MODEL BUILDER

WORLD'S MOST COMPLETE MODEL PUBLICATION

SEPTEMBER 1989
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volume 19, number 211

REVIEWS:

Goldberg
MIRAGE 550

Airtronics
VANGUARD PCM RADIO

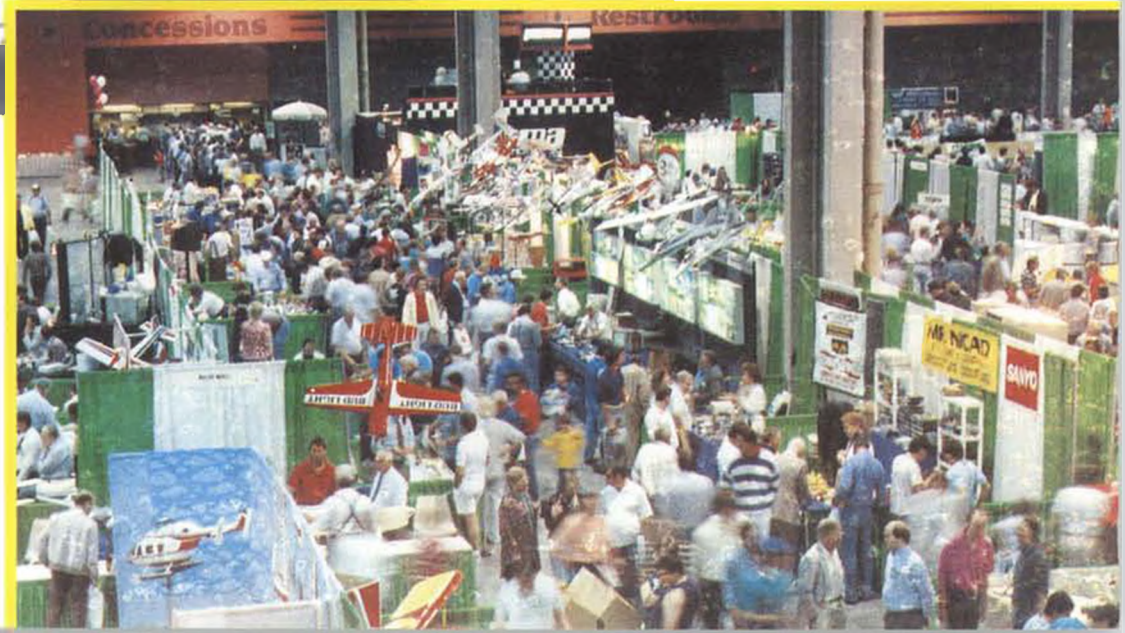
Hobby Lobby
MFA SPORT 500 HELI

IMS ATLANTA 1989

CONSTRUCTION:

EEE-Z-FLI
4-IN-1
Trainer

1/2A R/C O.T.
Interceptor



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No Comparison.

All 4 channel systems are not created equal. Airtronics' Vanguard VG4R FM offers you incomparable quality, features, 1991 performance and component compatibility, that no other manufacturer can match, at any price.

Airtronics Quality

Vanguard is a world class R/C system that incorporates the same quality craftsmanship and component technology of our most sophisticated R/C systems. Airtronics utilizes the latest receiver Surface Mount Technology for more reliable operation. Advanced ergonomic design and engineering assures you an integrated system with well placed switches and controls for maximum comfort and easy operation.

Incomparable Features

Vanguard gives you exceptional value for your money. Designed for beginning and sport flyers Vanguard gives you features found on no other basic four channel radio, including a convenient Trainer system usually offered only on more expensive R/C systems. Compare for yourself.

Airtronics Vanguard VG4R FEATURES	Other Leading 4 Channel Radio System FEATURES
Servo Reversing on All Channels	Servo Reversing on All Channels
Adjustable Length Sticks	Adjustable Length Sticks
Adjustable Tension Sticks	Adjustable Tension Sticks
High Capacity Rechargeable 600 MAH NiCd Batteries	Rechargeable NiCd Batteries
Gold Label Super Narrow Band Dual Conversion FM Receiver	Single Conversion AM Receiver
Transmitter and receiver exceed *all* AMA Guidelines for operation beyond 1991	/
High Quality Micro Precision Gimbals	/
Trainer System	/
Full connector compatibility with all Airtronics systems	/
Full One-Year Limited Warranty	180 Days Limited Warranty

Proven 1991 Performance

Vanguard VG4R FM utilizes Airtronics' Gold Label Super Narrow Band Dual Conversion 1991 Receiver for performance far superior to any single conversion AM or FM receivers.

RECEIVER	Airtronics 92765 FM	AMA Guidelines and Measurements
Adjacent Channel Rejection:	Better than −81.3 db @ +8.5 KHz	−60 db or better @ +8.5 KHz
	−69.2 db @ −8.5 KHz	−60 db @ −8.5 KHz
Image Rejection:	−70.8 db	Greater than −60 db @ Image Frequency
3rd OIP:	+3.8 dbm	Better than −4 dbm

TRANSMITTER	Vanguard VG4R FM	AMA Guidelines and Measurements
Occupied Spectrum:	Better than −55 db @ ±20 KHz @ 3 KHz RBW	Better than −55 db @ ±20 KHz @ 3 KHz RBW
Frequency Tolerance:	±1500 Hz	±1500 Hz
	*(Test results are on file at the AMA.)	

Vanguard's Dual Conversion FM receiver and transmitter exceed all AMA technical guidelines and specifications. This assures you reliable 1991 operation at 20 KHz channel spacing and increased security against frequency interference.

We back up our performance claims with verifiable independent test results.*

Complete Compatibility

Airtronics offers total component compatibility, a full one-year limited warranty, and complete system upgrades and conversions to help eliminate costly R/C system obsolescence and replacement.

Vanguard VG4R gives you superior quality, incomparable features, and proven performance at a price that leaves our competition green with envy. If you demand Super Narrow Band Dual Conversion 1991 FM Receiver technology, product compatibility and the best R/C systems for your money, Airtronics is the only choice.

We Set The Standard.

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New book "briefings" from H.A.

REVOLUTION IN THE SKY, Allen. New, revised edition. Allen tells the exciting stories of all the passenger planes built by Lockheed during the Golden Age—Vega, Air Express, Sirius, Orion—and the pioneers who flew them—Lindbergh, Wiley Post, Amelia Earhart, Turner, Doolittle, and others. Illustrated with 250 historic photos and scale drawings, 256 pgs., 8½" x 11", hdbd. ..... A Reviewer's Choice! 3490C **$24.95**

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MODEL BUILDER

SEPTEMBER 1989

volume 19, number 211

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THREE-VIEWS

CONSTRUCTION

COVER: U.S. Marine Corps version of the British-designed Harrier, which has VTO capability. This is one of two Harriers flown in from squadrons based at MCAS Yuma, Arizona, to take part in a benefit air show at MCHAS, Tustin, California. Below: Partial view of the 1989 IMS Atlanta Model Sport and Hobby Show at the Georgia World Congress Center, Atlanta, Georgia, May 12, 13, and 14. Next year's show will be at the same location, on May 18, 19, and 20.

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It's amazing that high priced systems are just now using components[1] and techniques that we used in the design and manufacture of the Mark 2 through Mark 10 systems over ten years ago. DBM - Double Balance Mixing, was used on the Mark systems. Crystal filters - introduced in the early Expert FM systems.

As some of these features are now coming to market in other brands, we find it interesting and reassuring that we have been building the Expert right all along.

There are some new features we didn't come up with and will probably never have, for example, Liquid Crystal readouts and programmable transmitters. They are really nice, and well worth the big bucks. But, for our World Engines' flyers[2] and our flying buddies, we will still be flying 3 miles off the main road, between the cornfields next weekend and we will leave our hi-tech VCR and computer programming activity at home. Happy Flying.

[1] 8042 Integrated Circuits

[2] The World Engines' CEO has been flying R/C since 1955; he is an old flyer. Also, our Electronics Engineer, Marketing Director, Warehouse Manager, Engine Technician, and Graphic Artist are all R/C enthusiasts and pilots. Radio Control is our business, but we would do it anyway because we were R/C modelers first.

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PH: 305-581-9390
ST. PETERSBURG
Hobby House
6360 9th St. N
PH: 521-4148
SOUTH DAYTONA
Ace Hobbies
2127 So. Ridgwood Ave.
PH: 904-761-8780
TALLAHASSEE
Pam & Allen's Hobbies
1198-A Capital Circle N.E.
TAMPA
Charlie's Discount Hobbies
7530 W. Waters Ave
PH: 813-882-4007
TAMPA
Farmers Sundries & Hobbies
4838 E. Broadway
PH: 813-248-3314
VEROBEACH
Berggren's Hobbies
1505 20th St
WEST PALM BEACH
Craft House Hobby Shop
1079 N. Military Tr.
WINTER SPRINGS
Florenze Hobby Center, Inc.
420 W. State Road 434
PH: 407-327-6353
GEORGIA
ATLANTA
Brier Vista Lawn Mower
Sales & Service
1867 Lavista Road
PH: 633-6741
AUGUSTA
Otter Creek Hobbies
2625 Deans Bridge Road
PH: 404-790-6575
HAWAII
HONOLULU
The Hobbiest
1413 Tenth Avenue
IDAHO
TWIN FALLS
Aero-tronics Model Supply Co
320 Locust Street
ILLINOIS
BELLVILLE
West Side Hobby
2829 West Main Street
BLOOMINGTON
Hobbyland, Inc.
616-618 N. Main St.
CHICAGO
Stanton Hobby Shop
4734 N. Milwaukee Ave.
CRYSTAL LAKE
Frank's Games, Toys & Hobby
111 - 113 North Main St.
PH: 815-459-0247
EAST MOLINE
Tony's Hobby & Key
830 - 15 Ave.
ELMHURST
Al's Hobby Shop
121 Addison

LOMBARD
G & D Hobbies
716 S. Main St.
OAKLAWN
Pat's Hobbies & Crafts
5730 W. 95th
PH: 424-6131
ROCKFORD
Rockford Hobbies, Inc.
619 So. Rockford Ave
SPRINGFIELD
The Hobby House, Inc
3419 Chatham Road
TINLEY PARK
Orland Hobbies
16952 Oak Park Ave
PH: 312-429-9811
WAUKEGAN
Lake County Hobbies
37832 N. Sheridan Road
PH: 312-662-4544
INDIANA
FORT WAYNE
Phil's Hobby Shop
1722 Lake Ave
PH: 428-5058
RICHMOND
Radio Control Center
1408 So. U. St.
PH: 935-5060
IOWA
CEDAR RAPIDS
Tapco Engineering
1639 47th St. N.E.
PH: 319-393-4383
COUNCIL BLUFFS
Bud's Hobbies & Crafts
133 W. Broadway
DES MOINES
Hobby Haven
7672 Hickman Road
HOLSTEIN
Chuck's Lawn & Used Cars
520 East 2nd
LeMARS
Hobby Haven
Airport Entrance Hiway 75 S.
PH: 712-546-5960
MASON CITY
D 'n B R/C SUPPLY
201 So. Vermont
SERGEANT BLUFF
R/C Extras
Rte. 1, Box 288
PH: 943-4102
SIOUX CITY
Tri-State R/C
3201 Viking Dr
PH: 256-8160
WATERLOO
Bob's R/C Supply
935 Shearer Ave
WAVERLY
R/C Hobby House
918 E. Bremer Ave.
KANSAS
JUNCTION CITY
R/C Hobbies
115 W. 7th St.
PH: 238-1877
KANSAS CITY
R/C Hobbies
5820 State Ave
LIBERAL
Miller's Bike & Hobby Shop
105 E. Seventh
NEODESHA
SAC
Route 1
SALINA
Don's Hobby Shop
410 Hart
WICHITA
Big Frank's Hobby Center
2289 N. Amidon
Sweetbriar Shopping Center
PH: 838-3011
KENTUCKY
CAMBELLSVILLE
Cambellsville R.C. Hobby Shop
229 E. Main St.
PH: 502-465-6487
FLORENCE
Hobby Hanger
183 Lloyd Ave.
FLORENCE
Northern Kentucky Hobbies
7615 Burlington Pike
OWENSBORO
Hobby Master
X-Cell Models
2006 Triplett St.
PH: 502-683-9117
LOUISIANA
BATON ROUGE
Hobby Towne
3112 College Drive - Suite A
BATON ROUGE
Hobby Towne
6996 Airline Highway
COVINGTON
Uncle Sam's Hobby Shop
301 N. Hwy. 190, Suite E8
PH: 504-893-RCRC
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Mercury Hobbies, Inc.
Rt. 6 Box 734A
PH: 892-7204
METARIE
Hobby Hut Hobby Shop
708 David Drive
PH: 504-733-4829
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American Classic Dev., Inc.
1300 U.S. 165 North
PH: 318-343-5554
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BATH
The Hobby Shoppe
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FAYETTE
Tom's R/C Hardware
RFD. 1, Box 2260
PITTSFIELD
Hallett's R/C Planes
65 Somerset Ave.
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CM Piper Radio Control
Riva Ridge, Vassalboro
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Stoneleigh Cycle & Hobbies, Inc.
6717 York Road
GERMANTOWN
Fox Chapel Hobbies
19709 Frederick Road
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Larch Lane Hobbies
18 Larch Lane
PH:301-473-4587
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Bobby's Hobby Lobby
65 E. Main St
MASSACHUSETTS
CANTON
Advanced RadioControl Hobbies
323 Turnpike St. #8

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J & J Hobbies
133 Frontenac St.
PH: 592-1472
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R/C Hobbies
153 E. Falmouth
EAST LONGMEADOW
Bill's Hobby Supplies
800 N. Main St
PH: 736-7711
FISKDALE
K/N Hobbies & Toys
569 Main St
FRAMINGHAM
Fisher R/C
17 Salmi Road
GREENFIELD
Chano Hobbies
40 Bank Row
PH: 773-3300
HANSON
Hanson Hobby, Inc.
830 Main St
LYNN
Hobby City
263 Lynnfield St.
REVERE
Tony's Hobby Shop
90 Kimball Ave
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Jim's Hobbies
22-1/2 Day Street
WORCESTER
Ray's R/C Specialties
12 Sherman St.
PH: 757-5683
MICHIGAN
ANN ARBOR
Rider's Hobby Shop
115 W. Liberty
BATTLE CREEK
Hobby House
508 Riverside Dr
PH: 964-6105
BATTLE CREEK
J T HOBBY
625 Golden Ave.
CHARLOTTE
Hussey's Hobbies
222 Lansing St
PH: 543-4400
COLDWATER
Hobby Heaven
7 So. Monroe
PH: 278-6894
COLEMAN
Long's Aero & Hobby Shop
5812 W. Saginaw Road
DEARBORN
Joe's Hobby Center
7848 Wyoming Ave
PH: 933-6567
EAST DETROIT
Joe's Hobby Center
17900 E. 10 Mile PH: 733-8294
FARMINGTON
Joe's Hobby Center, Inc
35203 Grand River Ave
PH: 313-477-6266
GRAND RAPIDS
Rider's Hobby Shop
2055 28th St. S.E.
HOUGHTON LAKE
Craftsmen's Cove & Tradingpost
5729 W. Houghton Lake Dr
PH: 517-422-5714
KALAMAZOO
Rider's Hobby
3417 So. Westnedge
LANSING
Rider's Hobby Shop
1609 E. Michigan Ave.
PH: 517-485-0700
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RC Hobbies
921 Huron
ROCHESTER
Joe's Hobby Centers, Inc.
Campus Corners Shp. Ctr
105 S. Livernois
SAGINAW
Aerodrome Models Ltd.
2523 S. Miller Road
PH: 517-781-3000
SAGINAW
Roger's Hobby Center
5658 State
PH: 790-0080
Giant Shopping Center W.
SAGINAW
Tait's Hobbies & Raceway
3270 Bay Road
PH: 517-799-3900
UTICA
Henderson's Family Hobbies
2441 Auburn
WARREN
Prop Shop Hobbies
23328 Van Dyke
YPSILANTI
Rider's Hobby
4035 Carpenter Road
MINNESOTA
BLOOMINGTON
Jolly's Hobby & Craft Center
Southtown Shopping Center
LITTLE CANADA (St. Paul)
Hub Hobby Center
82 Minnesota Ave.
PH: 490-1675
MANKATO
Don's Hobby Co
424 S. Front St
PH: 387-1330
RICHFIELD
Hub Hobby Center
6416 Penn Ave. S.
ROBBINSDALE
Hub Hobby Center
4114 Lakeland Ave. N.
MISSISSIPPI
OXFORD
The Model Source
110 S. 11th St
PH: 601-234-9170
MISSOURI
GRANDVIEW
Flo-Mow Hobbies
700 Blue Ridge Ext
PH: 816-761-6471
GREATER KANSAS CITY
Hobby Haven
Metcalf S. Shop. Ctr.
Independence Center,
& 10901 Hickman Mills Dr.
MARYLAND HEIGHTS
Flying Models Hobby Center
2723 Creve Coeur Mill Road
RUSSELLVILLE
Adler Model & Diorama Hobby
113 Railroad Ave
PH: 314-782-4682
ST. CHARLES
Mark Twain Hobby & Craft
1201 S. 5th St
ST. LOUIS
J & J Hobbies
5511 So. Lindbergh

SUNRISE BEACH
J & S R/C
Rt. 2, Box 575
MONTANA
VICTOR
Murph's Hobbies
238 West View Drive
NEBRASKA
BELLEVUE
Gary's Hobbytown
701 Galvin Road 50 No. 103
NORTH PLATTE
Patterson's Hobbies
103 No. Jeffers
PH: 534-1038
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Hobby Cooperative Supply
13225 I Street
WEST POINT
Kruger's Variety Store
113 N. Main
NEVADA
NO. LAS VEGAS
Peterson Hobbies & Crafts
3262 S. Civic Center Drive
RENO
High Sierra Models
953 W. Moana Lane
PH: 825-9098
NEW HAMPSHIRE
AUBURN
CT Hobbies
49 Eaton Road
MANCHESTER
Queen City R/C
780 Hevey St.
PH: 623-8813
NASHUA
Hobby Emporium
Royal Ridge Mall
NORTH CONWAY
C-V Machine Co
Kearsarge St.
SALEM
Bill's Hobby Barn
326 S. Broadway
PH: 603-898-6341
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BOUND BROOK
CJ Hobbies
423 W. Union Ave
PH: 469-6844
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GB Hobbies
706 Bartley-Chester Road
CLINTON
Hobbies To Go
310 Hiway 31 N
Ridge Plaza
MARLTON
Hi Fly Hobbies
Route 70 & Cropwell Road
Marlton Square Shp. Mall
PH: 609-983-8080
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Iron Horse Hobbies
116 Flock Road
MIDLAND PARK
The Hobby Shop
291 Godwin Ave
POMPTON PLAINS
Hobby Hut
887 Rte 23
PH: 835-2077
RANDOLPH
Carl's Hobby Center
508 Rte 10
PH: 366-4300
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Hobbymasters, Inc.
82 White Street
RIDGEFIELD
Ridgefield Hobby
508 Broad Ave.
RIVERDALE
Zeppelin Hobbies
82 Hamburg Turnpike
SUSSEX
Sussex County Hobbies
69 Main St
WILLINGBORO
Willing Hobbies
Country Club Plaza
Beverly-Rancocas Road
NEW MEXICO
ALBUQUERQUE
Valley Hobbies
4522 4th St. N.W.
PH: 345-9688
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ALBANY
Competition Hobby Supplies
67 Exchange St.
BROOKLYN
Brooklyn's Model Masters
1192 GravesendNeck Rd.
PH: 718-743-0700
CANANDAIGUA
Finger Lakes Hobby
222 S. Main
PH: 394-7508
CHEEKTOWAGA
Field's Hobby Center
3523 Union Rd
PH: 681-6440
ELMSFORD
Andy's Hobby Shop
38 E. Main Street
GENEVA
Toys Trains 'N Things
480 Exchange St
ROCHESTER
Dan's Crafts & Things
352 Empire Blvd PH: 654-8388
ROCHESTER
Edmund's Hobby Shop
1521 Mt. Hope Ave.
PH: 442-6430
SYRACUSE
Walt's Hobby & Craft
2 Dwight Park Drive
PH: 315-453-2281
NORTH CAROLINA
ASHEVILLE
Carolina Art, Craft & Hobby
128 Swannanoa River Road
BURLINGTON
R/C Hobby Workshop/Raceway
1368 S. Church
PH: 228-6809
CHARLOTTE
Action Hobbies
2819 S. Blvd PH: 527-2566
GOLDSBORO
Hollingsworth R/C Shop
Rte 14, Box 93 PH: 735-8098
HENDERSONVILLE
The Hobby House
1211 Asheville Hwy Ph: 692-6863
HIGH POINT
Bernie's Craft & Hobbies, Inc.
2291 English Road
KING
King R/C
Five Forks Village Shp. Ctr.
PH: 919-983-3968
MAIDEN
Country Hobbies
Route 2, Box 291

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The Hobby Corner
136-C Oakwood Dr.
PH: 723-3589
NORTH DAKOTA
FARGO
Valley Hobby & Raceway
1543 So. 1st Ave. So.
PH: 701-235-1272
OHIO
AKRON
Miller's Hobby Shop
1018 Kenmore Blvd.
PH: 848-2264
BALTIMORE
Frank's Service
145 Baltimore-Somerset Road
Northwest
BERLIN HEIGHTS
Daniel's Hobbies
38 Center Street
CENTERVILLE
A Hobby Shop
13 N. Main St
PH: 433-7127
CHAGRIN FALLS
Trains, Boats & Planes Co
Stepnorth, 100 North Main
CINCINNATI
Carl's Hobbies
1188 W. Kemper Road
PH: 513-742-5880
CLEVELAND/PARMA
National Hobby, Inc
523 Ridge Rd
PH: 749-2450
FINDLAY
Jinx Model Supplies
721 Rockwell Ave
FINDLAY
Pussy Cat Company
515 Crystal Ave
FOSTORIA
Gene's Hobby
246 E. Eagle St
LAKEWOOD
Wings Hobby Shop, Inc.
17112 Detroit Ave.
PH: 221-5383
LANCASTER
Slater's Inc.
Plaza Shopping Center
1141 N. Memorial Drive
MANSFIELD
John's Hobby Shop
15 N. Main
MAPLE HEIGHTS
Southeast Hobby
5150 Warrensville Ctr. Road
MARION
Lew's Wheels Stop & Hobby
532 W. Center St.
PH: 389-3464
MIDDLEBURG HEIGHTS
American Modeler
7559 Pearl Road
MILFORD
House of Hobbies
204 Main St.
PH: 513-248-8220
NORTH CANTON
Aero Tech Hobbies
902 N. Main
NORTH CANTON
Modeler's Haven
4265 Portage N.W.
PH: 499-6000
PARMA
Hinch's Train & Hobby
7862 Broadview Road
Tri City Plaza
TOLEDO
The Hobby Stop - West
4558 Monroe Street
UPPER SANDUSKY
Jim & Ken's Hobby Shop
14836 CH 53 RR3
PH: 419-294-1712
WAPAKONETA
Dad's Toy Shop
123 W. Auglaize St
PH: 419-738-2007
YOUNGSTOWN
Boardman Hobby Center
6820 Market Street
OKLAHOMA
OKLAHOMA CITY
Campbell's Hobby House
3500 N. MacArthur
TULSA
Action Hobbies
4423 E. 31st St
TULSA
Wings 'N Things
5153 So. Peoria
PH: 745-0034
OREGON
CANBY
Northwest Hobbies
465 S.E. 1st Ave.
CORVALLIS
Trumps Hobbies
2401 N.W. Kings
Timberhill Shopping Center
EUGENE
Eugene Toy & Hobby
32 East 11th Ave.
PORTLAND
Norm's Hobbies Unlimited
4503 N. Interstate Ave
PENNSYLVANIA
BATH
Dick Wetzel's Hobbies
514 E. Main
PH: 837-6881
ERIE
Maxwell's Hobby Shop
5014 Station Road
EVANS CITY
Cranberry Hobby Depot
Cranberry Gardens Plaza
20327 Perry Highway
GETTYSBURG
Gilbert's Hobby Shop
230 Steinwehr Ave
PH: 717-334-5715
HUMMELSTOWN
The Hidden Hanger
145 S. Hoernerstown Road
MARS
Wildwood Hobbies
178 Mars Valencia Road
MONONGAHELA
Red's Model Plane Supplies
147 Taylor Run Road
MORRISVILLE
Z & Z Hobbies & Crafts
229 Plaza Blvd.
422 Pennsbury Plaza Center
PH: 215-736-3361
N. HUNTINGDON
High Tek Hobbies
13380 Rte 30, Ledonne Village
READING
Iron Horse Hobby House
60 South 8th St
READING
Ott's Hobbies
536 N. 10th St.

TAMAQUA
Prop & Wheels Hobbies
139 W. Broad St
WILLIAMSPORT
Growing Tree Toys & Hobbies
115 West Third Street
WARMINSTER
J.C. R/C Hobbies
13 York Road PH: 672-5200
WEST CHESTER
Montgomery Nurseries
Route 162 & Telegraph Rd
YORK
Mel's Hobbies
935 East Market St.
YORK
Skelly Sporting Goods
2227 W. Market St
SOUTH CAROLINA
MYRTLE BEACH
Ed's Hobby Shop
702 Main St PH: 448-8885
PELZER
Hilley's Hobbies
591 Cooley Bridge Road
ROCK HILL
Rock Hill Hobbies
1204 Mt. Gallant Road
SIMPSONVILLE
Golden Strip Hobbies
551 Fairview Road #111
YORK
Bethany Hobbies
2386 S. Hwy 161
PH: 803-222-2756
SOUTH DAKOTA
ABERDEEN
Klein's
408 S. Wilson
RAPID CITY
RCA Hobbies
Route 6, Box 1270
PH: 787-6668
WATERTOWN
Hollon's Hobbies
Route 2, Box 14
TENNESSEE
COVINGTON
M-H Supply
114 Star Shopping Center
KNOXVILLE
M & N Hobbies
1923 Brandville Rd
PH: 525-7532
KNOXVILLE
Tennessee Model Hobbies
6909 Oak Ridge Hwy.
PH: 615-482-2900
OAK RIDGE
Ridge Handicrafts, Inc.
205 Jackson Sq.
TEXAS
AUSTIN
Command Hobbies
6929 Airport Blvd., Ste. 146
BELLAIRE
I and I Hobby Center
6707 Chimney Rock
CONROE
J & K Hobbies
201 Enterprise Row, Suite 101
PH: 760-1966
EL PASO
Hal's Hobby Shop
4886-A Hercules PH: 756-1914
FARMERS BRANCH
Bold Hobbies, Inc.
101 Valwood Village Shp. Ctr
PH: 214-241-6482
FORT WORTH
Bold Hobbies
8220 Bedford Euless Road
HOUSTON
Larry's Hobbies
156-F 1960 East PH: 443-7373
HURST
Roy's Hobby Shop
1309 Norwood
JASPER
Beard's Hobby Shop
400 N. Main St
LAREDO
Border R/C Models
1112 Calle Del Norte
LONGVIEW
Leslie's Hobby Shop
2726 Gilmer Road
McALLEN
B & B Hobbies
521 So. Main St
ODESSA
Odessa TV Video Clinic
805 N. Jefferson PH: 332-2831
ODESSA
The Windsock Hobby Center
Crestwood Shopping Center
3819 N. Dixie PH: 363-0300
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Model Airplanes & Boats Galore
217 Franklin St
PH: 214-786-3008
PORT LAVACA
The Plane Shop
1808 Jackson St.
SAN ANGELO
Cactus RC Hobbies
3122 Sherwood Way
SAN ANTONIO
Clayton Hobbies
5707 E. Mobud
SULPHUR SPRINGS
Hudson's R/C
508 Merrill Drive
WACO
Beverly Hills Model Shop
3421 Memorial Drive
WESLACO
Stanford R/C Hobby Shop
280 S. Texas
VERMONT
NO. FERRISBURG
Yandow's House of R/C
Route No. 7
VIRGINIA
RICHMOND
The Hobby Center
The Shops at Willow Lawn
WASHINGTON
BELLEVUE
R/C Model Shop
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PH: 508-747-8914
BELLINGHAM
Hobby Hive
703 W. Holly PH: 734-4090
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Performance R/C
328 E. Fairhaven Ave.
PH: 206-755-9464
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1175 Gilman Blvd. Ste. 1913
PUYALLUP
All Hobbies
1430 E. Main Suite D
SEATTLE
Webster Hobby Shop
1116 N. 183rd

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345a W. Washington
SPOKANE
R/C Hobbies of Spokane
W. 1104 Wellesley
TACOMA
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CHARLESTON
Fountain Hobby Center
200 W. Washington St
WISCONSIN
APPLETON
Galaxy Science & Hobby Center
756 Northland Mall
FOND DU LAC
Focus
75 S. Main St
GREEN BAY
Modelcrafters
Division of Woodcrafters Wood
& Tool Store
1607 7th St
PH: 414-496-0208
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W7563 St. Cross Ave
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Hobby Craft of Madison, Inc.
6632 Odana Road
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Kundlog Hobbies
104 S. Mill
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ABC R/C, Inc
1441B East Main St.
WAUSAU
Pope's Hobby Land
640 South 3rd Ave
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SAWLF, ALBERTA
Alberta's Littlest Airport
Box 6 PH: 373-3853
CALGARY, ALBERTA
Calgary Hobby Supply, Ltd
Box 3173, Stn. "B"
CALGARY, ALBERTA
P.M.S. Hobby Craft
154-495 36th St. N.E.
MILLET, ALBERTA
Sunset Radio Control
P.O. Box 716
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JB Crafts & Hobbies, Ltd
Box 538, 4816 - 50 Street
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Ritz Bros. RC Supply & Access
1058 B Canada Ave
VICTORIA, B.C.
Royal Oak Hobbies
4464 W. Saanich Road
BRANDON, MANITOBA
R/C Hobbies
48 Confederation
WINNIPEG, MANITOBA
Cellar Dweller Hobby, Ltd.
1354 Main St.
PH: 589-2037
ST. JOHN'S, NFLD
Capitol Hobby Centre, Ltd
6 Freshwater Road
BURLINGTON, ONTARIO
Skycraft Hobbies Inc
141 Plains Rd W.
PH: 416-629-0668
800-263-6331
COURTRIGHT, ONTARIO
Plane Crazy
428 #80 Hiway, RR1
PH: 867-3102
KITCHENER, ONTARIO
Flite Craft Model Co
1585 Victoria St. N.
LONDON, ONTARIO
Flite Craft Model Co., Inc.
1700 Dundas St. E.
MILTON, ONTARIO
R/C Ready Models
175 Mary St
PH: 416-875-1554
SCARBOROUGH, ONTARIO
National Hobby, Inc
1875 Lawrence Ave. E.
PH: 416-755-1766
WILLOWDALE, ONTARIO
Keith's Hobby Shop
5205 Yonge St
PH: 222-4721
CHARLOTTETOWN, P.E.I.
Jim's R/C Supply
132 Nassau St
PH: 368-1655
FLEUREMONT, QUEBEC
Sher-Hobby
1086 12th Ave. Nord
LAVAL, QUEBEC
Carl's Hobby Shop, Ltd
1500 Cure Labelle Blvd.,
Chomedey
MONTREAL, QUEBEC
Can-Am Hobbies
5860 Gouin Blvd. Ouest
PH: 514-332-3566
MONTREAL-NORD, QUEBEC
Passe-Temps Chevalde Troie
13A - 10581A - PIE - IX Blvd.
ST. GEORGES BEAUCE, QUE
Place Bureau Enr.
12515, lere ave. est, Ville de
ST. MARTIN BEAUCE, QUE.
Passe-Temps 107
107-1 Ave. CP97
VILLE ST. LAURENT, QUE.
Hobbieville
902 Decarie PH: 744-6260
REGINA, SASKATCHAWAN
Aero Specialties
200 Shannon Road
SASKATOON, SASKATCH
RC Hobby World
108 - 2301 Ave. C North
Hascamp Centre
PH: 652-4775
AUSTRALIA
SIDNEY, NSW 2232
The Hobby Headquarters
91 Rival St. Kareela
ENGLAND
NORFOLK, NR17 1DG
Pegasus Models, Ltd.
Caston, Attleborough
NEW ZEALAND
HASTINGS
Hastings Model Supplies
523 Frederick Street
THE NETHERLANDS
DEN BOSCH
P. Toemen Model Shop
Minderbroedersstraat 32
PH: 073-140104
NORWAY
PORSGRUNN
B.S. Hobby Import
Lyngv. 3c
SWEDEN
S-871 02 HARNOSAND
Modell Produkter AB
Box 2060

DEALERS: Write For Details On How Your Name Can Appear In This Column

from Bill Northrop's workbench

Winner of "Best of Show," and of course, first in its category, Giant Scale, is this K-10 Shoestring by Greg Waits. He used Bob Morse plans (now from Bob Holman Scale Plans), Dan Parsons cloth and Micafilm, K&B satin epoxy base under DuPont 580s clearcoat. Power is a Sachs Dolmar 4.2 cu. in. on C.H. throttle coupled ignition, with 6-volt, 900 mAH battery. Zinger 22x14 prop. Radio is JR PCM9, with Futaba 9201 and 31s coreless servos. SR 6-volt 2000 mAH battery through JMP 5.2-volt power supply.

• Couple of days ago, this writer started on a model airplane building project . . . the first in quite a few years. Don't get me wrong, I've *assembled* numerous airplane, car, and boat models in recent years, especially since getting into the car and boat magazines, but a strong urge to get back to basics . . . and maybe even find a source of relaxation that hasn't been too easy to come by in recent years . . . prompted me to dig into the back room and come out with a partial kit for a model I last built in 1940 . . . Dick Korda's '39 Wakefield winner, as originally kitted by Megow, selling price (no discounts then), one dollar.

The propeller with this partial kit from Bob Sliff's Hobby Horn, consists of a block of balsa which is 2-1/4 x 1-3/4 x 8-1/2 inches long (that's about as partial as you can get, although it's nice to have wing and stab ribs all neatly machine cut). First you bandsaw the block to establish the hub end, and to get a reduced pitch as you work out toward the tip. Then you get out your good old trusty pen knife and a fine sharpening stone, and begin making balsa chips.

Now it was bad enough having to start carving a balsa prop for the first time in about 40 some years . . . all others since then having been built up from a hub and two sheet blades, or ready made from plastic . . . but on top of that, this was a single blader! I don't remember what came with the original Megow kit, but I'm sure this was the first time I ever carved a prop without one blade or blank to hold onto while hacking away at the other half! There's no safe place to put the fingers of the hand that's doing the holding!

Well, in spite of the "risk," the prop is coming along nicely, thank you, and no sliced fingers from the experience. But while chipping and sanding away, the thought dawned on me (I'd forgotten how prop carving provides just the right atmosphere for relaxed thought dawning, or maybe it was subliminal) that it's almost exactly 50 years since Dick Korda's 43-minute flight literally started and ended the 1939 Wakefield contest. Apparently Korda was the first to fly, and he released the plane into the only thermal that was to appear for the balance of the competition! From that day to the present, the Korda '39 Wakefield winner has continued to be one of the winningest models ever created. Even today, it not only tops Old Timer rubber competition, but has been known to occasionally outfly (though not outclimb) modern, high-tech Wakefields as well.

In memory of this famous model and its builder/designer, various groups around the country are holding special "Korda" events this summer. At the SAM Champs in Jean, Nevada (near Las Vegas), October 9-13, a special event will be held in conjunction with the four-ounce and eight-ounce Wakefield competition for both the '38 and '39 Kordas. An East and West Coast competition will have been completed before this is published, scheduled to take place on the exact 50 anniversary (August 6), as arranged by Dave Platt in the East, and John Oldenkamp in the West. And in the southeastern Pennsylvania area, the S.O.T.S. are planning a Mass Launch for

Who was that guy? He came by our booth at some show this year, to offer this plane (shown with son) for publication. Left photos, but no name. More in text.

Korda Replicas in September or early October. You still have time to contact Fred Bahrenburg, 103 Tower Hill Road, Doylestown, PA 18901, phone (215) 345-8958, to find out when and where.

While we're on the subject, the 34th Eastern Canada Open, to be held in September at the Gananoque Airport, Ontario, will feature a 50th Anniversary contest for replicas of what has turned out to be the forgotten airplane that took second at the '39 Wakefield, Canadian Fred Bower's entry. Contact Peter Mann, 36 Sydenham St., Guelph, Ontario, N1H 2W4 Canada, phone (519)822-9582.

INFORMATION PLEASE

Back in the mid to late thirties, when free flight was the only thing to understand about model airplanes, I built a cabin-type rubber powered fuselage model with twin rudders, from a Burd kit. It had a relatively short nose, and I believe the plans showed how to install a clapper device that was supposed to make the model sound like a gas job. It had about a 30 to 36-inch wingspan.

I used to walk out the back door of the house, to the side road that went through some open farm land in the suburb of our small university town, to fly my airplanes on weekends or summer evenings. Traffic? About one car every ten to fifteen minutes.

Having had experience at this sort of thing, I stopped at the base of the nearest telephone pole to wind and launch the model, knowing that the last place in the world it would go was back to the pole where I stood. Hand winding was the only thing I knew about in those days, so I probably put in no more than two or three hundred turns. You can already guess what the model did. It flew out in a gradual climbing circle, lined itself up on the pole, and made contact just under the few wires at the top. It then proceeded to slide all the way to the ground, nose down at about a thirty degree angle, as if guided on a wire. The only damage was a slight scraping on the top of the noseblock and a couple of knicks in the prop.

Again, experience dictated that lightning doesn't strike twice in the same spot, so another launch was made. You know, if I had made a bet, it would have missed the pole this time . . . but I didn't make a bet, and it did . . . hit the pole dead on and slide down perfectly to the bottom!

No, we're not trying to make a point, and it didn't hit the pole on what was now an *attempt* for three in a row. It went on to put in a satisfying flight. Or maybe we *are* making a point, about the memorable fun you could have on a few bucks worth of balsa, tissue, and a lazy afternoon in the "good old days."

I've looked high and low in the old model mags, checking the Burd ads, but have not been able to find this model. Does anyone recall it? Cabin fuselage, short nose, high-wing monoplane, twin rudders, two-wheel gear. . . .

MORE INFO PLEASE

Over the past month or so, someone, I believe from the northeastern U.S., sent us

Continued on page 106

ADVICE FOR THE PROPWORN
—By Jake

Dear Readers:

Thank all of you who wrote for pointing out that only an idiot would call an oxymoron an aximoron. I realized that "Grammarian in Great Neck" had mixed up his morons, but I chose to print his letter exactly as I received it rather than correcting him in print. It is my general policy to print all letters exactly as received unless they contain profanity or ethnic slurs. (You'd be surprised how much of my mail contains profanity, some of it tape recorded for clarity.) I looked up aximoron, by the way, and it means "stupid Nazi."

Thanks also to Pete Roehling of Redlands, California. for pointing out some of the other oxymorons associated with our hobby. For those of you who missed the original letter, an oxymoron is a multiple word phrase with a commonly accepted meaning, but whose component parts can't possibly go together, such as "jumbo shrimp" or "deficit spending." Pete suggests that "free flight," "radio controlled," and "crash landing" all qualify as oxymorons from the modeling hobby. I went to a "fun fly" once and crashed two airplanes and had a dog lift his leg on my flight box, so maybe that's another one.

Jake

* * *

Dear Jake:

Hi, it's me, Tommy Smith, again. You haven't heard from me for a while because I'm away at camp. Mom and Dad love it when I go to camp. They told me I could stay as long as I wanted. I want to stay four weeks, but they're making me stay six.

I took my model stuff with me so I could still fly my models. I also brought along some super glue in case I had to make any repairs. Which brings me to my problem. I had a little accident in the woods today. Do you know how to unstick a hedgehog from a Jeep?

Your Friend, Tommy Smith

Dear Tommy:

I'm not even going to ask you how you managed to glue a forest creature to an Army surplus motor vehicle, but you better have your folks send you some cyanoacrylate debonder . . . preferably a 55 gallon drum.

Jake

* * *

Dear Jake:

I notice the cat's dish in your workshop says "Feelix." Besides having absolutely no originality in choosing your pet's name, don't you even know how to spell? "Felix" has only one 'e'.

Maurice in Minnetonka

Dear Maurice:

No, Feelix has only one 'i,' but he still sees well enough to catch a few mice and find the litter box.

Jake

* * *

Dear Jake:

I'm a pattern flyer from Arizona. I travel all over the country to major contests. Since I can't afford the extra time to drive, I travel by airline. That means I have to bring my model airplane and support equipment with me in a custom built travel case. It's a pain in the derriere, but it has always worked quite well. Until now.

I was in Chicago recently with my pattern ship. My return flight to Tucson was uneventful and I arrived right on time. My model case did not arrive at all. The airline that achieved this feat started a trace. Four days later they called me with a report. It seems my pattern airplane had visited several exotic ports-of-call since I had last seen it. The itinerary included: Halifax, Nova Scotia; Grand Forks, South Dakota; San Juan, Puerto Rico; Duluth, Minnesota; and Santiago, Chile.

When I finally got it back, the damage was only minor. That means it was run over by a minor truck, not a major one. The airline, of course, refused to pay any damages, but they did want to bill me for a customs duty which had been charged at an airport in Chile.

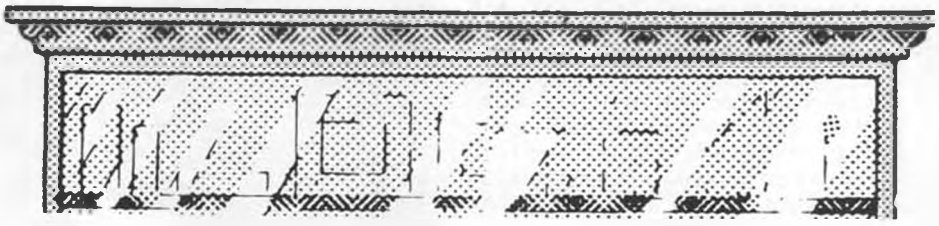
My question is . . . Do you think I hold the record for air miles by a model airplane?

Tony, Near Tucson

Continued on page 107

OVER THE COUNTER

All material published in "Over the Counter" is quoted or paraphrased from press releases, furnished by the manufacturers and/or their advertising agencies, unless otherwise specified. The review and/or description of any product by MB does not constitute an endorsement of that product, nor any assurance as to its safety or performance by MB.



• Sport and Pattern R/C fliers will be especially interested in this first of several new products we have for you this month: Futaba Corp. of America has just introduced the new YS-Futaba .61F Long Stroke engine, intended as a direct replacement for the highly regarded YS .60F. The new engine is being offered in both side and rear exhaust versions and incorporates the "long stroke" design currently favored by many top Pattern fliers. The new carburetor is an offset butterfly type said to produce a linear throttle response. Of course, the most novel feature of YS engines, the integral fuel pump, has been retained and appears to be the same as used on the older YS .60F.

Specs on the engine include a bore and stroke of 23 and 24mm respectively, an all-up weight of 565 grams, and a practical rpm range of 2,000 to 18,000. The mounting bolt pattern on the new .61 is the same as on the .60.

Those interested should contact Futaba Corp. of America, 4 Studebaker, Irvine, California 92718 for more information.

* * *

From Great Planes Model Distributors comes word on a couple of new items. First is the Hobbico "Super Starter," claimed to have 25% more power than the original Hobbico Deluxe 12-volt starter. The machined aluminum drive cup is designed to work on just about anything with an engine in it; there's a V-groove for belt starting on boats and helicopters, a ridge groove for car starter wheels, and of course the usual rubber cup insert for airplane spinners, outboard boat engines and helicopters with starter cones.

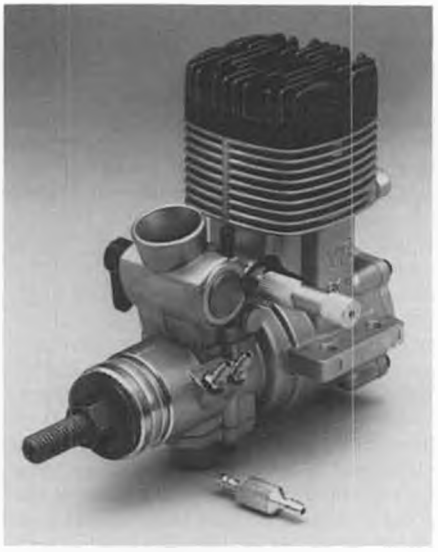
Great Planes is also importing the latest powerplants from O.S., the pump-equipped .46 SF ABC-P and .46 SF-P, the latter being a ringed engine. The remotely mounted pump works by crankcase pressure, same as the original .61 size pump, but this new one is smaller and lighter. Both versions of the .46 pumper are equipped with new carburetors specifically designed to match the pump's fuel delivery for maximum performance. For the most consistent and reliable engine runs, this new O.S. pump system sounds like the way to go.

The last bit of news from Great Planes concerns O.S. engine warranty. In the past the warranty was limited to 90 days; this has now been extended to an unprecedented *two years.* In short, the coverage warrants all O.S. engines to be free of defects in parts and workmanship under normal use for two years from the date of sale to the original purchaser. The authorized O.S. service and warranty center is Hobby Services, 1610 Interstate Dr., Champaign, Illinois 61021; full details, including the procedure for filing claims, can be obtained from them.

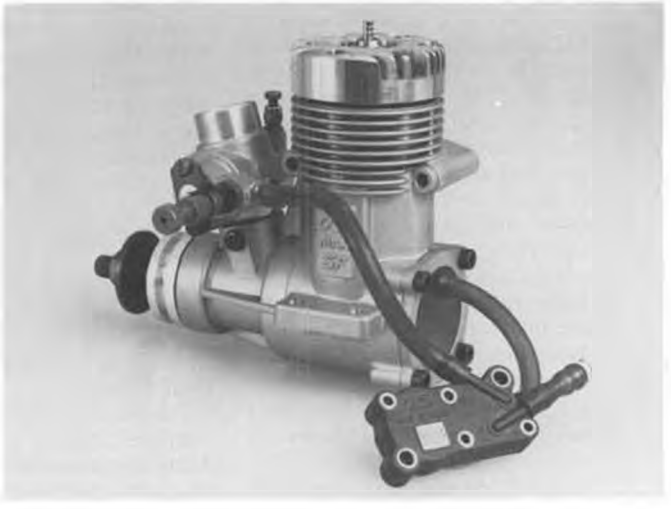
Great Planes Model Distributors, P.O. Box 4021, Champaign, Illinois 61820.

* * *

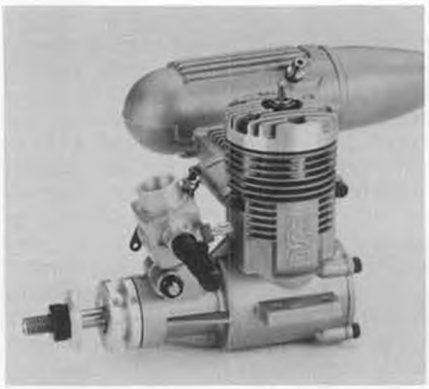
Optional collective pitch head for Hobby Lobby's MFA Sport 500 R/C helicopter.

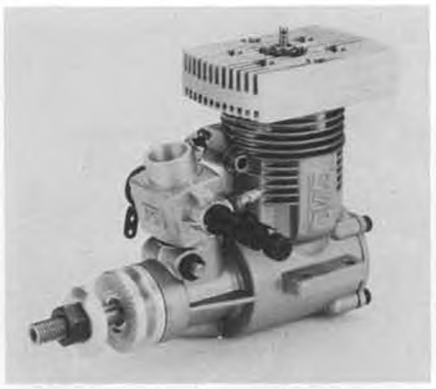


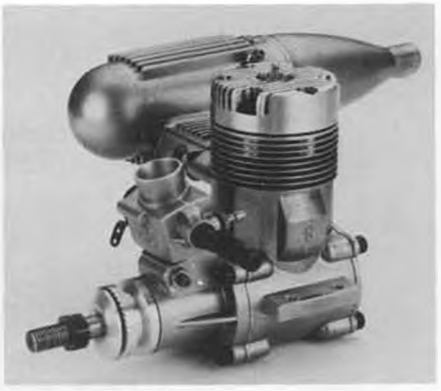
New YS .61F Long Stroke from Futaba, available in side and rear exhaust versions.



Two new items from Great Planes Model Distributors are (above) the Hobbico Super Starter, and (right) pump equipped O.S. .46SF engine.







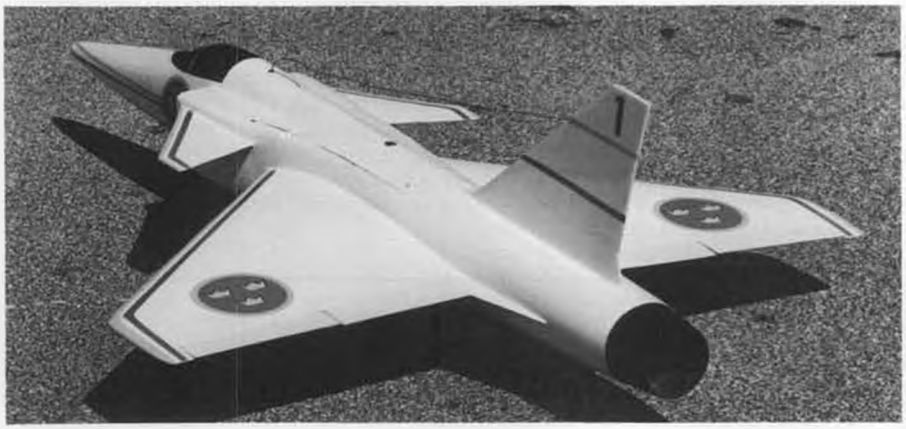
Latest additions to the World Engines line of imported ASP engines include the ASP .46 FSR ABC in both airplane and helicopter versions (left and center respectively), and the big ASP .61 airplane engine.

An outfit by the name of Mike's Models is in the process of developing a line of R/C ducted fan aircraft kits, the first of which to be unleashed on the modeling public is a stand-off scale model of the interesting SAAB JAS-39 "Gripen" fighter. As the photo shows, this aircraft has a delta/canard configuration that is claimed to make the model very stable and free of any nasty stall characteristics. It's designed for five-inch fan units and .60 to .80 size engines; other specs include a span of 42 inches, length of 66 inches, and a flying weight of around eight pounds.

The model Gripen is built mainly of foam and fiberglass. Included in the kit are molded inlets, thrust tube, and tail cone; all necessary wood, adhesives, hardware, full-size plans, and complete instructions. Performance to date has shown a moderate top speed of 130 mph using a Rossi .61/Dynamax fan combo; this would no doubt go up considerably by using a bigger engine such as the Rossi .80 ducted fan motor. Slow speed handling on the Gripen is said to be excellent.

For more information you'll have to contact the manufacturer directly: Mike's Models, 4245 N.W. 114 Ave., Sunrise, Florida 33323. Don't forget to send an SASE with your inquiry.

Also new from World Engines is the "Black Eagle" electric ARF.



The SAAB "Gripen" ducted fan fighter from Mike's Models.

* * *

The latest catalog (#14) from Hobby Lobby is now available and the best part is that it's free for the asking! Call or write for your copy today.

