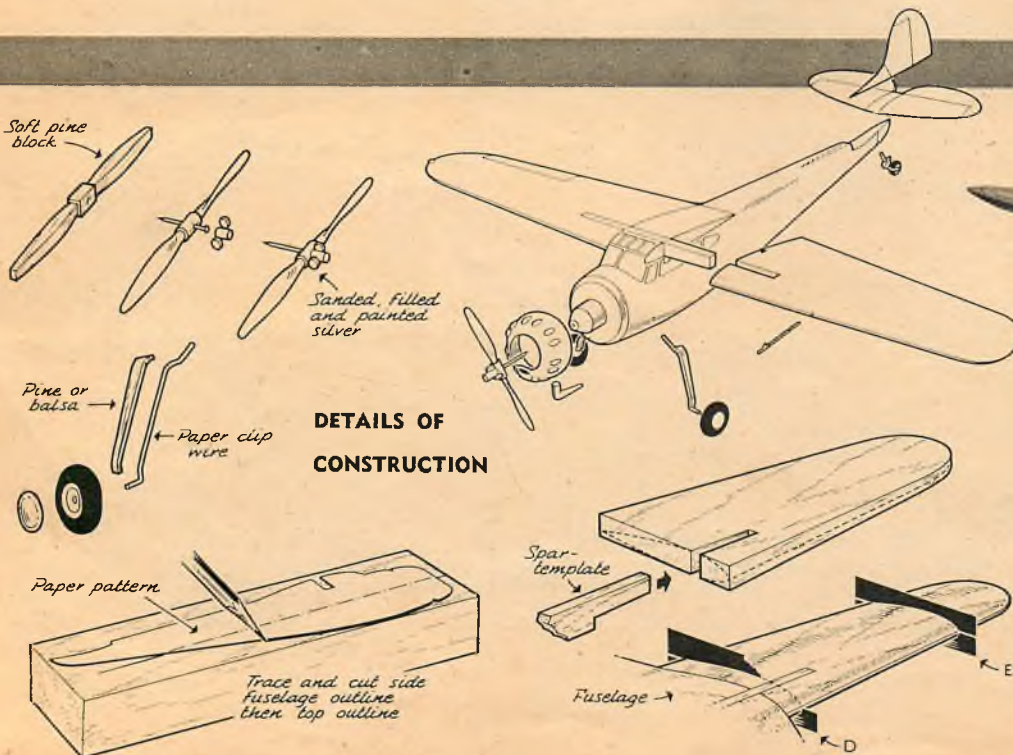
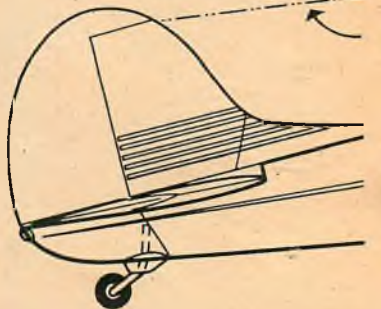
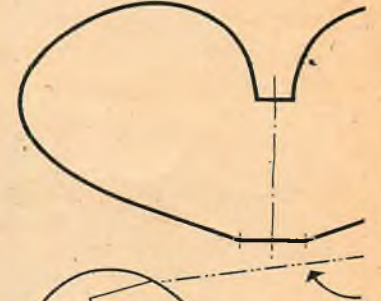
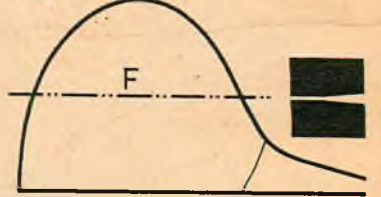
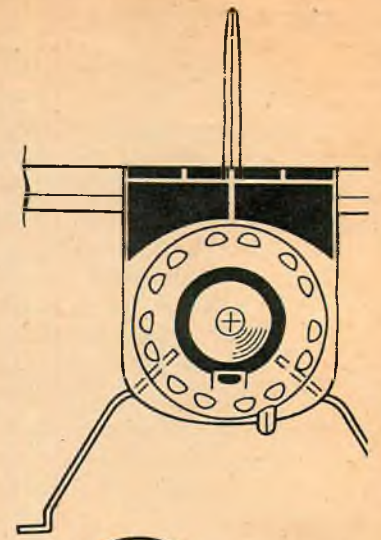
# CESSNA'S BIG BOY

190-195'S NOTABLE FEATURE IS HIGH WING DESIGN BY H. A. THOMAS

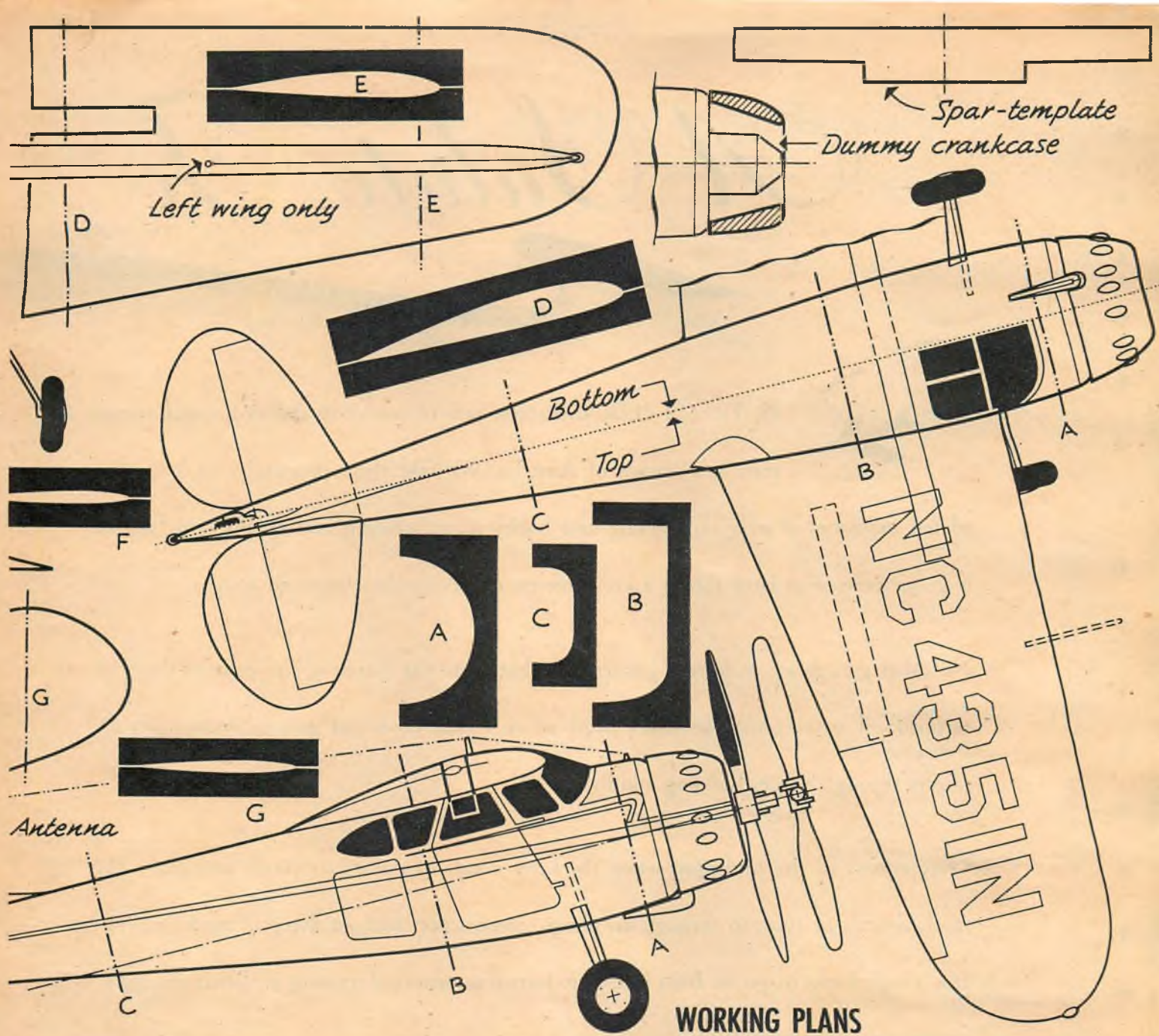
**T**HE pre-war Cessna "Airmaster," which earned the reputation of being a most efficient airplane, serves as a basis for the currently popular Cessna 190 and 195 personal aircraft. Designed for businessmen, sportsmen, and fixed base operators, the all-metal Cessna is an extremely clean, eye-appealing ship. Accommodating five passengers and powered by the Jacobs 300-hp engine, the plane tops 180 mph. Its range of over 750 miles and 1,200-ft.-per-min. rate of climb are outstanding. The model 190 is virtually identical, being powered by the 240-hp Continental.

Cessna argues, favoring the high wing as opposed to the currently popular low wing, that rough air stability is better and that the "passengers may sit in the shade and view the countryside below." The model 195 offers luxury-liner comfort and virtually everything in the way of equipment and accessories needed for extensive air travel.

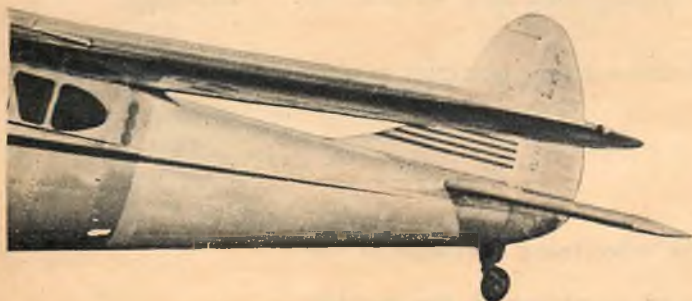
Our solid scale model Cessna is built at  $\frac{1}{4}$ -inch scale, a convenient size for a desk or shelf ornament. Parts are sawed to block outline of medium texture balsa. The fuselage is carved to approximate shape then sanded with progressively finer grades of sandpaper to final contours. After cementing the spar-template into the slot provided for it, the wing panels are fitted and permanently cemented in place. Final shaping of the wings follows with (Turn to page 78)







● Outwardly there is no difference between the Cessna 190 and 195 models. Power plant for the former is a 240-hp Continental; for the latter, a Jacobs 300-hp engine. All-metal, they afford luxury-liner comfort.





# A Salute To



AIR TRAILS BEGINS its 21st year of service to the air-minded young men and women of America. We take this opportunity to salute the related industries of aviation training and hobby manufacturing and supply—in fact, all manufacturers who have shown a keen interest in serving the American youth.

No other groups are making a greater contribution to the future of this country than the aeronautical schools and the many firms which enable boys and girls to embark on air careers through model building and flying.

Preparedness in the air begins when the keen minds of American youth first grasp the fundamentals of aviation through the design, construction and test flying of model aircraft. It is a logical step to go on from models to formal aeronautical training in the air mechanic-engineering institutions.

We doff our hats to the model kit manufacturers, the distributors, the hobby shops, the aviation schools—to all concerns contributing to the advancement of aviation. Without their support, and the support of millions of young men and women, Air Trails would not have been able to achieve the important position it now occupies as the leading youth-in-aviation publication.

This anniversary issue carries the advertising message of the following firms which are grouped according to the number of years that they have been Air Trails advertisers.



# American Industry

## ★ 10 TO 20 YEARS

Aeronautical University  
America's Hobby Center  
Berkeley Models, Inc.  
California Flyers  
Cleveland Model & Supply Co.  
Handicraft Hobbies  
Harley-Davidson Motor Co.  
Megow  
Mercury Model Airplane Co.  
Miniature Aircraft Corp.  
Ohlsson & Rice  
Scientific Model Airplane Co.  
Soaring Society of America

## ★ 5 TO 10 YEARS

Academy of Model Aeronautics  
Aero Spark Co.  
A-J Aircraft Co.  
Austin-Craft  
Champion Spark Plug Co.  
Dallas Aviation School  
Denver Hobby Shop  
Embry-Riddle School of Aviation  
Forster Brothers  
Francisco Laboratories  
Herkimer Tool & Model Works, Inc.  
Hillcrest Mfg. Co.  
Junior Aeronautical Supply Co.  
Leader Model Supply Co.  
Lehr-O-Plane Wholesale Distributors  
Midwest Model Supply  
Parks Air College  
Phillips Petroleum Co.  
Radio Control Headquarters  
Nathan R. Smith Mfg. Co.  
Spartan School of Aeronautics  
Victor Stanzel & Co.  
Testor Chemical Co.  
Trust Model Airplane & Hobbies  
United States Army and United States  
Air Force Recruiting Service  
X-acto Crescent Products Co. Inc.

## ★ 3 TO 5 YEARS

Burgess Battery Co.  
Cal-Aero Technical Institute  
Cavacraft Model Planes  
Consolidated Model Engineering Co.  
Dealers Hobby Supply  
Froom Mfg. Co.  
Haines Hobby House  
Marine Model Co.  
Model Craft Hobbies, Ltd.  
National Model Distributors  
Northrop Aeronautical Institute  
G. Sexauer  
Streed Electric Co.  
Sullivan Mfg. Co.  
Tiger Products  
R. L. Webber

## ★ UP TO 3 YEARS

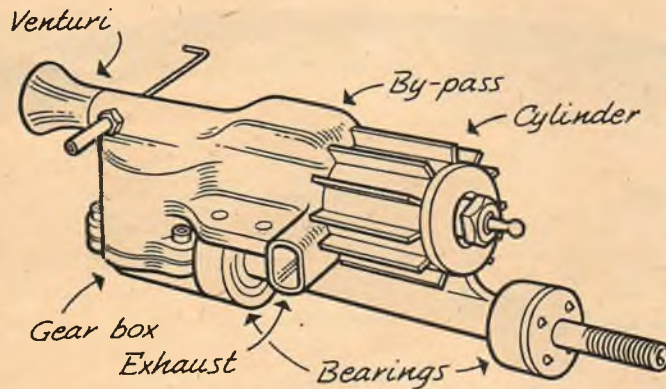
AC Spark Plug Co. —  
Div. General Motors Corp.  
Aero Design Model Mfg. Co.  
Aeromarine Co.  
Airmanship Unlimited  
American Hobby Specialties  
Boyle-Midway, Inc.  
Brayton Flying Service, Inc.  
Bropar Distributors  
Brown Mfg. Co.  
Campus Industries, Inc.  
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California Model Co.  
John E. Clemens  
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Modelcraft DALE Specialties, Inc.  
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Bob Roberts  
Ranger Products  
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Scalemaster Model Aircraft Co.  
Scranton Hobby Center  
Ships & Aircraft  
Sky Hobby, Inc.  
J. Spokane & Co. Inc.  
Sportco Products Company  
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Thomas Associates  
United Hobby Distributors  
United States Rubber Co.  
Walthour & Hood Co.  
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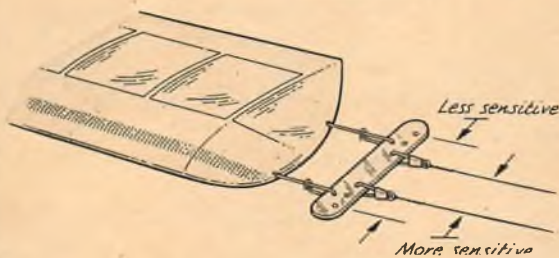


# Sketch Book

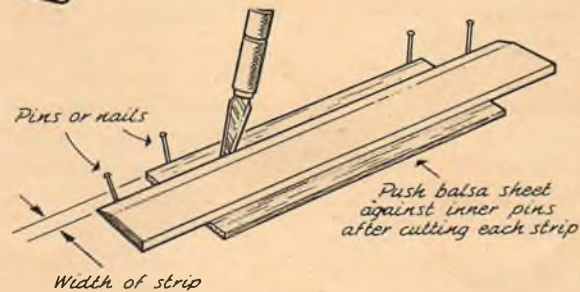
HAVE YOU DEVELOPED SOMETHING NEW IN CONSTRUCTION, CONTROL, OR FLYING THAT MIGHT INTEREST OTHER MODELERS? SEND A ROUGH SKETCH—WE'LL REDRAW IT AND PAY \$2 FOR EACH ONE ACCEPTED



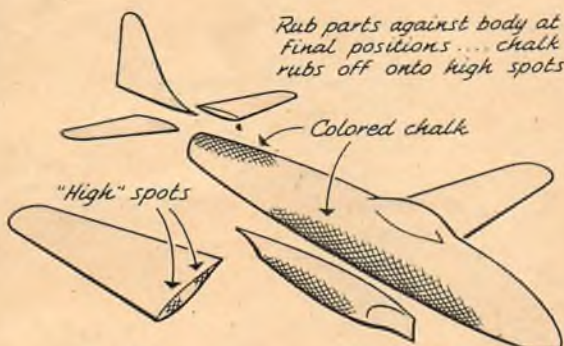
● Graham Fulton, Newtonville, Mass., has progressive ideas about model engines. His proposed design would employ bevel gears so cylinder could lie parallel to longitudinal center line and substantially reduce head resistance. Disadvantage would be increase in friction, thus lowering efficiency. Expense of manufacturing undoubtedly higher than for standard engines.



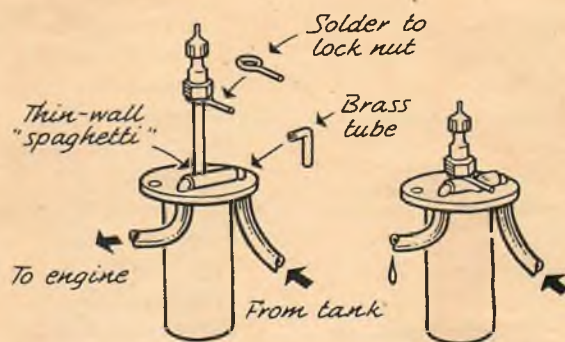
● Extremely simple and practicable is device by Jim Hite, Wenatchee, Wash., for changing sensitivity of control-line models. Metal plate has adjustment holes.



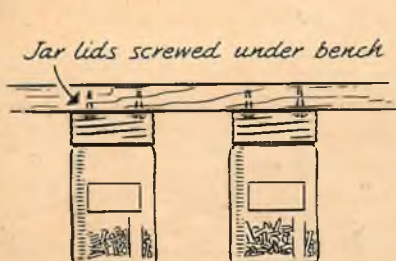
● Use four straight pins or small nails for easy slicing of uniform width balsa strips. Outer pins align straight-edge, inner ones space sheet stock to desired width.



● An old machinist's trick is adapted to solid model assembly by George Kupec, Schenectady, N. Y. Colored chalk on fuselage rubs off high spots of adjoining parts.

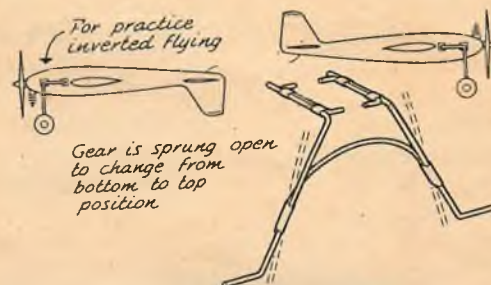


● Carl Hermes, Bridgeport, Conn., uses Austin timer to squeeze off fuel supply for limited engine run with glow plug. Allow for fuel in line after timer closes.



Small magnet suspended by string

● Kay Dawkins, Rockingham, N. C., keeps work bench orderly by sorting small parts in jars, held under bench by screws in lids. Horseshoe magnet holds small pins.

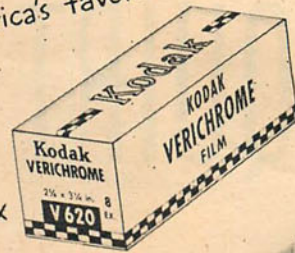


● Two-position landing gear for stunt models is suggested by two readers: Henry Nelson and S. Anzalone, New York City. Gear is moved for inverted flying.



# "These snaps rate a big A-plus!"

Getting the snapshots that get  
high marks from your friends is a cinch! Especially with Kodak Verichrome Film!  
You press the button...it does the rest. That's why it's America's favorite  
film, by far. Eastman Kodak Company, Rochester 4, N.Y.



Kodak Film...the film in the familiar yellow box



Kodak

"KODAK" IS A TRADE-MARK



## Model of the Month

# SQUIRT

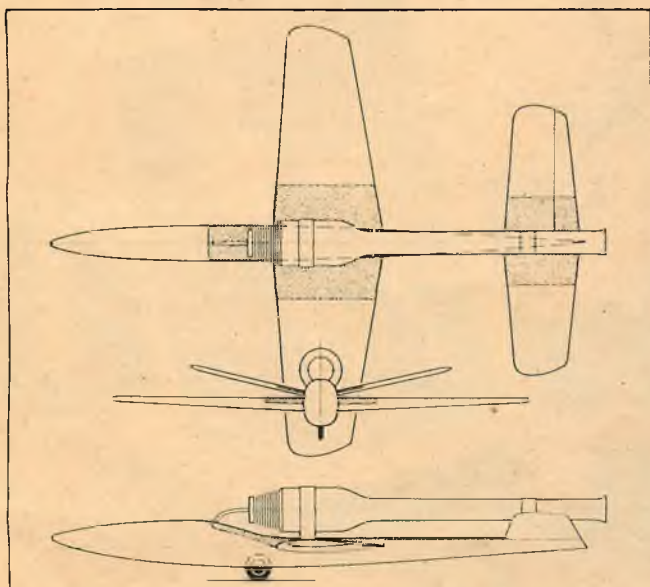


**JET-POWERED CONTROL-LINE SPEED FLYING GETS OFF  
TO A GOOD START WITH THIS INTERESTING NEW KIT**

**F**OR most manufacturers the decision to produce a new kit has become as momentous as getting married or buying a house. At today's high cost of materials and labor, any new quality kit necessarily must be based on careful surveys of the trade. Usually such a kit is a "house" proposition—the idea, plans, parts, materials, being tailored to meet the demand. All of which makes the story behind this kit of the month—Berkeley's Squirt—a spectacular exception to the rule.

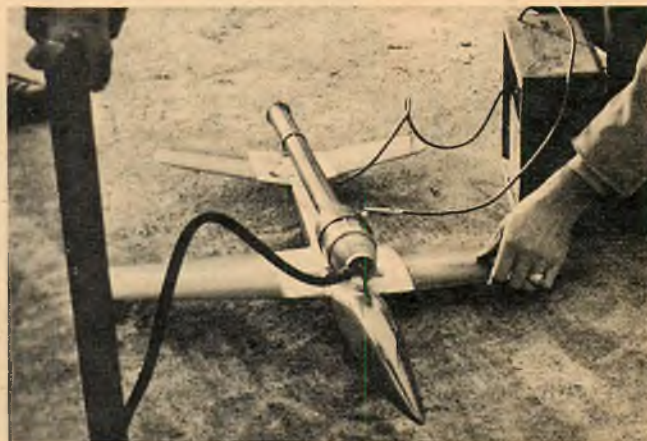
This Dyna-Jet-powered speed model is a pioneer project which judged by the usual standards, would be fraught with risk. Tangible proof that the Squirt does not stem from surveys is the interesting fact that if surveys indicate demand, that demand is evident only because similar kits already on the market have begun to move. Being a first, the Squirt is one man's calculated risk. The Squirt was designed, like many Berkeley kits, by an outsider, Harold Bunting, president of the Prop Twisters Model Club, Greensboro, N. C. With a surprisingly small span of 24" it is the speedy end product (159 mph unofficially as this goes to press) of a series of ships that have had great success in the South.

