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Airtronics is the best.
Our competition has proved it.

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

First In The Industry

We know a lot about 1991 environments. Airtronics was the first major R/C system manufacturer to introduce 1991 capable R/C systems. We were also the first, and for a long time the only, R/C manufacturer to have our 1991 systems independently certified to meet all the AMA guidelines.

In fact, since 1988, all Airtronics' advanced FM and PCM aircraft transmitters and compatible Gold Label Super Narrow Band Dual Conversion receivers have been independently tested and certified as meeting and exceeding every AMA and RCMA guideline and specification for narrow band R/C operation in 1991 and beyond.

Flight-Proven 1991 Technology

In a word, our systems work. Airtronics aircraft systems consistently provide "glitch free" operation in the most demanding narrow band environments, whether it's modeler to modeler interference, or outside 10 KHz pager interference.

We also offer a low-cost R/C system upgrade service to convert your present Airtronics' AM or FM transmitter and receiver to 1991 AMA guideline specifications and operation. We provide modelers with an affordable alternative to expensive product replacement and obsolescence.

We Care About The Modeler

We're helping advance the sport of R/C modeling through excellence in our equipment. Airtronics continues to develop new products and technology to keep us ahead of the competition.

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

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

We Set The Standard.

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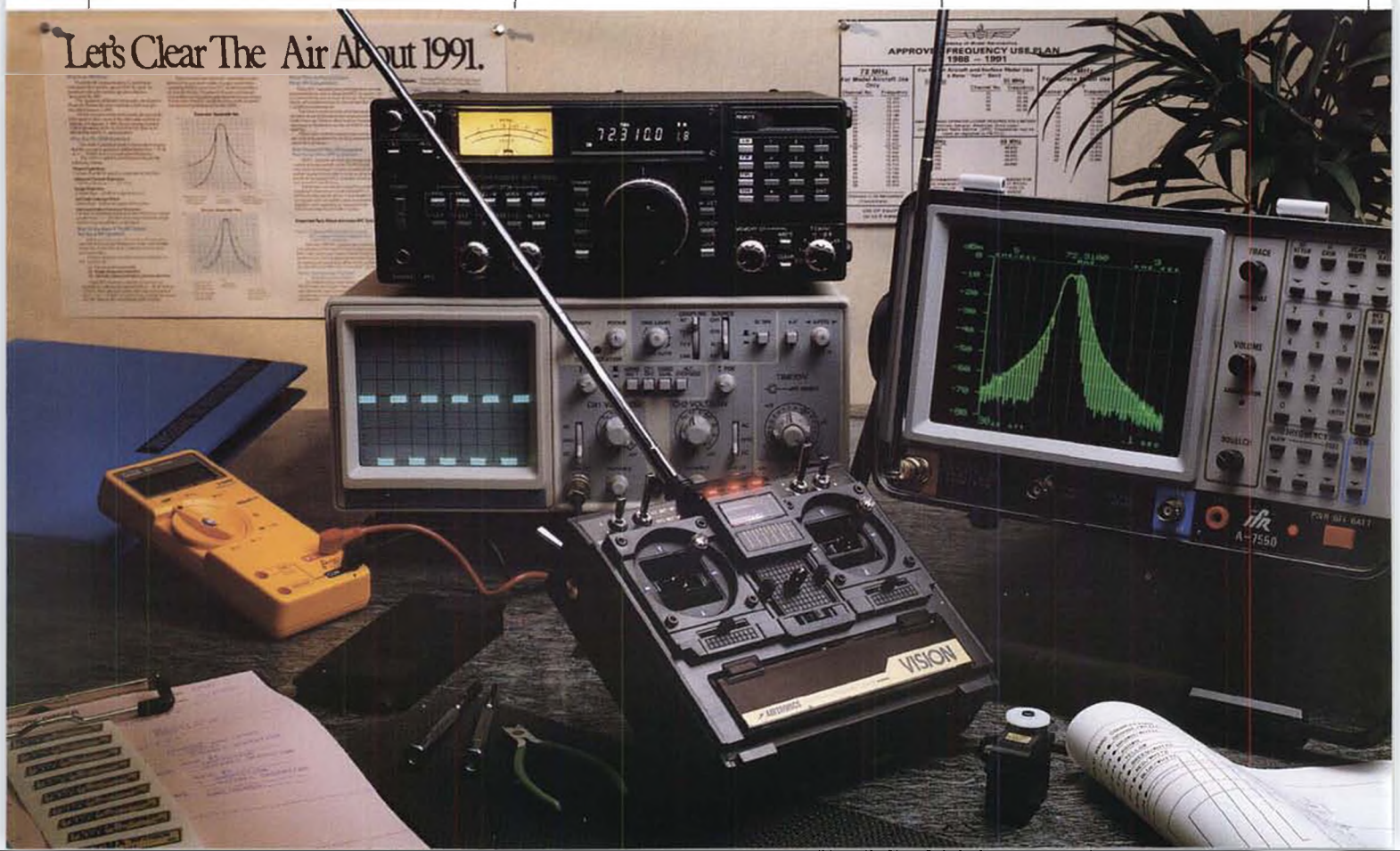

New book "briefings" from H.A.

ACES AND WINGMEN II, Morris. Over 600 photos, dozens in color, and 55 paintings enhanced a remarkable historical coverage of the 8th Air Force's exploits in Europe during World War II. It combines recollections, stories by 13 combat pilots, and official documents recently declassified to produce a panorama of the air action. Much other data including group histories of all 15 of the 8th AF Fighter groups, plus the 354th group of the 9th AF, Aces lists, and a chronology of 8th AF's major events. 256 pgs., 8 1/2" x 11", sfbd. 1239B **$39.95**

ATTACK ON YAMAMOTO, Glines. Americ's code-breakers intercepted a message in 1943, telling of Japanese Admiral Yamamoto's flight from one base to another, and used the opportunity to attack and shoot down the Japanese aircraft. It was the longest intercept mission in wartime history, one that became a classic, eliminating a powerful enemy leader. More than just the mission story, the book is an attempt to confirm which allied pilot actually shot down the Jap leader. 288 pgs., ill., 6" x 9", hdbd.....3521C **$19.95**

FIGHTING COLORS Glory Days of U. S. Aircraft Markings 1930-1990, Dorr. A look at the markings, insignia and nose art of the combat fighter. Once bright, vivid, splashy colors decorated these planes, gave courage to their pilots and evoked fear in the enemy. Today these markings have given way to drab, low visibility paint schemes so the combat pilot can hide in the invisibility of the vast sky. But occasionally a pilot dabs on a few splashes of brightly colored paint even on today's high-tech jets. Sfbd., 9" x 10 1/2", 128 pgs., 80 color ill. Books shipped 4/15/90.....3187B **$19.95**

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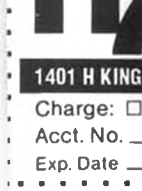

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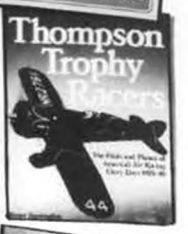

GEE BEE. The REAL Story of the Granville Brothers and Their Marvelous Airplanes, Haflke. To the buffs, the Gee Bees represented power, speed and thrills. Designed by the Granville Brothers (G.B.'s), each plane had its own mystique. Book portrays each model, its oftimes tragic career and the famous pilots who flew and raced them. A must for the air-racing historian. Over 200 photos, 176 pgs., 8 1/2" x 11", hdbd 4700C **$24.95**

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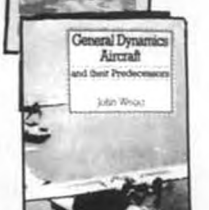

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SEPTEMBER 1990 • VOLUME 20 • NUMBER 222
898 West Sixteenth Street • Newport Beach, CA 92663
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DEPARTMENTS

FEATURES

CONSTRUCTION

ON THE COVER

The startling "comin' at you" painting of three Marine VMA 214 'Blacksheep' A4M "Skyhawks," entitled 'Triple Threat," was created by John Doughty Jr. Full color, limited edition, hand signed and numbered lithographs, 29 x 37 inches, double matted and framed in anodized black metal, are available from Aviation Arts Gallery, 533 S. Coast Highway, Laguna Beach, CA 92651, phone (714) 494-4303.

The insert photo, taken by Linda Mas, shows Mike Mas, world class RC helicopter pilot and former world champion, also the first ever to fly an RC helicopter inverted, performing his latest feat, a single-point inverted landing! The heli is a stock Hirobo Shuttle ZX, very obviously Enya powered, now being imported and distributed by Altech Marketing. For more details on this amazing accomplishment, see Bill Northrop's "Workbench.

MODEL BUILDER (ISSN 0194 7079) is published monthly by RCMB I NC., 898 W. 16th St., Newport Beach, California 92663. Phone (714) 645-8830. Subscriptions: $25.00 per year, $47.00 for two years. Single copies , Call. Subscriptions outside the US (except APO & FPO) $38.00 for one year, $68.00 for two years. All payments must be in US funds, drawn on a US bank.

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PH 303-789-9411 or 781-4106
GRAND JUNCTION
The Hobby Hut
811 North 12th Street

CONNECTICUT
BERLIN
Berlin Hobbies
162 Mill St PH 203-828-1778
BRISTOL
Bristol Hobby Center, Inc
841 Farmington Ave
Bristol Plaza
PH. 203-583-7273
BROOKFIELD
Vinnys Hobbies
847 Federal Road
DANBURY
The Hobby Center
388 Main Street
PH 203-746-9984
GLASTONBURY
Dave Hobbies
46 A Wales St
Fox Run Mall
PH 203-633-3056
MANSFIELD
Bruce Hammond's
R/C Hobby Shop
380 Storrs Road
MILFORD
Radio Acres 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
5 Hayes Street
ANCHORAGE
Hobbycraft, Inc 1
Dimond Center
800 E. Dimond Blvd.
PH 907-349-5815

DELAWARE
WILMINGTON
Brandywine
1918 Zebley Road

FLORIDA
BOYNTON BEACH
G & C Hobbies
3468-8 W Boynton Beach Blvd
FT. LAUDERDALE
R/C Hobbies
6800 N. University Dr.
JACKSONVILLE/ORANGE PARK
Hobby World
175 Blanding Ph 272-6315
7273 103 St Ph 772-9022
9825 San Jose Ph 288-7224
9851 Beach Blvd Ph 645-7171
MIAMI
Crown Hobbies
7439 Coral Way
MIAMI
Orange Blossom Hobbies
1975 N.W. 36th Street
OCALA
Rob's Baseball World
7651 S W. State Road 200
ORLANDO
Bob s Hobby Center, Inc
7333 Lake Underhill Road
PH 407-277-1248
ORLANDO
Central Florida Hobbies, Inc
5800 W. Colonial Drive #311
ORLANDO
Colonial Photo & Hobby, Inc
634 N Mills Street
PENSACOLA
Bobs s Hobby House
5719 North W. Street
PLANTATION
Universal Hobbies
141 South State Road 7
PH 305-581-9360
ST PETERSBURG
Hobby House
8360 9th St N
PH 521-4148
SOUTH DAYTONA
Ace Hobbies
2127 So. Ridgewood Ave
PH: 904-761-9780
TALLAHASSEE
Pam & Allen's Hobbies
1196-A Capitol Circle N E
TAMPA
Charlie's Discount Hobbies
7530 W. Waters Ave
PH 813-882-4007
TAMPA
Farmers Hobbies
4939 E. Broadway
PH 813-248-3314
WEST PALM BEACH
Cash House Hobby Shop
1079 N. Military Tr
WINTER SPRINGS
Forever Hobby Center, Inc.
420 W. State Road 434
PH 407-327-6353

GEORGIA
ATLANTA
Briar Vista Lawn Mower
Sales & Service
1857 Lavista Rd PH 633-9741

HAWAII
HONOLULU
The Hobbyist
1413 Tenth Avenue

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

ILLINOIS
BELLVILLE
West Side Hobby
2629 West Main Street
BLOOMINGTON
Hobbyland, Inc
618-818 N. Main St
CHICAGO
Stanton Hobby Shop
4734 N. Milwaukee Ave
CRYSTAL LAKE
Frank's Games, Toys & Hobby
111 - 113 North Main St
PH 815-459-0247
EAST MOLINE
Tony's Hobby & Key
800 - 15 Ave
ELMHURST
Al's Hobby Shop
121 Addison
OAKLAWN
Pat s Hobbies & Crafts
5730 W. 95th
PH 312-424-6131
PALESTINE
Kincaid Farm Store
302 South Main
ROCKFORD
Rockford Hobbies, Inc
619 So. Rockford Ave.
ROUND LAKE BEACH
Fairfield Hobbies & R/C
1305 Fairfield Road
TINLEY PARK
Orland Hobbies
16853 Oak Park Ave
PH. 312-429-8811
WAUKEGAN
Lake County Hobbies
37832 N Sheridan Road
PH. 312-662-4544

INDIANA
FORT WAYNE
Phil's Hobby Shop
1722 Lake Ave Ph 219-426-5056

IOWA
CEDAR RAPIDS
Tapco Engineering
1639 47th St N E
PH. 319-393-4383
CLINTON
Russ's Miniatures & Hobbies
423 11th Ave So
COUNCIL BLUFFS
Bud's Hobbies & Crafts
133 W. Broadway
DES MOINES
Hobby Haven
7872 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
SIOUX CITY
Tri-State R/C
3201 Viking Dr.
PH 712-255-8190
WATERLOO
Bob's R/C Supply
930 Sycamore Ave.
WAVERLY
R/C Hobby House
916 E. Bremer Ave

KANSAS
JUNCTION CITY
R/C Hobbies
115 W. 7th St. PH. 238-1877
KANSAS CITY
R/C Hobbies
5620 State Ave
LIBERAL
Miller s Bits & Hobby Shop
105 E Seventh
NEODESHA
SAC
Route 1
SALINA
Don's Hobby Shop
410 Hart
WICHITA
Big Frank's Hobby Center
2288 N Amidon
Stressbriar Shopping Center
PH. 838-3011

KENTUCKY
FLORENCE
Hobby Hanger
183 Lloyd Ave
HENDERSON
Hensley s Hobbies
241 Second St.
LEXINGTON
Hobby Center
1025 Industry Road

LOUISIANA
BATON ROUGE
Hobby Towne
3112 College Dr., Suite A
BATON ROUGE
Hobby Towne
6990 Airline Highway
DOWNGTON
Uncle Sam's
301 N. Hwy 190, Suite E8
MANDEVILLE
Mercury Hobbies, Inc
Rt. 6 Box 734A
PH. 892-7204
METAIRIE
Hobby Hut Hobby Shop
709 David Dr
PH 504-733-4629

MAINE
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
JAY
Chatenauer Hobbies &
R/C Raceway
Old Jay Hill Road
PITTSFIELD
Hallett s R/C Planes
85 Somerset Ave
PH 207-487-3058
VASSALBORO
Cliff Piper R/C
RR1 , Box 4470, Rive Ridge
PH 207-873-4885

MARYLAND
BALTIMORE
Stonehegh Cycle & Hobbees, Inc
6717 York Road
GERMANTOWN
Fox Chapel Hobbies
19709 Frederick Road
MIDDLETOWN
Larch Lane Hobbies
18 Larch Lane
PH 301-473-4587
OAKLAND
Brodak's Hobby Shop
810 N. 3rd St
WESTMINSTER
Bobby's Hobby Lobby
85 E Main St

MASSACHUSETTS
CANTON
Advanced RadioControl Hobbies
323 Turnpike St #9
CHICOPEE
J & J Hobbies
133 Frontenac St
PH 592-1472
DENNISPORT
New England Hobby Shops Inc
691 Main St
EAST FALMOUTH
R/C Hobbies
153 E. Falmouth
EAST LONGMEADOW
Bill's Hobby Supplies
800 N. Main Street
PH 413-738-7711
FRAMINGHAM
Fisher R/C
17 Salmi Road
GREENFIELD
Chano Hobbies
40 Bank Row
PH 413-773-3300
HANSON
Hanson Hobby, Inc
830 Main St
LEE
Barn Speed Hobbies
63 Center St
MERRIMAC
George s Hobby Shop
22 Merrimac Square
NEW BEDFORD
Paragon Stamp Works
293 Brock Ave
PH 508-992-8812
REVERE
Tony's Hobby Shop
90 Kimball Ave

STURBRIDGE
K/N Hobbies & Toys
392 Main Street
WEBSTER
Jim s Hobbies
22-1/2 Day Street
WORCESTER
Ray s R/C Specialties
12 Sherman St. PH 757-5883

MICHIGAN
ADRIAN
House of Hobbies
2475 Cadmus Road
ANN ARBOR
Rider s Hobby Shop
115 W. Liberty
PH: 313-668-8660
BATTLE CREEK
J Y HOBBY
825 Golden Ave
CANTON
Rider s Hobby
42007 Ford Road
PH: 313-981-8700
CHARLOTTE
Hussey s Hobbies
222 Lansing St PH: 543-4400
COLDWATER
Hobby Heaven
7 So. Monroe
PH: 517-278-5894
COLEMAN
Long's Aero & Hobby Shop
5812 W. Saginaw Road
DEARBORN
Joe s Hobby Center
7845 Wyoming Av
PH 313-933-6567
EAST DETROIT
Joe s Hobby Center
17800 E. 10 Mile
PH: 313-755-8294
FARMINGTON
Joe's Hobby Center, Inc
28203 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
PH: 616-349-2668
LANSING
Rider s Hobby Shop
1909 E. Michigan Ave.
PH: 517-485-0700
PONTIAC
RC Hobbies
921 Huron
ROCHESTER
Joe s Hobby Centers, Inc.
Campus Corners Shp Ctr
105 S. Livernois
SAGINAW
Aerodrome Models Ltd
2111 Marshall Court
PH: 517-781-3000
SAGINAW
Roger s Hobby Center
5658 State PH. 517-790-0080
Gratiot Shopping Center W
SAGINAW
Tait s Hobbies & Raceway
3270 Bay Road
PH: 517-799-3900
UTICA
Henderson's Family Hobbies
2441 Auburn
WARREN
Prop Shop Hobbies
23328 Van Dyke
YPSILANTI
Rider's Hobby
4035 Carpenter Road
PH: 313-971-6116

MINNESOTA
LITTLE CANADA (St. Paul)
Hub Hobby Center
82 Minnesota Ave
PH: 612-490-1675
MANKATO
Don's Hobby Co
424 S. Front St
PH: 507-1330
RICHFIELD
Hub Hobby Center
6418 Penn Ave S.
ROBBINSDALE
Hub Hobby Center
4114 Lakeland Ave N

MISSISSIPPI
BRANDON
Simon & Simon Trains/Hobbies
2405 Hwy 80 E
OXFORD
The Model Source
110 S. 11th St
PH: 601 234-8170

MISSOURI
DES PERES
Des Peres Hobby Shop
12019 Manchester Road
PH: 314-966-5360
GRANDVIEW
Flo-Mow Hobbies
700 Blue Ridge Ext.
PH: 816-761-6471
GREATER KANSAS CITY
Hobby Haven
Metcalf S Shopping Center
Independence Center,
& 10901 Hickman Mills Dr
MARYLAND HEIGHTS
Flying Models Hobby Center
2723 Creve Coeur Mill Road
RUSSELLVILLE
Adler Model & Diorama Hobby
113 Railroad Ave
PH: 782-4682
ST CHARLES
Mark Twain Hobby & Craft
1201 S. 5th St
ST. LOUIS
J & J Hobbies
5511 So. Lindbergh
ST. LOUIS
Schaefer's Hobby Shop, Inc.
4206 Virginia Ave at Mesamec
PH: 314-352-3750

MONTANA
VICTOR
Murph s Hobbies
239 West View Drive

NEBRASKA
NORTH PLATTE
Patterson's Hobbies
103 No Jeffers
PH: 534-1038
OMAHA
Hobby Cooperative Supply
13225 I Street
OMAHA
Hobbytown U.S.A
711 N. 132nd St
WEST POINT
Kruger's Variety Store
113 N Main

NEVADA
NO. LAS VEGAS
Peterson Hobbies & Crafts
3262 B. Civic Center Drive

NEW HAMPSHIRE
LONDONDERRY
J & S Hobby Center
13 Sanborn Road
PH: 603-432 7056

NASHUA
Hobby Emporium
Royal Ridge Mall
NORTH CONWAY
C-V Hobbies Co.
Kearsarge St
SALEM
Bill s Hobby Barn
326 S. Broadway
PH: 603-898-9241

NEW JERSEY
CHESTER
GB Hobbies
705 Bartley-Chester Road
MARLTON
Hi Fly Hobbies
Route 70 & Cropwell Road
Marlton Square Shp Mall
PH: 609-983-8080
MERCERVILLE
Iron Horse Hobbies
116 Flock Road
MIDLAND PARK
The Hobby Shop
291 Godwin Ave
POMPTON PLAINS
Hobby Hut
587 Rte 23
PH: 201-835-2077
RANDOLPH
Carl s Hobby Center
508 Rte 10
PH: 201-366-4300
RED BANK
Hobbymasters, Inc
62 White Street
RIDGEFIELD
Ridgefield Hobby
508 Broad Ave
RIVERDALE
Zeppelin Hobbies
62 Hamburg Turnpike
SUSSEX
Sussex County Hobbies
60 Main St
TOMS RIVER
Ocean County R/C Service
2123 Vermont Ave
WILLINGBORO
Wilting Hobbies
Country Club Plaza
Beverly-Rancocas Road

NEW YORK
ALBANY
Competition Hobby Supplies
67 Exchange St
BALLSTON SPA
Racing City Radio Control
2033 Doubleday Ave
BELLEROSE TERRACE
Performance Hobby
225-08 Jamaica Ave
CANANDAIGUA
Toys, Trains n' Things
222 S Main St
CANASERAGA
RC Supply
Main Street
CHEEKTOWAGA
Field's Hobby Center
3523 Union Rd
PH: 716-681-8440
ELMSFORD
Andy's Hobby Shop
36 East Main St
HORSEHEADS
Altoona Shop
584 Westinghouse Road
Village Plaza
MINEOLA
Wills R/C Hobbies
285 Willis Ave
NORFOLK
R/C Aero Hobbies
Box 4A Plumbrook Road
PH: 315-384-4413
ODESSA
D & B Hobbies & Crafts
205 E Main St
PENFIELD
Panco Hobbies
1865 Penfield Road
PH: 716-383-1320
ROCHESTER
Dan's Crafts & Things
352 Empire Blvd
PH: 716-654-8388
ROCHESTER
Edmund's Hobby Shop
1521 Mt. Hope Ave
PH: 716-442-8430
SIDNEY
Sidney Cycle & Hobby Center
3 Smith Street
SYRACUSE
Walt's Hobby & Craft
2 Dwight Park Drive
PH: 315-453-2291

NORTH CAROLINA
ASHEVILLE
Carolina Art, Craft & Hobby
128 Swannanoa River Road
BURLINGTON
R/C Hobby Workshop/Raceway
1358 S. Church
PH: 919-228-6808
CHARLOTTE
Acton Hobbies
2818 S. Blvd
PH: 704-527-2596
GOLDSBORO
Hollingsworth R/C Shop
Rte 14, Box 93
PH: 919-735-5088
HENDERSONVILLE
The Hobby House
1211 Asheville Highway
PH: 692-6583
HIGH POINT
Bernie's Craft & Hobbies, Inc
2291 English Road
KING
King R/C
Five Forks Village
Shopping Center
PH: 919-983-3988
MAIDEN
Country Hobbies
Route 2, Box 291
PH: 704-428-3101
WINSTON-SALEM
The Hobby Corner
484 Knollwood Street
PH: 919-788-2345

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

OHIO
AKRON
Miller's Hobby Shop
1018 Kenmore Blvd
PH: 216-848-2264

BALTIMORE
Frank s Service
145 Baltimore-Somerset Rd NW
CINCINNATI
Carl's Hobbies
1188 W Kemper Road
PH: 513-742-5880
CLEVELAND/PARMA
National Hobby, Inc
523 Ridge Rd
PH: 216-749-2450
FINDLAY
Jim s Model Supplies
721 Rockwell Ave
FINDLAY
Pussy Cat Company
515 Crystal Ave.
GREENVILLE
Weaver's
Wayne St. & Meeker Ave
PH: 513-548-1035
LAKEWOOD
Wings Hobby Shop, Inc
17112 Detroit Ave
PH: 221-5360
LANCASTER
Sister's Inc
Plaza Shopping Center
1141 N Memorial Drive
MANSFIELD
John s Hobby Shop
15 N Main
MAPLE HEIGHTS
Southeast Hobby
5150 Warrensville Ctr. Road
MARION
Lew's Whistle Stop & Hobby
532 W Center St
PH: 389-3464
MIDDLEBURG HEIGHTS
American Modeler
7558 Pearl Road
MILFORD
House of Hobbies
204 Main St.
PH: 513-248-8220
NORTH CANTON
Aero Tech Hobbies
802 N Main
NORTH CANTON
Modeler s Haven
4256 Portage N W
PH: 216-499-8000
PARMA
Hinch's Train & Hobby
7882 Broadview Road
Tri City Plaza
PH: 216-842-9443
TOLEDO
The Hobby Stop - West
4558 Monroe Street
UPPER SANDUSKY
Jim & Ken's Hobby Shop
14835 CH 53 RR3
PH: 419-294-1712
WAPAKONETA
Dad's Toy Shop
123 W. Auglaize St
PH: 419-738-2007
YOUNGSTOWN
Boardman Hobby Center
6820 Market Street

OKLAHOMA
OKLAHOMA CITY
Campbell s Hobby House
3500 N. MacArthur
PRAGUE
DJ s Hobby Stuff
807 Broadway
TULSA
Acton Hobbies
4423 E. 31st St
TULSA
Wings 'N Things
5241 So. Peoria
PH: 918-745-0034

OREGON
CANBY
Northwest Hobbies
485 S.E. 1st Ave
CORVALLIS
Trumps Hobbies
2401 N W. Kings
Timberhill Shopping Center
PH: 503-753-7540
EUGENE
Eugene Toy & Hobby
32 East 11th Ave
OREGON CITY
Quality Toys & Hobbies
205 7th Street
PH: 650-8023
PORTLAND
Norm's Hobbies Unlimited
4500 N Interstate Ave
PENNSYLVANIA
BATH
Dick Weitzel s Hobbies
514 E. Main
PH: 215-837-6681
BROCKWAY
Gerio's
Custom Arts & Crafts Shoppe
P O Box 258
PH: 814 265-5395
CARMICHAELS
Brodak's Hobbies
558 Route 88
CRANBERRY TOWNSHIP
Cranberry Hobby Depot
Cranberry Gardens Plaza
20327 Perry Highway
ELMHURST
The Hobby Hut
Route 435
ERIE
Maxwell's Hobby Shop
5014 Station Road
GETTYSBURG
Gilbert's Hobby Shop
230 Stevenette Ave.
PH: 717-334-5715
HUMMELSTOWN
The Hidden Hanger
145 S. Hoernerstown Road
LANSDALE
Penn Valley Hobby Center
837 West Main St.
MARS
Wildwood Hobbies
179 Mars Valencia Road
MONONGAHELA
Red s Model Plane Supplies
147 Taylor Run Road
MORRISVILLE
Z & Z Hobbies & Crafts
229 Plaza Blvd
#22 Pennsbury Plaza Center
PH: 215-736-3351
MUNCY
Tony's R/C Hobbies
RD2, Box 273
N HUNTINGDON
High Tek Hobbies
13380 Rte 30, Ladonna Village
QUAKERTOWN
J & D Whistle Stop
Quakertown Plaza S.C
READING
Iron Horse Hobby House
60 South 6th St

READING
Ott s Hobbies
536 N. 10th St
SUNBURY
Rachau's Wings & Things
136 S. Street
TAMAQUA
Pete & Wheels Hobbies
138 W Broad St
WARMINSTER
J.C. R/C Hobbies
13 York Road
PH: 215-672-5200
WILLIAMSPORT
Growing Tree Toys & Hobbies
115 West Third Street
YORK
Mel s Hobbies
835 East Market St.
YORK
Shelly Sporting Goods
2227 W Market St

SOUTH CAROLINA
GREENVILLE
The Great Escape
1426 Laurens Road
MT. PLEASANT
Randy s Hobby Shop
515 Coleman Blvd
PH 803-884-7411
MYRTLE BEACH
Ed's Hobby Shop
702 Main St
PH: 448-6665
PELZER
Miley's Hobbies
Highway 247
ROCK HILL
Rock Hill Hobbies
1204 Mt. Gallant Road
SIMPSONVILLE
Golden Strip Hobbies
551 Fairview Road #111
YORK
Bethany Hobbies
2388 S. Hwy 161
PH 803-222-2758

SOUTH DAKOTA
ABERDEEN
Allen's
406 S Wilson
RAPID CITY
RCA Hobbies
Route 8, Box 1270
PH: 605-787-6858
WATERTOWN
Hallon s Hobbies
Route 2 Box 14

TENNESSEE
COVINGTON
M H Supply
114 East Shopping Center
KNOXVILLE
M & H Hobbies
1923 Brandville Rd
PH 615-525-7532
KNOXVILLE
Tennessee Model Hobbies
8808 Oak Ridge Hwy
PH: 615-482-2900
OAK RIDGE
Ridge Handicrafts, Inc
205 Jackson Sq

TEXAS
AUSTIN
Command Hobbies
6929 Airport Blvd., Ste 148
AUSTIN
Hobby Town U.S.A
Brodie Oaks Shopping Center
4107 Capital of Texas Highway
BELLAIRE
I and I Hobby Center
6707 Chimney Rock
EL PASO
Hall's Hobby Warehouse
1440 Bessemer
PH: 915-591-2213
FARMERS BRANCH
Bold Hobbies Inc
101 Valwood Village Shp Ctr
PH: 214-241-8492
HOUSTON
R/C Hangar
17550 W Little York
HURST
Roy's Hobby Shop
1309 N. Norwood
JASPER
Jasper Hobbies
120 N. Austin
LONGVIEW
Leslie s Hobby Shop
2726 Gilmer Road
McALLEN
B & B Hobbies
521 So. Main St
ODESSA
Odessa TV Video Clinic
805 N Jefferson
PH: 915-332-2831
ODESSA
The Windsock Hobby Center
Crestwood Shopping Center
3519 N. Dixie
PH: 915-363-0300
PORT LAVACA
The Plane Shop
1808 Jackson St.
POTTSBORO
Airplane & Boats Galore
219 Franklin Street
SAN ANTONIO
Clayton Hobbies
5707 E. Mobud
SULPHUR SPRINGS
Hudson s R/C
508 Merrill Drive
WESLACO
Stanford R/C Hobby Shop
260 S. Texas

VERMONT
NO. FERRISBURG
Yandow s House of R/C
Route No 7

VIRGINIA
RICHMOND
The Hobby Center
The Shops at Willow Lawn
STERLING
Doug s Hobby Shop
Parc City Centre - Route 7

WASHINGTON
BELLEVUE
R/C Model Shop
14010 N E. 21st St
PH: 508-747-9914
BELLINGHAM
Hobby Haus
703 W Holly
PH: 206-734-4090
BURLINGTON
Performance R/C
328 E. Fairhaven Ave
PH: 206-755-9464
ISSAQUAH
Abernathy's Northwest Hobbies
1175 Gilman Blvd Ste 1813

PUYALLUP
All Hobbies
1430 E Main Suite D
SEQUIM
Fred s Hobbies and Guns
349½ W. Washington
SPOKANE
R/C Hobbies of Spokane
W. 1104 Wellesley
TACOMA
All Hobbies
Narrows Plaza
2310 Mildred W
YAKIMA
Model Aircraft Supply Center
508 N 20th
PH: 509-453-8238

WEST VIRGINIA
CHARLESTON
Fountain Hobby Center
200 W. Washington St

WISCONSIN
APPLETON
Gateway Science & Hobby Center
756 Northland Mall
FOND DU LAC
Focus
75 S Main St
GREEN BAY
Modelcraftsmen Division of
Woodcraftsmen Wood & Tool
1807 7th St
PH: 414-498-0208
HOLMEN
SUBWAY
W7563 St. Cross Ave
MADISON
Hobby Craft of Madison, Inc
6832 Odana Road
WALDO
Kwik-Stik Hobbies
104 S Main
WAUKESHA
ABC R/C, Inc.
14418 East Main St.
PH 414-542-1345
WAUSAU
Pops s Hobby Land
640 South 3rd Ave
PH. 715-842-4371

CANADA
BAWLF, ALBERTA
Alberta s Littlest Airport
Box 6 PH 403-373-3953
CALGARY, ALBERTA
P M S Hobby Craft
154-485 38th St N E
MILLET, ALBERTA
Sunset Radio Control
P.O. Box 716
DUNCAN, B C
Rita Bros' RC Supply & Access
1098 B Canada Ave
VICTORIA, B.C.
Royal Oak Hobbies
Royal Oak Centre
BRANDON, MANITOBA
R/C Hobbies
48 Confederation
WINNIPEG, MANITOBA
Cedar Dealer Hobby, Ltd.
1054 Main St
PH 204-589-2037
ST JOHN'S NFLD
Capitol Hobby Centre, Ltd.
6 Freshwater Road
BURLINGTON, ONTARIO
Skycraft Hobbies Inc
141 Plains Rd W
PH 416-529-0556
800-263-9331
COURTRIGHT, ONTARIO
Plane Crazy
426 #80 Highway, RR1
PH 867-3102
KITCHENER, ONTARIO
Rita Craft Model Co
1585 Victoria St N
LONDON ONTARIO
Rita 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
1675 Lawrence Ave. E
PH 416-755-1788
WILLOWDALE, ONTARIO
Kash's Hobby Shop
5205 Yonge St
PH 222-4721
CHARLOTTETOWN, P.E.I
Jim's R/C Supply
132 Nassau St
PH 902-368-1855
FLEURIMONT, QUEBEC
Shak-Hobby
1085 12th Ave Nord
LAVAL, QUEBEC
Carl's Hobby Shop Ltd
1500 Cure Labelle Blvd.
Chomedey
ST GEORGES BEAUCE, QUE
Plans Bureau Enr
12515, 1ere ave est Ville de
ST MARTIN BEAUCE, QUE
Plane-Temp 107
107-1 Ave CP97
VILLE ST. LAURENT, QUE.
Hobbieville
902 Decarie
PH 514-744-8280
REGINA, SASKATCHAWAN
Aero Specialties
200 Shannon Road
SASKATOON, SASKATCH
RC Hobby World
108 - 2301 Ave C North
Hascamp Centre
PH 306-652-4775

AUSTRALIA
KIRRAWEE 2232, N.S.W
The Hobby Headquarters
Unit 14/10 Yalgar Road
PH: (02) 545-1944

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

NEW ZEALAND
HASTINGS
Hastings Model Supplies
523 Fredrick Street

THE NETHERLANDS
DEN BOSCH
P Toemen Model Shop
Minderbroedersstraat 32
PH 073-140104

NORWAY
PORSGRUNN
B.S. Hobby Import
Lyngv 3c

SWEDEN
S-671 02 HARNOSAND
Model Produkter AB
Box 2060

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

WORK BENCH

BY BILL NORTHROP

SO LONG, WALT

Last month we published a last-minute announcement in this column that Walt Schroder died on June 4. There was no time then to prepare a thorough memorial to Walt, who was a leading participant in the postwar era of the model airplane hobby. Even now, with more time for preparation, it is difficult to sum up all of Walt's widespread contributions and activities in the hobby.

In his early career, before the hobby became a full-time business, he was involved in aircraft seat design. The various aspects of comfort, utility, and particularly safety, took this aspect of industrial design far beyond merely creating something to sit on!

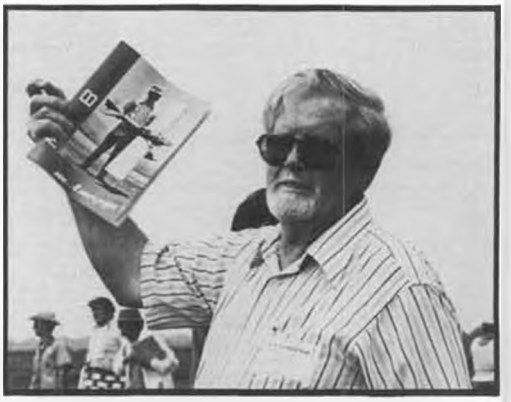
In 1945 and 46, Walt had become Assistant Editor of *Air Trails* magazine, working with veteran aviation editor, Bill Winter. In 1947, he joined Eagle Model Aircraft Co., where he designed and manufactured model airplane kits. One of his well-known designs was the "Dreamer," a twin-boom control line model. He was also involved with free flight and early radio control designs. His free flight Jersey Javelin, named after his Newark, New Jersey birthplace, was one of his better known creations. He was also involved with the manufacturing of the small Mite diesel engine for free flight models.

In 1960, Walt took on the job of Editor of *Model Airplane News*. While he was there, along with the steady growth of radio control, he never forgot the roots of the model airplane hobby, and kept a steady flow of free flight and control line material in the magazine, which continued until soon after he left the company. Also while at M.A.N., Walt became known world wide for his modeling activities and promotion of the hobby, and was constantly "on the road," visiting modelers, clubs, and shows all over the country as well as overseas. He played a major roll in arranging the affiliation of the model airplane industry with the HIAA, Hobby Industry Association of America. Walt received many honors and awards for his devotion to the growth and good will of the hobby. He was a life member of AMA and also a member of its Hall of Fame.

In 1974, Walt Schroder and Bill Bennett, of the Circus Circus Hotel-Casino-Spa in Las Vegas, co-founded the International Tournament of Champions and put on the first of these historic T.O.C.s in December of that year. It has gone on to be the most prestigious radio control competition event, regardless of category, ever since, drawing as much attention from modelers and industry as any world championship competition.

Walt left M.A.N. in 1979 and joined *Model Builder* magazine as publisher and business manager, moving to California, while maintaining his longtime home in Bedford Village, New York, just north of White Plains, site of the annual WRAM trade show. After retiring in mid-1981, he and his "Team Manager," wife Susan, returned to Bedford Village, where he spent his last years.

The new Kalt "Whisper" electric RC helicopter, coming soon from Hobby Dynamics Distributors. More info in text.



This photo of Walt Schroder was published in our January 1973 issue, in which he graciously held up a copy of his competitor's magazine. Actually, Walt was heavily responsible for this editor's entry into publishing. Thanks Pops... I think!

"Name That Modeler." From the Bev Smith photo collection. Send us a postcard or letter if you know his name. Earliest postmarked correct answer earns an Uber Skiver knife set. The June photo was of John Worth, recently retired Executive Director of AMA, taken shortly after his discharge from U.S. Air Force, circa 1945-6. Earliest correct answer to be announced in next issue.

WELL DESERVED

Congratulations to *Model Builder's* "Free Flight" columnist for many years, who has been appointed District Superintendent of Schools in the Albany, Oregon area, as of July 1, 1990. In a 5-0 vote by the School Board, Dr. Robert D. Stalick was unanimously approved for the position.

Bob began his career in education as a teacher in Albany schools in 1960, teaching English, speech, theater arts, and creative

writing at Albany Union High School. He also directed dramatic productions at the school. He was assistant principal in 1969. When South Albany High opened in 1971, he became that school's assistant principal. He moved into administration as director of instruction in 1972, and in 1979 became assistant superintendent in charge of development, implementation, and evaluation of all district instructional programs.

Bob graduated from the University of Oregon in 1960, earned his master's degree in 1969 from Oregon State University, and his Ph.D. in 1982 from the University of Oregon.

Sure glad Bob found time to keep up his free flight activities and write a column every month while all that stuff was going on!

MODEL BUILDER TV "JERK" AWARDS

A recent commercial we saw on TV has prompted us to establish a new "Model Builder TV *JERK* Award." This dubious award will be presented on an irregular time schedule, and will be bestowed on whatever TV program or commercial that is aired to the public, which in our opinion, is detrimental, misleading, inaccurate, demeaning, or just plain stupid as it relates to the fine sport/hobby of radio control modeling. Any information on possible nominees for this award are indeed welcome!

The TV commercial which triggered the establishment of this "JERK" award, and is thus the well-deserved and premier recipient of this dubious honor, was for Citibank Credit Cards, The commercial tells us about a father who has purchased, with his Citibank card, a radio controlled airplane kit and radio system. He's going to build this airplane and give it to his son to fly. No mere trainer either, this is a gung ho, fully aerobatic, .60 powered aircraft which experienced RC modelers would instantly recognize as the very popular Aeromaster Biplane, originally designed and kitted by Lou Andrews and now produced by Great Planes Model Mfg..

Following a brief glance at the uncovered fuselage during construction, we are next shown the son, obviously excited and filled with anticipation, wiggling the sticks on the transmitter... you may have guessed it... this kid probably isn't old enough to register for kindergarten! In fact, he's not much older than that little devil we've all seen in another commercial, stuffing oatmeal into his father's new VCR, also purchased on a credit card.

Now, are you ready for this? In the final scene, this airplane is shown flying off into the sunset because of some miraculous control malfunction that is managing to keep it in stable flight although it cannot be brought back! But fear not, because as the announcer confidently states, dear old Citibank will *replace* the recalcitrant airplane and the airborne equipment!

So there, all you newcomers to RC! Go out and buy the hottest, most advanced model airplane and radio of your dreams and pay for it with your Citibank credit card,

continued on page 106

DEAR JAKE

ADVICE FOR THE PROPWORN—BY JAKE

Dear Jake:

I belong to the Delta Valley Modelers. A club member tells me I need a dolly for my new speed U-control job.

Does this mean I can use the girl up the street, since she is known as "Eager Ernestine"?

Wayne from Stockton

Dear Wayne:

You've got the wrong idea entirely. Your fellow club member was no doubt referring to the use of a doll as a model pilot to dress up the scale appearance of your airplane. He seems a little off base, however, because most ukie speed ships I've seen don't even have a cockpit.

This kind of misinformation is a perfect example of why you should stick to the experts, such as myself, for your advice.

Jake

• • •

Dear Jake:

Our club likes to participate in community activities in order to foster the reputation of the model aircraft hobby and to recruit new model aviation enthusiasts. Consequently, we appear at a lot of children's functions.

Last week we made a presentation to Sister Marietta's third grade class at the Immaculate Conception School. We brought in some airplanes, showed some videotapes, and spoke about the thrills of building and flying.

Sadly, the school grounds weren't large enough for a flight demonstration. But Stewart Fontenescu, our club treasurer and an amateur mime, saved the day by concluding the presentation with a mime performance entitled, "A Day at the Flying Field."

The little ingrates beat him to a pulp with their Care Bear lunch boxes.

Ed in Syracuse, New York

Dear Ed:

Good for them. Maybe Stewart should have tried "rap."

• • •

Dear Jake:

Are nylon bolts better than rubber bands?

Gus in Brooklyn, New York

Dear Gus:

Depends on how you plan to use them. If you mean to attach your wing to the fuselage, nylon bolts work great. If you're talking about a motor strand for a rubber powered model, nylon bolts don't work very well at all.

Jake

• • •

Dear Jake:

Is it possible for aerions to leak out through a hole in the covering? My scale rubber power free flight crashed the other day and there was absolutely nothing wrong with it, except for a small tear in the silkspan. The model wasn't old, so there should have been plenty of aerodynamic half-life left. What do you think went wrong?

Jerome in Jericho Park

Dear Jerome:

As you know, aerions will only float away upwards, so if the hole in your wing was on the lower surface, no aerions should have escaped (unless, of course, you stored the model upside down).

It is more likely that your silkspan lacked sufficient coats of dope to prevent aerion loss by osmosis. You must be very careful to fully seal porous covering materials like tissue, silkspan, and silk.

A neighbor of mine covered his Senior Telemaster with a bedsheet and brushed on several coats of driveway sealer. He apparently failed to eliminate the fabric's porosity, however, because the 79-pound airplane would not fly. And to show you the contrast of what a good covering job can do for you, consider Burt Scales. Burt opened a can of aerions in a Scotch-Guarded pup tent and hasn't been seen since, except on radar.

Jake

• • •

Dear Jake:

I've heard that the spirit of the Pony Express lived on in the early Air Mail pilots. Is that true, and if so, why?

Brad in Flossmoor, Illinois

Dear Brad:

There is no truth to that romantic nonsense about the early Air Mail system being a throwback to the Pony Express. The old biplanes used on the first mail routes were neither large enough nor powerful enough to carry a horse.

Jake

• • •

Dear Jake:

At the Air Force Museum in Dayton, Ohio, there's a B-24 named the "Maggie Dowling." I've collected extensive literature on the B-24 and none of it contains any reference to this particular aircraft.

Is this aircraft a legitimate historical warbird, or did some museum restoration worker decide to put his girlfriend's name on it?

Bomber Buff in Butte, Montana

Dear Buff:

The "Maggie Dowling" is 100 percent authentic. Its historical obscurity is not surprising, however, given its war record.

The "Maggie" started its service as a trainer aircraft in New England in 1942. Toward the end of the war in Europe, it was converted to cargo status and made one ill-fated supply run to Great Britain.

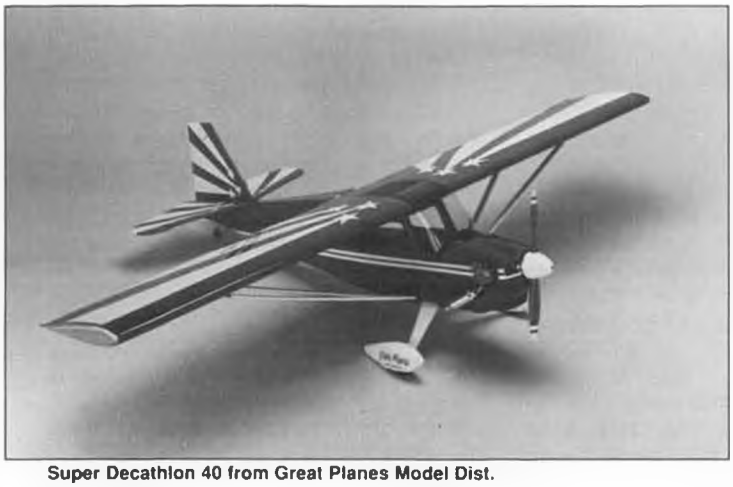
The second officer, a Lt. Roger Dowling, had stowed away his spinster Aunt Margaret on the flight. Margaret Dowling, a librarian from Boston, had such a love for English literature that she had convinced her nephew to sneak her on board and deliver her to the

continued on page 48

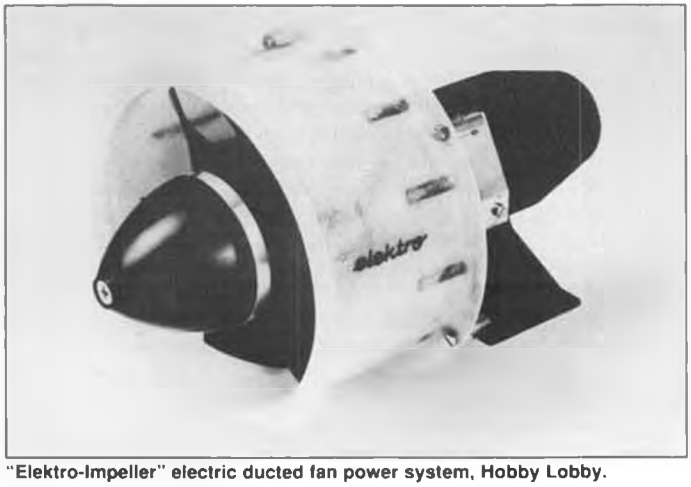
OVER THE COUNTER

Hobbico transmitter carrying case from Great Planes Model Dist.

