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AIRTRONICS
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Now that 1991 is almost here, a lot of R/C manufacturers are finally beginning to follow Airtronics' lead. Some of them are introducing equipment that will operate in the 1991 narrow band environment. We think it's about time!

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We not only invest a great deal of time and money in product development, we also work to inform and educate modelers about the complexities of 1991 specifications and claims. We believe that knowledgeable, informed modelers will intelligently choose the best equipment available.

In the race to develop reliable narrow band 1991 R/C systems, everyone else is following our lead. Despite all the claims and confusion, Airtronics still sets the standard in R/C quality, technology, and 1991 performance.

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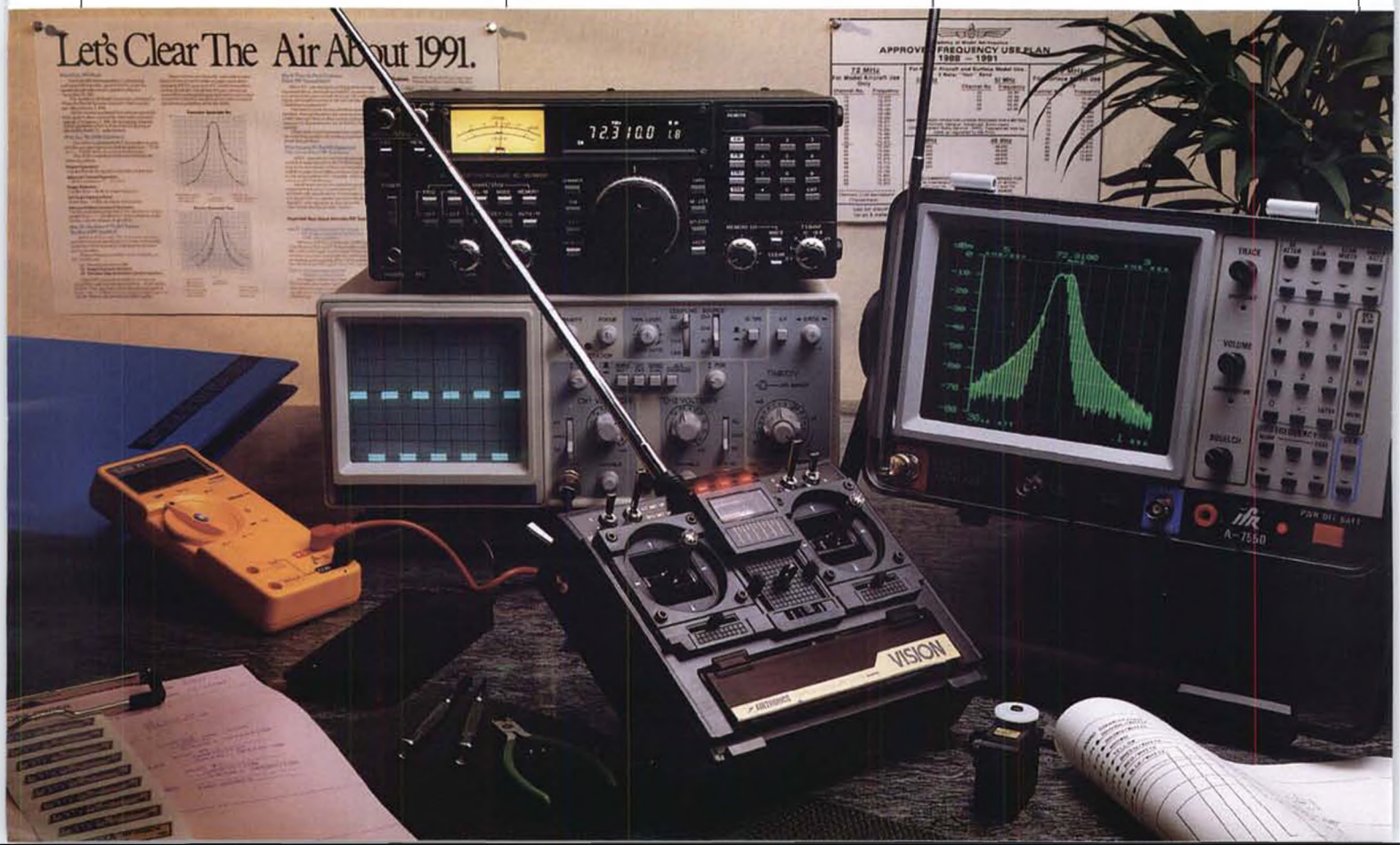

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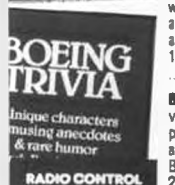

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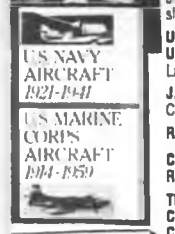

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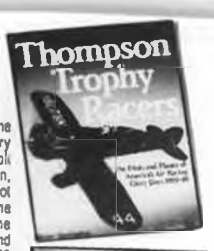

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MODEL BUILDER

MAY 1990

volume 20, number 219

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CONSTRUCTION

Cover: Dave Malchione's F-86F Sabre was built from a Bob Violett Models kit, and reviewed in this issue, beginning on page 46.

Also reviewed in this issue is the Kalt Cyclone II helicopter (see insert) along with the JR MAX 5H FM heli radio, both from Hobby Dynamics Distributors. Review by James Wang begins on page 42 of this issue

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PH: 305-581-9390
ST. PETERSBURG
Hobby House
8393 9th St. N. Ph: 521-4148
SOUTH DAYTONA
Ace Hobbies
2127 So. Ridgwood Ave.
PH: 904-761-9780
TALLAHASSEE
Pam & Allen's Hobbies
1195-A Capital Circle N.E.
TAMPA
Charlie's Discount Hobbies
7530 W. Waters Ave.
PH: 813-882-4007
TAMPA
Farmers Hobbies
4936 E. Broadway
PH: 813-248-3314
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
Briar Vista Lawn Mower
Sales & Service
1657 Lavista Rd. PH: 633-9741
HAWAII
HONOLULU
The Hobbietat
1413 Tenth Avenue
IDAHO
TWIN FALLS
Aero-tronics Model Supply Co.
320 Locust Street
ILLINOIS
BELLVILLE
West Side Hobby
2629 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
800 - 5th 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: 312-424-6131
ROCKFORD
Rockford Hobbies, Inc.
619 So. Rockford Ave.
TINLEY PARK
Orland Hobbies
16952 Oak Park Ave.
PH: 312-429-9911
WAUKEGAN
Lake County Hobbies
37632 N. Sheridan Road
PH: 312-662-4544
INDIANA
FORT WAYNE
Phil's Hobby Shop
1722 Lake Avenue
PH: 219-426-5056
IOWA
CEDAR RAPIDS
Tapco Engineering
1639 47th St. N.E.
PH: 319-393-4383
CLINTON
Rusti's Miniatures & Hobbies
423 11th Ave. So.
COUNCIL BLUFFS
Bud's Hobbies & Crafts
133 W. Broadway
DES MOINES
Hobby Haven
7672 Hickman Road
HOLSTEIN
Chuck's Lawn & Used Cars
320 East 2nd
LeMARS
Hobby Haven
Airport Entrance Hiway 75 S.
Ph: 712-546-5980
MASON CITY
D 'n B R/C SUPPLY
201 So. Vermont
SIOUX CITY
Tri-State R/C
3201 Viking Dr.
PH: 712-255-8190
WATERLOO
Bob's R/C Supply
935 Sheerer Ave.
WAVERLY
R/C Hobby House
916 E. Bremer Ave.
KANSAS
JUNCTION CITY
R/C Hobbies
115 W. 7th St. PH: 238-1877
KANSAS CITY
R/C Hobbies
5630 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
2269 N. Amidon Ph: 838-3011
Sweetbriar Shopping Center
KENTUCKY
FLORENCE
Hobby Hangar
183 Lloyd Ave.
FLORENCE
Northern Kentucky Hobbies
7615 Burlington Pike
HENDERSON
Hensley's Hobbies
241 Second St.
LEXINGTON
Hobby Center
1025 Industry Road
LOUISIANA
BATON ROUGE
Hobby Towne
3112 College Drive - Suite A
BATON ROUGE
Hobby Towne
6906 Airline Highway
COVINGTON
Uncle Sam's Hobby Shop
301 N. Hwy. 190, Suite E8
PH: 504-893-RCRC
MANDEVILLE
Mercury Hobbies, Inc.
Rt. 6 Box 734A PH: 892-7204
METAIRIE
Hobby Hut Hobby Shop
709 David Dr. PH: 504-733-4629
MONROE
American Classic Dev., Inc.
1300 U.S. 165 North
PH: 318-343-5554
MAINE
BATH
The Hobby Shoppe
94 Front St.
ELLSWORTH
The Camera/Photo Smith's
Maine Coast Mall
FAYETTE
Tom's R/C Hardwars
RFD. 1, Box 2260
JAY
Challenger Hobbies &
R/C Raceway
Old Jay Hill Road
PITTSFIELD
Hallett's R/C Planes
65 Somerset Ave.
PH: 207-487-3058
WATERVILLE
Cliff Piper Radio Control
Riva Ridge, Vassalboro
Route 3, Box 1980
PH: 207-873-4685
MARYLAND
BALTIMORE
Stoneleigh Cycle & Hobbies, Inc.
6717 York Road
GERMANTOWN
Fox Chapel Hobbies
19709 Frederick Road
MIDDLETOWN
Larch Lane Hobbies
18 Larch Lane
PH: 301-473-4587
OAKLAND
Brodak's Hobby Shop
810 N. 3rd St.
WESTMINSTER
Bobby's Hobby Lobby
95 E. Main St.
MASSACHUSETTS
CANTON
Advanced RadioControl Hobbies
323 Turnpike St. #9
CHICOPEE
J & J Hobbies
133 Frontenac St. PH: 592-1472
DENNISPORT
New England Hobby Shops, Inc.
691 Main St.
EAST FALMOUTH
R/C Hobbies
153 E. Falmouth
EAST LONGMEADOW
Bill's Hobby Supplies
600 N. Main Street
PH: 413-736-7711
FISKDALE
KN Hobbies & Toys
559 Main St.
FRAMINGHAM
Fisher R/C
17 Salmi Road
GREENFIELD
Chano Hobbies
40 Bank Row Ph: 413-773-3300
HANSON
Hanson Hobby, Inc.
830 Main St.
LEE
Barn Speed Hobbies
63 Center St.
LYNN
Hobby City
263 Lynnfield St.
MERRIMAC
George's Hobby Shop
22 Merrimac Square
NEW BEDFORD
Paragon Stamp Works
293 Brock Ave.
PH: 508-992-6812
REVERE
Tony's Hobby Shop
90 Kimball Ave.
WEBSTER
Jim's Hobbies
22-1/2 Day Street
WORCESTER
Ray's R/C Specialties
12 Sherman St. PH: 757-5883
MICHIGAN
ADRIAN
House of Hobbies
2475 Cadmus Road
ANN ARBOR
Rider's Hobby Shop
115 W. Liberty Ph: 313-668-8950
BATTLE CREEK
Hobby House
506 Riverside Dr. PH: 964-9105
BATTLE CREEK
J T HOBBY
825 Golden Ave.
CANTON
Rider's Hobby
42007 Ford Road
PH: 313-981-8700
CHARLOTTE
Hussey's Hobbies
222 Lansing St.
PH: 543-4400
COLDWATER
Hobby Heaven
7 So. Monroe
PH: 517-278-5894
COLEMAN
Long's Aero & Hobby Shop
5812 W. Saginaw Road
DEARBORN
Joe's Hobby Center
7845 Wyoming Ave
PH: 313-846-0567
EAST DETROIT
Joe's Hobby Center
17900 E. 10 Mile
PH: 313-733-8294
FARMINGTON
Joe's Hobby Center, Inc.
35203 Grand River Ave.
PH: 313-477-6286
GRAND RAPIDS
Rider's Hobby Shop
2055 28th St. S.E.
KALAMAZOO
Rider's Hobby
3417 So. Westnedge
PH: 616-349-2666
LANSING
Rider's Hobby Shop
1609 E. Michigan Ave.
PH: 517-485-0700
PONTIAC
RC Hobbies
921 Huron
ROCHESTER
Joe's Hobby Centers, Inc.
Campus Corners Shp. Ctr.
105 S. Livernois
SAGINAW
Aerodrome Models Ltd.
2111 Marshall Court
PH: 517-781-3000
SAGINAW
Roger's Hobby Center
5658 State
PH: 517-790-0080
Giant Shopping Center W.
SAGINAW
Tait's Hobbies & Raceway
3270 Bay Rd. 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
PH: 313-971-6116
MINNESOTA
LITTLE CANADA (St. Paul)
Hub Hobby Center
82 Minnesota Ave.
PH: 612-490-1675
MANKATO
Don's Hobby Co.
424 S. Front St. PH: 587-1330
RICHFIELD
Hub Hobby Center
6418 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. Shopping Center
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: 782-4682
ST. CHARLES
Mark Twain Hobby & Craft
1201 S. 5th St.
ST. LOUIS
J & J Hobbies
5511 So. Lindbergh
MONTANA
VICTOR
Murph's Hobbies
239 West View Drive
NEBRASKA
NORTH PLATTE
Patterson's Hobbies
103 No. Jeffers PH: 534-1038
OMAHA
Hobby Cooperative Supply
13225 I Street
OMAHA
Hobbytown U.S.A.
711 N. 132nd St.
WEST POINT
Kruger's Variety Store
113 N. Main
NEVADA
NO. LAS VEGAS
Peterson Hobbies & Crafts
3262 B. Civic Center Drive
NEW HAMPSHIRE
AUBURN
CT Hobbies
49 Eaton Road
LONDONDERRY
J & S Hobby Center
13 Sanborn Road
PH: 603-432-7058
NASHUA
Hobby Emporium
Royal Ridge Mall
NORTH CONWAY
C-V Machine Co.
Kearsarge St.
SALEM
Bill's Hobby Barn
326 S. Broadway
PH: 603-898-9241
NEW JERSEY
CHESTER
GB Hobbies
705 Bartley-Chester Road
MARLTON
Hi Fly Hobbies
Route 70 & Cropwell Road
Marlton Square Shp. Mall
PH: 609-983-8090
MERCERVILLE
Iron Horse Hobbies
116 Flock Road
MIDLAND PARK
The Hobby Shop
291 Godwin Ave.
POMPTON PLAINS
Hobby Hut
567 Rte 23
PH: 201-835-2077
RANDOLPH
Carl's Hobby Center
508 Rte 10
PH: 201-366-4300
RED BANK
Hobbymasters, Inc.
62 White Street
RIDGEFIELD
Ridgefield Hobby
508 Broad Ave.
RIVERDALE
Zeppelin Hobbies
62 Hamburg Turnpike
SUSSEX
Sussex County Hobbies
89 Main St.
TOMS RIVER
Ocean County R/C Service
2123 Vermont Ave.
WILLINGBORO
Willing Hobbies
Country Club Plaza
Beverly-Rancocas Road
NEW MEXICO
ALBUQUERQUE
Valley Hobbies
4522 4th St. N.W.
PH: 505-345-9688
NEW YORK
ALBANY
Competition Hobby Supplies
67 Exchange St.
BALLSTON SPA
Racing City Radio Control
2033 Doubleday Ave.
BELLEROSE TERRACE
Performance Hobby
225-06 Jamaica Ave.
BROOKLYN
Brooklyn's Model Masters
1192 GravesendNeck Rd.
PH: 718-743-0700
CANASERAGA
RC Supply
Main Street
CHEEKTOWAGA
Field's Hobby Center
3523 Union Rd.
PH: 716-681-6440
ELMSFORD
Andy's Hobby Shop
36 E. Main Street
GENEVA
Toys Trains 'N Things
480 Exchange St.
HORSEHEADS
Altoona Shop
584 Westinghouse Road
Village Plaza
MINEOLA
Willis R/C Hobbies
285 Willis Ave.
NORFOLK
R/C Aero Hobbies
Box 4A Plumbrook Road
PH: 315-384-4413
ODESSA
D & B Hobbies & Crafts
205 E. Main St.
PENFIELD
Panco Hobbies
1865 Penfield Road
ROCHESTER
Dan's Crafts & Things
352 Empire Blvd.
PH: 716-654-8388
ROCHESTER
Edmund's Hobby Shop
1521 Mt. Hope Ave.
PH: 716-442-8430
SIDNEY
Sidney Cycle & Hobby Center
3 Smith Street
SYRACUSE
Walt's Hobby & Craft
2 Dwight Park Drive
PH: 315-453-2291
WAYLAND
Finger Lakes Hobby & Gift Cnt.
6 North Main St.
NORTH CAROLINA
ASHEVILLE
Carolina Art, Craft & Hobby
128 Swannanoa River Road
BURLINGTON
R/C Hobby Workshop/Raceway
1356 S. Church
PH: 919-228-6809
CHARLOTTE
Action Hobbies
2819 S. Blvd.
PH: 704-527-2596
GOLDSBORO
Hollingsworth R/C Shop
Rte 14, Box 90
PH: 919-735-5098
HENDERSONVILLE
The Hobby House
1211 Asheville Hwy.
PH: 692-6683
HIGH POINT
Bernie's Craft & Hobbies, Inc.
2291 English Road
KING
King R/C
Five Forks Village Shp. Ctr.
PH: 919-983-3999
MAIDEN
Country Hobbies
Route 2, Box 291
PH: 704-428-3101
WINSTON-SALEM
The Hobby Corner
136-C Oakwood Dr.
PH: 919-723-3589
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: 216-848-2264
BALTIMORE
Frank's Service
145 Baltimore-Somerset Rd. NW
CENTERVILLE
A Hobby Shop
13 N. Main PH: 513-433-7127
CINCINNATI
Carl's Hobbies
1188 W. Kemper Road
PH: 513-742-5880
CLEVELAND/PARMA
National Hobby, Inc.
523 Ridge Rd.
PH: 216-749-2450
FINDLAY
Jinx Model Supplies
721 Rockwell Ave.
FINDLAY
Pussy Cat Company
515 Crystal Ave.
GREENVILLE
Weaver's
Wayne St. & Meeker Ave.
PH: 513-548-1035
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 Whistle Stop & Hobby
532 W. Center St.
PH: 389-3464
MIDDLEBURG HEIGHTS
American Modeler
7559 Pearl Road
MILFORD
House of Hobbies
204 Main St.
PH: 513-248-9220
NORTH CANTON
Aero Tech Hobbies
902 N. Main
NORTH CANTON
Modeler's Haven
4255 Portage N.W.
PH: 216-499-6000
PARMA
Hinch's Train & Hobby
7982 Broadview Road
Tri City Plaza
TOLEDO
The Hobby Stop - West
4558 Monroe Street
UPPER SANDUSKY
Jim & Ken's Hobby Shop
14835 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
PRAGUE
DJ's Hobby Stuff
807 Broadway
TULSA
Action Hobbies
4423 E. 31st St.
TULSA
Wings 'N Things
5241 So. Peoria
PH: 918-745-0034
OREGON
CANBY
Northwest Hobbies
485 S.E. 1st Ave.
CORVALLIS
Trumps Hobbies
2401 N.W. Kings
Timberhill Shopping Center
PH: 503-753-7540
EUGENE
Eugene Toy & Hobby
32 East 11th Ave.
OREGON CITY
Quality Toys & Hobbies
205 7th Street
PH: 650-8023
PORTLAND
Norm's Hobbies Unlimited
4503 N. Interstate Ave.
PENNSYLVANIA
BATH
Dick Wetzel's Hobbies
514 E. Main
PH: 215-837-6681
BROCKWAY
Geno's
Custom Arts & Crafts Shoppe
P.O. Box 255
PH: 814-265-5395
CARMICHAELS
Brodak's Hobbies
558 Route 88
CRANBERRY TOWNSHIP
Cranberry Hobby Depot
Cranberry Gardens Plaza
20327 Perry Highway
ELMHURST
The Hobby Hut
Route 435
ERIE
Maxwell's Hobby Shop
5014 Station Road
GETTYSBURG
Gilbert's Hobby Shop
230 Steinwehr Ave.
PH: 717-334-3715
HUMMELSTOWN
The Hidden Hangar
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.
#22 Pennsbury Plaza Center
PH: 215-736-3351
MUNCY
Tony's R-C Hobbies
RD2, Box 273
N. HUNTINGDON
High Tek Hobbies
13380 Rte 30, Ladonna Village
QUAKERTOWN
J & D Whistle Stop
Quakertown Plaza S.C.
READING
Iron Horse Hobby House
60 South 6th St.
READING
Ott's Hobbies
536 N. 10th St.
SUNBURY
Rachav's Wings & Things
136 S. Street
TAMAQUA
Prop & Wheels Hobbies
139 W. Broad St.
WARMINSTER
J.C. R/C Hobbies
13 York Rd. Ph: 215-672-5200
WEST CHESTER
Montgomery Nurseries
Route 162 & Telegraph Road
WILLIAMSPORT
Growing Tree Toys & Hobbies
115 West Third Street
YORK
Mel's Hobbies
935 East Market St.
YORK
Skelly Sporting Goods
2227 W. Market St.
SOUTH CAROLINA
GREENVILLE
The Great Escape
1426 Laurens Road
MYRTLE BEACH
Ed's Hobby Shop
702 Main St.
PH: 448-8685
PELZER
Hilley's Hobbies
Highway 247
ROCK HILL
Rock Hill Hobbies
1204 Mt. Gallant Road
SIMPSONVILLE
Golden Strip Hobbies
551 Fairview Road #111
YORK
Bethany Hobbies
2395 S. Hwy. 161
PH: 803-222-2756
SOUTH DAKOTA
ABERDEEN
Klein's
406 S. Wilson
RAPID CITY
RCA Hobbies
Route 6, Box 1270
PH: 605-787-6858
WATERTOWN
Hollon's Hobbies
Route 2 Box 14
TENNESSEE
COVINGTON
M-H Supply
114 Star Shopping Center
KNOXVILLE
M & N Hobbies
1923 Brandville Road
PH: 615-525-7532
KNOXVILLE
Tennessee Model Hobbies
8909 Oak Ridge Hwy.
PH: 615-482-2900
OAK RIDGE
Ridge Handicrafts, Inc.
205 Jackson Sq.
TEXAS
AUSTIN
Command Hobbies
8029 Airport Blvd., Ste. 146
BELLAIRE
I and I Hobby Center
8707 Chimney Rock
CONROE
J & K Hobbies
201 Enterprise Row, Suite 101
PH: 760-1986
EL PASO
Hal's Hobby Warehouse
1440 Bassamar
PH: 915-591-2213
FARMERS BRANCH
Bold Hobbies, Inc.
101 Valwood Village Shp. Ctr.
PH: 214-241-6492
FORT WORTH
Bold Hobbies
8220 Bedford Euless Road
HURST
Roy's Hobby Shop
1309 Norwood
JASPER
Beard's Hobby Shop
400 N. Main St.
LONGVIEW
Leslie's Hobby Shop
2725 Gilmer Road
McALLEN
B & B Hobbies
521 So. Main St.
ODESSA
Odessa TV Video Clinic
805 N. Jefferson
PH: 915-332-2831
ODESSA
The Windsock Hobby Center
Crestwood Shopping Center
3619 N. Dixie
PH: 915-363-0300
POTTSBORO
Model Airplanes & Boats Galore
217 Franklin St.
PH: 214-786-3006
PORT LAVACA
The Plane Shop
1608 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
WESLACO
Stanford R/C Hobby Shop
260 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
14010 N.E. 21st St.
PH: 506-747-8914
BELLINGHAM
Hobby Hive
703 W. Holly
PH: 206-734-4090
BURLINGTON
Performance R/C
328 E. Fairhaven Ave.
PH: 206-755-9464
ISSAQUAH
Abernathy's Northwest Hobbies
1175 Gilman Blvd. Ste. 1913
PUYALLUP
All Hobbies
1430 E. Main Suite D
SEATTLE
Webster Hobby Shop
1116 N. 183rd
SECUIM
Fred's Hobbies and Guns
349s W. Washington
SPOKANE
R/C Hobbies of Spokane
W. 1104 Wellesley
TACOMA
All Hobbies
Narrows Plaza
2310 Mildred W
YAKIMA
Model Aircraft Supply Center
505 N. 20th
PH: 509-453-8238
WEST VIRGINIA
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
1607 7th St. PH: 414-496-0208
HOLMEN
SUN-WIN
W7565 St. Croix Ave.
MADISON
Hobby Craft of Madison, Inc.
6632 Odana Road
WALDO
Kwindlag Hobbies
104 S. Mill
WAUKESHA
ABC R/C, Inc.
1441B East Main St.
PH: 414-542-1245
WAUSAU
Pope's Hobby Land
640 South 3rd Ave.
CANADA
BAWLF, ALBERTA
Alberta's Littlest Airport
Box 6 PH: 403-373-3953
CALGARY, ALBERTA
P.M.S. Hobby Craft
154-495 36th St. N.E.
MILLET, ALBERTA
Sunset Radio Control
P.O. Box 716
ROCKY MTN. HOUSE, ALB.
JB Crafts & Hobbies, Ltd.
Box 538, 4918 - 50 Street
DUNCAN, B.C.
Rite Bros. RC Supply & Access.
1059 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: 204-589-2037
ST. JOHN'S, NFLD.
Capitol Hobby Centre, Ltd.
6 Freshwater Road
BURLINGTON, ONTARIO
Skycraft Hobbies Inc.
141 Plains Rd. W.
PH: 416-529-0559
800-263-9331
COURTRIGHT, ONTARIO
Plane Crazy
428 #80 Highway, RR1
PH: 867-3102
KITCHENER, ONTARIO
Flite Craft Model Co.
1595 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: 902-368-1555
FLEURE'MONT, QUEBEC
Sher-Hobby
1085 12th Ave. Nord
LAVAL, QUEBEC
Carl's Hobby Shop, Ltd.
1500 Cure Labelle Blvd.,
Chomedey
ST. GEORGES BEAUCE, QUE.
Place Bureau Enr.
12515, lere ave. est. Ville de
ST. MARTIN BEAUCE, QUE.
Pease-Temp 107
107-1 Ave. CP97
VILLE ST. LAURENT, QUE.
Hobbieville
902 Decarie PH: 514-744-8280
REGINA, SASKATCHAWAN
Aero Specialties
200 Shannon Road
SASKATOON, SASKATCH.
RC Hobby World
108 - 2301 Ave. C. North
Hazcamp Centre
PH: 306-652-4775
AUSTRALIA
SIDNEY, NSW 2232
The Hobby Headquarters
91 Rival St. Kareela
ENGLAND
NORFOLK, NR17 1DG
Pagasus 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-671 02 HARNOSAND
Modell Produkter AB
Box 2060

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

FAREWELL, WALT

On March 1st, 1990, Walter E. Mooney, age 64, passed away.

How can one let go of such a friend?

By reflecting upon his accomplishments?

By remembering joys shared with him?

Walt was an artist, author, engineer, historian, test pilot, lecturer, TV performer and possibly the most productive designer of model airplanes in the United States, if not the world.

Truly a "total aviation person," he was equally at home in the spheres of model aircraft, sailplanes, lightplanes and aerospace vehicles, although one suspects that the smallest ones were his favorites.

Walt's enthusiasm for life was contagious . . . he delighted in sharing his pleasures with others . . . and gave freely of his encyclopaedic knowledge. His energy seemed boundless, and he packed more living into a day than anyone else I've ever met. His curiosity was unlimited, extending far beyond aviation, encompassing animals, especially birds, all types of machinery, languages and philosophy.

He had friends throughout the world, and a large portion of his spare(?) time was devoted to answering mail. He also had strong feelings for political injustice and used his powerful pen to make his opinions known. Counterbalancing this was his remarkable ability to deliver jokes and puns in apparently endless variety.

To Walt, each day was a new adventure, and he made the most of it, finding "silver linings" even in situations which would have discouraged most people. For example, when confined to a hospital bed some years ago with a serious heart condition, Walt didn't feel sorry for himself at all. Rather, he seized the opportunity to design and draw half a dozen new Peanut Scale models! And, his positive outlook made such an impact on the nurses that they told him he was one of the very few patients they didn't want to leave. . . .

Walter E. Mooney, Jr. June 6, 1925-March 1, 1990

Walt leaves us with a rich legacy . . . his family . . . all of whom are endowed with sizeable portions of his philosophy, his legion of friends who will help keep his memory alive, and, of course, his designs which are now such an integral part of both full-size and miniature aviation.

In thinking back over the many years it was my good fortune to know Walt Mooney, I remember most his cheerful disposition, optimism, patience and willingness to share.

One special experience stands out: During a glorious summer day near Lake Elsinore, California, one of Walt's models caught a thermal and headed for the horizon, with the two of us running, eyes skyward, to keep it within view. When the model finally landed we were far from the contest site and weary from the long chase. It was only as we gazed around us that we noticed thousands of brilliant wildflowers in variegated colors extending in all directions. As we sat down among them to rest, Walt turned to me and said: "You know Hannan, this is probably as close to Heaven as we'll ever be here on earth." How right he was. . . .

Bill Hannan

Walt Mooney in his Piper PA-15 "Vagabond" N4121H. Photo possibly taken from the cliffs of Torrey Pines, one of Walt's favorite full-scale soaring sites.

from Bill Northrop's workbench

We have neither the desire nor the capability of adding anything to the words so well written here by Bill Hannan in the memory of Walt Mooney. We only wish to express our own personal sadness over the loss of a good friend, one who allowed us to be the outlet for his teachings in the fine art of building and flying small scale model aircraft. No one has or will replace him.

It is ironic, but perhaps most fitting, that the last unpublished design by Walt

Mooney to appear in *Model Builder*, in this issue, has been sitting in our file for almost a year. As you will see, it is a 16-inch span model of his own Piper "Vagabond," and there is absolutely no explainable reason why it has not been published until now. That is not to say that the decision had already been made to publish the model in this issue before word came of his passing, but the question does come to mind, "Why had we been saving it?" Walt even suggested in his note with the article, "If you want to shrink it to Peanut size, go ahead, but you'll have to 'doctor' the text in a few places." Some months later, probably as a gentle reminder, he sent along the color slide, probably taken at Torrey Pines, as he made a pass along this well known slope soaring site.

We will repeat some of Walt's Peanuts from time to time, particularly those published in issues which are no longer available. Bill Hannan was correct . . . as long as there are balsa sticks and covering tissue, Walt Mooney will never be forgotten. . . .

WHERE ARE THE KIDS?

This question has been beaten about by columnists, by letter writers to editors, by serious thinkers, by even more non-thinkers, and particularly by groups of long-time modelers who "were there" during the rapid growth era just prior to WW-II. It has come up again in this issue, in Bob Stalick's "Free Flight" column, and we'd like you to take a look at it, even if you don't ordinarily read the column. Bob has quoted Ken Sykora, editor of the *Flightplug* newsletter of the SCIFS, Southern California Ignition Fliers Society. We have quoted some of Ken's editorials in this column over the years, and for good reason. Lots of people can write, but only a chosen few can really say something in the process . . . Ken is one of those.

CONTINUED ON PAGE. . .

We have received quite a few letters from readers concerning several missing "Continued on page so and so's" in the March '90 issue. Most were good-natured jabs at our production slip-up, which can only be written off as "Haste makes waste." However, some seriously commented that we really shouldn't drop this convenience to the readers, while one writer is still waiting for the next issue in hopes that the construction article for Don DeLoach's Bostonian Nats winner will continue. We told him to check page 86!

We particularly enjoyed the following letter from Don Nix, proprietor of Powermaster Products, Inc. . . . see ad in this issue . . . who conjures up a variety of glow fuel mixes (He oughta call 'em Nix'es Mixes).

Dear Bill,

Just thought I'd drop a note to say that I enjoyed the March issue of Model Builder. *As usual, you cover a wide range of modeling topics. However, I did notice one thing that kind of had me wondering a bit. Several articles seemed to start and*

The first time this happened, I thought that perhaps something had simply slipped. Then, once again, I would start a story, get engrossed in reading it, and suddenly, without warning, it

I remember Anita mentioning she was looking for a new editor, so perhaps you had a rookie in training. On the other hand, the date for the makeup of the March issue was probably just about the time you were up to your ears in preparation for the

In any case, I'm sure I'm not the first person to mention this. I assume that in April things will be back to normal. By the way, this letter will not be

(Continued on any page)

Yours very truly,
Don Nix

SPECIAL IMS INFO

IMS has arranged for special travel rates with Delta Airlines to and from the Atlanta and Milwaukee IMS Model Sport and Hobby Shows. Delta is providing a 40 (forty) percent discount off its domestic full round trip day/night coach fares. In addition, a 35 (thirty-five) percent discount off Delta's full round trip day/night coach fares will be offered for Canadian travel. For all of the

Continued on page 65

ADVICE FOR THE PROPWORN
—By Jake

Dear Jake:

I'm having radio problems with my Windward R/C glider. When I push the stick to the right with my right hand, the airplane turns right. But when I push the stick to the left with my right hand, the airplane turns left. Consequently, if I use my left hand to push the stick to the right, the airplane turns right. I could almost understand that, but if I push the stick to the left with my left hand, the airplane turns left!

What do you think the problem might be?

Anson in Milwaukee

Dear Anson:

Sounds like you've got an intermittent—between your eyebrows.

Jake

* * *

Dear Jake:

Why are the central top wing mounts on a biplane called cabane struts?

Bob in Donnelsville

Dear Bob:

The cabane strut gets its name from Descartes Cabainne, a French aviator later associated with the famed Lafayette Escadrille of World War I.

Cabainne was an advanced thinker and long before the war he envisioned aerial combat and its requirements for maneuverability, strength, and speed. He saw that tight maneuvering required strong wings, but that a biplane's wire bracing added drag and slowed the aircraft.

His first experimental aircraft, "L'Oisseaux DeCrepe" (The Ruptured Quail), simply eliminated the wing wires in order to assess their contribution to the aircraft's structural integrity. Having answered that, and after having his casts removed, Cabainne built "Le Grande Pechez" (The Large Carp). This second aircraft had extra and beefed-up struts to compensate for the missing wires. The plane performed well in flight, but having no negative G

Continued on page 68

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.

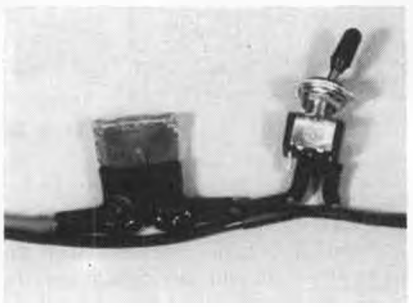
Nick Ziroli Plans, 29 Edgar Dr., Smithtown, NY 11787, has announced the release of its construction plans set for a Giant Scale B-25, famous WW-II medium bomber. At 1/8 scale, or 1-1/2 inches to the foot, the model spans 101 inches, has a length of 79 inches, and comes in at 30 to 35 pounds in weight. The prototype, built by Bill Steffes, placed second in its category at the 1989 WRAMS show, and has flown many times since then. Construction, as with all of Nick's designs, is conventional balsa and plywood. Plans consist of four sheets, with all parts full size. Both glass and gun nose versions are shown. Plans also show installation of flaps and Robart retracts. The prototype was powered by Zenoah G-23 gas engines turning 15 x 10 props. Two-cycle glow engines .90 to 1.08, or .90 to 1.2 four-cycle, can also be used. Cowls and canopies, including nose, turret, side, and two versions of the tail gun position are available. Price of plans is $38.00 p.p. in the U.S. For a complete catalog of all plans and accessories, send $2.00 to the above address. Catalog is free with a set of plans.

* * *

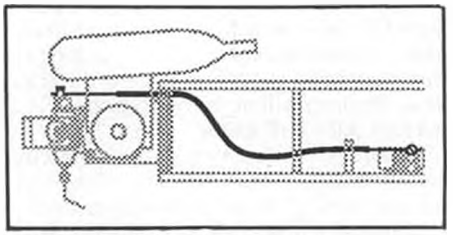
We first mentioned this next product almost a year ago, following the Toledo Show. For all intents and purposes, you could call it "iron-on tissue," because that's what it looks like, what it feels like, and if you could remove a 20 by 36-inch piece of tissue after it has had about three to four coats of dope added, and compared the two, what it weighs like! The biggest difference between the two is that real tissue, as anyone who has used it knows, just loves to be torn, punctured, and have careless fingers poked through it. On the other hand, Litespan, which we like to call "iron-on tissue," is in reality a tough synthetic material which is airtight, waterproof, and resistant to glow and diesel fuels (also rubber lube). It is also resistant to tears, punctures, and careless fingers. And best of all, it is finally available in the U.S.!

Charlie's R/C Goodies, 2828 Cochran St. Suite 281, Simi Valley, CA 93065, phone (805) 581-5061, FAX 805-527-9114, now has Litespan in stock. Weighing about one ounce per square yard, Litespan comes in two styles. The first has a tissue grain with the appearance of having several coats of clear dope . . . glossy, but without a plastic look. It comes in Red, Yellow, Orange, and Blue. They all have almost a luminescent appearance, and the blue is just gorgeous! The second style is more opaque: Dark

The Seamaster 120, from Ace R/C.

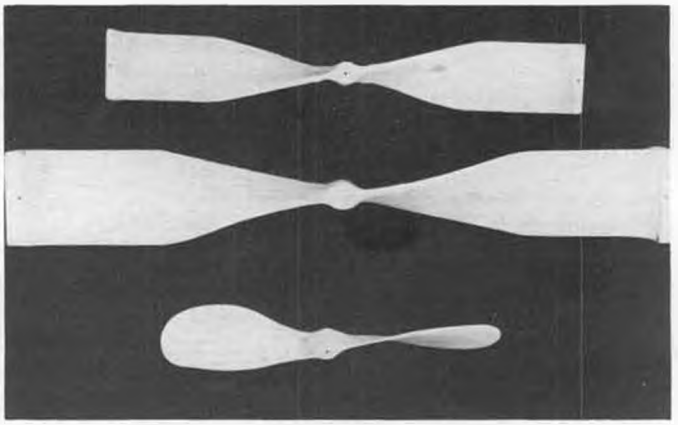


Fuse/switch harness by Ace R/C.

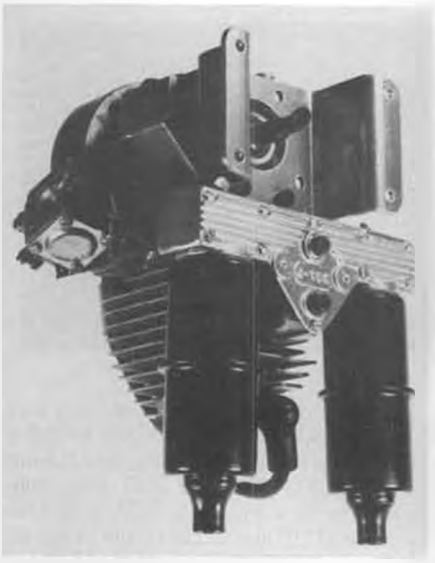


Flex Throttle linkage by Ace R/C.

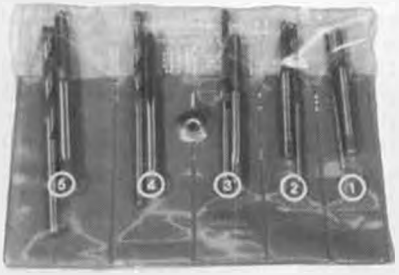
Jaguar XRJ10, 1/10-scale on-road car from Associated Electrics.



Machine-cut balsa props from Superior Props.



"Double Snuff" muffler by J'Tec.



Taps and matching drill bits from Ace R/C.

Green (for WW-I aircraft), Antique (Cream), Black, White, and Silver (a shiny textured aluminum effect). The sheets are 20 x 36, weigh about .56 ounces per sheet, and all can be painted or doped. To apply, the framework is first coated with Balsaloc, then the covering is sealed to the frame with a film-type covering iron, and then shrunk by iron or heat gun. Litespan is priced at $3.00 per sheet, and a 110 gram jar of Balsaloc, enough to install 7 to 10 sheets of Litespan, is $4.00. In addition to lightweight R/C models, and particularly the popular hand launch R/C gliders, we expect to see a lot of Litespan on free flight models belonging to those who are not totally locked into tradition. When installed, it looks so much like doped tissue, that you'll have trouble telling the difference. Just ask the modeler if you can give his "tissue" covering the poke test, but be sure to ask him *before* you poke, not after!

"EZ" Fuel Tubing, from Ace R/C.

Litespan is available direct, with additional shipping and handling charges. Standard discounts are available to dealers.

Before we leave Charlie's R/C Goodies, here are two more new products available: Glow Head Adapters for .049, .051, .09, and .15 Cox engines. Replace the standard glow head with this adapter, and you can use your favorite standard glow plug, particularly shorts, though long reach can be used in some cases. Just be sure to check for clearance with the piston at TDC (Top Dead Center). Prices range from $3.25, to $3.95, to $4.15.

The second item is iron-on hinges that can be applied directly over clean wood, sheeted, or Coverite covered surfaces. Eliminates control surface gap and increases control efficiency. One-inch hinge material, for surfaces up to 1/4 inch thick, 36 inches long, is $2.05. 1-1/2 inch by 36 inches, for surfaces over 1/4 and up to 1/2-inch thick, $2.35.

* * *

The word "Ninja" conjures up thoughts of martial arts, Black Belt, and the like, but among R/C slope soaring enthusiasts, it will now bring forth visions of a sleek, penetrating, aerobatic slope soarer designed by Mike Pratt and available in kit form from Sig Manufacturing, Montazuma, Iowa 50171. Listing for a very reasonable $59.95, the Ninja spans 58 inches with 500 sq. in. wing area, a length of 39 inches, and a flying weight of 30 to 32 ounces. For fast construction, the wings are 1/16 sheet balsa covered foam cores

Clipped Wing T-Craft, D.G.A. Designs' plans.

with an Eppler 374 airfoil, a die-cut Lite-Ply fuselage featuring "Tee-Lock" Alignment Tabs, pre-cut sheet balsa tail feathers, and a complete hardware package.

Another new product from Sig is called SuperStripe. It is not just another trim tape, but has several special features, the most notable being that its adhesive is totally

Giant scale Cessna-type gear from Ace R/C.

fuel proof. It also has a very high gloss and is very thin, and works well over painted or plastic film surfaces. It is made from a special elastic polymer so that it will bend and go around any type of compound curve very easily. The high nitro fuel used to test the adhesive damaged the painted surface it was adhered to but did not loosen the tape. The tape is also packaged in such a way that it will not "telescope" when stored away until used. SuperStripe comes in eight colors: orange, silver, yellow, dark blue, black, white, medium blue, and red. In 36-foot lengths, it comes in widths of 1/16, 3/32, 1/8, 3/16, and 1/4. Prices range from $1.99 to $4.25 a roll. Hmmmm . . . thin, glossy, good adhesion . . . sounds like just the thing to do a custom striping job

B-25 built from Nick Ziroli Plans.

"Ninja" slope soaring R/C glider from Sig Mfg.

Litespan synthetic tissue from Charlie's R/C Goodies.

Funk B-85-C built from D.G.A. Designs plans.

on the car . . . full size, that is. . . .

* * *

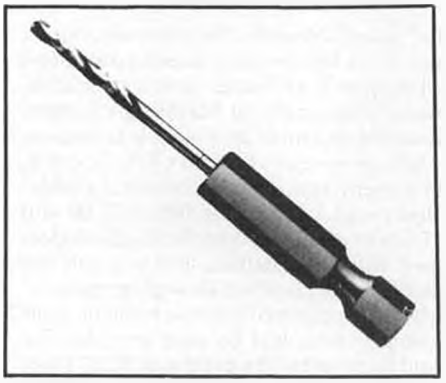
Ace R/C, 116 W 19th St., P.O. Box 511, Higginsville, MO 64037, phone (816) 584-7121, has a whole bunch of new items, the biggest one without question being the newest version of the Ken Willard-designed Seamaster, the 120. As the number implies, this 85-1/2 inch span flying boat is designed to be powered by an engine in the 1.20 cu. in. size range. The wing area is 1432 sq. in., length is 75 inches, and the flying weight is 16 to 18 pounds. The pylon-mounted engine and T-tail stab stay

Concept II rocket line from MRC.

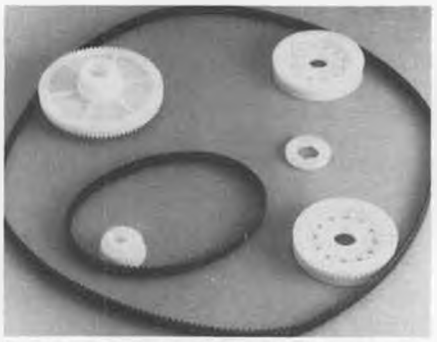
clear of the water while accelerating, while the high lift wing and double-stepped hull get it up on plane and off the water in short order. Lite-Ply is used generously in the construction, with lock-tab locaters to keep things in line during assembly. The wing is two-piece for easier transporting, and a landing gear kit is available separately for flying off of dry surfaces, making the Seamaster a true amphibian. Retail price of the kit is $199.95, landing gear is $14.95.

Now to the small stuff. First there is a fuse/switch harness for electric aircraft and boats. It is pre-wired, using FlexMaster 16 gauge wire, a 15-amp spade type fuse, and a heavy duty toggle switch. Fuse unplugs for easy replacement. Price $5.00.

Next comes a really new approach to



Drill bits for cordless screwdriver, from Ace R/C.



Yokomo YZ 10 Belt & Pulley Kit, Associated Electrics.

the usual fuel line and its various attachment and leakage problems. Ace offers "EZ" Fuel Tubing. This is stiff nylon tubing, 1/8 inch O.D., .096 inch I.D. which is a perfect replacement for the brass tubing normally used in fuel tanks. But not only that, it can also be bent to any shape using a heat gun, so it can run from the tank right up to the engine and pressure nipple. A short piece of regular fuel tubing is used to make that connection. Engine heat does not affect the tubing, so you can virtually wrap the "EZ" tubing around the engine in a tight installation. A $1.25 package includes four 12-inch lengths of "EZ" Fuel Tubing.

Drilling and tapping requires to things . . . a tap, of course, but also the correct size drill bit to make a hole to be threaded with the tap of your choice. Unless you do this ten times a day, you'll be digging around for your tap/drill chart and if you locate it, find that you need a bit that is bigger or smaller than your standard sizes. For $10.98, Ace has a drill/tap set that covers the five most used sizes for model building; 2-56, 4-40, 6-32, 8-32, and 10-32, plus the approximate drill bits, all packaged in a handy pouch.

For that cordless screwdriver, you can now have a set (or two) of drill bits to fit the chuck of the screwdriver. One set has four sizes: 1/16, 3/32, 1/8, and 5/32. The other set has three sizes; 3/16, 7/32, and 1/4. They cost $11.98 and $12.98 respectively, or you can buy individual bits from $2.98 up to $5.29. But get the sets. You'll always need the size you didn't buy if you only get one or two. How am I doing, Tom?

Giant scale aircraft need giant scale landing gears. Ace has a Cessna-style biggie that has a 19-1/4 inch tread, 7-1/8 inches high to the axle, and a 5-1/2 inch wide by two inch mounting base at the center. It's made from T-6 aircraft aluminum and cut to fit the 4-120 fuselage. Price is $19.95.

Yokomo YZ 10 Spur Gear Adaptor, Associated Electrics.

Back to the nylon tubing again, but this time it comes with a solid nylon inner rod, and is for a "no RF noise" throttle linkage. Called Flex Throttle, you heat-bend the outer tubing to give you a curved run from the throttle servo to the throttle arm on the carb. Nothing you can jam against it will pinch the tube so the inner rod can't travel

Continued on page 70

Sig Super Stripe trim tape.

R/C SOARING

By BILL FORREY

This year's International Modelers Show at Pasadena, California produced what must have been a record turnout for sailplane exhibitors. As in the past, it was a typically Southern California mix of mostly slope soaring aircraft with a smattering of thermal and electric designs to make things even more delightful.

To thoroughly review all that was seen or heard directly or indirectly related to soaring at this IMS is just not practical or even possible. Instead, I will attempt to hit the highlights as I saw them, and apologize to those who may be left out.

ACE R/C, INC.

Ace had two new items of greater than usual interest this year. The first item was the long-awaited Ace MicroPro 8000, an eight-channel computer radio. The second was a newly designed two-meter sailplane to be released in kit form.

Owing to the very nature of its myriad of functions and features, there is just no way I can do this radio transmitter the justice it deserves in just a few paragraphs. Paul Holsten from Ace took at least fifteen, maybe twenty minutes of his time to demonstrate some of the MicroPro's programmability, and although it looked simple enough, I doubt I can relay a fraction of what he said.

In general, the MicroPro 8000 has six proportional channels and two switch function channels. You have the option of transmitting four to eight channels to permit the MicroPro's use with four to eight-channel receivers.

It has four electronic trims (aileron, elevator, rudder, and flap or throttle). It also has in-flight automatic trim (for aileron, elevator, and rudder) which at the touch of a button allows you to redefine servo neutral trim while flying, leaving the trim tabs in physical neutral. This eliminates the fly, land, recalibrate neutral, and refly test routine that we are all used to.

All eight servos' end points are adjustable, and so are the neutral points (I believe). This makes model setup a breeze, and eliminates many headaches related to linkages.

There is a built-in stopwatch function for countup or countdown timing. There is a digital voltmeter which also has a beeper to let you know when to land—or else. There is a timer which lets you know how long the transmitter has been left on since you last charged its 800 mAH Ni-Cds.

In the mixing department, it has the flexibility to mix any channel with any other channel and in any manner (uni or bidirectional). In addition, it has preprogrammed differential aileron mixing, V-tail, and elevon mixing. You may have exponential throw on aileron, elevator, rudder, and throttle (flaps) with your choice of nine curves (from soft neutral to hard neutral). There is also an aileron coupling function which is adjustable, three dual rates (A/E/R), a throttle (flap) preset, and memory for eight aircraft setups. All programming and calibrating is menu driven, and is done with the control sticks, not a keypad.

Slope Scale booth brimming with beautiful WW-II war birds. PSS really growing, following trend set in UK.

Physically, the transmitter has a vinyl clad aluminum case with metal gimbals and sticks. You have a choice of single or dual stick configurations. Two things I'm not clear on. The first is whether this transmitter is AM or FM (or FM/PCM). The second is whether it is only available as a transmitter for under $375.00 (Ace's target price), or whether you can buy it as a complete system (I would assume this is possible!).

Transmitter news aside, Ace also had on display a two-meter sailplane prototype

Ace R/C's Tom Runge lofts new Easy Eagle two-meter sailplane. Note Micro-Pro eight-channel computerized Xmitter at bottom.

Mark Hambleton and his new Windstar I (and II) long wing ships. Slope racer and thermal versions available.

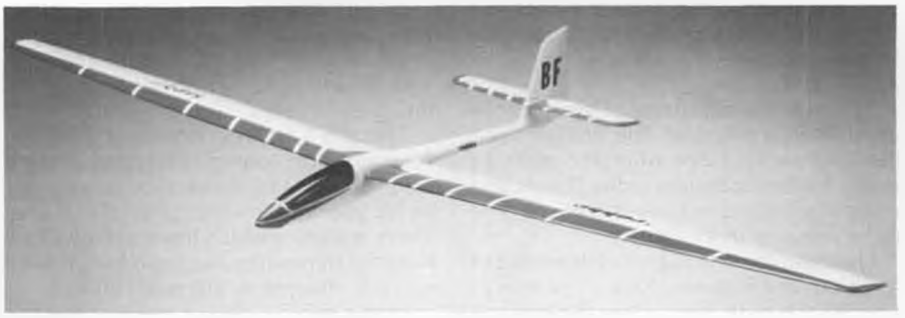
Gheetah Models slope combat and aileron trainer models, Cheetah and Super Cheetah. Replaceable parts make combat practical.

Sheryl Hambleton with Stryker (L) and Microfly slope ships. Military paint job makes Stryker look like true jet fighter, which it isn't.

VS booth too crowded to get decent picture until after closing! So many neat gliders, so little time to build them all!

Cliff Hanger Models featured nine PSS ships and one non-scale aerobatic model. Note all new F-18 Hornet. Something for everyone.

Jeff Fukushima, designer and proprietor of Vortech Models. A P-51 and Zero PSS gliders for the aerobatically inclined.



New Saphir from Robbe Model Sport. An ARF glider in two spans: 96 or 112 inches. Can also be converted to electric. Great model for those with little building time.

designed by Harley Michaelis called the "Easy Eagle." It is a polyhedral ship with flaps, rudder and elevator, Schuemann inspired multi-sweep leading edge, "turbulator spars," and a Selig airfoil (which one, they weren't sure).

A friend of mine from the St. Louis area, Mark Nankivil, is testing this sailplane, and he reports that it has excellent flying abilities. Any questions you may still have can be answered by writing Ace directly at: 116 W. 19th St., P.O. Box 511, Higginsville, MO 64037, or by calling (816)584-7121.

AMERICAN SAILPLANE DESIGNS

Gary Anderson is truly a sailplane lover. He loves gliders so much that he went into business as a mail order distributor for many off-brand and name-brand designs. Because of this, it's always a good idea to check with him when you are looking for any unusual kit sailplane. You can do this by calling (619)575-5133, or by writing 2626 Coronado #89, San Diego, CA 92154.

At the IMS this year, Gary introduced two new medium-tech competition sailplanes. They are the "Southwind" and "Westwind." Because no brand name other than Gary's own appears on the show brochure, I believe he is the exclusive distributor.

The Southwind is a polyhedral, intermediate contest or sport sailplane that is designed to use flaps for camber changing or landing approach control. It sports a Schuemann-like wing planform, but with only one wing tip panel per side, its not much different than a Gentle Lady. The wings come apart at the center as do the stabs for easy transporting. You get complete hardware, machine cut parts, hand selected woods, and an easy-to-repair balsa and spruce fuselage.

The Southwind spans 99 inches, has a wing area of 780 squares, features the good old Eppler 193 airfoil, has a root chord of 9 inches and a tip of 4.5, weighs 45 ounces (or more) for a 8.8 (or higher) oz./sq. ft. wing loading, and is 51 inches long. Gary's price is a reasonable $74.95.

The Westwind is more of an advanced contest or sport sailplane. It features flaps, ailerons, all-flying stabs, and rudder, which

The new shape, Cox Cobra, single-stick radio, in two or three channels.

Glidesigns "Lance" ("Lance-A-Lot" not shown). Milled hollow wings from solid balsa. See text.

Keith Schwemmer, designer of R/C flying wing "Genesis." Watch for Keith Shaw's, coming.

Curt Oliver, Celebrity Aerotechnical Designs, with T-tail R/C HLG. F 14 overhead is R/C; small one, along with other kits on rack, is free flight.

Katie Martin with Bob Martin Models Coyote and SR7, re-released near-indestructibles. Facility in Havasu is again cranking 'em out!

Gary Anderson, American Sailplane Designs with Westwind thermal competition sailplane, uses S3021 airfoil. New Southwind not shown.

Mini I and Kam-U aerobatic slope gliders from K&A. Will also custom cut form cores. See text for more.

makes this an excellent choice for radios like the Airtronics Vision or Ace MicroPro. It too is Schuemann-like in appearance with a flattened Gentle Lady wing plan. Unlike the all built-up Southwind, the Westwind comes with foam core wings and built-up fuselage.

Specs for this ship are: wingspan, 102 inches (can be chopped to 100); root chord, 10 inches; tip chord, 6.5 inches; wing area, 844 squares; airfoil, Selig 3021; weight, 60 ounces; length, 50.5 inches. Gary is asking a fair $125.00 for this sailplane kit.

BOB MARTIN R/C MODELS

From out of the Lake Havasu area comes a pair of re-releases that will send many to their local hobby shop with cash in hand. Katie Martin says that the Coyote and SR-7 aerobatic slope ships with their indestructible plastic Duralene fuselages are back in circulation.

There isn't much need to go over specs with these sailplanes as so many of you are familiar with them already. Suffice to say they are rugged with a capital R, attractive, and fun to fly. If you fly from a slope that likes to chew up your sailplanes, try one of these, you'll like 'em.

CELERITY AEROTECHNICAL DESIGNS

This company is just getting off the ground with a handful of products that are really neat. If any of you out there have kids from ages five to on up, you've got to try CAD's "War Wings" hand launch glider jets. They aren't R/C, but they are gliders and they really do fly. There are F-14 Tomcats, F-18 Hornets, Russian MiG-23 Floggers, and Russian SU-27 Flankers. All are about 10.25 to 16.25 inches in span and about 14 to 17 inches long. They come machine precut from balsa, and glue together in about 15 minutes. They include scrap balsa for beginners to practice gluing using the instant glues, instructions, and even nose clay for balancing.