Bill Effinger, Jr., the younger member of the father-son manufacturing team minimizes Berkeley's part in making the kit available. An active oldtime builder himself, the younger Effinger is more impressed by Bunting and the other boys of the Prop Twisters who merrily fly more jets than most clubs fly gas. Bill has been in the business over twenty years, more than fifteen as a manufacturer. His company bears the name of a street in Brooklyn where he lived and built models over the garage. So many neighborhood pals came round after school that Bill took to buying supplies which speedily were consumed on a "self service" system. Benny Shereshaw, then running Kresge's model department in Newark, N. J., swapped a gas model plan (the original Cavalier) with Bill for a pair of badly needed air wheels. One thing led to another. So many customers wanted materials to go with the Cavalier plan—which Bill was by now selling—that he began to make small quantities of kits. Bill Effinger, like the Buccaneer, is unique for weathering all storms. His manufacturing technique is based on a large number of kits which can be (Turn to page 76)



● Harold Bunting (above) designed the Squirt. Almost entire nose section ahead of motor is fuel tank. Wing span, 24".

● Dyna-Jet powers the Squirt. Ease of starting shows jets have come a long way and make such flying practical now.



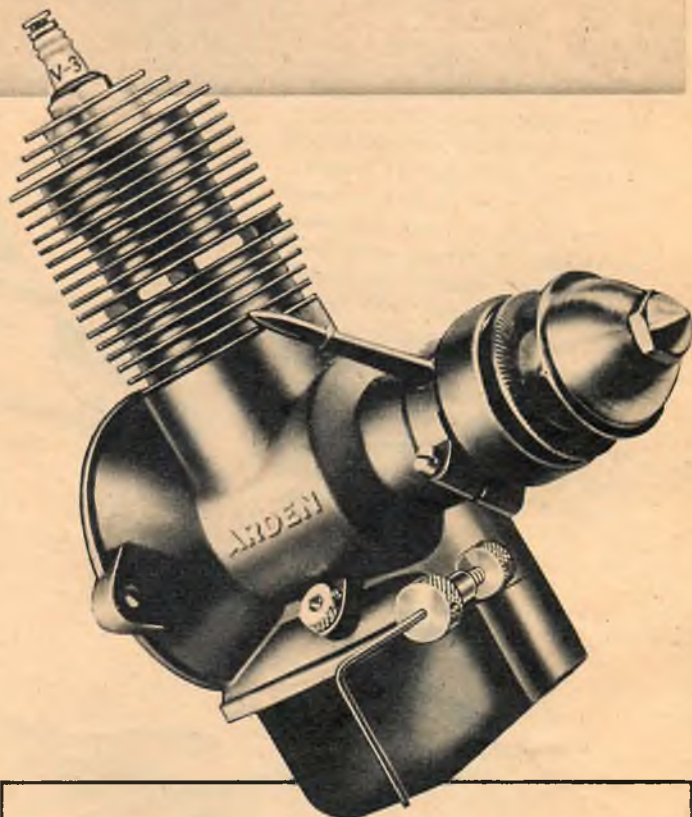


# *Again it's* **ARDEN**

... with a new and improved **ARDEN GLOW PLUG** designed to permit replacement or interchanging of **HOT and COLD ELEMENTS**

**Another engineering first...  
saves money too**

1. **YOU CAN NOW EXPERIMENT** with your engine and determine which of the two elements will insure its greatest operating efficiency.
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E-7002	Battery Connecting Cord Kit	35c

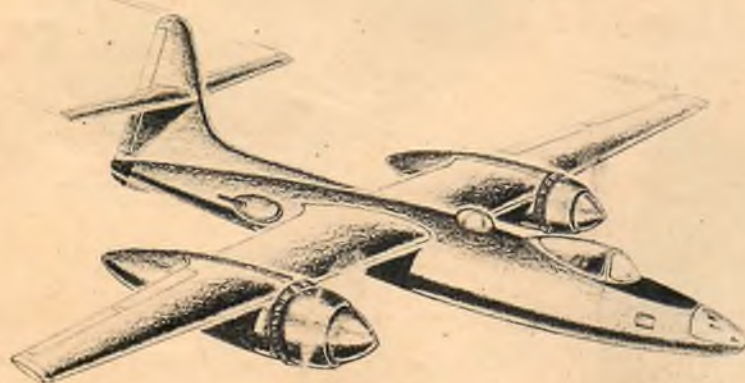
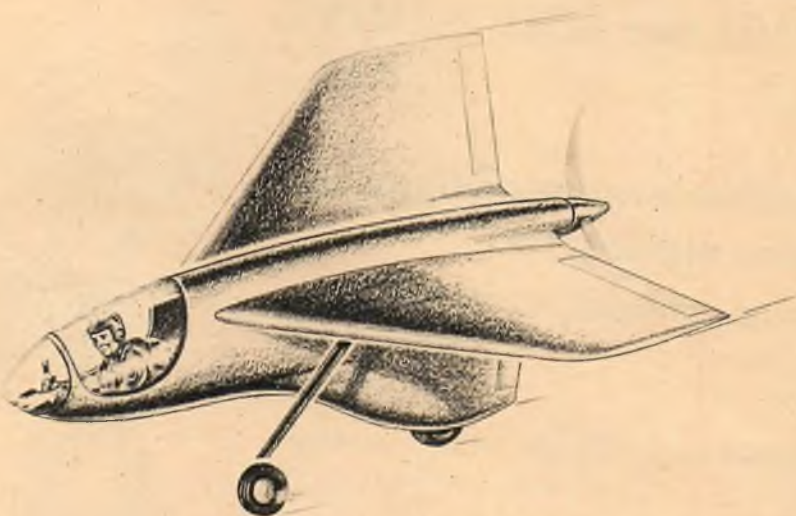
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# Airmen of Vision

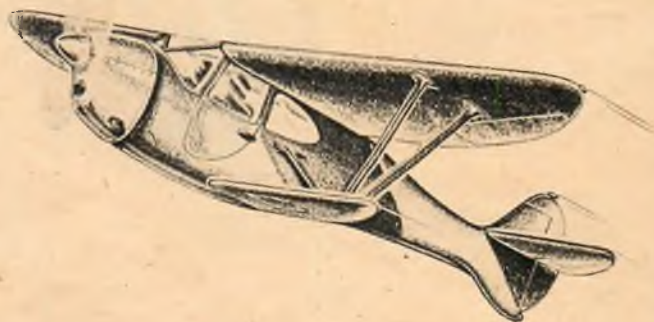
## DESIGN COMPETITION

● First place winner in this month's Airmen of Vision competition is amateur Sidney Goldin of Trenton, N. J. His entry is a high-speed personal plane that can also serve as a racer. It features prone-pilot and sandwich construction having outer plywood panels with balsa-wood core. 85-hp engine in rear, equipped with a cooling fan. Landing gear is steerable and retractable. Tail wheel in the vertical fin. Wing span is 14', length 12.5', wing area is 75 sq. feet, gross weight 600 lbs., speed 275 mph.



● Second place winner 15-year-old amateur Fred Thompson of Atlanta, Ga., sent in this straightforward design for a long range patrol bomber. Carrying a crew of three, the plane is capable of a speed of 475 mph. It is armed with four .50 cal. machine guns and two 20 mm cannon in the nose, two .50 cal. machine guns in the side of fuselage and two in the tail. Bubble behind pilot's cockpit is for navigator who also mans remote-control tail guns. Power is by 2 3,000-hp radial engines.

● An interesting two-place side-by-side sesquiplane design submitted by Kenneth Pruitt of Lamesa, Texas. The plane features tricycle landing gear with main wheels retracting into wing stubs, and split flaps. It has a range of 500 miles, a cruising speed of 100 mph, and a stalling speed with flaps of 35 mph.

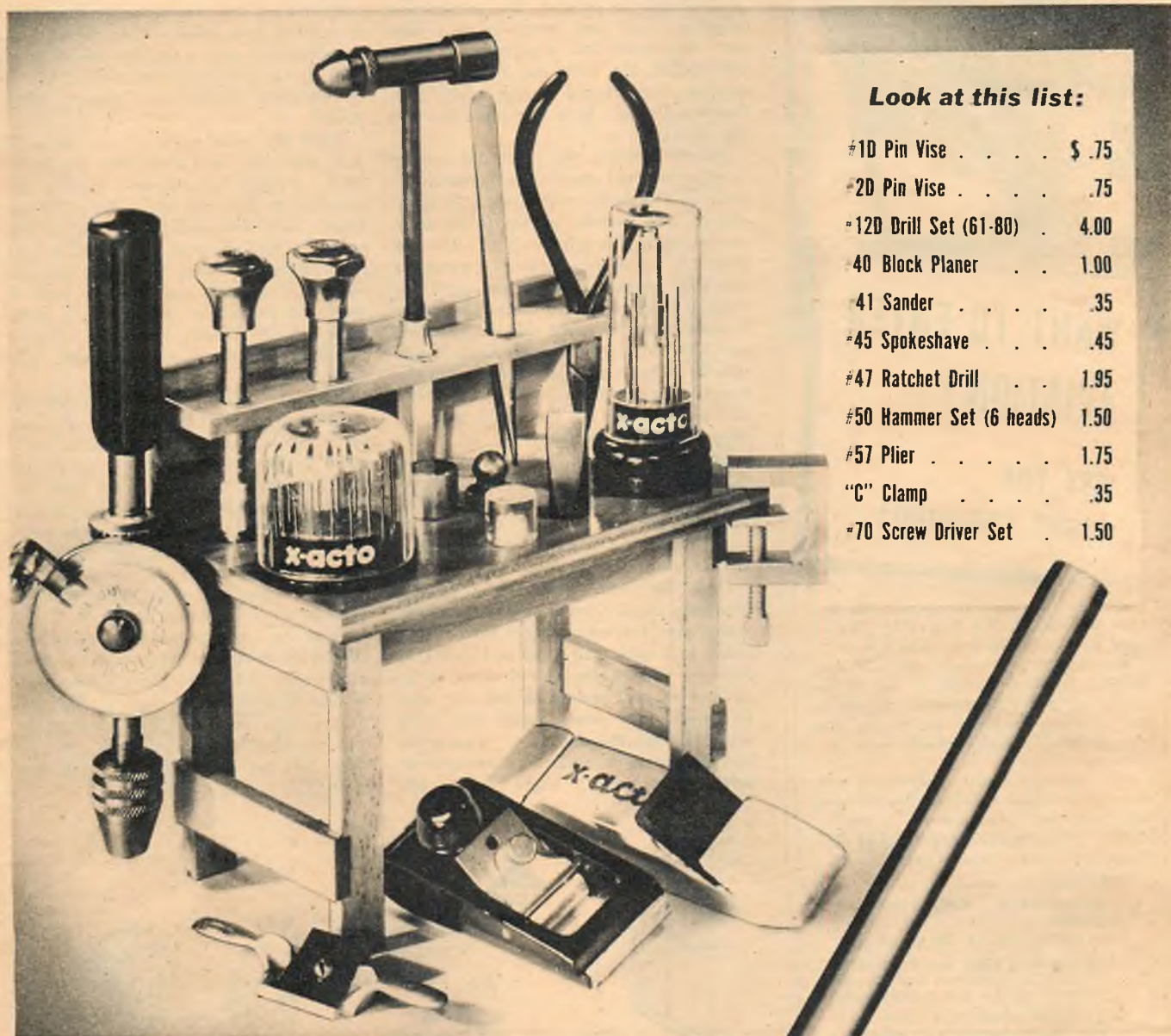


[See Rules on Page 84]



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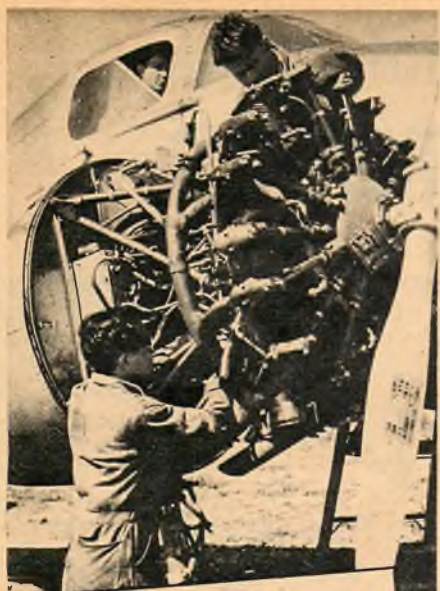
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## LITTLE ROCKET

(Continued from page 48)

before it is cemented in place. The block protrudes to fit between the crutches for aligning upper and lower halves. The rear hold-down bolt is screwed in from the bottom, the front one from the top, passing through and resting against the hardwood spar. It is accessible through the air outlet.

Before tackling the cowl, the engine is mounted and the halves fastened together. The front cowl block is roughly shaped, and extends upward to the level of the top of the cylinder head. The top block is similarly fashioned, smoothed carefully inside, then these two parts are cemented and pinned in place. Use paper to make patterns of the side pieces which are 3/64" aircraft plywood. Cement and pin the sides to complete the cowl in the rough. We saw the exhaust pipes off the McCoy engines so the cowl may be slipped over the cylinder.

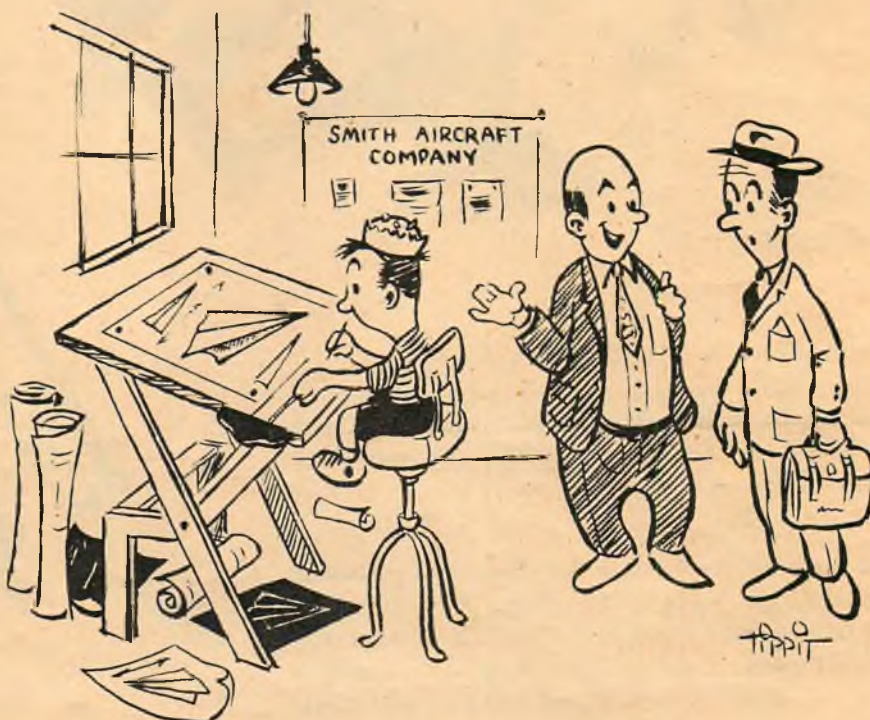
Shape the exterior of the cowl and trim the intake opening, smoothing it inside as well as outside. Build up fillets of Plastico-Roc or similar material to smooth the cowl-fuselage joints. Use it also at wing and tail roots.

Dope the entire model as a primer. You may brush several coats of sanding sealer over the entire model sanding between each coat, then spray on two liberal coats of auto primer. Sand these, spray on another coat and finish this one with fine wet-or-dry emery paper used with water. Finish the model by spraying on two thin coats of synthetic enamel, using colors you prefer. Light colors are

recommended, since it often becomes difficult to see a fast model in late afternoon if it is of dark color. After the enamel has hardened over a ten-day period (you may fly the ship in the meantime) it can be smoothed further with rubbing compound.

Bend the wire parts of the drop-off gear carefully; bind and solder the joints well. Prongs are tapered slightly by grinding so they will not stick within the tubes. Add the trailing "switch" which serves to bind the gear to the model until it is airborne. Test the gear through simulated take-offs and adjust it until it works to perfection. (See March, 1948, issue of *Air Trails* for more detailed description of the operation of this type drop-off gear.)

Here are a few tips for the relatively inexperienced speed modeler: Be prepared for a quick take-off and somewhat of a zoom as the gear drops free. Often the first laps are the fastest; learn your engine's tendency in this respect and get on the pylon early enough to catch the fastest part of the flight officially. Take off always *with the wind at your back* and strive to keep the model at a uniform altitude of from six to ten feet. Carry on your own experiments with propellers to find diameter and pitch best suited to your engine and plane. Class D lines may be .014 stainless steel, class C .012, and class B may be .010 if in each case the ends are doubled and soldered and provided you are alert for kinks and rust spots.



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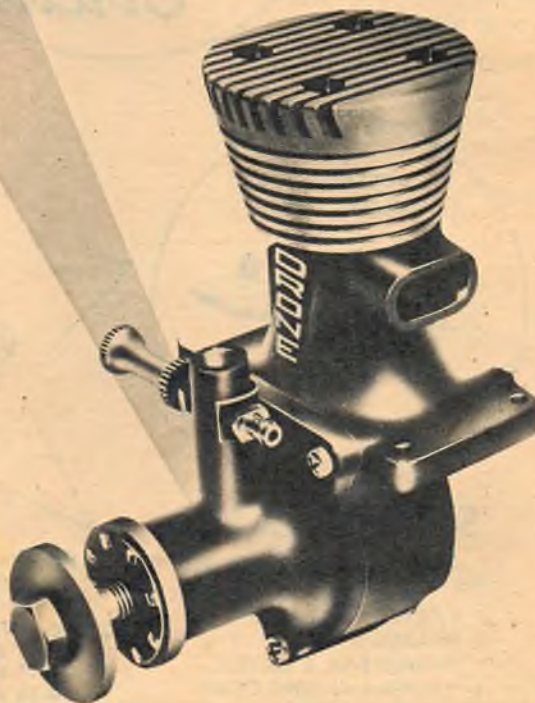


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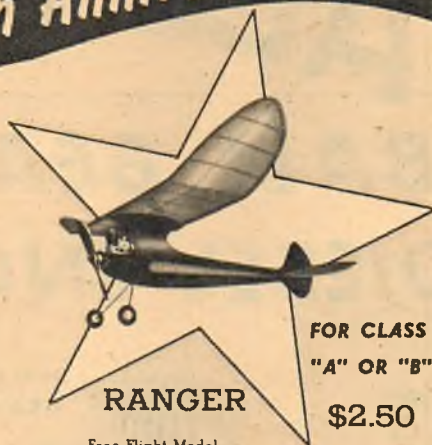
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## BLIND FLYING BY EAR

(Continued from page 30)

termine the kinds of sounds that can be discerned by humans, and the selection of signals which may eventually serve many purposes besides the blind flying of airplanes. This program Johns Hopkins calls "long-haired research in sound."

When in 1936 de Florez tried out his theories in a Fairchild cabin monoplane, he used two kinds of signals: a steady tone that increased or decreased in pitch to indicate a dive or climb, and an increase of volume in one ear to show a turn in that direction. De Florez depended on the inherent stability of the Fairchild to keep it upright in the air. While great spirals resulted, de Florez did maintain the upper hand, even to recovering from those blindfolded spins. When the Harvard researchers began hitting the ball, some remarkable things happened.

For guinea pigs ten men of the Civilian Public Service Test Unit, ranging in age from 19 to 36 years, were selected. None had prior flying experience. In the beginning the scientists did not know what kinds of sounds to use, or even how many sounds could be heard and acted upon simultaneously. Largely by cut-and-try methods it was learned that as many as four simultaneous sounds could be identified and acted upon, without interfering with radio and interphone. The psychology of sound was found vitally important for each signal used had to create a mind-picture of the behaviour of the airplane. Tones, pitches, and "chopping" sounds in various combinations were readily distinguished. Combinations of tones were a dismal failure.

After two hours of instruction all the "guinea pigs" could fly the celebrated Link instrument trainer on a straight course by ear alone, a surprise result that compares favorably with visual instruction! Six private pilots who had some prior instrument time could hold the Link on course by ear after one hour's instruction.

Drs. T. W. Forbes and W. R. Garner, of the Psycho-Acoustic Lab eventually hit upon two combinations of sound. The first and simplest involved a tone corresponding with right and left variations of the radio compass, coupled with an additional indication for air speed. An increase in air speed reveals a dive and vice versa. The second and more promising scheme combined three signals. A repetitive or sweeping sound from left to right indicated a turn, variations in pitch for tilt, and variations in a putt-putt sound associated with engine noise.

At this point professional pilots will groan, "Oh, my aching ear." But FLY-BAR already has some obvious possibilities. Bell Telephone Laboratories was brought into the picture to develop a



fifteen-pound automatic annunciator, a light, compact, multi-channel sound reproducer of the magnetic tape variety. When this voice-in-a-box is connected with various instruments it actually announces the readings in easily understood words. It can, for example, call out air speed and altitude at regular intervals during a climb or a difficult approach to a landing in bad weather. This could be an enormous help to the overworked pilot of a single-seat fighter or in larger ships it could eliminate the need for the copilot to call out data to the busy captain. Regardless of the ultimate fate of FLYBAR, the annunciator may find use as a warning device. An over-busy pilot who misses a bet may someday hear an admonishing but calm voice saying, "Your wheels are up, your wheels are up," or "Put down your flaps, put down your flaps." This "third man" in the cockpit could have a telltale affect on safe flying.

At best, FLYBAR will not be a complete cure for "instrumentitis." It will supplement rather than replace present visual methods. For the plane without an automatic pilot, a sound signal rigged with the gyro compass can liberate the eye from its wearisome checks of the compass needle. A pilot may home on a radio station by sound. On very long flights, FLYBAR can be co-ordinated with the radio compass. It is expected that FLYBAR will have many similar applications.

Psychologists have discovered five important principles in successful blind flight by sound. Signals must conform to habitual methods of thinking about altitude and speed. Since primary attention is focused on instruments, only the simplest self-explanatory sounds can be employed. Because it is human nature to concentrate on one thing at a time, researchers found that there had to be a special sequence for listening to the sounds, just as a prescribed sequence is used in conventional instrument flying. For military operations, sounds cannot interfere with the constant stream of messages. All signals must be tried and proven on unbiased subjects to be sure their interpretation is within the capabilities of the average pilot.