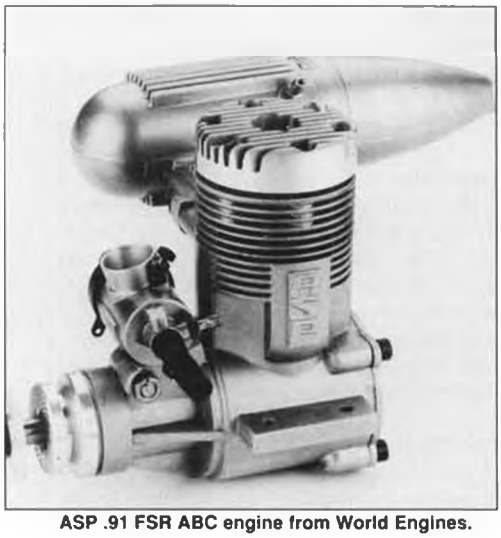
Heading up our new products showcase this month are a couple of new items from Great Planes Model Distributors. First is the Super Decathlon 40 kit produced by Great Planes Model Mfg. Co. We're not sure, but without having a photo of the full-size ship by which to compare it, we'd say the model appears to be very close to scale. Span and overall length are given as 64 and 45 inches respectively. Recommended power is a .40-.46 two-stroke or .48-.70 four-stroke. Construction is conventional balsa and plywood, and included in the kit are a pre-formed aluminum landing gear, molded ABS plastic cowl and wheel pants, and molded clear plastic windshield and side windows. Retail price is set at $99.95. It looks like it should be an outstanding aerobatic performer, especially when powered by one of the larger four-strokes such as an O.S. .70 Surpass. We'll know for sure pretty soon, as we received one of the Super Decathlon 40 kits here at the *MB* office and have already sent it out to be built and tested—look for a review on it in an upcoming issue.



Super Decathlon 40 from Great Planes Model Dist.



"Elektro-Impeller" electric ducted fan power system, Hobby Lobby.



ASP .91 FSR ABC engine from World Engines.

EGAS II on-board glow driver from World Engines.

Also new from Great Planes is the Hobbico transmitter carrying case, made in two sizes to hold either one ($64.95) or two ($79.95) transmitters. The case itself is made of aluminum, with foam lining in the lid and a foam padded interior to support the transmitter(s). In case you have a transmitter of unusual size or shape, extra foam pads are included to allow you to do your own custom fitting. These cases appear to be an excellent means of protecting today's highly sophisticated—and expensive—radio equipment.

From Great Planes Model Distributors, 1608 Interstate Dr., Champaign, IL 61820.

• • •

Ducted fan jet models are becoming a common sight at fields all over the country, and if Hobby Lobby has anything to say about it, soon you'll be seeing *electric powered* fans performing right alongside the alcohol-burners. That's right, Hobby Lobby is now importing the "Elektro-Impeller" electric fan unit produced by Bauer in West Germany. As far as we know, this is the first commercially produced electric fan to be offered to the modeling public. The Elektro-Impeller measures 9 inches long, 6-1/8 inches outside diameter, has a 4-7/8 inch diameter fan, and weighs in at 13 ounces without the motor. Speaking of motors, the unit is designed for those capable of putting out 1000

MiG-15 kit designed for the Elektro-Impeller, Hobby Lobby.

Pro Charge Dual Multi Charter from World Engines.

Multi Cylinder Glow Driver from World Engines.

Violett Supply catalog.

watts for short periods—typical examples are the Astro Cobalt 40 and 60, and the Ultra 1600, Ultra 2000, and GT300/10 motors handled by Hobby Lobby. Thus powered, up to 9 pounds of thrust is available. A typical flight, according to the press release, would have the motor producing 1000 watts at 16,000 rpm for about one minute for takeoff and climb, then the motor would be throttled back to 300 watts and 11,000 rpm for about four minutes' worth of level flight.

Inside the motor housing are metal straps that secure your motor in place. A two-leg base is provided for mounting the fan unit in an airplane. As with any ducted fan system, proper ductwork to and from the fan is essential for optimum performance and must be carefully thought out when designing a model for the Elektro-Impeller.

SoftMounts, by Software Associates.

You say you'd like to give electric fans a try but don't want to go through the exercise of designing your own ship? That's OK too, because Hobby Lobby is also offering Bauer's semi-scale MiG-15, made specifically for the Elektro-Impeller fan unit. It features a very light epoxyglass fuselage with interior ductwork already in place, as well as obechi sheeted foam wings and fixed landing gear. Wingspan is 58 inches, length is 55 inches, wing and stab area together add up to 713 square inches, and the all-up flying weight comes to about 9 pounds.

Both the Bauer Elektro-Impeller and MiG-15 kit are fully described in Hobby Lobby's new catalog #16, which is free for the asking. Write to Hobby Lobby International, 5614 Franklin Pike Circle, Brentwood, TN 37027, or call (615)373-1444.

• • •

Zenith Books has two new hardbound titles that WW-II aviation history buffs are sure to want to add to their libraries. Unfortunately we haven't received review copies before press time so we can't give a firsthand personal impression of either one, but will do the next best thing and just quote straight from the information sent to us by the publisher.

Battle of Britain was written by Alfred Price, has 96 pages in an 8-1/2x11 format, and is priced at $9.95. Here's what the publisher has to say about it:

"Although outnumbered three to one, the courageous pilots of the Royal Air Force managed to inflict losses on the enemy that stacked heavily in their favor. It was an historically decisive encounter. The stakes were very high, and there were three months of hard fighting before the enemy was finally beaten back.

"This, the first campaign ever to be fought solely between two opposing air forces, remains the definitive military encounter of its type. It is above all a human story that will fascinate all World War II buffs and military aviation enthusiasts today.

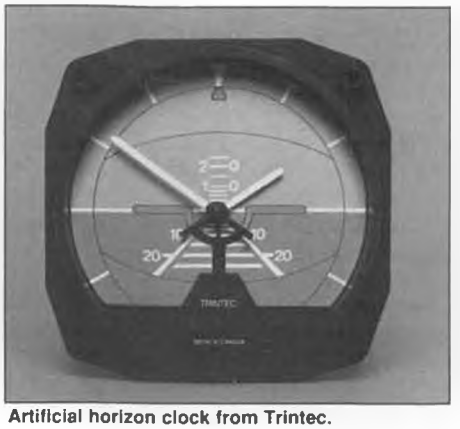
"1990 marks the fiftieth anniversary of the Battle of Britain, making the telling of this story more appropriate than ever. Nearly 200 wartime photos provide a stunning side bar to the tales within."

The other new release is called *Fighters of the Mighty Eighth 1942-1945,* by William N. Ness and Thomas G. Ivie. This is a much larger work, with 272 pages, 8-1/2x11 format, and priced at $39.95. The description reads as follows:

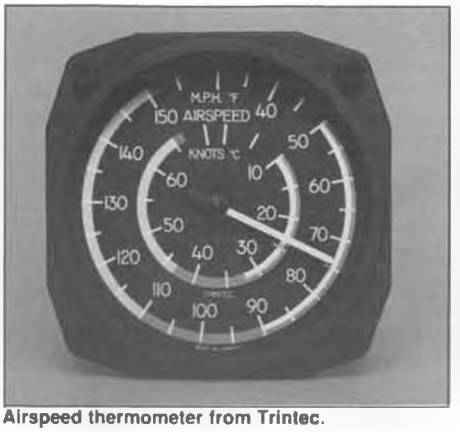
"The Eighth Air Force was the largest fighting force ever assembled. At the start of World War II it numbered nearly 350,000 men, by mid-war it had dwarfed even that amazing figure. Of all the men and all the units, none were more glamorous than the fighter squadrons. Yet, a highly detailed account of their operations has never been published. *The Mighty Eighth,* by Roger A. Freeman told the story of the operations of

Altimeter clock from Trintec.

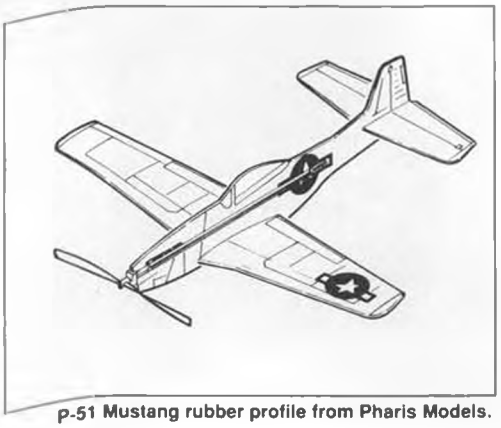
Directional gyro clock from Trintec.



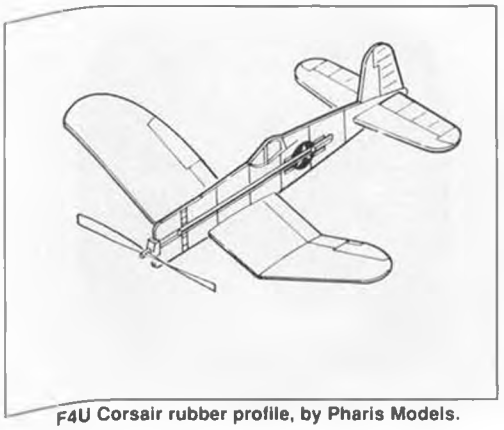
Artificial horizon clock from Trintec.



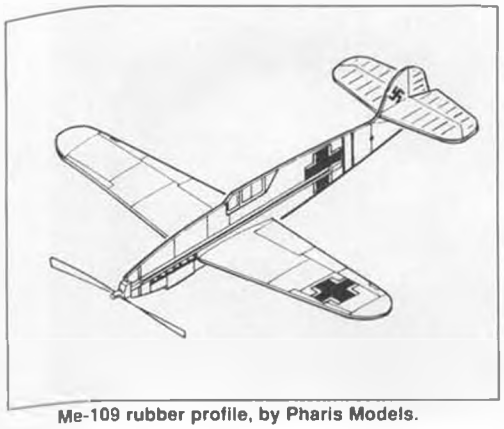
Airspeed thermometer from Trintec.



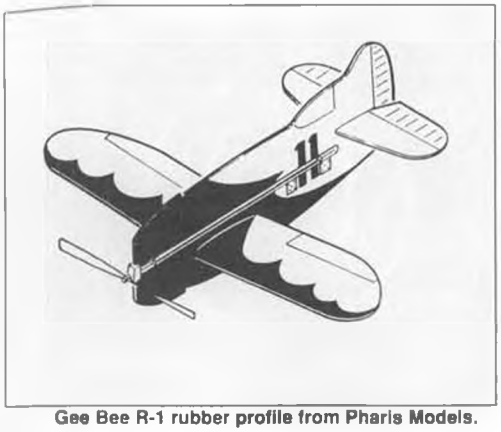
P-51 Mustang rubber profile from Pharis Models.



F4U Corsair rubber profile, by Pharis Models.



Me-109 rubber profile, by Pharis Models.



Gee Bee R-1 rubber profile from Pharis Models.

the Eighth's bomber squadrons and has been acclaimed as one of the greatest histories of the war. Now, *Fighters of the Mighty Eighth 1942-1945* tells the story of the fighter squadrons.

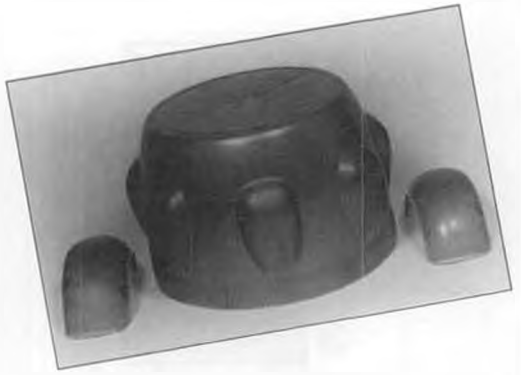
"*Fighters of the Mighty Eighth 1942-1945* is an in-depth narrative history of Eighth Air Force Fighter Command Operations. It vividly describes the battles, the missions, the wins, and the losses, of every fighter squadron in the Eighth. Chronicles, day by day, their operations throughout the war in photos and a fascinating text. The extensive appendices describe the diverse markings of the various fighter groups and includes tables of information on the top aces, aces in a day, strafing aces, jet victories, and more."

Both books are available now from Zenith Books, P.O. Box 2, 729 Prospect Ave., Osceola, WI 54020. You can also order toll free by calling 1-800-826-6600.

• • •

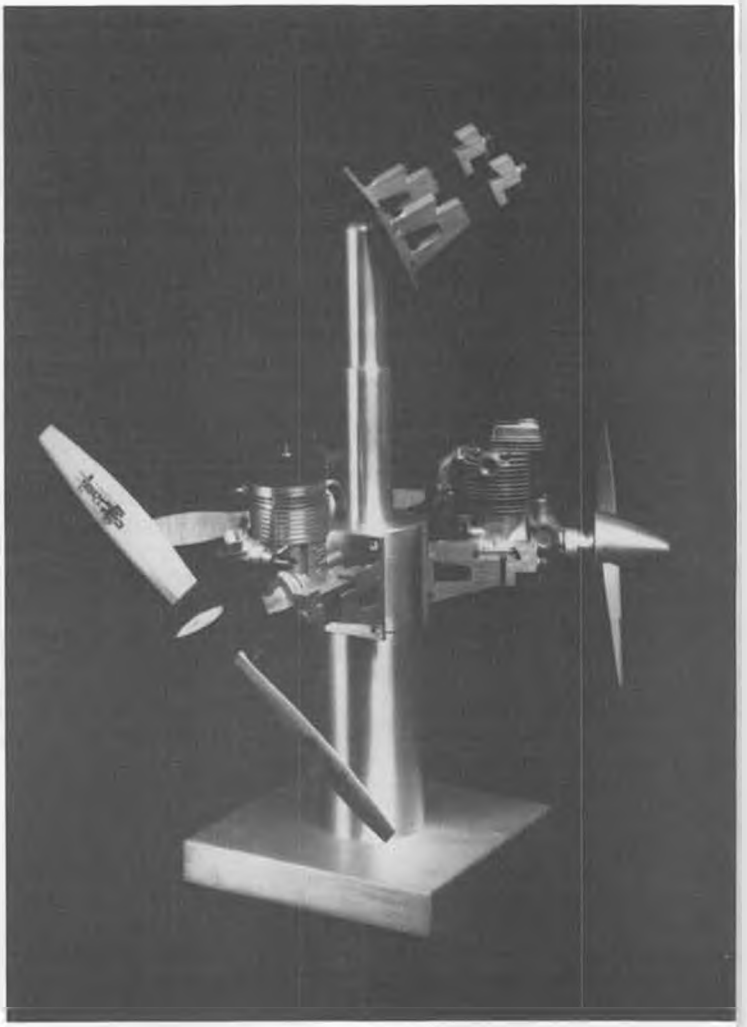
World Engines has added a .91 size FSR ABC powerplant to its line of imported ASP engines. A good choice for most models requiring a .75 to 1.08 size glow engine, the ASP .91 boasts Schnuerle porting, dual ball bearings, an ABC piston/cylinder assembly, a new design carb, and muffler. Suggested retail price is a very reasonable $189.95.

Also from World Engines is the Pro Charge Dual Multi Charger, which is unusual in that it can simultaneously charge two battery packs of up to 12 cells each from standard house current (110 volts AC). Both charging circuits are independent and have separate current adjustments. Also, both battery terminals are protected from reverse polarity installation. A voltmeter can be used via the voltmeter jacks on the front panel. The charger comes with a five-year limited warranty, and is priced at $109.95. One last noteworthy feature: the charger and all of its major components are made in the U.S.



Bucker Jungmeister cowl and wheel fender set, Fiberglass Master.

Need an on-board glow plug driver? World Engines now offers two electronic units, the small EGAS II ($44.95) for single or twin-cylinder engines, and the larger Multi Cylinder Glow Driver ($109.95) for one to five cylinders. Since these are electronic devices, there are no mechanical actuation or in-line switches required—they work right off the receiver, just like a servo, and in fact are wired into the throttle channel via a Y-harness to work in conjunction with the



Universal Adjustable Engine Mount, by West Coast Engines.

"Top Gun" jet pilot bust by MGA Enterprises.

• • •

Recognizing the need for high quality, unique scratch building and kit enhancement products, Bob Violett Models has formed a separate division called Violett Supply. Many of the items offered are the same as those supplied in BVM jet model kits—so you know they *have* to be the very best accessories available, right?

The Violett Supply product line includes the following:

Building materials—Balsa wing skins in 1/16x12x41 and 1/16x14x47 inch sizes, "Mighty Lite" premium grade plywood, Pacer Tech adhesives, "Poly Ply" fiberglass laminate, and "Magnalite" composite building materials.

Equipment—The complete Viojett injection molded accessory line, and BVM carbon fiber molded retracts.

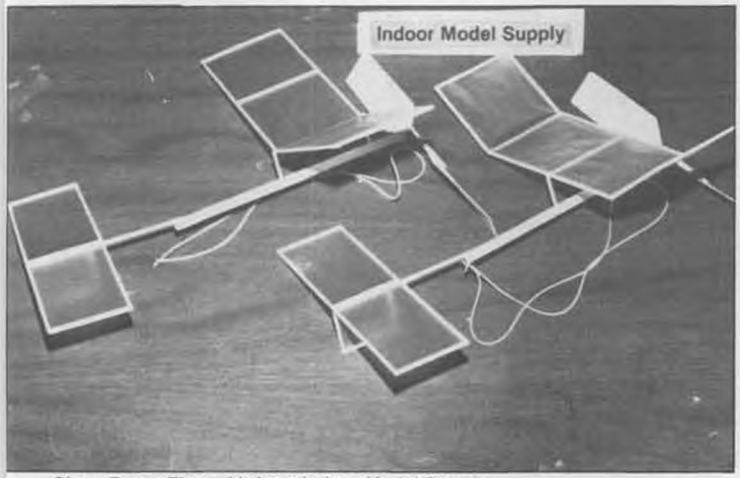
Finishing products—Fascal covering film, K&B Super Poxy in larger, more economical quantities, water transfer decals, and rub-on rivets.

All of these products are fully described in Violett Supply's complete price listing and "how to" catalog, available for $3.50 from Violett Supply, 1373 Citrus Road, Winter Springs, FL 32708, or call toll free 1-800-899-1144 to charge by phone.

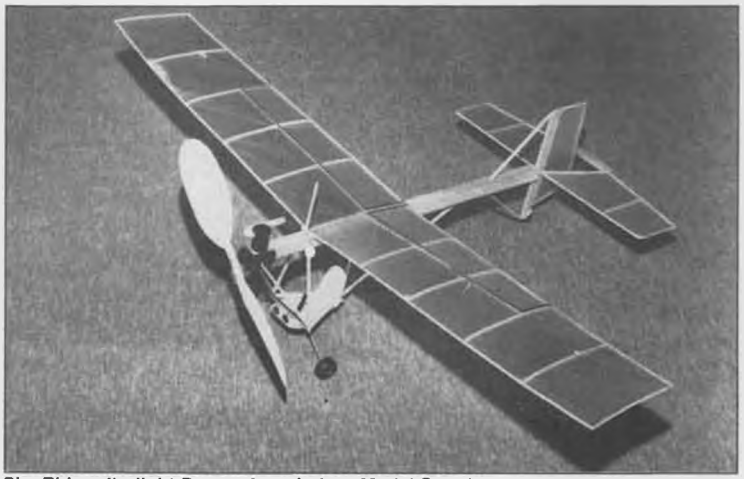
• • •

A nifty way to dress up your workshop and add to its "aviation atmosphere" at the same time is with one of the great looking aircraft instrument clocks made and distributed by Trintec Industries. Actually there are three different clocks—with faces resem-

continued on page 48



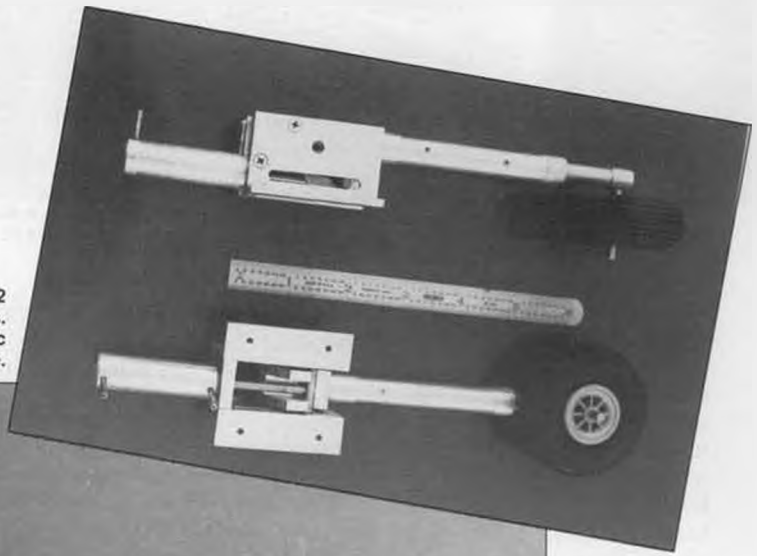
Class Room Flyers kit from Indoor Model Supply.



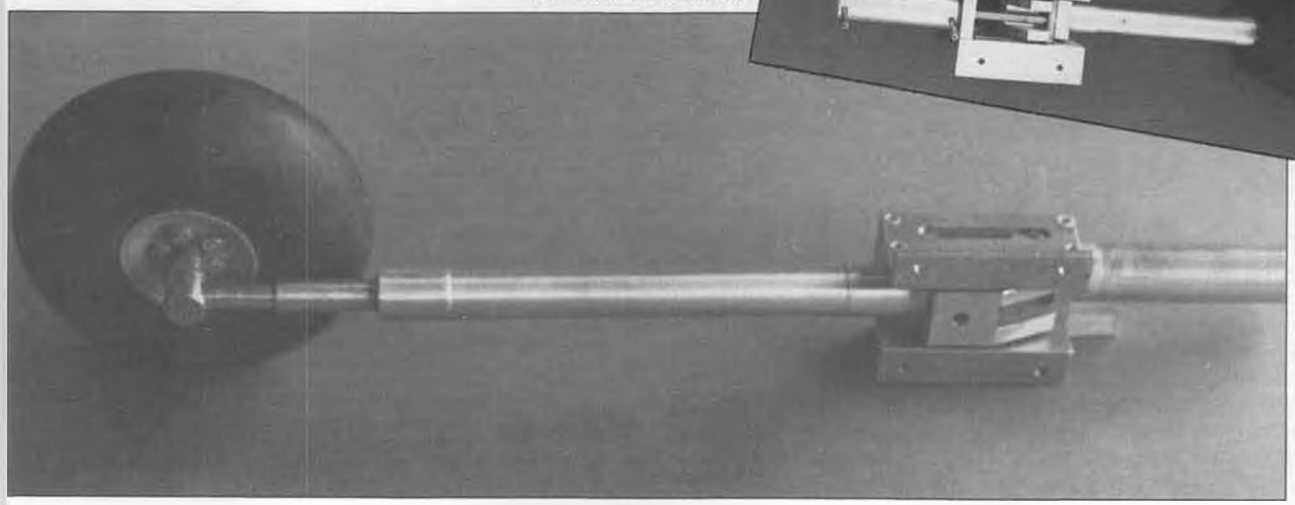
Sky Rider ultralight Peanut from Indoor Model Supply.

throttle servo. Each requires its own separate power supply—one or two sub-C NiCds, depending on the unit. Both feature an adjustable power zone, indicator light for easy setup, and a reversing switch. The Multi Cylinder Glow Driver also has an LED strip to show the condition of each glow plug. Physically, the EGAS II measures 1-1/4x2x5/8 inches, whereas the larger glow driver is 2-5/8 inches square by 3/4 inch deep.

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



(Right) Robinaire LG-2 pneumatic retracts. (Below) LG-3 pneumatic retracts from Robinaire.



BIG BIRDS BY AL AMAN

DIESEL-POWERED DUCTED FAN!

John Whitmore couldn't be more pleased with his scratch-built F-4 Phantom ducted fan, which is all the more unusual in that it is powered by *a diesel converted* Rossi .65—see text for details. The airplane performs well in spite of the fixed landing gear.

Back in the early part of April, Connecticut's John Whitmore flew the first diesel-powered ducted fan.

The 11-pound F-4, scratch-built by John, was powered by a Davis Dieselized Rossi .65 taching a very impressive 19,000 rpm. Bob Davis sent me a videotape of that first flight and it was obvious that in spite of its fixed landing gear, this bird really moved along. The prototype F-4 is 59 inches long, spans 54 inches and has 1100 square inches of lifting area. The dieselized Rossi 65 was mated with a Byron fan unit and utilized a Davis Iso-Mount and SoundMaster High Performance Quiet Pipe.

Typical of diesel conversions, this installation offers a number of advantages when compared to glow operation. We're talking about more rpm, cooler running, less noise and, because the dieselized engine burns barely half the amount of fuel, a choice between either a much lighter airplane or over twice the flying time (she carried 22 ounces of juice which could have yielded a 22-minute flight).

Shortly after I received the video, the same F-4 flew with a dieselized Rossi .90 turning 21,000 rpm. This is serious stuff! There was an expected increase in speed but the *big* difference was in vertical performance, which is now virtually unlimited.

And a diesel coupled with an effective quiet pipe should help to eliminate the main complaint about fans: the screaming, irritating noise. Many Big Bird Fly-Ins don't include ducted fan aircraft because of this extreme noise factor.

In truth, even glow-powered fans can be made much quieter than they are, because suitable pipes are available. I think perhaps that it's the old "Macho Syndrome" again—that some fan-jet people just like to generate

Big Sky R/C's handy airplane hanger at rest. The foam-covered arms slip under the assembled model's wing roots, then the whole shebang is hung up on a hook. Very clever, and available in four different sizes.

as much noise as possible (some WW-II Heavy Iron types are also afflicted by the same malady).

This reminds me of the other ducted fan bugaboo I keep hearing about: that grass runways, regardless of length, can't be used. Now I'm having a hard time understanding this because back about 1980 I did a product review on a K&B .23-powered Midwest Jetster, and even though this relatively small fan-jet had a power-to-weight ratio of "only" 73% (without a pipe) and small wheels, I had no trouble getting her off a freshly-mowed strip. I'm told that the current generation of fans put out even more thrust (closer to 100%) so why do grass runways present a problem?

Anyhooo... to find out more about diesel-powered fans, contact Bob Davis, Davis Diesel Development, P.O. Box 141, Milford, CT 06460; (203)877-1670.

HAVE I GOT A DEAL FOR YOU!

Actually this offer comes from the Airtronics folks, who are encouraging the use of buddy-boxes. They're giving clubs a chance to purchase complete buddy systems, a state-of-the-art four-Channel Vanguard radio with a second (gutted) tranny that functions strictly as a student box.

Buddy-boxes have proven to be invaluable for instructing fledgling pilots. With a buddy system you eliminate the yelling, screaming, and stress that are built-in when the instructor has to hover over the poor bewildered beginner and be ready to grab the transmitter... because it's not a question of if the student's gonna screw up, it's a question of *when* he's gonna do it.

With a buddy-box the instructor is able to calmly and instantly switch control from one box to another as needed, very often saving a bird (many times on takeoff or landing) that otherwise would have dorked. This more relaxed method of instruction maximizes the student's quality flight time and allows him to gain sorely needed confidence much faster than he would by the "grab and fumble with the transmitter" method.

And how's this for a dandy price? Only $125.00, plus $2.50 for postage and handling, for each complete system (you can order more than one). Airtronics is selling these buddy-box systems to clubs *only* and requests that all orders be made on club stationery. Payment, in the form of a money order or a club check, must accompany the letter... and don't forget to specify the frequency(s). Airtronics, Inc., 11 Autry, Irvine, CA 92718; (714)830-8769.

HANGING AIRPLANES

Back in the April issue I offered some sketches and photos to show how I hung my birds. Those hangers were easily made from 1/2-inch PVC pipe and certainly didn't require any special engineering know-how or expertise.

Well, along comes Big Sky R/C (Lander Indust., 1005 19th Street Ct., Havre, MT 59501) with a hanger that is simplicity itself as you can see from the photo. And they're available in four different sizes: Small (20 to 40); Medium (40 to 60); Large (60 to 90); and X-Large (1/4 Scale) which has a maximum weight limit of approximately 25 pounds.

Dick Parshall's old 1/4-scale Gypsy Moth was built from Bill Northrop's plans that appeared in *MB* some years ago. It's since gone to Valhalla, so Dick is replacing it with a 1/3-scale size—also available in plans from *MB*.

Colorful Curtiss P-6E Hawk is just one of several large scale models available in plan form from Wendell Hostetler.

You just hang the hanger on a hook, and then place the assembled plane on its foam-covered arms... and there you have it. These hangers balance perfectly and the aircraft is protected by the heavy tube foam.

And if you'd rather store/display your birds on the wall, Big Sky R/C also has a wall hanger. You just attach this hanger to the wall at the desired height and then place the tail of your flying machine into its foam cradle for safekeeping. One size fits all.

FEEDING TIGRES

The big Super Tigres have been out for a number of years and have proven themselves to be honest engines. They're pussycats to start, dependable and put out a goodly amount of power. And with the right prop and a SoundMaster muffler, they are easy on the ears.

Their instructions, although translated from Italian in a quaint way, do clearly specify that low nitro and 10% oil is preferred... and, indeed, is what these engines are most happy with. In fact, a higher than 10% nitro content (actually 5% is best) and/or more than 10% oil will make a Tigre kinda cranky and reluctant to run right.

The reason for mentioning this is because of a number of letters about ill-behaved Tigres—and it turns out that in virtually every case the poor engines were being gagged by the high oil content of standard R/C fuels.

Here's an economical way to brew the right kind of fuel: combine a gallon of 15% nitro standard fuel with a gallon of methanol. You'll end up with two gallons of 7-1/2% nitro, 10% oil fuel. I've been feeding this very same mix to my big Tigres and four-strokers for the past eight years and they love it.

E-POWER

Just a short note to those electric power afficionados who dared/challenged me to

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R/C PRECISION AEROBATICS

BY RICK ALLISON

Last month I promised a short look at the future of R/C Pattern. This futurist stuff is always full of pitfalls and snags, being at best merely a bunch of SWAGs. For you nontechnical types, SWAG is an engineering acronym meaning Scientific Wild A—ed Guess. Only a fool attempts to predict the future, and only an idiot takes him seriously, right? Remember that before you write me those nasty letters!

Actually, what follows here is cheating. Most of the predictions I'm going to make are based on trends that are already up and rolling with a good head of steam.

As I believe I pointed out last month, major developments in pattern aircraft design in the recent past have included longer tail moment arms, larger stabs, larger control surfaces, and thinner airfoils. I don't believe that any of these trends have really peaked as yet, though we may be nearly maxed out in all of these areas as far as the numbers are concerned. Obviously, there are practical limits. No one is going to build an airplane that is longer than their car, for instance. Stabs need to be able to fit through standard doorways, servos need to be able to actually move the control surfaces, the wings need to have enough depth for the retracts to be fitted, and so on. Plus, there are some minor aerodynamic considerations to deal with here, like having to locate the balance point near enough to the wing so that the sucker will fly, and maybe distributing the draggy bits so that the pointed end stays pointed where you last pointed it until you point it somewhere else.

Seriously, look for more experimentation in the areas mentioned above. In recent years, composite materials have made large gains possible in airframe construction. Strength is up and weight is way down. These new materials have been a source of much inspiration for many designers, and I expect them to continue to be used in an innovative fashion. I know of at least one major pattern kit supplier who is now experimenting with all-Kevlar fuselage construction. I have heard of experiments with sheet fiberglass skinned and vacuum-bagged wings such as the glider folks use for slope soaring. Carbon fiber/balsa laminate is now replacing aircraft plywood in many applications. Vibration isolation engine mounting has seriously reduced several types of airframe structural loads, which in turn allows still lighter construction techniques to be tried.

A welcome trend of late has been a significant increase in the number of people attempting their own aircraft designs. I'm sure that a large component of this development

Part of the other side of the flight line at the 1989 Nats. Who says Pattern isn't a spectator sport?

Two of the more popular computer radios for Pattern are the JR Galaxy Computer 8 PCM (left) and the Futaba 1024A PCM.

Bells and Whistles Dept.: Note the split-rudder airbrake on Steve Rojecki's "Runaround," seen here being carried back to the pits by Don Weitz.

was the ridiculously long waiting lists some of the major pattern kit suppliers were running for the most popular designs. There are definite signs that this particular log jam is breaking up, so some of this design impetus will no doubt be lost. Still, designing, building, and flying your own airplane has become a more common and accepted thing to do than it was just a few years ago. A climate of creativity has been established that I think will be around for awhile, so look for the proliferation of new designs and designers to continue, at least for the near term.

I'm not sure if the era of the pattern ARF is just beginning or just ending. A lot depends on what I call the Porsche Syndrome, wherein a windshield wiper motor stamped "VW" costs $73.47, and the virtually identical part (different mounting lugs, right?) stamped "Porsche" lists for $413.92. Evidently it is possible to build and sell a .45 sized, 6 lb. sport ARF for about $200, while a .60 sized pattern ARF weighing about 2 lbs. more costs anywhere from $700 to $1000. Should a full-sized, light, decent flying pattern ARF ever become available in the $300-$400 range, I'm sure it would sell like rowboats during a flash flood. The offerings presently available either don't fit that description or that price, and I don't see their market share expanding. In fact, I see a lot fewer of them than I did just a few years back. In a way, this is too bad, because one of the biggest boosts this branch of modeling insanity could receive at present would be a decent, low priced, entry level ARF pattern machine. Is there a manufacturer out there who is listening?

Engine technology seems to be advancing rapidly. Even without an increase in the current displacement limits of .61 cu. in. for two-stroke and 1.2 cu. in. for four-stroke engines, we will see definite improvement in the power available for our airplanes in the not-so-distant future. The four-strokers would seem to have the edge here, because new applications of proven ideas like in-head rotary valve induction and supercharging could offer such obvious performance gains. I wouldn't sell the two-strokes short, however. Even if the gear drives don't make a comeback, a lot of performance can be had from a properly designed, low rpm timed, free breathing two-stroke engine. The O.S. Long Stroke and Y.S. Long Stroke are only the first of this new breed, and they have already had a considerable impact on model design. Also, there is much to be said for light weight and mechanical simplicity. Look for the new lightweight carbon fiber pipes to become more popular and more available for these engines.

If the four-strokes pull too far ahead in the power race, look for an adjustment in the displacement limits to even things out. Most probably, this adjustment will be in the form of an increase in the two-stroke limit, rather than a decrease in the four-stroke limit. I wouldn't look for this to happen anytime soon, however. Personally, I hope it doesn't

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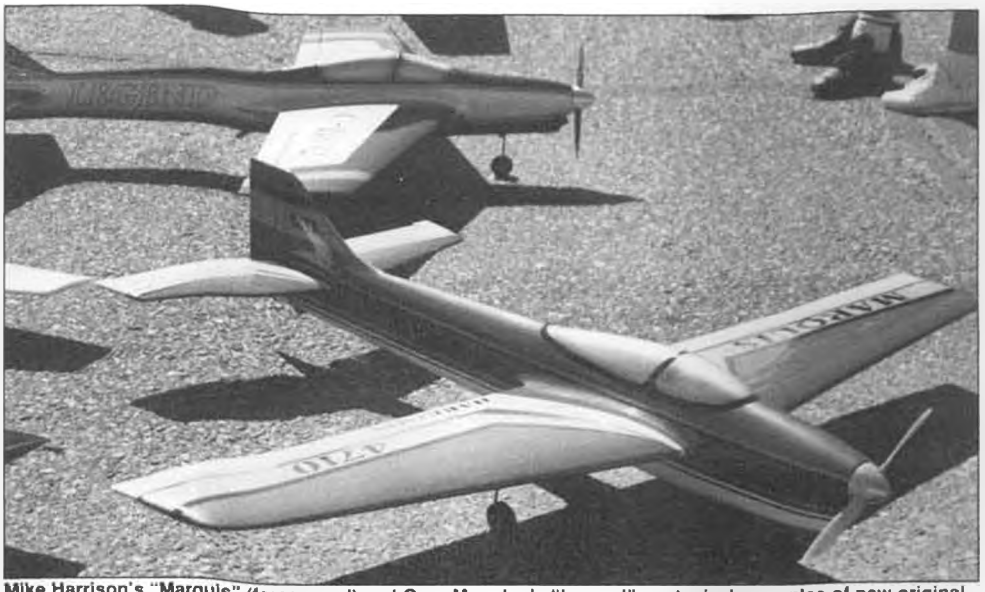


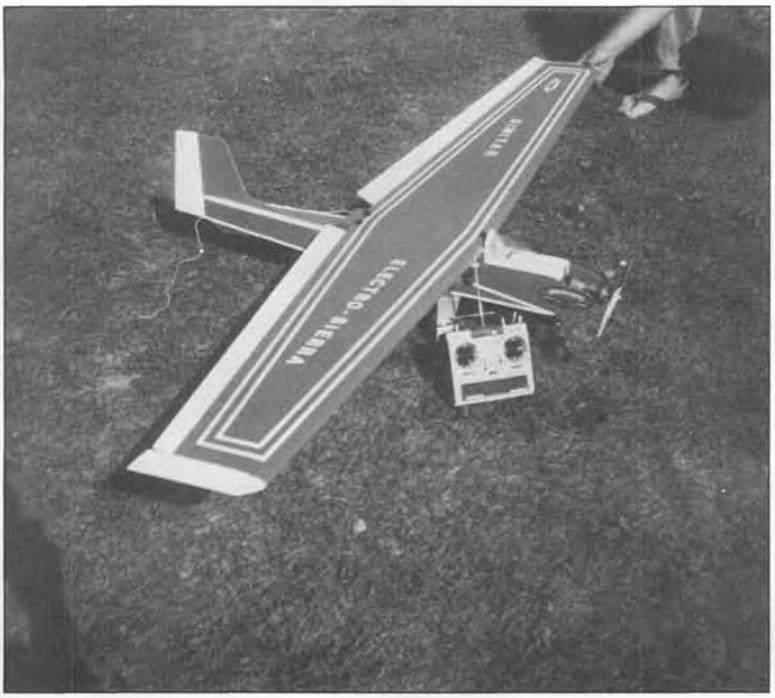
Mike Harrison's "Marquis" (foreground) and Greg Marsden's "Legend" are typical examples of new original Turnaround designs being seen in Pattern competition these days.

"Eclipse" designer Henry Piorun (center) surrounded by Eclipses at a recent WIRCS meet on Whidbey Island, Washington. Our columnist originally built the airplane in the left foreground; long since sold, it has now logged 1520 flights! Other fellows in the photo are, from left: Behzad Pakzad, Gus Ozols, Dale Moore, and Keith Varley.

Our columnist, with wife, in an aggressive mood. The aircraft is the same one as seen in the left foreground of the other photo, only about 1450 flights newer!

ELECTRIC POWER

BY MITCH POLING



Gordy Stahl is really sold on Bill Evans' "Simitar" tailless designs—he's built them for electric power in numerous sizes. The "Electro-Sierra" shown here is equipped with an Astro 40 on 21 cells, has a plywood sheeted foam core wing.

Roland Schmitt sent me a letter that had some interesting questions and information. Here is some of Roland's letter as paraphrased by me;

"My wife and I were shopping at a Target store when I spotted a marked down, cordless power screwdriver priced at only $4.95. Sensing the batteries alone were worth at least twice that amount, I bought it. Upon disassembly, I found two NiCds, 3/4 sub-C size, marked with JAPAN on the bottom (Sanyos). Testing showed capacity of about 1000 Mah. The motor was very well built, with big brushes, heavy case, and a `flux' ring. The motor is in the AP-29 or Astro 035 size range. It is marked Johnson *(a good motor—Johnson is popular with off-road racers for stock classes. MP).*

"This was promising enough to justify going back to the store and buying two more units. I assembled a three-cell pack for further testing; the results are summarized in the accompanying graph. I was amazed to see how linear the results were, and very reproducible. It was very edifying to find what the peaks for the peak power output and efficiency were, and how prop rpm is such a factor in the power output (using the Abbott equation). However, we all know airspeed will change propeller characteristics and loading, and hence rpm, efficiency, and power. But who can afford a wind tunnel? Any ideas? Another question—how is the wattage rating of a motor established? What would be the wattage rating of this screwdriver motor?"

Roland asks the right questions! This got me thinking. The answers are interesting, and we will get to them in a moment. Roland's letter struck a responsive chord. When I was a post-doc at the University of Oklahoma in 1973, I bought a grass clipper at a bargain price. It had four sub-C GE cells and a 540 Mabuchi motor. I designed an airplane for it, which I called the "American Clipper." It was very lightweight, about 24 ounces and 350 sq. in. It flew well with the grass clipper motor and battery pack. That was the start of what is now known as the 05 or 100 watt class of plane. So, buying bargains is fun, and can lead to some very interesting things!

Well, on to the questions. On wind tunnels—I used my car as a "wind tunnel" a few years back to see what unloading did. I used a Leisure 05 motor on six cells, and a 6x4 prop. To my surprise, I saw no unloading at speeds up to 30 mph. I did not try higher speeds, as the motor, tach and ammeter were all on the hood of the car, and I wasn't sure they would stay there if I went faster. Since I have no idea of the effect of the airflow over the car, I can't say much about unloading. A much better way is to have an in-flight tachometer. Applied Telemetrics, Inc. offers digital telemetry for airspeed, rpm, altitude, battery voltage, and other functions. I do not have the prices, but you can write to them at 184 North Maine, Champlain, NY 12919 for their catalog and price list. Someday I would like to do in-flight monitoring of rpm, voltage, and current to get a handle on what the "real world" is doing in our planes.

Next question—the wattage rating of an unknown motor. Before Ed Westwood got ahold of me with motor equations, I would look at the size of the motor, weigh it, and figure it would use the same battery packs as motors I was familiar with in the same size bracket. For the screwdriver motor, this would mean packs in the three to six-cell range, with four to five cells the most likely. I would then try out different props to get the current and rpm typical for that size motor. This would be 8 to 12 amps for the screwdriver motor, and I would try 5-1/4x3 to 6x4 props. All this would take quite a lot of bench time, and possibly wiring packs, etc. Finally, after selecting the battery pack and current, I would rate it on input power. If, for example, the motor did well on five cells and 12 amps, I would rate it as a 60 watt motor. Well and good; I figure all this would take me two to three days of my spare time.

Ed convinced me that the motor equations work very well, and they are a good way to cut down tremendously on the bench

Two more of Gordy Stahl's variations on the Simitar theme are the "Simitar E-Racer" (left) with Graupner Speed 600 motor, and the "Simitar Electro-Q" with Astro 25. Gordy is the Commander of the Milwaukee Simitar Squadron.

Kirk Massey experimented with electric power in an ARF 40 EZ Chipmunk back in 1985. Flew OK on an Astro 40, but was really too heavy for good aerobatics.

time. Here are the steps I use to calculate what battery pack, current, and propeller I will try on an unknown motor:

1. Do two runs on the motor, one at light load (2-3 amps), one at heavier load (8-12 amps). Record the voltage at the motor terminals (use a digital meter if at all possible), rpm, and the current. You can use any battery pack; I usually use a six-cell sub-C pack. I adjust the current by using a smaller prop for the light load, a larger prop for the heavier load. The 4-1/2x2 Cox prop makes a good light load, a 7x3 or 7x4 prop makes a good heavier load for the 100 watt (05) motors. You can cut down a prop to get the lighter load; a 6x3 cut to 3 inches makes a good light load. I balance cut-down props on the edge of a #11 blade going through the hub hole. This works well.

2. I get R (motor internal resistance) and k (motor speed constant) with the motor equation and solving by simultaneous equations. You can avoid the use of simultaneous equations by using stall current and free running current (no load) if you wish. If so, use only one or two cells to determine stall current, otherwise the current goes beyond 30 amperes. You will then get R at stall, and k using the no load value. I prefer simultaneous equations, otherwise I have to wire a single cell, which takes more time than changing props.

3. Using R and k and the Abbott equation, I calculate the battery pack and prop needed.

Let's use Roland's screwdriver motor as an example.

Step 1: From the motor curve he sent me, I see that the motor will turn a 6x3 prop at 10,000 rpm, 8.2 amperes, three cells, 3.35 volts at the motor terminals. It will turn a 7x4 prop at 7500 rpm, 11 amperes, 3.22 volts at

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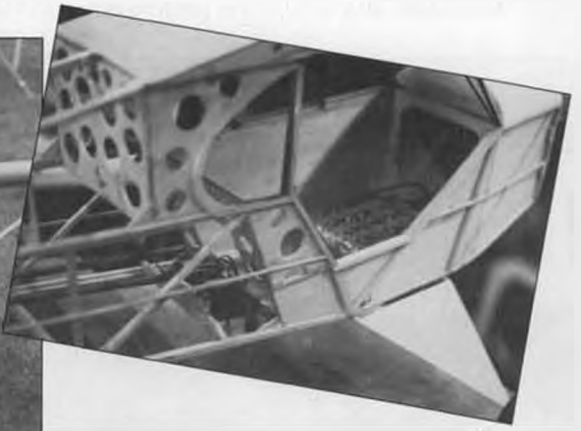
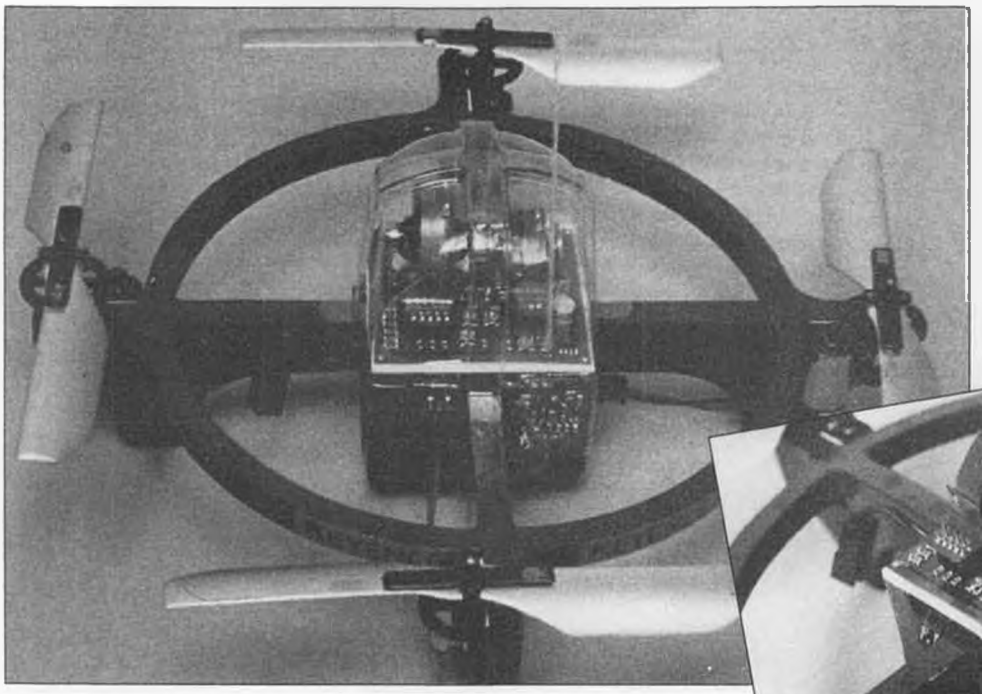
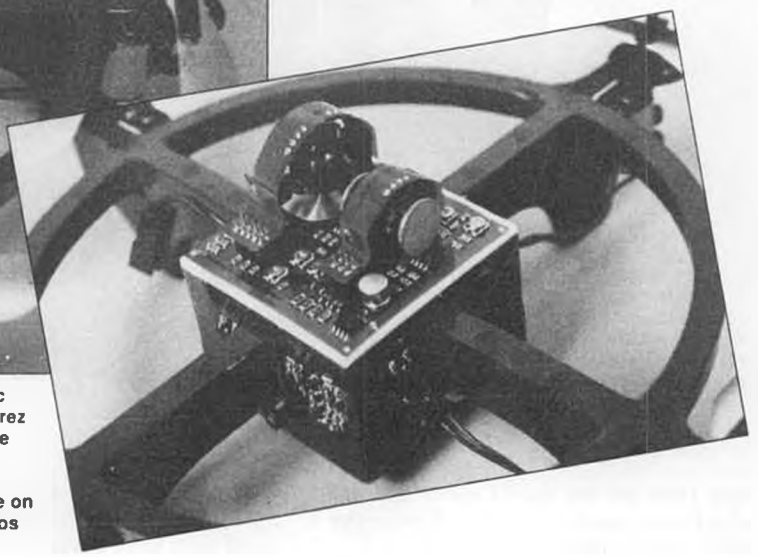


(Above) Bare bones close-up of Kirk Massey's Cub shows the battery installation and the extensive use of lightening holes in the cabin area. (Right) A lightened Bud Nosen kit was the basis for this very nice 1/4-scale clipped-wing Cub built by Kirk Massey in 1985 and flown regularly by him ever since. Weighs only 11 pounds with an Astro 60 and 27 cells.