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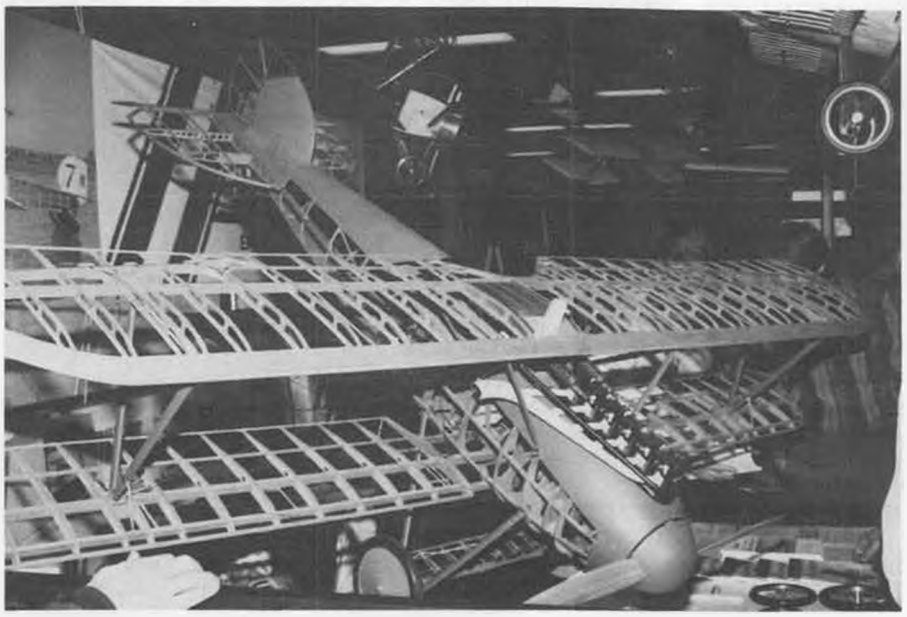
EZ Sports Aviation's electric ARF motorgliders, the Lota 1700E. Easy assembly, great flier.

Combat Models PSS offerings A4 Skyhawk, A-10 Thunderbolt II, MIG-23 Flogger, and F-16 Falcon. Byron Bruce designer and proprietor.

Dynaflite's new Apogee thermal duration ship hovers above classic Thornburg "Bird of Time." Both are great contest ships.

BIG BIRDS

By AL ALMAN



The bare bones of a Proctor Albatross DVA. Don't even think about it unless you're an experienced model builder. It's a NNRF, Nowhere Near Ready to Fly!

COORDINATING RUDDER WITH AILERONS

Most of our Big Birds look and fly a lot better if we learn to coordinate rudder and ailerons.

It's true that many of the newer radios include a CAR (Coupled Aileron and Rudder) switch/control, but you'll do better if you learn to coordinate both sticks. By doing this you can adjust the amount of rudder or aileron at any given time to keep those turns looking good; something you can take pride in.

There's another good reason for learning how to coordinate those two controls. If you lose aileron authority for any reason, instinctively coding in with the rudder stick may very well save your bird. Most guys with aileron problems keep on pushing that stick from side to side in a futile attempt to regain lateral control and never even think of using the left stick. So they often end up with a plane that's totalled and a transmitter with a severely bent right stick.

It's worth practicing.

WHAT'S A BIG BIRD?

Everybody seems to have their own ideas about what qualifies a model to be a Big Bird.

The International Miniature Aircraft Association (IMAA) uses wingspan to define what is and what isn't a Biggie. Any monoplane over 80 inches and any bipe over 60 inches can take part in an IMAA Sanctioned Fly-In. The aircraft itself, however, can be anything from the ubiquitous "Stick" to a super-detailed scale model as long as it meets these wingspan minimums. Also, IMAA Fly-In's are noncompetitive; they are low-pressure, social events—no Judging or trophies allowed.

The Quarter Scale Association of America (QSAA), on the other hand, leans toward scale or scale-like models and has no wingspan parameters. They're happy with any true quarter-scale rendition, regardless of size. Unlike IMAA, QSAA entries are judged and prizes/trophies are awarded.

As far as this column is concerned, any flying machine that spans over six feet is okay, although bipes should be somewhere close to 60 inches minimum.

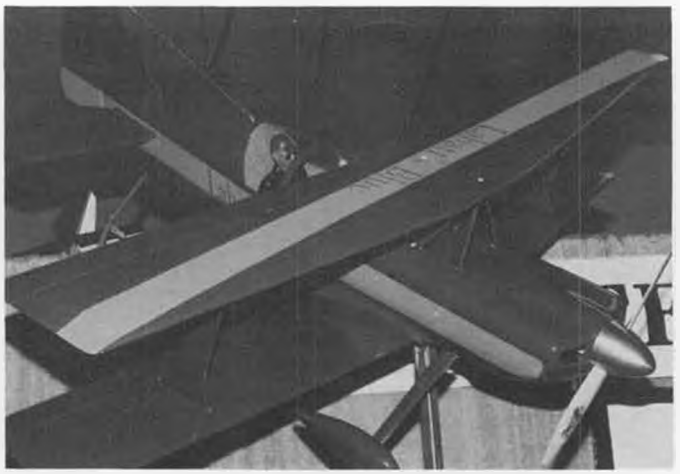
Now, some guys feel that every bird, no matter how many wings it has, should be at least 72 inches, while others insist that an absolute minimum of 80 inches is the only way to go.

But it seems that size alone is not the only way to determine Big Bird status. Lots of folks are more concerned about the type of power used than the planes's actual wingspan or size.

Some figure that no matter how big it is, a Big Bird must have some sort of internal combustion power pulling or pushing it, or else it doesn't qualify. These people are willing to lump both two-cycle and four-cycle engines together.

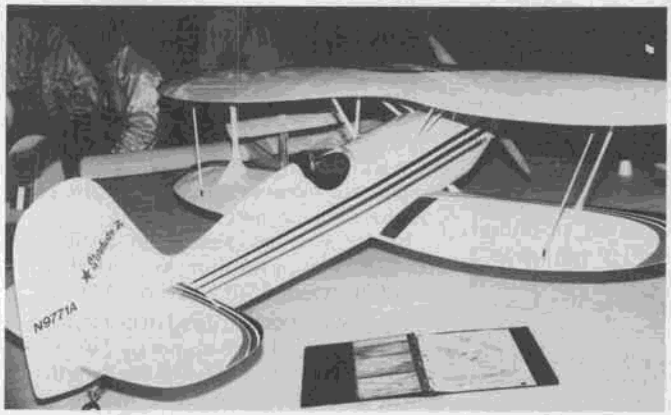
But not the guys who love the thundering noise of two-cycle gas burners like the Sachs, Quadras and Zenoahs. To them this

Ultimatesport R/C's Sukhoi SU-26M. An ST-3000 is recommended for power. It's a 14-pound aerobatic machine.



Another Ultimatesport R/C . . . the Ultimate 10-300. Span 62 inches, weight is 13-15 pounds, and best powered with ST-3000 or equal.

Albatross DVA built by Dick Hanson from Proctor kit.



Beautiful "Starduster Too" by John Cobb, from Dario Brisyghella's plans.

Joe Bridi's "BIG Bee" is a popular airplane. Flies well on 1.08 up to a big Sachs. Many have been customized.

is the only way to go.

Of course the four-cycle enthusiasts don't think that you can make a Big Bird sound decent or realistic with anything other than a four-stroker.

Electric power is not generally considered to be a valid part of the Big Bird formula because . . . "these planes are wimpy in both performance and sound." I guess the message here is that electrics aren't macho!

But what's probably most surprising is the way IMAA rules have been interpreted. Nowhere is it stated that power is limited to a certain type of engine or motor, yet I keep getting letters that read:

"I agree that Big Birds should be engine-powered as per what IMAA stands for," and . . . "It's too bad we have to tolerate people with whims about electric motors in a Big Bird club."

Some guys have even gone so far as to quit an IMAA Chapter because they felt that without a Big Banger up front a Big Bird just ain't what it's supposed to be.

I don't understand what all the fuss is about. Unless it's because a noise abatement or safety rule has been violated, why does it matter what the other guy's plane is powered with? We're forgetting that this is a *hobby* and that the basic idea is to relax, socialize and have fun.

Sure, we need some rules, but only enough to insure that we govern ourselves in a safe manner and that we remain considerate of others, especially non-modelers.

NORTHWEST MODEL EXPO

As usual, the Expo keeps getting Bigger and better. It's held at the Puyallup Fairgrounds and what has really helped this show grow has been the renovation a few years ago. The old barn-like buildings were cold—you could hear and feel the wind whistling through and everything associated with the old fairgrounds, especially the food concession, was kinda makeshift.

The new setup is much more inviting and so much more comfortable for the folks on both sides of the booths. Many spectators have mentioned that the new, warmer buildings helped draw them to the show. I'm not sure if this year's show set an attendance record but no matter where you turned there was a solid wall of humanity.

Although there were beautiful model aircraft of all sizes in the manufacturer's booths and on display, people seemed to be drawn to the Bigger airplanes. And there were plenty of them to be seen.

Looking back 10-12 years ago, I remember that many self-proclaimed prophets were all too quick to spread the word that Big Birds were a fad, a very temporary thing that would shortly fade away. And at that time not many manufacturers were willing or able to provide us with the engines, kits or parts we needed.

Continued on page 76

Big and Beautiful . . . the only way to describe Bob Kreuzinger's Quadra-powered DC-3 built from Nick Ziroli plans. Won top honors at Northwest Expo.

ELECTRIC POWER

By MITCH POLING

In the December column I asked for information on torque meters so I could measure electric motor horsepower directly. Just after that, Ivan Meek wrote about how to build a torsion rod dynamometer in the November '89 issue of *Model Airplane News*. Then shortly after that Francis Reynolds, who writes the "Model Design and Technical Stuff" column for *Model Builder*, wrote to me and described his pioneering with pendulum dynamometers. Meanwhile, I found an FAA/DOT Aircraft and Powerplant Handbook, AC 65-12A, that described the Prony brake. Now I have plenty of information! I would like to thank Francis especially for sending much information. Francis may well have been the first to build and use a pendulum dynamometer for model engines. He will go into the ideas and principles in more detail in his column.

I built a Prony brake and a pendulum dynamometer, and both turned out to be very simple to build. The sketches show how. The Prony brake is very simple . . . just two bolts, two pieces of wood, and a scale, plus a boat-type coupler for the motor shaft friction surface. The Prony brake presses on a digital scale for the force measurement. I use a Duncantronic CR-105 digital scale. I have had this scale for nearly a year, and I am very pleased with it. I recommend it for measuring anything; from one-gram balsa pieces to four-pound aircraft ready to fly. It will weigh up to 2 kilograms (4.4 lbs.) and will do the first kilogram (2.2 lbs.) in one-gram increments. This is better than most digital balances I have seen advertised. It also has a built-in calculator, alarm clock, and gram to ounce converter. Pretty fancy! It is quite compact; 7-1/2 x 6 x 2-1/2 inches, and is priced lower than most digital balances. It is Item No. P96-7384-522, price $39 plus $5 shipping, from Comb, 1405 Xenium Lane N, Minneapolis, MN 55441-4494, phone 1-800-328-0609.

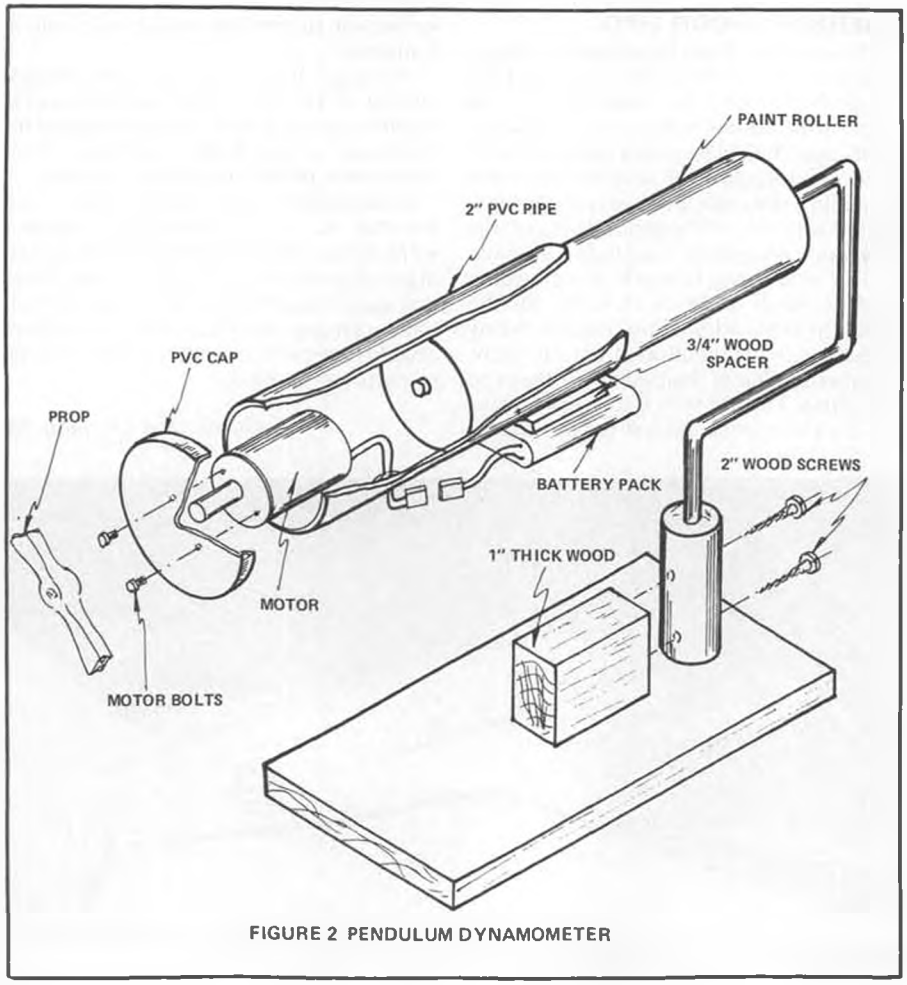


FIGURE 2 PENDULUM DYNAMOMETER

I made the pendulum dynamometer from an eight-inch long, two-inch O.D. PVC pipe, a PVC cap for the pipe, and a paint roller! The battery pack serves as the pendulum, the paint roller provides the plastic bearings. If the plastic proves to have too much friction, I will replace them with regular ball bearings. The paint roller handle is screwed to a wooden base which I usually use as a motor test stand. The motor bolts inside the cap, and the motor battery is held onto the PVC pipe with Velcro and rubber bands. The battery pack is the pendulum, which eliminates the drag that wires to an outside pack would generate. Besides, it eliminates making a pendulum!

The horsepower equation for the Prony brake is:

bhp = scale reading (in lbs.) x length of arm (ft.) x rpm x 1/5252.

The horsepower equation for the pendulum dynamometer is:

bhp = sine of pendulum deflection (degrees) x pendulum weight (lbs.) x pendulum length (ft.) x rpm x 1/5252.

If you wish watts instead of horsepower, you can multiply the above by 746. Alternatively, you can measure the lengths in cm. (centimeters), the masses in g. (grams), and use 1/97650 instead of 1/5252 to get an answer in watts. I just finished building the dynamometers, so I have no experimental data yet; we'll save that for another time. This does get us closer to the goal, which is "Peter Chinn"-type motor evaluations, with real numbers and motor curves. Then we can look at a motor and know what we have!

I reviewed some of the books on electric power available in Germany in the April column. Since then I saw the article on Solar Power by Guy Revel in the January *Model Builder*. This is really a good article, and it inspired me to buy one of the books I mentioned, *Solar Modellflug*, by Helmut Bruss. This is really a fantastic book, it is very clear that Helmut is both enthusiastic and knowledgeable. If any of you are interested in solar powered models, I recommend this book. It is in German, but is so profusely illustrated that you can learn quite a lot just using a good German dictionary to translate captions. It covers the advantages and disadvantages of a huge variety of subjects. Some of them are coreless versus conventional motors, ferrite versus cobalt versus boron-neodymium-iron motors, single crystal versus polycrystalline solar cells, conventional versus special airfoils, on-board batteries versus pure solar power, wiring solar panels, three-views of successful solar planes, and on and on. The 114 pages are packed with information. Helmut flies solar planes, so all this information is backed by his personal experience. There is a list of solar power supplies included, these are German, but several are International and could supply U.S. customers. The book is available from Verlag fur Technik, Postfach

1128, 7570 Baden-Baden 1, W. Germany. It is DM 25 plus about DM 8 for postage, about $20 total. One of these days I will try solar power. All the planes shown are conventional planform. I think flying wings, such as the Klingberg, would make excellent solar fliers. The Klingberg is exceptionally efficient and has no vertical surfaces to shade the solar cells.

I just purchased another book from VTH *Der Akku in Modellbau* (Batteries used in Model Building), by Helmut Wolken-Mohlmann. It is a real value at 14.80 ($9). There are lots of schematics for fast chargers, including one that will charge up to 10 cells from 12 volts. The nice thing about this book is that the circuit board layouts are included (for photocopying onto circuit boards). This really reduces the effort of doing your own. The book is available from VTH at the address given above.

Modell magazine also has an excellent series on electric planes and related topics. I bought two books by Ludwig Retzbach; "Drehzahlregler" (speed controls), and "Akkus und Ladegerate" (Batteries and Chargers). Ludwig clearly knows his subject, both books are over a hundred pages and profusely illustrated. Like the Solar Power book, you can learn a lot just from illustrations and captions. The speed control book shows schematics for speed controls that you can build. They range from very simple to quite sophisticated, with optocoupling and the ability to handle 28 cells. The battery book includes schematics for chargers with peak detectors, with the ability to charge up to 24 cells from 12 volts, and temperature sensing. The speed control book is DM 24 (about $15), the battery book is DM 22.40 (about $14). Other books in this series are: RC Electroflug by Hans-Dieter Levine, a classic book revised in 1988, DM 29.80 ($18), Modellbau-Electric Leichtgemnacht (Electric Model Building Made Easy), by Hermann Bock, DM 14.80 ($9), and Electroflug Muss Nicht Teuer Sein (Electroflight Doesn't Have To Be Expensive), DM 9.80 ($6). Include about DM 8 ($5) for postage, Neckar-Verlag GmbH, Postfach 1820, 7730 Villigen-Schwenningen, W. Germany.

One last item about books, then enough! Dave Snider wrote to tell me about his Seagull. I made an offer to send tracings of the Seagull for $1 over a year ago, and I am still getting requests! I have sent about forty of them. Don set up the Seagull as both a seaplane and a wheel plane. Anyhow, he decided to use the brake circuit shown in my book, *Building and Flying Electric Model Airplanes*, page 27. He ran into a snag, the circuit didn't make sense. He's right, the circuit is wrong! The book has been out since 1984, and has had a revision and second printing in 1988 and still, somehow, that error got through. Well, that will keep me humble. The correct circuit is shown here. The one shown in the book will run the battery right through the brake resistor, which would probably burn out the resistor, or cause enough heat to cause a fire. Ouch! If you have the book, change the drawing. By the way, the brake resistor can be just a piece of wire; that is, no resistor, just a shunt. That will provide very rapid braking action for those props that stubbornly refuse to fold. Thank you, Dave, for pointing this out.

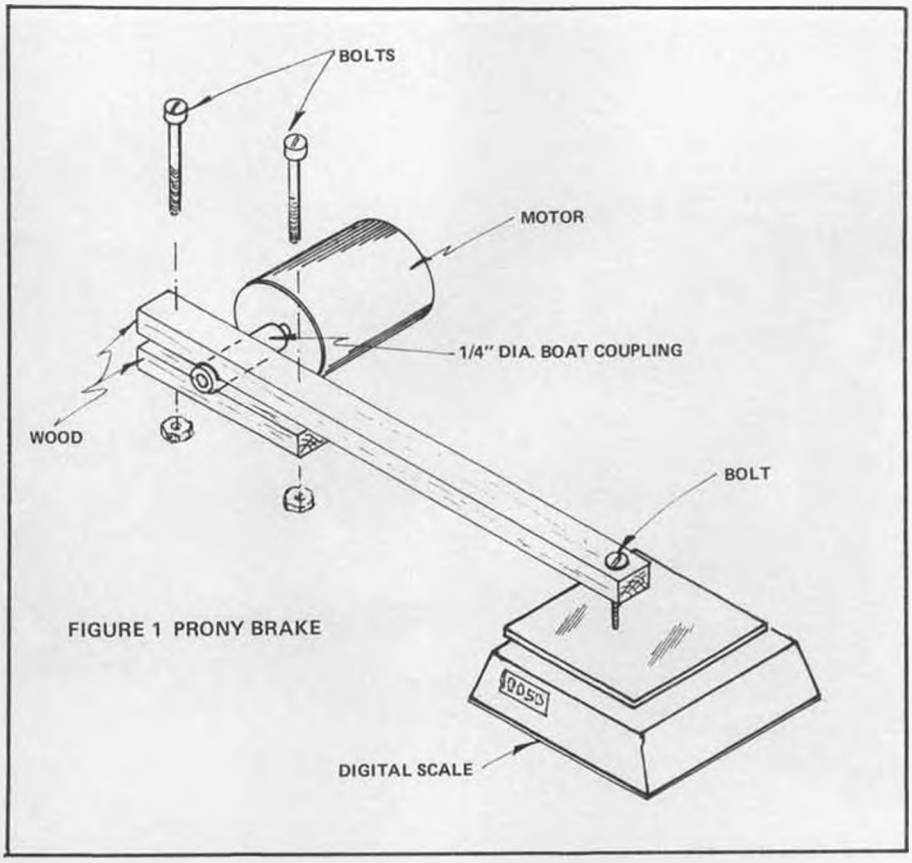


FIGURE 1 PRONY BRAKE

Scott Hartman sent in the first flying report on the Seagull. At 39 ounces his plane will outclimb a lot of the sport electric trainers on the market. ROW is in about 50 feet, and six cells are best, five cells are good only in very flat water. Landing is best done on the natural glide path until a few feet above the water, where elevator is fed in gradually until the speed bleeds off. The plane loops and rolls with just rudder and elevator. Scott is quite pleased with it, and has over fifty flights on it. If others who got the tracings have flown their planes, I would be very interested in hearing about it. I still have some tracings, they are still a dollar! I think I might make one change in

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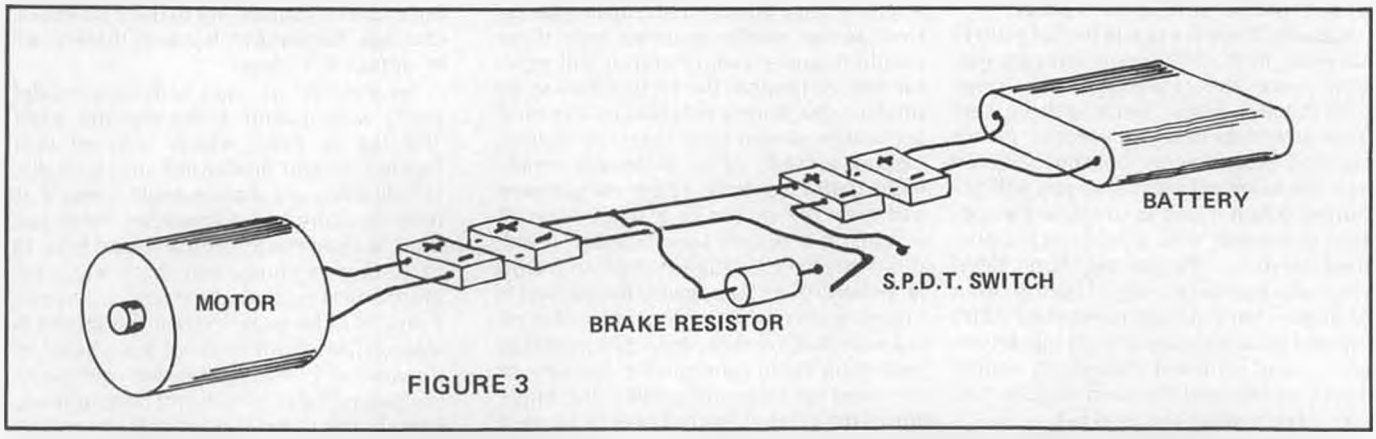


FIGURE 3

Correction to "Building and Flying Electric Model Airplanes," page 27. The correct wiring is shown: motor connects to center terminal of SPDT switch, battery connects to one side, brake resistor to the other side of switch.

Long-time (notice we didn't say "old") very good friends of the writer, Betty and Carl Cantera, now semi-retired and living on the Chesapeake in Maryland, with their K&B .45 Greenhead powered Smog Hog. Radio was an eight-channel Bramco, with ground-based transmitter operated by the single-stick control hand-held box with connecting cable, hanging on the antenna. Eight-channel meant four controls; one channel for each direction of rudder, elevator, ailerons, and throttle. Note air pump. Back then it was for inflatable tires, not retracts!

"I ain't got it!"

By BILL NORTHROP

Rubber Only! Did you see that typo error in the last "I Ain't Got It" column? In closing, we said, "Come back next month (it has now been several months) and we'll do some loops and rolls . . . with rudder-only!" Trouble is, the typesetter put in "rubber" instead of "rudder."

Actually, there is a vague hint of truth to that error, in that the *rudder*-only escapements were almost always *rubber* powered! We say "almost" because there were a few attempts at using electric motor powered escapements, but they suffered from the same problem that you will encounter when trying to simulate escapement operation with a modern proportional servo . . . they're too damn slow! When you pushed the signal button on an old single-channel transmitter, the rudder snapped instantaneously to its full deflection . . . and returned instantly to neutral when you released the push button. And that's exactly what you needed.

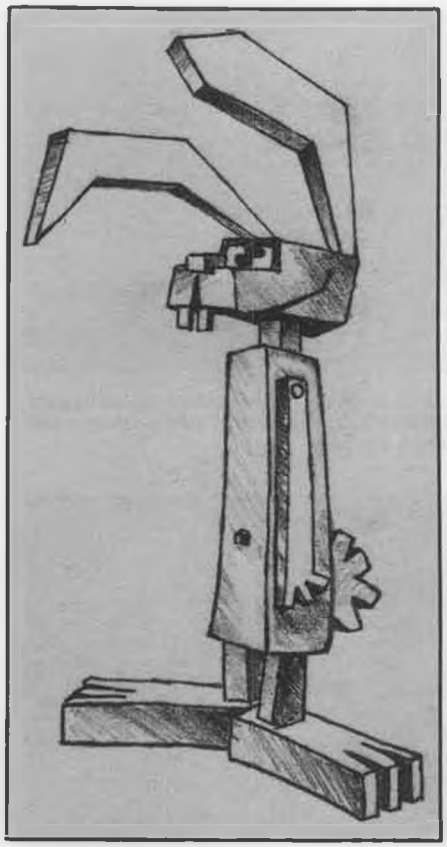
This brings up another characteristic of escapement-controlled model designs. If you study any of the plans for vintage single-channel, rudder-only models, you'll note that the rudder area was very small. The "WAG" featured in the December '89 issue is a good example. Note the extremely narrow chord on the rudder. This characteristic came about for two main reasons. First, as the rudder assumed only three positions under radio control; full right, full left, or neutral, the surface had to be small or the plane's reaction to a control application would have been too violent, causing a crash, or an extremely erratic flight path. Secondly, as the escapement had only the power of a single loop of wound up 3/16 or 1/4-inch rubber strand, it did not have enough oomph to push a large control surface against the air load of a moving aircraft! This is the reason that on old scale R/C models, restricted mostly to high wing cabin monoplanes because of the need for inherent stability, the hinge line of the vertical fin could not be located in the scale position . . . it was usually moved back so that only about one-third of the scale rudder actually moved.

OK, are you ready to try a loop, using nothing but rudder control? Get plenty of altitude so you'll have room to spare. Of course, it's reassuring to know you have elevator control if you run into trouble, but promise yourself not to use it unless all else fails. Remember, it wasn't there at all in vintage R/C days!

For the first try, start with your model pretty well upwind. Make a gentle, wide 180-degree turn, which will get you headed straight downwind and, typically, still climbing at a shallow angle. Leave that throttle alone too. Remember, from last time, we had the throttle adjusted for a 15 to 20-degree climb, and that's it . . . no more adjustment on the throttle . . . we're flying "rudder-only." When the model is about directly in front of you, headed downwind, hit full right or left rudder. As the plane begins to turn and drop its nose, keep holding that rudder until the model has almost completed 180 degrees of turn. At the appropriate moment . . . it may take

a few tries before you get it right, release the rudder to neutral and pop in an instant of opposite turn to make the model straighten out at exactly 180 degrees and headed upwind. At this point, depending on the type of model, it may be pointed anywhere from straight down to somewhere around a 30 to 45-degree downward angle. Having built up speed in the spiral dive, the increased lift generated will automatically bring the nose up into a climb that may or may not continue until the model pulls over the top, or at least falls over on its back into another dive . . . your first rudder-only loop. Nobody said they would be perfectly round!

If the model pulls up to near vertical, but falls off before completing the loop or falling over on its back, you may need to help it build up more speed in the spiral dive. This can be accomplished by making the dive longer, even up to a 360 degree spiral (which, of course, would have to be started in an upwind direction in order to pull out into the wind). The main point is to neutralize so the plane will pull out into the wind. It may be that the model you are using is too light and docile for aerobatics . . . a true beginner's trainer. If it won't do this basic stunt, chances are it just isn't suitable for the job; you'll have to go to something a little hotter. Some of the really aerobatic vintage rudder-only models only required little more than a 90-degree spiral dive to build up enough steam for a loop. But on the other hand, when flown by a beginner, these were too hot to handle and soon got way ahead of the pilot, resulting in flyaway or crash loss.



Bob Lopshire designed and drew this logo for our "Square Hare" model. Yes, we were "from Delaware" at the time!

The writer with his first published model, about third R/C, one-inch scale Great Lakes Trainer with rudder-only control. McCoy .09 engine. For about 50 percent of every flight, no radio was used. It flew big, lazy circles to left. Radio mostly used to guide it back to landing area. Photo taken at Indiantown Gap, PA, 1957 or 1958.

If you're fortunate enough to have a model that requires no more than a 180-degree spiral dive to build up enough speed for a respectable rudder-only loop, you're ready to tackle the next basic maneuver, a barrel roll. You can just say "roll" if you want to, but nowadays, that expression *usually* refers to an axial roll, in which the aircraft is supposed to rotate around its centerline as it rolls. In a barrel roll, the aircraft sort of spirals around an imaginary horizontal line as it rotates through 360 degrees. The barrel roll is really a prettier maneuver than an axial roll . . . though it doesn't look pretty to the flier who was actually trying to do an axial roll when his aircraft decided to fly around the horizontal line instead of rotating on it!

Mercy! It is so easy to digress! Let's get back to the rudder-only barrel roll. The maneuver begins like most rudder-only maneuvers . . . with a spiral dive to build up speed. For simplicity, let's assume your model needs a 180-degree spiral to build up speed. This time, you head upwind until you're a couple of hundred yards from the

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The writer and his "Torrero," designed by Willy Smith and published in an early *RCM*, around 1964-65. Engine was a Clarence Lee .45. Note also twin wheeled nose gear. Basically a Stormer, the thick wing, with full-depth, notched 1/8 spars, was strong and light. A real good flyer. Our first multi-proportional, using Don Brown's first, grey-box Quadruplex. Tired of seeing my photos? Come on guys, send in pics!

Schneider Cup Reenactment Director, Bob Martin, second from right, along with officials, examine Bob Heitkamp's winning 1927 Supermarine S5. Scored 87 out of a possible 100 points maximum. Scale size was just under one-third, .311.

A Supermarine S5 (two were entered) stands by on the beach as a Macchi banks for the Number One pylon.

SCHNEIDER CUP RACERS at Lake Havasu

By BOB MARTIN . . . Reenactment of the famed Schneider Cup competition as told by its creator and director. It could become the R/C scale event of the decade!

As with anything new, or anytime that you try something for the first time, there will be the surprises and the disappointments. This applies to Lake Havasu for the Schneider Cup Re-Enactment, and to the event itself.

The aircraft were, with only a couple of exceptions, beautiful replicas of the best seaplanes of their day. To my delight, most were detailed beyond the minimum requirements and the way they flew was so realistic that the 5,000 plus spectators applauded each flight.

If I were to express a disappointment in the aircraft, it would be simply that some of these great aircraft were unable to finish the event due to technical problems. A loss, not only to those who endeavored so long to be here, but to all of us who missed the opportunity to see them compete. We all wish better luck next year!

The event was, by most standards, a tremendous success! The number of aircraft entered, twenty-four in all, was far greater than anticipated. The quality of the aircraft and the proficiency of the pilots also was a surprise for us. We of the "Committee" take our hats off to the competitors, who were a part of and made this first event such a success, congratulations on a job extremely well done.

We must also thank those competitors who tolerated the problems that we encountered in our first event. We can assure you that we have already taken measures to insure that those problems will not re-

Exactly scale takeoff style of R3C-2 done by pilot Ken Merrill. Don't believe it? View old films or ask Jimmy Doolittle!

Splooshl We're guessing, but this may be Bob Heitkamp's S5 not exactly kissing the surface of Lake Havasu.

Nifty rig for scooping up and returning stalled aircraft, with Curtiss R3C-Z on board. Macchi MC 72 awaits clearance.

A Gee Bee on floats? It'll never fly.

Well . . . Aw, come on!

Wow, steady as a rock! Seein' is believin'. Mike Johnson silenced a lot of hecklers during the fun-fly portion of the weekend.

Larry Botsford's seventh place Supermarine S5 displays the typical fine workmanship and magnificence of all of the Schneider Cup racer models brought to Lake Havasu.

occur next year.

So you can plan your vacation, schedule your building time, make reservations or whatever, the 1990 event is scheduled for November 2-4. Friday, November 2nd, will be for sign-in; November 3rd and 4th will be flight realism; and the awards presentation will be late Sunday afternoon.

For those of you who did not have the opportunity to witness this historic first Schneider Cup Re-Enactment in the US, I will try to convey to you what happened, but when describing the feeling you got if you were here, words fail me.

For the next five days, mother nature would offer the contestants and spectators some of that great Havasu weather we enjoy so often. The cloudless blue sky would offer an uncluttered backdrop for some of the most unique racers of all time. The mornings would be in the high sixty degrees, and by noon the mercury would rise into the eighties, and only a mild breeze would drift through occasionally. Perfect weather conditions allowed the spectators to lay back on the grassy incline that led down to the beach, some under the shade of the palm and olive trees, while others just soaked up the rays.

Wednesday, Nov. 8th

Many of the competitors had already arrived. The excitement was running high, and the members of the Desert Hawks R/C Club had marked the parking area so that as many RVs could be parked close to the flight line as possible. Late into the night RVs rolled into Lake Havasu and the Nautical Inn. Roy Slater, from Salinas, CA, who had entered a beautiful Sopwith Tabloid, arrived on Tuesday and helped mark the parking and manufacturers area, and then helped late into the night showing late arrivers where to park. Joe Russo and several other members of the Catalina R/C Modelers up from Tucson, AZ, came in on Wednesday night and gave us a hand with parking on Wednesday night and throughout the event. Their wives took over on Saturday so that their husbands could watch the event. Our thanks to you girls too!

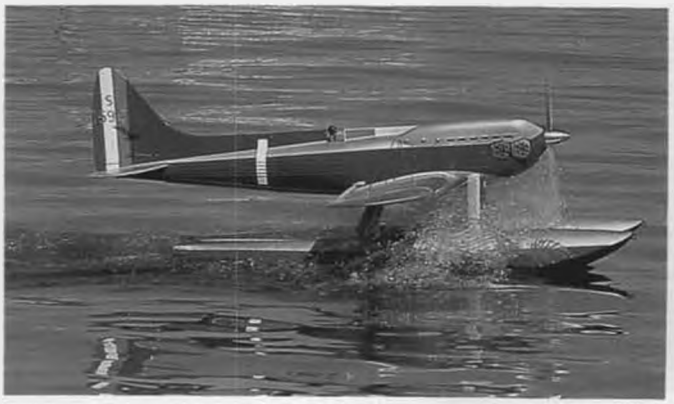
Thursday, Nov. 9th

At the crack of dawn, entrants were waiting outside of the convention center (where the registration, static judging, and safety inspection took place), ready and eager.

At registration, each entrant was given a packet with passes, goodies, and a special book that outlined and explained each step they would go through. Next, each transmitter was presented for spectrum analyzation by Fred Morgan. Once this step was complete, each aircraft was internally inspected and then assembled for static judging. This is where things started going wrong.

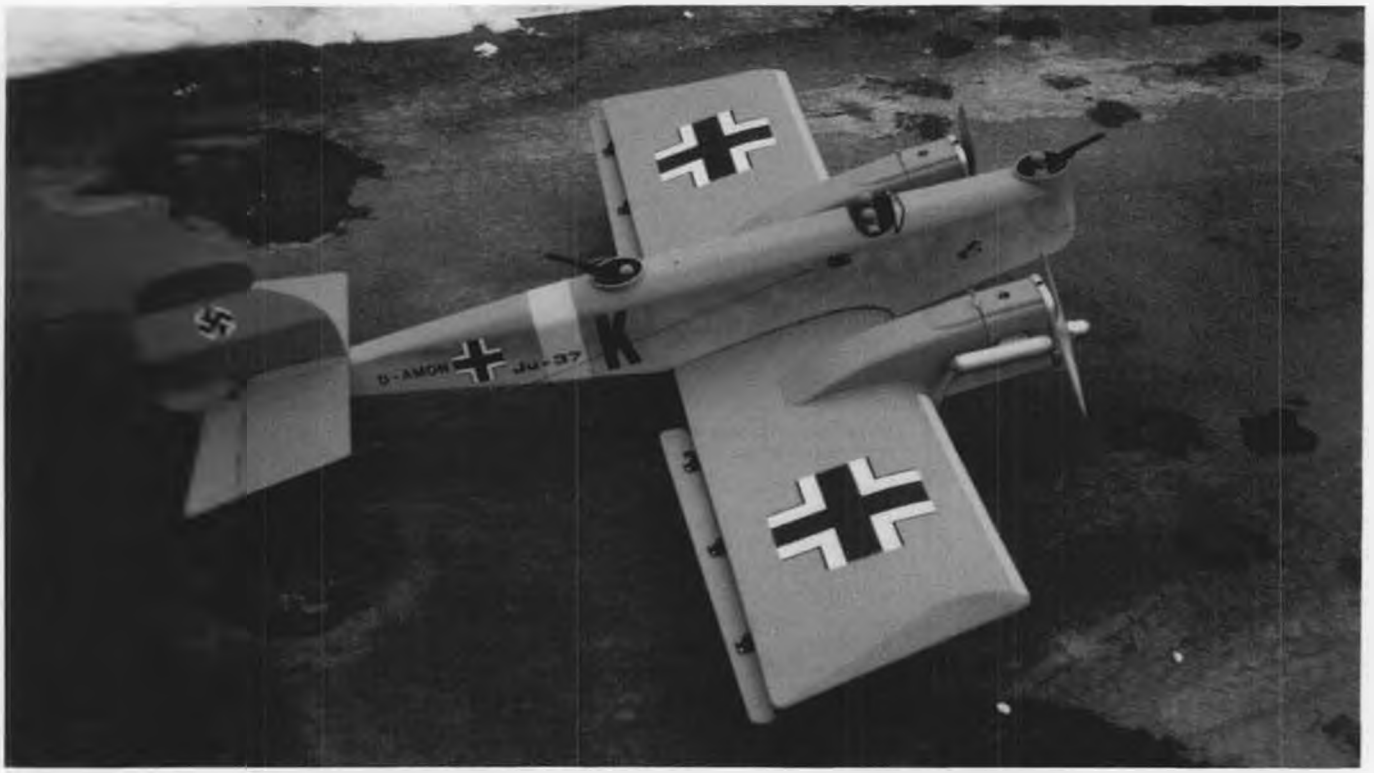
We had labored long to find, what we believed, to be the most knowledgeable judges of Schneider Cup aircraft. We had confirmation from our English, French, and two US judges, and a potential Italian judge. What a class act, I thought to myself. One US judge was forced to cancel due to a scheduling change at his employment. We still had three, and possibly four judges, nothing to be concerned about . . . after all, I had hundreds of other things on my mind. Tuesday night I received a call from the French judge. He had the flu and could not come. I began to worry, and late Tuesday night I was told that our efforts to get the air transportation for the Italian judge had failed, and he would not be here. Panic began to set in . . . What will I do? It is

Continued on page 104



Ken Bundt's sleek 1931 Supermarine S6-B on a high-speed taxi. It is quarter-scale and powered by tandem-twin ST 6000.

Ray Young, of local Desert Hawks club, won raffled Stream Eng. Schneider look-alike. Bob Martin, left, Tom Swift, right.



On a runway pock-marked by bomb damage repairs "somewhere in Germany," the author's Ersatz JU-37 Bomber awaits the signal flare to take off. Note the special aileron treatment, using Fowler type flap hinges.

ERSATZ BOMBER JU-37

By ALEX McLEOD

Here is a might-have-been airplane built from a Midwest Twin Stick kit or scratch built from these plans. It's as stuntable as any pattern design.

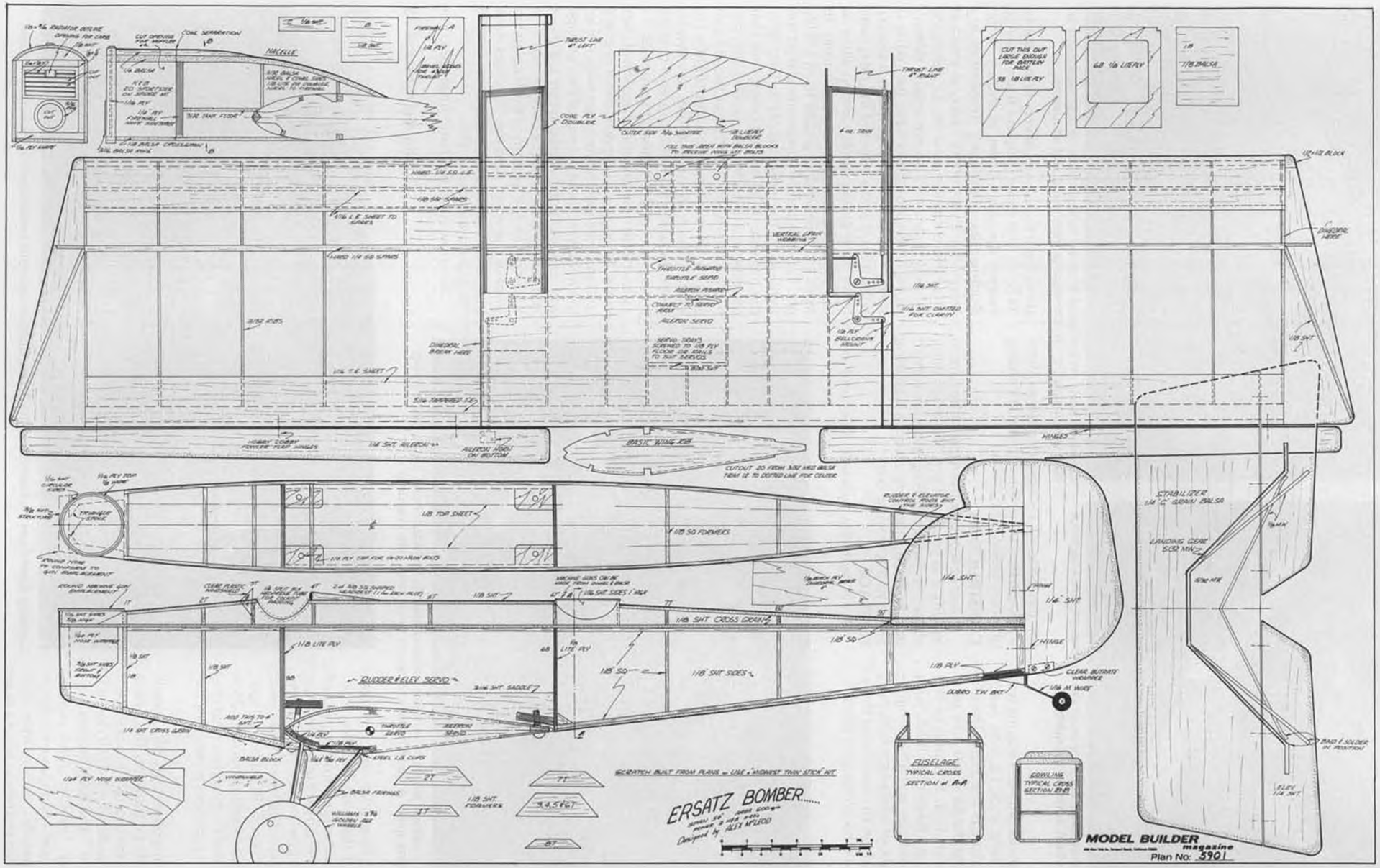
If you have ever been to the Paul E. Garber facility at Silver Hill in Maryland, you will be greatly impressed by the German Arado Ar.234.B-2, which they are restoring there. Frank Rabbit, a very informed guide, impressed upon us the fact that many German technical advances of World War II were far ahead of the Allies, but were too late or lacked strategic materials for large scale production.

The Ar.234 wasn't the only advanced bomber that Germany produced. Back in 1924, when there was a ban on German development of military aircraft, they produced proposed bombers in miniature and made adaptations from existing materials. The Ju-37, Junkers Juwel, was one such proposed aircraft, would you believe, built as a radio controlled model for practical test purposes. (They even used proportional radios like ours today.) The Ju-37 was to be the gem in the crown of the Luftwaffe bomber fleet. Hence their name Juwel (translation Jewel). The miniature test vehicle was never put into production but superseded by more recent aircraft of the 1930s. I wonder if the R/C model was captured by the U.S. Axis Aircraft Recovery team in 1945 and stored with other flying treasures at the Silver Hill facility?

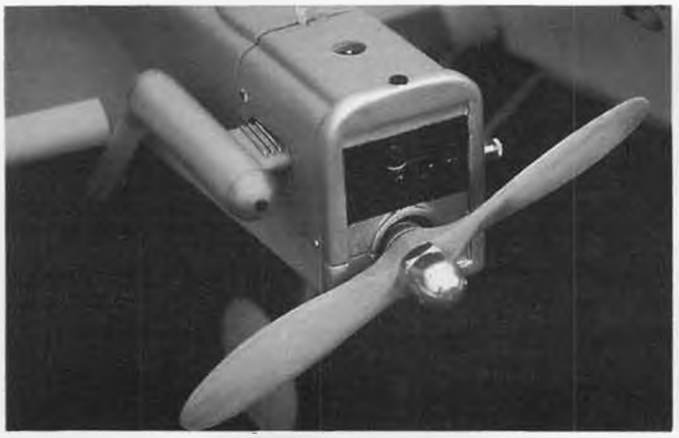
One of the strangest things is that the Ju-37 looks just like a converted Midwest Twin Stick. These kits, like the Ju-37, are not now in production. If you have the Twin Stick kit, then modify it according to the plans. If you don't, then scratch build the whole thing as shown. I hope you be-

In Canada, you don't always wait for Spring to go flying. If it ain't snowin' or blowin', it's flyin' time. Temperature? What's that?

A view of the JU-37 from a three-quarter front angle. If you happen to have a Midwest Twin Stick, you have it made in the shade. K&B Sportster 20's are perfect power.



FULL-SIZE PLANS AVAILABLE—SEE PAGE 106



Nacelles are square shaped, but front looks like a radiator to allow air in for cooling. Engines offset outward for safety.

One-inch scale crew drafted from der Villiams Bros.! Windshield frame is split wire insulation. Machine guns from wood and wire scrap.

lieve my story.

This Ersatz (artificial) Bomber was my way of making the Twin Stick kit look like a possible real airplane of the 1920s. The unfortunate fact that the kit is not now produced is really too bad. It is one of the nicest flying twins I have ever built, with pattern ship capabilities and single engine survival. Ed Rogala, of Midwest, confirmed that production of the kit ceased over three years ago, but gave his blessing to this article. If you don't have a kit, then go right ahead and build the little bomber from scratch, since I'll describe construction as if it were not a kit. Please do not feel that the fuselage and rudder shapes need to be exactly as in the plan. Change it to suit your taste. Make it a French, Russian, or Japanese, or any obscure looking bomber. People will say "Oh yeah! I recognize that one from the books, I just can't remember the exact name."

If you've built any other Ugly Sticks you'll realize how aerobatic they are. This one is no exception. Even though it looks like it should fly slowly and awkwardly, it doesn't. It's truly a "Ringer." The K&B Sportster 20s are good, steady, reliable, quiet power, right out of the box. I can't say enough in favor of them; besides, they're inexpensive. So here is your chance to build a twin for the price of a single engine airplane and keep the cost of the airplane, including engines, below $125.00.

CONSTRUCTION

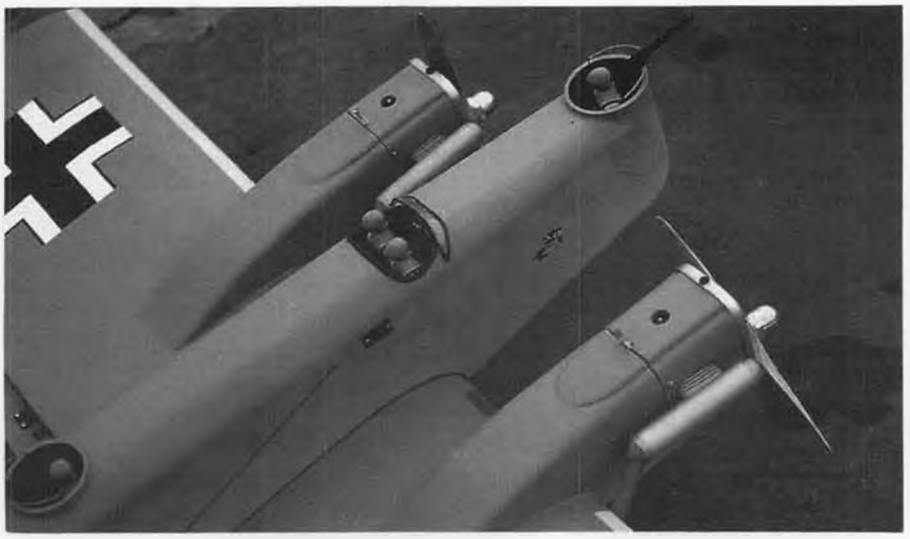
If you're working from the kit be sure to modify it as you go along. The main thing about it is that the fuselage sides are turned upside down, changing it from a high wing plane to a low wing one.

FUSELAGE

Begin with the fuselage sides and cut them from two sheets of very firm 1/8 x 4 x 36 balsa. Use some scrap cut from them to extend the sides down as shown at the leading edge of the wing. Remember, in a twin the fuselage doesn't carry as much as in a single engine aircraft; i.e., motors, landing gears, etc., so our model doesn't need heavy doublers here just what is shown on the plan. Eighth-inch square balsa is used at the edges of the sides both to increase gluing surface and to allow us to round the corners. Cut out former 1B from 1/8 sheet and 3B and 6B from 1/8 lite ply. Glue 3B and 6B, perpendicular to the right side in the indicated place. Then glue the left side to 3B and 6B being sure that the edges of the sides are parallel. Join the rear of the sheets together at the tail and glue in 1B to bring the nose slightly together. The 3/16 sheet saddles can now be glued in, along with the top and bottom cross pieces and 1/8 sheet at former 2B. It's a good time now to install the control rods in the fuselage and support them at every station. They exit the fuselage sides under the stabilizer. Sheet the top of the fuselage with cross-grained medium soft 1/8 sheet and do the same with the bottom rear. Use 1/4 sheet on the bottom of the fuselage in front of the wing. Add the 3/8 sheet nose blocks and triangular stock, then extend the top sheeting over this.

You now have the basic fuselage com-

Continued on page 78

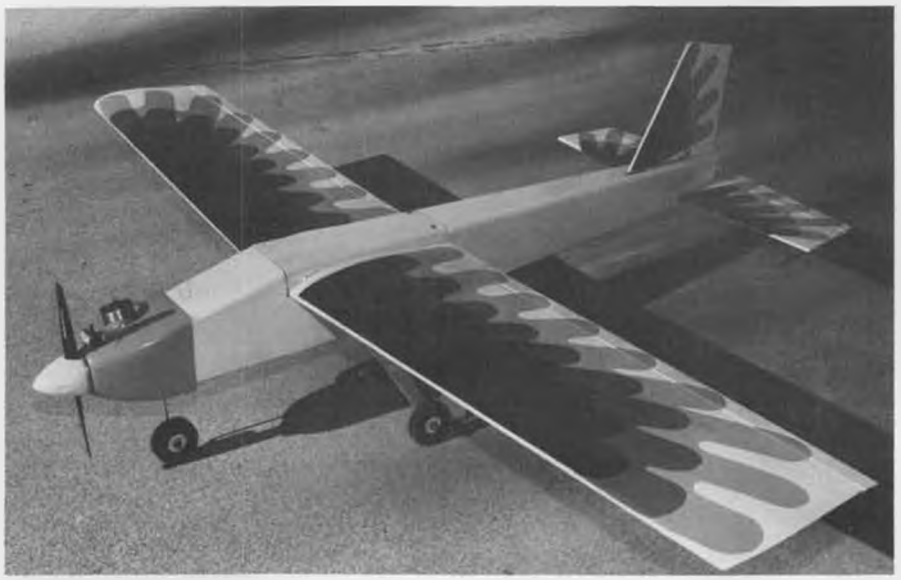


Another angle on engines. Mufflers look like exhaust stacks. Outward thrust keeps plane flying straight if one engine quits. A good feature for sport twins, and very practical!

Looking down from the tower onto the Ersatz Bomber. Allerons reminiscent of Stuka dive bomber.

ALL ABOUT ARFS

By ART STEINBERG
By ART STEINBERG



Completed Aeromodel Tampico ARF sports an ambitious color scheme lifted from the famous Christen Eagle.

Except for wingspan and constant chord wing, Shark-SS is identical to Shark-ST.

This month we focus our attention on a most interesting ARF which is produced by our neighbor to the south, Mexico. This conclusion was easy to arrive at, since virtually every piece of wood in the airplane was clearly marked "Made in Mexico." I am not aware of any other models imported from Mexico at this time, so this may be a real milestone in the model industry, and may even be the forerunner of more products to come. This model is called the "Shark-ST," and is a shoulder wing airplane with a number of novel features. In the strictest sense of the term "ARF" I suppose it has to be classified otherwise. "Almost Ready To Cover" is really more accurate a description of the Shark-ST. as it comes fully framed up and sanded, just waiting to be enveloped in your favorite covering material. For those who prefer painted models, just go ahead and apply any finishing technique you like. In my case, I gave it one of my pseudo Christen Eagle Super MonoKote jobs in four different colors. I spent a lot of time on this project, because I haven't exercised my MonoKote skills for quite some time, and was curious to see if I still had the touch. Besides, the outstanding quality of the construction was richly deserving of more than a slap-together job.

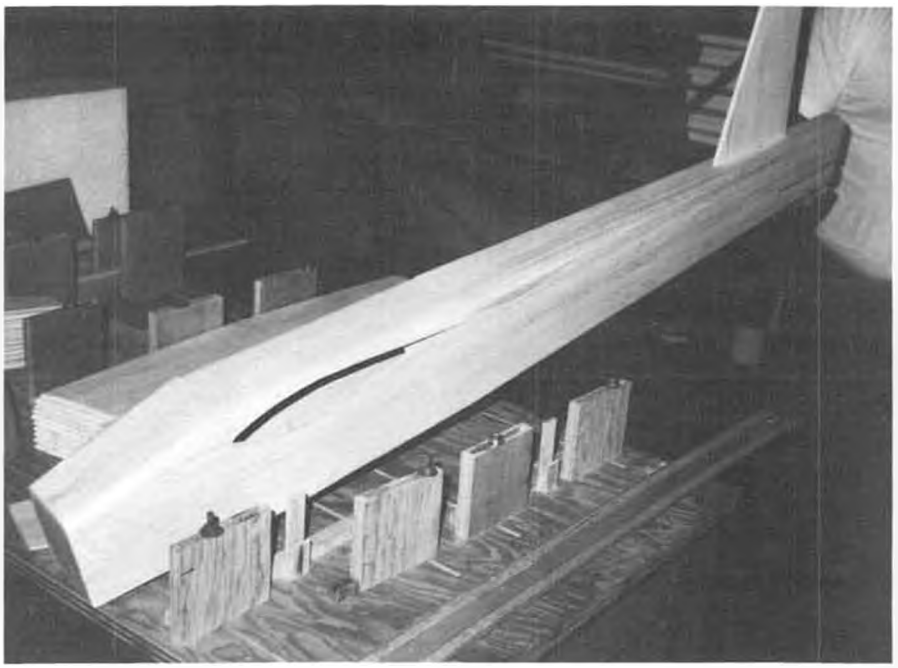
At this point let's hear some quotes from the manufacturer: "The Shark-SS and ST prefab aircraft are excellent intermediate trainer and first aileron planes. The 15% symmetrical airfoil gives the planes good aerobatic qualities. As the result of flight testing, the airfoil has modifications that have produced forgiving landing characteristics. Aeromodel (refers to the manufacturer, Aeromodel Tampico) planes are constructed from quality medium light balsa, supplied by a U.S. supplier of cut balsa. Only final assembly is necessary, as the planes are 80% complete. The wing must be joined with epoxy in the center, hinges must be installed in all control surfaces, horizontal and vertical stabilizers must be installed and glued with instant glue. It is also necessary to install the wing hold-down bolts, drill for the wing dowel and install same. Next, the landing gear and motor mount are installed, then the fiberglass cowling is cut out to clear motor and installed. Plane is then covered and decorated as the buyer desires."