There are lots of neat and interesting items in Hobby Lobby's catalog, items you won't find anywhere else, but there's one in particular we want to tell you about because it ties in perfectly with James Wang's review of the MFA Sport 500 R/C helicopter elsewhere in this issue. The Sport 500 is an inexpensive fixed-pitch beginner's .40 to .45 size machine manufactured in England and imported to the U.S. by Hobby Lobby. Aspiring chopper pilots who may be attracted by the low price but may not be too crazy about the fixed-pitch feature will be happy to learn that the Sport 500 is now available with a collective pitch head, which provides more precise and instantaneous altitude control and also allows autorotation descents. The collective pitch head and autorotation kit are also available as a retrofit accessory for those who may want to update their existing fixed-pitch Sport 500 to a higher performance machine.

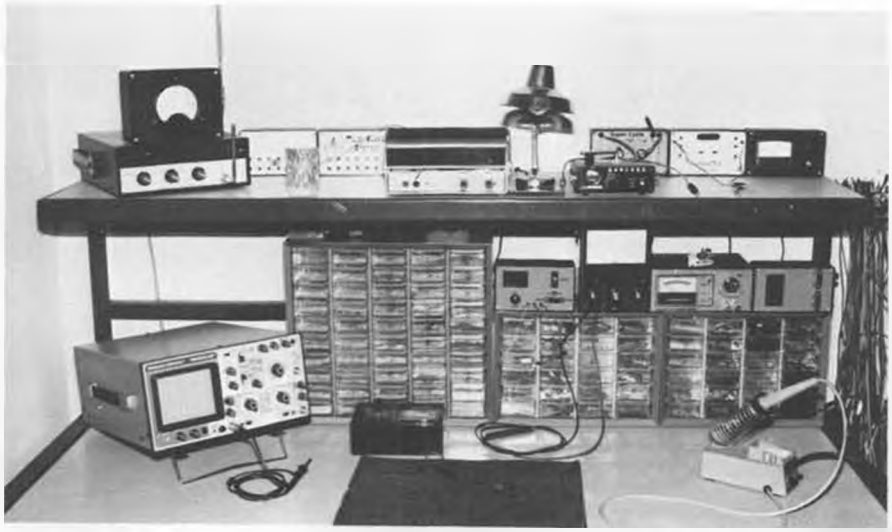
Full particulars and pricing are included in catalog #14. From Hobby Lobby International, 5614 Franklin Pike Circle, Brentwood, Tennessee 37027, (615)373-1444.

* * *

So far this month we've told you about two new engines being put on the market—now here come three more! World Engines has announced three additions to its line of imported ASP motors. Actually two of them are basically the same; the ASP .46 FSR ABC is available in both airplane and helicopter versions, the only real difference being the heat sink head on the latter. The .46 is an entirely new engine, not just a bored-out ASP .40. The crankcase has been completely redesigned into the two-piece unit seen in the photo. All im-

Continued on page 64

Latest modeling book offered by Zenith.



Electronics Corner

By ELOY MAREZ

NITINOL

Sounds like a cold remedy, doesn't it? As pronounced, "night 'n all," it reminds me of a girl I new in New Zealand! Well, much less exciting, but still with some interesting features, Nitinol is a nickel-titanium alloy, one of a group of metals referred to as a "Shape Memory Alloy." Such metals react sharply to changes in temperature, with accurately predictable and controlled effects. The subject is raised by Jim Petro, of Gary, Indiana, who writes:

"Most of my flying is across the street in a schoolyard, so small planes are necessary. The Mattel/Ace pulse is a lot of simple fun, and I have thoughts about indoor electric using a tiny receiver rescued from a tabletop R/C car. The hard part is making/finding a small, light actuator. A thought that I would like to throw out for discussion is using Nitinol memory wire similar to the enclosed sketch.

"Very light, small, and simple . . . if it works!"

Well, Jim has thrown down the gauntlet, and Wee R/Cers are not ones to ignore a challenge, are they? Let's look further into this interesting possibility. However, this discussion is going to center not on Nitinol, but on "BioMetal," a newer generation SMA. And no, I haven't started to invent meaningless acronyms as I spoke about last month; SMA is the standard abbreviation used in that particular industry, one which you will find liberally sprinkled throughout the literature obtainable from the companies which I will tell you about shortly. Anyway, BioMetal is claimed to be more reactive than earlier SMA's and as such seems a better choice for this particular application. BioMetal wire, like all other SMA's, has a property that is useful to Jim's proposal: it will shorten in length when subjected to an electric current.

At this point, Jim's idea begins to make sense, doesn't it? In both of his schemes, when current is applied to the SMA wire, it will shrink and pull the control surface over. Though he doesn't mention the fact, obviously the wire/cable on the other side would have to give some for the surface to move, which would have to be compensated for with a spring or stretch in the cable. Quite frankly, I myself have not done any work with this material, but I saw its possibilities when I was first exposed to it at an electronics show last year and immediately added all available materials to my files. I did throw the thought out to Georgia Wee R/C guru, Fritz Mueller, who responded with the thought that current demands were too high and response too slow. Be that as it may, I'm sure that Fritz will be the first to agree that with enough heads working on any subject, if a solution exists it will be made to surface, which is why I am presenting it here to the rest of you.

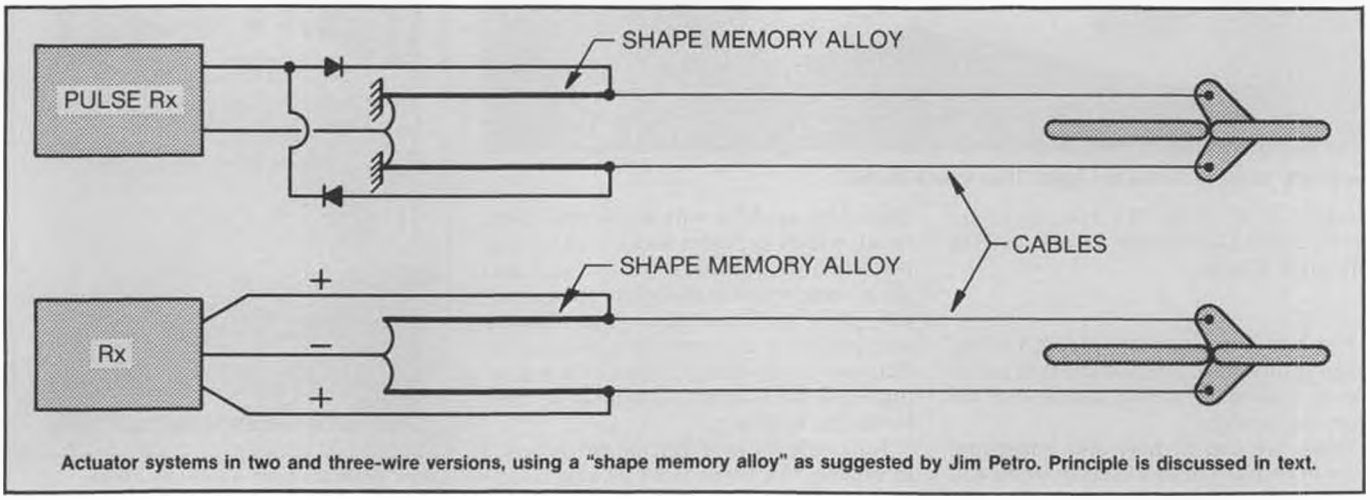
Let me quote how the manufacturer describes BioMetal: "This innovative metal fiber flexes like human muscles when electrically stimulated. BioMetal is the approximate size and weight of a human hair, yet stronger than steel. The material can react within one-thousandth of a second and can repeat its performance up to 500 times per minute. Fatigue tests demonstrate that the corrosion-resistant, durable fiber can flex in excess of 20 million cycles."

Obviously, this metal can be produced in any size and shape, though the most effective size, certainly one which we can use if at all, is a five (.005-inch) and six mil (.006-inch) wire. The obvious questions are: 1)what are the current requirements, and 2)how much power is exerted as the wire shrinks. Again, let me quote from the maker's literature:

"What about BioMetal's resistance and current requirements? Resistance changes with the diameter of the wire. Six mil BioMetal has a resistance of about one ohm per inch, and can be heated with around 1/4 amperes. This varies with many factors and is best measured for your specific application.

"How much can BioMetal pull? This is a very complicated question. The stress and strain, along with the thickness of the wire, are combined in various ways to make this answer difficult. Currently, tests are under way to provide accurate information for engineering purposes. However, in very rough terms, BioMetal currently comes in five and six mil diameter wires. The work-

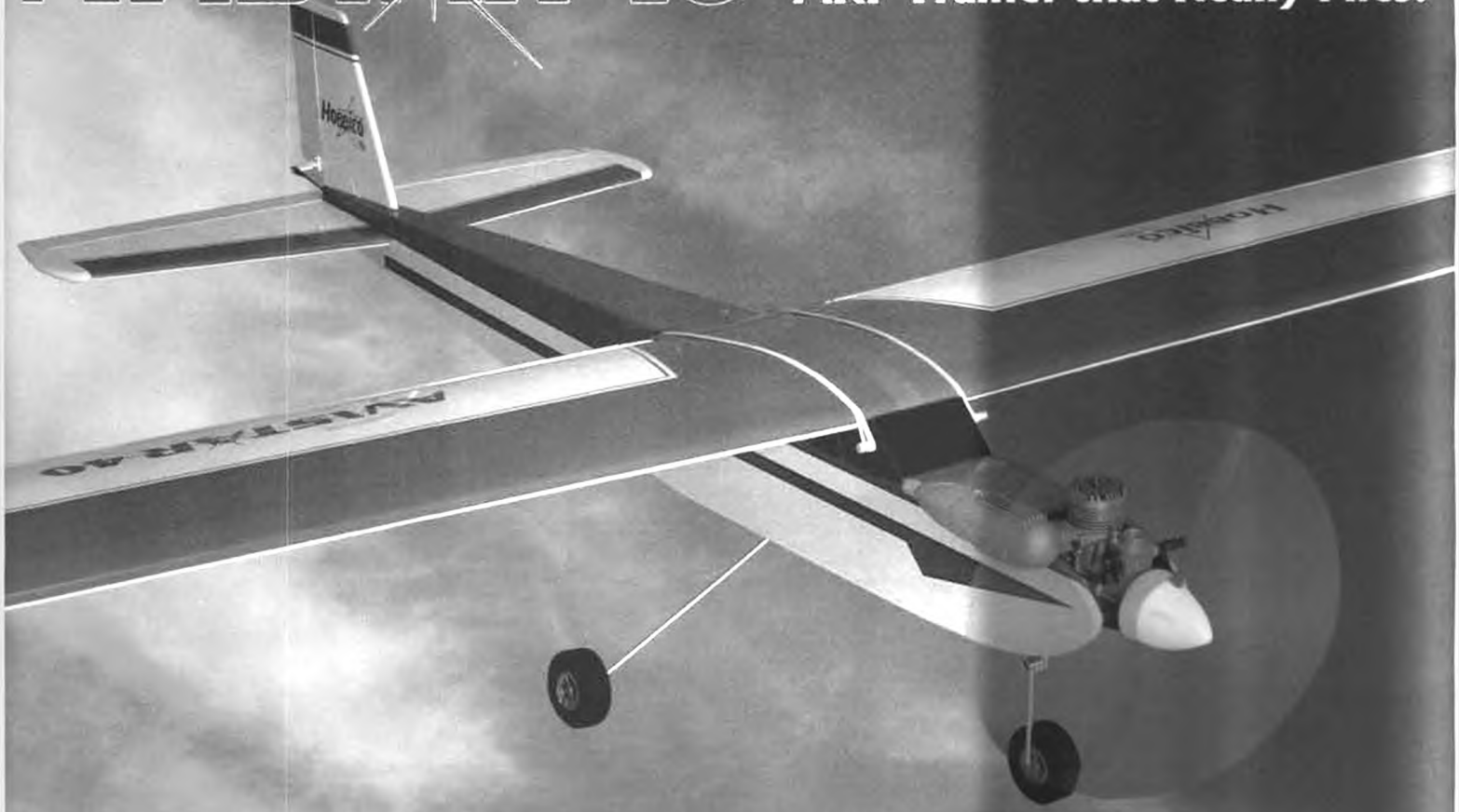
Continued on page 73



Actuator systems in two and three-wire versions, using a "shape memory alloy" as suggested by Jim Petro. Principle is discussed in text.

HOBBICO™ AVISTAR 40™

Build-It-Yourself Quality in an ARF Trainer that Really Flies!



No short cuts have been taken in the design of the new **Hobbico Avistar 40** ARF trainer. After brief assembly, it offers you an ARF with hand-crafted quality. Boasting premium all-wood construction, pre-covered with strong and impressive red, white, and blue polyester film, the Avistar 40 is one of the most attractive fliers at any airfield.

When the hard work has already been done, and all the required accessories are included right in the box, there's really only one thing left to do. Have some fun learning to fly!

For the flier in you, not the builder.

The 60" span Avistar 40 flies slowly and gently, so your early flights are very much under your control. Excellent recovery characteristics offer the margin of safety most new pilots appreciate. This trainer also practically lands itself. The Avistar 40's durable construction and smooth flying qualities will allow you, with practice, to take full advantage of its semi-symmetrical airfoil and perform some aerobatics.

Only with the new Hobbico Avistar 40 can you get hand-crafted quality in a trainer that takes only a few leisurely evenings to complete. Best of all, this ARF really flies!

High-quality pre-built parts assemble quickly for an ARF trainer that looks hand-constructed.

The Avistar 40's wing is all-wood, pre-covered with strong polyester film for added durability.

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P.O. BOX 4021, CHAMPAIGN, IL 61820

The calm before the storm. Booths are all set up, and exhibitors are visiting among themselves before the onslaught of the general public on Saturday. Flying area is visible just to right of balloon, and giant car track is further back and to the left.

SECOND ANNUAL IMS Atlanta

By STU RICHMOND

• Sherman, in his (in)famous march to the sea, burned Atlanta to the ground over a hundred years ago. The saying later was . . . "save yer Confederate money, boys, the south will rise again!"

And the south and Atlanta ARE still rising in prominence . . . and the Atlanta IMS Show is rising with it now. The show had a hurried 1988 start that was well supported by the hobby industry. For 1989, the show moved to a still bigger hall in the Georgia World Congress Center, just a few blocks off Peachtree Street, again was well supported by the industry, and this year the attendance really spurted up as the Southeast's modelers came, saw, and now believe!

And here they are, ready to storm the gates! IMS "discovered" Atlanta, and now the southeast modelers have "discovered" IMS! Saturday's attendance was more than triple that of both days total for the first show in 1988. IMS was also "discovered" by TV this year.

The '89 show was open to the hobby retailers on Friday, May 12th . . . it was an ideal chance for any size hobby retailer to talk one-on-one with the industry's big guns, to see and touch their stuff, and to place orders. On Saturday and Sunday, May 13th and 14th, the turnstiles opened to the model building public and attendance shot up over the first year. My wife, Lynn, and I ran the static model display sections, checked in the entrants, and stood guard over the areas for the three days. On the first day it was evident the model display would be at least three times bigger than the '88 opening . . . and so was the attendance and so was the overall activity of '89's IMS Atlanta.

The hobby industry realizes the best way to increase sales is to be at these regional hobby shows . . . to show their products . . . to introduce their newest goodies . . . and to let you see and touch their stuff. These shows are like visiting one of the world's biggest hobby shops . . . where practically everything is in stock. Some of the hobby industry's smaller manufacturers (and a few large ones too) will often bring a limited quantity of their brand new products and offer them for sale at bargain

Ralph Malott, of World Engines, removed from his model the very first ASP .61 in the USA to bring to the show. The smaller ASP .40s have proven to be fine values. A few of them have been seen on the Quickee 500 racing circuit. The ASP engines are precision made in China, and World Engines has plenty of parts in stock.

IMS has a fledgling swap shop that's sure to grow. The IMS Pasadena swap shop occupies several large rooms. Here's Red Garlough, who manages both IMS shops, showing Neut Heuberger, Fred Mulholland, and Tom Gealta a rare 1946 U-Control Hornet Speed engine. Swap shops always have super values!

I was privileged to see test flights on video tape in April '89, made by Byron design engineers, featuring their prototype Ryan ST . . . one of the all-time beautiful aircraft designs. Here's the final product in dress colors, as now being shipped . . . Super Tigre 2500/3000 is ideal power. The video tape showed the model to be a better flier than the engineers had dreamed.

Airtronics' best selling radio is its fine Vanguard series matched to the new dual conversion receivers we all must have in 1991 to be able to fly together. But for those who want the very finest American electronic engineering mated to made-in-Japan mechanics, you must consider the new Vision set Jack Albrecht is holding . . . It's a winner!

Cox Hobbies showed the prototype of its new, under-$100, R/C gas engine powered car. Real fine engineering, and it has a muffled .049 over the rear axle.

basement prices to get them out and in use to further increase the demand for these new items in addition to magazine advertising. It's a smart way to advertise . . . and model builders everywhere are learning to bring money to these shows to scoop up the bargains. I saw a lot of smiling faces carrying out Lanier kits, PIC cyanoacrylates, the new Fox .40 R/C engine, all sorts of stuff from Indy R/C . . . and on and on. Those who came without hobby dollars missed out.

IMS Atlanta was also an opportunity to get a free AMA transmitter check . . . and to meet the AMA Superstars of modeling . . . like Keith Shaw, Dave Shadel, Horace Hagan, Dave Platt, Brian Agnew and others. These guys are human . . . and they love to talk modeling with you. •

The "5151," which is the current delight of the ultralight/homebuilt/kit enthusiasts, was a last-minute display at the show, brought by owner/manufacturer Mike Loehle, and was extremely popular. It's built just like a model, only bigger materials are used. More info in last month's "Workbench."

Here are two friendly competitors we got together for a single picture. Smiling Aurora Parkinson is touching the unfinished show model of Bob Parkinson's Flying Models made up in Canada . . . and on the left is genial Jim Parrish of Parrish Aircraft and Scale Models in Plantation, Florida. Both models are sorta-scale and sorta-jet easy builders that use a regular two cycle model engine up front. Who sez this ain't one big and great hobby?

Duke Fox used IMS Atlanta to introduce (in his right hand) what he calls a "mild-cam street version of my firebreathing Quickee .40 racing engine." It's for the sport flier who wants a bit more power than his Fox 40 Standard. His other hand holds the very first Eagle IV .61 which is becoming available as you read this. The new Eagle has a number of refinements and carries several polished surfaces too.

The Hobby Lobby/Graupner "Systems" model struts its stuff in the generous 32x48-foot boat pond. It's electric powered and very fast!

The Static Model Competition featured a growing array of excellent models for the 48 categories. Low platforms for the displays weren't ready this year, but will be for May 18, 19, and 20, 1990.

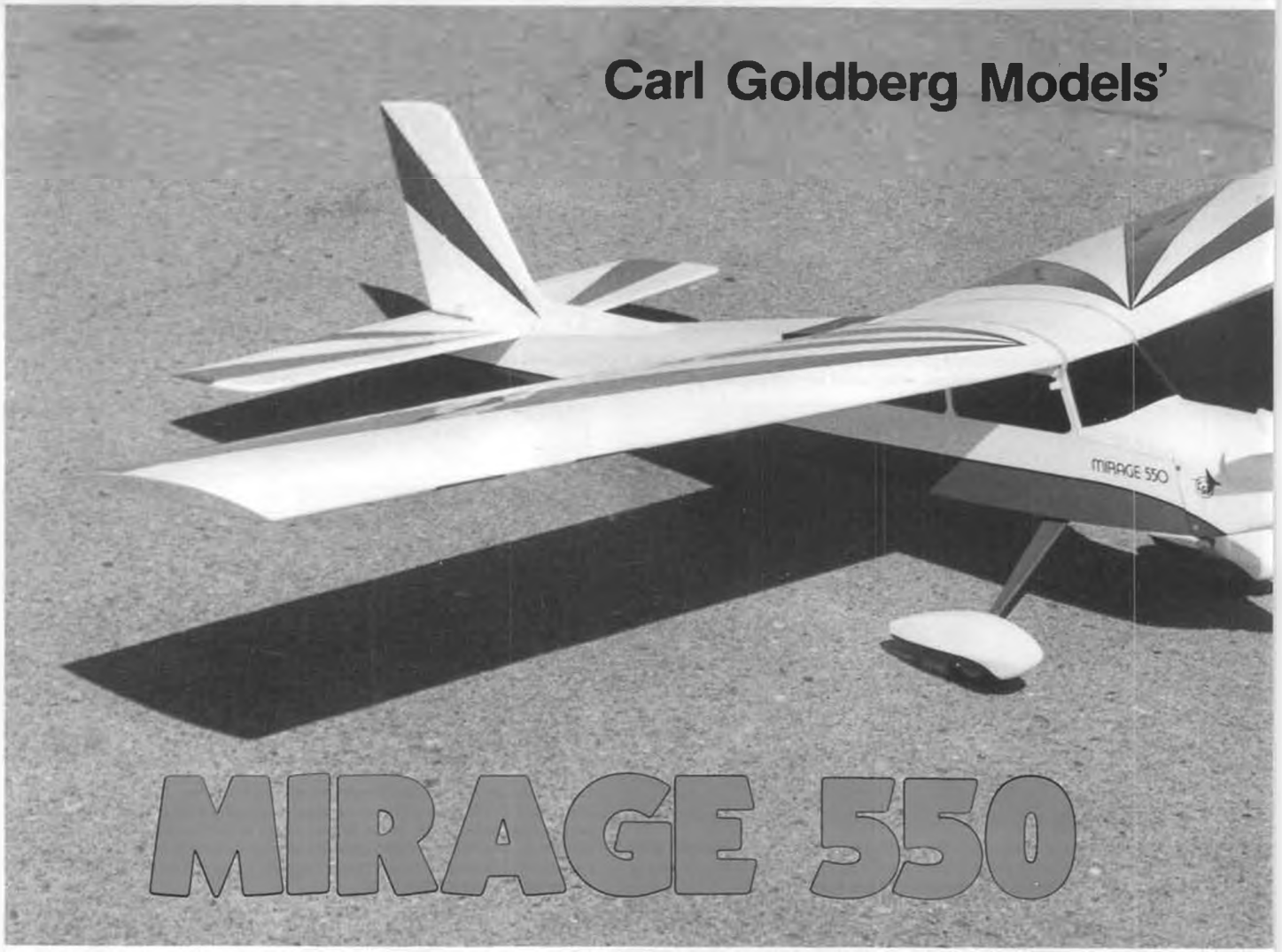
Organized racing was held throughout the two public days of the show. A pit area was set up near the track; both a convenience for the drivers, and an added attraction for the spectators, who could see what goes on behind the scenes at a race. Special heats set aside for exhibitor demos.

Greg Namey, part of Innovative Model Products, Margate, Florida, with latest kit plane, the long-nose, Focke Wulf 190. Innovative is one of many exhibitors that sell direct to consumer at the trade shows.

Dave Duncan is the Chief Engineer at Cox Hobbies. Just wait till you see the neat Fairchild 24 with clever blow-molded fuselage and hollow foam wings. It should weigh under 22 ounces at takeoff and be available as you read this. The Marine helicopter climbs up over two hundred feet, has a parachutist (hanging from Dave's fingers) jump out and the chopper and chute both start to descend.

California's Grande Queen of model building, Addie Naccarato, put on live flying demos each day, with the Black Sheep Exhibition Squadron, of Burbank. Addie's holding a C/L Seafire. Like others in demo, it's powered by a simple ferrite electric 540-type motor, and six 270 mAH cells. Quiet fun! (Right) IMS opted to use extra wide, 10-foot aisles to reduce the traffic problem. It worked . . . most of the time . . . note bunching at top of photo. Violett, Fox, Horizon, Mallory, Byron visible in this photo from meeting room overlooking show hall.

Carl Goldberg Models'



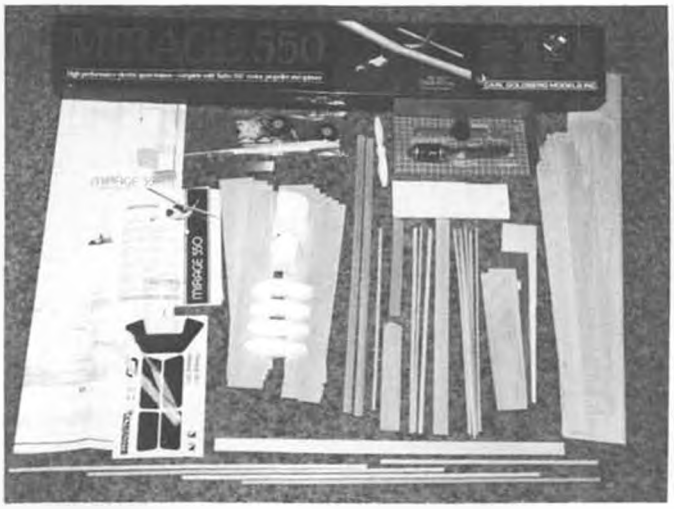
MIRAGE 550

• Contrary to popular belief, a model airplane does not have to resemble the box it came in to be a good trainer. Balderdash, you say? Well, may I offer as evidence the Mirage 550, the newest electric aircraft from Carl Goldberg Models Inc.

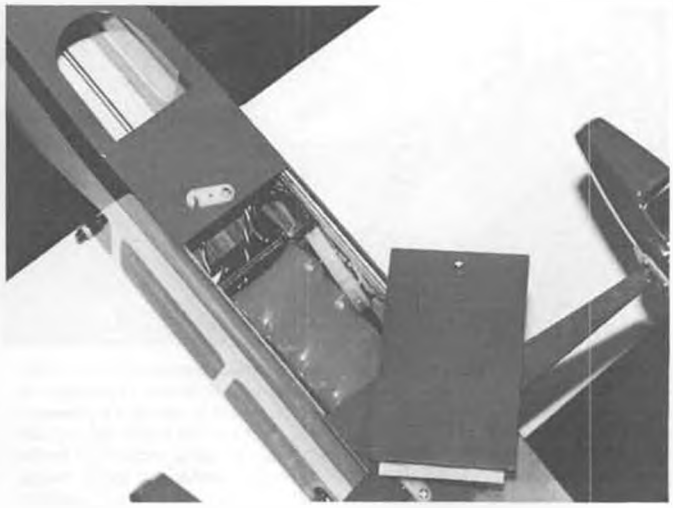
Third in a series of electric powered planes produced by Goldberg, after the Electra and Sophisticated Lady (with power pod) the Mirage has been designed as a two or three-channel sport trainer. The model uses the Goldberg (Mabuchi) Turbo 550 motor that is also used in their other electric kits. Looks aside, this little ship is up against some pretty stiff competition in the electric trainer field so let's see how she stacks up.

THE KIT

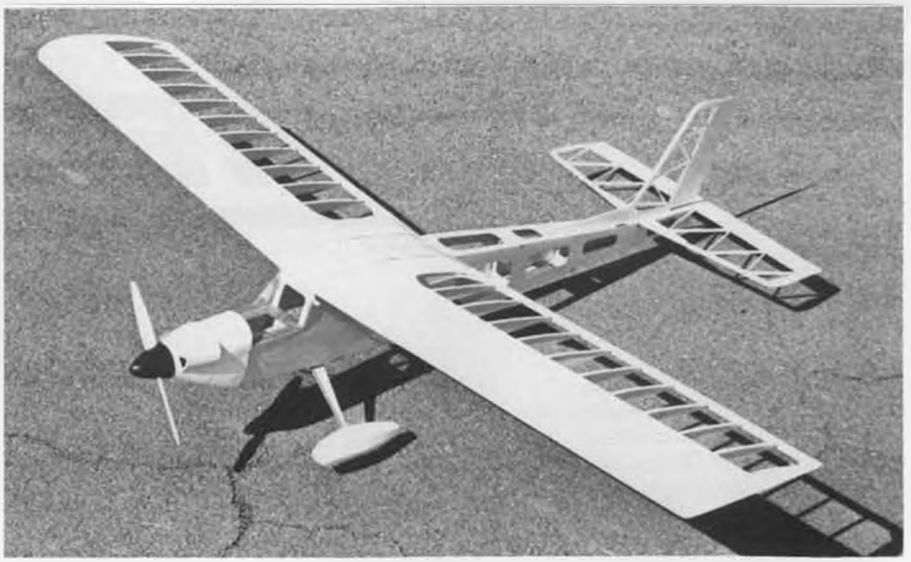
The more I rummaged around in the box after opening, the happier I became since not only is this kit, for all practical purposes, as complete as possible, it is also of first rate quality which is remarkable for such an inexpensive high volume unit. All of the balsa and plywood parts supplied were lightweight, with no evidence of die-crunching, all such parts being removed from their sheets without the aid of a razor blade. A couple of nice touches, among



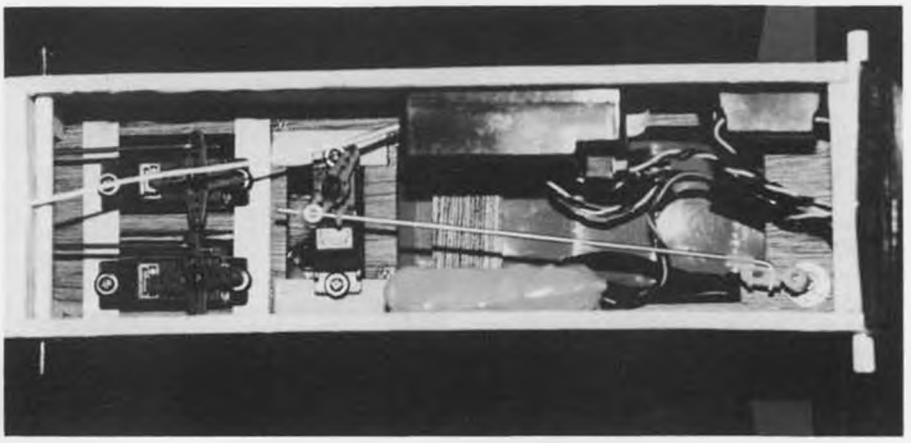
The Mirage kit comes complete with Turbo 550 motor, prop, spinner, all hardware, and a molded plastic cowl, canopy and wheel pants.



Access to the motor batteries is through a hatch in the fuselage bottom. Opening just aft of the hatch is an exit for battery cooling air.



Construction of the Mirage 550 is entirely conventional, with a capstripped D-tube wing and sheet balsa fuselage—note cutouts in fuselage parts for lightness. Span is 54 inches, weighs 50 ounces.

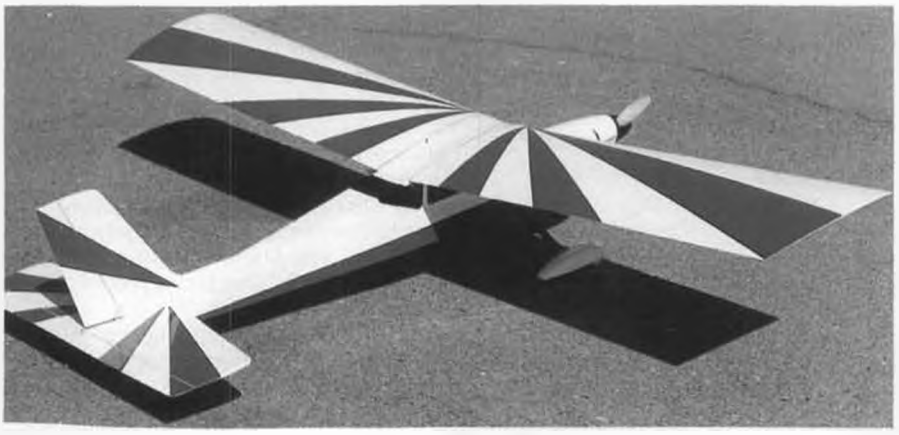


Skip's model uses a Futaba Conquest radio with S-33 micro servos. Larger servos will fit easily, but be careful about adding excess weight—it can noticeably detract from the model's performance.

By SKIP RUFF

many, are the pre-formed leading edge stock and pre-cut shear webs. Full-size plans, along with a fully detailed and illustrated 79-page construction manual that covers everything you need to know about building and flying, are provided along with the previously mentioned motor which comes pre-wired to the on/off switch, fuse and Tamiya connector. The list goes on with the prop, spinner, threaded rods, clevises, hinges, horns, vacu-formed windshield, cowling and wheel pants, sticky vinyl decal sheet, wheel collars, wheels and assorted other small items such as screws, keepers, etc. Regarding the wheels, they are custom versions of Dave Brown's Lite-Flite units, being only 2/3 as wide and therefore lighter than the over-the-counter items.

Required to complete your model to flight-ready status will be the radio (preferably lightweight and at least three-channel), a motor battery and charger, finishing materials, and adhesives; all items where everyone pretty much has their own personal preferences.



BUILDING

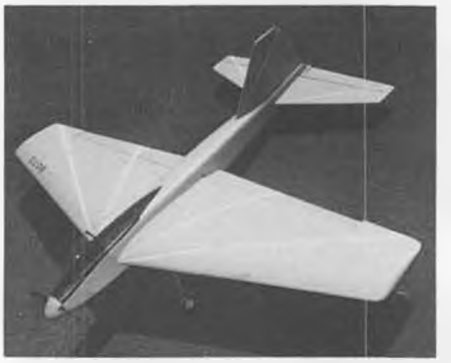
You should have no problems here! Everything is well covered in the manual and plans. Although the wing is of rather robust construction, with hardwood spars separated by shear-webs, the rest of the model is quite lightly built, being only as strong as it needs to be. I was pleased with how well everything fit together, the fuselage especially. The plywood and balsa pieces all have locking tabs for alignment and it is virtually impossible to build it crooked. This precision also applies to the very lightweight plastic units which fit together and on the model just right, and are, to a large extent, responsible for the outstanding good looks of this aircraft. To be sure, the lack of an engine cylinder and muffler sticking out somewhere to ruin the clean lines also helps.

I made only two minor modifications during construction; one being to install a steerable tailwheel, instead of the fixed one supplied. It's not necessary, but it can come in handy, especially if you choose to use a speed control now or in the future. The other was to add a small crosspiece to the front of the motor bearers to prevent

Continued on page 69

ELECTRIC POWER

By MITCH POLING



Electric pattern ship by Woody Blanchard uses a Graupner Ultra 1600 motor on 14 cells.

• Francis Reynolds had a challenge for me; compare gas to electric directly. Frances writes the "Model Design and Technical Stuff" column for *Model Builder* and he has a habit of asking simple questions that are hard to answer! The equation in George Abbott's article on propellers in the August 1988 issue of *Model Aviation* came to mind immediately. This equation says that the horsepower absorbed by a propeller is given by the rpm cubed times pitch times diameter to the fourth power, divided by a constant (1.4 times 10^{17}). Pitch and diameter are given in inches. I have used this equation a lot, and it has been very consistent and given results that make sense. However, Francis has come up with several tests that say the power should be to the fifth power of the diameter. Are there any aeronautical engineers who can clear this up? If so, drop me a line care of *Model Builder*, as I would certainly like to know. At any rate, a very timely article on mufflers in *Radio Control Modeler*, June 1989, by David Abbe, had a very complete chart of rpm and props for all sizes of glow engines. I also have a chart for the Astro cobalt motors from Astro Flight. This gives me enough to compare gas and electric directly. I am going to assume that the Abbott equation is right, as it has worked well for me. I prefer watts rather than horsepower; the conversion is 746 watts per horsepower, so multiply the equation by 746 for watts.

The accompanying table shows some of the results.

This is about as direct a comparison as I have seen anywhere. It would be nice to be able to say what props were used on the electrics, but that is not specified in the Astro sheets. As you know, I recommend Graupner props for electrics. These are available from Hobby Lobby. My conclusion is that the Astro labels are what Astro says they are, comparable to plain bearing (bush) gas engines. This makes sense when you fly the planes too, the Astro motors fly the RTF planes I use in a very similar way to the gas engine specified. That is, if a plane asks for a 40 gas, you can use an electric 40 in it. The question I am always asked is: "What motor can I use in this plane?" The answer is simple: use the Astro motor with the same number on it as the gas engine usually used. It is surprising how many gas fliers would like to use 100 watt (05) motors in a 40 gas plane! Usually the question comes in the form of, "If I use a geared 05, can I fly the 40 plane?" No, the gearing does not change the picture, as the tables show. You can run geared motors at higher power levels, but only if you increase the number of cells and use a smaller prop. I think you could boost a 100 watt motor to a 200 watt motor this way (05 to a 15), but I have not tried it. If you do, be sure to use the Astro gear boxes, most other gear boxes will not take the strain. The real pioneers in boosting 05 motors are the drag racer folks; they have been doing a lot of this type of work. I don't know the details, I think most are using between 10 to 12 cells. I do know the Astro Turbo 05 holds the current drag racing record (over 60 mph).

Back to the main point! There are some interesting quirks in the electric tables.

Also from Woody Blanchard comes this photo of his Savoia Marchetti S35X flying boat, a very unusual and successful six-footer powered by two Mabuchi 550 ferrite motors.

POWER OUTPUT: GAS VS. ELECTRIC

Gas Engines (David Abbe, RCM, June 1989)

Engine	prop	rpm	watts output
O.S. 61 SF	12x7 Graupner	11,000	1030 watts
O.S. 50 FSR	11x8 Graupner	10,800	786
O.S. 40 b	10x5 Graupner	12,200	484
O.S. 25 AEC	9x4 Graupner	13,700	360
O.S. 25 b	9x4 Graupner	12,300	260
O.S. 15 b	8x5 Graupner	12,200	198
O.S. 10 b	7x4 Graupner	13,300	120

Note: b = bushed bearings

Astro cobalt motors direct drive (Astro info sheet)

Motor	prop	cells	rpm	watts output
Astro 60	13x8	28	9,000	888 watts
Astro 40	10x5	18	11,500	405
Astro 25	9x5	14	10,000	175
Astro 15	7x4	12	16,500	230
Astro 05	7x4	7	14,500	156
Trinity 05	6x3	6	15,750	81 (my data-MP)

Geared Cobalt Motors (Astro info sheet)

Astro 40	13x8	18	6,600	350 watts
Astro 25	13x8	14	5,800	238
Astro 15	11x7	12	7,500	230
Astro 05	11x7	7	5,500	91

Continued on page 73

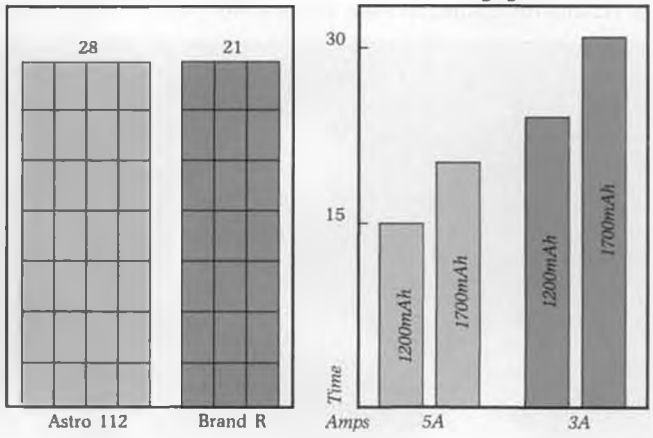
Charge the Big Ones Fast

The Astro Model 112 DC/DC charger is specially designed to charge BIG ELECTRIC SYSTEMS FAST. No more waiting around for hours trying to charge the twenty eight cells in your Quarter Scale Cub. No more removing the wing to take out the four battery packs so you can charge them one at a time. Now you can charge all twenty eight cells (44 volts) at the same time. Just plug the astro Model 112 into the charging jack on the side of your model, set the timer for fifteen minutes and relax. Our high power precision electronics will do the work.

For versatility the Astro Model 112 can't be beat. It can charge any nicad battery with as few as one cell or as many as twenty eight cells. And the Constant Amp Charging Circuit is adjustable from one to five amps, so you can safely charge 250 and 500ma receiver packs, 900 and 1200ma airplane packs, and 4000ma boat and truck packs. The Astro Model 112 charges them all faster and more efficiently. The reason is simple, our super heavy duty DC/DC inverter puts out more juice. The proof is right there on the meter.

You will appreciate another little feature. The input cord is both fused and diode protected so if in haste you were to inadvertantly hook up the alligator cord backwards nothing would get fried. Just pop in a new 20 amp fuse and you're back in business. Also, voltage jacks are provided on the front panel, so you can monitor the charging process with your digital voltmeter.

DC/DC CHARGER COMPARISON



AstroFlight INC.
13311 Beach Avenue/Marina del Rey, CA 90292 (213) 821-6242

EEE-Z-FLI

The Maui Wind Machine

• Those of you who have visited and flown with us on the Hawaiian island of Maui are aware that our widely touted "gentle trade winds" frequently become quite energetic, particularly during the summer months. Flying during these periods leaves the enthusiast with few choices; get up with the proverbial chickens and fly from 6 a.m. till about 9 a.m. when the winds pick up, fly a pattern type aircraft with good penetration, or pack it in and go home. Unfortunately, many modelers (and some well known editor/publishers) are not early risers, not all of us are into pattern aircraft, and those going home are often faced with mundane tasks like mowing the lawn, trimming the hedges, or worse.

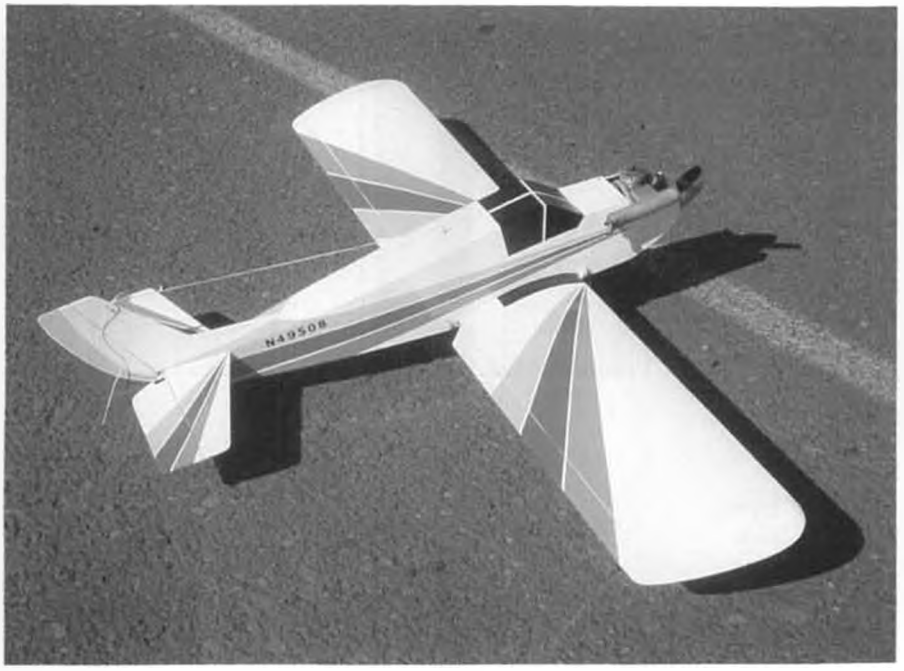
Seriously, the least fortunate are the students, as most of the "leading trainers" just plain blow away before they even get off the ground. The obvious answer is an airplane capable of handling the windy conditions in the hands of a student, one that is tough enough to withstand the inevitable knocks of training under adverse conditions and, most important, an airplane that introduces the newcomer to R/C flying as an affordable pleasure rather than an expensive task. Other considerations for those who like to build is ease of construction without a need for exotic materials and a basic structure that, should it be damaged, is easily repairable.

In addition to the foregoing, basic design goals are quite simple.

1. A landing gear that is "student strong" and properly triangulated to prevent easy tip over when operating in strong winds and one that provides straight tracking and easy rotation.

2. A combination of airfoil and wing loading that provides stability, good penetration and minimized gust effect on approach and landing.

3. A control system adaptable to both the student's slower response requirements and the more advanced flier's aerobatic taste.



Left: The low-wing taildragger version will most likely yield the highest performance of the four variants detailed on the plan; two of the other three possibilities are shown on the facing page. All of the prototypes have been flown with K&B .20 Sportster engines, and with very good results.

4. The completed model has to look more like an airplane than a 2x4 with a wing attached.

Although not initial design criteria, follow-on considerations have produced easy conversion from tri-gear to taildragger configuration and from high wing to low wing, using all the same basic components, and one set of drawings and building instructions.

The design and test phases have now reached the point where, with over ten aircraft in all variations flown extensively, we find that all initial design and performance criteria have been met, or exceeded. Perhaps the time has come to tell all windy weather fliers about EEE-Z-FLI, The Maui Wind Machine.

By AL WHEELER . . . Here's a simple, basic airplane designed to handle windy conditions and also to be tough enough to stand up to a beginner's abuse. A bonus feature is that it can be built as a high or low wing, trike gear or taildragger—take your pick.

PRE-CONSTRUCTION CONSIDERATIONS

A review of the drawings will indicate that you have several choices; the basic high wing tri-gear version, a high wing taildragger, or either landing gear configuration in the low wing version. The basic high wing tri-gear is recommended for the beginning student, while the low wing serves as an excellent step up to an aerobatic trainer and Sunday fun-fly aircraft.

NOTES

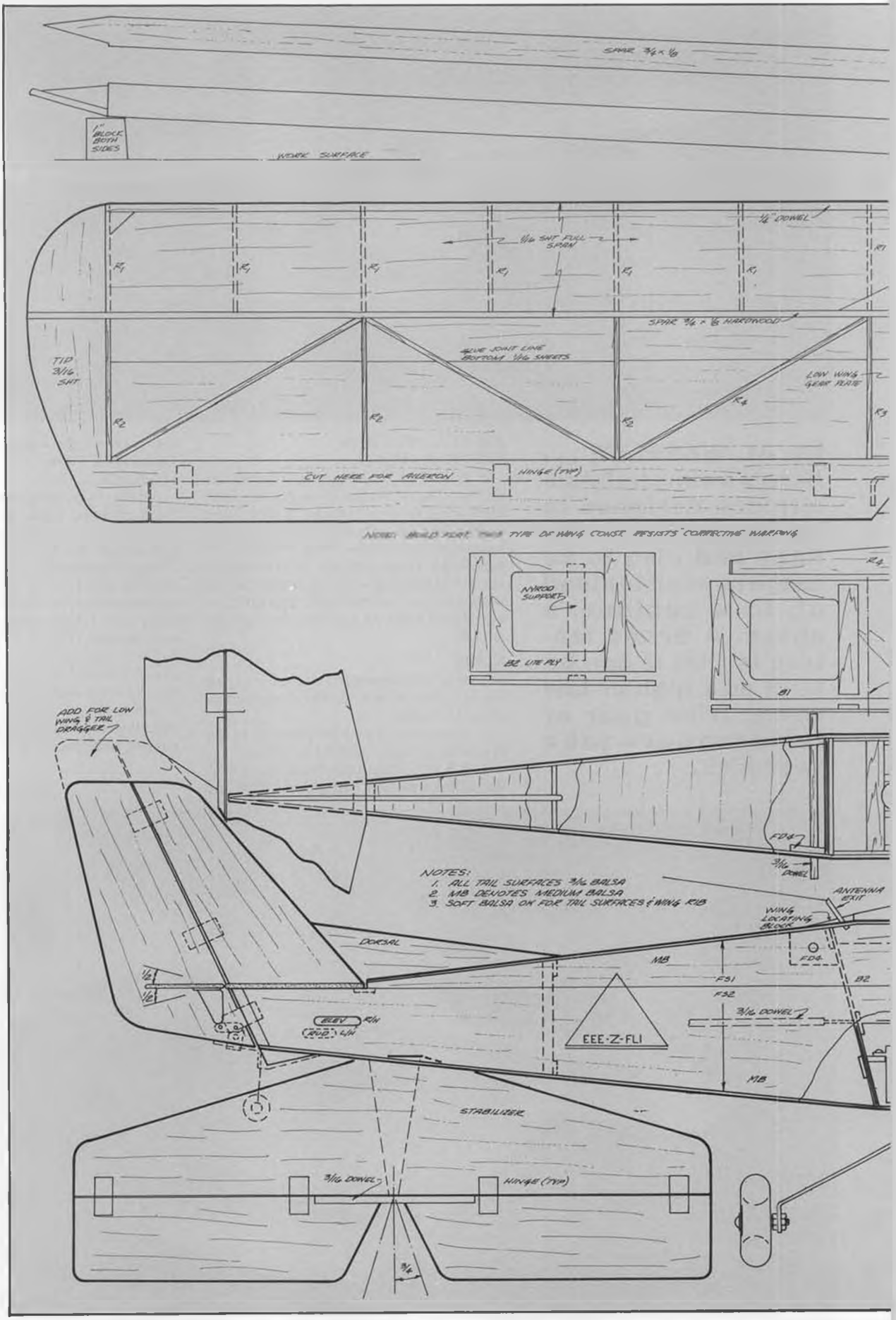
1. It is recommended that all parts be cut out prior to the start of construction, more like a kit.
2. Any installation item peculiar to the low wing version is noted in Italics.
3. It is important that this wing be built *flat*, as this type of construction is rigid and resists corrective warping.