CHOPPER CHATTER

BY JAMES WANG





(Above) And now for something completely different: a four-rotor electric powered R/C helicopter! This is the same flying contraption that Eloy Marez talks about in his May '90 "Electronics Corner" column. All four props are fixed pitch; height, fore/aft and left/right cyclic controls are all done by increasing or reducing the rpm of one or more of the electric motors. (Right) Stability of the four-rotor helicopter is provided by two gyros; one on the right controls yaw, one on the left is for pitch and roll cyclic. No servos are used. More details in text.

This month's column focuses on how the Bell-Hiller control system works on model helicopters. Last month we explained the purpose of the stabilizer bar that's on top of the model helicopter rotor head. Last month we showed the differences between the Bell control system and the Hiller control system. Now we will combine the two systems.

Nowadays, all the collective pitch model helicopters on the market employ the Bell-Hiller control system. The combination of Bell and Hiller systems gives the benefit of quick response rate and utilizes the mechanical advantage of the Hiller system to reduce servo workload. Furthermore, the Bell- Hiller combination retains the beneficial stabilizing effects due to the Bell stabilizing bar, commonly known as a flybar by modelers.

At any air show, our columnist can always be found hanging around the helicopters. The rotor head on the Bell UH-1 Huey shown here is almost identical to GMP's Prohead, except that the Huey has Bell stabilizer weights instead of Hiller paddles on the flybar.

Figure 1 is a drawing of the GMP Prohead. It has been around since 1983, and it is probably one of the most popular and commonly seen rotor heads at the flying field. The Prohead is shown here because it is almost an exact copy of the full-size Bell UH-1 Huey rotor head. The photograph shows the Army Huey UH-1. The only difference between the two is that the Prohead has Hiller paddles on the end of the stabilizer bar to boost cyclic control response, while full-size UH-1 uses a viscous damper linked to the seesaw to increase control response. On the full-size Bell UH-1 and Bell 47, instead of having paddles at the ends, they have dumbbell weights. They each weigh about five to 10 pounds. Without the paddles, the UH-1 rotor head is called Bell control only, and the bar is used strictly for stabilizing the vehicle's pitching and rolling motions. On the UH-1, the stabilizer bar serves only *one* purpose: to improve the helicopter's dynamic stability. (Model helicopter stability and flybar stabilizing principle were explained in *Model Builder* August 1989 and January 1990 issues.) When paddles are used to replace the dumbbells, then the stabilizer bar serves *two* purposes: 1) stabilizing and 2) control boost. With the paddles, the rotor would then be said to incorporate a Bell-Hiller system.

The little swivel arms sitting inside the seesaw are called Bell-Hiller mixing arms (see Figure 1). These little swivel arms cause the blade pitch to change when the flybar tilts. For any Bell-Hiller rotor head, when the

The hot new X-Cell 60 Custom that our columnist has recently begun testing. Look for a product review of this machine after James gets some more flight time on it.

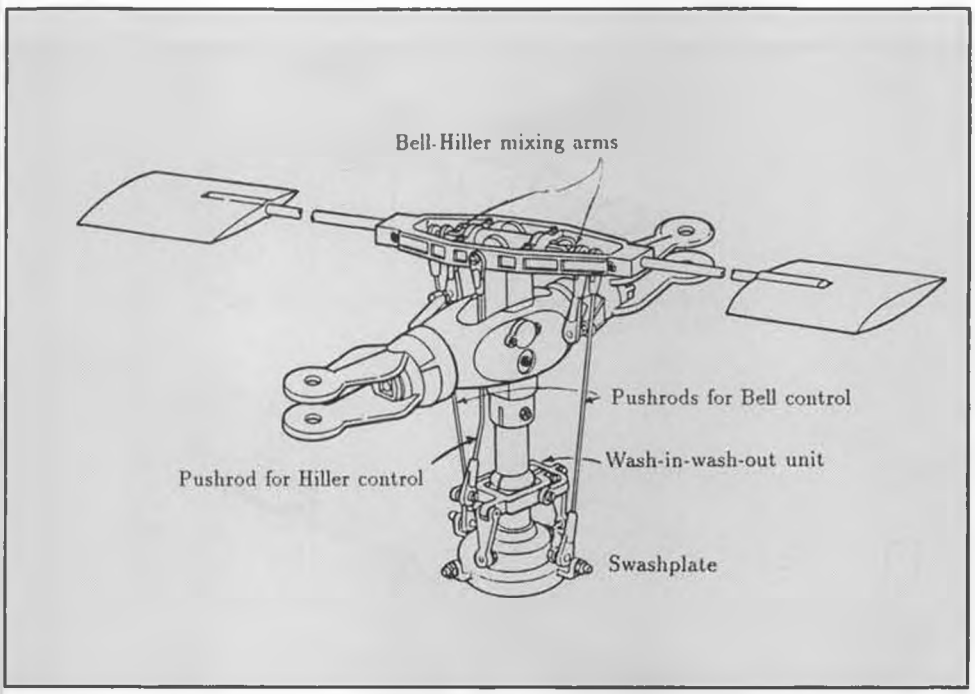


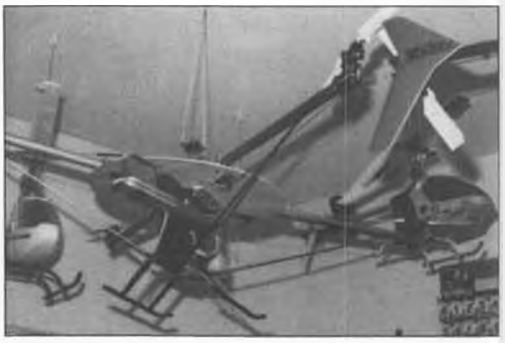
Figure 1. GMP's Prohead provides a good example of a typical model helicopter rotor head incorporating the Bell-Hiller control system, the topic of this month's technical discussion.

pilot feeds in a fore/aft or roll cyclic input, the swashplate will tilt, which causes the paddles to change their angle of attack. The aerodynamic forces acting on the paddles then cause the flybar to tilt. Because the flybar has tilted, the mixing arms will move and cause the main rotor blade pitch to change. The blade's angle of attack will vary azimuthally as the blade rotates around the shaft. (Azimuth angle was illustrated last month.) The cyclically changing blade pitch angle produces cyclically changing aerodynamic forces to cause the rotor blade to flap, thus causing the entire main rotor disk to seem tilted toward the direction you want the helicopter to move. This sequence of actions is called Hiller control, and accounts for half of the control power from a Bell-Hiller rotor. The Bell part comes from the swashplate tilt directly feeding in pitch change input to the two little swivel arms to change the blade pitch instantly.

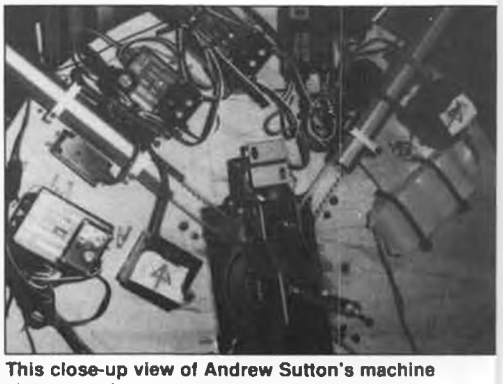
Note, the key words in the preceding paragraph are "directly" and "instantly." The Bell control system means that pilot/swashplate input causes direct and instant change to the blade pitch angle, whereas with Hiller control there is a very slight delay between pilot/swashplate input and actual main blade pitch change. The delay time is attributed to the fact that it takes time for aerodynamic forces to tilt the flybar, which then causes the blade pitch to change. Did I lose you again? You must review last month's column to really appreciate how simple Hiller and Bell systems work.

Figure 2 illustrates the five commonly possible control systems. It shows flybarless Bell control (like the GMP flybarless Legend and full-size Jet Ranger), Bell control with flybar (like the full-size Huey UH-1), fixed pitch with Hiller control (like the GMP Cricket or Rebel), collective pitch with Hiller control (like the old Kalt Baron 20 or Baron 50), and full-blown Bell-Hiller control (used on all the modern collective pitch models). I said earlier that the paddles on a Bell-Hiller rotor head are used to boost the cyclic control response rate. Does this means a Bell-Hiller rotor head equipped helicopter should have a quicker roll rate than, say, a flybarless helicopter which does not have Hiller paddles? Intuitively, you would think so because there is a roll command from the Bell's blade pitch change action, and additional blade pitch change action from flybar

GMP's dynamic duo: the fully aerobatic Legend Elite on the ground and the entry-level Rebel in the air. Both belong to Jim O'Brien. Jim's Legend is set up with lots of exponential control throw, which helps prevent pilot induced oscillations in hover but still provides plenty of control for aerobatics.



California's Andrew Sutton has also been experimenting with four-rotor helicopters. His machine, shown hanging from the ceiling of his shop, is basically a stock GMP Legend fitted with four Legend tail booms and tail rotors.



This close-up view of Andrew Sutton's machine shows the three gyros used to help stabilize it. Tail rotor drive belts are driven by toothed pulleys, which are in turn driven by a stock Legend main gear.

tilt due to Hiller action. Thus, you may think that with these two forces acting together, the model should roll really fast. However, the answer is no. Actually, a flybarless helicopter (which means it only has Bell control action) will roll much faster than a flybared helicopter (which implies Bell-Hiller control here). For example, the flybarless GMP Legend can roll faster than the flybared Prohead or Elite head Legend. The subtle reason is simple: the Bell-Hiller rotor head may gain extra control authority due to the addition of Hiller control action, but the flybar *also* provides dynamic stabilization which impedes the pitching and rolling action of the helicopter, and this stabilizing effect annuls the control gain from adding the Hiller control paddles. If you like hair-raising, snappy, hot-dogging action, try the GMP flybarless Legend. But expect the inherent stability to be slightly less than a flybared helicopter.

In summary, here are three conclusions:

1) A flybarless helicopter will give the quickest pitch and roll response rates, be-

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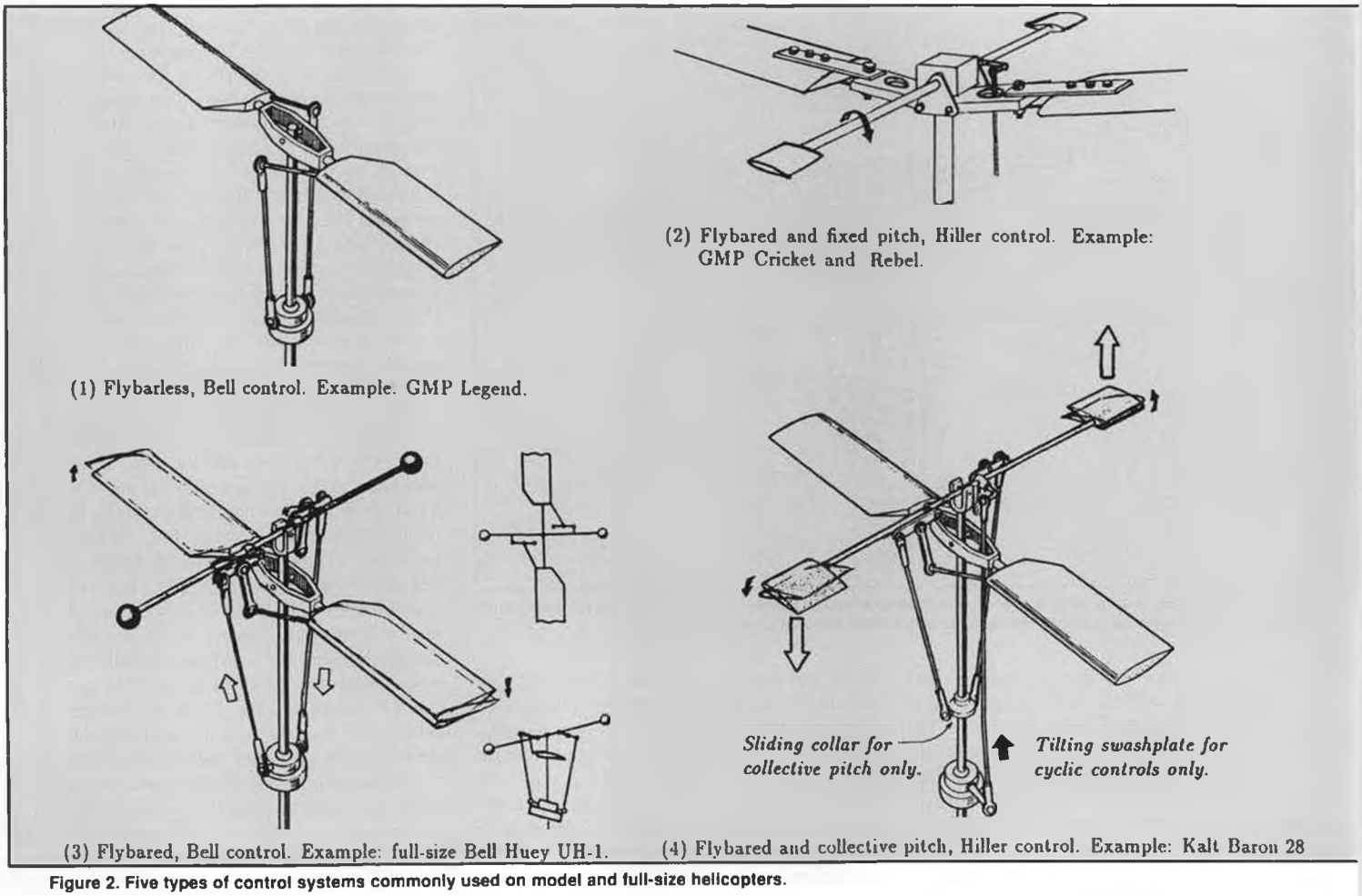
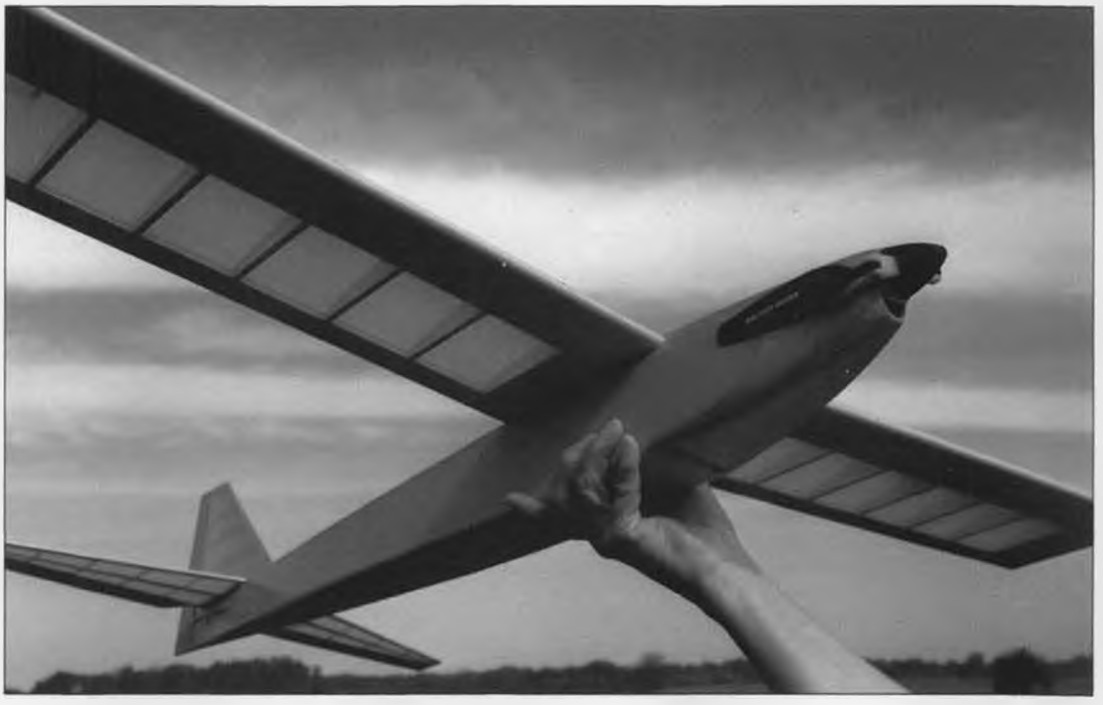


Figure 2. Five types of control systems commonly used on model and full-size helicopters.

BY WELDON SMITH

QUIETUS

A quiet, clean and efficient electric powered R/C aircraft for model builders.



(Right) Clean, simple lines of the Quietus are revealed in this underside view. Don't be tempted to omit the opening just below the spinner, as this is the inlet for the all-important cooling air for the motor, speed control (if used) and motor batteries. The warm air then departs via an opening on the top of the fuselage, just aft of the wing. (Below) The Quietus making a power-off pass across the author's local flying site. The ship was not designed solely with motorgliding in mind, but if built light, has a flat enough glide and low enough sink rate that it can soar in moderate lift.

Electric flight is taking off, judging by the number of models being offered in magazine ads. This is not surprising, since electric power now offers a variety of flying styles, depending on the type of airplane chosen. One can have aerobatics or soaring flight without the support equipment normally needed for either. The only thing required at the field is a charger with which to "refuel." The most obvious advantage to this choice of power is the complete lack of noise. But there is still another plus, which may be the biggest. A flying session can be enjoyed in street clothing without fear of splashed fuel. And later you won't reek of castor oil.

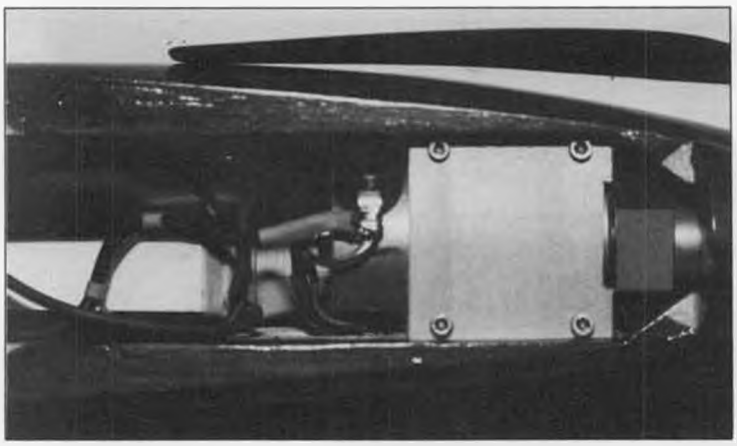
Having tried a couple of the kits and motors available in the early Eighties, I wanted a bit more in performance and convenience. I reasoned that a removable battery pack was essential so that it could be replaced while charging. I have found that three packs are quite sufficient to keep a plane in the air as often as I wish: one pack flies while one cools and the other one charges.

Another point that I considered desirable was ease of installing the motor, hence a large hatch in the nose would be required.

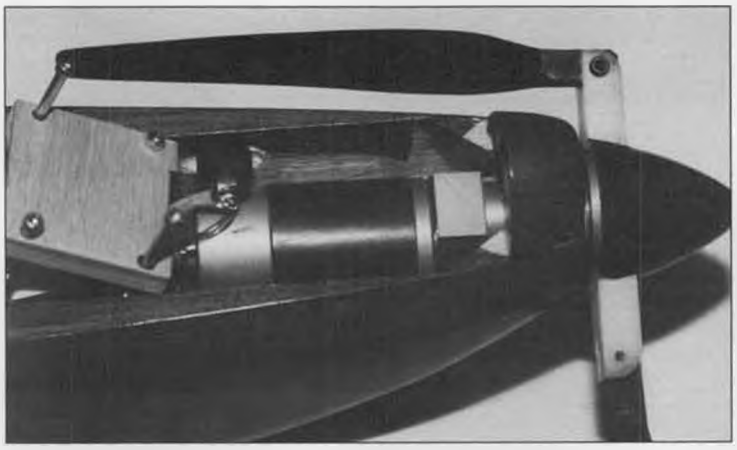
The final thought was to make the plane simple to build and yet somewhat pleasing to look at. All of these desires were in my mind when I first saw the then-new Astro Cobalt motors at a trade show. I quickly obtained an 05 geared system and a ship was designed around it. What developed was the Quietus—a compromise between glider and airplane. The climb is impressive, but the fast, flat glide makes it capable of soaring too.

CONSTRUCTION

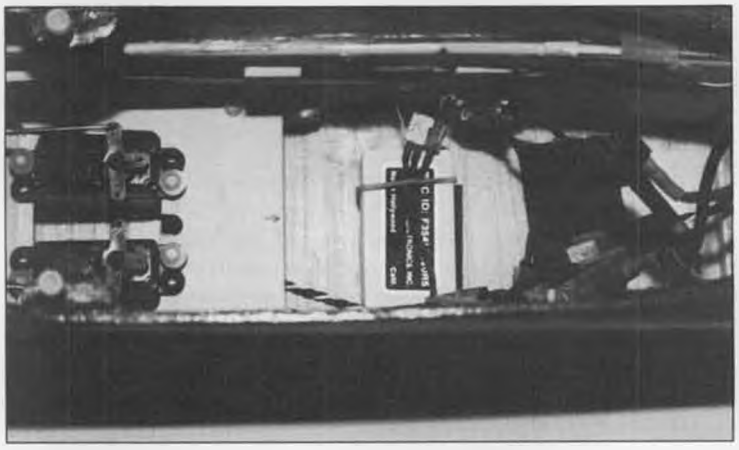
Building the Quietus is not difficult for the average modeler, so no attempt will be made to give step-by-step instructions. Instead, a few hints are offered. The wings are very simply made by laying out all of the bottom sheeting and working up. Leave a half-inch or so out of the bottom center section sheeting, right behind the spar, so that you can install a spar joiner later. Don't notch the top of the ribs deeply for the doubled portion of the top spar until the ribs are glued in place. Before installing the center basswood ribs, make a groove in each one where the 1/8 dowel will go. After the panels are joined your drill will follow the grooves without drifting away from the glue joint. The dowel need only be a friction fit in the hole—it does not have to be glued in, simplifying replacement. When applying the sheeting to the top of the wing be sure the panel is on a flat surface—you won't be able to twist it after the



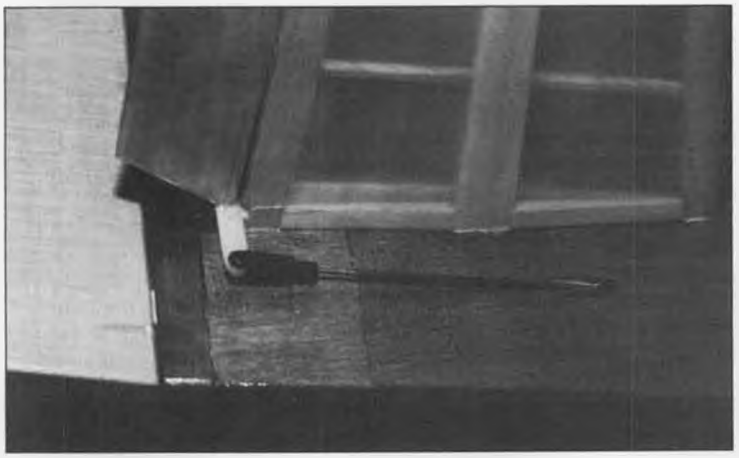
Close-up of the motor installation; the plywood plate and four screws secure the Astro 05 Cobalt motor in place. Directly behind the motor is a High Sky electronic on-off motor controller.



With the plywood plate removed, the motor can easily be lifted out. Access to this and all other pieces of equipment in the fuselage is quick and easy, thanks to the removable wing and the extra-long forward fuselage hatch.



Normally with the wing removed you'd see only the motor battery (seven 1200 mAH cells in a side-by-side arrangement), but here the pack has been removed to reveal the radio gear mounted underneath.



Elevator linkage detail. Tail surfaces are glued permanently to the fuselage. The prototype Quietus was covered entirely in good ol' silk and dope, but any of the lighter iron-on films could also be used.

sheeting is in place. When both panels are complete, sand the 4° dihedral angle into each root rib and join the panels. Install a 1/8 hard balsa wing joiner and apply the rest of the center section sheeting.

Make the basic fuselage sides of 1/8 balsa. Using 4x36-inch sheets, lay them out from the tail forward. The sheets will be a bit short at the nose, but you can make up for the shortage by placing the doublers properly. After all doublers, stringers, servo rails, etc. are in place on each side, join the sides around the two 1/4x1 cross members. If you cut these accurately and install one on each side squarely, the sides will join easily, inverted on a flat board. Add the bulkheads and motor mount, and sheet the top and bottom from the wing back. Install the motor temporarily and add blocks to the inside of the nose as necessary so that you can shape the nose to the 1-1/2 inch spinner. Line the space above the motor compartment with waxed paper and build the hatch framework in place. Install the 1/16 aluminum tubing, being sure that the tube in the hatch is aligned with the tube in the fuselage. Remove the frame and cover it with 3/32 balsa. A sharpened piece of .032 piano wire through the tube and into the nose block holds the hatch in place.

Tail surfaces are easily built on a flat board. After covering and hinging, glue the tail surfaces to the covered fuselage.

The servos are mounted on a piece of Lite-Ply which is held to balsa rails with 4-40 nylon machine screws. Harden the threads in the rails with CA glue. Mini servos will fit, but micros are better. Connect them to the tail with 3/16 square balsa pushrods. Parts from the Du-Bro mini pushrod assembly are handy to complete the ends of the pushrods, and are much lighter than standard 2-56 rods and clevises.

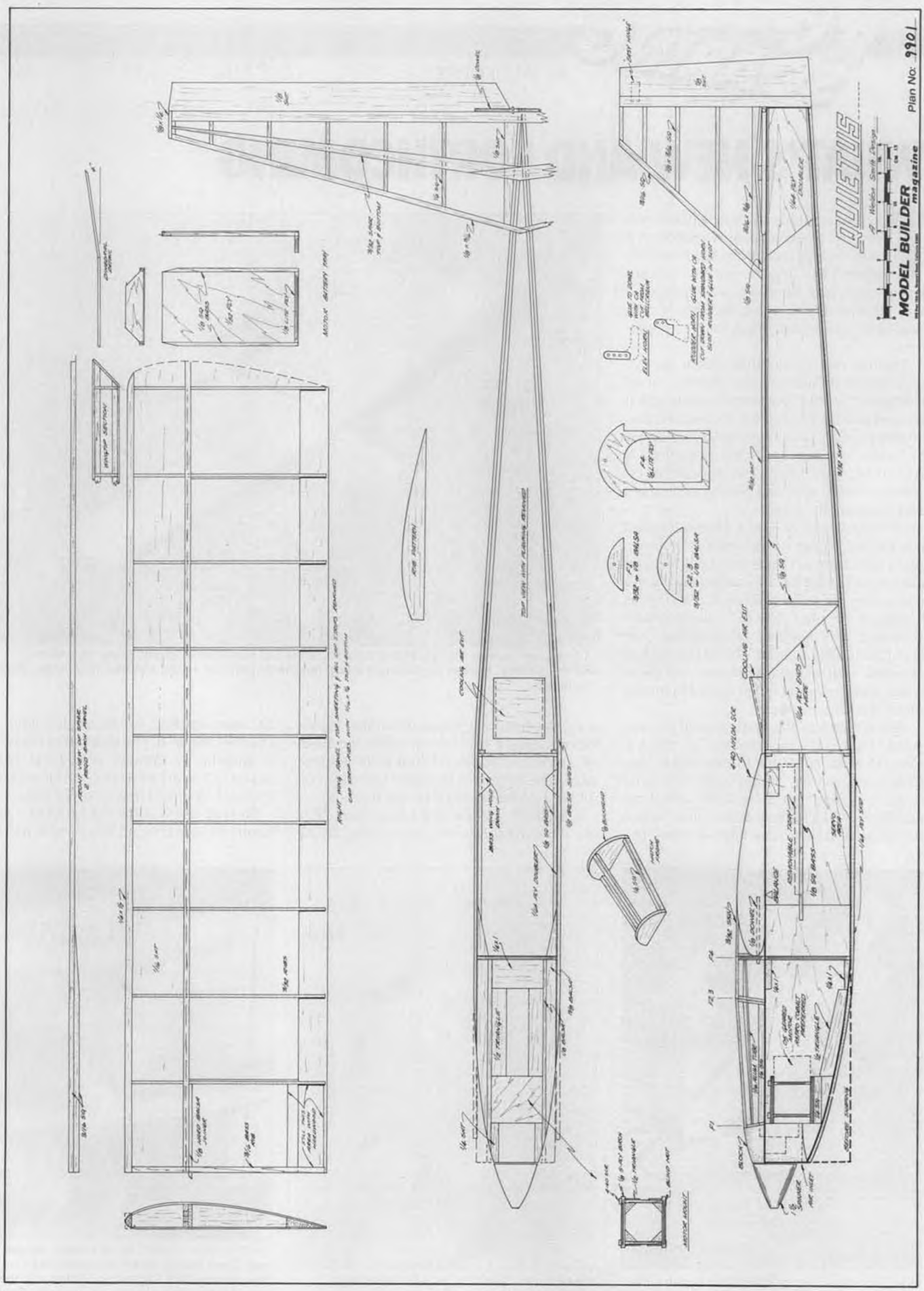
There is more than adequate room in the nose behind the motor for a motor speed control and a 270 mAH receiver battery. Like most fliers, I fly either at full power or with the motor off, so I use a High Sky on-off controller. I don't use an arming switch and have not had an accident with the propeller, being sure to have the throttle at idle when my transmitter is turned on. I do install a fuse and hard-wire everything together except the battery, which I connect with a Deans four-pin connector. (I know that everyone who has written about connectors says that the Sermos type are the best, but the compactness of the Deans is irresistible.) There is more than enough room for a receiver in the space ahead of the servos and, if necessary for balance, the receiver battery will also fit there. Balance the model at the spar.

With the motor battery tray in place above the servos there is room for a seven or eight-cell sub-C battery. A bit of foam between the wing and battery keeps everything secure. There is no need to fasten the tray in place. Two 4-40 nylon screws hold the wing down.

FLYING

I've used many different propellers but the one which gives the fastest climb is a

continued on page 77



FULL PAGE PLANS AVAILABLE. SEE PAGE 106

BY BILL FORREY

WHAT'S NEW AND FORTHCOMING

The Philadelphia show took place over the first weekend of May. Although it was the first show of its kind in Philly since 1949, the turnout for the consumer days was excellent, as expected. I was there and took a few pictures of new sailplanes and motorgliders for your enjoyment.

The first new model that caught my eye was the Great Planes Model Manufacturing Company "Spirit." The Spirit is a polyhedral winged two-meter sailplane for two or three-channel operation (control functions would be rudder, elevator, and optional spoilers). It is claimed to be an entry-level model that assembles easily, flies in a wide speed range, and is unusually durable.

Don Anderson of Great Planes showed me the kit contents and the CAD drawn plans which are accurate in every view and also in parts match. Die-cutting tools were made from the same CAD parts drawings as appear in the plan. The die-cutting looked excellent and features tab-and-slot type construction throughout. The kit box looked jammed with materials, plans, and hardware, and it even included a pilot figure for under the clear canopy.

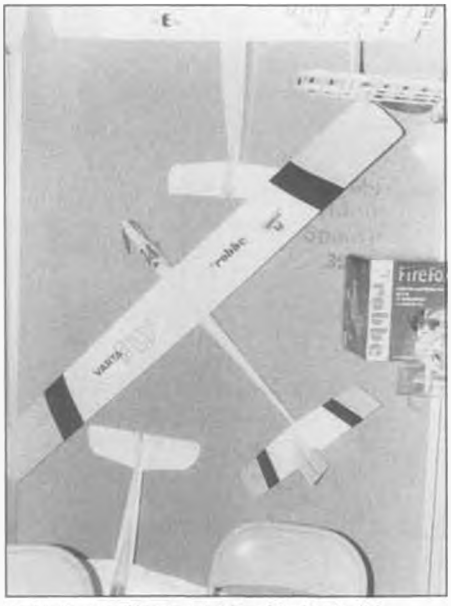
"Ailergnome" is what Pancho Morris calls his latest R/C hand launch glider. Based on a Midway Models "Gnome" kit, this scratch-built model reportedly turns on a dime and flies very nicely. More info in text.

Performance of the Spirit should be very good. Paul Carlson (formerly of Off the Ground Models, and a former AMA Nats Champion) did the design work. The wing features a modified Selig 3010 airfoil for excellent stall characteristics, slow speed handling, and high speed penetration. The wing tips feature a Schuemann-like, triple-taper planform which from a distance gives an almost elliptical curve look to the leading edge. The wing can be either bolted on or rubber banded in place on the fuselage.

The Spirit's specifications read: span, 78.5 in.; wing area, 676 sq. in.; weight, 28-32 oz.; wing loading, 6-7 oz./sq. ft.; radio, 2-3 channel required. The retail price is $47.95. Availability is through your local hobby dealer or Tower Hobbies. Look for a product review in the next few issues of *MB*.

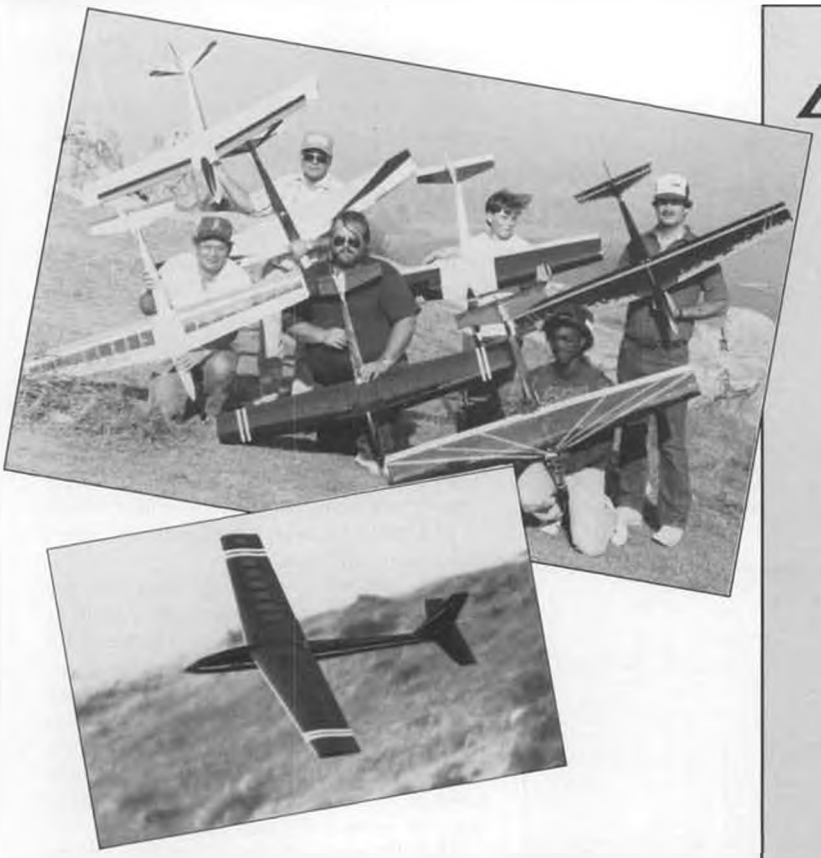
Next in line was the Robbe Model Sport booth. Here we found lots of new models,

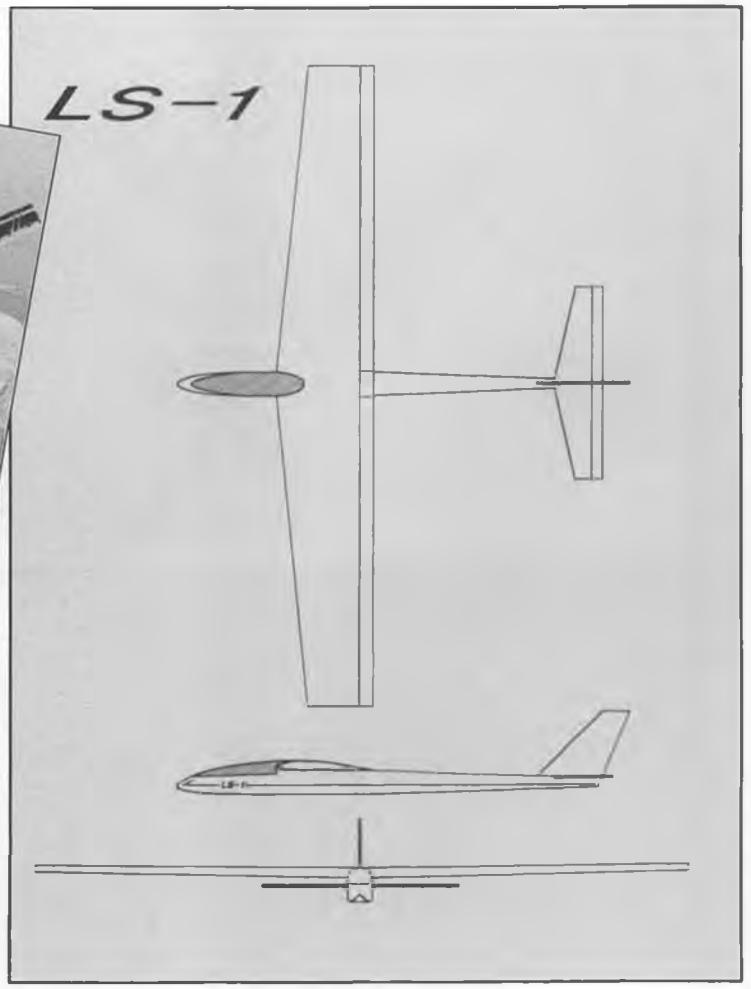
Mike Fritz shows us the latest from Kyosho, the "Soarus" electric motorglider. Mike says he likes it even better than its bigger brother, the Kyosho Stratus 2000.



Robbe's new "Varta Fly" is a kit that builds rapidly due to its tab-and-slot construction. Flying performance should be excellent. Look for a full review in *MB* in the next couple of months.

The two-meter "Spirit" is the newest release from Great Planes Model Manufacturing Co. Designed by Paul Carlson and kitted with the help of CAD plans and die-cut parts, the Spirit has the makings of a real winner. A review will appear in *MB* soon.





(Top) Members of the La Sierra Slope Soarers pause for a group shot with their LS-1s. Back row, from left: Clarence Michael, Nick Radle, and Carl Maas. Front row: Richard Teller, LS-1 designer Mike Reed, and Sean Silas. Photo by Dale Widmer. (Above) An inflight photo of Mike Reed's prototype LS-1 showing off its clean, racy lines. Computer drawn plans for this ship are available at a very reasonable price; see text.

poster-size pictures of models, and new models in the updated catalog. One of the new models on display was the "Varta Fly." This model is an electric motorglider kit. Having recently received a Varta Fly for review and already completed 80% of the assembly, I can say with some confidence that this is already looking like one very nice aircraft.

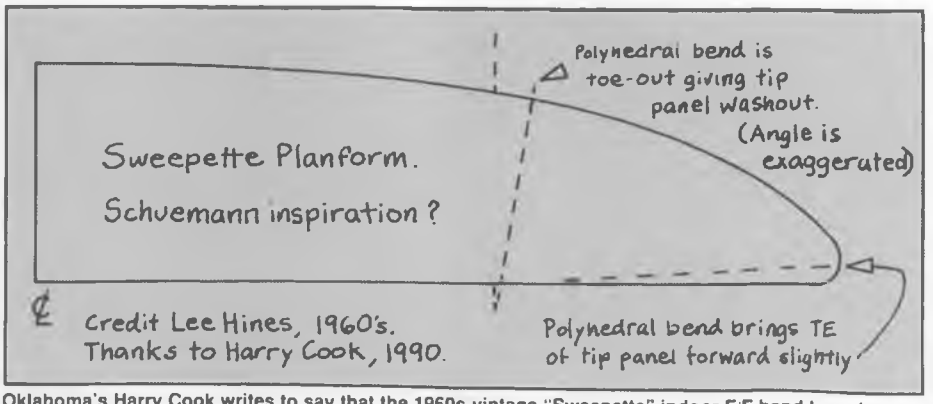
The Varta Fly is a typically European V-dihedral winged, rudder-elevator-throttle type motorglider. The airfoil is a flat bottom of about 8.7% thickness somewhat resembling a Gottingen 795. The span of the Varta Fly is 71 inches, the fuselage length is 43.3 inches, the wing area is 516 sq. in., and the all-up flying weight is claimed to be 51 ounces. The fuselage is molded from white Robbe Plura (a type of plastic typical of Robbe models), and it is pleasingly slender and efficient-looking.

I am expecting this model to be a very clean, fast, high performance motorglider with good climb rate and ground covering ability, we shall see! Stay tuned for a full review very soon in *MB*.

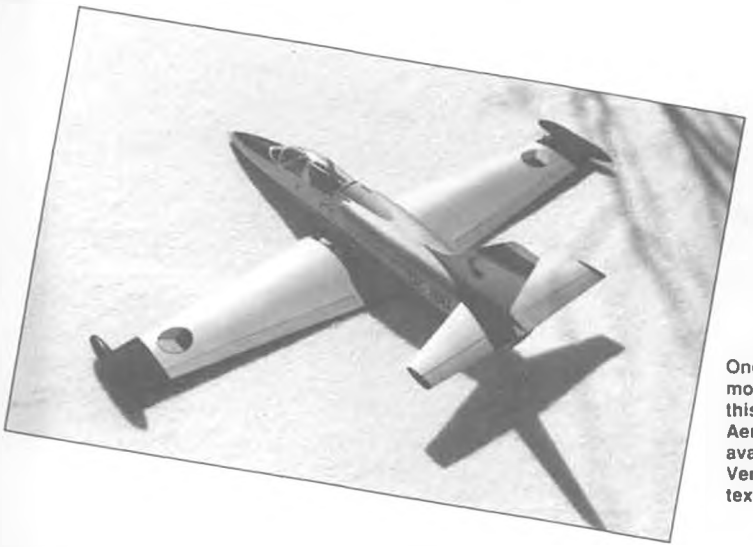
The Varta Fly comes complete with all necessary hardware. The kit includes a bushed armature, ferrite magnet Mabuchi "550-type" can motor with stator ring; a new and really exciting 9x5 Rudolf Freudenthaler folding glass nylon prop (Freudenthaler is a world champion level, European F3E flier); prop adaptor; spinner; noise suppression capacitors; and an old-style Associated (R/C car) motor connector. All you will need to get it flying will be glue, MonoKote, a six or seven-cell battery, and a speed controller—and a radio, of course. The retail price is $175.95, but it has been advertised as low as $159.95. Phone Robbe at (201)359-2115 to place an order or find a dealer in your area.

As an aside, Robbe is now the exclusive agent in the U.S. for the high performance Keller samarium cobalt and ferrite-boron neodym alloy magnet motors. These motors were previously very hard to get, and the neodym motors are relatively new even for German modelers. In the past, you either had to go to Keller in West Germany and pick one up yourself, or you had to "know somebody" (i.e. Steve Neu) in the U.S. who could get one for you. Keller motors are in high demand among electric fliers. With Robbe's new factory for these motors recently completed and operating under Keller's personal supervision, their availability will very likely improve shortly.

Lastly, in the Great Planes Distributors booth I found the new Kyosho "Soarus" electric motorglider kit. Similar in many respects to the Varta Fly, the Soarus has a molded yellow plastic fuselage and balsa flying surfaces. The wing is V-dihedral and is turned with rudder and elevator. The



Oklahoma's Harry Cook writes to say that the 1960s-vintage "Sweepette" indoor F/F hand launch glider has a wing planform that might have inspired the Schuemann planform. He's partly right. Here we see how toed-out tip dihedral gives the tip panel washout, a key ingredient often missed in the



One of the sexiest PSS models we've ever seen is this Czechoslovakian Aero L-39 Albatross now available as a kit from Vern Hunt Models—see text for more info.

modified Selig 3021 airfoil is used for good performance.

According to Great Planes' Mike Fritz (a certified soaring nut and a super guy to talk to) the Soarus flies very, very well as it has an excellent climb and glide. He feels it is the perfect size for a six or seven-cell motorglider. The specs for the Soarus are: wingspan, 67 in.; wing area, 469 sq. in.; and radio requirements, 3 channels. This is all the info I have; for additional info, contact your local dealer or Tower Hobbies.

MORE NEW PRODUCT NEWS

Moving from Philadelphia north and west, we arrive at Vern Hunt Models, 4950 Butternut Tr., Juneau, WI 53039, (414)349-8101. Vern Hunt writes to inform everyone of a new Power Scale Slope (PSS) glider which he is kitting, namely, the Czechoslovakian Aero L-39 Albatross.