I found it difficult to believe that the manufacturer referred to the Shark-ST as an "intermediate trainer," as it looked like a very hot sport model to me, so I decided that this was another case in which the truth has been stretched a bit in order to sell more models. After all, I've seen many so-called "trainers" which turned out to be pretty high performance airplanes, so I

Kingsway R/C Hobby Supply, 5559 Richmond St., Houston, TX 77056 introduced the Shark-ST at the 1989 IMS Atlanta show.

Possessing excellent stability, the Shark performs a rock steady, low level fly-by for the camera. Shadow at bottom right.

Fuselages undergoing final inspection before packing and shipping.



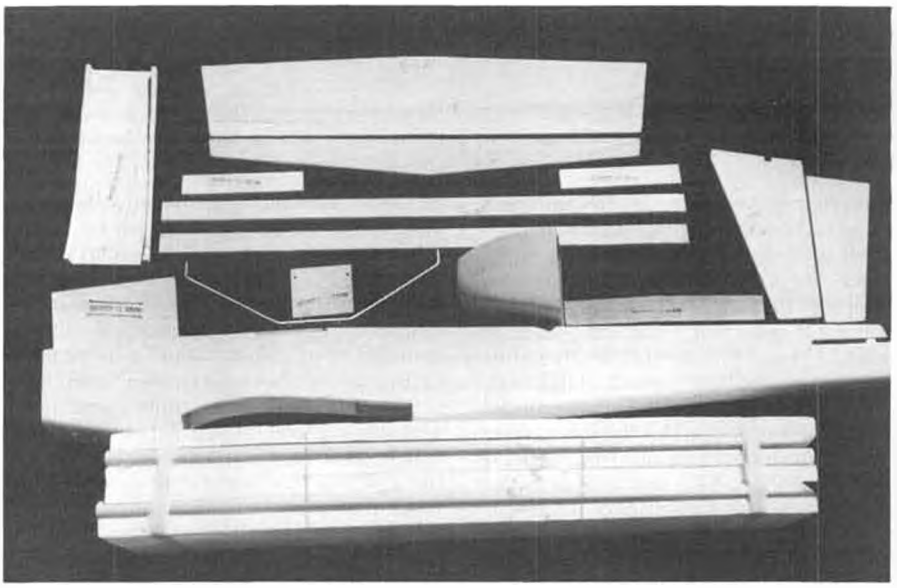
Each Shark fuselage is hand-built in a jig, assuring straight and true construction. Balsa construction leads to easier repairing, if it unfortunately becomes a necessity.

finally decided to ignore its classification as an intermediate trainer. By the way, the "Shark-SS" mentioned above refers to another model which is identical to the ST except the wing is 56 inches in span and is square, rather than tapered. It is a bit slower than the ST, with somewhat less neutral stability.

The wing halves consist of foam cores fully sheeted with balsa, and after joining them and fiberglassing the center section (fiberglass tape was not supplied), I found the wingspan to be 61 inches with a 10.5-inch chord at the center. The leading edge had a slight taper, ending up with an eight-inch chord at the tip, and the wing area calculates out to about 564 square inches. The balsa was top grade and was hand-sanded to a very smooth finish, and this motivated me to apply an extra deluxe Super MonoKote covering job.

Another thing I liked about this airplane was the name, as anything called "Shark" has to be a slick performer, be it car, boat or plane. Accordingly, I expected my Shark-ST to be a real barn burner of an airplane, so I gave a great deal of thought to the

Continued on page 81



Mexico's entry into the ARF field, the Shark-ST, as it comes out of the box. A little less ARF, but a lot of quality!

Business end of this month's ARF, with Rossi .40 and MACS Products header. Note heavy gauge fiberglass cowling.

Elizabeth King holds a Shark-ST powered by an O.S. .50. Nice looking model(s)!

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- *Must be AMA member to compete*
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- *No flying at this site on channels 44(72.670 mHz) or channels 50(72.790 mHz) due to local paging systems.*
- *Send coupon for pre-registration materials.*

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The 3rd F3C RC HELICOPTER WORLD CHAMPS

(CONCLUSION)

By JAMES WANG

An X-Cell 60 with Quicksilver fiberglass fuselage, YS power, flown by Efraim Kastiel of Israel, who placed 32nd.

In this month's chopper column we have the grand finale of our three part series on the state-of-the-art technology at the 1989 Helicopter World Championships. We have included a table that lists the technical specifications of the models used by all the contestants. Elsewhere in this issue, we also have a product review of Kalt's new Cyclone II helicopter. Next month we will talk about helicopter acoustic theory. We will explain how rotor noises are generated. Next month we will also look at the new helicopter products revealed during the International Modeler Show held at Pasadena in January. Furthermore, next issue includes our 500 Flights Update on the Concept. We will concentrate on all the new tune-up accessories for the Concept. We will also report to you our flight test results of Kyosho's scale bodies, EZ's Bell 222, and E&G's Airwolf.

Now, let's delve into the World Champs report. In the December 1989 issue we concentrated on the four American competitors and their hardwares. In the March 1990 issue we focused on the winning Japanese team's helicopters. In this final report, we will emphasize the European contestants and their models. First, I would like to pay my respects to the British and other teams that received no financial support from their country. For instance, the British contestants had to pay their own travel, lodging, and meal costs to attend the World Championships held at Chesapeake, Virginia. Len Mount of England told me that he spent $5000 to cover this trip for himself and his wife (his wife was also his caller). The German, Dutch, and some other European teams received some stipend from their country's R/C modeling organization. (Averaged around $600 to $800.) The Americans were fortunate to get some financial support from AMA. However, the Japanese team members were the luckiest; their budget was completely covered by radio and model manufacturers.

Two-time Swiss National Champion, Rudolf Linder, with his Heim Star Ranger. Had special shaped Sitar Hiller control paddles, parabolically shaped at tip to reduce profile drag.

There were 41 contestants at the World Champs. The proficiency among the pilots was not very consistent. Some contestants were just not up to par for world class competition. However, the top twenty contestants were just awesome! As shown in the table, the total score varied from 691.0 points for the first place to a mere 270.5 points for the last place. That is a very wide spread!

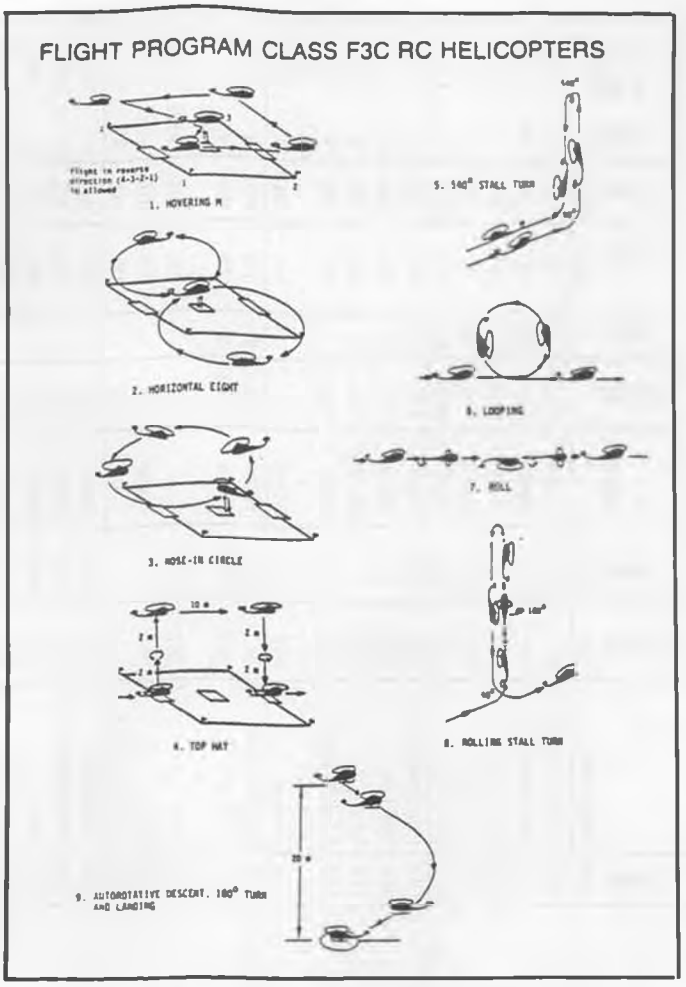
Compared to F3A R/C airplane aerobatics, the F3C helicopter competition is still in the embryonic stage. When R/C airplane pattern competition was already well established in the early '70s, R/C model helicopter was just being developed. *(In fact, the first convincing demonstration of stable helicopter flying was seen by the modeling world at the 1972 World Aerobatic Championships in Doylestown, PA, performed by Dieter*

Curtiss Youngblood (left) and Massimo Alta, age 19, of Italy. Massimo flew Schluter Champion with Master Fly Jet Ranger. Heaviest model, at 12.3 lbs.

Two-time European Champion, Ewald Heim, of Germany with his Heim Lockheed 286H models, which were lightest at the meet, 9.2 lbs.

Helm Star Ranger with Vario brand tuneup parts, flown by Joop Van Lent, Netherlands. O.S. .61 SFH, JR/Graupner. Beautiful ship.

Curtiss Youngblood's number one ship, a GMP Legend Elite with GMP Jet Ranger fuselage. He performed beautiful loops and rolls with it.



Schluter. wcn) Helicopter contests were just getting started in the late '70s. The first F3C helicopter World Championships was held in 1985. If you look at the nine compulsory maneuvers shown here, they are relatively simple as compared to F3A maneuvers. In the future, we will probably see the F3C maneuvers becoming more complicated because our models have improved over the years. Furthermore, the top pilots are certainly capable of performing more sophisticated maneuvers, such as consecutive loops, consecutive rolls, Cuban Eights, rolling circles, backward loops, etc. At present, the maneuvers have to be kept simple because there are only a handful of master level pilots who can do them. Excessively complicated maneuvers will only deter average modelers from entering contests.

About half of the 1989 contestants were directly or indirectly related to the R/C helicopter business. And these people were the top placing contestants. For example, seven of the top ten winners work in the model business. But all top ten winners received almost unlimited free support. Otherwise, unless you are independently wealthy and have time to burn, it's difficult to keep up with the dedications put in by the others. For instance, the seventh place winner, Len Mount, said that during the three months before the show time, he practiced five days a week. Each morning he brought two ships out. He practiced till noon, or until both models failed. A pipeline supply

Continued on page 100

Len Mount's gorgeous Jet Rangers. He molds his own fuselage, sells them for $100. Call in England, 01144474323132. Used GMP Legend Elite mechanics.

All of Australian team flew X-Cell 60's with Quicksilver fuselage. Wessel and Barbuto used Kevlar/fiberglass varying airfoil blades.

INFORMATION & SPECIFICATION CHART OF 1989 R/C HELICOPTER WORLD CHAMPIONSHIP ENTRIES

PLACE	CONTESTANT'S NAME	OCCUPATION	COUNTRY	MODEL (MFG.)	WEIGHT (lb)	ROTOR HEAD	MAIN ROTOR BLADE							GEAR RATIO	
							DIAMETER (in)	CHORD (in)	AIRFOIL	MATERIAL	TWIST	WEIGHT (g)	HOVER (rpm)	ENGINE	MAIN R. TAIL R.
1	Yukihiro Dobashi	Futaba engineer	JAP	SST Eagle (Hirobo)/Black Shark (Karukawa)	10.6	Hirobo—New SSR	61.4	2.24	Semi-S	Wood	3.5	195	1280	9.7	: 1 : 5.3
2	Kazuyuki Sensui	Izumi Model Co.	JAP	Kalt prototype	10.3	Kalt Black-10 OF	61.4	2.21	Semi-S	Wood	3.5	180	1280	9.3	: 1 : 5.5
3	Curtis Youngblood	Student	USA	Legend (GMP)/Jet Ranger (GMP)	10.3	GMP Elite	57.0	—	Sym.	Wood	0	185	1800	—	— —
4	Shizuo Ishikawa	Futaba engineer	JAP	Black Star (TSK)	11.4	TSK Pearl III	61.4	2.44	Semi-S	Wood	3.5	175	1280	9.77	: 1 : 5.1
5	Robert Gorbam	Model consultant	USA	Legend (GMP)/Cobra Ranger (GMP)	10.5	GMP Elite	58.0	2.36	Sym.	Wood	0	180	1550	9.5	: 1 : 4.3
6	Ewald Heim	Technical engineer	FRG	Heim Mechanics (Heim)/Lockheed 286h (Graupner)	9.2	Heim Standard	58.3	2.56	Reflex	F.G.	0	185	1300	10	: 1 : 4.5
7	Leonard Mount	Model manufacturer	UK	Sovereign (L&O Models)/Elite (GMP)	10.8	GMP Elite	58.0	2.44	Reflex	F.G.	—	200	1640	9.5	: 1 :
8	Daniele Graber	Civil engineer	SUI	(Sitar)/JET Ranger (Sitar)	11.2	Sitar	60.6	—	Eppler	F.G.	0	185	1250	10	: 1 : 5
9	Timothy Schoonard	Miniature Aircraft Co.	USA	X-Cell 60 Custom (Miniature Aircraft)/ Long Ranger III (Miniature Aircraft)	10.3	X-Cell 60 Delta III	58.0	2.44	Sym.	Wood	—	195	1650	9.1	: 1 : 4.5
10	Josef Brennsteiner	—	AUT	Champion (Schluter)/Long Ranger (Schluter)	11 9	Schluter	59.0	1.97	Semi-S	F.G.	—	—	1500	10	: 1 : 3.5
11	Volker Heine	Robbe/Schluter Co.	FRG	Magic (Robbe/Schluter)/Magic Ranger (Robbe/Schluter)	10.6	Robbe/Schluter	58.3	2.56	Reflex	F.G.	0	185	1400	10	: 1 : 4
12	Thomas Dooley	Accountant	USA	X-Cell 60 Custom (Miniature Aircraft)/ Long Ranger III (Miniature Aircraft)	11.5	X-Cell 60	58.0	2.44	Reflex	Wood	0	225	1550	9.1	: 1 : 4.5
13	Maurice Depigny	—	FR	Heim Mechanic (Heim)/P.S. Long Ranger II (Heim)	9.5	Sitar	58.0	1.89	—	F.G.	—	170	1500	9.697	: 1 : 3.757
14	Peter Daeppen	Carpenter	SUI	Heim Mechanic (Heim)/Long Ranger (P.S.)	9.7	Heim	58.3	—	Eppler	F.G.	—	175	1600	—	: 1 : —
15	Colin Bliss	—	UK	Omega Professor (Kalt)/Omega (Kalt)	10.3	Kalt Black-10S II	—	—	—	F.G.	—	185	1600	9.7	: 1 : —
16	Rudolf Linder	Mechanical engineer	SUI	Star Ranger (Heim)	10.2	Heim/West	59.0	2.48	Semi-S	F.G.	3.5	185	1330	—	: 1 : —
17	Jochen Gerkens	Robbe Model Co.	FRG	Heim Mechanics (Heim)/Wizard (O.D.)	9.9	Heim Standard	59.0	2.56	Reflex	F.G.	0	185	1440	10	: 1 : 4.5
18	Massimo Rocchi	—	ITA	Heim (Heim)/Star Ranger (Self)	11.4	Heim	62.2	2.56	Semi-S	F.G.	8	190	1700	10	: 1 : 4
19	Michael Lieu	—	HK	SST-Eagle (Hirobo)/Nova (Hirobo)	10.9	Hirobo-SSR	59.0	2.28	Semi-S	Wood	0	190	1200	9.5	: 1 : 5.3
20	John Wallington	Technical manager	UK	Omega Professor (Kalt)	10.1	Kalt KSSB	62.2	2.44	Sym.	F.G.	—	200	1400	—	: 1 : —
21	Massimo Aita	—	ITA	Champion (Robbe/Schluter)/Long Ranger (Master Fly)	12.3	Sitar	58.3	2.56	Sym.	F.G.	—	180	1400	9.375	: 1 : 3.625
22	Paolo Mella	Hobby shop manager	ITA	Heim (Robbe)/Star Ranger (Mella)	10.1	Sitar	62.2	2.56	Semi-S	F.G.	—	187	1400	—	: 1 : 5
23	Gerald Weil	Electrical engineer	FR	Star Ranger (Graupner)	10.6	Sitar	57.1	—	—	—	—	180	1700	—	: 1 : —
24	Philippe Rose	Architect	FR	Heim (Heim)/Lockheed (Heim)	9.5	Sitar	57.9	1.89	Semi-S	F.G.	—	—	1640	9	: 1 : —
25	Rob Barbuto	Service technician	AUS	X-Cell (Miniature Aircraft)/Quicksilver (Miniature Aircraft)	10 8	X-Cell	58.3	Taper	Changes	Kevlar	—	210	—	—	: 1 : —
26	Harald Bingel	Shop owner	AUT	Heim (Graupner)/Star Ranger (Graupner)	11.7	Sitar	59.0	—	Semi-S	F.G.	—	180	1200	9.3	: 1 : 4
27	Joop Van Lent	—	DUT	Vario (U. Streich)/Star Ranger (Graupner)	10.8	Vario	59.8	—	Semi-S	—	—	—	1500	—	— —
28	Jan Verhagen	Wang computer manager	DUT	(O.D.)/Leguaan (O.D.)	11.0	Heim	59.0	2.56	—	F.G.	—	170	1400	10	: 1 : —
29	John Wessel	Service technician	AUS	X-Cell 60 (Miniature Aircraft)/ Quicksilver (Miniature Aircraft)	10.8	X-Cell	58.3	Taper	Changes	Kevlar	—	210	1630	9	: 1 : —
30	Geoff Woodward	—	AUS	X-Cell (Miniature Aircraft)/Quicksilver (Miniature Aircraft)	10.3	X-Cell	57.1	2.56	Semi-S	Wood	0	180	1500	9	: 1 : 4
31	Kees Verplanke	Technical manager	DUT	—	—	—	—	—	—	—	—	—	—	—	—
32	Efraim Kastiel	Student	ISR	X-Cell (Miniature Aircraft)/Quicksilver (Miniature Aircraft)	10.6	X-Cell	—	—	Sym.	Wood	0	200	—	—	— —
33	Kari Porokka	Student	FIN	Champion (Schluter)/(Schluter)	10.6	Schluter	55.1	—	Semi-S	Wood	—	—	—	—	— —
34	Christer Palmdahl	Craftsman	SWE	X-Cell 60 (Miniature Aircraft)/ Long Ranger L206 (Miniature Aircraft)	11.2	X-Cell	55.1	—	Reflex	F.G.	0	140	1400	9	: 1 : 5.5
35	Han Jun Park	Jun Co. president	KOR	Omega professor (Kalt)/Jet Stream (Kalt)	10.8	Kalt Black-10 OF	61.4	Taper	Semi-S	F.G.		186		9.77	: 1 : 5.5
36	Kit Flammang	Model distributor	LUX	Heim (Graupner)/Lockheed 286H (Graupner)	9.5	Graupner/Heim	58.5	—	—	F.G.	—	185	1600	9.5	: 1 : 2.5
37	Alan Campbell	Police dog handler	NZ	Omega (Kalt)/Jet Stream (Kalt)	11.2	Kalt Black-10S II	61.4	—	—	F.G.	—	—	1400	—	— —
38	Angel Maldonado	—	ARG	X-Cell 60 (Miniature Aircraft)	9.9	X-Cell	56.9	2.56	Sym.	Wood	0	235-245	—	9	: 1 : 4.66
39	Patrick Prange	—	LUX	Heim (Graupner)/Lockheed 286H (Graupner)	9.5	Graupner/Heim	58.5	—	—	F.G.	—	185	1600	9.5	: 1 : 2.5
40	Jyrki Lehtinen	Model sales manager	FIN	X-Cell 60 Custom (Miniature Aircraft)	9.7	X-Cell	56.9	—	Sym.	—	—	200	—	—	— —
41	Neville Wright	Accountant	S.AF	X-Cell 60 (Miniature Aircraft)/ Quicksilver (Miniature Aircraft)	10.8	X-Cell	—	—	Semi-S	—	—	—	1600	—	— —

CONTESTANT	PITCH SETTINGS: HOVER	AEROBATIC	AUTO-ROTATION	ENGINE	GLOW PLUG	MUFFLER (TP=TUNE PIPE)	RADIO	MODE	SERVOS	GYRO	IN-FLIGHT SENS. ADJ.	FUEL	NITRO (%)	AGE	IN 85 WORLD CHAMPS	IN 87 WORLD CHAMPS	SCORES: R 1	R 2	R 3	R 4	TOTAL
Y. Dobashi	-2.5 to +13	-3 to +8.5	-4	YS60FS	Enya 1	Hatori	Futaba PCM1024H	I	5	Futaba G-153BB	Y	MG1000F	30	20	—	—	218.5	222.0	238.0	231.0	691.0
K. Sensui	-2.5 to +12	-3.5 to +8	3.5	OS61ST-H	Enya 3	K&S	JR PCM10	I	5	JR 120BB	Y	MG1000F	30	19	—	—	209.0	224.5	228.5	235.5	688.5
C. Youngblood	-6 to +9	-6 to +9	11	OS61SFN	Enya 3	V-Tech (TP)	JR PCM10	S	5	JR	Y	K&B500	—	20	—	■	146.0	196.0	222.0	228.5	646.5
S. Ishikawa	-3 to +11	-2 to +8	-4	YS61SH	Enya 4	Hatori	Futaba PCM1024H	I	6	Futaba G-153BB	Y	MG1000F	30	37	—	■	200.0	216.5	207.0	217.5	641.0
R. Gorham	6 to +9	6 to +9	12	Enya 60 X LF IV	Enya 4	Hatori	Futaba PCM1024H	II	5	Futaba G-153BB	N	Power Master	15	29	—	■	179.5	207.5	204.0	219.0	630.5
E. Heim	4 to +5	-2 to +8	-4	Webra Speed 61 R ABC	Enya 3	Heim	Graupner 5016	II	5	Graupner 4021	Y	Carbulin Speed	10	43	■	■	186.0	206.0	207.5	216.5	630.0
L. Mount	4 to +8	6 to +8	15	Rossi 60	Rossi 7,8	OPS (TP)	JR Apex	II	6	Futaba G-152	Y	L.M. Glowbright	—	—	■	■	109.5	205.0	202.5	207.5	615.0
D. Graber	-5 to +10	-2 to +10	12	YS 60	Enya 5	Hatori	Futaba FC28	II	5	Futaba G0153BB	Y	M6 F700	—	39	■	■	181.5	216.0	215.0	124.5	612.5
T. Schoonard	-1 to +9	-4 to +9	-5 to +12	OS 61 FSR ABC	Enya 5	M.A. Magna (TP)	JR PCM9	S	6	JMW Custom	Y	K&B500H	12.5	32	—	—	181.0	184.0	199.0	228.5	611.5
J. Brennsteiner	2 to +6	2 to +8	10	Webra Speed 61	Webra	Schluter	Webra Space	I	5	Robbe Expert	N	Webra	5	42	■	■	194.5	201.5	196.5	211.0	609.0
V. Heine	-2 to +6	-5 to +9	-5	Webra Speed 61 Ring	Enya 5	Robbe/Schluter	Robbe CM Rex	II	5	Robbe RS700	Y	Carbulin Speed	10	32	■	■	174.0	198.5	193.5	213.0	605.0
T. Dooley	-1.5 to +8.5	0 to +8.5	-3 to +12	OS 61 SFN-H	Enya 5	M.A. Magna (TP)	Futaba PCM1024H	II	6	JMW Expert	N	Cool Power	12	36	—	—	189.0	195.0	207.5	198.5	601.0
M. Depigny	— —	— —	— —	OS 61 SF ABC	Enya 5	Hunner	Futaba PCM1024H	III	5	Robbe Expert	Y	Carbulynx	10	40	—	—	191.0	196.0	201.0	200.5	597.5
P. Daeppen	— —	— —	— —	Webra	Enya	Hunner (TP)	Futaba PCM1024H	—	5	Futaba	Y	—	—	34	—	■	190.5	202.5	191.5	195.0	589.0
C. Bliss	-1 to +5.5	-5 to +9	-6 to +12	YS 61	Enya 3	Hatori	Futaba PCM1024H	I	5	Futaba G-153BB	Y	K&B500	15	28	—	■	142.5	195.5	191.5	189.0	576.0
R. Linder	— —	— —	— —	YS 60 FSH	Enya 5	Heim (TP)	Graupner MC-18	I	5	Futaba G-152BB	Y	Carbulin	11	36	■	—	177.5	183.5	194.5	192.0	570.0
J. Gerkens	4 to +5	-3 to +7	-4	Webra Speed 61 ABC	Enya 4	RD (TP)	Robbe Promars Rex	I	6	Robbe RS700	Y	RD-Synth Glow	17.5	29	—	—	77.5	193.5	186.5	173.5	553.5
M. Rocchi	-3 to +5	-3 to +8	11	OPS	OPS	OPS (TP)	Multiplex Rex	II	5	JMW	Y	—	—	36	—	—	181.5	189.5	179.0	171.0	550.0
M. Lieu	-2 to +10	-4 to +8	-4 to +12	YS 60 FS	Enya 4	EK	JR PCM10	I	5	JR	Y	MG1000F	30	29	—	—	161.5	182.0	169.5	198.0	549.5
J. Wallington	-5 to +8	-7 to +8	-7 to +15	YS 60 FRH	Enya 5	Hatori	JR PCM10	I	6	JR	Y	—	10	34	■	■	147.0	187.5	182.5	172.0	542.0
M. Alta	-4 to +10	-4 to +10	-6 to +12	YS	Enya	Robbe	Robbe CM Rex	II	5	Robbe RS700	Y	—	15	21	—	—	133.5	185.0	166.5	189.0	540.5
P. Mella	-1 to +5	-2 to +9	13	Picco	Enya 5	Hatori	Futaba PCM1024H	II	5	Robbe	Y	—	5	42	■	■	173.0	162.5	174.0	189.0	536.0
G. Weil	-3 to +9	-3 to +9	-4 to +10	OS 61 SFN Ring	Enya 5	Hunner	—	II	5	Robbe	N	—	15	39	—	■	159.5	159.5	163.0	203.5	526.0
P. Rose	-2 to +7	0 to +7	12	OS 61 SFH Ring	Enya 5	Hunner	JR 5016H	II	5	JR	Y	Omega	15	47	—	—	137.5	169.5	164.0	188.5	522.0
R. Barbuto	— —	— —	— —	OS 61 SFN	Enya 5	M.A. Magna (TP)	Futaba PCM1024H	I	5	Futaba	Y	Morgan	15	35	—	—	133.0	174.5	158.0	161.0	493.5
H. Bingel	— —	— —	— —	Webra Speed 61 RHM	Rossi 4	Damm (TS)	JR Graupner MC18	I	6	Robbe ExpertBB	Y	Morgan Cool Power		29	—	—	128.5	157.5	151.5	172.0	481.0
J. Van Lent	2 to +2	3 to +5	7	OS 61 SFH	Rossi 5	Vario (TS)	JR Graupner MC18	III	6	JR	N	Morgan	—	44	■	■	153.0	159.5	148.0	167.5	480.0
J. Verhagen	— —	— —	— —	Rossi	Rossi	—	Robbe-Futaba	—	6	Robbe/Futaba	Y	Homemade	—	40	—	■	0	166.0	147.0	161.0	474.0
J. Wessel	0 to +8	-2 to +9	-4	OS 61 SFN	Enya 5	M.A. Magna (TP)	JR PCM10	I	5	JR	Y	Morgan	15	28	—	—	121.5	166.5	144.5	160.0	471.0
G. Woodward	4 to +5	3 to +9	-5	OS 61 SFN ABC	OS 8	M.A. Magna (TP)	JR Apex Computer	I	5	Futaba G-153BB	Y	Homemade	10	10	33	—	—	145.0	135.0	150.5	145.0
K. Verplanke	— —	— —	— —	—	—	—	—	—	—	—	—	—	—	—	—	—	69.0	173.5	142.5	121.0	437.0
E. Kastiel	-1 to +7	-7 to +8	-4	YS	Enya	M.A. Magna (TP)	—	—	5	JMW	Y	—	15	16	■	—	127.5	112.0	161.0	145.5	434.0
K. Porokka	— —	— —	— —	Webra 61 ABC	OS 8	Schluter 924	Futaba PCM1024H	II	5	JMW	Y	Morgan/Omega	10	22	—	—	114.0	103.5	152.0	149.5	415.5
C. Palmdahl	— —	— —	— —	OS 61 VF	Enya 5	M.A. Magna (TP)	JR PCM10	II	5	JR	Y	—	5	38	—	—	103.5	134.0	149.0	78.0	386.5
H. Jun Park	0 to +9	-4 to +8	-4 to +10	OS 61 SF-H	Enya 4	K&S	JR PCM10	I	5	JR 120BB	Y	Morgan/Omega	15	28	—	—	117.0	118.5	106.0	146.5	382.0
K. Flammang	3 to +4	-2 to +8	12	OS 61 SF	OS 5	OS (TP)	Graupner MC18	III	5	JR 120	Y	Motel	5	30	■	■	125.0	129.5	117.0	0	371.5
A. Campbell	4.5	-4 to +8	-5 to +16	OS 61 SFN-H	OS 8	M.A. Magna (TP)	JR Galaxy8	II	5	JR 120BB	Y	Morgan Cool Power	15	34	—	—	109.0	110.5	141.0	113.0	364.5
A. Maldonado	-2 to +7.7	-4 to +9	-5 to +12	OS 61 VF ABC	Webra 3	M.A. Magna (TP)	JR Galaxy8	II	5	JR	Y	Omega	15	40	—	—	119.0	135.5	106.5	0	361.0
P. Prange	3 to +1	-2 to +8	12	OS 61 SF	OS 5	OS (TP)	Graupner MC18	III	5	JR 120	Y	Motel	5	31	—	—	99.5	0	132.5	122.0	354.0
J. Lehtinen	— —	— —	— —	—	OPS 300	M.A. Magna (TP)	JR PCM9	II	5	JR	Y	—	—	20	—	—	89.0	111.0	109.0	36.0	309.0
N. Wright	-2 to +9	-5 to +11	11	OPS	ST. Red	M.A. Magna (TP)	Multiplex	II	5	Multiplex	N	Homemade	—	29	—	—	78.5	81.0	0	111.0	270.5

1. SAM 100 display booth at the Central Penna. Model Association Flea Market. Great way to get club exposure. Sorry, no names.

2. Very active SAM 100 club at shopping mall exhibition. Plenty of membership interest here. See text for club member names.

PLUG SPARKS

By JOHN POND

Finally! We have some reports on East Coast activities from John Delagrange and his SAM 100 cohorts. We are pleased to feature photos and write-ups of Old Timer models and modeler activity in the east, something we have been unable to do with any degree of regularity in this column.

One of the main drawbacks to East Coast activity is the severe winter weather, something we on the West Coast do not see very much. Regardless, the snowbound boys still have a considerable amount of wintertime activity in the form of indoor flying, trade shows, etc.

Photo No. 1 shows what we are talking about; seen here is the SAM 100 booth at the Giant Central Pennsylvania Model Association Flea Market, held at the Lebanon, Pennsylvania Fairgrounds. Seen is Dick Bozzard and Bob Gennethum III hawking model magazines, engine mounts, plans, you name it.

This is something more SAM Chapters on the West Coast should get involved in. About the only real display we have out here is the SAM booth at the International Modeler Show at Pasadena, California. This is great for recruiting new members, showing models, and exchanging ideas and information. Of course, there are several MECA Collectogethers but they don't attract all that many fliers, being staged mainly for engine collectors.

SAM 21 has participated in shopping mall shows, but this sort of thing is quite rare. In light of the number of Old Timer contests (17 R/C annuals and majors, six two-day F/F annuals and a host of singles) it is not surprising that time is lacking. However, it is this writer's viewpoint that many clubs looking for exposure and new members would do well to participate in mall shows and trade shows wherever possible.

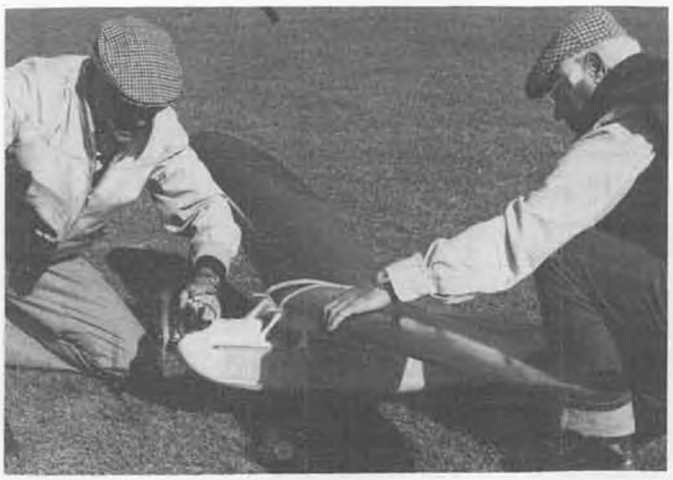
Photo No. 2 shows the type of exposure we are referring to as no less than seven O.T. models can be seen in this group shot of SAM 100 at the Lebanon Mall late in winter 1989. Seen in the photo are Bob Bennethom, Paul Ahnert, Harry Albright, Ray Primaldi, Jack Conrad, John Delagrange, and Rudy Liebeskind. A live bunch!

SAM 100 put on a humdinger of a meet on November 12 called "The 1989 Old-Timers Convention." Sixty people showed, of which 27 signed up in five different events.

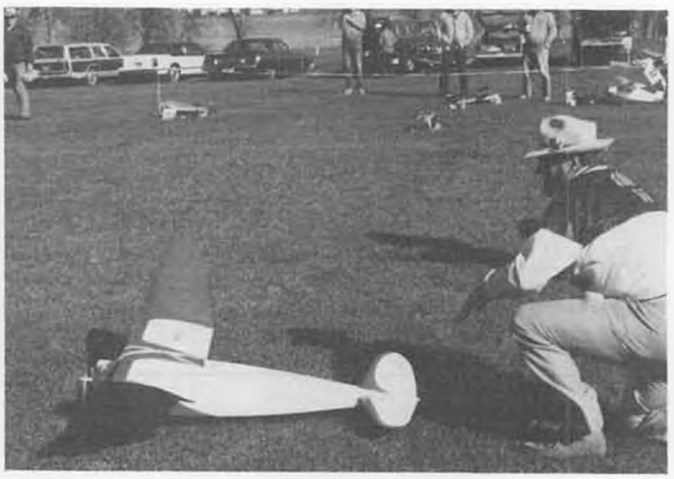
As John D. points out, the list of different old time aircraft was incredible. One doesn't need to enter the meet; simply walk around and observe the beautiful models. Best of all, talk to the expert SAM fliers. Fliers came from SAM Chapters 12, 36, 76, 66, 15, and 100. Great turnout!

Paul Ahnert took the photos, so let's continue with the coverage. Photo No. 3 shows Charlie Thuet running up his Anderson Spitfire mounted in a Miss Delaware II, an improved version of Steve Kowalik's original Miss Delaware. Charlie placed fourth in combined Class ABC fuel allotment (glow and ignition combined) with a respectable time of 937 seconds.

He may not get into too many photos,



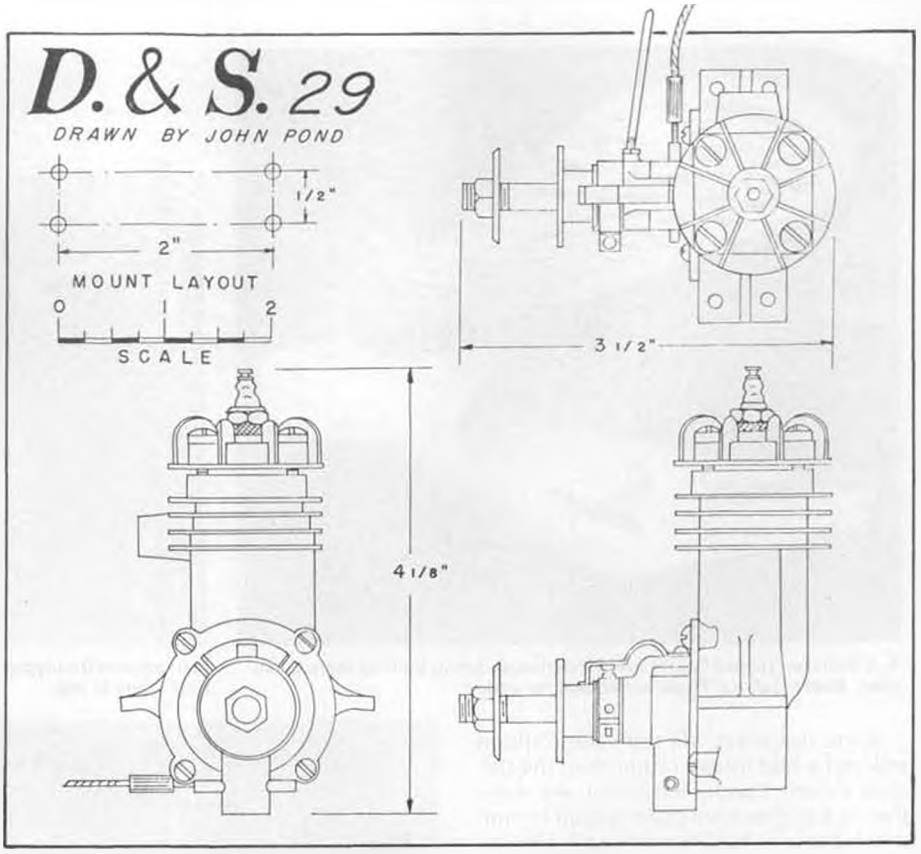
3. Miss Delaware II by Charlie Thuet. One of Steve Kowalick's last designs. Yep, it's an ignition engine.



4. Bill Brenchley releases Skip William's Rambler. ST 29 engine. Looks a mite chilly there!

5. Bob Bennethom holds last rights for his Quaker Flash, formerly high wing. Pager did it!

6. Len Fox launches 1/2A Playboy. Love those 1/2A Texaco R/C models!



but the reader should recognize Bill Brenchly in Photo No. 4 letting go of Skip Williams' S.T. 29 powered Rambler. Skip also took third in 1/2A Texaco. Brenchly flew but without much luck. Bill will be the Associate Contest Director for the SAM R/C O.T. events to be held in conjunction with the NFFS Champs at Lawrenceville, Illinois during the week of October 16-20.

Photo No. 5 is a rather sad one showing what can happen to a Quaker Flash when a "pager" gets you from an adjoining channel. Bob Bennethom holds his hat over his heart. This is getting to be a serious problem as the pagers, 10 KHz away, have enough power to overflow into our adjacent channels.

(No plug intended, but maybe the best idea is to build a receiver much on the line of the pager receiver being sold by Sheldon's Hobbies. This appears to be the best defense against extraneous signals.)

To wrap up the report on the very active SAM 100 club, Photo No. 6 shows that once a free flighter, always a free flighter. Note the perfect launch by Len Fox of his 1/2A Texaco Playboy. Takes experience to get off smooth launches like that!

ENGINE OF THE MONTH

Once again, we are indebted to Bob McClelland, that indefatigable secretary-treasurer of the Model Engine Collectors Association (MECA). Although some of his engines have been held by this writer for close to a year, there has not been one word of complaint.

Getting on with this month's subject, the D&S .29 is probably the best known racing engine of 1940, yet very few modelers have ever seen one. The D&S (from Joe Delong and Bob Steele) was first produced with the intention of winning the Nationals events in 1940. These engines were carefully doled out to the most competent and winning modelers. This careful approach assured the success of the engine in winning the events entered.

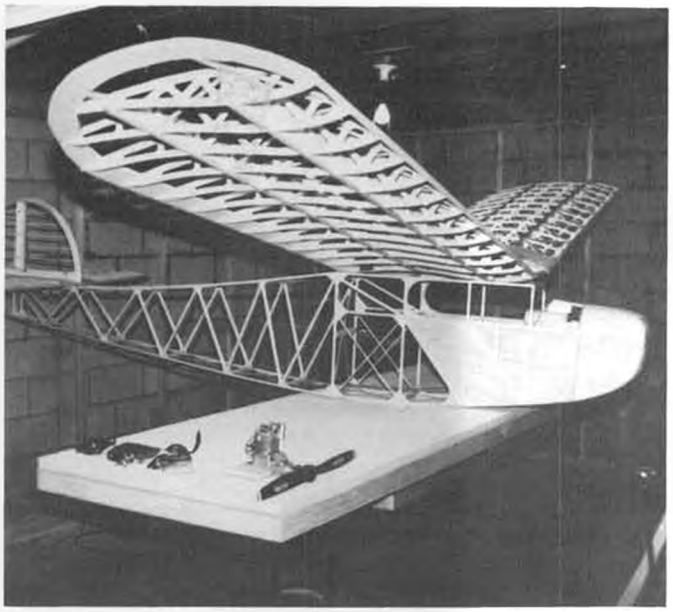
Before one gets the idea the engines were simply given away, Delong and Steele "loaned" engines to hand picked contestants. These fliers were instructed to report back on possible flaws and improvements along with comparisons to the competition. On this basis, D&S engines were quite successful, as the manufacturers were extremely careful to test and run all engines under the best conditions available to them.

From the successful D&S engine, the Cannon engine was produced with the claim that the D&S engine was its predecessor. Although it has not been confirmed, it appears that Delong and Steele sold their rights to the Cannon people, who had enough capitalization to promote and manufacture two follow-on engines, the Cannon 300 and 350 for Classes B and C in free flight.

Meanwhile, Delong and Steele started up separate enterprises with Delong marketing the highly successful Delong .30 using the same practice as before the war, i.e. handing out the best performing Delong .30 engines to the experts who promptly started setting records. This system works well to start with, but those purchasing the "garden variety" of Delong engines found them wanting when raced against the competition, such as Torpedo and McCoy.

Bob Steele continued (as before WWII) to produce engines on a semi-custom basis. The Steele RB Special was quite similar to the D&S; however, Steele felt that a rear timer location would allow for a cleaner run and unfouled timer points.

7. An R/C overcast! Huge Lanzo Racer built by Jim Deata, of SAM 39. Powered by a 1.20 four-cycle engine.



9. A fourteen (Good Grief!) foot Powerhouse being built by Mark Glammier, South Dakota. Flight scheduled for spring.

8. A reduced Dennyplane by George Noreen, Portland, Oregon, from Dan Lutz plans in *MB*.

Some modelers will note the Cannon utilized a side intake rather than the updraft shown. Careful inspection will show the D&S engine front plate updraft venturi arrangement had mounting holes arranged in a square pattern that would allow the intake to be placed in any of four desired positions. (Of course, porting would have to be changed on the crankshaft.)

D&S engines were made up of rough aluminum castings looking somewhat crude and showing file work to clean up the rough exterior. However, the interior was something else with excellent machine workmanship.

The D&S engine featured a stroke of .675 inches and a bore of .750, giving a displacement of .295. As mentioned before, the crankcase, head, and front plate were sand cast aluminum. A steel sleeve was fitted to the cylinder and a mehanite piston lapped to the sleeve. Other items were a two piece crankshaft with a pressed-in crankpin, a steel wrist pin, sand cast brass conrod, and a timer resembling the prewar model.

BELATED ACKNOWLEDGEMENTS

There were so many items to cover at the recent SAM Champs at Jean, Nevada, that the Champs newsletter was seemingly taken for granted. No such thing! This attempt to revive the "Daily Blurb" put out in the 1940 Nationals was an excellent one.

Ned Nevels of SAM 27 should be given the kudos for excellent coverage. Don Bekins brought the word processor and Ned did the work. As a matter of fact, he was so dedicated to his task that he was not able to fly in the events.

Instead, Ned, after organizing the paper, would drive to Las Vegas every day to get the material published. Furthermore, this was strictly Ned's idea and as such, he paid for all costs incurred in printing, driving, distribution, etc. What a terrific guy! This really helped to make the 1989 SAM Champs a great success!

CAN YOU STILL SEE IT?

There has been a lot of controversy over

11. Leon Nodolski and his Bob Toft "Snuffy VI" (we published plans). Leon encountered unusual fuselage twisting problem discussed in text. Answers needed!

10. Impeccable Kowalik "Miss Arpiem" by Phil McCary. Ohlsson 29 power. Construction article and plans published in *MB*.

12. Electric powered Miss Delaware by Marc Bird, Oceanside, CA. Could be scaled down, we're not sure. Clean and neat.

13. Another clean and neat electric O.T., a Simplex, by Dave Hicks, Washingtonville, NY.

what color is the best for high flying Texaco models. This writer uses models with white as the predominant color in opposition to Jim Kyncy and his SAM 30 cohorts who insist that black is the best for visibility.

The "Index of Visibility" chart included with this month's column has been kicking around the various club newsletters; hence, this writer feels some national recognition is appropriate.

The chart was originally published by the Marshalltown Flyers, and is based on studies made by several government agencies. Of particular note is that all U.S. Air Force trainer type aircraft are painted luminous orange with white trim or striping to identify pilots undergoing flight training. According to the chart, these are the top visibility colors! No more arguments, fellows!

SAM 39

Bucky Walter of SAM 39 has been quite faithful in submitting photos of that club's activities. Before Chet Lanzo's death, Jim Deats built a Lanzo Racer as soon as the plans were available. Jim selected a Magnum 120 four-cycle engine, which flies the 2216 sq. in., 10 pound Racer very smoothly. Unfortunately the engine is not legal for SAM R/C events.

Regardless, it is simply great to see a fellow build a model for his own enjoyment. Enjoy Photo No. 7!

ANOTHER "FUN" MODEL

In that same line, Photo No. 8 comes from the Great Northwest showing a scaled-downed Dennyplane Jr. built by George Noreen of Portland, Oregon.

The 48-inch model was built to plans appearing in *Model Builder*, as designed by Danny Lutz. The Dennyplane Jr. was the first successful commercially produced model that was available on the West Coast. Reginald Denny did a terrific job of promoting model aviation, to the point of getting movie studios to use model planes in their aviation sequences.

Dennyplane models flew fine, but as a duration model, left a little to be desired. What most modelers fail to recognize today is that at that time, almost all contests in the Los Angeles area were "precision" type contests. In this type of meet, the models were judged for appearance and flight characteristics consisting of takeoff, climb-out, flight pattern, glide, and landing. Before anyone says this type of contest would never catch on, consider the record of the Southern California Gas Model Association which never had a contest that had less than 250 contestants.

Eventually, Dennyplanes were distributed all over the country and became extremely popular. As a matter of fact, the late Ray Van de Walker was employed by Walt Billet, a Minneapolis hobby dealer, to build complete ready-to-fly Dennyplanes for $100.00. Seems cheap now but a hundred dollars was a month's pay or better in those days!

SAM 46

Mark Glamier writes to send photos of his king-sized Powerhouse. Of the three photos sent, we have selected Photo No. 9 as most representative of the workmanship.

As Mark sez, "Although it may appear to be just another Powerhouse in the bones, it has been doubled in size to 14 feet. Built it last winter but covering was another problem in finances. I discovered if I used transparent MonoKote the cost would be over $180.00 even with discount prices. Finally settled on Sig Koverall.

"The model is built from balsa, spruce, and Lite-Ply (with plenty of lightening holes). The model with engine, radio, and landing gear came in at 12 lb., 9 oz. The finished model will approach 20 pounds giving a wing loading of 10 oz./sq. ft.

"I didn't build the Powerhouse 200 for competition, but rather as a show, promotion, and public demonstration model. Plenty of wing area; anyone want to rent billboard space?"

RARE ONES

Maybe this columnist should entitle this section, "Have You Seen This Item Lately?" as we feature several little-known Old Timer designs.

One of the main features of this column is to acquaint the average modeler with the looks, performance, and general arrangement of little-known designs. Such is the case of Photo No. 10, sent in by Phil McCary, showing a design by Steve Kowalik called the Miss Arpiem.

The name was derived from the newsletter put out by Junior Motors (Brown Jr. engines) with the title of "Arpiem" (RPM, tricky huh?). Of course, the design featured an upright exposed Brown Jr. engine.

Phil has gone the original design one better with an O&R .29 engine inverted with a slick cowl and landing gear fairings. All-up weight is 30 ounces, which should make the model climb well. Model is silk covered. Phil reports the model literally flew off the drawing board with two degrees of down and right thrust.

ANOTHER "UNUSUAL"

R.J. "Mik" Mikkelson continues to send in photos taken at the various SCIF meets held at Taft. Presented is Photo No. 11 of Leon Nadolski and his O.S. .15 converted ignition powered "Snuffy VI," a design by Bob Toft, well-known midwest rubber speed and duration man.

The Snuffy design appears on paper to have everything going for it: a high, stable pylon, neatly faired octagonal fuselage, and Comet Sailplane type wing. On half power the model flies excellently, but at full power the model will climb steeply and as it goes into a spiral climb the fuselage twists to the point that the stabilizer is

14. A big Fiske Hanley 1937 Texaco Winner by Al Wolsky, Hemet, CA. Flies great on a Webra .61 on ignition.

90 degrees to the wing. Wow!

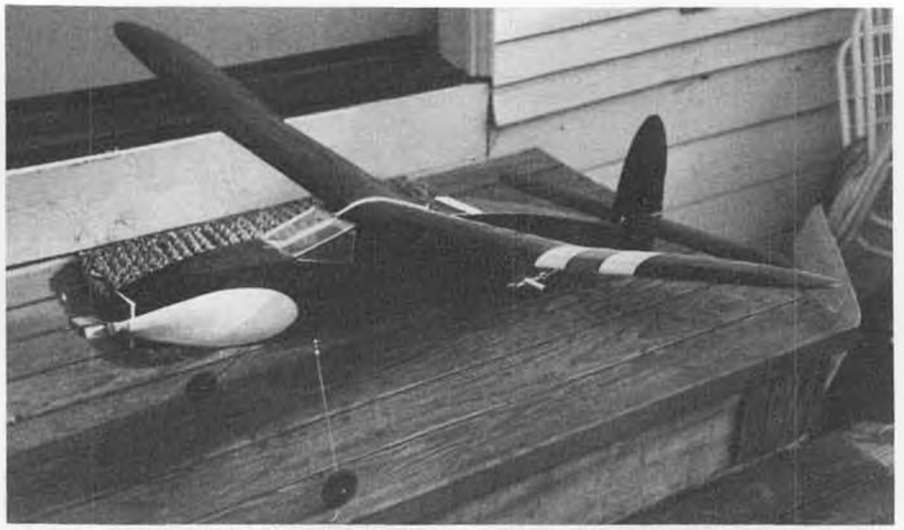
This was particularly noticeable in this writer's scaled Madewell .49 powered version. Attempts to stiffen the fuselage met with repeated failures. First, the fuselage was double tissued with a cross-grain arrangement, then internal diagonal cross bracing, then double silk covering—all to no avail.

In talks with midwest modelers, some indicate that designer Bob Toft sheeted the fuselage. This has not been the answer. Truly a shame as this model has tremendous flying potential. Perhaps the readers out there have discovered a way to make the fuselage twistproof. From personal observations, it appears to be an inherent design flaw. We solicit your opinions.

RUBBER NOTES

This column is so heavily oriented to gas powered models, we sometimes forget that rubber power model competition has experienced an amazing rennaissance. Entries have doubled and tripled in most all events.

This has been brought about by the availability of good rubber. The FAI rubber that has been marketed by Ed Dolby of FAI Model Supply has been excellent. Ed has recently brought out "tan" rubber which appears to be the best yet for power and duration.



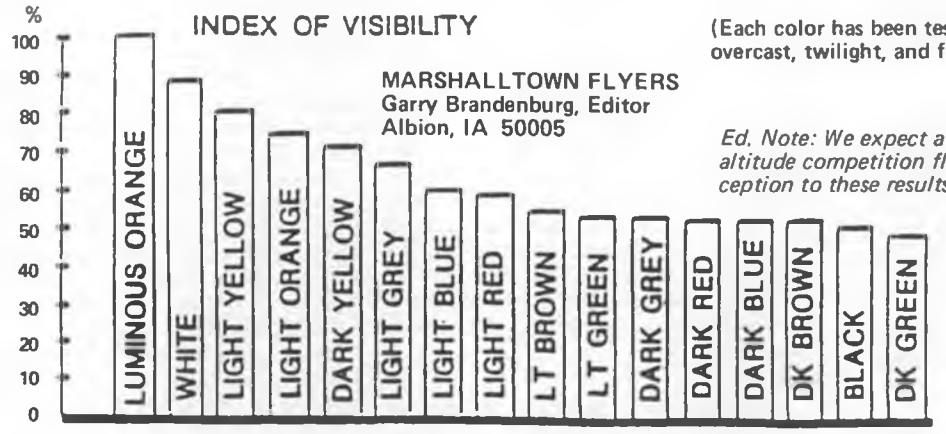
15. A nice Dick Korda Wakefield by Mark Sexton. Authentic color scheme (including wing stripes?).

The SAM 86 newsletter, as edited by Al Wale, provides a good insight on this new product. We quote as follows:

"The currently available tan rubber has excellent energy. Samples measured yield figures of 3597 and 3710 ft.-lbs./lb. of energy. The gray-black 1/8-inch FAI (1987 and 1988 batches) averaged 3520 ft.-lbs./lb. over six different boxes. Pirelli rubber, depending on the source, varies from 3780 to 3687 (Che Hobbies); FAI Model Supply gives figures of 3614 ft.-lbs./lb., while the Joe Eisen Pirelli measured 3690 ft.-lbs./lb. over a four-box average.

"From the foregoing figures, FAI Tan rubber is as good as any. Comparing torque

Continued on page 83



INDEX OF VISIBILITY

(Each color has been tested equally under sunny, overcast, twilight, and foggy light conditions.)

MARSHALLTOWN FLYERS
Garry Brandenburg, Editor
Albion, IA 50005

Ed. Note: We expect a lot of experienced high-altitude competition fliers are going to take exception to these results. So will the poor timers!