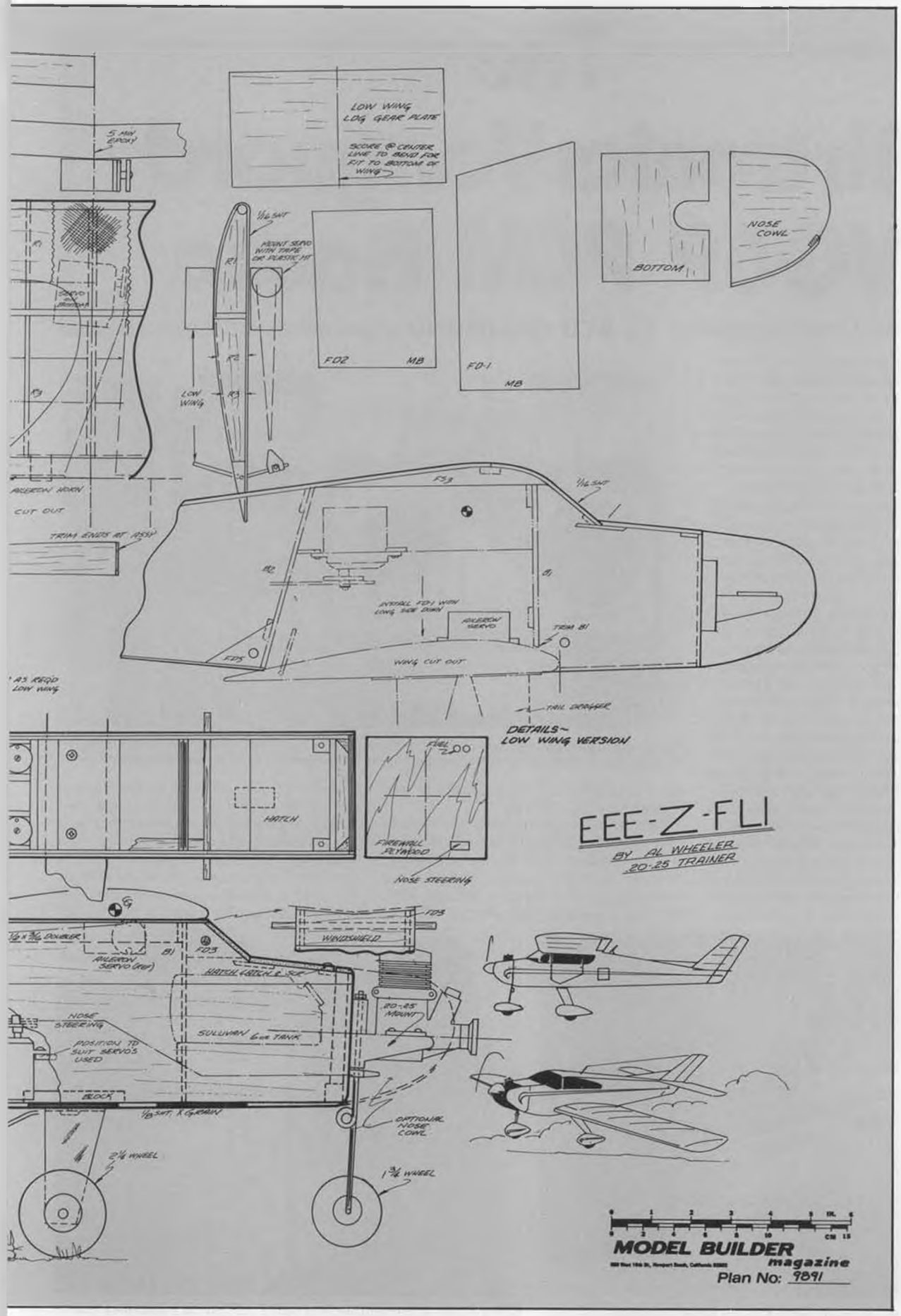
CONSTRUCTION

FUSELAGE

Select two matched sheets of 1/8 medium hard balsa. Cut FS-1 and FS-2 pieces from each sheet and edge join on a flat surface. *For the low wing join FS-3 as shown.* Cement FD-1 and FD-2 to the sides starting with FD-2. Position FD-2 1/8 inch behind the front of fuselage side; this provides a slot for the firewall. Install FD-1 1/8 inch behind FD-2, this provides a slot for B-1. *For low wing version invert FD per drawing to provide clearance for the wing trailing edge.* Install vertical 1/8x1/2 pieces in aft fuselage. Mark and cut pushrod openings in aft fuselage. *For low wing now cut out wing saddle on both sides.* Install

Continued on page 81


SPAR 3/4 x 1/8
1" BLOCK BOTH SIDES
WORK SURFACE
1/16 SHT FULL SPAN
1/4" DOWEL
SPAR 3/4 x 1/8 HARDWOOD
GLUE JOINT LINE BOTTOM 1/16 SHEETS
TIP 3/16 SHT
LOW WING GEAR PLATE
CUT HERE FOR AILERON
HINGE (TYP)
NOTE: WOULD FEAT THIS TYPE OF WING CONST. RESISTS CORRECTING WARPING
NYROD SUPPORT
B2 LITE PLY
ADD FOR LOW WING & TAIL DRAGGER
NOTES:
1. ALL TAIL SURFACES 3/16 BALSA
2. MB DENOTES MEDIUM BALSA
3. SOFT BALSA OK FOR TAIL SURFACES & WING RIB
ANTENNA EXIT
WING LOCATING BLOCK
DORSAL
MB
F31
F32
B2
3/16 DOWEL
ELEV ROD
EEE-Z-FLI
STABILIZER
HINGE (TYP)



FULL-SIZE PLANS AVAILABLE—SEE PAGE 106

The Airtronics Vanguard VG6P PCM Radio

By STU RICHMOND

• To learn how our radios work, *Model Builder* readers should follow the "Electronics Corner" column written by Eloy Marez. So I leave to Eloy the explanations of how the mysterious electrons run around inside our radios and make things wiggle and move as we move the sticks. He's an expert at those explanations.

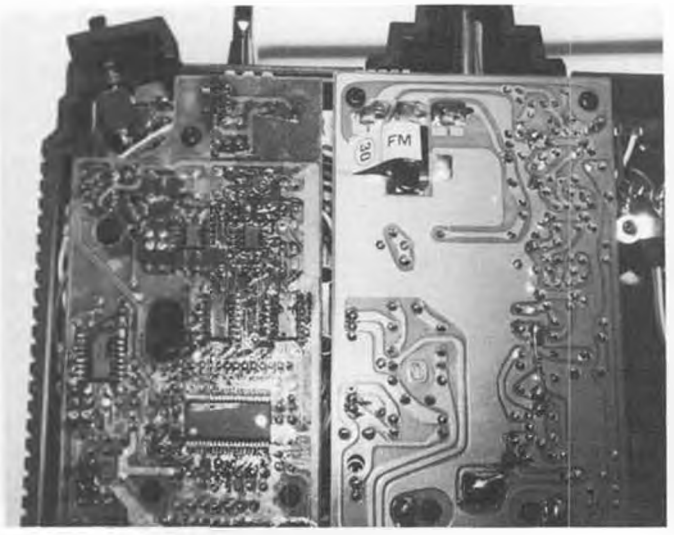
But it's nice to know what we're getting when we buy a new radio. Since most of us are reluctant to go probing inside to take a close look, let's take a close look together.

The only good radio is one that works—but that definition is going to be timedated in 1991 if not before. Some of the old reliable systems that never failed us are virtually obsolete as we make way for progress in the form of many more frequencies for planes, cars, and boats. In the long run these new frequencies will be very beneficial to us, but we're going to have to shelve our old, wide-band transmitters and their matching single conversion receivers. The transmitters, in many cases, can be fixed (narrow banded) but for greatest reliability we're going to want the more advanced dual conversion receivers that have proven to be so reliable. George Steiner recently told me that a tremendous amount of quiet, behind-the-scenes technical work is being done on new receivers and that new narrow band receivers to fit our favorite old transmitters will be available as you read this, or shortly after.

The Vanguard incorporates state-of-the-art features, while at the same time doing away with most of the superfluous bells and whistles that most sport fliers will never need or have occasion to use.

Russ Kime points out that mathematically and in practice it's now certain that any pair of transmitters that are precisely 23 channel numbers apart (odd number channels become legal in January 1991) will beat together to generate a 460 kilohertz signal that will most certainly glitch any and all regular low-priced single conversion receivers. All superhet receivers use a 455 kilohertz signal internally. Russ points out: "When any two channels which are 23 numbers apart (such as 12 and 35, or 20 and 43, for example) are operated simultaneously they will produce a 'beat' of 460

Stu chose to remove the on-off switch actuator on the transmitter; text tells why. Actual switch is recessed into the transmitter case.



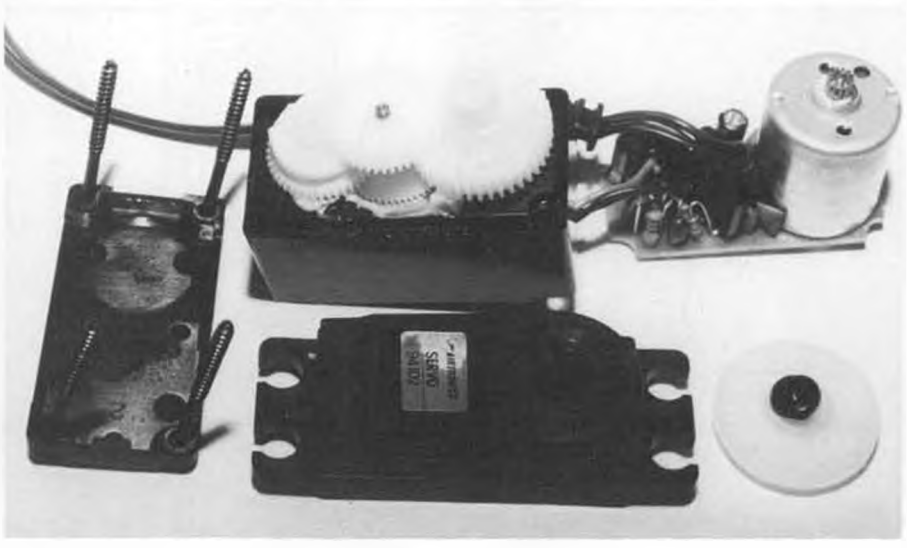
With the back of the transmitter removed you can get a good idea of the electronic complexity inherent in PCM systems.

Khz (20 Khz x 23 = 460 Khz) and this 'hits' almost directly on top of the 455 Khz intermediate frequency which is used in all our present receivers with deadly results for both receivers. Dual conversion receivers use a first stage I.F. frequency of 10.7 Mhz and this effectively screens out the 460 Khz beat from reaching the second I.F. stage. If you insist on running a single conversion receiver after January 1, 1991, keep an eye out for anyone who is 23 channels away unless you enjoy rebuilding airplanes."

Let's look at the latest Airtronics Vanguard PCM system. The Vanguard has been the largest volume seller for Airtronics, as it offers advanced features without all the bells and whistles that most of us never need and won't ever use.

TRANSMITTER

The VG6P PCM transmitter is the top of the line in the Vanguard series. During the past year the change has been made to much higher capacity Sanyo transmitter battery packs; my charge/discharge tests



Top: These controls are behind the pull-down door on the front of the six-channel transmitter. The four-channel version does not have dual rate adjustments or flap/elevator mixing.

Center: The Airtronics dual conversion receivers are marvels of electronic packaging. Stu's famous one-inch ruler gives size comparison. Text tells why we should all be using dual conversion receivers by 1991.

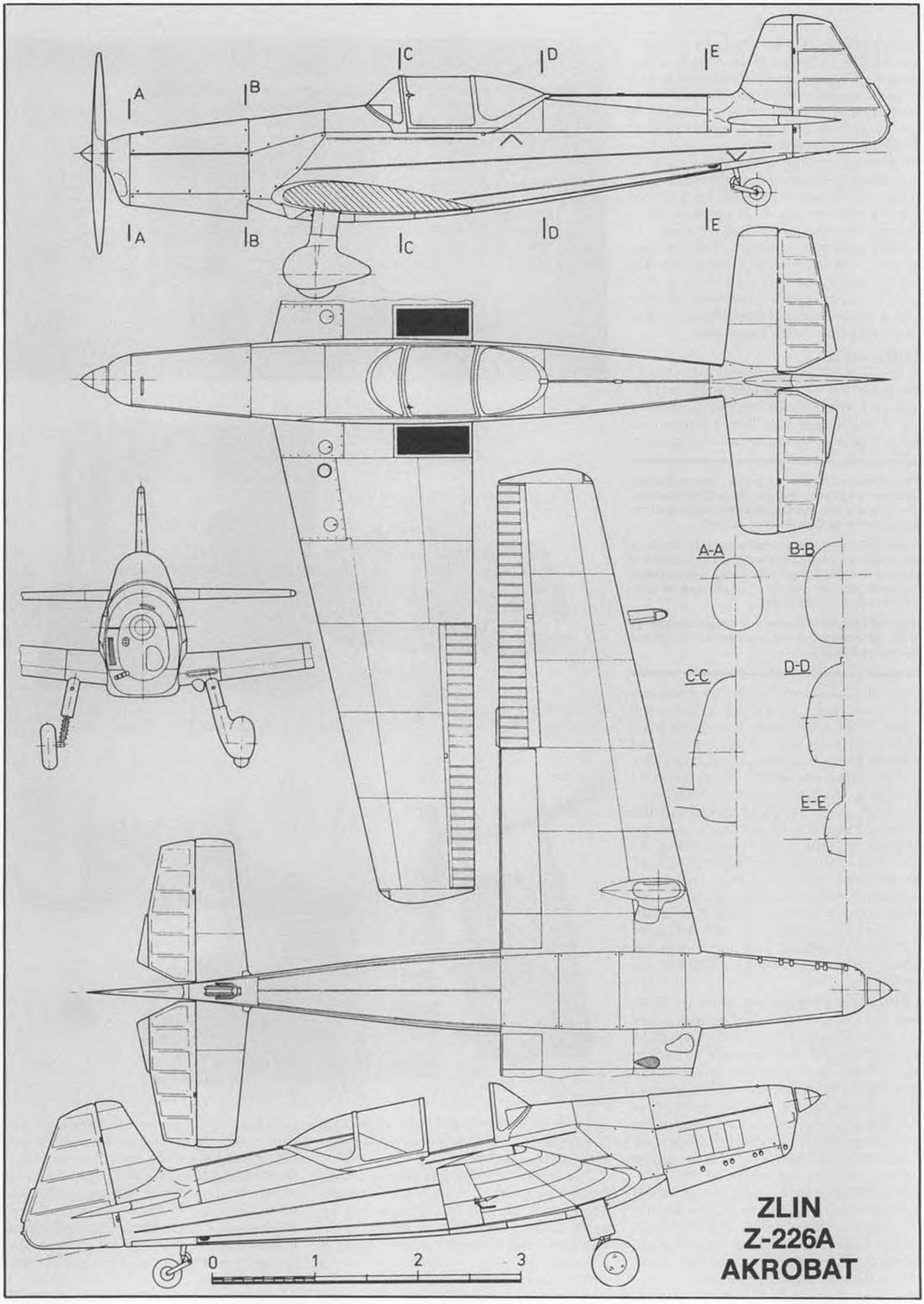
Bottom: The #94102 servo is the basic workhorse in the Airtronics line. Four are supplied with the Vanguard system.

show the transmitter battery pack will run for 175 minutes, just short of three full hours. If the transmitter is switched from PCM (pulse code modulation) to PPM (normal FM or frequency modulation) the run time stays the same. I chose the PCM version as it offers a continual reference between the transmitted signal and the received signal as to accuracy of transmission/reception—it's modern state of the art, unlike my trusted 1977 model Kraft Sport Series Tx that's due to become a bookend! A four-channel version (VG4R PCM) is also available, but I often use a fifth channel for hauling up rolls of toilet paper for target dropping, and one model has Rhom-Air retracts, so the six-channel was my choice.

Nikon and other fine cameras have clear, sticky plastic on their metal bottom plates for scratch protection; my VG6P PCM transmitter came with the same protective plastic on the pull-down door's front plate. I peeled it off and Goo-cemented an identifying nameplate on the door so the guys would know who left his transmitter at the field. The sticks felt too "soft" to me—the instructions tell how to increase the spring tension and that got me inside the transmitter. The new battery pack is rated at 600 millamps and male/female plugs make the connection. There are two major printed circuit boards inside and everything is tightly packaged to fit the available space. The intricacies of a PCM transmitter don't show from the outside, but after seeing the inside you can't help but have respect for the engineers and technicians who produce today's radios.

The central board takes a plug-in crystal, but be aware that changing this crystal yourself is illegal. Slight retuning on sophisticated equipment follows crystal changes at the Airtronics service center. If a frequency change is required it's best to simply pack and ship the whole thing to Airtronics for service. The servo reversing switches, which are reached through the pull-down door, are on a lesser board mounted below the main boards. Like most transmitters, the stick assemblies are identical plastic units that are simply reverse-mounted in the case. The modern single-scissor blade centering mechanism is 1000% better than the old slider/block system of past years that wore and was not

Continued on page 76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AKROBAT

PLUG SPARKS

By JOHN POND

• Although the following write-up by Earl Stahl, entitled "Looking Back," has been published in the DC Maxecutors newsletter, Bill Baker's "Okie Free Flight Flyer," and of late in the SAM 41 San Diego Aeroneers newsletter, as so ably edited by Jim Alaback, this columnist feels, as Stahl does, that we should get the word out to as many modelers as possible. Therefore, we are pleased to present Earl Stahl's views on yesterday's and today's models:

"It is probably unwise to spend much time reflecting on the past. I believe we should keep looking and moving toward the horizon. My exception to that philosophy involves the aircraft and model planes of the period between the two great wars.

2. The rubber powered flying scale designs by Earl Stahl are unequalled for popularity. These scaled-up versions were seen at Old Warden, England. From left: Mike Hetherington, Mik Mikkelson, and Don Knight.

"Among my earliest recollections are the visit of the Gates Flying Circus to my home town, and then, later, the excitement and awe imparted by the exploits of Lindbergh, Chamberlin, Goeble, Byrd, Earhart, and their contemporaries. Lindbergh's daring conquest of the Atlantic had the greatest impact on the populace. I was almost nine at the time and I first heard of his success from an exuberant policeman as I was making the long trek, on foot, from a local farm being used as a flying field. Even before the 'Spirit of St. Louis,' I had been hooked!

"At first, the man-carrying machines and their pilots were the thing, but when the local newspaper commenced a series of construction articles on R.O.G. Stick, Tractor Endurance and Twin Pusher models (by Merrill Hamburg, as I recall), some of us youngsters grabbed the bait. Not long after that, the second issue of *Model Airplane News* appeared on the rack of our neighborhood 'Mom and Pop' grocery store. My Dad provided the first fifteen cents and, somehow, I have found the cash for almost every issue since.

"The dreadful Depression of the thirties permeated all activities. I don't remember many of the hardships but, rather, I identified with the promise of the future as exemplified by the feats of dashing aviators flying ever better aircraft. Model building, at that time, was an excellent activity to pursue.

"Unlike kids of today, we didn't have to be sent to camp or summer school to keep us occupied. With some pine, balsa, Ambroid and periodicals we never had to ask, 'What can I do?' to keep from being bored. For me, it was a great period.

"Competitions for free flight rubber-powered models were held frequently during the thirties. In our region, the largest city, Pittsburgh, had newspapers which promoted Junior Birdmen (Hearst) and Junior Aviator (Scripps Howard) model plane activities. Those competing publishing giants had their local and national youth-oriented aviation events to enhance the sales of papers. The forerunner to the AMA Nationals commenced even earlier. As a teenager, I participated in a great number of those contests.

"Getting to those distant happenings was a challenge. Our family did not have an automobile so I rode Greyhound from Johnstown, Pennsylvania to places like Detroit, Chicago, Akron and Cleveland. Safely transporting eight or ten models was a problem. Storage for big items of baggage on those old buses was under canvas on the roof. To protect my homemade model cases, I would insist on climbing the chromed ladder at the back to attend to the proper placement and retrieval. No transportation casualties ever occurred.

1. Earl Stahl's Fokker D-VIII is still a popular subject for O.T. F/F Scale events. Robert Pond holds grandpa's Deezil powered version.

"One can't be absolutely certain but I believe competition in those days was every bit as stiff as I observe today. To be a viable competitor, one had to build good models, be able to analyze and correct flight characteristics, and then practice, practice, practice to be able to deal with all kinds of environmental conditions.

"In our little city, there were a dozen or so of us who were extremely active. Except during the bitter winters, we flew almost every day in a nearby park, or at a small, grassy airport. Large groups of spectators were common. Once I launched a twin pusher, which had been wound backwards, over the heads of the crowd that had gathered about in a circle. The big canard backed down after my upward thrust and settled on the head of a small boy. The exposed, unwinding motors snatched his hair. He was flailing at the model. His dad whipped out a pocket knife to resolve the problem. I pleaded 'Cut the hair!' and then, in defeat, wilted at the loss of those valuable strands of 1/8 brown rubber.

"My first flying scale model was a George D. Wanner Co. Leopard Moth. It was a prize from some contest event and it was one of the few kits I ever assembled. It was a competent flier and, because of the nice appearance, stimulated a new interest, fly-

3. Karl Spielmaker did a nice job reworking this "Thor" slag engine. Modifications include a new, larger cylinder fin assembly. Turns a 10x4 prop at 8000 rpm.

4. Stu Bennett of SAM 21 shows off his Korda Wakefield done in green/white/red Italian flag colors and dubbed the "Korda Leone."

5. Beautiful lines on this double-size Thermic 50 sailplane by Don Bekins. An O.T. R/C Glider event will be featured at the '89 SAM Champs.

6. Joe Percy, a member of the highly competitive Texas R/C O.T. contingent, sent in this photo from a Fort Worth Gas Model Association contest in 1939. Original Fiske Hanley Texaco Winner at left.

ing scale models.

"Shortly thereafter I came upon outline drawings of the attractive Rearwin Speedster sport plane. I fashioned a flying scale version, applying some of the know-how acquired from free flight contest type models. It was a superb flier, so I built another and yet, one more. A picture of the second one was sent to *Model Airplane News* with the hope that it might be selected for inclusion in the section of the magazine devoted to readers' accomplishments. The picture was published and then the editor, Charles Grant, invited me to prepare a construction article on the Rearwin for publication. That is how the series of articles on flying scale models started.

"Doing those articles was genuine fun. (Perhaps I should explain that I could devote time to such activity since I worked only part of each day on the original airmail pickup system. We used Stinson SR-9s to deliver and collect, on the fly, mail for towns and small cities of Pennsylvania and West Virginia. The airline was All American Aviation, which became Allegheny, and is now U.S. Air. I was one of their first employees.) Unfortunately, I had the feeling that the construction articles were being received with indifference by the readers. Oh, I got letters from Europe, Africa, South America and Australia, but the editors, aside from never rejecting an article, made few comments or recommendations. Usually, I would suggest the plane type for the next subject and that was it. To this day I have no idea of the circulation of *Model Airplane News, Air Trails* or *Flying Aces* during the time I was a regular contributor. For several decades after I stopped submitting the articles I supposed the various models had been forgotten. Then, in recent years, letters, phone calls and visitors to my NASA office have made me aware that many folks had built and enjoyed the models. It is a source of pleasure to be aware that some of the designs are still being built and flown.

"Recently, possibly because of the acute interest in realism—pilot in the cockpit, authentic colors, markings of specific aircraft, etc.—a few have questioned the

7. A new R/C event cooked up by SAM 48 (New York) is for .049 powered O.T. Scale models flown in the R/C 1/2A Texaco format. Shown here is Jack McGillivray's 1936 E-2 Cub. Looks like fun!

8. Dallaire Sportster by SAM 49 president Ken Myers gets off the water just as easy as you please in the Texaco Hydro event at the Bill Barton Memorial, held at Woodland/Davis, California.

9. Ken Myers is not a bad R/C pilot but his seamanship really stinks. He volunteered to retrieve the capsized Bomber in the background and promptly got all bollixed up with the oars. This escapade at the Bill Barton Memorial contest (see text) earned him the new nickname of "No Oars Myers."

authenticity of those old designs. The information explosion upon us has made available much more data on most any aircraft than was obtainable, at least to me, in those earlier days. The point to be made is that a sincere effort was made to be as accurate as material at hand permitted.

"*Aero Digest* was the foremost magazine of that time. It cost thirty-five cents a copy which was big money. Annually, in March, they published a huge issue which had three-view drawings, specifications and pictures of scores of commercial and military aircraft. The price escalated to fifty cents. Although the drawings were small, they were a priceless source of data for the modeler. If one of the designs interested me, I would write to the manufacturer for more details, glossy photos and, above all, large drawings. Some companies responded favorably. Otherwise, the tiny drawings had to be scaled-up using dividers. Later, I met a model builder who worked for the local power and light utility. His job included operation of their photostat machine. He would enlarge those *Aero Digest* drawings several times—black-on-white, white-on-black, etc.—to meet my sizing requirements and ease the drafting burden. Expanded by that method, some of the lines looked so broad and fuzzy, one might conclude that they were made with the wet end of a cigar butt! Occasionally very complete information could be gotten.

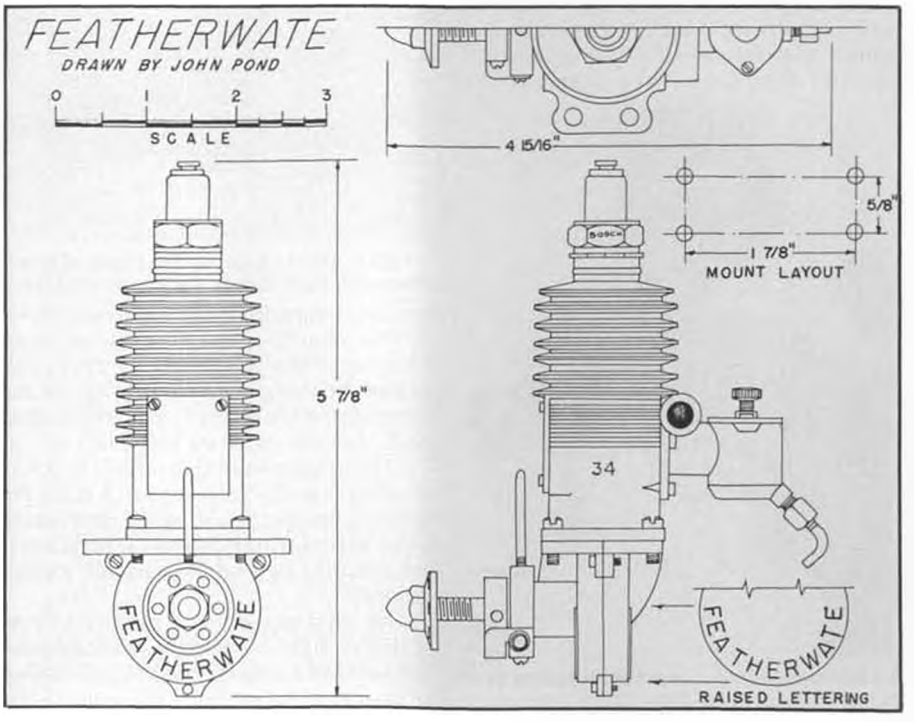
"Phillips and Powis Aircraft, Ltd. in England, despite the raging war, sent excellent drawings, photos and manuals for the Miles Magister article.

"I would first design the models in simple form on large tablet paper. The magazine page size usually dictated for me the fuselage length and, thus, the overall size. Once the prototype model was built, photographed and tested, detailed drawings were made. As was clearly evident, I had no training in drafting, except that someone had cautioned me not to dip bow pens in ink to load them.

"Unlike many builders today, I did not try to duplicate colors or exact markings of a specific aircraft. My object was to use colors which I had learned would photograph well in black and white. I had best luck with reds and yellows, so no sand or spinach or olive drab for my Spitfire, Hurricane or P-40 Hawk. They were red.

"The photos to illustrate the articles never matched my expectations. I used a Welta film pack camera with ground glass for the stills and a Kodak Retina 35mm for action. The only guy in our town who would tackle my processing orders for enlargements was 'Thumbs' Salinger. He seemed to specialize in water marks. I criticized his prints. He explained that I gave him almost nothing to work with.

"In retrospect, I must conclude I could have done more work on optimizing propellers. Once I settled on a length, width and pitch, that was it. Surely there is an opportunity to improve on the performance of my original designs by some propeller experimentation. Incidentally, I do not admire the use of the manufactured, plastic propellers which are common to-



10. A gorgeous building job on this O&R .60 powered Ontario Hornet, built by SAM 00's Howard Osegueda from an Easy-Built kit. Photo taken at the Bill Barton Memorial.

day. They are probably better than our hand-carved ones of days gone by but I do believe that skillful fashioning of a prop presents the greatest challenge in the construction of a rubber powered model, so I like to see that effort on the part of the builder.

"A fair question is: Which of those old models was my favorite? Actually, no single one. I thought the little Waco E and the Hawker Hurricane were handsome. The Interstate Cadet and the General Skyfarer were as capable fliers as equal size 'cabin' contest models. The most overall enjoyment was probably derived from what I called a semi-scale North American Apache. The real prototype later became the P-51 Mustang. I liked the appearance and the flights were super; stable, powerful, smooth and consistent.

"Along with the Wakefield, Moffett and other contest models, I hung the flying scales as they grew in numbers from the ceilings and on the walls of a several-room unoccupied house at the back of our lot. It was so full, space was at a premium. The place was a gathering site for modelers from all about as well as curious neighbors. In summer our English setter and beagles came and went through the open windows. Sticky ribbons of paper, common at that time, hung from the ceilings to trap and torment flies and mosquitos. Lots of strangers came. One night, Holger Hoiriis, who flew a Bellanca to Denmark behind Lindbergh and Chamberlin, knocked at the door. He was crossing our mountains on a westward flight and was forced down by low clouds on the outskirts of town. Hearing of the youth with all the model planes, he abandoned Lowell Thomas and Amos and Andy on the hotel radio to drop by to talk planes. I was thrilled.

"Those were enjoyable times. I look forward to one day stepping back from the busy routine that has occupied my working years so I may participate in the great activity of building and flying scale model planes."

The most popular gas powered flying scale free flight designed by Earl Stahl is the Fokker D-VIII seen in Photo No. 1. This shot of grandson Robert Pond shows an all-red Fokker with Ernest Udet's marking of "Lo!," a shortened version of his girlfriend's name, Lola. Udet was one of the surviving WWI aviators who also participated in WWII.

The continuing popularity of Earl Stahl's designs is graphically illustrated in Photo No. 2 showing the 200% scaled Earl Stahl model contest entries at Old Warden, England. Seen in the shot are Mike Hetherington, Mik Mikkelson of the American SCIF club, and Don Knight of SAM 35 (England), the latter with a Miles Magister. Needless to say, all fly well!

ENGINE OF THE MONTH

As usual, another of the outstanding members of MECA, Dick Dwyer, is responsible for this month's engine. The "Featherwate" is an extremely rare engine dating back to 1928. According to Dick, this engine today would have a value of two to three thousand dollars on the collector's market. We are indeed fortunate to have this engine for the column.

The Featherwate engine, as best as can be determined, originated after the Lindbergh NYP flight in 1928 on the wave of aviation enthusiasm. The manufacturer was the Power Model Supply Co., located in Wichita, Kansas. This company also produced compressed air engines ranging from two-cylinder to four-cylinder models, both assembled and in kit form, along with propellers, air tanks, and miscellaneous brass fittings. Plans to a 4-1/2 foot "Spirit of St. Louis" and a Lockheed Vega, for $.90 and $.50 respectively, were offered.

11. Sleek Streeks galore! Robin Pharis, of Pharis Models, sponsored this fun event at the Bill Barton Memorial. Mass launch, last one down is the winner.

12. And the winner is . . . a girl! Ruth Rediger beat out all the guys in the Sleek Streek event.

This engine was found in the Earl Vivell collection by John Gracie and subsequently sold/traded to Karl Carlson and then to Dick Dwyer. In going through Vivell's effects, some correspondence between the Power Model Supply Co. and Earl Vivell was found wherein Vivell ordered a Featherwate on November 27, 1929, for the price of $23.25 less 15% dealer discount. Quite a bit of money in those days.

The Featherwate was sold in three sets: the first at $8.85 consisted of a complete set of unmachined castings; Set No. 2 was the same as Set No. 1 but with the cylinder bored, faced and tapped for 12mm Bosch Spark plugs. The piston also came finished,

13. Bunch "Scorpion Major" with Bunch floats is a fine performer for Eut Tileston.

15. Best-By-Test "Altimeter" rubber ship is the work of master craftsman Phil McCary, of Henderson, Nevada. Phil is the Assistant Contest Manager for the upcoming 1989 SAM Champs in Jean, Nevada.

as did the crankcase halves. The balance of the assembling could be done with hand tools. All of this went for $14.75.

Set No. 3 consisted of the complete engine, ready to run. Also offered were a sundries kit of nuts, bolts, fibre, etc. for the engine and carburetor. A helpful blueprint was sold for $1.00.

The Featherwate was a two-cycle, three-port engine, air-cooled or water-cooled as desired. Specifications quoted a one-inch bore and one-inch stroke, giving a .78 cu. in. displacement. The weight of the engine was a surprisingly light 10 ounces. Horsepower rating was 1/6 to 1/4 hp at 1200 to 3000 rpm. Claims were made that the engine could run half a day on a teacup full of fuel.

The crankcase was the split type with three bolts to hold parts together. The crankshaft was built up, utilizing a steel disk, tool steel crankshaft, and connecting rod stud. The carburetor was a cast aluminum atomizer with three fuel and air adjustments. A throttle valve could also be provided.

14. The Cleveland "Wakefield Gull" is an excellent O.T. competition rubber model. This one is shown with its builder, Jerry Persh, of Nokesville, Virginia.

The fuel consisted of twelve parts gasoline to one part oil. Their later instruction pamphlet indicated a mix of 15 to 20 parts of high test gas to one of unidentified oil viscosity. Recommended ignition was the Ford ignition coil with a dry battery.

Starting the engine was not easy as some experimentation had to be made to arrive at the right setting. Once a fairly good setting was arrived at, the engine could be fine tuned using the air valve adjustment on the top of the carburetor. As the firm stated, "On an engine this small, carburetor adjustments are very particular and must be 'just right.' "

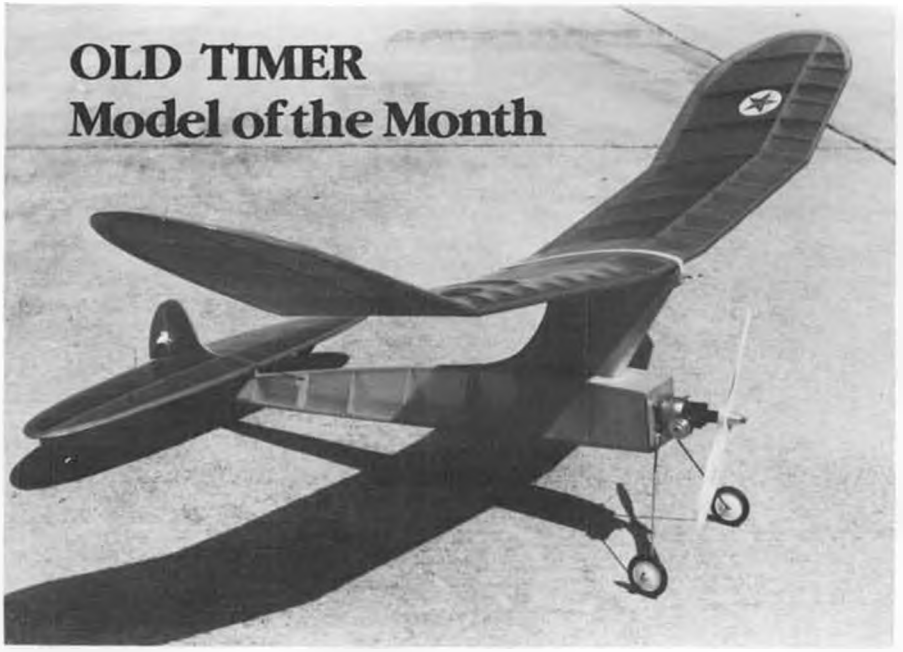
ENGINE FOLLOW-ON

Received a nice photo of the Thor engine that was "face lifted" by Karl Spielmaker, 4690 Burlingame S.W., Wyoming, Michigan 49509. As can be seen in Photo No. 3, the original fins have been machined off and replaced with larger ones. Spielmaker reasoned that slag engines, being made of aluminum, heat up very quickly with resultant loss of power. Karl's judgment was vindicated when he tried the engine using a 10x4 wood propeller; 8,000 rpm, and this is using the old wiper point system!

In that same line, Gordon Burford, noted engine manufacturer in Australia, has selected the Genie slag engine as his next project. Minor modifications will be much in the line of Spielmaker's Thor. Both en-

Continued on page 86

16 (left). Jim Kelley sent in this photo of Colby Evett and his modified Zipper, taken at the famous Rosecrans and Western field in Los Angeles in December of 1941. Zipper mods include a flat wing center section and stretched fuselage. See text for details.



COMET INTERCEPTOR

Carl Goldberg's famous 1942 pylon gas model, equipped with a two-channel radio and built light, is a hot contender in R/C 1/2A Texaco events. This one took first place at the 1986 SAM Champs.

By JIM REYNOLDS

• The 1942 Comet Interceptor makes a very competitive R/C 1/2A Texaco model. For the past five years several members of SAM 82, Houston, Texas, have been flying and winning with them. Their success with the Interceptor convinced me to build one, too. The model is slightly more complicated to build than some others, but the extra performance is worth the effort. With the Interceptor, I was lucky enough to take first place in 1/2A Texaco at the 1986 SAM Champs.

The original 1942 plans that were used to build the model show a class A and a class B version. Both use the same basic fuselage. However, there is a different size wing, horizontal stabilizer and rudder for each class. The class A size was just perfect for 1/2A Texaco. According to the plans, the projected wing area was 288 square inches. SAM R/C rules require the use of planform wing area to compute the minimum weight. The planform wing area figured out to be 296 square inches and the minimum weight to be 16.4 ounces. (By the way, the easy way to figure out the SAM minimum weight of eight ounces per square foot for 1/2A Texaco models is to divide the planform wing area by 18.)

The model was built like the original except for the changes required for radio control and a few to accommodate my idiosyncrasies. The original main wing spar was replaced with an upper and lower spar with 1/16-inch balsa vertical sheet webbing in between. Also, to save weight (which turned out not to be necessary), the rear spar and a few wing ribs were left out. That was a mistake because the airfoil is very thin, and my wing tends to warp. To cure that problem the plans show a rear spar and all the wing ribs. No, the minor weight increase is not a problem because two ounces had to be added to my original model to bring it up to weight.

Left: Our author's model is the same size as the original Class A (short wing) Interceptor. Span is 44 inches, planform wing area is 296 square inches, and the minimum weight required for SAM competition is 16.4 ounces. Covering is silk and dope, but lightweight silkspan or even a heat-shrink plastic will work just as well.

The space for the R/C equipment is very limited in the Interceptor. Maybe you can figure out a better way, but it was difficult to find enough room for two micro servos, a normal size receiver and a 250 mAH battery pack. There wasn't any space left for a conventional switch and charging jack. So, they were replaced with a three-pin Deans connector and a shorting plug. If you use this method, remember to tie the shorting plug to the aircraft, so that it cannot get lost. The radio antenna runs through the fuselage in a tube made with cocktail straws. The fuselage is too short to contain the antenna, so it exits out the bottom below the tail.

The fuselage has solid formers. This makes installing a control system a bit of a problem. Sullivan's Very Flexible Cable

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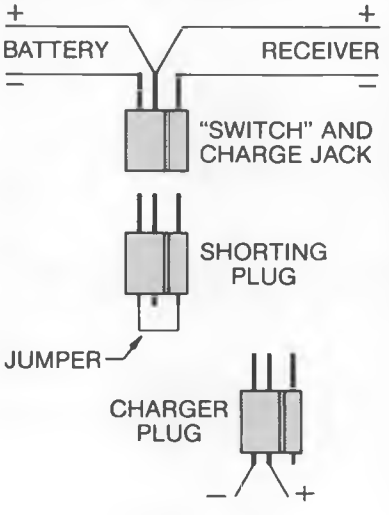
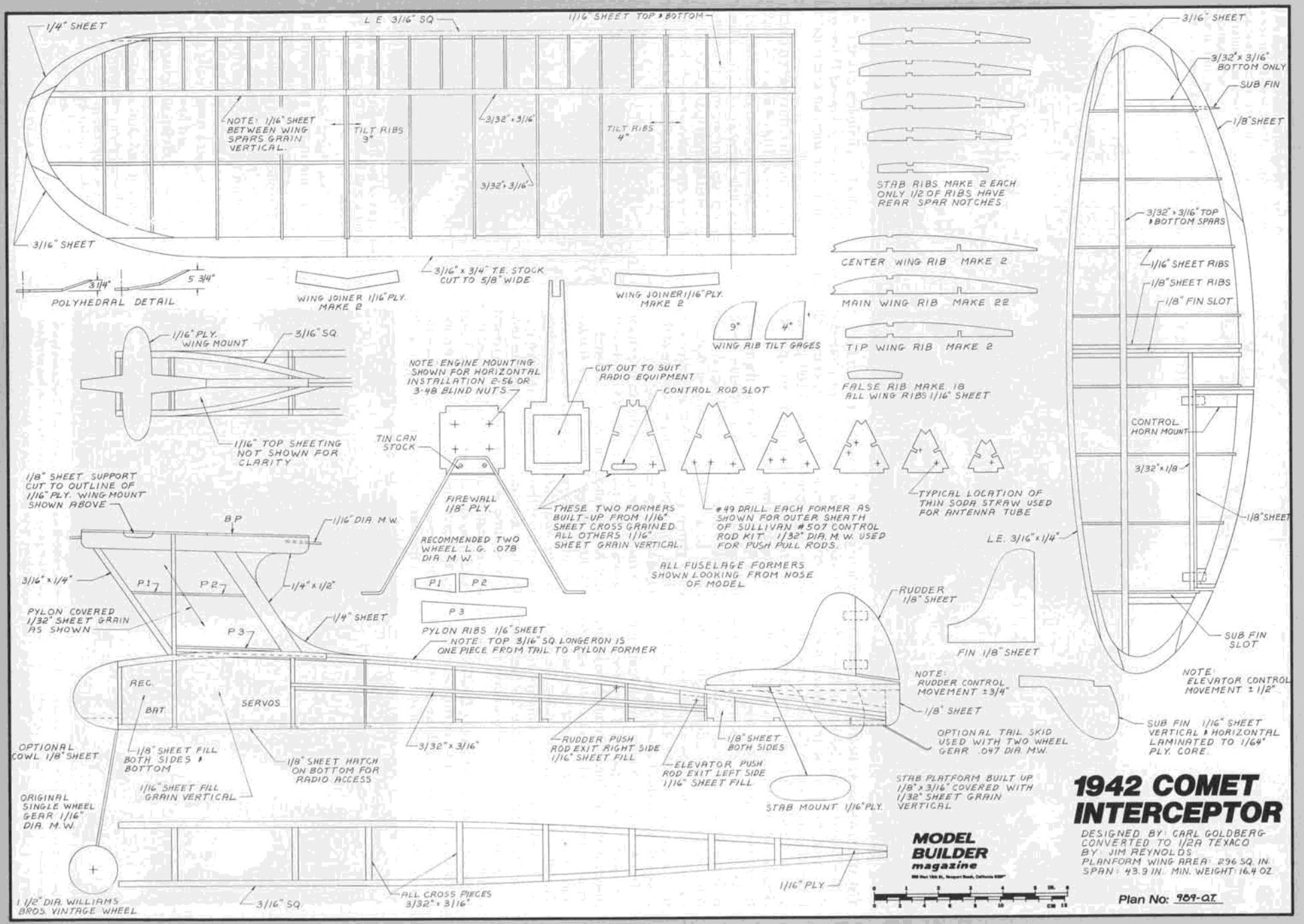
A LIGHTWEIGHT RADIO ON-OFF SWITCH MADE FROM DEANS CONNECTORS



Front view shows the side-mounted Cox Black Widow (the new Cox Texaco .049 would also be a fine choice for this model) with the needle valve positioned opposite to the cylinder—makes needle valve adjustments much safer because the pylon doesn't get in the way. Seen hanging below the fuselage is a shorting plug, which replaces the normal on-off radio switch; see sketch at left for details.



1942 COMET INTERCEPTOR

DESIGNED BY: CARL GOLDBERG
CONVERTED TO 1/2A TEXACO
BY: JIM REYNOLDS
PLANFORM WING AREA: 296 SQ. IN.
SPAN: 43.3 IN. MIN. WEIGHT: 16.4 OZ.

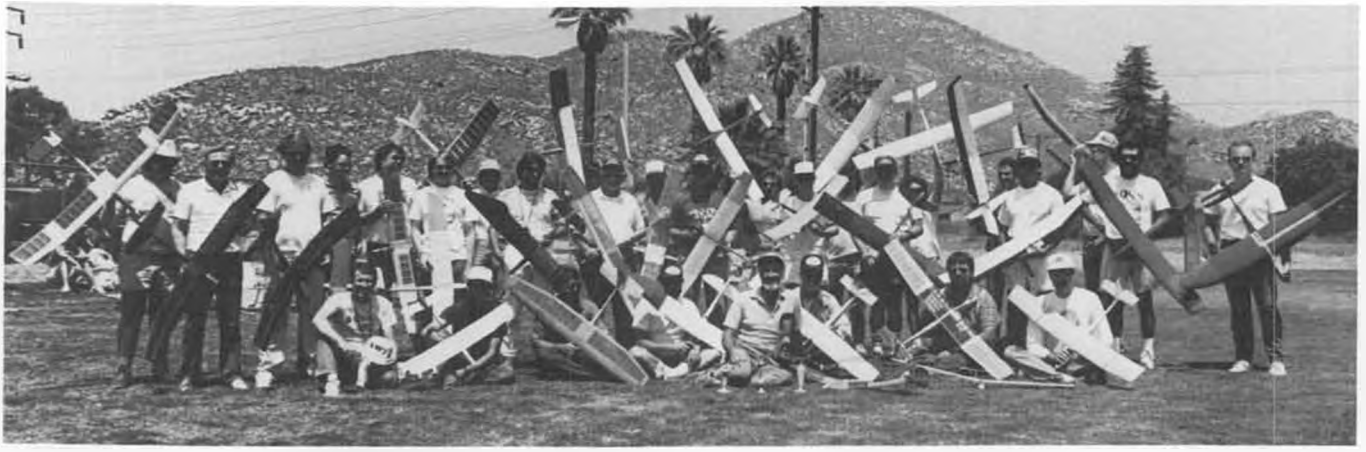
MODEL BUILDER magazine

Plan No: 989-QT

R/C SOARING

By BILL FORREY

Below: Thirty-three fliers participated in the 6th Annual R/C Hand Launched Glider Contest sponsored by the Inland Soaring Society of Riverside, California. Six contests in a row, with turnouts ranging from 28 to 51 entries, proves that AMA Class A sailplanes are definitely here to stay.



THE SIXTH ANNUAL ISSRCHLG CONTEST

The Inland Soaring Society of Riverside, California, held its big 6th Annual Radio Control Hand Launch Glider Contest this year on Sunday, June 4th. The skies were cloudy until the third round, and a gentle breeze blew most of the day.

Model Builder again sponsored the trophies, and several major manufacturers donated prizes (from radios to gift certificates) making this one of the most prestigious events in AMA Class A sailplane competition in the United States.

The AMA Class A glider by definition is limited to a wingspan of 1.5 meters (just under five feet). This class sailplane is very small, quick to build, fun to fly, easy to transport, and can be kept at the ready for lunchtime flying anytime during the week or on weekends. There are many kits available. Most of these are excellent fliers and can become competitive with only minor fiddling.

TASKS OF THE ISSRCHLG CONTEST

The tasks this year were the same ones flown for the previous three contests. All three rounds are ten-minute time slots where you can begin flying at the start of the slot, but you must be on the ground at the end for your last flight to count. All scores are normalized to 1,000 points, man-on-man within flight groups. No landing bonuses exist.

In Round One the longest flight wins the flight group. Unlimited throws are allowed. Theoretically, the longest flight could be a 9:59.99. The longest flight of each group gets the 1,000 and everyone else in that group gets a percentage of the 1,000 based on his flight time.

Round Two is five-minute precision duration. The object here is to fly exactly 5:00.00. Unlimited throws are allowed.

Round Three is limited to six throws. The object here is to get as many two-minute max duration flights as possible. The worst of the six flights is thrown out. The best accumulated time in the ten-minute time slot wins. This is the round where strategy and flying skill count the most. You can always get lucky and find the lift that no one else can reach in Round One, or you can find it first, seconds sooner than the next best finisher in that heat. In Round Two luck is a little less a factor with the five-minute max. In Round Three you can't just find one thermal and hope to win; it takes many!

As the name implies, this event is strictly a hand-toss event. The official rules state, "Anyone may throw your glider for you." This takes a little pressure off those whose arms are not up to throwing the typical 13-16 ounces of 60-inch span glider at high speed. There are always enough throwing arms around to eliminate any problems of age or injury. The "hand launch only" rule yields a more interesting competition as opposed to those using only high-starts or zip-starts. The pilots spread out all over the field, aggressively searching the air in all directions. With fixed location zip-starts, only the air surrounding them gets tested.

Longest flight of the day went to Stan Sadorf, who posted a 9:46 in Round One with his Top Flite Wristocrat.

The top three fliers at the 6th Annual ISSRCHLG Contest with their models and loot. Trophies were sponsored by *Model Builder*. From left: Joe Wurts won third place and a Flinger kit with his original design; Todd Billman and his "Illegitimate Lady" took home first place and an Airtronics Module MD7SP radio; Larry Jolly flew his Flinger to second place and received a Futaba 4NBL Attack radio.

Attendance figures have really rollercoastered over the past five years. What I see is a definite correlation between this event's turnout and the amount of magazine exposure, local club newsletter exposure, and hobby shop exposure it gets. The first annual contest in 1984 drew 32 fliers; in 1985 there were 51 fliers, in 1986 there were 44, in 1987 there were 46, in 1988 there were 28, and this year there were 33. The most effort to publicize the event came in 1985. The worst publicity

and worst weather (threat of rain) came in 1988. Considering the fact that not enough people hear of this event ahead of time, the number of fliers that do show up is incredible.

WHAT WAS FLOWN THIS YEAR

The models flown ranged from kit-builts to original designs. The latter is still by far the biggest group. By a somewhat incomplete count (I am short by two models), there were 11 original designs out of the 33 models flown. This is perhaps an indication that there is still a lot of experimenting going on out there with airfoils, planforms, fuselage shapes, etc. Class A gliders are built quickly, so experimental data is gathered quickly. It could be said that the principle of instant gratification applies best to Class A glider designs.

The most numerous kit design this year was the Larry Jolly Model Products "Flinger," with seven Flingers or modified Flingers present. The second most popular kit design at four present was the Paraphrase by Scott Whitney Models. Next in line were the BODST and Tossette at two each, and the Gnome, Zephyr, Wristocrat, Mini-Mirage, and Mini-Prodigy at one each.

The Flinger design was first published right here in *Model Builder* as a feature construction article. The month and year was September 1984. (MB Plan No. 9842, $9.50, see MB Plans Service ad for ordering details.) What makes the Flinger so successful is that it flies very well, and many of the more experienced HLG'ers prefer it. It frequently wins HLG events, and as a result has earned a very favorable reputation.

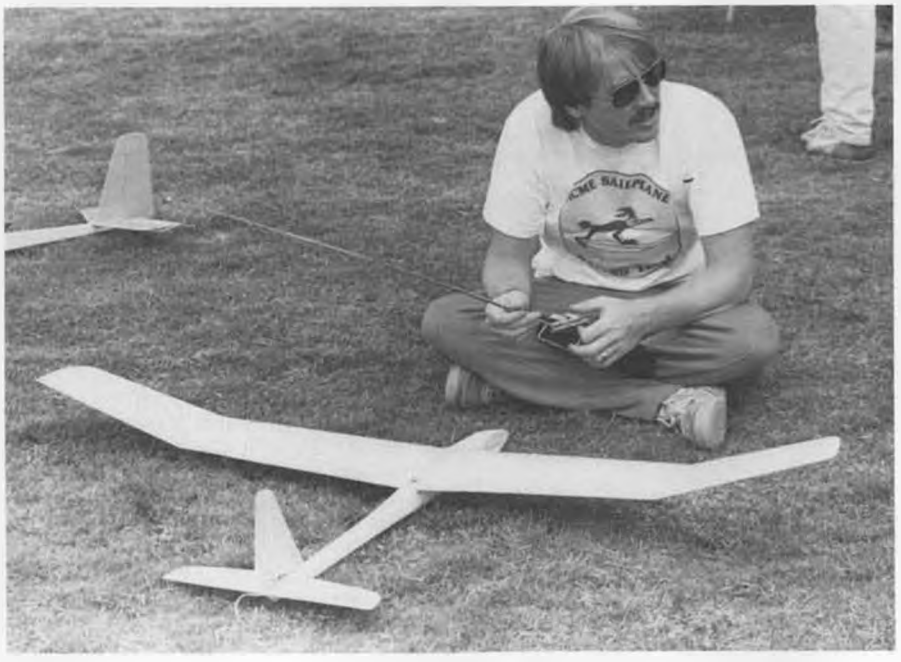
This year, Flingers placed in 2nd and 5th places. Last year one was in 2nd place. In 1987 Flingers placed 1st and 3rd. In 1986 I couldn't tell you where the highest placing Flinger was (not in the top three, for sure), but in 1985 they were 1st and 2nd. Flingers have consistently risen to the top of the heap.

This year, lacking the time and the energy (due to illness) to build a Request HLG kit prototype, Larry Jolly resurrected a four-year-old, much-used Flinger the night before the contest. (Larry, by the way, is on the U.S. FAI/F3B team which is going to France this summer.) Larry finished the ISSHLGC in second place.

Larry was hot! In Round One he had the third longest flight of the day at 6:52 for a 1,000 point score. In Round Two he got aced out in his flight group by first place finisher Todd Billman by only eight seconds with a 4:52 flight and 973 points. In Round Three, the strategy round, Larry was awesome! His times were: 120, 120, 120, 110, and 28. That's eight minutes and 18 seconds officially, with probably another 25+ second throw-out flight. He was probably only "on the ground" for 20 seconds or so out of the ten-minute slot! All on five or six throws.

