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WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

JANUARY 1990
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volume 20, number 215

RENO AIR RACES:
The Bold and the Brave

CONSTRUCTION:
Edge of Knife
Peanut Zlin Z-XII
Lit'l Dennyplane Jr.

REVIEW:
GMP/Hirobo 'Shuttle' Helicopter

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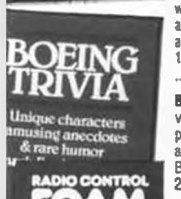

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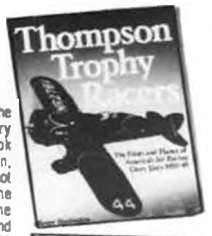

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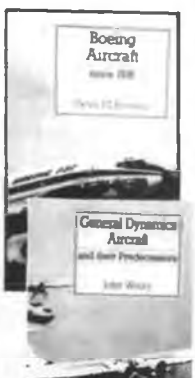

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MODEL BUILDER

JANUARY 1990

volume 20, number 215

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FEATURES

CONSTRUCTION

COVER: T-6 Class racing action at the 1989 Reno National Championship Air Races, with Linda Finch, a nursing home manager from San Antonio, Texas, in "All Star Rent A Car," following Jim Good of Casper, Wyoming, flying "Wildcatter," into pylon #2. A report on the Reno Air Races begins on page 27. Photo by Felix Vivas.

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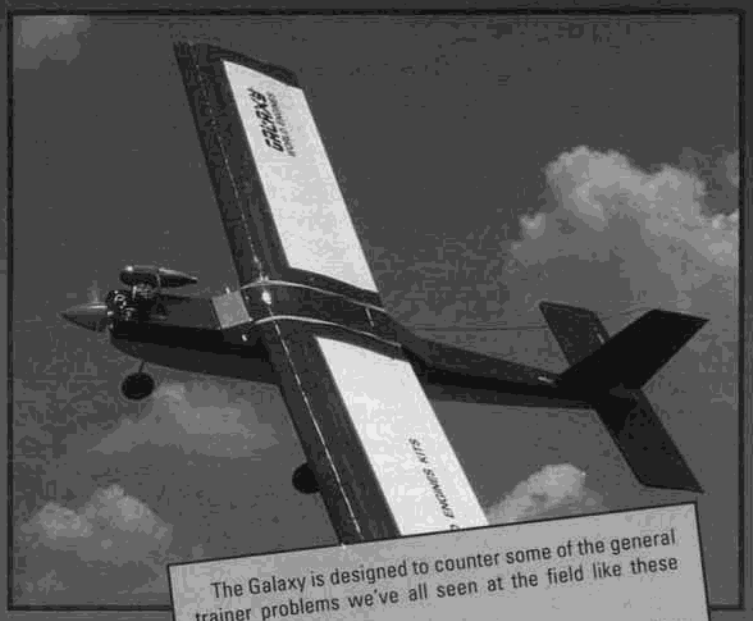

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SANTA MONICA
Evett's Model Shop
1638 Ocean Park PH: 452-2720
SANTA ROSA
Toy & Model
711 Coddingtown Mall
PH: 528-1488
TORRENCE
Flying Machine Model Center
24209 Crenshaw
VALENCIA
Smith Brothers Hobby
23132 Valencia Blvd.
PH: 805-259-5895
VAN NUYS
Smith Brothers Hobby
16053 Victory Blvd.
PH: 818-786-8583

COLORADO
ARVADA
Action Hobbies
10372 Ralston Road
AURORA
Tom Thumb Hobby Center
10718 E. Colfax PH: 361-8159
COLORADO SPRINGS
Custom Hobbies
2813 E. Platte Ave.
ENGLEWOOD
Bill Discount Hobby Center
2495 W. Hampden Ave.
PH: 303-789-9411 or 781-4106
GRAND JUNCTION
The Hobby Hut
811 North 12th Street

CONNECTICUT
BERLIN
Berlin Hobbies
162 Mill St. PH: 828-1775
BRISTOL
Bristol Hobby Center, Inc.
841 Farmington Ave.
Bristol Plaza PH: 583-7273
BROOKFIELD
Vinnie's Hobbies
847 Federal Road
DANBURY
The Hobby Center
388 Main St. PH: 748-9884
GLASTONBURY
Davis Hobbies
45 A Welles Street
Fox Run Mall PH: 633-3056
MILFORD
Radio Active Hobbies
374 New Haven Ave.
Farmer's Market Plaza
PH: 203-877-8200
NORWALK
Al's Hobbies
54 Chestnut Hill Road
WATERFORD
Shore Line Crafts
8 Hayes Street

DELAWARE
WILMINGTON
Brandywine
1618 Zebley Road

FLORIDA
BOYNTON BEACH
G & C Hobbies
3489-8 W. Boynton Beach Blvd.
FT. LAUDERDALE
R/C Hobbies
6800 N. University Dr.
FT. MYERS
Carl Wilson's Clear Track, Ltd.
7101-22 Cypress Lake Drive
FT. PIERCE
Hobbyland USA
850 S. 21st St. Unit N
JACKSONVILLE/ORANGE PARK
Hobby World
4 Locations in area
MIAMI
Crown Hobbies
7436 Coral Way
MIAMI
Hobby Land
14530 S.W. 142nd Ave.
PH: 305-238-4387
MIAMI
Orange Blossom Hobbies
1875 N.W. 36th Street
ORLANDO
Bob's Hobby Center, Inc.
7330 Lake Underhill Road
PH: 407-277-1248
ORLANDO
Central Florida Hobbies, Inc.
5600 W. Colonial Drive #311
ORLANDO
Colonial Photo & Hobby, Inc.
634 N. Mills Street
PENSACOLA
Bobe's Hobby House
5719 North W. Street
PLANTATION
Universal Hobbies
141 South State Road 7
PH: 305-581-9390
ST. PETERSBURG
Hobby House
5090 9th St. N. PH: 521-4148
SOUTH DAYTONA
Ace Hobbies
2127 So. Ridgewood Ave.
PH: 904-761-9780
TALLAHASSEE
Pam & Allen's Hobbies
1198-A Capital Circle N.E.
TAMPA
Charlie's Discount Hobbies
7530 W. Waters Ave.
PH: 813-882-4007
TAMPA
Farmers Sundries & Hobbies
4839 E. Broadway
PH: 813-248-3314
WEST PALM BEACH
Crell Houses Hobby Shop
1079 N. Military Tr.
WINTER SPRINGS
Forensus Hobby Center, Inc.
420 W. State Road 434
PH: 407-327-8353

GEORGIA
ATLANTA
Briar Vista Lawn Mower
Sales & Service
1657 Lavista Road Ph 633-9741
AUGUSTA
Otter Creek Hobbies
2825 Deans Bridge Road
PH: 404-790-6675

HAWAII
HONOLULU
The Hobbiest
1413 Tenth Avenue

IDAHO
TWIN FALLS
Aero-tronics Model Supply Co.
330 Locust Street

ILLINOIS
BELLVILLE
West Side Hobby
2829 West Main Street
BLOOMINGTON
Hobbyland, Inc.
616-618 N. Main St.
CHICAGO
Stanton Hobby Shop
4734 N. Milwaukee Ave.
CRYSTAL LAKE
Frank's Games, Toys & Hobby
111 - 113 North Main St.
PH: 815-459-0247
EAST MOLINE
Tony's Hobby & Key
830 - 15 Ave.
ELMHURST
Al's Hobby Shop
121 Addison
LOMBARD
G & D Hobbies
716 S. Main St.
OAKLAWN
Pat's Hobbies & Crafts
5730 W. 95th PH: 424-6131
ROCKFORD
Rockford Hobbies, Inc.
619 So. Rockford Ave.
TINLEY PARK
Orland Hobbies
18853 Oak Park Ave.
PH: 312-429-8911

WAUKEGAN
Lake County Hobbies
37832 N. Sheridan Road
PH: 312-662-4544

INDIANA
FORT WAYNE
Phil's Hobby Shop
1722 Lake Ave. PH: 426-5058

RICHMOND
Radio Control Center
1408 So. U. St. PH: 935-5080

IOWA
CEDAR RAPIDS
Tapco Engineering
1639 47th St. N.E.
PH: 319-393-4363
COUNCIL BLUFFS
Bud's Hobbies & Crafts
133 W. Broadway
DES MOINES
Hobby Haven
7672 Hickman Road
HOLSTEIN
Chuck's Lawn & Used Cars
520 East 2nd
LeMARS
Hobby Haven
Airport Entrance Hwy 75 S
Ph: 712-546-5660
MASON CITY
D n B R/C SUPPLY
201 So. Vermont
SERGEANT BLUFF
R/C Extras
1404 Vandenberg Circle W
PH: 943-4102
SIOUX CITY
Tri-State R/C
3201 Viking Dr.
PH: 255-6190
WATERLOO
Bob's R/C Supply
835 Sheerer Ave.
WAVERLY
R/C Hobby House
818 E. Bremer Ave.

KANSAS
JUNCTION CITY
R/C Hobbies
115 W. 7th St. PH: 238-1877
KANSAS CITY
R/C Hobbies
5620 State Ave.
LIBERAL
Miller's Bike & Hobby Shop
105 E. Seventh
NEODESHA
BAC
Route 1
SALINA
Don's Hobby Shop
410 Hart
WICHITA
Big Frank's Hobby Center
2208 N. Amidon Ph 838-3011
Sweetbriar Shopping Center

KENTUCKY
FLORENCE
Hobby Hanger
183 Lloyd Ave
FLORENCE
Northern Kentucky Hobbies
7615 Burlington Pike
HENDERSON
Heavenly's Hobbies
241 Second St.
LEXINGTON
Hobby Center
1025 Industry Road
OWENSBORO
Hobby Master
X-Cell Models
2006 Triplett St. Ph: 683-9117

LOUISIANA
BATON ROUGE
Hobby Towne
3112 College Drive - Suite A
BATON ROUGE
Hobby Towne
6868 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

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BATH
The Hobby Shoppe
94 Front St.
ELLSWORTH
The Camera/Photo Smith's
Maine Coast Mall
FAYETTE
Tom's R/C Hardware
RFD 1, Box 2260
PITTSFIELD
Hallett's R/C Planes
66 Somerset Ave.
WATERVILLE
Cliff Pipes Radio Control
Riva Ridge, Vassalboro
Route 3, Box 1980
PH: 207-873-4885

MARYLAND
BALTIMORE
Stonelaigh Cycle & Hobbies Inc
6717 York Road
GERMANTOWN
Fox Chapel Hobbies
19705 Frederick Road
MIDDLETOWN
Larch Lane Hobbies
18 Larch Lane
PH 301-473-4587
OAKLAND
Brodak's Hobby Shop
210 N. 3rd St.
WESTMINSTER
Bobby's Hobby Lobby
65 E. Main St.

MASSACHUSETTS
CANTON
Advanced RadioControl Hobbies
323 Turnpike St. #9
CHICOPEE
J & J Hobbies
133 Frontenac St. Ph: 592-1472
EAST FALMOUTH
R/C Hobbies
153 E. Falmouth
EAST LONGMEADOW
Bill's Hobby Supplies
600 N. Main St.
PH: 736-7711
FISKDALE
KAN Hobbies & Toys
558 Main St.
FRAMINGHAM
Fisher R/C
17 Salmi Road
GREENFIELD
Chano Hobbies
40 Bank Row PH: 773-3300
HANSON
Hanson Hobby, Inc.
830 Main St.
LYNN
Hobby City
283 Lynnfield St.
MERRIMAC
George's Hobby Shop
22 Merrimac Square
NEW BEDFORD
Paragon Sasmp Works
293 Brock Ave.
PH: 508-992-8812
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

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ANN ARBOR
Rider's Hobby Shop
116 W. Liberty
BATTLE CREEK
Hobby House
508 Riverside Dr. PH: 964-0106
BATTLE CREEK
J T HOBBY
825 Golden Ave.
CHARLOTTE
Hussey's Hobbies
222 Lansing St. Ph: 543-4400
COLDWATER
Hobby Heaven
7 So. Monroe PH: 278-5894
COLEMAN
Long's Aero & Hobby Shop
5812 W. Sleginaw Road
DEARBORN
Joe's Hobby Center
7845 Wyoming Ave.
PH: 933-8587
EAST DETROIT
Joe's Hobby Center
17900 E. 10 Mile PH: 733-8294
FARMINGTON
Joe's Hobby Center, Inc.
35200 Grand River Ave.
PH: 313-477-6288
GRAND RAPIDS
Rider's Hobby Shop
2055 28th St. S.E.
KALAMAZOO
Rider's Hobby
3417 So. Westnedge
LANSING
Rider's Hobby Shop
1808 E. Michigan Ave.
PH: 517-485-0700
PONTIAC
RC Hobbies
521 Huron
ROCHESTER
Joe's Hobby Centers, Inc.
Campus Corners Shp. Ctr.
105 S. Livernois
SAGINAW
Aerodrome Models Ltd.
2823 S. Miller Road
PH: 517-781-3000
SAGINAW
Roger's Hobby Center
3658 State
PH: 790-0080
Giant Shopping Center W
SAGINAW
Tast's Hobbies & Raceway
3270 Bay Rd. PH: 517-799-3900
UTICA
Henderson's Family Hobbies
3441 Auburn
WARREN
Prop Shop Hobbies
23326 Van Dyke
YPSILANTI
Rider's Hobby
4035 Carpenter Road

MINNESOTA
LITTLE CANADA (St. Paul)
Hub Hobby Center
62 Minnesota Ave.
PH: 480-1675
MANKATO
Don's Hobby Co.
424 S. Front St. PH: 567-1330
RICHFIELD
Hub Hobby Center
6416 Penn Ave. S.
ROBBINSDALE
Hub Hobby Center
4114 Lakeland Ave. N.

MISSISSIPPI
OXFORD
The Model Source
110 S. 11th St.
PH: 601-234-8170

MISSOURI
GRANDVIEW
Flo-Mine Hobbies
700 Blue Ridge Ext.
PH: 816-761-8471
GREATER KANSAS CITY
Hobby Haven
Metcalf S. Shop Ctr.
Independence Center
& 10801 Hickman Mills Dr.
MARYLAND HEIGHTS
Flying Models Hobby Center
2723 Creve Coeur Mill Road
RUSSELLVILLE
Adler Model & Dioramas Hobby
113 Railroad Ave Ph: 782-4682
ST. CHARLES
Mark Twain Hobby & Craft
1201 S. 5th St.
ST. LOUIS
J & J Hobbies
5611 So. Lindbergh

MONTANA
VICTOR
Murph's Hobbies
238 West View Drive

NEBRASKA
BELLEVUE
Gary's Hobbytown
701 Galvin Road 50 No. 103
NORTH PLATTE
Fallerton's Hobbies
1103 No. Jeffers PH: 534-1038
OMAHA
Hobby Cooperative Supply
13225 I Street
WEST POINT
Krugle's Variety Store
113 N. Main

NEVADA
NO. LAS VEGAS
Peterson Hobbies & Crafts
3282 S. Civic Center Drive
RENO
High Sierra Models
953 W Moana Lane
PH: 825-9008

NEW HAMPSHIRE
AUBURN
CT Hobbies
49 Eaton Road
LONDONDERRY
J & S Hobby Center
13 Sanborn Road
PH: 603-432-7056
NASHUA
Hobby Emporium
Royal Ridge Mall
NORTH CONWAY
C-V Machine Co.
Kearsarge St
SALEM
Bill's Hobby Barn
328 S. Broadway
PH: 603-898-9241

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BOUND BROOK
CJ Hobbies
423 W. Union Ave PH: 469-8844
CHESTER
GB Hobbies
705 Bartley-Chester Road
MARLTON
Hi Fly Hobbies
Route 70 & Cropwell Road
Marlton Square Shp. Mall
PH: 609-983-8080
MERCERVILLE
Iron Horse Hobbies
118 Flock Road
MIDLAND PARK
The Hobby Shop
291 Godwin Ave
POMPTON PLAINS
Hobby Hut
587 Rte 23 PH: 835-2077
RANDOLPH
Carl's Hobby Center
509 Rte 10
PH: 366-4300
RED BANK
Hobbymasters, Inc.
62 White Street
RIDGEFIELD
Ridgefield Hobby
508 Broad Ave.
RIVERDALE
Zeppelin Hobbies
62 Hamburg Turnpike
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Sussex County Hobbies
69 Main St.
WILLINGBORO
Wilmig Hobbies
Country Club Plaza
Beverly-Rancocas Road

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ALBUQUERQUE
Valley Hobbies
4522 4th St N.W. PH: 345-9688

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67 Exchange St.
BALLSTON SPA
Racing City Radio Control
2033 Doubleday Ave.
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Performance Hobby
225-06 Jamaica Ave.
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Brooklyn's Model Masters
1192 Gravesend/Neck Rd.
PH: 718-743-0700
CANANDAIGUA
Finger Lakes Hobby
222 S. Main PH: 394-7509
CANASERAGA
RC Supply
Main Street
CHEEKTOWAGA
Field's Hobby Center
3523 Union Rd PH: 681-6440
ELMSFORD
Andy's Hobby Shop
38 E. Main Street
GENEVA
Toys 'n' Things 'N Things
480 Exchange St.
HORSEHEADS
Allsons Shop
984 Westinghouse Road
Village Plaza
MINEOLA
Wills R/C Hobbies
385 Willis Ave.
NORFOLK
R/C Aero Hobbies
Box 4A Plumbrook Road
PH: 315-384-4413
ODESSA
D & B Hobbies & Crafts
206 E. Main St.
ROCHESTER
Dan's Crafts & Things
352 Empire Blvd PH: 654-8368
ROCHESTER
Edmund's Hobby Shop
1521 Mt. Hope Ave.
PH: 442-8430
SYRACUSE
Wall's Hobby & Craft
2 Dwight Park Drive
PH: 315-453-2291

NORTH CAROLINA
ASHEVILLE
Carolina Art, Craft & Hobby
128 Swannanoa River Road
BURLINGTON
R/C Hobby Workshop/Raceway
1358 S. Church
PH: 228-6809
CHARLOTTE
Action Hobbies
2818 S Blvd PH: 527-2996
GOLDSBORO
Hollingsworth R/C Shop
Rte 14, Box 93
PH: 735-5088
HENDERSONVILLE
The Hobby House
1211 Asheville Hwy.
PH: 692-6883
HIGH POINT
Barnes Craft & Hobbies, Inc
2291 English Road
KING
King R/C
Five Forks Village Shp. Ctr.
PH: 919-983-3988
MAIDEN
Country Hobbies
Route 2, Box 291
PH: 704-428-3101
SHELBY
Hobbies Unlimited
2102 Fernwood Dr.
WINSTON-SALEM
The Hobby Corner
138-C Oakwood Dr. Ph: 723-5589

NORTH DAKOTA
FARGO
Valley Hobby & Raceway
1543 So. 1st Ave. So.
PH: 701-235-1272

OHIO
AKRON
Miller's Hobby Shop
1018 Kenmore Blvd.
PH: 848-2264
BALTIMORE
Frank's Service
145 Baltimore-Somerset Rd. NW
CENTERVILLE
A Hobby Shop
13 N. Main St. PH: 433-7127
CINCINNATI
Carl's Hobbies
1188 W. Kemper Road
PH: 513-742-5860
CLEVELAND/PARMA
National Hobby, Inc.
6220 Ridge Rd.
PH: 216-749-2450
FINDLAY
Jax Model Supplies
721 Rockwell Ave.
FINDLAY
Pusey Cat Company
515 Crystal Ave.
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
6150 Warrensville Ctr. Road
MARION
Lew's Wheels Stop & Hobby
532 W. Center St.
PH: 389-3464
MIDDLEBURG HEIGHTS
American Modeler
7589 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: 499-8000
PARMA
Mench's Train & Hobby
7982 Broadview Road
Tri City Plaza
TOLEDO
The Hobby Stop - West
4558 Monroe Street
UPPER SANDUSKY
Jim & Ken's Hobby Shop
14635 CH 53 RR3
PH: 419-294-1712
WAPAKONETA
Dad's Toy Shop
123 W. Auglaize St
PH: 419-738-2007
YOUNGSTOWN
Boardman Hobby Center
6820 Market Street

OKLAHOMA
OKLAHOMA CITY
Campbell's Hobby House
3500 N. MacArthur
TULSA
Action Hobbies
4425 E. 31st St.
TULSA
Wings 'N Things
5153 So. Peoria
PH: 745-0034

OREGON
CANBY
Northwest Hobbies
485 S.E. 1st Ave.
CORVALLIS
Trumps Hobbies
2401 N.W. Kings
Timberhill Shopping Center
EUGENE
Eugene Toy & Hobby
32 East 11th Ave
PORTLAND
Norm's Hobbies Unlimited
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PENNSYLVANIA
BATH
Dick Wetzel's Hobbies
514 E. Main PH: 215-837-6681
CARMICHAELS
Brodak's Hobbies
558 Route 88
ERIE
Maxwell's Hobby Shop
5014 Station Road
EVANS CITY
Cranberry Hobby Depot
Cranberry Gardens Plaza
20327 Perry Highway
GETTYSBURG
Gilbert's Hobby Shop
230 Steinwehr Ave.
PH: 717-334-5715
HUMMELSTOWN
The Hidden Hanger
146 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
N. HUNTINGDON
High Tek Hobbies
13380 Rte 30, Ladonna Village
QUAKERTOWN
J & D Wheelie Stop
Quakertown Plaza S.C.
READING
Iron Horse Hobby House
60 South 6th St.
READING
Oz's Hobbies
538 N. 10th St.
SUNBURY
Rachee's Wings & Things
138 S. Street
TAMAQUA
Prop & Wheels Hobbies
138 W. Broad St.
WARMINSTER
J.C. R/C Hobbies
13 York Road PH: 672-5200
WEST CHESTER
Montgomery Nurseries
Route 162 & Telegraph Rd
WILLIAMSPORT
Growing Tree Toys & Hobbies
118 West Third Street
YORK
Mel's Hobbies
935 East Market St.
YORK
Shelly Sporting Goods
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GREENVILLE
The Great Escape
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MYRTLE BEACH
Ed's Hobby Shop
702 Main St. PH: 448-8665
PELZER
Hilley's Hobbies
581 Cooley Bridge Road
ROCK HILL
Rock Hill Hobbies
1204 Mt. Gallant Road
SIMPSONVILLE
Golden Strip Hobbies
561 Fairview Road #111
YORK
Bethany Hobbies
2305 S. Hwy 161
PH: 803-222-2756

SOUTH DAKOTA
ABERDEEN
Klein's
408 S. Wilson
RAPID CITY
RCA Hobbies
Route 6, Box 1270 Ph: 787-6658
WATERTOWN
Hollon's Hobbies
Route 2 Box 14

TENNESSEE
COVINGTON
M-H Supply
114 Star Shopping Center
KNOXVILLE
M & N Hobbies
1923 Brandville Rd Ph: 525-7532
KNOXVILLE
Tennessee Model Hobbies
8909 Oak Ridge Hwy.
PH: 615-482-2900
OAK RIDGE
Ridge Handicrafts Inc
205 Jackson Sq.

TEXAS
AUSTIN
Command Hobbies
8828 Airport Blvd. Ste 148
BELLAIRE
I and I Hobby Center
6707 Chimney Rock
CONROE
J & K Hobbies
201 Enterprise Row, Suite 101
PH: 760-1998
EL PASO
Hal's Hobby Warehouse
1440 Bessemer PH: 915-591-2213
FARMERS BRANCH
Bold Hobbies, Inc.
101 Valwood Village Shp. Ctr.
PH: 214-241-8492
FORT WORTH
Bold Hobbies
2401 Bedford Euless Road
HOUSTON
Larry's Hobbies
156-F 1960 East PH: 443-7373
HURST
Ray's Hobby Shop
1309 Norwood
JASPER
Beard's Hobby Shop
400 N. Main St.
LAREDO
Border R/C Models
1112 Calle Del Norte
LONGVIEW
Leslie's Hobby Shop
2728 Gilmer Road
McALLEN
B & B Hobbies
521 So. Main St.
ODESSA
Odessa TV Video Clinic
805 N. Jefferson PH: 332-2831
PLANO
The Windsock Hobby Center
Crestwood Shopping Center
3819 N. Dixie PH: 383-0300
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Model Airplanes & Boats Galore
217 Franklin St. Ph: 214-786-3008
PORT LAVACA
The Plane Shop
1808 Jackson St.
SAN ANGELO
Cactus R/C 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 E. Texas

VERMONT
NO. FERRISBURG
Vandee'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: 206-747-8814
BELLINGHAM
Hobby Hive
703 W. Holly PH: 734-4090
BURLINGTON
Performance R/C
328 E. Fairhaven Ave.
PH: 206-755-0464
ISSAQUAH
Abernathy's Northwest Hobbies
1175 Gilman Blvd. Ste. 1913
PUYALLUP
All Hobbies
1400 E. Main Suite D
SEATTLE
Webster Hobby Shop
1116 N. 183rd

SEQUIM
Fred's Hobbies and Guns
349a W. Washington
SPOKANE
R/C Hobbies of Spokane
W. 1109 Wellesley
TACOMA
All Hobbies
Narrows Plaza, 2310 Mildred W.
YAKIMA
Model Aircraft Supply Center
505 N. 20th
PH: 453-8238

WEST VIRGINIA
CHARLESTON
Fountain Hobby Center
200 W. Washington St.

WISCONSIN
APPLETON
Gateway Science & Hobby Center
758 Northland Mall
FOND DU LAC
Focus
75 E. Main St.
GREEN BAY
Model-crafters Division of
Woodcrafters Wood & Tool
1807 7th St. PH: 414-468-0208
HOLMEN
SUN-WIN
W7583 St. Cloix Ave.
MADISON
Hobby Craft of Madison, Inc.
6833 Odana Road
WALDO
Kenosha Hobbies
104 S. Mill
WAUKESHA
ABC R/C, Inc.
1441B East Main St.
WAUSAU
Pops's Hobby Land
640 South 3rd Ave.

CANADA
BANFF, ALBERTA
Alberta's Littlest Airport
Box 8 PH: 373-3853
CALGARY, ALBERTA
Calgary Hobby Supply Ltd.
Box 3173, Stn. "B"
CALGARY, ALBERTA
P.M.S. Hobby Craft
154-4695 36th St. N.E.
MILLET, ALBERTA
Sunset Radio Control
P.O. Box 718
ROCKY MTN. HOUSE, ALB.
Jill Crafts & Hobbies, Ltd.
Box 538 4818 - 50 Street
DUNCAN B.C.
Rite Bros. R/C Supply & Access.
1068 B Canada Ave.
VICTORIA, B.C.
Royal Oak Hobbies
4454 W. Saanich Road
BRANDON, MANITOBA
R/C Hobbies
48 Confederation
WINNIPEG, MANITOBA
Cellar Dweller Hobby, Ltd.
1354 Main St.
PH: 589-2037
ST. JOHN'S, NFLD.
Capitol Hobby Centre, Ltd.
6 Freshwater Road
BURLINGTON, ONTARIO
Skycraft Hobbies Inc.
141 Plains Rd W.
PH: 416-529-0559
800-263-9331
COURTRIGHT, ONTARIO
Plane Crazy
426 #80 Hwy., RR1
PH: 867-3102
KITCHENER, ONTARIO
Rite Craft Model Co.
1586 Victoria St. N.
LONDON, ONTARIO
Rite 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: 416-755-1788
WILLOWDALE, ONTARIO
Keith's Hobby Shop
3205 Yonge St.
PH: 222-4721
CHARLOTTETOWN, P.E.I.
Jim's R/C Supply
132 Nassau St.
PH: 388-1855
FLEURE MONT, QUEBEC
Shaw Hobby
1088 12th Ave. Nord
LAVAL, QUEBEC
Carl's Hobby Shop, Ltd.
1500 Cure Labelle Blvd., Chomedey
MONTREAL, QUEBEC
Can-Av Hobbies
5850 Gouin Blvd. Ouest
PH: 514-332-3568
ST. GEORGE & BEAUCE, QUE.
Place Bureau Enr.
12515, lere ave est Ville de
ST. MARTIN BEAUCE, QUE.
Passe-Temps 107
107-1 Ave. CP97
VILLE ST. LAURENT, QUE.
Hobbieville
902 Decarie PH: 744-8280
REGINA, SASKATCHAWAN
Aero Specialties
300 Sherwin Road
SASKATOON, SASKATCH.
RC Hobby World
108 - 2301 Ave C North
Hessaqua Centre
PH: 652-4775

AUSTRALIA
SIDNEY, NSW 2232
The Hobby Headquarters
91 Rival St. Manera

ENGLAND
NORFOLK, NR17 1DG
Pegasus Models, Ltd.
Caston, Attleborough

NEW ZEALAND
HASTINGS
Hastings Model Supplies
523 Frederick Street

THE NETHERLANDS
DEN BOSCH
P. Teeuwen Model Shop
Minderbroedersstraat 32
PH: 073-140104

NORWAY
PORSGRUNN
B.S. Hobby Import
Lyngv. 3c

SWEDEN
S-871 02 HARNOSAND
Model Produkter AB
Box 2060

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

from Bill Northrop's workbench

• Although it's only near the end of October as this is being written, it's still the last chance for us to bring you up to date on the first model trade show of the new year, the International Modeler Show in Pasadena, California, January 12, 13, and 14, 1990. The most important change to this 13th annual event is the addition of 33-1/3% more open time for the public... the show will be open to all from 2:00 p.m. until 7:00 p.m. on Friday, January 12, plus the usual 10:00 a.m. to 6:00 p.m. on Saturday, and 10:00 a.m. to 5:00 p.m. on Sunday.

Members of the industry are welcome throughout the weekend, but it is best for them to take advantage of the trade-only time, Friday morning from 9:00 a.m. to 2:00 p.m., when the public is not allowed into the show. Members of the industry are admitted free of charge all weekend, but Friday morning is their best time to visit and conduct business, without the pressure and interruptions of the general public. Dealers, distributors, or anyone connected with the industry who wishes to attend, should contact IMS as soon as possible by calling (800) 243-9593 (in California call 714-645-8830), or use our Fax (714) 650-5457, to order passes that can be picked up at the show entrance. Exhibitors and other industry members appreciate strict adherance to the trade-only time of the show, so please only apply if you can submit proof of your industry connection. A business card from the counter of a hobby shop won't cut it.

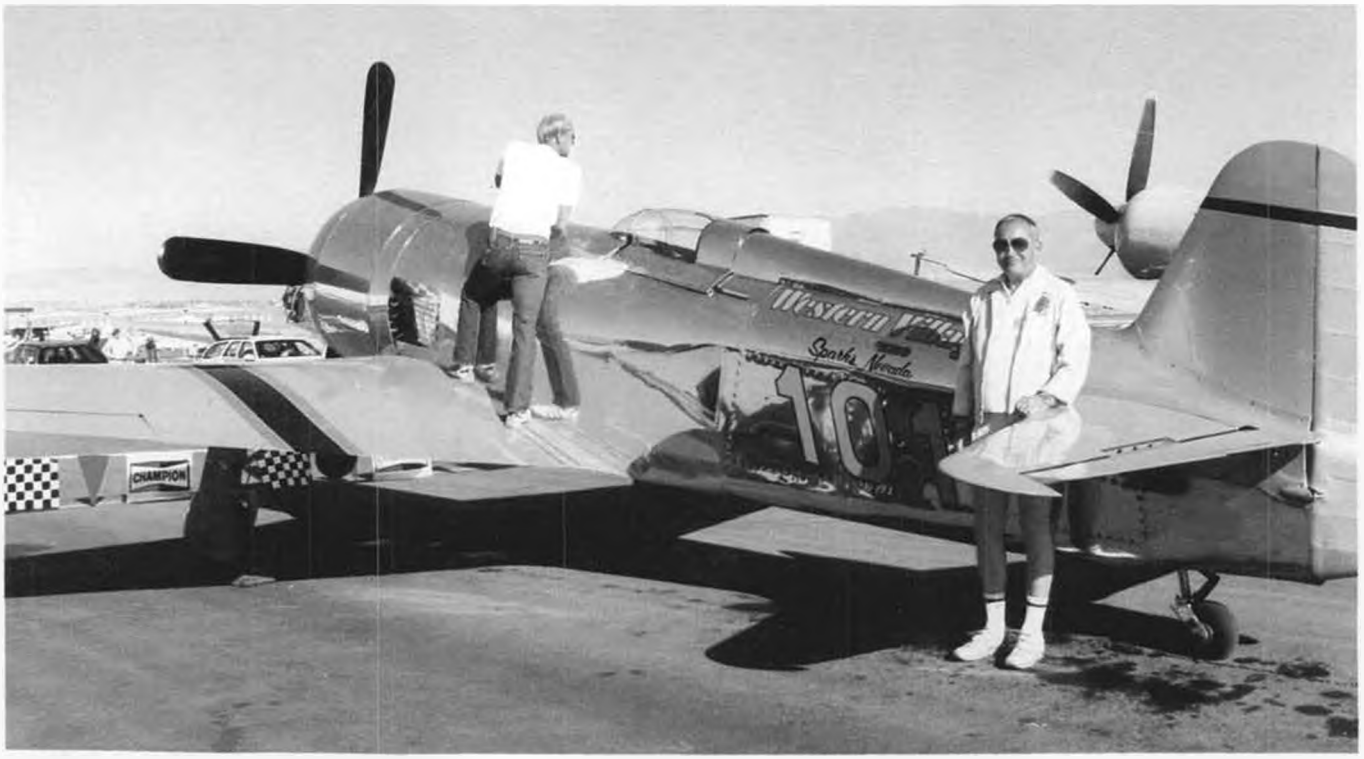
Now here's something of special interest to modelers who are thinking about entering the static model competition. Through a special arrangement with Airtronics, Inc., first place winners in 12 of the R/C categories will also win an Airtronics radio control system! The categories selected for this special prize are as follows: Race Boat, Gas; Sailboat; 1/10 Offroad Car; 1/4 Scale Grand National; Glider, Thermal; Electric, Sailplane; Electric, Sport/Pylon/Pattern; Old Timer; Giant Scale; Scale, Precision Military; Sport/Scale Helicopter; and Sport Biplane. As usual, there are trophies and ribbons to third place in 48 categories, plus Best of Show.

Out-of-town visitors to the show are reminded that the Pasadena Holiday Inn (phone 818-449-4000) and the Pasadena Hilton (phone 800-445-8667, or 818-577-1000) are both offering special reduced rates to IMS attendees. Just be sure to mention the IMS show when you call for reservations. The Holiday Inn is physically connected to the Pasadena Center through the two levels of underground parking garage (it does not clear Detroit-size vans), while the Hilton is just a block away. There is lots of free parking at the huge shopping mall just across Green St. from the center, and lots of space in the underground parking at the Center, although there is a daily charge. Motorhomes and large pick-up style campers are a real no-no for driving to the IMS show. The Pasadena Center is right in the middle of downtown Pasadena, and there simply is no space for motorhomes. The nearest facilities for overnight parking of motorhomes, as of last year, were at least a mile from the Center, and did not include water and electric hookups.

Out-of-towners who plan to fly to LAX or Burbank are referred to Ultimate Travel Inc., 800-346-8166 (in Florida, 305-445-6566) attention Lynn Novak, for special rates on Delta and United Airlines.

The following is a list of exhibitors who have registered for 1990 IMS Pasadena as of mid-October:

A & R IGNITION
ACADEMY OF MODEL AERONAUTICS
ACE R/C, INC.
ADVANCED PRODUCTS/RACE CASE
AEROSPACE COMPOSITE PRODUCTS
AIR PRO
AIRTRONICS, INC.
AMA TRANSMITTER CHECK
AMERICAN JR AIRCRAFT CO
AMERICAN ROTORBLADE MAGAZINE
AMERICAN SAILPLANE DESIGNS
ANTIQUE RADIO COLLECTION
APBA R/C MODEL RACING COM.



Bill Northrop stands by the Unlimited racer belonging to Bob Yancey, of Klamath Falls, Oregon. Averaging 406.046 mph, the highly modified Russian Yak II placed fourth in Sunday's eight-lap Gold Race at the 26th Annual National Championship Air Races at Reno, Nevada, on September 14-17, 1989. A full report on the Reno Air Races begins on page 27 of this issue. Photo by Felix Vivas.

ASTRO FLIGHT, INC.
AVIATION ART GALLERY
B & B MANUFACTURING
B & L RACING PRODUCTS
BELL ROCK INDUSTRIES
BOB GREGORY
BOB HOLMAN PLANS
BOB MARTIN RC MODELS
BOB SMITH INDUSTRIES
BOB VIOLETT MODELS
BOLINK R/C CARS, INC.
BONDHUS CORPORATION
BRIDI AIRCRAFT DESIGNS, INC.
BYRON ORIGINALS, INC.
C & R INDUSTRIAL TOOL & SUPPLY
CANNON R/C SYSTEMS
CARL GOLDBERG MODELS, INC.
CENTURY IMPORT & EXPORT
CHARLIE'S R/C GOODIES
CHEETAH MODELS
COMPOSITE STRUCTURES TECHNO
CONDOR TRADING CO. INT'L
COONEY TOOL INCOPORATED
COVERITE
COX HOBBIES, INC.
CUSTOM ELECTRONICS
D C U
DAVE BROWN PRODUCTS
DAVEY SYSTEMS CORP.
DAVIS DIESEL
DEL ORO PACIFIC MODEL RAILROAD
DR J'S WEST COAST HOBBY WHSE
DUMAS PRODUCTS, INC.
DYNAFLITE
DYNAMIC MODEL PRODUCTS, INC.
E H YOST & CO.
EAGLE MODEL PRODUCT
EAGLE SQUADRON MODELS CLASSICS
EASTERN TOOL & SUPPLY CO
EDELBROCK-DELARA CORP.
ELDON J. LIND CO.
ELECTRONIC MODEL SYSTEMS (EMS)
EOM SYSTEMS
FIBER GLASS MASTER, INC.
FUTABA CORPORATION OF AMERICA
GARBART
GILMER HOBBY & MACHINE, INC.
GLEN IVY PROMOTION
GLIDESIGNS
GM PRECISION PRODUCTS, INC.
GOLDEN AGE MODELS
GORHAM MODEL PRODUCTS, INC.
GREAT PLANES DISTRIBUTORS
HAYES PRODUCTS
HIGH POINT PRODUCTS COMPANY
HIGH SKY
HO PAO ENTERPRISES. TAIWAN
HOBBY DYNAMICS
HOBBY HORN
HOBBY LOBBY INTERNATIONAL, INC
HOBBY MERCHANDISER
HOBBY SHACK
HOUSE OF BALSA, INC.
HURRICANE FANS
IMS HEADQUARTERS
IMS RAFFLE
INDY R/C SALES, INC.
J & Z PRODUCTS
J'TEC
JA - LEA
JED'S SHADE CANOPIES
JOHN POND OLD TIME PLAN SERV.
K & A MODELS UNLIMITED
K & B MFG., INC.

Continued on page 108

ADVICE FOR THE PROPWORN
—By Jake

Dear Jake:

I fly a wide variety of models . . . Quickie 500, 2-meter sailplanes, 1/4-scale, R/C assist antique free flight, etc. My poor little two-door compact sedan just doesn't hack it anymore when it comes to transporting my fleet to the flying field.

I've decided to buy a new vehicle, but I can't decide what kind to get. Some of the guys in the club recommend a station wagon, but others say a van is better. Another faction says a pickup with a truck cap is the way to go.

What do you think I should buy that would be the best possible aircraft carrier?

Mick in Montclair, NJ

Dear Mick:

The U.S.S. Nimitz.

Jake

* * *

Dear Jake:

I red in yore magizine onct that yew shud put dope on silk with terlet paper.

The only terlet paper we hav is Sears catylogs and corn cobs.

I hav tryed both. The dope dont go thrue the catylog stuff and the cobs tare hell out of the silk.

Yew shud try out them dum idees afore yew put them in yore magizine.

Ephram in Wartrace, TN

Dear Ephram:

Sorry about the misunderstanding. When we said that toilet paper was an excellent way of applying dope to silk, we meant the usual kind of toilet paper . . . you know, a handful of leaves.

Jake

* * *

(Ed. Note: Jake and Ephram seem a little off base here. The following letter from Eldon Breazier of Kingman, Kansas offers a much better idea.)

Dear Bill:

The very best material to use in doping silk is well used strips of "Bounce" (used in clothes dryers to soften fabrics). Cut the Bounce in strips by extending the existing slits. It does not shed, will not tear, and does a great job. Make sure to get only well used pieces.

E.B.

* * *

Dear Jake:

Aviation scholars continue to argue about whether or not the Wright Brothers were the first to achieve powered, heavier-than-air flight. Do you have an opinion?

History Buff in Helena, MT

Dear Buff:

The Wright Brothers were probably not the first to successfully fly a powered machine, but their flight was longer, their aircraft was more controllable, and they had a better publicity agent. The latter most likely explains why history recorded the Wright's accomplishment, and why Wilbur and Orville received all proceeds from T-shirt sales.

Jake

* * *

(Ed. Note: The lesson here is: If you plan to do something that's going down in history, be sure to have a photographer handy. That's where Gustav Whitehead screwed up!)

Dear Jake:

I am just learning to fly aerobatics. What is a safe altitude at which to try my first ground loop?

Beginner in Bysalia, OR

Dear Beginner:

Many aircraft are seriously damaged in ground loop accidents every year, especially tail draggers. If your ship is a tricycle gear set up, you'd probably be safe to practice your ground loops at about 300 feet. But if you've got a two wheel gear, it would be very foolish to attempt a ground loop below 500 feet.

Jake

* * *

Dear Jake:

Many UFO sightings have been written off by the Government as swamp gas. Do you think that's the real explanation, or are we the victims of a cover up?

Suspicious in Susquehanna, PA

Continued on page 107

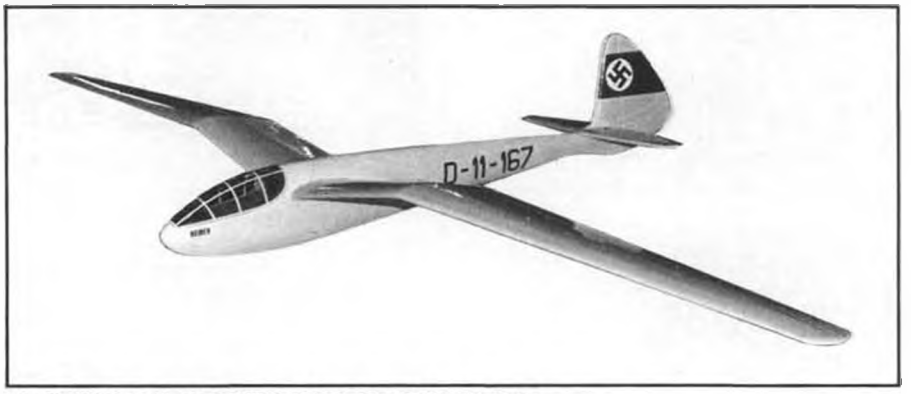
OVER THE COUNTER

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

• Kotzebue, Alaska, on the tip of a peninsula just above the Arctic Circle, sounds like an unlikely location for a model aircraft kit manufacturer, but that is indeed the home of Triton Models, a new company whose goal is to produce a line of R/C scale sailplanes. Triton's first offering is a 1/6-scale, 124-inch span replica of the DFS "Reiher" (Heron), built in small numbers in Germany during 1937 and 1938. At the time the Reiher was considered a very high-performance ship and was flown by some of the best pilots of the era, including Hanna Reitsch.

The kit is not intended for beginners, but intermediate builder/flyers should have no problem with the fiberglass fuselage and fully sheeted built-up wing. All wood parts are hand cut and sanded and the kit includes rolled plans, self-adhesive mylar decals, instruction booklet, molded canopy, and a complete hardware package. Radio requirements are a minimum of three channels (ailerons/rudder/elevator), with an optional fourth channel for spoilers.

Triton's DFS Reiher kit sells for $190 plus $12 shipping and handling, and can be ordered direct from Triton Models, P.O. Box 1157, Kotzebue, Alaska 99752. C.O.D. orders are also welcome; call (907)283-7716 weekdays from 9 a.m. to 7 p.m. PST.



The DFS "Reiher" scale R/C sailplane from Triton Models

Kraft Midwest's "Glowbox" glow plug igniter.

* * *

The latest word from Great Planes Model Distributors is that they are importing four new additions to the O.S. engine line, all of which are covered by the manufacturer's limited two-year warranty.

The new O.S. .25 SF actually accounts for two of the four new engines, as it is offered in both standard (ringed piston in a steel sleeve) and ABC piston/cylinder versions, both of which are claimed to give better power and performance over the earlier O.S. .25 FSR, which they replace. Quoted performance figures show the .25 SF putting out .7 bhp at 16,000 rpm, the .25 SF ABC doing even better with .8 bhp at 18,000 rpm. A weight of 7.59 ounces was quoted for both engines. Suggested retail for the .25 SF and .25 SF ABC is $134.95 and $159.95 respectively.

Next on the list is the O.S. .46 VF-P ABC, a pumper version of the O.S. .46 VF. The pump and #46 carb combination is designed to provide a more consistent, reliable fuel flow while at the same time giving a boost in power; 1.55 bhp at 16,000 rpm are the rated numbers. Going price is $269.95.

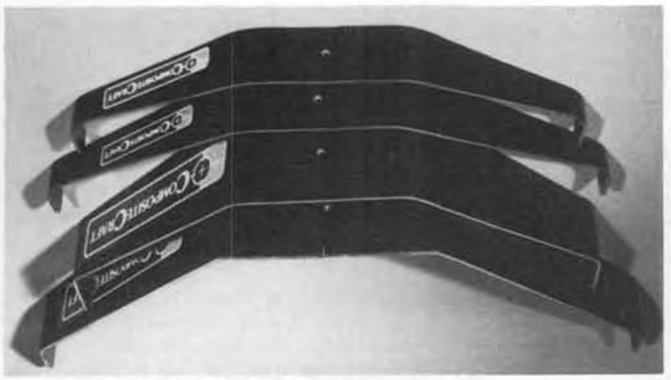
The last O.S. engine we're going to talk about this month is an especially interesting one, in that it is a .32-size helicopter engine equipped with its own recoil starter! It's called the O.S. .32 F-HX w/Recoil and is designed expressly for the immensely popular Hirobo "Shuttle" helicopter—which, it just so happens, is the subject of a Products In Use review article elsewhere in this very magazine. Price on the engine is set at $249.95. Great Planes cautions that the engine is *not* compatible with other .30-size helicopters such as the Kyosho Concept 30.

From Great Planes Model Distributors, P.O. Box 4021, Champaign, Illinois 61824.

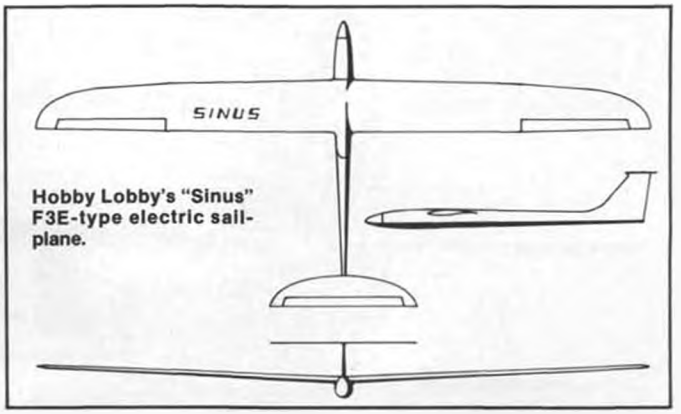
* * *

In his report on the Harbor Soaring Society's F3E electric sailplane meet in this issue of *MB*, Bill Forrey included a couple of in-flight photos of a model called the

Three new O.S. engines imported by Great Planes, from left: O.S. .25 SF, O.S. .46 VF-P ABC, and O.S. .32 F-HX w/Recoil.



Molded carbon fiber landing gear from CompositeCraft.



Hobby Lobby's "Sinus" F3E-type electric sailplane.

"Sinus." The Sinus (as in sine wave) is a product of the Aero-Naut firm of West Germany and is imported into the U.S. by Hobby Lobby. As with most European kits, the Sinus features extensive prefabrication including an epoxy fiberglass fuselage and balsa sheeted foam core wings.

Full particulars about the Sinus kit, including price, can be found in Hobby Lobby's catalog #14. We can't quote any of the ship's technical specs for you here because frankly, our office copy of catalog #14 flew the coop a few months ago and hasn't been seen since. Not to worry, however, you can get your own catalog free merely by calling or writing Hobby Lobby at 5614 Franklin Pike Circle, Brentwood, Tennessee 37027, phone (615)373-1444.

Pre-assembled field box from BP Industries.

* * *

CompositeCraft, Inc. is offering four sizes of molded graphite landing gears, the latest thing in high-tech model hardware. Available in 40, 60, 1/4, and 1/3-scale sizes, with prices ranging from $23.95 to $46.95. For more info, send an SASE to CompositeCraft, Inc., 2400 Sand Lake Road, Orlando, Florida 32809.

* * *

Eric Clutton writes to say that the new DS-4 series 1.49cc (.09 cu. in.) diesel, one of several sizes of P.A.W. diesel engines he imports from England, is the hottest P.A.W. .09 to date. He says the sleeve bearing version, with muffler, turns a 7x6 prop at around 15,000 rpm and that the ball bearing model will do even better, especially when run on a racing diesel fuel. Eric stocks the complete line of P.A.W. engines and spare parts, and operates a full service facility for these engines as well. For a catalog listing his products and services, send $1.00 to Eric Clutton, 913 Cedar Lane, Tullahoma, Tennessee 37388.

* * *

The "Glowbox" from Kraft Midwest is a pocket-size glow plug igniter with two self-contained 1.4 AH ni-cd cells wired in series to provide long life and ample voltage to clear flooded plugs, both 1.5 and 2-volt types. The circuitry uses a semiconductor to control the voltage at the plug; a meter on the box indicates the plug's status. The Glowbox is fitted with a special modular connector that serves both as a charging input from the separate AC wall charger (which is included) and as a hookup for the glow plug clip. A standard "Pozzi-Klip" is supplied with the unit, but if you prefer to use something different, the modular connector makes wiring it up an easy job. Going price on the complete Glowbox unit is $54.95.

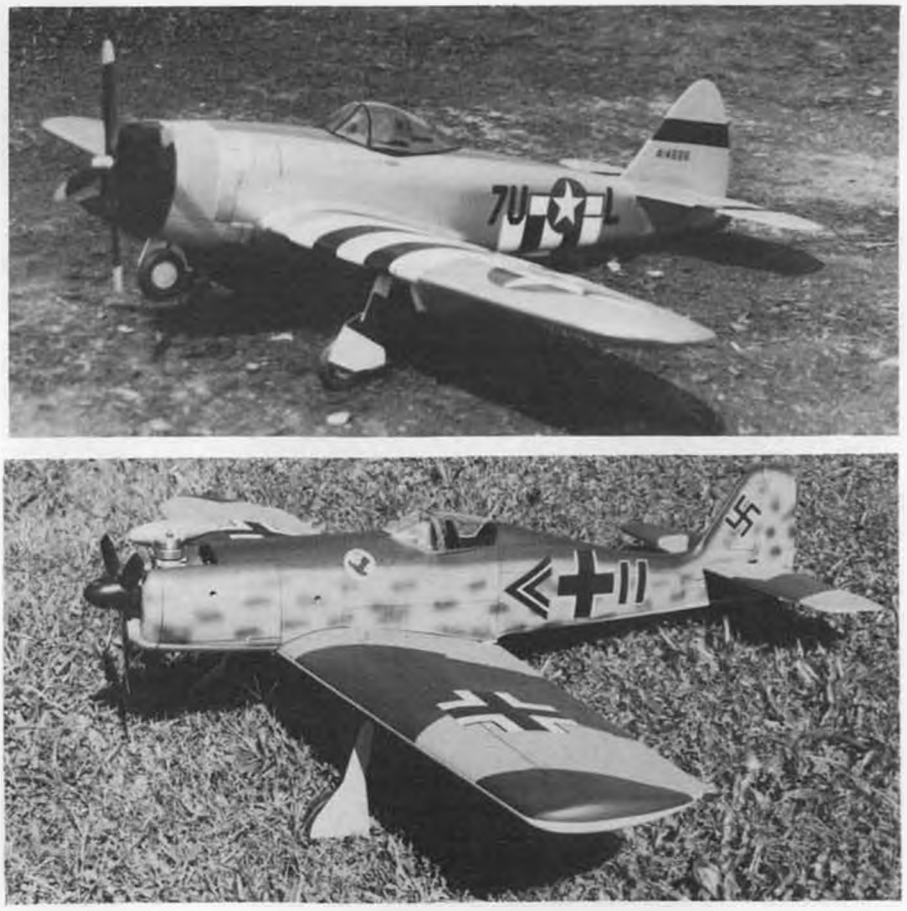
From Kraft Midwest Inc., 115 E. Main, Northville, Michigan 48167, phone (313) 348-0085.