De Florez's early trials with blind flying by ear have led where even that master of synthetic training devices probably little suspected. The research he requested in 1943 still gathers momentum. Now that the hazy outlines of the problem have been sketched, the Navy looks to Johns Hopkins to fill in the gaps. Making a fresh start, Dr. Garner, who is conducting the Johns Hopkins program, is well into the "basic research" stage, re-exploring the sounds that can be differentiated by the human ear, and the consequent choice of signals. Then the "control" phase will be entered upon, when the experimental signals will be thoroughly tested. After the limitations have been discovered, the use of signals in various practical systems will be investigated. Doing the job right will keep the Navy, and the public, waiting for a few years, but the results may well be worth it.

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## SQUIRT

(Continued from page 68)

easily dropped into a highly flexible production line many times, and whenever necessary. A flair for the experimental has interested him in many radical subjects for kits, the latest, of course, being the Squirt.

Harold Bunting, in explaining how he got started in jets, will tell you, "Our club, the Prop Twisters, wanted to do something for the big Milk Fund Drive and planned a model show. Most of the folks had seen speed jobs tear around the circle and the stunt jobs loop. We were desperate for something new, so made a feature of jets. But when the spectators saw a jet turn in 98 mph they wanted to know why it couldn't do 150 mph. It's a jet, they would say. That started me thinking."

As contest director, and winner of 14 third places and higher in 17 free-flight contests, and seven places in speed, Bunting thinks up his designs when he first hits the hay at night. Quite a few sheep failed to be counted while Bunting wrestled with the then many problems of jet. "I was tired of seeing the same old square model, two rudders, landing gear, wheels, big bulky ships, so began to think of how small you possibly could make one and still have it fly smoothly. All the small ones I had seen flew off the ground, up one side the circle, and usually hit the ground on the other side. Since most of us were building models with long moment arms, I decided instead to use a long nose to balance the weight of the tail pipe.

"Next came the mounting of the jet," Bunting continues. "I figured the lower to the fuselage it could be mounted the smaller the nose bulb could be, for I used the nose to streamline the fins on the jet. I tried to get as much of the big bulge as possible behind the nose. I don't like twin rudders for they create drag and, without torque, a V-tail was the solution. It did look like a 'built-in spiral dive' but I was thoroughly convinced and wanted to test my theory on short moment arms, long noses, low-mounted jet, and V-tail."

But would theory stand up? Finishing the first Squirt on the morning of a contest, Bunting knocked off 126, 127, and 128 on his first test flights, which was 16-18 miles better than the time at the Nationals. Scenting blood, he chopped out a smaller Squirt and by the following Wednesday at Burlington, N. C., did 132, 134 and 138 mph with a borrowed Red-head jet.

Perhaps the big secret of the Squirt's dependability is its fuel system which largely eliminates engine failure headaches. Though free-flight is Bunting's first love, he states that his troubles with jet don't stack up against the troubles with ordinary gas models.

Bunting built and tried a variety of

tanks, ranging from dope bottles and snuff cans down to baby-food cans. But the best tank proved to be one made from thin brass shim stock, with pipes as used on Bunting's Hornet speed model. Capacity was increased up to 7.5 ounces, then decreased to four ounces for lightness. This tank is constructed with two vent pipes and an outlet in the rear of the tank as on any speed job. The inlet vent is flared out at the bottom on the inside so that centrifugal action will force the fuel into the jet intake.

"Keep the metering nozzle clean and free from foreign matter," advises Bunting. "Keep gasoline clean (he uses Amoco white or aviation 91 octane). Adjust the T-model coil to buzz fairly fast, have good fresh batteries. (Bunting used two Burgess 3-volt.) Try several different metering nozzles, available at Dyna-Jet dealers. No two jets have run alike on the same metering nozzles. We have switched until we found one that works fine. Check nozzle for burrs inside. A good, non-leaking hose on a big bicycle pump is sufficient. A leaking hose causes a lot of trouble."

With troubles like these behind him, Bunting found that the important thing was keeping clean the jet and its equipment—a small grain of sand lodged between the vanes and the head may keep a jet from starting.

Usually when a manufacturer takes on an outside design like Bunting's, numerous construction details must be changed. Bunting's Squirt, oddly enough, was ideally suited for both easy construction and adaptability to mass production. The fuselage, for example, consists of two sheet-balsa sides, filled in forward with blocks, the whole being beautifully streamlined. Die-cut sides are included in the kit. All wing parts are die-cut or semi-shaped. Landing gear, push rod, and hinge are formed wire. Forty-three pieces for 15 different items are found in the fitting envelope. Miscellaneous parts include the tank stamping and metal hold-on straps. Completed, the Squirt weighs in at the remarkably low figure of 24½ ounces ready to fly. Thirty ounces is con-

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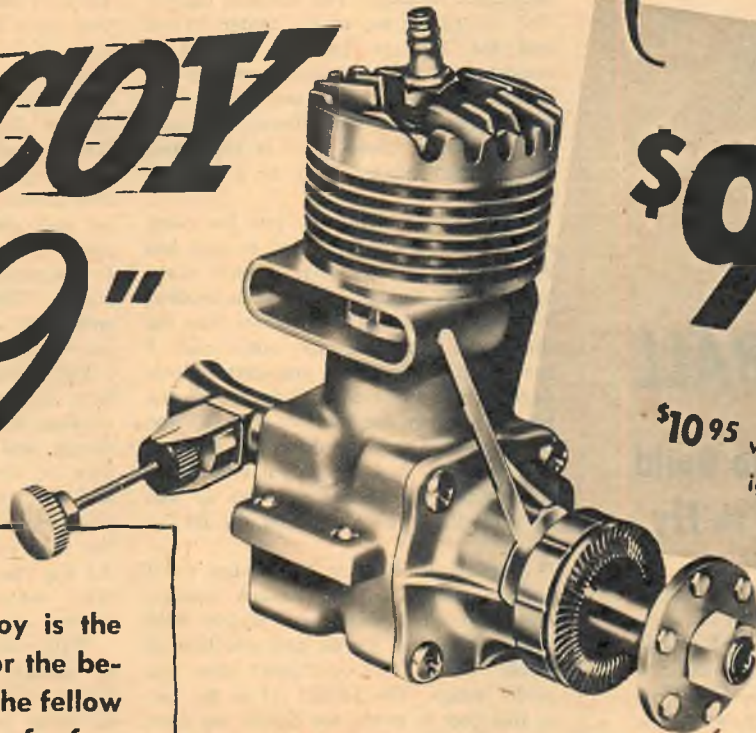
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From package to the thrill of flying is only a matter of hours with the A-J Fireball. The pre-formed and pre-cut parts of the A-J Fireball reduce assembly time to the minimum. Further-

more, the A-J Fireball set is most complete... containing everything you need (except motor and liquids) to build and fly the most famous U-Control plane in America.

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Full instructions for converting the standard A-J Fireball into a "hot" stunt plane are contained in Jim Walker's Dope Sheet. It's free for the asking at your nearest hobby dealer. Complete with diagrams, it shows how to make Jim Walker's Balloon Stunt Tank, the stunt wing and modifications that will improve engine performance.

Jim Walker

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sidered light for a jet and, since some experts report that a two ounce saving in weight is good for another five miles per hour, you can see the importance of Bunting's concept of a light, small jet airplane, as represented by this kit.

After sanding the assembled model, Berkeley recommends that a hard finish be provided by a coat of pyroxolin primer, or thinned out "Fil-it," followed by a final light sanding. The asbestos blanket that covers the top of the center section and the fuselage beneath the jet is cemented on with a non-inflammable adhesive. All bolt heads are faired with this cement. A non-inflammable paint like aluminum stove paint is suggested, waxed, then rubbed down to a polished finish.

"I have been flying my jets for many months," says Bunting "and no one has been injured in any way. I have never been burned, though I have been shocked by the coil, and that is no worse than the shock you get from any model coil. I have used some of the youngest fellows (age 11) in the club to help launch the jet and, if they are told not to touch the jet, I am sure they can do as fine a job as a grown up. Any one of our club members from 14 years of age and up will be perfectly capable of using the jet."

According to Bunting the design trend unquestionably will be toward smaller, thinner, cowled jobs, with weight held down by careful design and selection of wood. Wings will be thinner than gas model wings. The fastest jet in the air, as this goes to press, the Squirt has done 159 unofficially, flown by Arvel Moser, Burlington, N. C., and 154 for Bunting.

Best official time is 142 mph. Arvel and Harold work together on the jets. Moser used a cowl to hit 159 and Bunting flew his on .012 wires, although they use .016 wires in all their contests. Both 52- and 70-foot lines have been used with equal success.

Bunting recommends testing without wind, preferably at "dusky-dark," when not sure. His Squirts balance just in front of the rear line, yet fly stably. Any that were balanced at the pivot hole or forward to the front line proved sensitive on the controls. Testing is like any other control-line testing, except that full-up should not be used on take-off. The reason for this is simple. Thrust is not at the nose. The designer uses the stiff elbow method of testing until familiar with the ship. Berkeley's info sheet states that fore-and-aft trim is obtained by loosening the straps and shifting the engine. The power plant can be shifted a trifle left or right in angle to obtain maximum speed.

Bill Effinger tells us that the Carolina boys worked out a novel technique for slowing down the Squirt in the air. By diving and then zooming suddenly the flow of air to the jet can be disturbed and the "fire goes out." Then, if the pilot whips backwards (yep, that's right) the ship can be slowed down abruptly. At any speed above 90 mph the jet will start automatically when the ship is leveled off.

With calls to demonstrate the Squirt at air shows, model meets, and shows, national records being set, and, finally, the kit being produced by Berkeley, Bunting is overwhelmed by events. "All this seems a dream," he says.

## CESSNA'S BIG BOY

(Continued from page 62)

the section being checked during final sanding. Take care to work the trailing edges down to thin lines and notice that wing tip edges are quite sharp. The joints between wings and fuselage are filled flush with wood filler.

The tail group is of extremely simple construction and assembly. Stabilizer is shaped, sanded and mounted first, followed by the fin, after which the joints are smoothed with filler. Paper clip wire is bent to shape for the landing gear struts, and a small tapered piece of wood is cemented behind each wire member. Wheels may be rubber or wood, with the outer hubs covered flush. A small wooden wheel and wire strut make up tail wheel assembly.

The air vent, behind the engine cowl, is the location where the front of the fuselage may be sawed off to facilitate shaping the cowl interior. A dummy crankcase is cemented to the body, within the cowl, and the cowl itself is hollowed before being cemented in place again.

The tiny rocker box fairings are made by cementing small balsa blocks to the cowl and later carving them to indicated shape. The curved exhaust pipe is carved of balsa or pine and is cemented in a hole in the cowl.

A piece of apple crate pine will serve for a propeller block. It should be carved, complete with hub—the protruding cylinder and dummy counterweights being added after the mounting pin is pushed through.

Final appearance of the model is largely governed by your success at filling in the surface. A commercial filler, or a mixture of dope, talc, and a little thinner should be brushed on liberally and sanded thoroughly. Later coats are smoothed with fine emery paper.

Spray or brush several thin coats of aluminum dope over the entire model, then mask off the windows and trim stripes with scotch tape strips. Paint windows, cowl interior and tires flat black and add decal registration numerals.



## DOPE CAN

(Continued from page 59)

and to the public at large shows a fine job done in answering questions before they were asked. Old campaigners with years of contest experience behind them had nothing but praise for the six-page announcement which was absolutely complete. This column is being written in late June, so the meet hasn't been run off yet, but such careful preparation could only result in a successful contest.

**Advance Dope, Please!** Mention of the month in which this column was written was done for a particular reason. We would like very much to run meet announcements, but unfortunately they don't reach us in time. For your meets next year, therefore, send us the dope four months in advance of the issue in which you want the announcement to appear. This may appear to be quite a long stretch, but will have the advantage of indicating to prospective contestants that more than a little preparation has been made for them. Just under the wire in this respect are the Chi Spinners, with an announcement of their control-line contest scheduled for September 12 at Calumet Park on East 95th Street in Chicago. Richard C. Brown, who knows his way around a control-line circle, is to direct the AMA sanctioned meet, which includes speed, stunt, and combat on the list of events. Announcement so far in advance of the meet, as we have said, indicates careful planning for a good contest, so don't miss it!

**A Peach of a Georgia Meet:** What was probably the largest meet ever held in the Atlanta area took place in June at the Marietta Army Air Base, Marietta, Georgia. Run by the Atlanta Aero Engineers and the Atlanta Controliners, with the sponsorship of the Veterans of Foreign Wars, the two-day meet was directed by Hank Hudson and proved to be a tremendous success. Noteworthy was the fact that high time of the meet was the 3-flight total of 24 minutes by Dick Vickrey of Alexandria, Virginia, who flew an original design powered by an Arden .099 for a new record in Class A Open. The AMA Contest Board is still trying to dig its way out from under the tremendous pile of record applications received as the result of this contest. Gus Clarke, demon publicity man for the Aero Engineers, happily reports that grading and smoothing of the Atlanta flying field has been completed, and that everything is progressing well.

**New Wrinkle in U-Control Judging:** So you want to run a control-line meet, but don't have enough money for decent prizes in all events? A novel method, but economical, of running stunt and combat events, in addition to speed in two age classes, comes from Paul I

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Brown of Norman, Oklahoma. In casting about for a method by which engines of one class could compete on an equal footing with engines of another class, Brown hit on the idea of awarding winning places on the basis of a point system that he dreamed up, rather than speed in terms of miles per hour. For example, Fred Cook of Dallas, Texas, who took first in the speed event for those over 18, flew his .49 ship at 139.0 mph. His speed had subtracted from it the piston displacement of the engine he used (with that figure multiplied by 100) giving him 90 points for the event. Maurice Stanglin, also of Dallas, won the Junior Speed event with 83.5 points, obtained by subtracting the .29 displacement of his engine from the 112.5 mph speed he obtained. David Corley, Texarkana, and Keith McClure, Stillwater, won the stunt and combat events, respectively. Due to the novel point system used for awarding speed prizes, it was possible with a total prize budget of \$215 to award engines down to third place in each event. It's interesting to note that Class B appears to be the most popular, with 50% of the entries using 29's, 25% with 19's, 18% with 49's and 7% with 60's. Significant, too, is the fact that the percentage of winners by engine displacement closely parallels the percentage of entries.

**Ginder is a Wonder:** In Ocie Randall's "Fresno Model News" we see that 14-year-old Fred Ginder was the hottest free-flyer in the Fresno area early this year. In both the F.G.M.A.C. and Tulare meets, his Frank Ehling-designed model with a .24 Torp flew for high time regardless of age or class. An orchid, too, to Earl Ford of Coalinga, who despite the 38-mile wind at the Stockton contest hung up a high time of 15 minutes. That the AMA rules have made a hit with modelers is shown by the decision of the Fresno club to swing over to them.

**We Hear From Vermont:** Remember our list of clubs in the November, 1947, issue? Remember how Vermont model clubs were conspicuous by their absence? Thomas A. Dietrich, of Burlington, helped to correct this woeful condition as an organizer of the Green Mountain Modeleers. A model shop has opened up and sponsorship of the group has been secured in the form of help from the local Exchange Club. Novel twist is the club's setup of officers, with Secretary Dietrich as the only listed one. The "head man" of a club, they reason, should be the club member who is the most active on

the flying field as well as in club meetings. The position which would normally be that of president is filled by the club member who currently has the most points; said points being given for attendance at meetings and regular flying sessions, for new planes built and flown, for winning performances at club meets, etc. The club's first invitational meet drew flyers from all parts of the state. Membership is 100% AMA and the immediate club goal is the obtaining of an AMA charter.

**Florida Unites:** Realizing the advantages to be gained by united action, dynamic Don Warner, of Lakeland, Florida, is doing a bang-up job in organizing the Florida Association of Model Clubs. So many clubs have joined the organization that space forbids our listing them here, but we are sure that this is only the beginning and that the imposing list published in "The Skyscraper News" will become more imposing with each successive month. Interested Florida clubs may obtain details by writing the Association at Box 1581, Lakeland.

**Maine Meet:** As Maine goes so should go the rest of the country. This isn't political propaganda—it's just our way of praising the professional-appearing "Tale-Spinner," nine-page publication of the Flying Maniacs of Augusta, Maine. It appears from the publication that the club is 100% control-line, so that out-of-staters attending the club's annual Model Derby on September 12 should bring their speed and stunt ships along.

**Kansas Competition:** Latest issue of "Dope Fumes," official publication of the Hy-Flyer Clubs of Wichita, Kansas, consists of an announcement of the Central States Meet held in May. Sufficient events in both outdoor free-flight and control-line were run off to satisfy the most rabid of specialists. In addition to the regular speed events, a special speed event for Class D sleeve bearing engines, which is becoming more and more popular throughout the country, was also held. Reports have filtered through that Al Hummel did his usual swell job of directing.

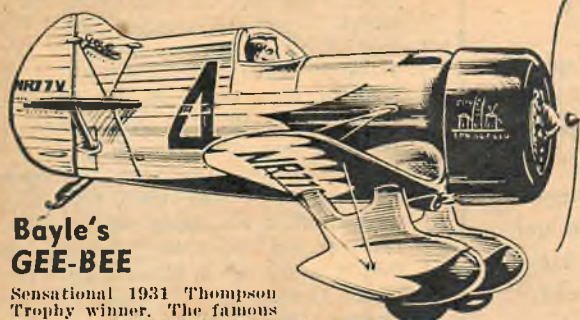




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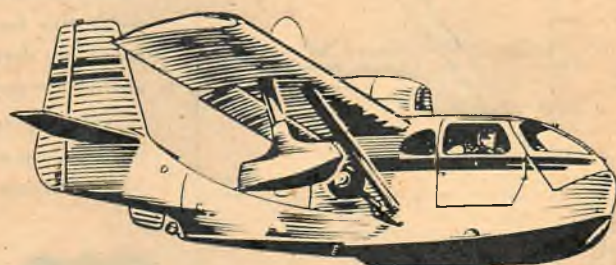
(for CO-2) Dry Kit..... **\$1.00**

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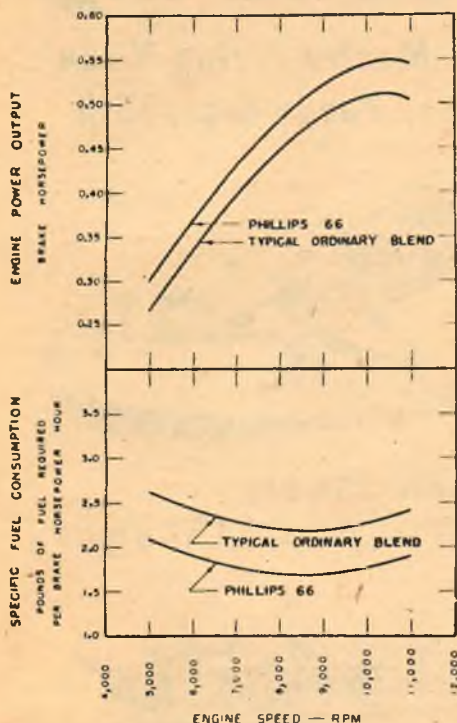
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## PHILLIPS 66 MODEL MOTOR BLEND

**City Assists Club:** A. J. Gearhardt writes of the formation of the Daytona Beach Plane and Car Club. 1948 officers include former AMA vice-president William T. Thomas, Sr., president, vice-presidents Leon Parkman, Model Plane Division, and Lawson Diggett, Race Car Division, and W. B. Clarida, secretary. Help has been received from the City of Daytona Beach in the form of a model race car track and three control-line circles. Plans are taking shape for both race car and control-line meets, the details of which can be obtained by writing to Mr. Gearhardt at 113 Orange Avenue, Daytona Beach, Florida.


**We've Heard From—**The Westchester Aeronauts via oldtimer Tony Tiso, who reports a speed in Class C Junior of 116.5 by Walter Wagner. Flyers within striking distance of Mount Vernon, New York, have probably seen 'Nuts attending every attendable meet during the summer.

The Flying Bisons of Buffalo, New York, in a communique from Norris Maltby, corresponding secretary. The Bisons had only attended five meets when his letter was written, but already had attained 28 "in-the-money" places. Third and last of their Workmanship Contests was won by Ron Kirk with a Dooling-Speedwagon combo.

**What's Your Trouble?** Ted Geng of New Brunswick, New Jersey, has what we consider a pretty good idea. Says Ted, "Why don't you ask your readers to send in their mixtures for glow plugging the various engines, then publish a list of engines and fuels?" In addition to fuels, personal experience leads to the belief that plugs as well as fuels should be specified. Ted is one of what we imagine to be a great number of modelers who haven't the time to give to experimentation for finding the right combination. Such a list would be a big help; how's about helping us out on this? As for Ted's trouble with his Pacemaker 59, we suspect that he may not have tightened his prop nut securely and that he may not have flipped his prop with enough oomph, thus causing the prop to be thrown. As for fuel, friends who have used the Pacemaker with incandescent plugs advise that while the engine seems to operate well with practically any brand of fuel, Ohlsson #4 seems to work out fine.

From Jim McVernon, 7432 Eighth St., N.W., Washington 12, D. C., comes a pat on the back and a generous offer. Jim says he has *Air Trails* from May, 1946, to May, 1948, that he'll give to anyone for the cost of the postage necessary to send them. Thanks, Jim, for your kind words about the column.

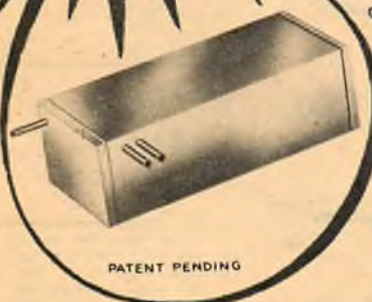
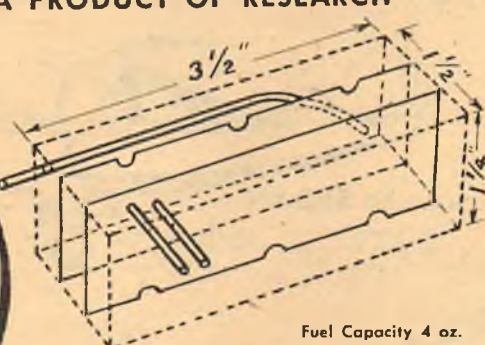
Jim Madell, 3538 Grand Blvd., Brookfield, Illinois, wants to know the span and wing area of Hank Struck's "New Ruler," as well as how and where he can get plans for it. The following is from memory only, but a flat span of 74 inches and a projected area of 780 to 790 square inches appear to be about right. As to his request for plans, will



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have to ask the readers to help out on this one. Write him if you've got 'em.