Dennis Brandt flew his well-trimmed Flinger to fifth place. Familiarity with a model design and lots of practice pay off bigger than anything else!

The Flinger has an Eppler 205 airfoil, a projected wingspan of 55 inches (the plans say 57 inches), a wing area of 330 square



Joe Wurts was running a fever throughout the entire meet and still managed a third place—this guy is *good!* Joe's original design model sports foam/glass wings and tail surfaces, balsa fuselage.

Charlie Morey's "Greg Oakert Vader Plane" gets a strong toss from Gary Anderson. Model spans 50 inches, weighs a mere 12 ounces, and has a Jack Chambers #18 airfoil.

T-tail RO-8 look-alike is the work of Mike Petten. Features a Selig 3010 airfoil, 59-inch span, 7-inch root chord, 6.5-inch tip chord. Needs "a couple of refinements" before it will be fully competitive.

Charlie Morey (left) of *Slope Soaring News*, and Doug Hertzog, of Douglas Aircraft (Silhouette slope glider kit) tried their hand at flat-land thermal hunting with their "Vader Plane" pod-and-boomers.

A BODST, built from the J.M. Lupperger Plans Service partial kit, was Norm Tillman's entry. Had the longest flight of Round One, Group 4 at 3:22. BODST is pretty in a nostalgic way.

The top finisher, Todd Billman, with his borrowed "Illegitimate Lady" built by Glenn Clifton. Goldberg "Ladies" are popular among the Xerox reduction set! See March/April *MB* for more on this design.

inches, an average flying weight of 13 to 15 ounces, and an average wing loading of between 5.7 and 6.5 oz./sq. ft.

The most common modification I've seen in the basic Flinger design is stretching the wings four inches to the full 59-inch Class A wingspan. The second most common mod is increasing the tip or center dihedral angle for increased roll response. Many pilots have also found that the E205 airfoil is prone to low speed stall behavior. Therefore, a third mod you will see most often is the addition of two layers of narrow striping tape to the top of the wing about 1/2 to one inch behind the leading edge.

"INCIDENTAL" SIDETRACKS

As long as the subject of modifying HLG kits for higher performance has come up, I'd like to sidetrack this report for a moment. After many years of observation and first-hand experience, it is my opinion that the two most common areas of kit design requiring the most adjustment are wing and stab incidence angles and dihedral.

I have built and flown four different kit HLGs. All of these needed adjustments in incidence angle and/or dihedral. The Buzz Waltz "Poquito Primero" is the most unusual because it is the only HLG I've seen to have *too little* incidence. At zero degrees wing and zero degrees stab incidence it needs a 1/8-inch shim under the leading edge of the wing and about 3/8 inch of washout to cure a bad tip stall problem.

Left: James Banas and his most interesting original design. See text for story.

In pitch, the zero-zero model generally tends to go in whatever direction it is headed. You throw it at 30 degrees, it goes at that angle until it slows down and then it either arcs over like some kind of javelin or it stalls. It seems to be pitch unstable because it *is* unstable! Constant elevator corrections are required. Launches are characteristically low, fast, and flat trajectories. It must have up trim or back stick to get a normal launch or to even fly level. Similarly, it is only flyable when you keep the speed up and hold in up trim. At slow speed, the elevator gets soft and the model pitches forward in what looks like a mild stall.

The Davey Systems "Ariel" and Larry Jolly Model Products "Flinger" which I built both had too much incidence and not enough dihedral. The Ariel needed a 3/16-inch T.E. shim and double the center dihedral. The Flinger needed a 1/8-inch T.E. shim and another 1/2 inch of tip dihedral. The J.M. Lupperger Plans Service

Jim Wiseman came out of soaring retirement to fly his Mini-Mirage in the 6th Annual. Placed 16th in final standings, not too shabby.

George Spitzer's modified Flinger shares a thermal with Charlie Morey's Vader Plane. In spite of the close proximity of all models in flight, only one mid-air occurred during the whole meet.

Tony Martin (left) flew this foam-and-glass winged Flinger to 8th place. Model is very clean and fast, but at 16 ounces is too heavy to be really competitive. Tony says his next one will be lighter and will have a Selig 3021 airfoil. Photo above shows the model's semi-translucent trailing edge—a common sight on foam/glass wings.

"BODST" partial kit was closest to being right on; it only needed a 1/32-inch T.E. shim and maybe a little extra tip dihedral.

The optimum incidence angle for most designs seems to be about 1° to 1.5°; that's actually much less than most Class B, C, or D models which typically run 2° to 4°.

Wing incidence determines the angle of attack of the wing, and therefore the amount of lift the wing is forced to make. Here are the symptoms of a properly balanced model with too much incidence. First, with the elevator in neutral, the model will abruptly pull up into a steep climb just after release. This requires the pilot to give down elevator as soon as possible to prevent a stall. The model will slow down rapidly as it approaches a near-vertical attitude. The box-stock Ariel will actually go beyond vertical into a loop! This tendency is a result of the wing working overly hard at generating lift. This in turn creates a lot of extra drag, draining the energy needed for a truly high launch or long flight.

Our columnist's "3 a.m. special" modified Flinger finished the night before the meet. Schuemann wing tips with extra dihedral bring the span to a full 59 inches. Tips will stall if the plane is yawed sharply and will be removed pronto! Tail surface chords have also been increased by 1/2 inch.

Second, this model will tend to fly very slowly with a high sink rate, sometimes appearing to drag its tail around. "Mushy" and "sluggish" handling will be evident. At times the model will even appear to have brakes! Stalls and wing boundary layer inconsistencies will be very evident, even when you think you are giving the model down trim.

A model with too much incidence already has 75% or more of the stab acting with too much up trim. Flying this model with down trim will only drive you crazy because the trim force it produces varies in effectiveness at slow and high speeds. Finesse will elude you in a thermal as up elevator becomes far too powerful in tight thermal turns.

End of sidetrack! Conclusions: experiment with shims under your HLG's wings to get the best pitch stability. If your model is slow to respond to rudder, give it a little more dihedral.

BACK TO THE ACTION AND THE MODELS

The winner of the whole enchilada flew an original design built by Glenn Clifton of the Silent Wings Soaring Association club, in the Pomona Valley of Southern California. The winner was Todd Billman, and the model was a miniaturized version of the Carl Goldberg Models "Sophisticated Lady." Glenn Clifton can be seen holding two of these models on page 30 of the March/April '89 issue of *Model Builder*. He calls it the "Illegitimate Lady"!

Todd was one of only two guys with a perfect 2,000 point total after the first two rounds of flying. The other flier was Jerry Bridgeman, flying a Midway Models "Gnome" with an Eppler 182 wing. Jerry ended up taking 4th place. Todd's longest flight in Round One was 2:18. His flight in Round Two was a perfect max at 5:00. Round Three, where 120 seconds was a max and your best five flights counted, saw Todd doing 120, 28, 52, 40, and 49 seconds for yet a third 1,000 point total!

The Illegitimate Lady could be called a Xerox special. The Sophisticated Lady plans were shot at 75% of original size on a photocopier. The model weighs only 13 ounces, which is pretty darn light for a full-size Class A model. The ship has a 57.25-inch wingspan; the root chord ends up at seven inches, and the tip at six inches. The stock airfoil is retained: thin and flat bottomed. Overall, the Illegitimate Lady works very well at its new size. By some accounts, its performance is not perfect, but it is good enough to win, that much has now been proven!

(Gee, first it was miniature Gentle Ladies, now it's miniature Sophisticated Ladies.

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These two photos show the terrific energy that Joe Wurts puts into his launches. Joe's ship consistently tops off about 20 feet higher than most of his competitors.

CHOPPER CHATTER

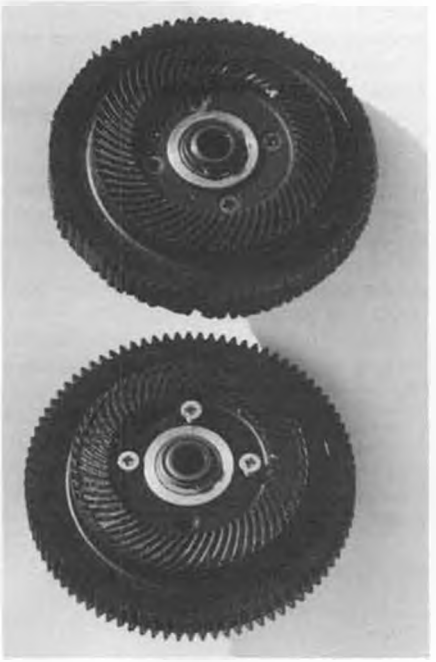
By JAMES WANG

• This month we will talk about the importance of proper gear mesh. Precise gear mesh is important because it reduces wear, minimizes vibration, reduces noise, reduces friction, and prevents slippage that can chew up the teeth. On any model helicopter, usually the only places where you need to set the gear mesh are where the plastic main rotor gear meets the clutch bell gear, and where the main gear meets the tail rotor drive gear. The easiest gauge of proper gear mesh is when they are tight enough to allow only a strip of normal writing paper to pass between them. You can check your helicopter by turning the gears and feeding in a strip of writing paper between the gears; the paper should just go in and come out corrugated. You can adjust the clutch bell gear mesh gap by loosening the engine mount and then joggling the engine slightly. The tail rotor gear mesh is adjusted by loosening the tail rotor drive gear and moving it up or down slightly.

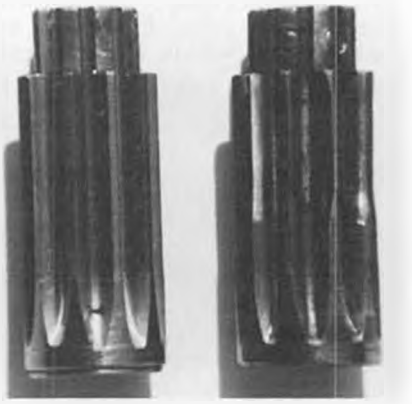
When gear mesh is too tight, the engine has to do extra work to overcome the excess friction. This robs power and can also overheat the engine. When the mesh is too loose, the gears can accidentally slip when a surge of power is applied; this will chew up the teeth. One of the photos shows two plastic main gears. The one on the top is chewed up due to bad meshing between the main gear and clutch gear. The gear on the bottom is chewed up where the main gear meets the tail rotor drive gear. These can be caused by bad alignment or when the engine won't quit after a crash.

It is almost always the plastic gear that is chewed up. After you have accrued a few hundred flights on your model, you should recheck the gear mesh because the steel gear on the clutch bell will have worn due to normal use. Check the photo of a new and a used steel gear from a GMP clutch bell. With usage, the steel teeth become sharper and thinner, consequently making the gear mesh sloppier which might cause the gears to slip and chew up the teeth. You should tighten up the meshing after every hundred flights.

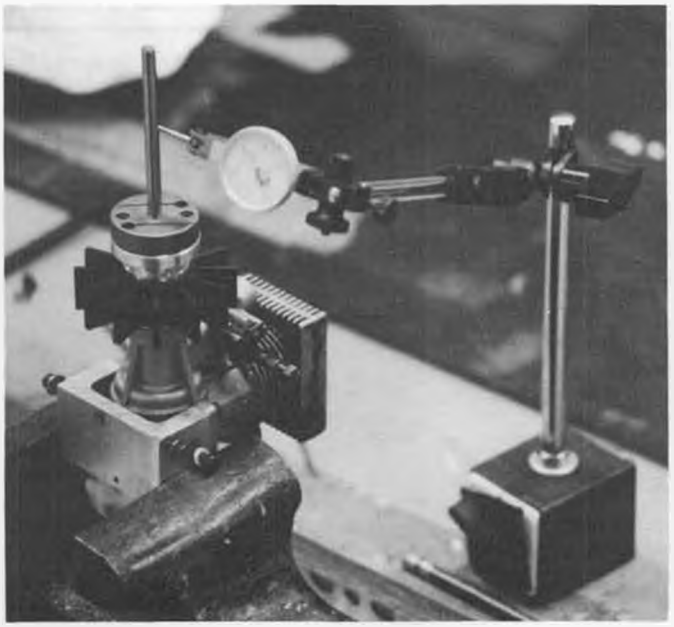
Most plastic gears used in R/C helicopters are made of Delrin, which is a synthetic petroleum product. A metal gear running on a Delrin gear is very quiet. A metal gear running on a metal gear can be noisy and the wear rate can be higher. For example, the Schluter Miniboy and the Junior have a metal tail rotor drive spur gear running on the metal clutch bell planetary gear. Have you ever listened to a Miniboy or a Junior in flight? They make a distinctive, high pitch, clashing noise. We often worry that metal rubbing on metal can generate electrostatic sparks that produce radio frequency noise to interfere with normal



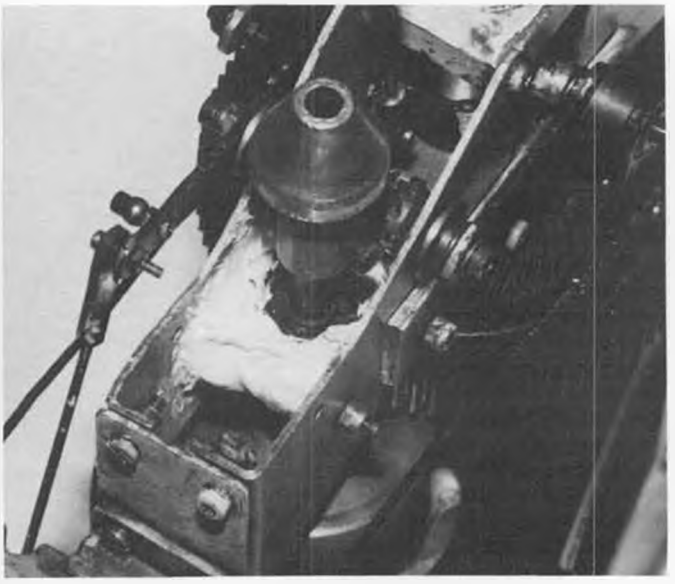
Two examples of chewed-up Delrin main gears, the result of improper gear mesh.



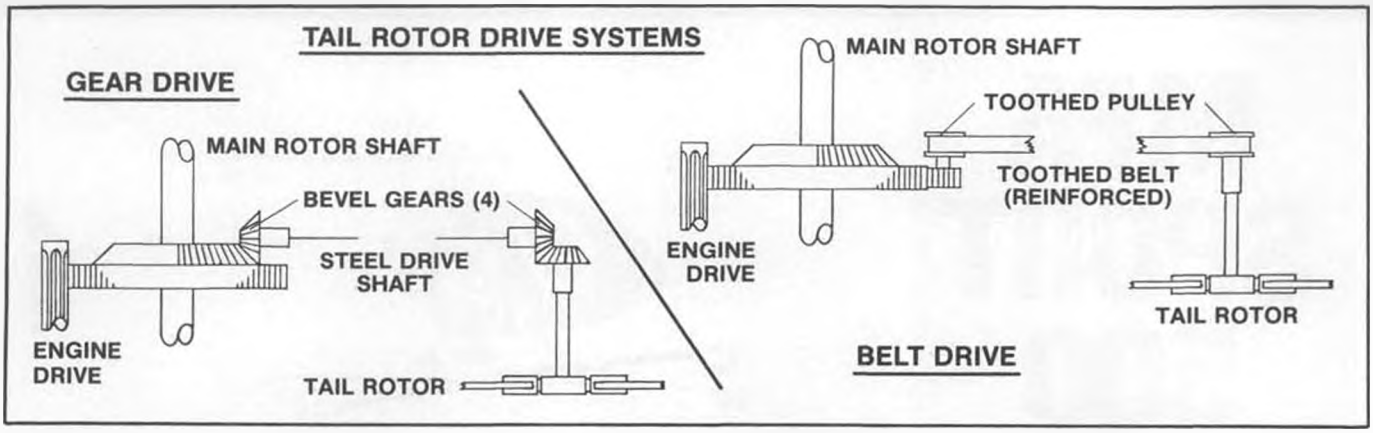
A comparison of new (left) and well-used clutch bell gears. These steel gears will eventually wear out just from routine use.



Always use a dial indicator to center the clutch shaft on the engine. Shaft runout should be no more than .003" for minimal vibration and wear.



Not the prettiest fix, but it works. To correct severe misalignment of the clutch shaft, the bearing block can be cut down in width and then bolted back in place, using RTV silicone rubber to fill up the gaps. Be sure to align the shaft before the silicone sets up.



radio operation. However, a metal gear running on a metal gear is not a rubbing action, thus it does not seem to produce radio interference. Most model helicopter tail rotor gearboxes have two metal bevel gears running on each other. Why don't they make a high-pitch clashing noise? Because they are 45° bevel gears, so they have greater surface contact area, and the gears are enclosed inside the tail rotor gearbox.

A good gear mesh design should always use bevel gears or spiral gears to maximize the contact area to efficiently transfer torque and to reduce noise. Acoustic noise is reduced because the greater contact area spreads out the load, therefore there is less pressure on the surface. For example, you must have noticed that when a woman with high heels walks by there is more noise than when she is wearing flats. (I don't mean the whistles.) The reason is that for a woman weighing 120 pounds, when she is walking each of her spiked heels is pounding the ground at, say, 50 pounds. Fifty pounds of force concentrated on a small 1/4x1/4-inch area means the pressure at the tip of her heel is 800 pounds per square inch! That's a lot of psi. Thus, the noise is more intense and higher pitched. If she were wearing flats (say the heel has a 2x2-inch area), which give more surface contact area, her heels would only pound the ground at 50 pounds divided by 4 square inches equals 17.5 psi. That is a lot of difference in pressure exerted on the ground.

Reducing the pressure reduces wear on both heels and gear teeth, and reduces the noise level at the same time. Always design gears to have maximum contact area, or as engineers sometimes say, 'footprint.' Similarly, when you have meshed the gears optimally, the teeth will contact each other over a greater area, thus reducing the stress on the teeth (stress is directly proportional to applied pressure). Pressure is defined as applied force divided by the exerted area.

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Right: Century Import's "Flight Master" 3-D training stand makes it impossible to crash while learning to fly. Now you can take that $199.95 you've set aside for replacement helicopter parts and spend it on this stand instead. Our columnist likes it, thinks it's great for learning nose-in hover.

SR Batteries Inc., P.O. Box 287, Bellport, New York 11713, is offering this nifty hex key wrench set for $26.95. Looks like high-quality stuff.

SR custom builds transmitter and receiver battery packs to your specs, in any size and configuration and with any connectors you choose.

MFA SPORT 500

R/C HELICOPTER

The MFA Sport 500 in a stable hover with the recommended beginner's training skid. This is a simple, inexpensive machine produced in England by Model Flight Accessories and imported into the U.S. by Hobby Lobby International.

By JAMES WANG

• This month, and in the next few months, we will have a look at three very simple and inexpensive R/C helicopters. We will start with the MFA Sport 500 fixed-pitch helicopter from England. It is imported and sold in the U.S. by Hobby Lobby International for only $199. In coming months we will look at the long time popular .25 size GMP Cricket, and the just released .40/.45 sized GMP Rebel.

Before we begin the review, let's first define what is a fixed-pitch R/C helicopter. A fixed-pitch R/C helicopter means the main rotor blades are clamped solidly to the main rotor hub at a particular pitch angle. Typically, the blades are set at about 4° because at this angle the airfoil gives very good lift and relatively low drag. This is called *optimal lift-to-drag ratio*. For a fixed-pitch helicopter, the vertical motion of the vehicle is controlled by speeding up the main rotor rpm to generate more thrust to go up, or by reducing the main rotor rpm to come down. Since the main rotor is geared to the engine, it follows that the main rotor rpm is controlled by throttling the engine. The drawback of a fixed-pitch helicopter is that there is a slight time delay for the engine to speed up or slow down, thus the vertical response is not instantaneous. Fixed-pitch helicopters require the pilot to anticipate and feed in commands ahead of time. For instance, in a landing approach from forward flight, the pilot needs to anticipate and feed in power earlier than he would with a collective-pitch helicopter, to cushion the final descent.

A collective-pitch helicopter means the main rotor blades can rotate to change the pitch angle to increase or reduce lift. On a collective-pitch helicopter, the main rotor rpm is kept pretty constant (around 1500 rpm); the helicopter's vertical motion is controlled by changing the blade pitch angle (see the June '89 issue of *Model Builder* for model helicopter rotor head design theory). The beauty of collective-pitch model helicopters is that you get fast vertical response. The drawback is that the main rotor head is mechanically more complicated and costs more. Both of these drawbacks may pose problems to beginners.

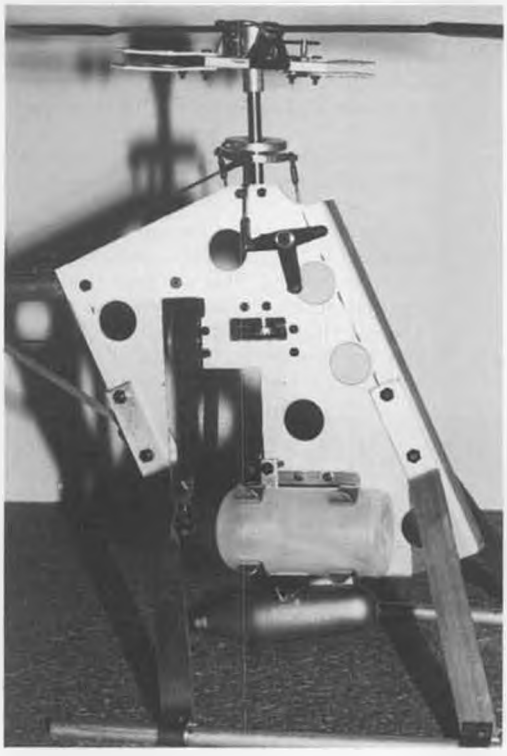
Fixed-pitch helicopters are inexpensive and easy to assemble. Most require only a four-channel radio with four servos. You do not need a special helicopter radio; any inexpensive four-channel airplane radio will suffice. A collective-pitch helicopter is best operated with a five-channel helicopter radio and requires five servos, the fifth servo being used to change the blade pitch angle. On a collective-pitch helicopter, moving the throttle stick on the transmitter will cause both the engine throttle servo and the collective pitch servo to move at the same time.

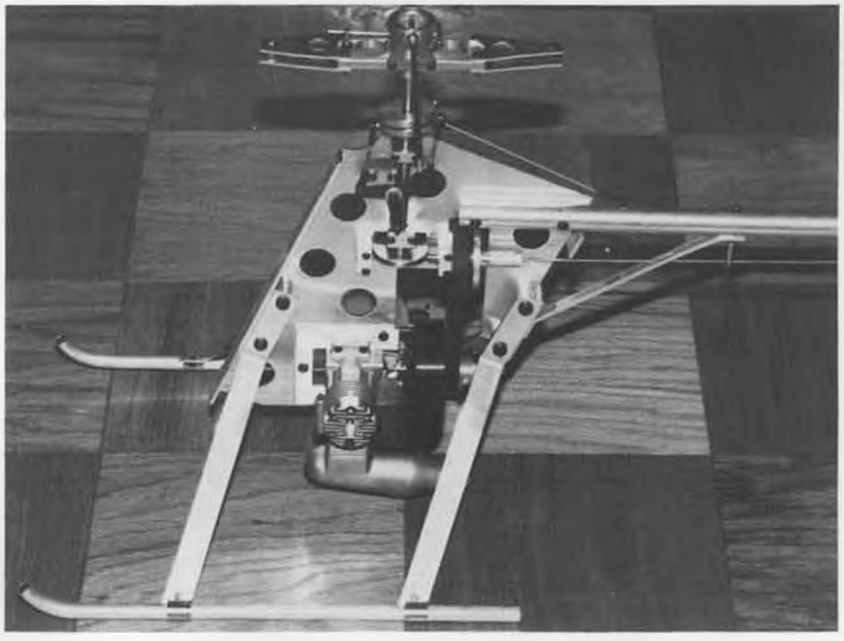
Collective-pitch helicopters range in price from $300 to $1,000. The three fixed-pitch helicopters currently on the market, the MFA 500, GMP Cricket, and GMP Rebel, can all be bought for under $200 in hobby shops. Fixed-pitch helicopters are extremely easy to build, and inexpensive to repair. A fixed-pitch machine may be a good way to get your feet wet.

Does it take longer to learn on a fixed-pitch helicopter? The first three weeks probably does not make any difference because the beginner is supposed to lift

Kit contents are well packed. The Sport 500 is designed for .40 to .45 size engines; this one is powered by an Enya .45.

This is all there is to it. Should take most beginners about a week to assemble. Printed plywood parts have to be cut out by the builder.





Above: The engine is mounted on the left side. Engine power is transmitted through a belt to the tail rotor shaft and main rotor reduction gear.

Left: The fuel tank is visibly mounted on the right side. The aluminum frame and landing gear are quite strong—perfect for novice fliers.

the helicopter no more than a few inches off the ground. He is supposed to concentrate on the tail rotor control only (beginners should read the July issue of *Model Builder* on how to fly). However, when the beginner begins to reach the hover and forward flight stages, then fixed-pitch helicopters will be slightly more challenging because the vertical control response is slower. However, I have flown six different fixed-pitch helicopter designs, and they all seem to be extremely stable in the longitudinal and lateral directions. Thus, fixed-pitch helicopters lose a few brownie points for slow vertical response, but get a few extra brownie points for excellent stability. Therefore, it might not take longer to learn to hover a fixed-pitch helicopter, but one thing for sure is, if you learned on a fixed-pitch machine, flying a collective-pitch machine later on will be a piece of cake.

Why are the three fixed-pitch R/C helicopters on the market very stable? First, they are designed as non-aerobatic helicopters for beginners, therefore, stability was the primary design criterion. Second, they all have a 100% Bell-Hiller mixing ratio between the flybar and the main rotor. All collective-pitch helicopters have less than 100% Bell-Hiller mixing ratio. A high ratio means lots of feedback to help stabilize the helicopter. Third, they all have a soft teetering (or soft offset flapping on the Rebel) main rotor head design which makes the cyclic control feel very soft and docile. A soft flapping main rotor head makes the fuselage just dangle underneath the main rotor disc. For beginners, soft response is nice, but for experts it would be boring.

OK, let's zero in on the MFA Sport 500. This model was designed and is manufactured in England. Hobby Lobby is the only outfit in the U.S. that imports it. The model is inexpensively priced at $199. The packaging of the kit is good; all parts are clearly labeled in plastic bags. One nice feature is that the 2mm, 3mm, and 4mm nuts and bolts are separately bagged. This is especially helpful for beginners because most would not be able to differentiate between a 2mm and a 3mm bolt. The kit does not require special tools to put together. A week's work should be enough.

Let's look at the design features. The layout of the MFA Sport 500 strongly resembles the American GMP Cricket, which is in turn similar to the British Micro Mold Lark introduced back in the '70s. The Cricket and Lark are certainly very successful fixed-pitch helicopters. The MFA Sport 500 helicopter is very robust. The aluminum side frame is a solid 1/8-inch piece; however, it is very tall, and sometimes when the engine is idling on the

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The tail rotor gearbox is mounted on the wooden tail fin to keep the tail rotor drive shaft straight. The instructions show the tail rotor facing to the left, but our author mounted it on the right because it's more efficient to have the rear-most tail rotor blade rotating downward.

The engine is started by using a belt, which is not included in the kit and must be purchased separately.

BIG BIRDS

By AL ALMAN

GUSSETS . . . DON'T FORGET 'EM

Some months ago I ran a photo of a fuselage section with gussets. The photo ended up kinda small and hard to see and I forgot to include an explanation in the text.

So here's another reminder that gussets are the best way to strengthen every part of that airplane you're building and still keep weight to an absolute minimum. Try 1/32 ply gussets, especially on the fuselage. They're light, strong and easy to cut.

A picture is supposed to be worth a thousand words, so take a gander.

FIREWALLS COMING LOOSE

"Losing an engine" usually means that it stopped running for some reason. But I know of three guys who literally *lost* theirs—the engine and firewall actually parting company with the fuselage—while amazing themselves and others with their derring-do.

This shouldn't happen if the plane is built right and the prop is balanced. It's bad news having a four to six-pound engine falling from the sky because you never know where they're going to impact (of course, being severely out of balance makes the *airplane* a falling hazard, also).

Looks like too many fuselages lack the airframe integrity necessary to be considered airworthy. And slapping in an excessive amount of epoxy to fill up gaps and holes in a poorly fitted glue joint isn't the answer, particularly around the firewall.

Here are a few ways to enhance the structural integrity of those firewall areas:

1) Use a hefty piece of top quality aircraft ply for the firewall. Lite-Ply or anything other than the best grade of multi-laminated aircraft ply won't stand the gaff. And don't skimp on the firewall thickness. On birds weighing over fourteen pounds use either 1/2-inch ply or laminate two 1/4-inch pieces together.

Don't worry about this adding too much weight because most of our birds come out somewhat tailheavy anyway. Instead of having to add a bunch of lead for balance you will have already invested that weight into a more meaty, solid and stronger firewall.

2) Install one-inch triangular stock to reinforce the rear of the firewall/fuse side joint.

3) Pin and glue the fuselage sides to the firewall with 1/4" dowels anywhere from 3/4 to 1 inch long. This will really help to keep that nose section together.

I know that many builders still favor epoxy for those firewall installations, but you should know that the very thick Hot Stuff Special "T" will do an equally good job. A reminder again that regardless of the adhesive used, you want each joint to fit well, so take those few seconds extra to get it right. As my nine year-old son, Adam, points out about his glue joints, "Look dad, I did my own personal best."

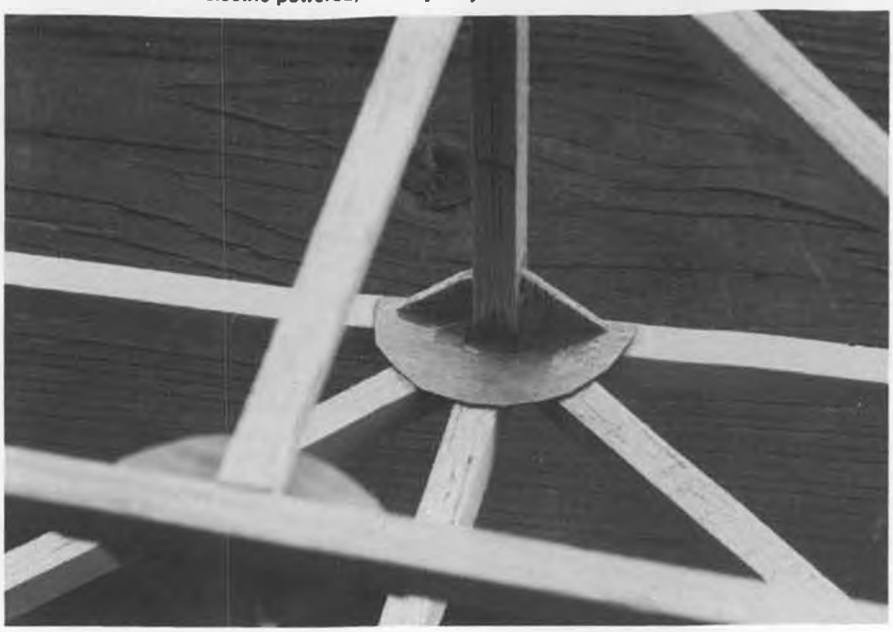
The 12 Foot Telemaster, originally produced by Joe Bridi for Hobby Lobby before the kit was discontinued, is available again in an even larger 150-inch version; see text for details.

12 FOOT (+6") TELEMASTER

So many folks have asked for and inquired about the 12 Foot Telemaster that Hobby Lobby's Jim Martin figured the world once again needed and was ready

Pretty shot of a colorful Fokker D-VII by an unidentified builder. It's Quarter Scale, but a little smaller, being a 3" = 1' model of a 7/8-size replica that was built specifically for film work. Model weighs in at 15-1/2 pounds, is powered by an ST-2500.

You won't see an engine cylinder sticking out of the skinny nose of this beautifully built Turbo Beaver because she's electric powered, built by Lloyd Roberts from a Unionville Hobby kit.



Gussets cut from 1/32 ply are a great way to beef up your airframes while adding a minimum of weight. Thin plywood cuts easily with ordinary scissors; glue 'em in place with CA.

supposed to fly like a Laser or a P-51. This Telemaster was designed for slow, relaxed flying, so prop the engine with more diameter and less pitch than you normally would use.

Besides being a good plane to learn on, she has the capability to haul a macho-type payload. If you've been hankering to play around with airborne videos/movies, tow banners, launch gliders and/or blanket the area with candy, this Tele's for you.

Hobby Lobby kits have typically been darned good, so I'd expect this biggest Tele to be chock full of quality, also.

Yes, that is Joe Bridi posing with the monster, and no, he's not quite that young anymore because this pic was taken several years ago, when Joe first started to make the kit for Hobby Lobby.

This new version, by Premier Balsa Manufacturing in England, is slightly larger than the original; she now spans 150 inches and features conventional balsa and ply construction, a two-piece wing with functional load-carrying struts, and a lifting horizontal stab.

For pricing and their new free catalog, write to Hobby Lobby International, Inc., 5614 Franklin Pike Circle, Brentwood, Tennessee 37027.

CLASSIC 1.20

Six years ago I bought my first four-stroker, an English-made Magnum .91. It's a massive looking brute, and although perhaps a bit less powerful than the latest generation of .90 four-strokes, puts out gobs of torque and *won't* sling props.

I've purposely overleaned the engine trying to get it to detonate and throw a prop, or at least to break one loose, but no soap; when too lean she just winds down and stops. This may very well be because she acts just like a big heat sink and has rocker arms and valve pushrods out in the open that allow heat to dissipate faster. (I get some kind of perverse pleasure out of watching those rocker arms and pushrods going like sixty.)

Because these Classics don't sling props—they apparently run cooler and are nowhere as sensitive to heat build-up as

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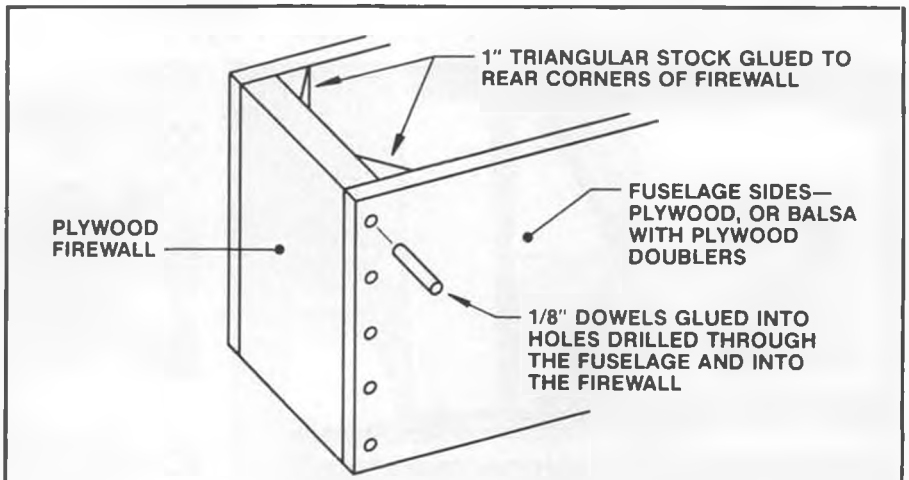
for this very big and very easy to build and fly aeroplane, so it's back due to popular demand.

I've flown a number of these humongous Tele's (the last one was an outrageously tricolored machine . . . yellow, pink and what would have to be referred to as "burple") and remember how well behaved they were. We're talking about an extremely beginner-friendly airplane that's perfectly suitable as a trainer. Can't deny that her size is intimidating at first, but it doesn't take long to appreciate how that bigness works for you; lots of time to think about what you're doing because she is so slow and easy to see.

Any decent running two to three cubic inch displacement engine is enough power for this bird because 3,000 plus square inches of wing area make her nimble and light on her feet. You could put in a bigger engine, but keep in mind that she's not



Even the smoothest running engine pounds the heck out of a model. What you *don't* want is a flimsy firewall installation. Method shown here will guarantee a strong front end.

ALL ABOUT ARFS

By ART STEINBERG

• In past columns we've done a lot of talking about the desirability of larger models from the standpoint of good flying characteristics and visibility. When it comes to trainers these are certainly good traits to look for, but let us not overlook the fact that there is often a place for a small airplane in our stable of R/C models. For example, on some of those summer family trips it really comes in handy to have a small, fully assembled model packed in your car, van, or recreational vehicle, ready for action on a moment's notice.

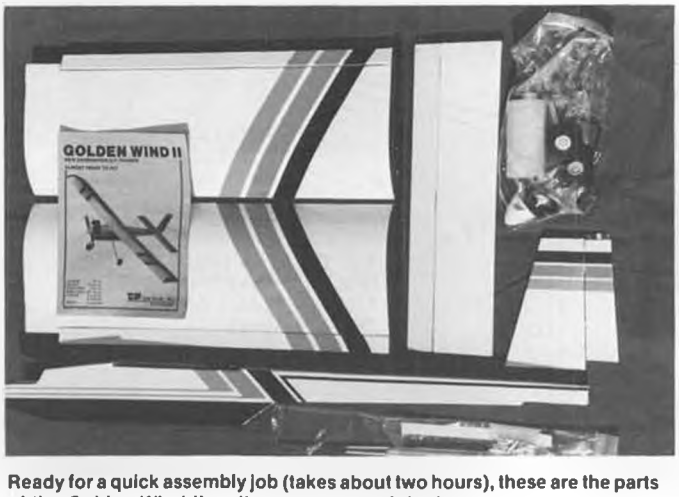
Recently I ran across one such model called the "Golden Wind II," a product of the Ten Plus Company. This company is committed to dealing in ARFs exclusively and the range of models they offer is mind-boggling. For example, they offer at least three different .60 sized state-of-the-art pattern planes, the Aurora 60, the Summit II, and the Beetle 60. These are nicely handcrafted models which require only installation of your radio gear, engine, and retracts to reach flying status. Besides the pattern aircraft, Ten Plus also offers a number of really esoteric ARFs, including a couple of twin-engine beauties consisting of a DC-3 and a Beechcraft twin. These are intended for .40 size engines and I was amazed to find that they only weigh about five pounds, less radio and engines! As is usual with their top-of-the-line models, the painted finishes were superb, and they are without a doubt among the finest examples of ARFs that I have yet seen.

Strangely, with all these high-tech models in their inventory, Ten Plus has seen fit to offer the Golden Wind II, a fairly conventional sport model, sporting a flat-bottom wing with a span of forty-seven inches, and a flying weight of about three and one-half pounds. If you have ever assembled one of the standardized ARFs which are so common today, then this one would be so easy you could almost do it blindfolded. I have reached the point where I can usually get the main assembly completed in about two hours, and this model is no exception. All construction is of balsa and plywood; strong, but extremely light. The tail surfaces are built-up and easily attached to the fuselage. The wing is held to the fuselage by the conventional rubber-band method, and the tricycle landing gear consists of a torsion-bar arrangement for the mains with a regular coiled nose gear. All hardware is included, including fuel tank, spinner, and sponge rubber wheels. All tail control surfaces are factory hinged. The aileron hinge slots are pre-cut, requiring that the ailerons be glued in place.

The entire model is covered with what appears to be a heat-shrink type of plastic film. However, a word of caution: *these coverings found on typical ARFs are not of the heat-shrink variety!* On opening the box it was found that some of the covering on the wings was sagging a bit, and from previous experience I knew that if I tried to tighten it up with even a low heat setting on my heat gun there would be real problems. This film is applied at the factory without the use of any heat. The film has a sticky back and is merely laid in place and hand stretched over the wood framework. It was never meant to be worked with heat, so one should never try to heat shrink it. The way to tighten it up is to take a sharp blade, lift the seam carefully, and stretch the covering until you get it the way you want it, then merely press it down again.

The covering material did prove to be quite strong in use, and if repairs are ever needed, the best way is to patch it with a piece of adhesive-backed MonoKote. The overall color scheme was quite attractive, basically white trimmed in red, yellow, and blue, and I found it to be quite visible at most all altitudes. Visibility was especially enhanced by the fact that the bottom of the fuselage was predominantly red, and the upper surfaces were mostly white. The one unusual feature about the Golden Wind II is the shape of the fuselage, looking almost like a pod-and-boom arrangement, and it does tend to give the model a real air of distinction. In any event, there was plenty of room for three standard servos,

This month's featured ARF is the "Golden Wind II," imported from Taiwan and sold here in the U.S. by the Ten Plus Company in Santa Fe Springs, California. It's a four-channel ship for .25 size engines.



Ready for a quick assembly job (takes about two hours), these are the parts of the Golden Wind II as they come out of the box.

Gene Liao of the Ten Plus Company shows some of the other models his firm imports. Note the .60 size Pattern planes in the background.

Kirk Murphy and Jim Bates of Carlsbad, California, are two novice R/C fliers who have both learned to fly on the same Cox PT-19.

Bill Selzer, president of Cox Hobbies, displaying the new Cox Fairchild 24, an .049 powered, two-channel ARF that promises to be a fine performer.

How about this motorized scooter for getting around at the local flying field? It's called the "Go-Ped," marketed by Vopard Enterprises, and our columnist is nuts about it. See text for details.

receiver, and full-sized battery in the spacious fuselage, and none of the components needed to be placed forward under the fuel tank.

A few minor comments on assembly are in order. The manner in which the two wing halves key together produces a perfect fit, even when working on an uneven surface. Some care must be exercised when mounting the horizontal stabilizer to the bottom of the fuselage, as some slight trimming is required to ensure that it is parallel with the wing. Of course, this may vary from one kit to another. The main landing gear had to be bent back at least a half inch so that the tail would not touch the ground.

The wingtip treatment is handled in a simple and straightforward manner, nothing elaborate, just an excellent fitting set of plastic end caps. This excellent fit was also carried out in the plastic caps on the tips of the tailfeathers.

As this model is intended for engines in the .25 size range we installed an old O.S. .30 of the standard porting type, figuring that this would supply sufficient power. The CG came out right on the money without the addition of any trim weight. Control throws were not specified, so a hefty amount of throw was used on the control surfaces. However, using a dual rate radio, we were able to tame the throws in flight if it proved to be necessary.

For the first flight, controls were set at low rate for takeoff, and a steady straight run lifted the Golden Wind II off the ground with authority in what looked like a picture-perfect ascent. From the moment it was in the air I was very impressed with the excellent response of this model. While in low rate my copilot, Rick Miller, and I found that we could perform virtually any maneuver in a graceful and docile manner, and we had a heck of a time doing spins, rolls, and flying inverted all over the place. After about ten minutes of flight time she was brought in for one of those absolutely perfect landings you become accustomed to when flying Senior Falcons, Proctor Antics, and eight-foot-span Old Timers. All we needed was to let her land herself with a touch of flair at the last moment. At this point I would once again like to convey my praise for the foam wheels which are supplied with so many of the ARFs today. These are so light that they add practically no weight to the model. Furthermore, they are outstanding in their shock absorbing qualities, and really help to smooth out

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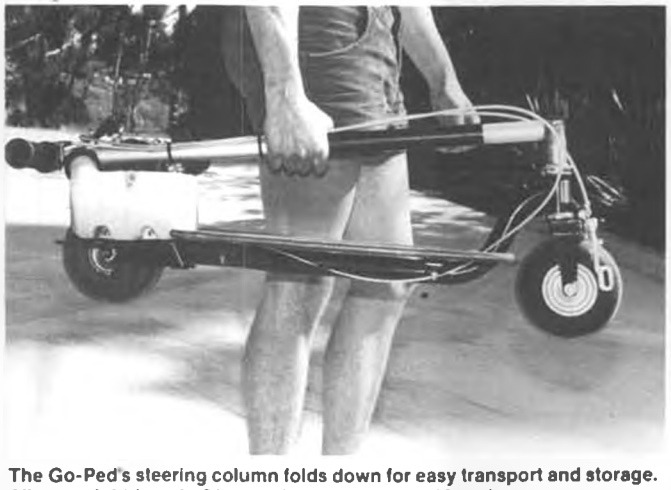


The Go-Ped's steering column folds down for easy transport and storage. All-up weight is only 21 pounds, can do up to 18 mph.

A close-up of the 1.4 hp Zenoah engine on the Go-Ped. Tires are solid rubber, not pneumatic, and should last a lifetime.

MODEL DESIGN & TECHNICAL STUFF

By FRANCIS REYNOLDS

• Last December I promised you an update on Cube Loading "in a couple months." So, I'm a little late. A lot late?

WING CUBE LOADING (WCL)

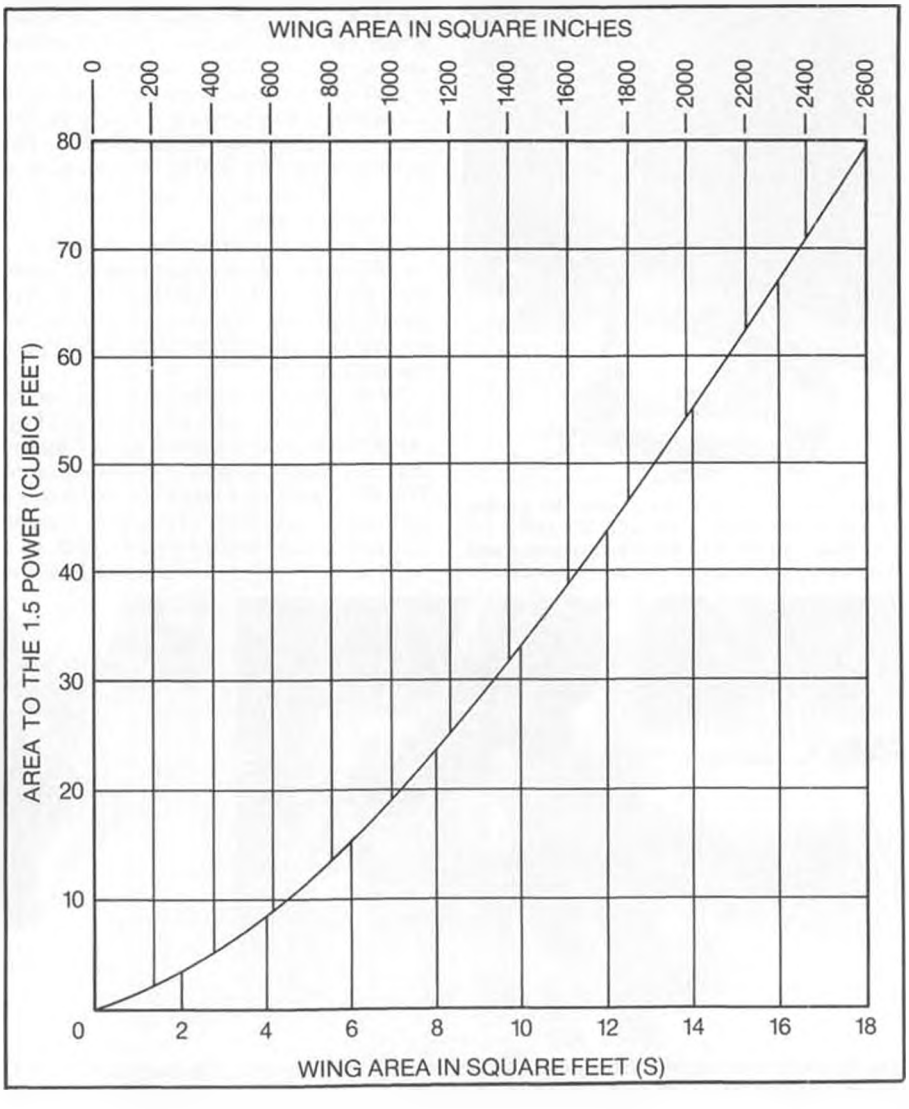
For newcomers to the column, and as a review for "oldcomers," I recommend that you reread MD&TS for September a year ago and also the December issue. Wing loading is a lousy way to compare models with each other and with full scale airplanes, because wing loading varies with the size of the plane. The problem is that we are dividing weight, a cubic-like function (weight is proportional to volume which we measure in cubic feet) by area, a squared function measured in square feet. We should be, and many modelers are, comparing planes by their wing cube loading, which is independent of size because both the numerator and the denominator are cubic.

As an example, the cube loading of a scale-weight, quarter-scale Piper Cub and a scale-weight .049-powered Piper Cub model will have exactly the same wing cube loading as each other and as a full-scale Piper Cub. This way we can compare airplanes directly and get a much better picture of how we are doing as model builders. The plain wing loading of these three Cubs would be very different from each other due to the size differences, and quite useless in comparing the planes. Even worse is the fact that we tend to forget that wing loading varies with size, and wonder why the quarter-scale model has a much higher wing loading than the small model. We didn't build it too heavy, we used the wrong measure of comparison.

Area is a squared term because it consists of a linear term (span) times another linear term (chord). We can change wing area to a cubic term by multiplying it by the square root of wing area, another linear term. Are some of you lost? Sorry; I tried. You may note that in my original effort last September, I didn't use square root of area for the third linear term, and the result wasn't independent of aspect ratio. When we introduce the square root of wing area, as proposed to me by reader William Kuhnle, the relationship is dependent only on the size-to-weight ratio. So don't use the formulas and examples in the September issue, use these instead.

Wing Cube Loading equals the weight of the airplane in ounces divided by the wing area in square feet and divided by the square root of wing area. The units of wing cube loading are weight per unit volume the same as density. This makes sense, since both cube loading and density are measures of relative weight.

FIGURE 1—CUBE LOADING



These days one can get a pocket calculator with a square root key for ten dollars, or you can use the curve in Figure 1 to simplify calculating wing cube loading for a large range of model wing areas. You will note that the curve is for area to the 1.5 power, which is of course the 3/2 power, or area times the square root of area. I'm such a helpful guy that I also put square

feet on the chart as well as square inches, to save you the trouble of dividing by 144. So to get WCL, in lieu of a square root table or calculator, take the weight of the plane in ounces and divide it by its wing area to the 1.5 power as read from the curve. WCL = W/(S to the 1.5 power).

I said earlier that the WCL of a scale model of scale weight will be the same as that of its full-scale prototype. That is true, but, most actual scale models have wing cube loadings on the order of a third lower than their prototypes, because we commonly build our scale models lighter than scale weight. The reason is that we wouldn't like the way scale-weight models fly. They would have to fly a bit fast for our human reflexes, especially old reflexes like mine. If scale event rules required scale weight as well as scale dimensions, the flight part of the event would suffer greatly. So model WCLs are a little lower than full scale WCLs, but model wing loadings are many times lower than full scale WLs.

SCALE SPEED

True or mathematically correct velocity scaling requires that the model fly at the prototype speed divided by the square root of the scale factor. Quarter-scale models should therefore theoretically fly half as fast as their prototypes, and one sixth scale models should fly 41% as fast. However, I understand that scale judges sometimes grade down a scale model whose flight is too fast to "look scale." Actually, as we usually build lighter than scale weight, most of these scale models are able to fly at a lower scale speed than their prototypes, but "apparent" scale speed differs from true scale speed.

Will Kuhnle points out to me that for models to fly at apparent or "visual" scale speed (prototype speed divided by scale factor), their weights should be proto weight divided by the fourth power of the scale factor. Wing Quad Loading anyone? Sometimes I wish I had never gotten involved in all of this!