* * *

BP Industries, up in Hubbard, Oregon, produces a variety of high-quality wooden field boxes, a sample of which is the DB-6D box shown in one of the accompanying photos. The box comes as you see it—fully assembled, sanded and ready for paint. Overall dimensions are 22 inches long by 10-1/2 inches wide by 17 inches high. There are six drawers in three different sizes plus a large compartment on top that will hold whatever the drawers won't. The DB-6D box is priced at $89.95.

For a complete catalog describing all of their products, send an SASE to BP Industries, P.O. Box 521, Hubbard, Oregon 97032.

Continued on page 89



P-47 (top) and Focke-Wulf FW-190 sport scale warbirds from Davey Systems.

BIG BIRDS

By AL ALMAN

NEW ADDRESS

Now that I've made my 20th, and hopefully my last move (14 times for Uncle Sam and seven since I retired), it finally dawned on me that each and every move gets screwed up in direct proportion to the amount of planning and coordination put into trying to avoid such complications . . . and, of course, the Post Office seems to enjoy adding to the misery.

Anyhooo . . . here's where to send those letters, cards, photos and newsletters: Al Alman, 1910 154th Street Court South, Spanaway, WA 98387, phone (206) 535-1549.

CARVING PROPS

Back in the "old days" (about the time that Jim Walker was making control-line popular), I'd already messed up an untold number of ten cent kits (Comet and Continental, I think) trying to get them to fly. I was about nine years-old and knew absolutely nothing about balancing, dihedral, alignment and trimming.

But three years later I'd stumbled upon some of these "secrets" and actually got a number of my rubber-powered birds to fly successfully . . . with a few even going OOS (Out Of Sight).

By then I was flying what we now refer to as Old-timers and making my own props and must have done an okay job carving them because half of those OOS birds had a handmade prop up front.

Beautifully built Stinson SR9 Taperwing by Gayle Paxson spans a whopping 10-1/2 feet, weighs in at 42 pounds and performs well with a Sachs 4.1 up front.

A few years later I'd saved up enough to get a Super Cyclone, followed by an Arden .09, and always flew them (when the ignition would work) with my own large diameter, low pitched props. A third engine, a GHQ acquired in a trade, made some noise while on my test stand trying to pass itself off as a real engine . . . but eventually found its niche as a superb paper weight.

Though I haven't tried my hand at carving props since the mid-forties, I've found that a surprisingly large number of modelers are keeping this art form alive.

Another Stinson, this one a Quadra powered 108 Voyager, is Tom McQuiston's dream plane. Built to 3"=1' scale from Sid Morgan plans, the model has a 105-inch span, came out at 17 pounds.

You'd think that with a plethora of manufactured props available, there wouldn't be a need for any hand-carving . . . but often guys want to mate an oddball sized prop to a particular engine/airframe combination, or just simply enjoy the satisfaction of turning out a beautiful and efficient propeller.

One of these prop makers is Warren Behymer, from Wilmington, Ohio, who writes:

"Enclosed is a picture of me and my Nosen Cub. The old Quadra swings a scale-sized 18x6 prop. I tried an 18x6-10, but like the 18x6 best.

"I have trouble landing. The gear gets bent and wood props get broken often so I carved several props out of walnut and oak (used wood rasps and a jig for most of the shaping). They worked just fine.

"Many years ago I carved props for an O&R .23 and a Brownie, mainly because I couldn't afford to buy them. Was very surprised that my planes flew with those props. However, carving an 18-inch prop is a lot more work."

Warren also mentioned that he's basically a 3-channel pilot by choice because, as he put it, "that 4th channel seems to get me in trouble." He's been using the Jomar Aileron/Rudder Coupler in his BIG Cub and finds it most suitable for his needs. He added that . . .

"Almost all my planes are set up with three channels which I like better than four channels. It's easier for me to handle and that means much more enjoyment every time I fly. I also have a Kadet Senior, a couple of old timers and a few gliders."

Warren represents a large number of pilots who prefer slower, more stable three-channel aircraft, sometimes because age has affected their reflexes and coordination and sometimes just because they happen to enjoy low-stress, relaxed flying. You gotta remember that we're not all hot-doggers and that there's something for everybody in our hobby.

BIG ELECTRICS

I'm often asked why I haven't gotten into electrics by now.

Well, like so many others, I've seen my share of the early wimpy electric planes . . . ugly, underpowered aircraft trying to stag-

ger up to treetop height and often not even getting that high. So these poorly planned and executed attempts turned me off (and affected most other observers the same way).

And I will admit that these past two years I've seen one helluva lot of fine looking and flying "B" birds . . . everything from motor-gliders to scale Classic beauties, WWII heavy iron and F-A-S-T racers.

But here's what's really kept me from jumping into electrics, and I suspect that many R/Cers share these feelings, too:

1) It still appears to be very much of a tinkerer's art (I had enough tinkering 30 years ago flapping/flopping a "bird-cage" of wire around on the tail through a crank controlled by a Mighty Midget Motor).

2) I'm intimidated by the idea of having the concentrated weight of 24 or 28 cells (for a 60 Cobalt) sitting there in the fuselage just waiting for a crash or hard landing so they can wipe out the whole front end of the plane. And how do you secure this mass of batteries properly without adversely affecting their cooling?

3) Even though I've already got so much money invested in two and four-cycle engines, props and support equipment, I'd still have to spend a bundle on a Cobalt motor and power system (even more for a second battery pack), a throttle control, a good charger, and good connectors.

4) And what do you do when one or more drive batteries fail? I don't like the idea of having to spend time messing around with two dozen cells trying to find the bad one(s). And if I do replace them, am I wasting time, effort and money by putting these two brand new cells into a used pack that is already showing signs of going down the tubes?

5) The reluctance to have to learn something new, i.e., the care and feeding of this completely different type of power system.

And then there are the guys who insist that BIG Birds should be flown only with REAL engines . . . that you can't have power without noise. Sounds like macho talk to me.

(To well-informed electric power fliers: Send your letters to Al . . . address above . . . I don't agree with him either! wcn)

NOISE

Of course you can't talk about electric-powered planes without admitting to the obvious . . . that they are QUIET. And as noise is our worst enemy when it comes to keeping flying fields, electrics may play a key role in the future of model aviation.

But I'm by no means ready to get rid of my four-strokers yet. When run with low nitro fuel and propped with BIG blades to bring the rpm down, these engines, even at takeoff power, are perceived as being relatively quiet . . . and when flying 300-400 feet high at a reduced throttle setting, they are unobtrusive and blend into the background noise. I sometimes have to "goose" the throttle a tad to make sure that my Saito's still running.

And two-cycle engines don't have to be the scapegoat either. By running them with BIG props and a throttle-coupled spark advance using a no-nitro fuel, you're well on your way to quiet running. Add one of the newer, really effective mufflers now available and you're there.

Don't know if he drew his own plans or used someone else's, but Jerry Kavis did a fine job on his scratch-built 1/3-scale Laser aerobatic machine. Quadra 50, 98-inch span, only 19 pounds.

A few years ago at The Puget Sound Rocs 5th Annual BIG Bird Bash, Bill Carpenter (he's the guy who makes CH Electronics Ignition Systems and Throttle Coupled Spark Advance) demonstrated how easy it was to achieve QUIET without any apparent sacrifice in performance.

One of his favorite birds, a Roadrunner, flew well with a 120 swinging a 15x8 . . . and it was fairly quiet. He then replaced the 15x8 with an 18x6 and flew the plane through the same maneuvers.

Neither Bill nor the Roadrunner appeared to have any problems performing those same maneuvers . . . but even more surprising was that I could hardly hear the engine when sitting just behind the spectator fence (he was barely a hundred feet away). And this was at ground level. When Bill took the RR up to about 400 hundred feet I couldn't hear any engine noise at all.

I'm especially sensitive to noise pollution at the present time because after six years of carefully controlled noise abatement at our field (no two-cycle glow operation under 1.08 cubes was allowed and all engines had to have an effective muffler), a senior citizen housing project was built next to our site. It was the beginning of the end.

And so we started to look for a new flying site. After a few months of dedicated searching we'd come up with no less than three good possibilities . . . but before we could choose any of these the Good Flying Field Fairy dropped another, even better, field into our laps.

Not wanting to anger this wonderfully friendly fairy and because the reduced noise level is so easy on the ears, we voted to continue the same engine restrictions at the new field.

Those months without a flying field were very uncomfortable. Some of our guys joined another club in order to fly, but we all knew that it was only a matter of time . . . because a club without a flying field can't grow or even stay healthy.

THOUGHT OF THE MONTH

From Fritz Bruning, the BIG Elf of the Olympic Black Forest, comes this profound observation; "All models are built terminal!" •

A Quadra 50 powers this sleek Knight Twister Imperial, built by Charles Singer from his own plans. The original Knight Twister design dates back to the 1930's, was way ahead of its time.

"I ain't got it!"

By BILL NORTHROP

MESSAGE FROM JOHN WORTH:

As President of the new (established in early 1989) Vintage RC Society, I'm delighted to hear that *Model Builder* magazine has initiated a column about old-time RC. Noting that membership growth in the Academy of Model Aeronautics has doubled in the past ten years (actually six times more since 1969!), with practically all new members indicating that RC is their main interest, it is obvious that the vast majority of current members are involved in flying radio controlled model aircraft. It also follows that most are newcomers to RC.

This in turn means that most probably know very little about what RC was like twenty or more years ago. Current equipment is so good and so reliable it would be easy to assume that it was always that way. But those of us who got involved with RC before the '60s know otherwise. In fact the stuff we used back then was so crude it's a wonder we ever got to where we are!

In describing vintage RC to newcomers I tell how some of the old systems worked and they're amazed. They take proportional control for granted, yet I remember when we used to argue about whether such a system would ever be any good. We started with bang-bang controls . . . push a button and the control surface would immediately go hard over to full travel, typically with instant return to neutral upon release of the button.

Imagine simulating that with today's equipment . . . try flying where every movement of the control stick is full deflection, with a sort of proportional control resulting from how long the stick is held full over, or how rapidly the stick is moved back and forth between full deflection and neutral!

In fact we can't really simulate such a control system because our current actuators (servos) are too slow! Back when we used escapement type actuators, full throw control was practically instantaneous. That was necessary *(Actually, there was no choice . . . that's the way they worked! wcn)* because we needed a lot of control in a hurry, to get a model response, but we didn't hold the control full over very long. So we actually pulsed the control one way or the other, with some systems actually waggling the control surface back and forth (too fast for the model to follow), until we stopped it in one fixed position or another.

It would be interesting to demonstrate to today's RCers how we flew then. One way would be to provide push buttons on the transmitter control box to give full deflection of the control surface. It would be quickly obvious that the buttons would be simply beeped or blipped with momentary pushes . . . holding a control full on for more than a second or so would probably result in a crash. Simulation could also be tried by simply banging the normal control stick to full throw (even so, the fastest of today's servos could not match the instantaneous speed of an escapement).

We learned to fly such systems with what we called 'nervous' proportional control . . . going to fu!l throw, watching the model respond, then returning the control to neutral when the model moved as far as we wanted. We got pretty good at it, too, so that a good bang-bang flight appeared to fly smoothly (mostly because the model damped out the quick full throw motions).

Don Brown, the Quadruplex man, at a Delaware R/C get-together circa 1960. Yes, the model is the famous Ed Kazmirski "Taurus," built from a Top Flite kit.

In short, we did what we had to in those days, with the unsophisticated equipment we had to work with, to get a model to fly a reasonably controlled flight path. We enjoyed doing it because it was a challenge. And there was tremendous satisfaction in making it all work, so that one reasonably good flight on a weekend was worth all the finicky fussing it took to get it.

The basic difference between then and now is that the radio of today works so well

WCN's "Great Lake Strainer," about 54-inch span, for .19 to .35, built around 1958. Our test-bed, it flew on rudder-only, then R.O. plus kick-up elevator, then Galloping Ghost, then 6-channel reeds (that's 3-channel today), then 3+1 Orbit proportional. Final disposition is unknown. We still have rough plans (that's all there ever were!)

The "Wild Child" was a great performer on R.O. with kick-up elevator (great for loops and flared landings). All-sheet balsa construction with a Jedelsky-type wing. Power was a screaming Cox RR-1 .049, which came with a large tank. Model was eventually published in *RCM*; Don Dewey built one or two. Note rudder enlargement.

we hardly think about it. So we concentrate on the flying. Back then it was sufficient to have the radio work well enough and long enough to get in an occasional successful flight. A byproduct of this is that back then it was extremely important to have a model which was stable enough to fly by itself (essentially a free flight design) when the radio didn't work. This also meant that it was important for the radio to "fail safe" so that lack of operation merely meant that the model would continue flying without control inputs. Now we're able to fly (if the pilot is good enough) some aircraft designs which would surely crash if not prevented

The R/C scoreboard at the 1963 AMA Nats at Los Alamitos NAS, California. Class I was rudder-only, Class II was whatever you could get from one channel, and Class III was multi. Recognize any names?

from doing so by skilled maneuvering.

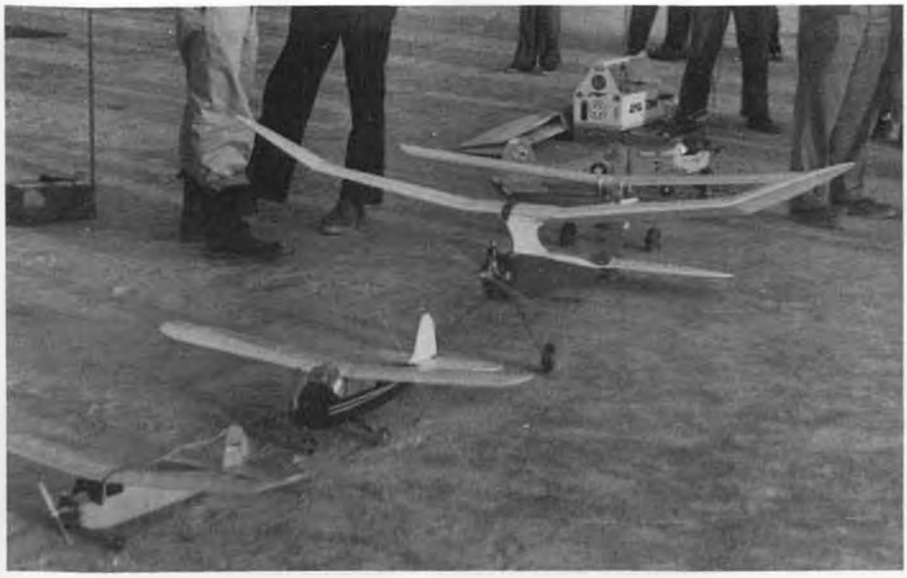
The natural result of how things were back then was that we learned about aerodynamics and how to trim a model so that it would fly safely when not being controlled. Or, if our piloting skill was not yet well developed, we could get out of a bad flight situation by simply letting go of the controls . . . the model's stability would cause recovery into a safe attitude.

Back then we took care to adjust (trim) a model so that it would fly without radio control. We didn't dare launch one that had not been properly balanced and glide tested. Now, with powerful control systems and ample engine power, we can fly many unstable or poorly adjusted models. That's okay until or unless the radio quits working or is hit by interference.

A couple of years ago I got a big kick out of losing one of my models (an electric powered deBolt Champion design). What happened was that the bottom nose hatch, held on by rubber bands, came loose in flight and the receiver battery pack fell out. The radio simply stopped working at that point, which happened to have the control set for a gentle circle, with the motor off. The model flew on in the grasp of a thermal and it disappeared into the clouds.

About a month later I got the model back (from about ten miles away). It was unharmed and with a new set of receiver batteries it has been flying well ever since. With a more modern and less stable design I probably would have picked up the pieces within a mile of where the batteries fell out.

What does all this mean? I guess it simply



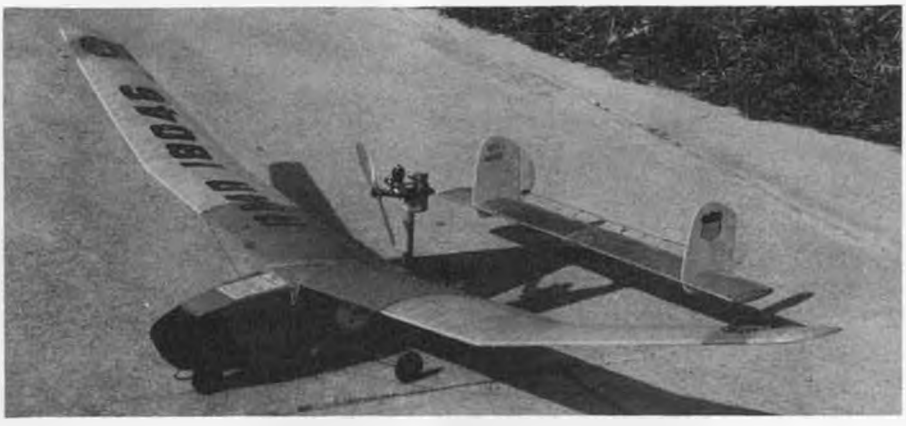
Part of *the* flight line, circa 1956, at a Delaware R/C Club get-together. So you think R/C O.T. started in the early '70s? Note the Goldberg Sailplane in the lineup.

is that RC today is different from what it used to be, but that doesn't mean that old was bad. We've got reliability in radios today (if we keep the batteries working) which is great. But we crash a lot of airplanes because many are difficult to fly. Maybe a happy medium is to fly the old model designs with modern radios. It's a good combination for safer, more relaxed flying.

* * *

What John says in the last two sentences is quite true. Proof of that is the popularity of radio assisted old time free flight models, which are, in all probability, the best and truest R/C trainers for newcomers who do not have access to a flight instructor. Too bad there aren't any ARF R/C Old Timers . . . Ahem! These models, by intent and design, were inherently stable, and fully capable of taking care of themselves in the air, once properly adjusted. Their only

Continued on page 89



Author's Jasco "Floater 72" converted to rudder-only escapement. Twin rudders were used to avoid the prop blast (breeze is more like it!) of the McCoy .049 glow. Actually won a club contest in about 1958. This was the first airplane we flew on six meters, back in 1962; a Kraft single with 1AG4 hard tube, Bonner SN escapement, left *or* right from neutral. You had to remember!

The original "Square Hare," designed by WCN, for .15 to .19 engines. First flew on pulse rudder about 1959-60, then Galloping Ghost (rudder and elevator). Plans first appeared in a 1962 issue of *Air Trails*, then again in *Model Builder* (it's plan no. 6751, $8.50). All sheet balsa construction.

R/C SOARING

By BILL FORREY

• Every year the Central Valley R/C Soaring Club hosts what many consider to be the premier west coast sailplane thermal duration contest. October 7th and 8th, 1989, marked the 16th year for this event which is held in Visalia, California.

Contest Director Marchall Searcy, Asst. CD Dell Henry, and the entire CVRC club are to be congratulated for yet another successful soaring and social event!

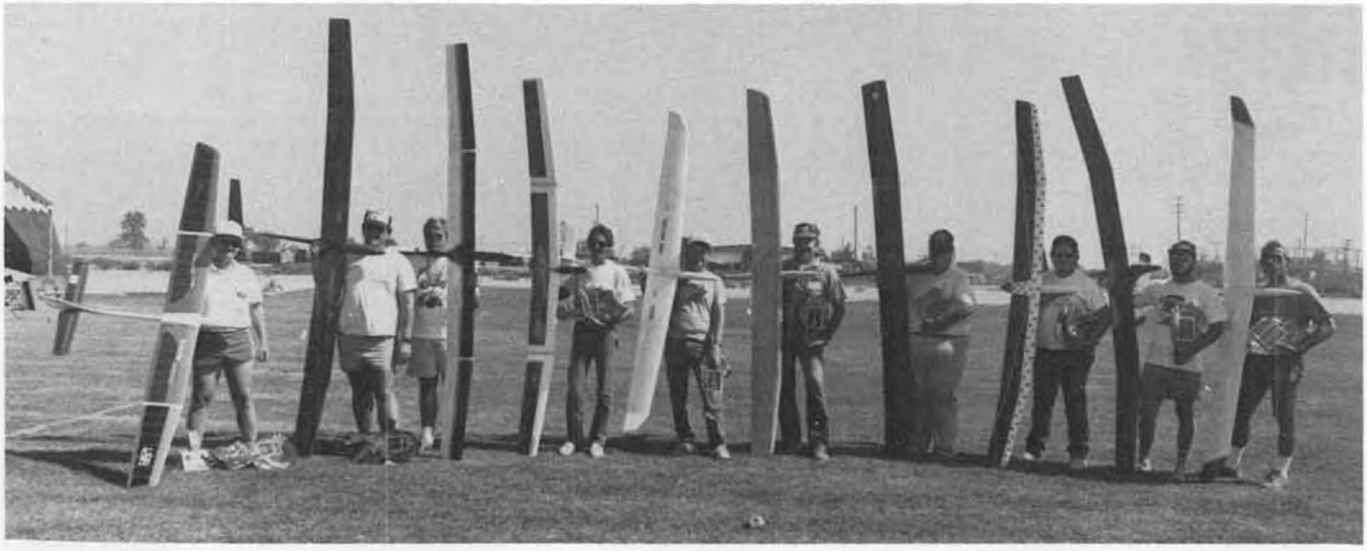
The question is often asked, Why is the Fall Soaring Festival such a huge success every year? I'm sure the complete answer is more than I can reason. However, the FSF does have the following going for it: a totally dedicated club; good contest management; a truly massive raffle of modeling and household products; free on-field camping with water and porta-potties; a first class, catered outdoor barbecue Saturday night; live entertainment before, during, and after Saturday night BBQ; free George Brothers winery tasting Saturday night; on-field breakfast and lunch provided; and a central California location. In short, it's a party!

To give you an idea how popular the FSF is, it is by invitation only. The invitation goes out to past participants (or anyone who gets wind of the event and asks to be invited). In the entry form is a mailing date, in this case August 1st. No entry would be accepted before 8/1/89. Well, 182 entries were post marked either 8/1 or were received by the CD with garbled PO dates at the same time as the 8/1 postmarks. The traditional cutoff number is 150 entries. After eliminating entries on overcrowded frequencies, no-shows, and cancellations, 154 flyers participated in the FSF! For a two-day contest, the FSF rivals the popularity of the AMA Nats!

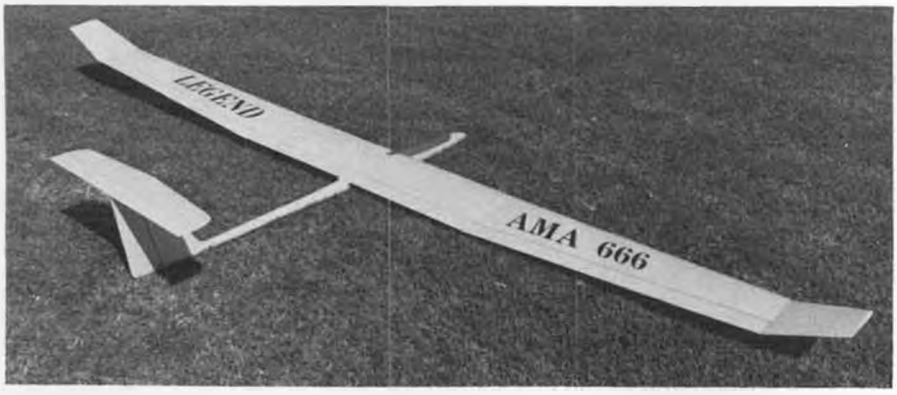
The thermal tasks at the FSF are always pretty standard fare: three and five-minute precision durations, fifteen-minute add 'em ups, etc. However, to help avoid ties, a difficult landing bonus is added. Triangles, narrow runways, sectioned runways, they've tried them all. This year was no exception. A 4 X 20 foot runway sectioned into five equal squares was the target. Maximum score came from landing in the center square, a 40% bonus of your flight time. The exception was round two on Saturday (the 15-min. add 'em up round) which was a 20, 30, and 40 point straight bonus.

The way the privately owned (CVRC leased) industrial lot is set up, launching must be to the north. Landing approaches must be from the east. Unfortunately, this usually works out to down wind or cross wind vectors on launching and landing. Such was the case for most of the event. It was a tough contest!

First place winner, Fred Weaver, strikes a pose with his beautiful redwood burl clock-trophy in one hand and his trusty Cumic in the other. This year marked Fred's third win at the Fall Soaring Festival.



The top ten finishers in the 16th Annual Fall Soaring Festival, with plane and radio used, from left: 1st, Fred Weaver (Cumic, Spectra 7SP); 2nd, Randy Spencer (modified Meteor, Futaba FM); 3rd, Chris George (original, Vision 8SP); 4th, Carl Anderson (stretched wing Gemini MTS, Conquest); 5th, Bob McGowan (Falcon 800, Module 7SP); 6th, Jay Siren (Cumic Plus, Futaba FG); 7th, Ben Matsumoto (original, Vision 8SP); 8th, Scott Richards (Cumic Plus, Conquest); 9th, Tom Copp (original, Vision 8SP); 10th, Steve George (Falcon 880, Vision 8SP).



The Legend, flown by Tim Renaud, is the prototype for a new Airtronics kit. Final version will be smaller, but will have the same overall look. Wing has slight polyhedral, flaps and ailerons.

Four winches with retrievers were provided and new line was spooled up on each. After the initial weak spots were found and retied Saturday morning, the winches performed very well the rest of the contest.

WHAT WAS FLOWN AT THE FSF

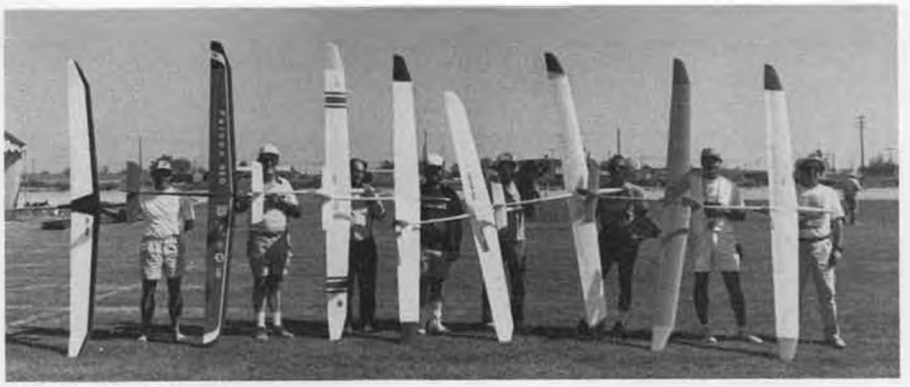
Blow-by-blow contest narrations tend to be pretty dry reading. Judging from my readership feedback, what most soaring pilots want to know includes what sail-

planes are currently in favor with the top fliers, what other designs were interesting, and what kinds of neat technical "tricks" were in use either in the aircraft or in the radios. The idea here is to learn something new and benefit from it somehow.

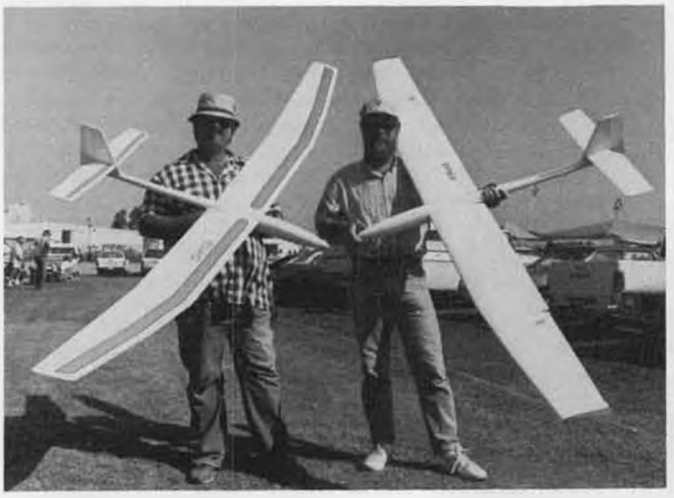
The remainder of this report will concentrate on the models. With 154 entries and a wide variety of aircraft flown, this is a most difficult task. Most of this report will have to be pictorial. Text will be limited to that which was the most impressive.

FLITE LITE COMPOSITES

By far the most numerous of the new production kit sailplanes was Mark Allen's Flite Lite Composites Falcon 880 and its Standard Class brother, the Falcon 800.



Team Falcon! Taken after the meet, this incomplete group photo shows most of the Falcon 880s flown at the 16th FSF. Fifth from left is a 100-inch Falcon 800. Excellent soaring machines!



Gary Anderson (left) and Tim Dolan with a pair of Pulsars from American Sailplane Designs. One is polyhedral/flaps, the other ailerons/flaps.

A Falcon 880 gets the old heave-ho from Dean Aldinger. Our columnist got in some stick time on this flight and now he's hooked on Falcons.

After the close of the contest and raffle on Sunday, a group of Falcon flyers was formed and photographed. Although at least one Falcon 800 flyer had already left for home, there were still eight remaining for the shot. Of the nine known Falcon flyers, seven flew 880s and two flew the Falcon 800.

I asked several contestants who flew Falcons what they thought of the design, and every one of them was very happy with it. Daryl Perkins, of Pasadena, recently won the Hans Weiss Memorial Slope Race flying a slightly modified Falcon 880. It had a 1.5 oz. fiberglass finish over the balsa skins instead of the more common MonoKote. It also had arrow shaft hinges instead of tape hinges.

Raffle prizes were everywhere! And these are only the radios; also on hand were a ton of kits and other merchandise. One of the many reasons why this contest is so successful.

Daryl had this to say about his Falcon 880: "It's the best flying plane I've ever had. It's fast, it floats, it's easy to thermal. It's the easiest plane to fly of all that I've ever flown. It has no bad habits, it launches easily . . . I love the airplane. Everyone I know who has one loves it. I'm building a second one right now, and I've never built two of anything in my life!" Comments like these were typical.

I asked to fly Dean Aldinger's stock Falcon 880 Saturday when the field was opened to fun flying. Dean handed me the transmitter with about 200 feet of altitude left. It was an absolutely thermal-dead, early evening sky. It just cruised around the field, sinking so slowly that it was hard to tell if it was sinking at all.

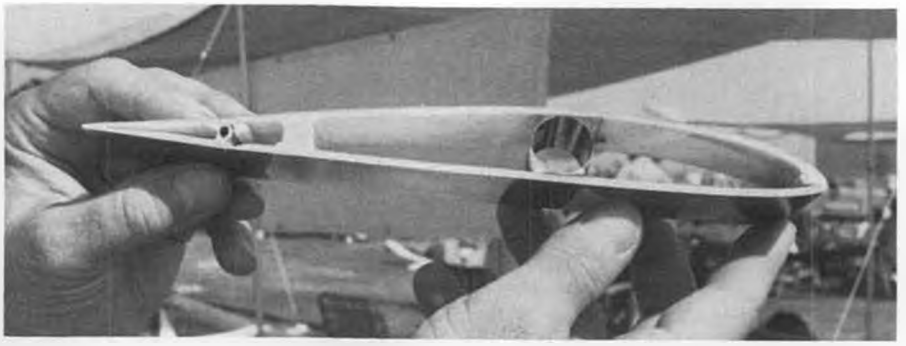
I didn't find any lift, but I wanted to see how it circled (as if it were in lift). A little left aileron command (with coupled rudder function) had it banking, then a little up elevator . . . and it was circling almost like a polyhedral ship. I'm thinking this is the best spiral stability I've ever seen in an aileron ship. Only rare, slight opposite aileron corrections are necessary to keep it circling at the same bank angle. I'm thinking maybe one click of opposite aileron trim would fix this, but it doesn't bother me enough. There is no tendency to tip stall at all. Nice!

I felt so confident about handling this aircraft that I asked Dean if he would let me land it. He said yes, so I started my pattern.

George Gillberg and Vern Oldershaw teamed up to fly a pair of tailless sailplanes designed by Vern; this one's called the "Big Wonder." Top and bottom dive brakes still need pitch compensation on landings.

I planned to fly a long down wind leg and a short base leg because this would leave me with a nice, long final approach. (Dodging the CD's anti-landing-practice barriers might be a problem: cardboard boxes, foam block barriers with fishing rod blanks sticking up, etc.)

On the down wind leg I slowly feed in flaps. It slows into a very controllable descent. Dean says, "You'll land short," so I bring them back up. I turn final and feed in flaps again. Pitch compensation is almost perfect; it needs a little more down ele-



Left: George Paige flew his Yahoo, a Mike Forster design with high-tech F3B features. Wing cutaway (above) reveals the unique spirally wrapped carbon fiber and fiberglass wing spar, and the glass/Rohacell/glass laminated sandwich wing skin. More details in text.

vator mixed in; ailerons still responsive. Halfway home . . . I ease off the flaps, it sinks a little, regains speed quickly, and flattens out. Only 50 feet left, full flaps . . . a little down elevator, retract flaps NOW . . . touchdown! Grass flies out from the shark's teeth skid. It stops in about a two-foot slide about 12 feet away, right on target. VERY NICE! I am impressed. (Thanks a lot, Dean, now I'm hooked!)

(I'm very sorry if you think I'm going overboard on this Falcon 880, but it really IS that good.)

Mark Allen says he built and tested five prototypes before he decided on a final design for the Falcon 880. One of his design goals was to get the handling as close as possible to a polyhedral ship, yet still have the more responsive ailerons for roll control. He has succeeded.

If it looks familiar, the Falcon 880 has been published as a three-view on the cover of the March-April '89 NSS Sailplane magazine, and as a mini review by Ray McGowan in *R/C Soaring Digest,* July '89. I've also recently seen it in *Model Aviation* magazine. It has been out about a year now.

Here are a few design specs on the Falcon 880: 112 inch wingspan (100 in. for Falcon 800); 880 square inches of wing area (830 sq. in. Falcon 800); 7.86 average wing chord; 14.25:1 aspect ratio; Selig 3021 airfoil from wing root to tip panel; Selig 3021 to 3014 transition from root of tip panel to wing tip; flying weight approximately 60

oz.; wing loading approx. 10 oz./sq. ft; wing planform is a modified Schuemann; and wing rod size 11/32. Functions are flaps, ailerons, rudder and elevator.

The construction techniques are not really high tech, but rather mid tech. The pre-joined, molded fuselage is fiberglass with Kevlar in the tail boom for strength. It has a high quality fiberglass fuselage with removable fiberglass canopy. The vertical fin is part of the fuselage. The quality of the glass work is excellent.

The Falcon's wings are lightweight blue foam core. You can order the Falcon one of two ways: Deluxe Version, or Basic Version. The less expensive Basic Version includes the cores and core beds (full chord length), balsa sheeting, full hardware . . . etc. The Deluxe Version comes presheeted with spruce and carbon fiber spars.

The Falcon's horizontal stabs are built-up, all moving types, and are quite conventional.

Contact Mark Allen for ordering details: Flite Lite Composites, P.O. Box 311, Windsor, CA 95492, (707) 838-3390.

AIRTRONICS

Tim Renaud and Ed Holder representing Airtronics were at the FSF flying two new kit prototypes. Tim flew the new Sportsman F3B or Unlimited Class AMA sailplane called the Legend. Ed flew the smaller AMA Standard or Unlimited Class thermal competition ship, the Image. Both feature a more conventional, less expensive, built up wing structure as compared to the more labor-intensive foam core.

Left: Tom Overton flew a Bob Sealy Ultima to a very good 17th place. The Wil Schuemann influence is very evident in this design.

The Legend comes with a molded fiberglass fuselage designed by Mark Allen. Like the Falcon 880, it too has a removable fiberglass canopy and Kevlar reinforced tail boom. Another similarity between the Falcon 880s and the Legend is the airfoil: Selig's 3021, the "improved Eppler 205." The Legend also uses the widely heralded "Schuemann" wing planform of straight trailing edge and multiple swept wing

Second place winner, Randy Spencer, displays his aileron and flap modified LJMP Meteor. Looked great in the air.

Mary Holley flies a unique Sagitta-Gemini built by Harvey Jenkins, and flies it well. Mary took 1st in a recent SCSC contest in the Sportsman class and currently ranks 9th overall. She's tough competition!

Jim Keller and Harvey Jenkins with their Osprey 100. Flies nice, looks great, and can take spear landings pretty well, right, Jim?

The 124-inch prototype "Winsome" gets a launch from designer Larry Jolly after the contest on Saturday. Final version will be smaller and lighter.

panels.

The Legend is actually both a polyhedral ship and an aileron ship, because at each swept wing panel is more dihedral. The overall effect is a near elliptical planform with a near elliptical upwards curvature. It is visually quite attractive!

The Legend has a short, constant chord main panel which spans across the fuselage in one piece. This allows the main panel to be a simple, bolt-on affair with easy access

The Chameleon SE is a Falcon 880 influenced original design by champion slope racer, Jerry Arana. Jerry uses a few neat tricks that will be fuel for future columns.

to the fuselage interior. The spruce spar caps in the main panels are themselves capped with .014 carbon fiber. Inside this panel are mounted either one or two servos to operate right and left flap surfaces.

Two servos were mounted in the prototype Legend's main panels to help Airtronics experiment with different mixer gains using the Vision 8SP radio. Tim had the flaps working as inboard flaperons to increase roll rate.

The tip panels are removable, and because they are so far outboard of the fuselage, smaller, lighter wing joiners can be used. The aileron servos are mounted inside the tip panels near the root. The aileron surfaces are as broad as the flaps and remain constant chord, even though the tip panels taper.

The Legend's T-tail is fastened to the fiberglass fin with two screws. The fixed stab and moveable elevator design allows for simple cable push rod actuation with short control horns.

The Legend is a big, three-meter span sailplane (119 inches) with something like 1,050 square inches of wing area. The wing loading is around 10.25 oz./sq. ft. at a flying weight of only 75 ounces.

The Legend uses the Vision radio for the following functions: aileron to rudder coupling; three-position flap presets (launch, thermal, speed); crow mixing with elevator pitch compensation; full-span camber changing flaps (4) with inboard flaps deflecting more than outboard flaps for washout effect, also with pitch compensation; full-span ailerons (4) with outboard ailerons deflecting more than inboard for extra roll rate with less drag; and aileron differential throw.

The size and speed of the Legend is such that it appears very big and graceful in the air. It looks like it's just floating along, when in reality it's really moving quite fast.

With its Legend, Airtronics is aiming more toward the sportsman multiple task

Ed Holder and the Airtronics "Image" sailplane prototype. New wing now sports an S3021 airfoil. Should be released soon.

Always a top contender, Joe Wurts shows us his latest and greatest (to date) 100-inch sailplane. He says the HQ 2.0/9 airfoil performs the best so far of all he's used.

glider market than the pure AMA thermal glider market. Because of this, the final prototype may end up a little smaller in span and area (113 in. and 1000 sq. in.). This will make it a little faster on the controls, and a little faster in overall speed. For the advanced contest flier, this should have greater appeal. We shall see.

Airtronics' other kit prototype seen at Visalia was the Image. The first prototype was unveiled in this column two years ago in my coverage of the 1987 FSF. That plane's modified Sagitta airfoil wasn't performing as well as hoped, and a new wing was designed and built. The new wing design looks and flies much better. Contact Airtronics for more info.

LARRY JOLLY MODEL PRODUCTS

Larry Jolly flew the contest with his new

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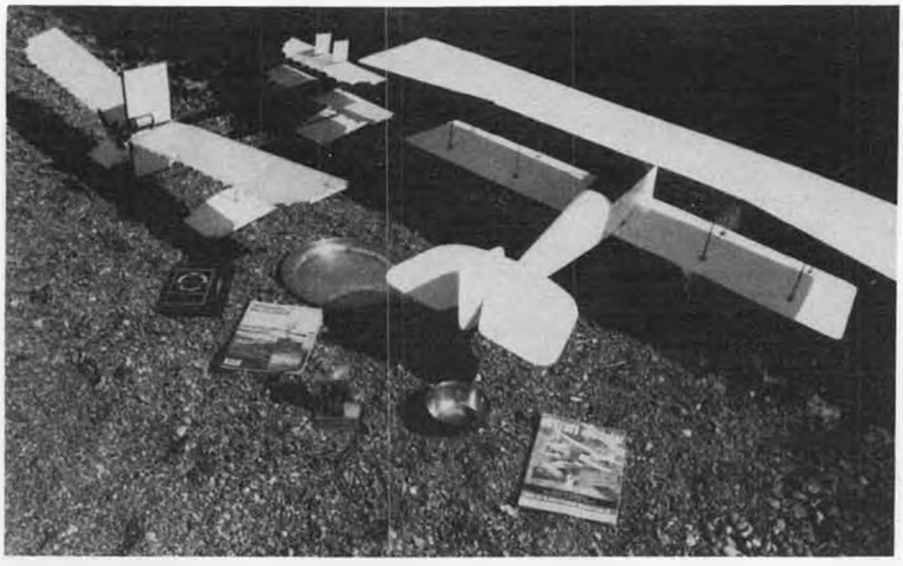
MODEL DESIGN & TECHNICAL STUFF

By FRANCIS REYNOLDS



Left: Two of our columnist's "antique" seaplanes, the 1910 Fabre Hydravion (far left) and 1916 "B&W" biplane, shown with their trophies and the magazines that presented their construction articles. The B&W appeared in *AAM*, while *Model Builder* featured the Hydravion in the March '84 issue (plan no. 3841, $21.50).

OLD AEROPLANES NEVER DIE

The other day I was approached by a fellow who wanted to buy a couple of my antique scale R/C models to hang from the ceiling of a restaurant which is being redecorated. I hadn't previously considered selling the models, but we struck a deal. This transaction brought forth some nostalgia and other emotions. I had scaled and scratch built both models, flown them quite a bit, and retired them to hangar queens on my shop ceiling many years ago.

Both models are seaplanes. The older model of the two (but the younger airplane), is the 1916 "B&W" twin-float seaplane, Boeing's first airplane. I wrote a construction article on this model which was published in the March 1970 issue of *American Aircraft Modeler* magazine. We even made the cover with a photo of my daughter Pat holding the B&W.

The younger model and the older airplane is the 1910 French Fabre Hydravion. This was the world's first successful seaplane. It took off from a lake near Marseille a year before Glenn Curtiss got off the water at San Diego.

This airplane was a canard, had three floats (two behind and a steerable nose float), used wing warping in lieu of ailerons, had a monoplane main wing aft but biplane canard surfaces and twin rudders forward. The lower canard was fixed and the upper canard was controllable in pitch. The pilot, who sat on top of a bare beam fuselage, controlled the forward rudders and elevator with handlebars and controlled the wing warping by foot pedals. The engine was one of the first Gnome rotaries.

The plane flew, and so did the model. *Model Builder* published this one for me, in the March 1984 issue. Again we made the cover. Bill Northrop can still probably *(Definitely . . . wcn)* sell you a set of plans, if you are interested. *(We also have plans for a 70" span B&W-1, by a different designer, from July '85. wcn)*

The photo(s) is the farewell get together of the models, their articles, and their trophies at their seaplane base on Lake Sammamish. One shouldn't profit by the departure of old friends, so we aren't. My wife and I are giving the money as a scholarship to a deserving engineering student

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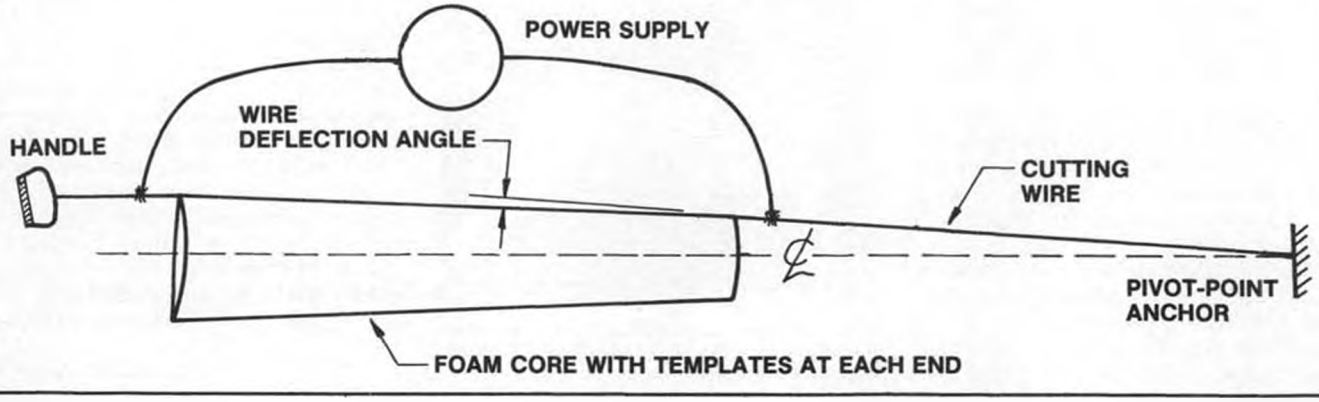
FIGURE 1: PIVOT-POINT FOAM CUTTING WITH TWO TEMPLATES



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SPECIFICATIONS

Wing Span	66-1/2 in.
Wing Area	495 sq. in.
Fuselage Length	40-1/4 in.

FEATURES

- **ELECTROSOAR** comes with a high-power Mabuchi motor, folding prop/spinner and wiring harness.
- All planes in series come with landing skid wheel, paint scheme on all sides of aircraft and all necessary hardware.

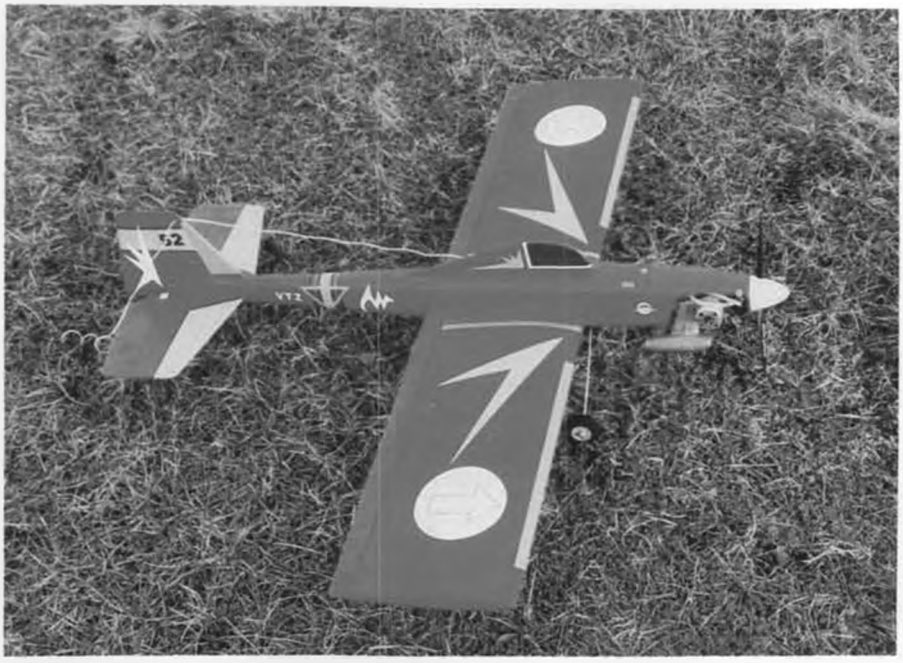
Royal

PRODUCTS CORP.
790 W. Tennessee Ave.
Denver, CO 80223

ELECTROSOAR—Electric Powered
EASYSOAR—Free Flight

Typical Kit Layout

POWERSOAR—
Gas Powered



You say you're looking for a red-hot sport aerobatic machine, one that can do it all, including knife-edge loops? Look no further! You'll find all the performance you can handle and then some in Tyrone Parker's. . .

THE EDGE OF KNIFE

• If you're interested in dampening the verbose a bit or just want to have a good time and make the other fellows jealous . . . this is the machine that is capable.

The vertical winglets above and below the C.G. (disguised as a canopy and an air scoop) enable this plane to effortlessly sustain knife-edge flight and perform the legendary knife-edge loop with ease. The disguised winglets also keep it up on axis as it rolls. It will flat turn 'round and 'round like a control liner . . . flat spin upright or inverted, and snap and tumble (lomcevak) like crazy. Keep it light . . . install a suitable engine (Fox .19 BB, Picco .21, and Super-Tigre .25 recommended) and it's guaranteed to blow the balsa dust out of your brain.

With the exception of wire-to-wood, where I use five-minute epoxy, cyanoacrylate adhesives are used. Regular CA to tack things together, followed by a coat of thin CA.

Begin construction with the wing. Cut spar halves from tough, springy 1/8-inch balsa and join with CA. Cut joiners from similar 1/16 stock, taper ends as shown on plan and CA to spar center section. Drill 7/64-inch I.D. control cable housing holes. Measure and mark rib locations. Cut light 1 x 1/4-inch trailing edge to fit as shown on plan and join with CA. CA 1/8-inch balsa joiner to T.E. Mark rib locations on T.E. Bevel sub-trailing edge so that it's 3/8 at the front surface and 1/4 at the aft surface. Trim ends as shown and mark rib locations. Cut sub-leading edge from 1/8 balsa and mark rib locations. Cut leading edge halves from 1/4-inch balsa. Cut W-1 ribs from 1/8 balsa and remaining ribs from 1/16 balsa as shown. Drill control cable housing holes in ribs W-1 through W-4.

Right: The latest variant of the "Knife," with the deepened fuselage and tapered wing. This is the version detailed on the plans. Power can be anything in the .19 to .25 range. Note the subtle differences between this and the earlier "Knife" shown at the top of the page, which sports a constant chord wing and shallower fuselage.

Glue aft halves of W-1 and W-4 to back of spar, taking care to keep them square. Glue trailing edge in place keeping it parallel with spar center and square. Add W-2 and W-3. CA W-7 to spar and add sub-trailing edge. Add W-5 and W-6 and 1/8-inch balsa brace at aft W-4. CA forward sections of W-1 and W-7 to front of spar and add sub-leading edge. CA forward W-2 through W-6 in place. Cut ends of 1-1/4 inch wide 1/16 balsa to fit around T.E. joiner as shown and CA in place. Cut out at aileron wells. CA 1-inch wide 1/16 balsa leading edge sheeting in place. CA remaining center section sheeting between W-1 and W-2 in place. Add 1/16 x 3/16-inch cap strips over ribs and 1/16 balsa fillets at inside corners. CA leading edge in place, trim, carve to shape, and sand. Cut ailerons from light 1-1/2 x 3/8-inch T.E. stock as shown. Sand front of tip section square and CA to sub-T.E. at tip. Bevel front of ailerons as shown on plan detail and check for nice fit in wells. Drill control horn mount holes. Add 1/4-inch light balsa wing tips then sand finished wing completely smooth. I've enjoyed good results by shaping lightly with #80 sandpaper, smoothing with #220 and polishing with #600.

Cut fuselage sides from light 3/16 balsa. Trim wing openings to fit. This is one of the most tedious parts of the entire project but get them close so you won't need any excess glue or filler (and weight). When satisfied, slide sides back off wing and mark landing gear mount position inside sides. CA 1/2-inch balsa triangle longerons in place from back of L.G. mount aft and from front of L.G. mount forward. If you've failed to select light enough stock you'll probably have to soak the triangles in ammonia, bend them and pin them to a board to dry somewhere before you can make the curve at the fuselage front. Using light triangular stock, or the old soak and dry technique, CA the top longerons in place.

Sand outside fuselage sides smooth, slide back onto wing and CA in place. Bevel aft fuselage insides. Using a couple of three or four inch long trailing edge scraps as a clamp, squeeze the aft fuselage ends together. Slide the ends to and fro as necessary to get even curves on both sides . . . check the vertical and tack with CA. Check again and secure with CA. Sand fuselage top and bottom using sanding block to reach both sides and straight edge to get things level and square. Cut F-4 sides to fit from 1/8 x 1/4 balsa and CA in place. Cut cross pieces to fit and CA in place.