Colin Doone wants to build a model dirigible but, he says, every time he mentions it to a model builder he gets the horse laugh. We model builders are nuts, Colin, so don't get upset. As to the feasibility of your idea, we've read of any number of dirigibles which have been flown successfully in the past. Novel, though, is your idea of placing a lifting section in the prop's air stream so that the slightly heavier-than-air model will climb only when power is on. Anyone with ideas along these lines would do Colin a favor by writing to him. His address: R.F.D., Gaylordsville, Connecticut.

From Jean Benguey, 45 Rue de Marechal Foch, Bordeaux (Gironde), France, comes a plea that American modelers correspond with him on the subject of speed flying. Modeler Benguey reports that not a drop of methanol is to be had in France, but that in spite of this sorry state of affairs he's done pretty nicely on a gas-oil mixture. Any dope you readers can send him on the subject of speed flying would be very deeply appreciated.

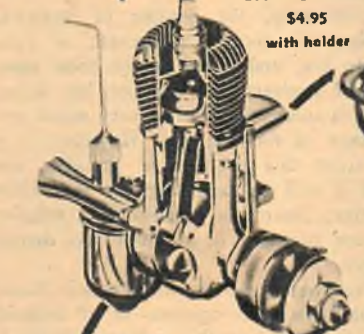
Very interesting are the descriptions and pictures, the latter unfortunately non-reproducible, received from Singapore and sent us by Leslie F. W. Hayward. His gas model, the "Big Beep III" with Ohlsson .60, has a span of over 8½ feet, weighs 5 pounds, and has lights for night flying. He reports that the ship's performance is exceptionally good. Since Mr. Hayward intends to return home shortly, those wishing to write to him should send their letters to 3, Raynor Close, Southall, Middlesex, England.

**Radio-Control Free-Flight:** During the 1948 model season the Academy of Model Aeronautics has received a number of questions regarding the use of radio-control units in free-flight gas models, control-line gliders and even outdoor rubber cabin models.

This raises an interesting point which not only concerns an interpretation of the current rules but has a bearing on the development and increased use of radio-control. On one hand, it is pointed out that there should be no objection to the flying of radio-control free-flight models in regular free-flight events until such time as it has been proved to be an obvious advantage over conventional free-flight models. Supporters of this line of reasoning point out that the early development of gas engines for models followed much the same pattern. They were flown in competition with rubber-powered models until it became apparent that a distinct advantage existed in favor of gas power. At that point the rules were revised and the separate categories developed as we know them today for gas and rubber.

The proponents of the above suggestion argue that, in reality, the use of a dethermalizer on a free-flight model results in the exercise of some control over the model and constitutes an advantage under the present regulations over those flyers who because of no dethermalizer

# "O.K." Consistent Winners

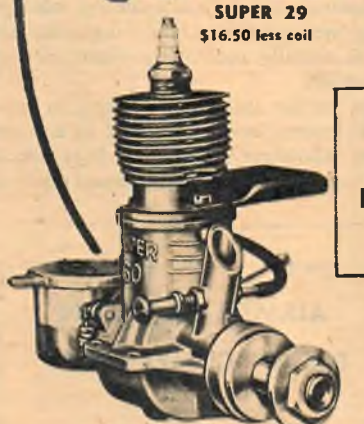
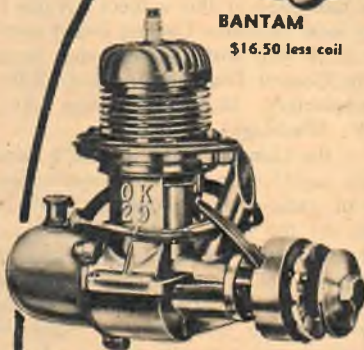


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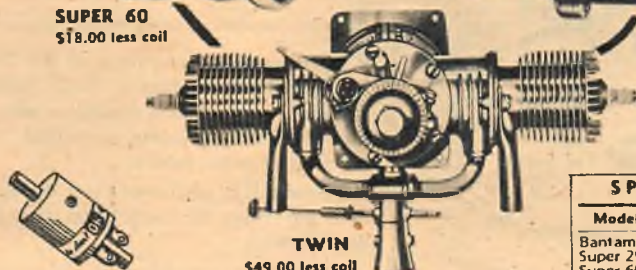
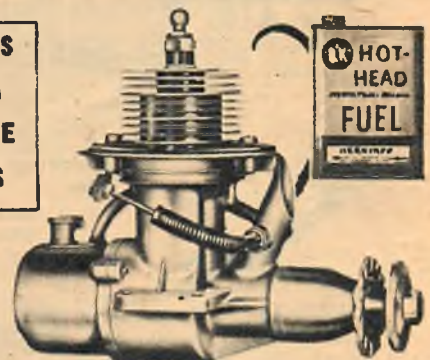
Authentic proof of championship performance is found in the consistent appearance of the "O. K." name on AMA Record Report Forms. Here are some recent winners announced by the AMA Contest Board.

- **FREE FLIGHT GAS—RISE OFF WATER**  
Class A, Open record time of 3:13.0 (3 flight average) established by Paul Salaka, Hampton, Va., on December 8, 1947, with a Bantam.
- **CONTROL LINE SPEED GAS MODELS**  
Class A, Senior record speed of 107.48 mph established by Maurice Stenglin, Dallas, Texas, on February 10, 1948, with a Bantam.
- **COMPRESSED GAS (CO<sub>2</sub>) MODELS**  
Combined class, Open record time of 14 min., 54 sec. (3 flight total) established by Joe Dodson, Hampton, Va., on March 4, 1948, with an "O.K." CO<sub>2</sub>.
- Class A, Open record speed of 97.47 mph established by John Kasserman, Knoxville, Tenn., on March 9, 1948, with a Bantam.

Whether you're building your model for contest work or just for the fun of flying . . . you're on your way when you say "O.K."



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Super 60*	.604	.900	.950
Twin	1.208	.900	.950
CO <sub>2</sub>	.0178	.275	.300
Hot-Head	.299	.760	.660

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## CO<sub>2</sub> SQUIRT

The Squirt can be powered with any CO<sub>2</sub> engine. Kit includes die-cut parts, flywheel, propeller, rubber universal and complete hardware.

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Classes B-C for .19 to .65 engines. Wing 40", Chord 7". Will perform all stunts. Prefabricated—easily assembled.

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Speedboat with carved hull. Class "E", length 17", beam 5 1/8", weight 2 lbs., for engines of .099 to .49.

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## TRAIL BLAZER

Classes A-B-C. Wing 24", Chord 6". The biggest value in control-line models. Has prefabricated fuselage.

\$2.95



## CIRCLE KING

Rubber powered control-line model. Wing 30", Length 27". Rubber or CO<sub>2</sub> powered control-line model. Easy to build and fly.

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## CYCLONE

For all engines of .19 to .65 displacement. Fine for training and stunt.

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## SHOOTING STAR

A scale jet propelled model with finished fuselage.

50¢



## CO<sub>2</sub> FLEA

A champion when flown with either CO<sub>2</sub> engine or rubber powered. Easily built.

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## SKYSTREAK

World's fastest airplane. The model is jet powered with CO<sub>2</sub> capsule. Finished fuselage.

50¢



## SPARTAN

Large 42" Wing. Flies beautifully with either CO<sub>2</sub> engine or rubber powered.

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MODEL AIRPLANE CO.  
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stand a greater chance of losing their model before being able to complete their three official flights.

On the other side of the question, it is argued that radio-control on a free-flight model would enable the flyer, under some circumstances, to keep his model within a thermal and to return it to the field after each flight thereby minimizing his chances of losing the model. This would appear to give an advantage to those individuals who are in a position, financially, to obtain and use radio-control equipment.

Admittedly, the number of modelers using radio-control equipment is relatively low, and based on the total number of contests, the question has arisen only in connection with a very small percentage of the contests. However, it is apparent this problem is growing and that it will be necessary for the AMA Contest Board to work out a solution to the problem in the not too distant future.

For these reasons, the Contest Board would appreciate opinions of all individuals interested in this subject. Write to your local Academy Contest Board member or, if you wish, address your letter to the Contest Board chairman at AMA Headquarters, 1025 Connecticut Ave., N.W., Washington 6, D.C.

For the Contest Board to take a stand which would retard the development and use of radio-control would be undesirable. At the same time it is necessary that competitive flying of model aircraft be carried out in such a manner that no advantage is permitted individuals who may be able to purchase more expensive equipment such as radio-control whether it be used merely to trip a dethermalizer or to actually control the flight path of the model.

As yet the use of radio-control in free-flight events has not resulted in any obvious advantage for the RC boys. As a matter of fact, most of the times reported

have been considerably under those reported in the same contests for conventional free-flight models, possibly because of the additional weight carried.

There are two possible solutions to the problem:

1. Revise the definitions of free-flight and radio-control models to provide the necessary differentiation.

2. Permit the use of radio-control units in gliders, free-flight gas models and rubber-powered models under existing regulations.

There is much to be said on both sides of this question.

**Associations of Clubs:** In the past, model aviation from the organizational point of view has developed principally through the formation of model clubs. These clubs offered an opportunity for model builders in a local area to combine and coordinate their activities. The most important of these was the running of contests each season.

In addition, the model clubs have performed a most important service to the activity in recruiting and developing new model builders and flyers, offering them instruction and guidance through the early stages of the activity.

As more and more clubs have been formed and as the number of active model flyers has steadily increased, it has become apparent that the next step, organizationally, would be the banding together of local model clubs into state or regional associations. Administratively, this expands the unit, permits a coordinated schedule of activity and gives better opportunities for such an organization to represent its membership in helping to decide administrative matters for the Academy and to elect its national officers.

This is a healthy trend. It is hoped that it will continue to the point where every state or region will function through an association of clubs under the Academy of Model Aeronautics.

## AIRMEN OF VISION DESIGN COMPETITION

(See page 70)

In response to many requests *Air Trails* has opened its columns to model builders and full scale airplane designers who are interested in presenting simplified plans for aircraft of the future.

There will be no formal rules or regulations governing the competition other than the following:

1. Three-view sketches of the proposed aircraft will be required. These sketches may be of any size convenient for handling except that they must not be less than 8 1/2 by 11 inches for the entire three views.

2. Sketches may be submitted in pencil or as inked drawings. If possible sketches of the complete airplane preferably in three-quarter front and/or rear position should be included.

3. If any entrant wishes he may submit photos of a completed model of his proposed design.

4. Each entry must be accompanied by information concerning the type of power plant(s) utilized, together with estimated performance, dimensions and explanations of any unusual features.

5. Entries will not be returned and for that reason those participating in the competition should make certain that they retain copies of all material sent to this publication.

6. Because of the large number of entries anticipated, the editors cannot enter into correspondence concerning designs submitted.

Designs may be of any type within the realm of reason: commercial aircraft, military planes—both small pursuit craft and large bombers and troop transports, planes for the private flyer and single-place sporting craft.

Entries will be designated as either professional or amateur. A professional entrant is one who earns his or her living or works part time in any of the many places of the full size aircraft business. Amateurs are all others including model builders, private pilots and the individual generally interested in aviation. Each entrant must classify himself. Additional data as to age, occupation or schooling, and aspirations will be welcomed.

The best entry each month will be prepared for publication by recognized aviation illustrators. An award of \$25.00 will be presented to the individual whose entry is judged by the editors as the most practical or of the greatest significance. Awards of \$5.00 will go to runners-up.

An annual trophy award will be made for the outstanding design of the year.



# CAL-AERO

(Continued from page 39)

aircraft overhaul shops on the field. The latest in commercial and military planes are brought to these shops and made available for student surveillance.

More than twenty firms make Grand Central Air Terminal their headquarters. These include representatives for most types of personal planes. The Rotor-Craft Helicopter Corporation which is currently preparing its new tandem helicopter for test is located on the field, as is Bauman Aircraft Corporation, manufacturers of the Brigadier 240 transport. Still another of the firms on the field is Bendix, which maintains its West Coast Aircraft Radio branch at Grand Central.

By arrangement with aircraft manufacturers in the area, experimental types of aircraft are brought to Cal-Aero. These opportunities to study new aircraft and accessories enhance the value of the training by permitting the students to tie in practical observation with their course work.

The Cal-Aero engineering curriculum has been endorsed by leading aircraft manufacturing concerns. The mechanics school is approved by the Civil Aero-

navics Administration; the training leads directly to an A and E license.

Cal-Aero is a member firm of the Aeronautical Training Society, an organization of which Major Moseley has served as vice-president for two terms. The school is also a member of the National Council of Technical Schools and a corporate member of the Institute of the Aeronautical Sciences.

The Aeronautical Engineering curriculum is comprised of two years intensive training directed to a twin objective. First, the student is given practical working knowledge of drafting and aircraft design so that he will be able to obtain a fast foothold in the industry. This sort of training has the additional advantage of placing the engineer in a position to assume immediately a specialized or advanced job, without having to get some time in "on the board."

The second objective of the Aeronautical Engineering course is to give the student a thorough training in engineering fundamentals. Since drafting is the language of the design engineer, emphasis is placed on board work, and on developing the student's ability to express his own creative ideas through this medium.

Strong emphasis is on the practical aspect of design. Through experience in the shops and laboratories, and lectures by experts in production design, it becomes second nature for the student to design parts that can be manufactured economically.

Thorough grounding is given in mathematics, physics, mechanics, structures and aerodynamics. All instruction is tied in closely with the current design problems.

Instruction is given by men of wide experience in aircraft and allied industries. Subjects are never presented in a purely academic manner. Through a special arrangement with several large aircraft manufacturing companies, these instructors return to professional engineering work at intervals, thereby keeping abreast of latest techniques and scientific progress.

Throughout the course of training, classroom work is supplemented by group visits to nearby manufacturing plants and laboratories engaged in production of aircraft and aircraft parts.

The Master Aviation Mechanics course consists of a total of fifty weeks instruction. Divided into three main phases, basic and airplane fabrication, engines, and airplanes, the course covers all types of modern aircraft and engine practices now in general use in the industry, plus advanced training in commercial aircraft power plants of tomorrow in the jet and rocket engine lab.

For students desiring to specialize in engines, a 33-week approved Engine Mechanics course is available at Cal-Aero. Students interested in the airplane phase may take the special Airplane Mechanics course, also 33 weeks.

All courses in the mechanics' division are complete and practical. With a minimum of required theory, emphasis is on

## Now FULLY FACTORY ASSEMBLED THIMBLE-DROME

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*No extra drilling, cutting or fitting!*

One of the many thrilling combinations offered by the world-renowned THIMBLE-DROME. More than that, it's factory-made, assembled and tested throughout. No tricky drilling or fitting operations needed. Ready for power. Ready for a powerful lot of fun.

**COMPLETE WITH  
GEAR DRIVE UNIT...**

**AS WELL AS  
HIGH SPEED  
WHEELS AND TIRES!**

Length: 9<sup>5</sup>/<sub>8</sub>"  
Width: 4<sup>5</sup>/<sub>8</sub>"  
Height: 3<sup>5</sup>/<sub>8</sub>"

Furnished complete, less engine and pinion. For Thimble-Drome engines add No. 1423 pinion gear, \$1.00. For Arden engines add No. 502 pinion gear, \$1.00. For all other engines add No. 1423 pinion gear, \$1.00, and No. 503 adapter, \$1.95.

Pilot your own sleek THIMBLE-DROME next time out. Flash along with your streamlined scale beauty, noted for its detail accuracy, as well as shatter-proof body, shiny chrome accessories and wide range of color choice in baked-on enamel. THIMBLE-DROME wraps up the thrills of racing for all to enjoy.

**SEE YOUR  
DEALER  
TODAY**

**ONLY  
\$8.95**

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# Fly Brown's Twins!



## SNAPPY, JR. for Precision Stunting

- Featuring Sculpt-turned Fuselage
- All Prefabricated Kit
- Hardwood Spars
- Designed for motors .19 to .30 cu. in.

**ONLY \$4.95**  
at your dealer



## LOCKHEED SIRIUS

- Sculpt-turned Hardwood Fuselage
- L. 17", S. 26"
- Designed for small motors, .19 to .36 cu. in.
- Kit & Plans Complete.....only \$4.95

## CONTEST WINNERS!

Charles Yurchick	Senior	153 m.p.h.	E. Charlevoix, Pa.
Bob Fraza	Junior	128.5 m.p.h.	Peoria
R. A. Rice	Open	145.1 m.p.h.	Peoria
R. A. Rice	Open	138 m.p.h.	Rockford
Jesse H. Rudder	Jr. Open	114 m.p.h.	Tulsa

**Super Sonic Flash \$5.45**

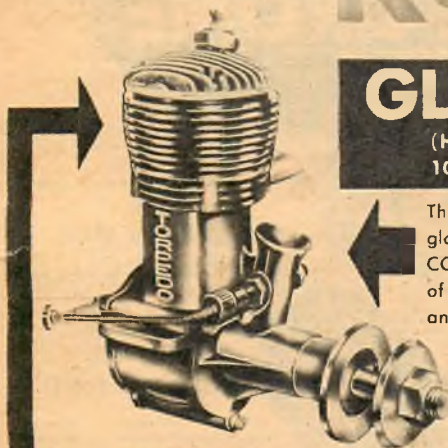
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## BROWN MANUFACTURING CO.

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## ALREADY BREAKING RECORDS!!!



## GLO-TORP "32"

(Holder of R. O. W. Class "C" Open  
10 min. 52 secs. May 16, 1948)

The **Glo-Torp**, newest K & B development, features glow-plug ignition. OPERATES WITHOUT COIL—CONDENSER or TIMER!! Eliminates added weight of ignition accessories... Provides maximum power and adds EXTRA MILES PER HOUR OR MINUTES IN THE AIR... **Glo-Torp** comes in 3 models. When ordering be sure to specify model—Available at dealers everywhere.

**Glo-Torp "32"**  
**Glo-Torp "29"**  
**Glo-Torp "24"**

Price **\$14.95** (WITH PLUG)

The Famous  
**TORPEDO "29"**  
**18.50** less C & C



SPECIFICATIONS			
	"32"	"29"	"24"
BORE	750	725	662
STROKE	724	724	724
DISPLACEMENT	318	299	249
WEIGHT (Bore, 6 ozs)	6 ozs	5 1/2 ozs	5 1/2 ozs
TYPE	2 CYCLE ROTARY VALVE		

This famous CHAMPION is known for its many CONTEST WINNINGS... The result of the skill of its maker and the high quality materials used... Every K & B engine FACTORY TESTED and GUARANTEED. Know you are getting the very best... INSIST ON K & B!!

Also available in the K & B "24"  
Price **16.50** (less C & C)

NOTE: Specifications same as shown above for "Glo-Torp" ("29" & "24")  
WEIGHT 7 1/2 ozs.

## K & B MANUFACTURING CO.

6901 Eastern Avenue, Bell Gardens, California

shop work, developing the student systematically into a practical aircraftsman, familiar with modern equipment. Upon graduation the mechanics school student is ready to pass government examinations.

Training equipment at Cal-Aero is as modern as that at most manufacturing or research concerns. For work in aerodynamics the school boasts a return-flow closed-throat wind tunnel more than 120 feet in length. In this tunnel principles of aerodynamics are illustrated and new sections or designs tested.

Activity in the jet laboratory has progressed to the point where original engine designs are now fabricated in the school shops. The engineering school, which projects the development work with jets and rockets, has completed designs for a new twin compressor jet engine and a transitional jet trainer matched to the engine.

The transition trainer is the second of two planes scheduled for fabrication at Cal-Aero. A five-place twin-engined personal plane has been designed as a project in the engineering school design classes and is now in the mock-up stage. A low-wing craft with P-38 lines, the plane will be completed next year.

Mechanics and engineering students have the opportunity to study latest helicopter equipment with standard control mechanisms set up and operating. A German helicopter kite is in the helicopter shop and will be test-flown after it has been rebuilt and subjected to strength tests.

Adding further to the completeness of equipment, the revolutionary tandem helicopter developed by Rotor-Craft Corporation has been assigned to the school for testing. Thus, Cal-Aero Tech students gain practical experience in the problems of construction and maintenance on one of the Army's latest experimental craft.

The curriculum and fine physical equipment, together with industry endorsement, has attracted students from countries throughout the world. Since the start of the current fiscal year 135 foreign students have enrolled at the school. Six are from India and two from South Africa. Twenty-eight Canadians are at Cal-Aero, as are eleven citizens of Mexico. Iceland has sent nine students, while eight have come from Surinam, Dutch Guiana.

Cal-Aero students live at the airport in attractive dormitories adjacent to the school administration building. The dormitories, combined with home cooked meals in the school cafeteria, insure economical living accommodations for students.

Recreation plays an important role in the student picture. A swimming pool and tennis courts are located on the campus. Student athletic teams compete in the Glendale and Los Angeles municipal leagues.

Directly adjoining Grand Central Air Terminal, and Cal-Aero, is Griffith Park, a 3,600-acre municipal recreation area featuring bridle paths, riding academies, a golf course, tennis courts, swimming



pools, picnic grounds, hiking trails, a zoo and the noted Griffith Park Planetarium.

Model building plays an important role in the recreation of Cal-Aero student engineers and mechanics. Although all types of model enthusiasts are found on the campus, it is natural that model aircraft fans are in the majority. Flight circles are provided on the campus for control-line models.

Cal-Aero students gained wide recognition last fall with stories on the miniature jet car races at the school.

Requests for jet racing information from modelers in almost every country in the world have kept the Cal-Aero "Fizz Kids" on their toes, designing models which would be efficient and practical to build with the limited materials available in some of these countries.

Many students at Cal-Aero prefer to fly full scale planes instead of the miniature counterparts. The Cal-Aero Flying Club offers low rate flying time to members in club-owned ships. A flight school is also active on the field for those desiring special ratings or instruction.

Student engineers have established an Institute of the Aeronautical Sciences branch with almost 200 members. Organized for more than a year, the group meets regularly to hear specialists from aircraft manufacturing concerns in the area. Among the men who have talked to the group are R. C. Donovan, project engineer of the Douglas "Skystreak," Art Chester, noted race plane designer, and George James, head of the Reaction Research Society.

Graduates of Cal-Aero are much in demand. Some students have had as many as twelve job offers even before graduation. This is the result of the activities of the school's placement bureau. C. T. Reid, former director of training and assistant to the vice-president in charge of engineering, Douglas Aircraft Company, Inc., heads this department.

To insure the best placement of Cal-Aero graduates, Reid recently completed a 10,000-mile aerial tour on which he contacted over 100 concerns engaged in aircraft operation, manufacture, or maintenance.

Cal-Aero is not content to rest on its accomplishments. Not only are instructors rotated on industry assignments but staff men are sent through special military and commercial training programs so that they may keep course material pertinent.

Indicative of President Moseley's faith in the future of aviation is the fact that he recently announced plans for the building of a new \$12,000,000 school plant on the field. Specifications for the new school are now being completed and all future construction work at the field will be made in accordance with the over-all plan.