HISTORY OF CUBE LOADING

A year ago I mentioned that others had also proposed similar solutions to the wing loading problem. Only when the letters came in after my cube loading column was published did I realize how many others, and how long this effort has been going on. Others have called it cube loading, wing volume loading, density factor, flyability factor, volumetric loading, etc. Some of the proposals were identical to what I am now preaching, but they sometimes used different names and different units. To give credit where credit is due, these are the people I know of who have been significantly involved. Bob and Roland Boucher, Chuck Cunningham, John McMasters, Ted Off, Dave Platt, Larry Renger, Ken Runestrand, Tom Stark, Ron St. Jean, Joe Wagner, Kent Walters, R.H. Warring (in England), and Nelson Whitman.

Several of the above took a wrong turn, in my opinion, when they proposed wing thickness as the third linear term to make a wing volumetric loading. One argued that a thick wing will generate more lift than a thin wing, and a thick wing would and

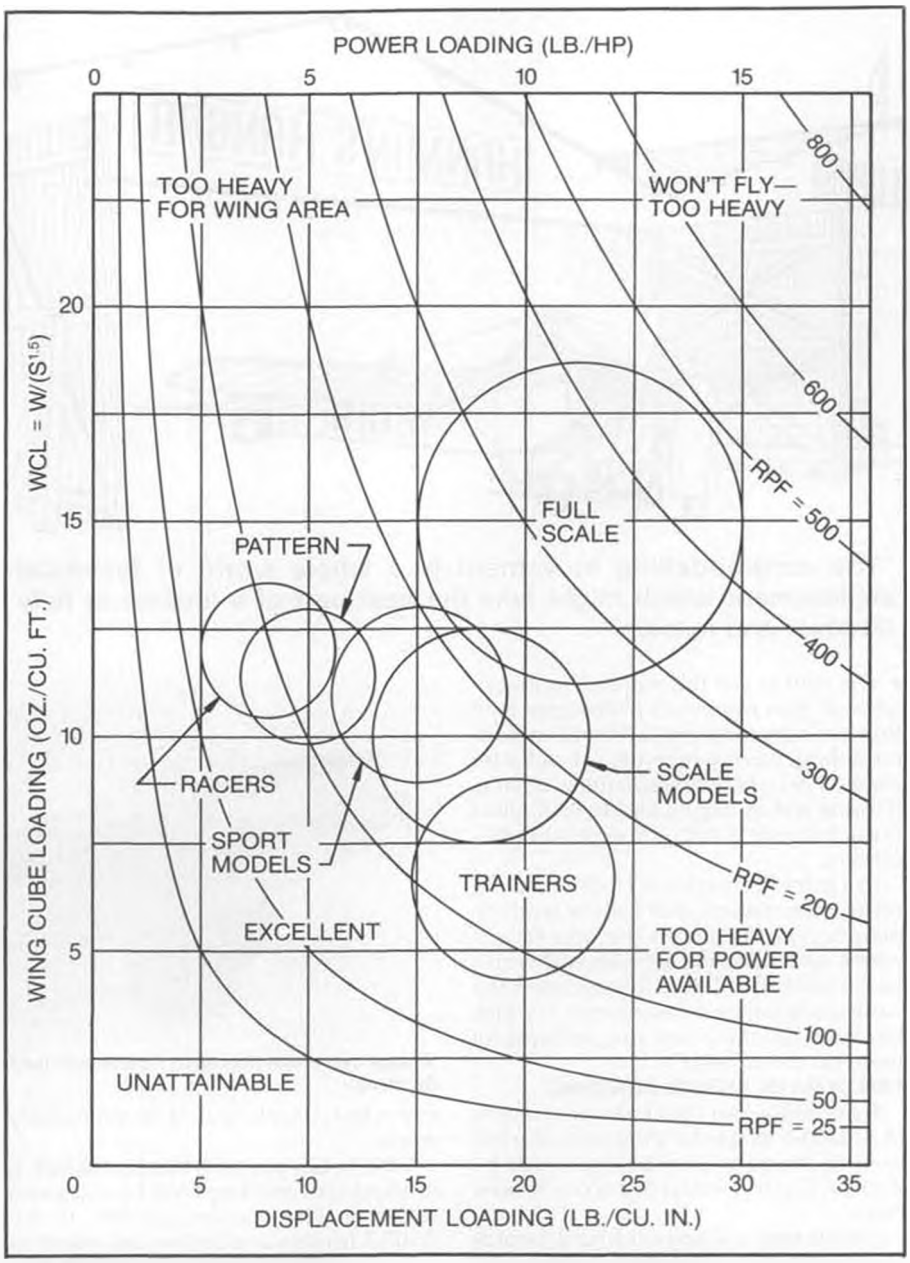


FIGURE 2—REYNOLDS PERFORMANCE FACTORS

"should" (?) result in a lower cube loading number, to reflect a "superior" airplane. High aspect ratio also indicates a superior airplane, so it could also be used, just as logically, for the third dimension. However, I am not hunting for a number that rolls all the reasons for aerodynamic superiority into one. Instead, I and others of the above, want a pure weight-to-size ratio measurement which is independent of scale. WCL, as proposed, fills that bill exactly.

UNITS

Modelers have a mess with regard to units, even before we talk about cube loading. We measure in inches and feet while the rest of the world uses centimeters. We talk about square inches of wing area until we calculate wing loading, then we change to square feet. Most modelers seem to weigh their models in ounces. I weigh mine in grams on a metric balance and convert the grams to pounds, which is the unit I think in. Then I have to convert the pounds to ounces to calculate wing loading in the usual units. Many different units are possible for our cube, volumetric or density loading parameter. After much thought, I have decided to use ounces and feet in calculating WCL, as these are the units commonly used for wing loading, and the answers come out as small easy-to-remember numbers.

RANGE OF WING CUBE LOADINGS

In the mid 1970s, Nelson Whitman compiled a list of the WCLs on over eighty published models. I can't publish Nelson's list but I can summarize it, with some shifts to account for changes in design in 14 years. The WCL for gliders will *average* around 4, R/C Trainers around 6, Sport Aerobatic ships about 9, Pattern jobs about 11, R/C Racers around 12, Scale Models from 10 to 15, and Full-scale Airplanes 15 to 20.

I put "average" in italics above because you will find a great range of WCLs for all

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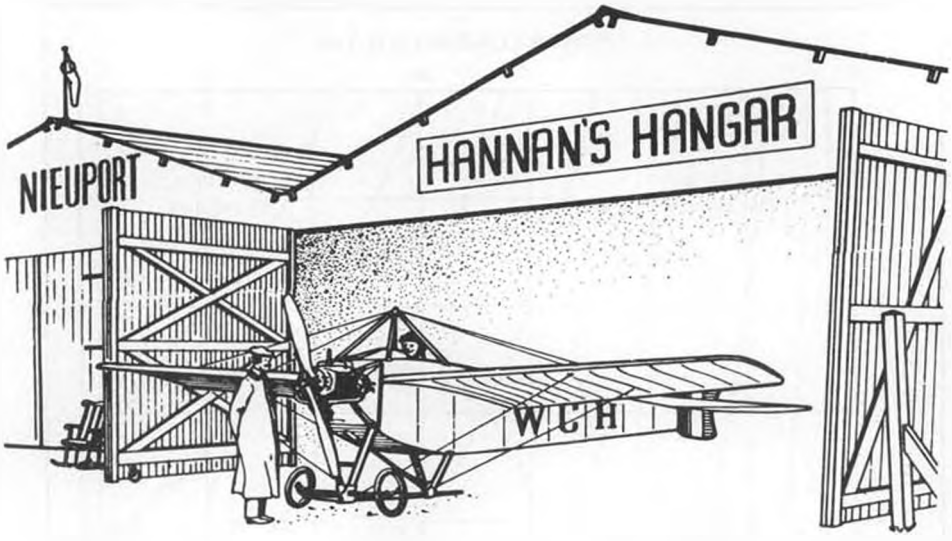


"The aeromodelling movement is a whole world of technical achievement which might take the best part of a lifetime to fully discover and master."

• Our lead-in line this month is representative of Ron Moulton's philosophy. And Ron has indeed devoted a lifetime to aeromodeling, having recently retired after some 39 years of building, writing, editing, drawing and managing for Model & Allied Press (currently Argus Specialist Publications).

In a letter Ron explained that he was *not* off to hibernation, but fully intends to maintain contact with the magazines, books, and modeling activities with which he has been so importantly associated. We particularly enjoyed the manner in which he closed his letter: "See you, perhaps, out there on the airfield?"

FREEDOM IN MODEL BUILDING

From editor Merv Buckmaster's column in *Airborne* magazine (Australia), the following thought-provoking words by Arthur Gorrie, extracted from *Model News:*

"While man and boy work hard towards earning a living or being educated to take a place in the world, it is often the experimental and seemingly timelessness of their relaxation period that produces the unexpected, unscheduled revolutionary article.

"The hobby period is that time which is unshackled, unhampered by rules and where an idea is communicated to the skillful fingers and to the raw material without red tape, without delay. If the idea is not successful there is no punishment, no reprimand, for this is *free* time. *Free* thinking—*free* creation.

"In our unique hobby and sport—'Aeromodelling and Model Aviation'—*free* flow, *free* exchange and *rapid* execution of ideas is very obvious.

". . . You may be sure that an Aeromodeller is a person becoming accustomed to producing the commodity he needs—quickly, strongly and cheaply. He is trying to combine strength, beauty and efficiency with economy."

To prospective employers, Mr. Gorrie suggests: "An aeromodeller could be a useful employee in your industry."

THOUGHT FOR THE DAY

"Children have more need of models than critics." Our thanks to George Minnear, of Verona, Pennsylvania, for sharing this line, which he found on a Salada Tea tag.

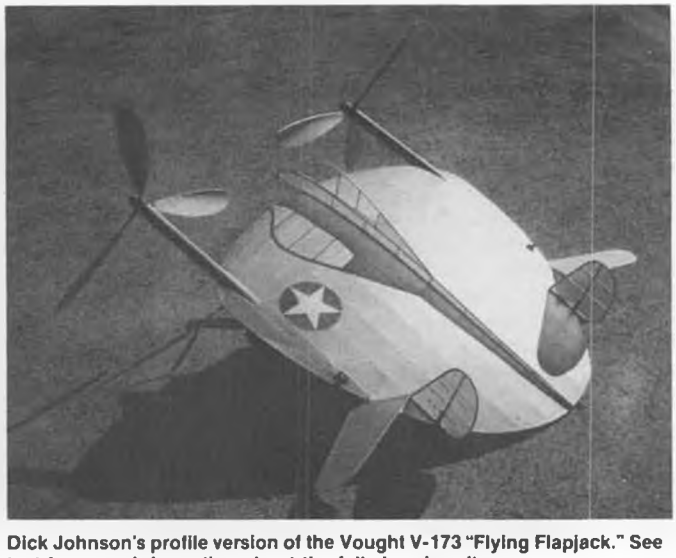
NEW MUSTANGS, ANYONE?

Mike Patti favored us with an article from the *EASTEC Product News,* regarding the ever-diminishing supply of WWII North American P-51s and the ever-increasing cost of them. Of approximately 15,000 produced between 1941 and 1945, fewer than 100 are thought to remain airworthy. Sold war-surplus for about $1450, a Mustang now (if available at all) can cost up to $500,000, or in the case of the famed "Miss America" P-51, $1,200,000!

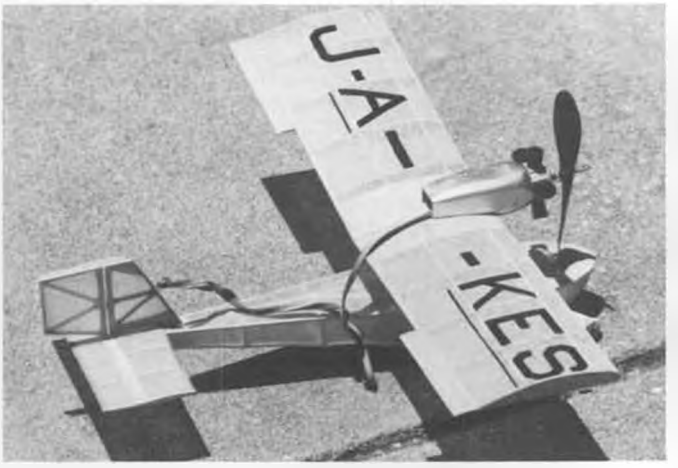
The demand for such aircraft has inspired a California firm to begin manufacture of full-size reproduction Mustangs from composite materials. Although the original P-51 is said to have taken only 120

Vintage cast-metal Rohrbach Roland with Iberia markings, in the collection of Hans Meier, Germany.

Flying Models **columnist Earl VanGorder found time to create this Jetex-powered F4D Skyray from a Canadian Easy-Built kit.**



Dick Johnson's profile version of the Vought V-173 "Flying Flapjack." See text for more information about the full-size aircraft.



Neat Dornier "Libelle" Peanut flying boat, built by Jake Larson from Walt Mooney's *Model Builder* plan (February 1979 issue).

Don't let the unusual configuration fool you; this super light "Guillebaud" Pistachio by young Czech modeler Ivan Simonelle can exceed 70 seconds indoors. Design and photo by Lubomir Koutny.

days from start of design until the first test-run, the reproductions are expected to consume about two years' time. They may be offered in either kit or finished form, are expected to weigh 50% less than the originals, and will sell for about $130,000.

GOOD ADVICE DEPARTMENT

Extracted from *The First Book of Model Aircraft*, by Richard Chick, published during 1944:

"Before you begin any model read all the instructions and be sure you understand them. Then you can make a flying start. Work steadily, do not try to finish in record time. We all know the person who starts any new job with a terrific zest, only to fizzle out when difficulties come along. Don't be like that. Take things steadily, give yourself time to do the job properly and follow the instructions carefully. They have been worked out for your benefit. You will also find it very helpful whilst you are doing any model to imagine what it will look like when finished."

Hmmm. Do we still remember to imagine what the finished model will look like?

HELL'S ANGELS ON TV

Howard Hughes' famed movie "Hell's Angels" has recently appeared on television. The 1930 classic has been skillfully restored, and includes a couple of previously seldom seen sequences in color. These portions were reportedly found in the estate of the late John Wayne.

Of special interest to aero enthusiasts are the fantastic dog-fighting scenes featuring some 50 aircraft, many of them genuine WWI types. Spectacular in quite a different way is actress Jean Harlow, who was only 18 years of age when the picture was produced.

The local television presentation of the movie included rare footage of the original Hollywood Grauman's Chinese Theater premier. According to the newsreel announcer, 67 aircraft roared through the skies overhead, 45,000 cars jammed the streets and 500,000 cheering film fans thronged outside. Hype was hype, even during 1930. . . .

Still, "Hell's Angels" was reported to have cost $4,000,000, employed 20,000 people and consumed more than 3,000,000 feet of film. As usual, Howard Hughes did the unusual thing, and the result is still regarded today as a classic of the cinema art.

SAY IT RIGHT

Al Lidberg is marketing plans for a 22-inch French WWI fighter, the Morane-Saulnier A1. Suitable for rubber, CO_2 or electric power, the plans are exceptionally cleanly drawn, and are accompanied by comprehensive instructions and proof-of-scale documentation. The price of $6 postpaid includes a copy of Al's latest plans catalog. Write to A.A. Lidberg, 614 E. Fordham, Tempe, Arizona 85283.

As for the "say it right" caption on this item, Al points out the correct pronunciation is "Moe-ran Sol-ne-ay."

PAULOWNIA PROPS

How many in our audience remember the Paulownia propellers? Careful, you're giving away your age! These prewar carved and hand-finished wooden productions were available in many sizes and styles. Manufactured in Japan, the props were distributed in the United States by International Models, of New York, under the "IMP" label.

George Kandylakis, of Greece, used three-views sent to him by our columnist to produce this fine Peanut scale Bellanca P-100 Airbus.

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Junior modeler Michal Reinish placed 5th at a recent Czechoslovakian contest with his beautifully built Gotha WD-VII Peanut. Flight duration is short, but scale points are high. Photo by Pavel Jelinek.

Free Flight Scale

By FERNANDO RAMOS

Absolutely immaculate Stinson SR-5E is the restoration work of noted Southern California F/F scale man, Tom Laurie. The aircraft is based at Flabob Airport, in Riverside. Tom's big Stinson took top honors at Oshkosh in 1984 and has been winning awards at fly-ins across the country ever since.

Beautifully restored and very rare Stearman C3R placed a close second to Tom Laurie's Stinson at Oshkosh. The competition between the two was so close that the judges could not come to a final decision until some of the cowling panels on both aircraft were removed and the judges given a chance to examine the internal detailing on both. Based on what they found, Tom was given the win.

• For the last ten years, I have been going up to the city of Merced, in central California, to an antique aircraft fly-in. I have had the good fortune of either taking my Marquart Charger biplane or my 1949 Bellanca Cruisair. Even though this fly-in does not have the magnitude of Oshkosh, it still has a higher number of excellent antiques than does Oshkosh. For a regional type of event, Merced drew, unofficially, 2000 airplanes, of which 990 were judged!

The Merced Fly-In is always held the first weekend of June; this year, however, as in years past, I and many of my friends from Corona airport departed after work on Thursday and flew to Bakersfield, where there is a great motel and restaurant right on the field. This way we get a chance to visit around the pool in 97° weather until it is time to get cleaned up for dinner. There are usually 30 to 35 of us for an excellent repast. As you might have gathered, this adds another day of flying fun!

Friday morning, after a light breakfast (you should have seen dinner!), we departed for Merced, which is about 1-1/2 hours from Bakersfield. The weather was perfect and the visibility was at least 30 or

Front view of Fernando's favorite, the Ryan ST-A. Fuselage is skinnier and the wheel tread narrower than on the later PT-22. Beautiful sheet metal work!

40 miles. I climbed to about 2500 feet and enjoyed the calm air and the scenery. For a Southern Californian, it is gratifying to see so much farmland, considering that all of the land in my area is being planted with homes and buildings.

As soon as I was close enough to tune in the Merced tower, I could hear all of the great airplanes approaching the field. When it gets busy like this, the tower does not want license numbers, but rather color and type of aircraft. At this point I could hear Staggerwing Beeches, Howards, and Luscombes entering the pattern. I could hardly wait to get there so that I could

One of the four 1940 Al Mooney designed Culver Cadets that showed up at Merced. With its cantilever wing, retractable gear and 140 mph top speed on only 75 hp, the Cadet was way ahead of its time and is considered a sprightly performer even by today's standards.

Culver V of 1946 carried 85 hp, featured retractable tricycle gear and dihedralled tips. This one is red overall with silver trim.

Continental A-40 cylinder head detail as seen on a Cub. Note the sheet metal baffle plate held in place with leather lacing cord.

With careful modification and a new paint scheme, this Stearman biplane takes on the look of a between-the-wars Navy shipboard fighter. A real attention grabber!

enjoy watching the rest of the arrivals!

Beside antiques, there are a fair number of homebuilt aircraft along with large numbers of production types (euphemistically called Spam-cans!). Even though there were a few warbirds, this particular fly-in does not normally attract very many.

For the remainder of the day Friday, we enjoyed seeing all the arrivals, visiting with friends from years past, and "kicking tires." In the evening there is an earlybird dinner that is provided free to all registered pilots and crew. They serve a great meal of chicken with all of the trimmings and beverages.

Saturday always starts off with an excellent breakfast . . . after all, you need plenty of energy for all of the walking one does to see all of the aircraft. Just as there are those who have no peers at building models, the same goes for antiques and homebuilders. There are so many quality airplanes that pride in one's work is most evident. It is not too hard to figure why there are so many more airplanes being built at home instead

Rearwin Sportster is one of the rarer antiques seen these days. They were built in Kansas from 1935 to 1941 and were usually equipped with LeBlond engines of 70 to 90 hp, with an occasional 90-hp Warner. Fernando says he had a chance to buy one of these planes, in excellent condition, at a Rockford fly-in several years ago for only $2500, and passed it up!

of at Wichita. The price and quality are far better than any production aircraft you can buy.

Typically, as I walk around the field, I pick out my favorite airplane, hoping it will be the big winner. There were two Ryan STA's, both Menasco powered, that won my heart. I place the Ryan at the top of my list of favorite airplanes. One unusual sight was that of four Culver Cadets and one Culver V. When have any of you seen that?

Left: Very pretty Ryan ST-A is extra special in that it retains the original Menasco engine; most of the ones still flying have had Ranger engines fitted on account of the scarcity of Menasco parts.

Below: There are still quite a few Travel Air 4000's around, although not many are as nice as this one. This is the later version, without the "elephant ear" ailerons.

There was a Stearman that had an unusual canopy arrangement, giving it a Curtiss or F4B look. It was tastefully done. As a matter of fact, I counted about 16 Stearmans at one time, with probably a few more than that actually there. Quite something to see!

One surprising fact was there was only one Waco Cabin present; usually there are at least three or four. The Waco Cabin is going to be my ultimate goal. In other

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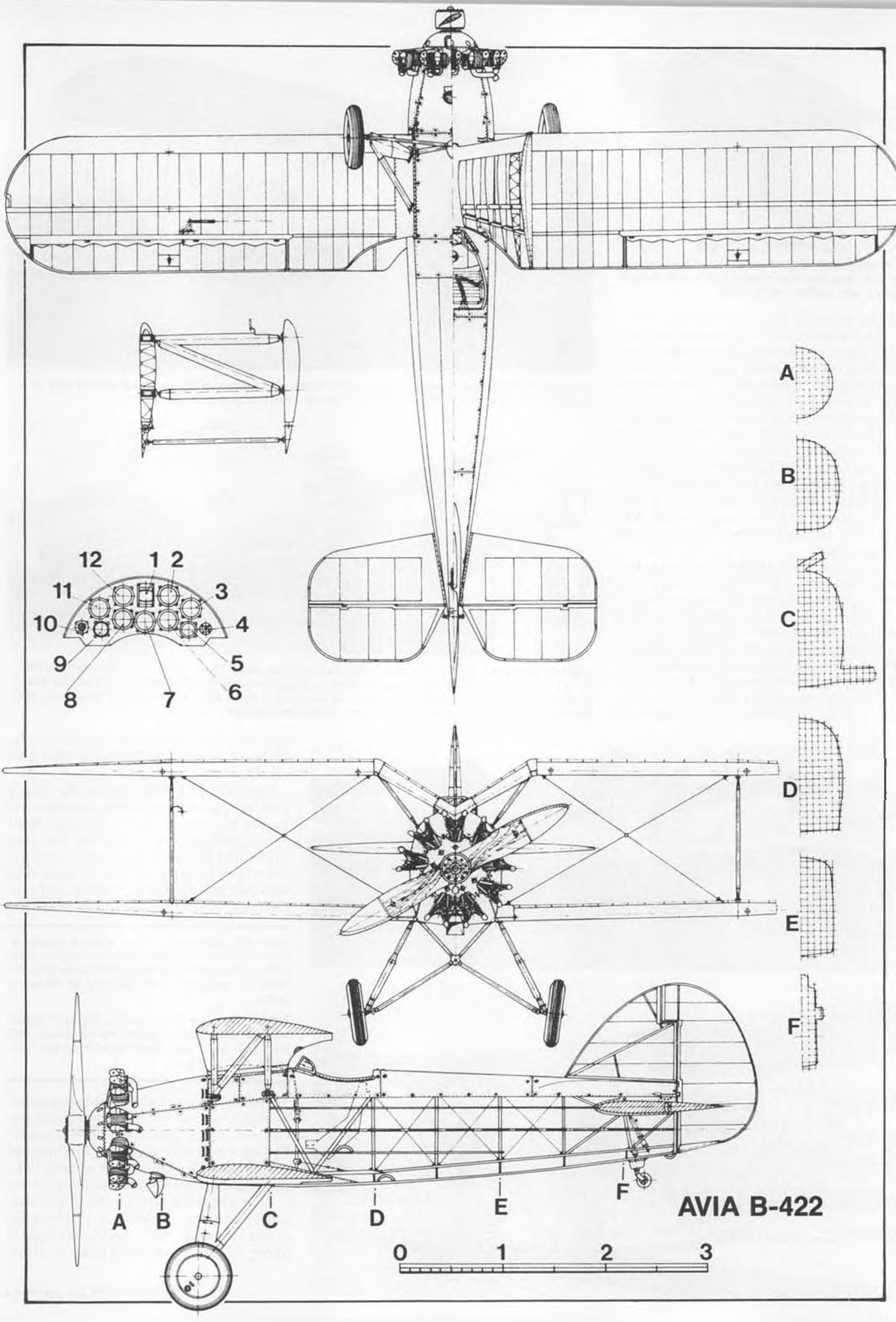
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Stahlwerk Mark MS-IIb

A VINTAGE POLISH BIPLANE IN PEANUT SCALE

By WALT MOONEY

• Obscure airplanes intrigue me and with the arrival of a three-view of the Stahlwerk Mark MS-IIb, showing the wing and fuselage lettering, an inspiration took place. How about using condenser paper for covering and doing the decoration with a black felt pen prior to covering? The felt pen will not run because the condenser paper is not porous and does not have a grain. Also, if permanent ink is used, the covering can be water shrunk and does not have to be doped, saving weight.

Besides the interesting markings, the design has a simple structure, a slab-sided fuselage, and no round tips on the wings or the tail surfaces. It does have a couple of potential drawbacks besides the complication of the biplane configuration, namely a very small scale horizontal tail and no real color documentation—although black letters on clear varnished fabric looks like a reasonable scheme that is nicely simulated with black ink on condenser paper.

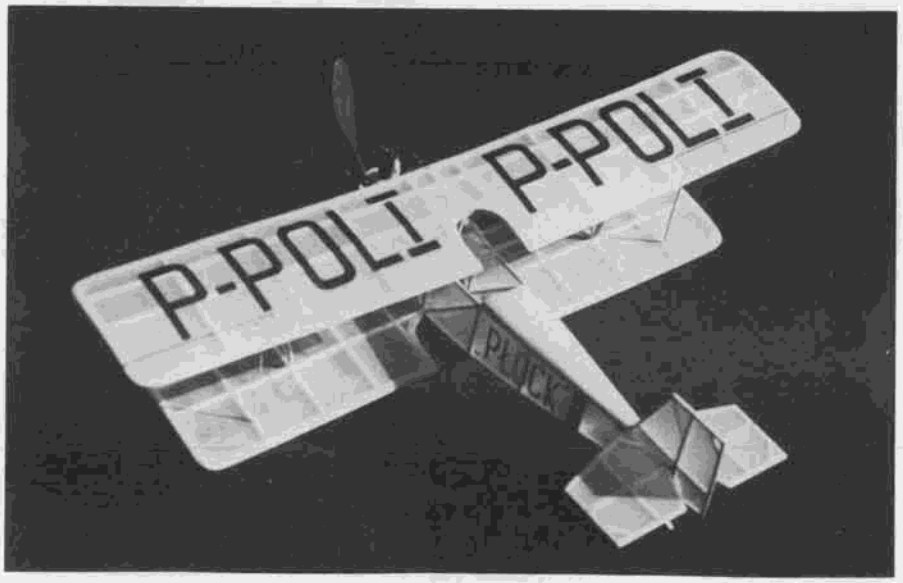
The fuselage is a relatively simple structure; two sides are built directly over the plans. When dry, the side frames are removed from the plan and separated from each other using a thin blade. Then crosspieces are added to make a fuselage box frame. The nose has two side pieces that are cut from 1/16 sheet, a bottom piece made from a solid 1/4-inch thick piece, and a top piece made from the same materials but hollowed as much as possible. The very front of the cowl uses a large Peck-Polymers plastic thrust bearing. Between the cockpits, and aft of the rear cockpit, the top of the fuselage is covered with thin balsa sheet or bond paper.

The wings have conventional structure: a leading and a trailing edge, two upper surface spars, tips, gussets to round off the corners of the tips, and cutouts at the center. All the wing ribs are the same airfoil shape. Make a pattern and cut out all the ribs, including the heavier ones used at the tips. Stack the ribs, all but the ones to be used for the tips, and cut the notches for the spars. Make the notches just a bit shallower than the spars so that the top of the spars will be slightly *above* the top of the ribs. This will allow the spars to be effective turbulators and will keep the covering above the ribs, eliminating the "starved" look a tissue covered wing sometimes gets with the ribs pushing up strongly under the tissue.

Assemble the wings directly over the plans by pinning down the leading and trailing edges and inserting the ribs and the tips. It is easier if the leading and trailing edge sticks are a bit too long so they can be pinned down through the wood. It also makes the tip gussets easier to install, the rounding at the corners being done after the wing structure is completely dry and has been removed from the plan. Use 3/16 balsa or three layers of 1/16 balsa to fill in the areas at the center that will be shaped for the trailing edge cutouts. Carve and sand the leading and trailing edges to the correct airfoil as shown in the side view.

The plans show the wing to have zero dihedral, at least on the top wing, but the photos of the model show that I felt it

Continued on page 79



Right: No shortage of wing area here! Scale size tail surfaces are shown on the plan, but the model can be made easier to fly by enlarging the horizontal stab by a couple of inches.

LEADING EDGES ARE 3/32ND SQUARE HARD BALSA

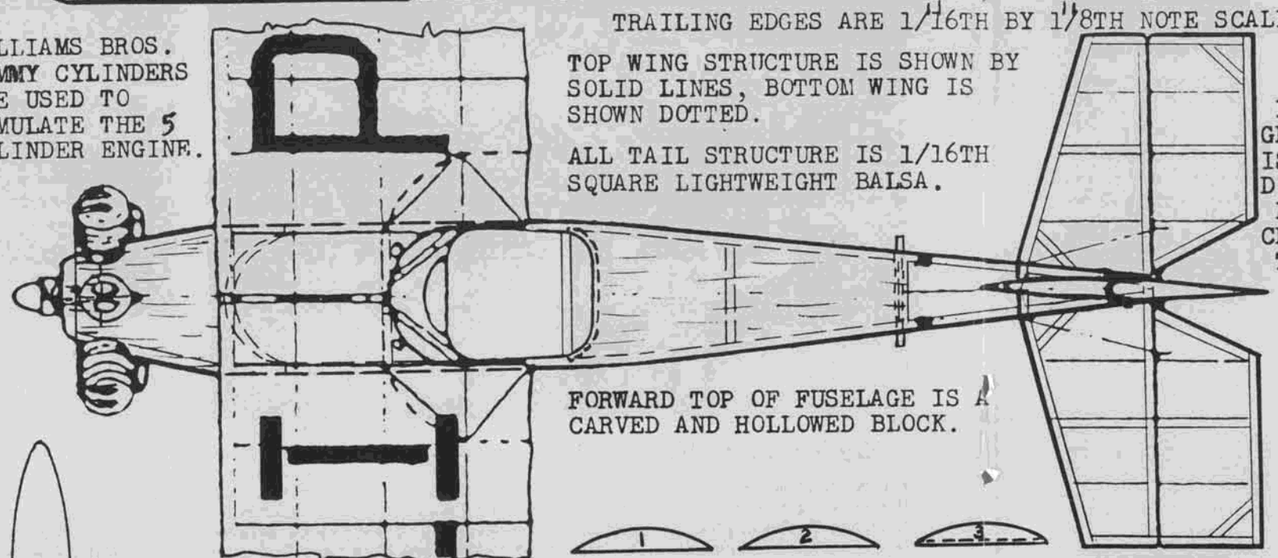
P-POLI P-POLI

TRAILING EDGES ARE 1/16TH BY 1/8TH NOTE SCALLOPS

WILLIAMS BROS. DUMMY CYLINDERS ARE USED TO SIMULATE THE 5 CYLINDER ENGINE.

TOP WING STRUCTURE IS SHOWN BY SOLID LINES, BOTTOM WING IS SHOWN DOTTED.

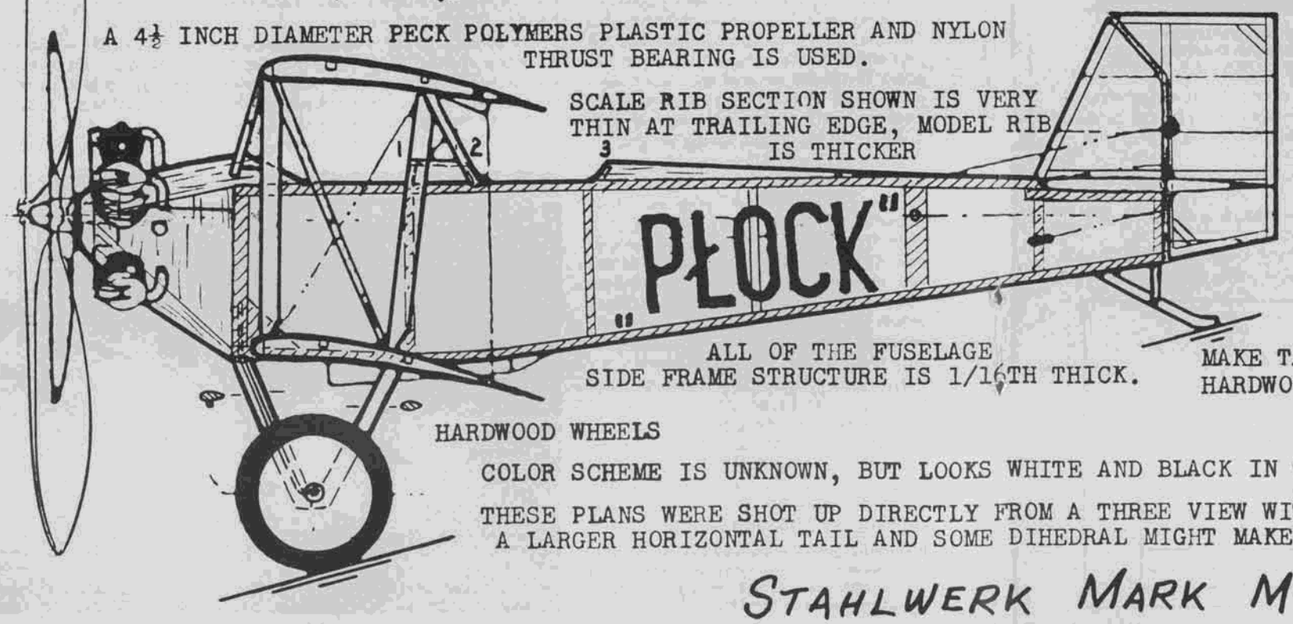
ALL TAIL STRUCTURE IS 1/16TH SQUARE LIGHTWEIGHT BALSA.



FORWARD TOP OF FUSELAGE IS A CARVED AND HOLLOWED BLOCK.

A 4½ INCH DIAMETER PECK POLYMERS PLASTIC PROPELLER AND NYLON THRUST BEARING IS USED.

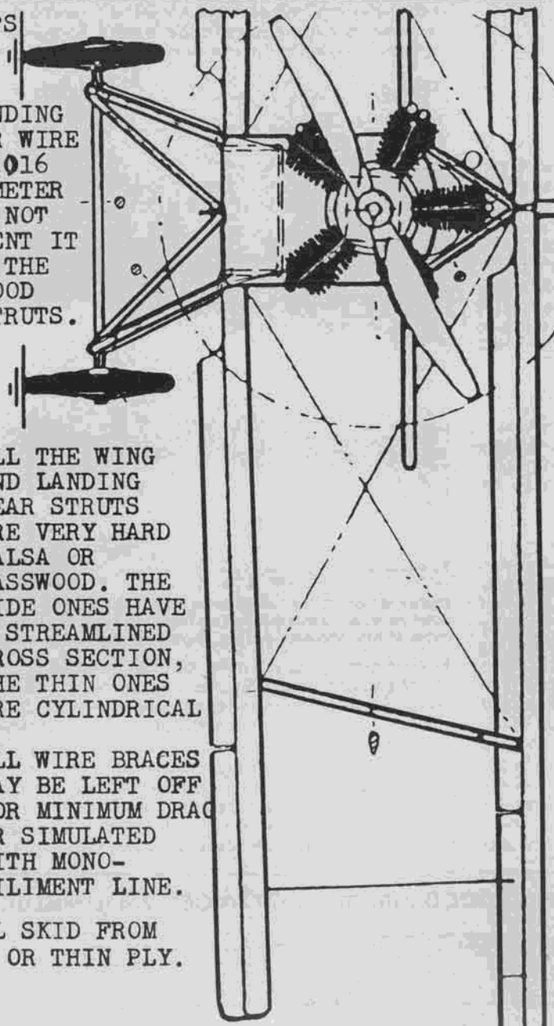
SCALE RIB SECTION SHOWN IS VERY THIN AT TRAILING EDGE, MODEL RIB IS THICKER



ALL OF THE FUSELAGE SIDE FRAME STRUCTURE IS 1/16TH THICK.

HARDWOOD WHEELS

LANDING GEAR WIRE IS .016 DIAMETER DO NOT CEMENT IT TO THE WOOD STRUTS.



ALL THE WING AND LANDING GEAR STRUTS ARE VERY HARD BALSA OR BASSWOOD. THE WIDE ONES HAVE A STREAMLINED CROSS SECTION, THE THIN ONES ARE CYLINDRICAL

ALL WIRE BRACES MAY BE LEFT OFF FOR MINIMUM DRAG OR SIMULATED WITH MONO-FILIMENT LINE.

MAKE TAIL SKID FROM HARDWOOD OR THIN PLY.

SCALE PROPELLER SHOWN IN THIS FRONT VIEW.

ALL WING RIBS HAVE THE SAME AIRFOIL. TIP RIBS ARE HARD 3/32ND, ALL OTHERS ARE 1/16TH SHEET.

STRUTS ATTACH TO THE WINGS AT THE SECOND RIB FROM THE WING TIPS.

COLOR SCHEME IS UNKNOWN, BUT LOOKS WHITE AND BLACK IN THE ONLY PICTURE AVAILABLE.

THESE PLANS WERE SHOT UP DIRECTLY FROM A THREE VIEW WITH NO SCALE DEVIATIONS. A LARGER HORIZONTAL TAIL AND SOME DIHEDRAL MIGHT MAKE FLIGHT TRIMMING EASIER.

STAHLWERK MARK MS-11b Walt Mooney 01-29-84

Free Flight

By BOB STALICK

• The new Nostalgia model design and eligible engine listing should be available from Bob Larsh by the time you read this column. This is list Number Three and, according to Bob, "It will contain more models, identification of eligible ignition class designs, corrections and clarifications of rules which appear open to interpretation, and a general upgrading. It is our desire to continue to upgrade the index and maintain a current posture. This publication not only lists the models in order, but also references the designer, plan source (magazine and/or kit), the date, wingspan, and the different sizes originally released. Perhaps some day we can include the wing areas, but as this is not always given, we did not list it."

Bob Larsh has pursued this task in his usual indefatigueable style. The lists have been most helpful for contest directors and others who are really into the Nostalgia scene, and these lists have been adopted by the National Free Flight Society as their official rules and eligibility lists. Most areas of the country where Nostalgia is flown follow these rules explicitly, or make modifications to suit local conditions and expectations. If you are interested in the newest listing, write Bob at 45 S. Whitcomb Ave., Indianapolis, Indiana 46241. Enclose a check for $1.50 for each list you want.

Bob Larsh is also working on a description of eligible engines for SAM, as there has been quite a bit of controversy surrounding this topic in Old Timer circles of late. For those of us who were not active (or alive) during the ignition engine days but who are still interested in flying old timer events, knowledge about eligible engines is not readily available. Even more critical and controversial recently is the proliferation of foreign diesel engines that are being used in Old Timer events. These engines may or may not meet the engine eligibility criteria, but most of us are even foggier on whether or not these engines qualify. The new list should help with this problem.

Finally, as some of you might have read in this column, the word is out that the original Gollywock design apparently used a 13.5-inch propeller, not the 12-inch prop featured in the Midwest kits. Currently, no one has a certified statement from the designer, Wally Simmers, about the authenticity of this larger prop. Bob Larsh, again, is pursuing this bit of information as well.

By the way, Mark Sexton, of the Kent, Washington Strat-O-Bats (S.O.Bs) has built a 13.5-inch prop for his Gollywock and claims that it makes a big difference in the climb pattern and the height gained during the climb. Stay tuned to this column for further developments.

That's a Nelson .15 that John Tischler is about to fire up; model is a Zingo, designed by the late Tom Hutchinson, who was also *MB*'s Free Flight columnist for a time. John did a nice tissue trimming job on his, with the checkerboard tips. Photo by Wil Nakashima was taken at the 1988 U.S. F/F Champs.

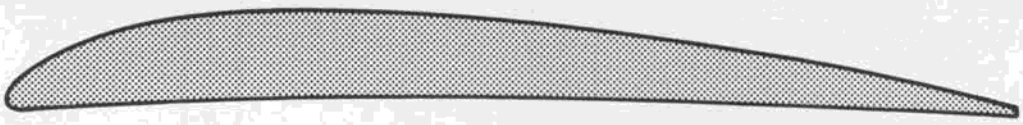
AUGUST MYSTERY MODEL

This is one of those mystery models with which I had some personal involvement. The ship was first published in 1969, at the instigation of the father of the National Free Flight Society, Carl Fries, who saw the need for a competitive design that could be built and flown by newcomers to FAI Power (F1C, as it is now called). Carl requested master free flight designers, George Aldrich and Howard Timlin, to come up with such a design, and the August Mystery Model is the result.

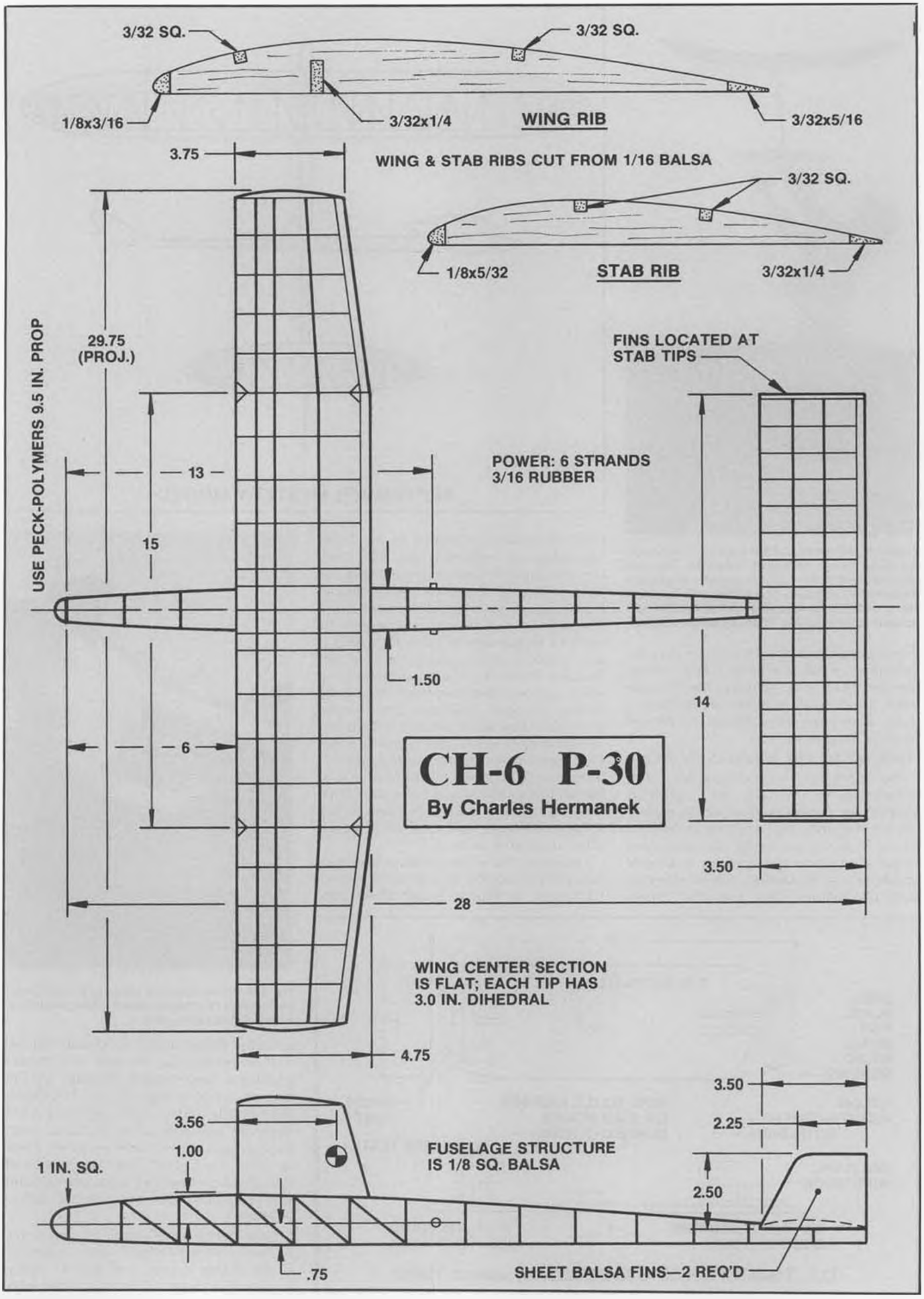
When I first saw the prototype of the ship, I was impressed with its lines. I recall my statement, "It looks like it is going 100 mph standing still."

So, as usual, if you think you know the name of this design, write the name on a

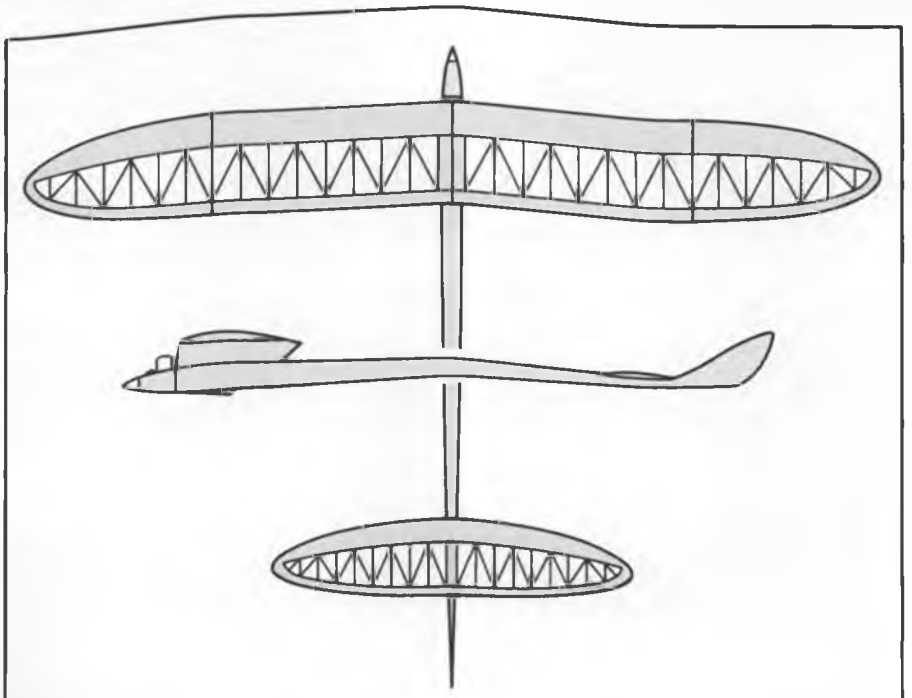
DARNED GOOD AIRFOIL—GOTTINGEN 274 (DAIMLER V)



STATION	0	1.25	2.5	5.0	7.5	10	15	20	25	30	40	50	60	70	80	90	100
UPPER	1.07	3.08	4.16	5.85	6.94	7.85	8.93	9.59	—	10.04	9.74	9.08	8.22	6.99	5.39	3.36	0.80
LOWER	1.07	0.00	0.06	0.43	0.59	0.75	1.05	1.20	—	1.39	1.55	1.55	1.49	1.23	0.96	0.61	0.00


3/32 SQ.
3/32 SQ.
1/8x3/16
3/32x1/4
WING RIB
3/32x5/16
3.75
WING & STAB RIBS CUT FROM 1/16 BALSA
3/32 SQ.
1/8x5/32
STAB RIB
3/32x1/4
29.75
(PROJ.)
USE PECK-POLYMERS 9.5 IN. PROP
FINS LOCATED AT
STAB TIPS
POWER: 6 STRANDS
3/16 RUBBER
13
15
1.50
14
6
CH-6 P-30
By Charles Hermanek
3.50
28
WING CENTER SECTION
IS FLAT; EACH TIP HAS
3.0 IN. DIHEDRAL
4.75
3.50
3.56
2.25
1.00
1 IN. SQ.
FUSELAGE STRUCTURE
IS 1/8 SQ. BALSA
2.50
.75
SHEET BALSA FINS—2 REQ'D

"Deluxe" is the name of this original 1/2A design by Nigel Tarvin, of British Columbia. The ship was inspired by this month's mystery model and features VIT and autorudder. Weight is 6 ounces, wing area 250 square inches. A hot Tee Dee .049 takes it up very quickly. Photo by Barbara Stalick.



SEPTEMBER MYSTERY MODEL

letter or card and drop it in the mail to the attention of Bill Northrop, Editor, *Model Builder* Magazine. As usual, the first one with the correct moniker will receive a free, one-year subscription to *Model Builder* magazine.

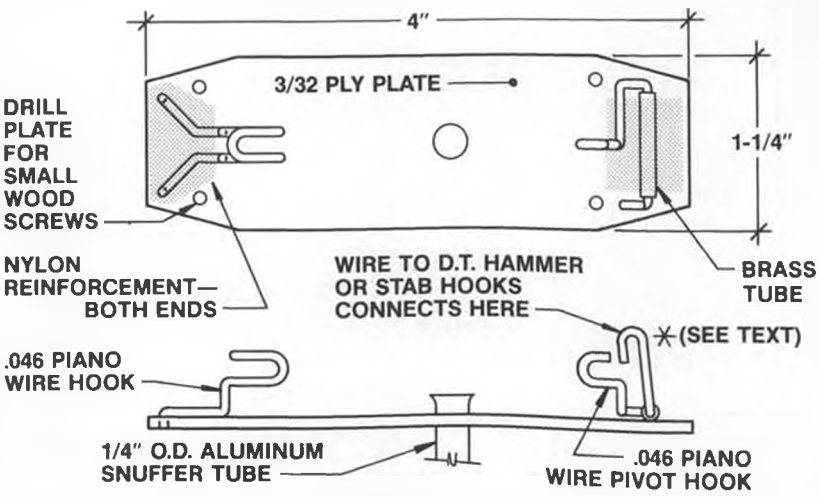
MYSTERY MODEL WINNERS (By WCN)

Boy, does time fly (free flight, of course) when you're having . . . er . . . fun! It doesn't seem possible that our last update on M/M winners was way back in the February issue, so we better not waste any more words and get on with it. Lots of modelers recognized (or knew where to look up) Arthur "Red" Everitt's "Three-Five" Wakefield, published in *Air Trails*. Not everyone realized it was *NOT* Dick Everett's (note the different spelling of the last name) design. He submitted the article, however, which created the confusion. The first correct answer was sent in by Richard Thompson, of Imlay City, Michigan, who wins the subscription to *Model Builder*. However, the most interesting letter, just two days late, came from Ernie Wrisley, of Santee, California. Ernie has the original model stored away in a large box at his home! He says the name "Three-Five" came from the intended weight . . . three ounce airframe, five ounces of rubber and that's the way it came out! Ernie goes on to say that Red now lives in San Rafael, California, and they still see each other from time to time.

February's M/M has an interesting story too. The first correct answer came in from Ed Turner, Ft. Worth, Texas, whose subscription will go to his friend, Ivan Horejsi, in Czechoslovakia. He says the correct spelling, in lower case, is "fifnella," but the original article in Sept. '55 *M.A.N.* called it the Fifinella, and no one disagrees that the designer was Bob Larsh. So Dave, even though your answer came in sooner, it was not the "Go-Getter" (Joe Weathers), and Bill, you must have had *some* plan around for years, but this was not Sal Taibi's "Zenith."