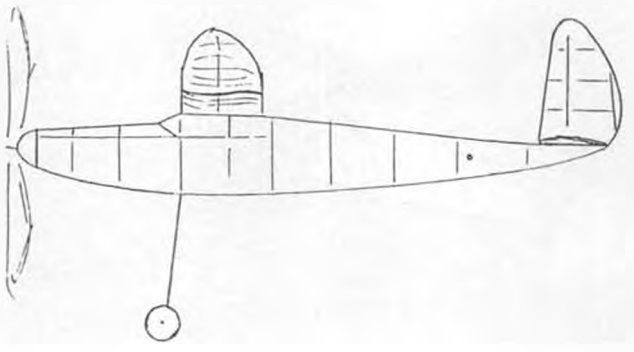
BOB ROMEISER'S

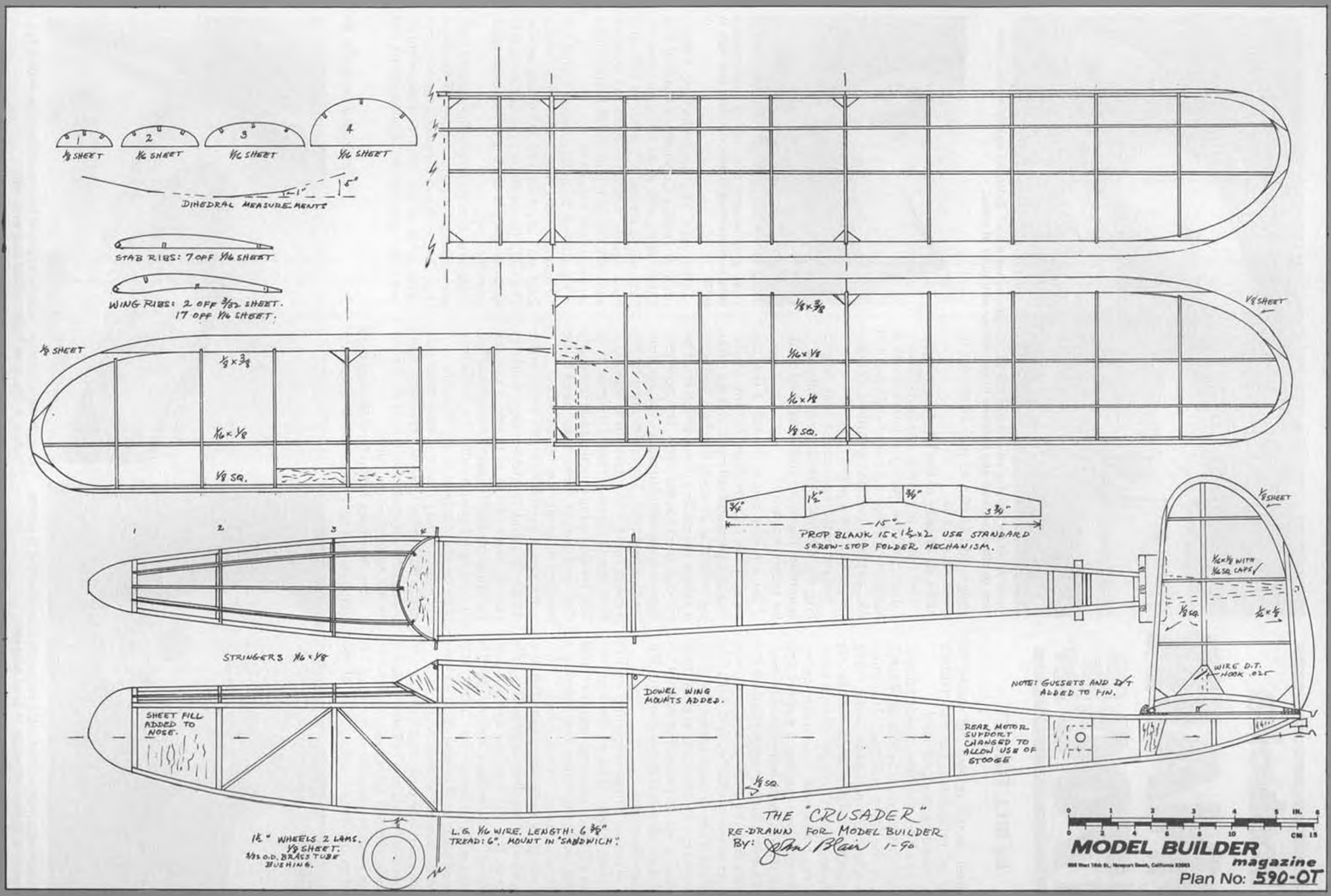
CRUSADER

First published in the October 1940 issue of *Air Trails* magazine, this medium-sized rubber powered endurance model, Romeiser's "Crusader," flies very well. In Old Timer competition it just qualifies as a "Small Cabin," and can hold its own against the Jabberwocks and Miss Canada Seniors. Our semi-regular contributor from Warne, North Carolina, John Blair, drew these plans and speaks from personal experience about its performance. John did a little legal beefing in certain areas, all indicated on the plan, that should result in a more reliable model. It certainly couldn't be any more basic or simple to build. •

OLD TIMER Model of the Month

Drawing and Text by JOHN BLAIR





FULL SIZE PLANS AVAILABLE – SEE PAGE 106

Yoshioka ONAIR 1700E

By BILL FORREY

Parts layout for installation of Astro FAI 05, six-turn cobalt motor. Extra ply spacer moves motor back to close oversize gap between thrust washer and nose of plane.

The repair would restore the model to flight in all probability, but the model's beauty would be compromised.

As I said earlier, the blow-molded plastic nose section is attached by four small black screws in the front bulkhead. This bulkhead is about 1/4 inch wide, and is made from a sandwich of two pieces of three-ply light plywood. A very large hole has been cut in this bulkhead. In a rough, nose-down or sideways landing, I suspect that the nose will rip loose from this bulkhead. This problem is further aggravated by the possibility that the non-folding prop will catch on some obstacle, and with the strength of its lever-arm, tweek the nose off or bend the motor shaft. In all fairness to Yoshioka, my initial testing has not included such abuse, and this problem has not been observed.

The elevator hinge is formed by the outer white plastic skins of the top and bottom surfaces coming together and touching along the hinge line, forming a completely sealed, "living hinge." This plastic hinge is very stiff, even after the recommended break-in flexing. This stiffness gives the S33 elevator servo a real workout at full deflection. The net effect is increased drain on the receiver battery and increased wear on the servo gears. However, in all fairness, it does work.

Structurally, based on my predictions of failure in the hands of a beginner, or as a result of accidental abuse, I would have to give the ONAIR a middle of the road 3.0.

To sum up Area I, the quality of the design: add 4.5 plus 4.7 plus 3.0 divided by three equals 4.06.

AREA II: Quality of the kit, 4.1 average.

First detail, precision. The parts fit is excellent, and the quality of the materials is likewise excellent. It is a very well executed ARF airplane. Everything worked. For precision, I give it a perfect 5.0.

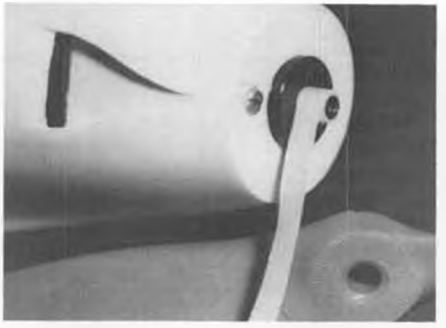
Second detail, ease of assembly. In general, the ONAIR 1700E was not difficult to assemble. There are areas that I feel could be better, however.

For a model called an ARF, I feel too much time is consumed cutting plastic fuselage parts and tail parts. This is a tricky job which can be easily botched. The main fuselage has cooling holes which must be cut out, then routed open. The nose section is a blow-molded piece of plastic similar to a fuel tank. Two sides must be removed, two NASA intake ducts opened, a hole opened for the front of the motor, six holes drilled using a model knife or electric drill, and two of these holes need to be beveled to accept flat head screws.

If it slips, a hand held hobby knife can be dangerous and/or yield sloppy work. In cutting these pieces of plastic, I can see potential trouble for some modelers. Plastic cutting is better handled by the factory than by the modeler in my opinion.

Only one very minor cutting error was made during my ONAIR's assembly. It involved the incorrect placement (by 5 mm) of the radio's on/off switch.

One drawback to the ONAIR's fuselage design is that only micro radio equipment



Wrap prop adaptor shaft tightly with masking tape to make snug fit with standard size hole in prop.

can be used. This would include a radio such as Futaba Conquest 4-channel FM Glider radio with its R114H mini receiver, S133 micro servos, 275 mAH Ni-Cds, and mini switch. Airtronics mini FM receiver with 501 Microlites, or the JR Propo micro servos would also work.

I installed a slightly older Conquest 4-channel AM Glider radio with Futaba R4H mini receiver and S33 micro servos. The S33's fit the factory die cut servo tray with only a slight sanding of the rectangular tray opening.

Because the S33 servos stick up very high above the servo tray, care MUST be taken that the pushrod clevises attach to the servo arms at the inner or next-to-inner arm holes as drawn in the instructions, but

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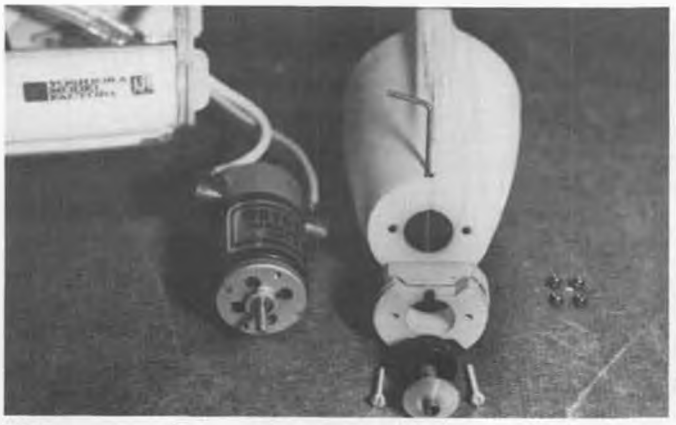

Whole assemblage from another angle. Note hole in cowl bottom to access Allen wrench to tighten set screw in prop adaptor.

Completed installation. Note how spinner blends into fuselage. Prop is 8x6 Robbe. A Graupner folder would also work well.

Airtronics new Vanguard 6-channel PCM radio being tested in a flybarless GMP Legend.

AIRTRONICS "VANGUARD" PCM & PPM FM HELI RADIOS

By JAMES WANG

The Airtronics Vanguard helicopter radios are the newest inexpensive helicopter radios to appear on the market. The Vanguard six-channel helicopter radios come in two forms, a PCM version and a traditional PPM version. Both are six channels and use FM (frequency modulation) for transmission in the air. Before we review the radios, let's first go over the differences between internal coding in PCM or PPM, and the transmission formats, AM or FM. People often get confused between coding and transmission.

PCM and PPM only refer to how the joystick commands are coded. PPM means pulse position modulation. In PPM, as the pilot moves the control stick, the width of the respective pulse will change accordingly. PCM means pulse coded modulation and it was introduced to R/C about seven years ago. For PCM, each position of the control stick gives a unique number, let's say between 1 and 1024. Thus, center stick means 512, full right stick means 1024, and full left stick means 1. This implies between full left and full right stick, you can only have 1024 different servo movements.

Both the traditional PPM and the newer PCM are considered as digital technology because they convert the analog voltage from the control stick pots to digital pulses. Thus, all modern aircraft radios are called digital proportional radios. It is how the pulses are coded that makes them different.

PCM has various advantages, the chief of which is the ease with which error correcting codes and various special characteristics of the message source may be exploited. For example, many modern music synthesizers also use PCM technology. Like the new sampling keyboards, once a speech wave has been converted into a sequence of digits by sampling and quantifying, it loses its identity as a speech wave. Strings of digits from many different sources—other sampled sound sources, music . . . can be flexibly interleaved to modify the original speech wave. Computers also operate in digital format, hence the PCM coding method gives rise to our modern programmable radios. PCM permits more imaginative functions, such as failsafe and hold-last-command, mixing, etc., to be added to modern radios. However, in terms of reliability, both PCM and PPM radios are proven methods of coding pilot's command signals.

Editor's Notes:

Though the author's comments regarding encoding are basically correct as being commonly accepted in R/C, they are not exactly correct according to electronic engineering practices. We would like to quote Fred Mark's writing in his excellent book on the subject of R/C systems.

"In order to avoid a possible misunderstanding, you should know from the outset that our model R/C digital proportional systems are not true digital systems as that phrase is used in electronic engineering. In electronic engineering, digital systems are most often used to transmit analog data (usually a human voice) in which the amplitude of a control voltage (a reflection of the amplitude of the voice) determines the time period between succeeding pulses. Decoding is easy because a re-

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The Vanguard PCM and FM transmitters look identical and have same helicopter features. Shown in Airtronics double Xmitter case.

Under front cover are the helicopter functions. Here the 6H FM transmitter is shown. The PCM has failsafe in addition.

Complete Vanguard installation, including 1991 narrow-band receiver. Special through-the-frame exhaust header designed by James, made by MACS.

The very new and inexpensive Airtronics SG-X gyro comes with its own special 94103 servo. Very compact and light weight.

Professional model builder Craig Wilson's beautiful "Aggressor II."

JET TRAILS
at the
Tangerine Ducted Fan Fly-In

By WALLY ZOBER

The Remote Control Association of Central Florida held its third annual Tangerine Ducted Fan Fly-In on December 31, 1989 and January 1, 1990. We have a rather unique situation here. You will note that the first day of the fly-in was the last competitive ducted fan event for 1989 and that the second day was the first ducted fan event for 1990. How's that for timing and planning?

This two-day fly-in was held at the Deland Golden Hawks flying field. The flying site is an abandoned concrete runway at the Deland County Airport—perfect for R/C jet models. The contest director was Dave Tyson and he kept the show rolling with at least three or four airplanes in the air at all times, except during the "Top-Gun" event. Dave organized this ducted fan fly-in as follows: On-site registration began at 8:00 a.m. on both days. Flying started at 8:30 a.m. and continued until 4:30 p.m. The speed traps were open from 10:00 a.m. until 3:00 p.m. The Top-Gun competition ran from 12:00 noon to 2:00 p.m. on both days and two rounds were flown each day.

Greg Garneau, down from Canada, was a participant in the Top-Gun event. Shown with his super flying "Aggressor."

Jerry Caudle won award for fastest flight with his very pretty "Viper," clocking 212.5 mph.

Dave Nicholson's modified Byron Mig-15. Uses BVM fan, duct, and KBV engine. Flies about 20 percent faster with this system.

Bob Fiorenze (left) was test pilot for first flight of Paul Lupia's giant Byron F-15. Paul's smile tells you how it turned out.

Bob Fiorenze with his new F-4 Phantom built from Yellow Aircraft kit. Uses a single fan.

The weather was really great both days. Sunday, December 31st was bright and sunny, but a little windy. Monday, January 1st, was partly cloudy with a slight breeze. Both days were great for flying. The Deland flying site was ideal for this competitive event. There was plenty of room for spectator parking and lots of room for contestants in the pit area. A large tent was set up for the food concession stands. There were twenty-four registered contestants and thirty-two airplanes. There was a good cross section of R/C jet models at this fly-in.

Bob Violett Models was well represented at this meet with Vipers, Sport Sharks, Aggressors, and his F-86 Sabre. Yellow Aircraft had several A-4 Skyhawks, an F-5E, and their newly released F-4 Phantom. Bob Fiorenze flew and demonstrated a few of the Yellow Aircraft models. There was also a Byron F-15 and a modified Byron MiG-15, a Nick Ziroli designed Heinkel He-162 (modified from the Midwest kit), and last but not least, a prototype F-20. The craftsmanship and the flying skills of the contestants was top drawer. There were no ugly or poorly built models at this ducted fan fly-in, nor were there any pilots who were unskilled or unqualified to fly these super, machines and yet, unfortunately, there were a few crashes. I'll talk about them later.

I'm not one for dropping cliches, but after watching this two-day event, I have three appropriate ones for you: "Triumph and Tragedy," "Agony and Ecstasy," or, as they say on Long Island where I lived before I moved to Florida, "You win some and you lose some."

Ducted fan pilots fly their high-tech, high-performance machines to the leading edge—there is no room for mistakes. If you do it right, you win—it's triumph, it's ecstasy. If you make a mistake—it's tragedy, it's agony and you lose. There was some really great and aggressive flying. Some of it was in the Top-Gun event, and some of it was done to excite the spectators. Top pilots such as Terry Nitsch, Bob Fiorenze, Jerry Caudle, Bob Violett, Dave Ribbe, and Dave Escobar, to name a few, push their jet models to the edge of their flying envelope.

Terry Nitsch, Top-Gun winner for '89/'90, showing bottom side of his modified "Viper." Checkers, anyone?

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Dave Nicholson's Nick Ziroli designed Heinkel HE-162 unfortunately no longer kitted by Midwest. Modified to use BVM fan equipment and KBV engine, it flies fast and with authority.

Bob Violett's F-86 Sabre. Equipped with gyro on rudder to help tracking. Has sequential operating landing gear doors. Also jettisons its auxiliary fuel tanks, for additional realism.

The author's Kalt Cyclone II test ship with pleasing paint job by Ray St. Onge. With OS 50H, it moves right along, does loops and rolls. At designer rotor speed of 1400 rpm control response is smooth, not quick enough for hot-dogging.

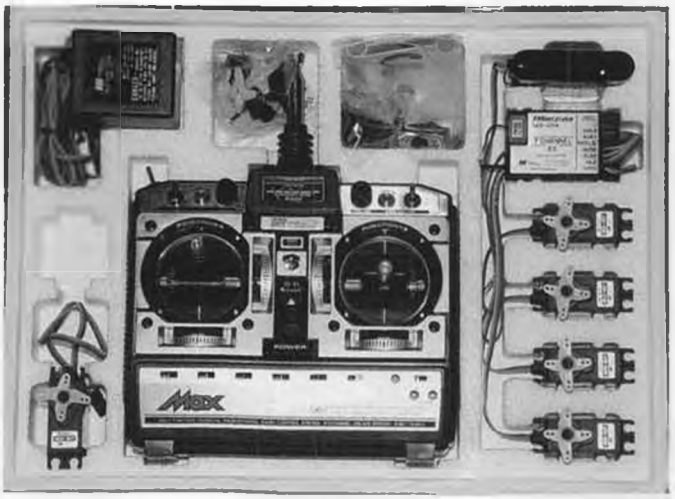
KALT "CYCLONE II"/JR MAX 5H FM
HELICOPTER HELI R/C SYSTEM

By JAMES WANG

For the past few months I have been testing a new R/C helicopter, the Kalt Cyclone II. It is a 50-size helicopter aimed at the beginner market. It is a follow-up to the earlier successful Kalt Cyclone I design. The new Cyclone II was released in 1989. The improvements include a completely new K-5 main rotor head, toothed belt-drive tail rotor, autorotation bearing, and a new canopy design. In this review we will first look at the Cyclone II's design integrity, then control setup, and finally the flying qualities. We will also talk about the new, inexpensive, JR MAX 5H FM radio.

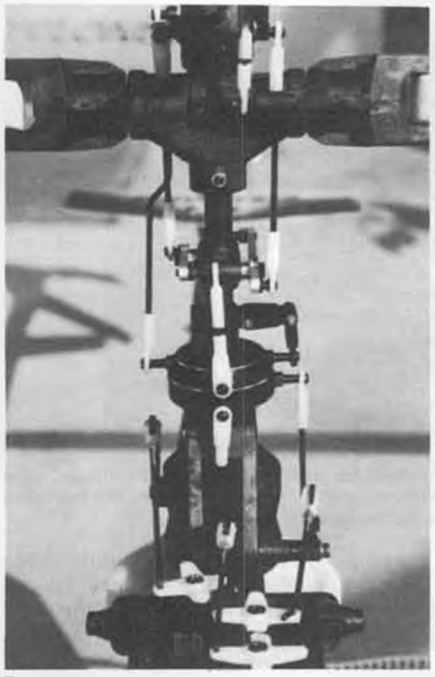
For readers who may not be familiar with Kalt products, here is a brief introduction. Kalt is one of the leading R/C chopper manufacturers in Japan. Kalt started in the mid-'70s with its successful Baron series. Kalt products were introduced to the U.S. in the late '70s by Circus Hobbies, and are now distributed by Hobby Dynamics. Unfortunately, most Americans have not been familiar with Kalt models because until now, before you could only get replacement parts through mail from Circus Hobbies. Thus, very few people flew Kalt models. Last year, Hobby Dynamics started distributing Kalt helicopters and parts to local hobby shops. Recently, we began to see more Kalt helicopters at the fields.

Of all the helicopter manufacturers, Kalt and Schluter have the best reputation for consistent quality control and kits without missing parts. Aside from the specific model designs, Kalt and Schluter metal parts are always well machined. The plastic parts are molded cleanly and fit together well. During the past 15 years, Kalt has introduced more main rotor head designs than any other company. Kalt pioneered the hinge less main rotor head for R/C helicopters, and was also the first to have a gas engine powered helicopter kit. Kalt's lineup once included a 60-size R/C autogyro. Their old clear-lacquered wood blades were once the best stock blades.

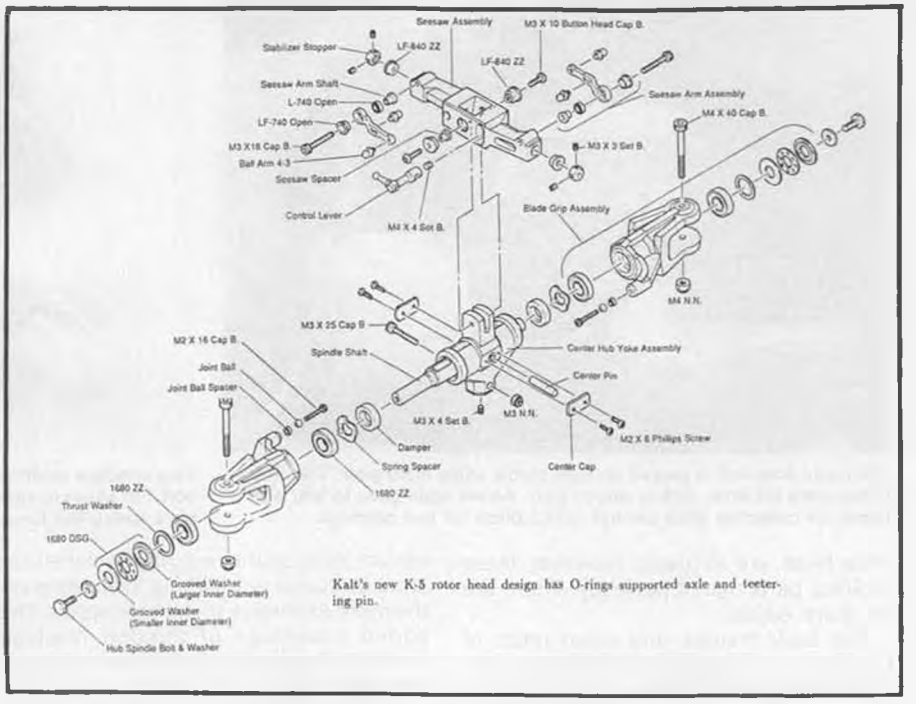


This is what greets you as you pull the top half of the foam case off the JR MAX 5H FM heli radio system. Neat, huh?

And this is what you find when you (carefully) spill out the contents of the Kalt Cyclone II kit box. Numbered bags for parts identification.



Front servo is pitch cyclic, middle is roll cyclic, rear is collective. Beautifully machined swashplate. Above it is swashplate follower and collective mixer.



Kalt's new K-5 rotor head design has O-rings supported axle and teetering pin.

Kalt models have always been popular in the Far East and Europe. If Hobby Dynamics maintains a strong campaign on Kalt, and staffs knowledgeable helicopter technicians who know the models and the parts numbering system, then you can expect to see more and more Kalt machines in U.S. in the future. The present lineup of Kalt machines in the U.S. includes: Omega Jet Stream (a Jet Ranger look-alike for experts, also winner of the 1985 World Champs, $1499); Omega Professor (the pod-and-boom version, also for experts, $1299); Excalibur (pod-and-boom, for intermediates to experts, $999); Cyclone II (pod-and-boom for beginners, $539); and a new 30-size Enforcer (general purpose fun machine for beginners to experts). That is a diverse selection of models to satisfy any palate. Furthermore, these are all sleek looking, cutting-edge designs. The old Baron series is being phased out. Stay tuned, as we will have the Excalibur and Enforcer reviews coming in a few months.

Now we shall look at the Cyclone II. As shown in the picture, the parts are packaged in nine plastic bags to match the nine assembly steps in the instruction manual. The manual is geared for minimal assembly time because there are only about 50 words on each page, and each page has large illustrations. It took me 11 working hours from opening the box to flying.

Glue the canopy: 1/2 hour

Assemble the frames: 1 hour

Install engine, clutch and fan: 1 hour

Assemble the tail rotor gearbox: 1 hour

Attach landing gear, tail boom, and fins: 1 hour

Add servo tray: 1 hour

Add control linkages: 1.5 hours

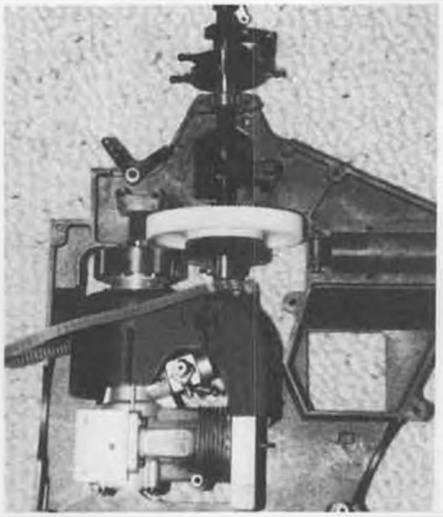
Smooth out the collective mechanism: 1 hour

Install radio system and gyro: 1 hour

Finish the rotor blades and painting : 1 hour

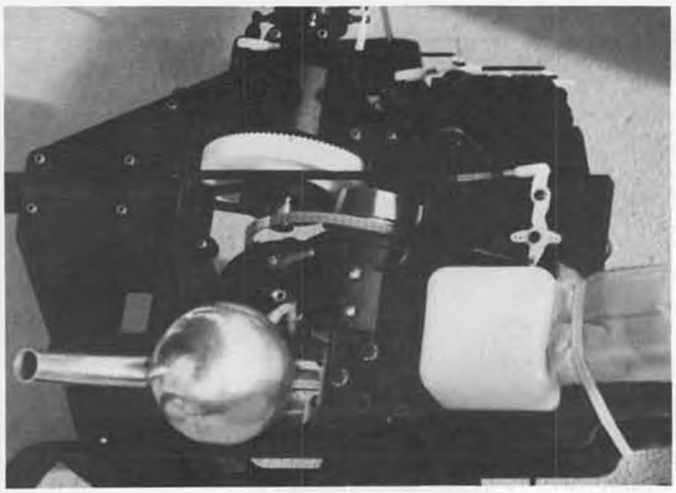
Check over the control setup: 1 hour

The Cyclone II is almost entirely put together from injection molded plastic parts. Aside from the main rotor blades, there aren't any wood pieces. The side frames, servo tray, tail fins, tail rotor blades, landing struts, tail rotor gearbox, and even the main

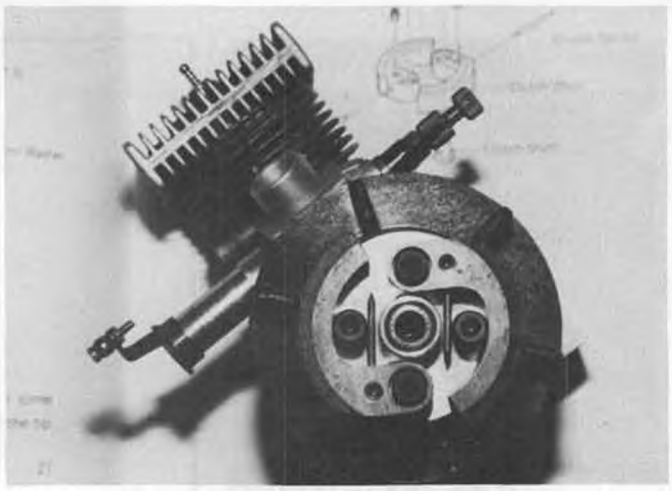


Left sideframe removed to reveal engine, cooling shroud, main gear, and clutch. Starting belt can get jammed in flywheel. Square cut-out for gyro, but it should go in cabin or model will be tail-heavy.

The K-5 rotor head. Above the 3mm nut you can see the teetering pin and brass bushing. See text. Sliding mixer shown has some play that needs improvement.



Tail rotor drive belt is picked up right below white main gear. This eliminates extra tail drive pickup pinion gear. Above main gear, to left, is 90° crank for collective pitch control. Good place for two bearings.



Very effective centrifugal clutch design. Steel pins between hub and 4mm bolt. For shoes to swing outward, sufficient force is needed to counteract pin's spring-like force. Its performance is very good.

rotor head, are all plastic. However, these molded parts mated perfectly. There are no sharp edges.

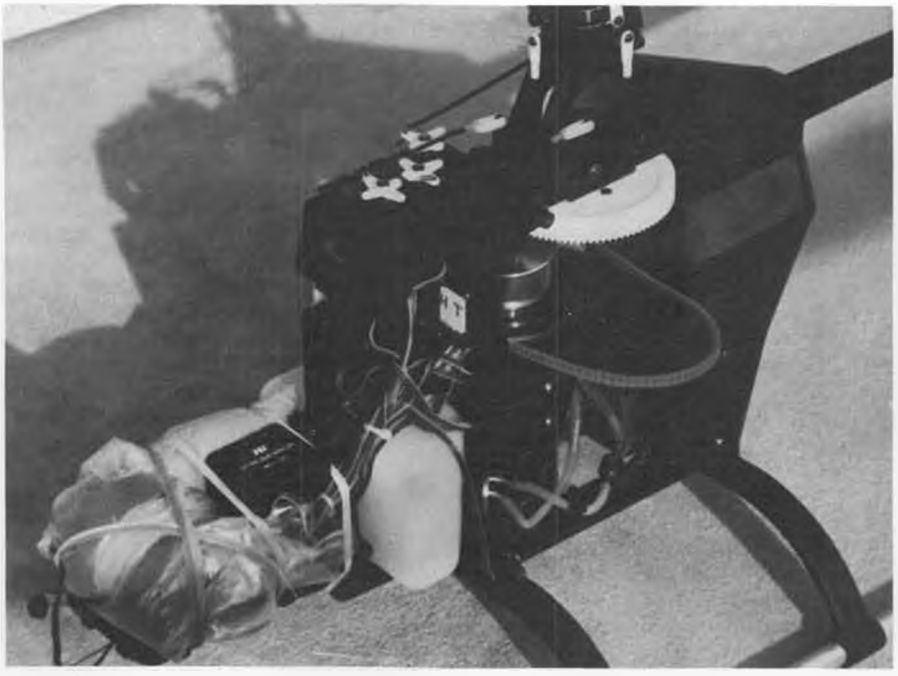
The basic frames, and servo setup of Cyclone II is identical to Cyclone I. The two molded side frames are very robust. The two frames alone weigh a total of 19 ounces. I have not crashed my Cyclone yet, but I suspect these two molded side frames can take some abuse. My first worry was that if the frames alone were over one pound, then the final helicopter must be quite heavy. Surprisingly, the final weight came out around 8.5 pounds. To help reduce the overall weight and prevent tail heaviness, the tailboom is a fiberglass tube instead of aluminum, as used by most other helicopters.

Most plastic helicopters use 3mm bolts and plain 3mm nuts, or self-tapping screws for holding the frames together. The problem is that the plain nuts or screws can vibrate loose spontaneously. Cyclone uses 3mm bolts and self-locking locknuts as on the more expensive metal helicopters. The added advantage of molded fuselage frames is that they include recessed hexagon wells for the locknuts to sit in. Thus, you don't need a hex wrench when tightening the 3mm bolt with an Allen driver. As the frames are molded quit well, once the engine, main rotor shaft, and main gear are installed, you will automatically get perfect gear mesh.

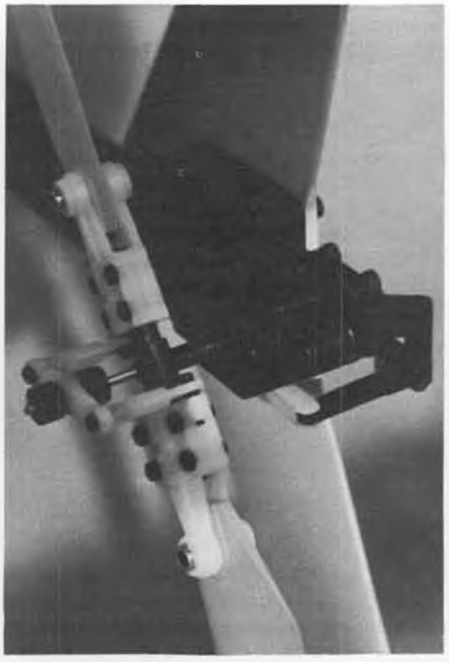
The engine mount which comes with the kit is pre-drilled for an OS 50 FSRH, or Enya 50. Hobby Dynamics (the U.S. importer of Kalt helicopters) also sells an optional 60-size engine mount. However, we believe that a 50 should be used with this helicopter. With an OS 50, our Cyclone climbed out very happily, but definitely not like a rocket. A 60 may overpower it and cause fatigue stress. Furthermore, the cooling shroud will not accommodate a 60-size engine with heatsink head. You will then have to cut and modify the shroud. If you want a 60-size helicopter, then buy a 60-size helicopter. The Cyclone is supposed to be a docile beginner helicopter, not a rocketship. By the way, a 40 or 45 engine will give sluggish performance. Hence, we recommend only the OS 50 FSRH, Enya 50H, or the Webra Speed 50H.

The centrifugal clutch on the Cyclone II is one of the most effective that we have seen. The picture shows its unique design. Unlike most other models which use a one-piece design, Cyclone uses an interesting steel pin design. The steel pin holds the clutch shoe in until the centrifugal force can throw the shoe out. So far, the clutch has worked extremely well. A good clutch means the main rotor blade will not

Continued on page 106



Heli radio with five servos and an electric gyro are needed to fly the Cyclone. Large fuel tank gives 20-minute flights. Plastic landing struts toughest author has seen. Robust servo tray.



Tail rotor blade grips supported on two radial bearings. Careful assembly of tail rotor gearbox assures smooth tail rotor control.

KALT

THE BEST TUNE-UP OF THEM ALL FOR 1990!

60 size Kit

- FAI style competition class
- High performance K-5 rotor head
- Autorotation
- New cone start system
- Precision tail drive assembly
- Push-pull control assemblies
- Weighted rotor blades

Excalibur inset: advanced mechanics for FAI.

Coming Soon!

Enforcer inset: revolutionary modular design.

30 size RTF

- Fully aerobatic
- Sealed transmission with planetary drive gear assembly
- Modular design
- Top cone starter
- Quality balanced rotor blades

50 size Kit or RTF

- Bell-Hiller mixing
- Autorotation
- Balanced rotor blades
- Tooth belt tail drive
- Easy to build
- High performance K-5 rotor head

Cyclone II inset: super-strong fiber-reinforced sideframes.

Helicopter Hotline

Kalt Support

Full line of parts and accessories available

Have a question about a Kalt Heli? Call an expert on the Hobby Dynamics Helicopter Hotline!

Name	Location	Time	Telephone
Maui Chai	Orem, Utah	7 - 9 PM CST	(801) 226-4286
Frank Dykes	Laurel, MS	7 - 9 PM CST	(601) 428-1716
Mike Ellis	Sevierville, TN	7 - 9 PM CST	(615) 453-6324
Rich Goss	Remsenburg, NY	6 - 10 PM EST	(516) 325-0265
Gary Kurtzman	Phoenix, AZ	After 6 PM MST	(602) 582-8604
Billy Pearce	Enterprise, AL	5 - 10 PM CST	(205) 347-4973

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BOB VIOLETT MODELS'
F-86F SABRE

By DAVE MALCHIONE

The world is full of classics—classic cars, Classic Coke—but whatever happened to the classic jets in the ducted fan industry? One jet that has the right to claim this title is the F-86 Sabre. Having seen combat from Taiwan to Argentina and from Pakistan to Korea, the Sabre has been exceeded in its widespread use only by the T-33, T-6, and the Dakota. In all, thirty-nine nations have operated the F-86 to protect their countries.

Bob Violett Models has been working on a correct scale outline Sabre for seven years and it has proven to be a winner. If you are looking for a scale single engine jet model that is large enough to see, stable in flight, and completely engineered, my opinion is that this F-86 is your best choice.

My F-86 was the first production kit to be built and flown per the plans and detailed instructions, with no modifications needed.

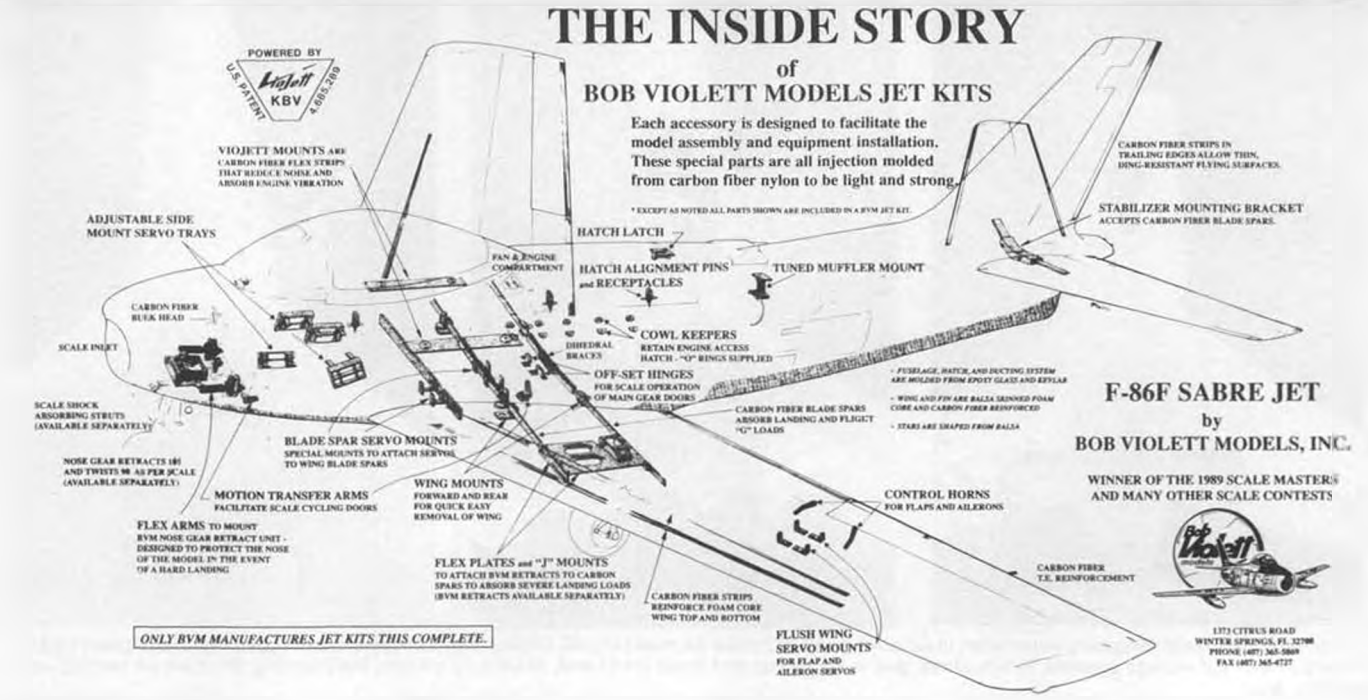
The Violett F-86 is an appraisal of a new generation of true scale jet modeling. Violett's design goal was to engineer the model with exact scale intake and exhaust areas, and still be able to deliver grass field performance. Many experienced jet modelers regard Bob's goals as unachievable. Not so—the F-86 is exact scale and flies like a dream.

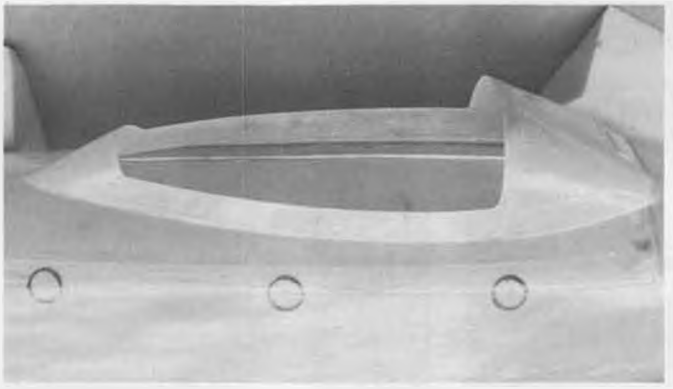
There are some unique features that set this kit apart from all the others. The use of highly engineered injection molded carbon fiber accessories make construction of this kit quick and easy. The kit comes complete with a Kevlar reinforced epoxyglass fuselage and a separate molded hatch. Ready-to-install ducting system and professionally cut and notched foam cores for the wing and fin are included. The horizontal stab is airfoil shaped from balsa. Special injection molded fittings include the wing and stab mountings, hatch and cowl attachments, and shock absorbing

The Gottschall sisters, Kimber and Heather, West Chester, PA, help us with a striking top view of Dave's BVM F-86.

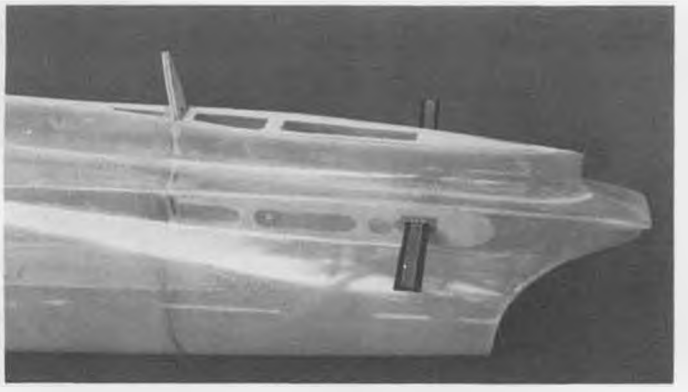
The Violett fan is double suspended in rubber mounts, for many good reasons.

An outstanding feature of the BVM Sabre are the scale inlet and tail pipe openings. No "cheater" holes required to gulp sufficient air for proper operation.





The canopy and equipment hatch are both molded as one unit. No need to hack out a hatch with an electric hand tool.



Stab dihedral mounting bracket and spars for correct scale angle.

landing gear mounts.

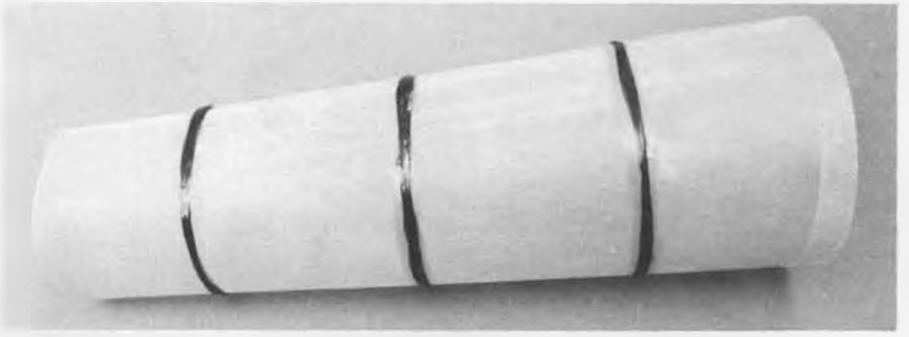
A clear canopy, decals, pre-joined and shaped wing skins, and a complete hardware package make this jet kit a real value for your modeling dollars. The best part of this package is that after you have invested your time and money you will have a 100% contest ready model. Any questions about assembly or fan operation were met with prompt and competent advice. This is nice to have when you are undertaking any sophisticated modeling project. All updates and modifications to the kit are sent at no extra cost to the customer.

Assembly starts with the stabilizer and Magnacore wing preparation. The horizontal stab is solid balsa shaped to an airfoil section with a carbon fiber leading and trailing edge, an injection molded dihedral brace, and carbon spar. The vertical fin is foam sheeted with balsa for light weight.

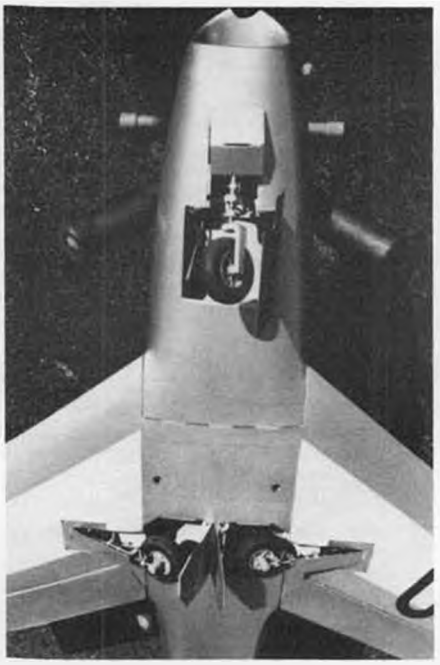
The Magnacore wing construction is simple, strong, and light. It features shock absorbing landing gear mounts that allow the model to survive a really hard crash landing without damage. First, all of the carbon spars, gear mounting plates, and servo bays are installed in the wing, then the cores are sheeted with the beautifully finished skins. Ailerons and flaps are then cut out of the wings and the assemblies set aside for finishing.

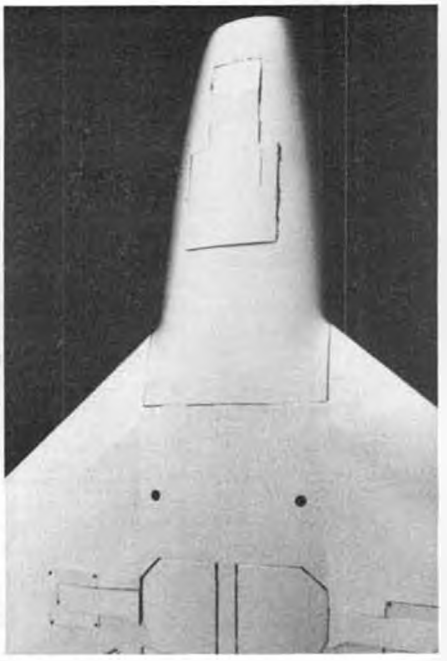
The fuselage assembly is quick, starting with the canopy/equipment hatch attachment. Carbon fiber injection molded hatch pins and latch make this an easy, light, and very secure system. After the hatch is complete, the pre-cut glass laminated formers are installed and the double rubber mounted Viojett fan is installed. This highly engineered mounting system is one example of the thought and completeness of this kit. This feature cuts down on the high frequency vibration related to ducted fan operation, resulting in longer radio and servo life. Lower DB levels also have been established with this mounting system. This mounting system sounds very complex, but in reality is easier to install and remove than the conventional four-bolt hard mount system.

All pre-cut glass laminated formers are installed in their proper locations. Carbon fiber stab mounting brackets are installed, making the preset dihedral simple and very

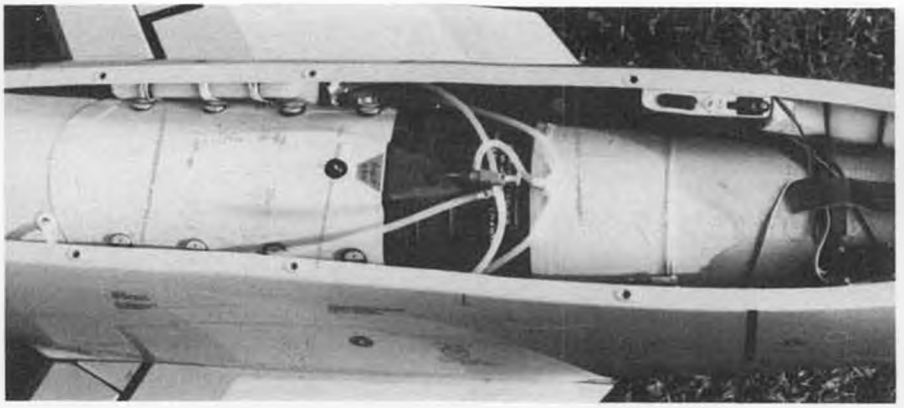


Inlet liner is wrapped with carbon cord to resist pressure drop created by fan. BVM employs extensive use of carbon fiber for lightweight reinforcing of components.

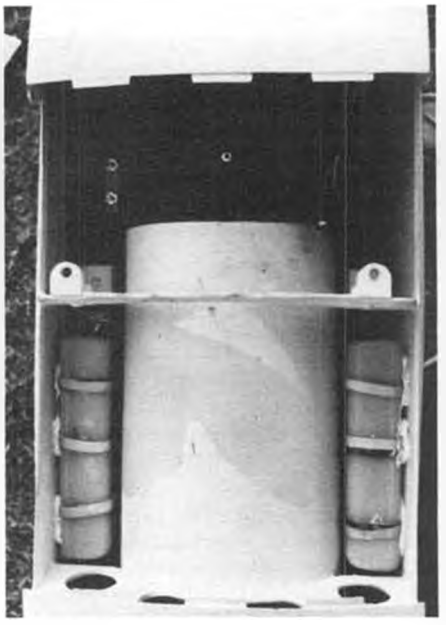




Three-step photos showing retract operation. In full down position, wheel doors are closed. During retraction, wheel doors open. Note nose gear rotating 90 degrees for flat storage of wheel. In final stage, gear is sucked up and doors are closed, all set for a smooth, belly landing. What are we saying!! Just kidding, Bob!



Viojett, external mixture control, and plenty of room for radio equipment. Note engine glow plug peeping through outlet tube.



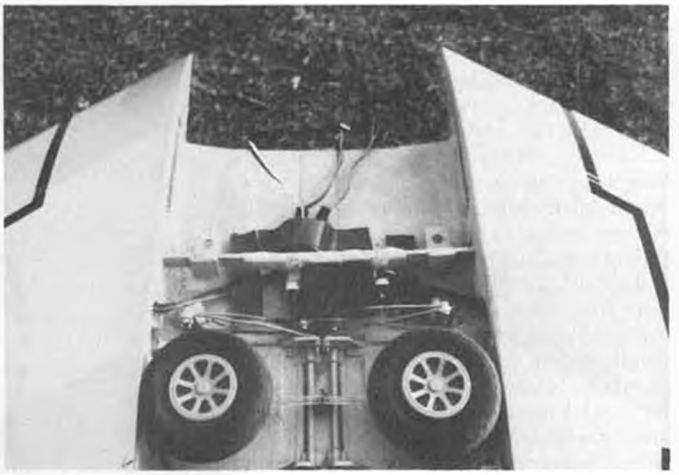
Saddle-bag fuel cells and molded wing mounts. Space left over!

strong. This one item saves countless hours of determining the correct scale stabilizer dihedral angle and is accomplished in minutes.

The next assembly step is the preparation for wing mounting. First, using Zap-A-Gap, the wing halves are joined together with the injection molded CF spar joiners. This process takes about fifteen minutes. The wing is then joined to the fuselage using the molded wing mounting brackets and rear mounting pins and bushings. One

Continued on page 88

Canopy, decals, and molded cockpit included in kit. Are you drooling, Bob Veasey?



Transfer arms, door hinges, and all linkages are supplied in kit. A place for everything, and everything in its place!

MODEL DESIGN & TECHNICAL STUFF

By FRANCIS REYNOLDS

REYNOLDS NUMBER

MD&TS is in receipt of a letter from Jim Adams, the President of The Society of Antique Modelers (SAM). In his letter, Jim asked for a little elucidation on Reynolds Number. I have referred to Reynolds Number a number of times in this column, but now realize that I have never gotten into explaining this bit of "Technical Stuff." What better person for the job than another guy named Reynolds? Let me share part of my letter to Jim with you.

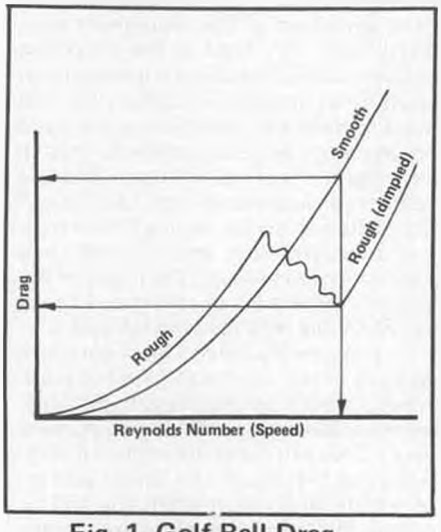


Fig. 1 Golf Ball Drag

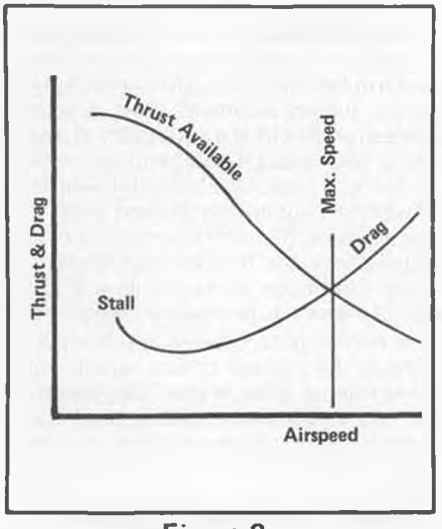


Figure 2

Most aerodynamics books talk about Reynolds number, and so do the encyclopedias. Quoting the Britannica, "Osborne Reynolds, a British physicist, first showed (1883) that the transition from laminar to turbulent flow in a pipe depends upon the value of a mathematical quantity equal to the average velocity of flow, times the diameter of the tube, times the mass density of the fluid, divided by its absolute viscosity. This mathematical quantity, a pure number without dimensions, became known as the Reynolds number and was subsequently applied to other types of flow . . ." (etc.).

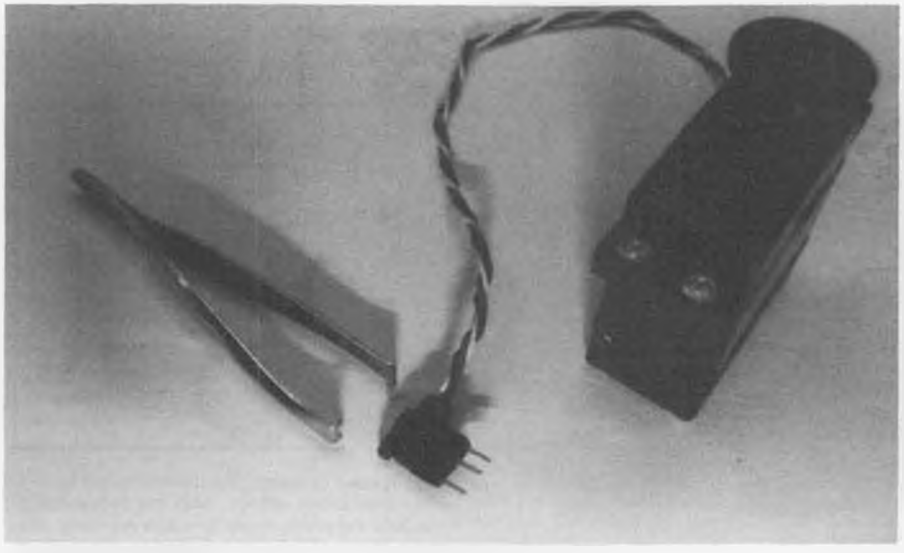
As you can see, uncle Osborne formulated his concept with hydraulics in mind, twenty years before the airplane was invented. It is still used extensively in hydraulics, but the new science of aerodynamics also found it to be indispensable.

Reynolds number (R.N., or sometimes just R.) is still the same as Reynolds formulated it, except that in aeronautics we use the chord of a wing instead of the diameter of a pipe, and the fluid we are talking about is air, not water. Whatever the fluid, if the R.N. for two flows is the same, the flows are geometrically similar. Note that the chord of a tapered wing varies, so the Reynolds number will be higher at the wing root than it is at the tip.

R.N. is density times velocity times chord divided by viscosity, or (rho)(V)(L)/mu, where L is the "length" of the chord. The density and viscosity of the air don't change much for our models, which usually fly near sea level, so we normally don't worry about rho and mu. What we do have left to worry about, therefore, are the speed and the size of the airplane.

Remember, the flows are similar if the R.N. is the same for both. This says that if one scale airplane is twice as big as another model of the same airplane, but is only flying half as fast, their R.N. is the same and therefore both have laminar flow or both have turbulent flow. The lift and drag coefficients on the two models will be the same.

This illustrates a problem in connection



The author's homemade tool removes tight servo plugs from receivers without putting a strain on the lead wires. Easily made from a cheap pair of tweezers.

Continued on page 97

Electronics Corner

By ELOY MAREZ

THE ELECTRONICS INDEX IS COMPLETED!

Finally! In my communications with some of you, I have mentioned that I had plans to update the *Model Builder* electronics index which I started some years ago. As any of you who have ever attempted this type of a project know, this is far from being an easy or enjoyable chore, and I kept putting it off in lieu of other more interesting pursuits. Well, I am happy to say that I finally ran out of excuses, and the *seventeen* year (1973 to 1989, inclusive) index of all electronics subjects to appear in *Model Builder* now actually exists. Some 21 single-spaced pages!

The idea of the index is to help me answer my correspondence, which as too many of you have found out, sometimes lags unforgivably. Though it generally takes me only a couple of minutes to pound out an answer, researching for that answer is often a real time killer. And while I know that I repeat myself at times in this column, I try to keep it to a minimum or at least not to do so unless enough time has gone by so that the information will go to a reasonable number of new readers.

The *MB* Electronics Index covers not only my efforts, but also those of every other person who has written on a related subject or product during that time. It is also broken down by actual subject, i.e., you won't find any listings for Electronics Corner—every subject discussed during a given month will be listed individually. In instances where a cross reference is called for, it is so listed: Reversing Servo Operating Direction and Servos, Reversing Operating Direction. Products discussed or reported on are listed under the manufacturer's name if well known, if not they too receive a double listing, so that you can locate that elusive electronic do-funny by its name if you forgot who makes it. In addition to the subject heading, also included are the issue by month and year, page number, and author, so that you can easily spot what your favorite writer had to say on any particular subject.