The new school facility will greatly increase the capacity of Cal-Aero and will additionally consolidate training centers to make the Southern California school one of the most modern and well-equipped in the world.

# GMCO Report to the Modelers

The Latest & Best in Modeling, Guaranteed by GMCO

## GMCO STOCKS NOW SUPPLY ALL HOBBYISTS WITHOUT DELAY!

24 HOUR SERVICE

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*Arden .099 H.H.	15.50
*Arden .109 H.H.	18.50
*Hantam .109	16.50
*Ohlson .19	9.95
*Ohlson 19	
(rotary valve)	10.95
Class B	
*Forster 20	14.85
*K & H Torpedo 20	18.50
*K & H Torpedo 24	16.50
*McKay 20	19.50
*McHawk 20	8.95
*Ohlson 23	9.95
*Ohlson 23	
(rotary valve)	10.95
*OK Super 20	16.50
Class C	
*Forster 305	14.85
*McKay 40	25.00
*Sportsman Jr. 36	14.95

Class D	
*Dooling 61	35.00
*Denny 61	6.95
*Contestor RV	18.50
*Hornet 60	22.75
*McKay 60	27.50
*OK Super 60	18.00
*Anderson Sulfire	24.95
*Sportsman Jr.	16.95
*Super Cyclone	
(single ign.)	18.95
*Super Cyclone	
(twin ign.)	19.95
*Super Champion	17.95
*Ohlson 60	15.00
Class E	
*Forster 99	24.75
*OK Twin	49.00
Less coil, condenser	

### GLOW ENGINES

Ohlson 19 kit	8.95
Ohlson 19	9.95
Ohlson 23 kit	8.95
Ohlson 23	9.95
OK Hothead	12.50
K & B Glo-Torp	14.95
Atwood Glo-Devil	15.00
Glo-Mite	14.50

### DIESELS

Mite A	12.50
Drone B	14.95

### JET ENGINES

Dyna-Jet Racing	35.00
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### Co2 Engines

OK Co2 Engine	4.95
Campus A-100	9.95

### FREE FLIGHT

Class A & B	
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Buccaneer 36"	1.95
Coronet 46"	2.50
Bee 48"	1.95
Brooklyn Dodger	
56"	3.95
Topper 41"	3.50
Roamer 45"	2.95
Rocketer 40"	2.95
Playboy Jr. 55"	3.25
Buccaneer B Spl.	
54"	3.95
American Ace 54"	3.95
Bay Ridge Mike	
40"	2.90
Alr. Feller 44"	2.90
Pixie A 42"	1.95
Musketeer 54"	3.50
American Ace 36"	1.95
Interceptor 51"	2.95
Skystreak 36"	2.95
Musketeer 42"	2.50
Brigadier 58"	2.95
Lark 50"	2.50
Mercury Jr. 50"	3.95
Good News 50"	3.95
Powerhouse 41"	3.95
Powerhouse 56"	4.95
Lusembe Silivato	
43"	3.90
Hundinger 52"	3.95
Brigadier 58"	1.95
Easterner 42"	2.90

### Class C & D

New Buccaneer	5.95
82d	
Custom Cavalier	10.95
108	
Piper Cub Super	10.95
Cruiser	
Flamingo	9.95
Amphibian	6.00
Playboy Senior	6.00
Westerner C	5.95
Pacer	4.95
Mercury	5.50
Stinson Bellant	17.50

### Largest stock of hobby, handicraft materials in the country.

GMCO's policy of supplying modelers with everything they need is time-tested. From special spur gears to the most complete stock of engine repair and replacement parts, GMCO's hobby supply is consistently filling orders for parts and supplies that can't be obtained elsewhere.

The new engine repair service is busy night and day, repairing and testing overhauled engines. Every engine listed by GMCO is backed by the necessary tooling and stock of parts.

For those who cannot come in person to our large retail store, this hobby supply is as near to your door as your nearest mailbox. This ad can list only a small portion of the GMCO stock. Send 25c today for the new Plane & Car, Model Railroad, Ship Model or Handicraft Catalog. 25c Refundable on first order, those who have catalogs please take credit on next order.

### ACCESSORIES

FROOM SPINNERS	
Needlenose 3" long	\$3.14 Dia. .85
AL 1 1/2" Dia.	1.25
4 1/2" Dia.	1.00
Standard	1.10
1 1/2" Dia.	.75
2 1/2" Dia.	.75
3 1/2" Dia.	1.00
VECO WHEELS	
2 1/2" dia.	\$2.15
3" dia.	2.50
3 1/2" dia.	2.75
4" dia.	3.00
4 1/2" dia.	3.25
5" dia.	3.50
5 1/2" dia.	3.75
6" dia.	4.00
VECO WHEELS	
(With Turned Alum. Hubs)	
3" dia.	3.00
3 1/2" dia.	3.25
4" dia.	3.50
4 1/2" dia.	3.75
5" dia.	4.00
5 1/2" dia.	4.25
6" dia.	4.50

SPONGE RUBBER WHEELS	
2" dia.	50c
3" dia.	60c
4" dia.	70c
PROPPELLERS	
Flo Torque	Testor's Props
(Low Pitch)	8" - 14" each .50
8" to 14" ea.	.35
16" & 18"	.75
Hi-Pitch	8" to 11"
(High Pitch)	9" to 14" ea. .35
12" to 14"	.60
12" to 14"	.60
12" to 14"	.60
7-3 and 8-3 propellers	.35c
ALUM. TUBING	
1/8" dia.	10c
3/16" dia.	12c
1/4" dia.	14c
5/16" dia.	16c
3/8" dia.	18c
GLO-PLUGS	
Arden Glow	8c
Hot Point	8c
Ohlson	8c
Ohlson	8c
Ohlson	8c
MISCELLANEOUS	
Silkspar 60	.05
Silkspar GM	.05
3 for	.25
Nylon yd 1 1/2	.15
4 in. yd 1 1/2	.15
BROWN RUBBER	
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**NEW TECHNIQUES IN TOWING**

(Continued from page 45)

matic towed flight possible under normal flight conditions, within a given speed range. In turbulent air or due to large variations in tow speed, the automatic pilot required retrimming in order to maintain the desired position on tow, and during instrument conditions the tow rope position indicator was referred to by the glider pilot for the necessary trim corrections.

Inasmuch as this equipment required the attention of a glider pilot for retrimming during varying flight conditions, it would not permit complete automatic tow without further development. The development of equipment which would automatically compensate for changes in tow speed and varying towline catenary was considered. However, the installation of such devices in small expendable gliders would have been impractical, and too complex from the standpoint of installation and operation in the larger gliders.

Attempts have been made to incorporate trailing stability in the design of certain experimental gliders without recourse to automatic devices by increasing the length of the tow moment arm from two to three chord lengths ahead of the C.G., and by varying the vertical location of the tow point with respect to the C.G. Some degree of trailing stability was achieved with these gliders in both high and low tow positions, but only in a very limited range of wing loading and tow speed. Trim about all three axes was

very critical, and due to other limitations this system proved unsuitable from an operational standpoint.

A method for obtaining trailing stability was developed in England known as "bifurcated tow." This system was first developed for the towing of glider type tow targets and its possible application was later investigated by the Air Materiel Command for the automatic towing of larger gliders and experimental models. Gliders of conventional design towed by this method exhibited remarkable stability over a wide range of speed and wing loading in the low tow position. Above the slipstream of the tow plane the behavior of these gliders was even more erratic than conventional tow due to the added upsetting moment created by the high tow point locations. So in order to guard against climbing into the high tow position or possibly into the slipstream at increased tow speeds, it was necessary to carry a permanent nose-down trim in gliders with this tow arrangement. At take-off and at minimum tow speed these gliders, when properly trimmed, would trail in an extremely low position and gradually climb higher as towing speed increased and then to a position just below the slipstream at maximum speed.

This tow arrangement damped out any tendency for these gliders to roll or yaw, and excellent longitudinal stability was evidenced by the lack of any tendency to



"That dope! I told him to go out there and solo!"



pitch, even in moderately turbulent air.

The magnitude of the restoring forces and damping moments for normal angles of roll, yaw, and pitch is dependent upon the horizontal and vertical distance of the apex of the bridle lines from the C.G., and the location, the spread, and the height of the tow points with respect to the C.G. of the glider. The theoretical locations of these points of attachment are based upon the wing loading, moments of inertia, stability characteristics and speed range of a given design. However, without basic parameters to obtain the most efficient arrangement, Sketch No. 1 provides a rule-of-thumb method which has proven satisfactory with conventional glider configurations of normal wing loadings.

The installation of these dihedral tow bars is a relatively simple matter with models and small target type gliders. However, such modifications to full scale towed aircraft prove to be highly undesirable in view of obvious structural and aerodynamic implications.

Further investigation of trailing stability and experiments with variations of bifurcated tow led to the development of a tow system by the Air Materiel Command which provides ample restoring and damping moments for normal angles of displacement on tow without fixed tow attachments extended outside the basic structure of the glider. (See Sketch No. 2.) This system is known as "trifurcated tow," and like the bifurcated system is applicable for low tow only.

This system satisfies the same conditions as the bifurcated system for normal angles of displacement with an increase in longitudinal stability in the design speed range. The increase in longitudinal restoring and damping moments for small angles of pitch is due to the large horizontal tow moment arm obtained by restraining the apex of the bridles with a third towline from the nose of the glider.

This tow system was first tested with small 2-foot span models towed in circular flight from the end of a long boom. These models demonstrated exceptional trailing stability over a very wide speed range and at wing loadings up to 400% over the minimum flight weight. Target gliders fitted with trifurcated tow were towed with a BT-13 airplane at air speeds ranging from 70 mph to 160 mph and at wing loadings of from 5 lbs. per square ft. to 20 lbs. per square ft. These gliders trailed the BT-13 in turbulent air through tight turns, steep climbs, dives, and during take-offs and landings, without any tendency to roll or pitch.

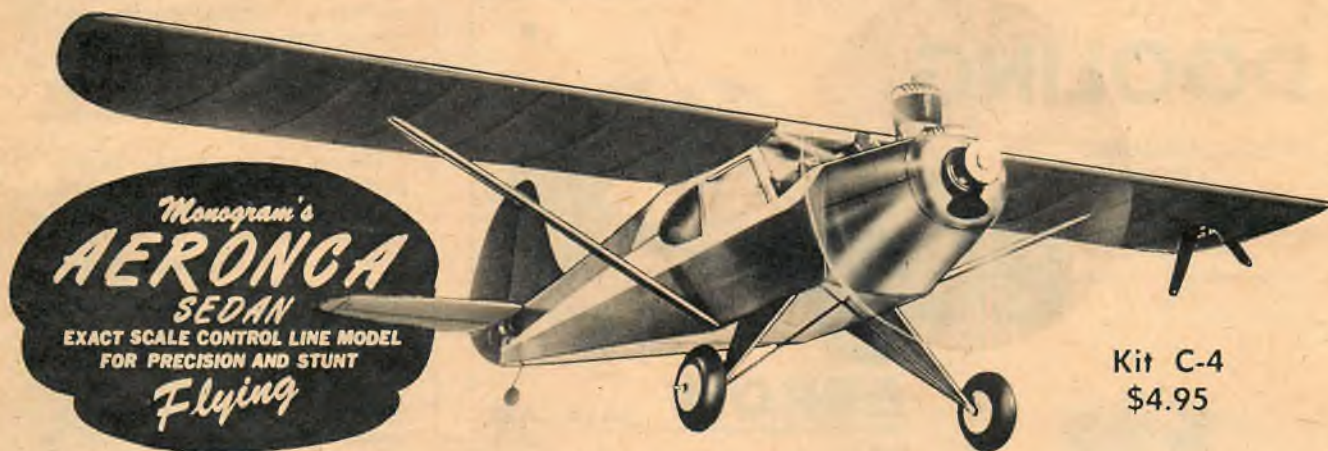
With this tow system, on gliders of conventional design, the lateral spread of the wing tow points is approximately one half of the wing span and located along the quarter chord line. The apex of the bridles has been varied from fifteen to twenty-five degrees above the C.G. and from three to four times the length of the mean aerodynamic chord ahead of the C.G. The nose tow attachment has been varied from one and a half to two times

the length of the mean aerodynamic chord ahead of the C.G.

Like the bifurcated tow, this system requires that a negative pitching moment be maintained to guard against climbing into or above the slipstream at high speed. A permanent nose-down trim to guard against climbing into the slipstream at high speed causes the glider to trail in an extremely low position during take-off or at minimum speed. Where the size and mass of a model or target glider is small in comparison to the towing element, the effect of trailing in an extremely low position at low speed will not seriously handicap the towing element, but with large full scale gliders such as the CG-15A a permanent nose-down trim, to satisfy the entire speed range, would have serious effect upon the stability and performance of the towing aircraft. Therefore, with gliders of this size it is necessary for the glider pilot to retrim the glider for the optimum trailing position at various speeds from take-off to cruise.

While this system is by no means the ideal solution to the problem of trailing stability, it offers a practical method without elaborate stabilizing devices, to accomplish stabilized towing of large cargo gliders within a reasonable speed range, to permit flight through the overcast, relieve pilot fatigue on long hauls, and to accomplish complete automatic towing of models, targets, and other relatively small towed aircraft from take-off to landing.

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## SLEEK STREAK

(Continued from page 57)

plane builders. It is an advantage to model car racers as well, because it offers them the opportunity to take the first step in aerodynamics by constructing and mounting an engine and air propeller drive unit. This sleek little racer might indeed be the missing link between model planes and model cars.

Its performance is exceptional. It starts from rest and gains a speed of more than 30 mph within 40 or 50 feet. The CO<sub>2</sub> cartridge supplies power for the engine for about 20 seconds, sufficient to provide several laps of thrilling performance when operated with guide lines. These may be of strong fish line, 20 to 25 feet in length. They are attached to the hooks protruding from the side of the car and are tied together at the ends so they are of equal length. Some smooth extensive surface, preferably a wood floor, provides the best race track.

When preparing for a run the CO<sub>2</sub> cartridge holder is released and pulled down from the under-side of the car and a cartridge inserted. The winged screw is then turned up tightly so that the cartridge is pressed up against the piercing pin in the upper end of the holder. This punctures the metal cap. The winged nut is then unscrewed one complete turn, so the pin is pulled out of the cap slightly and the gas released through the brass tube to the engine. The cartridge with holder is then replaced snugly and held in place tightly by a rubber band extending between two hooks within the car.

The car is now ready for its run. The guide lines are held by the operator at the center of the running circle while his helper places the car on the ground with the guide lines taut. When all is ready the helper spins the propeller clockwise with his finger. One spin is usually sufficient to start the engine which drives the propeller at 3,000 or more rpm. The car starts forward immediately and gains speed rapidly, continuing under its momentum for a considerable distance after its power is expended. A little oil on the wheel bearings will increase the run considerably.

If it does not run freely around the circle turn the front wheels slightly inward by bending the axle of the inner wheel backward and the axle of the outer wheel forward. The car may be tested by pushing it along the floor to determine the correct degree of circle. It may not be necessary however to do this because often the car runs around the circle freely even though the wheels are straight.

This little car will prove especially interesting to the less experienced builder, because it is much more simply constructed and operated than planes or

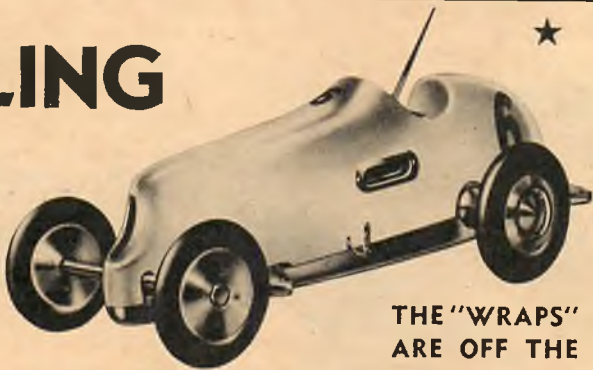
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**DOOLING**

**FAMOUS DOOLING  
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Finest and most powerful 0.60 cu. in. engine built. For cars, planes, boats. Ball bearing crankshaft—roller bearing conn. rod.



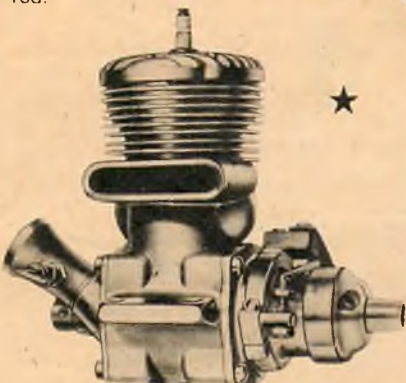
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**ARROW** RACE CAR

World's Record-holding Prototype Race Car: 123.98 MPH, official AMRCA record held by Joe Grijalva, Los Angeles, Calif. DOOLING "61" and the ARROW make a winning team!

Car furnished complete with fuel tank, coil mount, battery case, switch and bridle—less engine.

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race cars of customary design. Those who are more expert may prefer a type of power that provides a longer and more continuous run. In such cases compression ignition engines or small gas engines of .1 cu. in. displacement or less may be substituted for the CO<sub>2</sub> motor and cartridge. It will not be necessary to change the design of the car body, but only to modify the motor mount.

A special motor mount should be designed for gas engines. The size and construction depends upon the type of engine used. The motor should be attached to a hardwood base in a manner similar to the mounting of the CO<sub>2</sub> engine. The base with the motor then is attached to the upper end of the car fin. The mount may be larger in diameter than that of the CO<sub>2</sub> engine, in which case it should be streamlined into the fin with blocks of balsa, cut and sanded to graceful lines. The same propeller as shown on the plans should be used in any case.

With these latter types of engines speeds of at least 60 mph can be obtained. Not only is the car very easy to operate but it also may be repaired quickly when damaged. Any breaks or nicks in its balsa body may be cemented or repaired with small pieces of balsa. Excess wood is then cut away to renew the original contours. A little paint covering the broken parts makes the model like new again. The unusual nature of this little racer attracts attention wherever it is operated.

The following items and materials are required to build the car:

1. A block of medium hard balsa  $1\frac{1}{4}$ " long, 4" wide,  $1\frac{3}{4}$ " deep. The block may be 2" deep if the smaller size cannot be obtained. If a 4" block is not available cement together two 2" blocks to give the proper width.
2. Three pieces of balsa each 8" long, 4" wide,  $\frac{1}{2}$ " thick; if pieces 4" wide are not obtainable cement two pieces together to give this required width.
3. Four rubber-tired wheels  $1\frac{3}{8}$ " in diameter with solid aluminum hubs.
4. Drill rod or medium hard wire  $\frac{3}{32}$ " in diameter, sufficient for two axles  $4\frac{3}{8}$ " long.
5. A sheet of  $\frac{1}{8}$ " hardwood veneer of about 16 square inches in area.
6. A clear plastic cowl of a shape similar to the one shown in the drawings. A larger cowl than shown may be purchased and cut down to the required size.
7. Two clear glass marbles about  $\frac{1}{2}$ " to  $\frac{9}{16}$ " in diameter for headlight lenses. If unobtainable, sheets of clear plastic may be used.
8. About 10" of piano wire .030" to .045" in diameter for the guide line hooks.
9. Sixteen small washers to be used inside and outside of each wheel on the axles.
10. About 3" of  $\frac{1}{16}$ " annealed wire to serve as anchor pins for the rubber band that holds the cartridge in place.
11. A hardwood block 6" long,  $1\frac{1}{2}$ " wide,  $\frac{1}{2}$ " thick, from which propeller is

JASCO		JASCO		JASCO	
<b>Special</b>  Span 32 inches Class C Price \$1.50 The JASCO "SPECIAL" is a rubber powered high performance contest model. It has a folding propeller and a folding landing gear. It is an ideal model to make for those who have always wanted to build the long flying contest type of model with simplified construction.	<b>R.O.G.</b>  Wing Span 12 inches Price 35c The JASCO R.O.G. is a small 12 inch flying model that can be flown in almost any room at home. It can be flown in very small circles so that it can take off from the floor and fly up to the ceiling. You are missing a lot of flying fun if you have not built a JASCO R.O.G.	<b>Thermic 30</b>  Wing Span 30 inches Price 50c An all balsa glider that can be low-lined and hi-started. It can also be handlaunched from hills or slopes. It can be made quickly and will give good soaring and flying performance. The ailerons and rudder are movable for flying adjustments.			
<b>Thermic B</b>  Wing Span 20 inches Price 50c The THERMIC B is a high climb hand-launch contest glider. It has special ability to go high and then soar. It is a good model for experts or experts to be.	<b>Thermic Trio</b>  Price 35c The Trio kit will build three models that represent the three basic designs of airplanes, the Flying Wing, the Canard and the Conventional types. Interesting to build and fun to fly.	<b>Thermic 18</b>  Wing Span 18 inches Price 20c The THERMIC 18 is a simple smooth flyer that performs well in the hands of the most inexperienced. No matter how it is launched it will roll into the correct gliding position. It is an ideal project for schools and camps.			
<b>Thermic 20</b>  Wing Span 20 inches Price 35c A very popular all balsa handlaunch glider that will give hours of fun in contest or sport flying. It is easy to build and fly.	<b>Thermic 50</b>  Wing Span 50 inches Price \$1.00 Winner of more contests than any other glider ever designed. It is noted for its dependable flying, strong construction and simple building.	<b>Sailwing 50</b>  Wing Span 50 inches Price \$1.00 An unusually smooth flying wing type of glider. Few models provide so much flying pleasure as this experimental design. Flights of several miles have already been made with this model.			
<b>Floater</b>  Wing Span 72 inches Price \$2.50 The champion of champions when it comes to breaking all the Class "E" records. "It takes a Floater to beat a Floater". It can be adapted for radio control as it can carry 14 oz. additional weight.	<b>Thermic 70</b>  Wing Span 70 inches Price \$3.50 The Thermic 70 has been the co-partner of the Floater in breaking the records over and over again. The wing is exceptionally well designed for soaring.	<b>Trooper</b>  Wing Span 36 inches Price 65c The Trooper is a facsimile of the regular Army troop carrying gliders. The construction is simple and recommended for beginners. It has flown out of sight many times.			

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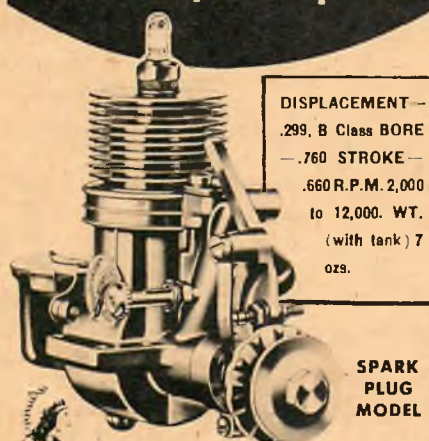
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carved. If preferred you may purchase a ready-made propeller 10" in diameter with an 8" pitch and measuring  $\frac{1}{2}$ " deep at the hub. This is to be cut down to a diameter of 6" and reshaped at the blade tips and hub to conform with drawings of the propeller shown on the detail plans.