Bend landing gear to shape from 1/8 music wire. Cut L.G. core from 1/8 hard balsa. Cut front and back plates from 3/32 aircraft ply. Squeeze plates to core and see if gear will fit in slot. If your core is a bit

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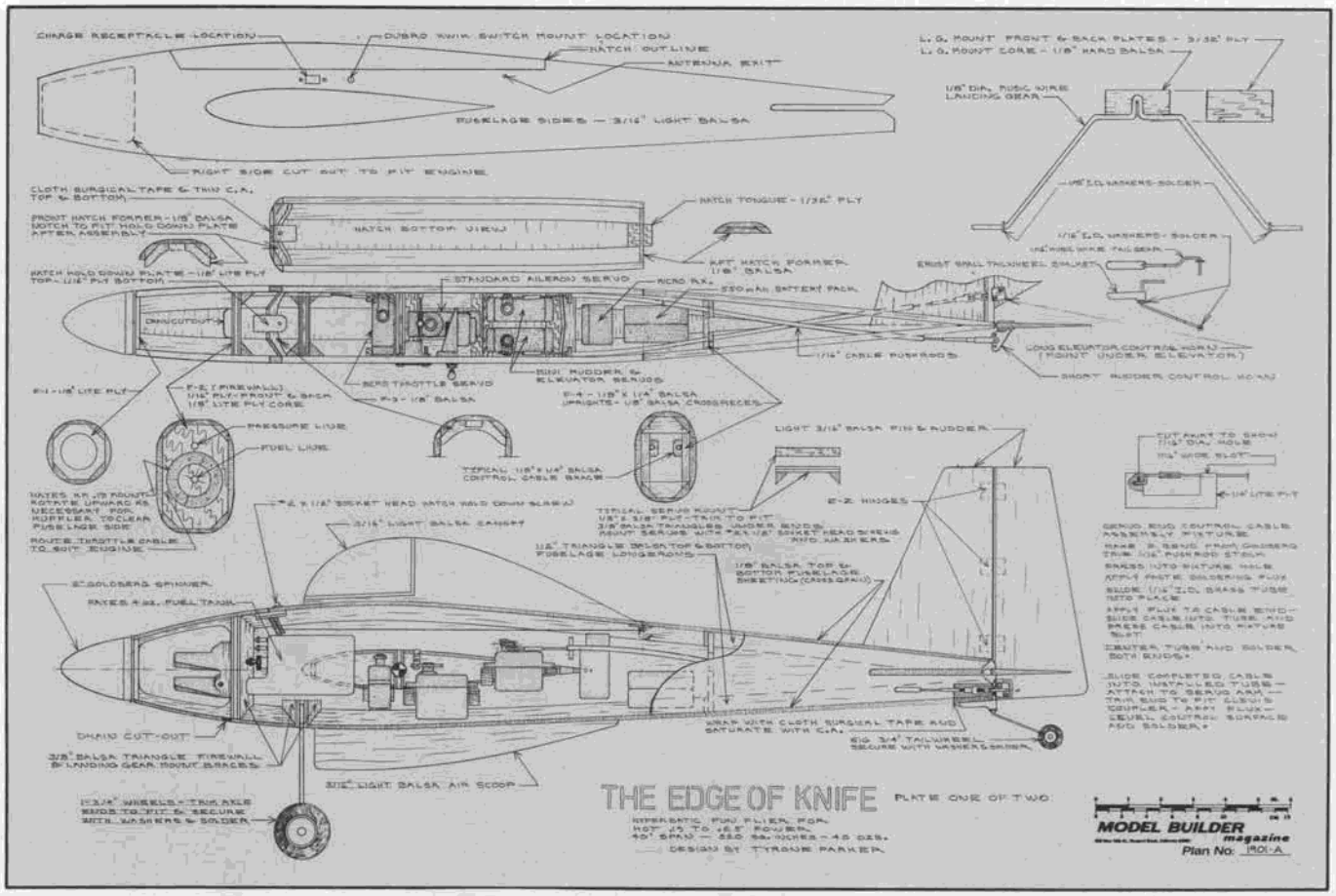
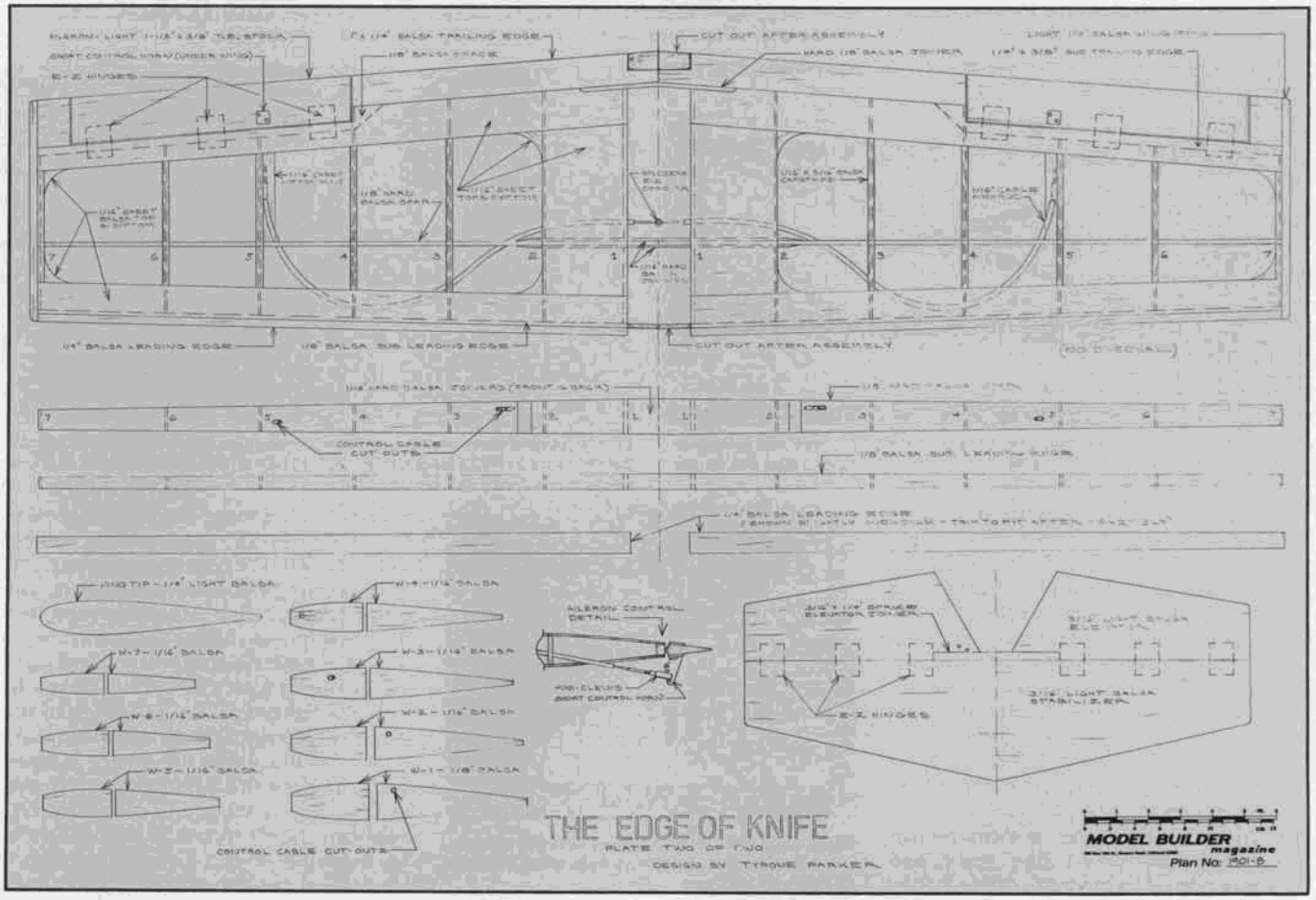


FULL-SIZE PLANS AVAILABLE-SEE PAGE 106



ALL ABOUT ARFS

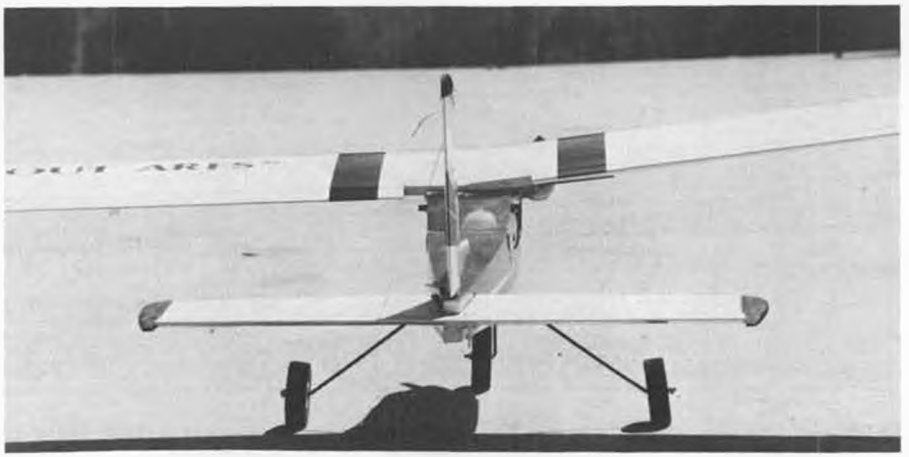
By ART STEINBERG

• When a modeler assembles a standard kit of an intermediate or an advanced R/C airplane, the instructions tend to gloss over many basic bits of model building knowledge. This is done with the assumption that the builder has had previous experience, and it is not deemed necessary to discuss in detail the fiberglassing of a wing center section or the fuel proofing of a firewall. It goes without saying that many of these models are built by newcomers to the hobby, or even old timers who haven't put together a model in forty years. Naturally, these people are unfamiliar with modern building methods and materials, and unless there is an experienced modeler available to supervise the construction, the model is probably headed for disaster.

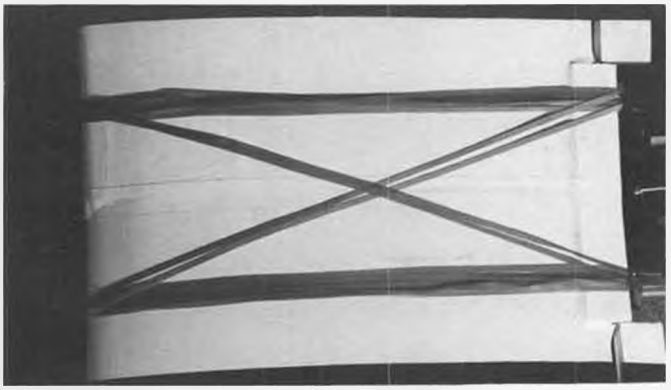
Recently, my next door neighbor's teen aged son was building his third R/C model in my workshop, a Sig Cougar, as he just moved in and does not as yet have a place to work at home. This boy is a good pilot, and at this writing has yet to crash an airplane. As he had already built two previous R/C models, I wasn't paying much attention to what he was doing. I just happened to be looking over his shoulder and noticed some basically unacceptable discrepancies; such as his wing hold-down blocks which were secured with cyanoacrylate and he had not fuel proofed anything. His push rods had an adjustable clevis at both ends, and his elevator and rudder control horns were installed more than an inch behind the hinge lines. We had a heart-to-heart talk about certain facets of model construction, and he then corrected the problems I pointed out. The next day he fired up the engine and taxied around the driveway, when the firewall spontaneously parted from the fuselage. It seems he had secured it with instant glue, and it had never occurred to me that anyone would ever use anything but slow curing epoxy for such a critical joint. So all this got me to thinking about the pitfalls of building and flying ARFs, especially by beginners who haven't paid their dues by gaining a solid groundwork in model building.

For example, most ARF wings come in two halves, and they are usually joined by one or two plywood spars and a lot of epoxy. I have not yet seen a true ARF in which the center wing joint is fiberglassed. On the contrary, often the spars supplied are made of a light plywood, really unsuitable for the strains of any violent aerobatics. I occasionally find myself fabricating replacement wing spars, rather than use the flimsy ones supplied with the kit. I remember one wing spar that crumbled in my hand as I attempted to insert it into the wing. Frankly, I am amazed that I have never yet seen an ARF wing fold in flight, but many were the times I winced with apprehension when I pulled a few extra Gs during a particularly violent maneuver while conducting flight tests on a new ARF.

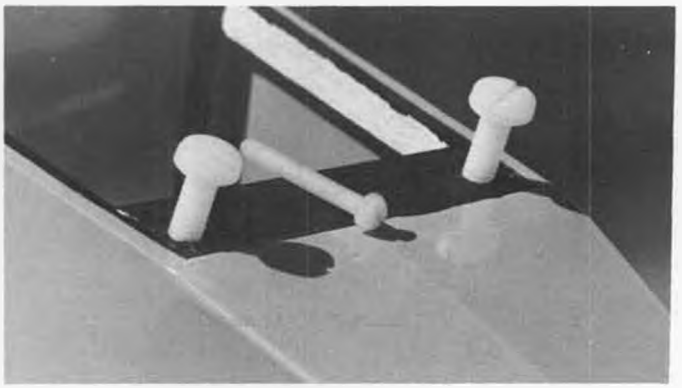
Then again, when it comes to attaching the wing to the fuselage, the standard ARF method is to use rubber bands. It doesn't take even a beginner very long to grow to detest the use of rubber bands to hold down a wing. They are greasy, messy, and need constant replacement. Also, you never get your wing mounted in precisely the same spot as the last time you flew, so right after each initial takeoff you find yourself changing your trim settings. If you fly in hot weather you can just listen to the rubber bands pop as they let go from baking in the sun. What the novice is never told is just how many rubber bands to use, and how to use them. First of all, the average plane uses #64 rubber bands, and these are available at your local hobby shop. I have used rubber bands from various



This month Art talks about some of the do's and don'ts involved in assembling an ARF. Shown above is an exaggerated example of poor alignment between the wing and horizontal stabilizer, which will cause erratic flight and cannot be corrected by making trim adjustments.



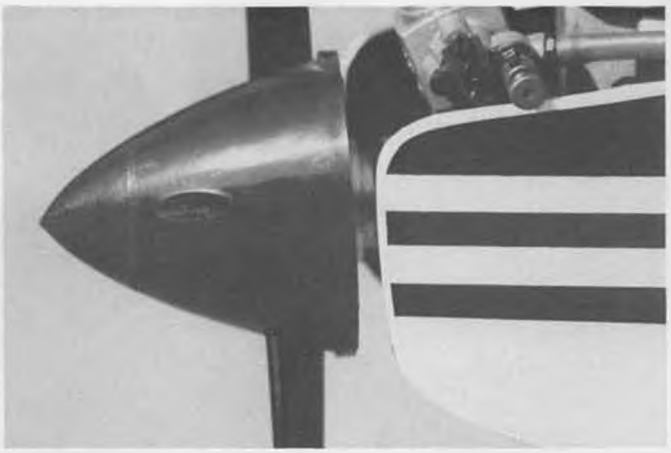
Many ARFs use rubber bands (ugh) to hold the wing in place. For adequate strength, use at least three rubber bands on each side, using the single crossed pair as safety retainers.



This wing hold-down system utilizes 1/4-20 nylon bolts, considered by our author to be overkill. He prefers the 8-32 bolt shown in the center, as it will shear more easily yet will provide more than enough holding power.

If you must use rubber bands to hold the wing on, this brand seems to perform best when exposed to fuel and sunlight.

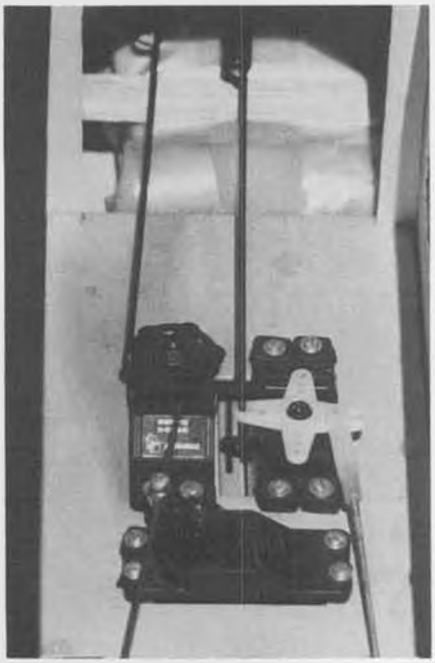
Typical wire landing gear as supplied with most ARFs. While satisfactory, they can be easily replaced with a more sturdy formed aluminum gear. Note that the radio switch is on the "dry" side of the fuselage.



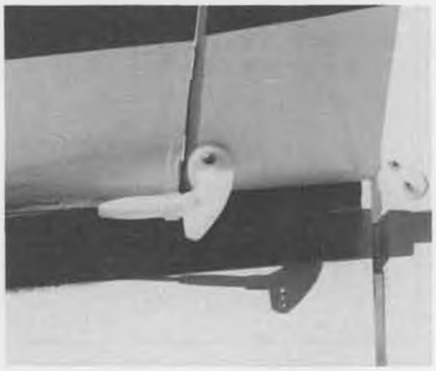
The usual ARF type plastic spinner, sometimes a cause of vibration due to poor balance. You may have to either replace it with a better quality spinner or dispense with it entirely.

sources, and have been surprised to find that some brands just don't hold up in R/C use at all. The worst ones I have found came from my local stationery store. They broke after just a couple of flights, appearing to have virtually no resistance to fuel and sun exposure. One of the best brands I have yet found were made by the American Rubber Band Company, and these came from a hobby supply source. My friend, Chuck Thompson of San Clemente, California, always shows up with a supply of unusual red rubber bands on his models, and they seem to hold up exceptionally well. He gets one delivered every day wrapped around his newspaper, and he really swears by them!

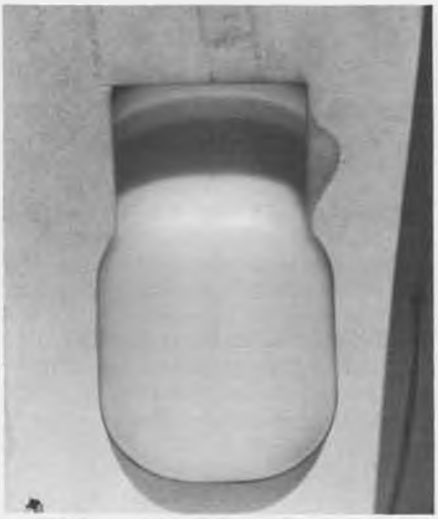
Now the proper number of rubber bands to use should never amount to less than ten. That breaks down into four on each side running straight back, with the last two placed in a criss-cross pattern. The theory is that the straight back rubber bands supply the hold-down strength, while the criss-crossing bands act as stops and prevent the others from slipping off the wing hold-down dowels. If you are mathematically inclined, you can actually work out the forces involved and prove that rubber bands which run straight back have greater holding power than crossed rubber bands. As in R/C there is no such thing as a universally believed theory, there are those who use only crossed rubber bands in the hope that they will let the wing part from the fuselage in a crash without tearing things up too much, and there may be some truth in this belief. However, any R/C modeler worth his salt will get away from the use of rubber bands as early in his flying career as possible. The real afficionado usually figures out a way to convert his rubber band ARF to a nylon bolt hold-down system, but some models are much easier to convert than others. In the event that you do install nylon bolts in lieu of rubber bands, the most common size bolt used seems to be 1/4-20. These are certainly strong enough to hold the wing securely, provided the hold-down blocks are strongly in place. There are some (including me) who feel that this size bolt is overkill in the average model, and being much sturdier than necessary, there is a tendency for the bolts to rip out the wing saddle area of the fuselage in some crashes, when the whole intent of using nylon bolts is to have them shear in a crash so as to reduce damage to a minimum. For this reason I try to use nothing larger than an 8-32 nylon bolt, going as small as 4-40 size in smaller models. Just to demonstrate the strength of these bolts, even the smaller ones hardly ever shear in a crash. By the way, a good inexpensive source of the smaller nylon bolts is at a well stocked electronics shop. And if you really want to impress the gang at the field, just whip out your electric screwdriver and nonchalantly use it to tighten down your nylon wing bolts!



Three ways to connect pushrods to servo arms are shown here. Z-bends are most reliable and are used for rudder and elevator. The adjustable clevis is fine for nosewheel steering, and the screw type connector is excellent for hooking up the throttle.



Control horns must be installed so that the clevis holes are on the hinge line. Note that the clevis has a safety retainer sliced from a scrap piece of fuel line.



A rear view of an ARF fuel tank firmly mounted in a plywood former. Rigid mounting like this has been known to result in fuel foaming and poor engine performance.

Then there is the subject of fuel proofing, which some sets of instructions ignore completely, and others only touch on very briefly. Sure, almost everyone knows the firewall has to be fuel proofed, but not everyone knows about fuel proofing the tank compartment. They usually don't tell you to enclose your receiver and its battery in plastic bags, and there is hardly ever any mention about how to seal the wing saddle against fuel. I once had an ARF which did come with rubber gaskets for the wing saddles, but most manufacturers just ignore the problem. I prefer to fuel proof my wing saddles with the tried and true method of silicone sealing.

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SOLAR FLIGHT: a world premier

By GUY REVEL... Three days in May, 1989 marked a milestone in modeling history with the world's first competition for solar-powered R/C models. Could this be a glimpse of things to come?

Above: Last flown ten years ago, Gunther Rochelt brought his historic "Silberfuchs" (silver fox) out of retirement to participate in the meet. Motor is driven directly by the solar cells; no buffer battery is used. Its last flight at Noerdlingen lasted over three hours!

• (Noerdlingen, in southern Germany, is the home of a very active group of electric power fans headed by Franz Weissgerber, a noted F3E competition specialist. It also happens that Franz Weissgerber is, since last year, holder of various world records for solar-powered flight with his famous "Solariane" model.

His interest with this source of energy is such that he converted many other modelers and, finally, organized the first ever competition devoted to this source of power.

SOLAR ENERGY AND BUFFER BATTERIES

Let me set things straight: the sun's energy can be used in two different ways. It can be directly converted into electric current supplied to a motor, or it can be stored into a buffer battery, itself supplying a constant voltage current to the motor. The former way, pure solar power, requires a very large area of solar cells to produce the necessary power, as well as the most efficient motors and propellers available.

On the other hand, the latter method produces usable power since the electric motor can be supplied with a constant current, regardless of the light rays' intensity and direction. True, one relies then on the motor being turned on and off so as to enable the buffer battery to get some minimal charge, but provided the model is a glider capable of soaring flight, very long flight duration is then possible. Quite frankly, this is the only practical method.

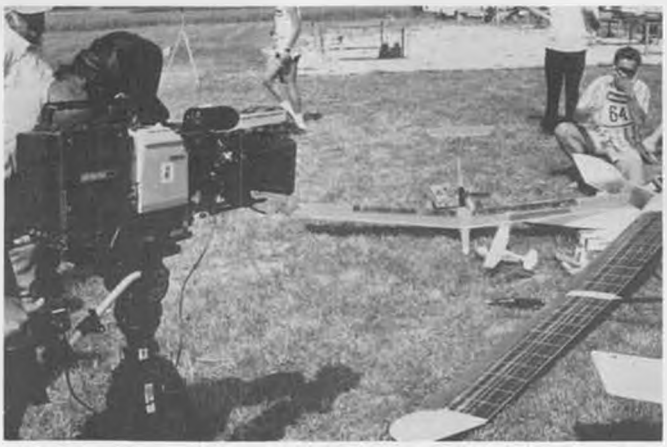
SIMPLE RULES

The rules of this first contest were quite simple: any model could be entered, as long as its motive power was provided by solar energy. The buffer battery, once drained, could be charged for one hour through the solar cells mounted on the model, after which a one-hour flight slot was called and the flight time measured, one point for every ten seconds of flight. A landing bonus was added.

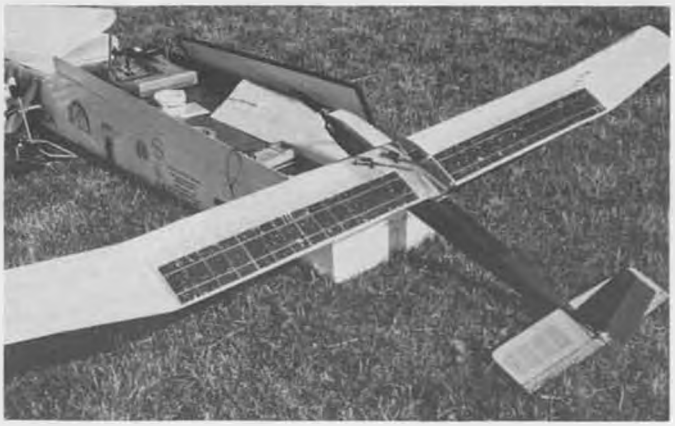
After the one-hour flight slot, another hour was allowed for recharging the buffer battery, and so on for a maximum total of three hours of flight over five hours.

Happy meet organizer and world record holder, Franz Weissgerber, with "Solariane."

Two views of the "Solariane" in flight. Model features a molded wing, with the solar cells embedded in the mold and covered with a layer of glass cloth and special UV-resistant resin. A small solar array on the horizontal stab feeds a small battery that powers the radio system.



A German TV crew spent an entire day covering the meet.



A typical "sport" solar model. Solar cells are merely taped to the upper wing surface, and a buffer battery is carried in the fuselage.

Simple, isn't it?

About fifteen pilots entered, with a few more present with various models. They came from all over Germany as well as from Switzerland and Italy. Models ranged from very sophisticated to quite crude, and this itself is an indication that solar power is now really a practical proposition.

There is no point in relating the competition flight by flight. Suffice to say that more than half of the entrants succeeded in flying at least once the full hour, and several did it every time! The eventual winner, Erich Toepfer, used quite a simple model with an epoxy fuselage and built-up wings. The motor was nothing more than a common geared Mabuchi of the type sold by Graupner under the name "Speed 600," which is in fact a newer type 550 with metal backplate. The buffer battery was made of eight Sanyo 900 mAH SCR's. Many other competitors used similar low-cost motors.

On the other hand, second placer Edwin Bloch was the only competitor to enter a model without a buffer battery. It is the more remarkable that he succeeded in flying the full hour during each of his five rounds, except during his throwaway round when a switch malfunction forced him to land and repair before launching again.

HOW TO?

There is no secret, no magic in building a successful solar-powered glider. In fact, you can use any reasonably lightweight electric-powered glider, with a number of solar cells consistent with the voltage of the buffer battery. A good starting point is about 3.5 solar cells per battery cell, simply parallel-connected with the battery. Any buffer battery, from about 600 mAH to 1.4 AH will do, consistent with the motor power. The silicium solar cells can even be taped on top of an existing model wing if you do not want to build a special set. A geared motor driving a large propeller is a requisite, since its better efficiency enables sustaining flight with less power.

The two main types of solar cells are the mono-crystalline and the poly-crystalline types. The former is the most efficient (up to 15%) and also the most expensive. The latter is much less expensive and is now widely used on models; the efficiency of the most widely used model reaches over 11%. Such cells, of rectangular shape, are easy to arrange on a model and are readily available from a number of manufacturers. The rated voltage is around 0.5 volt per cell and depends somewhat upon the lighting conditions. The most used cells at the meet were poly-crystalline rectangular cells from Telefunken measuring 50x100mm and rated at 558mW at maximum power. In practice the average obtainable power is about half this value.

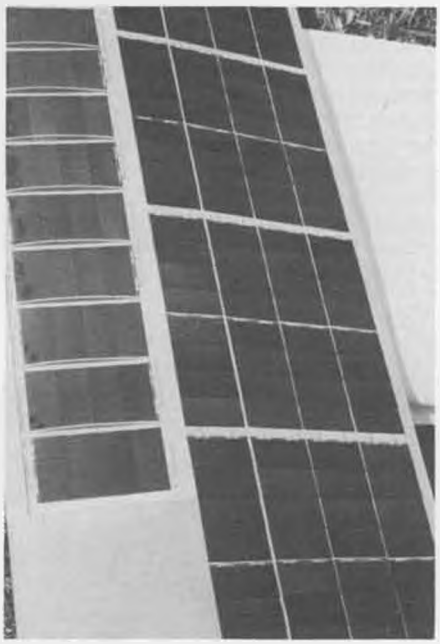
The cells are placed in rows on top of the wing so that the total voltage is the sum of the voltage of the individual cells. This enables the assembly to directly charge the buffer battery of lower voltage. A typical model would have, for example, a 7-cell buffer battery and 24 solar cells. The current flowing from the solar cells is then roughly one-tenth of that required to sustain flight. Provided the buffer battery is charged (via the solar cells) before the flight, it is then possible, under good conditions, to fully charge the buffer battery during the gliding phases of the flight and fly almost as long as the lighting conditions are adequate.

PURE SOLAR POWER

Although they did not actually enter the competition, other solar models, without

Continued on page 58

"Combi 2" being launched by Helmut Bruss, another pioneer of solar power for models. This ship normally uses a buffer battery to damp out voltage variations, but was also flown at the meet without it, using power directly from the solar cells.



Closeup of the "Combi 2" wing. The front cells are placed under a clear covering with plexiglass false ribs so as to ensure that no light is lost.

ELECTRIC POWER

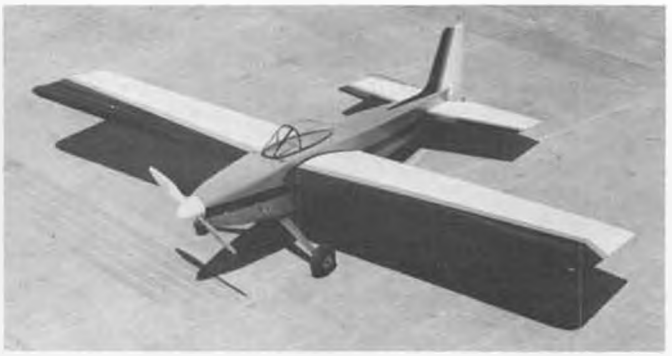
By MITCH POLING

• A couple of columns ago I compared gas and electric directly, using George Abbot's equation for power into a propeller. This equation says the horsepower is pitch times diameter to the fourth power times rpm to the third power, divided by 1.4 times ten to the 17th power. This equation is very easy to use, even if you don't have a scientific calculator. You can leave out trailing zeros and the powers of ten and just pick off the first two digits of the answer on a simple four function calculator. Francis Reynolds, who writes the technical column for *Model Builder*, pointed out to me that the usual textbook equation for horsepower is air density times rpm to the third power times diameter to the fifth power times the propeller power coefficient. This led to some head scratching; why the different powers for the diameter? George Abbott explained why in a letter to me; the propeller power coefficient has the diameter in it as a denominator, this cancels one power of diameter, to give the fourth power. However, George's contribution is much more than that. It turns out that the propeller power efficient is not so easy to get, "real numbers" are rare. As usual, theory outstrips practice. Without a real number for the propeller coefficient, the equation just stands as a pretty picture and the ordinary non-engineer types have no way of using it. George started with a fifty year old article by R.J. Hoffman that gave a value for standard light plane propellers, then worked his way through ten years worth of Peter Chinn's Model Airplane News engine reports. George used the torque and brake horsepower versus rpm curves to come up with a least squares value for the propeller coefficient. Due to the variation in actual pitch and diameter for real propellers, George, in his article, suggested that this would give an estimate accurate to +/- 20%. In practice, I think the equation is better than that, to within +/- 10%. As far as I'm concerned, this is the "Abbott equation," as thanks to George, who put it in a form we can all use. Thanks for the info, George!

I would like to measure torque directly, and I recall articles on how to do this, I think in *M.A.N.* Do any of you have copies of information on how to build a torque stand for model airplane engines? The setup for electric motors would be nearly identical to that used for gas engines, so I could easily adapt a gas setup. I would be very grateful for such information, and would be happy to reimburse mailing and Xeroxing expenses for information I can use. Since I am in transition between my address in Seattle and Germany, send any info care of *Model Builder*, and they can send it on to me.

Many electric kits have come on the market in the last two years, often with the motor as part of the package. The Goldberg "Electra" has been a great success, and has started off many people in electric. In the last year the high wing 05 (100 watt) kits have become popular, and there is a wide variety of offerings, including the Goldberg Mirage, the Parma planes, and the Midwest Aero-lectric.

I saw the Aero-lectric on display at the Puyallup Model Fair last February, and decided to try it. This plane is part of the "Success Series" from Midwest, featuring detailed step-by-step instructions and precision cut parts. This assures success in building. I was, to say the very least, impressed by the quality of the materials and the cutting of the parts in this kit. The only other kits I have seen at this level come from Airtronics. Everything is carefully packaged in numbered bags so you can follow the instructions exactly. The instruction book is 107 pages long, mostly because each step has a line drawing showing how to assemble the parts. The instructions are very easy to follow. In fact, you could assemble the plane just by following the drawings, no reading at all. Someone obviously took great care in doing this manual, and it is excellent. I followed it step-by-step, and had no problems. I am an experienced builder, design my own planes, and do a lot of scratch building. Despite this, my advice is to follow the instructions, do not free lance. Every plane is built according to a philosophy of design, and the instructions are made for the way this plane



Scott Hartman's scratch-built Super Doubler II is a red-hot performer with an Astro 40 Cobalt. Plans were published in *Model Aviation*.

Left: Second place in AMA 1989 Nats Sport Scale went to Bernard Cawley and his beautifully built 1/6-scale Taylorcraft. Astro 40 power.

Midwest's "Aero-lectric" is one of a growing number of kit/motor combos appearing on hobby shop shelves. Mitch put this one together in about eighteen hours, says it's a great flyer.

Continued on page 59

RENO '89

By BILL NORTHROP and FELIX VIVAS

The 26th running of the National Championship Air Races, as witnessed by a first-timer and a seasoned racing enthusiast. It's hard to describe in words and photos—ya gotta be there!

• I'll state the main theme of this report right off the top . . . if you're an airplane enthusiast, model and/or otherwise, and you've never attended the National Championship Air Races, make up your mind right now to put together the required time and expenses to get there at least once in your lifetime. It's an experience you'll never forget. I'm sure most everyone reading this has had their share of air shows, with blaring loudspeakers, static displays of aircraft, and various and sundry smoke trailing aerobatics by individuals and groups, and sometimes the military

John Maloney, in the radically clipped Chance-Vought F2G "All Coast Super Corsair," has a slight lead over David Price in the P-51D "Dago Red," coming into pylon #2.

teams, along with parachute jumpers, sky divers, etc. Of course, the Air Races have plenty of this too, in addition to many of the latest military aircraft, either on static display or on a fly-by from some distant air base, and it serves as a fill-in between races, as well as being a main attraction to many of the younger or less interested spectators who accompany the race enthusiasts. But to those of us who are old enough to have been involved in most any phase of aviation dating at least back to WW-II, or even into the prewar Golden Era of aviation, attending the National Air Races is a visit to Mecca . . . period!

The National Championship Air Races, which have been held annually in Reno, Nevada, since 1964, are a continuation of the fabled Cleveland National Air Races of bygone years, dating back to the Golden Era years of aviation between WW-I and II. Old time modelers became familiar with racing aircraft from the many fine scale kits produced by Cleveland Model Airplane and Supply Co., and in more recent years, modelers have been able to duplicate the excitement of speed and head-to-head competition through control line and radio controlled Formula I Pylon Racing.

Racing at the Nationals is made up of four classes; Unlimited, T-6, Formula I, and Biplane. The Unlimiteds are the main attraction, not only because they are the biggest and fastest, but also because they are the most glamorous and most easily recognized by the less knowledgeable public, being almost entirely comprised of carefully restored and detailed WW-II fighter aircraft, such as P-51 Mustangs, F8F Bearcats, P-38 Lightnings, Hawker Sea Furies, F4U Corsairs, and Curtiss P-40s. Add to these a couple of Russian Yak IIs and several original designs to break up the monotony. Some of the more familiar aircraft have been so highly modified as to be barely recognizable, with smaller canopies, high output engines, clipped wings, and revised tail surfaces. All of them have every crevice and bump smoothed to cut drag, and are brightly painted with a super-smooth, highly polished finish, again to improve performance.

The T-6 is an abbreviation for the North American Aviation military trainer for WW-II, called the AT-6 by the Army and Air Force, or the SNJ-5 by the Marine Corps and Navy. Strict rules prevent any outline

Bob Yancey in his Yak II, also pictured on page 6 of this issue. Not as fast as some, but he made it up with his tight, smooth, low flying. Took 4th in Gold Race.

modification of this aircraft or hopping up of the engine, the racing advantage being obtained through careful maintenance, skilled tuning of the engine, and tight, smooth, in-the-groove flying by the pilot.

Formula I is the oldest existing racing class, having been developed by a committee consisting of racing greats Art Chester, Tony LeVier, Benny Howard, and Keith Rider. The specs, revised a few times over the years, include a fixed-pitch propeller, powered by a 200 cubic inch, 100 horsepower Continental engine. Minimum weight of the aircraft is 500 pounds, minimum wing area is 66 sq. ft., and the

Lyle Shelton, owner and pilot of "Rare Bear," a highly modified Grumman Bearcat, proved his Unlimited win at Reno last year was no fluke by doing it again in '89. His average speed for the eight-lap Gold Race was 450.910 mph, a bit slower than the 456.821 mph he did in '88.

Left: Another look at John Maloney's F2G "All Coast Super Corsair," with everything hanging out but the kitchen sink! Finished 3rd in Unlimited with an average of 406.265 mph.

Below: Two Unlimited also-rans rounding pylon 8, Lefty Gardner's familiar P-38 and right down on the deck, John Paul's Curtiss P-40N, dubbed "Spud Lug."

landing gear cannot be retracted. Originally, when this class was first raced in 1947, it was called "Goodyear," after its prime sponsor. Later, when sponsorship by the Goodyear Tire & Rubber Company and Continental Motors was retracted, the name became Formula I. This is the class that has been so popular as a model racing category in C/L and R/C.

The only flying accident at the '89 Reno Races, which unfortunately was fatal to the pilot, occurred during a Formula I race early Friday afternoon. Of the several unusual Jim Miller pusher models being flown in Formula I, the #73 aircraft being flown by Errol Roberson, of Warrenton, OR, was hit by strong turbulence in the form of a dust devil as it approached Pylon 5 on the 3.1-mile Formula I/Biplane course. One of only five or six photographers with us at Pylon 6 at the time of the accident happened to be looking in that direction, as we were mostly concentrating on the aircraft rounding the pylon in front of us. The aircraft was seen to bobble for just an instant, and then one wing folded, followed by complete disintegration even before it hit the ground, which was almost instantaneous. The aircraft had been flying for over three years, having been raced by designer Jim Miller before being acquired by Roberson. The accident happened out of sight of the grandstands, but once the announcement was made, race fans began a "pass the hat" collection for Roberson's family that totalled more than $10,000 by the end of the race weekend. As you will see toward the end of this article, Jim Miller continued on to fly his Miller Special JM-2 pusher to second place in the Gold race, averaging just under 230 mph.

The Biplane class was started in 1964 by Bill Stead (man after my own heart!). We're not sure what the original specs were, but starting in 1986, the engine specs were revised to include the 180-horsepower, 360 cu. in. Lycoming engine, which allowed the well-known Pitts aerobatic biplane to get into the game. Other specs now include a minimum weight of 500 pounds, fixed landing gear and fixed-pitch prop, and no less than 30 percent of the total minimum 75 sq. ft. wing area can be contained in the smaller of the two wings.

For many years, particularly since moving to "Shakey" (that's the truck driver CB parlance for California) and being closer to Reno, we have wanted to attend the races, but it always seemed to come at a time when magazine deadlines interfered. In recent years, as an aerominded publication, we have received information from the Reno Air Racing Association, offering the opportunity to cover the event as a member of the press. Two years ago we took them up on the offer by sending a representative who volunteered (Are you kidding? Try "begged.") to cover the race for us. Felix Vivas, a professional photographer (much of it under, water shooting white sharks, yeuch!), ex-professional pilot, and currently very involved in FAI electric R/C (F3E), has covered the race for the past two years. His reports and photos

"Cottonmouth" is the Hawker Sea Fury owned by Jerry Janes of Vancouver, B.C., and flown at Reno by John Muszala. One of seven Sea Furys that raced at Reno this year.

Steve Hinton's mount for the past two years has been "Tsunami," an original design Unlimited racer owned by John Sandberg of Chino, California. Finished 5th in Gold.

Winner of the T-6 Gold Race was Tom Dwelle, of Auburn, California, flying a N.A. Harvard Mk. II he calls "Tinkertoy." Averaged 222.326 mph.

Fifth place in T-6 Gold went to "Six Cat," an AT-6G owned and raced by Nick Macy, an agricultural pilot from Tulelake, California. Did 212.429 mph.

Another AT-6, "Sio Thunder," flown by David Bruce of San Luis Obispo, California.

in *Model Builder* have been well received by the Association, and also sharpened this writer's determination to attend. Our and *MB's* General Manager sent us this year for our birthday, which was on the 14th of September, opening day of the actual racing. Thanks, Anita!

Making the decision, scheduling the time, and getting to Reno take only the normal amount of effort and desire. Finding a place to stay in Reno for that race period is something else! Some hotels will take your next year's reservation before you leave at the end of the current year's races. Others say, "Call back next week." By now, most everything is taken for the 1990 races, September 20-23! As our work schedule makes it difficult to plan a year ahead, the search for space began only four months prior to this year's race. Fortunately, we found a room at the Nugget Hotel, which is in Sparks, Nevada, just on the outskirts of Reno. Incidentally, the hotels have special rates during race weekend as much as double the normal amount!

A press pass (hospital type colored wrist band that you wear for the duration of race week and also worn by mechanics, pilots, officials, etc. . . . different colors for different jobs) entitles the wearer to general admission plus a permit to wander through the pit area, which affords the opportunity to get close-up ground shots of the various racing aircraft. However, pit passes are also sold to the general public, over and above regular admission, so that Wednesday and Thursday become the best days for getting clear shots of the planes before the crowds start building up on Friday. Saturday and

Bob Richeson, a restaurant owner from Graham, Texas, plays peekaboo behind pylon #8 in his AT-6G, dubbed "D.Q. Blizzard."

Sunday there is a human avalanche! Total attendance exceeded 148,000!

For members of the press who had sent in proof of previous photographic coverage of the races, there was an extra special additional privilege which was very closely guarded . . . a Pylon Press badge. With this, plus the wrist band, some of us were able to be transported by shuttles directly to and from a choice of three key pylons, from which we could watch and photograph the aircraft during the races. Some of the photos herein will prove to you that these positions afforded the "best seat in the house!"

We'd also like to point out at this time that the base of operations for members of the press was the Kodak Press Lounge, located within the pit area, at the spot from which the pylon transportation picked up and dropped off photographers. Don Stang and his crew, from the Professional Photography Division in San Francisco, were gracious and generous hosts during the entire race period, even to those whose film came out of "ugly little green boxes."

The actual races began on Thursday, with the planes grouped in heats according to the one-lap qualifying times that were previously established. In order that everyone would be exposed to any varieties in the weather, all classes flew each day and at various times. There were nine races on Thursday and Friday, and eight races on Saturday and Sunday. For example, on Friday, there was a T-6 race at 9:00 a.m., a Formula I race at 10:10 a.m. and at 11:15 a.m., an Unlimited race at 11:45 a.m., a Biplane race at 12:25 p.m., a Formula I race at 1:05 p.m., an Unlimited race at 2:20 p.m., a T-6 race at 3:00 p.m., and an Unlimited race at 3:35 p.m. With this kind of schedule, there were times when those of us who were out at the pylons would simply stay out there for several hours at a time. On Thursday, Friday, and Saturday until mid-afternoon, we cooked. Later Saturday it turned cloudy, and actually drizzled and became windy and cold before the last race (for Unlimiteds) of the day. After the last race, the clouds dumped a downpour of heavy rain, and the surrounding mountains had new snow down to the 5,000 foot level. Sunday was clear blue sky with large, white, billowy cumulous clouds, and a cold wind. Leather jackets and sweaters felt good, but it was a great sky background for low flying aircraft photos!

Based on qualifying times and heat race results, the final races on Saturday and

Left: The "Amsoil Pacific Flyer," a Mong owned and raced by Dan Mortensen, took 3rd in the Biplane Gold Race with a 184.697 mph average. He's president of Airline Ground School International.

Biplane Gold winner, Tom Aberle, of Fallbrook, California, in Boland modified Mong "Wanna Play II." Did 196.140 mph.

Sunday were divided into Bronze, Silver, and Gold races. Because we're kinda running out of space and want to include as many photos as possible, we'll conclude by giving you the results in order of finish, along with average speeds for the Gold Cup Races in each category.

UNLIMITED(8 Laps)
#77, Lyle Shelton, Granada Hills, CA, F8F Bearcat "Rare Bear," 450.910 mph.
#8, Rick Brickert, Mt. View, CA, Sea Fury, "Dreadnaught," 427.871 mph.
#1, John Maloney, Corona del Mar, CA, Chance Vought F2G, "All Coast Super Corsair," 406.265 mph.
#101, Robert Yancey, Klamath Falls, OR, Yak II, 406.046 mph.
#18, Steve Hinton, Chino, CA, original, "Tsunami," 385.754 mph (7-lap average).
#4, David Price, Los Angeles, CA, P-51, "Dago Red," 384.317 mph (7-lap average).
#6, David Crocker, Herndon, VA, P-51, "Sumthin Else," 358.888 mph (7-lap average).
#69, John Putnam, Bakersfield, CA, P-51, "Georgia Mae," DNF.
#7, Bill Destefani, Bakersfield, CA, P-51, "Strega," DNF.

AT-6(6 Laps)
#7, Tom Dwelle, Auburn, CA, "Tinkertoy," 222.326 mph.
#27, Eddie Van Fossen, Bakersfield, CA, "Miss TNT," 221.118 mph.
#75, Alfred Goss, Bakersfield, CA, "Warlock," 218.426 mph.
#18, Randy Difani, Gardena, CA, "Thunderbolt," 213.434 mph.
#6, Nick Macy, Tulelake, CA, "Six Cat," 212. 492 mph.
#44, Gifford Foley, South Salem, NY, "Miss Behavin'," 208.939 mph.

Cassutts are still very competitive. This slicked-up version, called "Sahara," took 3rd in the Formula One Gold Race for owner/pilot Scott Morris with an average speed of 219.245 mph.

Two Browns duke it out around pylon #6. Dennis Brown, flying his "Scarlet" Pitts S1C, has a slight lead over attorney Stan Brown in "Washoe Zephyr."

BIPLANE (6 Laps)
#40, Tom Aberle, Fallbrook, CA, Boland "Wanna Play II," 196.140 mph.
#69, Sam Maxwell, Pelham, AL, Pitts "Legal Eagle," 185.646 mph.

Sam Maxwell's trip from Pelham, Alabama paid off; he took 2nd in the Biplane Gold Race with his Pitts S1 "Legal Eagle," at 185.646 mph.

Most unusual Formula One was Jim Miller's JM-2 "Pushy Cat," which placed 2nd in the Gold Race with 229.945 mph.

#91, Dan Mortenson, Placerville, CA, Mong "Amsoil Pacific Flyer," 184.697 mph.
#90, Guy Paquin, Downey, CA, Mong "Buzz Job," 179.774 mph.
#1, Mike Penketh, Auburn, CA, Pitts, "My Pitts," 176.700 mph.
#62, Mike Harris, Sonoma, CA, Pitts "Sonoma Red," 168.831 mph.
#20, Cris Ferguson, Sunnyvale, CA, Pitts "Let The Good Times Roll," 164.591 mph.
#4, Peggy Penketh, Auburn, CA, Pitts "Passion Pitts," 159.514 mph (5-lap average).

FORMULA-ONE (8 Laps)
#4, Ray Cote, El Cajon, CA, Owl "Alley Cat," 231.251 mph.
#14, James Miller, San Antonio, TX, Miller Spcl. "Pushy Cat," 229.945 mph.
#33, Scott Morris, Evansdale, IA, Cassutt "Sahara," 219.245 mph.
#43, Hep Porter, Oakley, CA, Cassutt "Aero Magic," 211.995 mph.
#77, Vince Kirol, Parker, CO, Cassutt "Super Spook," 211.151 mph.
#21, Deke Slayton (the Astronaut), League City, TX, Williams 17 "Stinger," 207.843 mph.
#96, Jon Sharp, Lancaster, CA, Boyd, GR-7 Panther "Blue Streak," DNF,
#55, Jim Bumford, San Diego, CA, Grove GR-7 "Bummer's Bullet," 219.030 mph, moved to last place due to low and erratic flying.

Mean-looking "Stinger" was raced by former astronaut Deke Slayton, placed 6th in Gold with 207.843 mph.

There was so much to be seen and experienced in those memorable four days of air racing, that we can't even begin to tell it all within these pages, and our writing skill can't do justice to the thrill and excitement of being there to see and feel it in person. We can only repeat what we said at the beginning of this article . . . you have to make a point of being there at least one time . . . make yourself the opportunity . . . you won't regret it.

A LOOK AT THE UNLIMITED GOLD RACE, by Felix Vivas

Blustering gusty cold weather met all the enthusiastic true Reno Air Race fans Sunday morning for the last and climactic day of racing. The fans, as I did, had our prayers answered, no rain till the races were over. Just after the last race on Saturday it rained

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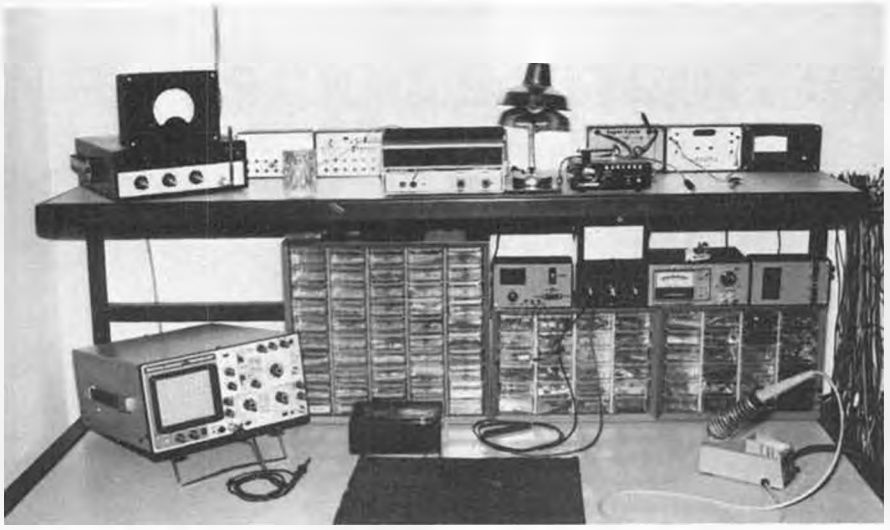


Electronics Corner

By ELOY MAREZ

• Well, it's the start of a new one! Can you believe it, it is 1990. As you receive this, it is still early enough to get in those New Year's resolutions; may I suggest a couple?

First off, promise yourself that for the next coming flying season, you will finally accept the inevitable and retire that old R/C junk that you have become so attached to. Yes, I know that it is almost sacrilegious to refer to our old Kraft, Orbit, etc. equipment, gear that brought us so many hours of pleasure often with great dependability, as "junk," but let's face it, conditions have changed. Those oldies must be considered simply that, no sentimental "oldies but goodies" tags are acceptable here. They simply will not play well under today's narrow spacing and interference-prone flying conditions.

Secondly, don't replace an old junk radio with a new junk radio. I shudder every time I see a well-built and finished airplane, one which the owner actually built, as distinguished from having assembled an "ARF." I know all the hours of painstaking building, followed by shaping, sanding, covering, finishing . . . does it make any sense, any sense at all, to then trust such a creation to a $119 radio system? It doesn't to me, not at all. The more expensive radios do come with more features, many of which the majority of us don't use in our sport type flying, but the more expensive radios are also of higher electronic and mechanical quality. While there is nothing now on the market that is absolutely glitch or interference proof, regardless of the car-salesman type of ads, the more expensive radios do provide an extra measure of security.

It is not a simple choice, inasmuch as it is difficult to obtain complete information on any one brand or model of R/C system prior to putting down your money. My recommendations are to start with the number two radio in a given line, as generally the top of the line is a competition system most often designed for Master's Class aerobatic flying and includes too many features that most of us don't need. The No. 2 systems are generally of the same quality and design, without the requirements for aerobatic flying, but with all of the advanced useful features such as servo reversing and throw adjustments. Additionally, most such systems also include some of the basic mixing functions which can be used to advantage in many sport flying applications. AM, FM, or PCM? Be reminded that PCM is an encoding technique, with the actual signal transmission being made on FM. Still, PCM is presently the most advanced and usually the most reliable system, and should be considered for any airplane you care about!