I am sure glad to get this done, and have vowed strongly to myself that from now on I will update it every year with the appearance of the December issue. Time will tell! In the meantime, for those of you who have expressed an interest in the index when I got it finished (Thanks for not saying *if!*), copies are available for $8, postpaid, not all crunched up but unfolded in a large envelope, directly from me at the address at the end of the column.

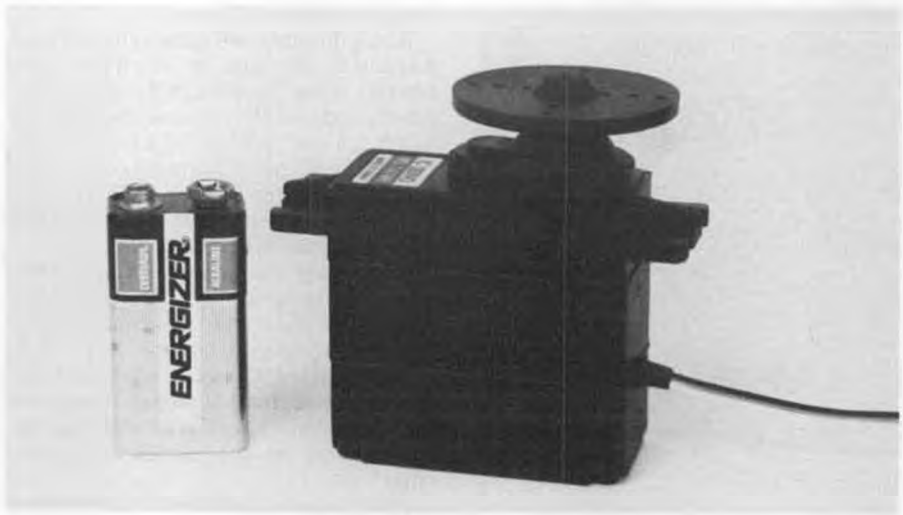
* * *

The D&B timer which I mentioned here a couple of columns ago (January, with photo in February) brought in a few letters on the subject of timers, most of which agree strongly with the advisability of never taking your eyes off your airplane—while it's flying, at least! One letter did point out a fact that I apparently glossed over, the rate at which this timer informs you of the elapsed time. For those of you who missed it, the D&B timer starts counting at your flick of the switch, normally at takeoff time. One minute later, it beeps at you once to indicate the passage of one minute. Another minute later, it goes beep-beep to let you know two minutes total have elapsed—up to fifteen minutes at which time, if you are still flying, it recycles and starts over.

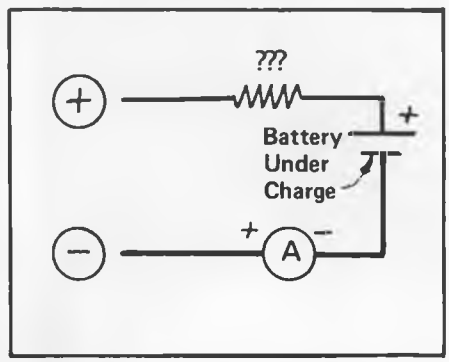
What was questioned, or rather criticized because the writer doubted his ability to count the beeps, is the *rate* at which they occur. Good question! No, they don't come at you like Morse Code at fifty words per minute, but actually more like a chime clock striking the hour, with more than adequate spacing between each beep for an accurate count. Actually, I have found that like so many other parts of R/C flying, time keeping with this device rapidly becomes automatic, and while it accurately paces you, it does so without a lot of conscious effort on your part. For example, if my last actual count was five minutes, I know that the next time it sounds it is indicating six minutes, without my actually having to think beep/one, beep/two, beep/etc. I have found too that it is a lot more comforting to have this close a count of your flying time than depending on just one tone to tell you when all of your allotted time has passed. Info on the D&B timer is avilable from D&B Electronics, P.O. Box 27727, Santa Ana, CA 92799.

The R/C Equipment Certified Listing in *Model Aviation* magazine has been a source of confusion to some who are apparently not reading what is actually being said, or NOT understanding what it does say. It does *not*, repeat *not*, say anything about this being a listing of AMA *approved* R/C equipment. It says only that the makers or importers of this equipment have filed a letter with AMA to the effect that the band width of said equipment has been tested by an independent laboratory and found to meet the specified narrow band requirements. Some questions do exist in the program, such as what constitutes a "registered professional test laboratory," as specified to do the testing? Who registers them, and does anyone verify their qualifications? However, the intent of the program bears a lot of merit, and I trust that AMA will maintain and uphold it.

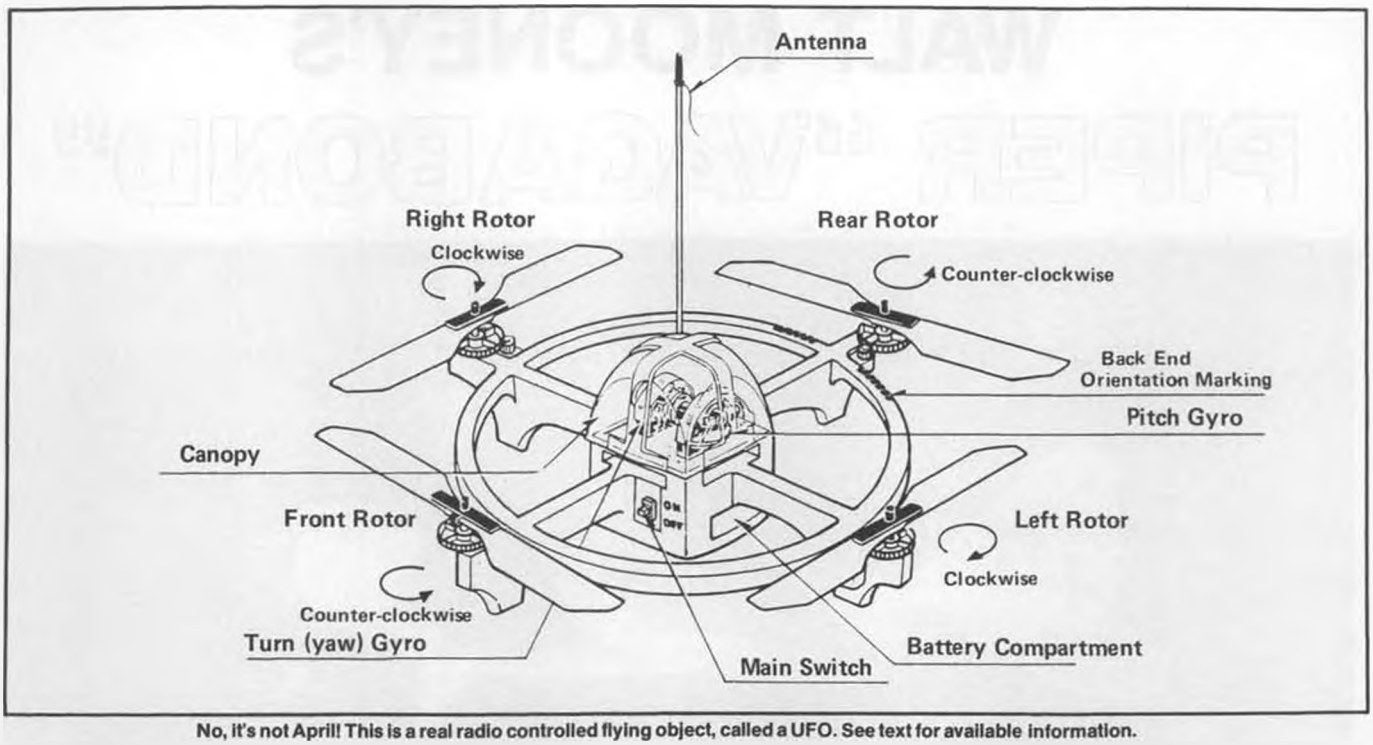
The program has raised a lot of questions because of the omission of some well-known names from the list, with the obvious ready assumption that the equipment simply does not meet the required standards. The 1991 deadline is almost with us, six months or so from when you will be reading this, and some clubs are already looking ahead to the expected chaos when these questionable transmitters are operated with 20 KHz spacing. We are hearing some strong talk from certain clubs about



The big, heavy-duty, high power MS-747WB servo (just think of Boeing's "Jumbo Jet") available from J.C. Development. Note physical size next to 9-volt transistor battery. See text.



Circuit used to match any given charger to any battery of lower voltage. With the connections made to the charger, battery, and ammeter, the value of the resistor is adjusted to the desired current value. Increasing the resistance will decrease the current, and vice versa.



No, it's not April! This is a real radio controlled flying object, called a UFO. See text for available information.

banning certain types and brands of equipment at their fields, clubs asking local dealers not to stock certain questionable equipment to keep it out of the hands of beginners, even about class action suits and other types of vigilante actions. Without the equipment with which to verify the cited specifications of any R/C equipment, I cannot and will not offer any opinion on this particular subject. However, as a number of my airplanes started their life as lines on a piece of paper and later as plugs for fiberglass molds, I do not care to trust them to questionable R/C equipment and understand perfectly why others can feel the same.

Since in my mind the main objective of "Electronic Corner" has been a place to share thoughts and ideas, I would like to hear from any of you who would care to expound on this subject. I have some information on hand, club newsletters and such, which express other thoughts and actions on the subject, which I will be happy to share with any of you who would like to know what is already being done and contemplated. SASE please! If you do write in on the subject, and would like to receive pertinent information from other sources in return, please mention that in your correspondence.

Years ago, the model industry was composed almost exclusively of those with personal experience in the hobby. Such is not the case anymore. The industry is large enough to have attracted those who are only chasing the buck. While I understand the need for a business to make a profit, I feel better with those companies that seem to have some concern about me as other than just another pocket to pick, and I will steer clear of those that can't or won't confirm to the recommended standards. Together, we have a much greater chance of making a difference. In the meantime, our best protection is to buy that equipment which meets all recommended specs from companies that are cooperating fully with the established programs.

* * *

Batteries and chargers are always a popular subject, and it seems every month brings questions different enough to warrant answering here instead of individually. Such is a letter from Larry Mitschke, of Houston, in my home state of Texas, who wrote:

"I bought a 12V gel cell from Tower Hobbies, and the charger it came with puts out 19V as I measure it. It says it is a 12v charger at 500 mA. I want to charge a 12v pack of ten Sub C cells with that charger, but I thought a 12v pack should be charged at 13.5V. Can I use this charger or not?

"Also, can a wall transformer (power supply or battery eliminator) of the correct milliamp rating be used as a battery charger? Aren't they all the same thing?"

Larry signs himself as a "Confused Cowboy"—we'll see if we can un-confuse him. The subject is confusing enough by its nature, often aided more than a little by the maker's somewhat cavalier methods of marking these items. Taking last things first, the difference between the similar appearing battery charger and power supply/battery eliminator is often a matter of filtering and/or voltage regulation added to the basic transformer and rectifier circuit. Also, we sometimes find one or the other marked specifically for its application with some companion electronic partner. They are interchangeable in some respects, but not in others—depending on the application.

To review, the common R/C equipment charger usually consists of a transformer picked to supply the voltage necessary to

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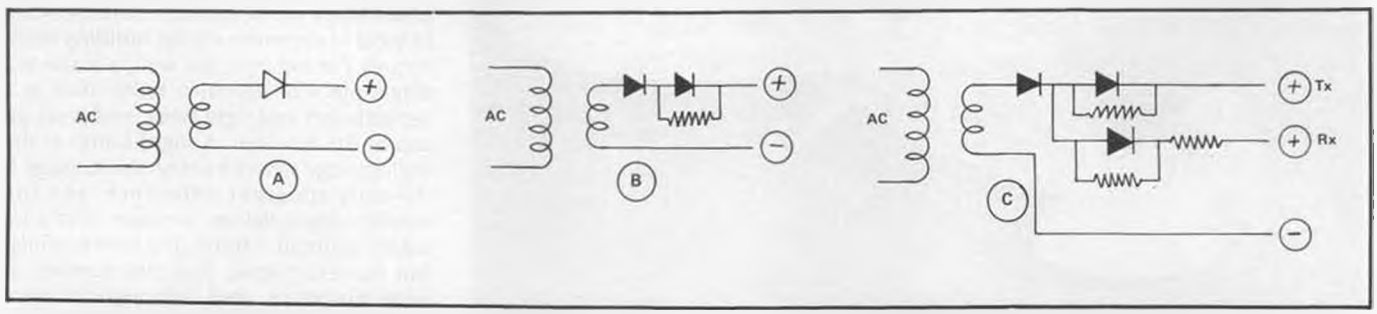
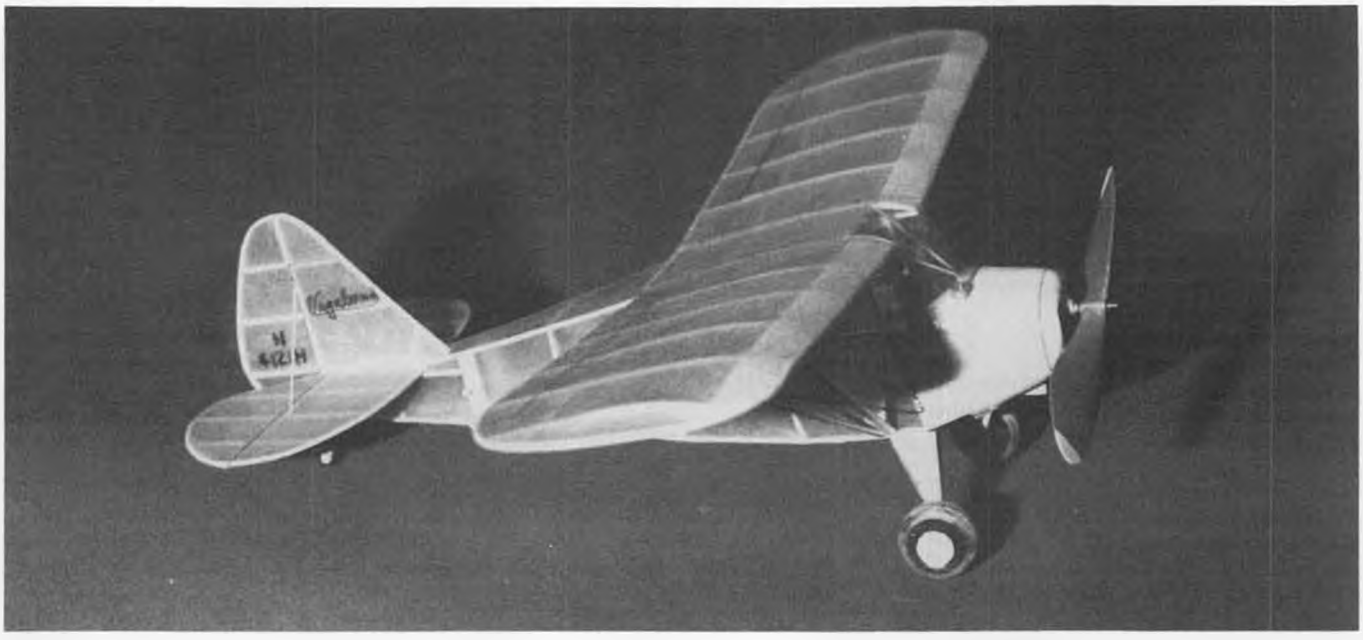


Basic NiCd charger circuits discussed in text. With some physical variations, every non-automatic charger used is based on this circuitry.

WALT MOONEY'S PIPER "VAGABOND"

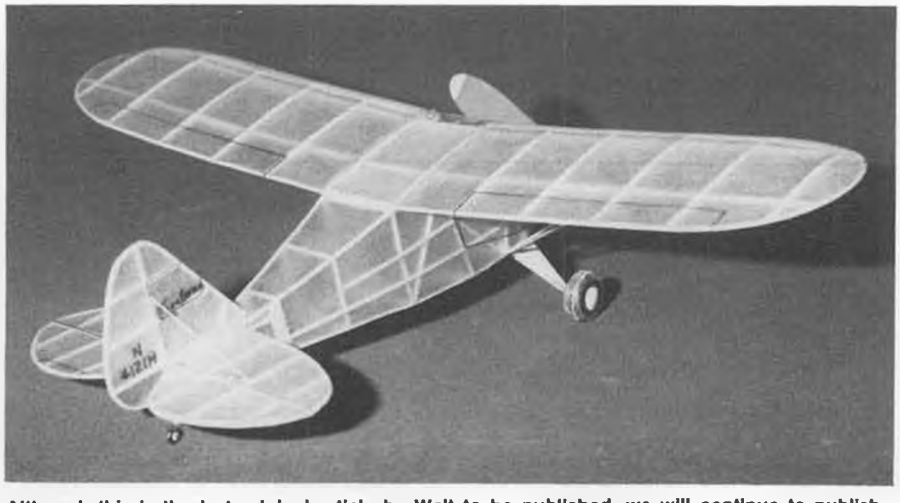


By WALT MOONEY . . . This is a model of Walt Mooney's own aircraft. He owned two of them (at different times). See color photo on page 6 of this issue. Photos here, as usual, by Fudo Takagi.

The Piper Vagabond was originally conceived because of the slump in sales of Piper Aircraft, as well as all other general aviation aircraft in the late 1940s. The J-3 Cub was being over shadowed by side-by-side airplanes such as the Luscombe Silvair and the Cessna 120. So a low cost side by side Trainer was designed. The design used existing "Cub" parts where possible and was simplified and reduced in size for faster production and increased performance.

The wing span was reduced to 29 feet, the length was shortened because it was no longer a tandem-seater, and as originally produced it had only a single set of controls, minimum instrumentation, and a single door. The shorter span wings allowed shorter struts and the shorter struts eliminated the need for jury struts. Landing gear shock absorbers were eliminated in favor of a rigid system that depended on the tires for whatever shock absorption was required. As a consequence of the decrease in size and the simplifications, as compared to the J-3 Cub, the cruising speed increased from about 65 mph to about 85 mph.

Piper eventually produced more than seven hundred of these short-winged birds. N4121H was the fourth one built and was one of the first ones photographed. A three-view of 4121H was published some years ago and this was blown up to 16 inch span for this model to give a scale design that meets the "Embryo" rules as well. The model, and all the Vagabonds built, is overall CUB YELLOW. The trim color was TRAINER BLUE, a rather dark metallic blue. There really wasn't much trim. Only the top cowl inside of the windshield, the registration numbers, and the "Vagabond" sign on the fin. There was no fuselage trim stripe at first because, "stripes cost too—much!" according to the president of Piper at the time.



Although this is the last original article by Walt to be published, we will continue to publish centerspread rubber models, even repeating some of Walt's from time to time.

What inspired this model? First, the Scale Staffel model club scheduled a "larger than Peanut" indoor contest, a quick building, good flyer was needed and I happen to own the real N4121H!

The plans are exact scale as far as I can determined and the model was built to the plans. There are deviations from exact scale in view of common model building techniques. For instance, the wing is made as a single piece of structure, rather than as a separate left and right wing, and is set on top of the fuselage. A slight bump at the trailing edge where it sits on the fuselage is the only apparent difference, and the model wing is lighter, stronger, and a lot easier to install. Model structure is similar but not exact scale. Half the number of wing ribs were used, although all were shown on the three-view and are consequently indicated on the plan. A slightly thinner than scale airfoil is used to avoid a

low Reynold's number laminer separation problem and eliminate the need for top surface turbulator spars. The leading edge sheeting that is aluminum on the real airplane is simulated, but only on the top surface of the wing.

The model as designed looks very much like the real airplane and flies very well indeed. It is stable and smooth and slow, just like the real one.

Al Backstrom's technique for making surface outlines is used for this model, and as it requires that the balsa be very well soaked . . . he says it should sink if it's wet enough . . . start this model by selecting enough 1/20th square stock for the wing tips, and the tail outlines, and set them to soak.

The fuselage structure is the standard two sides built over the plan with cross pieces to make a structural box which then has formers added and nose cowl sheeting. Note, however, that the sides are not exactly vertical in the area of the cabins but are wider at the bottom of the window than at the top and the bottom. The fuselage forward of the door hinge line is sheet covered on the top and the sides. The bottom is carved and hollowed from block balsa because of the formed lip for the cooling air outlet and the opening for the exhaust stack. The nose block is carved balsa and a Peck-Polymers plastic thrust button and 4-1/2 inch plastic propeller are used. The landing gear wire is bent from 0.025 piano wire; see the front view for the shape as well as the side view. The wire is installed along the back edge of balsa sheet fairings and the fairings are cemented only to the wire and not to the fuselage. This way any impact with the ground or other obstacle merely bends the wire back momentarily and does not break the fairings or the fuselage. Peck's medium sized plastic wheels are used, but four of them are required to simulate the fat donuts of the Vagabond. On the model, the axle covers were simulated by using a disk cut out of a 3x5 card as a wheel retaining washer, cut to the diameter of the wheels inside the tire, and then a large drop of epoxy was added to the disk to give it its hub-cap contour. The disk doesn't rotate with the wheels but it looks right and the end of the wire outside the wheel doesn't show. The rear

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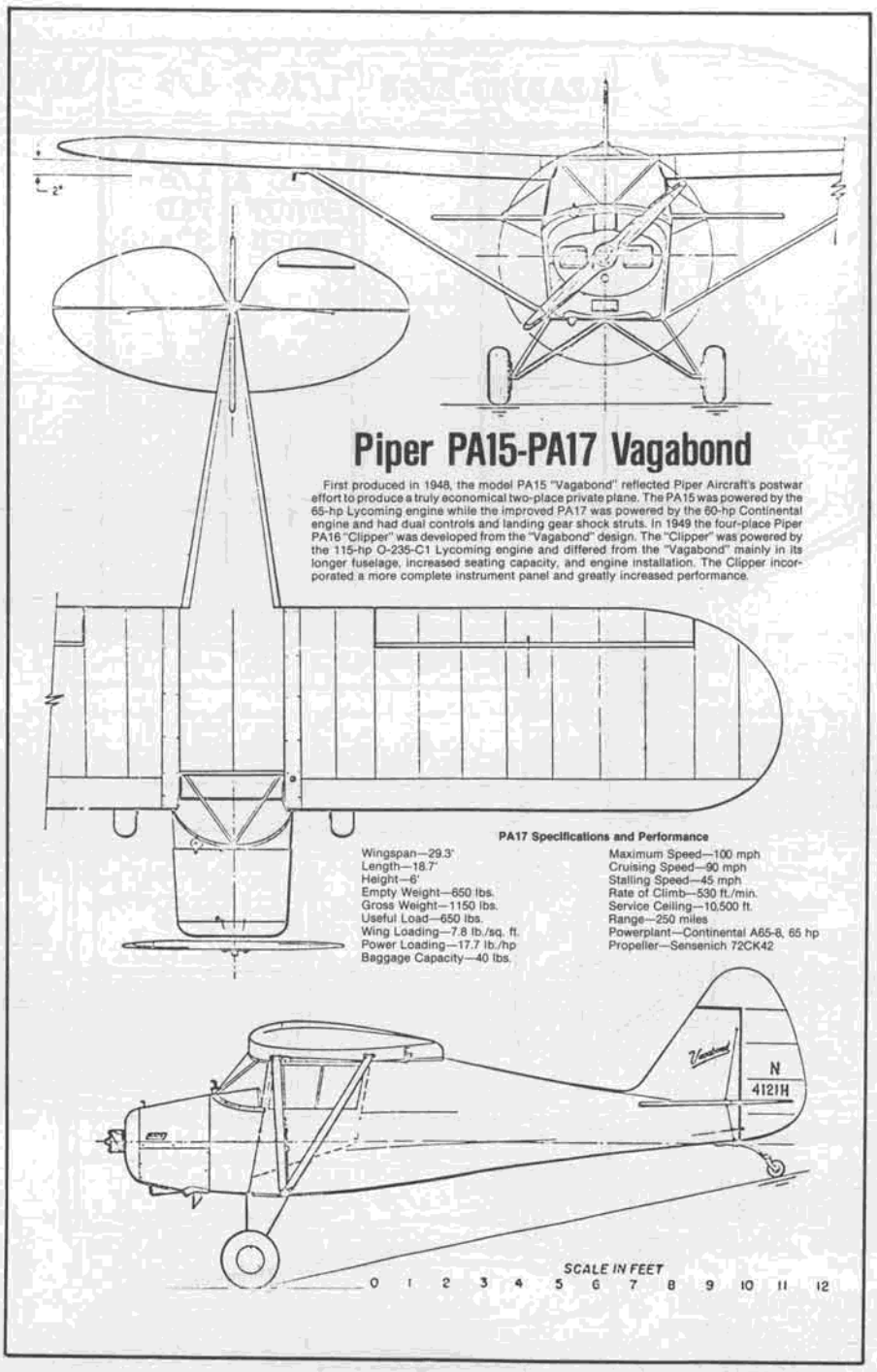
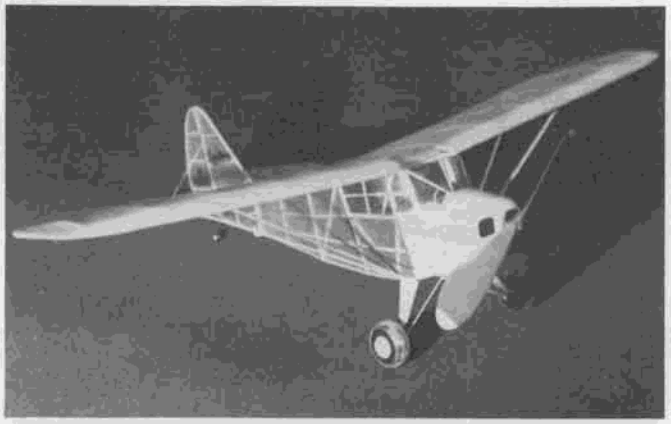
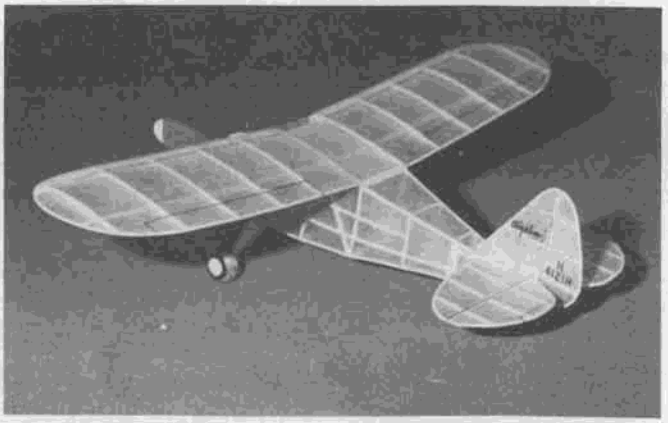






Fine model for a one-time, one-design contest in Walt's memory. Plans may be copied on 11x17 paper in copier to be *given* to club members . . . not for profit, please!

LEADING EDGE 1/16 X 1/8 HARD BALSA

1/20 X STRUT UNDER

1/8 PAD SPARS

WING PLAN VIEW

MODEL FULL

RIBS SIZE ARE RIBS

CUT SHOWN ARE

WING WITH SHOWN

SPARS TWO BY THE

FROM LINES HEAVY

1/20 LINES

SHEET

BALSA

1/64 SHEET COVERING FOR LEADING EDGE

THIN PLASTIC WINDSHIELD AND WINDOWS

1/20 X 1/8

FUSELAGE PLAN VIEW

TRAILING EDGE AND TIPS ARE 1/20 SQUARE

WING RIB PATTERN. TOP SLICED FROM 1/20 SHEET
BOTTOM IS 1/20 SQUARE

TAIL OUTLINE IS 1/20 SQUARE

ALL TAIL RIBS AND SPAR ARE 1/20 SQUARE

REAR MOTOR PEG 1/16 DIAMETER ALUMINUM TUBE

NOSE BLOCK IS CARVED FROM 1/4 SHEET BALSA

COWL TOP AND SIDES, SOFT 1/20 SHEET

DIHEDRAL

2°

Vagabond

N

4121H

SIDE VIEW

1/20 X 3/16

1/20 X 1/8

HORIZONTAL TAIL PLAN VIEW

ALL VERTICAL TAIL PARTS ARE 1/20 SQUARE BALSA

THIN DOWEL DIAGONAL WINDSHIELD BRACES

MONOFILIMENT FISHING LEADER BRACE WIRES

STREAMLINED HARD BALSA STRUTS

ENGINE COWL BOTTOM IS CARVED BLOCK

UNLESS OTHERWISE NOTED, ALL FUSELAGE STRUCTURE IS 1/20TH SQUARE BALSA.

1/20 SHEET BALSA

PLASTIC WHEELS

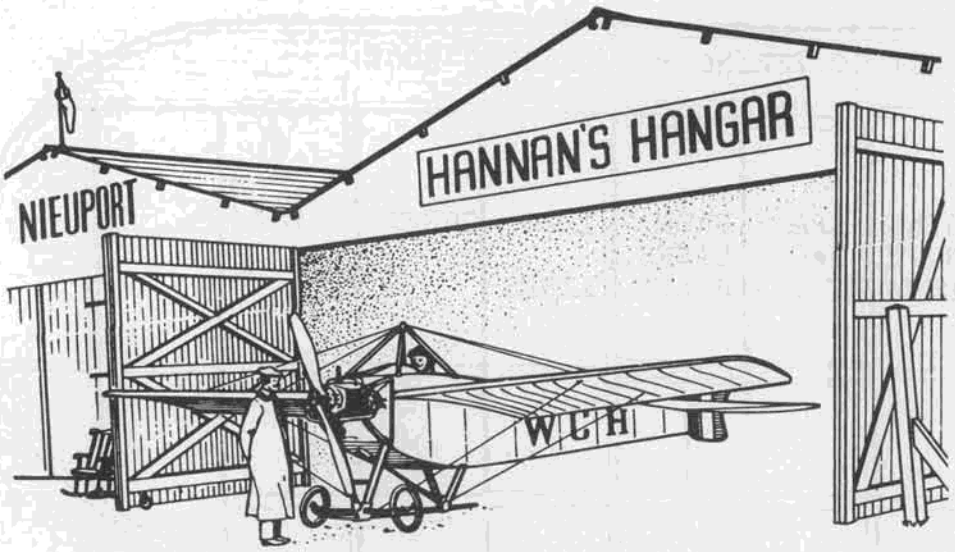
NOTE THAT THE LANDING GEAR WIRE GOES UP ALONG THE AFT EDGE OF THE LANDING GEAR STRUT

SCALE IN FEET

0 1 2 3 4 5 6 7 8 9 10

PIPER PA-15 Vagabond

M. E. Mooney 05-13-87



"If it's stupid but it works, it isn't stupid."

Our lead-in line this month, attributed to "an Army Colonel," by David Evans, was sent in by Mark Fineman, and relates quite nicely to intuitive solutions to model aeroplane problems! Often theory may not yield the best answer, as pointed out by Walter Carnahan in the February 1976 *Sport Aviation*, from which we extracted the following: "Thirty-five years in scientific work have taught me that too many authors just copy each others' glib pseudo-explanations, and mathematicians are the worst of all. They love to take a graph of experimental results, pound and snip the equations to fit, then pretend God carved them on stone."

John B. Rathbun, managing editor of *Popular Aviation* during April, 1935, had similar feelings: "There are those who believe that mathematics are the alpha and omega of all physical laws, instead of being simply a tool by which known laws can be expressed. Mathematics are not infallible in making predictions where experimental evidence is lacking."

And finally, Georges Chaulet, of France, chimes in with these opinions: "If there is a problem, the *computer* is guilty. Whenever a thing goes wrong on this planet, the mistake comes from the computer. There are no longer human errors. My *Model Builder* is late? Ask the computer! Prices are rising? Have a look at the computer. Indeed, the next time you catch a cold, you can be sure that there is somewhere a computer which has some problems!"

AN EXPERIMENT WHICH WORKED

The California Polytechnic Institute pedal-powered Da Vinci 3 helicopter, mentioned in our March column, was since officially witnessed in flight at an altitude of seven inches, according to clippings sent in by John Pond, Herb Weiss, and Ed Whitten. The nearly 100-pound craft, powered by student Greg McNiel, remained aloft for 6.8 seconds, with its 100-foot diameter rotor revolving at a mere 7-1/2 revolutions per minute.

Although the American Helicopter Society's $20,000 prize for a flight of one minute at 10 feet altitude remains unclaimed, the Cal Poly demonstration is, as S.B. Pell put it: ". . . a very small step for mankind, but a step nevertheless."

Unusual mail box, this stage coach is constructed of welded stainless steel.

UNORTHODOX MODELS, ANYONE?

Although conventional models can be challenging enough, special satisfaction awaits those willing to venture off the beaten path to try unusual designs. Hewitt Phillips is among those patient and persistent builders who has explored nearly every facet of aeromodeling. One of our photos shows his compressed-air powered pod-and-boomer, which spans 60 inches. Powered by a Bert Pond "Hoosier Whirlwind" motor fed from two plastic soft-drink bottles, the seven-ounce model is a fine flyer.

Hewitt has also made additional progress on his rubber-powered ducted-fan indoor model, improving its performance to the point that it has flown for 34 seconds following a rise-off-ground start, reaching an altitude of about 15 feet. (Maybe he should be working on that Cal Poly helicopter?)

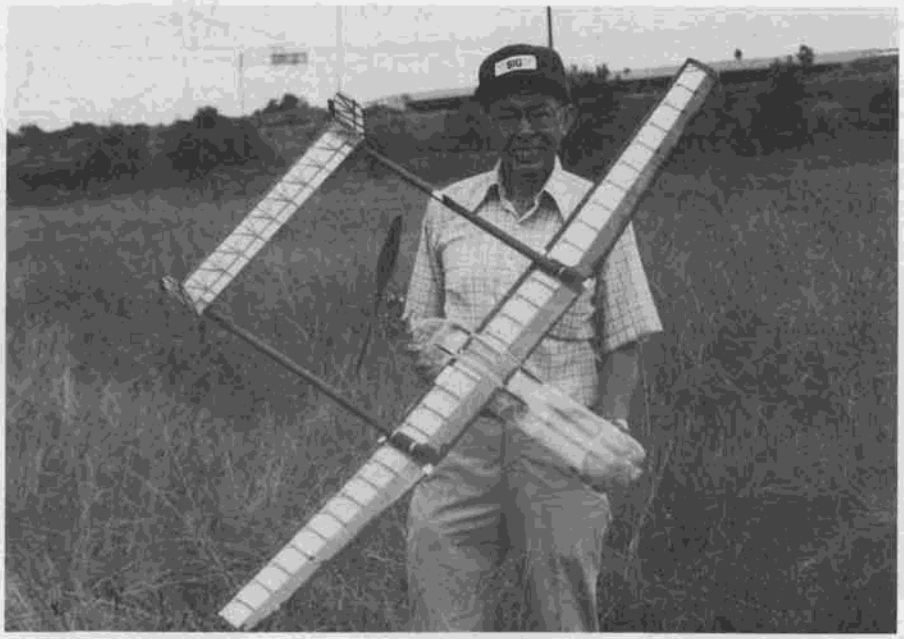
Meanwhile, in Japan, Kiyoshi Minami also prefers offbeat model aircraft, such as the Fabre pusher canard pioneer floatplane he is holding in one of our photos. Even more unusual is his semi-scale Kayaba wingless autogiro Peanut. Although duration thus far has been brief, the model does fly. Autogiros as a species remain rare, wingless examples rarer still, and scale types seem almost nonexistent, even in R/C!

Kazuhiro Suzuki is another Japanese experimenter, shown holding his Northrop N9M flying wing, which qualifies as a Peanut under the nine-inch overall length rule. We have seen a video tape of this difficult subject flying, both indoors and outside.

We applaud these dedicated model builders, and encourage others to break the bonds of boring subjects, and try their luck/skill with unorthodox aircraft!

SPEAKING OF JAPANESE PEANUTEERS

Five members of the Shonai Peanut Powers club recently toured California, visiting modelers and aero attractions. Misters Sugimoto, Uchida, Harada, Sugihara, and Yoshikawa examined the famed Howard Hughes flying boat at Long Beach, and spent considerable time at Montgomery Field and the Aerospace Museum in San Diego. These fellows participate in the International Proxy Peanut Contest of Japan, and are known for their fine craftsmanship far beyond the borders of their



Hewitt Phillips in a rare field of tall grass, prepares to fly his compressed-air powered original design. More details in text. Sometimes it's better *not* to mow the lawn!

own country. One of Mr. Harada's models is in the Aerospace Museum, and one of Mr. Sugimoto's is in a Texas model exhibit. Among those who assisted them during their sightseeing were Walt Mooney, Ray Crowell, Bill Noonan, Bob and Sandy Peck, Doreen Virtue, Paul Gauci, Joan Hannan, and yours truly. It was a pleasure meeting these gentlemen, and we look forward to seeing more examples of their ingenuity!

We feel privileged to be in contact with model builders in so many parts of the world. In spite of language differences and geographical distances, one soon learns that we are all kindred spirits, sharing in common the joys and pleasures of our hobby.

THOUGHT FOR THE DAY

On that note we'd like to share the New Year's wish sent in by the editor of the Australian model magazine, *Airborne:*

"For comfort, just enough of wealth;
For all thy life, the best of health."

MODELS IN THE MEDIA

Both Herb Weiss and Vern Clements sent us copies of the *Forbes* magazine article about the Lake Havasu City, Arizona, contest for model Schneider Cup racers. While it may seem surprising that a financial-oriented publication should devote coverage to model airplanes, consider two factors: First, Malcolm Forbes himself may be the greatest advocate of hobbies living today, with avid interests in hot-air ballooning, motorcycling, and miniatures collecting. Second, some of the models flown at Lake Havasu were definitely in the upper strata from a financial standpoint, costing from $17,000 to $24,000!

The article, entitled "Doolittle's Disciples," appeared in the December 25th edition, covered two and a third pages, and was illustrated with five full-color photographs. Quite comprehensive in its coverage, the story even mentioned Jeff Waldrop's magnificent contest posters, some of which were autographed by Jimmy Doolittle himself.

HOW'S THAT AGAIN?

Charles Beecher, of Phelps, Wisconsin, writing of the research efforts required in preparation for constructing his own scale model: "I'm working from scratch, and don't even have a good itch yet."

IMAGE PROBLEM?

Sir Lionel Cheetwell takes exception to the "boys who didn't grow up" opinion some people have of model builders: "I have never heard an aging (amateur) musician described as juvenile because of his lifelong interest in music. Model airplane building and flying have something in common with music: the initial activity is relatively simple but can progress through infinite variety and complexity, creating a lifetime of interest and enjoyment. And, both activities require a modicum of intellectual ability." Amen!

SPIRIT SPINNER

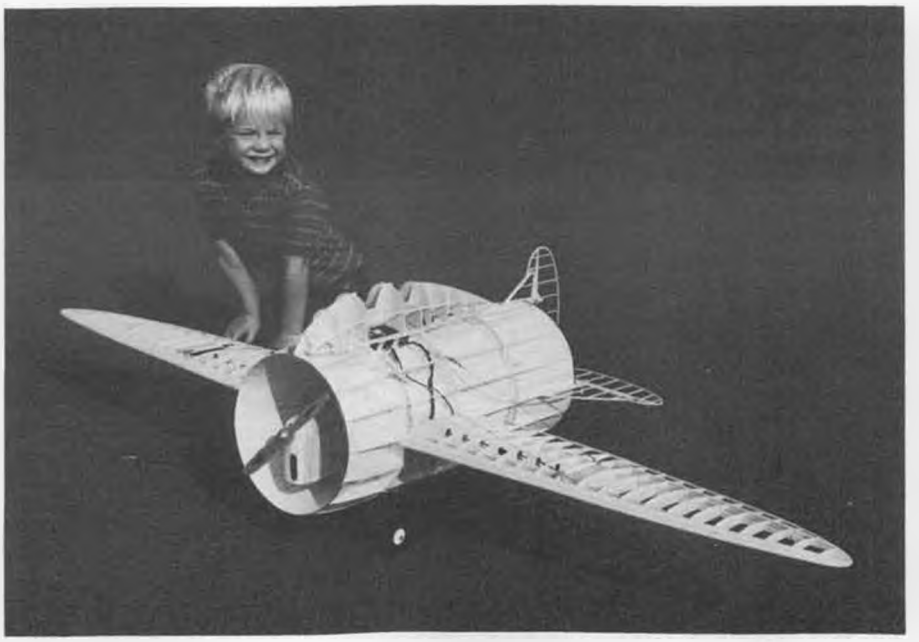
On a historical note, the original propeller spinner from the Spirit of St. Louis has recently been donated to the National Air and Space Museum of the Smithsonian Institution, by the Bowlus family. The spin-

Continued on page 91

Kazuchiro Suzuki, of Japan, with his successful rubber-powered Northrop N9M flying wing.

Kiyoshi Minam's Peanut model of the Fabre Hydravian, both photos taken by Taku Hamada.

Klause Jorg Hammerschmidt's red, white, and blue blimp is propelled by one of Stefan Gasparin's diminutive CO_2 engines.



Two scale models by Skip Ruff; his son, and his R/C Stipa Caproni electric powered "ducted fan." The 70-inch span model should be flying by now. Look out Top-Gun!

Free Flight

By BOB STALICK

WHERE ARE THE KIDS?!

About twenty years ago, this kind of statement was regularly seen in the national model press. I have not seen a comment or article on this subject in years, so it was with some pleasure that I read a newsletter article with this title just a few months ago. You will find it repeated later in this column. Since I have just completed mailing out 57 club surveys to AMA chartered free flight clubs, the question that I am asking myself is: *Where are the free flighters?* It is a question that the AMA has been asking us for quite a few years, and to be perfectly frank, I would be asking the same question if I were an AMA officer. Here are the numbers that I received from the AMA when I asked for a listing of the chartered clubs by district so that I could mail out the club surveys. Of the 2411 AMA chartered clubs in the country in 1989, 57 of them are listed as free flight clubs. That is, my friends, a whopping 2.4% of the total. The only district that has double digit numbers of clubs is District X, with 18 free flight chartered clubs out of 311 (5.8%). The lowest number is in District VIII. They have one free flight club—The Houston (Texas) Free Flight Club—out of their 242 chartered clubs.

One of the vagaries in the AMA chartered club listing, however, seems to be the large number of clubs that are listed as MU (multiple interest). As I looked over the clubs listed as MU, I noticed a number that I thought were free flight oriented—The Wichihawks, for example. This club and a number of others are listed as MU. My curiosity is this: How many clubs exist out there that are registered with AMA as multiple interest clubs that are primarily free flight even though they have members who fly other events? The second curiosity is: How many free flight clubs are simply not even chartered?

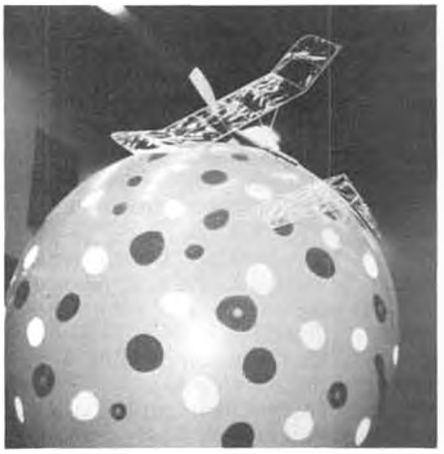
Well, all of you free flighters out there, your voice will be as strong as your willingness to stand up and be counted in the AMA. Charter that club and if you are a free flight club, don't list yourself as a multiple interest club. By the way, the club survey that I mentioned at the start of this column is only one of three free flight surveys that are being conducted at this time. The National Free Flight Society is conducting a poll of all of its members, and the National Indoor Model Airplane Society is doing the same. Please complete any and all of these surveys that come to your door. The information gathered from all of these sources will prove helpful to the entire free flight movement in the country. Thanks a bunch, and let's get on with some of the features of the May column.

MAY MYSTERY MODEL

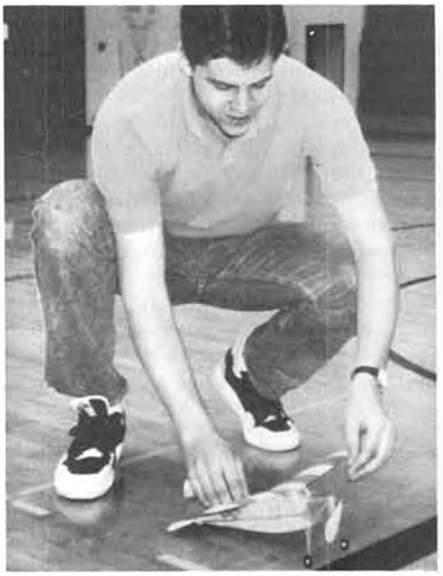
The late Conley P. "Lucky" Moody was one of those folks who liked to build and fly nice looking ships. When I first met Lucky, it was at one of our N.W. area meets, and he was really interested in promoting some Pacific Ace kits that he had been kitting. He was a guy you could talk to for hours about the "good old days." In those

Bill McDow produced this nice little Curtiss Robin Bostonian ship for the WMC Indoor season. Nifty model is still being trimmed. Bob Stalick photo.

Jim Longstreth with his version of Nats winning Bostonian, the "Blue Fin." Think his is called "White Fin." Stalick pic.

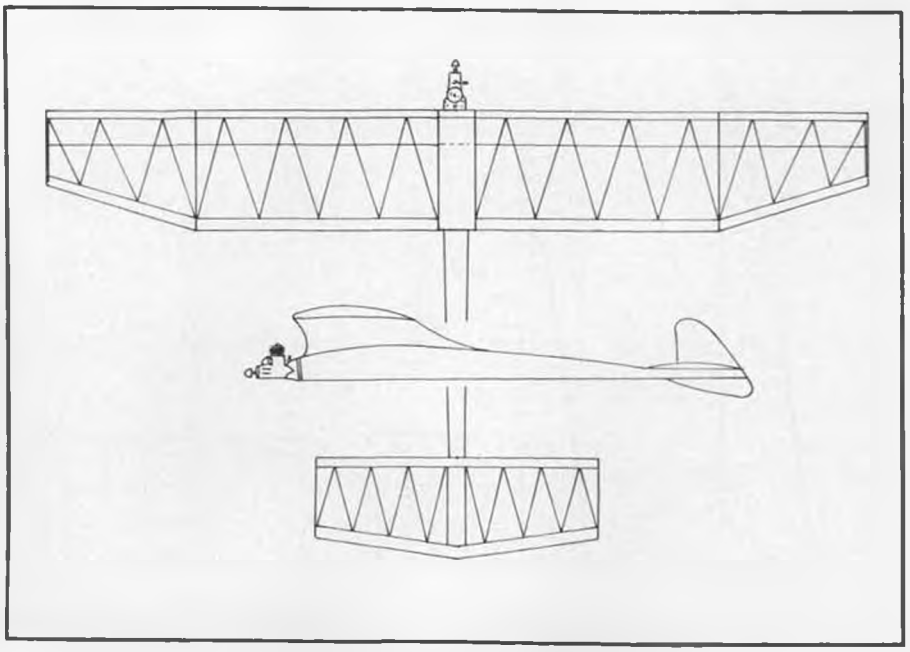


Bruce Kimball's Pennyplane piggybacking a ride from its high perch via Andrew Tagliafico's helium balloon. Some damage suffered, but rebuildable. Stalick pic.



Tom Stalick launches his Pacific Ace Bostonian (an *MB* plan) at the WMC Indoor Meet, South Albany. Stalick pic.

Smiling Bill McDow and his P-24 indoor duration ship. Scene is South Albany H.S. gym at Willamette M.C. indoor meet. Stalick pic.

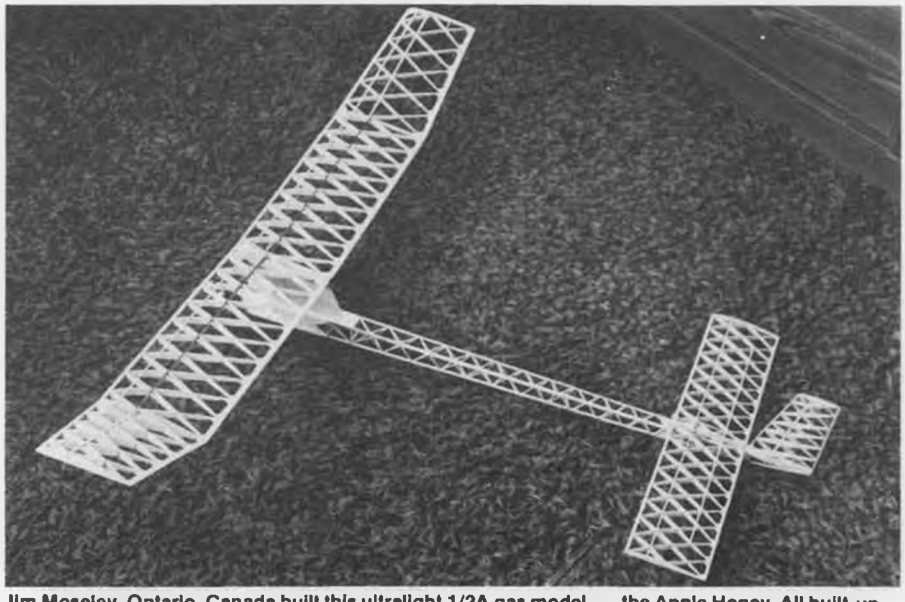


MAY MYSTERY MODEL

good old days, Lucky did a fair amount of building and flying. This design was one of his ½A ships, and it just misses the cutoff date as a Nostalgia model. The ship has a nice streamlined fuselage that was blended into the Holland Hornet engine with timertank. With only 200 sq. in. of wing area, it must have had a rocketlike climb. Anyhow, the rules of the Mystery Model competition are simple: If you know the name of the model, write it on a sheet of paper along with your name and address, then fire it off to Bill Northrop, *Model Builder* magazine. If yours is the first letter in the *Model Builder* office with the correct answer, you receive a free, one-year subscription to my favorite magazine. Now, Bill uses some form of geographical correction to allow for distance and such. Periodically, the winning entries are written up in this column. That's it. Simple.

MAY THREE-VIEW: BORTNAK'S OUTRIDER 1/2A POWER MODEL

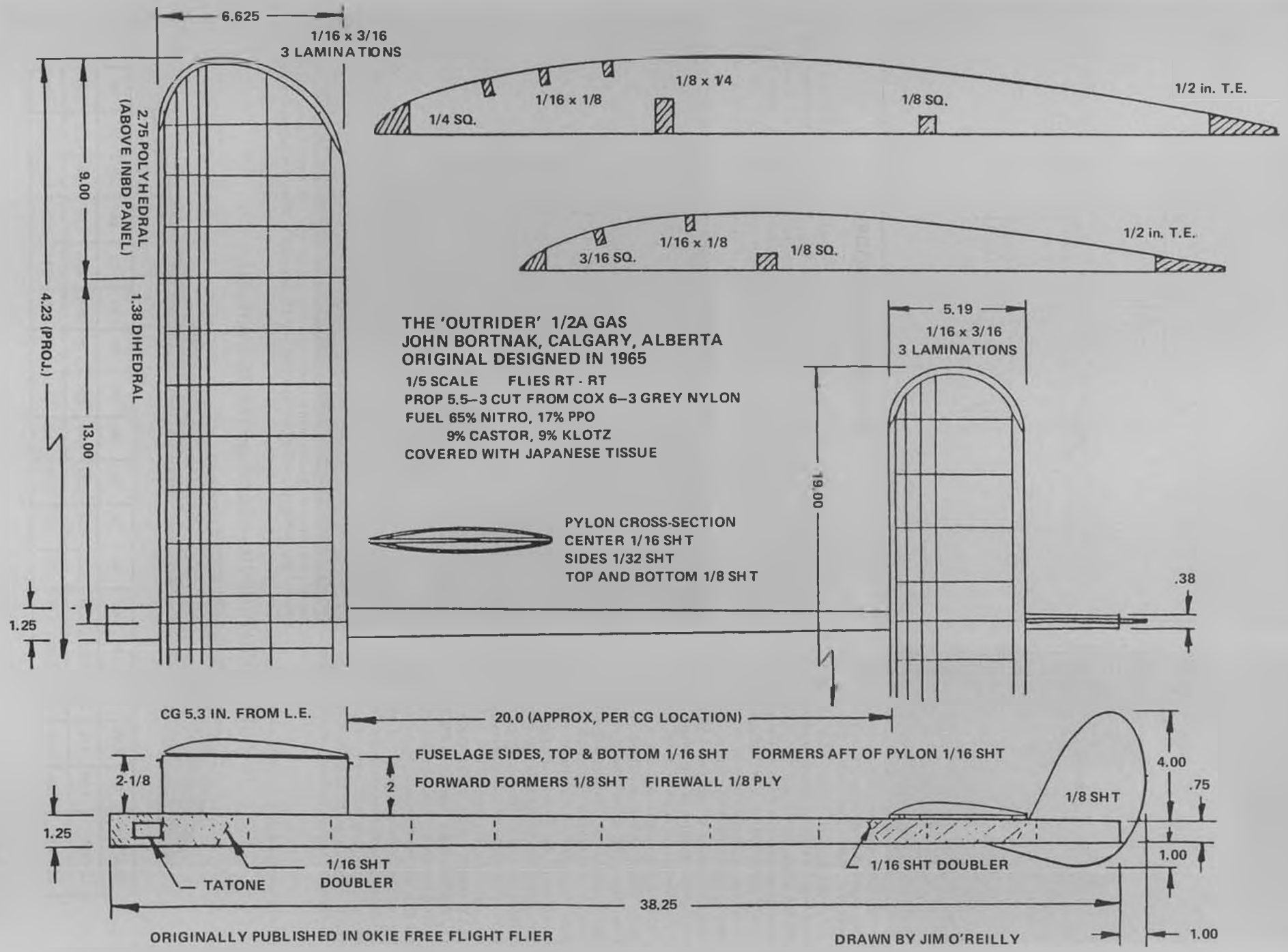
John Bortnak is one of those free flighters that seems to win a large number of events and championships at the larger U.S. and Canadian meets. Even though we had corresponded off and on for several years, I met John for the first time at the Tri-Cities Nationals in 1989, where he was shepherding a number of younger contestants as well as flying in practically every event being held. After looking over his free flight fleet, it became apparent to me that his ships are built to be functional rather than beautiful. The Outrider is just such a model. It is straightforward and lightweight. With a hot Tee Dee .049, I have no doubt that the ship would be a solid competitor for a first place at most free flight meets. With about 280 square inches of wing, it is well suited for category



Jim Moseley, Ontario, Canada built this ultralight 1/2A gas model . . . the Apple Honey. All built-up construction, 225 sq. in., weight 4-3/4 ounces with TD .049 engine. Should be faaast! Moseley pic.

DARNED GOOD AIRFOIL — Gottingen 144 (M.V.A.H. 21)

STATION	0	1.25	2.5	5.0	7.5	10	15	20	30	40	50	60	70	80	90	95	100
UPPER	1.50	3.06	3.96	5.40	6.30	7.00	8.08	8.69	9.19	8.90	8.08	6.96	5.65	4.18	2.23	1.25	0.00
LOWER	1.50	0.56	0.28	0.00	0.10	0.22	0.84	1.39	2.23	2.34	2.23	1.95	1.67	1.10	0.56	0.28	0.00



ORIGINALLY PUBLISHED IN OKIE FREE FLIGHT FLIER

DRAWN BY JIM O'REILLY

Bob Piserchio launches his Wakefield at Lost Hills Field, CA, for Patterson FAI Challenge, Nov. 18-19, 1989. Note open space!

George Xenakis winds his Wake at Los Hills. After a long chase, you need a compass to find your way back. No kiddin'!

II and III meets but appears on the small side for category I contests. The design is very straightforward and is presented in 1/5 scale so that it can be enlarged easily. Full-sized rib patterns are included for your use. The three-view was taken from a recent issue of the now defunct *Okie Free Flight Flier* newsletter.

MAY DARNED GOOD AIRFOIL: Gottingen 144/MVAH 21

Once again, I have gone to my file of airfoils from the Comprehensive Reference Guide to Airfoils for Light Aircraft. This section comes from the Gottingen laboratories and was wind tunnel tested in 1917. The reason I selected it is that it has some of the qualities that free flighters seek. It is 9% thick, has a moderate undercamber and a rounded leading edge. In fact, the front third of the airfoil is really quite thick in comparison to the remainder of the profile. Since it has an upswept leading edge and a rounded entry point, it should be a section that is forgiving and flexible for ease of flight adjustment. If you are looking for a section that would be good for models that require good lift characteristics and ease of trimming, give this one a long look.