Now here's a new angle. If you don't know the Mystery Model, write in and tell us it's drawn wrong, and that it's really some other design! That happened with

Wil Nakashima took this photo of Bill McConachie and his interesting canard rubber model at a recent Sacramento meet.



D.T. TIMER FOR GAS MODELS, by James Harris

Good action shot of C.O. Wright about to shoot for a max at the 1988 U.S. F/F Champs. Photo by Wil Nakashima.

our March/April model, so would the real "Firecracker" by Norman Marcus please stand up, and you, who looks sorta like John Gorham's "Contender" please sit down? Bill Park, of Charlotte, North Carolina, was the first to (correctly) nail this one down.

Well, there's no story with the May Mystery Model, except that a heck of a lot of modelers knew the answer . . . Ed Lidgard's "Flapper" ornithopter. It was featured in Bill Winter's 1947 *Model Aircraft Plan Book*, and the first correct answer came from a previous winner, Carl Stokes, of Seattle, Washington.

Ken Oliver's V-wing FAI model is a state-of-the-art design featuring an aluminum covered wing, tiplets, and shallow dihedral. See the March/April '89 F/F column for more details on this design concept. Wil Nakashima photo.

Even though we attempted to confuse the issue by switching the leading and trailing edges of the stab and wing (a goof by the sketch artist), it may have turned out to be a hint for the correct answer. If you mess up the words "hypodermic needle," you come up with "Hypodemic Nerdle" (sorta like nodlenees pliers), which was the correct name for the June Mystery Model. It was co-designed by Tom Peadon and Dick Mathis (Where *ARE* they now?) and published in the December 1967 issue of *Flying Models* magazine. Bob Norton, of Bakersfield, California, had the first correct answer, and Larry Kruse was the one to catch the TE/LE switheroo.

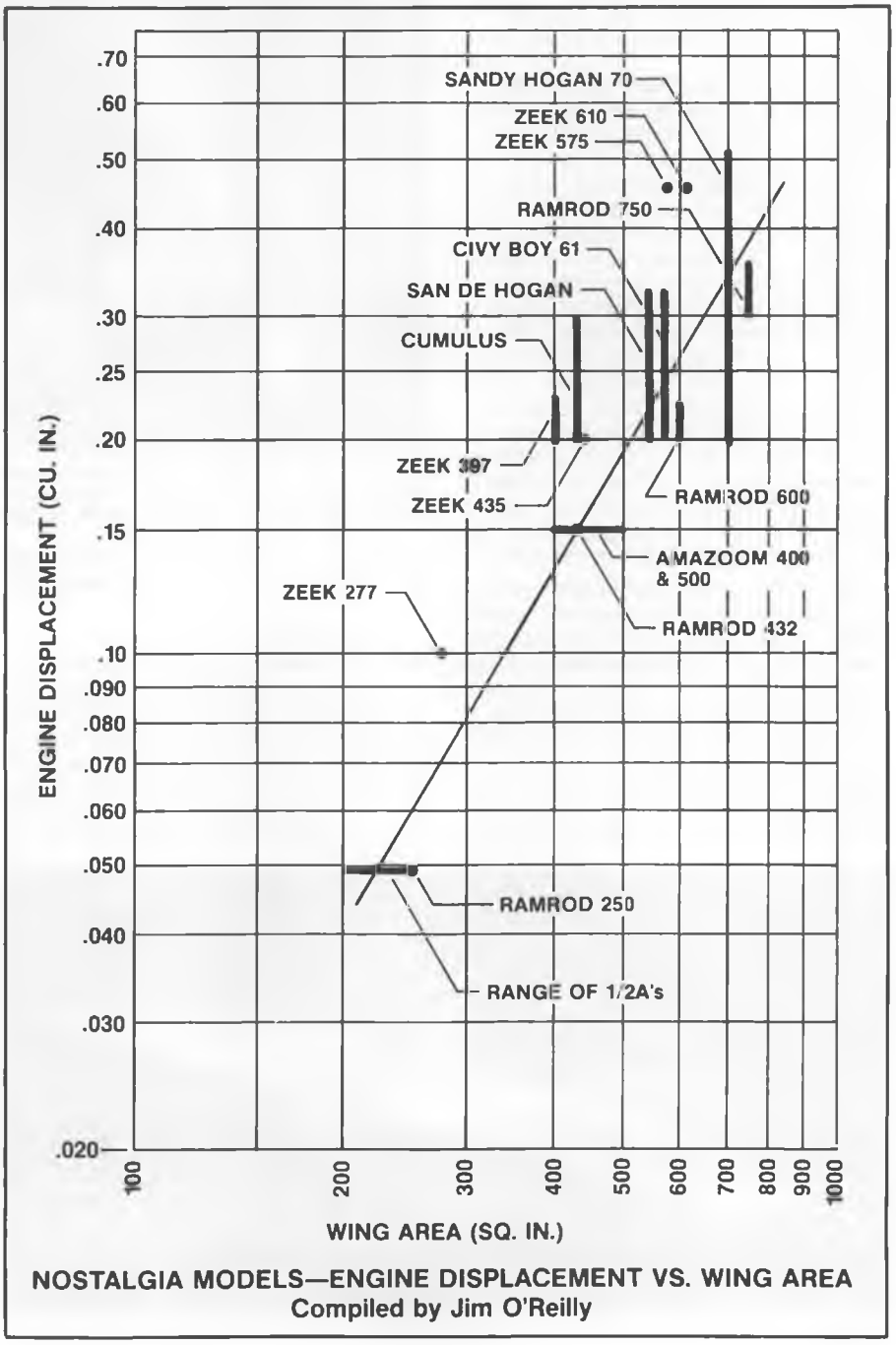
Bob Stalick's helpful (?) hint that the July Mystery Model designer lived in Sweden probably threw a few modelers off the track, as his name is Hoh Fang-Chiun, and his model was somewhat rightfully named the "Eastwind." We haven't seen anything from this prolific designer/modeler of the 1950's and 60's. Does anyone know of his present whereabouts? Oh . . . almost forgot. The first correct answer came from a regular Mystery Model contestant, Stephen Landy, of Newton Centre, Massachusetts.

And for an overseas winner, a one-year subscription (extension, I think) goes to John Birnie, Gloucester, England, for identifying "Red's Remarkable Wakefield" . . . although he did get fooled by the Everett/Everitt thing.

AUGUST THREE VIEW—THE CH-6 P-3O by Charles Hermanek

Bill Baker, who edits the soon-to-be-defunct newsletter, *The Okie Free Flight Flyer*, included this design in his next-to-last edition of the newsletter. What caught my eye is the construction of the model. It

Continued on page 83



NOSTALGIA MODELS—ENGINE DISPLACEMENT VS. WING AREA
Compiled by Jim O'Reilly

Control Line

BY JOHN THOMPSON

KIT CRAZY

Control line model aviators are able to enjoy a surge in the manufacture of new kits for a variety of kinds of flying, both from some of the major manufacturers and from the small custom manufacturers.

Here at *Model Builder* control line central, we've just received a couple of examples of kits previously mentioned in this column. A closeup look at these kits confirms our impression that the manufacture of control line model airplane kits has reached an all-time high in quality.

The particular examples we've received are the new Skyray 35 from Sig, and the Hornet, one of many kits from Dox Generix.

The Skyray is a sport/stunt plane and the Hornet is a slow-combat/sport plane. What is most impressive about both is the extremely high quality of the kits themselves.

The Skyray 35 follows the Sig tradition of completeness. Everything needed to build the plane is in the box, except for finishing materials, glue, engine, tank and wheel. However, the kit does include nifty stick-on decals, should you desire to duplicate the paint scheme on the box. Such hardware items as the bellcrank, pushrod and landing gear, elevator horns, etc., make the kit something that can be completed without repeated trips to the hobby shop.

In addition to the full-sized, extremely detailed plans, which at first review appear to leave nothing to chance, the kit includes a small pamphlet of photographs showing the plane at different stages of completion.

Wood in the kit was extremely well die-cut, suggesting that the parts will fit well. Quality of the wood in the kit I received varied but was generally good quality. Mass production doesn't lend itself to careful handpicking of wood. Sig does the best it can under the circumstances, but a builder concerned with weight and strength may want to examine each piece and substitute wood when necessary. One unusual aspect of the Skyray 35 kit was that it used light plywood ribs rather than the usual balsa ribs.

Writing this before having built the plane, I can see very little I would change in the kit. This is a plane that the beginner can build well by simply following the directions to the letter. Sig's design and manufacturing has kept up with current technology, and there are no instructions that have been outdated by the passage of time.

One small recommendation I would make, however, is to substitute the outboard side fuselage doubler with one that covers the fuselage slot in which the engine rests. This would strengthen the nose of the plane and reduce the drag around the front end. The builder could simply follow the outline of the plywood doubler provided with the kit, omitting the cutout at the engine slot. The weight penalty should be negligible.

The Skyray is a flapless sport-stunt plane with a 33-inch wingspan and 44-inch length and 396 square inch wing. This makes it most suitable for sport flying, stunt training and beginner level stunt competition. It's a bit large for slow combat or sport racing, but could be used. I plan to build mine as soon as I can and spend some happy hours on the flying field, flying just for the joy of it.

For those who have not discovered the Sig company, it's worth noting that Sig manufactures a varied line of control line kits ranging from the original .045 powered Skyray through the .60 powered Magnum top-level competition stunt kit. These include such favorites as the .15 powered Akromaster (a fine little sport-stunter), the Akrobat, Mustang Stunter, Super Chipmunk, Twister, Banshee and Goodyear Shoestring. In addition, Sig supplies the products of many other kit makers as well as virtually all the hardware, finishing and other modeling supplies that you could imagine. If you can't find what you're looking for in your local hobby shop, a look at the Sig catalog is likely to provide the solution to your problem.

For a catalog, send $3 to Sig Manufacturing Co., 401 S. Front St., Montezuma, Iowa 50171.

As a matter of fact, most serious C/L fliers build up and maintain a library of catalogs of all the mail-order suppliers. They are a good reference guide to available products as well as a source of supply. As C/L's resurgence continues, alert C/L fliers are noticing that more and more of the "R/C" mail-order houses are beginning to slip listings of C/L products into their catalogs. In the interest of making sure C/L fliers have all the available information, I try to pass along information on such sources of supply whenever possible. To that end, here's one such tip: Buried inconspicuously in fine print on

All C/L photos this month come courtesy of Nathan Sturman, an American modeler who has been living in Japan for the last six years. Shown here is Nathan with his Kawasaki KI-61 Hein stunter at a meet in Hammamatsu in October of '88. No starting battery? Nope, he uses diesels exclusively.

Nathan's 38-inch semi-scale Mustang is powered by a P.A.W. .19 diesel turning a Grish nylon prop.

Three-year-old Naomi Sturman helps her dad show off his "Joker II" with P.A.W. .19 diesel up front. Pink paint scheme was Naomi's idea.

An O.S. .25 with a Davis Diesel conversion head hauls this Kawauchi "Mercury" around with authority. Another pink paint scheme!

page 25 of the 1989 Sheldon's Hobbies catalog is a listing of Sig C/L kits; on page 54 is a listing of Fox C/L engines. These are both products not previously seen in this particular catalog. Similar nuggets often appear in the other major catalogs as well. The response from modelers may determine whether such listings continue. (For the Sheldon's catalog, send $1 to Sheldon's Hobbies, 2135 Old Oakland Road, San Jose, California 95131.

The Hornet kit from Dox Generix is a slightly different breed from the Sig kit. This is a kit made in the growing C/L "cottage industry," a modeling product made for modelers by modelers. Typical of such products, the manufacturer doesn't waste much expense on flashy packaging and printing, but devotes tender loving care to the product itself. Therefore, the plans and instructions are brief and clearly aimed at fliers with some experience in building control line aircraft. But the kit itself (which is only one of a large number of control line kits produced by Dox Generix for a variety of applications) features some extra amenities for the builder, particularly one who is interested in saving time and getting the plane in the air quickly—as all combat fliers are. This is, after all, a combat plane, with a 40-inch wingspan and 420 square inch wing, intended for .21 to .36 engines (the .36 for combat competition). This plane also presumably could be used in sport racing type events or for general sport flying.

The "extras" mentioned above include completion of some sub-assemblies, which greatly speed up construction time. The elevator/stabilizer comes pre-hinged and with the elevator horn installed. The fuselage front end (engine mount and doublers) comes all assembled and sanded, with a metal peg through the mounts from top to bottom for added strength. The center rib comes with bellcrank, pushrod and leadouts installed! The ribs and other wood parts are sawed, not die-cut, which should result in a precision fit. And, in a feature not available to makers of kits in larger volumes, the wood appears to have been carefully selected. All of the wood in the kit I received is excellent.

Interesting sheet-balsa Polikarpov I-15, displayed here by Masako Sturman, Nathan's wife, is powered by an Enya .06 diesel.

The "Novi" is one of Nathan Sturman's smaller C/L models, spans 32 inches and flies up a storm with a P.A.W. .09 diesel and 8x5 MK prop. Covering is tissue and dope.

The Hornet may be the airplane that gets this columnist back into slow combat after several years on the sidelines. A first impression is that this kit can be built in an evening and flown the next day if there's really a hurry.

For a catalog of Dox Generix products, write Doc Passen at 260 E. Main St., Jasonville, Indiana 47738.

I hope to give some details of construction and flying of these two fine kits in a future column.

HANDLE WITH CARE

Control line fliers have the best of both worlds. We can enjoy the thrill of flying

Continued on page 91

the INSIDERS

INDOOR FLYING REPORT

By DAVE "VTO" LINSTRUM

• Way back in 1975, "Doc" Martin, of the MIAMA club, built a terrific little AMA Indoor Scale version of the 1921 Kawasaki-Dornier "Komet" airliner. Thissilver bird was published in M.A.N. with a construction article and full-size plan available by mail. It attracted our son, Carl, who built a version for the Lake Charles Nats. He had some trouble, being a novice to scale, but the design held potential.

Recently, while flying our Coconut Scale Curtiss "Jenny"/Sperry Monoplane at a MIAMA meet at MacDill AFB Tampa (not in danger of closing, by the way—our wonderful flying site is safe from DOD cutbacks) we got some chiding on the lack of scale detail. Doc suggested that the Kawasaki-Dornier would make a great Coconut—lots of scale detail without too much trouble, and a great parasol wing configuration.

Mr. VTO poses with his 36-inch Coconut Scale Kawasaki-Dornier "Komet." Model weighs only 1.5 ounces. See text for plans availability.

We took his advice seriously, found a copy of the 8-1/2x11 magazine plan, used a scale ruler (plan span divided into 36 parts) to blow it up to Coconut size, and built one before the ammonia fumes evaporated from the blueline print! This model is lightweight (ours was 1.5 ounces less motor), can be built with outdoor wood (the wood sections should be medium/hard as they are slim), and is a real beauty with all silver tissue, black tissue trim, and a red magic marker bond paper insignia of the rising sun (Empire of the Sun) on the fuselage. With a plastic P-30 Peck prop and six strands of 3/32 FAI rubber, it will easily ROG, climbs like a homesick angel, and makes the most majestic indoor flights you have ever seen.

If you want to build your own version of this elegant Coconut (see photos), the plans are available by mail order from your "Insiders" scribe. Plans are 24x36-inch blueline prints with a Xerox sheet of insignia templates. For your copy, send a self-addressed, #10 large business envelope, or self-addressed 6x9-inch manila envelope, along with a check or money order for six dollars ($6) to: Dave Linstrum, 4057 San Luis Drive, Sarasota, Florida 34235. Postage is included and your plans will be sent out the next day by 1st Class mail. This offer is good in the U.S.A. and Canada *only*, and expires December 31, 1989. If you are looking for a nostalgic, great flying Coconut (or Jumbo Scale outdoor flier) then send for your Kawasaki Killer Kokonut plans today.

Revealed at last—VTO's own "Insider's Workshop" with two Peanuts under construction. See text for secret details. Clutter is a sign of creativity!

VTO'S INSIDERS WORKSHOP

Yes! Revealed at last, the inner sanctum where such craft as the "Swamp Bird" are created. Your "Insider" author works in a spare bedroom in a typical Florida ranch house. The principal building surfaces are a white Formica dinette table and a white Formica drafting table in an "L," with a swivel office chair. Not shown in photo is a white Formica desk with a portable word processor. The shop is always cluttered, a sign of creative efforts! Balsa, tissue and supplies are stored on shelves under the table or in a chest of drawers. Finished indoor models are all boxed and the boxes stacked. Magazines are kept in a pigeonhole wall unit. Like a galley kitchen, it is compact but efficient, with everything within reach. A key element is the small stereo/cassette unit, for listening to jazz or classics while butchering balsa. Craftsmanship is inspired by good music!

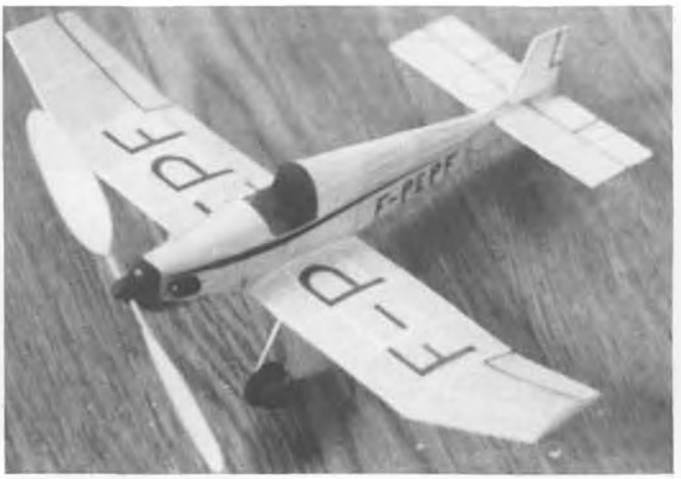
THE CIMAS CROWD

The Columbia Indoor Model Aircraft Society numbers among its members some very heavy-duty "Insiders." Ed Whitten, Ron Williams, the Gagliano family, etc., are all super competitors. They fly in the rotunda of the Low Library at Columbia University in New York. Their T-shirt logo, designed by Ron Williams, shows the flying site with a pair of wings attached to the rotunda dome. An appropriate motif, indeed!

Vic Gagliano has nurtured some fine fliers in his kids, and sons Charles, Matthew, and John Paul hold many records. Over the years, 23 different events have been flown in the library. Besides the usual Bostonian, Manhattan, F1B Microfilm, and EZB, they fly events like IMS Slowpoke and Chili Bean ROG. The motivation for AMA and site record breaking is very high, and the Gagliano crowd, along with Don Slusarczyk and Tom Iacobelli, hold many of these.

The site itself is awe-inspiring, being a classic atrium with 30-foot polished black marble Ionic columns etched with the words Philosophy, Literature, Theology, Science. Certainly there is some of all those in model flying, if you grant that there are mystical gods of flight.

Currently, the Gaglianos hold nine site records at Columbia. Charles owns the top time in Manhattan, EZB, Novice Penny, Chili Bean and CB Jr. Matthew sits on Novice Penny, while Dominic leads in Flying Wing and Canard. Even little John Paul has the IMS Slowpoke record. Venturing beyond NYC, Matthew set an AMA National Indoor Record of 8:19 in Cat. I



Two of Stan Fink's indoor Peanuts are the Caudron 11 (above) from Larry Kruse plans, and a French Bebe Jodel homebuilt (right). The Caudron weighs in at only 4.5 grams; the Jodel goes 6 grams and is good for over 40 second flights.

Doc Martin trims in a bit of washin to open up the turn on VTO's "Komet."

Novice Penny. Charles has several records, but the one he is most proud of is the latest: a Cat. IV Indoor Hand Launch Glider record of 2:39.4 at Akron's Goodyear Airship Dock. He set this with a slightly modified "Super Sweep" (the classic Ron Wittman IHLG) and got lots of coaching from IHLG ace Dan Belieff.

HOW THE INDOOR BUG BIT ME

This just in from born-again "Insider" Dave Hodges:

"Read your column in *Model Builder* religiously, and enjoy it.

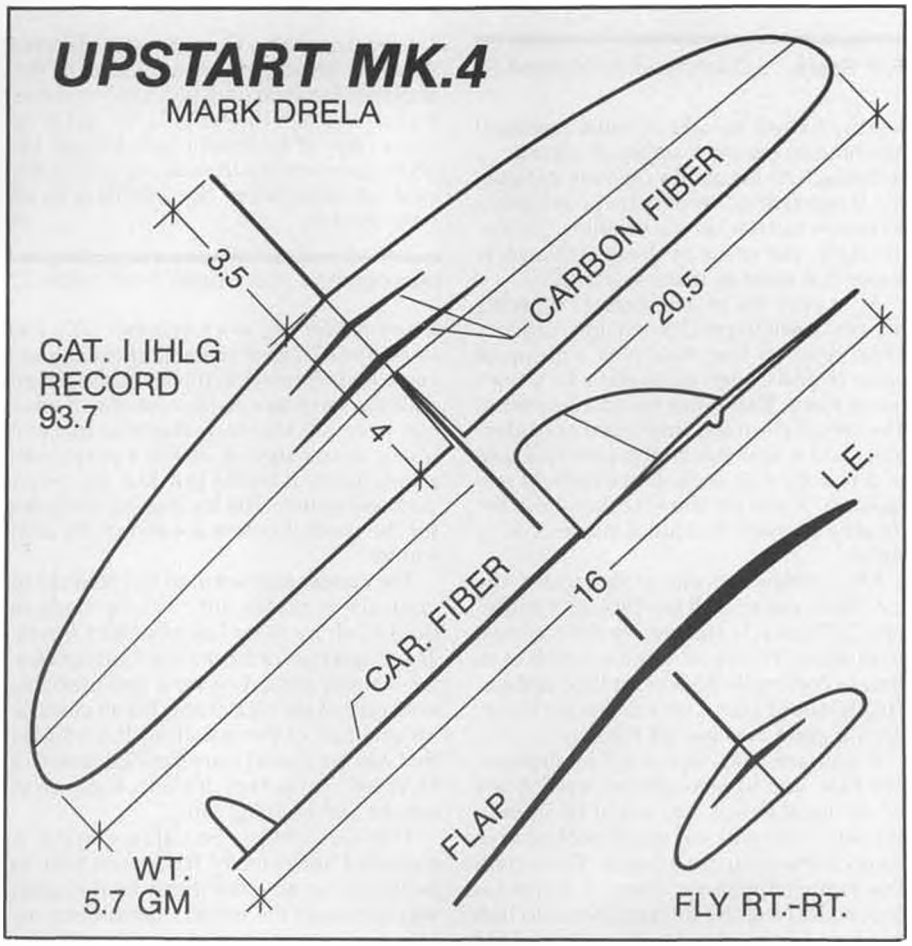
"I am a semi-retired electrical engineer, who has, in the last fifteen months, resumed modeling after a 53-year hiatus. My stepson came home from his job at the Jet Propulsion Laboratory announcing that he was going to take up radio controlled soaring. I replied, 'So will I.' Before I even got started, I read about electric powered radio controlled models. Then I read about Tony Naccarato flying at the IMS Show. Most of my EE consulting work is in the Los Angeles area, so I went to see Tony at his and Addie's T and A Hobby Lobby in Burbank.

"During our conversation, Tony suggested that I might like to attend the Blacksheep Exhibition Squadron's monthly indoor flying event at the Luther Burbank Junior High School gymnasium.

"As a youth (1933-35), I had read about indoor flying—seen photographs of those gossamer-like models flying in the big dirigible hangars. Participating was a dream that I never imagined that I would fulfill. Here was a chance. I built acouple of modified Peck ROGs and an IMS Slowpoke and showed up at the next meet. Len Marlow spent the entire evening with me, coaching and helping. I was hooked. R/C and electric are on the back burner. That was in March of 1988. In October I took a second in a Blacksheep Embryo contest and last month I took a first in a Blacksheep No-Cal contest with an Al Lidberg Tipsy Junior!

"Now I am trying to get indoor started near home. I live about ten miles northeast of Visalia, a town of about 60,000, located between Fresno and Bakersfield (not too far from Taft) in the southern San Joaquin Valley of California. Chuck Neeley and I have contacted the responsible people at the Visalia Community College, College of the Sequoias, and found that we can arrange for indoor free flight there. Now we need to find others who are interested in participating. In an effort to do this, I am sending an ad request to *Model Builder* magazine.

Continued on page 66



F/F Scale. . . *Continued from page 51*

words, I want to add a radial powered machine to my small stable of aircraft . . . someday! As far as the ultimate biplane, the Staggerwing, there had to be at least six or seven outstanding examples. Unfortunately, the price of these airplanes is about the same as many warbirds!

After a full day of "star gazing," I made a trip into town to get cleaned up in order to enjoy another fine meal with a group of close friends. Merced used to be a one-horse town. That is not the case anymore. The population has increased considerably, and it now has all the conveniences of any large city, including excellent restaurants. If you get the idea that these fly-ins are a bit more than just airplanes, you're right!

On Sunday, the day of departure, the L.A. Basin was socked in—typical of Southern California. Therefore, we did not leave until about 12:30 p.m. Then a bunch of us flew to Porterville Airport for food and gas. Finally, about 3 p.m., we headed for home, having good weather all the way.

If you are truly interested in airplanes like I am, you have to treat yourself to any of the local fly-ins that might be in your vicinity. You will see more prospective subjects than you can imagine. This month I've included pictures of several, but this is only scratching the surface. I ran into Bob Banka of Scale Model Research, 2334 Ticonderoga Way, Costa Mesa, California 92626, at Merced. He has most all of the airplanes featured here plus a zillion more. If you send him three bucks, he will send you a copy of his latest photo listings. He offers photos taken from all angles, just the kind we need when documenting those scale models. •

Interceptor. . . *Continued from page 32*

Control Rod kit, stock number 507, was used. The .032-inch diameter flexible steel cable that comes with the kit was replaced with the same size music wire. Now, what you have is a 1/32-inch diameter piece of music wire running inside a very small plastic tube. It works just like any other pushrod system. The location of the holes for the control system are shown on each former.

The rudder may seem to be too small to control the model, but it can be made to do the job by using lots of rudder throw. Three-quarters of an inch each side of center is about right. You have also probably noticed that the model only has an elevator on one half of the stabilizer. It is an idea that was borrowed from the Planesmen of Ft. Worth, Texas. Sure, it works. It also saves weight and building time.

The Cox .049 reed valve engine is mounted horizontally. It does not have to be done that way, but it may be the safest way to mount the engine. It has been my observation that many of the people wearing Band-Aids on their fingers at SAM contests are 1/2A Texaco fliers. It appeared to me that trying to adjust the needle valve and remove the glow plug connector located so close to the pylon was going to be a sure-fire finger slicer. The horizontal mount puts the needle valve on the side where it is easy to adjust. Also, it is easy to prime the engine because you can see the exhaust port even while wearing bifocals. Note: you have to decide which way you are going to mount the engine, horizontal or vertical, when you make the motor mount holes in the firewall because the engine backplate bolt pattern is not square.

The original Interceptor had a single wheel landing gear. SAM rules require that 1/2A Texaco models ROG. The rules also allow a single wheel landing gear to be converted to two wheels. We have considerable wind here in Texas, therefore, I went with two wheels. A tail skid was added to get the now unneeded sub-fins up off the ground.

When you are ready to fly your Interceptor, take someone with you who has great eyesight. It is the best insurance that you won't lose it, or any other 1/2A Texaco model for that matter. Above all, stay out of the clouds! •

O' Counter. . . *Continued from page 9*

provements that have been incorporated into the ASP .40, such as the new carb and sealed front bearing, are also used on the

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.46.

Going price on the ASP .46 airplane engine is $114.96; the helicopter version sells for only two bucks more. The helicopter engine, being inexpensively priced, would make a perfect match for the also inexpensive MFA Sport 500 helicopter described above.

The ASP .61 FSR is the biggest in World Engines' ASP line and uses a ringed piston/cylinder for long life and a short break-in period. Retail price on this brute is $129.95.

The "Black Eagle" is an electric powered ARF that requires only minimal assembly to complete. It comes supplied with a Mabuchi RS-540 motor, motor pylon, prop, landing gear, wheels, and all the rest of the required hardware. The only items left to buy are the radio (two or three channels) and a six-cell 1200 mAH battery pack. The model has a 58-inch span, 417 square inches of wing area, and will weigh in at about 44 ounces ready to fly. Suggested retail on the Black Eagle is $134.95.

From World Engines, 8960 Rossash Rd., Cincinnati, Ohio 45236.

• • •

Argus Books, the British publisher, seems to be cranking out modeling-oriented technical books by the bushel basket. The latest title to be received here at the MB office is *Radio Control Giant Scale Aeroplanes*, written by well-known English modeler David Boddington. The title says it all; we can only add that as with all of the other books in the Argus series, this one is very professionally done, is chock full of photos and illustrations, and appears to cover the subject of Giant Scale quite thoroughly. The book is in a 7-1/2x 9-1/2 inch format, with 170 pages divided into 14 chapters that deal with such subjects as how to select a model; kits, plans, or original designs; materials, engines, landing gears, control systems, covering and finishing—you name it, it's in there!

Radio Control Giant Scale Aeroplanes sells for $21.95 and can be ordered direct from Zenith Aviation Books, P.O. Box 2, 729 Prospect Ave., Osceola, Wisconsin 54020. •

Insiders. . . . *Continued from page 63*

"If you can do so within *Model Builder* magazine's editorial policy, I would appreciate it if you would include an item in your column about our aspirations. David A. Hodges, 34337 Road 168, Visalia, California 93291. (209)798-1963."

NFFS TEN MODELS OF THE YEAR

The National Free Flight Society is proud to announce the 1989 Ten Models of the Year and the inductees to the Hall of Fame.

AMA/OUTDOOR

LARGE POWER: HUMMIN BIRD, Charles Caton
SMALL POWER: BOOGER II, Glenn Schneider
LARGE RUBBER: BANDWAGON, Roger Gregory

INTERNATIONAL CLASS

F1A NORDIC: S-11 ALLROUND, Stefan Rumpp (W. Germany)
F1B WAKEFIELD: FANTASY, James Quinn (U.S.A.)
F1C POWER: SILHOUETTE, Stafford Screen (G. Britain)

INDOOR

INTERMEDIATE STICK: SYMPHONY, Earl Hoffman

SCALE

DO-X FLYING BOAT, Don Srull

SPECIAL

PUBLICATION: "Building and Flying Indoor Model Airplanes," Ron Williams
SERIES OF OVER 40 PEANUT SCALE DRAWINGS OF FRENCH CIVIL AIRCRAFT, Emmanuel Fillon

1989 HALL OF FAME INDUCTEES

FAUN W. SWANEY (deceased): Devoted most of his time to helping new modelers into the model aircraft hobby. Also, was instrumental in the establishment of the two West Coast AMA Nationals.

EDWARD NAUDZIUS: A prolific designer, builder and flier with championship results. Instrumental in the establishment of the Plymouth competition programs and teacher of propeller carving techniques.

JOHNNY CLEMENS: A driving force in the promotion of free flight activity in the United States during the 1930s. Father of many of the AMA programs including Nationals, Museum, Headquarters, organization, et al.

BOB and SANDY PECK: Two people in love—with model airplanes in a form that is understandable to the novice. Creators of fine scale kits and simple devices for them. •

Sport 500. . . . *Continued from page 41*

ground the frame will resonate and vibrate slightly. I think they could have used a shorter belt to reduce the helicopter profile, and thus reduce the frame height. The wood servo tray on the Sport 500 is strong. The landing gear is extremely beefy. The tail boom is solid. These are the ingredients perfect for a beginner's abuse. The raked forward landing gear is pretty, but the engine is located very low, and in a very hard landing the muffler could bang on the ground.

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The main rotor head is a solid unit. It has a steel teetering wire to give *spring stiffness action* to the main rotor, so that the rotor tilting action will be transmitted as a moment to the main shaft for improved control response. This feature is same as on the Cricket. The tail rotor gearbox is pretty good and is mounted in a unique way. As the photo shows, the gearbox is bolted to the plywood vertical fin rather than onto the metal tail boom like other model helicopters. The reason is so that the Sport 500 can maintain a straight tail rotor drive shaft wire. On the GMP Cricket, the metal tail boom is bent up slightly to maintain a smooth running tail drive wire. I think the MFA idea is good.

The biggest complaint pointed out by modelers regarding the Sport 500 is that in order to keep the cost down, the main rotor shaft is supported on one ball bearing and one bronze bushing; so is the tail rotor shaft. I believe that since these two shafts are turning at high rpm and carrying large radial loads, the kit should not have used bronze bushings. The other puzzling thing is why the designer did not incorporate a cone start feature for starting the engine. The MFA Sport 500's engine location is perfect for having a cone start similar to the Cricket's.

The bottom line is, how does it fly? So far it seems to be very stable. The fuel tank is clearly visible on the side so there is no excuse to run out of gas. The vertical response is not as quick as collective-pitch helicopters because it takes time to speed up or slow down the main rotor rpm. Since I had not flown fixed-pitch helicopters for a few years, I had to warm up a bit to get used to the delayed vertical response. But after a few flights on the Cricket and MFA recently, I can now fly a fixed-pitch helicopter around almost like a collective-pitch helicopter. Stall turns are performed in the same manner, however, no loops or rolls were tried on the MFA Sport 500 because it is not designed to do them.

If you want an inexpensive helicopter as a jumping stone to a full-out aerobatic machine, then the inexpensive MFA may be what you're looking for. Hobby Lobby has a very inexpensive Hughes 500 body for the MFA Sport 500, and also offers a helicopter package deal that includes radio, helicopter, engine and gyro for only $500. Call them at (615)373-1444 for a free catalog and more information. •

Mirage. . . . . . *Continued from page 17*

the motor from sliding forward under power.

RADIO

For the radio I chose to use my Futaba Conquest with a 225 mAH battery pack and three of the tiny S-33 servos for elevator, rudder, and on/off motor control. Although the die-cut ply servo tray has cutouts for standard servos and the model will certainly fly with the added weight, do try to use the lightest units you can find. It can only improve the performance. Ditto for the battery pack.

FINISH

All wood surfaces were covered with Top Flite MonoKote. The plastic pieces were painted with spray enamel for plastic models, while the pin striping was done with Goldberg's 1/16 trim tape. The black vinyl windows from the decal sheet went on easily and lined up perfectly, again showing that somebody at the factory did their homework. All finished, the model is handsome indeed, looking rather like the offspring of a Cessna 150 and a Citabria.

All up weight, ready to fly, with a standard 7-cell, 1200 mAH motor battery, came out at 50 ozs., just within the recommended 45 to 50 ozs. With a span of 54 inches and a wing area of 464 sq. in., this yielded a loading of 15.5 oz. sq. ft. Proper balance was achieved after adding 1/2 oz. of tailweight. Incidentally, if you use a flat 7-cell pack, you will have to move the rear battery brace aft about 3/4 inch from where it is depicted in the plans.

FLYING

A couple of quick power checks showed a peak of 9000 rpm on a 6-cell 1200 mAH battery pack and 9800 with the 7. The first flights with the 7 went without a hitch and I found the performance to be good, with a decent climb rate. If preceded by a dive, consecutive loops are accomplished easily and a slow rudder roll is even possible. The model is stable and forgiving and with the specified control surface throws, will not stall or spin (at least mine won't). There is very little trim change between power on and off due to the generous amount of built-in down and side thrust.

Although the 6-cell pack gives a longer motor run, the performance was a bit marginal for my taste, so I recommend the larger pack. Without much effort, you should be able to get 8-minute plus flights by using the on/off control.

As good as it is, the potential for more performance is there without any additional effort (although somewhat more expense). The new SR Batteries 1250 Magnum pack is about four ozs. lighter than a standard sub-C pack. The use of a radio system such as Futaba's Attack-4 Electric with built-in speed control and battery eliminator circuit would delete one servo and the 225 mah pack and save three more ozs. A lightweight covering like Coverite's Micafilm might knock off maybe a couple more. With the weight down in the low 40s the performance would be outstanding, and we haven't even discussed a cobalt yet!

But, of course, the idea is to have cheap, quiet fun and this the Mirage delivers, as is, with ease. Although the Electra and Sophisticated Lady offer better hands-off recovery from "unusual attitudes" and thus are probably better suited for a raw beginner, the Mirage, with the help of an instructor, can certainly fill in and it offers much more performance.

Give it a try. You won't be disappointed!

The following manufacturers have products used or mentioned in this article:

1. Carl Goldberg Models Inc., 4738 West Chicago Ave., Chicago, Illinois 60651.

2. Futaba Corporation of America, 4 Studebaker, Irvine, California 92718.

3. S R Batteries Inc., Box 287, Bellport, New York, 11713.

4. Top Flite Models Inc., 2635 So. Wabash Ave., Chicago, Illinois 60616.

5. Coverite, 420 Babylon Road, Horsham, Pennsylvania 19044. •

Electric..... *Continued from page 18*

Note the 15 and the 25 have nearly the same power output! The 15 does work harder to do that, and runs hotter. I also do not understand the large difference between the direct drive 05 and the geared 05. I would run these tests myself, but right now I an hard pressed for any time at all, so perhaps later.

Astro has now updated all its charger line, with very attractive new cases, and more heavy duty components. I have been using the AC/DC variable rate charger and the DC/DC Constant Amp chargers, and they are top quality. The AC/DC charger will charge up to 5 amps with no difficulty, for up to seven-cell packs. The DC/DC constant amp charger will charge any rate up to 4.5 amps, and up to 28 cells from 12 volts DC. I have been using it for my Astro 40 on 18 cells, with excellent results, it really is very close to constant current within half an amp. I recommend these chargers. The AC/DC Model 115 retails for $79.95, the DC/DC constant current Model 112 retails for $129.95.

Another product I have been very happy with is the Royal Products Digital Tachometer (790 W. Tennessee Ave., Denver, Colorado 80223). I bought one when my two year old son, Andrew, decided to give my AccuTach a bath. The AccuTach didn't like that, and while it was gone for repairs, I got the Royal as a stand in. It has a setting for both two and three-bladed propellers, and reads three digits, that is, to the hundred rpm level. It is quite accurate, it agrees with the AccuTach in the readings, and the AccuTach is the best I have found. It fits easily in a shirt pocket, and retails for $42.95. The NorCal Avionics AccuTach 2 is the other tachometer I recommend, it can read to tens of rpm, and is a voltmeter and ammeter as well. It retails for $89.95 and is available from Tower Hobbies.

Woody Blanchard (member of the AMA electroflight committee, and designer of the Guillow electric Aeronca) sent photos of his current projects (pun intended!). Woody flies electric seaplanes very successfully, including multimotor ones. The original Savoia Marchetti S35X flew in 1935 from Rome to Chicago non-stop. Woody's model spans 72 inches and weighs 4-1/2 lbs. It gets off the water in about 50 feet and will climb out at about 30 degrees! Quite respectable, and on two Mabuchi 550 direct drive ferrite motors. Woody did not say what props or how many or type of cells. Woody's latest electric is his AMA aerobatic pattern plane. Woody says the plane will do all the pattern, but the pilot can only do part of it! It is powered by a Graupner Ultra 1600 motor turning a 9x6 prop at 12,000 rpm on 14 cells. The plane is a beauty, in blue with white sunburst striping. Another kit, Woody? I do feel very strongly that now that the six and seven cell planes are strongly established, that there should be kits available for larger motors as well. I flinch when I hear the hobby store clerk say, "Learn on electric, then move up to the gas." Why??? As I have said many times, and many others have proven over and over, the 15 to 60 (250 watt to 450 watt) electrics perform so well that most gas fliers think they are gas when they see the planes in flight. There is no need to "move up," the electrics do it all! If a kit were available for 12 to 18 cells, more fliers could find that out for themselves.

Just as I was about ready to send this column off, I got the Hobby Lobby Catalog #14. Wow!! Get this catalog! It is $2, and worth every cent. Send to Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, Tennessee 37027, phone (615)373-1444. The cover shows Werner Detweiler launching his Rat Race electric pylon racer. This is competitive with Quickie 500 racers, but that is just the beginning. This catalog is loaded with high performance electrics, including the Uhu, well known for high performance. There are motors galore, including the Graupner cobalt motors, and a "secret" motor (GT 300) that is claimed to have more power than cobalts. Have fun with this catalog!

One last item for now, I will be living in Weisbaden, Germany for three years, starting in September. This is the very heart of electric flying in Europe, next to Frankfort. The column will be as usual, with more info on what is happening in Europe! When you write, the postage will be the same too, I will have an APO address. Until I have that address, send letters care of *Model Builder* and they will forward them. No, I did not join the Air Force, my wife did! She will be an Air Force doctor there. We are all looking forward to Europe! Es geht besser mit electrisch, till next time! •

Soaring..... *Continued from page 37*

Both fly well and are cute as buttons. Is anyone getting ideas over at Carl Goldberg

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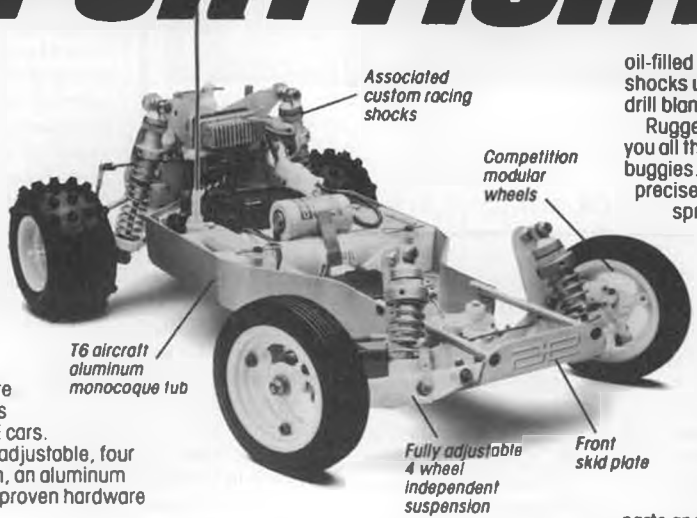
The new RC10 features fully adjustable, four wheel independent suspension, an aluminum alloy monocoque tub and race-proven hardware throughout.



And the RC10 doesn't need expensive accessories and modifications to handle the roughest tracks. The strength and durability is standard equipment.

RACE-WINNING ENGINEERING.

For maximum traction the RC10 suspension is damped by long throw, oil-filled racing shocks. These custom shocks use machined alloy cylinders and drill blank shafts for silky smooth action.

Rugged, yet light, the suspension gives you all the adjustability of full size, full race buggies. The A-arm/Ball joint design allows precise camber, caster, ride height and spring rate tuning. Even anti-roll bars and a VariLok dif are included.

Exceptional ground clearance and low center of gravity also contribute to the superb balance and performance of the RC10 over all types of terrain.

GET THE JUMP ON THE COMPETITION.

Go RC off-road racing with the leaders. The National Champion RC10 is available now and legal for ROAR and ORRCA nationally sanctioned competition.

Complete RC10 kits, replacement parts and spares are readily available through model car racing's most extensive dealer network.

Take the challenge and build yourself a winner. Team Associated's RC10.

Sealed gearbox VariLok differential

Full race rear suspension includes bulletproof half shaft and u-joints with tapered and keyed modular wheels. Quick release knock off design for fast pit work and tuning.

Smooth undercarriage maximum ground clearance

Model cars for Real racers.

Associated Electrics
3585 Cadillac Ave.,
Costa Mesa, CA 92626
(714) 850-9342

Models?)

The third place finisher was Joe Wurts. Joe was running a low grade fever at this year's event. The night before, he was finishing his new HLG model (with his wife and flying buddy, Jan, helping) while running a 103° fever. He claims his fever broke at 3:00 a.m., but it was only down to 101° when he left the house for the field, which was over an hour's drive away! Can you top that for motivation and desire to fly?

Joe's plane looked very much like the one he flew last year, i.e. blue foam core wings and stabs sheeted in vacuum-bagged, 2.2 oz. fiberglass, with a balsa Flinger-like fuselage. This year's model, however, lacked the carbon fiber strip reinforcing under the glass skins. Joe's favorite HLG airfoil is the Eppler 387.

Joe has an incredible throwing arm. It is more than a match for anyone on the field even when he's sick! With his left arm, he can toss his HLG a good fifteen to twenty feet higher than the average "good" arm. Because Joe is ambidextrous, he can guide the model to altitude from the moment of release with his right hand. Joe also flies the model right-handed. Put this all together with Joe's natural piloting skills and his sixth sense about finding thermals, and he is very hard to beat. Even in dead calm air, Joe claims to be hitting 60 seconds!

Joe dropped out of first place in the first few seconds of the contest. Round One is where the longest single flight wins the group. Well, Joe was in flight group #6 with Stan Sadorf of the ISS. Stan had been practicing on this field for two weeks leading up to this event, and his home field advantage was working quite well.

The ten-minute slot started and Stan hesitated. Joe threw his HLG. Then Stan threw his Wristocrat. Stan found lift and started working it. Joe didn't find lift. On his way down, Joe spotted Stan going up. Quickly, Joe forced the model into a hand-catch landing. He threw again, with only about a half-minute wasted, and caught Stan's thermal. Well, they both rode it out to the end of the slot, but due to Joe's second toss, he got 9:17 to Stan's 9:46. Joe got aced by the longest recorded flight of the day! Congratulations Stan!

Round Two and flight group #2 saw Joe almost getting aced by a different flier, Doug Hertzog, chief of Douglas Aircraft Company which makes the Silhouette slope glider. Doug found the one strong thermal that had "five minute max" written all over it. Joe wasn't caught nursing his fever, though. He saw Doug's little 7-1/2 ounce, 39-inch "Vader Plane" (a Skywalker variant) going up and came over to ride share! It's very hard to sneak one past Joe, even when he's sick! With a sprint across the field and a strong toss, Joe was soon up with Doug, getting small fast. Doug left the thermal and caught his plane for a perfect five minute time, and Joe got a nearly perfect 5:01. That one second cost Joe four points (996 vs. 1000).

In the last round, where 120 seconds was a max, Joe's five official times were: 120, 107, 119, 120, and 54. Three maxes, one near-max, and a 54 second flight are tough to beat! Eight minutes and 40 seconds of official flight time (plus the throw-out flight of, I think, 49 seconds), means he was only on the ground for 31 seconds in the ten-minute slot. That was the single most impressive performance of the meet!

The last model I'd like to mention before wrapping up this report is James Banas' unusual original design. It was noticeably the most creative new design at the field, and that design showed some real thought and potential.

James is an Air Force Crew Chief in the 4450th Tactical Group at Nellis AFB, Las Vegas, Nevada. His primary responsibility (I would guess) is to make sure the top secret Lockheed F-117A Stealth Fighter flies as it was intended: as a tactical deterrence type fighter. James is a relatively new western transplant from the Tidewater (Virginia) Model Soaring Society group, home of such notables as Bob Champine, Woody Blanchard, and Herk Stokeley.

James' model was finished the Friday before the contest and had only about two hours of trim and practice flights on it, and that was out at Edwards AFB in the very windy Mojave Desert. It has a 55-inch wingspan, an elliptical wing planform with straight trailing edge, a root chord of nine inches, a tip chord of four inches and a relatively heavy flying weight of about 18 ounces.

James' longest flight came in Round One, probably when his arm was its strongest, at 37 seconds. I didn't get a chance to observe the model flying during the event, so I don't know what was going wrong. However, with a little more design and flying experience, and that all-important practice, I expect James to be back next year "armed" (bad pun!) with a competitive plane and thumb.

MORE HAND LAUNCH NEWS NEXT MONTH . . .

. . . But for now, it's time to wrap it up! Send all correspondence, newsletters, photos, etc., to R/C Soaring, Bill Forrey, 3610 Amberwood Court, Lake Elsinore,

California 92330, (714)245-1702. Thank you! •

Electronics. . *Continued from page 10*

ing strength of six mil wire is approximately 0.7 pounds and the recommended minimum tension is 0.03 pounds. The strain or stroke is as high as 7% of the wire length. Best results are obtained with 2% to 4% for both long life and maximum pull."

Actually, this stuff is quite interesting, and while it is not yet in common use, the list of recommended applications ranges from simple actuators to robotics and prosthetic limbs. I have two sources of information for you (no SASE's to me on this one). First is the maker of BioMetal: Toki Corporation, No 7-9 Higashioni 4-chome, Shinagawa-Ku, Tokyo 140 Japan. Closer to home, it is: Toki America Technologies, Inc., 18662 MacArthur Blvd., Suite 200, Irvine, California 92715, (714)955-1206.

Toki Inc. provides a folder of material including a description of the metallurgy of BioMetal, as well as a more complete list of its properties and suggested uses. There is one more place to contact, a company that can furnish both Nitinol and BioMetal, plus some added information as well as a variety of experimenter's items and kits for building various assemblies up to and including a robotic arm that looks like it is well capable of holding parts together while you apply cyanoacrylate, thus saving you from gluing yourself to your latest project: Mondo-tronics, 1014 Morse Ave. Suite 11, Sunnyvale, California 94089, (408) 734-9877. I ask, of course, that if your experiments with Nitinol or BioMetal bear fruit, please share them with us!

WHY DON'T THEY DEPT.

Those of you who have traveled abroad know how often the first reminder you have that you are no longer in the good old U.S.A. is when you first go to plug in your system charger, or electric shaver or hair dryer. Even if the voltage happens to be the same, the plug isn't, and if you did not come prepared or are staying at one of the better hotels that provides such necessities, you may well go unshaven and with wet hair. What most of us don't realize is the extent of this inconvenience!

In an effort to get the European countries standardized, a group calling itself the "European Committee for Electrotechnical Standardization," with headquarters in Brussels, has been working for years to bring about an agreement on a common "Europlug." According to the committee, there are 40 *(forty!)* different AC plugs in use worldwide.

WHY DON'T THEY DEPT., Part 2

Do you often feel that a certain product could be improved, but don't bother to tell the maker because you think he won't care or even bother to listen? Well, I'm not here to tell you that they all do, but I can

tell you—and show you—that if your ideas have merit, there are companies that will listen and adopt them.

For example, back in April 1987, in answer to a question from a reader, I presented some modifications to the Ace R/C "Tachmaster," which increases the versatility of this useful instrument. Sure enough, a few months later the "Tachmaster II," which incorporated those mods, appeared. More recently, in March of 1988, again in answer to a reader's query, I suggested a simple modification to Ace's H/D 500 and DMVC chargers to allow their use from DC for field use. Well, the latest Ace R/C catalog now includes AC/DC versions of both of these chargers, with even a retrofit kit available for older versions.

The point is that some companies will listen, and pay more than lip service to our needs. If you have been sitting on an idea, by all means tell someone, either me or the manufacturer. However, let's be practical about it. Forget that pie-in-the-sky stuff about things "They" should make for us, if you can't furnish data that does not amount to more than criticism. Just *saying* something is no damn good and does not get much attention at the company level unless you can say *specifically* why it isn't so, and how it can be improved. Keep in mind too that most things can be improved, including most model products, but are we willing to pay the price?

Another good Ace R/C idea that did not come from me, but possibly from some other user, is the recent introduction of its trickle rate adapters for NiCd chargers and for the versatile Digipace Battery Cycler. Two versions are available for normal chargers: one for single output and another for dual output chargers, called "Add-A-Trickle," and a third version specifically designed for the Digipace called the "Auto Trickle." All of them have a similar purpose: to reduce the charge current after a given amount of time to a reduced value at which the battery can be left connected indefinitely without the possibility of overcharging.

The Add-A-Trickle units are simply spliced into the output harness of the chargers they are to be used with. The Auto Trickle installation is a bit more involved, requiring some connections to the PC board and some holes in the case of the Digipace. However, it is not beyond the abilities of anyone who has ever successfully completed an Ace kit, and as usual, the instructions are simple and complete. The Add-A-Trickles are $6.95 and $9.95 for the single and dual respectively; the Auto Trickle is available as a factory retrofit for $39.95 or only $29.95 for the do-it-yourselfer. Tell 'em we sent you.