A good place to review the true features of any R/C system, with hands-on possibilities, is the local flying field. Do not be ashamed to ask questions of its owner, after all he went through the same question period as you are now.

THE NEW YEAR also brings the first of the new addresses, which I try to keep you up to date on as I learn about them. This first one is: ME!

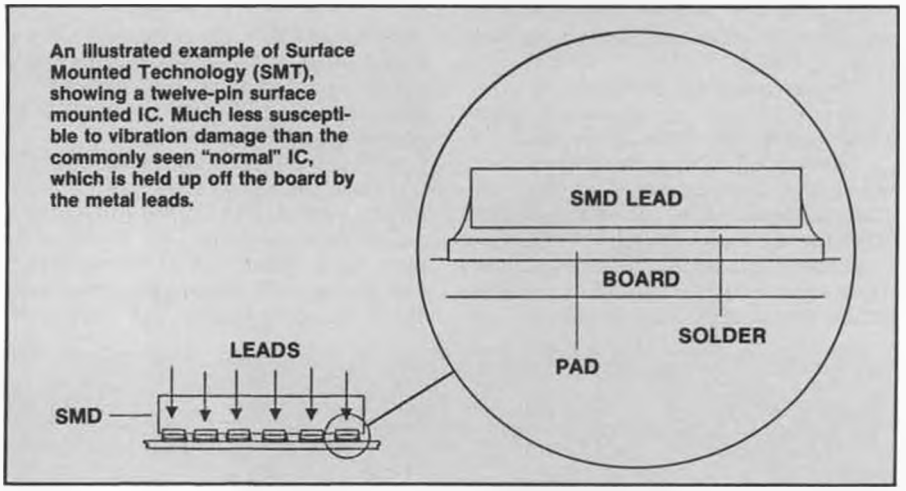
As all of you who have found the need to communicate with me have learned, you can always get me through *Model Builder*, with only a minor delay before your letter gets to me. However, many of you also prefer to write direct, and for those of you who do, the new address is: 2626 W. Northwood, Santa Ana, California 92704. Evening phone is (714)540-4935. And if you are calling from other than the West Coast, please take into account the time differences from wherever you are to here.

Along with this move I have gained a substantial amount of shop space, which once I get properly organized, will provide me with better working conditions for those dozens of projects that are waiting. Isn't it frustrating to never have enough time?

WE'RE STILL BATTING 100! I am always so proud to state here that in the almost eight years that "Electronics Corner" has been on the air, never has a request for information from me to my readers gone unanswered. The truth can often be better described as: flooded. That holds true for my latest such request, appearing in the November issue, to which I just heard from a familiar writer, Waldo Saintsing, of Thomasville, North Carolina. About my thoughts on a high power amplifier for six-meter operation which another reader had requested, Waldo comments:

"Our 750 milliwatt transmitters can control at distances further than we can see. With over six times the power you can imagine how far a control signal would travel. I wouldn't want to be within twenty miles on the same frequency."

The above confirms my thoughts on the subject, and while I do have such information, I decided not to pass it along for the benefit of those also using Six Meters in the same area. I think the word is coexistence . . . it becomes increasingly important all the time as the R/C population grows.



An illustrated example of Surface Mounted Technology (SMT), showing a twelve-pin surface mounted IC. Much less susceptible to vibration damage than the commonly seen "normal" IC, which is held up off the board by the metal leads.

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The Harbor Soaring Society's SPORTSMAN/NOVICE F3E CONTEST

Seven-cell F3E electric glider competition is really beginning to catch on. This particular Southern California meet is especially noteworthy for the generous cash prizes awarded to the winners!

By BILL FORREY

The handbills and magazine ads read simply, "SECOND BIANNUAL SPORTSMAN/NOVICE F3E CONTEST. $2,000.00 in cash prizes. $1,000 1st place. $600 2nd place. $250 3rd place. $150 4th place." That kinda gets your attention. After the doubletake, you ask yourself, "Is this for real, or what?" And as if to confirm, it goes on:

"A seven cell electric glider contest hosted by the Harbor Soaring Society, Costa Mesa, California, August 19 and 20, 1989.

"Open to U.S. resident AMA members. Not open to anyone who qualified for U.S. AMA F3E team selections, or made the team, or first or second place winners of the first Sportsman F3E contest held August, 1987.

"This is to ensure only beginners, novice/sportsmen have an opportunity at winning the cash prizes. Entry fee: $25.00.

"Seven 1.2 AH or smaller batteries. Any size glider, any size electric motor. Winning planes will be measured and weighed to assure they are within FAI F3E rules."

Contest Organizer Felix Vivas really knows how to bait a hook, doesn't he? His solution to getting more participation in "Sportsman F3E" is, to say the least, unique. I doubt many others would dare to try and muster this kind of industry support in an effort to foster grassroots interest of such a relatively new FAI event.

This year's winners and their teammates, from left: 1st place $1000 winner Jason Perrin with his primary and secondary Snipes, Jerry Bridgeman (Jason's teammate and creator of the Snipe), 2nd place $600 winner Bob Sliff with his primary and secondary Snipes, Chuck Hollinger holding M. Poelking's secondary T-tail ship, 3rd place $250 winner M. Poelking and his primary twin-tailboom ship, Tony Martin, and 4th place $150 winner Jared Stalls and his stretched-wing Snipe.

Felix did dare, and for the most part he succeeded. To his credit, when the industry money came up short, the prize money didn't. Felix came up with $1,000 of his own money rather than let the guys down! That's what I call believing in something! Felix is one guy who puts his money where his proverbial mouth is!

Thirteen flyers registered to fly. Although it seems like a low number, 13 is fairly respectable considering how new and specialized F3E is, and how relatively unknown it is among modelers.

Regular FAI F3E electric flying combines two of the three elements of F3B multi-task soaring (distance and duration) into a single, uninterrupted flight. Obviously, it also adds the dimension of electric powered flight.

Dieter Lamprecht gives John Lupperger's "Sinus" a sprinting head start into the initial climbout for distance, the first of two tasks to be flown in a single flight. See text for F3E contest format.

After 14 laps, John Lupperger flies the Sinus under the invisible "limbo bar" gate that starts the beginning of the second task, thermal duration.

M. Poelking's twin-boom pusher was the most unusual design at the meet. Proved to be short coupled and quite pitch sensitive.

Chuck Hollinger boosts M. Poelking's backup ship into the air. Fuselage is a Snipe, but wings and stab are original.

Unlike the "winch war" laws of F3B, there are no restrictions on motors in F3E. Only a few cell limitations and definitions apply as relates to the aircraft's power source.

In the Sportsman Seven-Cell F3E contest format, launching is accomplished by motor(s) driven by seven Ni-Cd cells of 1200 mAH or less capacity. Most flyers chose to use seven Sanyo SCR "1300" cells because they look like Sanyo SC 1200s externally. Also, the SCRs were used because the current draw of a typical Astro FAI 05 six-turn motor (which everyone used) is such that the smaller 800 or 900 mAH packs drain too quickly.

The 150 meter F3E distance course is identical to F3B. It is laid out as two imaginary geometrical planes which in theory stretch out to infinity yet never touch (they are parallel). These planes intersect the ground 150 meters apart.

Two sighting devices are used to define the course. Two spotters man the two sighting devices. Their job is to "flag" models as they cross each end of the course. Three minutes of working time is given to launch, climb, fly laps, climb again, fly more laps, etc., and finish the course. Partial laps at the end of the three minutes do not count.

Multiple motor runs are possible in distance because the FAI F3E rules now allow them. In fact, a second motor run is now required by the rules. All motor runs must occur outside course boundaries, and the second motor run must be finished within working time.

The first step of the F3E game is to identify your craft with the far turn flagman. Jerry Bridgeman is seen here lofting Jason Perrin's Snipe for a visual.

The second climbout rule was passed recently because of a dangerous situation that was developing. With the rapid advancement of E-power technology, F3E ships were getting dangerously high after about 20 seconds of motor run. With the old one-climbout rule, many pilots were flying their sailplanes beyond the limits of safe visibility before entering the distance course! And why not? After all, the higher you start, the more laps you can squeeze in before you run out of time or altitude. The more laps you rack up at 15 points per lap, the better score you get.

The FAI rule makers didn't want F3E models to start crashing everywhere because their pilots could no longer stay in control of their ships. Therefore, you may now climb as often as you wish in F3E distance, but you must climb at least twice. In Felix Vivas' Seven-Cell F3E contest, this rule applied.

Speed is a factor in F3E, even though it's not a separate task as in F3B. This is because in the distance tasks these heavier electric powered sailplanes do six to eight laps at a time (between motor runs) at speeds almost that of F3B ships! Some of these seven-cell "sportsman" fliers were doing four laps in about 34 seconds! The big unlimiteds are probably much faster than this.

What makes F3E distance challenging is the many judgement calls that must be made. Just how much climb is needed? Is there enough lift on course to go two more laps? Where is there better lift on course?

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Bob Sliff's Snipe gets a launch from Jerry Bridgeman. Swift and steep climbouts are what make the Snipe unbeatable in 7-cell F3E.

One of the original designs to show up was Hatch Manell's polyhedral ship, complete with spoilers. Had too much dihedral in the outer panels and was very sensitive to rudder control inputs.

CHOPPER CHATTER

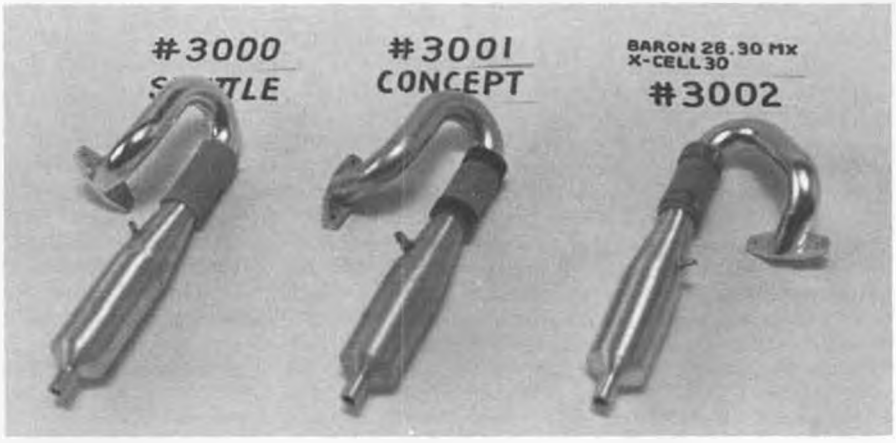
By JAMES WANG

• This month Chopper Chatter should be an interesting one because we will explain the principle behind that ubiquitous flybar that sits on every R/C helicopter main rotor head. We will explain how and why it works, and how to improve your helicopter stability and controllability.

I have recently come across two very good R/C helicopter video tapes for beginners. One is called *Model Helicopter*. It is narrated by Datu Ramel. This video uses the Concept 30 as the starring helicopter, and the video is made by Milt Video Library. The other tape, from R/C Video Magazine is called *You Can Fly R/C Helicopters*. This tape is also well narrated by an ex-Vietnam pilot, Ed Nakasone. This video uses the Concept 30 and Schluter Champion as examples, and it takes the viewers from basic setup, hover to autorotation. Call (800) 873-3347 to order. Ed even welcomes beginners to call him just to ask questions. Both tapes are aimed at beginners, and they are one hour long each. Beginners will benefit tremendously by watching these tapes, and at $20 a tape they are worth the money because they answer the fundamental questions that beginners ask and don't know where to seek the answers. However, if you can fly around and perform loops and rolls already, then you probably wouldn't be excited by this film. I suggested to Ed that he should have some advanced aerobatics and hot dog maneuvers training videos, too. *(Another tape "How To Build & Fly Schluter Helicopters," produced by Mike Mas, 1978-1982 National Heli Champ, is available from Robbe Model Sport for $49.95. Call Robbe at (201)359-2115. wcn)*

The next item on this month's agenda is new products. The photograph shows three new miniature tuned pipes for 30-size helicopters. These were sent to me from Century Import. They are available from Helicopter World in San Jose, California. These pipes are $49.95 each, and the one I tried is really quiet and gives my OS 32 about 5 to 10% boost as compared to the normal OS muffler. These pipes are called Super Tune Pipe, and are made by the same people who make Magna Pipe, in Taiwan. These pipes are copies of Japanese K&S pipes and cost half as much as K&S pipes. As K&S pipes are not readily available in the U.S., and I have not tried the genuine K&S before, I can't tell you if these copies are as good as the real McCoy. But at $49.95, they give 10% power boost and peace to the ear, so I think they do the job. For more information call HW at (408)436-1325.

A month ago at the Hobby Shack store in Los Angeles, I saw an European-style transmitter tray on sale at $49.95. This particular one as shown in the photo was designed by umpteen times R/C aerobatic champion Hanno Prettner, of Austria, and is produced by OK Products of Japan. I always wanted to try one of these trays to see if they can improve precision hover and F3C aerobatics, so I purchased one. At $49.95 it seems very expensive just for a thin plastic tray. All JR and Airtronics transmitters fit the tray perfectly, and so would the new Futaba 5, 6, and 7 channel radios, but not the 9-channel. Does the tray work? For me it feels awkward. I guess I am not used to it so it feels like something heavy is dragging my neck down, and the tray makes the switches on top difficult to reach. The tray does help in precision hover maneuvers because it provides a platform to anchor the palms so the hands have a nice fulcrum to provide precise finger-only movements. For forward flight aerobatics which require more stick movements, I found it wasn't as easy for me to move the sticks if I rest my hands on the tray. For hot dog flying, which requires frequent large amplitude and quick stick movement and some body language, I found that I could do better without the tray. However, as we pointed out in last month's F3C Helicopter World Championships report, all European competitors employ trays, but the winning Japanese team did not. If you have an opportunity you should try one, maybe it might improve your flying. You can probably fabricate one yourself a lot cheaper than $49.95. You do have to lengthen your transmitter sticks.



Three new miniature one-piece tuned pipes for .30-size helicopters, from Century Imports. They will give a 5 to 10% increase in power over a stock O.S. muffler. Text has details.

Our columnist checks out the European style transmitter tray designed by Hanno Prettner and manufactured in Japan by OK Products. Retail price is $49.95. James has mixed feelings about it; see text.

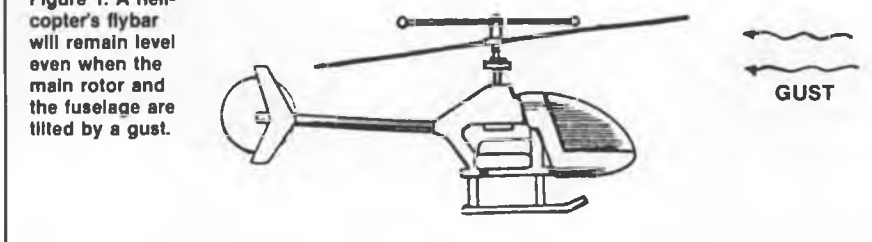


Figure 1. A helicopter's flybar will remain level even when the main rotor and the fuselage are tilted by a gust.

These are just some of the over 240 helicopters that showed up at the 1989 West Coast Fun-Fly in Merced, California. Over $7000 in prizes and awards.

No information was supplied about the builder or the machine, except that it's a scratch-built Hughes 300 and it's *big*. Merced Fun-Fly.

The European transmitter sticks average about two and a half to three inches long.

The next news is that Alex Gauss, who made the 60-size swept tip fiberglass blades that we showed you last month, now has a 30-size swept tip fiberglass blade for the Concept 30. The price is around $60 a pair. GMP is now including the Tech Specialty weighted blades in its Special Edition Stork kits. The old Japanese plain wood blades were OK for flying, but they don't have sufficient inertia for the autorotation maneuver. The new 160 gram blades make autorotation a breeze for the Stork. If you have a Stork already, try replacing the DDF head with a GMP Prohead, it makes the Stork very aerobatic.

Finally, let's now get to the meat of this month's "Chopper Chatter"; Explaining why and how a flybar works. The flybar was originally invented by Mr. Arthur Young in 1940. The flybar is also called a Bell stabilizer bar, because Arthur Young sold his idea to Bell Aircraft Company in 1940, and he also started working for Bell in 1940. The Bell stabilizer bar is a crude autopilot system. The proper technical description of it is: *"It's a mechanical stability augmentation system that provides a lagged-rate feedback to help stabilize the longitudinal and lateral angular motions of the helicopter." (We all knew that, right? wcn)* Now let me translate that to English so every chopper pilot can appreciate its beauty.

The flybar's purpose is to help stabilize the helicopter pitching and rolling motion.

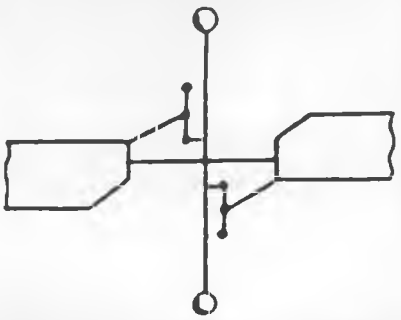


Figure 2. Bell-Hiller mixing arms are the small arms that relay flybar action to the main rotor blades to help stabilize the helicopter.

In the August issue of *Model Builder* we explained that ALL model and real helicopters are inherently unstable in pitch and roll. If left uncontrolled, all helicopters will drift and pitch into the ground or roll into the ground by themselves. The flybar functions as an artificial horizon to let the model helicopter know where the horizon is and let the helicopter know if it is nice and level. Assuming the model helicopter decides to roll left and head for the ground, the flybar will immediately tell the main rotor to tilt right to impede the drift. The flybar functions very similarly to our electronic yaw rate gyro, they both add *damping* to impede wanted and unwanted motions. The key word here is "damping" to vehicle motion. Damping means impeding or slowing down motion. With the flybar, model helicopters become more sluggish,

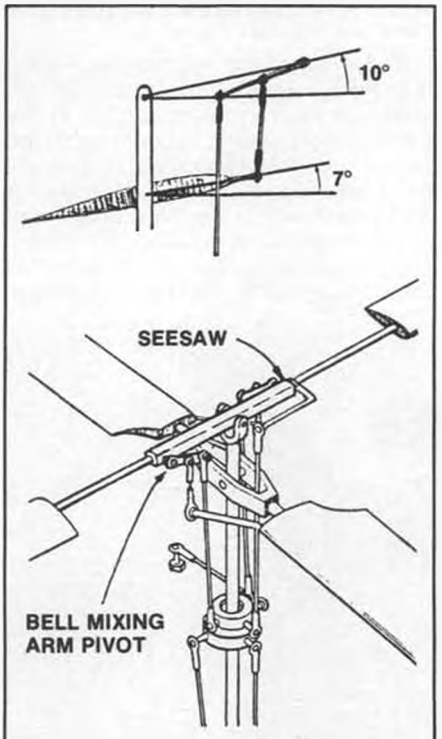


Figure 3. This diagram of the Kalt Baron 30 and 60 rotor head reveals a Bell-Hiller mixing ratio of 70%. The new Kalt K-5 head has 100%. See text for an explanation of Bell-Hiller mixing ratio.

and it is as if someone hit the slow motion button on a video game to slow down the action so you have more time to think. This is the reason that many people have the idea that flybarless machines are quicker and harder to fly. Well, let's not get into a debate on that issue! Let me just say that a well designed flybarless machine like the Legend and real Bell Jet Ranger and Bell 222 can have sufficient inherent vehicle damping through proper blade design to eliminate the need for the stabilizer bar. But in general, the flybar slows down helicopter reaction and tames the helicopter.

Let's see how the flybar achieves its stability augmentation effect. Notice that on all model helicopters the flybar and seesaw assembly is always a free teetering unit attached to the main rotor head. Because it can teeter freely, when there is a gust of wind pushing the main rotor and helicopter back, as shown in Figure 1, the stabilizer bar will act like a spinning gyro and remain level. Due to its ability to remain level, it functions like an artificial horizon to let the helicopter know where level is. We call things that can remain level without being disturbed an "inertial reference." The flybar thus acts as a good inertial reference. To take advantage of the "remain level" ability of the flybar, we attach small mechanical lever arms to it, so we

Continued on page 74

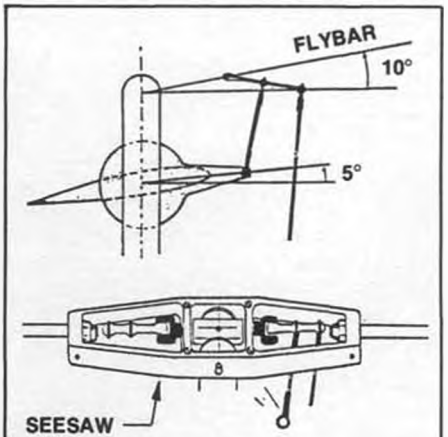


Figure 4. GMP's Prohead has a 50% Bell-Hiller mixing ratio. The higher the ratio, the more stable the helicopter will be.

PLUG SPARKS

By JOHN POND

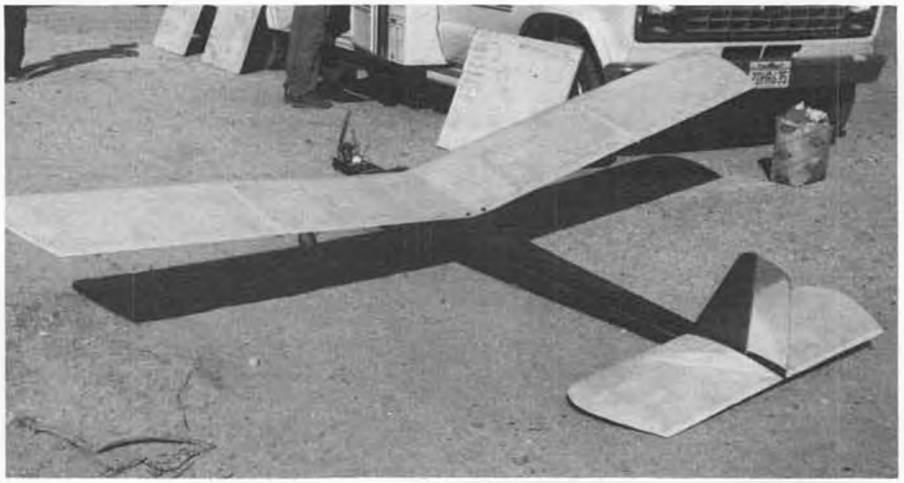
• We haven't reported a contest with photos and results in quite some time. What with the Lanzo Bombers, scaled in any size you want, results were not too interesting, except to see what engine was being used.

One of the designs not readily recognized is the Schmaedig Flying Stick as built and flown by Bob Angel. Powered by an Ohlsson 60, this has proven to be an excellent O/T R/C subject that appears to fly in any sort of weather with excellent results.

Encouraged by the performance of this seven-foot model, Ron Doig, a fellow member of SAM 26, decided to go Bob Angel one better and produced a twelve-foot version, as can be seen in Photo No. 1. We'll have more on the performance, improved or otherwise, in upcoming issues.

Bob Angel (Asst. C.D. to Hardy Robinson), wrote the following on the John Pond Commemorative XIV: "Weather cooperated nicely, with temperatures in a dry 91 degrees F, but more importantly, John Pond did show up in good spirits and apparently good health. He verified all this by winning Class A ignition with the only set of three perfect maxes in that event. Whenever we start to think John may be getting a bit 'over the hill,' he jumps up with an occasional surprise to remind us otherwise. Later, challenged by Hardy Robinson to a glider duel, John and Hardy strung out a hi-start and had at it. John came down early with a 'crunch' and an apparent radio problem, so Hardy just took one short flight to win it without 'running up the score' on his downed opponent."

Both 1/2A and Regular Texaco Events were hotly contested with flights of 30 minutes or better. Ken Kullman won second in Texaco with 33:18 and second in 1/2A Texaco with 28:02. Ken can be seen in Photo No. 2 holding his Elfin powered Class A Lanzo RC-1, another design which is gradually catching on.



1. Ron Doig's 1937 Schmaedig "Flying Stick," blown up to 12-foot span for R/C Texaco events. Ship features a three-piece wing and all-flying horizontal stabilizer. No great ball of fire under power, but boy, does it glide!

Angel makes the observation: "Were the Ohlsson engines underrated for reliability, as well as power output? In the Ohlsson special event, six out of eight fliers scored at least one max flight, and except for Tom Empey dropping out with a broken Bomber, all the Ohlsson flyers got pretty respectable double digit scores. Everyone got their flights in using the first three attempts only, with no one having to use their allotted extra fourth attempt. This is a better record for reliability than any other single event, even the all glow engine powered events!"

While this columnist was wandering about to get a few photos, he ran into Fred Lehmberg who most readers will remember for his "Chicken Scratchings" (as I call it) column.

As usual, Fred had his Ohlsson 60 powered Feather Merchant design, as seen in Photo No. 3, out for some test flying and fun. He was successful in damaging it to the point where entering the event was not possible. For those interested, Fred is still marketing two sizes of Feather Merchants and the Goon kits. If interested, write to Fred Lehmberg, 2646 E. Bolker Drive, Port Hueneme, California 93041 or call (805)984-6639.

2. SAM 51's Ken Kullman shows off his Elfin powered Class A version of Chet Lanzo's RC-1. Good performance and simple, lightweight structure make the RC-1 a popular choice for all O.T. R/C events.

3 (below). The original designer of the Feather Merchant, Fred Lehmberg, posing with one of the two sizes of the model that he offers in kit form—see text for address. This is the standard size Feather Merchant, equipped with an O&R .60 sideport.

Before giving you the results, Photo No. 4 should be the order of the day as Jack Albrecht is shown with Joe Percy. As can be seen, Jack has completely converted to Lanzo Bomber designs. No question about performance as Albrecht won Sweepstakes

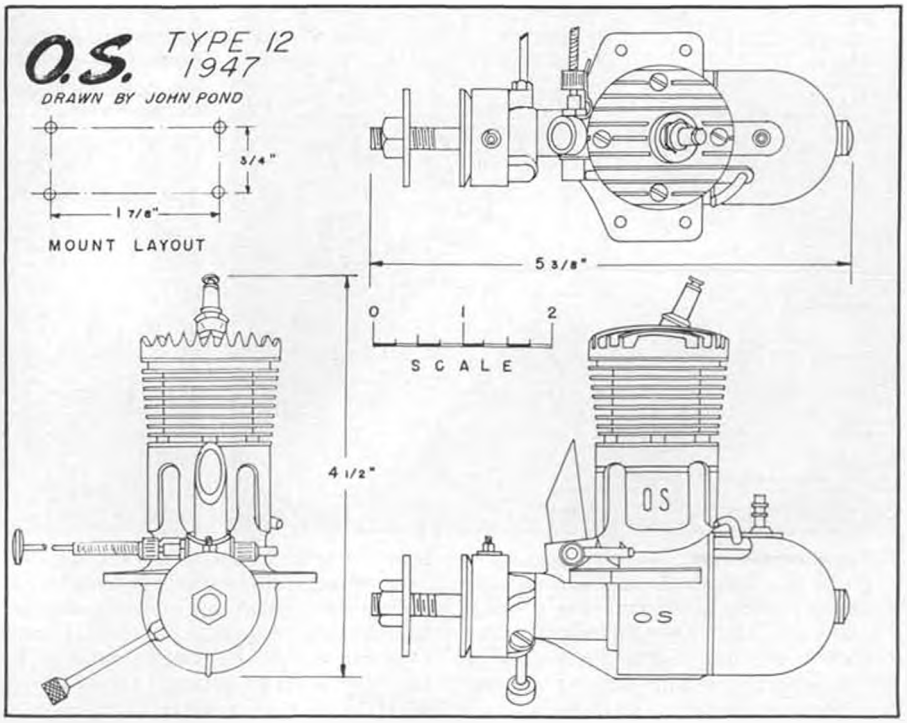
4. Top O.T. R/C contenders Joe Percy and Jack Albrecht (left and right respectively) show off their hot-flying Lanzo Bombers at the 1989 Southwestern Regionals, Eloy, Arizona.

5. Not too many Zombies being built these days. Don Bekins, of SAM 27, built this Class A ship from an original Megow kit. Alas, it exists no more.

with 15 points. Seems like the best get better!

Results - 14th Annual John Pond Commemorative, Sept. 1989

Class A Ignition (11)		
1. John Pond	Playboy Cabin/Elfin 2.49	21:00
2. Eut Tileston	Westerner/Elfin 2.49	18:01
3. Jack Albrecht	Bomber/McCoy 19	17:22
Class A Glow (5)		
1. Tom Empey	Viking/Cox 15	15:10
2. Al Hellman	Playboy Cabin/OS 20	14:56
3. Gary Westland	Ranger/Cox 15	8:56
Class B Ignition (10)		
1. Jack Albrecht	Bomber/Torpedo 29	21:00
2. Ed Hamler	Bomber/Torpedo 29	18:12
3. Gary Westland	Schmaedig/Torpedo 29	18:03
Class B Glow (4)		
1. Tom Empey	Playboy/K&B 4.9	15:06
2. Gary Westland	Bomber/Enya 40 FS	13:30
Ohlsson Sideport Special Event (8)		
1. Dale Tower	Bomber/O&R 60 SP	21:00
2. Jack Albrecht	Bomber/O&R 60 SP	18:49
3. Howard Osegueda	Scram/O&R 60 SP	18:22



Class C Ignition		
1. Jack Albrecht	Bomber/Anderson Spit.	21:00
2. Bob Angel	Schmaedig/O&R 60	20:06
3. Jim Robinson	Sailplane/O&R 60	19:02
Class C Glow (7)		
1. Bob Munn	Playboy Cabin/S.T. 35	20:02
2. Dave Lewis	Anderson Pylon/S.T. 35	15:41
3. Ray Westland	Sailplane/K&B 6.5	6:37
Texaco (12)		
1. Dale Tower	Bomber/OS FS 60	83:30
2. Ken Kullman	Bomber/OS FS 61	33:18
3. Ed Hamler	Red Zephyr/Torpedo 29	32:21
1/2A Texaco (13)		
1. Ed Hamler	Quaker	30:00
2. Ken Kullman	Westerner	28:02
3. Dale Tower	Stratostreak	26:11
Antique (6)		
1. Eut Tileston	Westerner/O&R 60	29:24
2. Bob Angel	Schmaedig/O&R 60	27:28
3. Dale Tower	Bomber/O&R 60	20:00
Pure Antique (12)		
1. Don Bishop	Bomber/Edco 65	30:00
2. Dave Steinel	Clipper/O&R 60	27:09
3. Tom Empey	Bomber/Spitfire	25:17
Electric Texaco (6)		
1. Jack Albrecht	Bomber/Leisure 05	30:00+13:36
2. Bob Boies	Bomber/LT50	30:00+12:53
3. Gary Westland	Bomber/Leisure 05	25:25
O/T R/C Glider (2)		
1. Hardy Robinson	Struck Soarer	
2. John Pond	Floater	

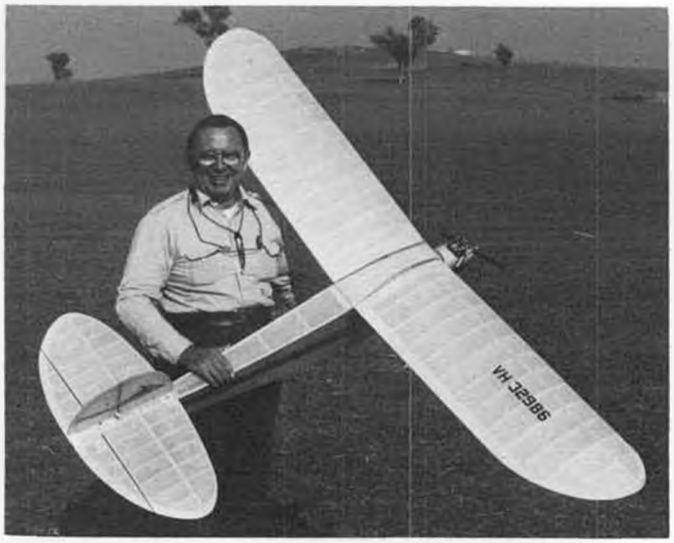
SAM 27 "BASH & CRASH" ANNUAL

One of the easiest going contests of the year was held at Schmidt's Ranch, Elk Grove, California. The hosts, Loren and Miriam Schmidt, make things so pleasant it is no wonder no one crabs about the competition or the pin frequency jams.

Weather-wise, the temperature got up to the eighties with only a 5 mph wind. Late in the afternoon, a cold front came in and effectively ruined any good thermal flying. Worst problem was that the wind continued well into Sunday, causing many, including this writer, to leave (also to avoid the "Silicon Valley" crush).

In his annual appearance, Don Bekins was Contest Director and worked hard to make the meet a success. Practically single-handedly, he did all the retrieving of the glider "high start" cable. Hard work on

6. Owen Black with a 1/2A R/C version of the Plecan/Shurman "Pinch Hitter," a wartime design of pine and spruce. It was the featured O.T. plan in our October '89 issue.



7 (left). Master craftsman Bob Munn, of La Mesa, California, is also a prolific builder, regularly turning out beauties like this slicked Taibi Powerhouse. Flies well with Enya four-stroke power.

8 (below). Bill Bowen gets to fly his hot Riser Rider only when he's not CD'ing the local O.T. R/C meets—and that's not often.

those plowed fields!

Photo No. 5 shows Don Bekins with his ill-fated Zomby built from the original Megow kit. After winning several times before it met that mysterious malady, a folded wing and resulting dive; combination equal crash.

We always welcome shots of different aircraft and Photo No. 6 is no exception, showing Owen Black with a "Pinch Hitter." This was a design that came out in November 1942 *Air Trails*, after Uncle Sam had gone to war. (Plans in Oct. '89 *MB*.)

Seen in Photo No. 8 is Bowen with a scaled "Riser Rider" powered with an OS 60 glow. This model goes up like a rocket and glides like there is no gravity. Gorgeous combination that Bill has been unable to fly much as he is constantly running the NCFFC O/T R/C contests.

Probably the most common sight on the field is the area generally occupied by Jack Alten and John Pond. As can be seen in Photo No. 9, Jack brings all the work tables and necessary equipment to do electrical motor repairs, while Pond brings a station wagon load of models, numbering as high as thirteen at times. Pond is a Boy Scout, "Be Prepared" (for any event).

This shot, taken at Marysville, shows Pond in a jubilant mood after a max with his 70% Playboy Cabin Kyosho electric powered. Jack is seen with his Lanzo Bomber built from a Leisure kit that has never failed to win or place. Jack is a real perfectionist when it comes to electric power.

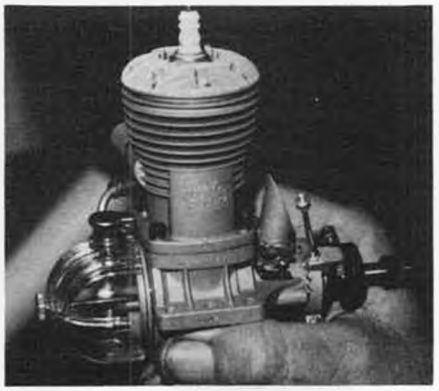
A new event, the Spirit of SAM Concours event, was introduced at this meet. Wouldn't you know it, Bekins won with an Ohlsson powered Scientific Ensign! Honorable mention went to John Pond (Bowden Mallard), Dale Bowers (Flying Quaker), and Ed Hemler (Red Zephyr). A gorgeous wire sculpture trophy of a Trenton Terror (created by Michael Thompson) was the hotly contested prize.

9. Busy area! Between all of John Pond's models and the work tables belonging to Jack Alten (back to camera), it's a wonder these guys can even turn around without breaking something.

The model, designed by Gil Sherman, was constructed of pine and/or spruce. The model was a good flyer despite the added weight of hard woods, but when constructed forty years later of balsa wood, the model is a dandy 1/2A Texaco flyer.

Bob Munn, who faithfully makes the trek from San Diego, has been winning in Class C with some degree of regularity. Munn, a member of SAM 41, has been building like mad since he sold all his models, including the Powerhouse seen in Photo No. 7. This shot was actually taken at Canowindra, site of the Australian SAM Championships.

Just back from a month long trip to New Zealand, long time buddy Bill Bowen showed up on Saturday to enjoy meeting old friends, the weather and the meet.



10. California's Marvin Miller is going into limited production on the Anderson Spitfire .60 and .65—see text for details.

Results - 12th Annual Crash & Bash

1/2A Texaco (12)

1. Danny Klarich	Anderson Pylon	26:28
2. Gino Ferrario	Red Zephyr	23:57
3. Ron Keil	Little Diamond	13:16

Texaco (13)

1. Stan Lane	Anderson Pylon/OS 60	45:00
2. Ken Myers	Clipper/OS 90	33:11
3. Dave Bruner	Record Breaker/OS 60	22:56

Old Time Glider Special Event (3)

1. Karl Righetti	The Hague	9:54
2. Don Bekins	Thermic 50 (200%)	8:59
3. Ken Myers	Soaring Champ	7:33

GHQ Flyoff

Our Contest Director, Don Bekins, decided there would be no GHQ flyoff this year. His decision was based on the assumption that a minimum of two entries are required to launch one flyoff. A wise decision. . . .

Class A Limited Engine Run (6)

1. Howard Osegueda	Buzzard Bombshell/Elfin	11:32
2. Loren Schmidt	Playboy Jr./Elfin	:25

Class B Limited Engine Run (8)

1. Don Parmenter	Anderson Pylon/O&R 29	19:44
2. Speed Hughes	Anderson Pylon/McCoy 29	15:55
3. Howard Osegueda	Bomber/O&R 23	15:25

Class C Limited Engine Run (12)

1. Speed Hughes	Bomber/SuperTigre 60	21:00
2. Don Bekins	Playboy Cabin/O&R 60	18:30
3. Karl Righetti	Ehling 2 in 1, O&R 60	17:59

Combined Antique/Pure Antique (5)

1. Ed Hamler	Bomber/O&R 60	26:43
2. Nick Sanford	Bomber/McCoy 60	25:33

11. Another rare bird is the Capitol "Flight Master" as built for 1/2A Texaco by SAM 39's Stu Warner. Finished in Stu's favorite: pink silk!

12 (right). Bill Cushenberry's "Kansas Wakefield," an Ernie Linn design, took 2nd in the Nostalgia Wakefield flyoff at the '89 U.S. F/F Champs at Taft.

3. Ken Myers	MG Cabin/Fox 60	22:51

Class A Electric Limited Motor Run Special Event (3)

1. Jack Alten	Bomber/Leisure LT50	18:29
2. Al Ward	Bomber/Astro Cobalt 05	18:11
3. Dave Lewis	Wasp/Leisure LT50	13:24

Class B Electric Limited Motor Run Special Event (3)

1. John Pond	Playboy Cabin	16:21
2. Jack Alten	Playboy Sr.	12:19
3. Steve Roselle	Quaker	1:39

Electric Texaco Special Event (8)

1. Jack Alten	Bomber/Leisure LT50	50:00
2. Gary Linford	Playboy Cabin/K480T	48:21
3. Tom Christian	Bomber/Kyosho 05	30:00

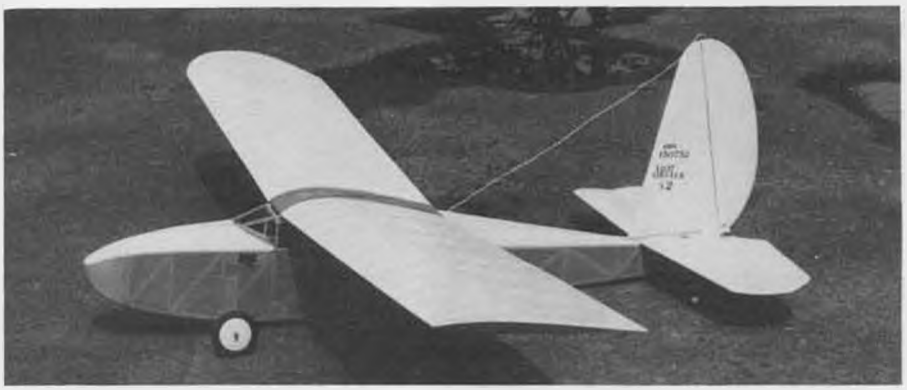
Ohlsson Sideport Special Event (6)

1. Ed Solenberger	Bomber/O&R 60	21:00
2. Bill Burleson	Bomber/O&R 60	16:09
3. Ed Hamler	Bomber/O&R 60	16:07

Ohlsson 23 Special Event (7)

1. Howard Osegueda	Bomber/O&R 23	13:19
2. Nick Sanford	Bomber/O&R 23	13:08
3. Don Parmenter	Anderson Pylon/O&R 23	9:35

Sweepstakes Winner: Speed Hughes



13. No shortage of fin area here! Don Lefferts built this double-size Weathers "Airster" for O.T. R/C Towline. This event is gradually catching on in California.

ENGINE OF THE MONTH

This month's engine is another rare one kindly loaned to this writer by Jim Perssons of Pleasanton, California. We are also indebted to Tony Farnan of Model Engines, Melbourne, Australia, who has been an O.S. distributor for years and has kindly furnished background data.

Shigeo Ogawa (O.S.) was always interested in model locomotives and airplanes. The involvement of miniature engineering fascinated Ogawa, and at the age of 15 he produced his first steam engine. This was followed by the Type I ignition motor in 1936. No great shakes for design, but in those early pioneering days, anything that started and ran was considered a success.

This month's engine, the O.S. Type 12, was produced in 1947 after the war. At this time, after WWII, most OS engines were produced for local consumption. It was not until 1949-1950 that OS engines came to the attention of American model builders through the OS 30, an engine showing Bill Atwood influence and imported by Atwood.

This twin stack engine was a rather noisy powerplant, but was a reliable performer.

About the time that the Type 12 was released in 1947, Ogawa had acquired considerable land and established a small factory in the suburbs of Osaka, some 40 minutes from the center of town. One could say this was really in the "country" as the plant was surrounded by rice fields.

The Type 12 engine shows considerable influence of American engine designs, especially the postwar Super Cyclone. In most cases, the most desirable features of the various engines were adopted; i.e., Ohlsson-type enclosed timer points and housing, Super Cyclone layout, etc.

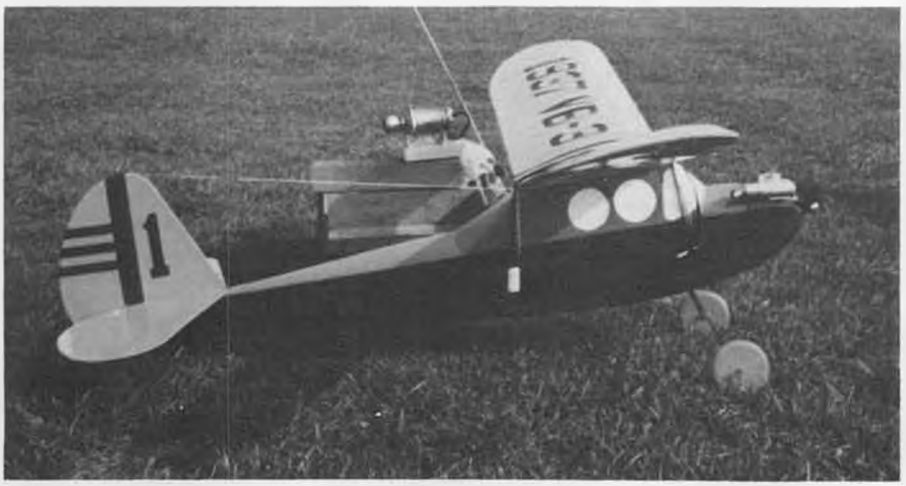
The O.S. company has put out a brochure showing the entire line of engines produced since 1936. The Type 12 was built in 9.85cc displacement (.59 cu. in.) and appears to be generally the same size as the 1946 Type 11 engine.

Improvements to the timer, arrangement, slant spark plug and cylinder head were the major changes for the 1947 model. Thereafter it was a new model engine design each succeeding year.

ANDERSON ENGINE PROJECT

The best news to be announced is that the Anderson Spitfire engine is now in limited production by Marvin Miller, 250 Bronco Road, Soquel, California 95873.

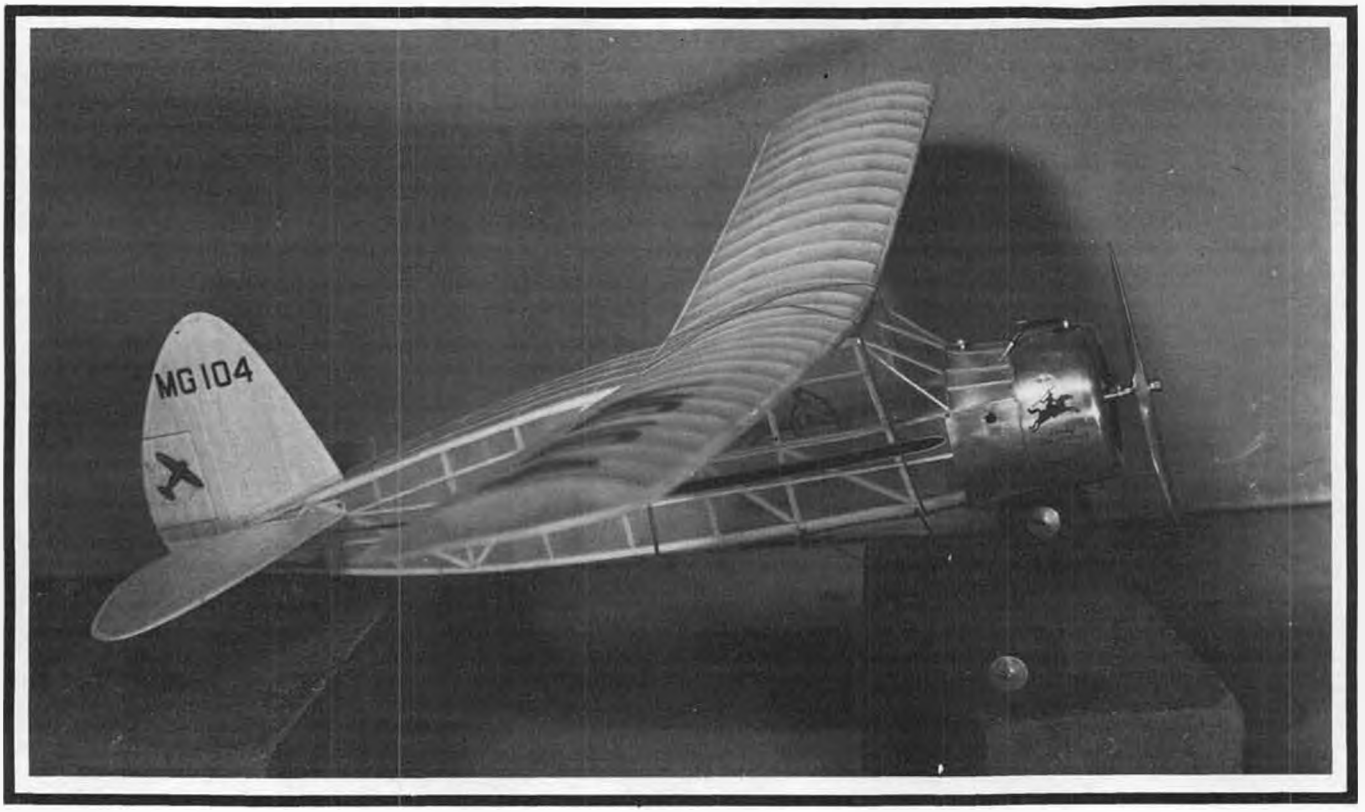
As can be seen in Photo No. 10, the engine features a glass beaded finish which enhances the appearance. The motor is excellently made and comes in two sizes,



14. Cy Sapsford built this R/C version of the "Old Faithful," a 1937 antique originally designed by Leo Vartanian. Model has also been known as the VB-3. Ship has nice lines, don't you think?

Continued on page 103

Lit'l Dennyplane Jr.



A 2/3-size sport R/C version of a classic 1930's Old Timer gas model, for .09 to .15 power. By DAN C. LUTZ

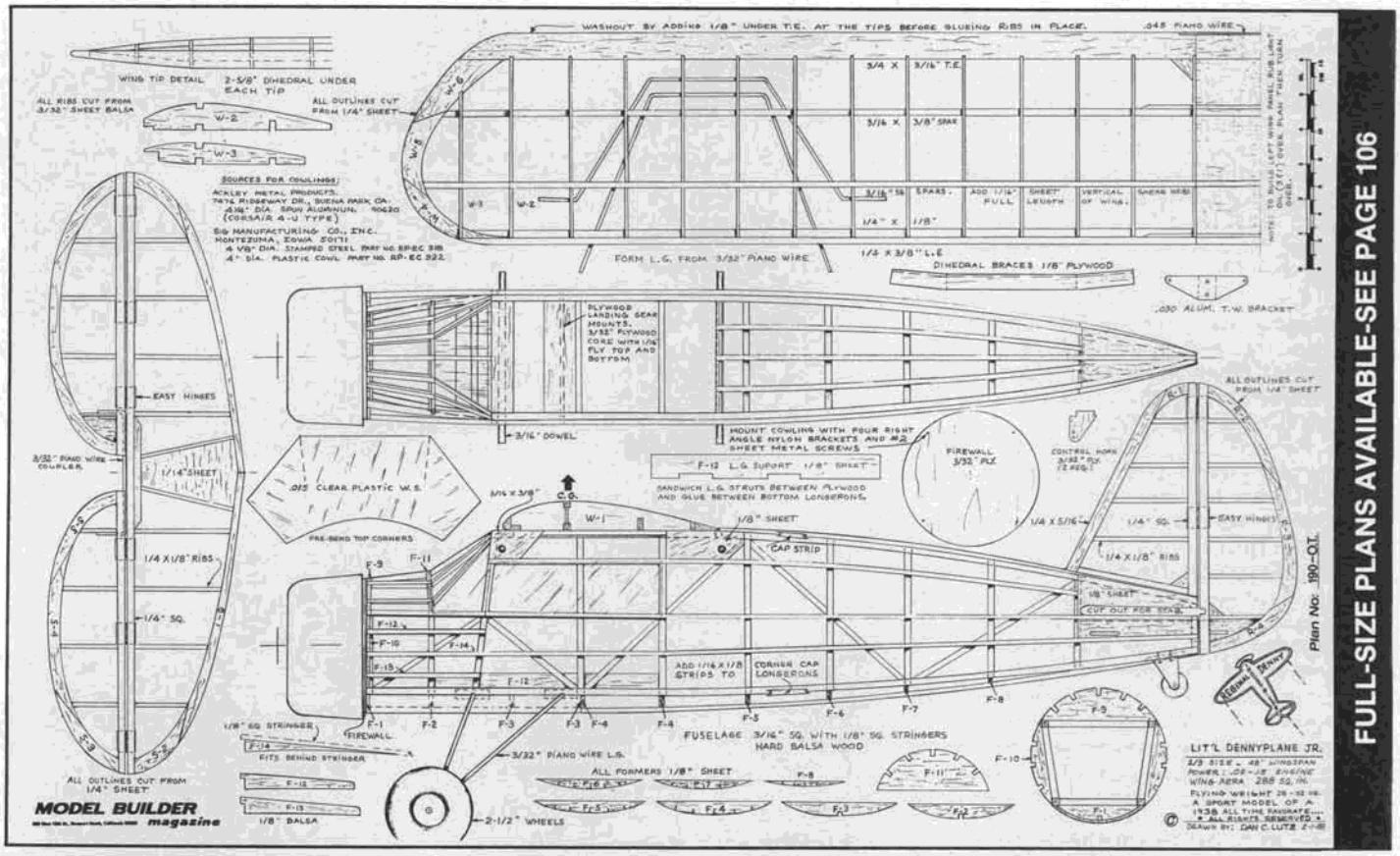
• For all those modelers who lived and grew up in the Southern California area during the late nineteen thirties, Reginald Denny's hobby shop was their headquarters for model supplies. This famous shop was located on Hollywood Blvd. just east of the movie theaters and nightclubs. The woodframe building was an old converted house with large display windows that were full of built-up models. There was even a very large scale model of a four engine China Clipper that was used in the movie of the same name. If you looked at it close, you could see the eyelets in the leading and trailing edges of the wing which were used to guide it across the movie screen on wires.