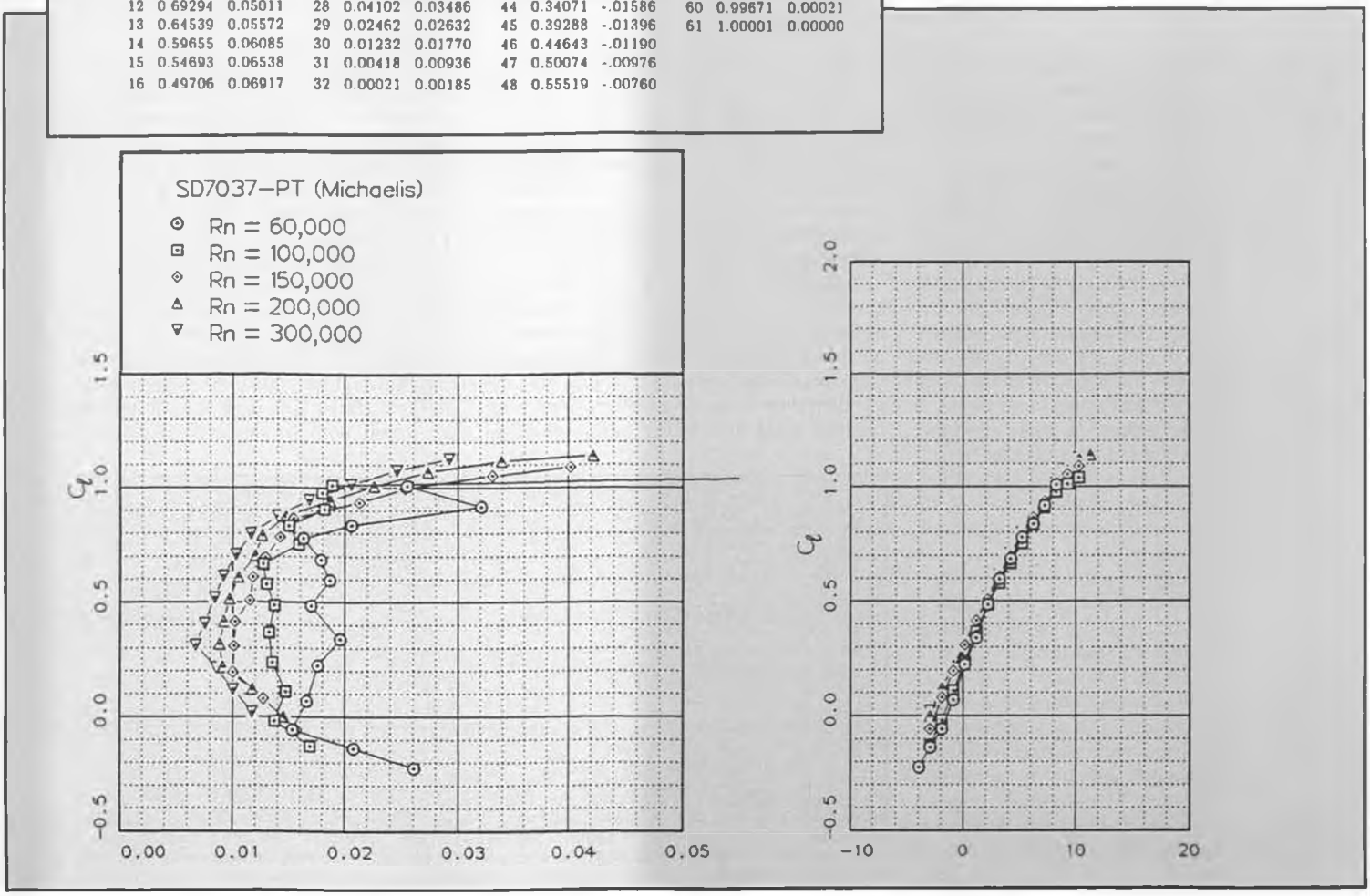
From the enclosed photo you can see what a sharp-looking subject the Albatross is. Vern says that he has been a modeler for over 30 years, and that he has been developing the Albatross kit prototype over a two-year period. This has allowed Vern to perfect both the aerodynamics and the manufacturing process into a marketable, quality product. Other PSS models will be added to the line in the "next few years."

The Albatross features a fiberglass carbon fiber fuselage which is the result of years of experimental building with these materials

continued on page 78

SD7037

1	1.00000	0.00000	17	0.44745	0.07211	33	0.00127	-.00393	49	0.60914	-.00549
2	0.99672	0.00042	18	0.39862	0.07410	34	0.00806	-.00839	50	0.66197	-.00349
3	0.98707	0.00180	19	0.35101	0.07504	35	0.02038	-.01227	51	0.71305	-.00168
4	0.97146	0.00436	20	0.30508	0.07488	36	0.03800	-.01541	52	0.76178	-.00014
5	0.95041	0.00811	21	0.26125	0.07358	37	0.06074	-.01777	53	0.80752	0.00104
6	0.92450	0.01295	22	0.21989	0.07113	38	0.08844	-.01934	54	0.84964	0.00182
7	0.89425	0.01865	23	0.18137	0.06754	39	0.12084	-.02017	55	0.88756	0.00220
8	0.86015	0.02490	24	0.14601	0.06286	40	0.15765	-.02032	56	0.92071	0.00218
9	0.82261	0.03141	25	0.11410	0.05715	41	0.19850	-.01987	57	0.94859	0.00185
10	0.78201	0.03788	26	0.08586	0.05049	42	0.24296	-.01891	58	0.97077	0.00132
11	0.73865	0.04413	27	0.06146	0.04300	43	0.29055	-.01754	59	0.98690	0.00071
12	0.69294	0.05011	28	0.04102	0.03486	44	0.34071	-.01586	60	0.99671	0.00021
13	0.64539	0.05572	29	0.02462	0.02632	45	0.39288	-.01396	61	1.00001	0.00000
14	0.59655	0.06085	30	0.01232	0.01770	46	0.44643	-.01190			
15	0.54693	0.06538	31	0.00418	0.00936	47	0.50074	-.00976			
16	0.49706	0.06917	32	0.00021	0.00185	48	0.55519	-.00760			



BY STU RICHMOND

KYOSHO'S ADVANCE SERIES 91 RADIOS

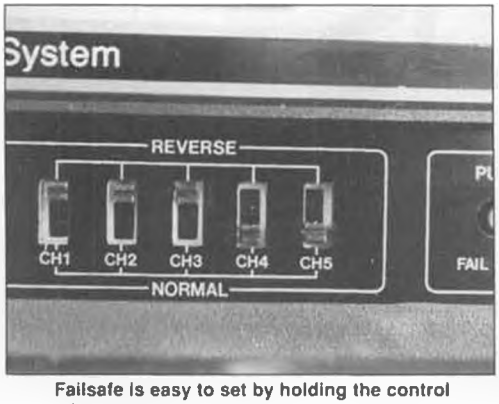
This Kyosho Advance PCM5 system has the best test performance as measured by Stu of all systems he's reviewed to date.

Simply stated, this new Kyosho system has the best-performing "uplink" of all the R/C systems we've studied to date!

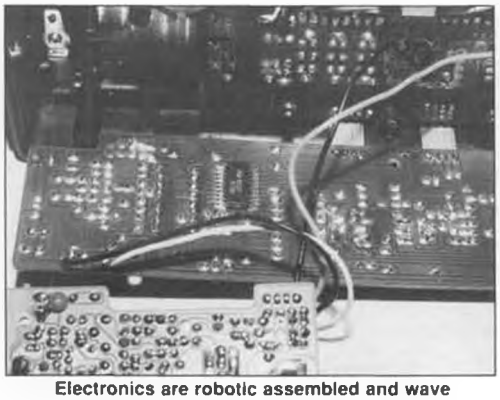
Uplink is the space age term for remote response to a given signal. When a human movement is made on one of the control sticks of the Kyosho PCM 5 transmitter, this system has the best measured response to that movement as measured at the mechanical output wheel/arm of that matching servo that's mounted in the airplane... or to put it another way... these servos follow the stick movements better than all the other systems we've tested and reviewed to date! The testing procedure and results are further down in this story... read on, please!

Mike Fritz is Hobbico's Merchandise Manager. and he worked closely with Kyosho's design engineers to develop the Advance PCM 5 as well as the Advance 7 FM system.Mike's extensive R/C experience here in the USA brings us the most-wanted features in a pair of totally modern R/C

When the smoked gray door on the front of the transmitter is lowered you have access to the adjustable controls. Trim levers have positive clicking detents.



Failsafe is easy to set by holding the control sticks in the wanted positions and pushing a button. By not pushing the button, failsafe is essentially inhibited. The seven-channel system is without this option... no failsafe on the seven.



Electronics are robotic assembled and wave soldered. This system has a 3-amp fuse in the charging circuit... suitable for fast charging.

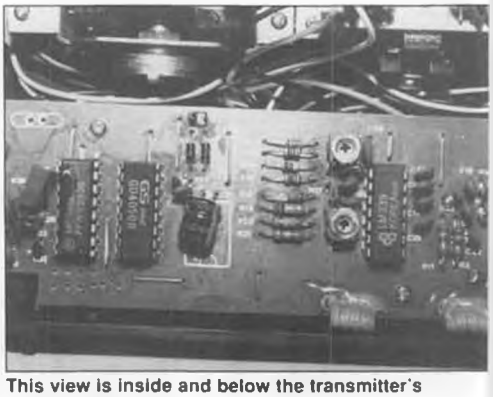
Your fingers comfortably wrap around two vertical semi-hemi ribs on the rear of the case... the Central Florida R/C Think Tank all sensed that "bio-goodfeel" on the case. Set comes with the gold sticker in place.

systems. The actual radio production takes place in a modern factory in South Korea which produces R/C systems for several worldwide markets. Only the best components are used... upscale Sanyo NiCds... Motorola output transistors... and some of the components are "mil-spec" quality... nice to see in our radio control systems. There appears to be no effort to cut costs in production in order to save the pennies that multiply with volume. The manufacturer seems hellbent on producing only a top quality product for Kyosho and us. It a bit like the Michelin tire philosophy... produce the best and let the quality be known worldwide.

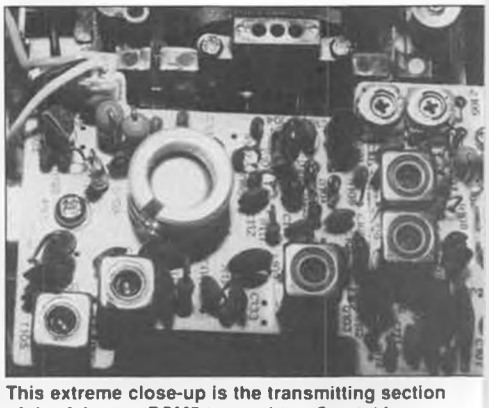
This and other *Model Builder* radio reviews are made possible by the Central Florida R/C Think Tank... a group of five active R/Cers: Herman Perez is a youthful graduate electronics design engineer who does high technology creative work at Martin-Marietta Aerospace; Bob Benton is an all-electric R/Cer who is a service technician for computer hardware used by the commercial banking systems locally; Ted Noel, MD, is a young doctor who daily works in human heart repair and partially paid his way through medical school doing electronics repair work; Ed Stone is a retiree from NASA who played a significant part in the USA moon landings. My part is to interpret the Think Tank's ideas about R/C and get them onto paper for printing here in *Model Builder*. The Central Florida R/C Think Tank thinks the next major new feature we'll see is fifteen-minute charge 'n fly built into our transmitters. And since Kyosho's manufacturer makes an advanced series of NiCd chargers now, we feel they may be the first to incorporate a full battery management system which would include the fifteen minute charge 'n fly feature in our future. We feel the ability to charge our NiCd packs to eighty or ninety percent of full capacity in only fifteen minutes would far overshadow in value all the bells and whistles the manufacturers are using as sales tools to attract us now.

The first generation of servos made by Kyosho's radio people (before they started manufacturing the Kyosho Advance systems) were totally terrible and carried the number 402. The new combination of higher quality electrical pots, a Mabuchi electric motor, a proprietary IC amplifier, and new precision gear molding gives the new production servos (like those in this month's review radio) really something worth bragging about. These are the new KS-100 series and are 1.6" x .8" x 1.8", weigh 1.6 ounces and have more than thirty-five inch/ounces of torque. These servos rotate a full 90 degrees from the control sticks and the trims add 10 degrees more to each end of the travel. The servo current draw measured about 9 milliamps at idle and they are faster than average... quoted is sixty degrees of rotation in less than one fifth of a second. Some modelers are trying to get faster rotation speeds on other brand systems by using five-cell receiver battery packs that yield a nominal six volts instead of the customary 4.8 volts. Among the R/C pylon racers, I've seen some in-flight servo failures with five-cell packs causing overvoltage on some component(s) on a servo amplifier board... a component will be burned, popped, or scorched via overvoltage. Although the Kyosho systems are listed as being suitable for 6-volt operation, I do not recommend it for any application at this time.

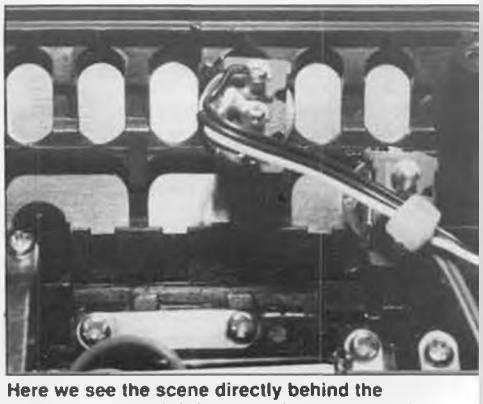
It's been very interesting to have watched the progress made in successive steps of transmitter stick assembly design by Kyosho's



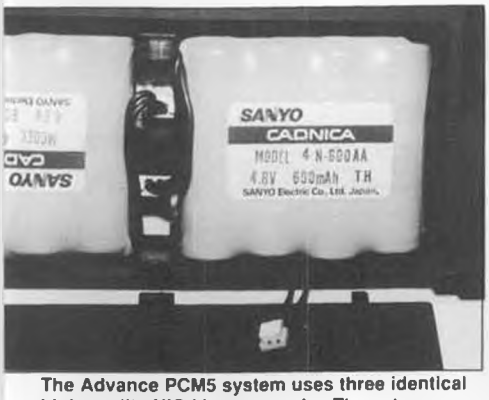
This view is inside and below the transmitter's right hand stick assembly. A series of ribbon connectors interconnect the PC boards. Low piece count is possible through heavy dependence on few integrated circuits... modern engineering at its best!



This extreme close-up is the transmitting section of the Advance PCM5 transmitter. Crystal is on the extreme right... that's a metal ribbed heat sink around the Motorola 2N4472 output transistor. It's normal for the output transistor to cause a warm spot on the rear of the Tx case.



Here we see the scene directly behind the transmitter's top/left/front section with a dual rate switch installed in one of the several available positions. The top/right/front section is identical... text tells about the positions' use.



The Advance PCM5 system uses three identical high quality NiCd battery packs. These two power the transmitter.

These components receive the transmitter's "uplink" information. Murphy's Law of Radio Testing took effect when our test crew overflew the capacity of the airborne battery during their enthusiasm for this totally terrific performing system... see text.

These servos closely parallel the final generation Kraft servos. The suggestion has been made that the three wires to the circuit board lettered "A", "B", and "C" also receive a dab of the mastic for vibration protection.

radio manufacturer. The mechanical centering of the sticks relate to much of the servo centering performance measured at the servos. An early stick design closely paralleled an Airtronics/Sanwa assembly... others have become more individual, and the sticks of the Kyosho PCM 5 and Kyosho 7FM are again unique and work very well, as you'll see when you study the uplink performance figures in this review.

This five-channel system uses a microprocessor chip that gives pulse code modulation and also has the ability to have complete (all channels) user-selected failsafe. The seven-channel system is an all-FM frequency modulated system. Servo reversing switches are standard, and both sets also come with all the normal trays, four servos, charger, flags, etc.

Kyosho has its own engineering and development staff and they have most of their manufacturing done elsewhere... a style of engineering and manufacturing mostly unique to the Orient. As Mike Fritz of USA's Hobbico worked closely with the Kyosho design team, an entirely unique transmitter case resulted. Futaba presently makes a basic four-channel system for sale in Germany and France. It is designed to have you buy the extra options you might need and insert them into the transmitter case's premade openings or positions and hook them up. Hobbico and Kyosho have smartly tailored the Advance transmitter cases with a whole series of similar molded-in-place holes and slots to possibly accept future switches, knobs, levers, and buttons to customize your transmitter to your likes. One of the photos shows the inside apertures molded into the top front of the plastic Tx case. The front pull-down door on the transmitter allows access to setting the dual rate switches for roll and pitch. The Central Florida R/C Think Tank advises against dual rate switches being used, as they are the cause of too many "wrong position" crashes. By setting the rates to "maximum," they are inhibited and travel is the same regardless of switch position... Reversing switches are under the door... as is the failsafe setting button. Setting failsafe is so simple. Hold the control sticks in the wanted positions (we recommend low throttle and slight "up" elevator) and simply push the failsafe button. The transmitter sends this position data to the receiver about every fifteen seconds as update information. The failsafe also allows a warning of low airborne battery voltage by pulling the throttle back in flight to give you an audible low voltage warning as your engine slows. The Advance PCM 5 and Advance 7FM sets are made for Mode II use only (throttle on the left control stick), and we consider them non-changeable to Mode I as I (and most of the rest of the non-USA world) fly. Mode I has the throttle on the right stick and elevator on the left stick. If you wanna buy an Advance radio on Mode I, write Mike Fritz at Hobbico. I changed my transmitter to Mode I myself (an extremely tedious job) and this got me into trouble... read on for details!

The 1991 AMA Gold Label is already on the transmitter. The AMA guidelines for 1991 receivers are set extremely technically tight, and although the supplied receiver is a dual conversion most modern design, it does not yet meet the tight guidelines in performance at this time. Our review radio is an early one and later Kyosho receivers may meet the rigid specs. Our review receiver has repeatedly been flown among a six-flyer flight station here in Orlando with five other models in flight... without so much as a single glitch. The chairman of the AMA Frequency Committee has reminded me

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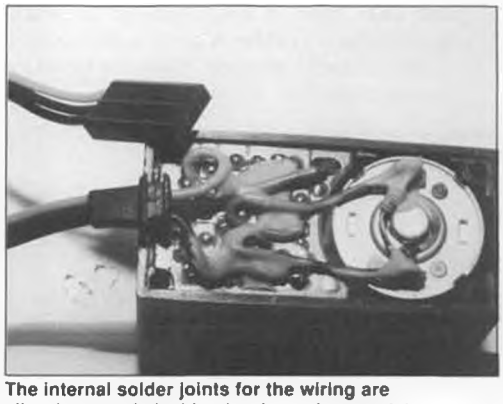
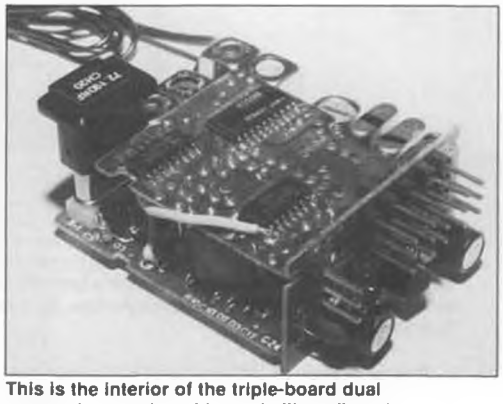
Stu crash-tested four of these standard servos from 400 feet at full throttle vertically into hard ground. All survived due to clever engineering as test tells and this picture shows.



The internal solder joints for the wiring are vibration proofed with a hard mastic material. Three ribs on one side of the male connector key into the receiver.



This is the interior of the triple-board dual conversion receiver. It's made like a fine piece of jewelry.

Unlike other servos seen so far, these K-100s with the Advance systems have dual bearings on the output shaft for maximum mechanical support. The R/C Think Tank feels this system beats a single ball bearing at the top of the shaft... as some upscale servos use.

PLUG SPARKS

BY JOHN POND

At a recent SAM 00 meeting, I was reminded by Jim Perssons that the 30th Anniversary of the Stockton Old Timer Contest is to be held at Madera, California on September 29 and 30 1990.

This came as quite a shock as this writer, in conjunction with Bob Bowen, originated the idea of competing with original size Old Timer models. While it is true that the Denver boys (later SAM 1) held an Old Timer meet one year prior, it was confined to small scaled-down models. A good write-up was given in *Model Airplane News* but failed to arouse more than a passing fancy.

3. Gene Pond's photo of an unidentified modeler launching a Miss Tiny at Stockton could just as well have been taken in the late 1930s.

1. A 30-year-old shot of our columnist who, along with Bob Bowen, is one of the co-originators of contemporary Old Timer flying. Photo was taken by John's brother, Gene Pond, at the very first Stockton Old Timer Annual, held near Sacramento, CA.

2. The first Stockton meet attracted fliers from just about everywhere. Bill Thompson came from San Diego, CA to compete with his Cox-powered Strato Streak. Standing at right is contest director, Bob Bowen. Gene Pond photo.

It was not until Bowen and Pond got together to stage a genuine Old Timer meet that the interest of modelers was fired to the point that the Old Timer craze spread like mad. With publicity from Pond and an excellently run contest by Bob Bowen, the meet attracted so much attention that numerous groups (the forerunners of SAM Chapters) started to form for the purpose of staging Old Timer contests.

4. At least three copies of the Simmons "Gas Champ" showed up at Stockton. This Bunch Tiger powered version belongs to Dud Williamson of Eureka, CA. Gene Pond photo.

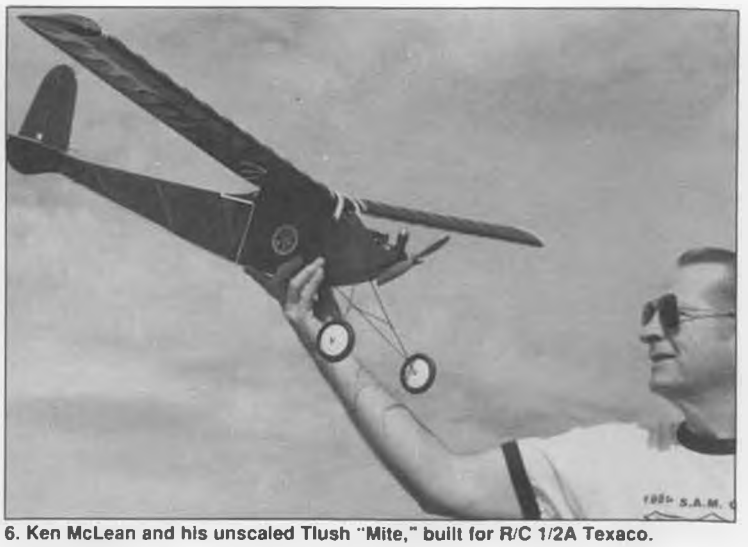
How did this all happen? As noted in previous articles, the idea of flying original size old models with appropriate engines came about in a discussion between John Pond and Bob Bowen. They were thoroughly tired of the trend in free flight, where fun seemed to have left the scene. Then, too, nostalgia played a great part with both men remembering the "good old days" of pleasant flying with old, slow-flying models prior to 1942.

At this time both Bob Bowen and John Pond were contributors to Howard Puckett's publication, *West Coast Model News,* a magazine that lasted thirty years. While Bob Bowen and his brothers, Bill and Jack, were helping to organize the first O.T. contest, Pond wrote the following rules:

Proposed "Old Timer Model" Contest for Prewar Free Flight Models

General:

5. A seldom-seen 1941 design by John Tatone, called the "Atomizer"—originally powered, we presume, by an Atom .09 ignition engine.



6. Ken McLean and his unscaled Tlush "Mite," built for R/C 1/2A Texaco. Took 2nd place in that event at the SAM 41 (San Diego) monthly contest in February. Photo by Jim Alaback.

1. An "Old Timer" model shall be defined as follows:

(a) The design (or kit) shall have appeared or have been advertised in any regularly published model making magazine no later than December 31, 1942.

(b) Original designs will be considered only if substantial proof can be presented in the form of dated photographs, drawings, and/or reputable persons who can vouch for the authenticity of the original design.

(c) Deviations permitted will be: 1. Spark ignition engines will not be required. Any modern glow plug engine may be used. 2. Interior construction may be revised to allow reinforcements, dethermalizer tails, etc., but the general exterior form must coincide with the original design. This includes wheel size, dihedral, location of thrust line, etc.

(d) The model shall be produced to duplicate scale. No reduction or increase of the original shall be permitted.

(b) Plans employed in the construction of the "Old Timer" model must be presented at the time of processing for checking of conformance to fidelity of reproduction.

(Top left) 7. Larry Oliver snapped this photo of SAM 41's Jim Alaback and his 1936 Flying Aces Stick, powered by an O.S. 26 four-stroke. Ordinarily you wouldn't think such a model would be very competitive, but Jim won R/C Texaco with it at his club's February meet. (Bottom left) 8. Bob Munn, also a member of SAM 41, displays his immaculately built 53-inch Class A R/C Anderson Pylon. Engine is an Elfin 2.49cc diesel made in Australia by Gordon Burford.

Rules:

1. All models must rise off ground from a normal three point attitude: three points being defined as two wheels and tailskid, one wheel and two tailskids, or tricycle landing gear. Vertical, or near vertical, takeoffs will not be permitted. Models must demonstrate ability to rest in normal takeoff position unassisted.

2. Launching: (a) Models shall be released with no assistance on takeoff other than the guiding of one wing tip. Any obvious pushing or assisted takeoff of the model shall disqualify that flight. (b) Landing gears shall be firmly affixed to the model. Droppable type undercarriage will not be permitted. However, folding landing gears will be allowed if called for in the original design.

3. Motor runs shall not exceed twenty (20) seconds.

4. The maximum flight on any one flight shall be five minutes. A normal three flight total shall be considered the maximum, unless the contestant has completed three maximum flights. In this case, the competitor may continue to register official flights so long as he can make maximum flights.

5. After three maximum flights, there will be no unofficial flights. The release of a model being timed shall be constituted as an "official" regardless of immediate motor failure, failure to take off (this includes hitting obstructions), or the dropping of parts.

6. The maximum motor size shall be .99 cubic inches.

7. There shall be no power loading and/or wing area weight requirements.

8. Weight of the model shall not exceed seven (7) lbs.

9. Miscellaneous rules under standard A.M.A. regulations such as midair collisions, model passing out of sight, etc., shall apply in all cases.

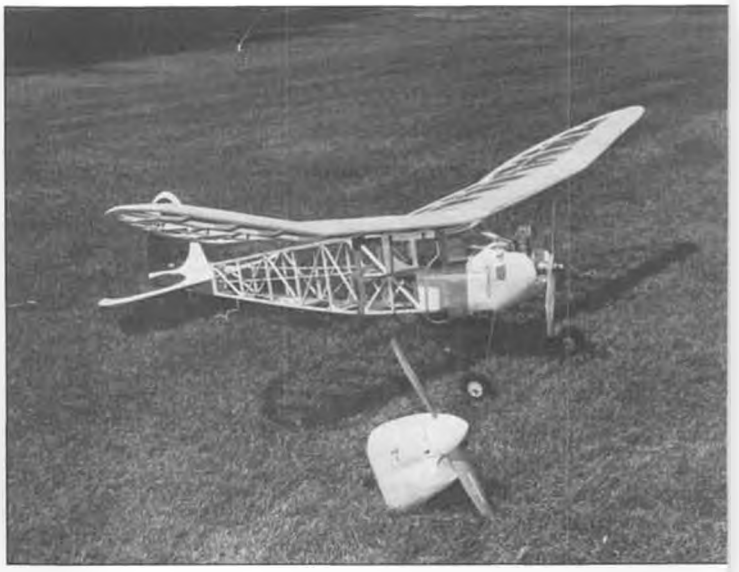
10. There shall be two classifications divided according to size of engine employed: Class I: .010 to .250 cu. inch displacement. Class II: .255 to .99 cu. inch displacement.

11. The spark ignition event shall be limited to those engines employing points, coil,

9. Seen at the '89 SAM Champs at Jean, Nevada, is a gaggle of various size Powerhouses, all built by SCAMPS member Bud McNorgan. Spans range from four to the full seven feet.

10. It looks quite a bit like a Korda, but it's actually a "Miss Canada Sr." as rendered by master craftsman Phil McCary.

11. Very similar in appearance to the Pacer is the 1939 "Yehudi" as displayed here by Jerry Stoloff, the original designer and builder. Plans to be available soon from Pond.



12. Bob Rooman, of Springfield, Missouri, can fly his Scientific "Coronet" with either gas or electric power merely by switching front ends. Also flies it on floats!

13. The Buccaneer C Special was one of the seven different Buccaneer models kitted by Berkeley. This one is the work of Tom Fiacco, flies great with an Ohlsson 60.

14. You don't hear much about Old Timer flying in Japan, but Nathan Sturman is helping spread the O.T. gospel over there with his diesel powered Modelcraft Wasp.

condenser, and batteries for combustion.

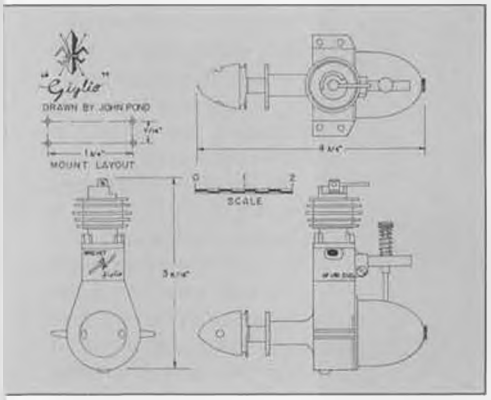
Real simple rules, huh? They sure are a far cry from today's voluminous SAM Rule book. As Bud McNorgan and I have often observed, there were a heckuva lack of beefs then.

Thirty years is quite some time to recall but luckily this writer had access to all the old pertinent issues of *West Coast Model News.* To top this off, he also found a flock of old photos taken by his brother, Gene Pond, who was quite the photographer then. Just to relive some of those old days, here is an extrapolated version of the original report:

Description of the Old Timer contest sponsored by the Stockton CMA and SF Vultures, held 5 November 1961, at Jackson Road Field, Hwy. 16.

After the "blow out" of 29 Oct., the modelers had to admit it was worth postponing the contest one week. Weather was ideal, temperature in the seventies with a gentle breeze of 5 m.p.h. Although thermals were not very strong, a considerable number of good flights were noted. Indicative of the weather was the fact that no models were lost.

Among the numerous crackups (and they were numerous because of untried models) was the heartbreaking crackup of the Bassett "Miss Philadelphia VI" flown by the team of Jerry Powell and Rudy Thomas. After some beautiful floating trial flights in the morning,



the team fell into that old trap of "tweaking the rudder." Net result, a huge loop with disastrous effects. This seemed to be extremely catching as no less than a dozen models were observed to loop in. Even the NCFFC 1961 overall Free Flight champ, Clark Hahn, smashed his "Wedgie" after an opening five-minute flight.

Some of the old designs appeared to need downthrust badly (despite what the theorists claim), as even the good flying ships were half-looping with rollouts at the top. The hot glow engines strained many a model. The hottest ship on the field, an .049 powered Strato-Streak, by Schaeffer, shed its wings at 300 ft. just by sheer speed.

You have been reading quite a bit; let's get to a few photos starting with the writer, John Pond, who showed up with a Simmons Gas Champ and a Cleveland Playboy as seen in Photo No. 1. Although he elected to fly the Playboy in the contest, the Simmons Gas Champ proved to be a better flier that day.

Excitement ran very high as can be seen in Photo No. 2 showing the crux of old timers: "makin 'em R.O.G." Bill Thompson, from San Diego, demonstrates this very well with a Strato-Streak on the improvised takeoff boards. Seen also is Ed Ghoorzoe with a Gas Champ; Clark Hahn, Stockton GMA President; and the Contest Director, Bob Bowen.

The ignition event was very reminiscent

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15. "Giant" in Australia! Basil Healey built the huge 176-inch Boehle design for the Australian SAM Champs at Canowindra. Quigley photo.

16. Beautifully finished "Pagan" O.T. C/L ship was built especially for the Aussie SAM Champs by Mike Pettigrew, SAM 1788 president. Quigley photo.

17. Photo taken by Mik Mikkelson at Old Warden three years ago shows an unidentified gentleman lofting his nicely built Hermes "Hayseed" for the camera. Engine appears to be an early model O.S. 60 four-stroke.

MODEL DESIGN & TECHNICAL STUFF

BY FRANCIS REYNOLDS

Hey, I get to help a fellow columnist. In his "Electric Power" column in this magazine for January, Mitch Poling asked if anyone could show him how to measure the torque on our motors. He thought he recalled articles on the subject in *Model Airplane News*, but didn't know where. I don't read *M.A.N.*, but I can help anyway. I'm a mechanical engineer, and M.E.s are supposed to know about such technical stuff. Glad to be of service, Mitch. You have helped me a number of times.

DYNAMOMETERS

A torque meter combined with a load for absorbing power and used to measure the output of an engine or motor is called a dynamometer. When my wife and I toured the Volkswagen plant in Wolfsburg, Germany years ago we watched the VWs drive directly off the assembly line onto a set of rollers, rev up to full throttle for a few seconds, then drive off. The roller setup under the rear wheels was the visible part of an electric-generator-type dynamometer. Each car was being tested for peak horsepower.

When I took engineering at the University of Washington we had to run dynamometer tests on steam engines (this was fifty years ago), gasoline engines, and electric motors. The heart of the old "dyno" we used was a "Prony Brake." This was an adjustable brake which applied a load or torque directly to the motor under test. The torque was transmitted by an arm on the brake to a platform scale where it was measured. The setup was big and crude by modern standards.

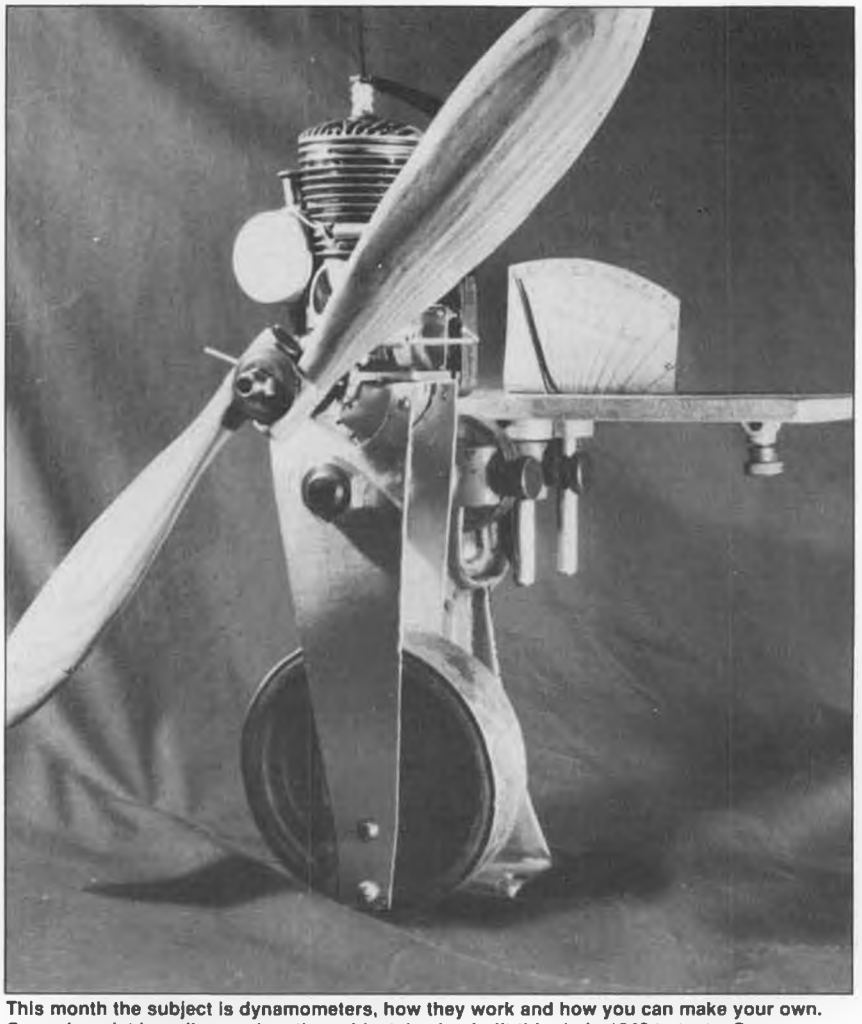
Fortunately, there is a much simpler and very accurate way of measuring the torque and ultimately the power of *small* motors and engines such as we use. I "invented" the pendulum dynamometer I'm about to describe. I put "invented" in quotes because it is so simple that I'm sure I actually reinvented it. The model engine manufacturers and engine columnists may use the same system, but I haven't seen their setups. This pendulum setup will also be easier and much more accurate than the electric generator dyno you described in your December column, Mitch.

THE PENDULUM REACTION-TORQUE DYNAMOMETER

The old Prony-brake apparatus measured the torque on the brake. The pendulum dynamometer measures the reaction torque on the engine. The entire engine is mounted on a hinged pendulum such that it can rotate a part of a revolution about an axis parallel with its own shaft. The load to develop the torque is not a brake but a propeller. The torque is not measured by a scale but by the deflection of the pendulum from vertical. In other words, gravity is the reference by which we measure the torque. Have a look at Figure 1. This simple setup would have to be very large to test full-scale engines, but for models it is beautiful.

I wrote my thesis at the U of W on a magneto for model airplane engines. This was in 1942 and the glow plug wasn't developed for some years after that. I made two mags, ran one on a Super Cyclone and the other on a Phantom Bullet. They worked fine, were lighter than battery ignition, and the engine never quit because of dead batteries.

But I digress. I designed, built, and used the pendulum dynamometer shown in the 1942 photo to compare the power of the Super Cyke on magneto with the power on battery ignition. It put out two percent more power on the mag than it did on battery. Hotter spark.



This month the subject is dynamometers, how they work and how you can make your own. Our columnist is well versed on the subject, having built this rig in 1942 to test a Super Cyclone with homemade magneto.

THE LOAD

Note the crude homemade adjustable-pitch propeller in the photo. A remotely-adjustable prop would have been better. With this one I had to stop the engine and readjust the prop pitch after each full-throttle torque reading. The efficiency of the prop is of no concern here because we are only trying to develop torque, not thrust. Paddle blades at a ninety degree angle would do just as well.

If you don't want to build or buy an adjustable-pitch prop, you can use a number of different sized props. Take a torque reading with each prop on the motor to get the data for plotting the torque and power curves of a particular motor. If you are only interested in knowing the torque or power absorbed by one chosen prop, you have only a single data point to get.

MEASURING THE TORQUE

To deflect a pendulum from vertical we must apply a torque to it. The greater the torque, the higher the pendulum bob will rise. When the bob is level with the shaft (the pendulum arm horizontal) the torque is maximum for that particular arm length and bob weight. The application of more torque would swing the weight over the top and whirl the motor clear around, which would probably be a disaster! Therefore, always put a mechanical stop on the dynamometer to prevent it from rotating more than ninety degrees.

The torque required to hold the pendulum at an angle of ninety degrees is simply the arm length from the pendulum pivot

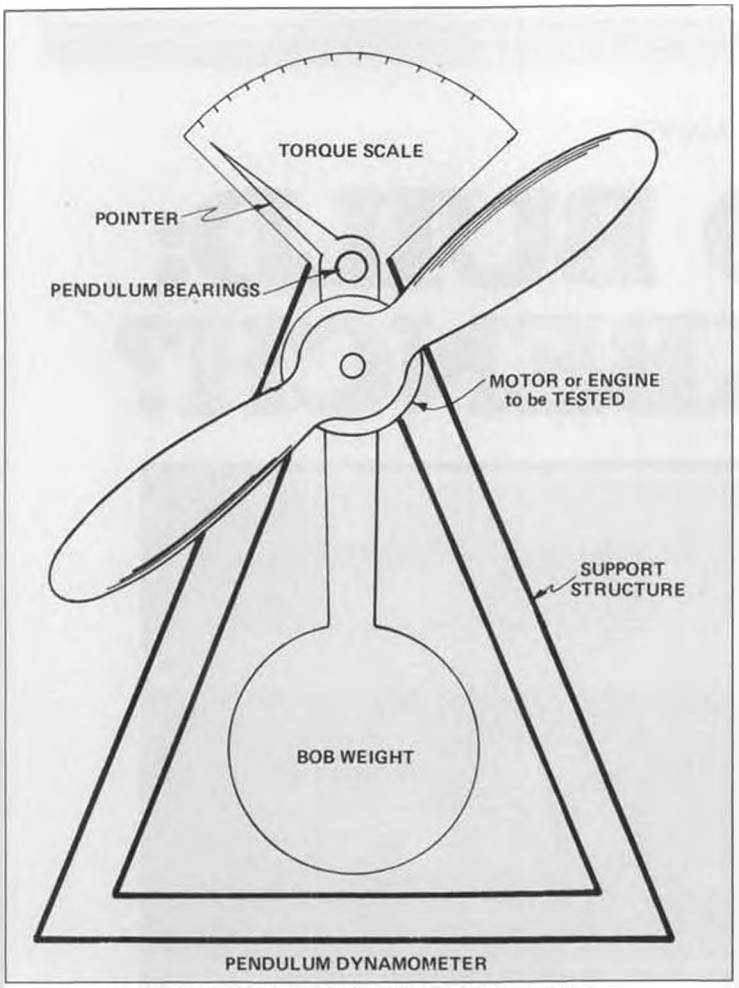


Figure 1. A typical pendulum reaction-torque dynamometer.

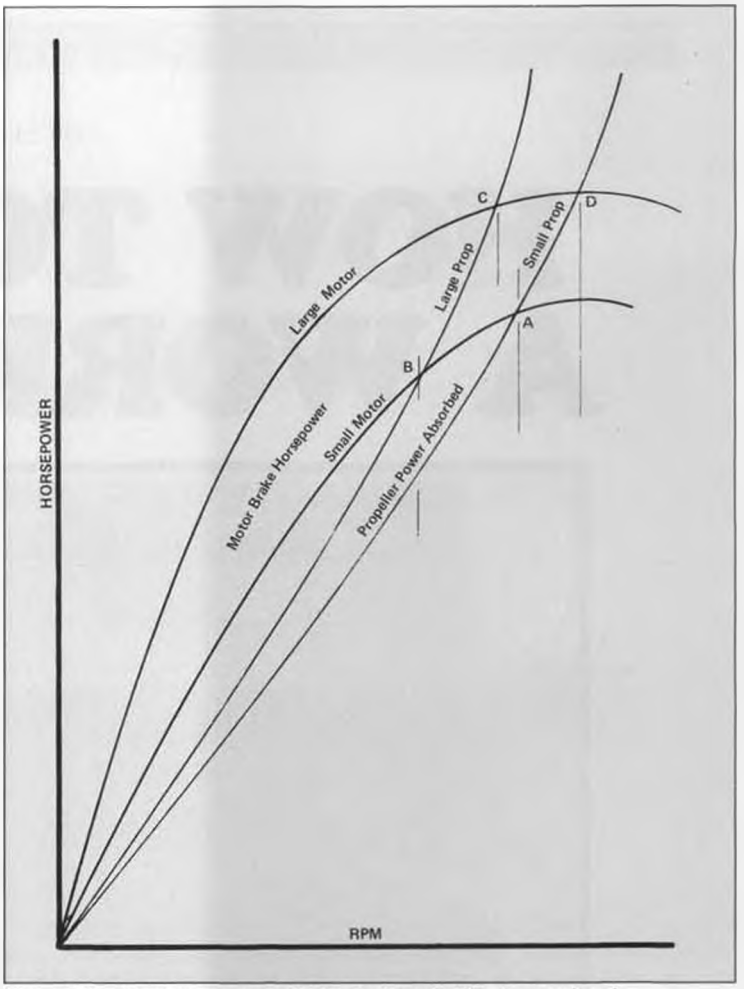
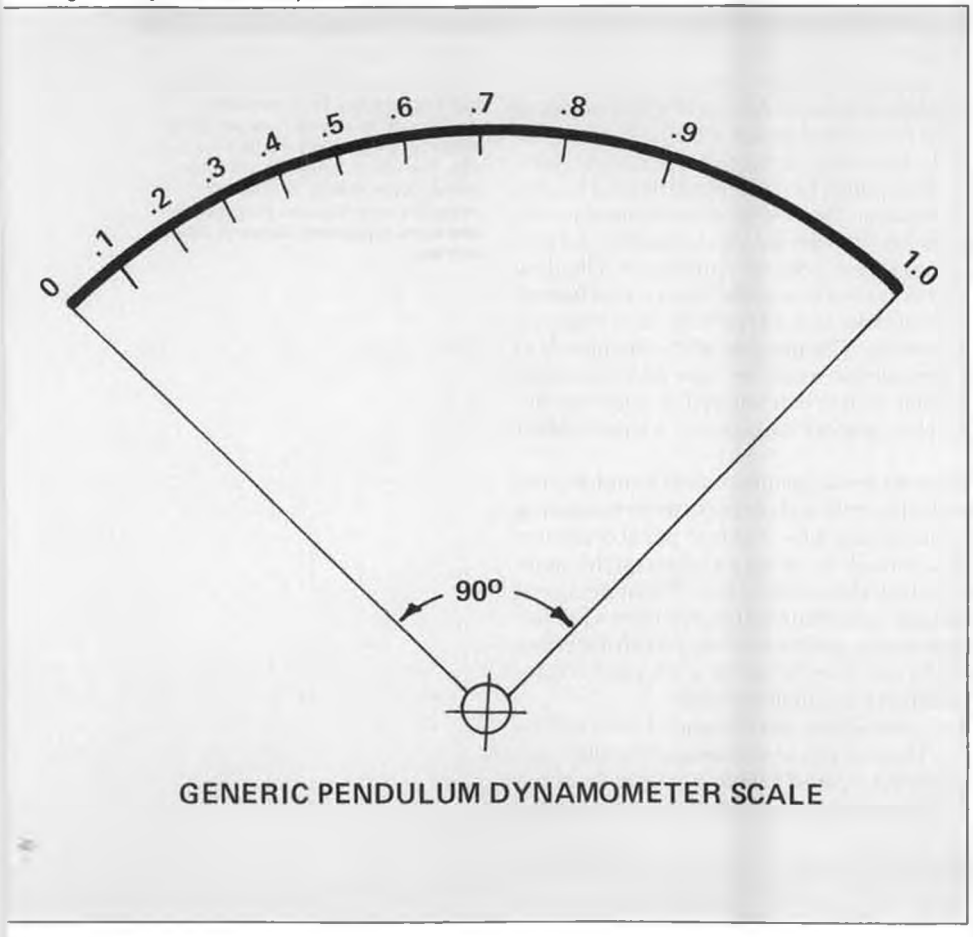


Figure 3. Typical power curves obtained when plotting the results of dynamometer tests.

Figure 2. Dynamometer torque scale.



point to the center of gravity of the entire pendulum (including the mounted motor) times the total weight of the pendulum and motor. This torque is easy to measure directly. Support the pendulum bob on a good scale with the arm exactly horizontal, record the weight, and measure and record the distance from the pivot point to the point where the scale supports the bob. The product of this weight and distance is the torque in ounce-inches, pound-feet, or whatever units you measured in.