Next month? Who knows? But don't let the suspense get to you—tune in and find out! •

Big Birds. . . *.Continued from page 43*

most other big four-strokers—they should do well in cowled-in scale-type birds where ventilation can be a problem.

Since the .91 has been so reliable, I thought I'd try its big brother, the Classic 1.20, which, along with the .91, is presently being marketed by Hobby Lobby. I've got about 30 minutes of break-in time on the 1.20 and, although no tach readings have been taken yet, find that it's as easy to start as the .91 and surprisingly smooth at all speeds. Also, no fiddling with the low speed needle was needed to achieve an impressively slow and sustained tick-over.

Instructions specify that a 5% nitro, 8% oil fuel be used, and they're not kidding. Years of running the .91 have proven that these engines are happiest with between 6%-8% oil. The easy way to tailor fuel for a Classic is to mix one gallon of standard 15% nitro fuel with 150 ounces of fresh alky, ending up with a little over two gallons of an almost 5% nitro, 8% oil mix. Be advised that Classics run crappy if the oil content is over 10%.

And don't underprop these engines; they like bigger props. Also, they can be made to run in reverse simply by switching the intake and exhaust tubes around and then doing the same with the valve pushrods.

BIG ELECTRICS

There seems to be a lot of guys interested in big electrics. I've already received letters about the July "Big Birds" column that Crash Evanson did on big E-Power—even though that issue's been out for only two weeks.

Most of the writers are still building their planes, but Lloyd Roberts is way ahead of the pack. He's got a mighty fine looking Turbo Beaver that's going to the IMAA Festival in Odessa later this month and what he says about gearing the Astro 60 should be of interest:

"Just read your Big Birds column on big electrics. Enclosed is a photo of a plane I recently built from a Unionville Hobby Kit (it's designed for a .60 two-cycle).

"This Turbo Beaver spans 96 inches, weighs 11-1/2 pounds and flies fine with a geared Astro 60—which they say is not available, but the motor is drilled for and accepts the 25/40 gearbox.

"The problem is that when the 60 (1-1/4 hp) is geared it's hard to find a prop big enough to get the power out of the motor. I'm working with a 16x8 three-blade Graupner and am only pulling about half the rated amperage with 28 cells. I think for the hot air in Texas I'll have to go to a 16x6-10 which will be made up from Zinger props. The Graupner is a bit chunky so I think I can do better with a reworked wood blade . . . and save some weight, too.

"Big electrics are a challenge because there isn't much written about it. I took/substituted/left out a pound from the kit and really should have done better; perhaps another four to eight ounces if I'd been thinking ahead. Didn't use the hardwood ply, bulletproof fiberglass cowl and some sheeting that came in the kit. Drilled big holes in all of fuse sheeting to save another two ounces and make it *look* light . . . but then added some weight back in landing gear fairings. I think that a carbon fiber landing gear instead of 3/16 wire would save some weight."

Lloyd sez this bird is aerodynamically very clean, and needs those flaps. When he cranks them in just right he can make some spectacular short-field takeoffs and landings. And his last comment about the Beaver: she's not a beginner's airplane because of a tendency toward "nasty, deep stalls."

A geared 60 seems to have one helluva lot of power. Wonder how big a bird has to be to accommodate two geared 60's? Anyone got a twin geared 60 he'd like to tell us about?

THOUGHT OF THE MONTH

Frustration is when your cope runneth over.

Al Alman, 16501 4th Avenue Court East, Spanaway, Washington 98387, (206) 535-1549.

Choppers. . . . *Continued from page 39*

Proper gear mesh alleviates concentrated wear patterns and lowers the intensity of the gear noise. Less impulsive contact also means a smoother running helicopter.

For you designers and scratch builders, you should use gears with a high contact ratio. Most standard gears contact each other at only two points. The improved high contact gears contact each other at three points, transmitting torque through three points rather than through two points to reduce the stress at each point.

Another means of reducing stress on the teeth is to operate at a higher rotor rpm. Intuition tells you that high rpm tends to be more damaging to your transmission. Not true. If the amount of horsepower transmitted to your main rotor is held fixed, increasing rpm will reduce torque; lowering rpm will increase torque. The best proof of this is to hover your helicopter at high rpm first, then reduce your main rotor rpm by increasing the collective pitch trim. You will discover that you now need more tail rotor thrust to balance the torque increase. Therefore, high rotor rpm requires a less beefy gear system, which translates to a savings in weight. High rotor rpm also improves the vibration characteristics; it becomes small amplitude, high frequency vibration, rather than large amplitude, low frequency vibration. Sometimes, if your engine is set too rich, the helicopter will start to vibrate. Just lean out your engine slightly and let the rpm churn. High rotor rpm also helps stabilize the pitching and rolling modes of a helicopter, but tends to destabilize the vertical mode slightly.

What types of gears are best? Spiral and bevel gears are best from a performance standpoint because they have maximum contact area, thus they are quieter, can carry more torque, and have a more precise mesh. The drawbacks are that they are heavier and a lot more expensive to manufacture. Some model helicopters such as the GMP Cricket and those produced by Kavan, use a toothed belt drive instead of gears for the main rotor transmission. Toothed belts are also used for the tail rotor drive on the Kalt Cyclone, GMP Legend and Stork. The toothed belt drive is very quiet, and alignment is less critical. The only drawback is that belt drives tend

to eat up the plastic gears after an extended period of time, and the belt tension needs to be checked periodically.

Besides proper gear mesh, there is one other thing that is crucial for a quiet and smooth flying ship: the clutch mounted on the engine should be precisely centered. The photo shows how this is done. Either go buy a dial indicator (about $50 to $100), borrow one from a friend, or send your engine, fan, and clutch to a model helicopter specialist store to do it for you. Check your local hobby shops or check the magazine ads.

The photo is pretty self-explanatory. The idea is to use the dial indicator to make sure the fan/flywheel is truly centered. Use the dial indicator on the side of the flywheel first. If there is considerable runout, loosen the engine shaft nut and adjust the fan/flywheel. After the fan/flywheel is centered, use the dial indicator to make sure the top surface of the flywheel is flat, or perpendicular to the engine shaft. There should be no more than .003 inch tilt. If necessary, file the top surface. Finally, mount the centrifugal clutch onto the flywheel and use the dial indicator to check the clutch shaft both at the base and at the top of the shaft. Correct any runout by tapping the shaft with a plastic-tip hammer. Ideally the shaft should not wobble more than .001 inch, which is also called one 'mil.' A more reasonable target would be less than two or three mils, because that would take you at least one to two hours already.

Typically, if you just assemble the fan/flywheel and clutch straight out of the box, the runout can be as much as 50 mils, which can cause fuel tank foaming and high frequency vibrations that cyclically stress the aluminum fuselage side frames and eventually crack the frames prematurely. A quick way to check whether your existing helicopter has an aligned clutch shaft or not, is to grab the tail boom where it joins the side frames, while your engine is idling (make sure your other hand is holding on to the main rotor blade!). The vibration that you feel should be very small. If not, then take out your engine and dial it in.

Well, sometimes your clutch shaft or frames are so badly out of alignment that you just can't dial it in. The not-so-elegant remedy is as follows. First make the clutch shaft as straight as possible. Then, as shown in the photo, cut about 1/16 inch of material off both sides of the plastic bearing holder. Assemble them back in the helicopter, but also add some RTV silicone rubber to fill the gap. Since the silicone rubber is elastic, a small misalignment of the clutch shaft is not rigidly transmitted to the side frames. Don't forget to reinstall the bolts that hold the bearing block. Make sure the gear mesh between the clutch bell gear and the main rotor gear is snug, otherwise the slightly movable clutch gear will chew up the main gear immediately.

Next month we will talk about my research on state-of-the-art rotor blade tip design for full-size and model helicopters, like swept-back tip, swept-forward tip, BERP tip, anhedral tip, winglet tip, notched tip, slat tip, taper tip, etc. Meanwhile, if you want to learn more about gear design theory, an excellent reference book is *Fundamentals of Gear Design* by Raymond J. Drago, Butterworth Publishing, Boston, 1988. •

Vanguard. . . *Continued from page 25*

adjustable.

Many of us tend to customize things a bit. I added an extra throttle spring to stiffen the ratchet feel (I did the same in my buddy's new Spectra set too), but this is a job best left to the service department. Since we fly off of pavement, I also added small protective nylon buttons (from the electronics supply store) at the bottom corners of the battery pack's door so that the case back wouldn't get scratched with time.

Although the system allows for dual rates on elevator and ailerons, I dialed them 100% out. The six-channel system also provides for a settable elevator position if flaps are used. That switch was also decontrolled by dialing the mix to neutral. Of the four exposed switches, three are neutered and the fourth works retracts.

RECEIVER

The heart of tomorrow's R/C system is a super narrow band receiver that sees only its transmitter signal in our crowded airwaves. Most R/Cers aren't aware that, although our new frequencies are for R/C only, *between* our new frequencies the pocket pagers of the Personal Radio Service are sandwiched. So if our receiver is the very best that can be built to the rigid AMA specifications, it'll only receive our sent signal. I've already lost two models to a supposedly "1991" receiver matched to my old transmitter. These new Airtronics super narrow band receivers are the best that money can buy, as some private empirical testing has shown. The proof is in the flying. The receiver is a combination of printed circuit boards that assemble in boxlike fashion. Again, the crystal plugs in readily, but a frequency change needs a technician's attention.

SWITCH HARNESS

This set comes with a special PCM switch harness. Two wires go from the 600 milliamp battery pack to the switch itself, but **three** wires go from the switch to the receiver. The Vanguard PCM system has a failsafe that's settable and it stays supplied with power even when the set is turned off by "keep-alive" voltage through that third wire. It's like shutting and locking your car—but the clock is still powered from under the hood.

FAILSAFE

To the immediate left of the transmitter's battery meter is a small protected push-button switch that's used to set the failsafe feature. If you don't ever push the button (it'll beep loudly when pushed) the receiver will hold the last servo settings received from "good" transmitted data. But I teach my R/C students to pull both sticks back in case of trouble; the combination of low throttle and up elevator gives what I call a "parking position." So, by holding both sticks fully back (up elevator and low throttle) and then pushing the failsafe button, in case of a signal interference in the radio frequency link the model will go to parking position in about one second's time if the interference persists. And I think that's pretty darn smart!

OTHER SMARTS

Bells and whistles are out—loud beeps are in. Turn on the transmitter and you hear a beep. When the transmitter runs its battery pack down to marginal voltage the transmitter starts beeping and persists until you either land or crash from low voltage. When the airborne battery pack nears its low voltage limit it simply runs the throttle servo to idle once every minute—a brilliant bit of electron action!

I was uncomfortable with the transmitter on/off switch being exactly at the same latitude as the elevator trim lever. I was afraid of trimming in a bit of up elevator in flight and accidentally switching off the transmitter instead—it's already happened in a Formula 1 R/C pylon race with a Vanguard system. But Cliff Weirick at Airtronics told me the easy fix. He said, "Just pop the switch lever arm off; you'll find the actual switch itself is recessed." Cliff is sure smart! One of the photos shows the arm removed and how the switch is recessed well. And the instructions tell you how you can disable the failsafe feature if you wish.

SERVOS

It's the servos that do the work we command. I've seen multi-page servo stories in foreign magazines that deal with stall amperage drains and grams per centimeter of force—all of which mean absolutely nothing compared to how well the servos move, *and return to neutral.* I went through several hundred actuations of the control sticks (and servos) during a ninety-minute "burn-in" time while watching television, and reasoned I should test how well these new #94102 servos return to neutral after a command is sent. It was fresh in my mind how a friend had so much trouble recently trying to trim a model with poorly recentering servos that he finally bought two new Airtronics servos and wired them into his non-Airtronics radio, thereby solving his problem.

Each of the four new #94102 Airtronics servos supplied with this system was carefully clamped to a test bench and a three-foot-long pointer was glued to the output wheel on the servo. Then each servo was given one hundred commands from the same channel of the transmitter (aileron) and the "return to center" of each servo was plotted in 1/16-inch increments at the pointer's tip. *This is a meaningful servo test* to the average R/Cer, I feel. It parallels the importance I give to the speed range figures in my "Inside Engines" columns here in *MB.* The results were most interesting. The best of the four servos showed only a 1/2-inch total variation at the end of the three-foot pointer, with an outstanding 81% return within the middle 1/4 inch. The greatest variation measured was 3/4 inch, with 61% of the cycles returning within the middle 1/4 inch—still excellent performance by anyone's standards.

AND FINALLY

A Denver club was having considerable interference difficulties and identified high powered beeper transmitters adjacent to channels 22 and 38. Airtronics sent two of these new systems to Denver for testing; they were on channel 22 and channel 38 purposely, and performed flawlessly.

And for you hi-tech types—you've just got to see the new Airtronics Vision system that has the transmitter electronics all made in the U.S.A. and neatly installed into a made-in-Japan transmitter case.

Yes, these new transmitters all come with the AMA gold sticker. They're ready for 1991! •

Hannan. . . . *Continued from page 49*

Many of us junior model builders never gave much thought as to what the "Paulownia" trademark meant. Thanks to Ed Whitten, we now know. It seems that Paulownia is a species of tree (Paulownia tomentosa) also known as the "Princess Tree." Being rapid growers, the trees can attain up to 50 feet in height in a relatively brief time. So popular is the Paulownia in

some parts of the world (the Orient and New York City, for example) that it has become endangered by tree thieves!

THOSE HOMELY FLIERS

Two of the least aesthetic designs ever to become airborne are the Lacey M-10 and the Fike. However, models of these machines are wonderful fliers and continue to dominate contests.

Evidently, in an effort to curb such unsightly entries, the competition results reporter of the Washington, D.C. MAX-FAX newsletter has instigated a novel program: every time one of the offending models appears in print, he notes after it (YUK!).

SPEAKING OF CONTESTS

The Northwest "No-Doc" free flight scale meet will be conducted at the Snohomish Harvey Airport in Snowhomish, near Everett, Washington state. Featured are events for rubber, CO_2, electric, glow and diesel powered scale models. The basic philosophy of the "No-Doc" group is that documentation is not required, since their accent is upon fun, simplicity and enjoyment. "Let's fly 'em, not just look at 'em."

However, for the more dedicated purists, a Master's Class event requiring documentation will also be included. Even in that category the parameters are flexible: "Enlarging stabilizer area and/or increasing dihedral to improve flying is okay, and the extent of which will be scored at the judges' discretion."

THE FLYING FLAPJACK

Dick Johnson, of Texas, favored us with a photo of his profile Vought V-173. Arriving almost simultaneously with Dick's photo was the TWITT (The Wing Is The Thing) newsletter featuring a fine article by Ed Lockhart, entitled *The Most Beautiful/Ungainly Aircraft Ever Flown*, from which we extracted the following:

"November 23, 1942 occurred in Stratford, Connecticut on the same day Vought Aircraft's chief test pilot, Boone T. Guyton, flew the radical all-wing 'Flying Flapjack' for the first time. Designed by Charles T. Zimmerman, it was designated V-173. In this case, radical means *radical*.

"Pilot position: prone (changed to a more conventional seated position later in the program). Planview: like a pumpkin seed (long edge forward), but slightly D-shaped at the leading edge. Two small rudders about six feet apart appeared topside near the trailing edge, and two small horizontal control surfaces grew out of the wing just ahead of the rudders, functioning as both elevators and ailerons.

"Propeller shaft extensions, faired smoothly, formed the wing's front 'corners,' mounting a pair of enormous (18 feet diameter), three-bladed wooden propellers. These turned outward, in opposite rotation, to counter the sizeable wingtip vortices inevitable with more 'wingtip' length than leading edge.

"Buried within the wing, two overworked little Continental 90 horsepower flat-fours powered those forward-facing windmills. The wing's aspect ratio of noticeably less than one, coupled with the need for wheels on stilts to function as landing gear, caused this bizarre machine to resemble a praying mantis insect on the ground.

"Now that we have poked fun at its ungainly appearance, it was in fact the cleanest, neatest collection of curves that could possibly comprise such a configuration. Even its stork-like landing gear was faired with finesse.

"After its 13-minute maiden flight, Guyton said: 'It was the most interesting flight I've made in my career as a professional pilot.' No doubt. Also, that he felt exalted and had the foolish urge to yell: 'Charlie, she flies!'

"Not only did Zimmerman's brainchild fly, but so well that it was airborne in 200 feet, landed at less than 50 mph and was controllable at a 45 degree angle of attack. Throughout its 131-hour, 200-flight career, the V-173 could not be made to stall or spin. Its only drawback was in being so underpowered that its maximum speed was 139 mph. Considering its ton-and-a-half weight, its performance was phenomenal.

"The Navy agreed to go all-out with a new version, powered by two 1,350 horsepower Pratt and Whitney Twin Wasp radials. Performance was projected to be 500 mph maximum speed, yet the machine would be able to hover and climb vertically. Configured essentially the same as the V-173, but with four-blade propellers and retractable landing gear, there was ample reason to believe the new XF5U-1 would outperform, by far, anything flying through 1945 air.

"Taxi tests completed, the magnificent machine was en route to Muroc Dry Lake (now part of Edwards Air Force Base) for flight tests, when a telegram stopped progress dead. Navy brass swivel-chair pilots unbelievably picked this moment to decide an all-jet future for Navy aircraft. The XF5U-1 was to be destroyed at once!

"Navy historian John Elliot writes: 'The reason for this order is a mystery. I have never found anything that explains why the Pancake was destroyed.'

"Another case of bureaucracy gone berserk, like slicing Northrop's flying wings into scrap. It makes one want to cry."

SIGN-OFF

A thought to ponder, from the pen of the late Dr. Alexander M. Lippisch, originally published in *Air Trails Pictorial:* "It is

important to realize that the lower surface is the 'sacred surface' on the wing of a model (or even a glider)." •

Peanut. . . . . *Continued from page 53*

needed at least a little dihedral. My recommendation is for at least 3/8 of an inch under each tip of the top wing.

The tail surface structure is strictly conventional, and built directly over the plan. Scale tail areas are shown, but the model will undoubtedly be easier to fly if a larger horizontal tail is constructed. Increase the span of the tail by about two inches if desired. Using sandpaper, round the leading edges and taper the trailing edges of the tail surfaces.

The landing gear is composed of balsa wheels, balsa stick strut legs, round bamboo sway braces and cross axle, and bent piano wire to take the loads that model airplane landing gears get in action. Bend the wire part first, making sure it is the right length and the same length on both sides. Fit it in the fuselage frame and cement it in place. It will provide a support for the rest of the landing gear structure while it is being assembled. Take a piece of 1/16x1/8 balsa and sand it to the streamline V-strut cross section shown. Use this to make the struts for each side of the landing gear and lightly cement them to the fuselage frame. Note that the struts are just inside the wire and will be supported by the wire, but are not to be cemented to the wire. Now, using round bamboo, install the cross axle and the two sway braces. When all these pieces have been securely cemented together, they can be carefully removed from the fuselage, to be reinstalled after it is covered.

The cabanes were constructed from round bamboo. The forward cabane is a simple inverted V, and the aft one is two inverted V's connected at the top to make a four-legged pyramid assembly. The legs of the cabanes can be sharpened so they can be stuck into the top covering of the fuselage for easier and stronger assembly.

Lightly cement the top wing in place on the cabanes and block up the tips with books or whatever is handy. Lightly cement the lower wings in place on the sides of the fuselage and block them up. Now sand another piece of 1/16x1/8 balsa to a streamlined cross section and carefully make the wing struts to fit between the wings. I find it easier to assemble the wings, struts, cabanes, etc., before the model is covered because being able to see and insert your fingers or tweezers through the structures makes it easier to get accurate alignment and fits. Now disassemble all the lightly cemented parts.

The covering on the model in the photos is condenser paper. It is light, airtight, shrinks well, and could even be the right color for a model of this time period. Two black, waterproof, permanent, felt pens are used to decorate the paper before it is used to cover the model. A fine felt pen is used to outline the letters and a broad one is used to fill them in.

For each set of letters, take a piece of condenser paper somewhat larger than the part of the airplane to be covered. Tape this down over the plan so it won't slip around, and trace the outlines of the letters with the fine felt pen. Using the broader pen, fill in the outlines very carefully. This is done for the top of the upper wing, the bottom of the lower wing, and for each side of the fuselage. Note that the lettering on the fuselage is shown for the left side and must be put on a piece of paper so that it reads correctly on the right side. That is, with the letters facing forward and the "P" to the rear with the "K" to the front. Note that the letters on the lower wing must be slightly smaller to fit.

The paper on the model was attached using a commercial glue stick. There are several on the market. They are really paste, not glue, and are white, sticky, solid, and about the consistency of lipstick. Don't get a liquid. Simply rub the glue stick all around the outline of the part to be covered, and attach the condenser paper, pulling it as smooth as you can. Make sure, if the paper is one with lettering on it, that the lettering is properly located. It takes a sharp blade to trim condenser paper so use a new razor blade to trim around the parts. After all the parts are covered, lightly fog on a mist of water and let the parts dry. A nice, smooth covering job should be the result. If some areas are still wrinkled, those areas can be rewetted to shrink some more.

Because the model has been assembled in the uncovered condition, it is a simple matter to reassemble the covered com-

ponents into a complete model with the exception of details like the engine cylinders, cylinder heads, pushrods, and the tail skid. Carefully paint the tires flat black.

The cylinders on the model are plastic dummies made by Williams Brothers with black dress-snap heads and straight-pin pushrods. Intake tubes are made for the back side of the cylinders from balsa scrap or thin plastic tubing. The engine on the Stahlwerk appears to have a single exhaust valve on each cylinder and no exhaust pipes. It sure must have been noisy. There is a small hole in the side of the nose just behind the left upper cylinder which may have been the air inlet to the carburetor. •

ARFs..... *Continued from page 45*

landings. And lastly, they have an attractive appearance and seem to last forever. I've been using some of these wheels for a couple of years now and have yet to discern any detectable wear.

A quick refueling and back into the air, only this time we flew with the controls set on high rate. Wow! Our docile little model was now a hot sport plane, and this was made evident when we did the first snap roll. I have never seen a snap roll performed more quickly by any other model!

To repeat, I am highly impressed with this airplane, even though it is of an ordinary configuration and really nothing unusual as sport models go. It will just be a real fun airplane for intermediate fliers and an acceptable trainer when flown with reduced control throws and a buddy box setup. Considering the great performance we attained using only a standard ported O.S. .30, substituting a modern high-performance .25 or .28 would satisfy any hot-dog pilot. Further information on any of these ARFs can be obtained from the Ten Plus Company, 9949 Tabor Place, Santa Fe Springs, California, telephone (213) 944-8899.

COX HOBBIES FAIRCHILD 24

While we are on the subject of small and portable R/C models of the ARF variety, I recently had a sneak preview of one of the latest products to come from Cox Hobbies, Inc. This is a jewel-like little scale model of the Fairchild 24, comes complete with a Cox .049 engine installed, and is intended for two-channel operation. Details like wing struts and wheel pants have been incorporated so as to give the model a real appearance of authenticity. The wing span is 38 inches, overall length 29 inches. A lot of scale detail has been built into the blow molded plastic fuselage, and the glossy finish closely simulates a fabric covering. Because of the high wing design the Fairchild 24 should prove to be stable and easy to fly, and I am looking forward to personally flight testing one at the earliest opportunity. I intend to eventually use throttle control and a three-channel radio setup utilizing mini-servos. Perhaps I may install my new Cox .074 Queen Bee with its throttle control carb and muffler. But with either two or three channels, this model should be a fine performer. For availability of the Fairchild 24, check with your dealer or contact Cox Hobbies, Inc., 1525 Warner Avenue, Santa Ana, California 92705.

VOPARD ENTERPRISES GO-PED ARS

No, ARS is not a typographical error, just the term for one of the most unusual products I have ever encountered. First of all, as readers of this magazine, you certainly want to know all of the necessary technical details of any new product. Well, this one comes ready to fuel up and operate, is powered by a Zenoah G2D two-cycle engine, and weighs 21 pounds. Overall length is 38 inches, height is 32 inches, but when folded up for storage or carrying it is only 14 inches high. By now you may have guessed that I am not referring to an ARF R/C model, but an ARS, an "absolutely ready to scoot" vehicle called the Go-Ped. I feel that it can be considered a highly useful R/C sporting accessory, and there is

going to be a lot of interest expressed by the model flying fraternity, especially by you older guys who would rather ride than walk. I have been having the time of my life with this little scooter, and it is becoming a familiar sight to see me flitting around the local model flying fields. I realize we have somewhat departed from model airplanes in reviewing this product, but it seems to have a great deal of appeal to modelers because of the sheer practical use it affords, and the outright fun you get from it. Besides, running small piston engines is right up our alley, and the sound of a steady putt-putt, plus a whiff of the exhaust, puts us into a kind of euphoric state.

Folded, this baby uses practically no space in the trunk of any vehicle, as it takes up only 2.5 cubic feet of storage space. Lately I've been carrying it in my motor home, and the convenience is just amazing. The fuel tank carries .2 gallons of gasoline mixed 40:1 with two-stroke oil, and it seems to run about a week (actually about 45 minutes) on a tankful. The single cylinder air-cooled Zenoah has a displacement of 22.5cc. The muffling arrangement is really ingenious; the exhaust flows into the steel alloy frame and comes out from a few small holes, keeping engine noise down to a pleasant purr. At slow speeds you can hardly hear the thing run. Horsepower is 1.4 at 8,000 rpm, and the ignition is completely electronic. There is no complicated transmission, as the direct drive principle is utilized. Your left hand controls a set of front wheel caliper brakes, while the right hand has a very responsive throttle control. The manufacturer claims 18 mph as the top speed and 15 mph for cruising, and these figures appear quite accurate to me. It is also claimed that the maximum carrying capacity is 400 pounds. The machine is supposed to be able to carry two riders, but I haven't tried it out with a passenger yet. You would need two people with small feet to get them both on the Go-Ped even though the platform is a comfortable twelve inches wide. The wheels are six inches in diameter, of solid rubber, and should last indefinitely. Replacements are available from the distributor.

Learning to ride the Go-Ped comfortably was no problem at all, and after about ten minutes I was feeling quite at ease. After half an hour of practice I found I could even do wheelies and jump small curbs. Maneuverability is exceptional, as the turning radius is just 2.5 feet. Best performance is on smooth, paved surfaces, but depending on how you like your thrills, I am sure it will negotiate some rough trails. It is really kind of eerie to go scooting along on this tiny machine, as you actually feel you are just flying through the air like Superman, suspended in the air with nothing supporting your body. And the way it zips up and down hills is remarkable, considering the modest power source. If you really want to get fancy about this pocket-sized personal transporter, the manufacturer even offers a handsome over-the-shoulder carrying case.

I just can't wait to take my Go-Ped to the AMA Nats this year. Just imagine how much ground you can cover in going from one event to another! So now that you feel you just have to have one of these sidewalk speedsters, they are available from Vopard Enterprises, Suisun City, California 94585, telephone (707)422-6755.

In closing this month, I wish to thank my readers for their kind and interesting letters and phone calls. I will always find time to reply to your questions and comments, and we are particularly interested in hearing of your experiences with ARFs of all types. Meantime, my address is still 2267 Alta Vista Drive, Vista, California 92084, telephone (619)726-6636. •

EEE-Z-FLI. . . *Continued from page 21*

B-1 in slot in one fuselage side and B-2 flush against the aft side of FD-1. *For low wing, install B-2 flush with the bottom of the fuselage and add scrap to the top as required. Trim the bottom of B-1 even with the wing cutout.* Join the fuselage sides by cementing B-1 and B-2 to the remaining side. Use a flat surface and square to align sides at aft end. Install FD-3 and FD, *FD-5 for the low wing.* On high wing only install 1/2x1/8 doublers at top of fuselage from the back of B-1 to the front of B-2. Make firewall from 1/8 ply, mark and drill for desired engine mount and install blind nuts. Mark and drill for fuel lines and throttle and cut slot for nose steering arm. Install firewall in slots provided using 5-min. epoxy. Install triangular braces behind firewall and cross brace across firewall top for hatch support.

Pull aft ends of fuselage together, assure

good alignment (no bananas, please), secure with clothes pins and cement. Install vertical filler, support V under stabilizer cutout and if a taildragger, a bottom V pad. Install top and bottom cross braces in aft fuselage. The fuselage bottom may now be covered with 1/8 balsa back to the 1/8 ply landing gear pad. If you plan to convert to a taildragger, install a landing gear pad long enough to accommodate both landing gear positions. Install triangle braces between gear pad and fuselage sides in the length required. The aft end of the fuselage from gear pad back is covered with 1/16 balsa cross grain. Top of fuselage may now be covered with 1/16 balsa from the back of B-2 to the stabilizer cutout. Cement windshield to forward face of fuselage sides. Note that the top and bottom edges are cut at an angle to fit. Install the hatch screw pads and install the hatch with the tab under the windshield and two #40 screws in the front corners. *On the low wing, install the cross braces at the base of the windshield area and the top of FS-3. The entire top of the fuselage from the windshield base to the stab cutout is covered with 1/16 balsa cross grain.* Servo support rails may now be installed using 1/8 ply. *On the low wing the rails are attached to the top of FD-1 and the servos are mounted inverted.* Position the forward rails to accommodate the servos used. Golden rod or pushrods may be used, all prototypes used pushrods.

TAIL SURFACES

All surfaces are medium hard balsa. Note the stab requires a piece of scrap to extend the leading edge to the 3-1/2 inch dimension. Elevators are joined with 3/16 dowel as shown. Join on a flat surface and be sure the leading edge is flat and straight. Cut hinge slots and cement hinges into stab only. Join fin and dorsal and install hinges in fin and aft fuselage only. Mark rudder and cut slots. Note: For taildragger, reinforce bottom of rudder both sides with 1/16 sheet. Trial fit stabilizer and fin to fuselage and trim dorsal to fit top of fuselage if required. Do not cement fin to stabilizer yet. Sand all edges round and put aside for covering.

WINGS

Select four matched sheets of 1/16 medium hard balsa and, working on the plans, cut and edge-join the bottom wing sheets. Leaving the bottom sheets on the plan, mark the spar and rib locations with a ball point pen. Cement the spars to the bottom sheets, assuring that the sides are vertical. Cut the trailing edge material to length, mark its location and cement it to the bottom sheets. Now install the three R-3 ribs. Make sure that they are flush with the top of the spar and 1/16 inch below the front edge of the trailing edge. Note: Angle the butt ribs to accommodate the dihedral angle.

Now install the three R-2 ribs, assuring that they are 1/16 inch above the spar top and flush with the top of the trailing edge. Bevel the ends of the R-4 ribs for a good fit and install, also 1/16 inch above the top of the spar and flush with the top of the trailing edge. On the nine R-1 ribs, be sure that the round cutouts for the leading edge allow it to seat firmly on the bottom sheet, even with the front edge of the sheet. The rear edges should be flush with the top of the spar. Install the R-1 ribs and cut the leading edge dowel to length. Cement it in place, being sure of a good joint with the bottom sheet and all ribs. From 1/8 scrap, install spacers between the R-3 ribs flush with the face of the trailing edge and 1/16 below the top. This provides a better seat for the center section planking. The area between the R-3 ribs may now be planked with 1/16 balsa. End the planking at the center of the spar. Cut a length of 1/16 for the leading edge, notch to clear the center section planking at the spar top. Wet the top surface and install flush with the rear face of the spar. Assure adequate cement on the spar too, the top of all ribs and on the leading edge dowel. Tape around the leading edge to assure a tight joint. The tip plate may now be installed; sand the straight edge for a good fit against the end rib.

The ailerons may now be cut from the trailing edge, trim the inboard ends as shown and bevel the aileron leading edge. Cut hinge slots in the ailerons and the trailing edge, install the hinges in the trailing edge only. Install actuating hardware as shown. *On the low wing version, the actuating arm is in the up position and should be bent forward about 15 degrees to provide clearance at B-2.* Trim and sand the bottom sheets and the top planking to form a round contour with the leading edge dowel.

The wing halves may now be joined. With a 1-1/2 inch block under one tip,

sand the butt ends to obtain a good fit assuring that the leading edge is straight. When satisfied with the fit, puncture holes in both butt ribs to provide for better epoxy penetration. Join with 5-min. epoxy. When cured, sand entire wing and ailerons. Install glass tape reinforcement, double in area of aileron servo attachment. *On low wing model, install 1/8 ply pad for landing gear mount, drill and tap 1/4-20 to match holes in gear. Note: If gear is not pre-drilled, drill mounting holes per drawing.* If a tail-dragger version is built, mount gear in the forward position and install a Goldberg or similar tail wheel support, bend wire as shown and make a U-clip for attachment to the bottom of the rudder. Mark and drill holes for wing attachment dowels, cut and install dowels, press fit only, no cement.

COVERING

Sand all surfaces a final time, round fuselage edges, hatch corners and windshield. Covering may be done in the builder's choice of materials. The prototypes were covered and trimmed in Super MonoKote. Mark, cut, and remove covering from all assembly joints to assure a wood-to-wood cement joint.

ASSEMBLY

Cement stabilizer to fuselage, checking for alignment. Position fin on top of stab with rudder attached, to check alignment with the aft fuselage. Mark and install, using a square to be sure it is true, and be sure the dorsal is centered on the top of the fuselage. The elevators may now be installed and the hinges cemented, followed by the rudder. Install fuel tank, engine, landing gear, servos, and control pushrods. Engine thrust lines are built in. The wing saddles, both high wing and low wing, should provide a +2 degree incidence angle with the stabilizer level (0 degrees). Adjust control throws per drawing. Roll the aircraft to assure straight tracking, adjust the nose gear linkage as required.

BALANCING

Battery location may be varied fore and aft to produce a slight nose-down attitude when suspended from the balance point on the drawings (fuel tank empty). None of the prototypes have required the addition of any weight to correct balance.

FLYING

All prototypes were flown with the K&B .20 Sportster, turning a 9x6 Master Airscrew on 5% fuel. Double check all control throws for amount of deflection *and proper direction.* Adjust engine for proper running, a little on the rich side, if new. On a smooth surface, EEE-Z-FLI will track straight on acceleration and, due to the negative ground angle, will not lift off without a touch of up elevator. There are no surprises in EEE-Z-FLI's flight characteristics once it is properly trimmed out. You will find that it stays in any moderate attitude that it is put and nose drop in turns is slight. Power off approaches are slightly nose down and the flare is smooth and effortless. Touchdowns are soft and the rollout is straight, making touch-and-goes a delight, even with the taildragger.

FINAL COMMENTS

All versions of EEE-Z-FLI have been flown extensively by fliers with broadly varied flying experience and several have been built from the plans presented here. All have been pleased with both the performance and the ease of construction, and some have even found crash survivability to be remarkable!

BUILD . . . FLY . . . AND ENJOY! •

Free Flight. . . *Continued from page 59*

has classic rubber model lightweight style; stick and tissue. Another feature that I like

RELAX. WE CAN FIX IT! IT'S A STARHAWK.

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about it is its simplicity. All of the airfoils are flatbottomed, so covering the wing should be a snap. The model should have a fast climb, but the glide will probably be average. Whatever the case, I believe that this is a model that could be built by an experienced free flighter in a weekend. A newcomer to the hobby would take a little longer, but not much.

Although I have never been a fan of twin fins at the tips of the stabilizer (too easy to change alignment), it obviously works for folks like Bob White. So, the change that I would make to Hermanek's design is the fin location. My first choice would be to mount the fin on the fuselage directly in front of the stab, and my second choice would be to mount it directly under the stab on the fuselage. Hermanek's ship has a total fin area of 10.5 square inches, so a forward or subfin should have about the same amount.

At any rate, I like this ship a lot. It has style and classic simplicity. It should be a performer.

AUGUST DARNED GOOD AIRFOIL—GOTTINGEN 274 (DAIMLER V)

Once again, I have turned to the pages of the *Comprehensive Reference Guide to Airfoil Sections for Light Aircraft* as I referenced in last month's column. This airfoil section is one that was developed by the famous laboratories in Gottingen, Germany. The date of this section is 1918. I am not sure what the reference to Daimler intends, but it was probably to be used on a full-sized aircraft designed by Daimler.

What I like about the section is that it features a high lift section with moderate drag. In fact, the best angle of attack for this airfoil is one that would be highly desirable for model use . . . about 2.5 to 3 degrees. Although it is a little on the thick side for contemporary free flight power models at 10%, it would be an appropriate section for slower flying ships or higher wing loading ships. It could be slimmed down as well, say to about 8.5 to 9% thickness and used for more contemporary models. Structurally, due to the thickness of the section, almost any of the traditional construction techniques would do the trick.

NOSTALGIA—SELECTING A POWER LOADING by Jim O'Reilly

The following article and accompanying graph (see elsewhere in this column) appeared in the *Okie Free Flight Flyer*.

"Walt Rozelle asked the other day if I had a method of selecting the wing area for a Nostalgia gas job to go with a given engine. As a matter of fact, I didn't. But, after some pondering and doodling, the accompanying chart resulted. I first plotted the data on quadrille paper and got a line that seemed to be curved. Hmm. There have been articles recently, and some not so recently, that claimed that the relationship between wing area and engine displacement was not direct but that engine displacement and wing volume should be a constant ratio. Remembering that all exponential lines are straight if they are drawn on log-log graph paper, I reached for a piece and plotted the data as shown.

"The result comes pretty close to the 'wing volume' theory. Taking .06 displacement and 250 square inches as a point on the line that I 'eyeballed' in the wing volume theory says that, for a .30 cu. in. engine (5 times the displacement of the .06), the wing area should be 731 sq. in. Not bad agreement.

"How would one use this graph to select an area to go with a given engine? As I said, I 'eyeballed' the line through the data, intending to define an 'average' power model, that is, neither a high wing-loading 'hot' one like the Zeeks nor a somewhat 'powered glider' type like the Ramrods. If you will be flying more Category I type competition, then you might want to fudge in the direction of the Ramrods, or toward the Zeeks if you will be flying lots of short runs and two-minute maxes.

"Also, what kind of an engine will you be using? Is it 'average' for Nostalgia-era engines or it is a real hummer? The easiest way to make this kind of conversion is probably to rank your engine in Nos-era equivalents. For example, if you have a Fox .25 that you feel is as hot as most Nos-era 29s, go to the chart at the 29 displacement level and read 650 square inches. Then, for two-minute max work, stay on the small side of this, perhaps 600 sq. in. For Cat. I and six-minute maxes, ease up on toward 700 square inches."

BANANA LIQUID REVISITED

Several months ago, I led readers on a

search for the elusive Banana Liquid (or Banana Oil, if you prefer) for use as a model covering filler and top coat. Recently, I received a nice note from Earle Thompson, of Port Angeles, Washington, with the following bit of old time trivia: "I guess I am as old as you, or maybe older. I remember 'Banana Oil' (we called it 'oil' not 'liquid'). I even remember using it a time or two. Of course, in those days my models didn't last long enough to get soaked in rubber lube. For that matter, what was rubber lube?

"I can remember hearing something about 'oiling' your rubber with something soapy. So, I got a bar of bath soap and rubbed the rubber on it. Don't think it helped too much.

"Anyway, when I read about your quest for banana liquid, a little bell went off somewhere deep in the back brain room. I started digging through old stuff, and after about a month, I found the following: Banana Oil . . . Any acetate with nitrocellulose and gum dissolved in it.

"No, don't ask where this formula came from, as I have no idea. It struck me though, that it is similar to plain old nitrate dope with some doctoring. Interesting!"

D.T. TIMER FOR GAS MODELS
by James Harris

Although I have a little difficulty describing this device (sketch elsewhere in this month's column) as a 'timer,' it is nonetheless a nice little gadget that can be used on gas models as a complete unit. I believe that it is, at four-inches long, a bit on the large size, but of course it can be made smaller. What I like about it is that you have no possibility of catching your fuselage on fire as you might with a traditional snuffer tube arrangement, and the question of whether you have adequate rubber band tension to keep the stab held in place is dealt with nicely. Here's what James has to say about his little gadget; "Here is the D.T. 'timer' I used on my 'C' gas Starduster a few years ago. I had several hundred flights on the Duster before I broke the fuselage and stab on a hard landing. This timer never failed to work and it never D.T.ed accidentally. I will be using it on my new 'C' gas model as well.

"Construction notes: When you glue the rear pivot brass tube, reinforce it with some nylon tape glued over the tube. Same for the front hook. Make your snuffer tube long enough to extend just beyond the other side of the fuselage. I use a #12 rubber band on the front hook, around the rear hook and back to the front hook. I used a D.T. hammer on the Duster. I did this so I could have an adjustment screw on the hammer to change the stab angle and the hammer keeps the stab from lifting under power and spoiling the power pattern (and the model, I might add). If you don't want to use the hammer, cut the pivot wire off at the '*' so the line will release and D.T. the stab. This timer can be scaled down for smaller models. Try it, I think you'll like it."

NATIONAL FREE FLIGHT SOCIETY HALL OF FAME INDUCTEES AND TEN MODELS OF THE YEAR FOR 1989

As the NFFS has done for fifteen years now, the Society announces the annual winners for the top ten awards and inductees to the Free Flight Hall of Fame. These awards will be presented during the annual NFFS Symposium Presentation which will occur at the U.S. Outdoor Championships held on June 22, 1989 at Lawrenceville, Illinois.

Next month, I should have ordering information about how you can get a copy of the 1989 NFFS Symposium Publication and its cost.

THAT'S IT DEPARTMENT

That should do it for this month. I know I promised you a surprise in the form of a newly eligible Nostalgia model for this month, but all of the pieces haven't fallen into place yet. If all goes well, you will see it next month. In the meantime, keep writing those cards and letters and including those pix of the model activities in your area. Who knows, you might become famous because your picture was in *Model Builder* "Free Flight!"

Until next month, catch a thermal for me. •

Plug Sparks. . *Continued from page 31*

gines in the old days were marketed at the same time by Gotham Hobby Shop, in New York City.

With more reliable running engines becoming available, the Slag Engine event at the SAM Champs should become more popular.

SAM ACTIVITIES

SAM 21

Wouldn't you know it! It took a real old timer, Stu Bennett, to build a Korda Wakefield Winner in the colors of the Italian flag (red/white/green) with the inscription of "Korda Leone" on the sides as seen in Photo No. 4. Readers will readily recognize this name as Cordileone, the Godfather in the book of the same name. Tricky!

Bennett reports the Korda cabin model flies like all those built before: good! Stu sez it is a great model for those wishing to start and learn in competition.

SAM 27

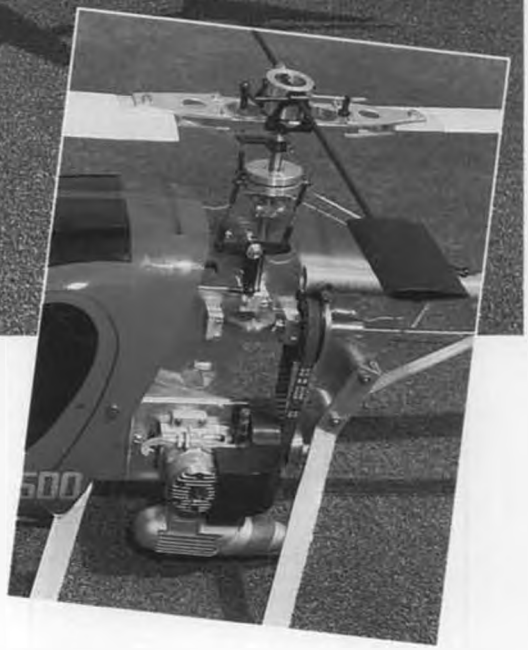
Don Bekins, the SAM 27 mainstay, has sent in Photo No. 5 showing his R/C version of the Thermic 100. Actually, this is a Thermic 50 scaled to double size. Turns out the Thermic 100 wings are a perfect match, so why not a fuselage model rather than the pod-and-boom?

Incidentally, Don states the R/C O.T. Glider event will be held at the 1989 SAM Champs. If you want to get into the fun, now is the time to get cracking!

While we are on the subject of SAM 27 activities, Bekins has asked for official notice that the Ohlsson .23 R/C event will be held at the SAM Champs. The rules for the Ohlsson .23 event are simplicity themselves and the model can also be used in Class B Ignition:

1. Ohlsson FRV and sideport engines on ignition only.
2. Old Timer models with scaling allowed, minimum wing area of 450 sq. in.
3. Engine runs: 35 seconds for sideport, 25 seconds for front rotary valve.
4. Three five-minute maxes.
5. Four attempts for three flights.

HERE is the very best R/C helicopter for the modeler who has never built or flown an R/C helicopter!



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SPORT 500 is **lightweight,** has a **proven Hiller teter-rotor control system,** and was designed by an active RC helicopter flyer and engineer — Chris Baker — with **beginning helicopter flyers in mind the whole time.** Its light weight means that SPORT 500 is never marginal — it flies easily and lightly, not just barely and "on the edge"

Construction is easy.

For example: Instead of a special adapter to fit the cooling fan, drive takeoff, and starter pulley to the engine shaft, they simply mount like a propeller — the shaft goes through the holes (which can be drilled larger to fit any conceivable engine) and the whole works is held with the prop nut.

Another example: Every construction step **(there are only 31 steps!)** is described in very few words and accompanied by one or more **photographs** that show that step!

It works well:

SPORT 500 is "over-designed" — there are **ball bearings** instead of the more maintenance prone bushings in almost every possible shaft support. The clutch is all steel (except the lining) for **durability.** The chassis, engine mount, landing gear, rotor head, and other assemblies are **so strongly made** that minor accidents and jolts will not "ground" your SPORT 500.

Starting the engine is easy because of the sensible engine location and the use of a simple starting belt.

Adjustments are easy because the cabin only encloses the radio gear — all the mechanics are open and reachable.

The fixed-pitch rotor head is **damage resistant and easy to adjust.**

The engine cooling shroud fits close to the engine head and eliminates engine cooling problems.

The rotor runs at about **half the speed** of other helicopters because of the belt reduction system. This not only makes **clutch engagement more progressive** and **puts less strain on the mechanics,** but also makes SPORT 500 **sound more realistic** in flight.

The teter damper is spring steel not unpredictable plastic or rubber and you'll notice **more predictable control response** because of this. The rotor blades are preshaped, predrilled, composite hardwood and balsa and are supplied in matched pairs. The tail rotor blades are preshaped and drilled hardwood.

Because SPORT 500 uses a fixed-pitch head it does not have auto rotation capability. However, few beginners could use auto rotation even if their helicopter was equipped to do it, and the gain in **simplicity and durability** makes it worthwhile **not** to have it.

SPORT 500 takes any .40 or .45 2-stroke model airplane engine (Schnuerle ported engines are recommended), and any 4 channel radio (a gyro is recommended). Rotor diameter is 42". Flying weight (including gyro and oversized receiver nicads) is only 7 pounds.

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6. No pressurized engines.
7. 10 oz./sq. ft. wing loading.

This event will feature a new Ohlsson .23 perpetual trophy, to be presented by Irwin Ohlsson at the SAM Banquet. Howard Osegueda is the event director, and as such, has donated a brand "new" Ohlsson engine. There won't be any lack of prizes!

SAM 29

As usual, the Texans are "laying in the weeds" and expect to win the majority of the trophies at the SAM Champs. We can kid all we want about rivalry but there really is a hot one between California and Texas, even to the state flags being flown at the banquet tables.

Joe Percy, 2100 Gumm Road, Fort Worth, Texas 76134, writes to send in an old photo taken at a Fort Worth Gas Model Association contest in 1939. Of particular notice in Photo No. 6 is the Korff "Professor" in the foreground, while the big model on the left is Fiske Hanley's original 1937 Nationals Texaco Winner.

For the rest, to the right of the Hanley model is an original design by L.E. Sloan, the guy with the Clipper in his lap is Neal Snebold, and next is Joe Percy with a Clipper also, with his dad squatting down. Joe sez, "Check those beautiful automobiles in the background."

SAM 48

Jack Brown writes to announce the 6th Annual SAM 48 Western New York SAM Champs, to be held August 12-13 at Hamburg Model Airplane Field, Lake Road, Hamburg, New York. Although this notice will probably not appear until after the contest is over, notice should be taken by all that SAM 48 stages this meet every year. Keep in touch with Jack Brown at 1446 Red Jacket Road, Grand Island, New York 14072, or better yet, call him (evenings) at (716)773-5674.

Jack sends in Photo No. 7 of Jack McGillivary's beautiful 1936 Taylor E-2 Cub which was built for a SAM 48 special event: 1/2A Texaco Scale R/C. Now how about that for a fun event?

Rules are pretty much like regular 1/2A Texaco with two officials, three attempts, and 15 minute max flights with one attempt under four minutes allowed. The model must be a replica of a reciprocating engine-powered man-carrying aircraft built prior to 1943. Minimum wing loadings are 8 oz./sq. ft. for monoplanes and 6 oz./sq. ft. for multi-wing aircraft. All models to be powered with Cox Black Widow/Babe Bee type engines, no throttles, standard 8cc tank, 8-inch maximum diameter prop, and R.O.G. is required. Sounds like fun!!

SAM 51 Water Meet

The Mavis Hinson field in Woodland, California, is probably one of the best for versatility. SAM 51 not only runs a regular SAM O.T. R/C Annual, but also includes Texaco Hydro and L.E.R. Seaplane events. Makes for a very interesting day.

Called the "Bill Barton Memorial" in honor of the SAM 51 founding father, this meet has been growing in magnitude every year. With the addition of the water events, the fun angle has been increased to the point where one must pick the events in which he has time to participate. After all, there were 12 events for two days. Even Bekins couldn't do them all!

In that line, what could be prettier than a picture of a Dallaire Sportster on floats taking off? Photo No. 8 shows Ken Myers' jewel just lifting off. The hands belong to Dave Steinel.

He did it again! We have been calling Ken by the sobriquet "Flat Tires" but this columnist thinks we should call him "No Oars" Myers. While helping to retrieve a Lanzo Bomber, Myers jumped into the boat and promptly tried to row. What Ken didn't allow for was the lack of oarlocks. As can be seen in Photo No. 9, Ken is rapidly getting fouled up to the point where he eventually loses the oars. The ironic part is that the model in the meantime drifted to shore, was recovered, and then everyone had to wait for Myers to drift into shore. That's our boy!

Probably the prettiest model on the field was Howard Osegueda's Canadian "Hornet," seen in Photo No. 10. Built from the Easy-Built kit, Howard put out a very highly decorated version. Pretty and flies well; took a fifth place. Unfortunately, at the follow-on SAM 49 meet at Taft, Howard lost sight of the model downwind and crunched it very well.

This most interesting contest also featured a "Scramble" event which featured a mass launching of Sleek Streeks as seen in Photo No. 11. All due credit should be given to Robin Pharis, of Pharis Models, for sponsoring this fun event. Everyone has a chance as witnessed by the winner being a girl; Ruth Rediger. Photo No. 12 shows Ruth with her winning model. You don't have to be a model builder to fly a model!

Photo No. 13 is an excellent shot of the Bunch "Scorpion Major" as originally designed for floats. Built and flown by Eut Tileston, this design has proven to be an outstanding flier either in hydro or land configuration. With that big rudder, the model is an ideal radio control Old Timer with plenty of control. However, as a free flight this is just what the modeler doesn't want in a landplane. A tweak of the rudder either way and the model promptly becomes a nose-diving powerhouse.

However, early in the game Dan Bunch, Howard Broughton, and the rest of the Bunch Mfg. Co. group found the model was an ideal free flight hydro model. With those large sled-type floats, the model became rock steady. In short, when you convert a model to hydro, you must increase the rudder area for ease of handling on water and in the air. This was proven by many of the early full-scale seaplanes like Fairey, Vought, etc.