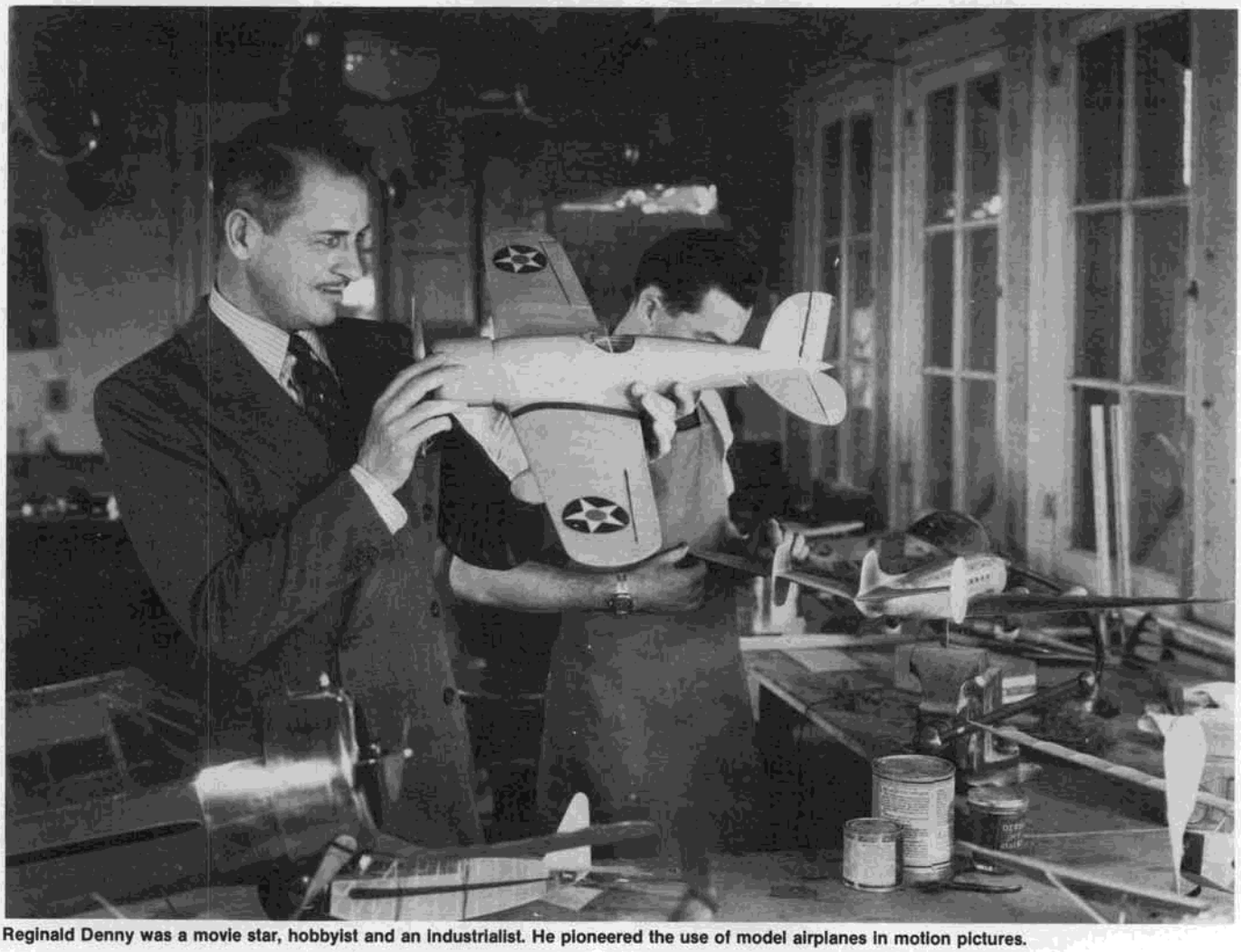
Adjacent to the hobby shop was a large work area that had many models in various stages of construction hanging from the ceiling and walls. Most of them were Dennyplanes. This hobby shop was just part of Reginald Denny Industries. They manufactured and distributed everything from engines, kits, and airwheels to a complete line of model racecars and accessories.

All of this was owned by the flamboyant movie star, Reginald Denny. He appeared in many of the motion pictures filmed in the '30s and '40s. He was quite debonair and appeared with many famous actresses of the same era. He was noted for giving complete and fully tested Dennyplane model airplanes to some of the young and

Photo at top of page shows an original factory-built Dennyplane Jr., powered by one of ten Sky Charger engines developed for Denny Industries. This version appears to be the last of the Dennyplane Jr. series.

Left: Our author chose to cover his four-foot R/C Dennyplane Jr. with good ol' silk and dope to maintain the appropriate vintage look. Power is an O.S. .10. Sources for the metal cowl are listed on the plan. About the only noticeable difference between this and a "real" Dennyplane Jr. is the substitution of built-up tail surfaces for the original's solid balsa.





Reginald Denny was a movie star, hobbyist and an industrialist. He pioneered the use of model airplanes in motion pictures.

up-coming child movie stars.

Freddy Bartholomew received just such a model for a Christmas present. He showed up with it at the Pacific Coast Championships in the summer of 1937. This eleven year old M.G.M. movie star had high hopes of winning until an over-enthusiastic photographer stepped into the path of his model as it was taking off. The wing and nose section were badly damaged and beyond repair.

There were also photos of Jane Withers holding beautifully built Dennyplanes that appeared in the movie "Holy Terror." Jackie Cooper was another young star who received one of the six-foot models as a gift from Reginald Denny.

As the years passed, so did the Denny name. By the mid-1950s, the only thing left of Denny Industries was a few left over Dennymite engines that were sold at discount prices. The Reginald Denny name also disappeared from the marquee at the local movie theaters. The once famous Reginald Denny retired and moved to England where he passed away in the 1960s without much fanfair from Hollywood.

Occasionally you can still see him in some of the old movies featured on the late night T.V. shows. The brilliant acting and gracious smile of this noble Englishman will always be remembered, along with his famous Dennyplane models.

Top: Completed Dennyplane Jr. models hanging from the ceiling of Reginald Denny's workshop, which was adjacent to his famous hobby shop located on Hollywood Blvd. Note the 4-1/2" Denny airwheels on all of them. The major differences between the Dennyplane Jr. and the earlier Dennyplane are that the Jr. does not have wing struts; has thick, carved solid balsa tail surfaces, and features much simpler construction.

Center: Photo taken at the 1937 Pacific Coast Championships shows child movie star, Freddy Bartholomew, preparing his Dennyplane Jr., a gift from Reginald Denny. Power was a Gwin Aero.

Bottom: Jane Withers appeared as "Corky" in the movie *Holy Terror*, which featured several Dennyplane Jr. models. This particular ship has wing struts, but it's still a Jr.

There were two or maybe three different Dennyplane designs. They all had six-foot wingspans and radial cowls. I chose the later model with the one-piece wing, which was the more popular model. The construction follows the original except for the full depth main spar. Dennyplanes were noted for folding their wings in a loop. The original models used solid sheet tail surfaces which I also changed to conventional built-up construction to save weight in the tail section. My model is two-thirds size, which builds fairly fast. The basic box fuselage with bulkheads and stringers shouldn't present any construction problems to the average modeler. The lower longerons tuck in a little narrower at the firewall. This will give the engine installation a small amount of needed downthrust. The wing and tail group just about fall together once you get all the parts cut out. In keeping with the tradition of the

Continued on page 58

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The GMP/Hirobo 'SHUTTLE XX'

.30 size R/C Helicopter

This is how the Shuttle looks, right out of the box—truly an ARF machine. The large cardboard kit box doubles as a shipping and storage container. Shuttle XX has ball bearing linkages throughout.

By JAMES WANG

• This month we will take a look at a long time successful model, the Hirobo Shuttle. It was first introduced to the U.S. in 1985. After five years and over 10,000 sold in the U.S., is it still a beginner's choice? Or is the Concept and Rebel a better choice? Since we will have a dedicated review of the Rebel soon, let us compare the Shuttle to the Concept that we reviewed in June '89 *Model Builder.* In this month's review we will also evaluate the E&G Enterprises MD 530F body and see how it changes the Shuttle's flying characteristics; it certainly improves the look.

In the early '80s, ARF (almost-ready-to-fly) R/C airplanes became very popular in the U.S. *(ARFS first became available in the mid-60s to R/Cers, though in smaller quantities. wcn)* The Japanese, being smart businessmen, have given the model world what it wanted. Hirobo of Japan was shrewd enough to realize that it was time to introduce ARF model helicopters. Yep, that was a strategic move. During the all time high, Hirobo was able to sell up to 1,000 Shuttles a month in the U.S. alone. The average completion time from the opening of the Shuttle box to the point of being ready to fuel up and fly is only five to six hours. You can buy one in the morning at your local hobby shop and start flying lessons in the afternoon. The Shuttle has monopolized the low-cost trainer market because of its almost-ready-to-fly feature and its compact size. However, the arrival of Kyosho's Concept 30 in 1989 and GMP's new Rebel really gave the Shuttle competition. Hirobo finally felt the squeeze and decided to update the Shuttle and will soon be introducing two new Shuttles called the Shuttle Z and Shuttle ZX. The only major difference will be a new underslung flybar main rotor head. The mechanics and control setup remain untouched.

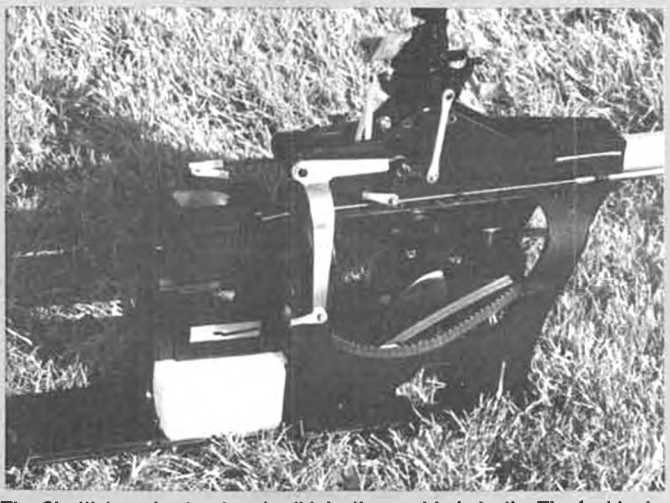
The Shuttle has many good attributes, of which the strongest is its low price tag and that it comes all assembled, and it really flies great! The basic Shuttle with green color canopy sells for around $250 to $300. The deluxe Shuttle XX is about $80 to $100 more, but it comes with 18 extra ball bearings and a white canopy. The bearings just make the controls slightly smoother. However, beginners would not have developed sufficient finesse to feel the difference between the two versions.

The Shuttle is extremely stable and aerobatic and I love flying mine. However, it does have some weak points. I have flown the Shuttle at least 100 times, which includes the first generation Shuttles with individual flapping rotor head and the second generation Shuttle with floating axle design rotor head. But I have not flown the new third generation Z models with the underslung flybar head. Before I dish out all the nice features, let's look at the areas that need improvement.

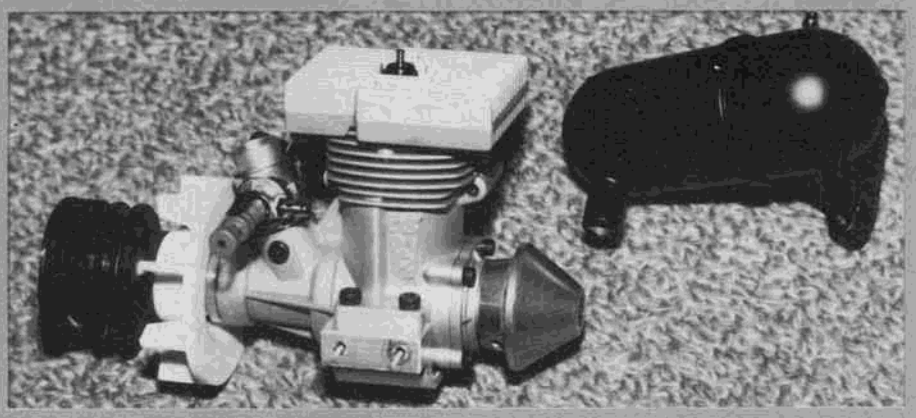
First of all, the plastic clutch is a problem. It will last hundreds of flights without failure, but the clutch does not like to sit in the center of the clutch bell housing, so it wobbles the entire clutch assembly at 15,000 rpm to shake the helicopter, and worse to shake the engine bearings. Unfortunately, the new Z model still has the plastic clutch. Hirobo does sell an optional metal clutch, but it's an additional $40. Rave's Model Product makes their own version of the metal clutch for the Shuttle at $30. If you value your Shuttle as more than just an expendable, first trainer, then it's highly recommended to get a metal clutch.

All the nuts used on the Shuttle to secure the frames and tail rotor casing are non-locknut. The Concept also uses non-lock-

The stock Shuttle XX with the high-tech, chisel-look canopy. It's one of the most aerobatic and stable .30 size helis available.



The Shuttle's main structure is all injection molded plastic. The fuel tank and controls come pre-installed, cutting assembly time to 5-6 hours.

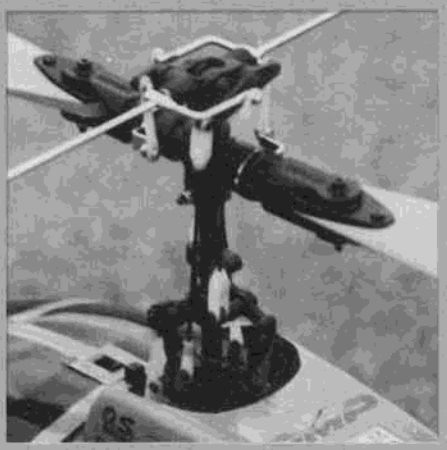


Right: An O.S. .32 FS cone start helicopter engine is recommended for the Shuttle. The muffler shown is an all-metal piece that is included with the Shuttle kit, and is designed to fit O.S. .28 and .32 engines. Entire engine unit is quickly and easily removed for service, if necessary.

nuts. Even though the model comes pre-assembled, you should loosen all the nuts and add a drop of Locktite liquid to secure all nuts just to make sure vibration does not loosen them. I did not do so in the beginning and on the fifth flight the tail rotor plastic casing nut vibrated off. Luckily, I heard the tail rotor drive belt make a strange noise, so I landed it before serious mishap. If you bought a pre-built Concept, please Locktite all the nuts, too.

The next problem is that there is not enough collective pitch travel for doing inverted flight. You have to enlarge the holes where the collective pitch bellcrank swings up and down to increase collective pitch throw. The stock Concept DX does not have enough collective travel for inverted flight either. OK, I agree that these models may be aimed at beginners, but since manufacturers always advertise them as great models for beginners through experts, then why not design them to have sufficient throw at the beginning? Sure, we enjoy modifying them, but . . .

My biggest complaint about the Shuttle is that the main blades go out of track too easily! For example, you may have the model perfectly tracked on Saturday, then you fold the blades back and take the beautiful model home, but the next day, when you come out to fly, the blades may be off track by a half inch! Why? It's because the aluminum main rotor blade pitch arm is too thin and soft, thus it deforms very easily. If you want to adjust the pitch, you don't even need to loosen the clevises, you might as well take needlenose pliers and twist the skinny pitch control arms. They are flimsy. How flimsy? After an aerobatic flight the blades can go out of track by a half inch. Why? Because as we pointed out in the last issue of *Model Builder*, when a blade has the chordwise center of gravity behind the aerodynamic center of the blade, which is at about 25% chordwise location, and when the blade airfoil is not of symmetrical design, then the nose-down aerodynamic pitching moment in high lift and stall condition will twist the blade's leading edge down severely. In this case the flimsy Shuttle pitch arms deform.



The main rotor head is a floating axle design. Flapping stiffness is perfect for aerobatics, although the soft aluminum blade pitch arms can distort under heavy loads.

The main rotor shaft on the Shuttle is very long, and it tends to bend too easily in a crash. A tall main rotor shaft is desirable to achieve good static stability in hover, however, it should then be supported at a location higher up, closer to the main rotor hub, so it will not bend easily. In this respect, the Concept design is better because there is less distance between the top support bearing and the main rotor head. I shortened my Shuttle main rotor shaft by one inch to improve the scale appearance for my MD 530F and did not notice much reduction in hover stability.

The Shuttle main rotor blades are the best finished kit blades that I have seen. The blades are beautifully painted in white

Two aftermarket bodies for the Shuttle: Hirobo's pre-painted fiberglass MD 500, and the clear plastic MD 530F from E&G Enterprises.

One very nice feature of E&G fuselages is that the forward section is held in place with Velcro, makes for easy access to equipment.

Wow! A striking color scheme, to say the least. The addition of the MD 530F fuselage affected the Shuttle's handling dramatically; see text.

Continued on page 93

Control Line

BY JOHN THOMPSON

HANGING ON

Control-line model aviation's enthusiasts can't be described as people with their heads in the clouds. They're looking up, certainly, but usually no higher than 60 or 70 feet, well below cloud level, where the planes are clearly visible and, in fact, in direct contact with the pilots. That's what is so often mentioned as the source of much of the joy in the piloting of a control-line model . . . the feel of the plane in your hands.

But while we have our hearts, minds, and eyes engaged with the airplane above us, we sometimes overlook the most basic tool of CL flying . . . and the one that's closest to us: the handle.

But the handle . . . to the surprise of some of the newcomers to the hobby . . . is not only basic but important as well and certainly something that can be a key factor in the performance of an airplane.

A letter from Gene Fierce, of Spokane, Washington, sets us off, first down memory lane and then to a few comments about modern control-line handles.

"Back in the mid-50s I once purchased a control-line handle made of black plastic complete with a clutch assembly and lines," Gene writes. "I believe it was called a 'U-Reely.' Is this or something similar available today?"

Yes, indeed, Gene, it would be hard to imagine anyone who remembers control-line flying in the 1950s not remembering the U-Reely as well. You'll see one in the photograph accompanying this article.

The one in the photograph is one of the later models, which were produced up until the early 1980s, I believe. The photographed copy was purchased in the mid-70s. My vague memory is that the earliest U-Reelies actually had a metal body and the plastic version was released in the 1960s. Someone with a better memory or a more complete collection may be able to provide more specifics.

The U-Reely, originally a product of control-line pioneer and promoter Jim Walker, later was produced by other manufacturers. I believe it is no longer manufactured.

This month our columnist talks about C/L handles, some typical examples of which are shown above.
Upper left: E-Z-Just Hot Rock handle with four-inch line spacing, popular for combat and sport flying. No longer made, but much sought after.
Upper center: E-Z-Just handle with wide spacing.
Upper right: Sullivan Pylon brand handle. Lightweight, suitable for sport or 1/2A flying.
Center left: Three-line handle, used for throttled airplanes.
Center right: Fox handle, strong, with two choices of line spacing.
Lower left: U-Reely, popular in the '50s and '60s. Lines could be cranked up into the handle.
Lower left top: Sturdi-Bilt handle currently made under the E-Z-Just name.
Lower left bottom: FAI style racing handle, custom built by Dick Salter. Very narrow spacing.

The U-Reely had a clutch assembly and a brake, which, working together, were designed to allow the pilot to use any line length he desired. There are stories about in-flight adjustments, both intentional and by accident, but I don't recall witnessing either myself. Jim Walker is reported to have used the U-Reely in such a way that he would launch the plane himself and feed out the line as the plane took off and gained speed.

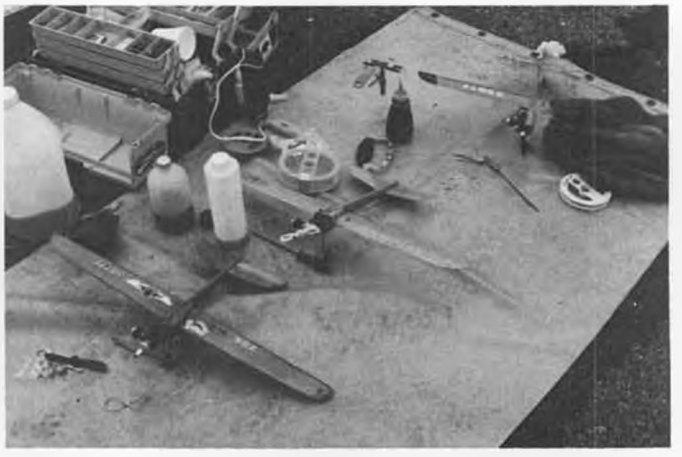
One of the many astonishing stories about another control-line pioneer, the late Oba St. Claire, of Eugene, Oregon, refers to an even more spectacular handle innovation. "Obie," as he was known, had a handle that was spring-loaded so that it could take up the slack should an airplane lose line tension during a flight. The lines then could be reeled back out during the same flight.

Among the advantages of the U-Reely were that the flier could set up his plane, reel the lines out and go flying in a short time. Since the handle had no adjustment of the lengths of the lines relative to one-another, they had to be preset or adjusted by the use of extra connectors. The lines could again be reeled up quickly. It was a perfect arrangement for schoolyard flying or another place where space was a premium and spectators might tend to walk across lines.

The handle had disadvantages as well. The lines could not be adjusted in their relative lengths. Unless you always reeled all the lines out, some kind of mark on the lines was necessary to indicate the desired length for the particular plane . . . I used a small piece of tape as a marker. You could not change line diameters easily, as lines were more or less permanently connected to the handle. Further, the U-Reely was heavy and had the line-to-handle connection quite a distance from the flier's hand, a couple of circumstances that could be annoying unless you were quite accustomed to such an arrangement. But, in the days when U-Reelies were common, fliers were somewhat less knowledgeable about the effects of different changes in handle characteristics and were less likely to complain about the U-Reely's shortcomings.

I am not aware of any handles currently in production that provide a reel-type adjustment similar to the U-Reely. The modern trend has been entirely toward storing lines on reels separate from the handles. There is however, quite a wide

Unusual Northwest Super Sport Race biplane by John Hall competed in the 1989 Washington State C/L Champs (also known as the Raider Roundup), held in September at Kent, Washington.



Lineup of Mouse Racers at the Raider Roundup. Models are by Ron Salo and Marty Higgs. Photo by John Thompson.

Precision Aerobatics models lined up for judging at the 1989 Northwest Regional Championships at Eugene, Oregon. The lone biplane is a "Biceps" flown by Walter Hicks of Bishop, California. Photo by Jim Cameron.

Top three teams in Open Class I Mouse Race at the N.W. Champs. Front, from left: Remy Dawson, Roy Andrassy, and Joe Armstead. Rear, from left: Marty Higgs, Paul Gibeault, and Bob Boling. Photo by Jim Cameron.

variety of handles available on the market, some from the major manufacturers and available through hobby shops. Others are made on a more limited basis and advertised through specialty newsletters.

Some of the old favorite handles, such as the immensely popular E-Z Just handle, no longer are available because of product liability concerns. There have been lawsuits against handle manufacturers by the victims, or relatives of victims, of electrocution caused by flying control-lines into electrical power wires. It seems that no amount of written warning has been able to keep some inexperienced fliers from flying too close to power lines. If you haven't heard it before, you're reading it now: *Never* fly within 200 feet of any power line! Your steel wires will divert the juice right down into the palm of your hand!

Here are some general remarks about control-line handles and some of their characteristics. Considering these factors may help fliers determine what kind of handle to select for a particular plane.

• Construction: A basic requirement for any handle is a strong and durable construction. We want a handle that will not break under heavy use or strong pull, and that will not wear out quickly. This means a strong grip and arms, and hefty, flexible leadout cables that won't be subject to fraying. Remember that the handle has to withstand not only flight stresses but being dropped, dragged, tossed in the flight box, etc.

• Comfort: This is a very subjective topic; each flier will have his or her own requirements for the way the handle feels in the hand. Size and texture of the grip, and weight, are among the most common factors to which fliers react. Many fliers prefer a handle with a grip that is large and rounded enough that it will not become uncomfortable under prolonged use or when flying planes with strong pull.

Some fliers will find that no commercially manufactured handle feels just right to them and will either make or modify a handle to their own specifications. One flier I know has carved the shape of his hand into the grip on the wooden Fox handle, which he uses for racing. Another used some sort of plastic material to mold a grip to his hand's shape. Two-time national Champion fast combat flier Norm McFadden uses an old Magnum handle wrapped with a tape that rounds the small, sharp grip into a comfortable shape.

The general design concept of the handle also is important. For example, a simple U-shaped handle like the old E-Z Just might work well for flying stunt, sport or combat, but one with a front bar like a Fox handle may be necessary for racing (where both hands may be needed to withstand the pull) or for training beginners in a situation where the handle may be passed from one flier to the other.

• Adjustment: Most modern handles have some easy method of adjusting the lines' relative length. This is important . . . and the U-Reely concept was outmoded . . . by the need for the flier to adjust the lines to his own particular "feel" for where neutral control is (and because the rules of competition allow only one set of connectors on each end, outlawing use of multiple connectors for adjustment). If a flier has to constantly hold "up" or "down" control in order to fly level, and just turn his hand more one way than the other, he never will be able to fly comfortably and precisely.

Some fliers, in fact, check their handles without initially looking toward the plane (they feel for neutral, then look at the elevator to see if the plane matches their feel; they adjust, feel and look again). This is particularly true of combat and racing fliers, who have to fly without looking at their planes.

Frank Boden sent in this photo of the 1989 Bladder Grabber winners. From left: meet sponsor Bob Carver, 5th; John Salvin IV, 1st; Steve Stewart, 2nd; Michael Willcox, 3rd; and Mike Petri, 4th.

A good handle will have adjustment methods that are both easy to do and infinite in their range. If the adjustment is too coarse, or too difficult to accomplish, the handle can be troublesome. The adjustment system should be secure, not allowing the lines to slip out of adjustment during flight.

Also, it's important that the adjustment not interfere with the flying. Big awkward knobs, for example, could snag lines, clothing, etc., in multiple-pilot situations,

Continued on page 97

the INSIDERS

INDOOR FLYING REPORT

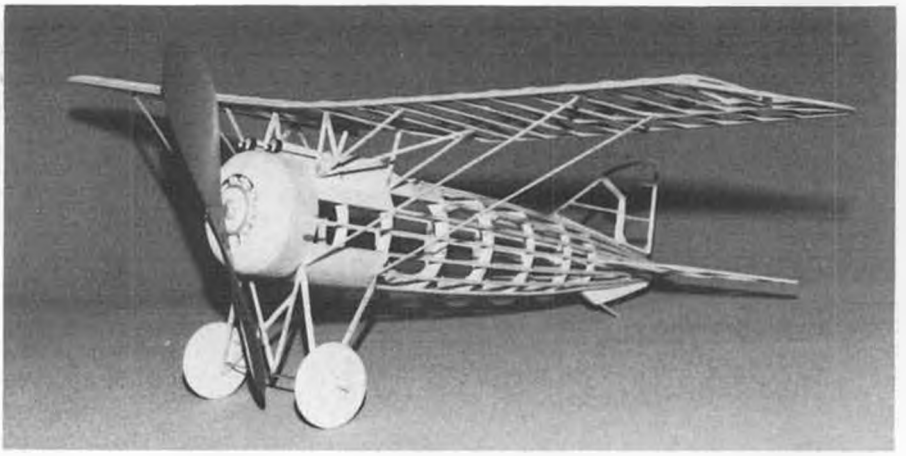
By DAVE "VTO" LINSTRUM

NFFS SYMPOSIUM REPORT

Most Insiders and free flighters in general have an enduring interest in the technical end of the aeromodelling hobby/sport. For many, this dates back to the first Zaic Yearbooks of the late thirties. Now that these are no longer annual events, we have the National Free Flight Society Symposium Report as a more than adequate substitute. Now in the 21st year of publication, the Sympo is a wonderful compendium of the theoretical, practical, and with the Ten Models of the Year, the world's best models.

This year, Editor George Xenakis (USA FAI CIAM Rep), put together a large bundle of useful material, including such gems as: The Free Flight Glide Miracle, FF in The People's Republic of China, Nose Lifting Canard Soarers, A Portfolio by Will Nakashima, NFFS Cartoonist, and the Ten Models drawings. We mention only a few of the 15 articles in this beautifully produced volume, and note with pride that Earl Hoffman's Intermediate Stick "Symphony" is one of the Ten Models. John Oldenkamp and his San Diego cohorts put all this in a clean, clearly organized format that is a pleasure to read.

To put this book in your library, send $15 to 1989 Sympo, Fred Terzian, 4858 Moorepark, San Jose, California 95129. Price is postpaid USA/Canada. Add overseas postage if you live across the pond and pay in U.S. funds. Make check or money order payable to National Free Flight Society. If you have a proposal for the 1990 Sympo, send it to George Xenakis, Editor, 1288 Oak Knoll Dr., San Jose, California 95129.



Stalick goofed! In his October Free Flight column Bob Stalick mistakenly named the plans source for this Morane-Saulnier as Ed Lidgard, whereas the *real* designer/builder is Al Lidberg. The address given in the text is correct. Bob says he's sorry and that he won't do it again.

INSIDERS WORKSHOP GARAGE

Insider Dan Lutz (of Zeek fame) shares his model workshop with three vintage autos: 1931 Ford Model "A" Deluxe Roadster, 1936 Ford Roadster, and 1936 Ford Cabriolet. This 24 foot by 48 foot workshop is the biggest we have ever seen. Dan builds plenty of O/T models here, but the Peanut Scale ships are too small to be seen in the photo. Be sure to send us a photo of your Insiders workshop, even if it is smaller than this 1152 square foot beauty.

How about *this* for an Insiders workshop? This is where Dan Lutz, of Fallbrook, California, goes to relax. The vintage cars are further examples of Dan's talents. Text has details.

Stylish Benno Sabel of Frankfurt, West Germany, models the latest in flying gear—the MB T-shirt—while flying his 1909 Koechlin Peanut at a meet in Flemalle, Belgium.

GAMPI TISSUE SOURCE

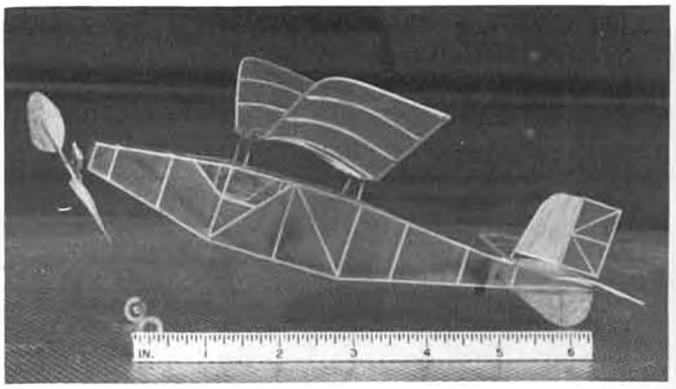
In our USIC Report in October, we mentioned that Tom Nied of Chicago uses an exotic Japanese tissue called "Gampi" that is very light. Unlike normal tissue, it is a fine art paper. It comes in two sizes: E81 Gampi Dark 20x32 ($3.50) and E82 Gampi Medium 18x24 ($2.95). Since they are virtually identical, except for edge, we suggest the E81 as best value. The tissue is off-white and is slightly crinkled. The source will ship UPS collect, or add some postage to order. Write to: AIKO'S Art Materials Import, 3347 N. Clark St., Chicago, Illinois 60657.

IDENTICAL SIDES

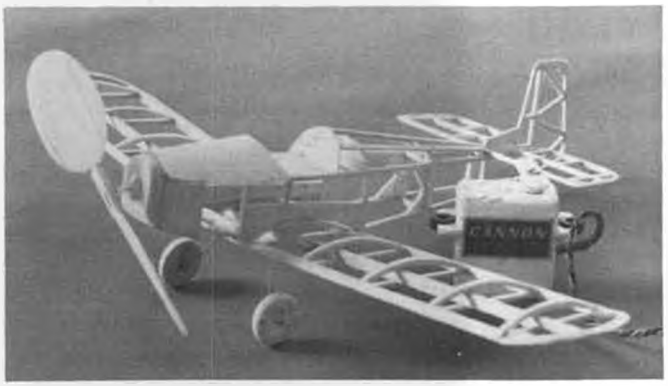
Your Insiders scribe has been building boxy stick 'n' tissue fuselages since about age six, when we attempted a Frank Zaic design built on an actual page of the encyclopedia "Book of Knowledge." In all that time, this advice from Herm Fessler of the Minneapolis Model Aero Club is by far the best we have seen. Try it—you will have a perfect box body. One further bit of help—use a tiny 3" draftsman's triangle to square up the two sides when joining with crosspieces over plan. Now for Fessler's Formula, from the MMAC NEWS:

Almost every stick and tissue magazine construction article and kit building instructions start out with "build two identical fuselage sides, one on top of the other over the side view of the fuselage." I cringe when I read this because I have never been able to do this very successfully. Either I

An impressive fleet of eight-inch span Pistachios by Los Angeles artist Otto Kuhni. Can you identify all six?



Walt Everson turned out this Pistachio sized version of Ed Whitten's "Riversider," the first Manhattan Cabin. Walt's has done 2:23.



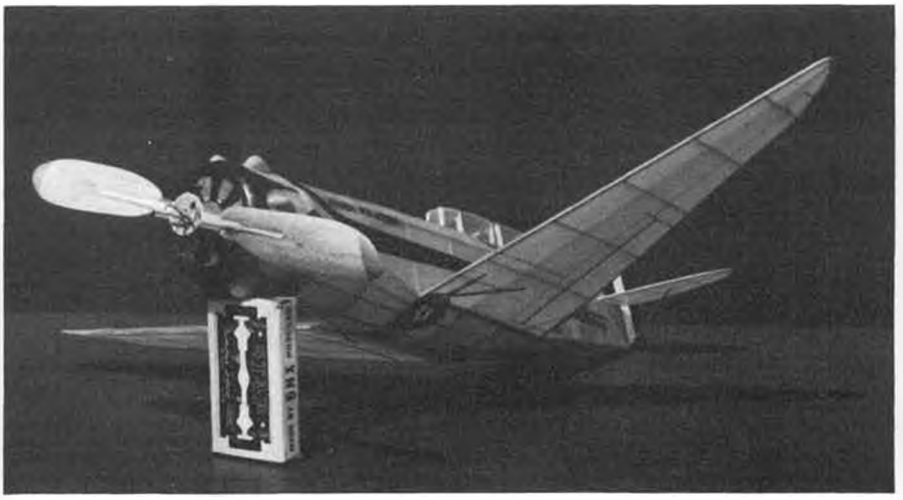
Pistachio R/C! Nope, the Cannon servo merely serves as a size comparison for Gerald Myers' cute Pistachio Druine Turbulent.

Otto Kuhni's meticulously crafted Pistachio Bristol Prier features considerably more detail than most Peanuts! Really superb workmanship.

leave the sides pinned down too long and they are hopelessly glued together, or I lift them off too soon and the top one falls apart. If I try putting a layer of waxed paper between the sides, the poor visibility through the paper and the parallax results in a set of not too-identical sides. Besides, with the CA super glues the thin stuff will wick through the pin holes in the waxed paper like it wasn't even there. Over the years, I developed the following method. Maybe it will work for you.

Start with a new clean layer of waxed paper. Pin or tape it over the plan so it won't move. Strip your longerons from the appropriate size balsa sheet. Use adjacent strips so they are all the same weight, strength and stiffness. Pin the longerons for one side to the plans using pins that are all of the same diameter. Push the pins into the building board far enough to hold, but not all the way through. Complete the side. When dry, carefully remove the pins. Slip a thin strip of metal, or stiff plastic, between the balsa and the waxed paper. Slide it back and forth until the side pops loose from the waxed paper. A six-inch steel rule works well. Don't use a sharp knife as the edge will tear the paper. We want a wedging action that will peel the paper from the glue and not move the waxed paper taped to the plan. Now build the second side using the same pin holes as the first side. Push the pins a little further into the board if they feel loose. The combination of adjacent longerons from the same sheet stripped to the same width and the same diameter pins in the same holes will in effect "dowel jig" the second side to a closer match with the first side than you will ever do with the naked eye. •

A beautiful blue Caudron C450 Racer in Peanut Scale by the French maestro, Emmanuel Fillon, who also happens to be a former Wakefield World Champion.



VTO's obscure aircraft of the month is this Italian Nardi FN-305D racer of 1930's vintage. It's a Peanut size model built by Bruce Holbrook, of Israel. Model weighs in at only 10 grams.

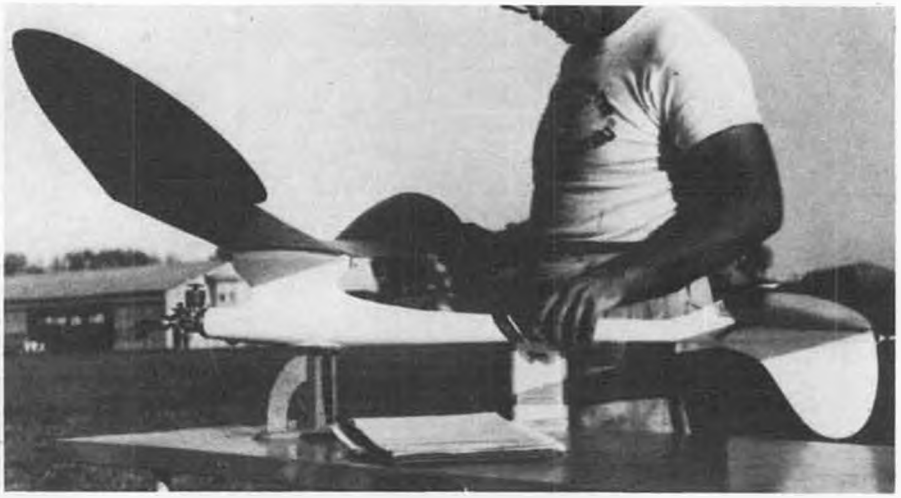
Free Flight

By BOB STALICK

• The eligibility question for Nostalgia legal models. Just what does it take for a designer to get his model qualified as a Nostalgia eligible model? This month, you will trace the evolution of just such a question. Most of us who are nostalgia era fliers, as I am, remember the name of Don Wensel. Don was an active FAI Power flier (remember the Lightning Rod?) during the 1960s, but he was an active designer well before that time.

Back in December 1987, Don sent a package of information to me regarding a model, the FAI Stardust, that he had designed in 1956. Usually, the designer presents a copy of a dated plan or several dated pictures that somehow show that the model was flying during the Nostalgia period (Jan. 1, 1943 through December 31, 1956). Other information, such as sworn affidavits from several recognized free flight authorities, usually helps make the case to the design approval team of Bob Larsh and Ralph Prey. Additionally, some provision must be made for the now approved Nostalgia design to become known to the free flight community. Publication in a national magazine such as *Model Builder* can accomplish this objective. Ideally, full sized plans should be made available as well, although this is not a prerequisite.

Well, here goes the story about the Stardust according to Don Wensel. "Back in 1956, Frank Zaic was going to have it (the Stardust) in his 1957-58 Yearbook, and I goofed royally. He was very busy preparing the text of the book, and I offered to help by making the drawings to his typical arrangement. I drew the thing to the 1/8" = 1.0" size and was advised that wouldn't work too well because it would have to be reduced, and the scale would no longer work. So, in the meantime, I had contracted some kind of a virus while going through a kidney stone operation and became 60%, paralyzed. It took a full year to learn to walk and build up my body again. By this time, my modelling was the farthest thing from my mind. All I wanted to do was get back in the swing of things. Thus the Stardust drawing was not printed in the yearbook."



The Stardust FAI, shown here being weighed and processed before going out to do battle. This photo, once featured in a 1957 issue of *Aeromodeller*, shows a major part of designer Don Wensel as well. The Stardust is this month's featured three-view and is legal for Nostalgia F/F events.

Subsequently, I referred Don's request to Bob Larsh for his consideration. Bob asked for verification, and Don was able to get some dated pictures from his files that show the model and a younger Don Wensel. One of these 1956 dated photos can be found in this issue. Additionally, Frank Zaic was able to verify Don's story about the three-view and the 1957-58 Yearbook. So, with the publication of the Stardust in this column of *Model Builder* Free Flight, the approval process is complete. The Stardust will be noted in the new version of the Nostalgia eligible model's list that Bob Larsh will have available by the time you read this. If you want a copy, drop a line to Bob at 45 S. Whitcomb Ave., Indianapolis, Indiana 46241. Enclose a buck and a large SASE.

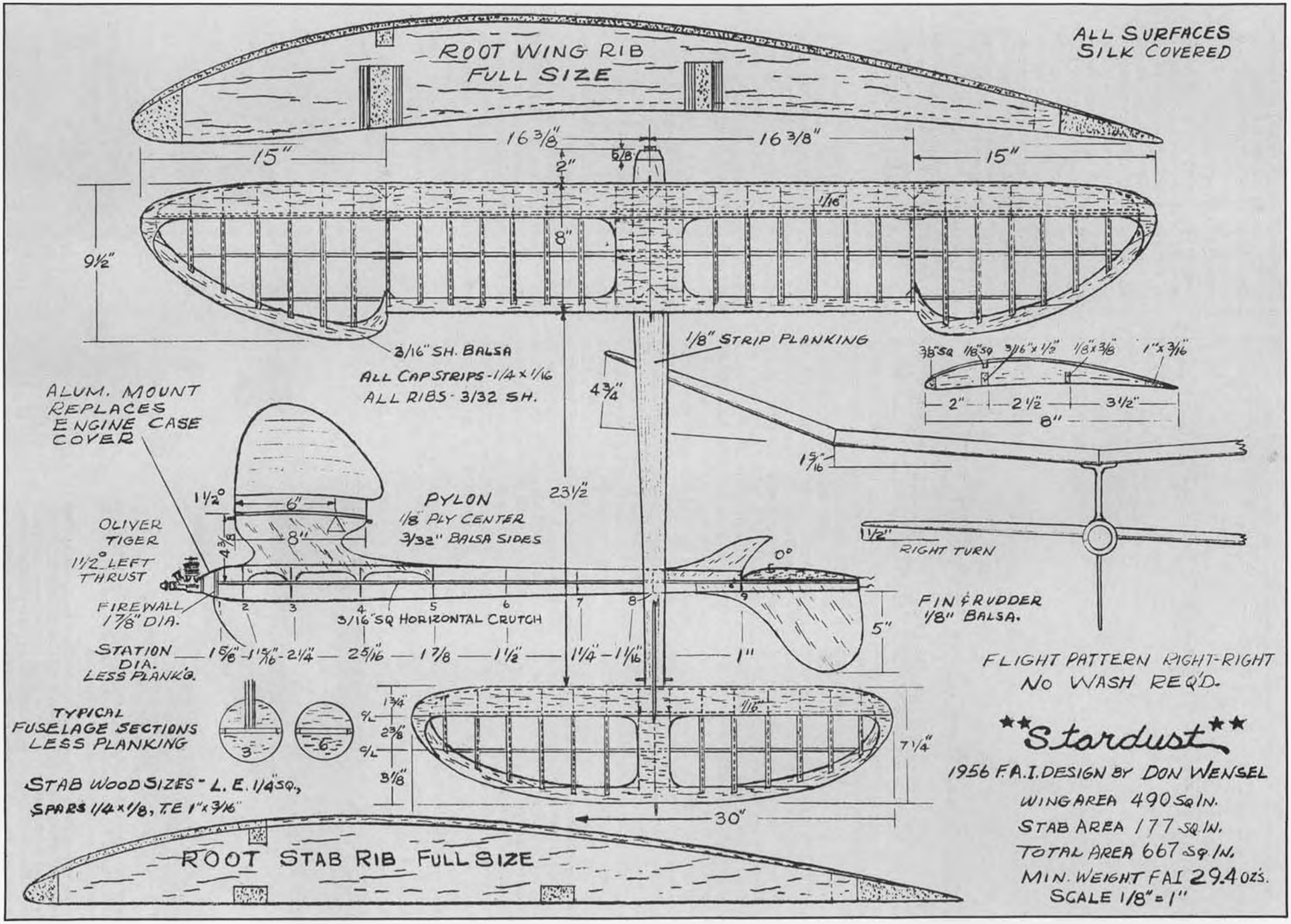
Don Wensel has noted to me that the full sized drawings of the Stardust are now available from him. I will have Don's address at the end of the Three-View Feature.

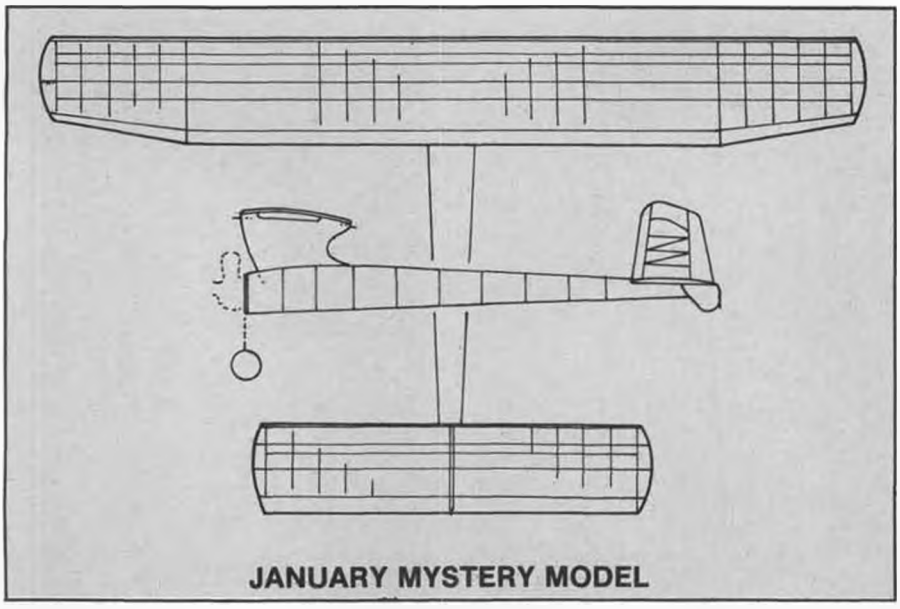
The introduction to this month's column provides you, dear reader, with the background leading to the publication of the Stardust in this issue of *Model Builder*. The three-view gives you much of the information that you need in order to build the ship, and if you want even more detail, I suggest that you order the full sized plan from Don Wensel.

I would like to point out a couple of features of the model that set it apart from your run-of-the-mill Nostalgia design. The first one is the "funny wing tip shape." According to Don, "this practice started in 1945, when I was discharged from the service. I wanted to sharpen up my 'Super Viking' old timer and the result was the 'funny wing tips.' This tip design was later used on the 1/2A Stardust and then the FAI Stardust with great success. I then used the tip on a 1957 design A-2 glider called the 'Top Hat,' which was very successful; winning first, second, and third at eastern con-

DARNED GOOD AIRFOIL—GOTTINGEN 457

STATION	0	1.25	2.5	5.0	7.5	10	15	20	25	30	40	50	60	70	80	90	100
UPPER	1.14	3.06	4.14	5.41	6.25	6.90	7.90	8.47	—	8.79	8.41	7.64	6.75	5.61	4.20	2.29	0.00
LOWER	1.14	0.25	0.09	0.00	0.09	0.20	0.38	0.64	—	1.15	1.40	1.53	1.40	1.17	0.84	0.45	0.00


ALL SURFACES
SILK COVERED
ROOT WING RIB
FULL SIZE
15"
16 3/8"
16 3/8"
15"
2"
5/8
1/16"
8"
9½"
3/16" SH. BALSA
ALL CAPSTRIPS - 1/4 x 1/16
ALL RIBS - 3/32 SH.
1/8" STRIP PLANKING
3/8"SQ 1/8"SQ 3/16"x1/2" 1/8"x3/8" 1"x3/16"
2" 2½" 3½"
8"
4¾"
15/16"
ALUM. MOUNT
REPLACES
ENGINE CASE
COVER
1½°
6"
8"
4 3/8
OLIVER
TIGER
1½° LEFT
THRUST
FIREWALL
1 7/8" DIA.
PYLON
1/8" PLY CENTER
3/32" BALSA SIDES
23½"
0°
1 2 3 4 5 6 7 8 9
3/16"SQ HORIZONTAL CRUTCH
5"
1½"
RIGHT TURN
FIN & RUDDER
1/8" BALSA.
STATION
DIA.
LESS PLANK'G.
1 5/8" 1 5/16" 2 1/4" 2 5/16" 1 7/8 1½" 1¼" 1 1/16" 1"
FLIGHT PATTERN RIGHT-RIGHT
NO WASH REQ'D.
TYPICAL
FUSELAGE SECTIONS
LESS PLANKING
3
6
1¾
℄
2⅜
℄
3⅛
1/16"
7¼"
30"
STAB WOOD SIZES - L.E. 1/4"SQ.,
SPARS 1/4 x 1/8, T.E. 1" x 3/16"
ROOT STAB RIB FULL SIZE
★★Stardust★★
1956 F.A.I. DESIGN BY DON WENSEL
WING AREA 490 SQ IN.
STAB AREA 177 SQ IN.
TOTAL AREA 667 SQ IN.
MIN. WEIGHT FAI 29.4 OZS.
SCALE 1/8" = 1"



JANUARY MYSTERY MODEL

tests for two years. The tip was then used on my A-2 Nordic called 'Royal Flush,' which won the 1965 Open Division A-2 Nordic event at the U.S. Nationals in a six way flyoff. During this period, the tips were called 'thermal hooks' by others who saw the models fly. The next use of the 'thermal hooks' was on my Wakefield, called 'Miss Universe.' This model flew so well that every one built was lost. Last, but not least, the tips were used on a very refined Stardust. This model, called the 'Starfire,' was a VIT-Auto everything ship that was super and still flies very well. I have a new FAI design now in the concept stage and these tips are appearing in several sketches."

So, there you are with the story of the "funny tips." I am still not sure how they work or whether they actually do what Don claims, but something seems to work, and they would be a definite conversation piece at the contest field.

The second point that is different from your run-of-the-mill ship is the rounded and planked fuselage. Don uses a series of ⅛-inch balsa strips from fuselage front to back to form this rounded cross section. Although at first blush, this would appear to be a lot of work, and I am sure that it was so in 1956, I have used Model Magic lightweight filler around these kinds of planking situations, and the effect is unbelievable. It's smooth and strong.

The third point about this model is that the flight pattern is right/right. It was typical of models during this period to fly right under power and left under glide. Current practice is to fly right/right usually accompanied with a little bit of wash-in on the right wing panel. The Stardust does not need wash-in. Maybe the "thermal hooks" allow the Stardust to avoid the need for wash-in.

One other point of note: The three-view indicates that the Stardust had 490 square inches of wing area and had to weigh 29.4 oz. in order to qualify for the FAI rules in effect in 1956. The current Nostalgia rules would allow this model to be flown at 15 oz. if powered by a .15 cu. in. engine as was the case in 1956. My guess is that it would be difficult to build this model as per plan at 15 oz., so you might consider powering it with a .23 cu. in. engine and attempting to lighten the structure enough so that it would weigh 23 oz. I think it can be done.

At any rate, here is a newly eligible Nostalgia gas model for your consideration. It's different, and it's now all yours. Don Wensel, as mentioned earlier, has the full sized plans. Although he didn't mention the price, I would enclose at least $5.00 for a copy. Contact Don at 1233 Sunford Ave. S.E., North Canton, Ohio 44720.

DECEMBER MYSTERY MODEL

Back in 1951, a well-known model airplane writer and future magazine editor of note, did a comprehensive survey of free flight winners at the 1950 Nationals, Plymouth meets, and other major contest winners. This writer determined that the designs of the day fell into four different categories: Shoulder wings, Hatchets, Californian, and Easterners. The salient features of these designs were outlined in the article: The Shoulder wing was said to have a "new lease on life" due to the removal of the wing loading rules and the success that such designers as Foote and Brofman had with this design type. The Hatchet design is portrayed as a form of low pylon design with the addition of streamlining the pylon and engine mounting system. Shulman's Banshee and Zombie, Taibi's Pacer, and Goldberg's Cumulus, are given as examples of this type.

The Californian is portrayed as a long moment-arm, flat-gliding, moderate pylon design with a 50% stabilizer. Ostensibly, these models were based upon the long fuselaged indoor gliders. These ships, so the article goes, have an ideal glide under favorable conditions but are difficult to fly in the wind. The Civy Boy is an example of this type of design.

Finally, the Easterner is portrayed as a sterling windy weather airplane. Stabilizer area is large . . . about 50% of the wing area, and the tail moment is shorter than the Californian. The pylon is high, the leading edge of the wing is forward of the firewall. Folk's Climax and Wheeley's Senator are noted as examples.

What this writer did was to average out all of the successful designs of the period and produce this month's Mystery Model. One more interesting feature of this model is that no reduced or full-sized plans appeared with the article in the magazine.