Obviously, the dynamometer must have more torque capacity than the motors you wish to test on it. Use a long enough pendulum arm and a heavy enough bob to react torque well in excess of the maximum you expect. Don't overdo it, however. An excessively large dynamometer will be less sensitive and therefore less accurate.

A pointer is installed on the pendulum, with a fixed scale behind it. For convenience in reading, I drew figure 2 such that the pointer is at an angle of forty-five degrees to the left when there is no torque. It happens that for normal right-hand rotation of the test motor, the torque scale comes out with zero at the left in the usual manner. If you also wish to test motors in reverse, set the pointer straight up for zero torque and calibrate the scale for pendulum swing in either direction from this center position.

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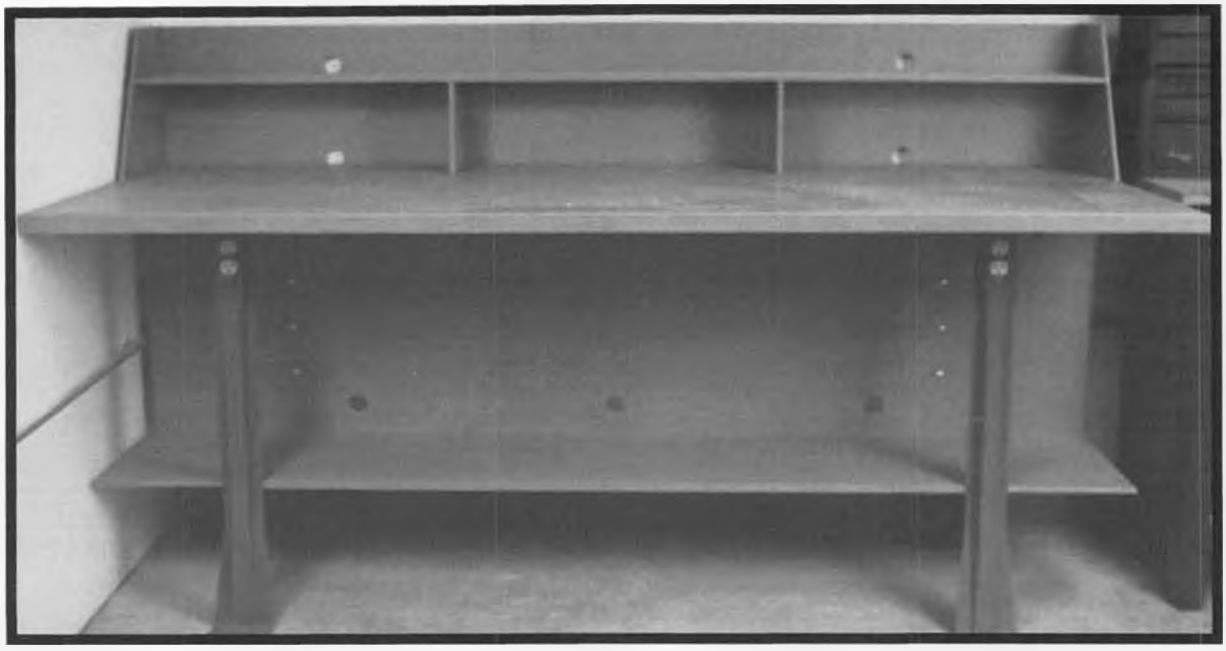
BY ELOY MAREZ

HOW TO BUILD: A WORKBENCH?



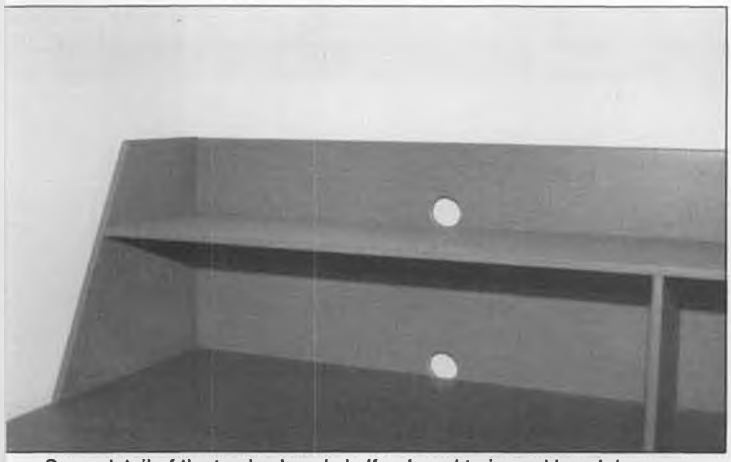
Seen here ready for that next model building project, the completed workbench is shown here perfectly clean for probably the only time in its life. The whole thing is built completely from readily available materials and requires only those tools and equipment found in most homes.

No doubt, you have perused dozens of "How to Build" articles in the model press. Each one told you how to build the world's best model of some particular class, and that is what the model airplane hobby is all about—building things that fly. However, as in any other pursuit, your success with that kind of a project will, at least partly, be determined by your having the required tools—and a proper table to work on. The new modeler learns this very early in his career. Just as soon as he graduates from the dining room table and gets at least a corner in the garage, he starts looking for a decent workbench. Oh, they can be bought; it is possible to spend the equivalent cost of the latest nine-channel PCM radio on a workbench. But the *real* modeler is not known by how much be spends on things, but on the things he creates. The purpose of this treatise is to inform you of some readily obtainable inexpensive materials from which you can assemble a professional looking, functional workbench tailored to your specific needs and likes. Cost? Less than $100, unless you opt for teak and a hand-rubbed oil finish!

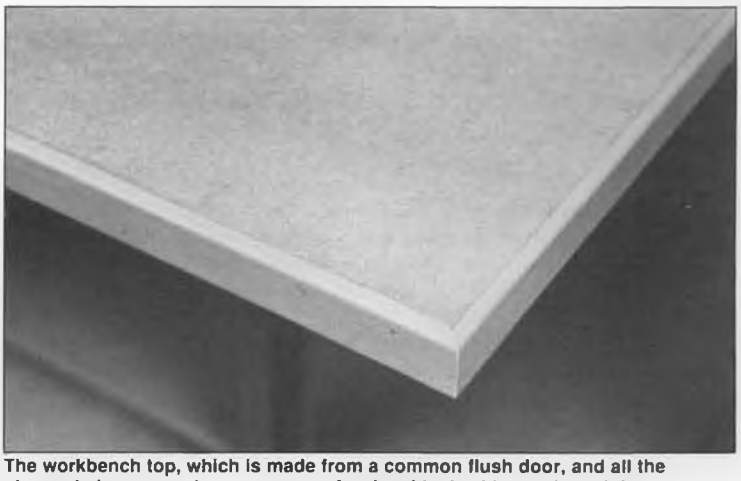
Building your workbench will require only those common tools found around every home: a hammer, screwdriver, an electric drill, and of course some measuring equipment. The one possible exception is a power saw. The best possible one for this or any similar project is a table saw, though by using a cutting guide, quite accurate cuts can be made with a hand-held electric circular saw. The professional carpenter or cabinetmaker will try to convince you that you have to have a jointer/planer, a power tool which, amongst other things, can be used to smooth the edges of the plywood pieces. It would help, but I find that the use of a plywood cutting blade on the saw and a sanding block will give acceptable results.

If you live in a large metropolitan area, everything recommended here will be available from no more than two sources. Those of you in smaller communities will still be able to get all but one item from the nearest building supply or home improvement center. That one item is a critical one, so let's discuss it first; it is the legs.

By now you will have looked at the photos. Note that the recommended legs are



Some detail of the top back and shelf, referred to in workbench language as a "riser." The dimensions shown are those used by the author to fit his particular needs, but can be adjusted as necessary to suit your own requirements.



The workbench top, which is made from a common flush door, and all the plywood pieces are given a more professional look with wooden edging available from any building supplier. The molding is attached with white glue and finishing nails.

metal and are made for industrial applications for workbenches, tables, and machine mountings. There are two types generally available; the ones shown are 32 inches in height and have contoured uprights with the base splayed out for a wider stance and greater rigidity. The others are U-shaped in cross section, the legs being straight all the way down, with subsections at the base by which the height can be adjusted from 29 to 33 inches in one-inch increments. Both types come in 30 and 36-inch widths; your selection will be based on the width of the top that you choose, to be discussed next. These types of workbench legs are sold by industrial machinery and equipment suppliers—check your local Yellow Pages.

Similar legs are made by a number of manufacturers, in 14 and 16 gauge steel, fully welded at all joints and perfect for this purpose. All of the legs that I have seen come pre-painted in a medium gray. I will shortly give you a nationwide source from which you can order them, should you need to. If you are able to locate a local source for them, be sure you purchase the ones that have the electrical socket knockouts, unless you are dead certain that you will not be wiring your bench for electricity. However, you can't have too many electrical sockets in your workshop and you definitely can't ignore the convenience of having some right on your workbench.

Caution! Some home supply stores carry metal table legs similar in outward appearance to the U-shaped ones mentioned, but they are not what you will want. Such legs are made of very light material, spot welded together, without the bases turned under for good weight distribution. In addition, they are quite narrow, usually no more than 18 inches in width. The legs recommended are only available from suppliers that handle material and equipment for plants and factories.

The source I have for you is C & H Distributors, Inc., with its home office at 400 South 5th St., Milwaukee, WI 53204. The nice part is that it has distribution centers in Atlanta, Boston, Dallas, Edison (NJ), Los Angeles, Milwaukee, Reno, and Toledo, so regardless of where you live, you will not have to pay shipping from clear across the country. Nice too is the fact that you can order the legs of your choice by toll free phone: (800)558-9966, or toll free Fax: (800)336-1331. The legs recommended are:

CONTOURED, 32" HIGH:
No. 53-024A, 30" wide, $17.84 each.
No. 53-025A, 36" wide, 19.15 each.
U-SHAPED, ADJUSTABLE HEIGHT:
No. 53-847A, 30" wide, $20.98 each.

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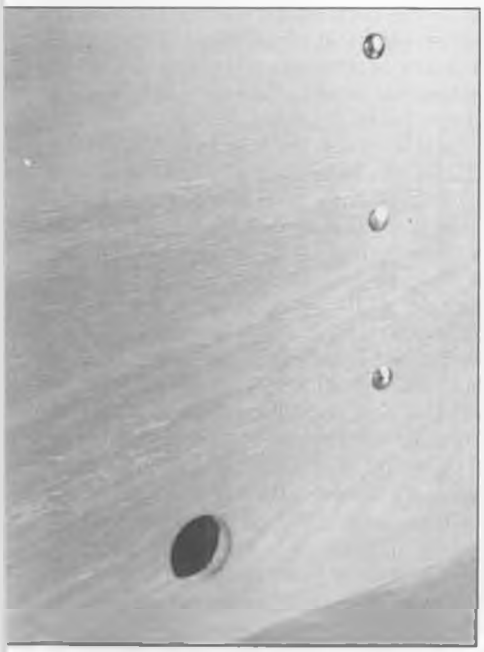


The lower back and shelf are attached to the legs with standard hardware store carriage bolts, nuts and washers. The large holes in the back pieces are there for the passage of wires for electrical items that might be placed permanently on the bench.

The recommended pre-formed metal bench legs come with knockout mountings for electrical sockets on both the front and rear legs. Wiring the front sockets is definitely recommended, as they are in an extremely handy location. Rear ones are optional.

Strictly for esthetic reasons, the end panels for the top riser are attached with hardware store finishing washers and screws. No question about it, they make for a really sharp looking finished product.

ELECTRONICS CORNER

BY ELOY MAREZ

An anniversary slipped by me, something that seems to happen more frequently as more of them do pass. Anyway, the January Electronics Corner marked the start of the ninth year, with not a single month missed. My thanks to all who have helped and supported me during all that time. Which brings us to this month, and for openers, an ongoing subject here in EC:

NiCd batteries, as discussed in a letter from Robert L. Marin, of Matawan, New Jersey. Bob writes:

"I am writing to you once again, hopefully this will be published as an open letter to all R/C manufacturers in your column. I believe that everyone will agree that R/C equipment has come a long way in reliability, size, and versatility. The pioneers and manufacturers responsible can certainly be proud of these achievements. One of the weakest links is still the care and maintenance of the NiCd batteries in these systems, especially by the newcomers.

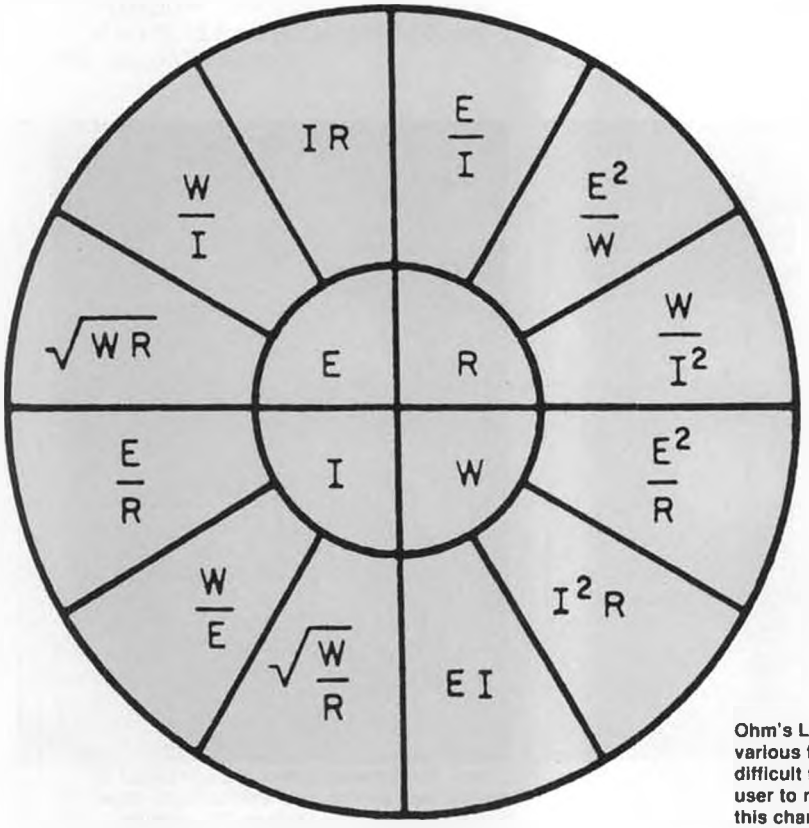
"This letter was prompted by a JVC camcorder and a Norelco 950RX cord/cordless razor the writer received for Christmas. What, you may ask, has this got to do with R/C equipment? Well, I believe it proves that the technology is there for improving our present systems.

"The first is the JVC camcorder that is powered by 9.6 volt battery packs ranging from 500 mAH all the way up to 1800 mAH capacities. The packs easily snap and lock on to the back of the camcorder without further electrical connections. This would be a nice feature for our present day transmitters that would allow us to utilize spare battery packs if needed.

"The second is the Norelco 950RX razor which features the state-of-the-art charge of its NiCd batteries. It has a built-in LCD meter that measures a mere 5/16 x 3/4 inch that displays the percentage of charge remaining in the batteries. A fully charged battery displays all the readouts on the meter as 100-80-60-40-20. As current is consumed, the 100 will vanish from the meter, showing that 80% of the charge remains in the batteries. This process will continue during battery drain until it reaches 20% on the meter. At that point, the figure `20' will blink and a tiny audio charge alarm is activated when the razor is switched off. The batteries can then be fully charged within an hour with its built-in charger using either 110V or 240V AC. State of charge can be determined by reading the LCD meter and a tiny charge indicator light that blinks when 100% of charge is reached. I feel certain that this circuitry and parts could be modified for the voltages and capacities of NiCds used in our

continued on page 92

The type of information much needed by the R/C beginner can be found in these two books by well-known model aviation writer, Doug Pratt. They are available in hobby shops or from Ace R/C, 116 W. 19th St., P.O. Box 511, Higginsville, MO 64037.



OHM'S LAW

ELECTRONICS CORNER / MODELER BUILDER MAGAZINE

Ohm's Law in all of its various forms can be difficult for the casual user to remember. Have this chart copied and stick it in some convenient spot over your workbench as a ready reminder.

REVIEW

KALT 'EXCALIBUR'

CONCLUSION BY JAMES WANG

Folks, we are back for part II, the conclusion of the Excalibur review. Last month we examined the Excalibur's flying qualities and its engineering qualities. The summary was that the Excalibur has very pleasant handling qualities. It is probably the most docile .60-size helicopter in calm weather, but its forward flight penetration and hover stability fall off on windy days. Last month we also explained air resonance, and explained how to avoid air resonance on the Cyclone II by choosing an alternative main rotor rpm. We also said the Miniature Aircraft modified O.S. .61 SFN-H and Hatori pipe combination provided a 10 to 20% gain in power over a regular stock O.S. .61 SFN-H with standard Kalt muffler.

Now let me continue with the Excalibur's handling characteristics. When the wind is less than 10 miles per hour, the model is so docile and predictable, that it makes a perfect FAI contest machine. I would even say it makes a great trainer, too. However, due to its high quality, the price is quite high,

(Top) The Kalt Excalibur is already a very sleek machine, but the custom paint job by Ray St. Onge makes it look even more so. (Left) Close-up shot reveals the air scoop below the canopy, sort of like an F-16. Even though the engine cylinder faces forward, the scoop is more for looks than for actual cooling. The aftermarket exhaust system is comprised of a U-shaped Hatori tuned pipe and Hatori #765 header. (Right) The Excalibur's power train and control setup. Assembly time is very low, thanks to the factory assembled main and tail rotors. The standard Kalt muffler is shown in this photo—very quiet, but it doesn't provide the power boost that a tuned pipe does.

Oh no! James' banged-up Excalibur is the result of pilot error—an improperly executed low-altitude roll. Doesn't look too bad, but the broken canopy and fins, cracked main rotor hub, bent main shaft and flybar, and

Lineup of helis at our author's local club field. From front: X-Cell, Excalibur, GMP Jet Ranger, Rebel, Legend, Concept, X-Cell, Legend, X-Cell, King Cobra, and Concept.

which makes it a heavy investment for beginners. If you have the bucks, then I recommend it with both thumbs up. The reason I like the Excalibur is that it seems to have an excellent static stability margin. In layman terms, it means the vehicle tends to stay put and is less likely to drift off course. For example, in hover, the Excalibur does not drift or exhibit Phugoid oscillations as much as other helicopters. This is attributed to the model's inherent design. Variables such as rotor stiffness, fuselage inertia, mast height, CG position, rotor blade feathering axis, paddle design, etc., all contribute to influence stability. But the main reason is the thick and heavy Kalt paddles. The present Kalt paddle design has been around for a decade, and it is still one of the best for all-around flying.

In forward flight, the Excalibur is one of the few models that does not tend to balloon up when the pilot pulls the nose up. Most model helicopters in high speed forward flight would zoom upward spontaneously when the pilot feeds in any small amount of back cyclic stick. This is due to angle-of-attack instability characteristics that all helicopters possess. The Concept 30 has a very severe nose-up tendency in high speed flight. This is due to the soft, individual flapping blade design of the Concept's main rotor head. For example, if you put the Concept in a high speed level flight and pull the nose up just slightly, the rotor immediately sees an increase in angle of attack and instantly pitches the nose upward. This is quite undesirable. This happens to be the design trade-off of the Concept's soft flapping rotor head. But this same head makes the Concept one of the easiest to hover models in the world. The Concept's designer, Mr. Taya, was prudent; he realized that since the Concept was designed primarily as an easy-to-fly beginner's helicopter, he used the soft independent flapping rotor head, even though it pitches up.

It is extremely difficult to design any helicopter to be super stable in hover and track like an arrow in forward flight. The Excalibur comes pretty close. The Excalibur has only a very slight tendency to raise the nose when there is a rapid change in helicopter pitch attitude. (Aircraft pitching motion means the nose rotates up or down about the vehicle's center of gravity.) *All* the high quality .60-size competition machines also have a minimal nose-up tendency, but the Excalibur is the best! We have clocked the Excalibur with a radar gun; it did 70 mph at full bore, and the nose-up tendency was minimal. We have clocked a Concept doing 55 mph at full bore, but the slightest change in pitch attitude sent the Concept zooming upward.

However, when the wind was above 10 to 15 mph, the Excalibur lost some of its static stability. It drifted in hover. Adding a set of GMP flybar weights improved the handling,

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Details of the Excalibur's injection molded K-5 main rotor head, which boasts 14 ball bearings and two thrust bearings.

The author doing a demo at the American Institute of Aeronautics picnic. The Excalibur's inherent static stability allows for very relaxed flying—it and the Concept 30 are James' favorite hovering machines.

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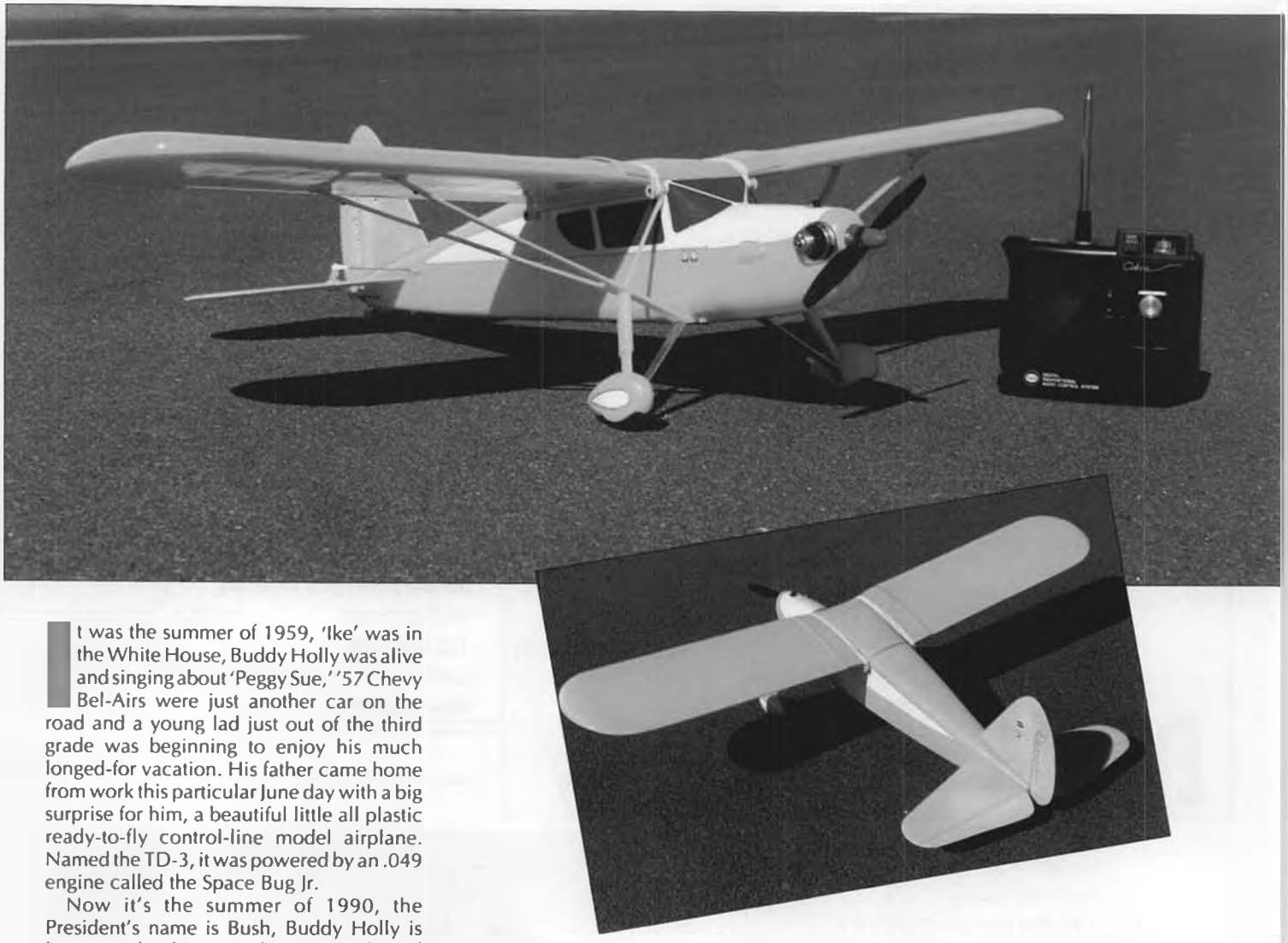
REVIEW

COX FAIRCHILD 24

BY SKIP RUFF



It was the summer of 1959, 'Ike' was in the White House, Buddy Holly was alive and singing about 'Peggy Sue,' '57 Chevy Bel-Airs were just another car on the road and a young lad just out of the third grade was beginning to enjoy his much longed-for vacation. His father came home from work this particular June day with a big surprise for him, a beautiful little all plastic ready-to-fly control-line model airplane. Named the TD-3, it was powered by an .049 engine called the Space Bug Jr.

Now it's the summer of 1990, the President's name is Bush, Buddy Holly is long gone but his music lives on, and good '57 Bel-Airs are almost worth their weight in gold. That same young lad is now rapidly approaching what some (depending upon your point of view) might consider to be middle-age, with more than a bit of grey hair to show for it. Funny though, he still plays with "toy" airplanes and is, in fact, out at the field flying a beautiful little all plastic, almost ready-to-fly R/C model airplane powered by an .049 engine that is somehow vaguely familiar.

Amazingly, in spite of the 32 year separation, both of these little airplanes have been produced by the same company, Cox Hobbies, Inc.

"Cox" is an American tradition, as the advertisement states, and that is a statement of which there can be no disputing. The company has earned and kept that title by producing countless numbers of quality modeling products for over 40 years!

A good example of their continuing quality is one of their latest offerings, and the subject of this article, an ARF model of the Fairchild 24 that, except for batteries and fuel, comes virtually complete, with the engine and the new Cobra two-channel radio. Also included (and an excellent idea at that!) is a 13-minute VHS video tape that offers, among other things, tips on assembly, radio installation and operation, hand launching. It also lets you hear the difference in sound between an engine which is adjusted properly and one that is too rich or lean, something difficult, at best, to describe on paper, and which will certainly help the low-time flyer.

The approximately 1/12-scale model is, as mentioned, primarily all plastic and, other than a bit of careful trimming of some of the pieces, strictly a bolt and tape together affair, absolutely no glue or paint being required.

The fuselage is a single-piece blow-molded shell of polyethylene, which makes it extremely tough yet flexible. The wing is a one piece OPS (orientated polystyrene) composite with a partial foam core. It has a flexible center joint which becomes rigid when the ABS plastic top center section is taped in place. The wing struts are nonfunc-

Spill-out of parts shows the complete combination package. Note VHS tape which assists in assembly and preparation for flying.

tional, and yellow (to match the color scheme) rubber bands are provided to hold the wing on. The tail surfaces are molded out of a plastic and foam laminate and are pre-hinged. The rib and stringer details of all surfaces are molded in to simulate the rag covering of the full-size machine.

The load bearing part of the landing gear is pre-bent and drilled aluminum. The rest of the landing gear/wing strut assembly is plastic and faithfully reproduces the rather complicated design of the real one. The wheel pants appear to be made out of the same material as the fuselage and, in spite of the small size of the wheels, have incurred no damage from the rough, rocky field on which I fly.

The .049 Ranger engine, a direct descendant of the Space Bug Jr., comes with fuel tank, muffler, prop, spinner, spring starter, and two special wrenches.

The decals provided are of the fuel-resistant, sticky-vinyl type and if trimmed and applied *carefully,* fit well with a minimum of bubbling, providing an attractive model.

Wheels, screws, pushrods, clevises, control horns, and other necessary items are included. As I said, the model is complete!

The Cobra radio included with the kit comes with two mini-servos and is designed to use either dry cell (alkaline) batteries or rechargeable NiCd pencells, four for the flight pack and eight for the transmitter. There is a charging jack on the transmitter so that a separately available charger can be

plugged into it when using NiCds. Speaking of the transmitter, this is where the biggest change has taken place compared to the previous radios Cox offered. Instead of the old single-axis, two-stick (elevator on the left and rudder on the right) job, the Cobra has a two-axis, singlestick (mode 2) and is thus more natural in use for those with previous flying experience. It offers servo-reversing on both channels and, as you can see from the photos, has an ergonomically designed case that, while looking a bit odd at first, is very comfortable in the hands, with a natural feel. Total airborne weight of the flight-pack, with four AA NiCds is about 6-1/2 ozs. The radio is warranted for six months (the model is 90 days). By the way, the radio is also available in a three-channel version and both come on 1991 frequencies (channels 38-56).

The model is recommended for ages 14 years and above and goes together quickly, with few problems, although it did take me somewhat longer than the advertised two-three hour assembly time.

In general I found the parts fit to be excellent. In fact, I had to look hard and get a bit picky to find any faults with the product at all! If I could change one thing it would probably be the taped-on top center section of the wing, as I think it detracts from the appearance a bit and the tape tends to come loose after awhile and must be pushed down and re-stuck. In its defense, it is a quick and easy way to add dihedral and rigidity to the wing.

All of the assembly screws are phillips head which worked out fine except for the two which hold on the landing gear. Those screw in very hard (as well they should!) and

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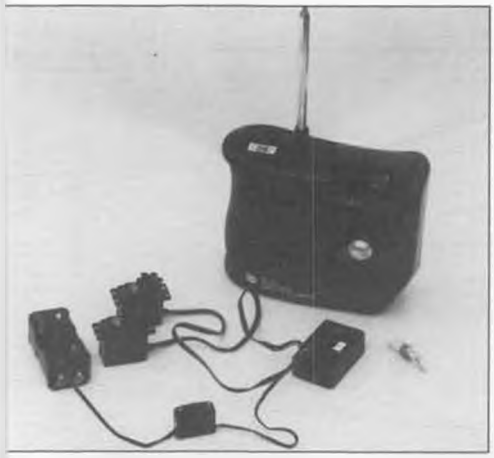


The complete Cobra radio system, with sensible single stick control for rudder and elevator. Odd transmitter shape is more comfortable in the hand than the usual square box.

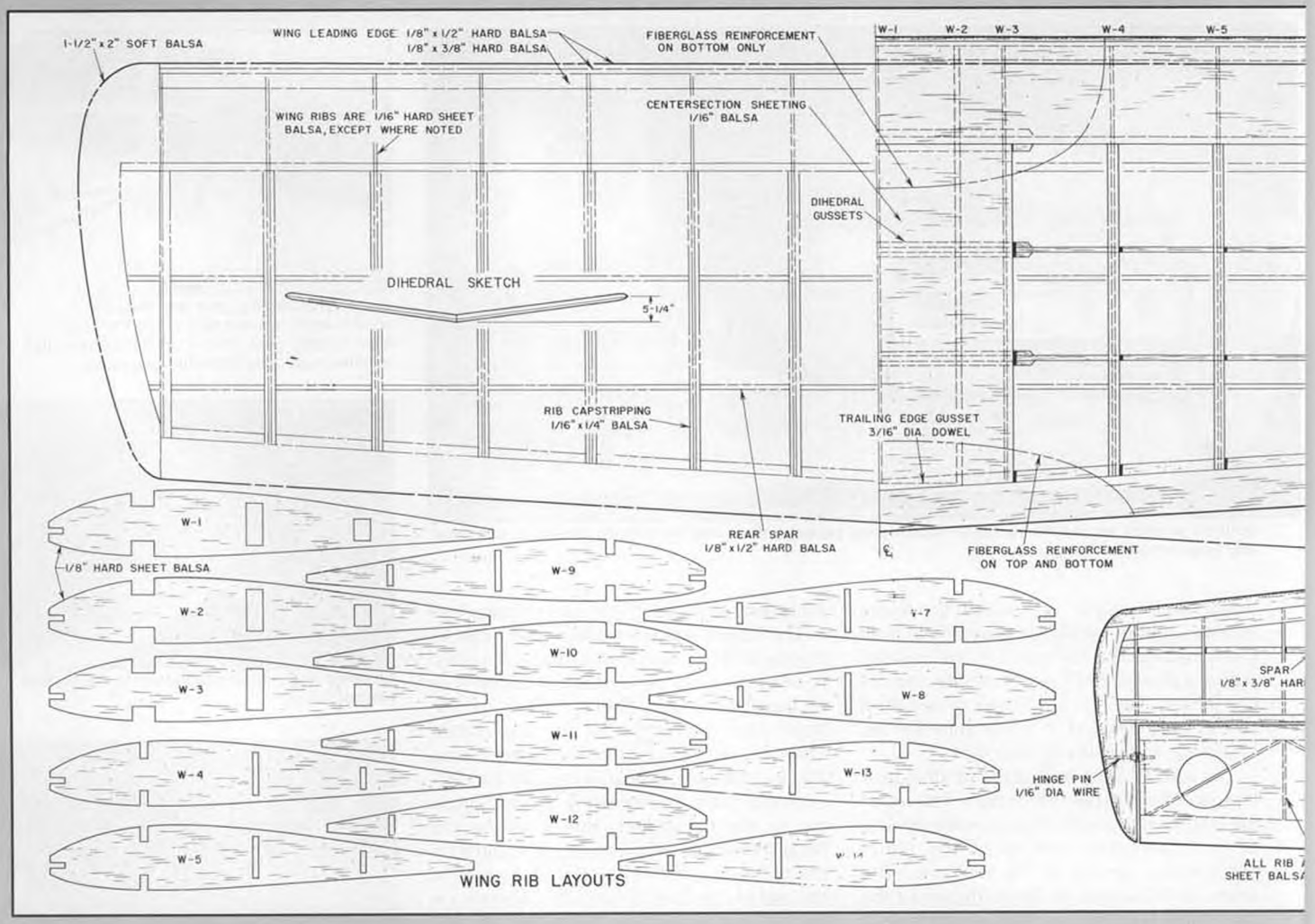
Close-up of landing gear and wing strut combination, a trademark of the Fairchild 24. Main landing gear strut of pre-bent and drilled aluminum actually takes landing loads.

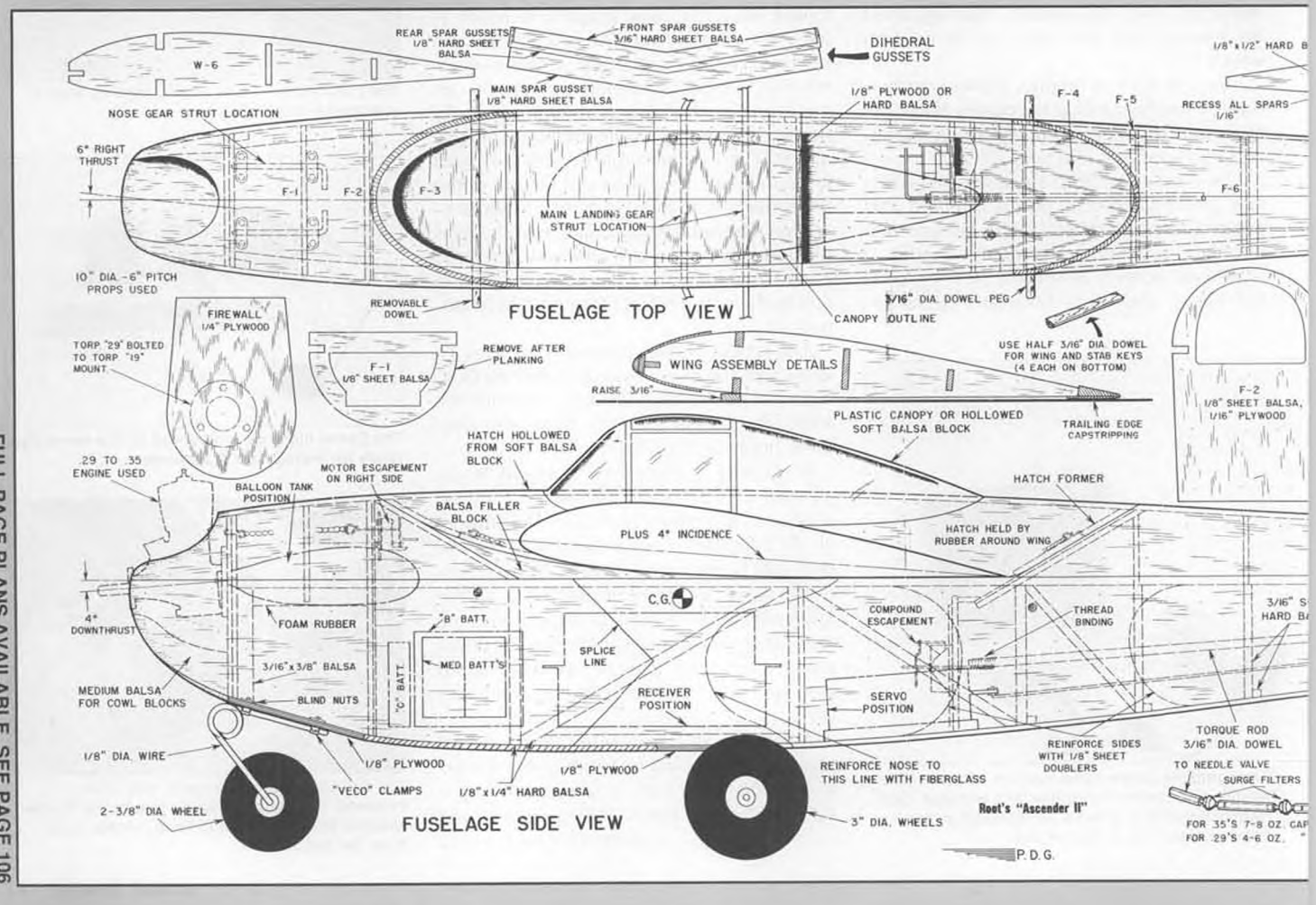
Close-up of pushrod attachment to tail surface control horns.

The Fairchild 24 glides in for a landing after a successful test flight.

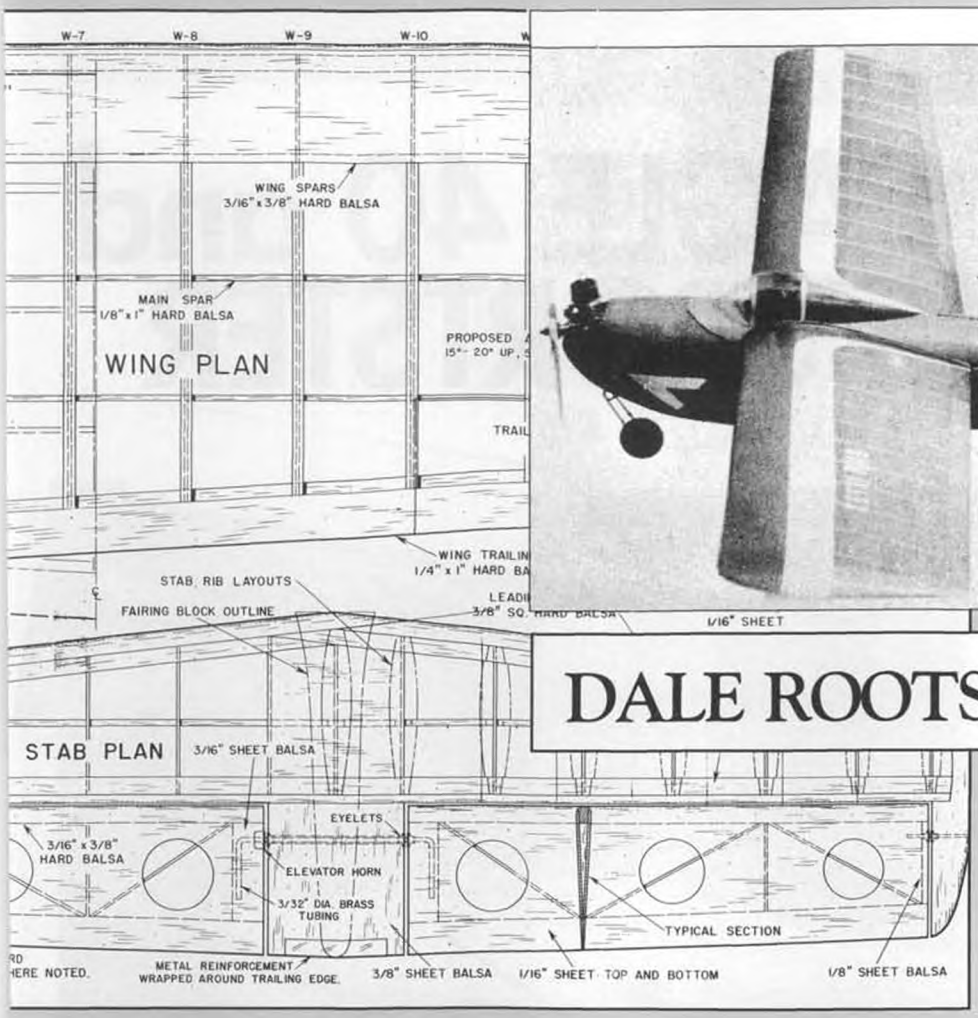
The Cobra flight pack mounted on the servo tray, ready for installation in fuselage.

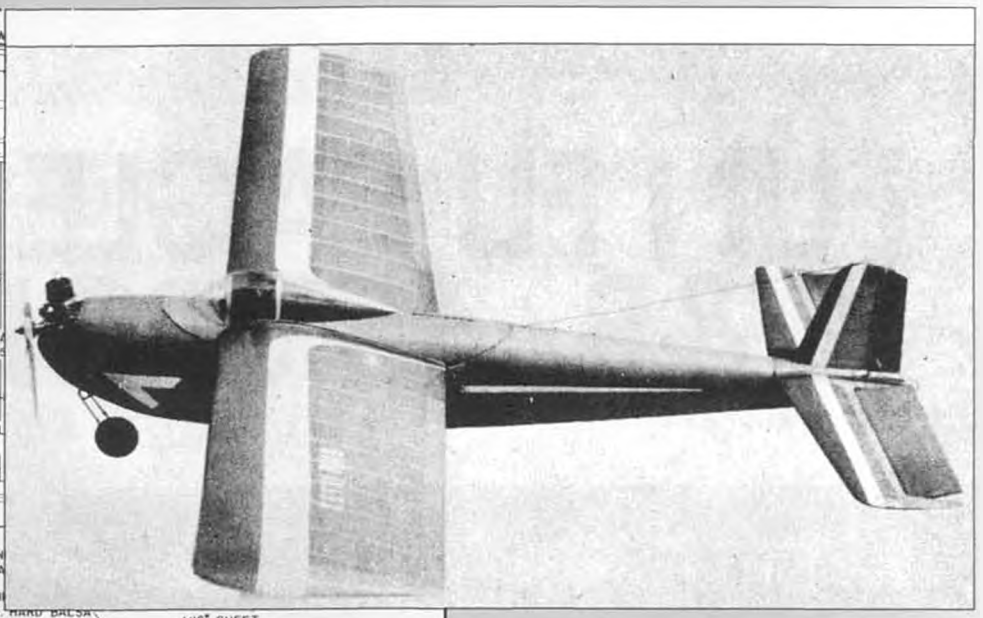
The Cox .049 'Ranger' engine, with cowl removed. Skip found it better to turn the muffler exhaust exit downward to keep residue away from the decals.





FULL PAGE PLANS AVAILABLE. SEE PAGE 106





DALE ROOTS 'ASCENDER II'

A top California R/C pattern airplane from the late 1950's.

BY BILL NORTHROP

In the August 1957 issue of *Air Trails*... whoops... *American Modeler*, a construction article and plans were published for this ahead-of-its-time RC design by Oakland, California hobby shop owner, Dale Root. Called the "Ascender II," it had accumulated a whole bunch of trophies by the time it was published. Just to put you in touch with RC in 1957, in the same issue of this leading model magazine, there was a grand total of 15 ads for RC materials, of which only two advertised RC aircraft kits; deBolt and Babcock, and aside from miscellaneous electronic supply houses offering possible RC related items from their stock, there were only six radio control equipment ads; Ace RC, Bonner, Babcock, Bramco, Citizen-Ship, and C.G. Only one of

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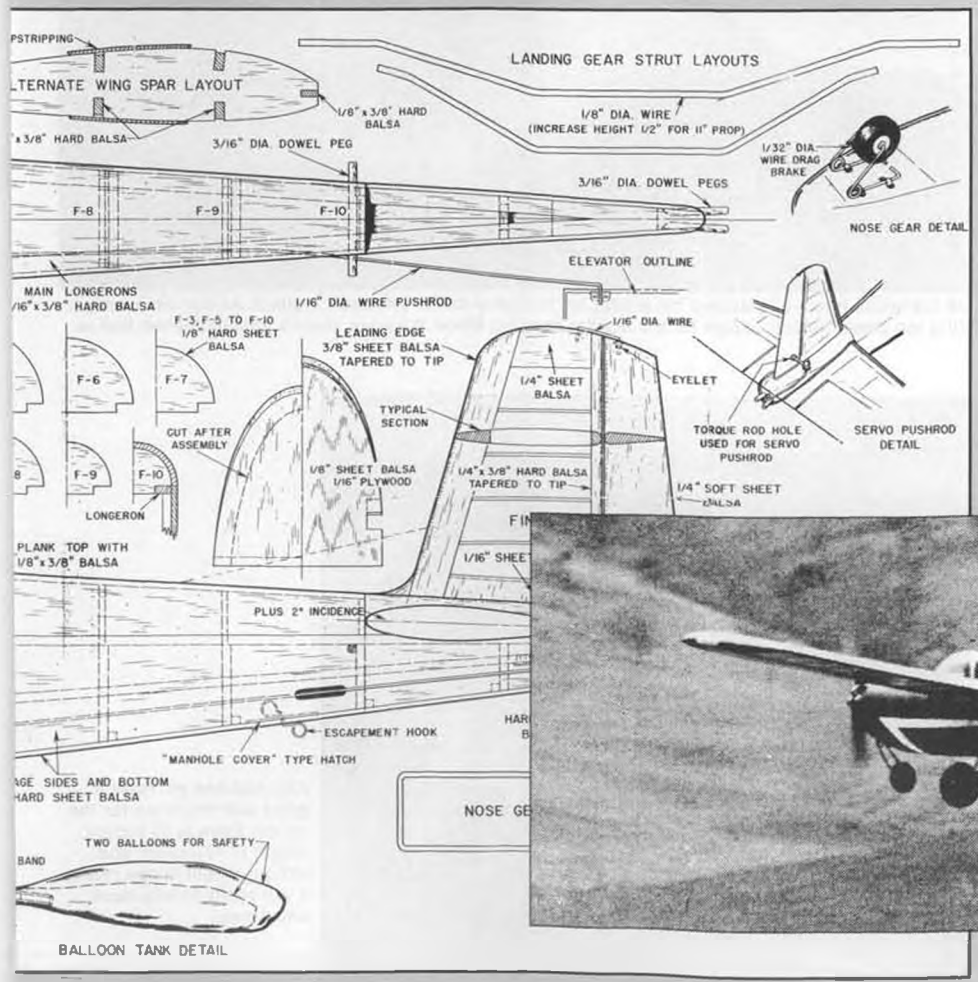


REVIEW

FUN FLI EAGLE 40 and K&B .45 SPORTSTER

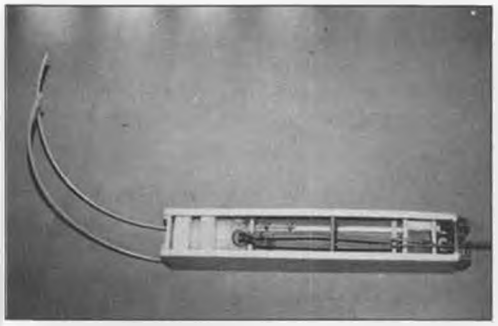
BY ALEX McLEOD

If you've been wanting to try a jet but are hesitant to sink big bucks into a true ducted fan model, try this prop driven jet model instead. As our author says, if you can see the prop or the engine in flight, you're flying too close! (Inset) Except for the muffler hanging below the nose, there's little indication that is not a true ducted fan powered F-15.