12. A block or blocks of balsa from which the engine cowl and propeller spinner are to be shaped. A block 2" square by 3" long will provide plenty of material.

13. A small sheet of  $\frac{1}{16}$ " balsa about  $2\frac{1}{2}$ " long and  $1\frac{1}{2}$ " wide to form the base for the cowl.

14. A complete CO<sub>2</sub> engine with cartridge holder, and a sufficient number of cartridges to satisfy your needs for thrills.

15.  $\frac{3}{32}$ "-diameter bolts  $\frac{3}{4}$ " long with lock nuts to bolt the engine securely in place to its hardwood base.

Start construction by cutting out body block to the proper length, width, and depth. Make templates of the side elevation and plan view of the body shown half scale on the detail drawings. Make sure that their outlines are plotted and cut accurately. Some of the details such

as axle center lines, wheel cutouts, hardwood bearing blocks and body cut-outs may be accurately sketched on these templates. This will facilitate the proper location of these various structural features when carving out the blocks.

Lay the side elevation template on the two opposite sides of the balsa block and trace its contour carefully. When drawing these outlines locate the lower edge of the template exactly on the lower edge of the block. Take the bottom template, place it on the under-side of the block and trace its outline on the block.

First step in carving is to cut away the top of the block to the exact contour of the side templates. You will notice that there will be an upward protrusion near the nose for the headlights and a slight rise at the center for the base of the cowl. Make sure that the block is cut straight across between the side contours without sags or bulges. When this is done draw lines on both sides of the block that represent the top line of the headlight cowlings and which extends rearward from the lights parallel to the bottom of the block. This is shown on the side view of the template. At the rear and over the rear wheel draw the dotted line on each side that represents

## Model Types by Godden



FLOWN FAST SHIPS BEFORE, MAC?



POP, I TOLD YA NOT TO SWIPE MY DIESEL FUEL!



MARY! HAS THAT KID BEEN BUILDING  
MICROFILM MODELS AGAIN?



HEY! THE PLANE'S SUPPOSED  
TO DO THE STUNTS!



the contour of the middle section of the body. You will note that the streamlining over the wheels is raised slightly above the middle section at this point. When this is complete cut the block at the nose and at the rear corners as indicated by the outline of the bottom template. The faces of these cuts should be exactly perpendicular at the bottom of the block.

Make a template to conform with the dotted outline shown on the bottom template. This represents the outline of the base of the fin and pilot cowl. Place this on the top curved surface of the body block making sure it is centered properly and in correct fore-and-aft position as indicated in the drawing. Draw the outline on the block top.

Cut away the upper outer edges of the block down to the lines representing the upper contour of the headlights and wheel streamlining, shaving off the top of the block so that it slopes in a straight line from the outer contour of the fin and cowl which you have drawn on the top of the block. This provides a slight slope from the base of the cowl to the upper surface of the wheel streamlining, to which it is tangent.

Shape the nose of the block by carving away the upper edges forward of the lights until the nose at the front face of the lights conforms to section A, shown in full size on the detail drawings. Other body sections B, C, D, E, and F are also shown. Carve the body between the lights and forward of the cowl so that the upper surface of the body sweeps forward with smooth contours forming rounded channels inside of each light streamlining and slight hollows beneath the lights. Carve the surface so these curves blend smooth into one another. Finishing touches and final shaping should be made with course sandpaper followed by smoothing with a finer grade. Proceed with the carving from the nose to the rear of the block shaping it to conform to the proper outline as indicated by the templates. The top of the body will have to be cut away at the center over the rear wheels. When this is completed redraw the outline of the base of the fin using the template previously made. Follow this by cutting out the wheel wells. On the inner face of these cut out recessions  $\frac{1}{8}$ " deep into which the hardwood bearing blocks are 1" wide by  $\frac{3}{4}$ " high.

Make a template of the outline of the hollowed out section of the under body surface. Draw this on the block and proceed to hollow out the block as indicated. The main hollowed out portion is  $\frac{15}{16}$ " deep; in the center of this a recess is cut through to the upper surface of the block into which the cartridge is to fit snugly. Make sure that the cut out section is located accurately and has the proper contours.

When this is complete cut out the bearing blocks from  $\frac{1}{8}$ " hardwood veneer 1" wide by  $\frac{3}{4}$ " deep and drill the holes through these blocks in the exact position shown. Fit these into the recesses in the wheel wells, making sure that the



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axle holes are in absolute alignment so that when a line is drawn across from one hole to the other it will be perpendicular to the sides of the body. Otherwise the axles will not be aligned properly and the car will not run straight or true.

After these blocks are cemented in place, drill the holes through the balsa body so the axles may be inserted. Two small washers, each about 1/30" thick or less, are inserted over each axle before the wheels are put on. Outside of each wheel two more washers are placed on the axle ends which are held in place with a drop of solder on the end of each axle. If no solder is available, the ends of the axles may be flattened by hammering. In this case the axles should be made of comparatively soft stock, such as drill rod.

Sockets may be hollowed out in the forward ends of the two lights and the marbles or plastic lenses cemented in them. The bottom surface of the block slopes upward at the nose and rear. The block may be cut away or sanded to give this shape.

Next construct the fin. This is made in three pieces with the over-all contour shown in full scale on the drawing. To cut these properly, pin three pieces of ½" stock together with their outlines coinciding. With the template, mark and cut the fin outline carefully. On the bottom side of the fin use the bottom template to draw the outline of this surface. Draw two lines on top of the fin blocks 1" apart and parallel to one another. These indicate the thickness of the fin at the top. Cut away the sides of the fin down to these lines that indicate the top and bottom contours, shaping the fin gracefully as shown in the drawings and as indicated by the cross sections D, E, and F. Finish smooth with sandpaper after the slot for the motor mount is cut at the upper rear end. This slot is indicated in the upper part of section F and in the side view.

Unpin the three blocks and cut out the center one as indicated by the dotted line K. This is to provide a hollow fin to enclose the brass tube leading from the cartridge to the engine, shown in the side assembly view. Two side pieces of the fin are cemented to the center piece.

Cut out the three pieces forming the motor base block from ¼" veneer. Cut out the hole in the center of each carefully and the key section which fits into it, from hard balsa. Cement the 3 hardwood sections together and slip them on over the balsa key. Clamp the sections together tightly and then slip them off again until the cement is dry. This aligns the blocks properly. When the cement is dry drill 3/32" holes through the hardwood veneer base for the motor mount bolts as indicated in the full scale drawing. When this is done bolt the motor to the hardwood base and cement the balsa key block into the base. After a 1/16" wide vertical slot, S, is cut in the rear end of the fin, the whole unit may be cemented into the fin, making sure that it fits tightly and that the motor shaft is,



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parallel to the lengthwise axis of the car. The brass tube fits up into the slot and rests snugly in the hollow fin center.

Cement the fin unit in place to the top of the car body, passing the cartridge holder down through the hole in the upper surface of the body into its carved-out recess. Make sure the bottom surface of the fin is shaped so that it fits the contour of the upper surface of the body snugly and evenly. Sand away the bottom of the fin slightly until the two surfaces contact one another throughout the entire length of the fin. Insert pins to hold the fin in its proper place until the cement is dry. Cut out the base for the cowl from 1/16" balsa sheet and cement it to the top of the body forward of the fin.

While the cement is drying cut out the plastic cowl. When it fits properly apply cement to the balsa base block and forward edge of the fin and attach the cowl, holding it in place with rubber bands extending around the body of the car and over the cowl, and with pins. Cut out a small balsa block, L, and fit it into the bottom of the body to hold the curved bottom end of the cartridge snugly. Hollow out the rearward edge of this block to fit the curved end of the cartridge. Scoop out 3 recesses marked R on the bottom view of the template drawing and insert the rubber band anchor pins into the balsa, cementing them in place. A rubber band is looped from one pin to the other over the screw at the lower end of the cartridge. This holds the cartridge and holder rigidly.

The next step is to shape the motor cowl as indicated in the drawings. Hollow this out until it fits snugly around the motor and tightly against the motor base block. A slot is cut in the forward face so that it may be slipped down over the shaft housing. A balsa block is then cut and fitted into this slot. If you prefer it, the block can be made in two halves. After the housing has been cemented in place to the motor and base, sand the outer surface of this cowl until it blends smoothly into the contour of the base block.

Cut out the propeller as indicated in the drawings from a block of hardwood. Shape the concave faces first then the forward, or convex surfaces of the blades. When these have been sanded smoothly and each blade has been shaped exactly the same at their respective points, round the blade tips as indicated. Cut down the blade tips to a thin edge and sand smooth. Drill the shaft hole exactly in the center of the hub. This is 1/8" for the CO<sub>2</sub> engine. The rear face of the propeller hub should be recessed 1/8". Make sure the propeller balances exactly. It may be balanced on a pin passed through the shaft hole. The propeller is now slipped over the engine shaft and held firmly in place by a washer and nut screwed over the end of the shaft.

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tips as indicated in the propeller detail drawing.

After the spinner has been formed and its rear surface hollowed out as indicated in the drawings, it is fitted into the recessed section of the propeller hub and cemented in place. If you wish to take off the propeller occasionally the spinner may be removably attached to the hub with a rubber band instead of permanently by cement. This passes through a hole in the spinner and is hooked around the ends of two hooks fitted into the hub, one on each side. The soft wire hooks are shaped as indicated in the assembly view, each fits into a hole drilled in the rear face of the hub. Cement holds them in place.

The construction is complete when you have shaped the two guide line hooks and inserted them in place. (These are made from medium hard or piano wire as indicated in the material specification.) The ends are bent over as in detail drawing, W, assembly view. The straight ends are passed through the left side of the body from the recesses hollowed out of the under-side. The outer ends are then bent over into loops and the cement is spread thickly over the U-shaped inner ends inside the body. Make sure they are firmly in place.

Now all that remains is to decorate your car. Sand it carefully with fine sand paper so that it is smooth and clean. Apply two coats of surface sealer, sanding down each coat lightly with fine sand paper. Then apply a finishing coat of lacquer of any desired color or combination of colors.

## MARTIN MAULER

(Continued from page 50)

formance was quite good with an Arden .099 engine up front. After many hours of flying time the model was overhauled and the ignition units removed. A glow plug Bantam was installed using the Bantam metal tank and the performance proved superb.

The fuselage is carved from a soft balsa block following the sections on the plan, and when sanded smooth is carefully split in half along the horizontal center line. Using an X-acto gouge, hollow the fuselage to about  $\frac{1}{8}$ " wall thickness. Bulkhead "B" can be cemented to the lower half at this time if the engine used is radially mounted. In the event that beam mounts are required, omit the bulkhead and install the bearers on the lower half of the fuselage. These should be  $\frac{1}{4}$ " x  $\frac{1}{2}$ " hardwood. Cut the tail surfaces from  $\frac{1}{8}$ " sheet balsa, sand to a streamline shape and cement firmly to the upper half. Mount the bellcrank on the  $\frac{1}{4}$ " x  $\frac{1}{2}$ " hardwood support and cement in place on the upper fuselage shell. The control rod can now be installed and connected.

In the event you decide to use electric ignition, the wiring is installed in the

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lower fuselage shell at this time. A fibre strap is used to hold the coil to the bulkhead; do not use a metal strap. The approximate location of the ignition units is shown on the plan. Solder all connections and test the system.

The wing is made in four sections, two inner panels and two outer. Cut the covering to shape from  $\frac{1}{16}$ " sheet balsa and cement to the ribs. After adding the joiners and landing gear the heavy leading edge can be cemented in place. This member takes the main stress of the wing along with the joiners. When dry the leading edge can be carved to its proper shape and sanded. It will be noted that no trailing edge is used on this model. The inner panels are well cemented to the fuselage and the joiners inserted through the shell and cemented to the inside of the fuselage. The two halves of the fuselage can be cemented together at this time and the outer wing panels attached to the inner. Check for the correct dihedral as indicated in the  $\frac{1}{2}$  size front view. A final sanding of the entire ship with very fine sandpaper prepares it for painting. The cockpit opening is optional. Wheels and tin fairings complete the structure.

A wood filler can be used but is apt to add excessive weight. The original was clear doped four times with intermittent sandings and then painted aluminum-gray using Aero-Gloss dope. Three coats were required, sanding with wet sandpaper after each application dried. Rubbing down the last coat adds that professional look. The anti-glare portion forward of the cockpit is black, as well as the letters, numbers, and propeller. The front of the cowl is colored red. Bubble canopy, antennae and decal insignia add the final touch.

Because of the small size of the wheels it is advisable to fly the model from a smooth surface such as concrete or wood. Use .008"-dia. steel-stranded flight lines, 35 feet long. For realism a 5"-dia. four-bladed propeller was used. This is cut from two standard 8"-dia., 8"-pitch propellers joined together by means of a half-lap joint.

The balance point of the Mauler should be in line with the forward control wire. Shift the batteries if the craft does not balance correctly. The glow plug installation balanced perfectly; however, the addition of a small amount of lead shot in the nose will correct tail heaviness and the opposite is true for a nose-heavy model. This unbalanced condition will depend on the engine and grade of wood used.

Conduct all flights with full power as this will prevent any mushing or sluggish control response. The Mauler has flown on windy days when the larger control-liners were grounded. On take-offs keep the model on the ground for at least a half lap to enable it to gain flying speed. When power cuts, the model does not settle very rapidly but may require a slight amount of leading if it weighs over 12 ounces. The author's model weighs 9½ ounces with a glow plug and yet is quite strong.

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## PHANTOM FLYERS

(Continued from page 23)

ing stylus activated, via radio, by the reaction of its particular gauge to trace an irregular pattern upon an endless roll of paper. After flight these patterns were transcribed by engineers into stress and strain figures.

Early in 1945, the flight program was put under way. Flying personnel consisted of Bell experimental test pilots "Slick" Goodlin, Bob Constant, and Murray Hawley, as robot safety-pilot, mother ship pilot, and ground-control operator, in order. Richard H. Frost fitted into the operation as project engineer and was largely responsible for the project's ultimate success. Robert M. Stanley supervised and directed the entire program.

Constant had a most ticklish job, as can readily be seen if one can imagine the difficulties of flying two airplanes simultaneously which is exactly what he had to do. With practice, he became remarkably adept at the process. It was he who evolved the flight technique, described later, which permitted the mother ship to effectively control the robot during dives and pull-outs without building up dangerous speeds of its own. One time, during a demonstration flight, he piloted both ships in tight formation across the airport at over 450 miles per hour and executed a perfect Immelman while the safety-pilot sat in the robot ship with his arms folded.

To the ground-controller went the difficult task of developing a standard method for conducting take-offs and landings from the ground—no mean feat on the forty-foot-wide runways that were used.

The most hair-raising episodes were experienced by the robot safety-pilot. He was the recipient of a great deal of abuse during the early days of the project, for the newly-invented Rate-Auto-Pilot was still erratic in operation and the two remote-controllers were, at first, awkward in their methods. There were three distinct methods by which the safety-pilot could instantly disconnect the remote-control apparatus and assume manual command, but it was his duty to delay his action until the last possible moment so that the remote-operators could plainly see and profit by their errors. In so doing, he was often placed in precarious positions that, but for quick reflexes, could have had unfortunate results.

Once begun, the program moved along with amazing rapidity, but like all experimental enterprises, it was not without its snags and incidents.

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thousand feet, over Lake Ontario, the robot's auxiliary wing tanks were dropped by remote-control, but the spring-loaded mechanism that performed the function did not switch the fuel selector valves to Main Tank position as it was supposed to do. Hawley tried to switch the selectors by hand, but they were firmly stuck! Thus he found himself, thirty miles away from the field, out of gas—with two full tanks! Thanks to his excellent piloting ability, the ship was neither lost nor damaged. With infinite precision he estimated his distance and rate of descent and glided his powerless ship to a safe landing on the only open runway (the others being snow-bound) at Niagara Falls Airport.

A stronger spring was substituted and corrected the drop-mechanism's defect.

The mother-ship's transmitter went out of commission one day immediately after the robot had been placed into a dive. Before the ground-station could assume control, the robot was so dangerously close to earth that the safety-pilot had to take over manually. After this, a device was installed which automatically pulled the robot out of a dive if the ship went below an altitude of ten thousand feet. The apparatus could be disconnected, via remote-control, for landing purposes.

Sammy Gray, the project's master radio technician, let himself in for a considerable amount of ribbing, throughout the duration of the program, by neglecting to check the robot's receiver before removing the transmitter from the mother aircraft. Some malfunctioning had been experienced with that piece of radio equipment and Sammy had taken it to his laboratory for inspection. Unbeknownst to him, the receiver in the robot was still on. It so happened that a group of visiting dignitaries was inspecting the experimental hangar at the time. Unaware of the nature of Project MX-536, they were startled into wide-eyed amazement when the orange-colored Reluctant Robot, sitting all by itself in a far corner, began to act in a most peculiar fashion. Its tail-flippers were wagging, the ailerons were fluttering and the flaps were moving slowly up and down! Then, to climax the incident, both wing tanks dropped to the concrete floor and hit with a sickening thud, spilling their contents in all directions!

Sammy's face retained its red glow for quite some time thereafter.

In order to preclude the possibility of the mother-pilot losing sight of the robot during nolo flight a device, also radio-controlled, was installed to inject raw fuel into one of the units causing it to emit smoke. Considerable power was lost during the process but this was considered inconsequential since it had to be turned on but for a second in order to produce a wide smoke-wake that was visible for miles. On one occasion this "negligible" loss of power almost proved to be disastrous.

After more than two months of relatively smooth sailing, there began a series of incidents which seriously threatened the

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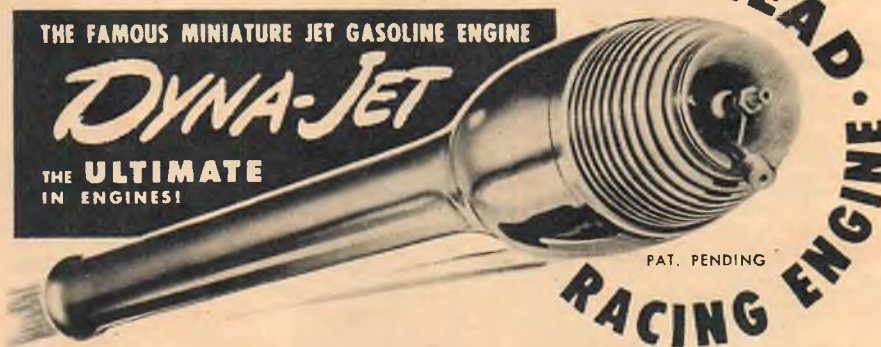
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project. The Robot became unreliable in the air. For inexplicable reasons, its gear or flaps would extend, or the ship would suddenly dive or zoom without any signals having been sent from either the ground or air-controller. Repeated inspections of the equipment revealed no defects. Engineers theorized that the eccentricities might have been caused by the extreme cold at high altitudes. Consequently, the remote-control mechanism was removed from both ships and tested in a cold chamber at temperatures as low as one hundred degrees below zero. Everything worked perfectly!

The queer behaviour continued. Obviously, the robot was receiving transmissions from somewhere—but where? Perhaps, it was suggested, static electricity was being generated during flight and transformed into tones that were being picked up by the robot-receiver.

Static eliminators were installed and, for three days, the irregularities ceased. It seemed as though the problem was licked.

Then, on the fourth day, one of those mysterious tones turned on the smoke valve just at the crucial moment of take-off. Revolutions on the jet-unit dropped off to such an extent that the power was insufficient to maintain air speed. The safety-pilot "disconnected" and assumed manual control, but the ship was already settling. There wasn't much that could be done. He picked a small adjacent field and scraped through the tree-tops, crash landing into it. It was a hard landing. The accelerometer broke at 12 G's. The ship was damaged, so was the pilot, but not irreparably. In a week, he was out of the hospital. In another two, the robot was out of the repair shop and both were flying again.

But the smoke mechanism was modified, restricting its operation to altitudes above ten thousand feet.

In the air, the robot's idiosyncrasies started all over again. Chief Engineer Robert M. Stanley finally suggested that a set of ear phones be plugged into the remote-control radio receiver to see if thus the source of the transmissions could be discovered.

When the safety-pilot followed this suggestion, this is what he heard:

"Car 79, Car 79, go to 141 Union Street and investigate a wife beating." The message was repeated several times and finally concluded with a sombre, "that is all!"

The pilot broke all records in getting the robot back to the airport for here, at



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last, was the solution to the perplexing riddle.

Through some mistake, the project's supposedly clear radio frequency had also been assigned to Police Broadcasting Unit WYGH in Cleveland, Ohio. Every time that the police announcer's voice hit a certain inflection close to the "bleep" or "bloop" that one of ten channels in the robot-radio was filtered for, then that channel went ahead and performed its function.

A new frequency was assigned and the project proceeded without any further inconsistencies. In May, 1945, it was demonstrated to high ranking Army officers for their approval and acceptance.

Had you been present, this is what you would have seen:

Let us assume that specifications called for a remote-control flight to forty thousand feet, at which altitude a fifty-degree performance dive was to be executed and concluded with a pull-out, at four hundred miles per hour, that would impose a force upon the aircraft equivalent to eight times that of gravity.

After complete pre-flight checks, the units of both ships were started and the automatic-pilot in the robot was engaged. For all practical purposes, the safety-pilot's work was then concluded. From the top of his control-truck, the ground-controller taxied the robot out to the runway.

The mother ship took off first and made a wide circuit of the airport while the ground-controller lined-up the robot in take-off direction. As soon as he received a signal from the mother ship pilot, usually "Let 'er go, Murray!" he started the take-off run. He kept his eyes glued to the robot while someone else, Dick Frost as a rule, read the ship's air speed off to him from the television screen. When sufficient air speed was attained, the stick was eased back and the robot became airborne.

At approximately fifty feet of altitude, the mother ship took over the reins. One pilot was now flying both ships. He raised the robot's gear and commenced climbing. At an altitude of twenty-five or thirty thousand feet, over Lake Ontario, the robot's auxiliary wing tanks were dropped and the ships continued their climb. At forty thousand feet they leveled off. Now, the mother craft began to drop behind to position itself for the dive. The ideal position had been determined as being two thousand feet below and a quarter mile behind the robot. From there, the mother ship could maintain visual reference, and control of the other ship through all phases of the test.

After notifying the ground-station that he was proceeding with the dive, the mother ship pilot pressed a button labelled *Data* on his switch-panel. This turned the telemetering apparatus on. It also started the television camera, if it should have been forgotten.

Ground-control signified that they were ready. The ship was then put into its dive. From here on, air and ground-



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## Join us at the Editor's Round Table



Here's your chance to evaluate the effectiveness of articles, plans and stories in this issue of *Air Trails*. By rating the material appearing you will enable the editorial staff to give you the type of article you find most interesting.