READERS WRITE

Our old friend, Jerry Persh, 4908 Saquoit Lane, Annandale, Virginia 22003, writes to send in Photo No. 14 showing his latest creation, the Cleveland Wakefield Gull, a 1940 vintage design.

Jerry reports the model flies like a dream; nice round climbing circles with a pretty flat glide. Jerry is a little critical when he says it doesn't soar like modern Wakefield designs, but one has to remember we are talking about Wakefield 45 years later. It would seem some progress has been

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PROFESSOR SPECIFICATIONS	
Length	35.04" (890mm)
Wingspan	48.82" (1240mm)
Area	446.5 sq. in
Weight (w/rec. system)	39 oz.
Motor	RS540SH w/3:1 reduction gearbox
Recommended system	Futaba 4NBL/MCR

REQUIRES: 7.2v/1200mAH NiCd battery pack and charger. 2-4 Channel radio control system (electronic speed control optional)

Futaba MCR-4A Integrated MOSFET speed control/ receiver (Not included) required for optimum performance. Specifications: 4 Channel; 1.5 oz. (excluding switch and connectors); 1.24" x 2.92" x 0.63." BEC Voltage regulator.

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made in all that time.

Jerry says modeling activity is picking up in the Northern Virginia/Maryland area with the formation of CAAMA (this was reported several issues ago by Jack Bolton in this column). The best part is the acquisition of a good flying field. This should bring out the members like crazy.

Flying in Virginia (F/F, that is) has been restricted to the Brainbusters two-day meet at Petersburg. Jerry says he got lucky and won with his Zipper. Unfortunately, this cost him his model, which was lost in the woods. Not too much hope in getting this one back. Tough!

MORE READERS WRITE

Haven't heard from Phil McCary of 532 College Drive, #212, Henderson, Nevada 89015 since he moved south from Carson City, Nevada. After a short hiatus in Southern California, he has finally found a place that can use a good geologist.

Phil sent in several pictures from which we have selected Photo No. 15 showing his latest competition rubber model, a Best-By-Test "Altimeter." This New York design is one of a series of models produced in the 1940-41 era. This particular model is covered with prewar Japanese tissue except for the fuselage, which employs lightweight silkspan (white, of course!). The propeller has been stained with walnut dye and covered with white silk. Using twelve strands of 3/16-inch FAI rubber, the ship looks like it will be a good Class C fuselage model.

STILL MORE READERS WRITE

Robert Lockwood writes to remind this writer that when I was talking about a possible Old Timer indoor meet, I mentioned that Frank Zaic had gathered together many of the old issues of *American Boy* which dealt with AMLA activities. Lockwood feels I have ignored the tremendous amount of work accomplished by Merrill Hamburg, the AMLA secretary. No question about it, Merrill was practically a one-man band when it came to heralding and trumpeting the cause of model airplanes. Hamburg not only wrote for *American Boy* but also wrote a complete book, *Beginning to Fly* (Houghton-Mifflin, 1928). This was the bible for any aspiring model builder.

Many AMA members do not realize Hamburg was elected to the AMA Hall of Fame. Here was a man who richly deserved the honor as he completely devoted himself to the promotion of model aviation.

"ZIPPER-SAILPLANE"?

A recent letter from James Kelly, 13025 Morningside Way, Los Angeles, California 90066, included a photo of Colby Evett with a modified Zipper.

This model came to the attention of Kelly while in Colby's model shop in Santa Monica, where a considerable number of photos of his free flight models adorned the walls. Photo No. 16 shows Colby in the early forties with a modified Zipper that had a ten-inch center section extension, which made the wing look like that of a Sailplane. The fuselage was extended two bays (five inches) beyond the pylon.

For those interested in trivia, this photo was taken on December 7, 1941 (Pearl Harbor Day) at the Western and Rosecrans Field in Los Angeles. Colby says a similar model was built by Frank Cummings, which eventually led to construction of the new Sailplane kit then coming on the market.

THE WRAP-UP

As usual we have distressing news. Longtime friend, Joe Havlik, of the San Diego Aeroneers, died on April 15, 1989 of a heart attack. George Wagner phoned to relay the bad news but because of a magazine lead time of 60 days, this obit is restricted to a thumbnail sketch of Joe's activities.

Joe was born in Chicago on January 7, 1916 (14 months before this writer!). Like this writer, Joe made model airplanes from wooden apple boxes at the early age of eight or nine.

In the late twenties, Joe was building flying models. While flying at Jackson Park in Chicago, Joe met Carl Goldberg (two year older) and a fast friendship formed. At fourteen years of age, Havlik built a working patent model of a helicopter type plane and received 50 dollars—a goodly sum in those days!

During the Depression years, Joe's folks lived in Lowell, Michigan, and he was president of the Junior Kent Flying Club in Grand Rapids. After graduating from high school, Joe attended Aero Industries Technical Institute in California during 1939. After being graduated, Joe went to work for Consolidated Aircraft in San Diego and

specialized in the model department.

After the war, Joe owned two hobby shops, running the one in Mission Beach and his younger brother, Eddie, operating the Pacific Beach shop. This lasted until 1950, when Eddie decided to go east and go into business for himself. In the meanwhile, Joe was approached by personnel from NEL (Navy Electronics Lab) and was hired to run the NEL model shop. Joe finally retired in September 1979.

Joe enjoyed modeling to the hilt, living on Summit Drive in the Windsor Hills area of La Mesa. The downstairs was where his tremendous amount of airplane memorabilia was stored.

When the Aeroneers Club (SAM 41) was reorganized, Joe became the vice-president. He was tremendously involved in all club activities and still found time to help Terry Toups market his Sky Devil engine. Joe's boundless enthusiasm will be missed by all. •

Control Line. *Continued from page 61*

while keeping our feet on the ground. The only injuries we suffer in a crash are to our ego.

But, like the pilots of full-scale aircraft, fliers of control line airplanes must keep safety in mind at all times. For the expert competition fliers, safety is such a way of life that often they say little about it. But closer observation will reveal that most such fliers follow some safe practices that might not occur to the novice flier. This is partly because the experts have seen many of the things that can go wrong with model airplanes. It must also be admitted that some of the experts get a little lazy at times and follow some unwise practices.

Not surprisingly, high-performance C/L planes are subject to more stresses than the common sport plane—high-rpm engines, high-G maneuvers, hard landings, sudden pit stops, etc. But all planes with vibrating engines, spinning props and mass in motion are, improperly handled, dangerous weapons in the same way that a recklessly driven car is dangerous.

With these thoughts in mind, let's discuss a few of the common areas of danger related to control line model airplanes and some suggestions for improving our handling of them.

Engine

It probably is safe to say that the engine is the most dangerous part of any model airplane. One need look no farther than the spinning propeller blade to instantly draw that conclusion.

It would at first though seem enough to say the obvious: Keep your hands away from the spinning prop. But amazingly, fliers, particularly new ones, have a way of sticking their hand into those spinning blades. Perhaps it is only through the development of several very strong habits that such mishaps can be avoided. At the same time, these habits can help keep the flier from encountering some of the less obvious dangers associated with props, for the experienced flier knows that there are

many ways to get "bitten" by the prop besides sticking a hand in it.

First of all, a way to remember that spinning prop, for the beginner, is to make sure that the prop's tips are painted some bright color, so that a clear band of color will be seen at the outer edge of the prop arc. This will help remind the flier that the blades are there. This is particularly important with some types of propellers of a color that tends to "disappear" when the engine is running; black props are particularly invisible when turning.

Secondly, fliers should develop habits about how a running engine is approached. Simply put, a prudent flier never approaches a running engine from the front. In fact most competition fliers—particularly those using high-rpm racing, speed or combat engines—get away from the front or sides of a running engine as soon as possible. Any kind of propeller can potentially throw a blade, or the blade can come off, or the crankshaft can break, the spinner explode, etc. Propellers and their parts will move forward and to the side when such a failure occurs. The only safe place is behind the propeller.

The most common propeller-related safety violation—unfortunately seen quite frequently—is for a flier standing in front of the plane to adjust the needle valve by reaching around the propeller. Think of the potential dangers: a sudden movement of the plane, a thrown blade, a slip of the hand, etc., and the person in front of the plane is in danger of receiving the blade's tips, the whole blade, or the spinning prop nut in his face, arms, chest, etc. When you reach around a propeller blade, your life-giving wrist veins are the closest thing to the spinning prop tips. Your jugular vein isn't much farther away.

The proper practice, once the engine starts, is to get around behind the engine and adjust it from the back. Should you slip, you will hit the back of the blade, where you come in contact with the rounded trailing edges, and you will be much less likely to suffer serious injury. If the blade should come off or break, or the engine should come loose or break, the flying parts will go away from you instead of toward you.

Lest the reader consider the above recommendations to be based on folklore, this columnist has personally seen, both in the air and on the ground, blades thrown from running engines, crankshafts break (sending propellers flying), engines come off while running (sometimes resulting from blade failure). I am personally acquainted with a model flier who had the tip of a blade thrown from the propeller on a .15-size engine stick in his throat, missing vital parts by millimeters. Now, really . . . do you want to stand in front of that engine?

Propeller blade dangers can come not only from simple failure. Winter weather has its hazards, for example. Many winter flying outfits include hoods with drawstrings. A hanging drawstring, or any other loose clothing, can be drawn into the blade, jerking the wearer along with it.

An engine should never be started until the person who will be starting it examines the propeller. Is it on tight? Are there any cracks? Are the tips skinned from a previous landing or takeoff? Watch the pit crew of any competition event. Subtly, almost unconsciously, they will go through a routine that every C/L flier should make as much of a habit as breathing: they take the prop wrench and check the tightness of the nut and run their hands over the blade and make a quick visual inspection. It takes only a few seconds.

How the propeller is treated during starting of an engine is important as well. Contrary to the instructions that come with some commercially made propellers, a propeller should never be struck with a hard object. If you must use a "chicken stick," make sure it is made of rubber hose or some other soft material, so that it won't crack or break the blade. Better yet, use a leather finger protector. You'll get a better feel for the engine, and you will be safer. Be wary of big, bulky gloves that can get caught on the prop or on the plane's hardware.

Finally, make sure that the propeller is suited for the use you are making of it. Some materials are stronger than others.


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For example, a plastic or nylon propeller, unless it is filled with some kind of fibrous material, may not be appropriate for a high-rpm competition engine. An epoxy glass, carbon fiber or wood propeller may be needed. Improperly balanced propellers also are potentially dangerous because of the extreme vibration they cause.

The propeller is not the only part of the engine that requires safe handling.

An engine should never be started until the mounting bolts have been checked for tightness. Normally, once at the beginning of the flying session is enough, but on days when the temperature changes significantly, or there's a lot of flying done, another spot check may be advisable.

Is the engine vibrating excessively for a reason that doesn't seem to be caused by an unbalanced propeller or loose mounting bolts? It could be that internal parts are about to let go and should be inspected. Or, the vibration could be coming from structural failure somewhere else in the plane, a loose tank, etc. If this occurs, a careful inspection of the plane is advisable.

What do you do if the vibration occurs suddenly in flight, detectable by a different engine sound or feeling of vibration in the handle? This could mean that the engine is loose, a prop blade has been thrown, the plane is falling apart, etc.

Those on the ground should be alert to sounds of dangerous vibration and take cover and advise unaware spectators to do the same. The pilot should do whatever possible to minimize the exposure of those on the ground to danger. If you're flying on a big open field, walk away from the crowd and fly out the tank at a distance from people. If that's not possible, keep the plane high, and signal those on the ground to be alert. The height will make it possible for those on the ground to see any jettisoned parts coming their way. In case of extreme danger, it may be necessary to ditch the plane on the side of the circle away from spectators.

Remember, an engine that is running or has just been running, will be hot—particularly if it had a lean run.

Aircraft structure

Proven aircraft designs are going to be strong enough when they are new to withstand the engine and flight stresses normally encountered. But, as planes age, repeated inspections are necessary to make sure that some structural problem is not developing.

Before leaving the workshop for the flying field, fliers should make a careful inspection of all key joints (wing, stabilizer, etc.), all hardware attachments (elevator horns, pushrods, tank screws or rubber bands, landing gear), all hinges, leadout guides, etc. Anything that is loose, deteriorated in strength, etc., should be repaired or replaced. Similar inspection should follow every hard landing or minor crash. At least a visual glance over the plane should precede every flight.

In most cases, failures of such parts will result in nothing more than the loss of a plane, but in some cases, flying parts or an out-of-control plane could be a danger to people.

Fuel

Though model engine glow fuel is not explosive like gasoline, it is quite flammable. Smoking around fuel is an invitation to unwanted fires.

Even with the safest practices, fires will occasionally occur in the model airplane pits. Usually they can be blown or patted out fairly easily. The most important aspect of fire safety probably is to be aware of the possibility of fire and be alert toward the need to detect and extinguish it.

Model fuel burns with an invisible flame in daylight, so the pit crew must be aware of the sound of a backfire that could touch off a blaze, and be sensitive to unusual heat that indicates fire.

A rag is a handy fire-extinguisher. Also, unlike gasoline fires, alcohol fuel fires can be put out with water. Whenever putting out a fire, remember that it will spread to the area below the plane on the ground, so look there, too.

Fire danger can be minimized by spilling as little fuel as possible on the ground and on the plane, and by never continuing to use a leaky tank. Be particularly on the lookout for fires when starting engines on cold, wet days when you tend to use a lot of prime and high glow-plug tempera-

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tures. Fires also are more common in low-nitro, high-alcohol content fuels.

Lines

Lines should be inspected before every flight.

Most fliers run their hands along the wires as they roll them out, and then before each flight as they separate and untwist the lines. They are looking for any serious kinks or any fraying. Even one broken strand in a set of 7-strand lines requires replacement of the line. Pay particular attention to the point at which the lines exit the crimped tube at each end—a common fraying point.

Lines, particularly single-strand racing lines or speed wires, should be periodically cleaned with a rag to make sure they slide freely. This is particularly necessary for the small 1/2A racing lines, which can lock up when wet or dirty.

Pilots should "run out" the lines with their hands as they go to the handle for each flight, picking the lines up as they go and making sure they are clear of snags in the grass or pavement.

Handles

Even the strongest handles are subject to fatigue and should be inspected regularly for signs of cracks, fraying, or other signs of impending failure.

Is your handle clearly marked "up" and "down"? Even if you know which way is up by the look or feel of it, you may find yourself letting somebody else fly the plane; can they tell which way is up? In any case, any flier should test up and down controls as well as adjusting for neutral elevator—just to make sure they have the handle upright.

Some fliers have a habit of always laying the handle down in one direction so that they automatically pick it up correctly. This can be a dangerous practice. In a rush, you may let someone else carry your handle to the circle and they may put it down the wrong way. Somebody may trip over your lines and flip the handle. Develop the habit of always looking at your handle and making sure you pick it up the right way.

Make sure your handle is suited to the type of flying. Don't use a lightweight handle designed for 1/2A planes to fly hard-pulling .36-sized planes. Make sure there are no big wing nuts or other objects sticking out from your handle that a line could catch on in a moment of slack caused by wind or turbulence (your columnist once lost a fine combat plane when a down-line looped over a wing nut on a new handle in an instant of slack caused by turbulence aloft).

Field conditions

Is the field you are flying on a safe one? Beware of tall weeds that could catch lines and cause a bad takeoff or a broken line and a fly away. Is the field secure for spectators?

School yards are excellent places to spread the word about our fine hobby, but your spectators may not be aware of the dangers of the aircraft or the routes they may take.

It's a good idea never to fly alone by using a stooge, so that you have help in case of an injury. However, it is particularly important in school yard or park flying to have an assistant to warn spectators of danger.

I learned that truth when flying a stunt plane stooge-assisted on a neighborhood baseball field. That muffled engine was quiet and unthreatening perhaps too much so. Coming around upwind after having done some maneuver on the downwind side, I was astonished to see about a four-year-old girl standing in my circle, reaching up toward the pretty red and blue plane! Naturally, I climbed high and gave the girl some emphatic directions. She apparently had come from some houses on the far edge of the field. Having recovered from that fright, I was making another flight the same day when a school district workman strolled out right under the plane and installed a sprinkler head! This "average citizen," completely unfamiliar with model airplanes, had no idea of the danger he was in! If I had another flier along to watch for intruders, there would have been no problem.

Noise

Any flier who is around unmuffled engines for long periods should wear ear

protection. Any children in the flying area should be required to wear earplugs as well. Engine noise, particularly at close range, is a real danger to hearing.

General flying practices

Common sense is the best guide. Equipment that is damaged or weakened by crashes should not be flown. Spectators should always be kept in mind: Do they know what the model's circle boundaries are and that they should keep away?

Modelers, particularly teammates who know each other and are working on some competition project or other, will frequently trot in and out of the circle when planes are aloft. When they do so, it is not without communicating beforehand—the pilot knows the pitman is coming in. Don't let the spectators, particularly children, get the idea that they can run in, too!

Don't take off without checking the whole circle. Are there other fliers or spectators encroaching at any point?

These are just a few safety tips that come to mind. There are undoubtedly others that readers may want to contribute.

MAILBAG

One of the delightful pieces of mail recently received included a letter and photos from Nathan Sturman, who has lived in Shibukawa City, Japan, for the past six years. Here's his report on one man's C/L flying in that country:

"Here's a little note to your readers from one of the control line fliers still active in Japan.

"I began building again (after a long hiatus) about one year ago, when I sketched out a profile Polikarpov I-15 and cut the thing out of balsa and hardwood, then hung an Enya .06 on it. Fuel was my own. Then I built a Primary .15 stunt trainer from one of the many old U-Con kits gathering dust in the shops here.

"Ian McQueen's excellent 'Mr. Diesel' fuel (he now mixes a 'racing' brew for the new-type engines) and his supply of PAW engines gave me a new and unusual angle on stunt flying—I use diesels and Davis diesel conversions exclusively now.

"I'm active in a large Tokyo-based, free-flight club, The Launchers. I fly Japanese 'E class' 1/2A power (.06 engines, like the new F-1 class) and I build rubber and CO_2 and diesel powered F/F scale. In fact, I import and distribute Herb Clukey's excellent Flyline kits here.

"Recently, I placed sixth in 1/2A F/F at the winter Shonan meet. Ship was a Starduster X, scratch built, stock PAW .06 ball race, turns a 6x3 Graupner at 21,000-plus rpm on Mr. D's 17 percent castor brew.

"Control line stunt activities are my mainstay, however. I practice with a Japanese friend, Takao Ohashi, brother of Japanese stunt expert Eichi Ohashi, and belong to FMF—Tokyo and Kanto plain area control line crazies association. Great newsletter, *Hentai Kokku*—'perverted attitude flying,' literally. Free ads for any control line 'patrons.'

"My ships of the line include my original 'Primary' (featured in August '89 *Aeromodeller* letters column), now with a Nelson .15 diesel combat/stunt special turning an 8x6 MK or yellow Tornado, instead of the original PAW .15, which now pulls around a semi-scale (KMC) Messerschmidt stunter, after pusher service in a Shinden canard—an experience to remember, I assure you.

"I also have a trusty old Ringmaster Jr. (PAW .15 diesel) and a classic Kawauchi Mercury with an O.S. .25/Davis conversion up front. My daughter demanded the pink paint. The 42-inch model pulls 70-plus feet lines tight during even my bouncy, over-controlled, overhead maneuvering with 10x6 prop. Also, scale-like 'Joker II' stunter, 37-inch, has PAW .19 up front, great results with 9x6 MK prop.

"A .45-size Hien stunter has PAW .35 power, weighs 51 ounces, pulls like a bear but is currently being overhauled from being flown thrice weekly over about six months. Flew it on New Year's Day in Shibukawa City Park! (Along with an Easy-Built Wasp Texaco free flight!) The .09-powered British-style diesel 1/2A ships are latest experiment . . . 33 inches, weight below 12 ounces seems right . . . 8x5 Rev-Up prop on PAW .09 DS. Smaller ships favor a 7x6 when pulled by a PAW .09—like the Mini-All American, a 25-inch flapped stunter from Sawai.

"The .09 stunt is really a challenge, but there are lots of old .35-foot line sets in the hobby shops here, so it's convenient to

build cheap old kits, too. A .19 Stunt Machine and Nobler .20 are a-building. I'm a dope and silkspan man, incidentally.

"My wife, Masako, and daughter, Naomi, 3, and employer all are 'understanding.' This helps. I appeared on nationwide TV flying control line stunt (doing an outside loop with an .09 stunt ship . . . looked like a .60-powered bird on the tube) and teaching kids model building. Also had a show in the municipal library which was covered by local TV—20 minutes of my terrible Japanese. I pity the listeners as I explained the models.

"Latest feature on my exploits was in Yomuri, written by a young woman reporter for whom I flew at Gunma University's athletic field . . . nearly wrecked my Hien for her sake. My wife couldn't bear to watch the balked hourglass.

"I notice that the *Model Builder* large R/C airplane column is written by Al Alman. I believe he was my vice-commanding officer in the 416th Bombardment Wing (H) SAC, Griffiss AFB, New York, during 1966-67. I was a young airman 2nd at the time. I see he's still enamored of large aircraft, anyway. He was a great guy then, as now."

Nathan surely is able to pack a lot of information into a short letter. If anyone would like to correspond with Nathan, his address is: Nathan Sturman, 851-2 Sakashita Cho, Shibukawa City, Gunma Ken, 377 Japan.

By the way, we've corresponded with Ian McQueen about his writing a short item explaining some of the mysteries of operating the diesel engine. Look for that in a future issue.

Conversion of R/C kits and plans to C/L is a common practice among scale builders. We have an appeal from Nick Anderson of Kennesaw, Georgia, asking for some advice about how to go about that project and some ideas about the best kits to convert. Nick is particularly interested in finding a P-51 Mustang kit to convert.

Any contributions of information on that topic for the column would be appreciated. Anyone who would like to contact Nick directly can write him at: Nick Anderson, 172 West Station Drive, Kennesaw, Georgia 30144.

CHAMPIONS

The 1988-89 Northwest Sport Race Drizzle Circuit, a five-contest winter series of races for Northwest Sport Race and Northwest Super Sport Race, had lower attendance than usual this year, but the racing was hard-fought nonetheless.

Wayne Drake and Blake Jensen of Troutdale, Oregon, were the champions in Northwest Sport Race and the Nitroholics Racing Team (John Thompson, Cottage Grove, Oregon, and Mike Hazel, Salem, Oregon) were Northwest Super Sport Race champions. Drake had fast heat in both classes, with 4:19 in NWSR and 3:32 in NWSS.

Here is a rundown of past series winners:

1978-79: NWSR (old rules)—Mike Hazel.

1979-80: NWSR (old rules)—John Thompson.

1980-81: NWSR—Dick Salter. NWSS—Mike Hazel.

1981-82: NWSR—Dick Salter. NWSS—Mike Hazel.

1982-83: NWSR—Greg Beers. NWSS—Dave Green.

1983-84: NWSR—Dave Green. NWSS—Dave Green.

1984-85: NWSR—Beers-Cole Racing Team. NWSS—Dave Green.

1985-86: NWSR—Dave Green. NWSS—Dave Green.

1986-87: NWSR—Dave Green. NWSS—Dave Green.

1987-88: NWSR—Dave Green. NWSS—Wayne Drake.

1988-89: NWSR—Wayne Drake/Blake Jensen. NWSS—Nitroholics Racing Team.

As always, letters, questions and photos are welcomed. Write John Thompson, 1520 Anthony Ave., Cottage Grove, Oregon 97424. •

Tech. Stuff. *. Continued from page 46*

types of models. WCL will depend on the design, the materials, and the builder, but not the size. I didn't include the range of numbers that Nelson arrived at from his data, because they are too variable, and there will always be some unusual airplanes outside the normal range. The question, "What is normal?" applies.

BUILD LIGHT

Our goal, for any model, should be the lowest possible weight consistent with adequate power, strength and stiffness. If you have forgotten the thirteen reasons why light models are better than heavy models reread MD&TS for October 1988. You say you like to fly fast and hot, so you want a heavy model. Wrong thinking. A model may fly fast in spite of being heavy, if it has lots of power. If you lighten it, it will fly still faster (because there will be less induced drag); and it can also fly slower. Reducing the weight of a model reduces both its wing loading and its power loading, so there is a double-barreled gain.

In response to my request of last year for cube loading data on different models, I heard from many of you. Thank you all. I decided not to publish your data in detail, because of lack of space and because few

individual models would be of interest to the majority of readers. I have used your contributions in making the graph of Figure 2. However, before we discuss that, we should talk about power loading, displacement loading, and performance factor, as these are also part of that graph.

DISPLACEMENT LOADING

Not only do we need to build our models light, but we must build in enough power to fly them the way we want them to fly. Power loading or displacement loading figures help us in deciding how much power we need, or why an existing plane flies the way it does. Displacement Loading (DL) is the weight of the airplane (this time in pounds, to keep the numbers nice) divided by the displacement of the engine in cubic inches.

For reasons we discussed a year ago, we can equate our various types of power plants to each other and to full scale as follows: Power loading in pounds per horsepower will be roughly twice our displacement loadings. In other words, our modern two-stroke glow engines average about two horsepower per cubic inch of displacement. The disp. loading or DL of models powered by Schnuerle-ported glow engines and Davis Diesel conversions is simply pounds divided by cubic inches. For older non-Schnuerle glow engines multiply the disp. loading by 1.25. For Quadra-type gasoline engines and for four-stroke glow engines, multiply by 1.5. For antique Diesel engines, multiply by 1.75, and for antique spark-ignition model engines, multiply by 2.0. Those of you with engines specified in cubic centimeters can convert the displacement to cu in. by dividing by 16.4.

ELECTRIC POWER LOADING

I received a lot of good help from Roland Boucher, Mitch Poling, and Nelson Whitman on getting power-loading information for electric-powered models. Electric power seems simple compared to internal combustion, but it is not. For one thing, we can get a huge range of power out of any particular electric motor and prop combination by supplying it with a range of voltages (using batteries with different numbers of cells).

If you have an ammeter and a voltmeter, you can measure the input watts to the motor while it is driving the prop (watts = amps X volts). Multiply watts by a motor efficiency of 70 or 75% and divide by 746 to again get approximate output horsepower. This approach will be more accurate than the equivalent-displacement designations given to many model electric motors, because the latter can be valid for only one specific battery and prop.

Another approach to measuring the power of electrics or any type of power plant is to calculate the power absorbed by the propeller, which of course must equal the output of the engine. I am told that a formula for this purpose was published in one of the mags about a year ago. As the formula was passed on to me, however, it doesn't work for all sizes of props, and doesn't agree with the formulas in my aerodynamics books. Can anyone help us? I don't have back issues of all the model magazines, so if you have it, please send me a copy of the article with the formula for horsepower absorbed by a propeller.

RUBBER POWER LOADING

Rubber-powered models may be compared by relationships proposed to me by reader Barney Frommer. He points out that the potential energy of a rubber motor is proportional to the volume of rubber used. That volume, of course, equals the length of the motor times its cross-sectional area. Barney notes that the duration of the motor run is determined by the length, and the power is determined by the cross section of the rubber (and the prop). Unfortunately, cross sectional area is a square term, and we need a cube term for our power relationship. Otherwise the power loading numbers would vary with scale, as wing loading does.

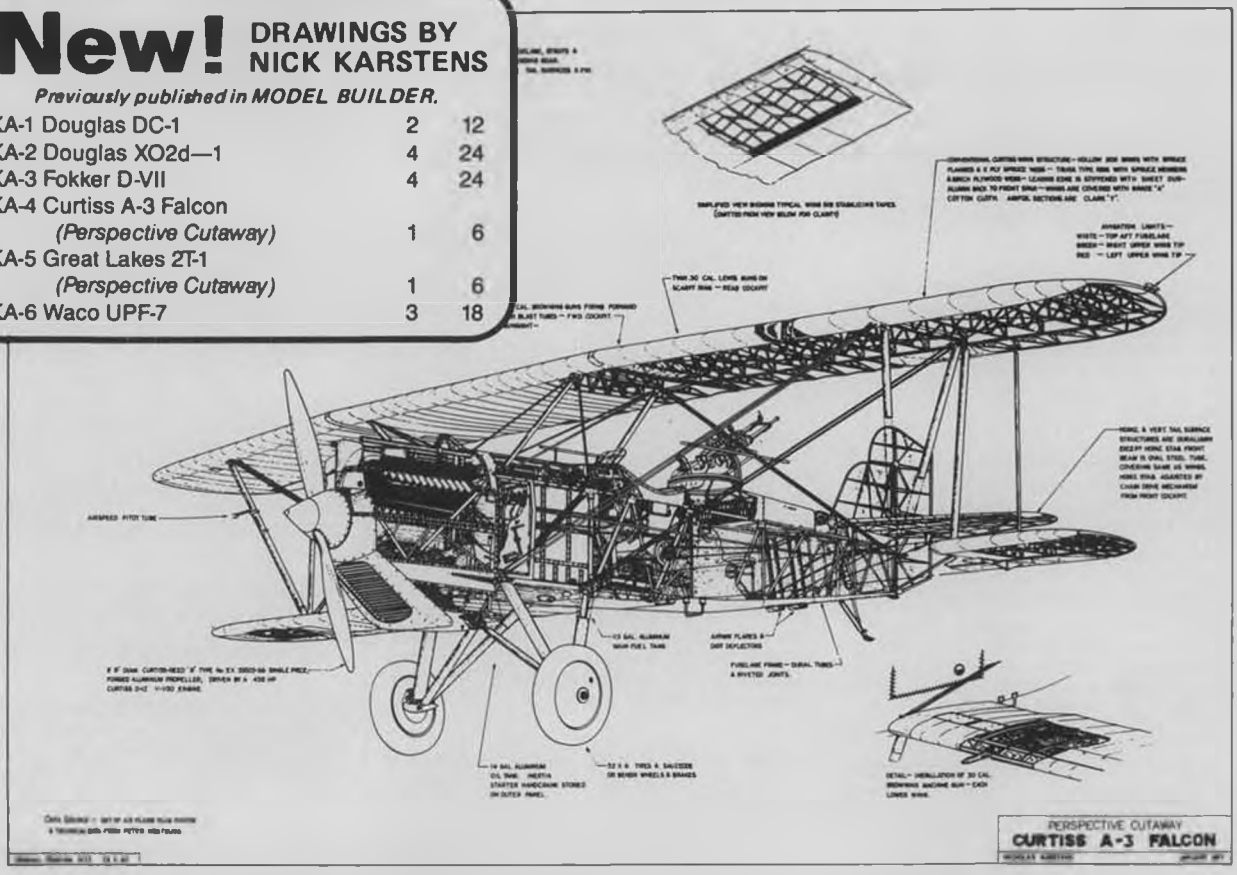
Barney proposes we do what we did to convert wing area to a cube for wing cube loading; multiply the rubber cross section by its square root. Beautiful! Now power loading for rubber powereds equals weight of the model divided by the cross sectional area of the rubber motor to the 1.5 power. The units of Rubber Cube Loading are pounds per cubic inch, the same as for displacement loading. Quite by chance the

Peter Westburg's
SCALE VIEWS

New! DRAWINGS BY NICK KARSTENS

Previously published in MODEL BUILDER.

KA-1 Douglas DC-1	2	12
KA-2 Douglas XO2d—1	4	24
KA-3 Fokker D-VII	4	24
KA-4 Curtiss A-3 Falcon *(Perspective Cutaway)*	1	6
KA-5 Great Lakes 2T-1 *(Perspective Cutaway)*	1	6
KA-6 Waco UPF-7	3	18



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WE-23 Douglas XO-36/XB-7	1	6
1/12th scale: 1" = 1 ft.		
WE-2 Boeing F4B-4/-3	4	24
WE-3 Boeing P-12E	3	18
WE-4 Curtiss A-8 Shrike	3	18
WE-7 Curtiss Gulfhawk 1A	2	12
WE-8 Curtiss N2C-2 Fledgling	4	24
WE-9 Curtiss O-1B/A-3 Falcon	3	18
WE-10 Curtiss P-1B Hawk	3	18
WE-12 Curtiss XP/YP-23	3	18
WE-13 Curtiss SBC-4 Helldiver	4	24
WE-14 Czech Avia B-534	2	12
WE-15 Davis D-1K	2	12
WE-16 Douglas O-25C	3	18
WE-17 Douglas O-31A/O-31B	3	18
WE-19 Douglas O-38/O-38B	2	12
WE-20 Douglas O-43A	3	18
WE-21 Douglas O-31C/Y10-43	3	18
WE-22 Douglas O-46A	3	18
WE-25 Fokker D-17	3	18
WE-26 General Western Meteor	1	6
WE-28 Grumman F2F-1	3	18
WE-29 Grumman F3F-2	3	18
WE-34 Stearman 4E Mailplane	2	12
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1/10 scale: 1.2" = 1 ft.	Shts.	$
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WE-11 Curtiss P-6E Hawk	4	24
WE-24 Fiat CR-32	3	18
WE-27 Great Lakes Trainer	4	24
WE-30 Hawker Fury Mk I	4	24
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numbers for RCL come out close to DL numbers, but a little lower. For a rough conversion from RCL to DL, multiply the RCL by 1.17. Thanks for the good work, Barney.

The propeller horsepower formula, when we get it right, will also be applicable to rubber power. The special shape of rubber-power props may require a different constant in the formula however.

RANGE OF POWER LOADINGS

How do you want it to fly? For a scale model of an early antique design, to fly only like the original did, you can use the same high power loading or displacement loading the prototype had, which may be a DL of 25 pounds per cubic inch or more. Make sure this is what you really want, though. It will climb very little, may have trouble making moderate level turns without snap rolling, and may descend if you use anything but full throttle. As with WCL, the displacement loading or power loading

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of a scale model will usually be somewhat lower than the DL or PL of its prototype, again because we like more performance than we would get from a model with scale power, and we lose some efficiency due to the low Reynolds numbers of models.

If you want to fly your model straight up and accelerate while doing it, you will need more thrust than the weight of the plane, which means a very low displacement loading. Thrust also depends on propeller size, pitch, and efficiency, but with our modern model props and a good unpiped engine, the displacement loading required for sustained vertical flight appears to be about 10 pounds per cubic inch or less. In other words, if you have a hot forty in a four-pound model, a sixty in a six pounder or a ninety in a nine pounder, you will usually have plenty of "vertical performance."

PERFORMANCE FACTOR

Wing cube loading and displacement loading figures each tell us something about a model, but taken together, they give us a more complete picture of a model's potential. For instance, an airplane with a high wing cube loading may still be a very good racing plane, if it has a very low power loading. Likewise, a plane with a high power or displacement loading but a low wing cube loading may still be a fine special-purpose machine such as a scale Jenny or a motor-assisted sailplane.

Some previous writers, including Stinton, in his book, *The Design of the Airplane*, have proposed performance factors which combined wing loading and power loading, but these had the same size dependency that we have observed in wing loading itself. Therefore, let's use wing cube loading, and have a performance factor which is independent of size.

I call my combined factor "Reynolds Performance Factor." RPF = WCL x 8882 DL. The units of RPF will therefore be ounces per cubic foot and pounds per cubic inch. Sounds messy, but don't worry about the units, just use it.

Wing loading and wing cube loading are really indicators of landing or stall speed, while power loading and displacement loading are indicators of maximum speed potential as well as rate of climb. Therefore one times the other or RPF is an indicator of speed range. Normally we consider a big speed range as highly desirable. The lower the RPF the greater the speed range and the better the airplane.

RPF RANGE

If we multiply a very low WCL of six by a very low DL of six, we get a very high-performance model (if it will stay together), with an RPF of only thirty six. Probably this

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A control line sport scale for .30 to .40 engines, made of cardboard! C. Felton.

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Rubber scale monoplane from 1940 Flying Aces. 28-inch span. C. McCullough.

No. 9881 BLACK STAR $10.00
A swept-wing, Vee-tailed R/C model for an .049. Uses foam wings. By Saponara.

No. 9882 CONSOLIDATED XBY-1 $7.50
A rubber-powered bomber in 1/20 scale with a 27-inch span. By Mark Fineman.

No. 1073-O.T. GOLDBERG ZIPPER $10.00
Most famous of all OT gas models, ended cabin era. Redrawn by Phil Bernhardt.

No. 8881 MEYERS OTW-160 $10.00
A sport-scale replica of a classic biplane for .45 power. 50-3/4" span. Rohrback.

No. 8881-O.T. F.A. COMMERCIAL $5.00
From the October, 1936 issue of Flying Aces, a fun rubber job by Herbert Spatz.

No. 7881 LITTLE JOHN $10.00
Reduced-size version of Bill Northrop's "Big John," for 4-strokers. A. McLeod.

No. 788-O.T. FOO-2-U-2 $5.00
A small electric version of Dick Obarski's 1938 Old Timer favorite. By Don Srull.

No. 6881 SUKHOI SU-26 $10.00
A control line profile model for .35 engines. 48-1/2-inch wingspan. R. Schneider.

No. 973-O.T. SPOOK 48 $8.50
Well-known gull wing design qualifies for Antique Old Timers. By Snyder & Muir.

No. 5881 FEATHER $10.00
A very easy-building hand-launched R/C glider with a four-foot span. Frank Green.

No. 673-O.T. ALBATROSS $10.00
Class C gas ship designed by George Reich. Redrawn by Phil Bernhardt.

No. 4881 BOXY-Z $7.50
A 1/2A canard design for R/C with Ace foam wings, easy building. By G. Weber.

No. 488-O.T. LANZO'S DUPLEX $7.50
Chet Lanzo's famous 42-inch span record setting rubber model from 1937.

No. 4882 A-3 BUBAK $7.50
An A-3 class glider, easy to build and fly, from Czechoslovakia. L. Siroky.

is too light to be practical. At the other end of the range, a heavy underpowered plane with a WCL of fifteen and a DL of twenty would have an RPF of three hundred. It won't be much of a flier, if it flies.

To get a better picture of the usefulness of RPFs, study Figure 2. This is a corrected and updated version of the chart in last September column. The curves are lines of constant Reynolds performance factor as labeled, so you can estimate the RPF of any plane without multiplying. I have included circles to show the general areas where different types of airplanes will fall.

These circles should apply regardless of the type of power used, including electric and rubber, if the power conversion factors, which have been proposed, are accurate. I don't guarantee the circles are in just the right places, or the right size to include most of the good airplanes of each type. They are only SWAGS (scientific wild-assed guesses).

Calculate the WCLs and the DLs for your models and any other planes you are interested in and plot their points on the Figure. If you prefer a little more space or don't want to mark up your magazine, I will mail you an 8-1/2 x 11 copy of the original for a dime and a self-addressed stamped envelope (two dimes if you want Fig. 1 also).

Performance factors have been presented in many forms, and the subject is somewhat controversial. Fellow engineer/experienced modeler, William Kuhnle (who helped me with the math and the logic of it all) proposed some. So did another engineer/model designer, Denis Mrozinski. I have studied these and others, and still prefer RPF. Anyway, this is my column!

Regular use of these design tools will make you a better model designer, and even a better kit or ARF buyer. Learn to think in terms of and use wing cube loading and displacement loading, but beware! There are myriad reasons why an airplane can be poor. These numbers are only intended to show that a model is light enough and has enough power to be a good airplane if it is otherwise a good design.

I am sorry if much of the above is more technical than some of you prefer. I feel it needed to be discussed, and I don't know how to do that adequately in simpler words. On the other hand I apologize for boring those of you who are way ahead of me.

When we learn by experience, we never get out of school.

Francis Reynolds, 3060 W. Lk Sammamish Pkwy. N., Redmond, Washington 98052. ●

Workbench. . . *Continued from page 6*

a price list for strip basswood. Of special interest was the fact that it is available in six-foot lengths. If that person sees this, or if any of our readers know who it may be, please contact us. We'd like to pass the information along, but have misplaced the poop sheet.

* * *

At one of the trade shows this spring, we talked with someone about their R/C design, with the possibility that it could be published when final drawings and an article would be completed. One of several

photos of the model that were given to us at the time, is reproduced herein. We don't have a name or address to go with the airplane and would like to hear from the designer/builder. Nice looking model, don't you think?

FLYING WING CONTEST?

For several years now, *Model Builder* has taken over sponsorship of the Northrop Flying Wing contest, which is still organized and put on by Carl Hatrak. For more years than that, the contest has been for free flight only, earlier at Mile Square Park in Fountain Valley, California, and for the last two years, as a separate event during the National Free Flight Championships at Taft, California. Ever since the R/C portion was dropped, there have been numerous inquiries about once again including R/C events, as in the past.

Because of the layout of facilities at Mile Square, where radio control and free flight activities are held on two different sites (at approximately the midpoint of two intersecting paved landing strips that form the longest legs of the triangle pattern of an old auxiliary field for the Santa Ana MCAS), it was difficult to manage both R/C and F/F events simultaneously. Our last recollection of R/C tailless aircraft at that event was not impressive . . . a bunch of heavy, odd looking, overpowered plank and triangle-shaped aircraft supposedly flying pattern, but mostly boring aimless holes in the sky at just barely subsonic speeds. However, there was an interesting selection of scale aircraft, and a few towline gliders.

If we were to reactivate the R/C flying wing event, we'd lean toward a scale category, for one thing, but the rest would likely be gas or electric powered aircraft potentially capable of limited engine run precision duration, with required times just long enough to put emphasis on some soaring ability on the part of both aircraft and pilot. Towline and/or hi-start gliders would be another category requiring the same capabilities.

We'd like to receive some feedback from interested fliers, in order to develop a well-rounded set of events for a one, or maybe two-day contest for flying wing R/C aircraft . . . including an uncomplicated set of specs that eliminate borderline designs. Address your comments to "Northrop R/C Wing."

NUFF'S ENOUGH

We don't like to pick on our primary entertainment media, television, because it has been very good to us in helping to promote the IMS shows in Pasadena, CA and Atlanta, GA. Actually, this has been through the efforts of their news departments, so please understand that we're not picking on them. In fact, it's not the broadcasting stations we're upset about; it's the irreparable damage that is done by careless, uninformed story writers, who have no scruples when it comes to creating a dramatic situation that will put money in their pocket. This introduction is leading up to excerpts we'd like to present from an article by the editor of *American Spacemodeling*, Kathleen Harrington. This is the official journal of the National Association of Rocketry, which, like the Academy of Model Aeronautics, is an affiliate of the National Aeronautical Association. The first paragraph we quote helps set the scene for what follows:

Far more disturbing is the perception in the minds of some that model rocketry is "dangerous." I can't quite figure out why this notion persists; model rocketry has an excellent safety record, far superior to that of most any other activity you care to compare it with. The problem may hark back to the "basement bomber" days of the late 1950s and early 1960s when young people (and some adults) who wanted to experiment with rocketry were often injured when they attempted to make their own propellants. With the ready availability of safe, pre-manufactured motors, this kind of danger is a thing of the past, but does the general (non-rocket) public know this? Or is it more likely that it's the assumption that rockets are fireworks, or that anything having to do with fire is inherently dangerous, that is at the root of this viewpoint?

Whatever, this misperception was further fostered on a nationwide level recently, when the ABC television show "thirtysomething" aired an episode (February 28, 1989) in which a young boy was seriously injured, apparently by an "exploding" model rocket. This child in question had wanted to get into rocketry, but his mother objected; "it too dangerous." The child's father promised to intercede, and the child was given a rocket by his grandfather. The father properly insisted the boy not launch it on his own, but to wait until they could do it together. The child, of course "forgot," and the rocket evidently exploded on launch (although all that could be seen was a cloud of smoke and the little boy writhing on the ground—no launcher or rocket visible). The story picked up in the hospital, where the boy was in serious condition with burns to his hands and face, and severe1 eye damage from "a piece of plastic." An accident of this sort has never occurred in the history of model rocketry, but the American public has been shown graphically what the writers and producers of that series think is the potential of our hobby.

Pat Miller [NAR President] wrote an excellent letter to the producer, Ms. Ellen Pressman, in which he explained the history of model rocketry, pointed out that there have been over 300,000,000 safe launches in the 30 years the hobby has been in existence, and that there has never been an injury of that nature associated with model rocketry. As of this writing, there has been no response; we can only hope that the letters written by Pat and the many other offended individuals have the effect of preventing the episode being shown as a rerun.

Although this article pertains to model rocketry, don't be complacent. The same thing can happen to the model airplane, car, and boat hobbies, particularly radio control. We have seen all too many TV "dramas" where radio control has been used to blow things up and kill people, fly model airplanes carrying contraband (spelled "narcotics") across international borders, carry bombs into buildings, etc., etc. Can anyone tell me when the hobby was shown in a respectable fashion? I won't hold my breath waiting for a positive answer. The most unfortunate thing is that once the damage is done, and it strikes without warning, it cannot be erased, except by time. It's like the clever court lawyer who makes comments that the judge orders struck from the records. However, he's already been heard, and the judge has no power to erase the words from the minds of the jurors.

If we could only demand and get equal time. . . . ●

Jake. . . . . . *Continued from page 7*

Dear Tony:

No. I hold that record myself. I have a large backyard and I often fly single channel .049 airplanes from it. Last year one flew away and it wasn't until a week later that I found it in my next door neighbor's yard. Well, big deal, you might say. It flew all the way to the next yard! I happen to know for a fact, however, that it flew all the way around the world before it landed next door. I have proof, because after I found it I noticed that the radio was Japanese.

Jake

* * *

Dear Jake:

My ailerons flutter when the aircraft's velocity exceeds 90 miles per hour.

Aeroelastic Problem in San Gabriel

Dear Aeroelastic Problem:

So? My dog's ears flap when the car exceeds 20 miles per hour.

Jake

* * *

Dear Jake:

I've been playing my AMA number, my frequency number, and my engine displacement in the Illinois lottery, and so far I haven't won a dime. Any explanation?

Player in Des Plaines

Dear Player:

No, that should work.

Jake

* * *

Dear Jake:

James Wang is great! He seems to be a veritable fountain of knowledge on helicopters, don't you think?

Hover Lover in Holland, MI

Dear Jake:

Who is this James Wang guy? When it comes to helicopters, he sure can shovel a mound of manure.

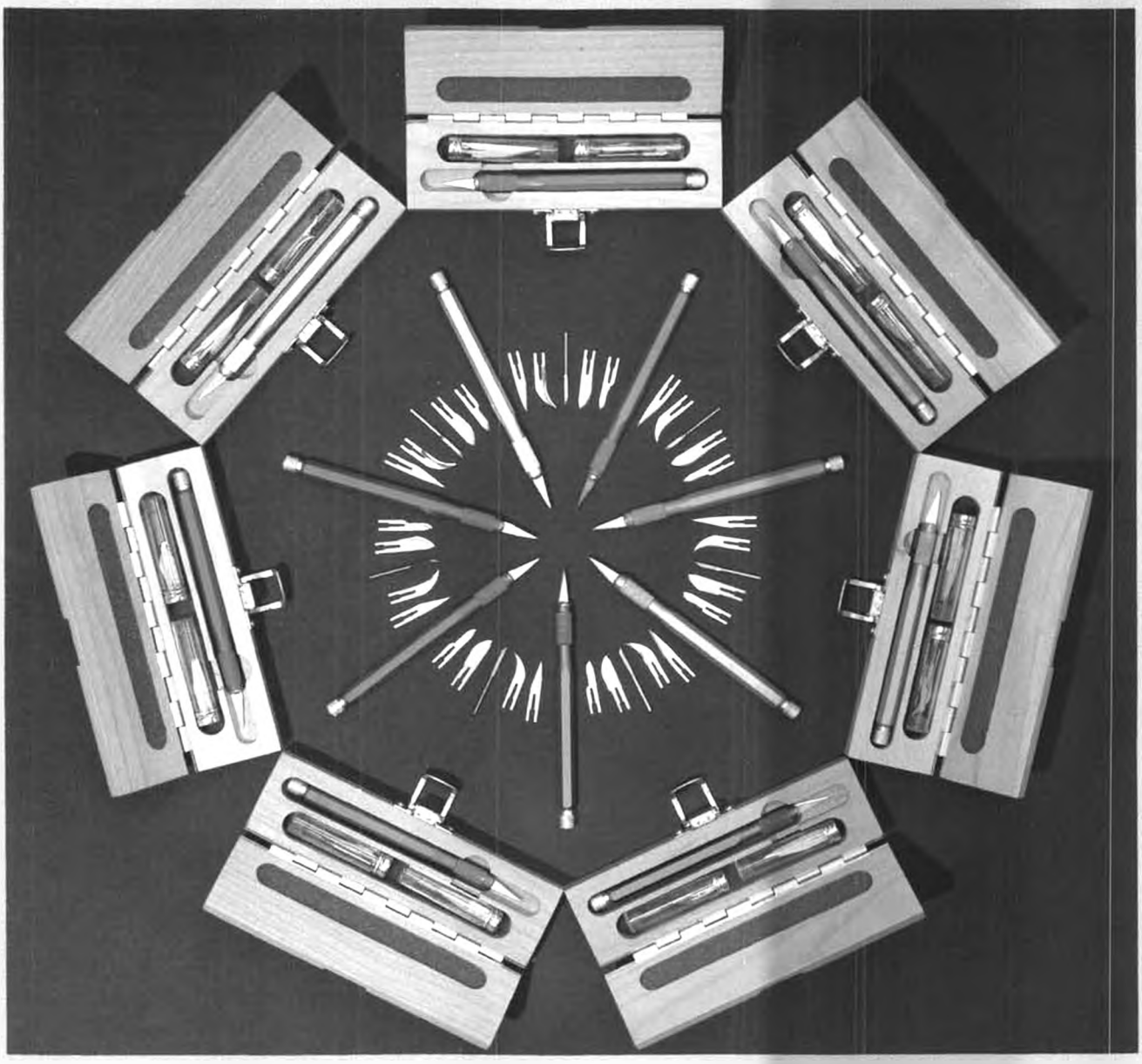
Rotary Winger in Rancho Sonoma

Dear Hover Lover and Rotary Winger:

I'm answering your two letters together because your comments are very typical of the two differing opinions that have been expressed in a great deal of my mail lately. To be fair to everyone involved I think we should all take some time before forming an opinion of our new helicopter columnist. In the meantime, let's compromise somewhere between "fountain of knowledge" and "mound of manure." How about "fountain of manure"?

Jake ●

IN THE BEST CIRCLES, IT'S **über skiver**



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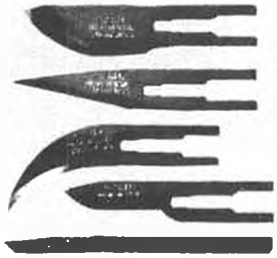

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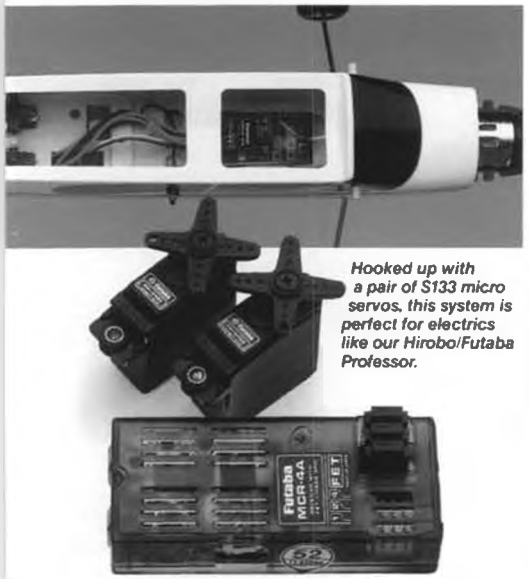

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