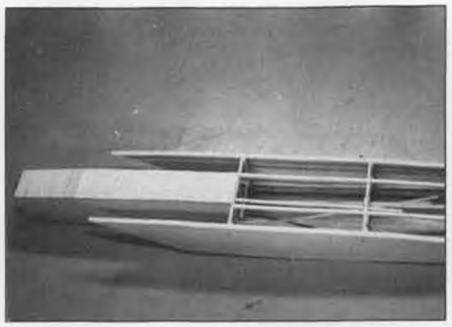
When Bill Northrop asked me if I would like to do a product review of one of Bob Parkinson's kits, I was extremely pleased. Here was my chance to build and fly a jet model aircraft. Of course I was thinking of a ducted fan model, since that is what Bob is best known for. As it turned out, it was a jet model all right, but not a ducted fan one. I'm sure many modelers who read this review would like to try a jet but haven't the nerve to buy one at the prices charged for the high-tech ducted fan models, or perhaps feel they haven't the building or flying skills needed. I have never flown a ducted fan either.

When I found it was to be a propeller driven, jet-like model, I was at first a little disappointed until I saw the kit and the finished model. The Fun Fli F-15 Eagle 40 is one of the most scale-like propeller driven

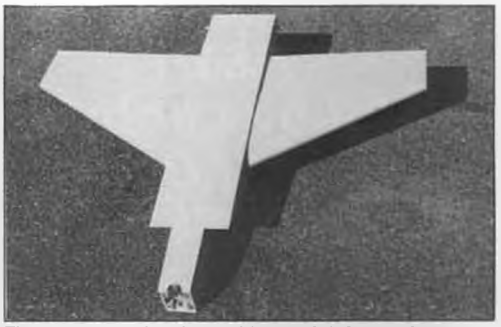
Alex McLeod provides a good size reference for the model. Span is 43 inches, length is 50 inches, and although built in one piece, it will easily fit into most small cars.



The center fuselage box with the two fuel tanks, pushrods, and motor mount extension blocks installed.



Basic fuselage structure, ready for sheeting. Fuselage sides are pre-drilled at the factory for dowel pins that automatically bring the wing and stab into proper alignment.



The completed fuselage with the pink foam wing cores attached. Wing sheeting is done after the cores are glued in place.

jet models I have seen. When you are flying it, if you can see the propeller or motor cylinder head, then you are much too close. I therefore can state that this model looks and sounds like a ducted fan in the air, but is quieter and less likely to cause you tolose your flying site because of disturbed neighbors when using the K&B .45 Sporster engine.

Apparently, this kit has just been put into production after extensive flying tests by Bob and was shown unfinished at the Atlanta IMS Show by Aurora Parkinson, as shown on page 14 of *Model Builder* magazine, September 1989. The first production run of the kit has now been completed. I wanted to pick the kit from the factory stocks at random so, with Bob's agreement, I drove to the factory near my home and had a tour of the plant and a chance to pick any of the F-15 Eagle kits I wanted for this product review.

When we arrived at the factory, we were given coffee and made to feel at home with over an hour spent chatting about models in general and the Fun Fli F-15 Eagle 40 in particular. Bob personally flies what he sells and I had a chance to see his stable of jets, including a new one he had been flying that morning. I certainly felt humbled and ready to try the F-15 Eagle as a ducted fan trainer.

The total work area of the factory, including balsa cutting, vacuforming, kit assembly areas plus materials and kit storage, was quite large, keeping four people busy with the various aspects of production. I wasn't surprised when I learned his company does the largest volume of business of any manufacturer of model kits in Canada.

As I looked at the finished model of the F-15 I decided to find out what I could about

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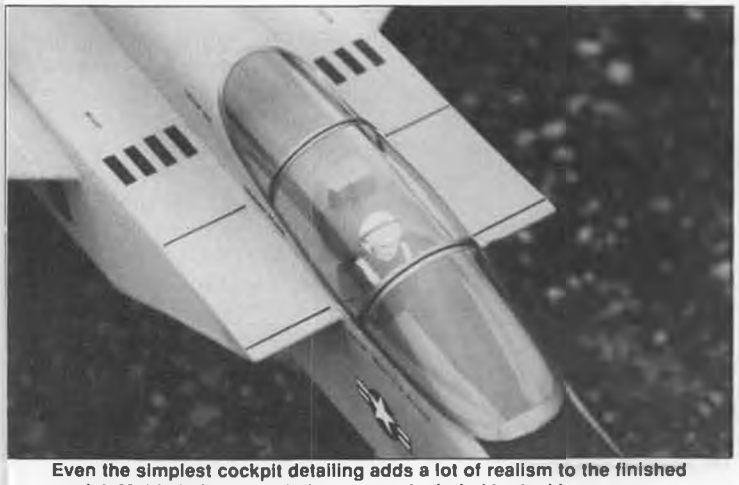
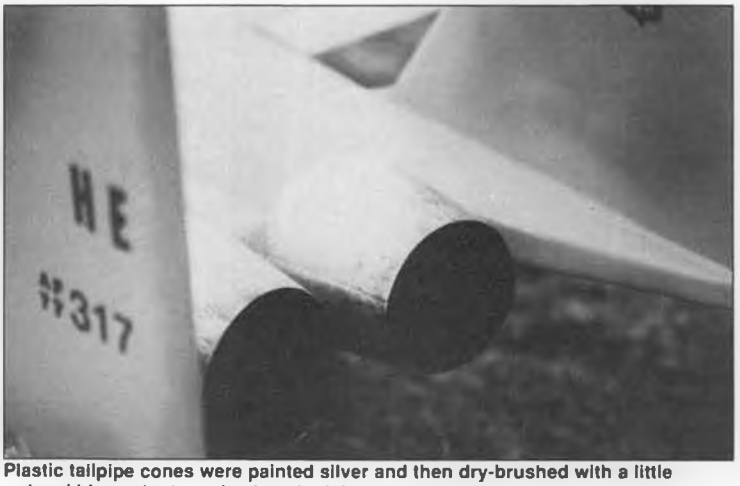
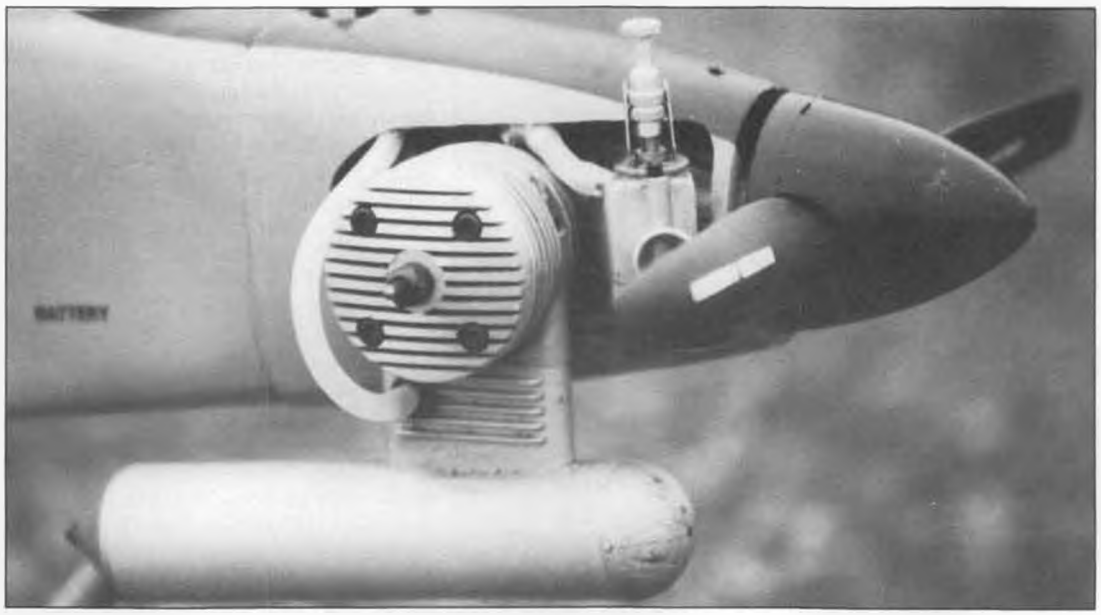


Even the simplest cockpit detailing adds a lot of realism to the finished model. Molded plastic cockpit parts are included in the kit.



Plastic tailpipe cones were painted silver and then dry-brushed with a little red and blue paint to make them look hot.



The K&B Sportsman .45 provides adequate power. Alex says the motor and prop can be easily ignored when the model is flying.

JAKE *Continued from page 7*

land of her literary heroes. Hidden amongst the cargo of commodes, Margaret spent the flight reading Chaucer and dreaming of England.

Approaching the English coast, the B-24 experienced a crankshaft explosion. Flying parts ruptured the wing fuel tanks. A quick calculation told the flight commander that the nearest air base was not reachable at full gross weight. So before Lt. Dowling could intercede, the cargo was jettisoned through the bomb bay doors, and 864 commodes and one librarian rained down on the Isle of Wight.

The B-24 reached base safely and was shortly thereafter christened the "Maggie Dowling" in honor of its lost stowaway.

Miss Dowling, who survived the incident by landing in a haystack, remained in England and lived out a peaceful life to the ripe old age of 83. There were no casualties on the Isle of Wight, although much of the livestock and many of the residents developed a fear of porcelain which is still common today.

Jake ***MB***

COUNTER *Continued from page 11*

bling an altimeter, directional gyro and an artificial horizon—and a thermometer in the guise of an airspeed indicator, all measuring 6-1/2 inches square. The casing is molded from black polystyrene plastic, the lens is glass and the clocks feature a quartz movement powered by a single AA battery. All come with a one-year warranty.

The suggested list price for the three clocks and the thermometer is $34.95 each. We're not sure if they are available direct from Trintec, but if not, they will surely be able to refer you to a distributor in your area. Write to Trintec Industries Inc., 467 Westney Rd. S. Unit 3, Ajax, Ontario, Canada L1S 6V7; phone (416)427-2039.

• • •

You'd think an outfit with a name like "Software Associates" would be involved in the computer industry, but what they actually produce is a line of vibration-absorbing "soft" engine mounts for model aircraft. SoftMounts, as they are called, are offered in sizes to accommodate .40-.65, .70-1.1, and 1.2-1.8 cu. in. engines, either radially or on beams. Prices range from $21.95 to $31.95. What is unique about these mounts is that the elastomeric elements are not loaded in tension, as is usually the case; they are loaded in compression and shear instead, which is claimed to greatly increase elastomeric life. SoftMounts also incorporate what is described as a "capture feature," which means the engine will not separate and go flying off on its own in the unlikely event of an elastomeric failure.

SoftMounts are available either from your local hobby dealer or direct from Software Associates, 10319 Pine Pass Dr., Houston, TX 77070; (713)469-3124. *continued*

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• • •

Pharis Models is one of the many small so-called "cottage industries" that our hobby is blessed with. All seem to specialize in one area or another, and Pharis Models is no different—the emphasis there is on small F/F sport aircraft. The man in charge, Robin Pharis, says his goal is to manufacture fun models. And if the poop sheets he sent are any indication, he is well on his way to achieving that goal!

Among other things, Robin puts out what he calls his "Profile Fun Series" consisting of four simple all-balsa profile replicas of the P-51 Mustang, F4U Corsair, Messerschmitt 109, and the Gee Bee R-1. All span 16 inches, were designed by Tony Naccarato, are no-cal contest legal, and have panel lines and insignias printed on one side. Instructions were written by Earl Van Gorder.

These four profiles, each of which is priced at only $4.95, are but a sample of the sport F/F kits Pharis Models has to offer. To get a complete descriptive listing, send a SASE requesting same to Pharis Models, P.O. Box 804, Folsom, CA 95630.

• • •

No matter what you may be looking for in the way of a fiberglass cowl, there's a very good chance that Fiberglass Master has just what you want. A 10-page catalog of all their products can be had for a mere buck. The latest addition to the line is a one-piece cowl (with blisters molded in) and wheel fender set for the big 1/3-scale Bucker Jungmeister sold in plans form by Dry Ridge Models. Going price for the set is $45.00. Jungmeister cowls for the Pica and Dave Platt airplanes are also available.

For more info and the catalog, send $1.00 to Fiberglass Master, Rt. 1, Box 530, Goodview, VA 24095.

• • •

Something really unique and different in the way of engine mounts has recently been developed by a company called West Coast Engines, in Hesperia, California. Their Universal Adjustable Engine Mount is sized to fit .35 to .80 size two-strokes and up to .48 size four-strokes. What sets this mount apart from others is the design: the two engine bearers attach to the baseplate with a dovetail connection, which allows the bearers to be spaced apart as necessary and then be clamped securely to the baseplate with 10-32 socket head screws. The engine is likewise *clamped* in place—no need to drill holes in the bearers. Two 10-32 socket head screws in each bearer provide high pressure clamping action on the engine's mounting lugs.

This mount seems like just the ticket for models used as engine test beds, or even for engine test stands. At an introductory price of only $19.95, how can you go wrong? From West Coast Engines, 17485 Catalpa St., Unit B-2, Hesperia, CA 92345. To order, call toll free 1-800-283-6463.

• • •

You ducted fan guys can now add that final touch of realism to your jet models with the new "Top Gun" 1/8-scale jet pilot bust produced by MGA Enterprises. As with the others in the MGA line, this one comes already finished, painted and detailed. Overall height is 4 inches, width is 3-3/4 inches. A unique feature is that the pilot's head is mobile and can be turned in any direction. The best of the best busts!

The "Top Gun" pilot bust is priced at $24.95. The folks at MGA stress that their products are sold only through hobby shops and kit manufacturers who offer MGA pilots as accessories to their models, not direct from the manufacturer via mail order. For more information on "Top Gun" or any of the other excellent pilot figures in the MGA line, write to MGA Enterprises, P.O. Box 5631, Fresno, CA 93755.

• • •

Lew Gitlow, who runs Indoor Model Supply up in Salem, Oregon, wrote to say that he is introducing two new indoor kits, one of which includes materials for two complete models. That one, called Class Room Flyers, can help teachers and instructors and even parents introduce the basics of flight. The airplanes are of classic indoor model design, but greatly simplified. For example, there are no curved ribs to cut, all flying surfaces being built flat from 1/20 balsa stripwood. The balsa prop blades come already steamed to the proper camber. Condenser paper and tan rubber are included as well. These models are designed to fly in tight circles so as to be able to perform in relatively confined spaces, such as a classroom.

The other new Indoor MS kit is a Peanut scale replica of the Sky Rider ultralight, and is claimed to be the first kit that will build into a finished model weighing only *three grams*. Contributing to that extremely light weight are upper and lower wire wing bracing, single surface covering as per the full-size aircraft, and the use of condenser paper for the covering. A standard sheet balsa prop is used in conjunction with .040-inch tan rubber, and all materials are specially selected to turn out a really light model for competition flying. Scale documentation is included as well.

Both of these new kits and an updated 1990 IMS catalog are available as a package deal for $18.00, from Indoor Model Supply, P.O. Box 5311, Salem, OR 97304.

• • •

Robinaire is producing two new sizes of pneumatic retractable landing gear systems that appear to be of strong, all-metal construction. The LG-2 main gear is the larger of the two, said to be compact enough to fit into most 1/5-scale model wings and yet strong enough for 1/4-scale ships. These are oleo style struts made in lengths of from 6 to 11 inches (wing to axle). The smaller LG-3 retracts are designed to handle up to 14 pounds of airplane and require a minimum of 1-5/16 inches of depth in the wing for mounting. These are also oleo type struts, made in lengths of 4 to 8 inches in one-inch

continued on page 56

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ALL ABOUT ARFS

BY ART STEINBERG

Herk Stokely, of Virginia Beach, Virginia, and his rubber powered R/C model, which is mentioned in the text.

I hope my editor doesn't take this personally, but in the February issue of *Model Builder* he kind of stuck his neck out. Bill ran a photo submitted by Luigi Micheli of Viareggio, Italy, depicting his 1932 Wakefield rubber job with a rudder-only radio control setup. While he didn't exactly claim this is the first time this was done, he seemed to imply that it was. At least I am convinced that Bill never did run across a rubber powered R/C airplane before, so I'll just give him the benefit of the doubt and call it an honest error on his part. *(Not so. Read on. wcn)*

My indisputable evidence, which proves without a doubt that the honor of conceiving and executing the very first radio controlled rubber powered model belongs to a 100% American, a distinguished genius in the field of model aeronautics, and a true gentleman, whom I am proud to call my friend, Herk Stokely of Virginia Beach, Virginia. Yes, I still clearly recall that cold day in February of 1976 when Herk appeared at the flying field operated by the Tidewater Radio Control Club in Virginia Beach. I was absolutely astounded when Herk showed me his rubber powered model, complete with folding prop, with an Ace single-channel wigwag radio controlling the rudder. Herk flew the model a number of times that day, and every flight was successful, returning the model to land at his feet each time. I immediately recognized the historic implications of what Herk had devised, so I recorded the scene for posterity with my trusty Nikon. The original photograph reposes in my collection, and on the back is stamped the processing date by Eastman Kodak, thus verifying this most important claim.

(Above) Hobbico's Telstar 40 is one good looking bird, hard to tell from a hand-built model. Properly powered, it leaves very little to be desired in terms of all-out performance. (Left) The Telstar 40's engine compartment comfortably accepts the potent O.S. .46 SF two-stroke, a highly recommended powerplant for this airplane.

After all these years I looked up Herk's address and got in touch with him, telling him that I was about to reveal to the world the details of his accomplishment. He sent me some details about that R/C rubber model as follows:

"The model in that picture you sent was an experiment in all-foam construction. It originally was just an unlimited class rubber model free flight, but I later added that baby Ace pulse single-channel to the rudder so

(Above) Pattern Tek's new "Superstar" is an accurate copy of Hanno Prettner's "Suprastar" pattern design—only the name has been changed. This one is the handiwork of Buck Faure, of Encinitas, California. (Far left) Alex Chan and Jerry Jay of Pattern Tek displaying their "Superstar" at the 1990 Pasadena IMS Show. (Left) Jerry Jay gives us a close look at the wing construction of the Pattern Tek Superstar.

that I could steer it a bit. It worked very well, and the model wasn't a bad performer, though it wasn't up to free flight competition status.

"I designed it myself, and just took advantage of the fact that I had been cutting a great deal of foam, and thought that the simplicity of a foam airfoil combined with a turbulating natural surface roughness would be a neat trick. There were a whole series of free flight and R/C gliders that I built that way in the early seventies, and all flew quite well, though they weren't very durable. This model had a tubular foam fuselage, a foam pylon, and of course, foam wings and tail."

And so, Herk, on behalf of Bill Northrop, *Model Builder* magazine, and yours truly, I would like to say that this matter now stands corrected. As of now you are the unquestioned pioneer in the field of rubber powered R/C, and the fact that you have accomplished this monumental feat brings credit to both you and your country!

Incidentally, I haven't seen Herk since I retired from the Navy fourteen years ago, but I was pleased to note that he is still actively involved in modeling. His present interest seems to be directed toward R/C soaring, as he writes a monthly column on that topic for another model publication. I look forward to meeting up with him again one of these days.

Just to save other better informed modelers the trouble of writing in, we'll comment on Art's statements regarding rubber-powered R/C models.

Knowing that Hewitt Phillips had flown rubber-powered R/C many years ago, we qualified the caption information on Luigi Micheli's 1932 Wakefield photo in our February 1990 issue by referring to his model as O.T. R/C! Because Art challenged this statement herein, we decided this rebuttle was necessary. We just concluded a phone conversation with Hewitt in which he confirmed that he flew a rubber-powered model in the mid-sixties, which was written up in one of the model magazines at the time. He used an Albin receiver and a magnetic actuator which was hand-pulsed for right and left rudder.

It would be interesting to know if anyone has knowledge, and proof, of earlier rubber-powered R/C flight, whether specifically an Old Timer or otherwise. wcn

R/C MEANS REALLY CARING

Not long ago this column told about Bud Lavagnino, a correctional officer at an institution for juvenile offenders in the state of California. Bud takes a great interest in the welfare of his wards, and some time ago he initiated an R/C flying instruction program for the benefit of those young inmates who expressed an interest in learning about R/C. Due to severe cost limitations, no building program is in place yet. Bud furnishes a plane at his own expense and does the best he can. It turns out that there isn't a great deal of space for landings and takeoffs, so Bud and I decided that an Old Timer would be the best model to use, both from a standpoint of short takeoffs and landings, and also

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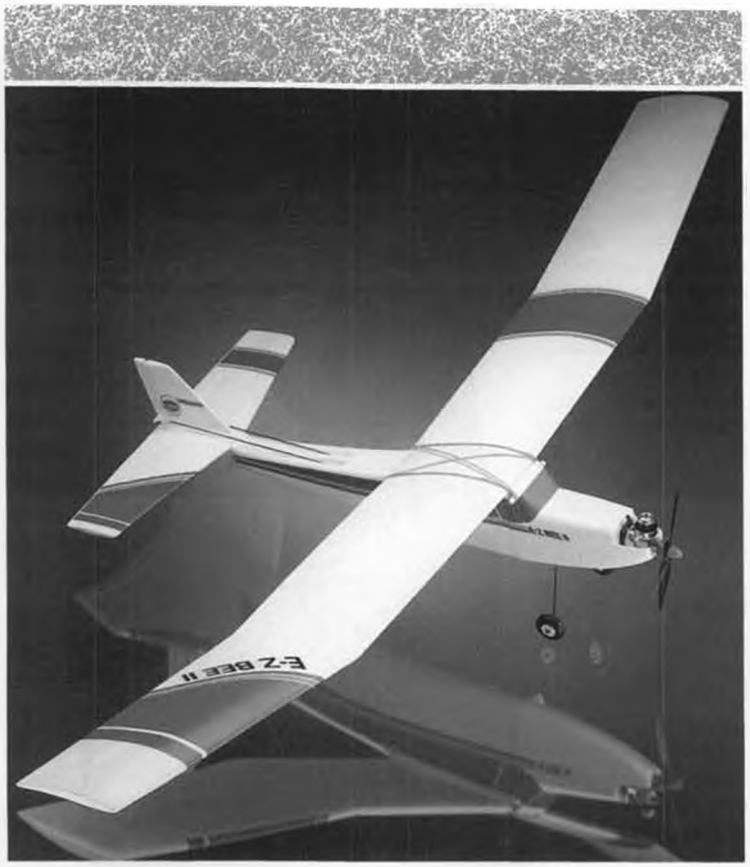
Art Steinberg clowns it up at the Pasadena IMS Show with Miss Starhawk 1989 (right) and Miss Starhawk 1990.

Avoid ARF Shock

ARF shock *(Almost Ready to Fly* shäk) **n. 1.** sinking feeling that occurs when dreams of quickly assembling and flying an "ARF" labeled R/C airplane are dashed **2.** initial reaction to the sight of scores of pieces that need to be built, and parts that must be glued **3.** dismay that costly additional component purchases are needed

COX Airplanes Live Up



E-Z BEE II 55″ Wingspan
31″ Length
Cox .049 Engine Powered

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Purchasing a Cox R/C airplane requires no additional, costly accessories. When you purchase a Cox R/C airplane with radio, your only required separate purchases are Alkaline batteries for the radio system and, if your model is engine powered, a Cox 400 or 990 kit with fuel and starting battery. Cox electric airplanes always include Nickel Cadmium motor batteries.

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Cox is the only company to include an instructional video with your airplane. Cox Video-Copilots enhance written assembly and flight instructions, helping you to correctly assemble your Cox ARF and fly successfully.

COUNTER *Continued from page 50*

increments—custom lengths can also be had for an additional charge.

For pricing information and descriptive literature on these and Robinaire's other fine products, send a long SASE to Robinaire, P.O. Box 6766, Lake Worth, FL 33466-6766. ***MB***

BIG BIRDS *Continued from 13*

find out what electric is really all about.

Just wanted to let you guys know that, undaunted, unafraid and armed with everybody elses' knowledge, I'm about to get some practical, hands-on experience with both large and small electrics. I should have something (constructive) to say in either my September or October column.

WW-I GOTHA

W.T. Galt, who resides in Temple City, California, decided, as he got out of bed one sunny morning, to build a 1/6-scale model of a WW-I Gotha bomber.

Have you ever seen a pic of a Gotha? Besides being a behemoth (in 1/6-scale she'll span 11 feet), the version Mr. Galt is building is really weird-looking, what with its upper wing being flush with the top of the fuselage and its bottom wing slung way underneath. It also happens to have two engine nacelles (he's already built them; they're 4 inches wide, 6 inches high and 12 inches long) on that bottom wing and one helluva lot of support struts between the two wings.

At first glance, the bird appears to be upside-down because of this crazy wing configuration. Unfortunately, the only useable pic I have of a Gotha is different from the model that W.T. is building so I can't use it. Oh yes, almost forgot to mention that this lumbering giant will be powered by two geared cobalt 40 electric motors.

Mr. Galt promised to keep us updated on his progress, so hopefully we'll have some pix to share before too long. He's literally jumped into this project. I don't think we'll have too long to wait.

PUGET SOUND ROCS FLY-IN

This meet will be held July 14 & 15 at the Rocs new field, which is a dandy place to fly. This Big Bird Bash & Tea Social is both AMA and IMAA sanctioned and, like all IMAA fly-ins, is a relaxed, low-key, noncompetitive get-together.

There's plenty of room for RVs and campers, so if you're gonna be in the Puget Sound area on the second weekend in July, c'mon out and fly with us.

Don't know how to get there? Just ask me or Event Director Bruce Gale (811 9th Ave. SW, Puyallup, WA 98371; (206)845-0705) for a flyer. It's got all the info and an easy-to-follow map on the back.

QUIP OF THE MONTH

"Would you like your coffee black?"

"What other colors do you have?"

Play it safe out at the field; an accident could ruin more than just your day. Al Alman, 1910 154th Street Court South, Spanaway, WA 98387; (206)535-1549. ***MB***

PRECISION *Continued from page 15*

happen at all, but I think I know better.

two-stroke or four-stroke, the engine of the future will be a low rpm powerhouse. Torque will be the name of the game, and the idea will be to turn large, efficient props slowly and quietly. Vertical fins probably will need to be a little larger, percentage-wise, and you might look for the sub fin to make a semi-comeback.

It is practically beyond question that some type of fuel delivery system will be standard equipment for both the two and four-stroke engines of the future. The aerodynamic advantages of being able to locate the fuel supply at the C.G. and the proven horsepower edge derived just from being able to increase the carburetor venturi size are simply too great for this not to happen. To a very large extent, this part of the future is already here. With few exceptions, the major engine manufacturers now offer these systems. Those manufacturers that don't have been rewarded with a significant drop in sales.

This is the safest prediction of the lot: engines will cost more.

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HANNAN'S HANGAR

BY BILL HANNAN

"Save your time for important thing" (sic).

The above quote from a Mr. Tanaka, via Herb Weiss, may not be grammatically quite correct, however the meaning for model builders comes through clearly. Don't become too bogged-down in chores and duties; allow at least some of your "quality time" for your hobby fun!

WASP POWER

Nope, not the famous Pratt & Whitney radial engines of that name, but the real insect variety. When Rex Bixby decided to restore three rubber-powered models which had been stored near the ceiling of a hangar for some years, he was amazed to discover wasps' nests in the noses of two of them. Intriguingly, both were white Joe Ott design S.E.5s, while the third, a red Fokker D-VII had no such inhabitants—go figure!

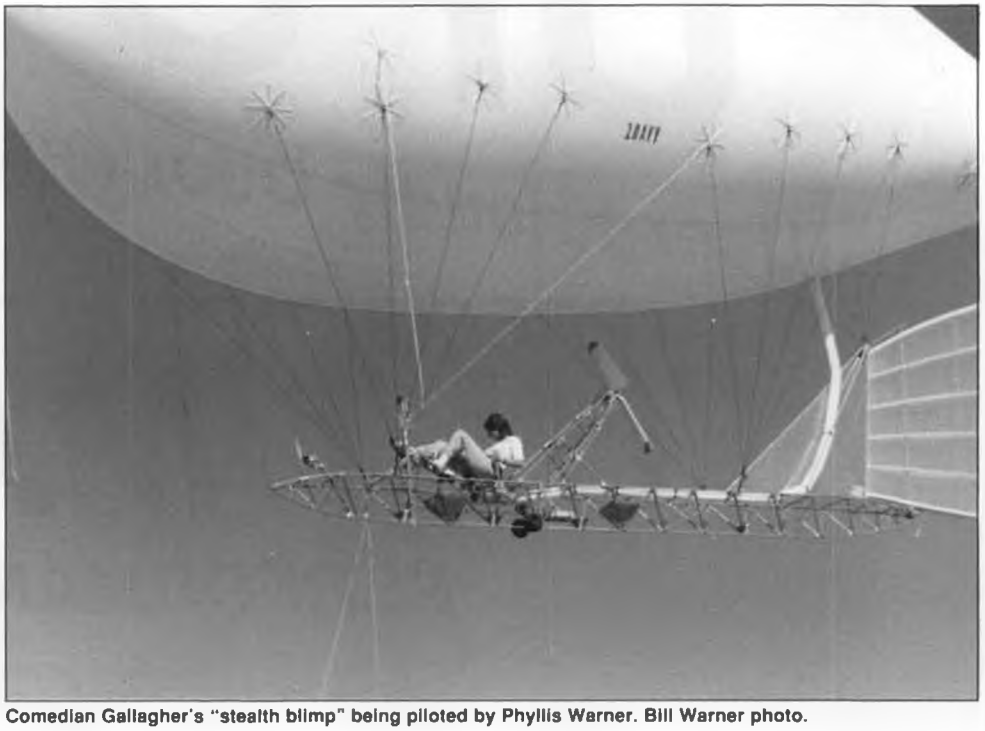
MYSTERY PLANE

Our April '90 column included a photo by Elisbet Ballin, of an unidentified vintage monoplane suspended in a Hungarian Hilton hotel. Two of our readers, Barnet Frommer, of New York, and Gary Golichowski, of Iowa, think the machine is some variety of French Antoinette. It also exhibits certain characteristics of the German Taubes. So, positive identification still eludes us. Does anyone in our audience have connections in Hungary? Or in the Hilton Hotel chain?

RECORDS GALORE

Frank Zaic sent us a copy of *World and United States Aviation and Space Records*, published by the National Aeronautic Association. NAA is the governing body for organized U.S. aviation activities, and is affiliated with the world record-keeping Federation Aeronautique International (FAI).

You wouldn't think, judging by his sombre expression, that Australian junior modeler Benjamin Jones gets much of a kick out of flying his Wittman Tailwind Peanut—but he does! Photo by Howard Jones.



Comedian Gallagher's "stealth blimp" being piloted by Phyllis Warner. Bill Warner photo.

We were pleasantly surprised to learn that the NAA, which traces its roots back to 1905, is operated by a small staff of only five paid employees. Their book, comprising over 300 pages, documents records established in parachutes, balloons, landplanes, seaplanes, rotorcraft, spacecraft and, of course, model aircraft. Containing thousands of facts and figures, the publication is interestingly written, and we can only imagine the many hours which must have been spent typesetting and proofreading it! Yet, we found only a very few obvious errors.

It was amusing to note that there has been no distinction made between records set by male and female achievers since 1982. The already-extant records will remain segregated, but no more will be added. Incongruously, the discrimination still remains for certain categories, such as parachuting and "man-powered flight"!

It was rather satisfying to be reminded that flying models predated man (and woman!) carrying aircraft by several centuries. And, some of the model records are indeed impressive. Witness this small sampling:

Free flight glider distance, straight line: 192.71 miles (set in Czechoslovakia).

Free flight glider altitude: 7,753.92 feet (established in Hungary).

Free flight rubber-powered model speed: 116.62 m.p.h.(USSR).

Indoor rubber-powered model duration: 52 minutes, 14 seconds (USA).

Similarly impressive marks exist in almost all other model categories as well.

Also featured in the book are "Ten Easy Steps to Setting Your Own Record"—in case any of you may feel so inclined.

The volume is available from NAA, 1763 R Street NW, Washington, DC 20009, for $13.95 plus postage. Please tell 'em *Model Builder* sent you!

MORE NEW BOOKS

Eric Clutton recently sent a copy of his *Dr. Diesel's Diary* to the hangar, and we found it both educational and entertaining to read.

Although Eric's first engine was an Ohlsson .60, he could not use it because of 1940 wartime restrictions in his native England. However, "immediately after peace broke out" he was among the first to buy a Mills diesel—which promptly flew away during its model's maiden flight! Clutton never looked back and has remained a staunch diesel engine enthusiast ever since.

A "Wasp powered" Joe Ott S.E.5 currently being restored by Rex Bixby—story in text.

Ray Crowell (left) and the late Walt Mooney examine a model Penaud planophore in the San Diego Aerospace Museum. Photo by Hiroshi Yoshikawa.

After moving to the U.S., he was appalled by the obscurity of diesels here, and hopes his new book will help to redress that situation. Written quite objectively, the volume points out the "negative advantages" of diesels (they smell, though not nearly so badly as the full-size variety) as well as their virtues (they run without batteries, glo-plugs, wires or other failure-prone items). Eric freely admits that diesels are somewhat messy, and counters with the suggestion that one simply join the "Oily Rag Brigade"! He also maintains that "the modern diesel is a far cry from the long stroke plodders they were when first introduced. Diesels, with their much greater torque, thrive on large props. I am fond of telling anyone who will listen that if rpm flew airplanes, we would fit flywheels instead of props!"

Clutton offers many practical hints on the care, operation and safety of these engines—in short, almost everything anyone is apt to wonder about diesels. Available directly from its author, *Dr. Diesel's Diary* costs $10 plus $1 postage and packing: Eric Clutton, 913 Cedar Lane, Tullahoma, TN 37388. If you ask him nicely, he may even autograph your copy!

A beautiful building job on this Peanut Scale DH 80A Puss Moth, by Australian modeler Mike Combe. It's a replica of Jim Mollison's 1932 Atlantic crosser—and it's also only the second Peanut that Mike has ever built!

NEW FROM ARGUS

Continuing their extensive series of model handbooks, Argus of England offers two new releases. *Flying Radio Control Gliders,* by George Stringwell, is actually much more comprehensive than its title implies, since it touches upon basic theory, kits, construction, radios, and a modicum of philosophy: "The creation of the model is surely one of the most satisfying parts of this hobby; it has to be said that there is a tendency to treat something which has been created with one's own hands with a great deal more care than something which has simply cost money."

George offers suggestions on tools, building-boards ("the finished board almost requires the services of a crane to move it, but it is certainly flat!"), covering and finishing ("paint weight is purely parasitic..."). Flying subjects treated include slope soaring, thermal soaring, aerobatics and even power-assisted soaring. Certainly the appeal of gliders is expressed perfectly in this small

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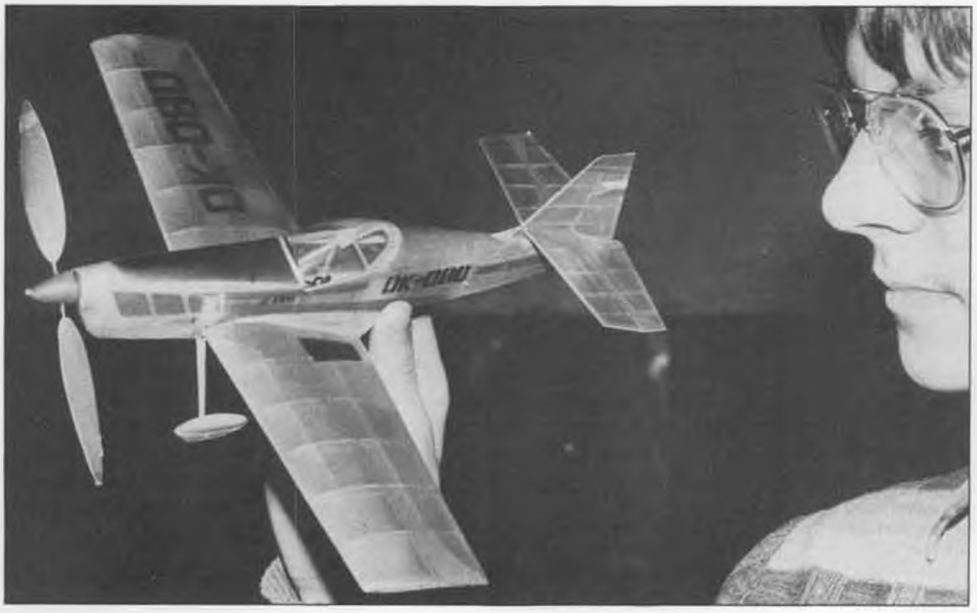


Lubomir Koutny, of Czechoslovakia, submitted this photo of Ivan Simolik and his Zlin Z-50M, which regularly makes flights in excess of 80 seconds.

INDOOR

BY KEN JOHNSON

REFLECTIONS ON A FRIEND

I cannot help but offer a few reflections on the passing of my friend, Walt Mooney. This writer knew Walt more years than some and fewer years than others—about 18 more or less. The first scale model I built (as an adult) was Walt's Piper Vagabond Peanut. The Vag was published in 1960 and was Walt's first center spread Peanut plan. I scaled up the plan to 25-inch span and built it for outdoor rubber. I guess this model and Walt were responsible for my love of rubber scale, both indoor and outdoor. This one led to my building eight more Vags from 8 to 55-inch span. When my family moved to California in 1972 I finally met Walt in person. When he saw my 44-inch Vagabond his face lit up. "It's a model of my real Vagabond," he said.

In succeeding years we saw each other at many meets. Several Halloweens we spent together at the home of Dick and Shirley Baxter. Walt was best man at the Baxters' wedding. No one I have known, as a modeler, was so well liked and admired. All those times still come to mind, of Walt on the flight line at Mile Square Park launching his newest scale ship. I cannot recall him coming out to a contest with the same model twice. Several years ago, we held a "Beat Walt Mooney" indoor contest in the gym in Santa Monica. I found a nice photo of Walt in Bill Hannan's *Peanut Power* book. A

The "BS-36" is the creation of Blacksheep member Gary Teti. All photos on these pages except those from the Inter-Gnats were taken at Luther Burbank High School (CA) by Donicia Atadero.

Bill Young likes the weird and the wonderful—his Bleriot canard pusher (*Model Builder* published the plans long ago) consistently turns in long, smooth flights.

Our indoor columnist with his new ornithopter designed by Warren Williams of Claremont, California. Looks to be very similar in design to the one pictured on page 57 of our June '90 issue.

Big guys build small planes! Clarence Ames was photographed winding his Peck-Polymers Bostonian Pup for an official flight at a local Burbank, CA meet.

The concentration is intense here as Wally Stevens and Mike Thompson wind motors for their Easy B models during a practice session.

sketch of Walt was made from this and etched onto a zinc-faced plaque. Needless to say, Walt won and said he was happy with the trophy I had made.

The last time I spoke with Walt was just a few weeks before he died. I was trying to locate a year-old plan of one of his models. Walt had laryngitis and could barely talk. Still, he chatted for awhile and several days later the plan came to me in the mail. What a guy! I wish I had one of his models with which to remember him.

REED WING TIPS

Basketweaver's reed has great potential for flying surface outlines. Recently I received a quantity of this material from Tom Matterfis in Clearwater, Florida. Tom is a Wakefield flyer who has used reed for years as outlines for his stabs and rudders. It is about 1/32 of an inch round in cross section and is almost as light as balsa. The strength-to-weight ratio is very high. The thing that I like best about it is that it can be bent into a very tight circle (about two-inch diameter) without breaking. And that is dry bending! Tom writes that it can be immersed in boiling water and will hold its bent shape when dry. I am certainly going to try the reed for indoor and outdoor rubber power models. It can be split lengthwise and made even smaller in cross section. If you are interested in this product contact Begley Caning and Basket Supplies, 3517 North High Street, Columbus, OH 43214; (614)263-0879.

GRAM SCALE

Have you invested in a good gram scale yet? If you fly Pennyplane or Bostonian you might want to acquire one. I found mine at the local jewelry supply store. It is a JSP Pennyweight/Gram Scale. It goes from 0 to 60 grams. It sells for about $15.00 retail. It is all metal and should last for years.

INSTRUMENT PANELS

While browsing at the last I.M.S. show in Pasadena, California, I noticed a small package of instruments on one table. They are ideal for Peanut and indoor scale applications. The face of the scale instrument is printed on white coated paper. Thirty-nine are shown in 1/4-inch diameter faces (1/12 scale) and 44 faces in 5/32-inch diameter. A clear plastic sheet containing 10 bezels each for the 1/4-inch and 5/32-inch sizes is also included. These bezels can be painted silver and the instrument face cemented over the bezel. They are very realistic in appearance. The cost was about $6.00 per set. The product name is J'TEC Scale Instruments. The address on the package is 164 School St., Daly City, CA 94014; (415)756-3400.

INDOOR NEWSLETTER

Looking for a good newsletter to get the latest in East Coast happenings? Just got my first copy of *Dome Duster* from Mr. Stan Fink. It looks great. This one you've gotta get. Write to Stan Fink at 1810 Pine Street, Philadelphia, PA 19103. This issue features plans for Carl Hedley's Percival "Mew Gull" racer in Peanut size. I've been wanting to build this model for some time. The cost for six issues a year is $10.00.

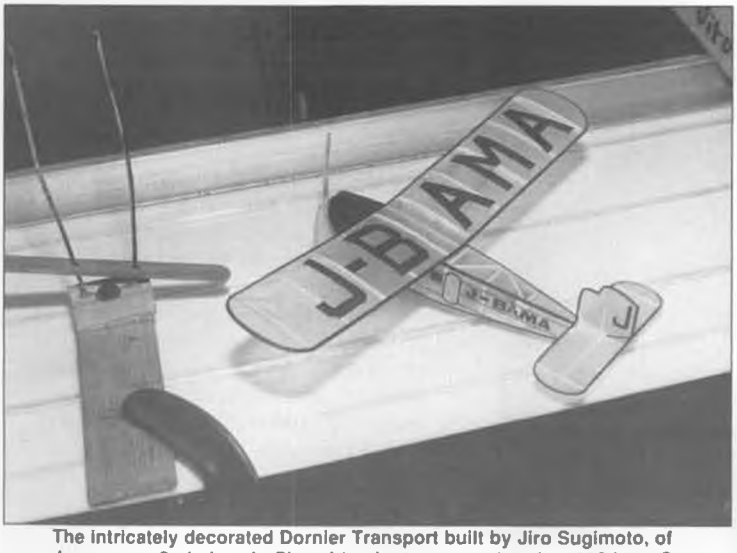
OLDTIMERS CHALLENGE

Last column I mentioned an old-timer indoor contest we had several years ago in

continued on page 103

All-balsa profile Old Timers—this 13-incher belongs to Wally Stevens—are rapidly becoming popular with members of the Blacksheep Squadron. Could this be the next new Indoor event? More in text.

Two neat Pistachios seen at the 1990 MIAMA Inter-Gnats meet were Dave Robelen's *all-balsa* PT-19 (took 3rd place in Class II) and Millard Wells' Fokker Triplane, capable of flights over 40 seconds.



The intricately decorated Dornier Transport built by Jiro Sugimoto, of Japan, won 2nd place in Class I (under two grams) at the 1990 Inter-Gnats with flights of over one minute.

David Ganzer is involved in aviation both professionally and as a hobby. By day he works for Rutan Aviation, and in his spare time he builds models such as this 14-gram Bostonian.

FREE FLIGHT

BY BOB STALICK

I know that you think it is the middle of the summer, but this is being written in the early spring, so my outdoor flying season is just now getting started—and not too soon. As usual, I have not completed a number of models that I have worked on for the past several years, but I have started and finished a couple of others. So, I guess it all works out. In the meantime, the local fliers have extended the indoor season well past our usual winter activity. So, if you are into the outdoor scene, follow along this month, as this column features some ideas and products that will make this summer a special one just for you.

THREE-VIEW FOR JULY/AUGUST—
Ed Keck's PRIME TIME C Gas Winner

Thanks to Bob Hatschek's Skyscraper's Newsletter, *The Flyoff,* this month's three-view is the current C Gas Record Holder for Cat. III. Here is what Bob has to say about the record setting attempt:

"*Prime Time* is a well-named airplane! It best demonstrated that fact at Lawrenceville, Illinois last June 22 (1989) when it broke the existing national AMA record for Class C power models in Category III competition with a remarkable total of 39:36—a string of maxes that wasn't broken until the 17th flight! That's three two-minute maxes on seven second engine runs, two more on five seconds, then 11 flights of 2-1/2 minutes on four seconds of power, and finally a last flight of over two minutes still on a four second run.

"The real oddity is that Keck did not win the event.

"The meet, of course, was the 1989 U.S. Outdoor Championships, where Ed had typically been the man to beat in the larger power classes. Class C Gas was proving to be a really wild shootout among three of the nation's top competitive power fliers: Russ Snyder, Keck, and Charlie Caton, who ultimately finished in that sequence. The trio were merrily maxing away—making it look easy to any casual observer—on a beautiful day on a beautiful field, the Mid-American Air Center.

One of the hot tips in 1/2A Nostalgia is the T-Bird, and no wonder—there's little visible difference between it and a contemporary 1/2a ship. This one built by Bruce Augustus, of Sun Valley, Idaho.

Rod Persons flew a "Climber," originally designed by Ed Lamb, in O.T. Rubber at the 1989 Fresno Annual. Photo by Wil Nakashima.

"Caton's string was the first to snap, well along in the afternoon, leaving Charlie with a total that would have won almost any contest. Then, just before the whistle blew to end the day's competition, Snyder dropped a flight after 10 or 12 straight maxes. At that time, however, Snyder was still one flight up on Keck even though Ed had not yet dropped any flights. That gave Russ the winning score for the event and left Ed in second place as the official flying ended for the day.

"But Keck's score was still unblemished, so he asked for permission to continue flying for a record attempt. This was granted by the CD, so Ed continued with a small contingent of timers, the event director, an alternate CD, a volunteer retriever, and several other onlookers in attendance while most of the other people on the field departed to attend the NFFS banquet scheduled for that evening.

"Ed and *Prime Time* continued to make 2-1/2 minutes look easy on a four second engine run. But after several more maxes, Ed began to appear a bit nervous—his wife had gone into town for some shopping, and he was supposed to meet her and return to the motel in time to get ready for the banquet. A volunteer departed from the small band of observers to meet Mrs. Keck, explain the still-unfolding situation, and drive her back to the motel.