If you think you know what this design is and who the writer was, drop a note to Bill Northrop, % *Model Builder* magazine. The

Continued on page 97

Duane Renken's novel F/F delta was built for Pee Wee 30 competition and features a Davis CO_2 conversion on a Cox .020. See text for more info about the ship and Duane's interest in the event.

Right: Remember the 1/2A Vee concept model from the March/April '89 F/F column? Both of these fellows built one, but all that Charlie Steed (left) has left of his is the piece of D.T. fuse he didn't use—need we say more? The other flier is Neil Smedley, who built his model pretty much according to the drawing. Both are from the Ogden, Utah area. Steed photo.

ZLIN Z-XII

By
JOHN BERRYMAN

Ready to try a low-wing Peanut? This month's featured model may be just what you're looking for. The full-size Zlin Z-XII was a pre-WWII design by the famous Czech manufacturer and can be considered to be the predecessor of today's high-performance Zlin aerobatic aircraft.

• No airplane nut needs to be introduced to the Zlin family of aircraft. These nimble Czech stunters have delighted air show audiences the world over for many years. The Zlin modeled here is a pre-war version, and could in some sense be called the granddaddy of the modern Zlins.

I first saw this Zlin presented as a quarter-scale R/C ship. It possessed the kind of angular grace common to many pre-war designs that I find very appealing. In addition, it seemed to have reasonably good moments, and was quite colorful. The designer/builder, Mr. Dennis Tapsfield, was kind enough to present a three-view with his construction article, and after a midnight raid on the office Xerox, a set of Peanut-sized reference drawings were produced. After I took a look at the larger drawings, a lot of my enthusiasm evaporated. The wings *really* tapered, the fuselage was *really* skinny, and of course, the tail was too small. On the plus side, the ship had a long nose and some sexy exposed cylinders that could further aid the CG, and it also had quite a bit of dihedral. To overcome some of the problems I found in the prototype, I made the following deviations from scale in designing my version of the Zlin:

• The tail surfaces are enlarged by 30%.

• The amount of taper in the wings is reduced slightly . . . by just over one-eighth inch at the tips.

• The dihedral is roughly 50% greater than that exhibited by the prototype.

• I made no change in the fuselage dimensions, and this means that it's snug in there. I simply decided that the thin fuselage was part of the charm of the ship, and should not be altered (it would be like putting dihedral on a Fokker Tripe). This means *build lightly*, because there's not a lot of room in there for rubber, folks!

Let's get your Zlin flying!

FLIGHT SURFACES

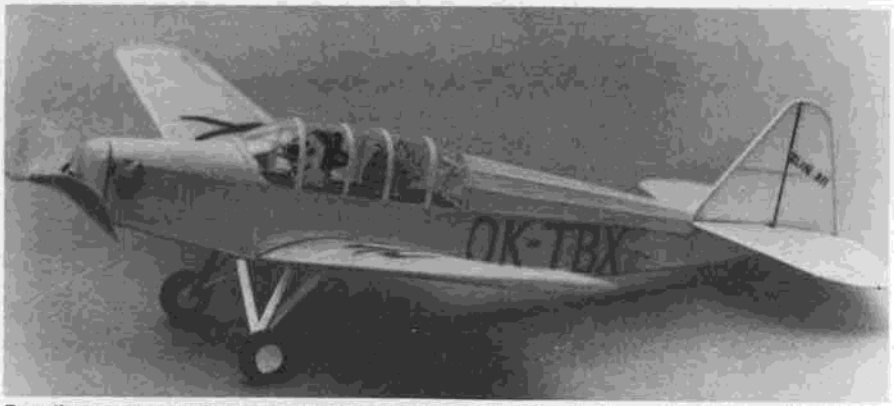
No surprises here. The tips are laminated balsa, and the ribs are sliced in Mooney fashion. The dimensions shown for the spar are approximate. I personally tend to cut my ribs a bit fat, which means that they don't always clear the spar. I cut *tiny* notches in the spar to correct this, and rationalize the procedure by telling myself that this helps lock the structure together. Build the wing flat, and add the dihedral (the breaks are outboard of the root ribs) after the glue has dried. For my own peace of mind, I also added gussets at the dihedral breaks. Make sure the root ribs are truly vertical, so that they will mate properly to the wing saddle . . . and don't forget to add the LG mounts before you remove the wing from the building surface!

FUSELAGE

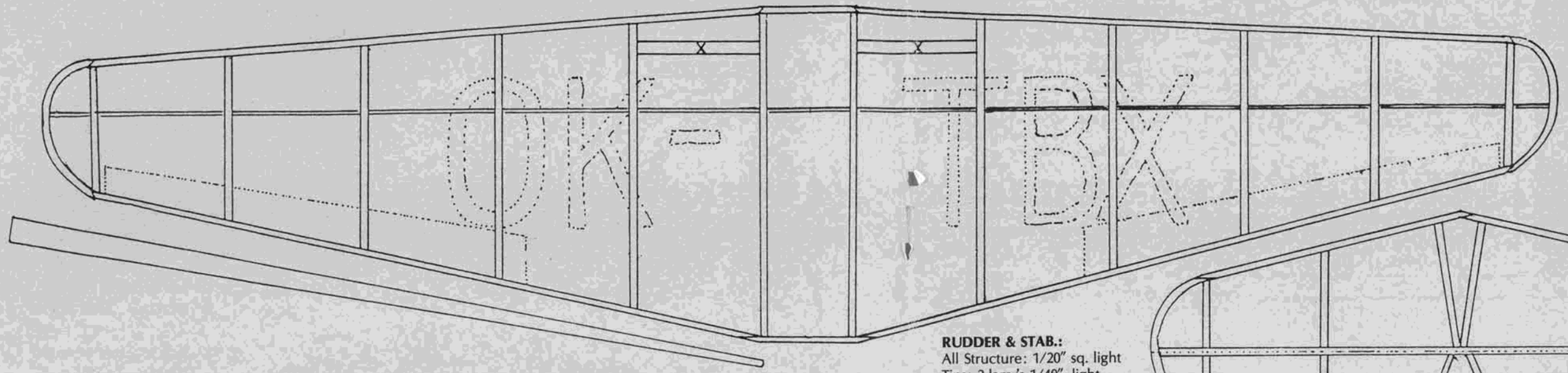
Again, we'll follow standard Peanut practice, building one side on top of the other (separated by waxed paper, of course), and taking great pains to make each side *exactly*, I mean *exactly*, like the other. A little time now will keep alignment problems to a minimum later. I used firmer stock for the longerons, and lighter stuff for the cross pieces. To avoid wavy stringers, I find it much easier (and neater) to notch the rear formers *after* they're glued in place. I use a piece of taut thread to establish a straight line, and use a new, *sharp*, double-edged razor blade to cut the notches. After the stringers have dried, I then "scallop" the formers between the stringers. A small drum-shaped bit in a Dremel works well for this.

When I mated the sides together, I used "false bulkheads" (located at stations 3 and 4) to preserve alignment. I've simply never been able to make squares and jigs work on tiny, floppy Peanut fuselages, and with false bulkheads and slow-firing CA glue,

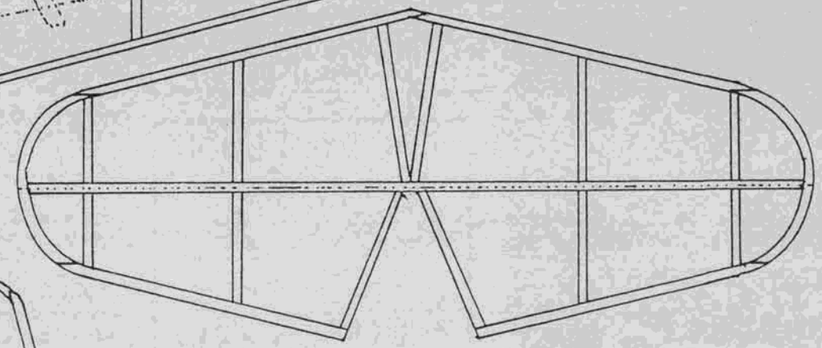
Continued on page 56



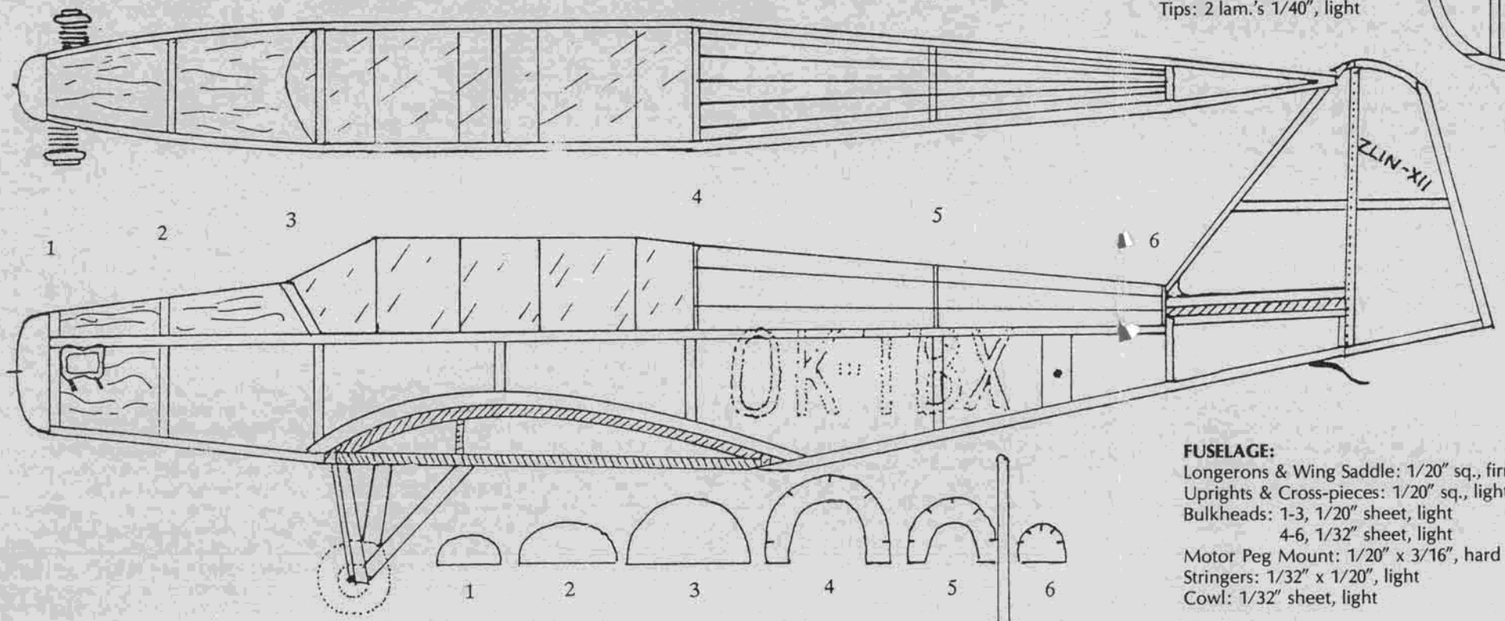
Dauntless aeronauts Calvin and Hobbes exude confidence prior to another thrilling flight. The author chose to retain the short scale landing gear, which necessitates a small diameter prop; builders looking to improve the duration may want to lengthen the gear and use a larger prop.

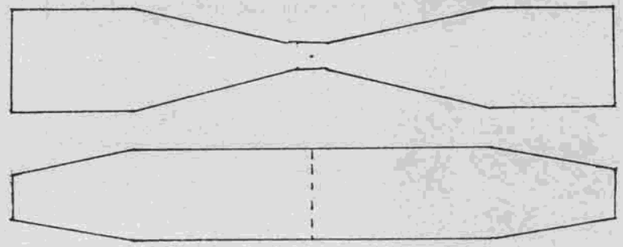


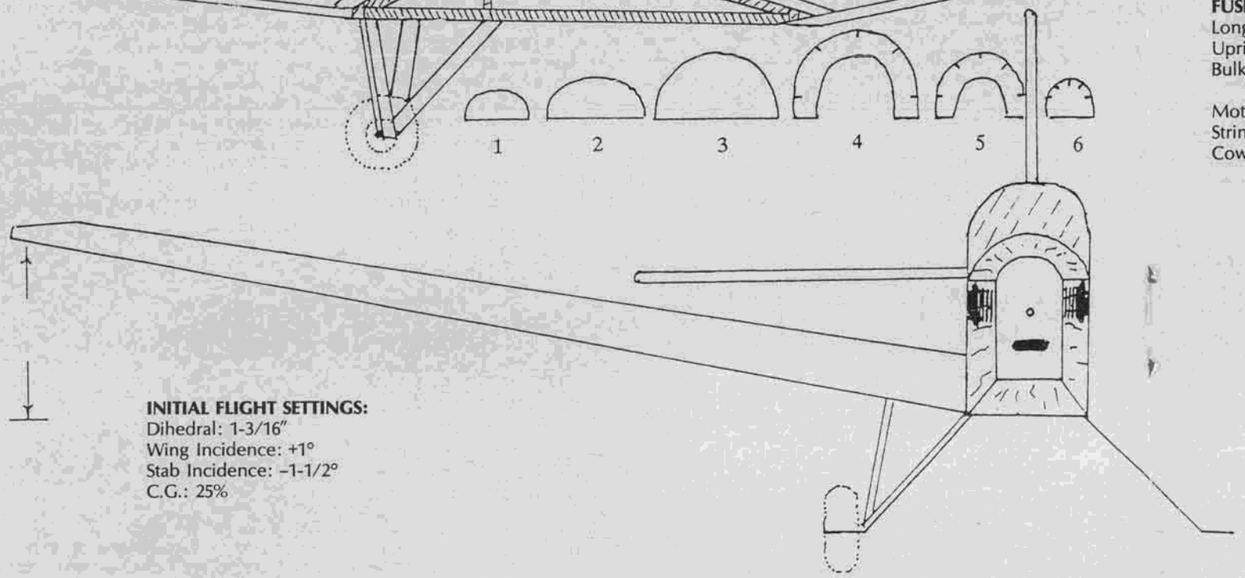
WING:
L.E. & T.E.: 1/20" sq., firm
Tips: 2 lam.'s 1/40" strip
Spar: 2 from firm 1/32" sht., 6-1/2" long, taper 7/32" to 1/16" (approx.)
Ribs: 12 sliced from 1/20", light



RUDDER & STAB.:
All Structure: 1/20" sq. light
Tips: 2 lam.'s 1/40", light







FUSELAGE:
Longerons & Wing Saddle: 1/20" sq., firm
Uprights & Cross-pieces: 1/20" sq., light
Bulkheads: 1-3, 1/20" sheet, light
4-6, 1/32" sheet, light
Motor Peg Mount: 1/20" x 3/16", hard
Stringers: 1/32" x 1/20", light
Cowl: 1/32" sheet, light

PROPELLER:
Diameter: 4"
Pitch: 6.8" (nominal)
P/D ratio: 1.7
Blade Thickness @ tip: .32"
Max. Blade Thickness: .60"
Max. Blade Width: .66"

COLOR SCHEME:
Yellow: Entire Aircraft
Blue: Reg. Numbers

MISCELLANEOUS:
Canopy: Vac. form from .005" butyrate
L.G.: .008" m/w, 1/8" x 1/20" struts, firm
Wheels: 3 lam.'s 1/16" soft, bush w/ 1/16" birch dowel
Engine: Thread-wrapped balsa, scrap, alum. tubes, etc.

INITIAL FLIGHT SETTINGS:
Dihedral: 1-3/16"
Wing Incidence: +1°
Stab Incidence: –1-1/2°
C.G.: 25%

ZLIN Z-XII
A Pre-War Czech Peanut

Designed and Drawn by John Berryman

Peanut .... *Continued from page 53*

you can build "in the air," checking alignment as each cross piece is inserted. On the other hand, most of the people to whom I've explained this process are appalled (or worse, amused) by it, so if you have a better system, by all means use it. All the sheet in the nose is 1/32-inch soft, light stock.

PROPELLER

I felt that the short landing gear was also part of the "character" of the Zlin, and elected to leave its length alone. This dictated a small prop, and in the interest of saving a bit of weight, I decided to carve one. The blank shown will produce a 4-inch diameter, 6.8-inch pitch prop with a pitch-to-diameter ratio of 1.7. This is a bit more than I like to carve, but is not really excessive. I carve my props from a jealously hoarded supply of 22 lb. stock. I prefer the heavy stuff because a thinner, more efficient prop can be carved from it, a prop that still has enough strength to take a battering. I wish I had an easy solution for prop carving, but I don't. I make the blank, bush the prop-shaft area with a 1/8-inch birch dowel, and cut away everything that doesn't look like the prop. Start with the back surface (a sanding drum mounted in a drill press can speed the rough carving), progress to the delicate use of a *sharp* knife, and sand and sand and sand. . . . If you don't care about ROG's, a Peck 4-3/4 inch plastic prop should work fine.

MISCELLANEOUS

The only wire in the landing gear is in the front legs (.008-inch music wire), and it is hidden behind the gear fairings. The wheels are made from three crisscrossed laminations of 1/16-inch balsa. The outer two laminations are "donuts," while the inner is solid, and contains a 1/16-inch birch dowel bushing. The landing gear wire protrudes into the inside of the donut, and is kept from slipping out by a *tiny* glob of epoxy. The epoxy trick works better if you let it get a bit gummy before you try to apply the glue, and better still if you mask off the inside of the wheel with a tiny disk of waxed paper. After the whole works has dried, tear out the waxed paper and cover the mess with a "hubcap" made from bond paper to which tissue has been doped.

I vacuum-formed the canopy using a vacuum former I built from *Model Builder* plans (No. 4763). It works like gangbusters, and I highly recommend it. I've learned a cute trick associated with vacuum forming. Fabricate the form in the usual manner, and sand well. Don't take any special pains with finishing it, however. Then pull a canopy over the *un-lubed* form. Now, trim off the excess plastic and *leave the canopy in place on the form.* Then lube the plastic-covered form with Pam and pull a *second* canopy *over* the first. The first canopy makes a beautifully smooth surface over which to mold the "real" canopy, and this procedure is *much* faster than trying to get a really smooth, heat-resistant finish on the balsa form.

The little Czech four-banger was fabricated from the contents of my junk box: thread, scrap balsa, and some thin aluminum tubing.

COVERING AND FINISHING

I used yellow Peck "Superlight" tissue to cover the Zlin, and made the registration numbers from blue Peck tissue. I apply dope with an airbrush. I like to thin it by about 75% and try to barely mist on a coat. The lines for the control surfaces were drawn with a fine tip "Sharpy" permanent marker . . . the only brand I've found that doesn't bleed through the dope, or rub off.

FLYING

Peanuts are cranky. Low wing Peanuts are even crankier. That caveat aside, the Zlin is reasonably easy to get flying. My

INTRODUCING SEAMASTER 120

Designed by Ken Willard

This is the one you've been waiting for . . . the **Seamaster 120** is now a reality! Hot on the heels of our most popular kit ever (**Seamaster 40**), the **Seamaster 120** is expected to break all scores records. This big, flying boat will take on some of the roughest water with no problem; no longer do you have to wait for a perfectly calm day to fly off the water. Seen at both **Float Fly '88** and **'89**, people are truly amazed at the gentle characteristics of this giant bird.

Like its little brother, the **Seamaster 120** has a pylon mounted engine and "T" tail that stay out of spray while accelerating. A very high lift wing and double stepped hull make it very quick to get up on plane and break water. A retractable water rudder makes water handling at slow speed no problem.

The **Seamaster 120** can handle most any engine in the given ranges. A 1.20 4 cycle or 1.08 2-cycle flies it at a very scale-like speed, while still having plenty of power for mild acrobatics. If you have a smaller lake (or just like the bigger engines) try a G38 Zenoah or ST2500 to 3000 - - all three of these fly it just great! The engine pod is designed to be self contained; the fuel tank and throttle servo are all contained in the pod. This makes set-up quick and easy.

The **Seamaster 120** utilizes lite ply construction throughout. (This plane is built to take it!) Lock tab construction aids in quick, warp-free construction. A two piece wing, joined with a T-6 aluminum tube and a removable tail make transportation a bit easier. Great die cutting and machined parts (plus the amount of hardware included in this kit) are hard to believe! All control surface hardware is here, including: nyrods, **Dave Brown** fiberglass pushrods, **Rocket City** horns, **Robart** hinge points, special **Hobby Lobby** pushrod system (for elevator), aluminum wing joiner system, clevises, nuts, bolts and much . . . much more!

The **Seamaster 120** will also fly off land! The landing gear hardware is offered as an option which includes all the necessary hardware to make the **Seamaster 120** a true amphibian! We suggest that you build the landing gear option into the **Seamaster** during initial construction instead of retrofitting it later. Once the landing gear option is installed, it can be removed in seconds to convert to a seaplane.

If you like to have the flying stopped (and have all eyes on you and your plane) when you show up at the lake, you're ready for the **Seamaster 120**!

50K231 Seamaster 120 Kit $199.95
25K231 SM 120 Landing Gear 14.95

How to get your Seamaster 120...

...check with your local dealer first. If he does not have one or cannot obtain one, you can order direct from Ace at the address below (add $3.00 P.H.).

ACE R/C

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Zlin flies on a 10-inch loop of .080-inch FAI rubber. To fly left, mine needed tweaks of washin on the left wing panel, washout on the right, and a tad of left rudder. Thrust adjustments consisted of the usual "right and down." Bear in mind that the Zlin has a small nose block, and that even a small shim can have a dramatic effect on flight characteristics. I used layers of masking tape as shims.

Enjoy your Zlin, and may all your aerobatics be intentional! •

Dennyplane *Continued from page 42*

original Dennyplanes, I covered mine with white silk and clear Butyrate Dope. A few drops of Tri-Cresyl Phosphate (T.C.P.) to your dope will help prevent warps in the flying surfaces. Dave Brown Products markets a fine plasticizer called Flex-All which also works well in Butyrate Dope. The Denny emblems on the rudder are from an original set of kit decals that I found while doing the research for my model. I listed the sources for the radial cowls on the plans. Any one of them will fit with very little alteration. I did not show an engine installation on the plans. My orginal model has an O.S. 10 engine and a mini airborne R/C system in it. If kept light, one of the new Cox .074 Queen Bee engines or even electric power would make an ideal powerplant for sport flying. The generous amount of wing area and the wide spread landing gear makes it a pleasure to fly, even for the novice.

When I show up at the local flying fields with my Lit'l Dennyplane Jr., most of the guided sphere kit builders ask, "What's that?!" A few take one look at it and start off with, "I remember back when . . ." Oh well, you know the rest of the story once you get a couple of old timers talking about the good old days.

I wish to thank two very good friends, Bill Ladner and Frank Estrada, for their assistance in researching the Dennyplane models and the loan of their very old photographs. •

Solar . . . . . *Continued from page 25*

buffer battery, were present and flew. In fact, two of the pioneers of solar flight were there with models: Helmut Bruss, the theoretician and author of several famous books on the subject, and Prof. Gunther Rochelt, who even brought his original "Silberfuchs," one of the very first solar-powered models to ever fly. One could also see the original world record holder "Solariane" of Franz Weissgerber as well as another similar model. With Edwin Bloch's model entering the competition, this made a total of five such models that flew a total of over 60 hours over the three days of the meet! Had the organizer foreseen the necessary officials and instruments, all existing world records for the class would have been bettered!

On numerous occasions the five big birds were flying together, and the feat was duly recorded by North German television. Even owing to the necessity of the competition and frequency conflicts, several of these models made several flights of over three hours, thanks to additional solar cells for the receiver and even the transmitter batteries.

Such models are quite different from the former. They have to fly on very limited power and maximum efficiency is essential throughout. The wingspan is such as to accommodate a sufficient number of solar cells arranged both in series and in parallel so as to supply sufficient voltage and enough current. The typical nominal voltage is then around 20 volts. The motor is of the highest possible efficiency, a high-grade industrial coreless type, the most popular being the German Faulhaber range. The actual efficiency reaches over

80%. A similar quality gearing enables this high-revving motor to drive a very large, optimized, variable-pitch propeller.

Needless to say, these slow-flying models are not for everyday use. They require the best weather conditions, excellent lighting and low wind velocity. But they also require a fully-optimized mechanical and electrical chain and will thus always be limited in their use.

Not so with the buffered models. They proved at the Noerdlingen meet that they were fully practical models which we may well see in increasing numbers on many flying fields, where modelers like long flight durations with a minimum of fuss. Solar flight has now entered a new era. ●

Electric . . . . *Continued from page 26*

is designed. It is different from the way I design, so I found following the instructions saved much time and frustration. The basic assembly less covering and radio installation, took ten hours. Radio installation took four hours, covering took four hours. For many builders, twenty to thirty hours from start to finish will be typical. This is about average for most of the planes I build. The plane is more complicated to build than most of my designs, which tend towards the extreme of simplicity. It is closer to conventional gas type construction. The only change I made was to make a latch for the bottom hatch so that it can be easily opened . . . the plans call for screws. This gets tedious as you would have to undo the screws for each battery change or charge.

All up weight with a full size receiver (Ace Olympic V), a 250 mAH receiver pack, a PDI speed control, and two one-ounce servos (mini) was 48 ounces. The specified weight range is 48-54 ounces, so Midwest has clearly set a realistic range. The motor is included, an HP-100, which is the same diameter, but longer than the stock offroad motors, about the size of the old Astro 075. The prop is included, and is an 8x4. I did not use the spinner provided, as most spinners cause too much vibration. I used several battery packs; a Sanyo SC six-cell, a Sanyo SCR six-cell, and an SR Batteries seven-cell pack.

I fly from a grass field, so I do hand launches. The plane climbed well on the six-cell packs, and easily cleared any obstacles in the first circle of the field. A circle and a half was enough for doing stunts. The plane easily loops from level flight, and does good rudder rolls and spins both left and right. It does fly fairly fast, due to the wing area of 393 sq. in. for 48 ounces, a fairly high loading for a plane this size. However, the plane is viceless, and easy to fly for someone who has soloed from a primary trainer. The Aero-lectric is labeled as a trainer, and it can be a trainer if someone has an instructor. Under no circumstances should anyone try to learn to fly it without help. It flies fast, it is aerobatic, and it has an excellent power-to-weight ratio. This makes it a perfect plane for those who already fly gas. A true beginner could not keep up with the plane without an instructor. Typical flights with six cells is about five minutes. With seven cells the climb is faster, and aerobatics are slightly more powerful. My feeling is that with an Astro cobalt 05 and seven SCR cells this plane could show some gas planes some tricks or two. I recommend this plane particularly to gas fliers who want to try electric, or for those flying electric who would like to have a sporty plane to do fun type aerobatics. Enjoy!

Ben Almojuela sent a news release that Bernard Cawley won second place in the AMA Sport Scale event at the AMA Nats with his 1/6 scale Taylorcraft. This is a first for an electric plane . . . congratulations Bernard! There will be a time when lots of electrics will win in scale. Electric and scale go together like peaches and cream. Everyone will say, "But electrics are too heavy!" Not so! Keith Shaw has proven that many times over with his twin De-Havilland and Spitfire. The Naccaratos have done it with their B-36, Cub, Farman, and many others. The no vibration nature of electrics lets you build light, which is just right for scale. Anyhow, Bernard's plane is modeled after a 1946 Taylorcraft operated out of Crest Airport in Kent, Washington. The model has a six-foot span, and designed from full-scale Taylorcraft drawings. The Astro 40 cobalt motor uses a 1.7:1 gear drive turning a Graupner 12x7 prop, with 18 Sanyo SC 1.2 Ah cells. The speed controller is an SC-4 Jomar, the radio is a four-channel Airtronics Vanguard FM. Ben and Mike Kometz were Bernard's assistants.

Bernard and I have been flying together for many years now, and I am very pleased

that Bernard has done so well. We had lots of discussions as the building progressed, and I like to think that some of my thoughts helped out too. I have about 80 hours in full-scale Taylorcrafts, all on floats, and my comment to Bernard was that ailerons would not be very important for turns. Sure enough, even with the scale dihedral, which is not much, Bernard wound up using the rudder exclusively. In fact, he took out the aileron servo! The one exception in the full-scale plane was side slips, then full aileron was effective.

Scott Hartman sent a photo of his Super Doubler II, built from plans from the article in the May 1987 issue of *Model Aviation*. This was a gas model, Scott made it electric with an Astro 40 cobalt motor, and 14 to 20 1200-mAH cells. With 14 cells it is 5 lb. 10 oz. with 20 cells it is 6 lb., 4 oz. The wing is 612 sq. in., the airfoil was changed to an Eppler 195 from the one shown in the plans. Scott likes to fly it on 14 cells for longer flights, using a Master Airscrew 10x6. The Super Doubler II will loop, roll, and fly inverted with 14 cells, and takes off in 30 feet. Flights are over five minutes. With 20 cells the performance is increased, but times drop to three or four minutes. The plane will roll the length of the field, do inside and outside loops, and take off in only 20 feet! Scott uses a lazy man's access hatch, a slot and a couple of rubber bands for quick battery access. The fuse is removable for safety. Thanks, Scott, for the info and photo. Scott proves, as many of us have, that the 40 and 60 size electrics are excellent fliers. I sure wish there was a kit available so more folks could discover that! How about it, manufacturers? My new address is Box 734 PSC2, 7100 CSW/MC, APO New York, NY 09220-5300. This is U.S. postage even though I am in Weisbaden, West Germany. Till next time, fly with pride, fly electric! •

ARFs . . . . . *Continued from page 23*

Back to my neighbor who uses my workshop, there was the time I suggested that he mix up some epoxy to spread on his firewall. Of course, as I forgot to specify what kind, he covered the whole thing with the five-minute variety. These teenagers just seem to look for the quickest way to do things. Maybe that's why ARFs are so popular. Speaking of fuel proofing, how about a few words in the manufacturer's instructions explaining that the on/-off receiver switch must be mounted on the "dry" side of the fuselage? Some beginners end up placing the switch directly in the way of the exhaust path, and that can lead to lots of trouble. Then there are those who don't mount the switch at all, just leaving it lying loose in the fuselage, and they have to dismount the wing in order to

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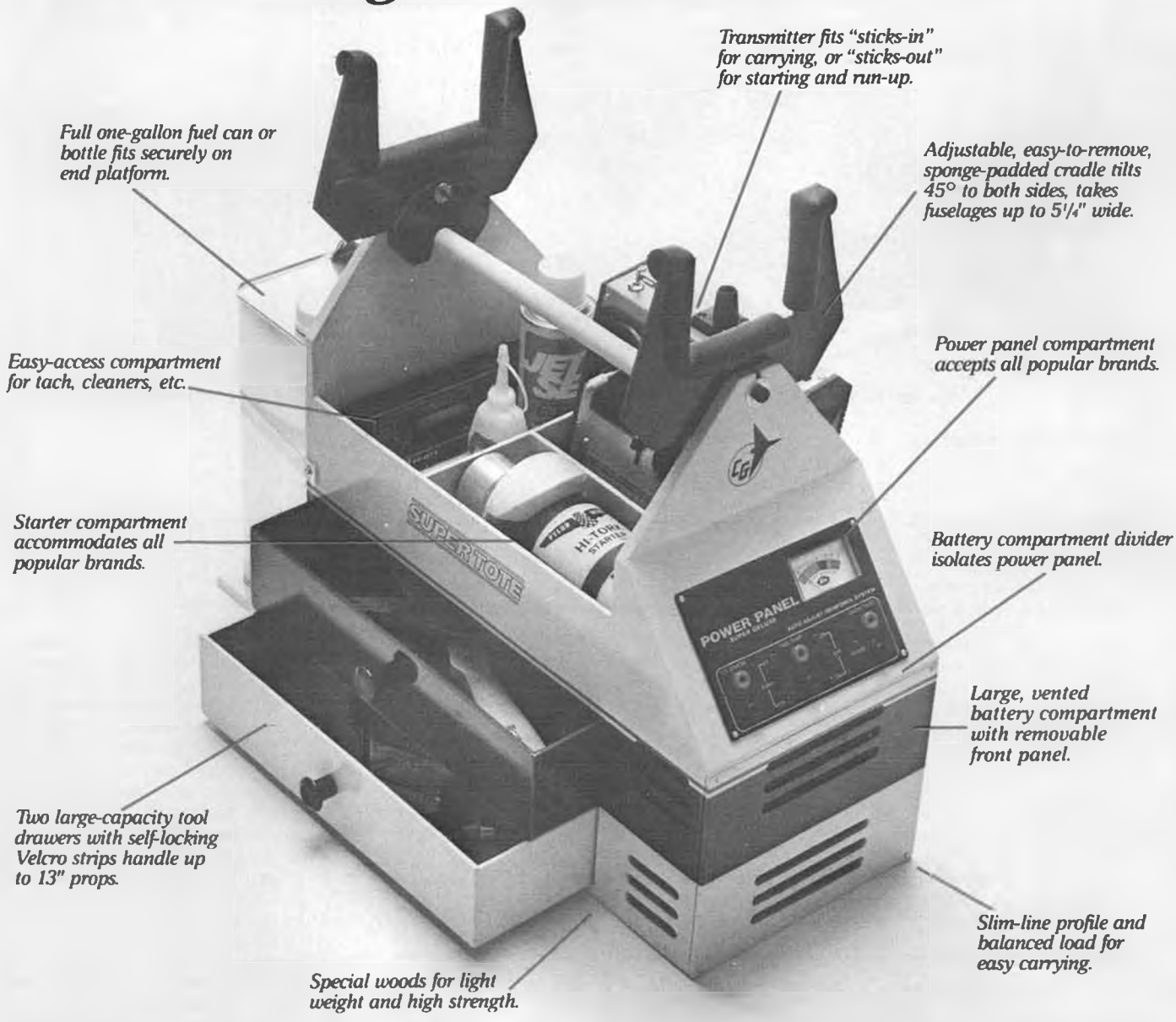

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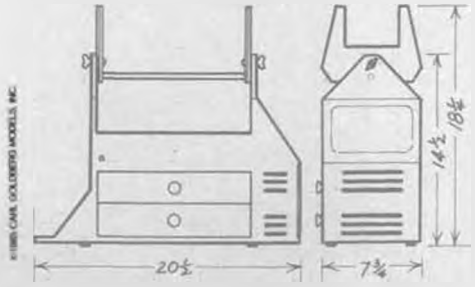

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switch on their receiver for every flight. This certainly keeps one busy on the flight line.

Most of your typical ARF trainer type airplanes come with wire torsion bar style main landing gear struts, and I have no complaints about them. They work well, even though they are a bit bouncy when one is learning how to perform an acceptable landing. The principal reason they are used by the manufacturers is that such a landing gear is significantly cheaper to fabricate than the formed aluminum kind. The aluminum gear looks a lot prettier, and will help take a lot of bounce out of landings. However, if you prefer six bounces per landing to one or two, the wire gear will do the job nicely. The point is that if you happen to have a set of extra aluminum type gear in the correct size lying around from a defunct model, it is no trouble at all to substitute it for the torsion bar gear. Just drill two to four holes and mount them to the fuselage bottom with nuts and bolts. Nothing could be easier. *(If the fuselage bottom is plywood. If not, you better add plywood pads inside the fuselage bottom to tape the load. wcn)*

Then there is the matter of balance. Many ARFs have detailed information as to the balance point, some even going so far as to permanently marking the exact spot on the fuselage. However, they seem to forget to tell you that this is the dry balance, and should be used only with an empty fuel tank. They also never mention that the wings should be laterally balanced, and ballast should be added to the lighter tip. It's a very rare wing that doesn't need at least a little balancing, and if not done, you will wonder why the darned airplane always turns to one side or the other, or why it can't perform a decent loop without dropping a wingtip. Besides balancing the wing, probably every R/C pilot knows about balancing propellers, or does he? I just don't know if we can take anything for granted when it comes to today's R/C hobbyists and their lack of experience. Suffice it to say, there are a number of excellent balancing devices available today, ranging from simple affairs to elaborate contraptions. I kind of cheat a little, as I take my balancer with me when I buy new props, not to see that each one is in perfect balance, but just to assure myself that each one is at least in the ball park. Once in a while a prop is grossly out of balance and will require that a great deal of material be removed from one side. This is usually true of wood props, as the wood density can vary greatly from one blade to the other. For beginners, I feel that the glass-filled props are best, as they will survive many more hard landings and they seem to need

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Adjustable Tension Sticks	Adjustable Tension Sticks
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Gold Label Super Narrow Band Dual Conversion FM Receiver	Single Conversion AM Receiver
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Adjacent Channel Rejection:	Better than −81.3 db @ +8.5 KHz	−60 db or better @ +8.5 KHz
	−69.2 db @ −8.5 KHz	−60 db @ −8.5 KHz
Image Rejection:	−70.8 db	Greater than −60 db @ Image Frequency
3rd OIP:	+3.8 dbm	Better than −4 dbm

TRANSMITTER	Vanguard VG4R FM	AMA Guidelines and Measurements
Occupied Spectrum:	Better than −55 db @ ±20 KHz @ 3 KHz RBW	Better than −55 db @ ±20 KHz @ 3 KHz RBW
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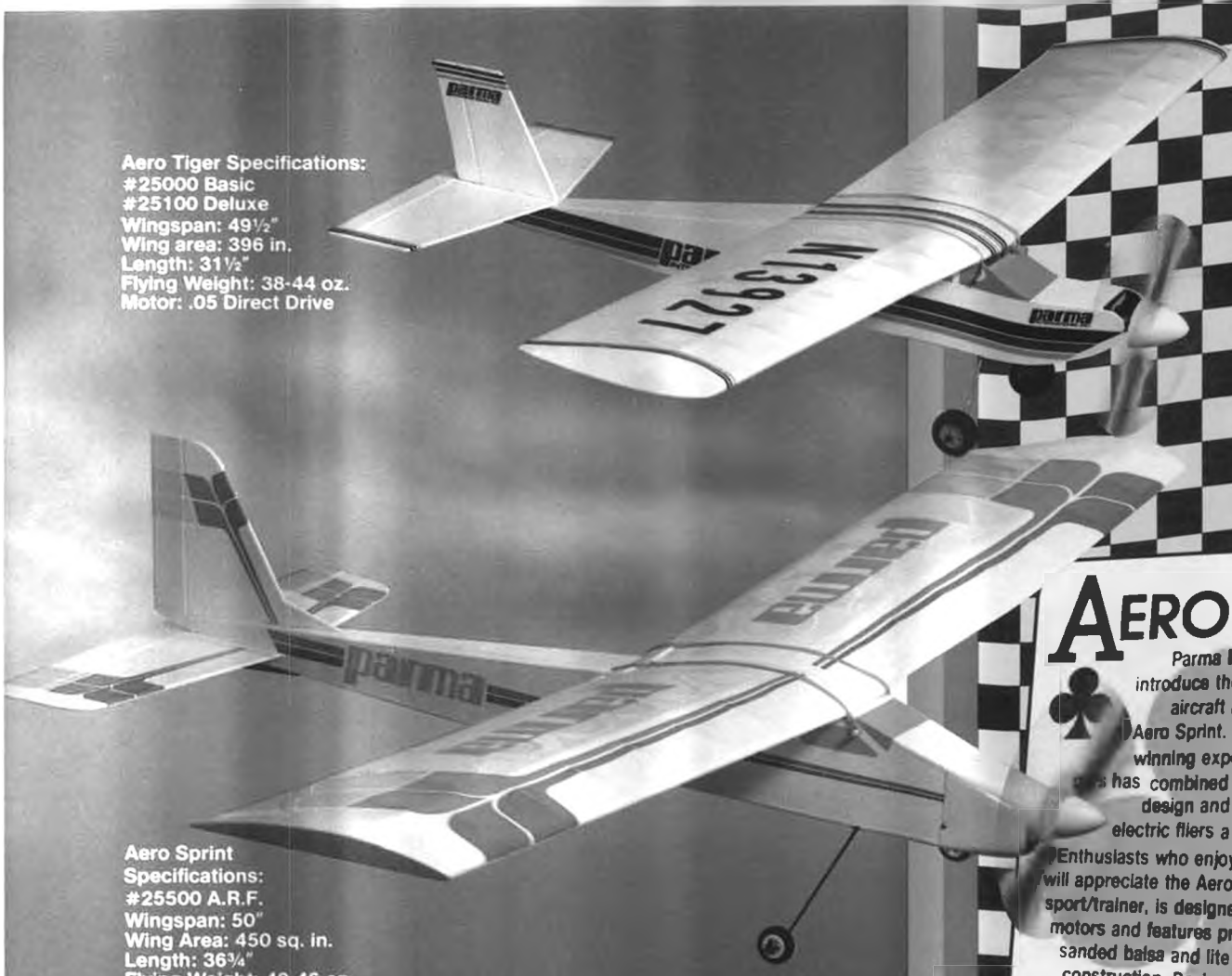
little or no balancing. Anyway, if you do wish to balance your props, ask an expert how it's done, because if done improperly it is worse than no balancing at all. Also, don't forget that the prop should clear the ground by at least one inch. If the clearance is insufficient, you can fix it in one of three ways, by going to a longer landing gear strut, a smaller prop, or larger nosewheel.

If a spinner is furnished with your ARF, it will be the plastic kind. I have not yet seen the better nylon or metal spinners come with an ARF kit. The plastic spinners usually work well, but here again, it is possible that they may also be badly out of balance. If you have balanced your prop and there is continued vibration, try running the engine without the spinner. A noticeable reduction in vibration will then indicate that the spinner should be replaced.

Control rods and radio installations are a topic which is too extensive to cover comprehensively. However, a few words would seem to be in order here. Most ARFs supply wooden push rods, and some furnish the nylon sleeved type. I have no pertinent objections to the latter, but my personal preference is for the rigid wooden type. No matter which is used, it is imperative that the adjustable clevis be used at only one end, preferably the end affixed to the control surface. The other end should be attached to the servo arm by means of a simple Z-bend, either bent by needle nose pliers, or specialized Z-bend pliers for those who like to go first class. My Z-bend pliers are probably one of the most used tools in my workshop.

If you do use rigid push rods, please make sure you observe the important commandment which dictates that you must never use right angle bends in the wire ends. No bend should exceed forty-five degrees, and I like to stay well below that limit. An acute wire bend will fail to operate properly under heavy loads. As for the plastic clevises used on the typical ARF, I have thus far found that the ones supplied with most kits are quite adequate. In any event, I have not yet seen one fail due to a factory defect. On the other hand, I have seen failures due to omission of a keeper on a clevis. There is absolutely no reason not to use a keeper on every clevis, as they are virtually cost-free when cut from a piece of scrap fuel tubing. But when I have complete freedom of choice, the clevis I like best has a metal pin or is constructed entirely of spring steel. The hotter a plane performs, the more I tend to use this kind of clevis, if only for peace of mind.

Many ARFs provide excellent fuel tanks, and often these are fitted securely into ready-made openings in the firewall and the first fuselage former. I am really of two minds about this. I certainly like the way the tank is firmly held in place, especially when it is given extra holding power by coating the neck with silicone sealer where it juts through the firewall. This is a tank that will stay in place no matter how



Aero Tiger Specifications:
#25000 Basic
#25100 Deluxe
Wingspan: 49½"
Wing area: 396 in.
Length: 31½"
Flying Weight: 38-44 oz.
Motor: .05 Direct Drive

Aero Sprint Specifications:
#25500 A.R.F.
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roughly the model is treated. Unfortunately, with nothing to insulate the tank from engine vibration, the phenomenon of fuel foaming can take place, causing erratic engine running. I don't know why, but we seemed to have a lot more problems with fuel foaming years ago than we do today. Perhaps the modern Schneurle ported and four cycle engines are less susceptible to this malady, but with the right combination of engine, fuel, and tank location, this vexing little gremlin can pop up to plague us at any time.

Now here's something the ARF manufacturers do tell you. They always say that the wing and tail surfaces must be perfectly aligned, with the vertical stab at exactly a right angle to the horizontal stab, and the horizontal stab absolutely parallel to the wing. The wing, of course, must be mounted precisely at a right angle to the fuselage. When all this is done by the book, you have a much better probability that the airplane will fly straight without the use of gross amounts of trim. However, I see plane after plane at the field in which the parts were glued together with no attention to alignment. And this is not by any means limited to ARFs, but often turns up in models which took weeks or even months to build. It is a real credit to our modern day R/C designers that most models fly fairly well in spite of poor alignment, but this is one area where a little attention to detail can really pay off big in a better flying machine.

The foregoing has been an attempt to let the first time ARF builder in on a few R/C trade secrets, and by no means does it even begin to represent a comprehensive primer for beginners. On the other hand, perhaps it will help prevent at least a few serious mistakes. I hope that those of you who are experienced in R/C model building and flying have had the patience to bear with me through what must have seemed a quite elementary dissertation to you. And above all, I want to apologize to my young neighbor, John Singleton, for having used him as such an example of ineptness. Since I did teach him to fly, and since I did supply him with my airplane on which to learn, to say nothing of fuel, props, glues, my flight box, almost daily transportation to the field, and everything you can think of, including the unlimited use of my workshop, I have a feeling he will forgive me. I just hope none of my other neighbors ask me to teach them to fly.

Art Steinberg, 2267 Alta Vista Drive, Vista, CA 92084, phone (619) 726-6636 (SASE for a reply, please). •

F3E ..... *Continued from page 33*

How much time is left? Can I get two more laps in? Am I flying a good course in this crosswind? How much motor run will I have left to do duration? There are scores of questions to answer and answers to weigh!

The end of the three-minute distance working time signals the start of a 60 second timer. Within 60 seconds the contestant must fly his model under an invisible "lim-

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bo bar" which is about 10 meters high and 30 meters wide.

There is no physical gate anymore. Too many F3E ships were hitting the uprights as they attempted to pass between them, so it was deemed unsafe.

Successful gate crossing is a judgement call on the CD's part. Yes, a few seven-cell flyers had to try a second pass!

When the model crosses through this invisible gate, the five minute duration working time starts.

Because you are beginning the duration task very near ground level, you initially turn on your motor to get to thermaling altitude. The ideal would be to glide for five minutes without the motor running at all.

As an interesting side note, some hotshot international fliers use the 60 second time period between distance and duration to gain altitude. They then dive steeply and whiz through the gate at almost ground level at very high speed. The moment they cross, the duration time starts. Their momentum carries them so high, sometimes they can get away with very little or no motor run!

Unlimited motor runs are allowed in F3E duration, but for each second the motor runs, a second is subtracted from your total flight time within the five minute working time. Obviously, you want to run the motor as little as possible!

Flight time stops when the model stops sliding on the ground. Points are subtracted for overflying the five minute period. Landing bonus points are awarded for landing inside a rather large bonus circle.

Three of the top four finishers in this event flew variations of a design called the Snipe. Originally the Snipe was a pivot wing slope racer. It became a faster slope racer when it was given conventional ailerons. Then the Snipe was transformed into an electric for the first seven-cell F3E contest in 1987. This year it has undergone a few more refinements and is now probably the most potent little F3E glider in the USA.

The Snipe is the brainchild of Jerry Bridgeman. Jerry is a 1988 USA F3E Team Member and is forever an ineligible contender for Felix's Sportsman F3E money. However, Jerry's good friends Jason Perrin, Bob Sliff, and Jared Stalls were eligible, and more than capable too!

First place winner Jason Perrin's primary ship is a more-or-less normal looking, 60-inch span Snipe with a root chord that tapers from a rather smallish 6.0 inches down to an even tinier 4.0 inches. This gives a petite looking wing of only 300 square inches of area and a relatively high 12:1 aspect ratio. At 34 ounces of flying weight, the wing loading comes to 16.3 ounces! Yes, Snipes fly at a pretty good clip!

Jared's Snipe had a wing slightly larger at 390 square inches and 70 inches of span. His ship's 41 ounces of flying weight and slightly larger size kept it from climbing as quickly as Jason's or Bob's.

Because Jason's Snipe was set up pretty

much the same as the others, here is a grocery list of equipment it carried: for motor control, a simple, cheap, $28 Becker USA on/off relay with anti-glitch circuitry purchased through Hobby Horn (rated to a true 35 amps, but known to handle up to 50 amps); for propulsion, an Astro Flight 6-turn FAI cobalt 05 racing motor; a now discontinued (too bad!) K&W 9x6 folding epoxy-glass prop reworked to 8.25 or 8.5-inch diameter, given a curved tip shape and a thinner cross section; a Cox spinner; a seven-cell, Sanyo SCR 900 mAH battery; 13 gauge high flex wire; and a Vision 8SP radio by Airtronics with a four-channel mini FM receiver. The Snipe carries three JR Propo metal gear micro servos. Two servos hide inside the wings and wiggle the ailerons, and one works the elevator. There is no rudder control.

Structurally, the Snipe fuselages were all basically the same (except Jared's), so here's how they look. All Snipe fuselages are made from Jerry's mold. Jerry prefers molding exclusively out of 1.8 ounce Kevlar cloth. One layer goes from the nose back to the wing, the other two cover the entire length. After wetting out the fibers, the epoxy is first sopped up with toilet paper, then is vacuum bagged in the mold to squeeze out every last unnecessary drop and give better wetting. The total weight of the finished Snipe fuselage is only 1.5 ounces! Jared's fuselage, which was a combination of fiberglass, Kevlar in the nose, and a pair of carbon fiber tow stringers down the side, was slightly heavier at 2 ounces.

Snipe wings generally have a Ralf Girsberger RG12a airfoil. However, Jared's Snipe used the Helmut Quabeck HQ-1.5/10 because he felt it thermalled better and would bury his Futaba 133 servos better. Jared's wing was also covered differently. Snipes generally have 0.5 ounce density blue foam cores. They are covered in a combination of fiberglass and Kevlar, vacuum bagged (this eliminates one ounce of epoxy!) to give a light, smooth finish. The top skin is a single layer of 3-oz. E-glass over a 1.0-inch wide, tapering carbon fiber tow "spar"; the bottom skin is a single layer of 1.8-oz. Kevlar. Jared used fiberglass skins laid on a 45 degree bias with carbon fiber mat spars under the top skin.

Snipes are very low drag, lightweight machines. Set up like Jason's, Bob's and Jared's they only draw between 31 and 34 amps. This gives about anywhere from 1:30 to 1:50 worth of motor run time on the 900 mAH cells if the runs are limited to five to 20 second bursts.

Initial climbouts in distance were never longer than about 20 seconds, with out-of-course bursts varying from 5 to 10 seconds. This keeps the internal temperature of the motor lower and more efficient, and it allows the battery pack time to recover chemically between the high amp motor runs. Therefore, the short burst method

delivers more power than continuous running!

Five to eight seconds will give a Snipe enough altitude to rip off anywhere from four to six laps. Twelve to sixteen-lap runs were common in the three minutes of working time. Compare this to the same laps in four minutes as in F3B!

The Snipes were so good at gaining altitude quickly that their style of thermal flying was very different. The idea in duration is to run the motor as little as possible. The quicker you grab altitude, the less you need to run the motor, and the more points you rack up.

However, Bob and Jason had a plan that took short motor runs a step further. Since it is true that battery packs will recover some voltage after a period of rest, and since it is true that the higher the voltage level, the more power a motor can produce, why not run it only briefly, five seconds max? Try to find lift at 100 feet rather than 300 feet. If you find lift, you've got it made, and you've only run the motor a very short time. If you don't find lift, try again in a different part of the sky. You'll be getting a strong motor run from a rested pack, and you'll only need another five seconds to get another 100 feet. If you fail again (almost unlikely), you can run the motor again for another five seconds and get another 100 feet. Fifteen seconds of motor run time versus probably 20 seconds if you had gone for the whole 300 feet in a single climb. The glide times are equal because sink rate and 300 feet are equal, but the burst method has taken less motor run time, therefore more points!

This kind of strategy and acumen comes from experience in electric competition and lots of practice. But learning these things is what makes multi-task competition challenging, whether it's F3E or F3B.

I hope that perhaps your interest in F3E has been piqued, or at the very least, your ideas about electric power have been brought up to 1989 performance levels. F3E has many things going for it, and seven-cell F3E even more because of its relative low cost. If you have electric fliers in your area, get a sportsman level F3E contest going. It is loads of fun!

A big thank you to the industry sponsors who donated prizes and/or monies to help make this contest possible: Hobby Lobby, Astro Flight, High Time Liquor, House of Batteries, Airtronics, *Model Builder* magazine, and especially to Felix Vivas for the prizes he bought and the $1000 in cash he donated. •

Soaring . . . . *Continued from page 17*

Winsome prototype. This model is one that Larry has been working on for over a year

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now. It's gone through a change or two to get where it is today.