INDOOR WORLD CHAMPIONSHIPS, 1990—JOHNSON CITY, TENNESSEE

With all of the discussion about the location of the 1990 Indoor (F1D) World Championships, the final venue has been set. The Champs will be held at Johnson City, Tennessee in conjunction with the U.S. Indoor Championships. In fact, the World Champs are scheduled for June 4-6 and the USIC will be held later in the same week, June 7-9. Here is your chance to take in the best indoor flying in the U.S.A. as well as the world all at one site, all at one time. The site is located on the campus of East Tennessee State College and is one of the premier locations for indoor meets in this country.

For awhile, it appeared that the World Champs would be held in the Romanian salt mines, site of one other world championship meet; however, with the political upheavals occurring there, the offer to host vaporized. Another site being promoted was the Kibbie Dome in Idaho, but given the short amount of time available, the Johnson City location and organization was selected as the place. So, if you are interested in attending as a spectator, helper, or contestant, keep your calendar clear during the week of June 4-9 and make plans to be in Tennessee. Further detailed information will be carried in this column and other free flight publications. But if you can't wait, send a large SASE to NFFS President, Tony Italiano, at 1655 Revere Dr., Brookfield, Wisconsin 53005.

AND WHAT ABOUT THE 1990 AMA NATIONALS?

As many Nationals competitors are aware, the AMA has dealt the National Free Flight Society an opportunity to host the 1990 Free Flight Nationals. This year, the free flight events are going to be separated from the remainder of the AMA events and will be held in Lawrenceville, Illinois. In addition to the Free Flight Nats, SAM 57 Old Timer and FAC Scale events as well as the Nostalgia Champs will be held at the same site at the same time. Unfortunately, due to the lateness of the AMA decision, the meet could not be scheduled until October 16 through 20. This late date may preclude attendance by many people who are affected by school schedules. However, we free flighters now have our own Nats.

AMA intends that the Free Flight Nats will rotate to various parts of the country each year. Ostensibly, the West Coast free flighters will have the honor of hosting the AMA/NFFS Nationals in 1991. If you want more information about the 1990 Nationals in Lawrenceville, send a large SASE to USOC, 4760 N. Battin, Wichita, Kansas 67220.

AMERICA'S CUP COMPETITION—1989

The following information was provided by Al Hotard, who has been the promoter of the America's Cup Competition:

"The 1989 America's Cup Competition is finished, and we have the winners! They are: Matt Gewain in F1A Nordic, Paul Crowley in F1B Wakefield, and Bob Sifleet in F1C Power. The SCAT Club extends congratulations to these three competitors in this, the first official year of competition. We look forward to awarding the beautiful

Continued on page 94

Matt Gewain, Nordic winner and America's Cup F1A winner, with wife, Gail, and Juan Livotto, at left. Photos by Al Hotard.

America's Cup Trophies (l to r): Bob White, Craig Cusick, Hector Diez, Juan Livotto. Craig, Hector, and Juan are SCAT club officers.

Speed flier Bill Nusz with his flock of fast birds at the '88 Regional Control Line Champs. The 1990 contest is May 26-27 in Eugene, OR. Photo by author.

Control Line

BY JOHN THOMPSON

Half-A Mouse Race is a popular NW Regionals event. Paul Gibeault shows excellent form as he makes the catch for a pit stop.

LET'S GO FLYING

It's the time of year where almost everybody in the C/L world gets out to the flying field with those new winter projects and begins to limber up the flying skills. Even where the winters allow year-round flying, that warm, dry weather makes it even more fun.

Winter, for many of us, is workshop time. Now that it's spring, the workshop takes a back seat to the flying field. If you were busy doing your building all winter—not wasting your time watching those ballgames—you're all ready for the season.

Spring brings with it all sorts of opportunities in addition to simply flying.

For sport fliers, naturally we want to get flying those new planes. But the opportunity to further our modeling education also is never better. Now is when the competition modelers all over the country start their heaviest season. It's a golden opportunity for casual fliers to make great strides forward in their hobby by dropping in on competitive events.

Even a modeler who never plans to fly competitively should not pass up the chance to attend nearby contests. Contests are where the very best modelers in the hobby gather. Just in going about the routine of their competitive programs, the expert modelers are virtually giving seminars in how to do things efficiently and well in the control line model aviation hobby.

Contestants usually are quite willing to answer questions and show off their equipment. As a courtesy, spectators and "students" visiting for educational purposes should pay attention to the contestant's first concern—the contest—and make sure to ask questions at a convenient time (not when the contestant is scrambling to get ready for a heat, match, or official flight!). Even if you don't get a chance to talk in detail, just watching and listening will provide a wealth of information. Any modeler will be glad to exchange addresses and phone numbers for later contacts away from the heat of competition.

Contests are listed in the Academy of Model Aeronautics' *Competition Newsletter*, which is in the back of *Model Aviation* magazine. Local clubs usually have newsletters which keep members and subscribers up to date on contest schedules. Hobby shops often post contest flyers. The contest also is a place to find out about area clubs and fliers.

Even if the contest is some distance away, it would be worth the drive for a sport flier to attend. You'll learn a lot and make new friends.

Competition modelers also have some springtime opportunities which some might consider necessities. A few might include:

- Test flying new airplanes and practicing with them *before* going to that first contest. This is true for every type of model. Do your testing and practicing on your home field away from the pressure of competition and avoid embarrassment and failure.
- Inspection of all pre-existing equipment. Examine all the nuts, bolts, screws, fittings, hinges, pushrods, elevator horns, etc., to make sure they're functional and safe. Check wing and stab joints and other stress points to make sure they are not cracked or loosening up. Check leadouts to make sure they aren't frayed. It's *essential* to check lines and handles for safety. Make sure your lines aren't frayed, corroded, etc. Give them all a pull test. High-speed lines may need to be completely replaced each season. Better safe than sorry!
- Stocking up on supplies for the season. You'll need ample supplies of fuel, plugs, props, lines, etc.
- Examining the AMA rulebook and your local rules sheets to make sure you're up to date. The first rule of competition is: Know the rules!
- Most important of all for everyone—get out and go flying!

THE CONTEST TRAIL

Contest activity is popping up all over the country at this time of year—and probably near you whether you know it or not. Unfortunately, most contests are not announced far enough in advance for mention in this column, but we do try to mention those we know about.

We have word of two in the Pacific Northwest that have become West Coast "must" contests for serious fliers with the ability to make it to them.

First it's the Northwest Regional Control Line Championships in Eugene, Oregon, on May 26-27, at Mahlon Sweet Airport. Sponsored by the Eugene Prop Spinners in cooperation with other Northwest clubs and individuals, it is one of the largest C/L meets in the nation, with 36 separate events, 112 trophies and merchandise prizes for everyone who places.

It occurs on one of the nicest control line flying sites in existence, a facility permanently available to local fliers and featuring, for competition, three asphalt circles and four grass circles. The site is at an active airport, with restaurant, restrooms,

rental cars, and other facilities within walking distance. Camping is allowed on the field and there are motels and other amenities within a few minutes' drive.

There are a few changes worth noting in 1990:

- Northwest Goodyear has been added to the schedule, replacing FAI Team Race. This is a low-key Scale Racing event that allows non-Nelson, non-Rossi engines.
- FoxDoo Combat has been changed to Fox .35 Combat. This will allow any airplane to be used, as long as it is powered by a Fox .35 stunt engine. Two airplanes maximum allowed per pilot. There is a 30-second engine starting period before the five-minute match. All other rules are per AMA Fast Combat.
- AMA Fast Combat will require .021" x 60' lines as a new safety measure.
- Northwest Super Sport Race will use the new rules allowing the sport .40 engine.

The contest events will be:

Speed: 1/2A, A, B, D, FAI, Jet, Formula 40 and .21 Sport Speed.

Navy Carrier: .15 Profile, Profile, Class I, Class II.

Racing: Mouse I, Mouse II, Goodyear, Northwest Goodyear, Rat, Slow Rat, Northwest Sport Race, Northwest Super Sport Race.

Aerobatics: Precision Aerobatics in the following classes: PAMPA beginner (new AMA beginner pattern), intermediate, advanced, expert. Old Time Stunt, Nostalgia Stunt.

Scale: Sport, Precision.

Combat: AMA, Slow, Fox .35, 1/2A.

Balloon Bust.

Junior events: Mouse I, Northwest Sport Race, Balloon Bust.

For a flyer, copies of regional rules or other information, contact John Thompson, 1520 Anthony Ave., Cottage Grove, Oregon 97424.

• • •

Another traditional high point on the Western contest circuit is the Bladder Grabber triple-elimination Fast Combat tournament.

This year it's scheduled for June 30 and July 1 at Harvey Field in Snohomish, Washington, the same site used in the past two years.

Several fliers from the Soviet Union, which sent a delegation to the 1989 U.S. National Championships in the tri-cities of Washington, are expected to attend the 1990 Bladder Grabber. BG official Howard Rush reports that the Soviets have Fox Combat Special engines and also are building their own .36 engines for combat.

As usual, the Bladder Grabber, the first and longest-running of the "pro" combat contests, will offer $10,000 in stereo equipment as prizes, donated by stereo giant Bob Carver.

Information is available from Contest Director Norm McFadden, (206)745-1314, or from Rush at (206)746-5997.

MIXED BAG

One of the questions raised by people writing to the C/L column is, "Where can I buy control line supplies?" Writers often note that their local hobby shops don't seem to carry any C/L materials anymore.

Therefore it is with considerable joy that I often find in the mailbox, right alongside the letter with the above question, the answer in the form of a new mailing from one of the many "garage" suppliers of C/L products. It's a secret sometimes kept from newcomers, but our hobby has a vast array of suppliers that is growing and changing daily.

And, in some ways, these "garage" businesses offer a level of quality higher than has ever been available to C/L modelers. Proprietors of these businesses are active C/L fliers who devote tender loving care to each and every item they sell, something the most earnest mass-producer finds difficult.

The array of products available is astounding. While a trip to a hobby shop might lead you to believe that there are only perhaps a half-dozen kits now manufactured for control line, I would guess that there actually are perhaps three or four dozen! You just have to know where to find them.

The customer would be well-advised to learn some of the rules of supplying his demands in the modern control line era:

- Try your local hobby shop first. It's important, even if the shop doesn't have what you're looking for, to let the proprietor know you exist and are in the market for products. Enough contact from C/L modelers has helped many hobby shops rediscover our segment of the hobby. Many of the garage manufacturers are in the business primarily to fill a need and would be delighted to see the demand filled by mass producers if it reaches a high enough level.
- Collect catalogs from the cottage industry businesses. Almost every modeler/manufacturer publishes a catalog that lists his products. The catalogs are updated frequently. Maintain a list of addresses of these suppliers and correspond if you have questions. They're all happy to answer your questions.
- Remember that the "garage" manufacturers are just that. Most have other jobs and produce their supplies as part of their hobby. Don't drive them crazy with phone calls. A letter with a self-addressed, stamped envelope for reply is a much appreciated form of communication, as is a dollar or two for the cost of printing the catalog.

Mel Marcum (l) and an assistant judge Sport Scale planes at '89 NW Regionals. Sport Scale is one of the low-key events; quite popular.

- Understand that garage manufacturers will be a bit irregular in regard to their delivery schedule. They may get behind on their orders, particularly if they produce top quality, sought-after merchandise. Be a little patient with them. The product will be worth the wait.
- Most garage manufacturers are sincere, dedicated and skilled craftsmen and modelers. However, some are less so. Your only guide will be your own experience with them. When you deal with mail suppliers, your first order is a gamble. In most cases, it pays off handsomely. If you have a bad experience with a supplier, don't hold it against all the others.
- Don't give up on the major mail-order suppliers. If your hobby shop doesn't have what you're looking for, you may find it in the fine print of one of the big catalogs or the periodic sale catalogs mailed by the big mail-order firms. As a case in point, while this column was being written I received a copy of Tower Hobbies' *Tower Talk* peri-

Continued on page 64

Miles Magister built by Piotr Zawada, using ST S61K. Second place in '89 Polish Nats. Piotr has had several construction articles in *MB*. Photo submitted by Stu Richmond.

Control Line *Continued from page 63*

odical with quite a nice list of C/L engines at good prices.

The above references to mail purchasing bring us to another piece of mail received just before this column was sent off to *Model Builder*. It's the latest catalog from Tom Dixon of Atlanta, Georgia, one of the suppliers of quality products, primarily for Precision Aerobatics but for other events as well. It is definitely a "must have" catalog. To get it, write to Tom at Suite 401, 1938 Peachtree Road, Atlanta, Georgia 30309.

As mentioned above, Tom advises fliers to try to find the products they need at their local hobby shops first. He deals in products he believes can't be found in hobby shops. And, he's willing to help customers find the items he doesn't have.

The envelope from Tom also contained some excellent news. I'll let his letter speak for itself:

"1. Merco engines should be back in production in late spring . . . after the change of ownership. The .61S will be back essentially unchanged. The .29 and .35 stunt are defunct, to be replaced by a .30 and .40 ABC. That's 'loop scavenged single bypass ABC,' *not* Schnuerle. I've asked them to send me examples to run and fly before I pop for a large volume purchase. The R/C engines are to be handled by Hobby Lobby. I will remain the Merco service center.

"2. Kits: I'm producing a line of quality stunt kits. All bandsawed parts, Sig hardware, copies of original article where applicable. Any of the plans in my catalog *(There are many! -jt)* can be done but the 'regular' line is:

"Black Tiger designed by Bob Elliott, the 1953 Nats winner (aka Berkeley Wombat). This is available now for $59.95 plus $3 shipping.

"1952 Nobler should be ready in late February. Will be re-engineered to build light with available wood. George Aldrich *(Nobler's designer - jt)* has given this project his blessing.

"(Probable) Skylark designed by Ed Southwick. Don't have Ed's permission yet, but do have the prototype kit cut. Will have to do some corrections before it's ready for sale.

"(Planned) Ruffy designed by Lew McFarland.

"(Planned) a profile sport stunter biplane probably based on the Zephyr published in *Model Airplane News* a few years back but prettier.

"Something modern for .40-.60 engines, likely my Charisma elliptical wing stunter. . .

"All of these are being engineered for competitive weight with generic average wood, which is all there is out there; might as well plan on it. . .

"Several new plans are in the catalog. Not yet listed but available is Bill Netzeband's Fierce Arrow 400. There is also a Space Shuttle version of the big Fierce Arrow. A couple of these are being built now, and foam wings for it are available from Aero Products, 1880 Scenic Hiway, Snellville, Georgia 30278, (404)979-2035."

Tom also mentions that tuned pipes have been developed by Les Bollenhagen for control line stunt, but no decision has been made to mass produce them. If demand seems to warrant it, Tom says, "We're ready."

Dixon's catalog includes a vast array of Bolly carbon fiber and glass props for all C/L applications (the catalog is a must for that alone!), Merco, Magnum, Fox, Royal, and K&B engines, SST mufflers (average 1/2 oz. weight!); various other engine accessories, landing gear, spinners, control linee Classics kits (Super Pow Wow, Oriental, Ares, Buster, Galaxy, Tomahawk, and Oriental profile), kits of the Barnstormer, All American Senior and Magician, and a tremendous list of plans for Old Time, Nostalgia and modern stunt.

And Tom is only one of several suppliers doing this kind of work—others have been mentioned in past columns and will be again.

* * *

The mailbag also contains some changes of address for a couple of the major special interest groups and their newsletters.

The Precision Aerobatics Model Pilots Association's newsletter, *Stunt News*, now can be reached through editor Mike Keville, who has moved from California to 6109 E. Ivyglen, Mesa, Arizona. PAMPA's membership chairman is Tom Morris, 1019 Creek Trail, Anniston, Alabama 36206. The new president is Ted Fancher, 158 Flying Cloud Isle, Foster City, California 94404.

The Miniature Aircraft Combat Association's *MACA News* also has changed hands. The new editor and membership chairman is Larry Driskill, 4916 Chagar St., Las Cruces, New Mexico 88005.

* * *

Every C/L event requires some kind of pull test before competitive flying. The lines, handle and airplane are tested either to some prescribed pull in pounds or in "Gs" (based on the weight of the plane). Sometimes these "G" figures can be a bit of a nuisance to calculate.

George Lieb of the Omaha, Nebraska Orbiting Eagles, has forwarded a handy chart of G ratings for planes of weights from 16 to 64 ounces at G ratings ranging from 20 to 40, plus multiplier factors for some intermediate ratings. The chart also includes the rulebook's requirements for each C/L class.

The chart is a bit lengthy to publish here, but I'll include George's address in case anyone should like a photocopy. If you write George asking for a copy, please enclose a self-addressed, stamped envelope and a quarter for the cost of photocopying it! (That's my recommendation—George didn't mention it but he'll sure appreciate your courtesy.) Write George Lieb, 5202 Emeline St., Omaha, Nebraska 68157.

* * *

Each time we mention some unusual or

historical topic in the column, it generates several letters from people with additional information—so we occasionally follow up with an addendum. (Boy, did that column on autogyros generate a flood of mail!)

One of the recent topics that generated some interest was the reference to flying C/L from outside the circle. A letter from Bob Root of Vermilion, Ohio, adds some historical perspective:

"Raymond DeWitt designed and built a U-control pylon device similar to the units shown in your November column. The unit he built was a more rugged design incorporating ball joints in the linkage and a seat for the pilot.

"This was in Plymouth, Ohio, in the late 1930s. A more exact date could be established if we knew when the Super Cyclone twin-plug engine and the Stanzel G-Shark were introduced. I flew my Shark with the Super Cyclone on the pylon.

"It was fast for its day and looked even faster when it was headed my way on the outside of the circle. I also flew my four-foot span SE-5 (scratch built) with a Brown Jr. engine. My SE-5 fell victim to an errant softball. Lesson No. 1: Don't fly anywhere near a ballfield.

"Raymond scratch built and flew a four-foot span Great Lakes biplane on the pylon. His first attempt at a loop was a failure. Lesson No. 2: Don't fly too high; the lines go slack. Needless to say, we didn't fly on windy days.

"At last report Raymond was living in Florida and had developed some of the hand tools used in the space flights.

"I am retired after 42 years in manufacturing and hope to get back to model building as soon as I get all the projects in the 'job jar' completed.

"I enjoy all the features in *Model Builder*, having been involved in free flight, control line and the early days of R/C."

To Bob Root from *Model Builder:* Welcome back!

As always, letters, photos, club reports, contest schedules, and reports are welcome. Write John Thompson, 1520 Anthony Ave., Cottage Grove, Oregon 97424. •

Workbench *Continued from page 7*

above, reservations and ticketing must be made a minimum of seven days in advance. Any changes to the outbound reservations must be made with seven days advance notice of the new flight. Changes to the return flight may be had at any time. There are no penalties for change or cancellation, when using these discount fares.

A 5 (five) percent discount is also available to you on Delta's published excursion fares, including instant savers. If you elect to use the 5 (five) percent discount off any excursion or instant saver fares, all rules and conditions of the fare will apply.

In all cases, seats are limited, so you are encouraged to confirm reservations as soon as possible.

Inclusive travel dates for the Atlanta show (May 18-20) are May 15 through May 23, 1990.

Inclusive travel dates for the Milwaukee show (Oct. 5-7) are Oct. 2 through 10, 1990.

To take advantage of these fares, follow these simple rules:

Contact Delta or have your travel agency call 1-800-221-1212 and ask to speak with Delta's Special Meetings Network.

Refer to Reference File Number K22088.

Hotels offering special rates to IMS attendees in Atlanta are as follows:

HEADQUARTERS HOTEL

Comfort Inn (formerly the Ibis)
101 International Blvd. N.W.
Atlanta, GA 30303 (404) 524-5555
IMS Rates: $49. single or double, up to four occupants per room.

OTHERS

Westin Peachtree Plaza
Peachtree St. & International Blvd., N.W.
Atlanta, GA 30303 (404) 659-1400
Call for special IMS rates.

Days Inn Downtown
300 Spring St.
Atlanta, GA 30308 (404) 523-1144
Call for special IMS rates.

Special hotel rates for IMS attendees in Milwaukee will be announced in the near future.

THORNBURG IS BACK . . . SORTA

Dave Thornburg wrote a very popular monthly column on R/C soaring some years ago in *Model Builder*. He then wanted to branch out into other model building subjects, so we changed his column title, stealing a little from another famous Dave's logo, "Thornburg at Large." His writing has been sorely missed by many of our readers. However, Dave has always stayed in touch, and kept his pencils sharp. We knew it was just a question of time before we would all hear from him again. So we'll let him do his own press release . . . after all . . . he is a writer!

New R/C Soaring Book

During the late seventies and early eighties, Dave ("Bird of Time") Thornburg contributed over sixty construction articles and essays to the modeling press. Now fifteen of his best soaring pieces have been reprinted in paperback.

Old Buzzard's Soaring Book is jammed with tips from the experts: thermal lore, contest do's and don'ts, programming yourself for better landings, ways to improve kit models, techniques for designing your own sailplane. The 160-page book includes two of Dave's classic essays on thermal-hunting, 'The River of Air' and 'The Perfect Thermal.' Many pilots have called 'The River of Air' *the single most helpful article they ever read on R/C soaring.*

The book's first nine chapters focus on flying; the last four cover sailplane design and basic aerodynamics. Dave's non-mathematical approach to aerodynamics is both witty and wise . . . without a single formula, he manages to explain not only

how your airplane flies, but how you can make it fly better!

Many of the chapters in *Old Buzzard's Soaring Book* originally appeared, in shorter form, in *Model Builder* magazine. Each piece contains new and updated material, including over fifty new cartoons, illustrations and comparison charts.

"This is a book for intermediate soaring pilots, not rank beginners," Dave says. "It won't tell you how to cover a wing or test glide over tall grass. *Old Buzzard* is for folk who already know how to fly . . . folk who are starting to think about how they might fly a little better, land a little more consistently, compete a little more successfully at contests. Also, it's just a fun book to curl up with on a rainy night. It's full of blue skies and cumulus clouds and rising (wow . . . I almost said *hot)* air. There's even a chapter or two on slope flying, in case you need a break from the pursuit of the wily thermal!"

Old Buzzard's Soaring Book is available direct from the publisher, The Pony X Press, 5 Monticello Drive, Albuquerque, NM 98123. Price is $14.95, plus $1.50 shipping and handling. Or call (505) 299-8749 for Visa-MC or COD shipment. Dealer discounts on ten or more copies.

INDUSTRY NEWS

Cox Hobbies, Inc., 350 W. Rincon St., Corona, CA 91720, phone (714) 278-1282, has introduced something special into its new 1990 line of fuel and electric powered R/C aircraft which include a two-channel R/C system as part of the package. It will probably start a trend to be followed by others in the industry. Realizing that so many newcomers to flying R/C are buying its products, Cox will include in each of these packages a "Video Copilot" to complement the included assembly and flying instructions. Assembly highlights, preflight checkout, proper hand-launching technique (an art in itself), detailed audio treatment on setting the needle valve, and flight orientation tape are all included. A great idea!

RENO AIR RACES, 1990

The 1990 Reno National Championship Air Races, the 27th annual event, will again feature all four classes of racing along with some of the most popular air show acts in North America.

The four-day event, September 20 through 23, 1990, will include a mixture of air show performers and approximately eight races per day. Among those performing each day will be the Canadian Snowbirds, celebrating their 20th anniversary as a precision jet team at this year's event.

Though not as fast as some of the much modified aircraft in the Unlimited category, Lefty Gardner will not only be racing his P-38 Lightning, but will also demonstrate its aerobatic capabilities. After watching him race last year, we don't know how he avoids getting grass stains on the left wingtip when he's rounding the pylons!

Bob Hoover will again perform aerobatics in the Shrike Aerocommander and in the Sabreliner twin-engine jet. He will also continue to pace the Unlimiteds in their three-a-day races, flying his P-51.

Other performers will include the Eagles Aerobatic Flight Team that is such a favorite at the Las Vegas Tournament of Champions; Charlie Hillard, Gene Soucy, and Tom Poberezny, also celebrating their 20th year as air show performers. Joann Osterud will perform aerobatics in her "Supernova" Hiperbipe. Jim Franklin, Johnny Kazian, Steve Franklin, and Tony Kazian will do their dual wingwalking routines in their UPF-7 Waco's equipped with brute sized, eardrum-busting radials that tingle your spine. Something else . . . those guys out on the wings may be holding onto a rack when doing some of the tumbling and inverted flight routines, but being out at one of the pylons, waiting for the next race, we saw them climbing from the lower wing to the upper, or working their way out to an outer wing strut, all being done in as casual a manner as making a peanut butter sandwich, and no safety line!

Back after a four-year hiatus, Leo Loudenslager, the 1980 World Aerobatic Champion will be piloting the Bud Light 200. Also present will be professional skywriter Suzanne Asbury-Oliver, flying the colorful Travel Air D4D, and Rick Brickert, Dennis Sanders, and Frank Sanders, will be flying the Red Knight, and all-red Lockheed T-33, that performs large, spectacular maneuvers accented by two wingtip smoke tanks leaving unusual trails affected by the tip vortices.

Tickets for the Reno Air Races can be obtained through various Bass Ticket Centers and Ticketron outlets. Check your local listings. Biggest problem is finding a place to park you bod at night. Hotels are signed up a year in advance. If you have a friend in Reno, take your sleeping bag and borrow some space on the living room floor! •

Advance Notice

Kyosho Advance Series 91 radios exceed AMA requirements for 1991.

Narrow-band dual conversion receivers, four KS100 servos, and full NiCds are included with each Advance radio system.

Servo reversing switches, dual rates, and more are conveniently located behind a smoked plastic window.

Kyosho is well ahead of the AMA's 1991 requirements for radio control narrow-band operation. The new **Advance Series 91** radios exceed the AMA's technical guidelines and specifications and also offer affordable 5- and 7-channel systems that provide versatile features for all types of flying.

Kyosho 5-Channel PCM and 7-Channel FM Advance Series 91 radios are truly ready for 1991. Each features a 1991-certified, Gold Label transmitter and dual conversion receiver with excellent narrow-band characteristics, plus four high-torque KS100 servos.

Each system offers the functions you want most, where you want them: servo reversing on every channel, dual rate switches for both aileron and elevator, fine ratchet trims for rudder, aileron, elevator, and throttle low-end, and more...all located for easy access, with enough flexibility so that you can customize the transmitter to your personal touch.

And Kyosho adds the special features that ensure smooth control during flight. The 5-Channel PCM's variable hold retains your last servo position in the event of signal disruption. If the interference lasts longer than 0.8 seconds, the system's fail-safe takes over. This feature enables you to pre-set your flight trim to a desired stable flight attitude. Channel coupling found on the 7-Channel FM transmitter permits coupling of rudder with ailerons to help correct adverse yaw. Rudder coordination with aileron can be adjusted to meet your individual flying needs.

High technology doesn't have to be high priced. Kyosho Advance Series 91 radios are your best value in 5- and 7-channel narrow-band systems — and will continue to provide versatile control for many years to come.

Send to our address for your FREE copy of Kyosho's Mini Catalog from Great Planes.

DISTRIBUTED TO LEADING RETAILERS NATIONWIDE EXCLUSIVELY THROUGH

GREAT PLANES™
MODEL DISTRIBUTORS COMPANY
P.O. BOX 4021, CHAMPAIGN, IL 61824-4021

Jake *Continued from page 7*

bracing, shed both its wings upon landing. Cabainne's final testbed, "d'Lancoix Cyste" (The Boil Lancer), took care of the negative bracing and added a fuselage mounted machine gun for the pilot.

Skeptics warned Cabainne that the gun would shoot off the propeller, but Cabainne had the last laugh when the propeller survived the one and only test flight without a scratch. The gun did, however, shoot off the central top wing struts and left Cabainne at the controls of another aviation first: the low wing monoplane.

Ever since, all fuselage mounted top wing struts have borne the Cabainne name, in honor of his flight demonstration of their utility.

Jake

* * *

Dear Jake:

If you're such a hot shot model airplane expert, when's the last time you won something at a major competition?

Duke in Decatur

Dear Duke:

Well, first let me say that competition flying is not necessarily the only way to become an expert modeler. Sport flying, fun flying, designing, and building are all worthy pursuits with many an expert involved.

As it happens, I have won a major competition recently. At the Aerolympics R/C World Championships in August, 1989, I won the Roseanne Barr look-alike contest at the Holiday Inn.

Jake

* * *

Dear Jake:

Any upcoming events where we can look forward to not seeing you?

Edna in Evansville

Dear Edna:

I'll be at Toledo again this year. I should be easy to spot. I plan to divide my time between the main floor, the annex building, the swap shop, and the men's room. In case you have trouble picking me out of the crowd, I'll be the one with my AMA number shaved on the back of my head.

Jake

* * *

Dear Jake:

Glad to see the level of good taste and refinement in model airplane ads has risen again. Take for example the full-page ad which shows a bikini-clad young lady smiling seductively as she crashes a model aircraft at her feet. Not to worry, says the ad, it's easily repairable.

I'm not sure what the message is here. Am I supposed to buy one of these airplanes if I plan to give it to a centerfold model, because she'll probably crash it, but I'll be able to fix it easily, so she can crash it again? Or should I buy this airplane only if I am a centerfold model myself? Or should I buy this plane regardless of who I am, as long as I intend to wear high heels and a bikini when I fly it?

I think it's a trainer airplane. Should I buy it if I have aspirations of becoming a better flyer? Or should I buy it if I have aspirations of becoming a better repairer? If I have aspirations of becoming a bikini-clad model, is this the plane for me? How about if I just have a nice aspiration?

Confused Consumer in Connecticut

Dear Confused Consumer:

I think the message is: buy the airplane because it's a good airplane, just don't let your wife see the ad.

Jake

* * *

Dear Jake:

I am an archaeologist at a major Northeastern research institute. Our recent digs in Mesopotamia have uncovered some fossilized balsa wood. Just exactly how old is the hobby of making model airplanes?

PhD in Pottsdam, New York

Dear Doc:

The model airplane game goes back much farther than most of us would imagine. We all know that mankind began in the Garden of Eden, and that woman was created from one of Adam's ribs. But few people realize that God took another one of Adam's ribs and started the wing for a Comet Clipper.

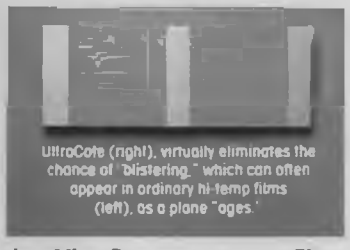
Jake

Bye-Bye Bubbles, So-Long Sags.

UltraCote™ Your favorite film covering's back and it's better than ever.

UltraCote's back with a flawless new finish, more colors, better color consistency plus all the qualities that made it great to begin with.

So if you've never tried it, now's your chance. You'll discover that UltraCote doesn't just *beat* the others, it virtually re-defines performance standards for iron-on coverings.


UltraCote (right), virtually eliminates the chance of "blistering," which can often appear in ordinary hi-temp films (left), as a plane "ages."

It goes on ultra-easy and holds on ultra-strong.

First off, UltraCote handles like a dream.

Its high-tech polymerized color-to-film bond lets you re-position it without fear of layer-separation and its broad temperature range helps you coax it around tough curves with ease.

And once you've got it on the way you like it, it's on for good.

The high-temp film without the high-temp headaches.

Some films don't bubble, and some don't sag. But until UltraCote, no one film could give you both bubble-free *and* sag-free results.

UltraCote is a true polyester film. Like the film you're most familiar with, it responds well to higher temperatures, and takes a really permanent "set."

But *unlike* the other polyester films, UltraCote's non-"gassing" adhesive won't produce "bubbles" on sheeted areas, which show up later as blisters and wrinkles.

Even areas of plywood won't give you problems.

Plus, unlike the *lower*-temp films, UltraCote's drum-tight shrink is stable, regardless of changes in weather.

Its ultra-handy width helps stretch your covering dollar.

UltraCote's a better value, too. Its longer, streamlined-width roll is shaped more like the parts you have to cover plus there are no unusable edges to discard.

With UltraCote, more covering ends up where it belongs—on your model, instead of on your workshop floor.

The gloss that doesn't glare.

UltraCote's fade-free colors even have a richer, more realistic gloss that won't leave your plane looking like a shrink-wrapped plastic toy.

So from start to finish, UltraCote is tops. Just try it yourself and you'll know why thousands of modelers are ultra-glad it's back at last.

CARL GOLDBERG MODELS INC.

Counter *Continued from page 10*

smoothly and without drag through the tube. A $2.49 package contains two 24-inch Flex Throttles along with two EZ connectors with nylon bolts and instructions. Geez! Where was this stuff 20 years ago!

* * *

Superior Props, 2412 Tucson Ave., Pensacola, FL 32526, phone (904) 944-1972, offers machine-cut balsa freewheeling props from four to 12-inch diameters, and can be ordered in any pitch specified, or with a standard 1.3. They come 90% finished. Only sanding and finishing, and preparing the center hub with prop shaft hook is required. They can be made of soft or hard balsa, and are true helical pitch. Name your poison.

* * *

Model Rectifier Corporation (MRC), P.O. Box 267, Edison, NJ 08818, phone (210) 248-0970, contact Fred Fischer, has introduced a complete new line of rocket products, sixteen in number, called "Concept II." The main themes of the new products are increased performance and realism along with ease of proper construction. One of the key elements in Concept II products is the FX Engine. It is used to create pre lift-off smoke for an added level of realism. The ability to ignite the FX Engine first allows the rocket to sit on the launch pad for up to seven seconds just billowing smoke, then igniting the primary engine to boost the rocket aloft just like a real NASA launch of a Space Shuttle. The new Tracker engines feature a molded nozzle which keeps the electric leads separated and holds the igniter in place until the moment of ignition, and then "pops-off," assuring reliable ignition every time. The propellant now produces a smokey exhaust during the boost and delay portion of flight for more realism and easier tracking during flight. The rocket kits feature molded plastic fins that plug in for accurate alignment, an ejection baffle system to prevent burning of the recovery system, pre-cut fabric parachute with tie-on shroud lines, color-coded parts, and three interchangeable engine mounts to allow choice of engine for different flying conditions and altitude desired.

* * *

Associated Electrics, 3585 Cadillac Ave., Costa Mesa, CA 92626, phone (714) 850-9342/Fax 1744, one of the leading R/C car manufacturers, now offers the Jaguar XRJ10, 1/10 on-road car. Its good looks and lap times to match make it a real winner.

For 4WD off-road where efficiency is the name of the game, Associated offers the Yokomo YZ10 Fine-Pitch Belt and Pulley Kit (#ZC650S). Fine pitch belting is the newest craze, and this kit comes complete with front and rear fine pitch belts and matching drive and differential pulleys.

Allowing you to use most any aftermarket spur gear available today, including the new Associated 48 pitch spur gear, the Yokomo YZ10 Spur Gear Adapter with Double One-Way Bearing (#ZC641G), with "one-way" drive bearings added, virtually eliminate the chance of losing your front wheel drive, even under the worst conditions.

* * *

A new muffler, the "Double Snuff," for the Zenoah G-38 and Quadra 35 engines, is now available from J'Tec, 164 School St., Daly City, CA 94014, phone (415) 756-3400. The muffler consists of a special cast aluminum manifold and two "Snuf-Ler" mufflers. It bolts directly to the engine with bolts provided, and total weight is 12-1/2 ounces. This muffler system reduces engine noise, has a lower tone, and does not affect engine rpm. Available at hobby shops or direct. When ordering, specify engine to be used. Price is $59.95.

* * *

D.G.A. Designs, 135 East Main St., Phelps, NY 14532, phone (315) 548-3779, announces three new scale plan sets for 1990. The Funk B-85-C is in quarter scale. Span is 105 inches, wing area is 1500 sq. in., and power recommended is a 1.20 four-stroke engine. Flying weight is in the 18 pound range. The model design features plug-in wing panels. Plans are on two rolled sheets, shipped in a sturdy mailing tube, along with a building booklet. Price is $25.00, postage paid in the US.

The other new release is the Clipped Wing Taylorcraft, available in two sizes; 76-inch span and 61-inch span. Recommended power is 1.2 four-stroke for the larger, and .61 four-stroke for the smaller. Both are designed for a one-piece wing for

X-CELL

SCHOONARD Helicopters

SOLID GOLD QUALITY

The term "Solid Gold" immediately brings to mind the image of quality. Similarly, in R/C helis, quality is immediately associated with the name *X-Cell*.

At Miniature Aircraft USA, our primary emphasis is on quality. We demand "Solid Gold" performance in our products. Our service, sales staff, and technical support are all worth their weight in gold -- all dedicated to insure your success.

1001	X-Cell 60 Series
1003	X-Cell 60 Custom
1000	X-Cell 50 Series
1008	X-Cell 30 Series
1009	X-Cell 40 Series
1004	X-Cell Long Ranger Custom
2515	Long Ranger Fuselage Kit
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quick assembly at the field. Plans and instructions for the sport scale T-Craft are shipped rolled. Prices are $25 and $21 respectively, postage paid. •

R/C Soaring *Continued from page 13*

Sand them if you want, paint them if you want, draw panel lines on them with a black felt-tip pen, or just fly them as they are. Kids love 'em plain! They cost only about $5.50 to $6.50 depending on the size and sophistication of the model and are available at your local hobby shop. Hobby shops can get them from Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610.

That large F-14 Tomcat hanging over the CAD booth in one of the photos is called the War Wings "Tomkitty." This one *is* radio controlled! As a PSS model, this one is different than most in that it is much lighter and cheaper than typical PSS'ers. It only weighs 21 ounces ready to fly with micro radio gear, and it only lists for $55.00 (discounted for less than this!). Don't worry about penetration, because the prototype has been flown with 16 ounces of ballast in 55 mph winds at Torrey Pines, and there is room for more ballast than this! In light winds, leave the ballast out and just zip around!

The Tomkitty spans 46 inches with a total lifting surface area of somewhere near 530 square inches. It is an all wood kit. It has machine sanded balsa parts throughout, with only a couple of Lite-Ply bulkheads. The stabs are all-flying elevators (not elevons like the full-size F-14), and it has ailerons for simple two-channel operation. It comes with complete hardware.

The T-tail model also pictured is the Celerity Aerotechnical Designs "Spridget." This kit is likewise machine sanded from balsa and Lite-Ply and comes with complete hardware. The Spridget is unique in that you get two wings in one kit, with the option to make the model with a T-tail or V-tail. The slope wing is intended to be built at 36 inches with ailerons. It features the popular Eppler 374 airfoil. With micro servos, three-axis control is possible (A/E/R), but with standard size servos, only two (A/E) can be made to fit. The polyhedral wing can be built up to 52 inches in span (or shorter), and it features the tried-and-true Eppler 205. This wing is best for training, flying over slope, hi-start, or as a hand launch thermal ship. The list price for the Spridget is $35.00.

CHEETAH MODELS

Larry and Bob Pettyjohn have been at war for years. I mean, they have been producing slope combat models for years. This father and son team can get you set up with a nearly indestructible Cheetah or Super Cheetah slope ship in short order.

Cheetahs are designed for darting around the slope without a care as you pursue your opponent across the sky. The idea with slope combat is to cut your opponent's magnetic recording tape streamer without crashing into his plane. Positive points for the cut, negative points for the crash. Streamers are usually seven times the model's span, and in spite of its length, the model hardly knows its there.

Aerobatics are second nature to these combatants, but the large stabs give Cheetahs amazing stability too. Their fuselages are rotationally heat molded polypropelene. They are nearly indestructible and come in a wide variety of colors. The wings and stabs are chromecoat (glossy white cardboard) covered white foam cores, and are cheap enough to be considered disposable, even though they are easily repaired with five-minute epoxy if broken. Replacement parts are easily obtained factory direct. These features make Cheetahs excellent slope aileron trainers.

Quickly, the specs for the Cheetah and Super Cheetah (in parentheses) are: wingspan, 48 in. (64); wing area, 432 sq. in. (496); flying weight, 32-34 oz. (34-36); wing loading, 11 oz./sq. ft. (10.45); fuselage length, 35.5 in. (35.5); stab area, 105 sq. in. (105).

Contact Bob or Larry by writing 14725 Bessemer Street Unit B, Van Nuys, CA 91411, or by calling (818)781-4544.

CLIFF HANGER MODELS

Featuring nine power scale slope (PSS) models and one non-scale aerobatic model called the "Cliff Hanger," Cliff Hanger Models is one of the biggest, if not *the* biggest source for this genre of sailplanes. The nine are all basically the same as far as what you get: fiberglass fuselage, foam cores, all wood required, and all for the same price: $89.95 list. (Dealer discounts are available for bona fide dealers.)

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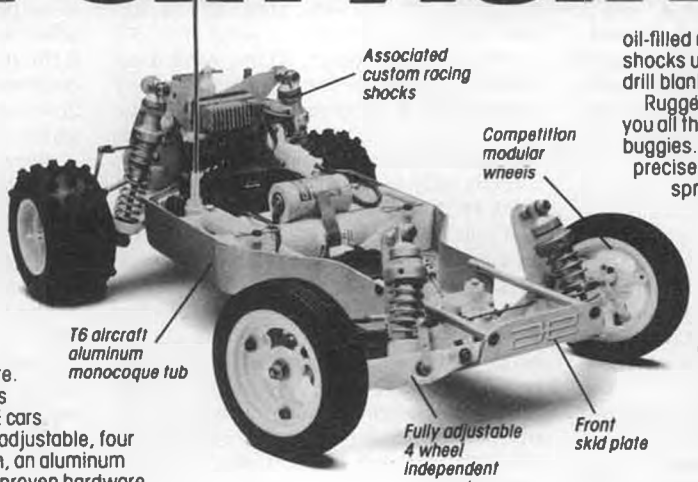

oil-filled racing shocks. These custom shocks use machined alloy cylinders and drill blank shafts for silky smooth action.

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.

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

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Model cars for Real racers.

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(714) 850-9342

Completely built and painted models, ready for your radio installation, are also available for $250.00 factory direct.

The models you may choose from are: F-5E Tiger II (38-inch wingspan, 31-fuselage, 28-32 oz. weight), P-40 Warhawk (44/29.5/28-32), KAI-10 Zero (44/28/28-32), F8F Bearcat (46/30/34-38), F4U-1A Corsair (50/31/32-38), P-51D Mustang (44/29/28-32), F-20 Tigershark (42/35/28-32), T-6 Texan (44/28/28-32), and the all new F-18 Hornet (42/34/32-36). All models use two-channel R/C control and accept any size radio equipment.

Call Cliff Hanger Models and ask for Marty or Steve: (213)320-4530, or write to P.O. Box 9081, Torrance, CA 90508. Send $1.00 for catalog. Dealer inquiries invited.

COMBAT MODELS

Byron Bruce has not rested on his laurels since his unveiling of the all-foam Combat Models F-16 a little over two years ago. That model touched off the rush in California for power scale slope (PSS) ships, and got Byron to thinking *let's expand!*

Now there are three more PSS offerings from Combat Models: an A-10 Thunderbolt II ("Warthog") attack plane, an A-4 Skyhawk attack/fighter jet, and a Russian MiG-23 Flogger. These differ from the F-16 in that they feature balsa built-up fuselages and stabs which are easily repaired if broken, are lighter, and are more durable than the injected foam F-16. They are faster, more agile, are very aerobatic, and yet can slow down for easy landings. These models feature a thinned Eppler 374 (7% thick) foam core, all wood required, and some hardware.

Quickly, the specs are as follows: A-10: wingspan, 49 in.; wing area, 361 sq. in.; MiG-23: wingspan, 45 in.; wing area, 315 sq. in.; A-4: wingspan, 43 in.; wing area, 266 sq. in. The price for these models is the same for all, $114.95 suggested retail, with some mail order houses selling them as low as $74.99 each. (Combat models sells directly only to dealers.)

COX HOBBIES

If you have been searching (in vain) for an inexpensive two or three-channel single stick radio to fly your gliders, your search may be over. Introducing the Cox Cobra series. These new transmitters are curved on the left side and the back side to fit your hands very comfortably. The Cobra Three has a small lever on the back side for the third channel which you very easily operate with your left index finger. The fit is fantastic, and all-day flights with these lightweight radios should produce no fatigue at all.

The airborne pack is also all new for 1990. Gone are the glitches some have experienced with the old Cadet series radio receivers. According to Pat Moore, the glitchy Cadets can be easily fixed at Cox, and the Cobras do not have these problems in the first place. These units are solid and dependable. They come with two Cox micro servos, AA or AAA dry battery box with switch, and new two or three-channel receivers. See your local dealer or contact Cox for a source near you: 1525 E. Warner Ave., Santa Ana, CA 92705.

DCU MODELS

DCU's Mark and Sheryl Hambelton were present at the IMS with many new offerings. For slope or thermal flying there is the new DCU Windstar I or II. Sharing a common epoxyglass fuselage with removable nose cone and airfoil-matched wing saddles, the Windstars are quite attractive.

Shown in the hands of its creator, Mark, is the Windstar I with its slightly tapered, V-dihedral, European style slope racer wings of 68-inch span. It will be available with either a Selig-Donovan SD7001 airfoil or 9% thick Eppler 374, at $135.00 direct.

The Windstar II is a polyhedral version of the I with a full two-meter wingspan. It will be available in your choice of four airfoils, including the Eppler 193 (others will be announced later, but I would assume the previously mentioned two are among them). It will have a 12 ounce wing loading and should be very competitive in thermal contests.

Sheryl holds the popular Stryker, a 50-inch span, futuristic slope fighter with the racy looks of a MiG-29 or F-14 and the speed and agility to go with it. The Stryker has been around for at least a year now and is a very good seller at California hobby shops and mail order houses. It has a flat, jet fighter-like epoxyglass fuselage and foam core wings of 400 sq. in. area. It weighs 30-32 ounces and uses full-size radio gear. List is $99.99 and it often discounts to 80-85 bucks, so shop around.

Sheryl also holds the new "Microfly"

prototype. It will be coming out some time this summer as a small, fast, fun, and inexpensive sloper. It will have a molded, high impact styrene fuselage, 11 oz. flying weight, 36-inch span, 144 sq. in. area, and have a retail of about $29.95. Just keep this one in the trunk of your car in case you find a good slope on a long commute to work, etc.

See your local dealer, or contact Mark at (714)535-6969, 1556 S. Anaheim Blvd. Unit C, Anaheim, CA 92805.

DYNAFLITE

Mark Smith and company were on hand to give this writer his first trade show sighting of the "Apogee" 100-inch thermal glider. This is your basic thermal duration and spot landing type aircraft, of the type that you will find on any Sunday at a local soaring field. Apogee is not a trainer, although it is not difficult to fly. It is more of an intermediate sailplane for a modeler of some experience.

The kit features quality die-cut balsa and Lite-Ply, hardwood spars, full-size plans, comprehensive building instructions, and hardware. The Apogee has a Schuemann inspired multiple swept leading edge, polyhedral/rudder for roll control, spoilers, and all-flying stab. Its biggest feature is its price: $59.95 suggested retail, often discounted as low as 40 bucks. See your dealer today.

EZ SPORTS AVIATION

The "Lota 1700E" made its West Coast show debut at the IMS. This model, advertised as "simply the best," is one of the simplest to build and fly ARF electric sailplanes on the market today. Having flown three of them to date built by three different modelers, I can vouch for its good manners in the air. It is easy to fly, and its climb and glide are up there with the best motorgliders on the market.

Features include prebuilt, precovered, four-panel, Eppler 195 airfoil, fully sheeted polyhedral wings; built and covered stabilizers; one-piece, Tufflex molded fuselage; clear canopy and pilot figure; complete hardware; high power ferrite motor with ball bearing and stator ring; folding scimitar shaped prop with spinner; and apply-it-yourself three-color graphics.

The going price is currently about $139.99 which makes the Lota 1700E a real bargain. Contact your local Global Full Service Dealer or Hobby Shack (800-854-8471 or 800-472-8456 in California) for availability.

GLIDESIGNS

Newcomers this year are Chris and Eugene Lovejoy, and their two new products are called the "Lance" and the "Lance-A-Lot." These are unique little slope and thermal ships in that their wings are milled from solid balsa using CNC technology. The airfoil is the popular Selig S3021, and it is not only milled on the outside, but rectangular grooves are milled inside, leaving a bunch of vertical shear webs. A bottom sheet caps over these grooves and you can't tell the voids are inside. The wing just feels unusually light for solid balsa (which is what it looks like). The Lance wings come ready to cover, sanded to shape, with a hardwood leading edge. Lance-A-Lot wings will be ready for flaps and ailerons. The fuselage is fiberglass and carbon fiber. The stabs are all-flying and solid balsa.

Specs for the Lance are: wingspan, 48 in.; length, 33 in.; wing area, 269 sq. in.; aspect ratio, 8.7:1; airfoil, S3021; and wing loading, 10.4 oz./sq. ft. with micro gear. Standard size servos will fit, provided a 270 mAH pack is used. Prices are: Lance, $145.00 and Lance-A-Lot, $190.00 factory direct. Glidesigns, 3184 Lynn Ct., Newbury Park, CA 91320, (805)498-2491.

K&A MODELS UNLIMITED

Featuring the Mini-I and Kam-U slope gliders and custom foam cutting, K&A is ready to help you get airborne. Designed for advanced fliers, these two models are capable of all two-function aerobatics using aileron and elevator. Low price helps keep these models standing out in a crowd.

The Mini-I has a span of only 28.5 inches, an area of only 167.5 sq. in., and a flying weight of only 9.5 to 10 ounces. Mini radio gear is required. Price is $34.95.

The Kam-U is the bigger of the two and is for intermediate to advanced fliers. Its span is 50 inches, area is 287.5 squares, flying weight is 19.5 to 20 ounces, and standard radio gear does fit. Price is $59.95.

Both kits come with complete hardware, include machine cut balsa and ply parts, foam core wings, full-size blueprints, and written instructions. Contact K&A at 5990 California Ave., Long Beach, CA 90805, (213)428-5423.

PECK-POLYMERS

Although not new as a design, the "Genesis" by Keith Schwemmer is now a new kit! It's been worth the wait for this unique, lightweight flying wing, however. The Genesis is a two (elevon) to three (elevon-rudder) channel, hand launch, slope, or hi-start thermal ship. It flies very well due to its light wing loading which is a result of its open wing structure.

Specs are: wingspan, 59 inches; area, 346 sq. in.; weight, 10-12 oz.; radio, standard two or three-channel receiver, micro servos. The kit comes complete with full-size drawings, instructions, die-cut balsa, ply, and hardwood, and full hardware. Three different radio setups are shown in the instructions: two-channel sliding tray for elevons; radio mixing; and mechanical mixing using the Du-Bro No. 215 mixer (not included). Price is $34.95 from Peck-Polymers, kit number PP-040. Phone (619) 448-1818, FAX (619)448-1833.

ROBBE MODEL SPORT, INC.

I photographed the new Robbe "Saphir" as it hung from the ceiling at the IMS, but the shot didn't do the model justice, so I asked National Sales Manager Gordy Cockburn to send me a studio shot to run in its place.

The Saphir is a model that an AMA thermal competition flier would love, and it is also a slope flier's dream plane. This is possible because it comes in two versions: T (thermal) and H (slope)! Plus, the T version can be built in four different configurations: a full-house aileron ship, a dihedral-rudder-elevator ship, and both of these versions as an electric motorglider!

It has beautiful, scale-like lines, a long

wingspan of 112 inches (T) or 96 inches (H), it can work light lift (T) or fly an aerobatic routine (H), and you get a tough, Robbe Plura fuselage and presheeted foam core wings and prefabricated tailplane components. Full-size plans and detailed instructions round out this valuable package. Order direct from your local dealer or from Robbe. Each costs $236.00 list, on sale at $199.95 each. Robbe, 180 Township Line Road, Belle Mead, NJ 08502, (201)359-2115, FAX (201)359-1415. For placing an order only, use (800)527-6223 toll free.

SLOPE SCALE

Brian Laird and Paul Masura have some of the nicest PSS models around! They take extra time to finish their models in super realistic colors, and their efforts pay off in extra turned heads at trade shows! The models they have to offer are: Me-109, FW-190, Zero, King Cobra, P-51 Mustang, Spitfire, and Hellcat.

Slope Scale kits feature tough, strong, one-piece fiberglass fuselages, high density foam cores, wing sheeting, precut tail surfaces, all other wood required, linkages, complete plans, and instructions. The specs are the same for all kits, so here they are: span, 46 in.; area, 292-322 sq. in.; weight, 26-32 oz.; airfoil, Eppler 374 (mod.); wing loading, 11.5 to 14.5. The Me-109, FW-190, Zero, and King Cobra are all $99.95, while the P-51, Spit, and Hellcat are $104.95. See your local dealer. If ordered directly from Slope Scale, add $4.00 shipping, and 6.75% tax if sold in California. Contact Slope Scale at 12935 Lasselle St., Moreno Valley, CA 92388, (714)924-8409.

VORTECH MODELS

Offering two PSS gliders in P-51 Mustang and Mitsubishi Zero form, Vortech is on its way to fame and hopefully fortune. Jeff Fukushima is the man in charge, and he's got a pair of really slick PSS kits for you. Each kit features epoxyglass fuselage, foam core wings, machine sanded balsa and hardwood parts, and detailed illustrated instructions. Each costs $98.95 list, and is available direct from Jeff at Vortech, 2032 San Anselino Ave., Long Beach, CA 90815, (213)594-9365.

Specs are, P-51: span, 50 in.; wing loading, 11 oz./sq. ft.; length, 38 in.; weight, 31 oz.; radio, two channels required. Zero: span, 52 in.; wing loading, 11 oz./sq. ft.; length, 32 in.; weight, 31 oz.; radio, two channels required.

VS SAILPLANES

Last but most certainly not least is VS. This booth was among the most crowded ones at IMS where sailplanes were being shown. I had to return after the close of show hours to get the photo you see with this report. Unfortunately, with this U-shape booth layout, not all the models would fit in a single shot.

Due to the length of this report, I'm going to have to cop out and say I can't tell you in detail about *every* model in Ken Stuhr's booth. There were slope aerobatic ships galore and even a couple of thermal ships present, most of which featured pivot-wing "pitcherons" for control where the elevator and/or rudder do not move. Many kits featured seamless molded Kevlar fuselages, a VS exclusive feature!

VS has the most complete information sheets I've ever seen on their sailplanes. I urge you to write or call VS and get a hold of one of these sheets, I guarantee you it will be worth your time. VS Sailplanes, 2317 N. 63rd, Seattle, WA 98103, (206)525-5776.

SIGN-OFF TIME

The mail bag is filling to overflowing. If you have submitted anything to appear in this column, hang tight, next month you'll probably see it! Thermals, Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330, (714)245-1702 (after 6:30 p.m.). •

Big Birds *Continued from page 15*

But how things have changed. Plans and kits of all kinds of Big Birds are available now, as is an amazing choice of large engines. Even in competition, especially the Tournament of Champions, there's been a trend toward Bigger aircraft because they look and fly better.

(I'm still awed by the quality of craftsmanship I see at the Expo each year. And, as usual, these magnificent looking birds make me feel that everything I've done is inadequate. So, my initial impulse is to rush home and wipe the slate clean by eliminating all the uglies hanging in my shop, and start creating something worthy.

But I don't destroy anything already built and stay juiced up only until the new plane is ready to cover and paint—and then the devil in me usurps the would-be scale buff that's trying to get out.

Ah, that devil is some sweet-talker. Before I know it he's made me throw on a quick and dirty finish and convinces me that "flying is the name of the game.")

Unfortunately I had to leave the Expo early Saturday afternoon because my generator belt broke on the way to the fairgrounds that morning and I had to get it replaced. And I couldn't make the show on Sunday because it was my son's tenth birthday party and I promised him I'd be there.

Anyhoooo . . . I did get pix of some dandy-looking Big Birds.

BIG BIRD SOCIAL CALENDAR

June 28 to July 1: This is the IMAA's Tenth Annual "Rally of Giants" and one you don't want to miss because this fly-in is gonna be held at the EAA's Wittman Field, in Oshkosh, Wisconsin. Besides all the Big birds, you'll have a chance to visit a great aviation museum—and don't forget those good buddies you haven't seen for a year or more.

Brochures with all the information and details are available from me or from Les Hard, 2909 W. Michigan Avenue, Lansing, MI 48917, (517)487-0653.

July 14 & 15: The Puget Sound Rocs will be hosting their 8th Annual Big Bird Fly-In at the Rocs' new flying field. This Bigger site is just six miles from where the old field was, just south of Rainier, Washington, on Vail Cut-Off Road.

The flyers have all the info and include a map. You can write to me or Bruce Gale, 811 9th Avenue S.W., Puyallup, WA 98371, (206)845-0705.

THOUGHT OF THE MONTH

Death is Nature's way of saying "Up Yours."