"*Prime Time's* last flight that day was about 6:30 in the evening. It was the 17th of the day, and it was 2:06 on a four second engine run. A long day's competition was done, a new record was on the books, and everybody went to the NFFS banquet."

The three-view shows the model in a scale of one inch equals one foot except for the root wing rib, which is featured in full size. Although the three-view details are quite small, it should be fairly easy to scale up the model for your own use. The vital statistics include a wing area (flat) of approximately 870 square inches, a stab area of approximately 200 square inches, and a stab percentage of 23%. The design is quite straightforward for a VIT and autorudder

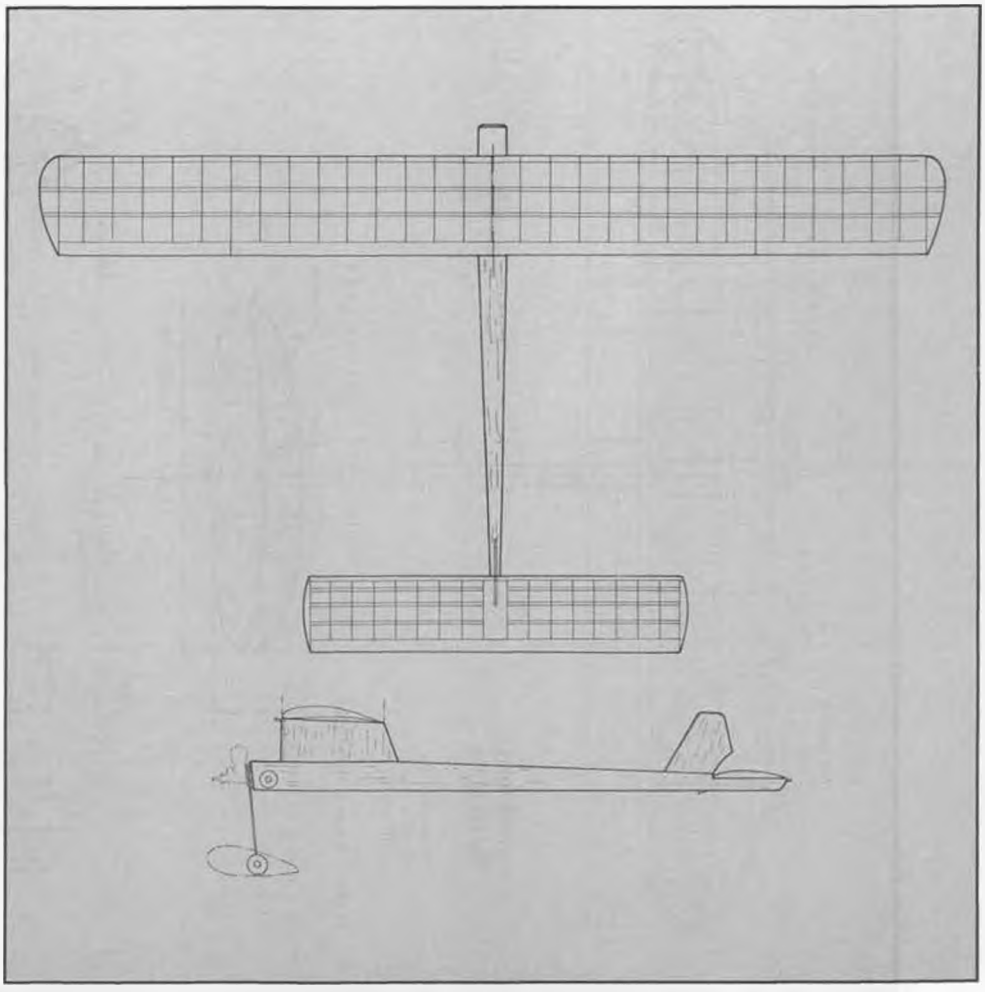
P-30 Rubber continues to be a popular F/F event. Photographer Wil Nakashima caught junior flier Chris Watanabe winding his squarish-looking model at the '89 Fresno Annual.

equipped model. The fuselage features a built-up framework of 1/4 square longerons on all four corners and a diagonal structure on both sides, top and bottom using 1/4 x 1/8 strips. The fuselage front is strengthened by 1/8 sheet as part of the substructure, as is the back end strengthened by 1/16 sheet from just before the front of the stab to the back end. Note that the entire fuselage is covered with 1/32 sheet.

No indication is noted as to whether Ed uses washin on the right inner wing panel or not, and it's possible that he gets enough safety and consistency with the VIT, autorudder and one degree left thrust. My preference would be to add about 1/8 inch of washin on the right wing panel and about the same amount of washout at each wing tip.

I have located the wing spars, leading edge and trailing edge on the three-view based upon my enlargement of the plans. These should be considered approximate. Finally, the stab section is not shown but indicated to be 6% thick. My recommendation is that the stab should be built using unshaped 1/16 rib blanks without notches for the top spar. Then, the entire stab should be sanded to shape with the high point 1/3 of the way back from the leading edge. Remember that a 6% thick airfoil on an eight-inch chord gives you a maximum thickness of only .48 inch. When finished sanding to shape, the top of the ribs can be notched to accept the top spar.

Note that the model is covered with silk for strength and lightness. The fuselage is covered with fiberglass cloth. It should be a good model, as it has everything going for it... good looks, good performance, and a winning record. I plan to build one for D-Gas. It's just right for my O.S. .46!



MYSTERY MODEL

JULY/AUGUST MYSTERY MODEL

This is one of those ships that just misses the Nostalgia list, as it was published beyond the cutoff date by only a couple of months. In the article accompanying this design is a chart showing how to build three different sizes. The version featured in this month's column, however, is the .15 powered size. The plans show the model fitted with either the standard landing gear or with floats for the R.O.W. event. So, if you think these clues are enough to get the name of the ship down pat, send it in to Bill Northrop, c/o *Model Builder* magazine. First in line with the correct answer gets the big prize—a free subscription to *Model Builder* magazine. Tell me it doesn't get any better than this!

DARNED GOOD AIRFOIL—B.I.R. 31a

This section is not one that I have seen presented anywhere in the model literature, but it does appear in the book of comprehensive airfoil sections I have used for this feature in the past. The B.I.R. has a couple of features that recommend it to free flight use. These are: a fairly thin high point at the 30% mark, slight undercamber, and a sharp leading edge. These characteristics are similar to the Lucky Lindy section except for the slight undercamber. The B.I.R. should be a fast climbing section, and with the addition of turbulator spars along the front 25% of the upper surface, it should have a better than average glide. I suggest someone give it a try on a fast gas model sometime soon.

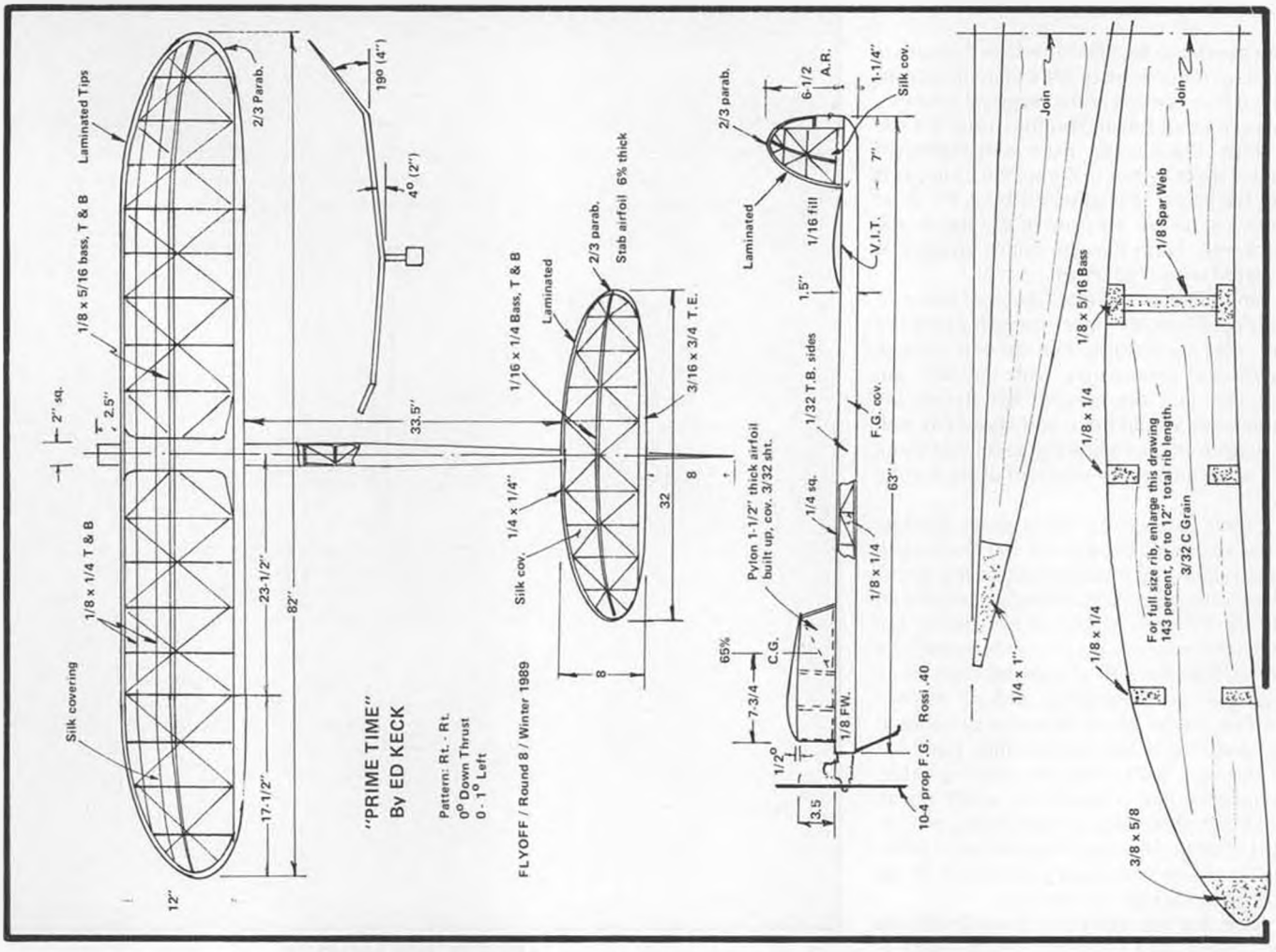
ACCURATE MEASUREMENT OF INCIDENCE—By Manny Gomez, P.E.

This little article and the accompanying chart appeared in a recent issue of the *Vegas FreeFlighter*, Phil McCary, editor. Gomez's information has already proven helpful to me in scaling up the Prime Time. I would suggest that you photocopy the chart from this issue of *Model Builder* Free Flight and post it on your workshop wall for easy reference. So, here's the article:

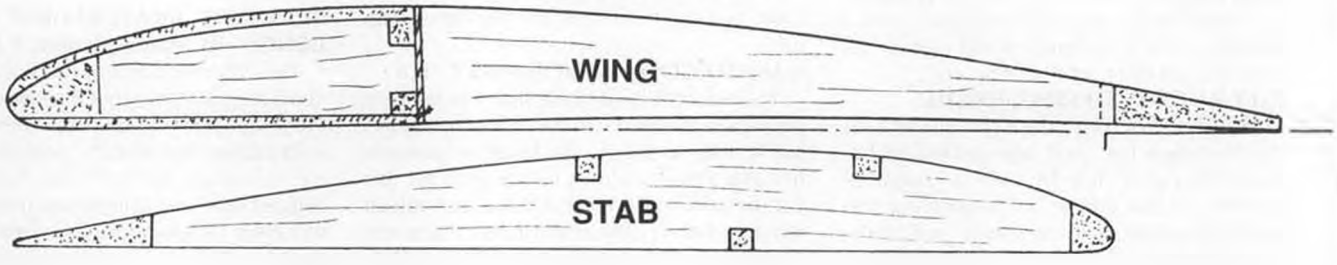
"During the trimming process, I always hear a great deal of discussion about incidence. Numerous times we are cautioned by designers to ensure that there is a certain amount of incidence in a wing or stab before we ever attempt to fly a particular design. I have read many articles in magazines and journals regarding the proper ways to meas-

DARNED GOOD AIRFOIL

STA	0.00	1.25	2.50	5.00	7.50	10.0	15.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100.	
UPR	0.00	1.95	3.15	4.80	5.90	6.75	7.70	8.10	8.20	7.80	7.20	6.25	5.10	3.63	2.05	1.12	0.00	
LWR	0.00	0.05	0.20	0.48	0.59	0.68	0.77	0.81	0.82	0.78	0.72	0.63	0.51	0.36	0.21	0.11	0.00	



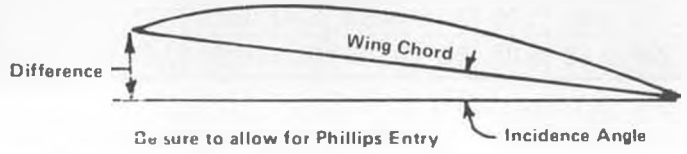
DIXIELANDER RIBS



WING CHORD

Difference\Inches		2	3	4	5	6	7	8	9	10	11	12
1/32	.0313	.90	.60	.45	.36	.30	.26	.22	.20	.18	.16	.15
3/64	.0469	1.34	.90	.67	.54	.45	.38	.34	.30	.27	.24	.22
1/16	.0625	1.79	1.19	.90	.72	.60	.51	.45	.40	.36	.33	.30
5/64	.0781	2.24	1.49	1.12	.90	.75	.64	.56	.50	.45	.41	.37
3/32	.0938	2.69	1.79	1.34	1.07	.90	.77	.67	.60	.54	.49	.45
7/64	.1094	3.13	2.09	1.57	1.25	1.04	.89	.78	.70	.63	.57	.52
1/8	.1250	3.58	2.39	1.79	1.43	1.19	1.02	.90	.80	.72	.65	.60
9/64	.1406	4.03	2.69	2.01	1.61	1.34	1.15	1.01	.90	.81	.73	.67
5/32	.1563	4.48	2.99	2.24	1.79	1.49	1.28	1.12	.99	.90	.81	.75
11/64	.1719	4.93	3.28	2.46	1.97	1.64	1.41	1.23	1.09	.98	.90	.82
3/16	.1875	5.38	3.58	2.69	2.15	1.79	1.53	1.34	1.19	1.07	.98	.90
13/64	.2031	5.83	3.88	2.91	2.33	1.94	1.66	1.45	1.29	1.16	1.06	.97
7/32	.2188	6.28	4.18	3.13	2.51	2.09	1.79	1.57	1.39	1.25	1.14	1.04
15/64	.2344	6.73	4.48	3.36	2.69	2.24	1.92	1.68	1.49	1.34	1.22	1.12
1/4	.2500	7.18	4.78	3.58	2.87	2.39	2.05	1.79	1.59	1.43	1.30	1.19
17/64	.2656	7.63	5.08	3.81	3.05	2.54	2.17	1.90	1.69	1.52	1.38	1.27
9/32	.2813	8.08	5.38	4.03	3.22	2.69	2.30	2.01	1.79	1.61	1.47	1.34
19/64	.2969	8.54	5.68	4.26	3.40	2.84	2.43	2.13	1.89	1.70	1.55	1.42
5/16	.3125	8.99	5.98	4.48	3.58	2.99	2.56	2.24	1.99	1.79	1.63	1.49
21/64	.3281	9.44	6.28	4.71	3.76	3.13	2.69	2.35	2.09	1.88	1.71	1.57
11/32	.3438	9.90	6.58	4.93	3.94	3.28	2.81	2.46	2.19	1.97	1.79	1.64
23/64	.3594	10.35	6.88	5.15	4.12	3.43	2.94	2.57	2.29	2.06	1.87	1.72
3/8	.3750	10.81	7.18	5.38	4.30	3.58	3.07	2.69	2.39	2.15	1.95	1.79

INCIDENCE IN DEGREES



ure incidence. Usually, they involve the use of a protractor or some other device which reads directly in degrees. For anyone who has studied geometry or mathematics to any extent, and used a protractor, you know that it is extremely difficult to read small increments. Generally, it is difficult to interpret anything less than a degree or so.

"I began wondering how so many people could measure incidence in the terms they discuss it, with accuracies to at least one-half of a degree, using the rather crude instruments that they were using, and enjoy good results. My final conclusion was that it was simply the result of many years of experience, experimentation, crashed airplanes, and some frustration.

"I set about devising a way that a person could accurately measure the degrees of incidence used in a wing, stab or an engine thrust line. Recalling my study of trigonometry, it became a rather elementary problem. If you will look at the attached sketch, you will see that the difference in the leading edge and the trailing edge elevation results in an angle which is accepted to be the incidence. That angle has a relationship between the chord and the elevation difference, which is governed by the laws of trigonometry. Rather than try to make you all proficient in the use of trigonometry, I have designed the attached table which is good for any chord or firewall from two inches across to 12 inches. The way it is used is as follows. One looks in the table for the amount of incidence desired. The column on the left will give the thickness of the shim required to give that level of incidence. For instance, if you have a wing or stab with a chord of six inches, and you desire one degree of incidence, look to the six-inch chord column and move down until you read the increment closest to one degree (in this case .90, or nine-tenths of a degree). Follow that table to the left, and you will see that a 3/32 shim inserted under the leading or trailing edge will result in approximately one degree (actually .9 degree in this example) of incidence. I have selected common wood thicknesses for the difference. Obviously, they can be sanded to make finer adjustments if desired.

"In conclusion, I submit to you that adjusting thrust lines or incidences with protractors is totally unnecessary and inaccurate in most cases. If you are really desirous of knowing precisely how much incidence, or thrust, you are building into your models, this method is much easier to use. Try taking a model that you fly successfully and use this method to measure just how much incidence, or offset, you are actually using. You may be surprised."

DIXIELANDER 88 RIB PATTERNS— A REPRISE

Back in March 1990, I featured a three-view of the Dixielander '88, presented by Peter Lloyd. Unfortunately, the wing and stabilizer ribs for this design were not included in the three-view. For those of you who have asked, they are presented here for your use. Only the wing root rib is presented, and this rib is used throughout the span of the model until the last two or three bays when the undercamber is sanded out of the rib, making it a true flat bottomed section. If you recall, Lloyd noted that the section started out as a NACA 4409, but was modified. Now you can see the modifications.

The stabilizer rib is stock Dixielander from the original Yeoman kit. Hope this does the trick for all of you.

Top flier Ron Wittman and his Baby Playboy. At 144 sq. in., this is one O.T. model that's just the right size as is for .020 Replica. Nakashima pic.

(Left) Ron Wittman's Lamb "Climber" sports an especially attractive color scheme of yellow and white tissue trimmed in black. Nakashima photo. (Above) Taking a break between flights at the '89 Fresno Annual, Joe Foster is seen here with a Mulvihill Unlimited rubber ship. Photo by Wil Nakashima.

CIAM PROPOSALS from George Xenakis

The CIAM is the agency that rules on all of the international events that are flown by all forms of our model aviation hobby. For free flighters, we are represented at the meetings by George Xenakis, and I have excerpted a few pertinent comments from his latest correspondence.

First off, George points out that the current rules are in effect until 1993. So, if you have a 1989 rules book, it is still in force, since all rules changes occur only on a four-year cycle. The following notes give some idea as to what might be expected to occur with the 1993 rules changes:

1. The proposal to prohibit radio control in free flight was strongly defeated. Implication: strong consideration is being given to using radio in international F/F competition.

2. The proposal to use binoculars during F1A (Nordic) was adopted unanimously.

3. The proposal to make the first flyoff round to be five minutes and to allow it to occur anytime after the required rounds were completed was approved. Implication: the number of flyoff flights to determine winners should be decreased by this action.

4. The proposal by the USA, to require only a .5% increase over a previous record to set a new record in F1D, was approved.

5. The French proposal to reinstate the builder of the model rule barely lost; however it was referred to a subcommittee for further study.

continued on page 103

CONTROL LINE

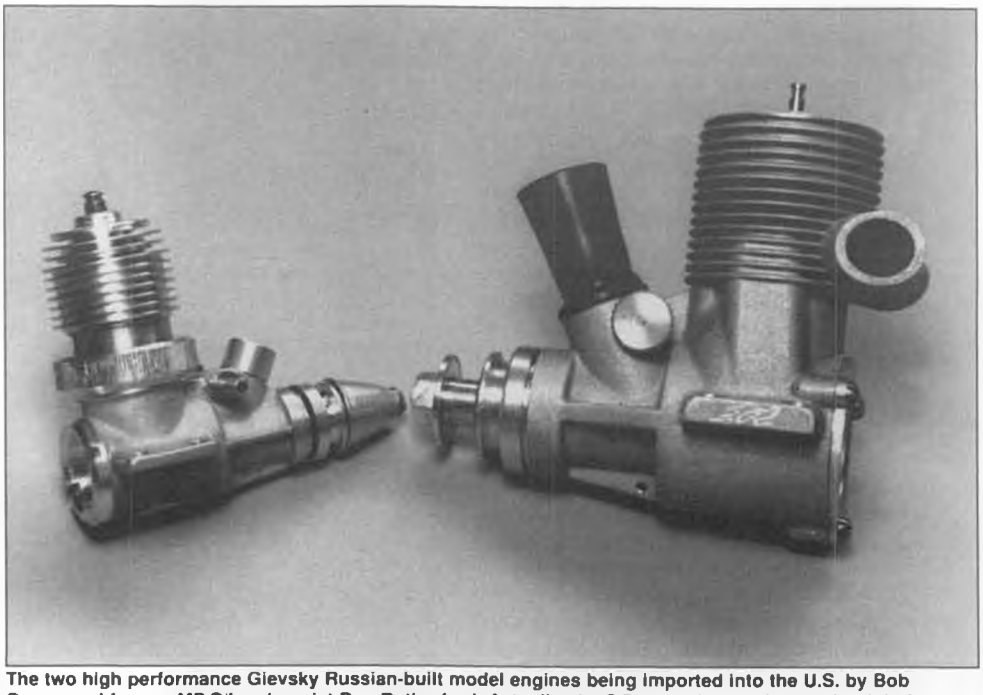
BY JOHN THOMPSON

A COMMON LANGUAGE

Control line Combat fliers in the United States and the Soviet Union have built a growing friendship over the past year or so, which was highlighted in 1989 by the visit of a Soviet team to the U.S. National Model Airplane Championships in the Tri-Cities of Washington State.

Since then, there has been continuing contact between the two countries' fliers. Invitations have been issued for Soviets to attend both the Bladder Grabber fast combat shootout in June of this year and the 1990 Nats. In the meantime, one of the main U.S. "ambassadors" to the Soviet Union has been Dan Rutherford, former author of this column and a combat flier and C/L modeler extraordinaire. Dan visited control line fliers in Leningrad, U.S.S.R. in March and was scheduled to go again in May, along with combat flier and renowned contest sponsor Bob Carver.

As part of the exchange of information and technology that has gone on between U.S. and Soviet fliers, Rutherford and Carver have begun importing some Soviet combat engines. A pair of letters from Dan adds details:



The two high performance Gievsky Russian-built model engines being imported into the U.S. by Bob Carver and former *MB* C/L columnist Dan Rutherford. Actually, the 2.5cc combat engine on the right is currently offered—the .8cc (.049) on the left is only a prototype, but should be available sometime soon.

(Left above) Parts breakdown of the Gievsky 2.5cc reveals thoroughly modern design and excellent workmanship. These things really put out—see Dan's letter in text for performance figures. (Left) The Gievsky .8cc engine appears to use a Cox spinner and glow head, and the same ball-and-socket piston/conrod connection used by Cox. The knurled ring at the bottom of the cylinder holds the cylinder to the case and allows the single exhaust port to be aimed wherever you like.

"Bob Carver and I have formed a partnership and this new company will be importing engines designed by Alexander Gievsky and produced by his cooperative STELS (Sports Equipment and Electronic Systems, Leningrad). Something gets mangled in the translation but `STELS' is in fact correct.

"The primary product is the well-known Gievsky 2.5cc FAI combat engine. While the U.S. market for such an engine is limited, it is a beautiful piece of work: lots of power, very light weight (4.8 ounces—137 grams—complete and as shown in the pictures), parts fits and workmanship easily equal to the best motors in the world.

"While such is not suggested, Spence (Spencer Sheldrew) and I have flown a couple of the Gievsky 2.5cc motors and it appears that they can be run real hard right out of the box without a problem, thanks to extremely close production tolerances. Our experience is that with each of the first few runs the motors get a bit stronger and start easier, but even on the first run it is possible to squeak the needle down to full lean and the motors will hold a steady setting.

"One motor has been devoted to `functional tests' to see just how reliable they really are and so we punched the FAI-legal 4mm (about 5/32-inch) venturi out to .210-

inch diameter. With F2D-legal fuel (10% nitromethane, 70% methanol) and a flying prop, on the first run the motor was pulling around 28,500 rpm and holding steady. I will have to buy a new tach, as the one in use now only goes to 29K...

"These are ABC construction, of course, with the liners manufactured by Anatoli Pereverzev, well-known FAI C/L speed flier. Ball bearings, of course. Glow head is retained by a threaded clamping ring and Cox Conquest .15 heads are a direct replacement item, although we will be stocking Soviet-produced glow heads along with a full range of parts.

"While I returned from Leningrad with motors, there are presently only a couple left, so I'm waiting for the first shipment *(as of March 24—jt)*. Production volume at STELS is presently at near-capacity just supplying engines to Soviet fliers, so availability will be limited. And pricing is at this time unsettled, due to a very high tariff of 70% that may any day be lifted. In any case, we will be making the engines available at the best price possible and those interested can write to me at: Dan Rutherford, 4705 237th Place S.E., Bothell, WA 98021. Or pricing and availability information can be had by calling (206)481-5760.

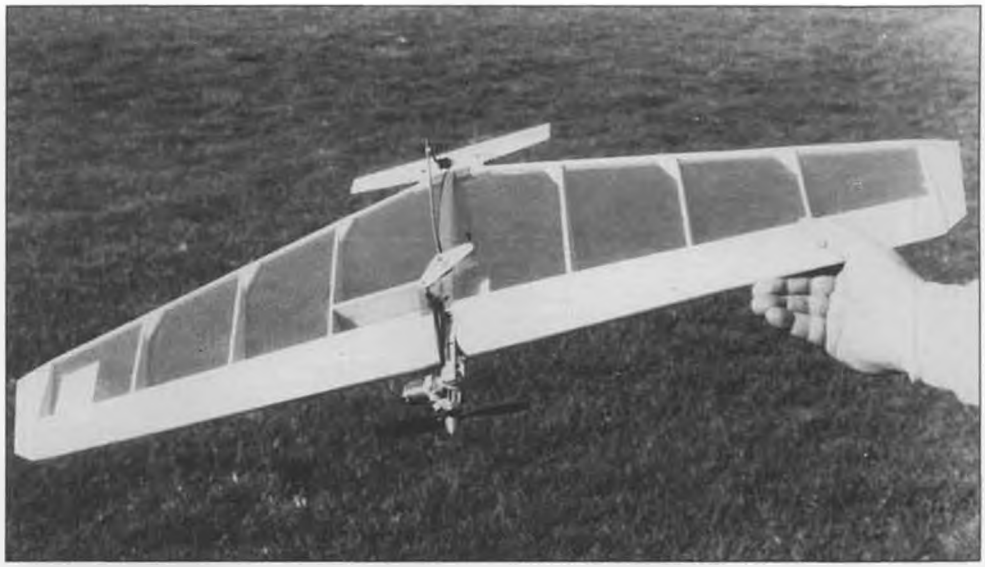
"Another engine of interest is the Gievsky .8cc (.049) shown in a couple of pictures enclosed. Only three prototypes exist as I write this, but as you can see much of the tooling is production-ready with the crankcase being cast, as opposed to machined from bar stock.

"This is a real interesting little motor. Construction is AAC and a single rear ball bearing is fitted with the possibility of also using a front ball bearing. A single exhaust port is used (Schnuerle porting, of course) and on the prototype a clamping ring allows positioning of the exhaust port any place convenient. Mounting bolt pattern is the same as a Cox .049, so it'll slip right on existing models. Weight of the prototype is 41 grams (1.45 ounces), about seven grams less than the competition and production pieces are promised to be lighter yet.

"Production claims being a touchy subject, and the one motor I have being a prototype, no rpm figures will be quoted at this time. I will tell you, however, that I am flying the engine at every opportunity and it runs right with my two very best Tee Dees, both of which have been heavily massaged. Further development is expected to result in significantly more power. We shall see...

"No pricing or supply information is available at this time, although a large order has been placed with STELS and I am awaiting their response both on price and production scheduling.

"More pics: Slava Beliaev built a couple of 1/2A combat models which are very similar to his F2D models and I came home with both of them. External bellcranks, square (and `open') bladder compartment, no boom, aluminum motor mounts, foam leading edge sheeted with drafting paper, Kevlar thread reinforcement throughout, including a spiral wrap around the leading edge/spar assembly and center section.



On his last visit to Russia, Dan Rutherford came away with a couple of Slava Beliaev's 1/2A Combat ships—see text for Dan's comments on the construction and performance.

"Extremely durable construction—Spence and I have punched the pictured model in a couple of times and it just bounces. Lots of line tension, but these first models are a little tail-heavy, which keeps most flights pretty exciting and prevents the model from being as `pointable' as the stuff Spence and I fly in 1/2A. It is a little tamer with the heavier Cox engines, but still not quite up to current standards for contest flying. Still, it is better than much of the equipment typically seen at 1/2A contests and is tougher than anything I have ever seen in a 1/2A model.

"Carver and I are planning on going to Leningrad May 10-22 for the `Cup of Leningrad' annual contest. All the FAI events of course, but this year they have added not only 1/2A combat but AMA combat as well. Right, a chance to fly `Bad Boy Combat' in the Soviet Union; who could resist that invitation? You may recall that when Alexander and the boys were here for the 1989 Nats, Spence and I sent them home with a couple of complete 1/2A models (engines included, of course) and Bob Carver kicked in with a new Rotation Station (AMA combat plane) and three Fox Mk. VI motors, one of which was a (Glen) Dye customized piece. This initial effort seems to have paid off as the Soviets are really interested in both events, with Beliaev doing demonstrations with the 1/2A models at Soviet contests.

"All the Soviets visiting the Nats in '89 send their best regards to their many new friends in the United States."

A communication from Dan a month later adds some interesting details of his engine testing program:

"Since previous communications I have fiddled a bit more with the Gievsky .049 motor...

"Fuel used was my standard AMA, slow and 1/2A mix, which is 40% nitromethane, 5% bean oil, 7% Delta (R/C car) oil, 48% methanol. With a Cox 5x3 black nylon prop

continued on page 104

Old Timer Stunt Dept.: 40 years after his "Triumphant" C/L ship was published in *Air Trails*, George Lieb built another, with the same power (Atwood Triumph .49), construction and color scheme as the original. George is on a real nostalgia trip with this one!

PRECISION *Continued from page 56*

In the past five years, radios have come on with a rush. Where do we go from here? Well, more of the same, most probably. The advent of the computer radio with its programmable mixing schemes was nothing short of a sensational development. I doubt that anything that dramatic is on the horizon as far as new bells and whistles go, but I would look for today's systems to become more user-friendly while their capabilities continue to increase. The packaging will get slicker, with more emphasis on ergonomics. This is probably more of a fervent hope than a real prediction, but it sure wouldn't be bad if the airborne components continued to become smaller, lighter, faster, stronger, and more accurate.

The safest prediction in this lot is that the RF link will become ever tighter. Given the frequency environment in which we all will be operating during the next decade, the alternative to good tight band systems will be crashing. Crashing is generally not acceptable to the manufacturers, as it has a mostly deleterious effect on radio sales.

Because of lightweight composite materials, the advances in construction methods made possible by those materials, and the increased power that will be available in the future, aircraft will be larger. Larger airplanes fly smoother and more visible maneuvers. Look for airframe size to increase by nearly 25% in the next ten years; 1000 sq. in. wings and ready-to-fly weights of 8-9.5 lbs. will be the "normal" sizes, and today's 7.5 lb., 800 sq. in. airplanes will be considered small. Because of the size of these aircraft, expect the current use of plug-in wings and stabs to increase. Flight speeds will continue to fluctuate slightly with the dictates of fashion, but the overall tendency will be in the direction of the "constant speed" airplane, and this will tend to keep that fluctuation at the low end of the range. The trend toward larger and more lightly loaded aircraft also points in this direction.

It is fairly certain that Turnaround flying will become the prevalent style in most or all of the pattern classes. Look for the number of classes offered at the average contest to shrink. The six classes now listed make contests very difficult (not to mention expensive) to run. More Turnaround classes, even though they are quicker to run, will probably not help the situation. Contest attendance is increasing, and this will apply further pressure. If the number of classes listed as rulebook events is not trimmed to a more easily handled number (a probability, and possibly the best solution), then I believe that the result will likely be more small, local events. CDs will tailor the event list to the needs of the competitors they can reasonably expect to attend, because running this sort of limited contest is a much safer financial bet for a small club.

What effect these limited contests could have on the quality of competition over time is uncertain, but my guess is that it would not be a good one, if only because the options

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and opportunities for the average pilot to progress could be limited. Pattern flying might tend to become more insular and provincial, with more competitors opting to stay within the local area, local judges seeing only local competitors, etc. Why travel across the state if your class isn't even offered? The conceivable result could be a severe case of aeronautical inbreeding. Look for attempts to deal with this situation in the next several rules cycles.

No matter what happens, finding qualified and willing judges will continue to be a problem. I am willing to bet the farm and almost all the chickens that this will still be true in 3046 A.D. Engines will continue to find a way to flame out at critical moments. No one will ever find a cure for mid-airs. While global warming may increase the length of the contest season in some locales, contests will continue to be rained out. The perfect site and/or weather for the Nats and Masters will never be found. Retracts and props will continue to break. In short, pattern will never change so much that we won't all still feel perfectly at home!

Back to the subject of radios for pattern. A question I am repeatedly asked by new recruits is if one of the fancy computer radios with all of the mixing is really necessary for pattern flying. This is like asking your wife if the new range she just bought with all of the fancy automatic timing features and the self-cleaning oven was really necessary. The answer is no, strictly speaking, but all of the fancy stuff sure does lighten the workload! By the way, never ask your wife questions like this, because she may ask you about all of that stuff in the basement.

Back when we all were wading about in the primordial ooze, trimming pattern airplanes developed into an elaborate process which used up a lot of the calendar and a fair amount of glue. Wings were subjected to multiple sawings-in-half in order to attain that exact and elusive dihedral angle which would yield Zero Roll Couple. Stabs were cut out and refitted, wing saddles shimmed and reshimmed repeatedly, ailerons were cranked up and down, CGs were tinkered with, and tuned pipes were moved about, all in pursuit of the Perfect Knife Edge. Articles on trimming by the masters of the art were devoured like the latest pronouncement of the Delphic Oracle. It is fair to say that a lot of pilots, including myself, devoted nearly as much time to trimming aircraft as they did to practicing maneuvers. Sometimes it seemed that I would get the thing flying just right about a week before it was worn out. Even a good, square, new bird whose design I was familiar with would use up a couple of weeks of putzing around before I could sign off as being satisfied.

Today I can teach a reasonably straight new airplane decent table manners in an afternoon or two, if pressed for time, and the difference is the programmable mixing in the radio.

The key words above are "reasonably straight." A really crooked dog can be helped a little, but a true fix for this class of buzzard is still old-fashioned major surgery and a trip back to the setup table. However, lots of small problems that used to end up being reluctantly lived with can now be dialed away with a few beeps here or there.

Does this mean that we no longer need to know how to trim? Does the fancy stove mean you don't have to know how to cook?

Heck, no. The good news is that some small problems can be fixed fast. The bad news is that aeronautical ignorance will still get you into just as much trouble as it used to, only faster and at greater expense (you bought the fancy radio, didn't you?).

The circle comes around. Functional aerodynamic purity is still the ideal, and you still need to build the straightest airplane that you possibly can. Heavy and underpowered airplanes are still more difficult to trim. Knowledge of why an aircraft acts as it does in various flight modes is as necessary as ever. A trim fix for one flight mode may still cause a trim problem in another. There are some trim problems the radio can't begin to solve, like thrust line misalignments and pitching on the vertical up and down lines. The only thing that has really changed is that we have now added the radio to the list of tools we can use to fix a trim problem. Glue bottle, model knife, razor saw, popsicle stick, radio, bubble gum, lead weights—the trick is to know when to use which tool.

You don't want to spank a baby with an ax, but a teaspoon isn't really an effective tool for cleaning a stable, no matter how much you like horses.

Perhaps the best thing about these wonder boxes is their ability to fine tune an already really good machine. Hitting such a state of precision trim with a model knife powered by crossed fingers and a lot of luck used to be much more difficult. Besides the mixing, features like auto dual rates, aileron differential, and throttle expo are probably worth the price of admission by themselves.

The biggest problem with all this mixing power is the growing attitude that almost any problem can be "dialed out." As my friend Paul Verger (The Mouth of the South) remarked sometime back, these hummers won't turn a toad into a prince—all they will do is give you a toad on life support!

• • •

News on the product front. RC City of Suisun, California, has recently acquired Aero Composites, adding the LA-1, Summit III, Vortex, Phoenix 8, and EU-1 designs to their lineup which already includes my Cursor design, the Eclipse, Avanti, Punch, Fresh Aire and Typhoon designs, plus Dave Patrick's soon to be announced Conquest Long Stroke and Conquest Four-Stroke. This probably makes RC City the largest supplier of pattern aircraft on the planet, at least in terms of number of designs offered. Owner Jim Graham is busy enlarging the factory, and reports that the huge backlog of orders on the Summit III and LA-1 should be cleared by the time you read this. In addition to the pattern line, the Aero Composites deal included the rights and tooling for the TOC-sized Krier Kraft, Skybolt, and Weeks Solution bipes, and Jim says these birds will be available soon as well.

A while back, a couple of new props arrived from Tom Dixon, the Bolly Prop man. My current favorite is the 12.25x11.5 two-blade for FAI, with the new 11.5x11.5 three-blade a close second. Both pull super well on the vertical lines, with the two-blade having a slight edge in level flight speed. The three-blade provides better braking on the down lines and is maybe a shade quieter in the air. Both props are extremely quiet, or maybe extremely quiet and extremely quieter. See ya at the field.

The following are addresses for the companies mentioned in this column:

RC City, 96 Railroad Ave. #F, Suisun, CA 94585; (707)428-3119.

Tom Dixon, Bolly Props, Suite 401, 1938 Peachtree Road, Atlanta, GA 30309; (404)973-0004. ***MB***

POWER *Continued from page 17*

the motor terminals.

Step 2: The motor equation is:

V = IxR + kxRPM,

where V is the voltage at the motor terminals, R is the internal resistance of the motor, I is current, k is the motor constant, and RPM is revolutions per minute. Roland's data gives two equations:

3.22 = 11xR + kx7500, and

3.35 = 8.2xR + kx10,000

To solve by simultaneous equations, multiply one of the equations by a factor that makes the R or k term the same as in the other equation. The factor 8.2/11 makes the R term in the first equation the same as in the second equation (from the coefficients of R, 8.2 and 11), and multiplying the first equation by 8.2/11 gives:

2.40 = 8.2xR + kx5591

Subtract this from the second equation, and the R terms drop out:

(8.2R - 8.2R = 0),

and we get:

-.95 = -kx4409,

k = .95/4409 = .000215

You can then use k in either of the two equations to solve for R, or repeat the simultaneous process to drop out k and get R. I prefer to repeat the simultaneous process; the factor to use will be 10000/7500 on the first equation. You will then get:

4.29 = 14.67xR + kx10000

Subtract the second equation, the result will be:

.9 = 6.07xR, R = .148 ohms

Step 3: Now comes the payoff: determining the rating of the motor and the propeller to use. You have to choose what current you want to run. This is an arbitrary choice, I prefer 12 amperes for motors of this size, and about 15 amperes for the 100 watt (05) size. Now we want to find what voltage, rpm, efficiency, and propeller work best for this current setting. We need a range of voltages, the power in, the power out, % efficiency, and rpm. The voltage range can be anything, but for motors of this size 3 to 7 volts usually is a good choice. VI is power in; at 3 volts and 12 amps that would be:

3x12 = 36 watts.

$VI-I^2R$ is power out, for this motor that is:

$36-12^2x.148 = 14.7$ watts.

Efficiency is:

(14.7/36)x100 = 41%.

RPM is:

(V-IR)/k; (3-12x.148)/.000215 = 5700 rpm.

I like to set up a chart for the voltage range; for the screwdriver motor it looks as shown in Table 1.

I would choose 5 volts for running the motor, 15,000 rpm is a reasonable number, and 64% is acceptable. To find the prop for this rpm, use the Abbott equation mentioned before in this column:

$Power=Pitch\ x Diameter^4 x RPM^3 x 5.33x10^{-15}$.

Use the output power—for 5 volts this is 39 watts. You have to choose either pitch or diameter; I prefer to choose diameter and solve for pitch. The Top Flite 5-1/4 inch prop is a good choice; when you run this through you get a 3-inch pitch. If you choose a 6-inch diameter you get a 2-inch pitch.

Now we can answer Roland's question—what wattage? This is nominally a 60 watt motor, assuming you want a 12 amp current and 5 volts at the motor terminals. This will

give you 15,000 rpm on a 6x2 prop or a 5-1/4x3 prop, at 64% efficiency, 39 watts output. However, it is fair to ask about other choices. We could have chosen 10 amperes, or 14, and so on. The results for those choices are shown in Table 2.

Again, either 5 or 6 volts would be the best choice. Note that at lower currents, it is easier to gain a little on efficiency. This is due to the I^2R terms for power out. As current goes up, the squared current takes a bigger bite out of the power.

One other item has to be taken into account before we are done. We are using NiCd packs; they have internal resistance, and so does the wiring going to the motor. The packs have values of about .010 to .020 ohms per cell, depending on their size. A sub-C cell has about .012 ohms. A typical wiring harness has about .020 ohms with two pairs of Deans connectors, a toggle switch, a 25 amp fuse, and about two feet of #16 SR wire. These values were all measured by me, and are exactly the values Ed Westbrook said were typical in a letter to me two years ago. Pretty good, Ed! Anyhow, a typical NiCd has 1.25 volts with no load. To get the actual voltage at the motor terminals, you have to add up all the resistances, multiply them by the current, and subtract the result from the no-load pack voltage. Examples are shown in Table 3.

At higher current the voltage loss will be more; at lower currents, less. My rule of thumb is to figure one volt per cell is available at the motor terminals at the usual currents we use.

Well, there you have it. From two motor runs you can calculate just how you want to use your motor at just about any current or voltage. You will have the efficiency, the watts, and the prop to use. If you want to use a gear drive, you can take advantage of the greater efficiency at higher rpm, as seen in the tables (though the drive subtracts some power too). Have fun! Thanks, Roland, for inspiring me to do the digging on this!

Gordy Stahl sent a nice letter with some photos of his Bill Evans designs. The Simitar Electro-Sierra is 72-inch span, uses an Astro 40 cobalt, 21 cells, Airtronics MD7SP radio, and a Jomar SC-4 speed control. The other photo shows his Simitar Electro Racer, 36-inch span, foam core wing, Graupner Speed 600 motor with a 7x3 prop, seven 800 mAH cells, and a Graupner BEC Model 20 switch. In the same photo is a Simitar Electro-Q, 50-inch span (foam core), Astro 25 cobalt, fourteen 1200 mAH cells, Astro speed control, and Airtronics Spectra radio. It uses elevons and rudder. Gordy did not say whether these were adaptations of Bill Evans' designs, or ones that Bill Evans has available in plans or kit form. I sure like the Simitar E-Racer! Gordon did not send any flying information, but I am sure they perform very well.

A couple of years ago I featured a "Slow Motion" (also a Bill Evans design) in the column. These no stabilizer planes fly very well. I have one half-done—one of these days it will get finished! Gordy and his friends are starting an electric power club called the "Flying RC Sparks." Almost all of them also fly giant scale gasoline powered models! If you would like to know more about the club, contact Gordy at 6623 W. Chambers, Milwaukee, WI 53210, phone (414)873-5842.

Kirk Massey sent photos of his plane, a quarter-scale Cub built from a Bud Nosen kit. I have heard that Bud Nosen kits are lightweight and suitable for .60 gas power, which made me think they would be a good choice for electric as well. They are also priced very reasonably. Kirk built his in 1985 and has been flying it electric since then. He has an Astro cobalt 60 in it with twenty-seven 1200 mAH cells, a 14x6 to 14x10 prop, and a Jomar SC-4 throttle. Flying weight is 11 lbs., and this includes a smoke system! The bare bones shot shows the battery pack on the cabin floor—they are held down with #64 rubber bands. The last photo is of his ARF 40 EZ Chipmunk powered by an Astro cobalt 40 (seven-turn) on eighteen 1200 mAH cells, 12x9 prop, 6.5 lbs. flying weight. It does short takeoffs and flies well, but is too heavy for good rolls. Kirk feels a modified prop and more cells would pep it up. Kirk organized an electro meet in Willis, Texas, for May 19. It included pylon, old timers, and sailplanes. Kirk would like to hear from other electric fliers in the area; contact him at P.O. Box 496, Willis, TX 77378, phone (404)856-4630. Thanks, Kirk,

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for the info!

A sad note recently was the news I received in the Blacksheep Squadron newsletter, saying Walt Mooney had passed away. I will miss his Peanut Scale centerfolds; I built several and they flew well. Thank you, Walt, for contributing to the pleasure of so many of us. His work is art, and will last for generations.

Enjoy electrics, design electrics! My address is: 7100 CSW/MC, Box 734 PSC 2, APO NY 09220-5300, or if you are not in the U.S., to Normannenweg 20 6200 Wiesbaden, W. Germany. ***MB***

Table 1

V(motor)	VI(power in)	VI-I2R(power out)	%	(V-IR)/k(RPM)
3	36 watts	14.7 watts	41%	5,700 rpm
4	48	26.7	56	10,320
5	60	38.7	64	15,000
6	72	50.7	70	19,600
7	84	62.7	75	24,300

Table 2
10A, screwdriver motor

V	P_i	P_o	%	RPM	Prop
4	40 watts	25.2 watts	63%	11,700	6x2
5	50	35.2	70	16,370	5.254x3
6	60	45.2	75	21,000	4.5x2
14A					
4	56 watts	27	48%	8,950	7x3
5	70	41	59	13,600	6x2
6	84	55	65	18,230	5x3
7	98	69	70	23,000	4.5x2

Table 3

Cells	Resistance Ohms	Current	V drop	No load V	Motor V
4	4x.012+.020 = .068	12A	.82	5.00	4.18
5	5x.012+.020 = .080	12	.96	6.25	5.29
6	6x.012+.020 = .092	12	1.10	7.50	6.40

CHATTER *Continued from page 20*

cause the pilot/swashplate command goes directly to the main rotor blades.

2) Adding a flybar and paddles will boost the control rate, but due to the flybar's stabilizing effect, the overall control response will not be greater than the flybarless machine.