Winsome is a sportsman F3B type design for the guy who prefers not to become involved with foam cores, wing molds or fiberglass. The wings and stabs are conventional wood structures. The three-meter, 1000+ square inch wing is a fully sheeted Eppler 374. It has flaps, ailerons, and (I think) spoilers. The T-tail fuselage is molded epoxy-glass with a removable nose sheath for a canopy.

Although I didn't get to talk with Larry about the Winsome, I did get about five minutes of stick time with it Sunday afternoon after the contest.

Larry handed me the transmitter with the Winsome up about 600 feet. Having flown Larry's planes before, I knew the Winsome would have exaggerated (and therefore sensitive) control throws. Larry warned that the elevator deflected 45 degrees at full throw! Because of this, I kept my control inputs at a minimum. Even so, I once tip stalled the left wing while trying to raise it in an overly banked turn. I came close to tip stalling a second time, but saw what was happening and avoided the right aileron input which initiated the first stall. The Winsome dove into the circle a little then pulled out with no loss of altitude, but it didn't stall.

After two or three minutes, I felt comfortable with the Winsome. Lift was widespread and not that difficult to find, but it was weak. The Winsome cruised along quite nicely and worked the weak lift well. I flew from one side of the field to the other stopping at two thermals along the way.

Too quickly it was time to pass the controls onto Don Edberg whose turn it was next. I wish I'd had more stick time on it.

ORIGINAL DESIGNS

Joe Wurts is one of this nation's greatest soaring experimenters, designers, and competitive flyers. Joe flew this year's FSF with a brand new original design. It hasn't been given a name . . . yet . . . So, with apologies to Joe, I'll give it one: JW89.

What's nice about Joe is that he is more than willing to share information, if one shows interest. As with practically everything Joe has built in the last several years, the JW89 is a composite design. Joe doesn't do much with balsa wood anymore.

The specifications for the JW89 are: 97 in. wingspan; 5.5 sq. ft. wing area; 61 oz. flying weight; and a HQ 2.0/9 airfoil section.

The JW89 is "The best flying sailplane I've come up with yet!" according to Joe. That's saying a lot, because he has come up with more high performance, contest winning designs than almost anyone I can think of, with the possible exception of Larry Jolly.

Joe also says that the JW89 has "Early morning sink rate that's great, and it's fast too. It just seems to fly on and on with its great L/D." He attributes the great perfor-

mance to the HQ 2.0/9 airfoil which he has discovered for himself. "I'm very happy, bordering on extremely happy with this airfoil. My days with the Eppler 374 are numbered."

Joe wished the JW89 had been a little bigger in span than 97 inches for this type of AMA thermal flying. He mentioned 110 inches. However, as he said, "I already had a fuselage ready to go . . . " so a standard class wing was built. Only one other wish was voiced for the JW89, namely that it had a longer tail boom for extra stability.

Joe had much to say about his new radio system, an Airtronics Vision 8SP. He called it the Porsche of radios. He said, "It is THE thing to have. It makes it so you can set up a sailplane any way you want. It's the exact radio that a sailplane lover would come up with. Vision radios are showing up all over the place. I'm ready to jump on it and change everything over to it."

Joe uses four Airtronics 401 Micro servos in the wings. This allows for independent aileron and flap mixing. Joe used flaps on launch (flaps down 30 degrees, ailerons down 5 degrees), crow mixing for landing (ailerons up, flaps down), camber changing (entire trailing edge goes from 5 degrees down, to neutral, to 3 degrees up), with pitch compensating elevator trim where required. Joe cautions 401 servo owners to land with flaps up or risk striping servo gears. (Rumor has it that Airtronics will be coming out with metal geared 401s soon.)

Structurally, the JW89 wing is a hot wired blue foam core. Joe tried a new composite layup for the wing skins this time. He found a source for 4.7 ounce unidirectional woven carbon fiber cloth, so that is what he used. There is a single layer of C/F, then a single outer layer of 1.5 ounce fiberglass at a 45 degree bias.

The wing is actually four cores, but they are sheeted one half wing at a time (right main and tip, left main and tip). Joe lays up the CF/glass skins on mylar sheets then slides them in a vacuum bag and turns on the pump. The two wing halves are then joined with two staggered layers of the 4.7 oz. C/F uni cloth.

Joe recommends Bob Violett's pin hole filler to fill any pin holes in the glass work. He says it goes on like car wax: rub it on, rub it off, pin holes are filled.

Joe says he's already planning a bigger version of the JW89 for F3B multi-task flying.

* * *

Jerry Arana, from Santa Cruz, is no stranger to old time sailplane fliers. His name and smiling face have cropped up in coverage of the RCM Trophy Races (now International Trophy Races) for many years. Jerry has frequently won the event.

A few years ago I reported on Jerry's Chameleon sailplane at the Western States Soaring Championships. This year at the

FSF he had a new version, the Chameleon SE. The SE now uses the almost ubiquitous Selig 3021 airfoil. It sports foam core wings, balsa wing sheeting that is covered in Silkspan, colored Japanese tissue and dope, arrow shaft hinges that allow removable control surfaces, PVC pipe shear webbing capped with C/F top and bottom, .049 wall aluminum tube wing joiner (3/4 in. OD) that slides into the PVC pipe shear webbing (really slick!), hard mounted plug-in servo connectors in the wings and fuselage, ballast capability inside the shear webbing or wing joiner (I assume), a Falcon 880 fuselage with modified fin, and elliptical shaped wing and stab tips which make the Chameleon sailplanes easily recognized in the air. Specifications for the Chameleon SE are: 100 in. wingspan, 870 sq. in. wing area, and a flying weight of 70 oz.

Jerry finished the plane the night before the contest and finished adjusting the flap throws just before its first tow. I would assume this means Jerry has an ATRCS-equipped Airtronics Module 7SP or Vision 8SP radio.

* * *

The last design I'd like to write up is the Yahoo prototype. This is a high tech, F3B-type construction, multi-task ship designed by Mike Forster. The Yahoo (that's pronounced yah-hoo, not yea-hoo) is yet another S3021/S3014 airfoiled sailplane, this time with molded, hollow wings.

George Paige flew a Yahoo in the contest and absolutely loves it. "It has very positive handling," according to George, "and it is very easy to fly." Mike Forster adds, "The stall characteristics are very smooth with a soft, mushy stall warning. As it approaches about a 15 degree angle of attack, the L/D just goes away. You almost have to jerk it into a stall, it generally just falls through. In thermals, the Yahoo practically pivots on its wing tips. It thermals very well, and the heavier one's (like George's at 105 oz.) climb with a vengeance. . . . It will do a sub-20 second F3B speed run with no problem."

The wing skins on the Yahoo are a fiberglass-Rohacell-fiberglass sandwich which is laid up (wet) into a unique, hematite-epoxy mold. Hematite is a naturally occurring mineral consisting of iron with silicon bonded to it. (It's the black stuff a magnet picks out of beach sand.) The mold is accurate to .001 in. according to Mike, and will never distort. I assume the wing skin is then formed into the mold via the vacuum bag method. The result is a glass smooth white finish.

Inside the hollow wing is a unique tubular fiberglass spar system. The F/G tube is spirally wrapped in C/F for added shear strength and then capped top and bottom with carbon fiber tow for stiffness. The spiral wrap of C/F carries the diagonal shear loads more efficiently than a vertical shear web. An .049 in. wall thickness, .75 in. OD, 30 in. long aluminum tube wing joiner slides into these hollow shear webs.

The Yahoo's wings are thick enough that Airtronics 831 servos will fit inside the wings with no problem. No exotic Becker servos are needed. The control surfaces have mil spec .002 mylar hinges attached with adhesive transfer tape. The hinge joints feature very nice, tight fitting wipers. The Yahoo wingspan is 113 in., wing area is 904 sq. in. (6.3 sq. ft.), and flying weight is either 85 oz. for the thermal version with 11% stab, or 95 oz. for the F3B version with its smaller 9% stab.

Contact Michael Forster for details about his plans to sell finished and partially finished Yahoos: (415) 949-2599.

Well, that about covers the detailed notes I have on the top new designs at the FSF. The photos and captions tell the rest of the story.

THANKS FOR THE HELP, SPONSORS

Stephen George provided me with a list of the major sponsors who donated hobby goods to the raffle. They were: Airtronics (one Vanguard FM, two Vanguard PCMs, one Module 7SP, and one Vision 8SP!), Futaba, Pierce Aero, Flite Lite Composites, Larry Jolly Model Products, Global Quality Kits, Hobby Shack, Culpepper Models, Precision Foam Cores, and Sheldon's Hobbies. Thank you all. Your donations help keep a very active California club running and make the Fall Soaring Festival the best in the west!

Thermals to all, Bill Forrey, (714) 245-1702. •

Choppers . . *Continued from page 35*

can link the main rotor blade to the flybar. The small arms are called Bell-Hiller mixing arms. The mixing arms are illustrated in Figure 2. These mixing arms permit the flybar to transmit the difference in angle between the flybar and main rotor disc tilt into a mechanical action to change the main blades' pitch angle to bring the rotor disc back to level.

You have probably heard the term Bell-Hiller mixing ratio before. The mixing ratio is simply a measure of geometrically how the flybar is linked to the main rotor blades. This ratio on modern R/C helicopters typically varies from 50% to 100%. A ratio of 100% percent is like turning up the feedback gain on your electronic yaw rate gyro, so that the flybar has a lot of authority over the main rotor blades pitch angle and hence a lot of damping is added to impede helicopter fuselage motion, making the helicopter very stable. For example, the GMP Rebel and Cricket fixed pitch helicopters have 100% Bell- Hiller mixing ratio. The Concept has about 90%. The Champion has about 50%. The Cobra also has about 50%. The new Kalt K-5 head is the only collective rotor head that I know of with 100% Bell-Hiller mixing ratio.

You can observe and check the amount of designed ratio on your model by setting the collective pitch of the main blade to O° first, then level the flybar. Now the blades and the flybar should appear parallel when you look at the flybar from the tip of the main blades. Now deflect the flybar by 10° and leave it tilted. If the main blade pitch angle also changes by 10°, then we say your model has 100% Bell-Hiller mixing ratio. If your blades only change angle by 5°, then we say your model has 50% Bell-Hiller mixing ratio. Through ingenious mechanical design, even ratios higher than

100% can be achieved. However, higher ratio does not necessarily mean the model is better. Too high a ratio may make the model too sluggish, or it may also destabilize the model like cranking up the yaw rate gyro gain too high. In Issue 4 of *International Helicopter Magazine*, and the May '89 issue of *Model Aviation*, I showed how you can modify GMP Prohead seesaw to increase the stock mixing ratio from 50% to about 70% for slight improvement in stability. However, I also tried modifying the Champion mixing ratio but found that increasing the ratio worsened Champion's handling qualities! The moral is: there is generally a narrow range of feedback gain for each model helicopter design that optimizes its handling qualities. In general, I assume that the manufacturers have played around with different Bell-Hiller mixing ratios to reach the best compromising ratio for all-around flying before they market their final design. Maybe in the future, manufacturers can offer variable mixing ratio design heads so the modelers can set it like they set their gyro, according to their flying style; a low ratio for hot dogging and aerobatics, and a high ratio for beginner hoverers and windy competition days.

I mentioned the flybar is called a Bell stabilizing bar because Bell Aircraft Company bought the idea from Mr. Young and used it on all the Bell 47 and UH-1 Huey helicopters. Then where does the name Hiller come from? Mr. Hiller is the inventor of the Hiller paddles used on real UH-12 helicopters. Thus the plastic paddles on model helicopters are also called Hiller paddles. The paddles serve two purposes. One is to add some aerodynamic damping to the flybar unit to remove some of its "remain level" ability so the model helicopter will not be too stable. The second reason is to function as a control boost to increase the controllability and agility of the helicopter.

The first reason sounds pretty strange, huh? Yes, without the paddles the model helicopter would be too stable. I suggest you try removing the plastic Hiller paddles next time you go flying. You will discover your model will become so stable and SLUGGISH that you almost have no control authority over it. Because of this principle, I suggest beginners might try cutting down the plastic paddles to half the size. They will discover that the model will become more docile, as if someone hit the super slow motion button. Why is it so? Because without the paddles, the flybar is like sitting in a vacuum, there is negligible aerodynamic forces acting on the thin wire bar so it functions as almost a perfect inertial reference. However, with the plastic Hiller paddles, the paddles can encounter air resistance and thus the flybar loses some of its remain-level capability. If you CA glue the seesaw solidly to the rotor hub, you have completely lost the "remain-level" ability of the flybar. The objective is to have a just-right size for the paddle that gives the paddles just the right amount of stickiness to the air, so the flybar can tilt and follow the helicopter slightly, and so the helicopter is not too stable.

On real Bell UH-1 helicopters, they don't have Hiller paddles at the tip of the flybar, instead there is an oil-filled viscous damper (like automobile shock absorbers) connected to the seesaw to make the seesaw "stick" to the hub a little so the helicopter is not overly stable and sluggish. We do not use this technique on models because the viscous damper would require too much maintenance, furthermore, we need the benefit of Hiller paddles to provide control power boost.

Next month we will continue with how Hiller paddles boost up the control power of our model helicopters, and explain why all helicopters have a 90° phase delay be-

tween cyclic input and when the rotor disc actually tilts. We will also explain why on many helicopters the swashplate needs to be rotated slightly counterclockwise to prevent cross-coupling in control. We will also explain why adding two electronic rate gyros is not quite the same as having the mechanical Bell stabilizing bar. Next month we will also show detailed pictures of the winning Japanese team helicopters from the F3C Helicopter World Championships. Then the following month we will have the Magic! •

Knife ..... *Continued from page 21*

thinner than the gear add a 1/64-inch core plate then sand the balsa side to get a snug fit. Front and back plates should protrude about 1/32 below the gear. CA plates to core but don't glue wire in at this time. Set mount in place between slots in bottom fuselage longerons. Mount should protrude 1/8 inch from bottom to fit flush when bottom sheeting is applied. Use 1/8 inch scrap to check. Slip gear in to check alignment tack mount with . . . remove gear and secure mount with CA. Cut 3/8 triangle balsa braces to fit and CA in at mount corners.

Cut firewall core from 1/8 lite-ply and front and back plates from 1/16 aircraft ply. Laminate with CA. Bevel top and bottom and trim to fit inside fuselage. Attach the engine you have selected to its mount and attach spinner backplate. Measure from back of backplate to back of mount so you get the firewall in the right position relative to the front of the plane. Mark firewall position inside fuselage and remove firewall. Take your engine with muffler attached hold it up to fuselage front . . . sight back and determine how much it needs to be rotated upward for the muffler to clear the fuselage side. Keep in mind that the fuselage will be rounded back into the longeron. When you have made your decision, transfer your mount bolt hole positions to the firewall. I drill 1/16-inch holes . . . tap them with a #4 socket head screw . . . saturate the holes with thin CA and secure the mount with #4 x 3/4 inch socket head screws. This method is light, convenient and I've had no trouble with them coming loose. If you prefer blind nuts, install them . . . drill your pressure and fuel line holes and drill your throttle cable hole to suit your engine. Set firewall back in place and squeeze fuselage sides firmly but gently to hold in place while you check alignment. Hold a straight edge vertically up against it and look at it from the side to get it straight up and down. Look down from the top to get it straight across. Tack firewall in place with CA . . . check alignment again then secure with CA. Trim 3/8 balsa triangles to fit and CA into back corners. Re-drill your throttle cable housing hole on through the triangle you have just glued in. Cut F-1 from ⅛-inch lite-ply and, being careful to keep it square vertically and across, CA in place.

Glue on bottom 1/8-inch sheeting from tail to about an inch in front of the tailwheel bracket position. Glue on top sheeting from tail to about an inch in front of fin leading edge position. Trim and sand flush with fuselage sides. Slot bottom for tailwheel bracket. Try to get it really tight. Tack CA a scrap of 3/16 x 1/4 balsa where your fin is going to be and another to the tail where your rudder is going to be. Now you can begin carving and sanding the fuselage corners. Doing so before the sheeting is applied saves a lot of glue and makes it easier to see what's going on. Carve and sand carefully up to the scraps tacked on at the tail and you'll have a nice fit when you later glue the fin-rudder in place. Carve and sand toward the front, leaving about a 1/4 inch of the longerons. When you've got it rounded, smooth and even, check the position of the hatch front and cut a section of sheeting apart at the

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angle of the hatch line. Glue these pieces to the fuselage top but not to each other so you can get a razor blade between them later to finish the hatch cut. Glue sheeting fore and aft of the rear hatch line, again gluing against but not to each other. Glue rest of top sheeting in place, trim and sand smooth. Sheet bottom from L.G. mount aft and forward. Trim and sand smooth.

Mark hatch cut-out with straight edge and pencil. Complete front and back cuts with razor blade and cut along sides with straight edge and a #11 model knife. Lift hatch carefully, cutting fibers loose here and there as necessary until it lifts free. Sand lightly. Cut hatch tongue a bit oversize from 1/32 ply and trim to fit tight up into fuselage. Coat this area of fuselage with CA and glue tongue into hatch. Trim aft hatch former to fit and CA in place. Cut F-3 to fit from 1/8 balsa and set aside. Cut hatch hold-down plate top from ⅛ lite-ply and bottom from 1/16 aircraft ply. Laminate with CA. CA hold-down plate up under fuselage top sheeting. Notch F-3 to fit and CA in place. Cut front hatch former from 1/8 balsa, CA in place then notch to fit snugly around hold-down plate.

Wrap cloth surgical tape around hatch front as shown on plan and saturate with thin CA to prevent hold-down screw from tearing through. When dry, set hatch in place, then drill and install the #2 x 1/2 inch hold-down screw (with washer). Sand hatch-fuselage area to smooth even fit. Cut canopy from light 3/16 balsa, trim to fit, trace base outline onto hatch top, and set aside. Remove hatch and set aside. Cut out sub-leading edge and back of trailing edge inside fuselage as shown on plan.

Cut out right front of fuselage to fit your engine. If you use a Picco .21, you'll need to cut out the right side of F-1 to clear the carb. When you get enough room, install engine, trim to final fit, then remove engine. Cut drain slot in bottom as shown on plan, then give all engine compartment seams a coat of thin CA.

Cut fin and rudder from light 3/16 sheet balsa. Tack glue together, razor-plane and sand taper to top (about 1/16), round leading edge, taper from seam to trailing edge, finish sand, separate, bevel rudder front, drill and notch for tailwheel wire, drill control horn mount holes, wrap control horn area with cloth surgical tape, saturate with CA, and set aside.

Cut stabilizer and elevator halves from light 3/16 balsa. CA elevator halves to 1/4 x 3/16 spruce joiner and tack elevator to stab. Razor-plane and sand taper to tips (about 1/16), round leading edge, taper from hinge line to trailing edge (about 1/16), finish sand, separate, bevel front of elevator, drill control horn mount holes, tape elevator to stab and slide stab into fuselage slot.

Hold elevator control horn in place and mark elevator control cable housing exit for smooth line from fuselage to horn. Remove and use similar procedure to determine and mark rudder control cable housing exit. Drill both exits.

Wrap tail wheel bracket area with cloth

FOUR BY FOUR.

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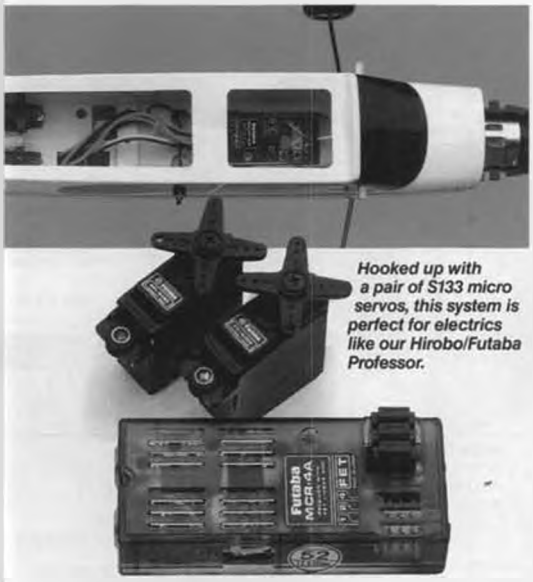

Hooked up with a pair of S133 micro servos, this system is perfect for electrics like our Hirobo/Futaba Professor.

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MCR-4A	S133(2)	BEC	72MHz	Electrics
R114H	S133(2)	NR-4K	72MHz	Sailplanes
R114H	S148(3)	Dry Case	72MHz	Aircraft
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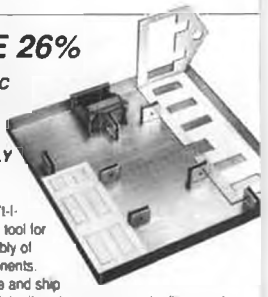

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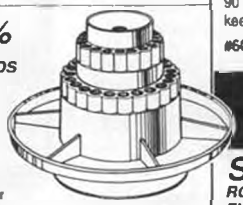

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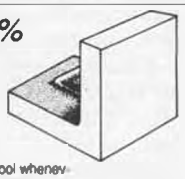

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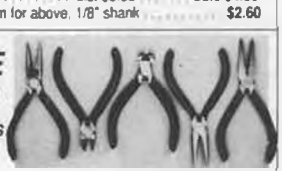

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surgical tape and saturate with CA. Bent bottom part of 1/16 music wire to fit around tail wheel. Solder inside wheel washer, slide wheel on, trim axle to fit and solder outside washer. Solder inside main gear wheel washers, slip wheels on, trim axles and solder outside washers. Slip tail wheel bracket bearing washer onto tail gear, bend wheel end of gear back, slip bracket on, bend top of gear back and trim end as shown on plan. Set both gear aside.

Install servo mounts as shown on plan, trimming and adjusting to fit servos used. I laminate my 1/8 ply from two layers of 1/16 ply so I can cut the parts out with a model knife.

Cut air scoop from 3/16 light balsa, trim to fit, trace position outline onto fuselage and set aside.

I cover everything except wing panels with Peck-Polymers domestic tissue (fuselage, hatch, canopy, scoop, fin, rudder, stab, elevator, ailerons, and wing center section, leaving a 1/2-inch strip just inside W-2). Brush on a coat of Balsarite and smooth the tissue on immediately. It shrinks up nicely as it dries. As each component is covered, I give it a coat of 40-60 Sig Lite-coat clear dope and thinner. Trim tissue from canopy base on hatch and, aligning carefully, CA canopy in place. Trim tissue from scoop base on fuselage bottom and, aligning carefully, CA scoop in place. Trim tissue from fin base area on fuselage and, aligning carefully, CA fin to fuselage. Trim tissue from stab where it fits to fuselage, slide stab into place, align carefully, and saturate seam with thin CA. Give all components two more coats of Lite-coat, smoothing between coats with #600 sandpaper.

Hinge elevator to stab with E-Z hinges. Cut an end of a 1/16 x 1/8 scrap stick of balsa at about a 45° angle and use the wedge end to dip into the CA bottle and touch the hinges. If you try to drop it right out of the bottle it will run through and onto your covering on the opposite side, no matter how careful you are. CA tailwheel bracket in place. Fit hinges into rudder, slot fin to receive rudder, slit paper at tail gear wire position on rudder, apply five-minute epoxy to slot and to wire end, slide rudder into place and when epoxy is dry, CA hinges.

Slide elevator and rudder control cable housings into place and CA at exits. Install braces at F-4. It's kind of a long reach back in there through the hatch opening, so you might want to skewer them on a model knife to set them in place. Install aileron control cable housings in wings. I cover my wing panels with translucent Micafilm. It requires a bit of extra care, but it's light, tough, and beautiful. Using Balsarite and low heat as per instructions, I cover the tops, wrap all around and trim back to about 1/8 inch all around underneath. Cut aileron control cable housing holes in bottom film panels. Balsarite wing frame bottom, iron on film and trim all around right on the edge. Run a bead of CA all around the seam, then, taking care not to get it too hot, shrink film. Hinge ailerons. Epoxy main gear in place. Apply trim and decals as desired and spray over everything with a couple of coats of clear polyurethane. Let dry thoroughly.

Install throttle cable housing. Secure to fuselage side where necessary with cloth surgical tape and CA. Attach rudder control horn and trim bolt ends. Attach elevator control horn and trim bolt ends. Attach aileron control horns and trim bolt ends. Thread clevises on to couplers and attach clevises (or clevi as the case may be) to control horns.

Install receiver battery pack and receiver (both well wrapped with foam). Install charge receptacle and switch harness. Install engine. Make up throttle, elevator, and rudder control cables as shown on plan detail. Turn your radio on and center your servo arms. Install elevator and rudder cables. Install front cable housing clamps, adjusting as necessary to get a smooth run to servo arms. Thread aileron cable into place. Secure E-Z connector screw with thread-lock. Install throttle cable. Level control surfaces. Trim and solder cable ends to couplers. Solder tailwheel bracket bearing up against bottom of bracket. (Use paste soldering flux for best results when soldering cables and wire.) Install tank, spinner backplate, balanced 9x4 or 9x6 propeller and spinner. Check all controls for proper direction and smoothness, secure hatch, and head for the field.

Exercise the customary caution, keep the

elevator throw low till you get used to it, then have fun. . . . •

Tech. Stuff. *Continued from page 18*

at the University of Washington, my alma mater.

To further compensate for my loss of the models is the knowledge that they will be displayed in a restaurant (The Keg, at Federal Way, WA) which is just south of SeaTac International Airport. It is close to the Museum of Flight where the full-scale B&W (replica) is displayed, and it is close to Boeing, the originator of the B&W. Also I will have an excuse to take my wife out to eat (to a restaurant displaying some model airplanes, of course).

FOAM CUTTING TIPS

Several months ago reader Tom Green asked some questions about foam cutting. My answers may be of value to a number of you, if you are relatively new at the foam-cutting art.

It is important to attach the templates securely to the ends of the foam blank. I don't have a good day if the template shifts or falls off while I'm making a cut. I've glued the templates on the blanks, with some success, and pinned them on with some success. I now usually play extra safe by gluing and pinning. Foam-friendly contact cement or double-back tape is used for the gluing, since the template can be peeled off later. Both of these adhesives are rubbery and have a weak bond, so there is danger of the template shifting or peeling off during the cut. Hence the addition of pinning.

The "pins" I use are 4d to 8d nails. Predrill the nail holes in the template, and push the nails into the foam. They will hold the template quite firmly. Common pins would hold very poorly in foam. The holes that are left in the end of the core after the nails are removed are harmless.

It takes a bit of experience to judge whether the temperature of the cutting wire is right. If the cutting produces smoke, the wire is too hot. Also, if the cut surface of the foam looks like it had been melted or has a rough cratered appearance, the wire was too hot and/or you didn't move the wire fast enough. The wire should not be anywhere near red hot. I don't expect you to measure it, but the wire temperature will probably be in the 400 to 600 degree F range.

The temperature/speed combination is ideal when many fine plastic threads of fibers are produced in the cut, and the cut surface is reasonably smooth. If the plastic fibers can't be brushed off easily with your hand, try a suede brush or other fine wire brush or stiff bristle brush.

If you have an adjustable power supply for wire cutting, which I strongly recommend, you can clean the wire after a cut by boosting its temperature up to almost red

and burning off the plastic residue.

Some adjustable toy train transformers work well for foam-cutting power supplies. I use an "autotransformer." These can be adjusted from zero to about 130 volts. Two common and good brands of autotransformer are "Variac" and "Powerstat." You will need at least an eight-ampere size for foam cutting. They are available from electrical supply companies.

Keep the cutting wire tension up to about the point where the wire begins to stretch, in order to minimize the distortion of the core shape due to the drag and resultant lag of the center of the wire. Not only must the wire be tight, but the cutting rate must be low to minimize wire drag, especially around small-radius curves. Don't push! Let the cut proceed at it's own speed with very little force on your part. On the other hand, keep the cut moving. If you let the wire stop it will make a groove in the core at that point due to excess melting of the foam.

All of these suggestions apply to both white foam and blue foam cutting, but the denser foams will require slightly higher wire temperatures for the same cutting speed. And at what speed should we cut? It varies, but I think most of my foam cutting is in the range of 1/8 to 1/4 inches per second. Adjust the wire temperature if it cuts too slow or too fast.

The higher the current the hotter the wire. The diameter of the wire and the type of metal in it, along with the wire temperature will determine the current (the number of amperes) required. It will usually be from two to ten amps for foam core cutting. The voltage required to produce the above currents will depend upon the length of the cutting wire as well. A very short wire may require only a couple of volts, while a long wing-core wire may require twenty or thirty volts. We don't adjust for nor measure either the current or the voltage, just the cutting rate, but we need to choose a power supply that is capable of delivering these voltages and currents.

PIVOT POINT CUTTING WITH TWO TEMPLATES

In the February 1989 issue of MD&TS I described a highly superior procedure for hot wire foam cutting, which I call the pivot point method. If you cut foam the old way and haven't read that chapter, I strongly recommend you do.

In February I talked about using only one template at the big end of the core. That works well, but I now frequently use two templates with the pivot point method, as suggested to me by Bert Baker. As with single-template pivot-point cutting, only one person is required, and the templates are not marked with progressive letters or numbers. The wire will automatically follow the template closest to the pivot point with no attention required. By using a second template, one can also cut rectangular-wing cores as well as tapered wing and fuselage cores.

With a single template, the distance from the core to the pivot point must be exactly right if the planned taper ratio is to be accurately achieved. With two templates, the pivot-point distance is not critical, but it must be somewhat less than the single-template distance would have been, in order for the wire to bear against the second template and cut an accurate core. You can also visualize, by looking at Figure 1, that the alignment between the two templates and the pivot point becomes less critical as the pivot point distance is decreased.

If the pivot-point distance is too short there will be too much force and drag on the wire at the second template, and the finished core will be distorted. The angle to which the wire is deflected by the second template is a good approximate measure of whether the pivot point distance is satisfactory. I would guess a wire deflection in the range of 2 to 10 degrees is OK. Eyeball it, Clyde.

As you probably know, the small end of a tapered core is usually somewhat overmelted due to the slower cutting speed at that end. It needn't be if you taper the wire with sandpaper as described in the Feb. '89 installment of MD&TS.

I have received literature on several foam-cutting machines that work well. I do not recommend any of them, however, as in my opinion they are unnecessary. I don't think any of these machines can do a better or faster job than can be done by the simple and inexpensive pivot-point

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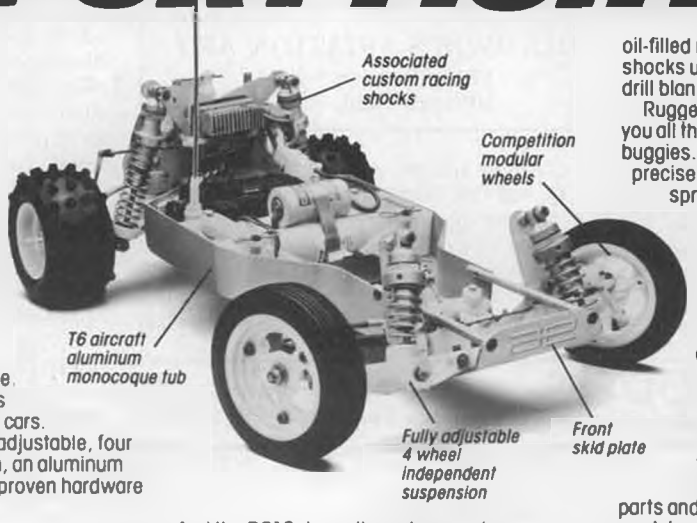

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cutting method. Pivot-point is being used by an increasing number of scratch builders as well as by many commercial foam core makers. The development of pivot-point cutting made foam-cutting machines obsolete. All other factors being equal, a simple answer to a problem is better than a complex answer. Any rebuttal?

GLASS ON FOAM

In the August issue, in summarizing our study of composites, I said that a thin epoxy-fiberglass skin on low-density foam is not an optimum structure because the foam doesn't adequately support the glass in compression. Reader Silas Seandel fears I may have misled some of you with that statement. I did not mean to scare you away from composites, but only to play the role of the structural engineer for a moment.

Glass on soft foam is not optimum, but Silas is right in pointing out that we don't have to design optimally to build good fun-fly models. If we are flying competitively, then the degree to which we optimize our designs will have a bearing on our success in contests.

Silas and I also discussed reinforcing of foam-fiberglass structures. He lays down adhesive-backed fiberglass strapping tape directly on the foam, and then fiberglasses over it, wherever he wants more strength, such as in lieu of regular wing spars. The strapping tape (available in hardware stores) has unidirectional fibers.

For still stronger low-cost reinforcing strips, use the semirigid fiberglass banding which is found on some commercially-packaged cartons of merchandise. These are thicker and much stronger. I don't know what the resin is in these bands, but it is tough stuff. Since the banding strap doesn't have an adhesive backing, you will have to epoxy or UFO it to the foam, then fiberglass all over.

Now back to the word "optimization," which got me in trouble. These readily available and inexpensive fiberglass tapes and banding straps are good but not optimum. If you are striving for a higher strength to weight ratio, use unidirectional carbon fiber reinforcing strips instead of fiberglass. If the application area is flat or nearly so, such as spanwise on a wing, use the premanufactured epoxy/carbon semi-rigid flat strips. These are available from some of the companies I have mentioned in previous months, in several thicknesses. If your application is around curves, use the bare carbon-fiber "tow," and impregnate it with epoxy as you bond it down.

However, as I wrote earlier, this is still

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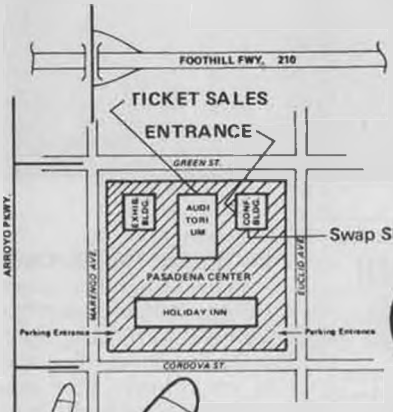

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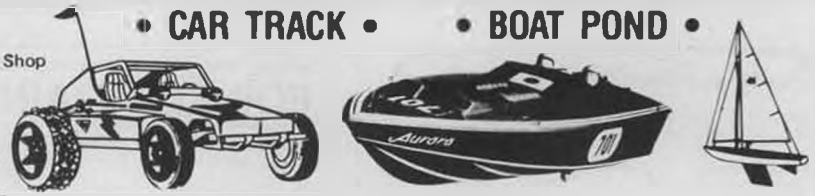

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not the optimum, because the low compression strength of the foam doesn't adequately support the strong fibrous surface material. We have discussed ways to improve such structures in MD&TS in the past. Use wood or stronger foams below the glass or carbon, for instance.

I always make an attempt to optimize my designs and construction because I enjoy the challenge. For one thing, we can reduce weight without reducing the strength by tapering our spars and reinforcing strips. On the wing, the bending moment decreases to zero at the tips, so why make the tips just as strong (and heavy) as the center section?

If you are using several reinforcing strips, make one or more full length and the others progressively shorter. If using wide strips, taper them, as I suggested in the construction article on SeaFli XI in the June '89 issue of *Model Builder*.

I sometimes hear modelers say, "that little bit of weight doesn't matter." True, if we are only talking about one little bit of weight, but overall weight is made up of hundreds or thousands of little bits of weight, and weight does matter, so the bits must also matter. To design and build lighter and therefore better, one must adopt the mind set that all unnecessary weight should be eliminated if it is reasonably easy to do so.

PROPELLER HORSEPOWER

In the September issue of this magazine I expressed confusion between different formulas for finding the horsepower absorbed by a propeller, as did Mitch Poling in his column. Our mystery has been solved. First we each got a letter from William Kuhnle, which gave us the answers, then both of us received letters from George Abbott, which also cleared up the mystery. One thing I have learned from writing this column: When I screw up or ask a question, I immediately get one or more letters which straighten me out.

Oh yes . . . the mystery. Mitch, author of the ELECTRIC POWER column in MB, had verbally given me a formula developed by George Abbott and published in the October 1986 issue of *Model Aviation*. Neither Mitch nor I could lay our hands on a copy of that article and I tended to doubt what Mitch remembered because it didn't seem to agree with the formula for prop horsepower absorbed that I had seen in a number of aerodynamics books. As it turns out the aero texts, George, and Mitch are all correct.

Not to put too fine a point on it, the classical formula for propeller horsepower is:

$hp = p \times n^3 \times D^5 \times Cp$

where hp is horsepower, p (actually rho) is density of the air; n^3 is rpm cubed, D^5 is propeller diameter to the fifth power, and Cp is a coefficient of propeller power.

On the other hand, George Abbott's formula, "the Abbott Equation" is:

$hp = P \times n^3 \times D^4/1.4 \times 10^{17}$

where the capital P stands for propeller Pitch in inches.

My concern stemmed from the use of diameter to the fifth power in the classical formula, yet only D to the fourth power in the Abbott Equation. I had never read George's article at that time.

We are getting more technical here than the intended level for this column, so let me wind this up as simply as possible. George was able to show that for normal props of the same shape, the prop power coefficient is nearly constant, so he proposed a fixed constant in an equation for estimating propeller power to an accuracy of 20% or a little better. In his formula, the power to which the diameter is raised correctly drops down from the fifth to the forth. Sorry if my confusion spread to some of you. The Abbott equation is a nice piece of work, and should be useful. Use it.

I GOOFED AGAIN

To all of you who wrote to tell me I forgot to include the address of Denis Mrozinski, and to Denis himself, I apologize. It is 2908 Snively Road, Yellow Springs, OH 45387. You will recall from the October issue of MD&TS that Denis puts out a very interesting and inexpensive model-design computer program.

This is the January issue of *Model Builder*, right? But we know better. A Merry Christmas to all and to all a good Flight!

Francis Reynolds, 3060 W. Lake Sammamish Pkwy. N., Redmond, WA 98052. SASE please. (206) 885-2647. •

Counter .... *Continued from page 9*

* * *

We'll wrap things up this month with the news that Davey Systems has added two new sport scale warbirds, the P-47 Thunderbolt and Focke-Wulf FW-190, to their ever-growing kit line. The models span 54 and 51 inches respectively and are designed for .45 to .60 size engines, either two or four-stroke. Another possibility is electric power, using one of the large cobalt motors available.

Both kits boast selected balsa, die and machine-cut balsa and plywood parts, precut fuselage sides and tail surfaces, a large hardware package, preformed landing gear, rolled plans, and step-by-step instructions. Both are priced at $99.95 and should be available now, either from your favorite hobby dealer or direct from Davey Systems Corp., 675 Tower Lane, West Chester, Pennsylvania 19380. •

Vintage .....*Continued from page 13*

problem was, that once trimmed to fly well, they would, without warning, take off for points unknown. Many of our vintage R/C models would do the same thing . . . fly away if the radio failed!

And also as John says, it certainly would be interesting to demonstrate how it was to fly vintage R/C aircraft (might take a few practice flights to regain the knack), but the very nature of even the simplest of today's two or three-channel proportional radios won't allow it. Wanna come close? Don't try this with a typical full-house scale, pattern, pylon, or even sport model. An R/C old timer is perfect, and so are some of the genuine trainers . . . the ones with flat or semi-flat-bottom airfoils, plenty of dihedral, and moderate to low power.

OK, ready? Get your aircraft airborne, adjust your throttle and elevator trims so the ship climbs . . . well, until you get used to the idea . . . at about a 10 to 15-degree angle. Use as little elevator trim as possible to achieve this, you want a deadstick glide that's a little on the steep side. Later you can set the throttle at WFO, but that's when you're ready to go beyond simple maneuvering. One step at a time! Now, try to forget that you have elevator and throttle control available. It's not easy to break the habit. All you have . . . is rudder . . . rudder only! Hey, there's our first event. How long, or what percent of your total flight time, can you stay off the elevator and the throttle?

Now comes the first and most important rule of rudder-only flying: *Keep the aircraft upwind.* Why? Without elevator to trim "down" for penetration, it becomes all too easy to find yourself downwind after a few maneuvers, and getting back to the starting point may be difficult or impossible. Many a rudder-only model on escapement control was lost downwind, even though the radio and escapement

were working perfectly!

Rule number two of rudder-only flying: To lose altitude, or kill that climb, hit rudder! If you turn your modern proportionally controlled rudder/elevator airplane, it becomes second nature to pull the stick just a little to compensate for the nose dropping in the turn. But remember, you're now flying rudder-only . . . no elevator available . . . unless you cheat! Unfortunately (as the case may be), you can still cheat with rudder-only on the modern radio . . . because you have proportional. Just use a tad of rudder for a gradual turn, and you can probably balance out the climb and hold altitude through the turn. It wasn't possible with escapements . . . it was full turn or no turn! What did you do? You blipped your way around, with momentary shots of full rudder . . . hold and let off . . . hold and let off . . . hold and let off. You get the feel of it in a little while, and your turn may (will) not be smooth and solid . . . sort of like a guy who's heavy on the stick . . . bank and level, bank and level . . . but that's all part of rudder-only flying.

To work your way upwind, you use a combination of gradual, blipped, left and right turns . . . never more than a total of about 45 to 60 degrees of arc. If instead of blipping you hold a turn too long, the nose drops more, speed and lift builds up, and the nose comes up when you neutralize or give opposite rudder. Now you'll stall and flounder around, and the merciless wind will push you . . . downwind . . . against that first rule!

To kill that climb as the speed builds up, you must apply rule number two . . . use rudder. Try to hit it just as the nose comes up to level . . . first some left, then some right . . . all the while getting yourself headed back into the wind. Let's face it . . . only the skilled and the stupid flew escapement rudder-only on windy days. And even the skilled didn't always get away with it!

Well, as you can see, it's not possible to totally simulate vintage rudder-only flying because you are handicapped (?) by an advantage inherent with modern radios; the proportional servo will not instantaneously snap over to full rudder, and you are able to hold just enough to get a smooth, gradual turn without dropping the nose, building up speed and "ballooning," as we used to say. And there's no real reason to take a giant step back in progress, other than to partially experience what vintage R/Cers were up against 30 years ago.

Actually, as your skills improved, those diving turns (spiral dives), built-up speeds, and the resulting high lift pullouts provided the means of performing aerobatic maneuvers that would ordinarily seem impossible to achieve from rudder-only

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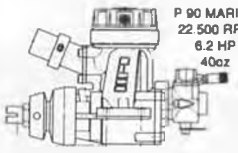

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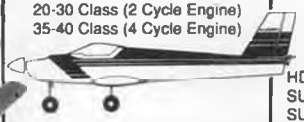

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control. First, let's see if you can rudder your way through a complete flight. It's quite a challenge, even with proportional control.

Come on back next month and we'll do some loops and consecutive rolls . . . with rubber-only! •

Reno ..... *Continued from page 30*

torrents and all night, even snow came down and could be seen Sunday morning. But the weather held and we were rewarded with a real "down on the deck, go for broke, barn burner" of a Gold Unlimited race, to end the four days of racing.

The last two years I've alluded to Robert Yancey of Klamath Falls, Oregon and his YAK II as being the underdog poor boy of the unlimited racers, competing against the high roller, highly modified, unlimited super fast, expensive iron. This year he didn't disappoint his fans and followers. He made it into Sunday's Gold event by winning Saturday's Unlimited 3B Silver Heat. The aircraft is a YAK II with an R 2800 CB radial engine which is not a lot of power when you're up against 4360s and Rolls Royce Merlins that are highly modified.

Sunday's Gold Unlimited race got off to a good start with last year's Unlimited Champion Lyle Shelton of Dallas, Texas, flying his magnificent "Rare Bear" (F8F Bearcat) jumping out in front, coming out of the narrow starting "chute" and around pylon number two.

Being the photographer covering the Reno Air races on behalf of *Model Builder* magazine the last three years has allowed me the privilege of being out on the pylons to photograph the various aircraft as they race, in other words, I'm very close to the action and the sounds.

Being an ex-professional pilot with a lot of experience flying a wide variety of heavy aircraft, I'm somewhat knowledgeable of what's going on and recognize a pilot with a good "touch," or a beautiful performing aircraft when I see one. Hence, when I heard the finely tuned Rare Bear's reciprocal engine's deep-throated roar as it streaked past the Number 8 pylon just above me in a preliminary heat, I knew she was really cookin' and Lyle had a very strong chance to repeat his last year's win.

So, I wasn't surprised looking from the Number 8 pylon toward the Number 2 at the start of Sunday's Unlimited Gold Championship race to see the Rare Bear well out in front, with Bill Destefani in his "Strega," a highly modified P-51 with a set of Lear Jet wings chasing Lyle Shelton. But what did surprise and thrill most of the approximate 50,000 Reno race fans was seeing Bob Yancey in his silver and green YAK II in a strong third place at the start.

All of Bob's years of flying experience as a crop duster combined with a soft skillful "touch" manifested itself the way he beautifully "grooved" his Russian aircraft into a perfect on-the-deck line around the course, making anybody in the faster 'iron' wanting to pass him really have to work at it.

Lap by lap Destefani in Strega worked at closing the gap between him and Rare Bear and in the fifth lap sneaked past Rare Bear into first place, only to have to pull up and out of the race in lap six because of engine and coolant dangerously overheating. Until then it was very dramatic racing between those two and Yancey fighting to hold off challenges by five faster aircraft hot on his heels. The very fast Hawker Sea Fury "Dreadnought," the 1986 champion flown by Rick Brickert, worked its way past Yancey early in the race, then John Maloney in his Super Corsair powered by a 4360 'corn cob' engine took a run at Yancey's Russian mount. It took him up to the last lap and down to the finish line to squeeze past Yancey by only two tenths of a second to take third with Bob and his YAK II finishing a very respectable fourth.

It is interesting to note the first four finishers of the 26th Reno Championship Unlimited race were all radial engine powered aircraft.

John Parker, of Torrance, California, brought a scratch-built, beautiful, clean small racer powered by a 340 Allison. He attempted to qualify his JP 350 to race but fell short and failed to qualify. Nonetheless, he still turned 317 mph which was very respectable for a small homebuilt.

The Bert Rutan-built Pong Racer failed to show and a lot of anticipating Reno race fans were disappointed but hopeful she'll appear and race next year.

Number 7, "Tinkertoy," won the AT-6 Gold Race, beating out Van Fossen's #77 "Miss TNT." Tom Aberle of Fallbrook, California, was the favorite to win in the Sunday Gold Biplane and did with a speed of 196.140.

Ray Cote, of El Cajon, California, flying his Number 4 "Alley Cat," very skillfully snuck up on James Miller of San Antonio, Texas, flying his pusher #14 and nosed him out to win the 1989 Gold Formula One Championship.

A heavy pall covered the F-1 races beginning Friday, when Errol D. Roberson, flying his pusher "Miller Special" #73 in an early heat Friday apparently flew through a turbulent dust devil causing the left wing to fold while rounding pylon Number 6. The aircraft disintegrated and he was killed. He will be missed.

The upcoming 27th Reno Air Races scheduled for September 20-23, 1990, should be very interesting, promising spirited competition and just maybe the

Pong Racer will be there to give us a thrill. •

Shuttle .....*Continued from page 45*

color and finished silky smooth, like Scandinavian furniture. I love these blades, however, they are made of very hard wood, so in a very hard landing or bad autorotation, if these blades come into contact with the tail boom, then caboom! I definitely don't want to get hit by a Shuttle main blade. Stock Concept blades are fabricated with a fiberglass spar and polystyrene-like foam molding on the outside. I've had my Concept blade come into contact with the tail boom many times (because the Concept head is too soft and should have a lower flap restraint), but the tail boom is only kinked and still reusable. I have the feeling that when a Concept blade comes in contact with a person, probably it won't do too much damage, but a Shuttle blade or any other wood blade would be highly dangerous. In other words, I think Concept blades are less deadly, and in the future, the model industry should research these composite blades.

Not all plastic helicopters are created equal. Shuttle employs the traditional two-side frames style of construction. We often call it A-frame construction. A-frame construction is perfect for aluminum frame materials because aluminum is more ductile and pliable so the flat side frames will not break or snap and they will only bend in a crash. However, plastics plates are more brittle, thus the Shuttle plastic side frame plates tend to crack in a crash. Especially when there is a boom strike, the side load imparted onto the tail boom from the blade is all transmitted to crack the brittle frames. For molded plastic helicopters, Concept's designer, Mr. Taya, did the right thing in that he chose space-structure style truss frame design to achieve strength and extremely low weight. Truss structure means using lots of crisscrossing bars as structural members, like a bridge. Note the German Heim helicopters, which are 60 size machines with plastic main structure, also use truss construction to achieve super strength and super light weight. The guts of Heim helicopters probably have the best strength-to-weight ratio of any model helicopter.

The molded plastic swashplate becomes sloppy after 50 flights. However, since the Shuttle is very stable, you will not really notice the control becoming sloppy. Both Hirobo and Kyosho offer a metal swashplate as an optional accessary. For normal flying you don't really need the metal swashplate, because they are over $70 each. By the way, Shuttle, Concept, and Rebel all have an 8mm main rotor shaft, so you can interchange swashplates, and even rotor heads. Rebel's metal swashplates are only $24.95, so that might be a good replacement. As the Shuttle head is very aerobatic due to stiffer flapping with the floating axle design, I think I will soon try to put one on my Concept to see if that will make the Concept more aerobatic. As of now, the Concept is too stable, because even with the hard flapping rubber O-ring, the Concept blades still flap too easily, so the rotor moment cannot be transferred effectively to pitch or roll the model rapidly. If you are into 30-size helicopters, then it would be useful to know Shuttle and Concept also use the same size flybar and the Hiller paddles are interchangeable. To make either the Shuttle or the Concept super-stable (very highly recommended for beginners) then put on a set of Concept DX metal paddles. They make the Shuttle and Concept very docile. The thick plastic Shuttle paddles are good for intermediates. The Concept 30 thin plastic paddles are good for experts. In fact, if you thin down the Shuttle or SE paddles on a sander, the helicopters will really groove. I am now using thinned-down paddles to speed up roll rate.

Overall speaking, the Shuttle is slightly more aerobatic than the Concept because of a different main rotor head design. You can really push the Shuttle very hard and it will do all sorts of fancy aerobatics, including snap roll! But the Concept is more forgiving, it has a nice imaginary safety flight boundary that it just wouldn't cross

no matter how hard you push it. For instance, I have tried and the Concept just would not do a snap roll even with the control throws maxed out. Thus a really aggressive hot-dog flyer may prefer the Shuttle more, but the average fliers will appreciate the forgiving handling characteristics of the Concept.

When sliding the Shuttle main rotor hub onto the 8mm main rotor shaft I noticed that the hub can wobble slightly on the shaft even after the bolt is securely tightened. This misfit can degrade the stability and control, so add a drop of CA glue there to ensure the hub is snug and solid to the main shaft.

I never figured out why the two halves of the thrust bearing inside Hirobo helicopter tail rotor blade holders always have one with perfect size inner diameter and the other half with a bigger inner diameter. If you take apart the tail blade holder and wiggle the thrust bearing then you will see it gives slop. Since earlier GMP kits also use the Hirobo tail rotor system, if you take apart your Competitor and Cricket tail blade holders you will notice the slop on the thrust bearing, too. For pilots who are really fussy about having absolutely no slop on anything, then you can purchase an extra pair of thrust bearings and pick the smaller inner diameter half disc out and use that only. For normal flying, you would not really notice the slop.

The last complaint is that the belt start method is archaic. Even beginners should enjoy the ease of the cone start feature on the Rebel and Concept. I use an OS 32 engine with integral rear cone start. The problem here is the rear metal landing strut needs to be removed and rotated 180°, then the starter cone will not bump into the strut. Alternatively, you can do what I did, which is to remove the starter cone and cut down the diameter on a lathe. Access to the engine's glow plug is difficult in the Shuttle. Furthermore, a standard McDaniel style pocket Ni-starter will not reach the hidden glow plug. You need to buy a glow plug extension or have an old clothespin style glow plug connector.

OS just came out with a new 32 heli engine with built-in recoil starter for the Shuttle and Baron 30. The engine is called the OS 32 F-HX. It retails for $250. It's not cheap, but should be really convenient.

Hmmm, reviewing kits is not easy. So far I gave the Shuttle a very stiff ride. Well, no kit is perfect, but by pointing out the shortcomings, maybe manufacturers will take note and correct them and you the readers can know what to expect. So far I think I have backed every complaint by a reason. Fortunately, the Shuttle has more strong points than weak points. Otherwise, Hirobo would not have sold 10,000 of them in the U.S. and probably another 10,000 around the world.