Keep those cards, letters, and photos comin'—and newsletters, too. Al Alman, 1910 154th Street Court South, Spanaway, WA 98387, (206)535-1549. •

Electric *Continued from page 17*

my own plane. I will try adding about a half to one inch to the nose to see if I can take out some of the downthrust. Less downthrust would give quicker takeoffs and less pitch change with throttle on-off. Thanks for the info, Scott.

Frank Korman sent photos of the Dallas Electric Aircraft Fliers funfly in October. There were 31 participants with 50 to 60 aircraft. The variety of planes was impressive, ranging from quarter-scale to a Klingberg wing. Jaime Colley's Klingberg wing was powered by two LeMans AP 29 motors in parallel to a six-cell 1200 pack, turning pusher Cox 6-3 props. The wing is 44 ounces, ROGs quickly, and left everyone in awe as it sliced up the sky. Jaime says each motor draws 90 watts, which is consistent with the high performance. Frank's Astro Porterfield is powered by a geared Astro 15 cobalt on twelve 1200 mAH cells, and weighs 80 ounces. It ROGs with ease, loops consecutively from level flight, and looks good in the air. Frank has advanced the timing on the Astro motor 15 degrees and reworked a Top Flight 12-8 prop, which turns at 6000 rpm. This is quite advanced timing on the Astro motor, I have never done this. Anyone else with experience in timing Astro motors? I usually leave mine "as is." Lowell Howe won the duration seven-cell glider and Old Timer (Naturally! I've seen this guy fly! MP). Spectators came from as far away as Missouri, and with ten members signing up on the spot, DEAF is up to 38 members. If you live in the area, you might contact Frank Korman, 5834 Goodwin, Dallas, TX 75206, about joining a good electric club. Next year may be a two-day affair. Thanks, Frank.

One last item! Lynn Cromer is willing and able to start a technical journal for electric planes. He would like to cover subjects like computer programs to predict performance, aircraft designs for electrics, definitive methods for determining the motor for a given aircraft, and technical information on motors and batteries, plus any other topics that may apply. The journal would be non-profit, with as much as possible done with donated time and materials. It would be published approximately every six months. So, Lynn is asking for papers, drawings, programs, or whatever that would be of interest to the electric modeler. You can contact him at 1148 Mt. View, Glen Heights, TX 75115, phone 214-230-0931. I hope Lynn can make a go of this, for as you know, information is the most valuable item in making electrics successful. We lack the books that are available in Germany, for whatever reason, so perhaps a journal will be able to fill the gap. Till next time, read on, and fly better electrically! •

Ersatz *Continued from page 24*

plete and what you add on top of this is up to you. Follow the plans for a Junkers-like top or vary it according to the type of model you have in mind. Don't forget the 1/4-inch ply blocks for the wing hold on.

WING

In a multi-engined model, the wing center section is the heart of the whole thing, as it must house the motors and the landing gear. On our Ju-37, the wing is built in three pieces, with one-inch or 4° dihedral under each tip at the last rib. The center of the wing is then the heaviest and busiest part of the airplane.

Begin by cutting out 20 ribs from firm 3/32 sheet. Twelve of these ribs will have to be slightly altered to receive the 3/32 sheet on top and bottom in the center section. It's easier to cut all the ribs the same, then alter them as needed. Use very firm and springy strips for spars and leading edge. Careful substitution of spruce would be OK. Build the wing on the plan in one piece, if you have 48-inch wood, or in three pieces, but be careful that they line up. The ribs are flat-bottomed from the spar back, so pin down the 1/4 sq. spar and the trailing edge sheet and then glue in the trailing edge stock; the ribs next, then add the top spars and leading edge. Remove from the plan and add the 1/8 sq. bottom spar. Sandpaper the trailing edge sheets to receive the top trailing edge sheets. Sand the entire wing panels and add the leading edge sheets of 3/32 (medium "A" grain if possible). Join the wing panels and glue in the 1/8 birch ply dihedral braces at the main spar. Be sure the dihedral is the same under each tip. Add the vertical grain webbing as shown. Glue in the 1/8 ply bellcrank mounts. Be sure to angle them so the push rods go down to the ailerons and up to the throttles. Grooved landing gear blocks are well cemented under the center section.

NACELLES

The nacelles are now started by gluing in the 1/8 lite ply nacelle doublers. The short one is outboard on each nacelle, to give about 4° outthrust, which is single-engine insurance that there won't be any surprise snaprolls. These go forward only to the 1/4 ply firewalls, which are now added. Be sure not to have any up or down thrust on the fire walls. Drill the holes in the firewalls for the motor mounts, use either the spider back plate on the K&B Sporsters or a glass filled mount. The center line should be 3/16 of an inch inboard on each mount so that the props emerge at the center line of the cowl. The 3/32 sheet nacelle and cowl sides are glued on, then the tank floor. Install the 4 oz. tanks next and sheet top and bottom, crossgrained. This should be faired into the wing sheeting. Cut out two cowl fronts from 1/16 ply and glue them in place. Build up the fronts with balsa as shown and add the grillstrips from 1/8 x 1/16 spruce so that air can enter for cooling and the carburetor. To make the fronts look like radiators, cut 1/8 x 3/8 strips with the grain running crosswise and wrap them around the cowl at the very front, as shown. Sandpaper everything to shape and separate the cowl tops as shown so that the muffler exit is on this separation line at the right side of each cowl. Be generous with the size of the holes here and on the top for the glow plug so that air can escape for cooling.

LANDING GEAR

Bend up the landing gear as shown. Bind and solder it together using the mount on the wing as a jig for alignment. Add the half-inch strips of spruce as fairings and sand smooth.

TAILPLANE

Both the fin and rudder, and the elevator and stab are cut from light but firm "C" grained balsa. The shape given helps the illusion of it looking like a Junkers, but change the shape to suit the model you have in mind. Just don't change the areas. Sand them to shape and sand the leading and trailing edges, though I prefer a slightly squarish trailing edge because this seems to keep servo centering from being critical. I inlaid 1/4 ply blocks in the fin and stab so that I could use screws to mount them for convenience sake.

FINISHING

The charm of this model is the scale-like appearance, so finishing it in a plain color with stripes or sun bursts, etc., won't do much for it. Keeping in mind that full scale bombers were painted with spray guns then that seems the way to go with this one. Choose whatever fabric works best

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

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Model: Amy Lynn Grunewald
Make-Up & Hair: Vince Faucy

for you and type of paint you like to work with. I used Sig Koveral and butrate dope.

The finish is only as good as the surface it is put on. Be sure to rough sand the model to shape with 40 to 80-grit aluminum oxide paper, or garnet paper, then progressively finer paper to about 300. Next, dampen the wood with a sponge but don't soak it. When it's dry, the surface will be raised showing indentations of the rough paper. Now sand it again with 300 paper and use Model Magic or similar filler to fill all the dings and hangar rash it acquired while building. Now sand it smooth with fine paper and apply two coats of Sig sanding sealer to the bare wood, sanding carefully between each coat. Next, two coats of clear butrate thinned 50/50 with dope thinners. When dry, lightly sand it.

Apply the Koveral by cutting a piece a half to one-inch larger than the surface to be covered. Lay it on the surface and carefully brushing thinned clear dope through it to the framework underneath but only around the edges, all the while pulling out the wrinkles, particularly around the edges, and moistening the doped edges with the brush if it has to be moved at all. When in position, let dry and then cut off the excess around the edge and dope down the edge left. If it doesn't flatten out on the edge don't worry, because the next step is to use a heat shrink iron and run it around the edge to smooth it out. Now apply more dope over the edges and when dry, use the iron to shrink the Koveral, starting near the middle and working to the edges. This helps eliminate the wrinkles. Then smooth any rough spots on the edges with the iron.

Cover the open spaces this way and anything else that needs strength. Now brush on many thinned coats of clear butrate dope. When asked how many; I don't know, but usually I keep going until I can't tell whether it's wet or not . . . usually well over ten. After about five coats, lightly wet-sand the fabric, etc., with fine wet-and-dry paper. DON'T CUT INTO THE FABRIC! Three to five sprayed coats of thinned color are next. Then mask the model and spray or brush on the trim (an airbrush for camouflage). When everything is painted, add two coats of clear dull dope, or shiny if you like, and it's ready to assemble and put in the K&B 2Os and the four or five-channel (if you want bomb drop) radio.

FLYING

I've flown a number of twin and four-engine airplanes and still have my heart in my throat on the first few flights of each. Not all of them survived many flights. The problem is engine failure on one side close to the ground and the remaining power puts you into an immediate snap. Experience doesn't help here in flying, just in setting up the engines and designing the airplane. The Ju-37 has out-thrust on the engines to keep the airplane from turning towards the dead engine. This also keeps the prop blast on the large rudder for effective steering. One 20 Sportster will maintain height so that you can bring it home. If an engine quits in a near stall condition, that's close to disaster, so don't fly around too slowly but maintain a good margin of airspeed on one engine.

After you are comfortable with the model in the air, try to have one engine cut out (up at least three mistakes high) and try your ability to fly on one. See what happens in a stall, etc., then you'll know. If you run into difficulty, chop the throttles and come in dead stick or on idle. If you keep it light enough it'll glide well. Mine weighs six pounds and has no bad habits.

On your first flight, start the right (starboard) engine first then tune it up to peak and back it off a little. Be sure it can run in all positions. Shut it down next and then start the left (port) engine and tune it as you did with the right. Now restart the right engine and listen to see if they are running fairly close to each other. If the rpms are very close you'll hear a beat. Don't adjust the needle valves. Try the throttles to make sure they'll both idle. Use a tach if you have one. If they are both running well make sure they are well warmed up, then try taxiing around the field to get the feel of the model. Don't be in too much of a hurry to fly. When you feel everything is in order then fly. If anything doesn't seem right, bring the airplane back to the pits and shut down the engines and retune them one by one. When all is in order and if your hands aren't trembling too much, try for a takeoff. Hold the tail down until it gets some ground speed then steer it gently. Don't hoist if off too quickly. Be prepared to chop the throttles and land straight ahead, whatever is there. Climb out without doing anything too abruptly and get lots of height before trying any maneuvers.

My twin will do everything in the book without excessive speed and is as docile as a kitten on landing. The quiet 20s give it the sound of a real twin. Enjoy your bomber and keep them guessing when they ask what real one was.

If you have any questions or suggestions please write to me, Alex D. McLeod, 352 Park St. N., Peterborough, Ontario, Canada, K9H 4P5. Happy Flying. •

Vintage *Continued from page 19*

center of your field. Push and hold full rudder, and as the model approaches the downwind heading, neutralize the roll with a bit of opposite rudder. Gee . . . ain't it simple when you only have one control to mess with? Like playing a tune on the piano with one finger! Now, as the aerodynamic forces get to work on the plane, the nose will come up as it did for the loop, only now it is going faster. When the nose of the model is pointing up at about a 30 to 45-degree angle, sock the rudder to it and hold it there as the model goes through a 360-degree roll. Get off the rudder just as the model has almost reached a horizontal atitude. When completed, the nose will be pointing up again, and you'll still have a good head of steam. You now have two choices. If this is your first try at a rudder-only roll, just tap some gentle rudder for a mild turn and allow the model to climb gradually, killing off its built-up speed. Mission accomplished! Work your way back upwind for another try. Depending on how the model completed the roll, you may want to start the next roll maneuver earlier or later as the nose comes up from the dive out of the spiral. Don't start it too soon, however! You could find yourself rolling into the ground. Proceed with caution.

After you become comfortable with one rudder-only roll, you can go for the second choice referred to above as you come out of the roll. If you started far enough upwind to complete the first roll before crossing the center of your flying area, and you still have extra flying speed, wait for the nose to come up to the same angle as before, and punch rudder again! Now

you're on your way through two sequential barrel rolls and you're already thinking, "Next time, I'm going further upwind before I start the spiral, and go for three rolls . . . maybe more." Fine . . . go for it, but if the wind is blowing very much, it'll be a long hard struggle getting back upwind after you decide to stop rolling . . . unless you cheat and feed in down elevator for better penetration!

Another trick that rudder-only fliers learned back in the old days for working their way back upwind, particularly with a good aerobatic ship, was to roll upwind! One New Jersey flier, Vince Bonnema, was especially skilled at this with a rudder-only contest ship of his own design, which he appropriately named "Rollo!" It was published in *Air Trails* and we have the full-size plans.

Next time, we'll combine the loop and roll maneuvers to talk you through an Immelman, sometimes referred to in the old days as an "Immelflounder!" In the meantime, keep them elevators, ailerons, and throttles locked up . . . and suffer, like the rest of us idiots who flew radio control in the vintage radio control days! •

ARFs

Continued from page 26

powerplant. The engine compartment was amazingly spacious, and I could have installed any engine I pleased, up to and including any .60 two or four-stroke. For some time now I've been itching to use my hot Rossi .40 ABC engine. I just love this engine, as it is very powerful, idles beautifully, and starts easily. Though I've had it for about two years, it didn't have more than an hour of running time, because the muffler furnished with the engine is, in my opinion, totally worthless. It is little more than a straight pipe which causes the Rossi to give forth an ear-splitting scream. I find this totally intolerable, and it never fails to bring down the wrath of my flying companions. After just a few flights with this muffler I knew something had to be done, and while I was thinking about the problem, one day the muffler shook itself to pieces. I then took what was left of the muffler, cut it in half, and attached a J'Tec Snuf-ler Muffler, which cut the noise back to a reasonable level. However, I felt I wasn't making enough use of the Rossi's potential power, so I had a talk with the folks at MACS Products. It took them about thirty seconds to solve my problem. They had me install one of their #2600 standard header pipes and a #1835 Wizard short tuned exhaust. This gave me three distinct advantages: it effectively quieted the engine, upped the power by at least 25%, and gave my Rossi a really businesslike appearance. Using a Hayes mount (not supplied with the model), the engine slipped easily into the engine compartment with enough room left over to stash a sack of peanuts. Though I usually use a ten-ounce tank with a .40 engine, the engine compartment was enormous, so I guess I kind of went overboard when I installed a fourteen-ounce fuel cell. What the heck, I could fill it at home and forget about it for the rest of the day's flying.

Now I turned my efforts to the fiberglass cowling, an example of authentic overkill. While an ABS cowling would have done the job quite well, the manufacturer for some reason saw fit to furnish a heavy-duty cowling of what appears to be hand-laid fiberglass. This is nicely primed and ready for painting, so after cutting the proper opening for the Rossi I sprayed on a few coats of Formula U yellow, ending up with a nice glossy finish. I did have to furnish the pushrods, control surface horns, clevises, etc., as very little hardware comes with the kit—just the landing gear, the nosegear bracket, and a few screws.

As the model approached completion, I was becoming more and more impressed with the quality and sturdiness of its construction. There was a lot of thick balsa used in the fuselage sides and the tail surfaces, and this was a model which obviously could take a great deal of punishment. Since I fully intended to put the screws to this airplane, I installed fiberglass pushrods for maximum rigidity during high speed maneuvers. Completed weight was 5-1/4 pounds, so the wing loading computed out at about 21.5 ounces per square foot, a reasonable figure for a sport plane.

Flight test day was sunny and calm, so I got the Rossi going and taxied downwind

on the paved runway. Full throttle and she was accelerating forward on a perfectly straight path, the engine turning up full revs on the 10x6 Master Airscrew and the mini tuned pipe. Boy, this was going to leap into the air like a tiger, so I braced myself and applied a little up elevator. What's this? A gentle climbout? Medium speed? What's going on here? The Shark-ST really was flying like an intermediate trainer, rock steady and with predictable responses. Well, I won't say I was disappointed, just surprised. The Shark was a lot of fun to fly and could do everything in the book, but it was no Quickie 500. It rolled nicely, flew inverted with authority, and especially excelled in snap rolls and spins. Knife-edge flight was quite good because of the generous fuselage side area and the large rudder, and slow flight was extra slow with no danger of dropping a wingtip while flying on the edge of a stall. It was kind of like a cleaned-up Ugly Stick, and I have every reason to believe that it was thoroughly flight tested by the manufacturer before being placed on the market. I couldn't find any bad habits, and managed to achieve a much snappier performance after I increased the control surface throws substantially. Any R/C flier who wants to graduate from a high wing trainer would enjoy flying the Shark-ST. As far as assembling this model goes, I put a lot of time into it, but I worked quite slowly and kept setting it aside to tackle other projects. As a matter of fact, I think I could have built up an entire conventional model in the same time, but remember that I spent two or three nights just on the MonoKote application. I think the average builder will put a solid week of evenings into the Shark-ST, but the time is well worth the results. You end up with a straight and sturdy airplane with fine flying qualities. Pricewise, the cost of producing a hand-built model such as this is comparable to the average ARF. Beginning with a direct mail-order price of $89.95, you do have to add the cost of miscellaneous hardware, motor mount, spinner, wheels, adhesives, and fuel tank, to say nothing of some kind of covering material or paint. This can easily add another $40 or so to the basic airframe cost, so do keep all this in mind should you decide to build a Shark-ST. For further information about this product, contact Kingsway Enterprises Imports, 4901 Richmond Ste. 200, Houston, TX 77027, telephone (713)621-7782 in Texas, or (800) 621-7783 outside of Texas.

ONCE UPON A CLEVIS

I lost a beautiful airplane the other day, and though it was a disastrous crash, it need not have happened at all. I won't mention the name of the airplane, because it was no fault of the manufacturer, and it wouldn't be fair to give anybody the wrong idea. I will go so far as to say it was a pretty hot performer, and flew much like a Pattern ship. I had been flying the model for a couple of weeks, and was quite confident in its flying ability. During one flight my son Gary asked to fly it, so I handed him the transmitter. I requested that he maintain a high altitude until he felt thoroughly comfortable with the airplane. After three or four minutes of high speed aerobatics I noticed he was flying low over the field, so I asked him to get it up high again. He managed to regain some of his altitude and remarked that the plane seemed to be in need of a lot of up trim, as it just didn't want to maintain altitude. We fed in all the up trim we had available, but still the model wanted to descend, so it was decided to land immediately. At that point elevator control was suddenly and completely lost, and in the resultant crash the model was a complete loss.

As much as I regret any flying mishap, I am especially annoyed with an unexplained crash. If the pilot does not determine exactly what were the circumstances which caused the problem, then nothing was learned about preventing it from happening again, and this compounds the tragedy even more. Therefore, one must exert every effort to determine what went wrong, much as the FAA does when it conducts minute investigations into the cause of a full-scale accident.

Accordingly, all the larger pieces of wreckage and even the fragments of the airframe were carefully gathered together for a post-mortem examination. In this case it was evident that the crash occurred because elevator control was lost, and this may have been due to a number of circumstances. First, structural failure was considered, but the horizontal stab was found to be intact, as were the hinges and

the elevator. The elevator servo was operating normally. However, it was easy to spot what really happened, as the clevis was firmly attached to the elevator horn, but it had parted from the threaded pushrod. Now my thoughts began to turn back to the many times I had deliberated and agonized over the choice of metal versus nylon clevises. In this case the clevis had been metal, and I have always preferred this type, though many modelers lean toward the nylon variety. Those who have been flying R/C for many years generally stay away from metal clevises, as we were frequently cautioned to avoid the type of radio interference resulting from metal-to-metal contact. However, today's radio systems seem to have conquered this problem for the most part, so I favor a spring steel clevis where strength is necessary. Anyway, as I was driving home from the field I got to thinking about why the clevis slipped off the threaded rod, and I realized that perhaps it was not the fault of the clevis, but of the rod. Sure enough, with the defective parts lying before me on my workbench I tested the clevis on a good quality American-made threaded rod and found it to be in perfect order. I then screwed it onto the suspect rod from the deceased model, and found that it slipped off with a firm tug. I then examined the threads of the rod under an optical loupe and there was the answer to the mystery. It seemed that the threads were quite shallow and did not mesh properly with the female threads of the clevis, so that after a dozen or so flights the disaster resulted from the parting of the clevis and pushrod.

What's the moral of this tale, and what does it have to do with ARFs? Well, this particular model was not an ARF, so the pushrod came from my parts box. Originally the pushrod was an extra which came with an ARF, but it would be impossible for me to determine which one it came from. Suffice it to say that the threads were not cut, but must have been impressed on the rod, resulting in an inferior type of thread. While the thread was too shallow to mesh correctly with a metal clevis, it probably would have worked satisfactorily with a nylon clevis, as the nylon clevis becomes tapped and mates correctly to any threaded rod. To be fair, ARFs are usually furnished only with nylon clevises, so you could say the accident was entirely my fault. Therefore, in my opinion, one should never use a metal clevis on a pushrod which comes in a kit. If you do decide to use a metal clevis, buy a properly threaded name brand pushrod to go with it. And that, dear readers, is our lesson of the month. Meanwhile, send your letters as usual to 2267 Alta Vista Drive, Vista, CA 92084 (SASE for reply, please), telephone (619)726-6636, or FAX (619)726-6907. •

Sparks *Continued from page 36*

curves the FAI Tan rubber has a flatter cruise portion. Both curves for Pirelli and Tan rubber show similar spike and knee curves, but the tan curve extends well beyond the other makes.

"This means you get more turns on the FAI Tan rubber and the higher energy is contained in the cruise portion of the curve. The additional winding potential of the FAI Tan rubber is particularly noticeable with repeated windings on the same motor.

"This all sounds great, but successive windings on the same motor, without rest, does lead to early motor failure. True enough, all rubber motors will fail under these conditions, but the FAI Tan rubber is particularly prone to failure with repeated low-turn winds!"

To summarize the findings (without getting into too many more paragraphs), Wale concludes by theorizing that the Tan rubber suffers from inadequate lubrication. The FAI Tan rubber appears to absorb very little lubrication, resulting in small edge nicks which lead to catastrophic failure.

The possible solution here is to use a more viscous lubrication which will not fly off the motor. This writer has successfully used a heat resistant silicone base lubricant known as "Sil-Glyde" that is normally used to preserve and restore vinyl base seat fabrics. In the last analysis, rubber should be checked for proper lubrication and the motor properly rested.

Unlike other lubricants, the silicone based grease material does not separate appreciably from the motor, saving the covering and wood framework from becoming disfigured from lubricant spatter. Sil-Glyde is available in most auto parts stores.

READERS WRITE

As has been proven time and time again, Old Timer models have proven to be among the best subjects for electric powered flying. Marc Bird, of Oceanside, California, sends in Photo No. 12 with the comment that he gets two to three flights on a charge. The model appears to be a scaled "Miss Delaware" or the follow-on "Air Chief" kitted by Ideal Model Airplane Co. One neat thing about electric is that the motor can be fully cowled, leading to very clean lines.

In that same line, Dave Hicks, of Washingtonville, New York, sends in Photo No. 13 showing an Astro 05 Cobalt electric powered Plecan Simplex. Dave reports the only change to the original was to lighten the construction of the rudder and elevator. He says the model climbs like it must have done in the old days with a Brown Jr. for power.

This free flight model glides well and gets at least two flights on one charge using ten 270 mAH batteries.

WE'LL STAND CORRECTED!

In a recent photo showing Warren Fletcher's 1949 Wakefield, the comments by this writer on its general appearance have led Charlie Stumpf to write a rebuttal. Charlie says, "I'd like to set the record straight. Warren Fletcher, who is now deceased, flew at the Wakefield Eliminations in New Jersey, that I attended. The model won the right to represent the U.S.A. on the Wakefield team for the finals staged in England.

"The design, which you disparage, won over other models flown by such notables as Frank Zaic and Alfred Van Mymersh. The model does feature a carefully streamlined fuselage, twin rudders, and a single leg retracting gear. When flown with Warren's expertise, the model was a first class performer."

MORE READERS WRITE

As noted before, this section of the column is getting to be the most popular with modelers wishing to have photos of their models published. We are delighted to do this with the proviso that the photo should be clear and capable of good reproduction in the magazine.

One great thing is the variety of models received, as evidenced by Photo No. 14 showing the Fiske Hanley 1937 Texaco Winner by Al Wolsky, 41890 E. Whittier, Hemet, California 92344. This 9-1/2 foot model is powered by a Webra .61 converted to spark ignition. Al reports the model flies great and likes Old Timer models because of the unusual designs that are available.

KORDA WAKEFIELD

Every so often we have to run a shot of the famous 1939 Wakefield winner as flown by Dick Korda at the Chicago Nationals.

Mark Sexton, of Seattle, Washington, sends in Photo No. 15 depicting a Dick Korda Wakefield as kitted by Megow. The finish is entirely as Korda had it, a red silk covered fuselage with the authentic Dick Korda trim pattern done with black nitrate dope.

Mark reports the model flies reliably with considerable promise to be a competition threat. Now if the model can just stay out of the downdrafts!

THE WRAP-UP

Maybe this section should be entitled, "Stop the Presses." Just received a phone call from Jim Adams, SAM President, who called to confirm the dates for the SAM Champs at Westover AFB, Springfield, Massachusetts.

Earlier, this columnist published his conversations about this item with George Armstead, contest manager. He is now able to confirm the requested dates July 2 thru July 5. Great stuff!

Inasmuch as flying gets started on Monday, this is an excellent opportunity to hold the MECA "Grando" Collectogether at the Quality Hotel at Chicopee. Although this writer is greatly pleased to hear the foregoing, the earliest we will have this in print will be April. By then, all items should be covered in the SAM house organ, *SAM Speaks*. I hope to see you all at Westover!

* * *

Just in from Tony Italiano, NFFS President, is an announcement that the 1990 AMA Outdoor F/F Championships have been combined with the U.S. Outdoor F/F Championships on October 16 thru 20 at Mid-America Air Center, Lawrenceville, Illinois. O.T. R/C Events will be run by SAM 57. •

On Air *Continued from page 38*

not mentioned in the text (which is where I feel there should be a warning). Then you

must adjust the control surface horns in as far as is needed to get the proper surface throws.

Without the servo arm warning, I believe it is easy to make the mistake I made, as follows. Because the adjustable control surface horns were longer than I'm used to seeing on a small glider, I used the third hole out on the servo arms to achieve the proper throws. This caused the servo clevises to rub against the fuselage wing cover or hatch. This in turn prevented the hatch from closing. My solution was to remove the offending hatch material. It worked, but I now have two small holes in this nicely shaped hatch. Spare hatches are available (as are most other parts), so I may end up replacing mine.

To achieve proper CG location, a mini receiver must be used because the ONAIR's receiver is supposed to mount under the wing fairing hatch near the CG point where there is very little room to spare. If it were to go under the canopy, there would be plenty of room, but the model would require tail weight to counter balance. As it is, the ONAIR is slightly nose heavy, so why make it worse with a big 500 mAH Ni-Cd in the nose?

For ease of assembly, I would give the ONAIR a 4.0.

Third detail: quality of the instructions. A fair amount of time was consumed puzzling over the wording of the instructions. Trying hard not to make mistakes, I took care to read every word. Although the written instructions are adequate for the job and very well illustrated, sometimes things were not perfectly clear to me. Many times I had to read and reread a construction step. I would give the instructions a 3.5.

The average score for quality of the ONAIR 1700E kit is 4.16.

AREA III: Suitability of the model for its intended purpose, 4.0 judgement.

The Yoshioka ONAIR 1700E is an electric powered motorglider. Because it is an "ARF" (almost ready to fly) model, it will attract a wide range of modelers with skills from beginner to expert. The box leads one to believe that "Since the main parts of the airframe are already assembled, you can have it ready to fly in just a few hours."

I am a model builder of 14 years experience. Taking care to do a good job, it took me about nine hours over a two-day period to complete the model to a point of airworthiness. This includes picture taking time and interruptions from small family members. Now that I am familiar with the ONAIR, I think I could cut this figure almost in half if I were to build another.

Considering how long it would take to build a similar model from scratch, I would say this model is about 90% ready to fly, certainly worthy of the word "almost" in the acronym ARF.

However, no place on the box or in the instructions could I find the answer to the question, who was the model designed for, or what is its intended purpose.

This question is a good one, because the ONAIR 1700E is a high performance, sleek, fast electric glider. It can build up speed rapidly if the nose is dropped, and at these higher speeds control sensitivity increases. At low speeds in turns it can tip stall. These things are not what a beginner needs.

The expected fragile nature of the fuselage is not desirable for training. Beginners often pound the ground when learning to fly and land. The ONAIR may not take a lot of abuse from a true beginner.

On the other hand, the ONAIR 1700E is highly maneuverable and even aerobatic! Combined with its speed and carry through, these things make it very attractive to the experienced modeler.

I would have to say that Yoshioka has successfully designed an electric for the intermediate to advanced modeler who wants a high performance, small, quiet motorglider that can be flown almost anywhere, and can be built in a day or two.

All things considered, I think a few beginners will be getting in over their heads with the hot performance of the ONAIR 1700E. Because of this, I would have to rate the ONAIR a 4.0 in its suitability for an obscure intended purpose.

AREA IV: Innovation, judgement 5 points.

The ONAIR 1700E is a very innovative model. New structural techniques appear to have been developed which give the ONAIR a very nice, high-tech, molded quality. The model is almost entirely plastic with plywood reinforcements and a few metal hardware pieces.

The ONAIR 1700E is a molded, expanded bead polystyrene model with something very unique added: a hard-shell plastic skin. The external appearance of this new skin material is smooth, hard, semi-gloss white, and very lightweight. The quality of

the moldings is exceptional. Accuracy is excellent, the aesthetics of the design are appealing, and the flying performance is first rate.

The ONAIR only weighs 41 ounces according to my cheap but fairly accurate spring scale. This is very light for any electric short of a competition model. This is a direct result of this new lightweight structural technique, and it is partly responsible for its excellent climb rate.

The great looks and performance that Yoshioka has achieved with the ONAIR are possible with this new and most innovative molding technique. It needs some further development to improve its ding resistance and give higher strength, but Yoshioka is definitely on to something with a lot of possibilities!

For innovation, I will have to give the ONAIR 1700E a perfect 5.0.

That is how I judged the Yoshioka ONAIR 1700E. When you add up all the points from the four main areas, you reach a 17.1 total. This score out of a possible 20 is excellent. I believe it accurately reflects my satisfaction with the model as a whole. For the electric flier with experience, I recommend the ONAIR 1700E.

* * *

UPGRADING THE ONAIR'S PERFORMANCE

The ONAIR 1700E comes with an excellent Mabuchi-type 540 can motor which has a ball bearing to support the front of the armature and a stator ring to concentrate the magnetic field and give stronger, longer motor runs. Normally, this motor is all you need for relaxed weekend flying as it delivers more than adequate climb performance and duration.

However, if you wish to compete in limited motor run contests that require long duration flights, then you will need all the horsepower you can get. The best choices I've seen so far are rare earth magnet motors such as Astro Flight's Challenger 05 seven-turn or six-turn (FAI) 8.4V motors, Hobby Lobby's Ultra Series 800 (8.4V) motor, or Robbe Model Sports Keller (8.4V) cobalts. I opted for the Astro Flight FAI 05 motor.

You will not be able to use the stock Yoshioka prop and spinner with this motor as the shaft diameter is too large. Also, the prop adaptor of the Astro motor is too long to allow a simple drop-in installation that looks right. It can be done this way, but you end up with an almost 3/8-inch gap between the "firewall" and the rear of the spinner. What you need is a 5/16-inch (or thinner) shim to go between the motor and the firewall to close this gap.

I made this shim out of a combination of Lite-Ply and aircraft grade plywood pieces from my bin of scraps. Two 1/8 inchers and one 1.5mm ply scrap tógether were the perfect thickness. Remove the stock firewall spacer, tack glue the scraps to it, then cut the scraps to the same size.

The Astro prop adaptor is much wider than the stock Yoshioka part, so what you'll need to do is open up the large hole in the firewall and ply shim pieces so that it will fit inside the plastic ONAIR nose cone with only the prop adaptor's flange and prop shaft sticking out. Don't let anything rub or you may end up frying your speed control when the motor turns on! I used a rat-tail file and a Dremel Moto-Tool with sanding drum for this operation and it worked great.

Next, because the prop adaptor runs partially inside the fuselage, you will need to drill a hole in the nose cone just behind the firewall, and file a groove in the stock firewall spacer to correspond to this hole, so that a hex key will reach inside to the set screw on the adaptor.

Astro prop adaptors rarely fit the holes in the props that are best suited for this motor, however this malady is simple enough to cure. Wrap a 1/4-inch wide strip of masking tape around the prop shaft until it is too thick for the prop to fit over. Then, one wrap at a time, cut off and remove the tape until a snug fit is achieved inside the prop. I have used Yoshioka 8X5.5 and Robbe 8X6 props with excellent flight results.

The climb on Astro's 05 FAI motor is nothing short of fantastic. It gets to thermal altitude in about 30 seconds, where the stock Yoshioka motor would take twice this time. There is a penalty to pay for this kind of horsepower (called watts), and that is increased current draw. The 900mAH, seven-cell Ni-Cds I used were out of juice in two minutes with the Yoshioka 8X5.5—less than two minutes with the Robbe 8X6 (as is expected). The Robbe gave the better climb, but at the cost of shorter motor runs.

Heat is a problem if you plan on running

the up-to-40 amps this kind of motor draws. By all means run a heat sink on your MOSFET speed control or you may end up damaging it. Those MOSFET types with Temp-FET designs also benefit from heat sinks even if they can shut themselves down before damage occurs, because as the temperature rises to extremes, resistance goes up inside the MOSFETs. That's bad. Heat sinks bleed off heat. That's good.

In all fairness, the Panda PSC-1 worked fine without a heat sink, but I plan to get one ASAP before I run it again. It does get very warm!

The ONAIR 1700E should be competitive against the better hand-builts in LER thermal duration contests. I plan to fly it at the next Astro Champs to see if I'm right. See ya there! •

Jet Trails *Continued from page 41*

One of the real crowd pleasers, in my opinion, was the scale R/C jets. Bob Violett put on a great demonstration with his camouflaged F-86 Sabre. This airplane looks very realistic in the air. Bob demonstrated his scale-like operating doors. He also did high speed passes and slow speed flights and he jettisoned his auxiliary fuel tank. The spectators loved it.

Not to be outdone, Bob Fiorenze demonstrated Yellow Aircraft's new single engine F-4 Phantom. This is a beautiful and highly detailed model done up in a Navy combat color scheme. The airplane is very fast, yet appears to be flying in the scale speed envelope. The Yellow Aircraft F-4 is rock solid in the air and does not use a gyro on its rudder to keep it tracking straight. When it comes to "hot dogging" a jet, Bob is the best. His high speed, low inverted passes appear to be a piece of cake for him. It sure excited the spectators. The low speed characteristics of the F-4 Phantom are also excellent. It is really a good flying airplane.

Another interesting airplane at this air show was Art Arro's A-4 Skyhawk which is an original Bob Violett A-4 Skyhawk kit. Art told me that this model is eleven years old and still flies great.

Paul Lupia kept the spectators guessing for two days as to whether he was going to fly his very pretty Byron F-15. Paul had registered as a competitor but chose not to compete due to the fact that his airplane had not yet been flown. After the contest was over, Bob Fiorenze test flew the big jet for a successful first flight. Upon landing, the spectators applauded both Bob Fiorenze, the test pilot, and Paul Lupia, the owner and builder of the model.

Dave Nicholson had two jet models at this meet. His modified Byron MiG, using a Bob Violett "Viojett" fan system, flew great and a lot faster with the Viojett modification, as did Dave's modified Midwest Heinkel using the same fan and engine.

Missing at this year's Top-Gun event were Ron Gilman (the first winner of the Top-Gun award), Ron Shafer, Eric Baugher, Louis Levine, Don Muddiman, Tom Velosky, and Norm Holland. I saw Norm, Tom, and Don as spectators. Maybe next year we will see them as competitors.

Now let's talk about the Top-Gun event. For those of you who are not familiar with this event or have never seen it, I will try to explain it to you. First of all, the Tangerine Top-Gun event should not be confused with Frank Tiano's Top-Gun Invitational. These two fly-ins are totally unrelated. The Tangerine Top-Gun was designed to offer a challenge to the top fliers and innovators in the jet model fraternity, to promote the advancement of jet models and their power systems, and most of all to have fun and fellowship with other jet modelers. (For those of you who would like a complete set of rules for Top-Gun, contact Contest Director Dave Tyson, at 1179 Howell Creek Drive, Winter Springs, Florida 32708, or call him at (407)695-2836.)

Now I will give you a brief description of the Top-Gun maneuvers: shortest takeoff, slowest flight and fastest flight (both of which are flown through a speed trap), most vertical rolls, two pattern maneuvers (pilot's choice) from the AMA pattern list, two freestyle maneuvers, spot landing, and lowest noise level.

The turnout for Top-Gun was rather disappointing, to say the least, with only four entries. However, the four participants did a dynamite job of flying in this competitive event. I congratulate Terry Nitsch, Dave Ribbe, Greg Garneau, and Dave Escobar, the four pilots who participated. In the Top-Gun fly-off, there is only one winner—no points for second place. The event was won by Terry Nitsch. He did a superb

job of flying his modified Viper. Dave Ribbe, a young engineering student from Orlando, was breathing down Terry's neck with only a few points separating the two. Watch Dave next year, he could be the next Top-Gun.

Jerry Caudle took home the Fastest Time trophy with a scorching 212.5 mph flying his Viper. I think he uses an afterburner on his jet model (only kidding, Jerry, you won it fair and square). Right behind Jerry was Mr. Top-Gun, Terry Nitsch, with a speed of 212.4 mph, flying his modified Viper.

Dave Latsha won Best Finish with his beautiful yellow and black Sportshark. Terry Nitsch won the Most Outstanding award for his performance with his modified Viper. Awards for Best Scale and Most Realistic Flight were won by Bob Violett with his F-86 Sabre.

As I said earlier, there were a few crashes—there usually are when you push airplanes to their maximum performance and then some. Dick Guerra crashed his great looking Viper. I did not see it happen, so I can't give you any details.

Dave Escobar wiped out his beautiful Viper done up in the Blue Angels color scheme. Dave was doing a high speed inverted pass when he dove in. His plane was completely totalled.

Bob Violett ran into some bad luck. After the contest was over the pilots were allowed to fly their airplanes. Bob was demonstrating his camouflaged F-86 Sabre. He was really pushing and hot dogging his F-86 with high speed low passes, four-point rolls, inverted passes, and climbing rolls. He sure looked like he was having fun. Then it happened. On another high speed low pass Bob hit one of the speed trap poles and his F-86 bought the farm. Even the pros are not immune from this type of accident.

In summing up, I would like to say that this Fan Fly was well organized and a lot of fun. It was also a great spectator attraction. However, I think we missed the true meaning of "Top-Gun." In the movie of the same name, Commander Mike Metcalf, code name Viper, states, and I quote: "Top-Gun was created for A.C.M. Air Combat Maneuvers (Dog Fighting)." He also stated that the Top-Gun school was for combat training. I think that the Top-Gun should be limited to scale military combat jet models. I'm sure there would then be more than four participants in the Top-Gun event. Have a special event for the "hot rod" jets and in this way you can have the best of both worlds.

I'm sure that I will get a lot of flak (no pun intended) on this subject. Stay well and keep 'em flying. •

F-86 *Continued from page 48*

of the last steps before finishing the model is the installation of the control linkages, which are clearly illustrated on the plans and manual. All control surfaces are very solid with every precaution taken to discourage flutter. Each aileron and flap has its own servo for a solid and easy installation. The elevator, rudder, main gear and throttle use one servo each.

The tailpipe is rubber mounted to absorb noise and vibration. Even the tuned pipe muffler is rubber mounted. All gear doors and the retract installation are clearly illustrated. After final sanding, the aircraft is prepared for finishing. All wood surfaces are covered with pre-primed Micafilm epoxied to the balsa instead of the conventional heat application. This process was used to eliminate bubbles and sagging and also to provide a hard skin finish. The epoxy is brushed onto the wing, Micafilm is applied, then a squeegee is used to remove excess epoxy under the Micafilm. This whole application resulted in a weight gain of only 3.6 ounces.

The retract system, which is engineered and manufactured by Bob Violett Models, is the only system developed and sold specifically for the F-86. The gear and doors are sequential and operated by only two servos. The system looks complicated, but through the use of highly detailed drawings and photos, it can be accomplished by most any modeler.

The aircraft was primed with K&B primer and sprayed with K&B Superpoxy.

To date, my F-86 has in excess of forty flights, all off of a grass field. This sounds too good to be true but this kit is a dream. The KBV 82 and pipe installation works flawlessly and is by far the quietest ducted fan flying to date. The landing gear, with all of its operating doors, is maintenance free, even for grass field operation. (In the

northeast, hard surface runways are only for full-size aircraft. Ducted fan pilots in this part of the country have to settle for aircraft that can fly off of a grass field. This eliminates 80% of the fan kits on the market today.)

The F-86 is very stable from a speed range of 30 to 150 mph. When flaps and gear are extended, there is no pitch change. Slow flight has to be seen to be believed. The Sabre turns tight and is controllable right down to touchdown speed. This is a giant step in true scale jet performance, and all credit is owed to Bob Violett. He is the one who started flying and designing fan jets, and now, many years later, he is the first to perfect ducted fan aircraft.

After building and flying ducted fan aircraft for the past ten years several observations have come to light concerning the F-86. First off, the model has more power than you will ever need. It is capable of accelerating in a vertical climb. You should decrease the power during dives because the model could exceed 200 mph. This is a speed which is probably beyond the servos' ability to cope with air loads.

The F-86 is surprisingly "user friendly." It performs and handles with the ease of a good pattern ship. After a few minutes of familiarization, everyone who flies it looks like an experienced jet jockey.

From the instructions to the injected molded parts, Bob Violett Model kits exemplify the total engineering concept. This includes their jet kits, Viojett fan, KBV 82, fuel cells, retracts, and even the starter probe. All of this makes the F-86 the perfect kit in today's market.

When I purchased my BVM product I also received free of charge the combined expertise of the entire Violett staff. They are all highly supportive of each customer's efforts.

As a final note, I would like to extend my congratulations to Bob Violett and his F-86 for placing first at the 1989 Scale Masters. •

Electronics *Continued from page 51*

charge the intended battery, and a rectifier diode. See Sketch A. An LED (light emitting diode) is generally added to the basic circuit (see Sketch B) as a charge indicator. In this case, the resistor seen in parallel with the LED is there to carry some of the charge current, LEDs being limited to 20 milliamperes or so. An expanded version is seen in Sketch C; a dual charger such as is furnished for transmitter and receiver use. In this case, the transformer chosen must furnish a voltage high enough to charge the eight-cell transmitter battery, the voltage being reduced to that required by the four-cell airborne unit by the series resistor. Minor variations will be found from make to make, such as the use of dual LEDs, or dual winding transformers, but basically these chargers are all the same.

The output of this type of circuit, a half-wave rectifier, is a 120 Hertz per second pulsating DC (direct current); only the positive side of the 60 Hertz AC (alternating current) input current is being rectified. This is fine for NiCd battery charging; as a matter of fact, NiCds seem to prefer this type of charging current to purer DC. The reason is probably that the pulsating current reduces the growth of inner "whiskers" that ultimately cause shorts between the elements of the cells. Of course, NiCds also charge well from pure DC, as evidenced by the thousands of battery powered chargers in daily use. Pulse charging will reduce heat buildup in the battery, and its effects are probably a small and maybe even insignificant increase in cell cycle life.

One of the poor qualities of this type of circuit, its lack of voltage regulation, is actually desirable for battery charging applications. The increasing resistance of the battery as it accepts a charge acts to automatically decrease the charge rate.

Anyway, these simple circuits work well, and are widely used for battery charging purposes. The power supply and/or battery eliminator are also transformer/rectifier circuits, but will usually use full-wave rectification, which generates a purer DC waveform initially, further improved by filtering. For use with equipment which requires an even steadier form of power, some of these units will sometimes include voltage regulation. Usually, audio or test equipment will be provided with this type of power source.

So far, we have been discussing and dealing with fact. Now the confusing part, we start dealing with the markings to be found on these devices, which you will soon learn to accept as proof positive that you should not believe everything you read—unless, of course, you are reading it here in EC.

In the case of Larry's 12V 500 mA charger, assuming total honesty on the part of the supplier, it is intended to charge a 12V battery at an *average* of 500 milliamps. Note that average—it is important. Because of the design, when tested without a load, as Larry indicates, it will exhibit a much higher voltage; 19V in this case. Also, when first connected to a completely discharged battery, the current will read higher than 500 mA. Conversely, when the battery has reached its full charge state, the current will be lower than 500. Somewhere in the range, and probably for the highest percentage of the recommended charge time, the current was at 500 mA. All of this is due to that changing battery resistance mentioned earlier. Now, we can't measure the true charger voltage with the battery connected, as the battery confuses the apparent value, but if we were to substitute a resistor of the same value for the battery at certain points of its charge cycle, we would find that the charger voltage is dropping at the same rate as does the current.

The same thing applies to and is happening with a system charger, generally marked "9.6V @ 50 mA and 4.8V @ 50 mA." In both instances, the unloaded voltage will read higher, as will the initial charging current which will decrease in

time.

Now, this same charger can be used to charge any other batteries of less than the charger's own voltage. The rate at which they will charge is determined by the difference of the two voltages; i.e., the charger voltage at the desired rate, and the battery voltage. We could, for example, charge a four-cell pack, though the current would probably be at two to three amperes. We can control and adjust this charge rate with a series resistor as shown in our basic charger diagram.

The ten sub-Cs that Larry mentions? Yes, they can be charged with this charger, but the voltage to be applied is determined by the charge rate desired. Obviously, with all of the variables involved, it is impossible for me to state any exact values, but obtaining them is easy. We need to start off with at least a 50% charged battery, to obtain an average charge rate. Refer to Sketch D; simply connect the charger to the battery, and read the current. Then add resistance to lower the current to the desired value, probably 120 mA for overnight charging for the sub-Cs. Again, the current will be higher initially, tapering off towards the end of the charging period. Although in this case we are measuring and adjusting the rate of charge, we are also effectively controlling the applied voltage to the battery. Ohm's Law is always working!

This same procedure can be used with almost any charger and battery combination, even down to one cell. The one caution is to not overload the charger, for which we can also test with more of those formulas. But there is an even simpler test: if it starts to get hotter than it does in its normal application, you are working it too hard and will eventually cook it. There are a lot of bargains in these wall transformer chargers from the electronic surplus stores and catalogs, and usually for a couple of bucks and a handful of resistors, one can come up with the proper combination to charge most any battery on hand.

* * *

Servos are almost as popular a subject here in EC as batteries. Therefore I know a lot of you will be interested to learn of a new one of the type often referred to as "Quarter Scale." It is the J.C. Development MS-747WB servo; large, heavy duty, high power. Specs for it are as follows:

Size: 2.125" x 2.375" x 1.0625"
Weight: 3.9 ounces
Speed: 0.26 seconds/60°
Torque: 167 ounce/inches
Required voltage: 5VDC
Current requirements:
  Idle: 25 mAH
  No Load: 300 mAH
  Maximum: 1400 mAH
Signal input: Positive pulse
  1.5 mS Neutral
  Min 0.8
  Max 2.2
Rotation: 90° or 180°
Connectors available: Futaba "J"

The MS-747 is definitely of the type required for Quarter Scale and other high power requirements. Its power is transmitted through a 9/16-inch output shaft to either a 1-5/8 inch wheel or 2-1/4 inch four-sided arm. Everything is sufficiently rugged as required for its intended application—heavy case and gears, ball bearings, large 25mm motor, IC amp with external drive transistors in a bridge configuration, and O-ring sealed case and output shaft. Though it is furnished only with a Futaba connector, installing any other can be done quite simply and safely without the need for splicing, as the amplifier is uncrowded and easy to work on.

The MS-747 is economically priced at $32.95, directly from J.C. Development, 2716 Bayberry Way, Fullerton, CA 92633; (714)879-3266. It is also available from Condor R/C Specialties, 1733-G Monrovia Ave., Costa Mesa, CA 92627; (714)642-8020. For comparison purposes, the Futaba FP-134, for which this is obviously intended as a replacement, is rated at 112 in./oz. and priced at $64.95.

WAS IST DAS?

I've mentioned before how frustrating it is to me to see something that appears interesting in one of the foreign magazines that come my way and not be able to "Read All About It." I manage to fumble my way through some of them, even resorting to the appropriate dictionary at times, but except for the electronic schematics, the Japanese *Radio Control Technique* defeats me almost completely. Almost, but not quite, because the old saying about a picture being worth a thousand words still holds true, apparently more so if the words are in Japanese. Therefore, I can introduce you to something quite interesting, if slightly out of the electronic context, from

the pages of the August 1989 *R/C Technique:* the E-17O "UFO" . . . see the drawing.

I'm not sure what one could call such a flying device, though it is obviously more helicopter than airplane. I guess the maker isn't too sure either, hence the "UFO" tag. Anyway, there it is, radio controlled, electric powered, gyro stabilized, and available only in Japan at this point. Control is achieved by varying the speed of the motors, all done automatically through a companion transmitter which, I am proud to announce, is a four-channel system configured to the mode of champions, Mode One! According to the other sketches included in the article, the (?) is capable of flying up or down, forward and backwards, left and right, and rotating around its central axis. It does not appear to be able to bank at all, though it would seem that it should with appropriate motor speeds. However, it has two gyros, working in different axis, and it is probably one of them that keeps it in a level position at all times and probably what makes it possible for it to fly at all.

Rather small, the UFO measures only 8.66 inches across its circular frame, not including the propeller arc. The props, which are shaped more like helicopter rotors than propellers, are 5.3 inches in diameter, and are driven by .5-inch motors with 1:5.4 reduction. Weight of the UFO is 4.2 ounces. Probably due to its weight carrying limitations, as with most electrics, the batteries in use are only of 120 mAH capacity at 1.4 ounce, with a resulting flight time of less than two minutes. I would venture to guess that even indoors under no-wind conditions, two minutes at a time is enough of this kind of flying for most of us.

Sorry, but to the best of my knowledge, the UFO is not available in the U.S. at this time, though if in fact it is a successful flier we'll see it soon after the next major trade show in Japan, as I know a large number of our major importers attend every year. Hey, come to think of it, apparently my Japanese isn't all that bad after all, huh? Maybe some of what a long-haired dictionary taught me a long time ago is still with me. And to clarify that point, I must say that in those years, only girls had long hair and wore ponytails! •

Hannan *Continued from page 57*

ner, signed on the inside by the entire Ryan crew who constructed the aircraft, cracked before the transatlantic flight, and was given to the late Hawley Bowlus, foreman of the Ryan team, by Charles Lindbergh himself.

FORTHCOMING EVENTS

June 4th through the 9th are the dates, and Johnson City, Tennessee is the place for the largest indoor model extravaganza of 1990. Included will be the F1D World Championships for microfilm models, the AMA Indoor Nationals, and the United States Indoor Championships. Bonus events are the MIAMA Pistachio Gran Prix, Federation ROG, and Coconut Scale. Something for almost everyone! More details may be obtained by sending a large, pre-addressed, stamped return envelope to: A.J. Italiano, 1655 Revere Drive, Brookfield, Wisconsin 53005.

PISTACHIO INTERGNATS

If you are unable to attend the Johnson City festivities, you can still participate in an international indoor event, simply by entering the MIAMA World Proxy Pistachio Intergnats. Rules are quite simple: Any flying scale model spanning eight inches or less, or having an overall length of six inches or less is eligible. Or, if non-scale is more in your line, you can build an eight-inch span version of any outdoor cabin model, and enter the model-of-a-model event. Proxy-flying instructions, documentation, return postage and, of course, your model, must be sent to Florida by April 20. Additional details may be obtained by sending a stamped, pre-addressed return envelope to: Dr. John Martin, 2180 Tigertail, Miami, Florida 33133. Where else can one find such low cost entertainment? There isn't even an entry fee!

FLYPAPER

Perhaps there are cheaper flying models than Pistachios, after all. We refer to paper gliders, which have their own avid supporters, and even a regular four-times-per-year newsletter, entitled, logically enough, *Flypaper*. Edited by Charles E. Peck, the 16-page publication is concerned with history, contest classifications, construction, book reviews, and plans. The current issue features a "Paper Cub" and an origami flying wing in plan form, both to be constructed from paper and intended to fly. Subscriptions are available for $10 from: Flypaper, Box 47186, Wichita, Kansas 67201.

WORDS OF WISDOM

Paul McIlrath's granddaughter, Shay, wrote a "How-to-make-a-project" theme for school (third grade class). She closed her article with these astute words: "If it works, don't let your little brother wreck it, and show it to your mother and dad. If it

doesn't work, give it to your little brother, and don't even tell your mother and dad about it!"

PREDICTION

Back during 1982, business writer Maxwell Newton was quoted in the TWA publication *The Skyliner* as predicting that by 1990 the major competition for airlines would be the communications industry. Noting the "wretched conditions" of airport access in metropolitan areas and the "filth and squalor" of public transportation, Newton opined: "Transporting human beings for the purposes of communication must progressively give way to the efficiency of moving voices and images and thoughts."

Our thanks to Carl Hatrak for this thought-provoking item.

SIGN-OFF TIME

We close this column with a comment submitted by Tom Ersted, of Kettering, Ohio: "Good enough isn't!" •

Vanguard *Continued from page 39*

sistance-capacitance integrator reconstitutes the original signal. This modulation scheme is called pulse position modulation (PPM).

"This type of digital control has not been developed for models because the digitalized input would have to be generated by shaft encoders or other analog-to-digital converters (one per channel) and similar devices would be required for decoding. Encoding and decoding equipment is so large and expensive that PPM is impractical for models."

What is referred to by our equipment manufacturers, who go so far as to even label their equipment as PPM, is in actuality PWM, Pulse Width Modulation, in which the length of the control pulse varies in accordance with the movement of the control stick. In true PPM, encoding is done by moving a fixed width pulse within a given time frame.

In review, the important points are that PPM (sic) and PCM are methods used to convert mechanical stick movements into electronic signals; AM and FM are the radio frequency transmission methods modified (modulated) by the encoded signal.

The above "Editor's Notes" were furnished by our "Electronics Corner" editor, Eloy Marez. Now back to James Wang.

FM and AM refer to how the radio signals are actually transmitted through the air. Both PCM and PPM signals can be used to modulate AM or RF signals before they are sent through the air. First, let's see what AM (amplitude modulation) means. For example, say I am using a 72.500 MHz (megahertz) transmitter. AM transmitter signals are sent through the air by varying the loudness (volume) of the electrical wave oscillating at 72.500 MHz. If you were able to hear an audio tone at 72.500 MHz, amplitude modulation means the tone would get louder and quieter, but always at the same pitch. In other words, the amplitude is being modulated.

Using the same example, FM signals are transmitted by distorting the 72.500 MHz frequency very slightly. Thus, if you were to hear audio tones at 72.500 MHz, the sound volume would be constant but the tonal pitch would vary high and low constantly. In other words, the frequency is being modulated. A large percentage of modern radio control sets are now FM because FM is more noise proof. For example, an AM set would get confused easily if you rub metal parts together because that generates sparks. It's like the 72.500 MHz sound is being polluted by another sound created randomly in the background. On the other hand, an AM system fails more gracefully. Under poor conditions, an AM system may still provide some degree of communication effectiveness when an FM system has failed completely. FM systems have a threshold effect; they either work flawlessly, or not at all! Most of us have experienced this threshold effect in listening to an FM radio in a car. As the distance from the transmitter increases, a fraction of a mile will often make the difference between high-quality reception and nothing but noise, while AM radio stations may have a lot of noise, but are still understandable.

Therefore, PCM and PPM refer only to internal coding. AM and FM determines signal transmission through the air. Presently, all the PCM radios on the market also employ FM transmission. But the less expensive PPM radios come in both AM or FM format. The Vanguard 6H comes in two versions. The PCM/FM version retails for $499.95 and it is called Vanguard 6H PCM for short. The PPM/FM version retails for $399.95, and it is called Vanguard 6H FM. As both sets incorporate FM transmission through the air, they should both have the same radio range. But the difference is that PCM is a smarter coding technique and the PCM receiver knows when there are noises from other channels or sources, and would intelligently neglect them. Both Vanguards come with four 94102 servos, 600mAH Ni-Cd battery, 1991 approved narrow band receiver, frequency flag, servo trays, and spare servo arms. Bob Renaud, at Airtronics, says in 1990 the radios will come with a 1000mAH receiver battery.

My Vanguard radios were tested in my flybarless Cobra/Legend helicopter. The Cobra/Legend is a model with a bunch of GMP Cobra and Legend parts mated together. As we explained in the World Champs report in the December 1989 issue, rotor blades generate significant amounts of steady and unsteady loads which are all fed back to the poor servos. For flybarless model helicopters, the dynamic loads are fed directly to the servos because there is no flybar to act as intermediate to dampen the aerodynamic and inertial loads. Therefore, flybarless model helicopters should employ only high torque servos. In the Legend review (*Model Builder* July 1989), I used the Airtronics Quantum radio with the 94735 contest heli servos. These servos each provided

80 in-oz of torque and the output shaft is supported on two ball bearings. The 735 servos so far have proved excellent.