There are 26 different features listed below on the ballot-coupon. Indicate the one you like best by placing "1" after its listing, "2" after second most interesting—and so on up and down the list until you allot #26 to the least interesting.

Detach-and-Mail

Editor's Round Table  
AIR TRAILS  
122 East 42nd Street  
New York 17, N. Y.

Here is how I rate the material in the  
October, 1948 issue of *Air Trails*:

	Rating
Development Highlights	.....
How Fast Can We Fight?	.....
Mystery Air Force	.....
New Techniques in Towing	.....
Fulton's Flying Flivver	.....
Phantom Flyers	.....
Airmen of Vision	.....
Plane Busters	.....
Little Rocket	.....
Blind Flying by Ear	.....
Two Decades	..... Air Notes
Letters	..... Showcase
Cal-Aero	..... Air Progress
Air Pix	..... Solo Club
Streak	..... Mauler
Jerseyette	..... Dope Can
We Fly	..... Cessna
Squirt	..... Sketchbook

Name .....

Address .....

City..... State.....

(You need not sign this if you do not so desire)

controllers worked in close coordination. The instrument readings on the television screen were relayed continuously to the air-controller so that he would know the exact angle of the robot's dive, as well as its air speed. At four hundred miles per hour, he pulled its stick back and held it there until he was told that the accelerometer, in the robot ship, registered eight G's. Then he began to ease it forward (otherwise, the ship would have continued around in a complete loop). The robot, by this time, was traveling much faster than the mother ship and was far below it, but it began losing speed, and gaining altitude, as soon as its nose was pulled up and the air-controller had only to retard its throttle and advance his own in order to regain formation. (It was also possible for the ground-controller to conduct the entire dive while the mother ship stood by as observer.)

Returning to the airport, the two ships flew a wide, rectangular pattern during which the air-controller slowed down the robot and extended its gear and flaps. The final approach was tricky; the two ships were close to the ground at diminishing air speeds, and with gear and flaps extended they were sluggish on the controls. Air speeds of the robot were broadcast continuously here also, permitting the air-controller to concentrate fully on an ideal approach so that the ground-controller's landing would be facilitated as much as possible. He took over control as soon as the robot was lined-up to his satisfaction, usually when it was about two hundred feet up and six or seven hundred feet from the airport boundary. In case the landing should be missed, the mother ship slithered off to one side and made S-turns, ready to slip in and resume control for another circuit of the airport. But the ground-controller seldom missed; in fact, during the last two weeks of the project, he successfully executed fifty

consecutive landings within ten feet of a predetermined spot.

Whether or not the Reluctant Robot was ever flown without a safety-pilot is something that the Army alone can disclose. But it *could* have been flown that way, for there was not a single instance, during the last twenty-five flights at Bell Aircraft, that necessitated the safety-pilot's intervention.

A year later, MX-536, adapted to a different type of aircraft, was demonstrated at Cherry Point, N. C., *without* a safety pilot. There, for the first time in history, a high-speed tactical airplane was publicly flight-tested—solely by means of remote control!

Post-flight investigation revealed that the Tigercat's landing gear difficulties were purely mechanical and could not have been remedied from the cockpit. Regardless of the subsequent crash landing, the ship had still been flight-tested. Stress and strain data had been obtained and permanently recorded by instruments on the ground. Had structural failure occurred, this data could have been analyzed and the cause derived therefrom. As it was, the information was obtained and the ship was safely returned. And at no time, thanks to remote control, was the life of any individual placed in jeopardy!

Since the days of MX-536, radio remote control has progressed by leaps and bounds. Its wartime potential, in terms of air crew lives saved, is beyond estimation. More important, however, is its peacetime future, in air cargo as well as in supersonic and stratospheric research. A giant DC-4 recently made a historical transatlantic flight with Radio as its pilot. But we can look forward to still more spectacular flights.

Who knows, our first rocket ship may soon reach the moon and tell us the secrets of interplanetary travel—and all by remote control!

## TWO DECADES OF AIR PROGRESS

(Continued from page 28)

row, 28-cylinder Pratt and Whitney Wasp Major which can develop 3,500 horsepower on take-off. In the low-powered field, personal planes were equipped in the majority of cases with the water-cooled Curtiss OX-5 engine of World War I vintage. This had to be overhauled every 90 hours. Now overhaul time runs close to 1,000 hours for both large and small engines.

Considerable excitement was evidenced in aeronautical circles back in '28 when five supercharged Curtiss Hawk high-altitude fighters were delivered to the Army. Today almost every Air Force fighter, attack, photographic and bomber craft is equipped with at least one super-charger per engine.

The theory of jet propulsion was

understood by only a handful of scientists then. Now the services are well on their way to becoming all-jet and serious attention is being given to reaction propelled commercial air transports.

On the other hand, turbine-driven props were considered practical back in '28. Several experimenters built aircraft turbines. One was exhibited that year at the New York Aviation Show, but difficulties encountered with vibration made it impractical.

Advancements in aircraft metallurgy have been responsible for the strength, light weight and increased proportions of our airplanes. Duralumin attained some prominence back in '28. During the last two decades it has become a universal material employed not only as a covering,



but also for such major components as spars, struts, ribs, and bulkheads. Addition of other alloys has made it as strong and as tough as steel with very small weight increase over the earlier 17S and 24S durals.

Another metal which has played an important part in the fabrication of modern aircraft—magnesium—was practically unknown twenty years ago. Its flammable characteristics precluded its use in airplanes. Since then this problem has been licked. Today magnesium is used widely in aircraft construction. An example is the entire mid-section of the Convair B-36 bomber in which the bomb bays are located—this is clad with magnesium.

At the present time, America has a greater production of all-metal planes than any other country. This is the result of our unique mass production methods which utilize machine tools and manpower so effectively that the United States delivered upwards of 90,000 military aircraft to the USAF and our allies in 1944.

Compare this figure with the 4,761 airplanes—both civilian and military—produced back in 1928!

Advancement in the science of aeronautics, coupled with progress in power plants and metallurgy as well as such related sciences as electronics, has been responsible for today's aircraft flying three times as fast and five times as far as the 1928 planes. Here the greatest contributions have been the low-drag (laminar flow) airfoils, reduction and control of the boundary layer, lift-increasing devices such as flaps, slots, and variable-camber airfoils, improvement in control surfaces (the Van Zelm ailerons on the Martin 202 is an example), design improvements in propellers and propeller control devices, full feathering and reversible props.

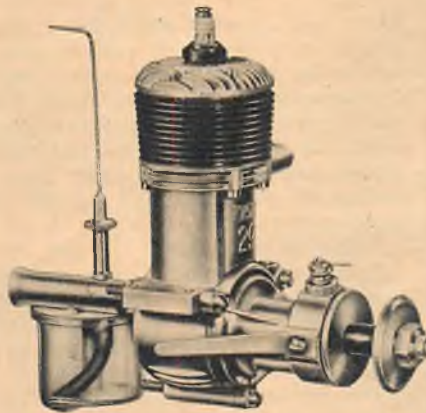
We were the first to attain supersonic speeds, these with the Bell XS-1 research plane. America hung up an all-time distance record without refueling of 11,822 miles when the Navy's Lockheed P2V flew from Perth, Australia, to Columbus, Ohio, in 55 hours. Compare those performances with the 1928 speed record of 200 mph and the distance mark of California to New York (also a Lockheed plane, then the Vega) in slightly under 19 hours.

Special credit is accorded the oil companies and their research laboratories in the development of the super-fuels used in today's large aircraft engines. Twenty years ago aviation fuels were little better than those offered the automotive trade. Aircraft fuels now reach the 130 octane mark. Such fuels were necessitated by increased compression ratios and the supercharging of modern aircraft power plants. The new fuels burn better, give greater economy and result in cooler running engines, thus prolonging the life of engines and increasing efficiency.

Advancements unpredicted twenty years ago in electronics, radio, and aircraft instruments have solved most of the major problems of blind flying and landing.

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Research by CAA, the Air Force, Weather Bureau and private agencies including the universities, enabled a C-54 to take off, fly across the Atlantic and land in England without a pilot handling its controls.

Atomic energy, once discussed by a handful of scientists, is now under study as motive power for aircraft. The NEPA (Nuclear Energy Power for Aircraft) project is going forward under the combined efforts of the Government and Fairchild Airplane and Engine Corp.

How vast a task it would be to enumerate every phase of aviation progress during the past twenty years! Such a compilation would have to include the vast network of radio navigation facilities which criss-cross the skies like highways, guided missiles, rockets, transport planes seating 60 passengers and capable of speeds close to 300 mph.

Flying the ocean back in 1929 was considered a daring stunt. Today you can week-end in London or Paris by means of a comfortable Atlantic crossing of 18 hours in a luxuriously outfitted airliner.

Privately owned aircraft were the exception rather than the rule two decades ago. Today the personal airplane is safe and easy to fly. It is used for business as well as pleasure. In many sections of the country, especially the West, farmers, doctors and ministers use the airplane instead of the automobile as they go about their daily tasks.

Rotary wing aircraft were just coming into being in 1928. Cierva in Spain was

experimenting with his autogiro. Helicopters were singularly unsuccessful. Hundreds of helicopters are in every-day service now, paying their way, even earning profits for their operators.

The remarkable strides aviation has made during the past twenty years can best be illustrated by a look at the record:

- Fastest transcontinental flight in 1928 was made at an average speed of 150 mph. Today's record is 585 mph.

- An unofficial speed record of 322 mph stood in '28, made by Al Williams flying a Schneider Cup racer. Major Marion Carl, USMC, is the current holder of the world's speed record—650.6 mph.

- The big bomber of '28 was the Curtiss Condor with a wing span of 90 feet and a weight, fully loaded, of 16,500 lbs. Today the Consolidated Vultee B-36 boasts a wing span of 230 feet and a gross weight of 275,000 lbs.

- In 1928 Capt. C. B. D. Collyer and John Mears flew a Fairchild around the world in 23 days, 15 hours, crossing the Atlantic and Pacific by steamship. William Odom now holds the globe-circling championship with a solo flight of 73 hours.

Your guess is as good as ours how far aviation will progress in the next twenty years. Will there be interplanetary travel? air bases on the moon? atomic-powered aircraft? Whatever the advancements, could we see ahead, they would appear as fantastic to us now as supersonic speeds, jet propulsion and radar sounded back in 1928.

## PLANE BUSTERS

(Continued from page 27)

which runs on rails the length of the high ceiling, hooked onto the frame and lifted it into the special cradle where the tests are being performed.

Before they get through with it the B-36 will be given 45 different types of tests. Part of these include engine tests already completed. The ship is now undergoing structures testing and is stripped of all instruments, unnecessary auxiliary equipment, engines, and propellers. Its control systems will get a thorough going over with the application of various loads on the ailerons, rudder, elevators. The pressurized cabin will be puffed up and punctured and blown up again until the air squeezes out and hisses through leakages or the whole fuselage lets go. A list of the tests now in progress includes: horizontal tail, fuselage, vertical tail, alighting gear, negative wing, flap and aileron, positive high-angle attack of wing, positive low-angle attack of wing, and nacelle—all to be subjected to weight and dynamic testing.

There are two methods used by the structures test engineers to apply simulated flight "loads," stress and strains to

the various parts of the airframe. The first method employs lead-shot bags or pig lead to apply a dead load to the structure. The lead shot bags are made of heavy canvas, each bag usually containing ten pounds of shot. These are piled (by hand) on the part being tested until a predetermined load has been reached or until the structure fails. During the application of the load, observations made by various test recording instruments show the bending of the part and reveal any signs of undue stress or bending failure of secondary or associated structures.

When they set out to break an airplane with this method, there is considerable danger. One time, for instance, when I was watching them "bag" the wing of an all-wood cargo plane, real trouble broke loose in the hangar. The long wing of the plane, resting in a special jig, was piled high with the shot bags and workmen were putting on more. The wing was bending and straining under the load. Then suddenly it snapped—pieces of wood went flying in all directions. There was a loud ex-



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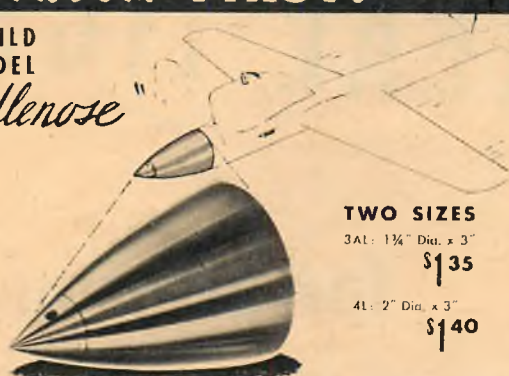
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CHICAGO 14

plosion and the fuselage flew up in the air as though a bomb had been touched off underneath it. Everyone ducked for cover. A cameraman, taking pictures of the failure, got hit in the head with one of the lead-shot bags and was knocked out. The plane itself was fit for kindling wood. They've had the same thing happen with metal airplanes. It could happen with the B-36.

If it does, part of the danger at least has been eliminated. There won't be any shot bags flying through the air. The reason is because engineers are using Method No. 2 which does away with the traditional method of piling shot bags and lead weights on the wings.

This new system utilizes rubber-to-metal adhesive tension patches that enable engineers to simulate and measure flight stresses and strains more accurately than ever before. Actual loads are applied by a series of adhesive tension patches on the top side of an airfoil and soft sponge pads on the underside of the wing. Hydraulic jacks then proportion the applied loads through a system of beams and levers to the patches and pads in accordance with the correct aerodynamic data for the airfoil sections incorporated in the specific design.

Essentially, the tension-lifting patch is a flat or curved plate (depending upon the surface to which it is applied) of steel, duralumin or plastic material. It may range in size from a six-inch square to a 6 x 24-inch rectangle, or even an irregular shape. One surface which is applied to the structure under test is covered with a piece of tough, high-tensile, rubber or neoprene sponge; the thickness of the rubberized patch or pad varies from 3/4-inch to 1 1/4-inches and forms a lifting element on the structural skin by adhesion. The lifting pads or pressure pads are the same size and composition but they are applied to the under-side of the airfoil.

Hundreds of tension patches and pressure pads are needed to run a single test—far less, however, than the number of shot bags required for the dead-weight method previously used. A single operator, for instance, can load and unload the test structure in a few minutes. By comparison, it formerly took days to pile on the shot-bags for simulating loads! In one test of a C-54 airplane 300 tension patches and 300 pressure patches were used; the set up took less than a day.

This method of applying load is particularly effective in the testing of cowlings, canopies, bomb doors, hatch doors, trim tabs and control surfaces. Prime reason is that it distributes the load more evenly. With tension cements now in use it is possible to develop a load capacity of 2,000 pounds per square foot on any structure for nearly five hours at a time. That's more than you would get being tossed around in a hurricane.

In the big Static Test Laboratory building at Wright Field they have two of these new static test machines—one with a lifting capacity of 100,000 pounds, the other with a lifting capacity of 1,000,000 pounds. They use the smaller machine for testing trainers, fighters, or



small gliders; the big machine (or system) is for the giants. Roughly estimated, they could pull the B-36 apart, by applying the full force of the jacks and levers, in a matter of seconds. But that wouldn't get the right results. Instead they're taking it section by section, applying loads gradually and determining minutely the reaction of each skin wrinkle or metal strain.

Referring to the advantages of the new hydraulic system of "loading," its inventors, Paul H. Kemmer, an Air Forces colonel, and Edgar R. Weaver, civilian technical advisor, list the following: The complete airplane structure including the fuselage and the horizontal tail may be tested simultaneously. Controls and control surface operation can be studied during the tests since there is no dead load inside the fuselage or piled on the wing to endanger personnel and interfere with control wiring and operation. Absence of the dead loads (shot-bags) in the fuselage makes it possible to visually inspect the stress reactions of the fuselage inside and out during the test. All hydraulic equipment and beams, lever systems, electric-driven pump, high pressure hydraulic cylinders and auxiliary pumps and gages are portable, can be readily disassembled and conveniently stored.

Danger of cascading shot bags falling on personnel when an airplane structure suddenly fails no longer exists. In the new system when structural failure occurs, the hydraulic pressure in the lifting system equalizes, releasing automatically the hydraulic pressures in the reactionary loading systems, thereby allowing the airplane to settle down in its cradle support without damage to the structure or to any personnel.

That the new system works effectively is best illustrated by the results obtained from tests during the recent years since it has been in operation.

The "plane busters," for instance, tried the system out a couple of years back on a new type, highly experimental design airplane which already was being purchased in numbers to go into service. Under test they found that the right wing near the root showed signs of weakness under static load applied with their jacks and patches. They recommended strengthening of this particular part. Others questioned the result of their test, not having too much faith in the new test method. That was a mistake. In subsequent flight operation of the airplanes, three accidents occurred in rapid succession during service testing. Each of the crash analysis reports showed the crashes due to failure of the right wing—structural failure identical to that obtained in the static test. After that they had more respect for the new gimmick. It became and still is the yardstick by which we judge whether an airplane's frame structure and skin can "take it."

We could go on and on naming the many results obtained from the static and dynamic tests of various types of aircraft. But suffice it to say that because of the "plane busters" we are getting tougher airplanes today than ever before.

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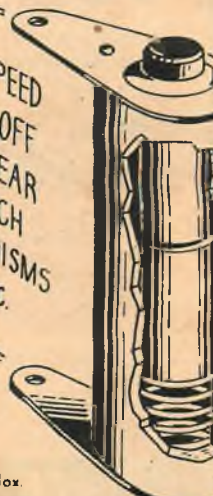
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## WE FLY THE NAVION

(Continued from page 37)

When you enter the Navion for your first flight, the operator will tell you to sit on the left side. This pleasantness is explained by the fact that a single hand brake beneath the dash, between the front seats, is used for braking, both parking and when taxiing or landing. There are no toe brakes! This important simplification is possible because of the steerable nose wheel.

The Navion is maneuvered on the ground by steering the nose wheel with the rudder pedals. The control wheel is not touched for taxiing. Outside of the Ryan being a heavier airplane and consequently taking more effort for turning, its ground handling characteristics are as exceptional as the Ercoupe's. The Navion is almost immune to wind on the ground. At no time did either of our check pilots say anything about the wind during taxiing. What a wonderful feeling! No keeping the flippers up, or down, or trying to turn with brakes and throttle, or fear of picking up a wing on landing in a strong cross wind.

One advantage of the Navion's steering system is that you don't have to center the control wheel when landing. The control wheel is not connected with the nose wheel. Nor, for that matter, is the nose wheel connected with the rudder pedals until the nose-wheel strut compresses on landing. This combination permits using aileron and flying the airplane without concern for the nose wheel until the wheels touch the runway. If much crab remains in the Navion close to the runway and the cross wind is too strong to permit kicking it out, you can land with the plane traveling in the direction of the nose, kicking it around the instant the nose wheel gets on and becomes steerable, according to the check pilot after we picked up too much drift on one landing.

In cross wind landings we had difficulty in kicking out the crab. The Navion, being heavier, seems to fly right on and you have to be on your toes with rudder if you don't want to hit with crab remaining.

The Navion has washed-out wing tips, which is to say that the tips are twisted down at the leading edge to have a smaller angle of incidence than the section at the root. There is a narrow metal leading edge spoiler near the center of the wing. The combination of these two features insures that the center of the wing stalls first, but with the tips continuing to lift, and with effective aileron control. In an intentional stall, power off, wheels and flaps up, considerable buffeting was felt with the wheel back, but the ship hung on nose high, with only a slight up and down motion of the

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nose. There are so many conditions under which this ship can be stalled, such as with two people, four people, flaps up, flaps down, gear up, gear down, and in all combinations, that we could not check these characteristics in every situation and hence don't wish to give a blanket verdict on stall characteristics. But the way we flew the Navion, we saw nothing objectionable. As a matter of fact, we had supposed that fast airplanes were much trickier.

The Navion has a bungee loaded system connecting its ailerons and rudder. However, the Navion is not a two-control airplane, a seeming contradiction that is explained by the fact that the pilot can overcome the system—no apparent effort is required—to cross controls, as for slipping. If you co-ordinate faultily on the Navion by applying rudder with insufficient aileron the ship co-ordinates for you by adding aileron! Since you won't be aware of this ghostly co-pilot you won't resent his kibitzing. One consequence of this system is that you aren't aware of one control being particularly sensitive, as often happens, nor do you note things like leading with an aileron. You turn the wheel, push the proper pedal, and around you go, no slip, no skidding. Period.

Although the Navion permits the pilot to overcome the co-ordinated aileron and rudder set-up for slipping, it can be flown like a two-control airplane with wheel only or, what is even more unique, with rudder pedals only. We flew the ship in well-banked turns both with wheel alone and with rudder pedals alone, and, either way, were able to hold a course in a strong cross wind. Co-ordination nonsense has been de-emphasized in the Navion without depriving the pilot of his right to fly the airplane anyway he chooses to.

The average lightplane pilot faces three hurdles in the Navion: flaps, retractable landing gear, and the Hartzell variable-pitch propeller (also possibly the three-wheel gear). Neither flaps nor gear will cause you any real trouble. Both can be operated by a hand-pump lever should the hydraulic system fail. The variable-pitch prop, on the other hand, is a more versatile gadget than we had believed. (An Aeromatic prop which adjusts pitch automatically with throttle is optional.) The first session in a ship with all three of these features keeps you busy. You may quickly learn where the gadgets are and what they do but you can't use them without plenty of help from the check pilot. In the circuit you find yourself thinking, "What do I do next? Did I forget something?" When you boil down your post-mortem reactions the chief difficulty seems to be getting the hang of the relationship between prop, throttle, and trim. This isn't as bad as it sounds, and an overnight opportunity to "think on it" works the usual wonders.

It isn't true that the cockpit is as simple as a lightplane's, but on the other hand it is a relief to find that you aren't overwhelmed. The standard panel includes nothing strange: there is the air-



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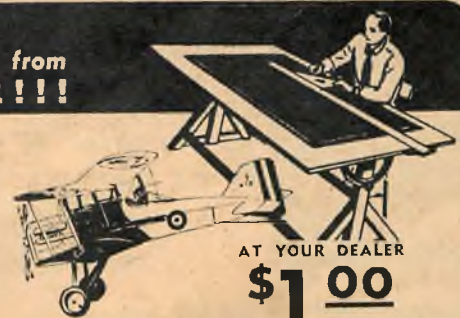
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speed, turn-and-bank, altimeter, and tachometer. Then there are the usual smaller faces: oil pressure, oil temperature, fuel quantity, and fuel pressure. Inasmuch as many lightplanes have a turn-and-bank, there is nothing here to get excited about. There are more handles, knobs, and buttons along the bottom of the panel than you have been accustomed to looking at but an hour or so makes order out of confusion.