What's the best thing about the Shuttle? It flies great! It is so smooth and easy to fly, on calm and windy days, it puts many bigger helicopters to shame. The tail rotor response is very fast. A rate gyro is strongly recommended. Pirouettes and 540° stall turns are a snap. The rolls are fast and crisp. The Shuttle definitely rolls faster than the Concept 30 DX and just as good as the Concept SE. Loops are effortless. In forward flight, it is fast! It's in the 50 mph range. Power-to-weight ratio is also very good. Vertical climb is nice and clean. In hover, the helicopter almost sits there by itself. In these respects, it does make an excellent trainer. But the crashworthiness has more to be desired. The Concept and Rebel can take more abuse than the Shuttle.

In terms of design, the Shuttle packs many innovative features. After all, it is the world's first almost-ready-to-fly helicopter. My favorite feature is that all Shuttle kits come with a very effective all-metal constructed muffler that fits perfectly on the OS 28 and 32 engines. The muffler is very quiet and it allows you to fly the Shuttle in backyards or schoolyards without causing a disturbance. The Shuttle is the only helicopter kit on the market that comes with a muffler, and that saves you $20.

The Shuttle comes all assembled and modelers only need to slide in the engine, which takes five minutes, and install the radio, then he is ready to rock and roll. It took me only three hours from opening the box to flying the Shuttle. If you consider the price of the Shuttle to a pre-built Concept, then the Shuttle is slightly cheaper. It is much easier to install and remove the engine on a Shuttle for service than the Concept. Shuttle's engine simply slides in from below and you do not even need to remove the cooling fan, fan shroud, or anything. That makes it the most convenient on the market! On every other helicopter, to take out the engine you need to remove the cooling fan, fan shroud, and clutch.

The other nice thing about the Shuttle is that the ball links come attached to the threaded push rods and the links are all of the correct length. The vertical and horizontal fins are all bolted to the model by the factory. The landing skids are all mounted in the landing struts, too. The only assembly required is strap on the landing gear and slide the main rotorhead on. Wouldn't it be nice if all helicopter kits were like this? The big styrofoam box is reusable. If you decide to take a trip on an airline, the whole Shuttle can go back as one unit into the box and check the box as luggage.

The normal Shuttle comes with strong plastic landing struts, and the deluxe Shuttle XX comes with polished aluminum struts. Actually, I tend to like the plastic

struts, Shuttle XX's metal struts are too brittle. Mine have snapped already. Concept's tall plastic struts are great, they are flexible and have lots of ground clearance.

The decal sheet which came with the kit is very complete. It has two complete sets of color trims to decorate your Shuttle so not everyone's Shuttle will look the same as yours. Now only every other one will look the same as yours! The canopy looks pretty hi-tech. So if you like the hi-tech chisel look, then go for the Shuttle. The canopy not only looks decent, it comes completely glued together, with the tinted canopy mounted, too. Nice! The super-strong canopy is molded from some heavy-duty plastic material. You have to do a nose dive to do harm to it. It has rails molded on the inside so it slides onto the Shuttle frame and than clicks and locks on. Very slick. The fuel tank is a decent size and fuel level can be checked easily at a glance. The tank gives 12 to 15-minute flights.

Now let's talk about the flying traits and control setup. If you build the Shuttle as designed, then the center-of-gravity will come out perfectly: just slightly forward of the main shaft. For your first flight, open the OS 28 or 32 main needle valve by 1-1/4 to 1-1/2 turns. I found this gives very consistent running on 10% nitro fuel. Set the swashplate roll control to give maximum swashplate lateral tilt. I used the third hole from the center for the roll servo control arm. For rudder servo I use the second hole from the center. A very inexpensive GMP rate gyro is used with my old Futaba radio. The GMP gyro gain is set at 50%. For elevator, I used the third hole. Collective pitch is set at -2° at the bottom, 7° for hover, and 12° at top end. These settings provide a very responsive and lively Shuttle. The helicopter feels so comfortable and predictable that I looped and rolled it on the first tank of fuel. However, my new 32 engine did have a tendency to overheat on the first few flights. But after 20 flights the engine was well broken in, then the Shuttle was screaming all over the sky. I have flown my Shuttle in 25 mph wind and it handles very predictably in wind. There is no sudden ballooning tendency.

After 50 flights of the Shuttle with the fish head canopy, I decided to replace the facade with something more appealing like a pink MD 530F fuselage from E&G Enterprises. I think it's an excellent choice because it is super light weight. The E&G MD 530F fuselage retails for $119 and it is available by calling direct at (714) 859-2030 or check your local hobby shops. The fuselage comes in a big box that contains two large sheets of vacuum formed plastic, the necessary screws, wood fins, and scale metal landing struts. Because the fuselage is plastic, it can be spray painted very well. The entire fuselage only adds about 11 ounces, which is only a few ounces more than the original canopy. Hirobo also has its own line of beautifully prepainted MD 500, Jet Ranger, Bell 222, and Ecureil, but they cost over $200 each. If you have bucks, then go for them.

It took me one entire Sunday to build and paint the fuselage. The work involves cutting out the plastic fuselage, then gluing the two halves together with CA, and fitting it onto the Shuttle. Expect to put in about 12 hours from start to finish painting. Normally when you glue plastic canopies like GMP, Schluter, and X-Cell, etc., there is a flange sticking up, however, the E&G plastic fuselage has the two halves mated to each other so there is no protruding ugly flange. In fact, the MD 530F is extremely scale looking, even better than other more expensive MD 500 fuselages on the market. The fuselage panel seamlines are all molded into the fuselage, too. As the entire fuselage is clear plastic acetate, there are no windows to glue on. Just mask off the window with translucent Scotch tape and then spray paint. I used Pactra R/C car body spray paint. It's done in Le Mans pink with red trim MonoKote for decor, and I fuel-proofed the whole helicopter with a coat of Formula-U clear spray. Finally I even spray painted the rotor blades hot pink to match the body.

With the fuselage on, the Shuttle became 10 to 15% slower in forward flight because of larger frontal drag area. The model also became more sluggish, so you can forget about aerobatics. But the hover static stability improved slightly due to more weight. To improve the scale look, I shortened the main rotor shaft by one inch and there is no loss in static stability, and instead the forward flight dynamic stability improved slightly (see Aug. *MB* for explanation on stability).

In forward flight the MD 530F tended to pitch nose-up severely. At first this was due to the fuselage making it tail-heavy, so the balance point went behind the main shaft. The problem was easily solved by remounting the gyro from under the shaft to the front of the cabin. This made the balance perfect. But the nose-up problem was still very severe. The next thing I did was to cut the horizontal stabilizer off and reglued it back on with +10° incidence so the horizontal stabilizer acts like a down elevator to keep the nose down in forward flight. This made the MD 530F fly much better. However, in a dive or a high speed straight level pass the helicopter still wanted to nose up slightly. Finally, I replaced the original Shuttle Hiller paddles with a set of Concept 30 DX aluminum heavy paddles and now the Shuttle flies straight and level without any ballooning tendency. The heavy paddles helped because they make the Bell stabilizer bar become a stronger attitude feedback control system to help stabilize the model (read this month's Chopper Chatter Column).

The full-size McDonnell Douglas 500 and 530 helicopter have a stability problem. The reason is all due to the T-tail not being in the main rotor downwash. For example, the Bell Jet Ranger and Bell 222 have their horizontal tail under the main rotor downwash all the time, so when the helicopter transitions from hover to forward flight there would not be a large change in trim. The T-tail is outside the downwash so in hover it is not influenced by the rotor wash, but in forward flight, due to helicopters having to tilt nose down to achieve forward

propulsion from the main rotor, the horizontal tail is tilted trailing edge up, which acts like an up elevator command to pitch the nose up severely (see *Model Builder* April issue to see how model helicopters trim themselves in forward flight). McDonnell Douglas knows about this problem but they choose to use the T-tail instead of the original V-tail purely for cosmetic reasons! They remedied the stability problem by adding a flat "wash board" on top of the rear engine nacelle. The board sheds off aerodynamic vortices to help stabilize the MD 500. Originally, the Apache AH-64 and Bell 222 both had the chic T-tail design, but the instability was so severe that they had to go. Maybe these are the reasons why the Jet Ranger fuselage is more popular than the MD 500 among F3C model helicopter competitors! By the way, the difference between MD 500 and MD 530 is that the 530 has a more powerful engine for hot and high altitude operating conditions, otherwise they look identical.

My E&G MD 530F also tends to yaw to the right severely in forward flight. All these problems did not exist before I added the fuselage. The yawing problem was corrected by cracking the wood vertical fin and regluing it back together with a built-in 8° left rudder to it. That solved the yawing problem completely. Since you will lose all your loop and roll capabilities with the fuselage, I highly recommend you use a set of Concept 30 DX heavy paddles. These paddles make the MD 530F so relaxing to fly you will have time to enjoy and admire the beauty of the model while in flight. The verdict is that I love to fly this model. A slow circuit flight with this model at sunset is a joy that you have to savor to appreciate. Thus, if you get tired of abusing your Shuttle, then this very scale looking fuselage will bring back the love. The only problem I observed with this plastic fuselage is that near themuffler the heat deforms the neighborhood region slightly. Maybe adding a 3 by 3 inch lining there will prevent heat deformation. The other thing is that the tall struts come in four separate pieces and hard landings tend to loosen them. E&G also makes a vacuum formed Jet Ranger and Bell 222 and Airwolf fuselage for 30 size helicopters. They will all fit the Shuttle, Baron 30 and Concept. If you stay tuned we will have them reviewed in *Model Builder* soon. OK, I think this has been a very long review, let's save some space for the airplane guys.

* * *

Even though the new Shuttle Z and ZX were not available at the time of this review, listed here are the new features of the Z models. Z configuration retails for $595, and ZX retails for $675. ZX is like the old XX configuration which has ball bearings at all the crucial places. Both models now come with an OS 32H installed. The present Shuttle and Shuttle XX will still be continued. The Shuttle XX will also be available with the OS 32 F-HX recoil starter engine for $475. These retail prices are from Copter Corner Hobby Shop in Santa Monica, California. In the future, Hirobo helicopters and parts will not be distributed by GMP, instead they will be directly imported from Japan by independent stores.

The new Z model still has the plastic clutch, but the expensive ZX has the metal clutch. The tail boom is slightly longer and covered with white shrink tubing. The tail pitch control has a new design that is similar to the sliding collar type on Concept, X-Cell, and Legend. New design ball links are included in the kit. These are said to be smoother. The stock kit now allows -10° to +12° collective pitch travel. The Hiller paddles are hollow and covered with plastic sheet. There is weight at the leading edge of the paddles to move the paddles' chordwise cg forward. Does that improve helicopter stability? I think this may prevent the paddles from flutter, but since the paddles are always rigid and of short aspect ratio, the issue is not applicable. Forward chordwise cg paddles may improve overall helicopter stability if the Hiller paddle control linkage is flimsy and spring enough to allow the paddles to change angle of attack as the flybar rises or lowers (technically this provides a lagged-rate feedback). If you have questions regarding the new Shuttle Z and ZX, then give Andrew Sutton at Copter Center a call, his number is (213) 828-2028. Tell him we sent ya.

Andrew also sells the ABC piston and sleeve from OS 32 FABC aircraft engines. These are used to replace the ring piston and sleeve assembly on OS 32 helicopter

engines. Andrew says he also modifies the port timing slightly and the new souped up 32 delivers 20% more power. Hmmm, I have to see it to believe such a good thing. See you next month. Folks, keep sending in your product information, club news, hints or inventions, and we will keep our heli column in *MB* the leader in helicopter technology and the first to provide most up-to-date product information. •

F/F.....*Continued from page 52*

winner is the first one on the *Model Builder* doorstep with the correct answers. What do you win? Why, a free one-year subscription to *Model Builder*, that's what! Worth the effort, I say.

DARNED GOOD AIRFOIL - Gottingen 457

Looking for a good climbing and gliding airfoil that meets today's design trends? Here is a good one. This is another of the sections from the famous Gottingen laboratories. Note that the high point is 8.79% at the 30% mark, and the undercamber is quite low with the maximum placed at 50%. For AMA gas and, if thinned out, for F1C, this section should do the trick for you. The best lift-drag location is only .5 degrees above the neutral point, so the model you build for this section need not have excessive angular difference built into it.

The trailing edge is thick enough to use the standard trailing edge stock construction system. The tests that I have seen do not provide information about turbulation or the like, so I would start with sheeting the leading edge on the top to the high point of the airfoil. One other possibility would be to use false ribs in order to maintain the leading edge shape.

DUANE RENKEN'S CO-2 SHIPS

Duane Renken is one of the folks who has really worked at the CO-2 event. Elsewhere in this article is a picture of one of Duane's Deltas. This one is powered by a Davis CO-2 Conversion kit. The model is equipped with a parachute d.t. system, and it meets the dimensional requirements for the Pee Wee 30 event. If you are taken with the possibilities in CO-2, contact Duane at P.O. Box 1503, Ann Arbor, Michigan 48106.

THE 1/2A VEE CONCEPT MODEL REVISITED

Earlier this year, March to be exact, I published a concept drawing of a 1/2A Vee wing competition model as a three-view of the month. Soon, a number of people began to inquire about the design, and before I knew it, replicas were being built. The first one that I heard of was built by Charles Steed from Ogden, Utah. Charles noted that he was test flying the ship in the evening with about a three-second engine run and didn't bother to light the fuse (usually, a fatal goof). Needless to say, he caught a thermal with it and it flew away.

Charles also made a few changes from the three-view layout, including a D-Box wing with cap strips and a straight trailing edge. He did not use VIT either. Charles added that his flying buddy, Neil Smedley, who is holding his model in the picture in this issue, built his ½A Vee a bit more closely to the plans.

CORRECTION...CORRECTION

In the October issue of *Model Builder* Free Flight, I inadvertently renamed Al Lidberg. According to that article, Al became Ed Lidgard. For those of you who were taken in by this clever ruse, be advised that both Al and Ed are quality free flight designers, but the Morane Saulnier plans that were featured in the October column were designed by Al. He can be contacted by writing Al Lidberg, 614 E. Fordham Dr., Tempe, Arizona 85283. My apologies to both Ed and Al.

THAT'S IT DEPARTMENT

Well, this is the January issue of *Model Builder*, and it comes to you in December. So, a Merry Christmas to all of you. If it is possible to catch a winter thermal where you are, please catch one for me. •

C/L ..... *Continued from page 47*

or even your own lines in the case of a momentary slackening. Some fancier handles used by precision aerobatics pilots have adjustment screws that can be varied in flight for that perfect trim.

• Weight: The weight and bulk of the handle has a direct effect on the feel for the pilot. Each flier finds his own favorite, but as a general rule, pilots tend to like a lightweight handle, with maximum feel of

the plane, for combat, stunt and sport flying. A heavier handle, usually with a front bar, is preferred by racing pilots, partly because of the strength involved in heavier equipment.

- Length of arms: By "arms" I am referring to the distance from the hand grip to the point at which the lines exit the handle. With U-shaped handles, two arms extend forward of the grip. With front-bar handles, the lines may exit the front bar. Fliers will notice differences in the responsiveness of the plane for different line lengths. Once you become accustomed to one style, it can be difficult to find the other comfortable. If possible, the arm lengths should be the same . . . uneven arms cause uneven control response, up and down.
- Line spacing: This is one of the most important aspects of any handle, and something that can surprise the beginner who hasn't experienced the differences that spacing can make. The term "line spacing" refers to the distance between the top and bottom lines as they leave the handle. A common beginner tendency is to use a big handle that requires very little hand movement for large changes in airplane attitude, which might seem at first thought to "increase" the plane's responsiveness. However, most experienced fliers actually will trend in the opposite direction: toward small-spaced handles that require a lot of arm movement for a moderate response by the plane.

The narrow-spaced handle/big arm-movement flying style allows pilots to be extremely accurate in their maneuvers; conversely, a handle with wide spacing results in a plane tending to be jumpy, unstable in level flight and erratic in maneuvers, bobbling after it's supposed to level out, etc.

A tour around the flying field will produce the following conclusions:

Combat fliers, who fly the fastest and wildest maneuvers, tend toward handles with about a 4-inch line spacing, such as the E-Z Just Hot Rock or Magnum handle. This will be combined with a trim that makes the planes need quite a bit of bellcrank movement for only a small amount of elevator travel resulting in fairly violent arm movements by the pilots. Wild as it looks, combat is an event that requires the ability to fly quite precisely.

Racing pilots, who want the absolute least responsiveness from the plane in order to fly at close quarter in heavy traffic (both in the pilot's circle and the air), will use handles with more narrow spacing, two to three inches typically.

Precision aerobatics pilots, who have their large, stable but responsive planes trimmed for smooth, graceful turns, will use 4- or 5-inch line spacing as a rule. At their slower speeds, they often can afford a little more "responsive" control setup . . . but will move to a more narrowly spaced handle if they discover difficulties in finishing off corners without bobbles, etc.

A general word of advice to new fliers: If you find it difficult to get your plane to fly level, or to level out after a maneuver, or if you find it difficult to open up your maneuvers, consider moving to a smaller handle. If, on the other hand, you find your plane sluggish in responding to your commands and difficult to turn well, you may need a bigger handle. (In both cases, this assumes that your plane is more-or-less properly balanced.)

In short, in trimming out an airplane, or in learning to fly with precision and stability, the first place to look may be the handle.

MAILBAG

Following up on our recent article, most of which was contributed by Ian McQueen of Japan, on the subject of diesel engines, we received a letter from a Mr. Poynter of Fort Worth, Texas, pointing out that the fuel requires a great deal of care in its handling.

As with all flammable liquids, diesel fuel and its ingredients must be kept far away from any flame or spark. The fumes of some of the ingredients are quite flammable, and can travel around your workshop just like those of gasoline and other dangerous liquids.

The fumes also can be dangerous to breathe, and should be mixed only in well-ventilated areas. Directions on any container should be read carefully. Fuels and their ingredients should be kept in tightly capped containers in cool, safe places.

Mr. Poynter also passed along some fuel formulas. One, in a publication whose title was not included, lists the "Super Tigre recommended diesel fuel mixture." The paragraph reads:

"Use 1/3 ether, 1/3 kerosene or paraffin, 1/2 high-grade castor oil, and 2-1/2 percent amyl nitrate as an ignition control additive. Starting is usually effected at a high compression setting and this should be progressively reduced as the motor warms up. At the same time, lean out the mixture to the most reliable setting. Ether based fuels evaporate very rapidly; keep container tightly stoppered when not in use. Starting will be very difficult if your fuel is allowed to become stale (aged)."

Thanks to Mr. Poynter for that valuable footnote to our discussion of diesels.

And from Duluth, Minnesota, comes a note from Tom Wilk with yet another tidbit

of information about autogyros, a topic that has generated continuing interest. First, an excerpt from Tom's letter:

"Just got my Aug. '89 issue of *MB* and was reading your column. Somehow I missed your item about someone wanting info about autogyros, but I thought I'd pass this on anyway.

"I have been in and out of modeling since about 1950. Some time ago, I started cataloging my magazines and those of my OFBs (Old Flying Buddies) on index cards. Last year we acquired a Commodore 64 and I now have all on diskettes. As you can see by the table of contents I'm sending only a small part. The complete listing now runs about 300 pages including R/C, FF, cars and boats, miscellaneous information and CL. . . .

"I'm first an R/C flier and old-time and sport, but will not hesitate to fly CL. I fly a bit of mouse race, special Midwest Sport Race and slow combat. And just to brag, the No. 4 finisher at the Texas money combat meet was my son. I am known locally as one who builds really different or ugly airplanes. If I build kits I wouldn't stand out and no one would notice me. I also edit our club newsletter. Also, as a part of this great hobby, I collect engines. . . ."

Tom's index includes listing from the following model magazines. *American Modeler, Air Trails, Air Trails Young Men, Flying Models, Model Aviation, Model Airplane News, Model Craftsmen, RC Models & Electronics, Sport Modeler, American Aircraft Modeler, Air Trails Hobbies, Flying Aces, Jr. American Modeler, Model Airplane Builder, Model Builder, Radio Control Modeler, R/C Sportsmen,* and *Scale Radio Control Modeler.*

The control-line index shows categories for autogyro, combat, flying wing, multi-engine, novelty, proto speed, speed, stunt, amphibian, carrier, Goodyear, mouse racer, profile, rat racer, seaplane, team racer, biplane, ducted fan, Dynajet, multi-wing, proto racer, scale, sport and trainer.

The partial listing of sport and novelty airplanes Tom included showed references to the "Gyro Chopper" printed in *Air Trails Hobbies* in September of 1955 and to "Otto the Gyro" printed in *Model Airplane News* in January of 1974.

It sounds as if Tom would be happy to share information from his index. His address is Tom Wilk, 212 W. Austin St., Duluth, Minnesota 55803. A recommendation: When requesting information, remember that there will be a cost involved for Tom. Send him a stamped, self-addressed envelope and a buck or two for his trouble, computer disk space, etc.

Some of the letters received here at *MB* control-line headquarters require a complicated answer, sometimes more complicated than one columnist can tackle alone. When possible, I try to answer the questions in the column so that readers get the benefit of the exchange.

One of those complicated questions recently was received from Kevin Yap, a 17-year-old novice combat flier from Singapore.

Kelvin writes that he flies in the annual club combat contest, which (from between the lines) it appears uses .15-powered planes but with rules somewhat different from FAI. Kelvin has been struggling to learn as much as possible about combat on his own, not always having received much help from the experts.

He asks why the local stars seem to be able to be faster with their Rossi .15 diesels than Kelvin and some of his young competitors are with their Super Tigre glow engines, which are run stock on 20 percent nitromethane with Tai-Pan 7x4 propellers.

He also is curious about the type of model, foam or balsa, that works best, and asks how to build foam airplanes.

Construction of foam airplanes deserves a column all by itself, which I hope to provide in the future. What follows is an edited (shortened) version of my letter to Kelvin, providing some answers to his questions.

First of all, I suggested that Kelvin and anyone else interested in learning a lot about combat should join the Miniature Aircraft Combat Association, which has a newsletter in which many good technical tips are exchanged. Then, you can write in to the newsletter with some questions and maybe find a combat pen-pal in your particular area of interest.

To join MACA, send $15 U.S. dues to the treasurer, Mike Urban, 316 Spring Ave., Glen Ellyn, Illinois 60137. To write to the newsletter, write Editor Pete Plunkett, 306 21st St. SW, Austin, Minnesota 55912.

I suspect that the Rossi .15 diesel is faster than the Super Tigre .15 glow simply because the Rossi is a much stronger engine . . . the glow is even faster! The expert fliers probably have some advanced knowledge about props, fuel, etc., that Kelvin and his friends haven't learned. Only experimentation with different combinations can lead to the most successful program.

However, based on my limited experience, I think Kelvin and his friends are right to continue with the glow engines for combat, as they ultimately will provide the most power. I hate to suggest expensive solutions, but in the U.S. right now the engine of choice for FAI combat fliers is the Nelson .15, a hand-built engine that runs about $175 each. If you are able to consider such an investment, I would suggest that you send a dollar to the following company and ask for their catalog. This is the supplier for Nelson engines and some other competition equipment that you may find useful. For a catalog, send $1 U.S., to Kustom Kraftsmanship, P.O. Box 3010, Fallbrook, California 92808.

In the short term, going to higher nitro may be the source of additional power, if the local rules allow it. Before FAI rules were limited to 10 percent, it was common to see 50 percent nitro used in the .15 engines.

It sounds like Kelvin is close on the prop, but experimentation with some others is the best source of the "propeller secrets." Try different lengths, pitches, and blade shapes, including modified version (try cutting them down, etc.). You are not looking only for straight-ahead speed; make sure you're using a prop that doesn't bog the engine down when you do maneuvers.

• In regard to the type of model, foam or balsa, I don't think it really matters as long as you build it light, straight, and strong. The layout and balance of the plane is very important. You want a plane that will be stable in straight flight but will turn quickly on demand, one that you can fly without looking at it. I find that a rather long tail moment, a large elevator with very small travel, and a control system that requires quite a bit of hand motion (push-rod near the pivot of the bellcrank, lead-outs at the outer ends of the bellcrank arms, tall elevator horn) is best for that type of control. You want the plane to balance at about 25 percent of the wing chord.

It is easier and faster to build with foam once you learn how and you can much more easily taper the wing for better performance. However, it is more difficult to build foam light.

Foam is cut with a hot wire, regulated with a model railroad transformer or a series of light bulbs to step the power down, or some similar system. Make a fixture to hold a piece of wire (I use .018" steel flying wire) tight. *(Check out recent articles on foam cutting by Francis Reynolds in his "Model Design and Technical Stuff" column. wcn)*

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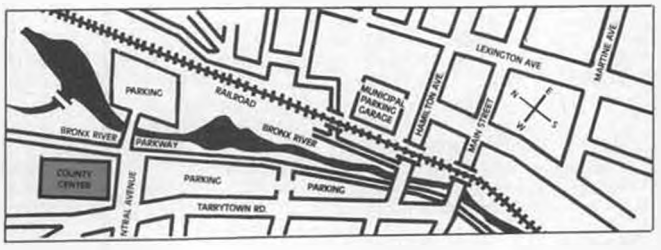

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STATIC COMPETITION
All models must be operable & RC controlled. Trophies and/or prizes to be awarded. VCR's to be awarded in three categories: "Best-in-Show" flying, "Best-in-Show" cars and "Best-in-Show" boats. Top of the line RC systems for 1st place in each category. Trophies for all other winners.

PLANES
- WW I
- Post WW I (Military)
- Post WW I (Non-Military)
- Stand-Off Scale
- Giant Scale
- Pattern
- Old Timers
- Sport (Non-Scale)
- Gliders
- Helicopters

BOATS
- Scale (Military)
- Scale (Non-Military)
- Racing (Deep-V)
- Racing (Hydro)

CARS
- 1/12 Scale
- 1/10 Scale
- 1/8 Scale or larger

JUNIORS
- All categories

BEST OF SHOW
- Planes
- Boats
- Cars

To obtain pre-registration Static Competition forms, write: (include self-addressed stamped envelope) Allen Reinhardt, 2 Douglas Dr., Pleasantville, NY 10570 Judging takes place Sunday afternoon. Entries accepted until 12 noon Sunday. Special admission area will be provided on both days for static display contestants with built-up models. Registration of models will start at 8:30 am each morning.

SWAP SHOP
The WRAM's Swap Shop has become one of the major show attractions with thousands of individual items changing hands. To help eliminate "registration crush," the Swap Shop will provide for preregistration forms. To receive these forms send a self-addressed stamped envelope to: John Isbister, 4 Devon Rd.,, Larchmont, N.Y. 10538.

SPECIAL NOTE
This year there will be no restrictions in the number of built-up models a registrant may place in the Swap Shop. **For further information, write (enclose self-addressed, stamped envelope) or call: Martin Lies, PO Box 162, Lincolndale, NY 10540 / 914-248-5799.**

Cut out a "blank" from a 2-inch thick sheet of polystyrene foam (commonly sold in hardware stores for insulation) that is the shape of the wing, plus about an inch of overhang at the back. Make hard templates of the root and tip, very smooth. Nail these to the ends of the foam blank along a centerline, and then run the hot wire around the templates to cut the foam. You can make other templates for spar notches and for coring the inside of the wing (for coring, the wire goes around the inside of a cutout in the middle of the template).

You will waste a lot of foam experimenting with different wire temperatures and tensions, etc., but once you get the hang of it it will be easy. It's also quite cheap. Cover it with a plastic covering (low-temperature).

In addition, I recommended that Kelvin, and anyone else with similar questions about combat, look for a copy of the May edition of *Model Builder*, if you don't already have it. The control-line column was primarily devoted to starting in combat in that issue.

It sounds like Kelvin and his friends have a good start and undoubtedly will improve rapidly. One of the best ways to improve quickly is to find a couple of friends to fly with and practice a lot of combat flying (.049 combat planes are an excellent tool for practicing combat).

Remember, in combat, even though we all strive for speed, you don't have to have the fastest plane . . . you can win with your flying skills.

Anyone in the Singapore area who would like to contact Kelvin, or anyone else who would like a combat pen pal, may want to write him: Kelvin Yap, 22, Joo Ave., Singapore 0821.

While we're mentioning pen pals, here's another flier who has not yet found anyone else in his area to fly with, and would appreciate meeting some nearby people to help him get his flying program off the ground: Charles Lowitzer, 504 NW 2nd St., Grants Pass, Oregon 97526.

We like to mention upcoming contests when we get the information soon enough . . . which often is a challenge given the lead time necessary to make the magazine's deadlines. Here's one for which we did receive the flyer in time, and it's a new and exciting meet that may attract those serious fliers interested in making some long-distance travel. Combine it with a family vacation and you have the makings of the modeling trip of a lifetime.

It's called the First Pacific Control Line Championships. The place is the National Control Line Site at Clareville Showground, Carterton, North Island, New Zealand. The contest is scheduled for February 4 and 5, 1990, the weekend of New Zealand's 150th anniversary.

David Wright, chairman of the CL Technical Committee, notes that the contest is on at the same time and place as the Third Pacific Free Flight Championships and a month after the New Zealand Nationals (Wigram, Christchurch, Dec. 28-Jan. 3). Just before the Pacific Championships is the Commonwealth Games sporting competition in Auckland.

"So have a flying summer 'down under' and take the opportunity to see our beautiful country at the same time," Don says.

He says the contest is "an attempt to establish an international event in this part of the globe.

"Down under, we have excellent conditions for model flying, and in New Zealand we have probably the greatest number of model fliers per head of population of any country in the world . . . Europe is only 30 flying hours from New Zealand, so the Champs would provide a great opportunity to flee the Northern winter for the sunny beaches and beautiful scenery we have here.

"Visiting modelers are always made to feel most welcome, and there will be no shortage of willing hosts."

Facilities at the contest site include grass and concrete circles, and a camping area. The site is 10 minutes from Carterton and 20 minutes from Masterton, both of which have motels.

Entry fees are $20 (NZ) per event. Events on Saturday are FAI precision aerobatics and FAI combat. On Sunday are FAI Speed and FAI Team Race.

For information, contact New Zealand Model Aeronautical Association Control Line Technical Committee Secretary David Sanderson, 16 Roto St., Te Kauwhata (0817) 63274.

We'll conclude with a note for old timers. You don't have to be an old-timer yourself to appreciate the wide range of products available from Argo USA, 3229 Dianora Dr., Palos Verdes, California 90274.

We recently received a catalog with a tremendous number of interesting items that would warm the heart of any member of the Society of Antique Modelers. Orwick engines, Edco Sky Devil engines, accessories for all sorts of ignition and glow engines, etc.

Write for the catalog!

Questions, comments, photos, contest reports, information on upcoming events, etc., are invited for the control-line column. Write John Thompson, 1520 Anthony Ave., Cottage Grove, Oregon 97424. •

Plug Sparks *Continued from page 39*

60 and 65 (as per the old production models). The lapped piston comes in 60 size while the 65 features a ringed piston.

Although only a few dozen have been delivered as of this writing, prices have changed slightly from the original announced prices. The piston version now sells for about $215.00, while the ring job is $235.00. However, these prices are approximate and subject to confirmation. Best idea is to call Miller at (408)475-6858.

Those now ordering should expect to find some delivery delay as Marvin can only produce so many a month. However, as noted before, these well made engines are worth the wait!

RARE ONE

We like to run photos of rarely built models (as per Photo No. 11) showing a Capitol "Flight Master" as built by Stu Warner of SAM 39. This model was equipped with a Cox Black Widow 049 for 1/2A R/C Texaco beautifully finished in pink silk, white and maroon trim.

This design evolved from a long series of similar kits made by various eastern firms. The Heathe Co. produced a "Monarch" design in two sizes, the smaller being renamed the "Junior Wasp." Shortly thereafter a design known as the "Corsair" was produced by Ed Beshar (Joe Beshar's uncle) which featured a tapered wing. The last of the line in 1940 was the "Flight Master," the kit design having been acquired by Capitol.

This is only typical of the early days when many original designs were renamed as in the case of the Thunderbird 45 being put out later under the name of VMS Gamma. Similarly, when Consolidated took over the Model Developments design, "Pursuitaire," this was renamed the "Roamer." Just keep reading this column, you'll eventually get the history of these early kits!

READERS WRITE

Ernie Linn, 3505 E. Mt. Vernon, Wichita, Kansas 67218, secretary of the SAM 56 "WHAM" Club, writes to describe the latest happenings of his "Kansas Wakefield" at the recent U.S. Free Flight Champs at Taft.

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"BEAN ROCKS" by WILLAIRCO. $6.75 per dozen. Beginners, roll-your-own, duration rockets for jet models and matching kits (U-2, F86K, F84, etc.). Send SASE to WILLAIRCO, P.O. Box 90533, Atlanta, Georgia 30364.

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GIANT SCALE plans by Hostetler We fly what we draw Send SASE to Wendell Hostetler's Plans, 1041-C Heatherwood, Orrville, Ohio 44667

WANTED: YOUR PLAN OR KIT for "Flying Model Warplanes An International Guide!" Companies and individuals encouraged to register Send catalog to John Fredriksen, 69 Flamingo, Warwick, RI 02886

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SCALE RUBBER PLANS. Over 50 Collector's quality plans. Scale 3/4" to foot Spans to 34". 1915's to 1940's Golden Age, American Military, British, French, German, Japanese. $6.00 each PPD. SASE for list. Flying Scale Inc., 1905 Colony Rd., Metairie, LA 70003.

Wanted: Telco—Brown—etc. Motors—Parts Buy—Trade stamp for materials list. Thomas Ogdon, 27 Cortland St., Norwich, NY 13815.

SCALE DOCUMENTATION. PLAN ENLARGING. Photopacks, three-views, drawings for 1800 aircraft. Super Scale R/C plans for Giant, Sport. 82 page catalog $4.00. Scale Plans and Photo Service, 3209 Madison Avenue, Greensboro, North Carolina 27403. (919)292-5239.

ENGINES: IGNITION, GLOW New, used Sell, trade, buy. SASE for list. R. Eierman, 504 Las Posas, Ridgecrest, California 93555; (619) 375-5537.

WANTED Pre-1950 model airplane engines and model race cars. James Clem, Box 524 Sand Springs, Oklahoma, 74063 (918) 245-3649.

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ANTIQUE MODEL IGNITION PARTS CATALOG, 1990, Timers, Tanks, Needle Valves, Cylinders, Points, Pistons, Drive Washers, Plugs, Operating Instructions, Engine Kits. Engines, Atwoods, Cyclones, Delong, Others. 1,000 Parts, $8.00 PP., Foreign $16.00. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, New York, 12078

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SHOOT STUNNING AERIALS: BUILD 4 OUNCE, 2 WATT, 2-1/4" X 4", COLOR/BW TV TRANSMITTER, UNDER $120. Best, easiest available. Complete plans, minicam info, $9.95 plus $2.00 S&H KLINDWORTH/KAWAI SUPERCIRCUITS, 1403-D Bayview, Hermosa Beach, CA 90254.

MAKE A BEERCAN BIPLANE, 9 inches long with 14-inch wingspan. Instructions, patterns, photographs. $9.95. Kit Nine, P.O. Box 72104, Marietta, Georgia 30007.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649 191st Ave S.E., Issaquah, Washington 98027.

WOW! GREAT FLYING ENTERTAINMENT! Rubber powered LIL' DEVIL Acrobatic or straight flights Stable in wind. 9-1/2 inch wingspan. Easy stick fuselage. $3.00 for plans and instructions. $10.00 for kit. Guaranteed. Wonder Wing Air Works, 184 Madrona Rd., Boulder Creek, California 95006

1930s MODEL SHOP! Sawed prop blanks, WWI/Balloon/Streamline balsa wheels, Hinoki wood, color nitrate, sticks, tissue, bobbins, prop hinges, bamboo, old Scale/Contest plans, and more! Illustrated mail order catalog. $2. Oldtimer Model Supply, P.O. Box 7334, Van Nuys, California 91409

OLD MAGAZINES/BOOKS: Model, Aviation Lists $1.75, 45¢ SASE. Clements, 308 Palo Alto, Caldwell, ID 83605.

DISCOURAGED BY FAST R/C "TRAINERS"? My "Ease-of-Flying Ratings" evaluates 30 currently available trainers Includes aerodynamic guides that guarantee slow, hands-off models. $1.75 plus 45¢ postage. Jim Waterman, 3818 Deerfield, San Antonio, TX 78218.

RAZOR BLADES, SINGLE EDGE, carbon steel, first industrial quality $5.00 per hundred plus 10% shipping COBBIE'S, RR 2, Box 454-A, Staunton, Virginia 24401 (703)885-8036.

ENGINES: IGNITION, GLOW. New, used. Sell, trade, buy. SASE for list. R. Eierman, 504 Las Posas, Ridgecrest, CA. 93555; (619) 375-5537

MONOCOUPE REARWIN CULVER. GEE BEE's. HALL CHESTER Etc.: Catalog/News $3.00 refundable "Meticulous PLANS" by Vern Clements (MB), 308 Palo Alto, Caldwell, ID 83605.

300+ Plans—Build shop machines and accessories Catalog $1.00 refundable. Wood-Met (MB), 3314 Shoff, Peoria, IL 61604

Ernie writes to say he and Bill Cushenberry made the trip and spent a good time under a 20-foot square canopy with Chris & Kitty Christenson, Chet Lanzo, Sal Taibi, and a couple of Detroit Balsa Bugs. Great bull session!

Both Ernie and Bill started off great with maxes but each of the following flights degenerated to the point where they did not place.

However, on Monday morning, the last day of the meet, Bill and Ernie both flew in Nostalgia Wakefield. Ernie was plagued with rubber bunching in the tail area but Bill did fine, gaining second place in the flyoff. Ernie is quite elated over the model's performance.

Ernie enclosed Photo No. 12 which shows Bill Cushenberry with the Kansas Wakefield at Taft. Ernie feels everyone ought to try this design.

Don Lefferts of 27 Rear Catoonah St., Ridgefield, Connecticut 06877, again sends a photo to show he likes all kinds of old timer activity.

Seen this time in Photo No. 13 is a Joe

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(Required by 39 U.S.C. 3685)

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I certify that the statements made by the above are correct and complete. Anita Northrop, General Manager

INDEX TO ADVERTISERS

Weathers 1937 "Airster" towline glider. The model has been enlarged two times to 60 inch wingspan. Control is by a two-channel radio system.

Other changes were the addition of false ribs for better airfoil profile, spruce and balsa spar to allow for "Hi-Start" stresses. Don says the model flies good, despite the large rudder and elevator areas.

ANOTHER RARE ONE

Received a call from J.G. "Bud" McNorgan, 11421 Salinaz Drive, Garden Grove, California 92643, inquiring about a design called the "V-B." Although this writer identified this as a Vartanian-Bellantonio design, to the best of his recollection, there was no follow-on from VB-1 and VB-2. Matter of fact, if anything was going to be VB-3, it would have been the model Leo Vartanian won with in the 1936 Junior Birdmen Championships at Lakehurst NAS. This model was highly praised by Charlie Grant, then editor of *MAN*, as an excellent flyer.

This writer has the sketches of this model (which somewhat resembles a K-G) that still have not been transferred to the drawing board. Just another project!

Upon receiving Photo No. 14 from McNorgan, this columnist instantly recognized it as the "Old Faithful" design by Vartanian that he flew in the Chicago area after moving from New York City. A photo of this very successful model appeared in a Carl Goldberg article in *Model Airplane News*, September 1937 issue.

The particular model shown was built and flown by Cy Sapsford. Cy showed up in a Canadian Toronto contest and attracted quite a bit of attention with this good looking model. Guess we will have to track down that VB-3 name. If you are reading this column, Leo, let me know!

THE LAST WORD

The *C.I.A. Informer* hit the nail on the head by the following:

"MECA Madness:

The guy who tells you that you can't take it with you is probably trying to get it away from you." •

Electronics. *Continued from page 31*

The next subject was twelve-volt input chargers for batteries of more than seven cells. I have a single schematic for such a charger, but it lacks component information on a toroidal wound transformer. On that subject, Waldo offers the following:

"I understand you have a schematic and an article to construct a charger for a large number of cells. Although you didn't offer any, I'd like to have a copy if you can arrange it. In the meantime, I can help a little. Starting with the wire, 1.6mm is .062992 in diameter. The closest British Standard Wire Gauge is #16. the closest American Wire Gauge (Browne & Sharpe) is #14 which has a diameter of .0641 or 1.628mm. Enamel insulation will increase the diameter to .068-.075 O.D., depending on whether or not it is heavy Formvar. Twenty eight turns wound in a single layer will occupy approximately two linear inches.

"Most cores for switching power supplies are powdered iron, although ferrite is also used. As this is in effect a switching power supply, a powdered iron core should do okay. They also seem to be more readily available. The 'T' designation is the approximate O.D. in hundredths of an inch. The number following that is the mix which also has a color code. Example T-130-2: Diameter is approximately 1.3 inches, and the mix is #2, whose color code

is Red. Green cores have the highest permeability (#41), lowest frequency, followed by Gray (#3), Red and White (#15), Blue (#1), Red (#2), Yellow (#6), and Black (#10) in decreasing order. FT designations are for ferrite cores.

"A T-94 or T-106 core would have to be wound in two layers as the I.D. is only .56 inches. I would think a T-106 would be preferred. However, a T-130 core has room for 32 turns in one layer which might be better.

"Both powdered iron and ferrite cores are available from Amidon Associates, North Hollywood, California 91607. Hosfelt Electronics, Inc., 2700 Sunset Blvd., Steubenville, Ohio 43952, also has a fair selection. They have no minimum order and a toll-free order number (800)524-6464. There is $3.50 shipping on orders under $100. If this doesn't help, maybe it'll give you some ideas. Most of this information is in Chapter 36 of the 1988 ARRL Amateur Handbook."

Does this guy know his toroidal transformers, or what? Waldo is correct in that I did not actually offer to send copies of the information I have on hand, feeling as I do that it is incomplete. However, the above information sheds a different light on the subject, and for those of you who have the time and inclination to do some experimenting, there is now enough data to give you a good start. Copies of the original charger information are available upon receipt of your SASE.

A few further comments on the subject! First, "Formvar," as Waldo mentions in his discussion of wire diameters. We are referring here to solid copper wires, actually some of respectable dimensions. Such wire is insulated only with a coating of varnish, "Formvar" being the family name of the most prestigious one of such coatings. I know absolutely nothing about the techniques of wire manufacturing, only that the better quality wires of this type are coated so perfectly that the completely uninitiated could easily miss the fact that there is a coating on the wire and assume that it is simply made of a material of that color. However, the wire is perfectly insulated, with voltage information being available from its manufacturer. A most important point to remember is that this varnish coating must be completely removed from the ends of the wire at which connections are to be made. There are chemical removers available for this purpose, but for the casual user, a simple scraping with a knife blade and a couple of swipes with No. 600 sandpaper will suffice.

On to that permeability and frequency business. The former is the ability of a material to provide a path for magnetic forces, as compared to air. Both of these parameters must be considered and matched to the circuit in question, as they have a bearing on its proper operation and ability to provide the current capacity requirements. Neither is super critical and a certain amount of overkill is generally found in such devices.

The name "Amidon" is not unfamiliar to me, and I was able to locate them exactly for you. They are at 12033 Otseto St, North Hollywood, California 91697, as Waldo mentions. Phone number is: (818)760-4429. I am sure they have catalogs and data sheets worth asking for . . . I'll be sure and visit with them at the next local electronic components trade show and see what is available on this and similar interesting subjects.

Another important point to remember is that this charger is completely out of the experimenter's stage and is very popular in Europe. What we are lacking is only information on one component in the circuit that provides a DC supply higher than the original twelve volts so that batteries of higher voltage can be charged. There is no reason this circuit would not work as an AC operated charger only, with simply the addition of a normal transformer of the proper secondary ratings and a diode rectifier.

Somewhat similarly, it is not necessary to build the complete charger simply to test out any theories regarding the choice of toroidal transformer components, following Waldo's recommendations. The power supply section can be breadboarded individually, and tested for output under its approximate load conditions, before the rest of the circuitry is assembled. Those of you who pursue the subject, please don't forget to share the results of your experiments with us.

SMT and SMD'S (Surface Mount Technology and Surface Mount Devices) have been discussed here before. Knowing that such subjects are hard to understand well without actually seeing the items in question or a good sketch or photo, I am enclosing a drawing showing the lead arrangement in a common twelve-pin surface mount IC. Remember that the non-SMD IC is mounted on stilt-like metal pins, the elimination of which greatly reduces the devices susceptibility to vibration. In the sketch, the "board" refers to the basic epoxyglas board material, the "pad" is the metal lands bonded to the board, and of course the "lead" is the individual connection to the IC. When selecting your new R/C system, the use of SMDs in its manufacture assures you of higher quality electronics and increased reliability.

TIME SURE FLIES when you are having fun. Not an original statement by any means, but judging from the variety of timing devices seen at any flying site, it's

quite true. Just as true is the importance of keeping track of one's time in the air, since dead stick landings, though not necessarily fatal, should be avoided whenever possible.

On this subject, and back to the high price transmitters mentioned earlier, in my opinion one of their most useless features, actually a dangerous one if used, is the inclusion of a flight timer in their digital readout. Such a timer requires that you look away from your in-flight airplane to see how long you have been in the air or how much time you have left to a preset amount. In either case, taking your eyes off your airplane, unless you are the only one up at the time and you are flying a floater, is truly courting disaster. At any busy field, such a step is definitely *not* recommended.

A little better timer is the audio type, generally made for use in the kitchen, which can be preset to any desired period of time and which tells you with a series of those electronic beeps with which we are all so familiar when the time has elapsed. Better, because it does not require that you take your eyes off your bird, however, it is still not the ideal timer as there is no pre-warning, all it tells you is NOW. Fear not, a better timer, designed not with the housewife, but with the R/C flyer or driver in mind, is on the way. This timer, a small device that clips to your belt or clothing, counts the actual minutes elapsed for you: "Beep" for one minute, "Beep, Beep" for two minutes, and so forth. That way, you always know exactly how long you've been up, how much longer you have, and can even squeeze in an accurately timed minute or two if things are really going good and you hate to land.

Sound good! Sure it does, and I'll have complete information for you next month, including a picture. If you can't wait, bug D & B Electronics, P.O. Box 27727, Santa Ana, California 92799. A dealer program is in the works, and inquiries from such areas are also being requested.

Got to go, time to build airplane racks in my new shop. I'll have a picture for you in a couple of months, I promise it will be as neat and clean as my electronics workshop. •

Jake ..... *Continued from page 7*

Dear Suspicious:

Our Government, the Air Force in particular, has been very fond of attributing unexplained UFO sightings to swamp gas. I don't buy it for a second.

Stop and think about it for a minute. How many bullfrogs, alligators, catfish, or other swamp dwellers are out there eating baked beans and root beer? Not too many, right? So how much swamp gas could there be?

My own theory is that UFO sightings are much more likely to be explained by chili cook-offs.

Jake

* * *

Dear Jake:

Is it true that Charles Lindbergh made a secret unsuccessful first attempt to fly the Atlantic in 1926, where he got two thirds of

the way across, decided he didn't have enough fuel, and flew back to New York?
Derek in Detroit, MI

Dear Derek:

I never heard that one before, but I suppose it's possible. I do know that Lindbergh did fly to Paris, Kentucky in early 1927 so he could practice landings on French soil.

Jake

* * *

Dear Jake:

I've heard that the lomcevok is the hardest aerobatic maneuver to perform. What is the origin of the lomcevok, and how do you do one?

Terry in Tullahoma, TN

Dear Terry:

The lomcevok gets its name from Piotr Lomcevokz, a Czechoslovakian figure skater who first performed the maneuver at the 1936 Winter Olympic Games. While attempting a sit spin, Piotr impaled himself on the aft end of his ice skate, and completed 47 divergent revolutions before extricating himself from his predicament.

The wild and uncontrollable gyrations first introduced in Piotr's performance have been translated to aircraft aerobatics in the form of tumbling or spinning gyrations in pitch and/or yaw. It is suspected, but not verified, that the howling wail that accompanied Piotr's inaugural performance is still practiced in the cockpit today by a pilot executing a lomcevok.

A full scale pilot follows these three steps to perform a lomcevok: 1) stall the aircraft at high speed, 2) push the stick and pedals to opposite corners, 3) eject. A modeler can do a lomcevok as follows: 1) enter a steep inverted climb, 2) push both transmitter sticks forward and out, 3) order a new kit.

Jake •

Workbench . *Continued from page 7*

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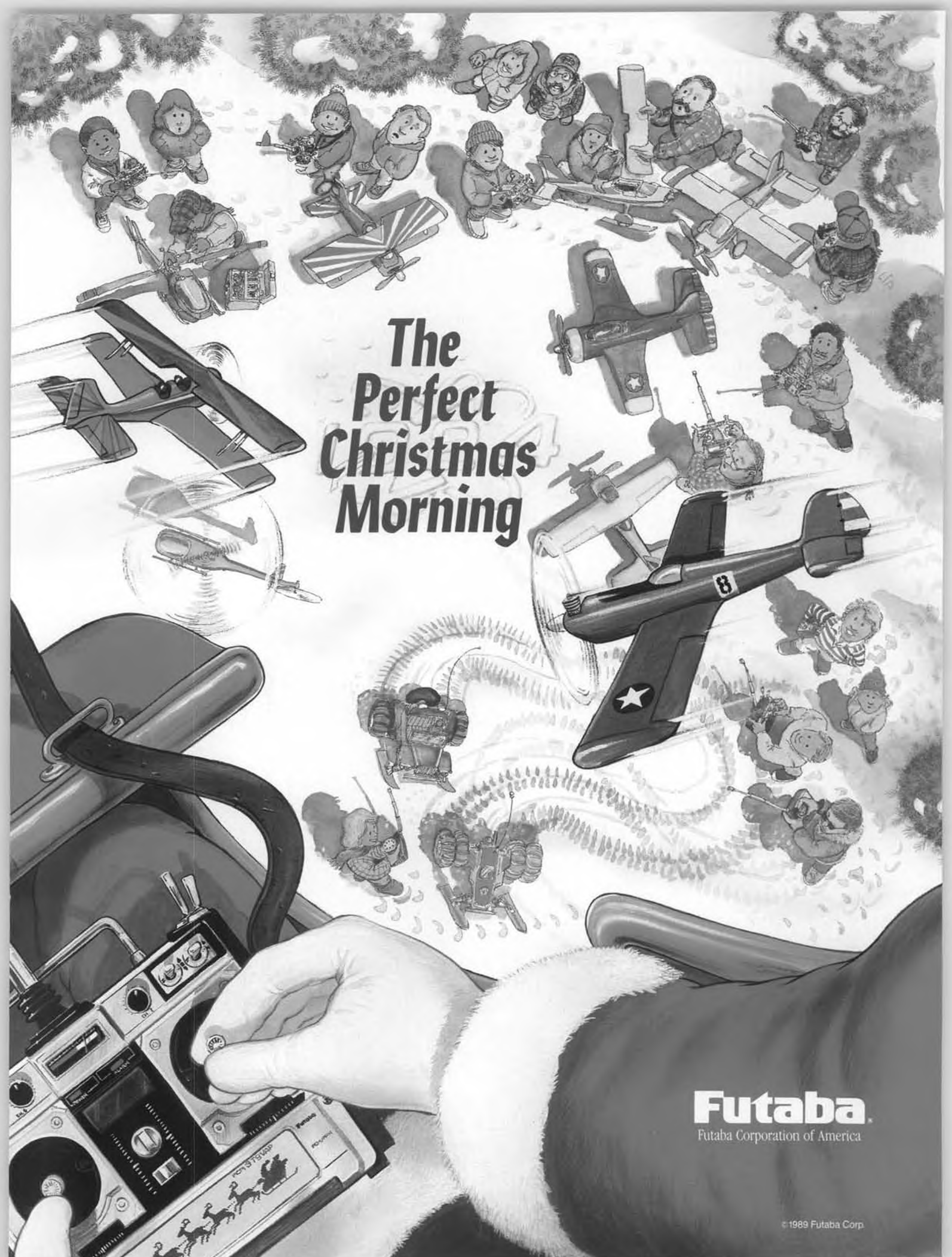
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What makes the Blackfoot so good? Well, first there's the front double wishbone and rear trailing arm suspension systems with coil springs all around. And a sealed differential powered by a high-performance 540-type motor. There's also a simple-to-adjust, precision-engineered, 3-step forward and reverse speed control, and light, strong, space-age ABS chassis.

In fact, any way you look at MRC-Tamiya's Blackfoot it's the best value in its class and the most popular 2WD ever made.

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