To stringently test the 102 servos that come with the Vanguard system, I installed the standard 102 servos in my flybarless helicopter. These 102 servos are only bronze bushings, but still provide pretty good centering and have 50 in-oz torque. With the 735 servos, if you grab the servo arm and jiggle it, you would not feel any movement. However, with 102 servos you would. But for the price of one 735, you can purchase three 102s. After at least 100 flights on the flybarless machine, the 102 servos are still working flawlessly, but the output shaft began to show slop and wobble. The conclusion is if these servos can survive the torture of a 60-size flybarless helicopter doing so many aerobatic flights, then they are good enough for any 30 to 60-size flybared helicopters. But I advise you to use the 735 servos for any flybarless helicopter. I used the 102 on mine only for testing to see if they would fail or not.

Both Vanguard PCM and PPM receivers functioned flawlessly so far; that means no crash due to radio problems! All Airtronic radios now come with AMA gold stickers that certify them as meeting or surpassing the 1991 20kHz narrow band requirement. The PCM receiver has a special feature that the PPM does not have. The PCM receiver has what Airtronics calls a ND plug. This ND plug will automatically pulse the throttle to idle for a half second at one-minute intervals when the receiver battery falls below 4.1 volts. This is a very nice feature which will certainly get your attention when you are hovering and the battery is getting low. I have tested this feature at home with a low battery, and it works. However, I have not run my battery that low while in flight tests. This ND feature is not available on the PPM system. The PCM system also comes with a different receiver switch harness. This special switch harness permits the receiver to draw a minute amount of current to keep alive its memory of your preset failsafe commands. If you unplug the receiver battery, then you have to reset the PCM failsafe settings.

The PCM has two modes of failsafe for emergencies, such as interference or loss of transmitter signals. In one mode, the receiver will automatically kick the servos to user preset servo commands; a popular choice is low throttle, low collective, and zero cyclics. In the second mode, the receiver will automatically remember the last valid radio command and locks the servos on the last command position. All PCM radios on the market have these two failsafe modes. I usually use the second mode because it's pretty rare that I lose a signal completely. More often it's only a temporary loss of signal such as may occur when pointing the antenna at the model, or a sporadic interference from pagers, or metal-to-metal contacts, etc. If I leave it on the second mode, the model would just ride through the temporary loss of signals, and most of the time you would not even notice it. In this respect, I like PCM radios more. But there is another school of thought that PPM is better, because if there is a glitch, they would like to know. PCM does not mean crashproof; if someone on the same frequency decides to turn on his transmitter, then you are going to crash, no matter what!

In terms of reliability, I trust all modern R/C radios, even the simple AM sets. Modern radio equipment is so refined that 99 out of 100 crashes are likely to be due to pilot mistakes. Furthermore, all Airtronics radios, including the Vanguard, meet and surpass the 1991 narrow band requirements set by AMA. By 1991, many of your present radios, which may be of the wide band design, will be illegal at club fields. If you do use them you are risking interference by the newer frequencied radio systems and pagers that operate in frequencies close to you. It is probably more economical to acquire a new inexpensive system than to convert your old system. However, your wide band radios will not be FCC illegal. If you do not fly near cities, or in club fields, then you can still use them, say in the middle of a Kansas prairie.

Let's look at some of the features on the Vanguard radios. Besides the failsafe, both PPM and PCM systems have the same features: throttle hold, hi-idle, separate dual rates for pitch and roll, low battery warning beep, servo reverse on all the channels,

and gyro sensitivity select toggle switch. One thing I immediately noticed is that the Vanguard switching directions are opposite that of JR and Futaba. For example, on Vanguard you push the throttle hold switch away from you to activate it. Of course, this is no big problem, but for someone who also owns JR and Futaba radios, this can make him pause for a second during flight. I simply rotated the switches 180°, so now all my radio switches are pull forward to turn on.

The throttle hold setting method is very interesting on the Vanguard. There is a throttle setting trim pot for throttle hold purpose, but when the throttle is activated, the normal throttle trim also has an effect. None of the other heli radios have this feature. It seems to be quite convenient because I can adjust the throttle hold throttle position without opening the cover. The hi-idle has only a throttle position trim pot, unlike the JR Century 7 which also has a point setting trim pot. As the Vanguard is aimed at beginners and intermediates, it is proper to keep the system simple and user-friendly.

There is only a hi-end pitch curve adjust, there is no low-end pitch curve adjust. For people who like to do a lot of autorotations, a low-end pitch curve adjust would be nice. The other unique feature is that the hi-end pitch adjustment has no effect when the throttle hold switch is activated. In other words, activating the throttle hold for an autorotation gives the full mechanical collective pitch for the top end. Some people may like this because it allows more collective at the top end for that final flair. They may not want that much top end pitch during normal flight because that would bog down the engine. There is also a global pitch curve adjustment pot under the cover. It would have been better if this was in the form of a knob located on the outside because it is a frequently adjusted parameter. Like all modern helicopter radios, Vanguard has separate up/down tail rotor mixing trim pots. This is nice because many prefer to dial out down mixing, so in the upside down portion of a loop or roll the model would not yaw excessively to the left. As there are seven trim pots underneath the cover, I wish the Vanguard could have come with the convenient plastic clip-on screwdriver that is standard on Airtronics' more expensive radios.

Besides the expanded scale voltmeter on the transmitter, the transmitter has a built-in audio warning that beeps when the voltage is low. There is one feature that I can't figure out. Why is the throttle response non-linear? The throttle servo moves more at above half stick than below half stick. The other comment is it would be nice if all the helicopter radio receivers came with a shortened base loaded antenna and a short rubber ducky antenna for the transmitter. I was planning to tell you about the new SG-X Airtronics gyro too, but the one they sent me was so new that they sent me the demo without the electronics inside! I had to send it back. We will have the SG-X gyro for the next time. The bottom line is the Vanguard 6H PCM and PPM have been tested in my flybarless helicopter with flawless records. They are two of the lowest priced helicopter radios on the market, yet they have proved to be very reliable in operation. For beginners, I always recommend a heli radio instead of an airplane radio. Vanguard may not have the extra features that experts demand, like invert switch, multiple idle-up, and multiple pitch curve adjust, but you can buy two or three Vanguards for the price of one computer radio, and not necessarily have better reliability. Need more information? You can reach Airtronics at (714) 830-8769. •

Free Flight *Continued from page 61*

trophies at the Max Men 14-Round International FAI contest at Lost Hills, California, February 17-18, 1990.

"The America's Cup is presented to the FAI flier who scores the highest four contest totals taken from a series of designated A.C. contests across the United States and Canada. Thus it can be said that the winners represent the best three FAI F/F fliers in their class for 1989.

"The 1989 competition was intense. Seventeen contests comprised the schedule. Since any number of A.C. contests could be flown with only the four highest scores counted, a number of 'hard-nosed competitors' travelled many miles to pile up points by attending contests across the U.S. and Canada. One or more fliers travelled well over 10,000 miles in their efforts. We admire such dedication to winning and we much appreciate the overall interest the Cup has generated.

"Now the SCAT Club is accepting applications for the 1990 schedule. Previous A.C. contestants will receive priority. The new schedule will be published, and the rules unchanged for 1990."

For further information, contact Al Hotard, 1012 Damato Drive, Covina, California 91724. Phone: (818)966-4788.

WHERE THE HECK ARE ALL THE KIDS?

As I promised at the beginning of this month's column, here is a reprint of Ken Sykora's thoughts on the "beginners' problem" in free flight today. This article is reprinted from the *Flightplug*, newsletter of the SCIFS.

"Where the heck are all the kids?

"That seems to be the question for those who have seriously surveyed today's model airplane activities. Good question, and if you are involved in this hobby/sport, certainly a serious one that could benefit from analysis.

"Step one in such an analysis might well be to take the lack of youngsters in modeling out of the context of just this single 'kid activity.' For example, where the heck are all the skateboarders? And how about those 'Hot Wheels' little racing cars? Huh? Time was when the remotest sidewalk or paved street was a busy skateboard track, and specially built 'dromes' had standing-in-line customers. Hot Wheels, in their

time, were just as popular. Special storefront tracks sprang up everywhere, and the competitions of scheduled races were fierce—for youngsters and adults.

"And then, suddenly, these two fads had reached their natural 'time span' and (mass popularity-wise) were gone. The reason for this would seem to be that kids—and many adults, for that matter—have this attention span that's about as long as the distance between their toes. Combine this fact with the wild enthusiasm of youth (when something 'turns them on') and you get the natural cycle for such fads. They develop seemingly overnight, burn very hot for a brief span, and then burn out just as quickly—while the crowd runs (not walks) to the next fad.

"But there is one other feature of this kid-fad phenomenon that is integral to the cycle. Within the ashes of the burnout market, after the mass sales have stopped, there always remains a small, hard core of enthusiasts. These individuals, for whatever personal reasons, have been locked in to the activity. It goes beyond being a hobby with them and becomes, if you will, an obsession. For their varied, individual reasons, they become attached . . . and will never, completely, leave this attachment.

"Now, for reasons we've never been able to fathom, those who decry the lack of swarms of 'new blood' into modeling seem to be unaware of this youth-fad-cycle business. Perhaps it's because, when you look at modeling history, we've had an unusually long run for our money.

"A lot of things came together at just the right time, when you stop to consider. For example: when Lindbergh turned us aviation crazy at the end of the '20s, rubber models were on the threshold of advanced development . . . and they progressed at a rapid rate in the '30s. Here was a creative hobby with a low cost feature (that meshed nicely with Depression poverty), yet yielded a lot of satisfaction. And, before this activity could lag, right along came

mass produced gas engines! And modeling kids were running in another direction.

"After WWII, modeling really branched out into C/L, F/F, and R/C and today the modeling mass market is of course in radio . . . with its unique features of ready made equipment, 'audience flying,' and programmed operations.

"Distasteful as this may be to the free spirited F/Fer, we remind you that popular model magazines still offer columns, pictures, and articles on a wide range of non-R/C modeling. These hard core areas are very much alive and well, thank you, and they continue to attract a select few recruits (young and old), which, 62 years after Lindbergh gave us that kick in the butt, ain't too bad! So, mass modeling is OK for the masses; but remember that special areas of the hobby attract a more select and limited few . . . a special breed of cat."

Well, that is a different twist to the old worry. It brings to my mind the Marines' recruiting slogan, "All we're looking for is a few good men!" Maybe that is our free flight future. A few good men and women, a few good fields, and a little bit of support from the industry and our leaders in the AMA. That, and good weather, may just be the best we will have. Maybe that's good enough.

JOHN OLDENKAMP'S RUBBER LUBE

John Oldenkamp, one of the San Diego Orbiteers' brain trust who helped develop the P-30 and the Pee Wee 30 events, has found a rubber lube that does the trick for him. According to John, "Some colleagues snicker at the appearance of my rubber motors because they look dry. I do lube my stuff, not with the usual gunk, but have moved over to an STP product called 'Son of a Gun' protectant, a water-based polymer very similar to Armorall, but which does not contain destructive solvents. So my lube is invisible, odorless, doesn't splash, and it's cheap at $1.89 per pint. To use, saturate the motors, leave overnight, then pat off the excess. Excellent for tissue covered Old Timers, etc., to avoid the white lube 'zits' that pile up after a few flights. Renew the STP application whenever you feel you need it. I have fully wound a Wakefield motor 30 times just to see what the difference might be, and it still puts out and has not broken."

SOME FLYING THOUGHTS AS I APPROACH THE 1990 CONTEST SEASON

The following thoughts are swiped, with

acknowledgements, from the *Phoenix* newsletter, edited by Sal Fruciano:

I would have entered but I didn't get it trimmed before the contest and it's too windy to do it today and look over there "he" is flying so I don't stand a chance and it's a bit cold and I think it might rain. . . .

Highlights from the above excuses:

1. If you do not enter you cannot win.

2. If you want to be a competition flier, you must be prepared to fly in the wind, turbulence, wet and cold.

3. If you think negatively, you will lose this year, and the next, and then give up entirely.

4. A positive thinker competes against his fellows and wins often, and a negative thinker competes against himself and usually loses.

5. In 99 cases out of 100, still-air times are totally irrelevant to your chances of winning or reaching the flyoffs.

6. Most competitions are lost, not won.

7. Only by putting your model into a thermal, will it max.

Thanks, Sal, I needed that to get my mind in place for the 1990 season.

THAT'S IT DEPARTMENT

Well, that does it for May. Actually, this column is being written toward the end of January, and it will be in your mailbox or newsstand by early April—so, you can see why sometimes this business is confusing. I hope that you continue catching thermals and banging rafters at a good rate through 1990. I'll look forward to seeing your face smiling at these free flight pages next month. •

Vagabond *Continued from page 55*

motor peg is a length of 1/16th diameter aluminum tube.

When the surface outline balsa strips have soaked enough they can be used to make the outlines by forming them around a pattern matching the inside of the outlines. For this model the patterns were cut out of 3/32nd sheet balsa and the edges were doped and sanded smooth. If the outlines were to be laminated, the edges would be waxed. The wet wood is taped to the pattern where there is a straight section and then wrapped around the form, being careful to keep tension on the strip as it is wrapped so that it doesn't kink and break. Tape the strip to the pattern at several points and let it dry overnight or in a low-heat oven.

With the dry outlines, assemble the vertical and horizontal tails directly over the plans using ½0th square sticks for the spars and the ribs. Don't forget to add the little short gusset pieces shown in the acute angled corners or you'll find that the tissue covering will have a wrinkle in that corner for sure.

The wing is assembled in a like manner directly over the plan. The leading edge is a piece of 1/16th by 1/8th set on edge on the plan. The tip and trailing edge is 1/20th square balsa as are the rib bottoms. Add the strut pads at this time. When the wing bottom structure is dry it can be removed from the plan and the leading and trailing edges cracked for the dihedral. The spars are cut to match the dihedral and then cemented to one side of the wing. The tops of the ribs, sliced from 1/20th sheet, are added next. Now push the spar down and cement it to the ribs at the other side of the wing. Add the rib tops. Finally, add the leading edge sheeting.

Before covering the model with Japanese tissue, make sure it is sanded smooth and that the edges on all the surfaces are round or tapered as required. Then cover the model with yellow tissue. (Note: the Vagabond is a private airplane and could be any color you desire, it doesn't have to match mine. In fact in the late '50s, I owned N4314H, which was yellow when I bought it and I immediately painted it red and white. N4121H was red and white when I bought it about ten years ago and when I rebuilt it the old original yellow color scheme was applied.)

When the model is covered, spray the tissue very lightly with water to shrink it taut. When dry, give the fuselage a couple of coats of dope and the surfaces at least one. Assemble the wing and tail surfaces to the fuselage, making sure they are in the proper position. The vertical tail should be perpendicular to the horizontal and it should be lined up with the fuselage center line.

Make streamlined struts out of hard balsa and fit them in place between the fuselage and the wing. "X" marks the spot on the wing strut pads where they attach. Add the diagonal braces behind the windshield at this point and then install the windows and windshield. Details, such as the carburetor air scoop, exhaust stack, gas

tank cap, oil dipstick, tail wheel, tail brace wires, landing gear fairings, and sway braces should be added now.

OK, the "VAG" is built, how should she be adjusted?

First check the balance and add ballast as required to get the model to balance at a point one inch behind the leading edge of the wing. Some ballast will probably be required at the front end because the model has a relatively short nose. Next, make sure the tail surfaces are not warped. Check the wings for warps; if both have a small amount of washout (the tips angle down looking forward relative to the roots) and if it's the same in both wings, that is ideal. If they are not warped, that's OK, but they should not be warped with washin, or differently.

Now take a 24 inch length of 3/32nd rubber and make a motor loop and install it. Your model doesn't balance any more, so re-ballast it. The model should glide straight ahead if the propeller freewheels or just slightly to the right if the propeller stops. Fifty winds in the motor should give a short, straight, level flight. Adjust the tail surfaces until it does this with fifty turns. Now wind it up about a hundred and fifty turns and try it. The model should climb a little and turn in a wide left turn due to propeller slipstream effects. From here on the flight adjustment should be made with thrust line adjustments; side thrust using shims between the nose block and cowl sides to adjust the turn diameters, and down thrust using a shim between the top of the nose block and the cowl to keep the model from stalling or looping under power.

The model in the photos weighs 11 grams without the motor and requires a small amount of ballast in the nose. It got a little washout in both wings when the tissue shrank, which was left in. No side thrust adjustment was necessary, but a 32nd shim was required to keep the nose from getting too high under the influence of maximum winds in the motor. The model has done over forty seconds indoors. Outdoors it's at the mercy of the great thermal gorilla, "Hung."

Have fun with a model of my Piper Vagabond or any other with a different color scheme that you'd like to represent. •

Tech Stuff *Continued from page 49*

with wind tunnel testing. Scale models are normally used so the tunnels won't have to be huge, but the R.N. used in the tunnel tests must be the same as for full-scale if the data is to be exactly applicable to full-scale. If the tunnel model is quarter-scale the tunnel velocity needs to be four times as fast as the real airplane flies! That can get difficult.

I said we modelers usually don't concern ourselves with the density factor in the R.N. formula, but some wind tunnels make use of it. "Variable density" wind tunnels increase the air pressure (and therefore its density) in the tunnel instead of, or in conjunction with, increasing the tunnel velocity in order to keep the Reynolds number full-scale. The old NACA-Langley variable density tunnel was enclosed in a steel shell and could be pumped up to 21 atmospheres (300 lbs. per square inch!).

Here is a convenient, simplified formula which is accurate at sea level: R.N. = 780 VL, where V is in MPH and L is the wing chord in inches. Therefore, if we have a big model with a sixteen-inch chord flying at fifty miles per hour, or a racer with an eight-inch chord flying at 100 mph, the Reynolds number is 624,000 in both cases. If an eight-inch-chord model flies at 20 mph, its R.N. is 124,800. An indoor model with three-inch chord and flying at two mph is at an R.N. of only 4680.

If you race model sailboats, you may be operating at Reynolds numbers from zero to around 100,000, depending on how much wind you have. Also, on a model sailboat, the R.N. is highest at the foot of the triangular sail and approaches zero at the tip, where the chord is reduced to practically nothing. (Boat sails and delta airplanes have similar taper ratios.)

Full-scale airplanes may have Reynolds numbers from about 900,000 for a small ultralight to about a hundred million at the wing root of a 747 in a full-bore low pass. At supersonic speeds the flow changes completely due to the compressibility of the air, and the R.N. plays second fiddle to Mach number.

So now we know what the Reynolds numbers are for various sizes and kinds of craft during operation. What good are they? Alone, this knowledge is worthless. In conjunction with a knowledge of the effects of R.N. on lift and drag, it is very useful. In general terms, the higher the Reynolds number in subsonic flow, the greater the maximum lift coefficient and the lower the profile-drag coefficient.

For these reasons, scale models are less efficient than their full-size prototypes. The top speed of exact-scale models (assuming scale weight and power) is reduced below scale and the stall speed is increased to above the scale stall speed. So scale models have a narrower speed range than their prototypes, even if weight, power, and other factors are completely to scale. You can also see that big models suffer less from Reynolds number effects than small models. This is one of several areas where the Big Bird boys have an advantage.

Getting back to the flow, which is what Reynolds number is all about, if the R.N. is low enough the flow will always be laminar, and if the R.N. is high enough the flow will always be turbulent. The "critical R.N." range where flow tends to change from laminar to turbulent depends upon many things, however. Also, in the real world, most flows are a mixture of laminar and turbulent.

Conditions may be unpredictable around the critical Reynolds number. Figure 1 was taken from page 94 of Darrol Stinton's *The Design of the Airplane*. Roughening the surface of a golf ball by adding dimples causes the drag to be higher than for a smooth ball up to a certain Reynolds number (ball speed), above which the drag for the rough ball is less than for the smooth.

There are some apparent paradoxes concerning airflow. A high R.N. is "better" than a low R.N., yet aerodynamicists try to develop laminar-flow airfoils (recall that laminar flow is characteristic of *low* Reynolds numbers). Some modelers also try to get laminar flow—why, I'm not sure—yet other modelers use leading-edge roughness or turbulators to get turbulent flow (for a delayed stall).

If one of you who understands this whole subject better than I do would care to write a short, not-too-technical essay on these paradoxes, laminar "drag buckets," etc., I would like to publish it in MD&TS.

I didn't intend to write a textbook on Reynolds number here, nor am I qualified to, so let's see if I can wind this up before I get completely over my head. Modelers need only worry about R.N. when they are trying to accurately compare the performance of a scale model to its prototype, or when they are involved in a by-the-book theoretical design and need to predict the performance of the model accurately. Then they should either use airfoil data that was taken at a R.N. comparable to that at which the model will fly, or apply correction factors to data taken at a different (usually higher) R.N. But in the meantime, "Reynolds number" is a handy technical term to throw around to impress people.

FOREIGN CORRESPONDENCE

We received a letter from Jakarta, Indonesia from Joe Jopling, a reader who bought his October copy of *Model Builder* in Singapore (his home is in the U.S.). The first time I heard from Joe, he was in Bangkok, Thailand and he bought that *Model Builder* issue in Hong Kong! Some people surely lead exotic lives. Joe made some comments and asked several interesting questions.

THRUST

In connection with my previous discussions of propeller horsepower, Joe asked if *thrust* isn't what we are really interested in, and suggested that we hook a fish scale to the tail of the model to measure the thrust.

Yes, thrust is what we are really trying to get, but we must have thrust *in conjunction with velocity*, if we are going to fly our models instead of use them for stationary fans. Fuel is burned (wasted) to develop static thrust, but thrust (force) alone can be free. The skids on a helicopter exert a thrust in holding up the aircraft, and don't use any fuel in doing it. Fly the helicopter up to a mountain top, however, and energy is required, which means fuel is used.

The useful energy or work will be the weight of the helicopter times the height of the mountain. Power is work per unit time or force times velocity (distance divided by time). Neglecting forward-flight drag and other losses, the output power is the thrust of the rotor times the vertical velocity, which is the same as the weight times the height of the mountain divided by the time it took to climb to the top.

I used a helicopter as an example for simplicity, but a climbing airplane would be similar. In level flight either vehicle uses all of its energy and power in overcoming drag, and we store no potential energy as we do in climbing.

I sometimes measure the static thrust of

an engine/propeller combination with a fish scale as Joe suggests. As long as we stick to the same prop, thrust is really as good a measure of engine performance as is rpm, except that tachometers are more accurate and more convenient to use than spring scales. Also, if we are concerned with real "vertical performance" of a model, then the static thrust must be more than the weight of the plane. If the static thrust just equals the weight we could hover hanging on the prop, if we could keep the model stable. In this case, power is being expended but it is all wasted in propwash and other losses. No net work is being done.

When we go from static engine run-up, to flight, holding the same throttle setting, the air velocity past the prop increases, the angle of attack of the prop decreases, and the thrust decreases.

The torque required to turn the prop also decreases, so the engine is able to turn it somewhat faster, restoring part of the thrust. But the faster we go the less thrust we have, because the top rpm and therefore the power of the engine is limited. We are trading thrust for velocity in the power formula. The maximum velocity of the airplane will be reached where the rising drag curve crosses the decreasing thrust curve. This is illustrated in Figure 2, which I again borrowed from Stinton (page 227).

So, thrust we must have, but it is *dynamic* or in-flight thrust we are most interested in, and that is something we can't readily measure on our models. We are also most interested in in-flight rpm, which we can't measure with an optical tachometer from the ground. We can, however, easily measure in-flight rpm with a sonic tachometer from the ground. I do it. Remind me to talk about that some month.

PROPS IN SLOTS

Joe Jopling also writes, "I would like to build a delta. I sketched one with the prop in a slot at the aerodynamic center. All the movable pieces could be located near the CG, and pitching moments would be minimized. Later I found that running a prop in a slot is nothing new; Mikulasko does it all the time, but aft. A balsa glider will probably supply a quick answer."

The reason for cutting a slot in the wing and letting the prop swing through it is, of course, to locate the prop over the wing, yet get the thrust line as low as possible.

The key to Laddie Mikulasko's success with props through slots in the wing is the word "aft." His props are back near the trailing edge of the deltas. In my opinion, putting the prop through a slot at or near the aerodynamic center would result in a very poor airplane. My reasoning is based on the fact that wing lift results from a higher pressure on the bottom of the wing than there is on the top. That difference in pressure would cause massive flow up through the prop slot, destroying much of the lift, if the slot is in an area of high differential pressure, such as the aerodynamic center (AC). There would also be big increases in drag and propeller noise.

A test is usually more convincing than a theory, however. Make the balsa glider you speak of, Joe, and glide it both with a prop slot near the AC and with the slot taped over top and bottom. My guess is that it will glide much better without the slot. It is true that slots can be used behind leading edge slats, and with slotted flaps, but these are very carefully contoured slots that increase the flow over the upper surface to delay stall. I don't think a slot with a prop beating through it could ever show that kind of gain.

Laddie's aft-slotted deltas also suffer some lift loss as a result of the prop slot, but he was willing to compromise in return for advantages he feels he gains from that prop position.

REMOVING SERVO PLUGS

The servo plugs are very tight in their sockets on one of my Futaba receivers. The removal chore was tough on my fingernails, so I did something about it. The photo shows a simple plug-removing tool made from a cheap pair of tweezers. To make yourself one, bend the legs far enough apart to straddle the plug and then bend and file the tips of the legs to fit it. This tool is always in my flight box and is very handy.

BOAT TECHNICAL STUFF

In the November 1989 issue of *Model Builder* I wrote about some work I had done on a wingsail boat model. Our editor, Bill Northrop, let me get away with talking boats in an airplane magazine, then he surprised me by republishing that same wingsail article in the winter issue of *Model Builder's* sister publication, *U.S. Boat & Ship Modeler*. As it turned out, that was only the beginning of an excursion into model boat writing for this author/engineer.

In the spring issue of USB&SM I will have an article on automatic sail trimming, a subject which was touched upon in the wingsail article, and upon which a number of you have asked for more information. After that will be an article titled "Innovation in Sailboat Design," which will discuss such technical stuff as improved hull design, keel fins and keel wings, automatically-shifting ballast, laterally-articulating keels, lifting sail catamarans, and hydrofoil sailboats. Still later will appear my story of an international champion twenty-channel R/C fireboat model.

Following that, I will discuss the invention of a unique marine vehicle called the

"hydrocopter." It looks a bit like a hovercraft and a bit like a hydrofoil boat, but it operates on a different principle than either. R/C models were used in the development program.

Unlike the wingsail article, these four additional boat articles won't also be published in *Model Builder*, so if you have an interest, Bill will sell you a subscription to *U.S. Boat & Ship Modeler.*

PARTING WORDS

I'm not "New Age," but I do believe in the power of crystals to do miraculous things for us! It is a select quartz crystal cut in just the right way, which controls the frequency of our transmitters, and another one in our receivers makes excellent rejection of unwanted signals possible. A quartz crystal cut to a different frequency assures that our electronic watches or flight timers are accurate. When the oxygen is removed from a quartz crystal the resulting silicon is the basis of all the integrated circuits in our radio gear and watches. The same silicon is also made into solar cells which we sometimes charge batteries or power calculators with. The fiberglass we use to build or strengthen structures is, again, made with silicon, the chief ingredient of quartz crystals. Silicone sealer and our silicone fuel tubing has an organic-like molecule based on that selfsame silicon from quartz. I am even grateful for the quartz sand on the beach where I fly seaplanes. Yes, I definitely believe in the power of crystals.

Francis Reynolds, 3060 W. Lake Sammamish Parkway N., Redmond, WA 98052. SASE please. (206)885-2647. •

Heli Champs *Continued from page 29*

of quick parts could provide an edge!

Let's do a run-down of the top ten winners on the list. Dobashi works for Futaba, and is Hirobo's demo pilot. Sensui works for Izumi Model Company and is a test pilot for Kalt. Curtiss Youngblood is sponsored by GMP. Ishikawa is a Futaba engineer. Robert Gorham is a consultant to his father's company, GMP. Ewald Heim is the designer of Heim model helicopters in Germany. Even though he sold the operation to Graupner, he still has a pipeline to parts. Len Mount runs a family business manufacturing his own fiberglass blades, and fiberglass fuselages. Len is the British demo pilot for GMP. Daniel Graber, a civil engineer from Switzerland, is the chief test pilot for Bernard Sitar. Tim Schoonard, needs no introduction, he is the son of Walt Schoonard of Miniature Aircraft. Josef Brennsteinner, a long time Schluter enthusiast, flew Schluter at all three World Championships. Occupations of the rest of the pilots are shown in the table. The common denominator is that most are in the technical field.

The Heim design was the most popular model used by the Europeans, and only Europeans used Heim. There were 11 Heim models entered in the contest. However, only one Heim model placed in the top 10. Even though Heim models never achieved a strong following in the US, in Europe, nearly a third of the modelers fly Heim. Why? Because the truss design is very light weight. The mechanics were specifically designed for scale fiberglass fuselages. The design is simple and has few parts. If we look at the specification chart, most of the Heim models weighed less than 10 pounds. The designer, Ewald Heim's Lockheed 286 weighed only 9.2 pounds, which was the lightest model at the contest! When the gusts picked up, the light 286 was definitely affected slightly. But light models are generally better for autorotation.

In Europe, there are many small independent outfitters making precision metal up-grade accessories to soup up the stock Heim. Vario, Peka, Wik, and Hunner are just a few of the many. I built a Heim Bell 222 in 1985, but I have yet to develop a passion for it. I think it is an unorthodox, but very innovative, and effective design. We will do a review on the Heim mechanics soon for *Model Builder* readers, and have detailed comments of its technical merits. Meanwhile, if you have questions on Heim models, give Dave Carter, of Orlando, Florida a call. He is the Heim dealer in the U.S. His number is (407) 649-8984, and he sells Heim's catalog for $4 a copy.

One of the most expensive model helicopter kits at the World Champs was the Sitar Jet Ranger. The kit alone costs over $1000. Daniel Graber was the only contestant using a Sitar Ranger. Every part was

handcrafted by Mr. Bernard Sitar in his basement in Innsbruck, Austria. Bernard is a fluid dynamics professor at Innsbruck University. Even though he does not fly model helicopters himself, he has worked closely with Daniel to engineer the Sitar Ranger. Mr. Sitar is also the famous chap who designed, produced, and sold the first commercial fiberglass blades for R/C helicopters. The Sitar blade designs have not been modified for six years. His symmetrical and reflexed blades are still competitive performers. Many of the modern fiberglass blades like Vario's and Len Mount's are copies and variations of Sitar's. Sitar is also the originator of the 45-degree sawed off blade tip. Sitar uses an Eppler airfoil for his reflex blades. We will talk about optimal airfoils for low Reynolds number model blades in the future.

If you have studied the table, it is very interesting to discover that every European contestant used fiberglass blades, while every American and Japanese pilot used wood blades. As I pointed out in Part 2 of the report, fiberglass blades have the potential to be better than wood blades, but the way the model fiberglass blades are designed does not fully utilize the advantages that composite blades can provide. Therefore, at the present, wood blades are just as good an aerodynamic lifting device as fiberglass blades. Model manufacturers need to do more homework in this area. They are just copying one from another. In fact, the top five winners all used wood blades. The average blade weight was around 185 grams.

The other interesting observation is that only American modelers use base-loaded antennas as manufactured by GMP or Dean. Europeans and Japanese all let their receiver antenna dangle below the model. I have used base-loaded antennas since Kraft first made them in 1982, and I have not yet had a crash due to loss of range. Base-loaded antennas hide inconspicuously inside the canopy, and away from the metal frames, gears, and tail boom that could be sources of RF noises. And, base-loaded antennas eliminate the possibility of being stepped on. Probably base-loaded antennas will catch on in Europe and Japan.

A very nice thing about this competition was that spectators were allowed to wonder through the pilots' tents to see the models and talk to the contestants. It was a very friendly atmosphere. Spectators were chatting with the competitors to learn some pointers. Unfortunately, the Japanese pilots did not speak any English. However, one of their mechanics did speak some English. Gerald Weil, of France, was asking him many technical questions on Dobashi's machine, but the mechanic was unable to handle it all. "Nitro, what's nitro?" In general, there was no rivalry between pilots, nor manufacturers; they all smiled and a good time was had by all! Truly a successful contest. And get this . . . there was not a single helicopter crash throughout the 164 flights in the four rounds!

The Australian team was probably the only one to use an electronic main rotor rpm governor. At the last World Champs, Joseph Brennsteiner, of Austria, used an electronic rpm governor made by Webra. The Australian rpm governor used a Hall effect (magnetic sensor) to detect the main rotor rpm, then the signal was fed back to a black box to increase or decrease the throttle to achieve a constant main rotor rpm. The technical reason for desiring constant main rotor rpm is to reduce the speed stability effect that could pitch the model nose up when collective is increased in forward flight. In summary, constant rotor rpm improves the longitudinal stability in forward flight, and improves vertical stability in hover. For more details on speed stability, I explained it in detail in Issue 15 of the British *Radio Helicopter USA Magazine*.

A general trend among many competitors was to use low rpm for hover and high rpm for forward flight aerobatics. Low means 1200 to 1400. High means 1600 to 1800. According to John Wessel of Australia, low rotor rpm improved his hover maneuvers by 1.5 points from each judge. Out of a perfect 10, that is quite significant. Again, let's see the theory behind this. I have also played around with different rotor speed and observed low rpm in hover improves vertical stability but decreases longitudinal and lateral stability. Vertical mode stability improves because low rpm reduces the rotor's sensitivity to vertical inflow change. Low rpm reduces longitudinal and lateral stability because lower rpm reduces the gyroscopic stability. Now, for high rotor rpm, the vertical stability is reduced (the model tends to float up and down), but longitudinal and lateral stability are improved. Again, the reason is because increasing rpm increases inflow sensitivity, and increases gyroscopic effect.

High rotor rpm is desirable for forward flight because high rpm quickens all four control responses, which is especially necessary for aerobatics. High rpm quickens controls because at 1400 rpm the Hiller paddles only deflect 1400 times per minute, while at 1800, the paddles deflect 1800 times per minute. Furthermore, vertical inflow sensitivity becomes less important because the model has momentum as it travels forward at high speed, thus, the model will not float up and down as in hover. High rpm improves aerodynamic efficiency of the blades, too. The blades can now operate at a lower pitch angle to generate the same amount of thrust which helps reduce the rotor's profile and induced drag. Furthermore, high rpm reduces the ratio between the incoming airflow velocity and blade tip velocity (this ratio is called advance ratio). Reducing this ratio ameliorates the destabilizing effect due to the rotor's inherent angle-of-attack instability and speed stability, which gives the oscillating phugoid motion.

Have I lost you? *(No, this puzzled expression is normal! wcn)* The objective of this column is to learn, improve, and appreciate R/C helicopter modeling through understanding the principles. Let's continue. FAI rules disallow the use of any electronic stabilization device, with the exception of an electronic yaw rate gyro which adds artificial rate damping to help stabilize the yaw axis. Gee whiz, otherwise, even I could take a shot at the trial, because six years ago I developed an electronic longitudinal and lateral stability augmentation system for R/C helicopters! The system used four feedback loops for each axis. It used gyros and accelerometers to provide angular rate, angular position, linear velocity and linear position feedback. The objective was to make the model significantly easier to fly, and to reduce the intensity of concentration required for flying. Intense concentration is what wears out and fatigues a pilot.

By the way, Bendix/King recently introduced a full three-axis autopilot for full size Bell Jet Rangers. Previously, there were no commercial autopilot units available for small civil helicopters like Jet Ranger, or

MD500. But there were electronic yaw dampers like our model yaw rate gyro. Previously, autopilots were only available for big military helicopters such as the Sikorsky CH-53E used in the failed Iran hostage rescue mission. The CH-53E was one of the very few capable of flying in total darkness. After two years of research and one million dollars of investment, Bendix/King has finally produced a low cost three-axis autopilot. The unit costs $40,000.

A gadget that was almost indispensable with all the European pilots was the transmitter tray *(Also popular with European F3A pilots. wcn).* Even though the European brands of radio, such as Ripmax, Robbe, and Graupner, look very different in dimension from the U.S. version, the guts are all made by Futaba or JR. The extra difference is that they have three-inch long transmitter sticks, are big in size, and look like a tray. If the transmitter does not have a built-in tray, then they all added a tray. Their palms were resting on the tray. Thumb and index fingers were used on the sticks. This style gives very precise commands for hover maneuvers, but the whole hand, including the wrist, has to move for aerobatic maneuvers. This style is not popular anywhere else in the world. I tried a tray and reported my results in the January '90 issue of *Model Builder.* After Kevin DeShazer of Kent, Washington, read my report, he sent me one of his tray designs. He calls it the Stabilizor. As the photograph shows, it is different from the heavy and bulky Euro style tray. It is made like an aluminum bracket. Instead of having the neck strap hooking at only one place on the transmitter, ala American style, Kevin's design hooks at two places on the bracket tray. This helps keep the transmitter level just like the European trays. The added advantage is that you can now still wrap your hands around the transmitter without bumping into any transmitter tray. This design combines the leveling feature of the Euro style tray with the lightness of the American neckstrap. It is very comfortable, too. Instead of using velcro to secure the transmitter to Kevin's tray, I used double-sided foam tape. Except, I sort of made the side facing the transmitter less sticky so it is not a permanent arrangement. This way I can place any transmitter on it, and there is sufficient stickiness to keep the transmitter sitting there without falling.

The other gadgetry by Kevin that has proved popular is the power handle and whip cord installation. At contests, you do not want to lug your entire field box from the tent to the ready starting area. Therefore, the power handle is a compact unit that puts a 12-volt gel-cell battery, 1.5 volt NiStarter, and an electric starter all in a portable unit. The $40 package includes the battery, handle, and a heavy gauge coiled wire for the starter. Very neat! See Kevin's ad in the magazine or call him at (206) 854-8053 for ordering information.

Besides having a well designed and set up model, it is important to be psychologically prepared, and have good teamwork. For example, for the three Japanese pilots, their caller/mechanic did all the chores. Their caller handled the engine starting, all preflight checks, picked up the models, delivered the score sheet, etc. The same is true with the six-times F3A airplane pattern champion, Hanno Prettner. He just stood there and mentally focused on his routines while his dad, also his caller, did the starting and checking. Right before Len Mount's turn, his wife held the umbrella to block the sun for him, while Len was mentally going through the sequence. It is also helpful to have a good rapport between the caller and the pilot, and keep the same arrangement for all the practices and contests. Curtiss Youngblood always has his dad calling for him. Teamwork and consistency produce results.

The contest was held every day from 8 a.m. to 5 p.m. After that, it was the spectators' chance to let out their itch on the sticks. There was a special practice field reserved for spectators to show off how good they were, and also for contestants to practice. There was some serious hot dogging going on! Santos Font, from New York, was doing inverted backward loops with his Scout. Mike Robins flew his 1989 Toledo scale winning Sikorsky Seahawk. Unfortunately, radio problems caused it to crash only seconds after lift off. Seeing a super scale model like that crash really hurts. Dan Melnik, the Kalt rep, was doing spectacular hot dogging with his Excalibur. He let me fly it. It was smooth and stable. He had the JR-120 gyro maxed out to 100%, and the model almost hovered there by

itself forever. Impressive setup by Dan. As I have said before, how well a model flies depends only 50% on the model design, the other 50% depends on the building and setup.

The following paragraph is a description given by a friend, Jim O'Brian. I think it sums up why the Japanese team won the World Championships for three consecutive times. "Stopped by the practice field again after the competition flying was over for today. Mike Mas was putting on some wild aerobatic maneuvers, along with his low level gyrations. Mike capped it off by doing several backward autos. The Japanese team then came by in their van and made it clear why they were winning. In complete contrast to the typical American experts who are busy demonstrating just how great a hotshot they are, the Japanese focused entirely on business. No hot dogging. Out came Ishikawa's two Bell 222s and he proceeded to put in a flight with each. Lots of stable hovering, followed by very clean rolls, loops, and rolling stall turns (all contest maneuvers). Incidentally, while this entire group was focused on checking Ishikawa's equipment to make sure everything was okay, Dobashi (the guy in first place, and going for the World Championship) was the one carrying the helis back and forth and doing everything he could to help. Testing over, the machines were quickly loaded back into the van. And one guy ran around stomping on the aluminum cans they drank from and putting them back in the cooler they brought. The pilots jumped in, and off they went. Very serious stuff! There was a job to be done, and no distractions would be allowed."

We will end our coverage of the third F3C World Championships here. We hope that you have learned a trick or two. Even though the coverage emphasized the equipment technology, we should point out that practice and skill is what it takes to win. The bottom line is, practice, practice, and practice! Learn to anticipate the next command needed to correct any perturbation, rather than wait till the model has deviated. The next F3C World Championships will be held near Milan, Italy, in August 1991. Again, it will be in the Aerolympic format, where F3A pattern, and F3D pylon racing will be held at the same time. I had so much fun this time, that you can count on me booking for a supersaver flight to Milan in 1991. Why not come and cheer with me? You can please your wife with a shopping spree at the fashion capital of the world, Milan, and top it off with a gondola ride through romantic Venice. If you have any suggestions or technical questions, you can reach me at (301) 589-0855. Or send a self addressed and stamped envelope, I will respond usually within three days. The address is P.O. Box 692, College Park, MD 20740.

Editor's Note: Having spent quite a few years as an AMA Nationals and FAI World Championship judge and chief judge, we're well aware of how little recognition is given in the press for the hard working officials and helpers at these major competitions.

The following list of contest officials at the 1989 R/C Helicopter World Championships, was provided by Horace Hagen, a pioneer in R/C helicopter development, and Contest Director of the 1989 World Championships.

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Horace Hagen
FAI JURY
Tony Aarts, The Netherlands
Francis Deproft, Belgium (Chairman)
Chris Greenwood, Australia
FAI JUDGES
Rudy Hadorn, Switzerland
Robert Harris, U.S.A.
Pierre Pignot, France
Wolfgang Roth, West Germany (Chairman)
Kiyokazu Sugaki, Japan
FLIGHT LINE COORDINATOR
Tom Unger
START BOX TIMER
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Havasu *Continued from page 21*

a bit late to search out another. Maybe someone who was at the event would qualify . . . at least I would have two judges, although three is much better. The English judge was due in Wednesday, his room had been arranged, but I did not know what time or how he would arrive in Lake Havasu. It was late Wednesday night and he had not yet checked into the hotel . . . I was exhausted and there were four long and tough days ahead . . . I hoped when I got up in the morning things would go better.

Thursday morning I called the hotel at 5:00 a.m., the English judge had not checked in . . . not what I wanted to hear. I hurried down to the Nautical Inn. Entrants were waiting to get in. NO JUDGES ANYWHERE! Registration began, safety inspection began, everything was going great, except NO JUDGES!

When one is in full PANIC, time passes

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very slowly, a minute delay seems like an hour. Mr. Robert Hirsch, one of the original five judges, showed up. No time to brief him. Someone suggests a guy who has judged at the Scale Masters, or the Nats, or something. Great! At least we had two, and when the English judge arrived, we would have three . . . I told the two judges to begin judging so we could get the show on the road.

Let me state, for the record, I do not in any way blame these two judges. They did the best they could, and in areas were very good. But instead, I must accept all criticism for the inconsistencies that followed. If I had kept my wits, I would have explained the proper criteria, and made sure each judge was clear on the method of judging from documentation, rather than, in some cases, from previous knowledge. My hat is off for their fine effort, as there were many fine aircraft to judge.

From here, final safety inspection, and the aircraft/pilots were transported to the SPEED TRIAL course. Here, Frank Kelly's timing team of Jack Polster, Al Gambee, and Doug Huntley, did an incredible job of timing these racers. Six competitors scored four percent or less off of a perfect scale speed, with Ken Bundt and his Supermarine S-6B hitting the speed right on the button.

Not all competitors successfully completed this portion of the event, and several were in no condition to fly after their speed attempt. Bill Young's electric powered Macchi 33 got airborne, but soon rolled over and disassembled itself on the water.

While we and our competitors were getting our task out of the way, the manufacturers were arriving and setting up their booths. They set up on the grass just in front of the Nautical Inn guest rooms, and just in front of them in the coming days, there would be thousands of spectators watching the races, admiring and purchasing the wares these manufacturers had brought to demo and sell.

Friday, Nov. 10th

We got through Thursday, with most things looking better. Friday morning presented another surprise. This year we had combined the London Bridge Seaplane Classic with the Schneider Cup event. To our surprise, we had over two hundred fun-fly aircraft to enter (only 45 had preentered). Registration once again did a great job. Safety inspection and impound geared up to handle the crunch. The RC AREA TEAM FLYERS opened everything up with the release of hundreds of red, white, and blue balloons, a three-aircraft fly-by with smoke, and the playing of our National Anthem. They did a terrific job, and everybody had a lump in their throat.

Flying began behind schedule, and the whole day was a bit of a rush. The Schneider pilots were ready on time. In groups of four aircraft, they launched and flew counterclockwise around a triangular course that had the first pylon some hundred yards to their right, made a sharp left turn, down the back straight some two hundred and thirty yards, another sharp left turn and flew nearly straight at themselves for about one hundred yards, and another left-hand turn toward the Number One pylon and into the second of ten laps, after which, when clear, they would bring their aircraft down onto the water and taxi back. If for some reason their engine would quit, J.T. Scott had engineered and built a special retrieval system. A four by six-foot platform was fabricated in front of J.T.'s pontoon boat. This platform would be lowered hydraulically beneath the water, the boat would carefully approach the stalled aircraft, the retrieval crew would center the aircraft over the platform, it would then lift the aircraft out of the water, and return to shore, where the pilot and crew would take over.

Most of the pilots had no problems and put on a fantastic show. By the end of the day, after each pilot had flown two heats, a pattern was beginning to appear. Some had had near-perfect flights: with their static and speed scores added, the competition was extremely close. Four pilots began to bunch up at the front of the point standings, but no one had a lock on this event yet. The Schneider Cup aircraft were transported a short way to the Convention Center for public display, and later they would be left there intact and be charged overnight. During the public display, videos were playing that showed some of the models flying, along with some footage of the original races, to the delight of all.

Our sincere thanks to Thomas Foxworth, who transferred some of his original film footage of the 1925 and 1927 races to video and sent them out for our viewing pleasure. In his film there was footage of the Curtiss R3C-2, Macchi M33, Gloster III, Gloster IV, and several other aircraft. Dick Skoglund also sent us a portion of film on Schneider racers that showed Curtiss racers, Supermarines, Navy Wright, and Macchi racers. Of particular interest was the part about the Macchi MC-72, its counter-rotating propellers, and the ultimate seaplane speed record.

Saturday, Nov. 11th

Saturday was the final day of competition for the Schneider racers, and the point standings were very close. The top contenders were serious and all business as they prepared for two more heats to see

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who would prevail as the 1989 Schneider Cup Champion.

The crowd, estimated at 5,000 plus, was anticipating the tight race, the fun flyers were eager, the recovery boats had placed the buoys and were ready, the Desert Hawks had things ready, and with the three RC Aero Show Team aircraft streaking across the cloudless blue morning sky, trailing smoke, the National Anthem played, with hundreds of red, white, and blue balloons drifting skyward.

In a short speech, the Mayor of Lake Havasu City welcomed the spectators, the fun flyers, the contestants of the Schneider Cup, and the manufacturers to our fair city. He stated that ". . . over fifty years ago, not far from where the London Bridge spanned the Thames in London, the Great Schneider Trophy Races ended with the third consecutive win by Great Britain. Today, that majestic bridge spans the channel here in Lake Havasu City, and it is only fitting that the First Annual Schneider Cup Re-Enactment take place here." The Mayor went on to compliment the Schneider Cup Committee, and the Desert Hawks for this fine event and wished the competitors good luck and for everyone to enjoy themselves.

After the Mayor's speech a huge roar went up as the first heat of Schneider Cup racers started their engines. It was obvious that the crowd was really into these huge vintage racers. The number of racers still able to continue the hunt had dropped to eleven, and the heats were consolidated. Supermarines, Curtiss, Macchis, Sopwiths, and a Depperdussin were all ready to meet the challenge and their pilots flew their hearts out.

Superb piloting brought incredible flight scores that varied so little that if any pilot made a mistake it could mean the difference between first and fifth place. It is indeed sad that all of these champions could not win, but the rules of competition allows but one to taste the sweetness of being Number One. But I feel, as did thousands of others, all of these competitors were winners!

Our sincere appreciation, along with a special Participant Plaque went home with each of these competitors. They made the dream come true, and let's hope that the future will bring many more immortal memories.

The ten competitors who completed the static and flying competition finished as follows: Bob Heitkamp (Supermarine S5), First; Ken Bundt (Supermarine S6-B), Second; Ken Merrill (Curtiss R3C-2), Third; Bill Curry (Macchi M-33), Fourth; Team Macchi (Macchi MC-72), Fifth; Frank Schoening (Sopwith Tabloid), Sixth; Larry Botsford (Supermarine S5), Seventh; Paul Schulz (Macchi M-52R), Eighth; Cliff Adams (Supermarine S6-B), Ninth; and Dick Skoglund (Deperdussin), Tenth.

The following modelers also entered the competition, but for one reason or another, were not able to complete all the requirements for obtaining a final score: Doug MacMillan, Dave Wilms, Bill Young, Steve Milos, Larry Sutherland, Derek Walkington, Ralph Burton, John Dolan, Douglas Cumins, Ian McInnes, and Eldon Keele. •

Cyclone *Continued from page 44*

spin when the engine is idling. As Cyclone has a belt-start method, there is no engine starting shaft to align to the engine shaft. This reduces some work for the beginners. However, the drawback of this archaic belt-start system is that it's not as convenient as the cone-start system, and the belt sometimes gets caught in the engine flywheel during engine startings. Furthermore, make sure that you tuck the belt away securely before takeoff. We suggest that you fabricate an extra wire bracket with a hook at the end to further secure the belt.

On the other hand, a side benefit of Cyclone's belt-start system is that, without a starting shaft, the whole engine and fan/flywheel unit can be removed in 60 seconds by simply loosening the four engine mounting bolts. The unique design of the Cyclone cooling shroud, which has a big opening on the bottom, allows the engine and fan to be removed without removing the fan shroud. Of course, a slight disadvantage of such a cooling shroud design is that you lose some cooling efficiency. The compressed high pressure air can leak out at the bottom of the shroud. Therefore, model and full-size helicopter designs are full of design tradeoffs such as this. Ease of maintenance usually means a loss of efficiency somewhere. A good design calls for the best compromise.

Another example of Kalt's attention to detail is that the steel pinion shaft that fits in the center of the clutch bell housing has a flat spot filed on it. When the set screws are tightened onto this shaft, the flat spot provides a better grip for the set screw. The gas tank included in the kit is big. It provides a good 20 minutes of flight time. My Cyclone kit even included a fuel filter and a Kalt fuel line shutoff clip. Very nice.

New Kalt canopies are formed from white ABS plastic instead of clear acetate, as used by all the other manufacturers. The ABS seems to be more brittle and flimsy than acetate. However, upon gluing the two halves together, and gluing to the cockpit, the canopy became a solid piece. So far, the canopy has lasted very well. A unique feature with Kalt kits is that the canopies are all pre-cut to the right shape and size. You do not need to trim them with scissors. All you have to do is use the enclosed MEK to glue them together. A small bottle is included. If you did not finish the small bottle, then it means you should have put on more glue. MEK is similar to the liquid glue that is used to glue plastic model airplane kits together. Be sure that you apply the glue to both sides, then push them together immediately. *(Be very careful when using MEK. A drop in the eye is instantly fatal to its vision. wcn)*

Due to the size of the shipping box, the long tail rotor control plastic tube had to be bent to fit inside. The tube can be straightened by holding it about six inches over a kitchen stove to soften it. Hold the curved inward side toward the heat. This allows that particular side to expand, and automatically straightens the tube. The instruction manual says there is an optional Kalt tail boom support. We believe the tail boom is already quite well supported in the sideframes; the optional support is not needed.

Now, we will discuss the control setup and preflight checks for Cyclone II. As Cyclone II is supposed to be an inexpensive beginner helicopter, none of the control bellcranks are ball bearing supported to keep the cost down. Even with the plain plastic bellcranks, the pitch and roll cyclic controls are all right. These two control runs are taut and slopless. Kalt helicopters' cyclic and collective control setup are different than, say, X-Cell's, GMP's or Schluter's. These helicopters obtain collective control by sliding the entire swashplate up and down, and tilt the swashplate for cyclic controls. Kalt reserves the swashplate for cyclic controls only. On the Cyclone, collective control is achieved by sliding a steel wire inside a recessed groove on the side of the 10mm thick main rotor shaft. The wire pokes a scissor mixing unit up and down to vary the collective pitch. This

method of separating the collective and cyclic controls usually gives a very nice and tight cyclic control setup. The added benefit is that this method eliminates undesirable cyclic change as collective pitch is varied; which is a common kinematic problem found on rising/lowering swashplate helicopters, such as Heim, GMP, etc.

On Kalt's 60-size Excalibur, which has a ball bearing supported collective pitch change lever, and ballraced scissor mixer, you have precise collective control. However, on the Cyclone II, the collective pitch change lever and the mixer do not have ball bearings. If you put your hands on the main blades, you can easily feel a play of one degree collective pitch change. In hover, sometimes the main rotor rpm changes by itself due to the slop in the collective pitch mechanism. We feel this is the only area that needs to be improved. The suggestion may be to machine the sliding mixer's base out of aluminum, or add a 10mm i.d. brass sleeve inside the existing plastic unit. The other suggestion is to have two ball bearings at the collective pitch lever's pivot. These two modifications probably should be implemented by Kalt, or by modelers who already own a Cyclone, and are thinking of upgrading their Cyclone for aerobatics. Alternatively, replace the plastic sliding mixer with a $90 ballraced, metal GMP washout unit (GMP #659).

With any model helicopter that uses a sliding wire for collective control, it always has a sliding ring at the bottom of the rotor shaft. For example, Schluter Champion, Kyosho Concept, and Kalt Cyclone all have this sliding collar. Make sure this collar can slide up and down very freely. If not, try bending the 90° wire elbow at the collar side very slightly. Try filing down the backside of the wire slightly. You might also take a piece of emery cloth and sand down the 10mm shaft at the sliding collar region. Finally, once the collar can slide freely, add some grease. I spent an hour at making my collective collar slide freely.

The tail rotor control setup requires some attention to make it smooth. After the tail rotor gear box is assembled, you should operate the tail rotor pitch change mechanism by hand to ensure it is smooth. Surprisingly, the instructions did not suggest lubricating anything in the kit. Maybe the manual forgot? Well, use your common sense, and do use some grease or oil at all the moving parts on the helicopter. Most hobby shops carry model car or helicopter lubricants. If the Cyclone tail rotor unit is assembled carefully, then the pitch change mechanism can be very smooth. If the pitch control mechanism sticks, then try bending the chrome plated control wire at the 90° joint very slightly. Time spent here will reward you with a smooth heading control helicopter. Otherwise, your gyro will have a difficult time feeding fine inputs to the tail rotor. Thus, if you wonder why someone else's helicopter flies so well, it's not necessarily the model brand, or design, it's the attention in setting up that counts significantly!

The pushrod lengths given in the instructions are perfect! Follow the instructions and set the rods exactly as shown. The Kalt white ball links that came with the kit fit the balls quite well; not too tight, and no slop either. If any of the ball links are too tight, fit a Philips screwdriver through the ball link's hole and move it around to enlarge the hole very slightly. The anti-rotation bracket above the swashplate is a beautifully made aluminum piece. The swashplate is a also a nicely machined metal piece. However, the swashplate design is not the modern inline swashplate design as used on the Kalt Excalibur, and on other brand kits. The problem of a non-inline swashplate as on the Cyclone is that it can cause a slight amount of longitudinal and lateral cyclic control coupling. Furthermore, it causes a slight amount of stress and binding on the anti-rotation arm when lateral cyclic commands are given. This is why most helicopters kits now use the in-line swashplate design.

The molded side frames have a rectangular cutout behind the engine for mounting an electronic gyro. At first, I mounted my rate gyro there, too. But I discovered that it made the model tail-heavy. Therefore, we advise you to mount your gyro in the front cabin. The ideal center-of-gravity for most helicopter models should be about 1/8 inch in front of the main shaft. If you pick up the helicopter by the flybar, the nose of the helicopter model should dip down very slightly (the nose leans downward about 1 to 2 degrees).

Editor's Note: Because of the length of this article, and not wishing to cut any valued information to the reader, we are concluding this review in the next issue.

HOW TO GET H

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