Directly in front of you, a little to the right and below the wheel, are two side-by-side toggle switches for battery and magneto. After flipping these on together you are ready for the magneto switch. It is to the right of the toggle switches. Over on your left, rather high and close to the cockpit wall, is the prime. The fuel shut-off switch is a button over toward the right center, along the bottom of the panel. This is left on at all times and apparently is pulled out only to shut off fuel-flow at the firewall in an emergency.

To the left of the usual push-pull throttle, and on a line with it, fairly closely bunched, are the landing gear retraction handle, the flap handle, and the trim wheel, with its small indicator. Just to the right of the throttle is the prop pitch control, a push-pull affair that looks like a throttle but not enough to cause confusion. Right under the throttle is an at-first-bothersome button which you pull out to turn on the hydraulic power for flaps and gear, and push in to relieve the pressure on the system when not in use. Its easy to know where the button is because a white light gleams from the panel just above the control wheel when hydraulic power is on. It seems that the constant high pressure of the hydraulic system in the early North American jobs forced leaks, and this button is simply a by-pass to relieve pressure. The auto-type foot starter is above the left foot pedals, against the firewall.

On your first flight, the check pilot tells you about taxiing and starting, as you follow through on the controls in take-off. In the beginning he handles the gear, flaps, and prop, permitting you to concentrate on the flying. Little by little he turns the gadgets over to you.

To check the mags, run-up is at 1,500 rpm. Fast cruising rpm is 2,150. You won't do it yourself the first time, but part of the run-up is to check prop operation, noting if there is a drop (there must be) when the prop control is pulled out to high or coarse pitch at 1,900-2,000 rpm. On a cool day, the check pilot explains that during the warm-up it is a good idea to "milk the prop," which means simply that the control is moved in and out to get the fluid flowing. When you open the throttle for take-off the ship rapidly accelerates to 55 mph, where you come back very slightly on the wheel to get the nose wheel off the ground. If there is a strong wind the ship is immediately flying. The initial 55 mph is attained almost as soon as you can make sure of your line-up with



the runway and glance down at the indicator.

Best climb comes at about 90 mph. You climb moderately fast and at a fairly steep angle. As a very rough guess, the climb seemed somewhat like that in a Stinson, a little less spectacular than in the Bellanca. We don't offer that as a hard and fast fact, but only as an impression. The Navion did have its 1,000 feet by the time we got squared away on the down wind leg.

Climbing on out to the practice area, the check pilot explained a little business known as "setting up cruise." This didn't sink in too well in our first flight, except for the fact that in going from climb to cruise, you dive shallowly, losing 150 feet or so, to get up to cruising speed, and adjust trim and prop pitch during the transition. Barreling along at 150 mph you begin to wonder if you will feel crowded on the turn, but when you begin the turn you note nothing unusual, unless it is the greater distance and time required to fly around a shallow-banked turn in a fast airplane. There is a tremendous difference between a turn at 75 mph and one at 150 mph. You can safely fly the Navion at the lower figure, flaps down or up, banking easily to look things over if visibility isn't too good.

The first time you use flaps you have a treat in store. The airplane is slowed down to 100 mph or under before dumping the flaps and, as they roll down, the ship tips smoothly and steadily into a steep nose-down angle, seeming to seek both the angle and the 75 mph approach speed. All you do is hold that speed with the wheel and look down over the nose at the spot. If you want to shallow out this approach, add throttle and the angle automatically lessens. A Navion approach is as certain as aiming a gun. It is small exaggeration to say you can almost look yourself through the landing.

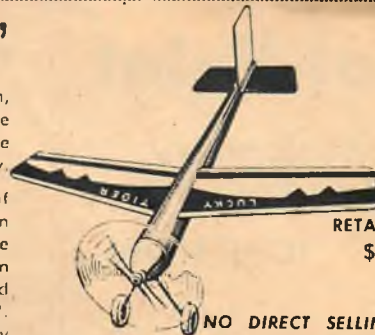
On the first approach, the check pilot purposely kept 1,000 feet until the head of the runway was ready to disappear under the nose (and don't forget how well you can see over that nose), then dumped the flaps. The ship tilted gently forward and glided as true as an arrow to the head of the runway for a perfect landing. To land the Navion you flare out gently, then hold it off until the main wheels touch at 55 mph. You gradually ease the control wheel back to hold off the nose wheel until absolute flying speed is killed—then because of the center of gravity location, the ship will nose forward onto the front wheel.

After a couple of successive landings and take-offs, the check pilot had us operating the retracting gear. While flaps were familiar to us, we felt busy enough at this point to leave them to the check pilot. You may have a tendency to think in terms of one special operation. Being used to the single operation of flaps, and suddenly substituting the operating of gear, you may think that things have been tended to once the wheels are down. Of course, flaps are still up. At this point we reached the end of the first day's session, having put in 45 minutes of dual.

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On the second flight, Hewitt had us "setting up cruise." As soon as we had it right, he'd put us back in the glide, then have us get the ship back to cruising trim. From the glide, the first step is to get back to the 90 mph climb to altitude. Then follows that slight dive losing 150 feet or so, while the trim is rolled back for the ship to fly hands off when it reaches the desired cruising speed. As the engine begins to over-rev you pull back on the pitch control, increasing prop pitch, and slowing down the engine. In that very rough air we desired to fly at 140-145 mph at 2,000 rpm. You learn to leave the throttle alone, once you have backed off some from full throttle, and to use the prop pitch as a throttle. If you need a little more power, you ease in the prop pitch a hair, letting the engine speed up a trifle. If you play with throttle, as well as trim and prop, you'll never get to hands-off cruising.

The fine art of flying this airplane seems to revolve around that propeller pitch control. If you go to too low a pitch to maintain altitude, you have come back too far on the throttle in the beginning, and then will have to add a little throttle. To get efficiency you pull a good bit of power with the prop out, or close to high pitch, and not with the throttle back with the prop in fine pitch. Trim, throttle, prop pitch are part of the technique for operating efficiently.

There is the usual fuel mixture control which should be used to get real fuel economy. The procedure is to pull out the mixture button very slowly—never more than an inch at most—until the rpm's peak and begin to fall off slightly. Then you push in the button until rpm's peak again and start to fall off. The button is left in this position. Of course, on letting down from a cross-country flight it is necessary to repeat the procedure to be sure of maximum power if needed to go round again. Inasmuch as the fuel mixture button is pulled all the way out to shut off the engine, you do have to be careful in the air not to pull the button to "off." For ordinary flying, mixture is left on full rich.

Letting down is another new experience to the lightplane pilot. Nearing the field, the airplane is slowed down to about 100 mph, while trim is reset as necessary. The gear warning horn probably will go off when you bring the throttle back, so you ease forward on throttle until the horn stops. This is a sort of land mark for the throttle. In this position you seem to have enough throttle to get any ordinary increase in power for maintaining level flight by decreasing prop pitch. The wheels should be down by the time you are on the down wind leg, and the flaps on the base leg. Prop pitch should be changed to low in case power is needed to go round. On the steep approach with flaps you can throttle back. When the wheels go down you both hear and feel the thump and the three lights shine reassuringly. As to flaps on the Navion, you have either full flap or none at all, although the check pilot had an interesting trick.

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the hydraulic power button off. Then by pulling out the hydraulic power button until the flaps rolled down to about one-third down, he could push the hydraulic button to "off," stopping the flaps in the desired position. He could tell from the trim of the ship when flaps were one third down. Partial flaps did seem to facilitate the landing in that high wind.

Ryan advises that in windy or gusty weather, it is better to bring the airplane in slightly faster and to touch down with less of a tail-down attitude. The check pilot also kept the hydraulic button off on landing. When we asked why, he explained that it prevented any mistakes in pulling up to go round again. In other words, the landing gear handle would have to be moved, the safety catch released, and finally the button would have to be pulled out before the gear would retract. While this takes but a few seconds, it does insure that you won't pull up the wheels too soon. By that time you are getting your 90 mph; retracting the flaps will not cause the ship to sink, as it might at lower air speeds.

The lightplane pilot does have to be careful of throttle on landing. If you are carrying throttle close to the ground, don't, as you might in a lightplane, take off that throttle, for a ship like the Navion will settle quite suddenly.

As a lightplane pilot, we tend to compare the Navion with various other airplanes we had flown. In making such comparisons one must remember that the Navion was designed for an entirely different market than the low-horsepower jobs, and for totally different purposes. Actually, the Navion can't be compared with the true lightplane but since our purpose here is to report to lightplane pilots the impressions of a fellow flyer, a rough comparison is not out of order.

The Navion is easier to land than some of the lighter ships that you have to stall on to the ground. The tricycle gear markedly improves ground handling, take-offs, and landing. If people insist on flying all three wheels onto the ground simultaneously, nose wheels can give trouble. Being heavier—and in this sense the comparison is unjust—the Navion has little tendency to balloon and will do so only if excessive speed is built up during the approach. It will not float. Its landing and gliding speeds are roughly "normal" for lightplane pilots.

The Navion is not tricky, and is easy to control and fly. It does have added features and procedures, as pointed out, but these can be learned without too much trouble. Only the interplay of trim and prop pitch to hold altitude, air speed, and rpm is completely new. Flying the pattern you may get rattled at first, for the Navion gets around so fast that the sequence of operations seems continuous. But then the Navion wasn't meant for mere pattern flying. On cross-country you set up your cruise and that is that until you let down hundreds of miles away.

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## SOLO CLUB

(Continued from page 40)

reached the point where we can really help each other, making private flying a better thing in the process. How?

For one thing, we all know how expensive it is to fly. The low-salaried chap who rents a Cub for thirty minutes on a Sunday knows it better than any of us. Every airplane owner knows that maintenance takes plenty of the coin of the realm. We know about the other fellow who inadvertently, almost always needlessly, stalls and spins in. Or the chap who knocks off a gear or cracks a wing in a forced landing—which, like as not, should not have happened in the first place—when he could have put it down smoothly and safely. How many people get lost? Or run afoul of weather? How many of us fail to get the most out of our flying, milling around the airport aimlessly just for the sake of flying, when flying for a purpose, if we knew how, would make it fun, always interesting, and instructive as well. Do we have trouble with cross-wind landings, short-field take-offs, strange field approaches? We never admit these things but who among us does not live in a glass house? The point is that, as a group, the Solo Club membership possesses a stockpile of experience too valuable for any price tag.

Dozens of us have had experience with forced landings, and did a good job. Hundreds, to put it mildly, have been lost and extricated themselves by bearing down with the old bean. We have concocted our pet methods of contact navigation, of bracketing courses, of picking up drift, of getting the most out of radio, making every flying minute count for added skill and experience, perhaps toward a higher rating. Or, most important, of flying in a manner that minimizes the chance of a mishap.

Let's pass this dope along. Any pet system that gets results, a useful experience, opinions and methods of safe flying, how to get a break for our dough, anything and everything that makes flying cheaper, safer, and more enjoyable. Why do many people give up flying? Is it expense alone, or does it get boring and actually fail to serve a purpose? Wish to argue? Then what value do you get from flying? Perhaps your thoughts hold the key to someone else's continuing to fly until he knows how to get the most out of it. So, if you have anything of use to others, let headquarters hear about it. If you have questions, shoot them in. As always, gripes, views, and recommendations will be welcome. When circumstances warrant it, the Solo Club will go to bat with the powers that be. Let's shoot a few trial landings. . . .

Bob Smith, St. Clair Shores, Michigan, one of the many teen-agers who soloed and then sat around waiting for their

17th birthday to take the private exam, had his money troubles. "My biggest gripe is getting enough money together every week to be able to pay for an hour or an hour and a half," states Bob. "It was easier in the summer when I could work, but during the winter months I go to school. I pay \$11.50 dual and \$8.50 solo."

Of importance to pilots who find flying a luxury is the question of how much time a year is really necessary to keep the hand in. Sharp pilots who work at flying say you need an hour a week, at least. Suppose he can't afford that seven to ten dollars an hour. Can he put in just an hour every other week, or even every third week? Or, perhaps, two earnest 30-minute landing sessions a month? Rather than give up flying, he might hang on for a better break. Shooting landings, they say, is the best practice for it involves just about everything, from turns, coordination, climb, glide, flying a rectangular pattern, correcting for drift and even, on landing, stalls. It would seem that the pilot with a hundred hours or so under his belt could get by with an occasional solid session. But how about the student or new private? How about this, you budget flyers? Let's hear how you manage.

That the average airline pilot has little love for little airplanes is well known. Some of the truck pushers claim we are a nuisance. This opinion is returned in kind by the average lightplane pilot who considers the multi-engine job an aerial road hog. Sergeant John R. Bray, 30th Communications Squadron, Andrews Air Force Base, Washington, D. C., gripes bitterly about fields in line with airline routes.

"Another field I found bad," the Sergeant tees off, "is in New York State. The transports would come over the field at 600 feet. One one occasion I was up practicing 180's and this DC-3 tears across the field. The J-3 sure hit the deck that day. I realize the pilots flying them are tops, but he sure did scare the daylights out of me. I believe that they should be made to adhere to traffic patterns no matter what size crate they are flying. It sure would be a black eye to aviation if one of them clubbed a J-3 in a traffic pattern some day."

Sarge, this is a touchy issue. Presumably, CAA approves, and should check on, the locations of fields and their traffic patterns, particularly when mixed traffic is a problem. One thing we do have to keep in mind is that these transports are not flying green houses. In a climb, a ship like a DC-6 sees very little. Pilots have told us that they just cross their fingers and hope that nothing is out front. It makes no difference whether it is another DC-6 or you in a Cub. Give the big boys the right of way all the time. Presume they can't see you. Besides a transport has to circle half a county to give way to a lightplane, burning plenty of someone's good gas while doing so. On the other hand, do the airlines make certain that their pilots avoid lightplane practice areas?

Tech Sergeant Rex Moore, a student



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with a total time of 54 hours and 20 minutes has the right outlook on private flying. After noting the need for publicity on the advantages of flying, economy, safety in flight, he says sadly, "The only time you read about flying is when some joker cracks up. It is a slow struggle to gain favor. Educate the pilots to brag more on safety and economy instead of their close calls. We cannot have any reductions in prices of planes, parts, maintenance, if we do not have people flying. We can not build up interest by publishing pictures of smashed airplanes."

Moore isn't talking through his hat. The records are full of gory crack-ups that should never have happened. If this is always a mystery to the guy who flies right, it can be explained by the perplexing fact that some people have a healthy respect for an airplane while others know neither fear nor respect. Some learn by experience and others will be forever incorrigible—as long as they live. Steve Slowka, Scranton, who doesn't mind telling how he smartened up from experience, learned to fly at Tri-Cities Airport, Endicott, N. Y., one of the nicest fields you'll want to visit, on the Susquehanna, near Binghamton. Two months later he checked out on a Waco UPF-7 and tried to learn aerobatics. Take over Steve.

"After having about only five hours in the Waco, I shopped around for an instructor to teach me to slow roll. I asked about five but none had the time and each one told me what to do, so I strapped on a chute and took off. I climbed to 5,000 feet, cleared myself and started. I got on my back all right but didn't get the stick forward quick enough and split-S'ed out. Having a lot of altitude I decided I would pull out slow. I cut the throttle and started down. I waited a couple of seconds and began to ease back on the stick and happened to glance at the airspeed. The needle was against the peg! After the blackness disappeared, I looked at the altimeter and it showed 2,500 feet. I consider myself lucky. All I can say is that the incident was plain foolishness on my part, without a competent instructor in the front seat."

Slowka knows he was lucky. But Moore's wise words were meant more for the guy who never knows, like this western operator who shall go unnamed. Here is a man with 550 hours covering 33 types of aircraft. Helping a mechanic (with switches off), the prop kicked over, skinning his knuckles, rapping his head, and calling for the ministrations of a handy doctor. A loose ground wire was found in the mag. Nothing daunted, this pilot climbed in and started the engine. The ship then headed at full throttle for the gas pit. Finding the brakes inoperative, he cut the switch. This time the butterfly valve was loose. Finally, he took off. After an hour, the prop flew off, chunks of engine sailed by, and the windshield was covered with oil. "There I was," he says, "over an overcast and had never flown on instruments." So he called the range, reporting what had happened and promising to call when he

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reached the ground. He got through the overcast without spinning or pulling off a wing but forgot to reel in the antenna which snagged on landing and was pulled out by the roots. By the time he got to a phone the searching parties were out. Two weeks later, with another prop and engine, he continued the journey. After an hour, the engine threw the prop. The pilot released the door which banged into the stabilizer. Climbing out on the struts to jump he "discovered" a field beneath, got back in, and landed. On flaring out with full flaps, a flap wire broke, with one flap coming down and the other staying up. The ship was vertical to the runway, but he wrestled it out and landed so hard that a tire blew. The owner sold the ship on the spot. Later, it killed two people. "As for me," concludes the pilot, "I will never fly in another . . . ." And as for us, we don't see what the make has to do with it. Why not have called it quits when that prop kicked over? Even if we knew the operator, we certainly would not stick out a neck a second time after the ship practically had run away on the ground. The ship should have been sent to the glue factory.

**Bulletin Board:** Regal Air Corporation, 318 West 39th Street, New York, has placed on the market a new finish that is long lasting, protective, with a mirrorlike appearance comparable to hand-rubbing. Called ReGlo, this finish is a clear solution sprayed over fabric or metal. Lasting for twelve months, it is impervious to all deteriorating conditions that plague owners of ships that are staked out. One hour is required to cover a lightplane with one gallon of this finish, and six-eight hours are needed for drying. The gloss is maintained with an occasional hosing and a light wiping. Grease, dirt, etc. can be washed off. More resistant, too, to burning, this finish is easily removed when desired and does not interfere with patching.

Thoburn C. Lyon, advises that the government edition of Practical Air Navigation (CAB 24) is now out of print. Lyon's new commercial edition has been found "acceptable and desirable by the government," he states, and unfilled and new orders for CAB 24 are being returned by the Government Printing Office with the information that in the future the book will be available only from the author.

## HOW FAST CAN WE FIGHT?

(Continued from page 25)

square feet, according to the range or distance they travel. The farther out the more they scatter. The object of gunnery is to produce a compact cone of fire. The speed of the enemy ship in itself causes dispersion of bullets, provided all are on target. Bullets cannot hit a speedy target close enough to-



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gether to be damaging in their fire effect. This means that in trans-sonic combat, every hit must count because fewer hits will result from the high speeds, even if a marksman is doing the shooting.

The gunsight aids immeasurably in good shooting because it is designed to correct for so many of these factors. The trajectory of the bullet in flight cannot be seen, except that of tracer bullets. What the sight does is see and aim along the path that known ballistic laws indicate bullets from the particular gun can reasonably be expected to follow. Optical sights for the fixed guns of fighters and the flexible or turret armament of bombers are designed so as to give the aimer a good estimation of both range and the amount of lead, or deflection.

The bombing sight does approximately the same thing for bombardiers, except that it makes more corrections. But there is still another factor in gunnery, for which no sight to date can correct. This results from the spin of the bullet imparted to it by the rifling in the gun barrel. For simplification this is just called "spin," but its proper name is "Magnus effect." In most guns the bullet is given a clockwise spin. In straight-on no-deflection shots, the effect is negligible in fixed guns. In flexible and turret guns, however, the bullet behaves queerly.

When a gunner swings his turret for a left broadside and fires, the bullet is exposed to the side-on action of the powerful slipstream. Since it rotates clockwise, the spin causes it to drop like a tennis ball that is given top spin. Contrariwise, from a right-side shot, the bullet rises like a golf ball with a lot of back spin that "takes off". Something else happens that is not too noticeable in fighter gunnery unless the plane is slipping or skidding when the shot is made. When the bullet leaves the gun in a broadside shot it is carried forward by the plane's movement, or sidewise as viewed by the gunner. The gunner himself must make corrections here, with some slight aid from his sight.

This is the combination of things that happens to a conventional caliber .50 bullet in flight at 250 to 300 mph. Double this speed and all the vagaries of bullet performance are multiplied by four! It would seem, then, that all and any hits would be a matter of luck—and they will be just that until our new ballistic laws can be put into action and equipment designed to correspond with them. Things happen just too rapidly for the human eye and brain. The pilot and gunner must have help; and the more automatic this happens to be, the better.

The Navy has already made two changes in standard armament. Their new 20-mm automatic cannon, incorporating the best features of both the Hispano-Suiza and Oerlikon guns, is mounted on the F8F-2B Bearcat interceptor and the Ventura patrol bomber. Some interesting innovations have been made in not only the barrel design and lining, but also in such vital items as feed mechanism, ejection, and lubrication. The caliber

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While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this October, 1948, index.

.60 machine gun has also been adopted as standard. With a firing rate slightly below the caliber .50, this amazing gun has a muzzle velocity of around 3,300 feet per second, and therefore a much flatter trajectory and greater range and hitting power.

How does the rocket shape up as an air-to-air and air-to-ground weapon for trans-sonic combat? A type such as the 5-inch HVAR "Holy Moses," with a velocity of 1,375 ft. per second, that did yeoman duty during the war, might serve as a starting point. Such a missile, fitted with VT fuse and stepped-up velocity, would prove effective if the sighting problems could be overcome.

Since rockets of this type are fixed to wing launching rails—and probably will remain so in the trans-sonic types such as the Panther and F-86 and F-88—accuracy will depend largely upon the proper aim (or guidance) of the plane itself, unless homing devices are incorporated. Factors other than piloting enter into this, however. Sighting takes into consideration altitude, indicated air speed, dive angle, and slant range. For given airplanes and rocket types, factors can be ascertained from calculation and firing range tests and compiled into handy tables that tell the pilot what settings are needed for the particular plane and missiles he is using. Using this data, he centers the target in the sight, flies at the recommended speed and angle, and lets go.

But any change in the speed or style of attack, means changing of settings and reference to tables. Pilots won't have time to get out the book. It has to be done automatically. The nearest we have come to this yet is the development of the Type 4 rocket sight that computes and feeds into the instrument dive-angle compensation for approaches ranging from 15° to 50°, altitude corrections from a barometric device, and automatic input of air speeds. By throwing a switch the instrument can be used as a gunsight.

Spinner rockets—so-named because their multiple exhaust nozzles are set at an angle that imparts high-speed rotation to stabilize their flight—will probably be favored over fin-stabilized rockets for several reasons. The finned missile must be long in proportion to its diameter, while the spinner is short and rather stubby. (The 5-inch spinner is only half as long as the finned 5-inch Holy Moses.) Greater numbers can be carried. The spinner is just as accurate for aircraft firing. Equally important, its size adapts it for more rapid firing.

Thus far, we have been considering the forward-firing rocket projectile. But there is another factor which enters into these ballistics. The rocket's velocity is its own speed, plus that of the plane, when fired forward. When fired rearward—and this is important for defense—the missile travels at its own velocity minus the speed of the plane. (The wartime VAR—Vertical Antisubmarine Rocket—worked to take advantage of this phenomenon. It was fired rearward at the same speed the plane was traveling, thus it fell vertically to the spot where the plane's detector measured a maxi-