3) The other extreme is adding a flybar, but without Hiller paddles. This will give the most stable helicopter. Roll rate will be the slowest because the flybar will make the model so stable that the cyclic controls will almost feel ineffective. Try removing the paddles on your model helicopter and then flying it. The model will be *extremely* stable, so much so that you almost wouldn't be able to move it. Try it. The French built a three-bladed full-size helicopter in 1950 with three flybars and no paddles. The helicopter was so stable that it was uncontrollable. Remember, as stability goes up, controllability must come down, and vice versa. This is why modern jet fighters are designed to be inherently *unstable*, so they can be really snappy. This is called *relaxed static stability*. To make the aircraft managable, an electronic autopilot must be used during flight at all times, but the autopilot automatically reduces its effect when the pilot feeds in commands. The idea is similar to a "stick priority" rate gyro used on models. As another example, the full-size Huey UH-1 does not have Hiller paddles, thus it is very

stable and sluggish. The full-size Bell Jet Ranger and Huey Cobra do not have stabilizer bars, thus they are slightly less stable than the UH-1.

Next month I will wrap up our discussion of model helicopter control theory using Schluter and X-Cell rotor heads as examples to illustrate control mixing ratio. The Schluter Magic, Scout and the M.A.S. X-Cell have different rotor head Bell-Hiller mixing arm arrangements than the GMP Prohead or Kalt rotor heads.

An interesting concept to keep you thinking for the rest of this month is the "variable stability helicopter." This idea came to me while I was setting up my helicopters. I used to set up all my helicopters with absolutely maximum control throws, minimal yaw rate gyro damping, and no flybar weight. That gives breathtaking aerobatics, but the models' static and dynamic stability would be minimal; they did not like to stay put in hover, and I like to hover a helicopter dead-still. With the above setup, I had to work at it to hold a perfect hover. Recently I added flybar weights on all my models, and replaced all the thin paddles with thicker paddles, but kept the control deflection at maximum. The extra weight and thickness made the models easy to hover, but the roll rate was severely jeopardized: the models became too stable in the lateral direction. Loops were not affected as much because helicopters are always less stable longitudinally, so there is no chance of fore/aft motion ever becoming too stable. Therefore, wouldn't it be great to have a variable stability helicopter? For aerobatics the flybar weights would stay inside near the main rotor shaft. When we wanted to perform a precision hover, just flick a switch on the transmitter, the flybar weight would move outward toward the paddles, and the paddles would shrink in size and inflate in thickness. (Thick, heavy and small paddles make helicopters stable; the opposite makes helicopters responsive.) If you can come up with such a variable stability helicopter you will have a contest winner!

• • •

We conclude this month's column by showing you pictures of a quad-rotor flying model helicopter. The beauty of any multiple rotor helicopter, such as the tandem rotor, or quad-rotor, is that they do not require a tail rotor for torque compensation. The engine power can be used 100% for lift purpose. Tail rotors do not perform any useful work, except to prevent the helicopter from rotating. However, with an even number of main rotors, the tail rotor can be eliminated because even numbers of main rotors means the rotors can rotate in opposite directions to cancel out each other's torque being exerted on the helicopter fuselage. Therefore, tandem and quad-rotor helicopters are more efficient than single rotor helicopters. The tail rotor can absorb up to 30% of the overall engine power!

The pictures show a new Japanese R/C quad-rotor model helicopter. The overall size of the model is only about 15 inches. In the middle is a conventional yaw rate gyro, and also a two-direction rate gyro to help stabilize the vehicle's pitch and roll mode. For the entrepreneurs out there, it's about time someone made a two-directional rate gyro. A two-direction gyro requires only one electric motor, so it would not add much weight or draw too much electricity. It could simultaneously stabilize the pitch and roll mode, or stabilize the yaw and roll mode (which improves the Dutch Roll effect that we talked about in this month's Excalibur review).

The other pictures show a larger quad-rotor model helicopter made by using four GMP Legend tail booms, and four Legend tail rotors for thrust. It was designed and built by Andrew Sutton of Copter Corner, in Santa Monica, California. It uses an O.S. .61 engine and three conventional electronic yaw rate gyros. Next time we will show you pictures of Sikorsky's new R/C flying saucer. It weighs 325 pounds, has internal contra-rotating three-bladed rotors, a Quadra engine, and the saucer is 5.5 feet in diameter. Sikorsky is one of the five major helicopter manufacturers in the U.S. The saucer is a prototype being developed for military reconnaissance purposes.

Another interesting thing I learned recently is that on Russia's state-of-the-art Mig-29 jet fighters, there is a button on the joystick called a "panic button." No matter what the aircraft's attitude, pressing the panic button brings the aircraft upright and wings level. Wouldn't it be great if we had one of those buttons for our models? Actually, it can done by using conventional model gyros. You need to remove the springs inside the gyros—then they are called "integrating gyros." With extra feedback and correcting mechanism, you can make them into vertical gyros that will "remember" where vertical north is. Thus, the model helicopter can tumble and loop or roll, the vertical gyro will remain pointed vertically. By pressing the panic button, the vertical gyro will tell the model to right itself.

Has anyone ever tried using diesel engines for R/C helicopters? I received two letters from a reader in Japan, Ian McQueen, suggesting that I try diesel engines for helicopters because they run cooler and have better fuel efficiency. We will end this month by showing you excerpts from both of his letters. If you have tried it, please write. My address is P.O. Box 692, College Park, MD 20740. If you include a self-addressed stamped envelope, I will usually respond within three days. Readers are welcome to call me anytime at (301)589-0855.

Now let's hear what Ian has to say:

Dear James,

I read with interest your helicopter column. Although I do not fly them myself, I find your presentation of information the best of the columnists that I have seen in the three U.S. magazines that I subscribe to. From the tone, I would gather that you have a technical background.

I am writing because my major interest is diesel engines. (There was an article in the October or November MB C/L column that I wrote.) I distribute UK-made engines (PAW) and Davis Diesel conversion heads here in Japan. Diesels run much cooler, develop higher torque, use substantially less fuel, and are quieter than glow engines. This would seem to make them ideally suited for use in helicopters, and Davis makes heads for helicopters, yet I have never seen a word about using diesels in helicopters in the magazines that I have read. (One company placed one full-page ad for diesel engine/helicopter combinations several years ago, but I never saw another mention of them.)

I am wondering if you have any knowledge or experience with diesels. If not, I think it would be an interesting topic for a future column. There is some learning curve involved, for the engines run so cool that it is actually necessary to reduce the flow of cooling air over the head, and the idle has to be made leaner. I believe that Bob Davis would be cooperative if you were to approach him for information. Here is the address: Davis Diesel Development, 132 Pepes Farm Rd., Milford, CT 06460. Phone (203)877-1670.

A Japanese friend, a model helicopter flier and university professor specializing in diesel combustion (full-size), is just about to begin extensive tests of an O.S. .32 in a Concept 30, and will be generating data that I will be able to share with you later. However, I think you should conduct your own tests to be able to give your readers a step-by-step recounting of your firsthand experience. There is a learning curve involved, and you could save your readers some time if you were to work out the kinks first. Diesels are not difficult to run once you understand what is going on, and I would never want to have to use a glow engine again! In theory, one would expect you to become equally enthusiastic about them after you have worked out how to set them, but the only way to check this out is for you to make the tests. I hope that you will be able to.

continued

Best regards, Ian McQueen.

Ian's follow-up letter, received three weeks after the first, reads as follows:

Dear James,

I have positive news about diesels and helicopters. My friend, Kenji, got his rig going. There was a problem with the head in that the groove for the head gasket had been cut too deep and it required three gaskets to seal correctly; the part of the head around the gasket contacted the top of the engine before the groove area pressed the gasket against the top of the sleeve. He has access to a machine shop and turned off enough metal to remedy the problem, and I have advised Bob Davis of the problem.

Kenji set up the engine (O.S. .32) on a test mount with a 10x5 (I believe) prop, thus getting the carb main and idle adjustments close to correct. He then transferred it to a Concept 30. It started easily, and he quickly got the adjustments finalized.

If you make a test, the first thing is to let the engine warm up completely. This takes 30-60 seconds. If the compression is set correctly, the engine will not develop enough power to fly during this warm-up. Another user here did not know this and increased the compression enough that the engine developed full power, but after the engine warmed up, the compression was then too high. This causes pre-ignition and hard running, overheating, and the generation of black exhaust. The correct compression setting with a warmed-up engine gives a light brown exhaust. If it is clear the compression is too low or the mixture is too rich, and if the compression is too high, the exhaust will be black and the engine (if you can hear it over the gears, rotors, etc.!) will have a harsh, metallic sound. He also found that the idle adjustment should be set just a tad rich in order to give good transition from low speed (since the engine does not have to idle very often while in the air!).

Anyway, the flight trials were very good, with good transition and good power. He is not an aerobatic flier, so could not explore the full power available, but his impression was that the power was higher. He estimates that the flying time was doubled with the same amount of fuel. Since the engine is buried in shrouding it was not possible to check the temperature, but it is certain that it would have been lower than when run as a glow engine. (If the compression is set too high with the screw in the head, the engine can be made to overheat, but that would be dumb to do intentionally.)

I think I wrote before that inverted diesels run just fine, with no problem of oil running to the bottom, which can douse a glow plug.

You wondered about vibration. I can't say for sure, but Davis wrote that making an O.S. .61SF (long-stroke) into a diesel made it much smoother than a glow.

Best regards, Ian McQueen **MB**

QUIETUS *Continued from page 22*

Master Airscrew 12x8 folder which is stretched to 13 inches with a longer hub. The longer hub makes it possible for the blades to fold flush against the fuselage. There is a loss in duration, however, since the pitch increases as well as the diameter, with attendant increase in current draw.

Flying without a landing gear is not as inconvenient as it might seem. Quietus abhors the ground when the power is on, so hand launches while holding the transmitter in one hand are no problem. It would be wise to have someone toss the model for you until it's trimmed out and you are familiar with its characteristics. After that it becomes a one-man show.

Lack of landing gear does not preclude touch-and-go landings. I regularly do several near the end of a flight, sometimes sliding ten feet (on grass!) before pulling off and opening the throttle. The rocker bottom of the fuselage profile makes this possible.

Though the plane has no ailerons, its four degrees of dihedral and high center of gravity make it very responsive to rudder. Horizontal (not axial) rolls are done with the same inputs you would use with ailerons. It does well in gusty conditions and has been flown on days that were too windy for many.

If you've been toying with the idea of an electric plane, try the Quietus. It will give you an appreciation of the practicality and possibilities of electric power. With battery technology improving, there is no doubt that a large segment of our hobby will use this source of power in the years to come. **MB**

R/C SOARING *Continued from page 26*

and test flying them. Over and over these models were flown in all weather conditions, establishing flyability and durability. To quote Vern, "Hill soaring can take its toll on a model. That's another reason for its tough construction. I've rolled this model into the hill on several occasions without major damage."

Vern also sent along the specs for the Albatross. These read as follows: wingspan, 52 in.; fuselage, 42 in.; airfoil, modified Eppler 205; weight, 48 oz..; materials, fuselage, polyester/glass and carbon fiber (rudder and fin molded in); wing, foam core with balsa sheeting; horizontal stabilizer, foam core with balsa sheeting; canopy frame, polyester/glass; canopy, formed butyrate; tip tanks, polyester/glass. No price was given, so it is best to drop Vern a line to find out, if you are truly interested.

MIKE REED'S LS-1 SLOPER

Mike Reed's name is no stranger to these pages as he has produced many a fine slope glider design and shared a few with us. As a follow-on design, Mike has come up with the LS-1 as a cure for the local slope club's apathy. To quote Mike:

"Our club was suffering from glider stagnation! Low turnouts for fun-flys and all-around disinterest was beginning to plague our once flourishing club. The thing that brought our club out of its slump was the LS-1.

"The LS-1 was designed over a year ago, but it still holds great popularity with club members. The LS-1 is a blast to fly! It has even been the inspiration for our younger modelers to design their own slope gliders, and quite respectable ones too!

"I am now building a new wing for my personal LS-1 which will use the SD6060 airfoil (improved E374). Other slope gliders that I have flown with this airfoil are really fast! The findings in *Soartech #8* seem to be right on as far as this airfoil is concerned."

Now to quote Mike further regarding the LS-1, "The La Sierra (LS) Slope Soarers are a flying club based in Riverside, California. Making good use of the westerly winds that blow from ten to thirty mph, members can be seen flying everything from floaters to slope racers.

"Flying a kit-built plane is fun for a while, but even the newest and freshest designs eventually get modified beyond recognition. Our club was looking for something different, a new design that didn't look like a clone or an off-the-shelf kit.

"During a club meeting, one member suggested that our club should have its own glider, one that could be considered indigenous to our club and hill. All members present were excited about the idea, and everyone agreed that the club glider should be geared toward the average pilot. We could have designed a sailplane that utilizes all the latest building techniques and space age materials, but the idea here was to keep it simple and low cost.

"However, simple was not to mean sacrificing performance. The goal was to achieve a good compromise of high performance and building convenience, to produce a sailplane that was easily scratch built from plans only, yet produce respectable performance. It was to be capable of performing aerobatics for pleasing the seasoned pilots in the club, yet be stable enough for a beginning aileron pilot. A design committee was formed and began to settle on the LS-1's various design features.

"The result was a sixty-inch span slope glider with built-up wings, ailerons, simple box-shape fuselage, solid wood tail surfaces, and a balsa hatch/canopy to clean up the front end. The LS-1 has ample room inside for full-size radio gear, including three servos and ballast (rudder control is optional). The wing is D-tube construction with cap strips. The Selig 3021 airfoil was chosen because of its wide speed range and ability to be heavily loaded (up to 13 oz./sq. ft. on the prototype).

"As an aileron trainer, the dihedral can be increased and the control throws decreased to produce gentle handling. Built per the plans, the LS-1 is a clean design that can perform all the standard aerobatic maneuvers with ease.

"The prototype LS-1 weighed in at 24 oz. ready to fly. A seven-channel receiver, two large servos, and a 500 mAH battery were used. At 24 ounces, the LS-1 is able to penetrate and maneuver in 20 mph winds. This slope glider really holds its kinetic energy so that large maneuvers flow from one to the next.

"In light wind (5 mph) the LS-1 is easy to fly for beginners because the controls are still quite responsive, and stalls are mild and easy to recover from.

"Many club members are building the LS-1; even new pilots are making the LS-1 their first scratch-built aileron ship.

"In the near future a "One Design" contest is inevitable, and we are hoping for a good turnout.

"In order to share this design with other modelers, plans have been made available. For $7.00 I will supply anyone with a really

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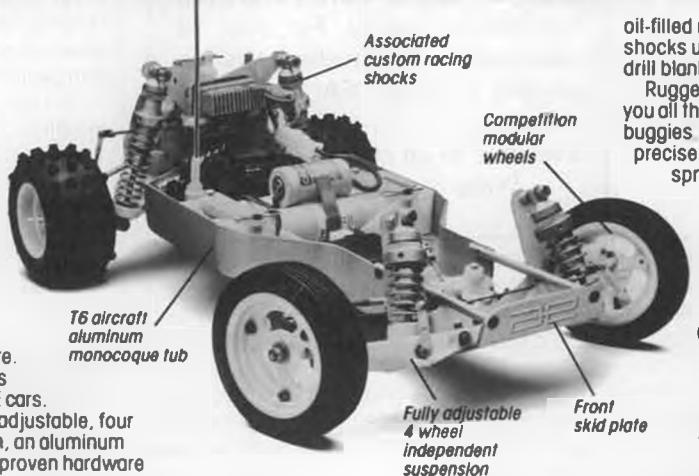

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clean, CAD drawn plan of the LS-1 complete with a rib and bulkhead template sheet and a three-view drawing. Contact: Mike Reed, 1775 Dumitru Way #B, Corona, CA 91720. Please, money orders only."

Having seen this CAD plan, I can testify that it is truly everything Mike says it is. Now, if Mike would just provide partial kits and a materials list for a ten-spot more ...hmmmm.

BURIED-IN-THE-WING BLUES? HERE IS AN ANSWER FROM AIRTRONICS

I have received inquiries from a few modelers who are wondering what the best servo is for burying inside a sailplane's wing when flying with an Airtronics Vision or ATRCS modified MD7SP radio. Well, up until recently the best choices were: 1) a JR mini servo (S350M) with its metal gears; 2) a standard Airtronics servo with its outer case ground down to clear the wing skins; 3) a Futaba S135 coreless servo, or 4) an Airtronics 94401 mini servo with its fragile plastic output gears.

Well, there are some difficulties. First, the JR mini servo does have some plastic output gears that will strip out if jarred sufficiently, and you need to reconfigure the connector to match Airtronics. As for option #2, many guys will not go for destroying a servo case just to squeeze in a standard size servo with its bigger, tougher gears. The third Futaba option involves soldering new Airtronics connectors and observing correct polarity which many would object to, and the Futaba S135 (aka S9601) mini servo with its metal and plastic output gears is a little fatter than the Airtronics 94401. And finally, the Airtronics 94401 servo, if used to operate the flaps, will strip its gears rather easily if the flaps are not retracted before touchdown. Problems, problems.

One solution, which was mentioned last month, is to go ahead and use the Airtronics 94401 servo and add an R/C car "servo saver." Because this makes the flap surface somewhat springy due to the spring-tension nature of the servo saver, it is OK for the slow flying thermal soarer, but undesirable for slope racing or F3B multi-task flying.

Apparently, the need for just such a buried-in-the-wing flap servo was great enough that the optimum solution has been reached by Airtronics themselves:

INTRODUCING THE AIRTRONICS 94141 MICRO SAILPLANE SERVO

This "141" servo is the latest thing from Airtronics. To quote the source, "Airtronics' powerful 94141 Precision High Torque Ball Bearing Micro servo is the strongest servo of its size and weight ever produced." It was actually designed for R/C car racing and aircraft use where space and weight is a problem. It is ideally suited for sailplane flap use, however.

The area of greatest concern for sailplaners is the output gearing. Again, quoting from Airtronics, "The 94141 is ruggedly constructed with a metal output gear coupled with a durable metal and molded gear train. Its fiber reinforced case features unique side mounting brackets that allow for easy horizontal servo placement inside sailplane and power aircraft wing structures."

Other features include a precision ball bearing supported output shaft, a quality coreless motor, and advanced electronic components.

The dimensions for the 141 servo are: length, 1.37 in.; width, 0.60 in.; and height, 1.27 in. Torque is rated at 45 oz./in. with a transit time of 0.25 seconds per 60 degrees of rotation.

By the time you read this, these servos will be available from your favorite hobby supplier. Any technical questions can be directed at Airtronics, 11 Autry, Irvine, CA 92718, (714)830-8769.

INDOOR FREE FLIGHT MODELER OFFERS INSIGHT FOR R/C TIP STALL BEHAVIOR

I recently received an interesting letter from one Harry Cook of Oklahoma City, OK. With it, Harry included a small, cardstock "wing" with an elliptical leading edge and a straight trailing edge. This flat little cardboard wing was bent at the tip in such a way as to demonstrate washout as well as tip dihedral. Perhaps there is a way for us R/C types to apply a F/F "trick to our HLGs and thermal competition ships? Let's hear what Harry has to offer.

"Dear Bill, I have been following the Schuemann wing thing in your column, December '89, and April '90, and had a light bulb light this evening. Perhaps you are familiar with the `Sweepette' indoor hand

launch glider design by Lee Hines that goes back to the '60's? To get wing tip washout (to slow tip stall), he canted the tip polyhedral joints—per sketch. Voila, a swept rearward tip trailing edge and from the dihedral, a swept forward trailing edge inner panel. Perhaps that had a part in making the Sweepette a super winner?

"Enclosed is a paper wing with `cant' fold to help you see how the fold produces washout.

"Enjoy your column each month, thermals, Harry R. Cook."

After folding and viewing the little cardstock wing I agree with Harry on the washout idea. It does give a lot of washout. In fact, the more the tip is folded or the greater the toe-out angle is in the crease, the more washout you get. And, yes, the Sweepette and other similar designs were a contributing factor in Wil Schuemann's decision to redesign his 15-meter full-size sailplane.

However, if you really fold the tip dramatically, the tip TE sweeps forward, not rearward, but only slightly. When you consider that the tip dihedral with its upward angle and attendant outward spanwise flow counteracts the forward sweep in the TE and its inward spanwise flow effects, all is well!

As concerns the inner panels, remember, dihedral increases (however slightly) the outward spanwise flow just like rearward sweep does. Therefore, the center dihedral acts more like rearward sweep than forward sweep. (Sorry to disagree, Harry!)

The proof of the pudding is in the eating, and the success of the Sweepette is legendary. Perhaps more R/C designers will pick up on this design idea.

MORE NEWS FROM OKLAHOMA: MODEL CONSTRUCTION VIDEOS

I have received a letter from a Mr. Donald (?, whose signature is a little hard to make out) that details the plans of his Model Construction Videos (MCV) company to produce educational videos for kit buyers and builders.

The idea is to give modelers a "decoded" construction guide or technical documentation of the building sequences of several model sailplanes. The first tape, "Building the Mariah," is available now, with the Falcon 880 to follow afterwards (probably available as you read this). This is a great way to preview the construction of a potential kit purchase before the investment of big bucks in the actual kit.

For details about this new tape idea, or suggestions about future tape subjects, contact MCV at 4227 E. 83rd Street, Tulsa, OK 74137. Price of a tape will be $21.95 plus $3.50 S&H, plus 7% sales tax if applicable.

AILERGNOME FOR RCHLG FLYING AND TNT THERMAL COMPETITION

Pancho Morris writes from Mesquite, Texas, to inform one and all about the Texas Soaring Conference's "Texas National Tournament" to be held late this summer, September 8 & 9. The site will be the University of Texas, Dallas Campus, Campbell Road, in Richardson, Texas. Two classes will be flown: Two-meter (B) and Unlimited (D) with two award categories, Sportsman and Expert, trophies to fifth place with a perpetual trophy for the overall winner. Tasks will be 7-minute duration with landing bonus. Two-meter will be flown Saturday, Unlimited will be flown Sunday. Entry fee will be $15/class if preregistered, or $20/class at the field. Everyone is welcome to fly. Contact either Chuck Fisher (214)270-2634 or Jack Hamilton (214)348-4669, the CD's, for details.

Ailergnome! Pancho says, "I know of your fondness for the RCHLG class, so I am sending you a photo of my current HLG. I call it `Ailergnome.' As the name implies, it is an aileron modified Midway Model Company "Gnome." I scratch built it from borrowed plans. Some modifications were made to the structure, but it is basically as designed. The center was left as is which gives good stability, and combined with a good deal of rudder throw gives what one local flier calls `aileron assisted rudder control.' The ailerons and rudder are both driven from a single servo as per the Culpepper Models `Chuperosa.' The model was covered with Coverite's Micafilm on the open structures and light silkspan and dope on the fuselage. The flying weight came in at 12.25 ounces. It turns on a dime and flies very well.

"Keep up the great column. Good lift and

100-point landings, Pancho Morris."

TORREY PINES SCALE FUN-FLY SCHEDULED FOR SEPTEMBER 1-3

Get ready to see some fantastic scale soaring at one of the world's premier cliff sites! The Torrey Pines Gulls are doing it for the second time! Take note that it will be on Labor Day weekend rather than Thanksgiving weekend as it was last year. Also note that this year will feature a Friday night get-together, a Saturday night banquet, and an official hotel HQ.

Charlie Morey, Publicity Chairman, can be reached at (213)494-3712 for details which were not available at press time. To get to Torrey Pines, go south on Interstate 405 (the San Diego Freeway) toward San Diego. Exit Genesee and go west (right). Go straight until you see the Torrey Pines Gulls sign next to the Scripps Institute. Turn right, follow the traffic barriers to the parking area, and you are there!

AIRFOIL OF THE MONTH: SD7037 FOR THERMAL FLYING

The source for this outstanding airfoil is properly credited to Michael Selig and John Donovan—the "SD" in SD7037. From *Soartech #8* ($15.00 from the publisher, Herk Stokely, 1504 Horseshoe Circle, Virginia Beach, VA 23451) we learn that, "The SD7037 is a thinner, decambered SD7032." (See *MB* Soaring column, April '90, page 38.) "As would be expected, the drag is lower, the polar is shifted downward in lift, and the lift range is less. To increase the lift range, flaps would be useful.

"The relatively low drag at Cl near 0.3 offers good L/D performance which, together with low drag at high lift, should make the SD7037 a popular airfoil, especially for thermal duration flying. For weak thermal conditions common to east coast soaring in the U.S., the SD7037 would make an excellent cross-country airfoil, but flaps in this case are almost essential to improve high speed, between thermal performance."

For those modelers with access to an IBM XT, AT or similar clone, I would highly recommend that you purchase the Foiled Again program and its E2F utility program for converting Eppler or Selig-Donovan style coordinates like the SD7037 into easier to understand NACA style coordinates.

Please refer to my April 1987 column, page 43, for a "how-to" explanation of hand-plotting the Eppler/Selig style coordinates, and for an explanation of the data graphs. I will be repeating that lesson next month, so there's a second option for you if you can wait.

GOTTA GO FLY A THERMAL NOW...

Darn, got a lot more for next time, as usual, but it will have to wait. Of course, I welcome your letters and contributions to the column, but if you just need a question answered (I get scores every month), please use the phone, letters are very time consuming. You usually get an instantaneous answer, and it doesn't cost that much either. R/C Soaring, Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330, (714)245-1702. ***MB***

KYOSHO *Continued from page 29*

high so that manufacturers will continue to improve the equipment we buy. We owe the entire committee (headed by George Steiner) a real vote of thanks.

Inside the KS-100 servos are five wires that connect as follows: two go from the amplifier board to the Mabuchi electric motor (as the wires' signals reverse, the motor runs in the opposite direction) that drives the gear train that drives the servo's output wheel/arm. Three other wires go from the amplifier board to the electrical feedback potentiometer that provides the signal for the motor to stop driving when the output wheel/arm matches the control stick's position. These five wires are reinforced at their solder joints with a hard plastic mastic for vibration protection... we used to have to do this protecting ourselves in the days of the old Kraft and Pro Line radios... nice one now, Kyosho!

Today's Sanyo AA-size NiCds are conservatively rated at 600 milliamps for the SC type cells this system uses. Three identical four-cell packs are used... two power the transmitter and the third powers the airborne. The SC Sanyo cells only leak off about one half of one percent of their charge in twenty-four hours. Transmitter stick lengths are adjustable within a comfortable range and the back side of the molded Tx case has two vertical semi-hemi bars that let your fingers wrap around for that "ergo-goodfeel" all-natural fit. Some of the paperwork says the stick tensions are adjustable, which is a partial error. We found the stick tensions perfectly comfortable, but they can be made tighter only by cutting off a coil or two from the centering springs... and looser only by slightly stretching the springs.. we recommend neither. Another minor flaw is that the adjustable length rack output servo arms don't fit the output shaft... we've gotten this info back to the factory and it'll soon be corrected, although the set comes with more servo arms/wheels than you can use anyhow.

The Kyosho KS-100 servos uniquely have two output bearings... one at the top of the output shaft and another at the bottom of the shaft so that it is fully supported in Oilite-like bronze running inside a cast iron support ring. These supports show well in one of the photos. We feel this is a better mechanical design than using a single upper ball bearing. Of unique interest is that we crash-tested a set of four of these servos with a Great Planes PT-20, using a different radio (but from the same manufacturer). The model made a full power vertical dive into hard ground from about 400 to 500 feet of altitude. The engine broke away as designed to do, suffering only a broken needle valve... the PT-20 was totally rekitted as might be expected... but the servos survived 100% perfect... no broken gear teeth, no broken cases... the output arms and wheels are designed with a weak point right around their attachment screw... and the arms and wheels all broke as designed and left the servos undamaged... Another nice one, Kyosho!

We found the Kyosho male plugs fitted a bit too tight into the battery pack, into the switch harness, and into the airborne charging receptacle, due to three tiny raised parallel ribs on one side of the male plug binding into the female connector. A few gentle wipes with one of those new Powermaster "super sander" sticks removed the ribs for a more comfortable fit. The ribs on the other male plugs are for polarity fitting to the receiver.

The square-edged, raised bezels around the Tx sticks were repeatedly mentioned as an aid to easily locating the four trim levers while in flight... nice! None of the Think Tank liked the soft, "thirty-click" throttle ratchet... we've complained on every system we've studied to date. We need about ten or twelve positive clicks for throttle, along with a way to set the resistance drag on the throttle travel to our personal feeling. The centering ability of the stick assemblies of these sets are the very best we've measured to date... and they contribute well to the uplink performance of this set. This performance statistically measures almost thirty five percent better than the average of the four nearest measured systems. By reading our past reviews you can gather the centering data yourself.

Our Advance PCM 5 set is on channel 20... we even flew the test model while we *purposely turned on another channel 20 transmitter* in an attempt to shoot our test system down. Our test set only occasionally latched into failsafe. Had it been an accidental "turn-on" of the other channel 20 Tx, there was plenty of time to holler, "Who's turned on a channel 20?" This flight testing was most impressive. The following week we did extensive ground testing of modeler-to-modeler interference as designed/suggested by George Steiner. The test system would only occasionally and momentarily latch into failsafe... and as before, it would readily come out as the interfering signals were overcome.

We then made about five full flights while the other five flight stations were also in use before Murphy's Law of R/C System Testing reached up and grabbed the test model... through my dumbness. We had again put the test model up alone and again tried to shoot it down with another channel 20 transmitter, as we did the week before. It would only momentarily get a most-minor glitch of "up" elevator... until we inadvertently *overflew the airborne battery pack*. As the set was changed from Mode II to Mode I by me, I never noticed the built-in low-voltage warning of the normal throttle function being retarded or pulled back, as it would (on Mode I) go to "up" elevator and it did exactly that as it is engineered to do... but it stayed in "up" elevator and lightly succumbed to Murphy's downward draw to a semihard and semi-damaging crash... to my complete surprise. In our total enthusiasm of the set's performance, we simply drained the airborne battery pack too low and the receiver pulled back the function controlled by the left transmitter stick... just as the microprocessor called for! With the help of the manufacturer's Dave Abbe, in California, my dumbness (enthusiasm and error?) was determined, and we concur with him that the system did exactly as designed. It had probably operated about two hours when the crash occurred. Normal operation of a PCM radio should be one to one-and-a-half hours... six or seven ten minute flights, before testing the receiver battery with an expanded scale voltmeter.

Our centering test consists of a 36 inch long pointer being attached to a servo output wheel and a ruler placed at the pointer's end. We move the stick from neutral one hundred times and as the stick is released it drives back towards center with variances. We measure the variances and we plot and count them to see how many fall within one-eighth of an inch, or one-quarter of one degree of servo rotation. The Kyosho Advance PCM 5 test set centered 20.1% better than the next closest test system... and this showed up, as I was able to make the best and easiest low inverted passes on our 800 foot runway... and was able to repeatedly fly the model upright onto the runway at full throttle and roll most of the length of the runway.

I knew we had a super system with precise control!

Testing yielded a: 58% return to 1/4 of a degree for elevator.

85% return to 1/4 of a degree for aileron.

56% return to 1/4 of a degree for rudder.

74% return to 1/4 of a degree for throttle.

85% return to 1/4 of a degree for retracts.

The suggested retail price of the Kyosho Advance PCM 5 system is $299.95 and the suggested price of the Advance 7FM system is $319.95. These new systems are distributed to your local hobby shop by Great Planes Model Distributors, in Champaign, Illinois. Repairs are available by Hobby

Services, 1610 Interstate Drive, Champaign, Illinois 61821... The systems carry a six-month limited warranty. ***MB***

PLUG SPARKS *Continued from page 33*

of the early days of gas models as no one outside of John Lenderman had a sure-fire starting engine. Numerous modelers were noted to be cranking all day with no results. The boys had certainly been spoiled on glow plugs. As it turned out, anyone who could get a flight could place—that is, providing the untried model would fly. The two problems together were just too much for most of the modelers.

Photo No. 3, in this writer's humble opinion, is what Old Timers are all about. Note the Miss Tiny on the takeoff board gaining speed gradually. The contestant's name is lost to antiquity but I'll bet he remembers this day for the rest of his life.

Get a load of Photo No. 4. Dud Williamson's Gas Champ just clearing the grass while picking up speed for a good flight. This was one of the more successful ignition powered models, employing a Bunch Tiger for motivation.

A few more comments taken from the report:

"The Beauty event was won by John Drobshoff with a very neat appearing Challenger. Perhaps the prettiest models on the field were Bob Bowen's "Topper" and "Honey B," works of art. Unfortunately the rules stated that all models entered in the Beauty Event had to have at least one official flight. Other Beauty event models suffered different fates. Bill Bowen's graceful Rocketeer was reduced to matchsticks on takeoff while Ray Richards' ignition O.K. .60 powered Sunduster just wouldn't start. Pond's Gas Champ was temporarily lost during judging. John Tatone stacked his usual fine model—strained it through a fence. The model, incidentally, was original, having been built in 1942.

Tatone's design, called the "Atomizer," has never been published although this writer has plenty of photos (Photo No. 5) and the full-size drawings by Roger Gregory. The model features the usual squarish lines so common to Tatone F/F designs.

The results of that first Stockton meet are not much different than today's flying except for the simplified classes:

FREE FLIGHT GAS	
Class I	
P. Kellas (Condors), Zipper	15:00
A. Schults (900), Strato-Streak	14:57
J. Pond (Vultures), Gas Champ	13:06
I. Isaacson (Condors), Interceptor	11:56
R. Belcher (Vultures), Zipper	11:46
Class II	
S. Belcher (Vultures), Sailplane	14:15
P. Forrette (Vultures), Bombshell	11:41
A. Schaeffer (900), Sunduster	8:55
J. Dawson (900), Playboy Sr.	7:51
R. Smith (SGMA), Playboy Sr.	7:00
Ignition	
J. Lenderman (900), Brooklyn Dodger	7:39
B. Kernoff (900), Zipper	2:54
W. Rady (900), Scientific Mercury	2:27
R.E. Dobbins (Condors), Bombshell	1:55
Cabin	
R. Fizer (SGMA), So-Long	9:59
P. Forrette (Vultures), Bombshell	9:54
J. Lenderman (900), Brooklyn Dodger	8:06
J. Drobshoff (Vultures), Challenger	6:55
K. Freese (Condors), Gladiator	6:31
Beauty	
J. Drobshoff (Vultures), Challenger	

Encouraged by the response in various model magazines, Pond immediately launched a one-man publicity campaign, attending meets from Los Angeles to Denver. No meet was too small or too large for this writer to encourage and spread the Old Timer gospel.

This columnist began in 1964 by flying Old Timers at the 1964 Dallas Nats. This was followed by unofficial Old Timer events at the Willow Grove Nationals in 1965. The stampede was on!!

ENGINE OF THE MONTH

This month's subject has made its way into this writer's hands by a rather circuitous way. When Gordon Burford, noted Australian engine manufacturer, visited my home, he brought with him several old time Italian engines which he had acquired during his trip to the Italian SAM Champs.

In deciding to use the engines in this

column, there was no alternative except to draw the engines immediately as less than three days were available for drafting work. Fortunately, this columnist was able to complete the required three-view drawings. Upon finishing the plans, this writer discovered the description, specifications, etc. were written in Italian. This called for letters to Roberto Margoli and Cesare deRobertis asking for help in translating the articles. Cesare was most kind in providing the following information.

The first commercial production of Giglio engines as designed by Grazzini started in 1937. Up to 1939, he produced the ignition engines, the Giglio 10cc, the Giglio 5cc, and the most well known, the Radium 3cc. This attracted considerable interest at the International Expo in Paris, France. All engines were produced in small numbers, no more than ten of each model. With the war coming on, not to mention the Abyssinian affair, ignition accessories such as coils, spark plugs, etc. became quite scarce, severely curtailing any future production. It was then that Grazzini gave up ignition engines and returned to diesel engines fitted with a cam operated contra-piston.

The most famous Giglio was the 2cc version which we are featuring. For those interested, *giglio* means "lily," the symbol of Florence, where Grazzini resided between 1940 and 1941. The Giglio was a clone of the famous Swiss Dyno engine, having a bore of 12.01mm and a stroke of 18mm. This engine developed 0.1 hp at 6,000 rpm using an 11x5 propeller. The cylinder was produced in nickel chrome cast iron with an aluminum finned head. The piston, likewise, was cast iron with a conrod of high strength steel with bronze bushings top and bottom. The crankshaft followed European practice, being made of three pieces welded together and machined to suit bronze bearings. The main engine crankcase and cylinder were a threepart assembly. The recommended fuel mixture consisted of 10 parts kerosene, 10 parts ether, and three parts mineral oil (about 45% ether and kerosene mix) with 10% oil and additives.

Operating instructions were pretty much standard directions for diesel engine starting. Each engine was factory run so the needle valve setting was specified, making starting much easier. It was recommended that the contra-piston be raised to a low-compression setting. The engine was choked with two or three flips, then flipped hard (this is something that the average beginner in diesel engine operation fails to appreciate). The Giglio ran equally well in both directions, hence it was imperative that the engine be flipped smartly in the desired rotational direction.

Cesare DeRobertis, who supplied most of the foregoing information, also offers some trivia worth noting. The logo and the lily embellishment on the front side were individually hand carved by a highly specialized goldsmith. In those years, Florence had a worldwide reputation for gold jewelry. As Cesare notes, the Giglio is a real jewel in every respect.

Translation of the Italian article on the Giglio claimed that Grazzini appeared at the 1934 Italian Nats with this engine. The statement is erroneous according to Uberto Travagli, the brains behind the "Atomatic" engine, as no engines made their appearance until the 1936 Nationals. Hence, Grazzini's diesel appears to have had a short and unsuccessful life.

SAM 41

Jim Alaback, who writes the SAM 41 *Aeroneer News* newsletter, has sent in a goodly bunch of photos of his club's activities in San Diego. We can't use them all, but will select them as the need arises.

Seen in Photo No. 6 is a shot of Ken McLean with a Tlush Mite. Francis Tlush will be pleased to find the model in original size (no scaling) and just right for the 1/2A Texaco event. Ken has covered the model in transparent blue MonoKote giving a real sharp effect. To show that looks don't mean everything, the model took second at the Aeroneers monthly meet in February.

Also at that same time, we are favored with Photo No. 7 of Jim Alaback and his Flying Aces Stick. This design, originated by Bill Effinger of Berkeley Models fame, was first published in the April 1936 issue of *Flying Aces*. Since then, this model design has appeared in various sizes in assorted model airplane magazines. Its popularity can be traced to the simplicity of construction and ease of flying adjustment.

MORE SAM 41

From that prolific builder, Bob Munn, of La Mesa, California come quite a few photos of his excellent handiwork. Photo No. 8 graphically shows how to make a pylon model look good. Munn is holding his latest, a Class A version of the Anderson Pylon.

If the model looks a bit like a Goldberg "Gas Bird" it is because the two of them were flying similar models in the summer of 1938. They really terrorized the competition with their hot pylon models, something which had not been seen before that time. The following year saw the final development of the Gas Bird in the form of the Zipper and the rest is history.

POWERHOUSE BRIGADE

The most prolific Old Timer modeler is without a doubt Bud McNorgan of Garden Grove, California. Bud has now fully recovered from a series of serious operations and this shows in Photo No. 9 where Bud has built a series of Taibi Powerhouses, with spans ranging from four to seven feet.

The models are powered as follows: four ft., Morrill Hornet 19; five ft., Forster 29; six ft., Super Cyclone; seven ft., OK 60. Bud reports the six-foot version flies the best. Although this writer is not the official SAM Historian, the approval by SAM of all these sizes of the Powerhouse has not been brought to his attention.

This writer has plans to all the Powerhouses, but they need retracing to put them

in reproducible form. Just a matter of time, men!

READERS WRITE

This is probably the most popular part of this column as everyone likes to see a picture of their handiwork. Needless to say, all are encouraged to send in good clear photos. We love 'em!

We hear again from Phil McCary, who is now the newsletter editor for the Las Vegas Vamps. McCary sends in Photo No. 10 showing a Miss Canada Sr., one of those rare Easy-Bilt models not seen on the flying field at every meet.

Phil further says the model is a "goodie" as it literally flew off the building board. Phil uses a 95% C.G. (man, that's far back!), two degrees downthrust and two degrees right thrust with 1.25 degrees decalage. Gross weight with twelve strands of FAI 1/8 flat rubber is just under four ounces. There you have it, all the secrets. Now go build one and win!

FLORIDA FLASHES

This writer recently had the pleasure of a visitor from Florida; to be exact, Jerry Stoloff, originally from Brooklyn and a member of the Skyscrapers.

Jerry favored me with Photo No. 11 wherein Jerry is displaying his famous "Yehudi" model of 1939. This 1990 version is R/C utilizing a glow O.S. Max 15 for power. Jerry says it performs just like the original.

In addition, while he was at the Pond domicile, Jerry gave me plans to the Yehudi complete with all photos and pertinent information drawn from magazines of that era. Just as soon as we find time, we will put out copies of an inked mylar that will produce lovely plans.

So, if you are looking for something a shade different, try Jerry's Yehudi. A real winner!

MORE READERS WRITE

It is always a source of amazement to this columnist how former members of SAM continue to keep in touch. Such is the case of Bob Rooman a former member of SAM 21, who moved from California to Springfield, Missouri. Bob bought a home with a tremendous expanse of lawn. You could almost fly R/C off his home grounds!

Before Bob left this area, he secured a few plans from Pond, among which was the Scientific Coronet. Imagine the SAM 21 club's surprise when letters and photos started appearing, informing one and all of his modeling progress.

Such is Photo No. 12 which shows his bare bones Coronet scaled up to suit a Saito 30 four-cycle engine. The model, now completely covered in green with white trim, is awaiting the day to fly. Neat!

AND STILL MORE R.W.

Although it was quite popular when O.T. R/C started making inroads in the SAM Champs, the Berkeley Buccaneer C Special has not been seen too often. Photo No. 13, sent by Patrick Blance, of Westbury, New York, shows what this good flying cabin model looks like.

This Buc, built from scratch by Tom Fiacco, was photographed at Cedar Creek Park, Long Island in the summer of 1988. The silk covered gem features Ohlsson 60 power and three-channel radio. Flies beautifully, sez Tom.

JAPAN

From far off Japan, Nathan Sturman, 851-2 Sakashita Clso, Shibukawa City, Gunma, Japan 377, comes a series of photos indicating that considerable interest in Old Timer flying has developed.

Seen in Photo No. 14 is a shot of Nathan's very successful 1/2A version of the Modelcraft Wasp as designed by Bob Milligan. This model is now over a year old with the photo being taken in September 1989. The only damage suffered to date has been due to early dethermalizing during the climbout.

This PAW .049 diesel powered design has become quite popular, with more than just a few building various sizes of Wasps with fine results. Engines that have been employed are the Fuji 15, Enya 11cx, PAW .06, PAW 15, Enya 15D, and various sizes of Cox engines.

AUSTRALIA

Just arrived in the mail from Basil Healy was a flock of photos taken at the Australian SAM Champs in April at Canowindra by John Quigley.

We'll try in a later issue to cover the activity, but the boys in SAM 21 are proud of the fact that one of our members won the

ignition version of the Texaco event. Dennis King, who flies 747s for Federal Express on the Australia run, brought along an Anderson Spitfire powered Powerhouse to compete in the SAM 1788 events.

For those who have not heard or seen the new Spitfire 60 and 65 reproductions, these are well-made products by Marvin Miller of Soquel, California. Production is quite limited so it does take time to get your engine. No doubt about it, this engine is worth waiting for!

Back to the photos that were sent. The first one that was picked is Photo No. 15 showing a huge Boehle Giant with builder Basil Healy in the background. We received other photos of the model taking off and flying. Graceful! This is what Old Timers are all about!

Another phase of O.T. modeling that has caught on in a big way is the control line stunt event. This is generally held on Processing Day, when no other official flying is taking place. SAM 1788 President, Mike Pettigrew, built and flew a Fox 35 powered Australian design known as the "Pagan." The model, as can be seen in Photo No. 16, is beautifully finished and flies quite well.

With a tremendous turnout of contestants for this SAM Champs, the weather failed to cooperate with heavy rains dominating the action. This necessitated reducing the amount of flying rounds from five to three. The flyoffs were actually going on in the sunset!

In wrapping up this short report, Basil Healy is still amazed that all events were flown despite the inclement conditions plaguing the meet. Just goes to show what hardy contestants the old timers are!

ENGLAND

We couldn't resist Photo No. 17 sent in by R. J. Mikkelson of SAM 3 (SCIFS) while in England at the Old Warden Vintage Get-Together in 1987. This meet is truly laid back as most everyone came to show and discuss his or their model.

This gorgeous Carl Hermes "Hayseed" is no exception. In his enthusiasm to snap a photo, Mikkelson neglected to get a name to go with the good photo. All we know for certain is that the model is R/C, with an O.S. 60 open-rocker four-stroke for power.

THE WRAP-UP

This time, instead of a flock of obits, we will fall back on the old saying, "Leave `em laughing." For this, we acknowledge the newsletter by Art Groscheider, SAM 1 editor, for his so-called "Curmudgeon Corner." Rather than copy what he calls aberrant behavior, we have changed the list to defining what each one is. Try this on for size:

Developmentally Disabled: When you launch the R/C with controls backgrounds or better yet, with switch off.

Diet Disorder: You are just plain "fatso."

Visually Impaired: Losing your R/C model at any altitude.

Alternate Life Style: Engaging in childish sports (according to your wife), like model airplanes.

Consciousness Raising: A session about the rules.

Cardiac Event: A heart attack as a result of your "jewel" crashing.

The foregoing is only a sample of what you can fall back on. Instead of saying you were shot down while flying R/C, you can say you had a "thumb glitch." As Groscheider points out, it is quite fashionable nowadays to label your idiosyncrasies (nutty behavior) with euphemisms (or platitudes a la President Bush). No longer will you have to endure insults such as *You dumb cluck!* when you stick your finger in a rotating propeller. Now you simply explain that you lack certain motor skills and you resent the label. Haw-w! ***MB***

TECHNICAL *Continued from page 35*

The basics of trigonometry permit us to accurately determine the torque required to deflect our pendulum to any angle. The present torque will always be the ninety-degree torque we measured times the sine of the present angle of the pendulum. When the pendulum hangs straight down its angle is zero, the sine of the angle is zero, and therefore the torque is zero. It makes sense.

If you have a scientific calculator or any book with trigonometric tables, you can work out the calibration of a pendulum dynamometer for yourself, but Figure 2 will

save you some effort. Note that because of the trigonometry involved, the scale on a pendulum dynamometer is nonlinear. That is, the divisions are closer together at the low-torque end of the scale than at the high-torque end.

Since I don't know the capacity of the dynamometer you are going to build, I couldn't put direct torque readings on Figure 2. Instead, it shows decimal fractions of the ninety degree torque you build into your machine. Simply multiply your ninety degree torque by each decimal number and put these lower torque numbers in place of the decimals. To make your numbers come out very simply, you can adjust the 90-degree torque to 10.0 lb. in. (for motors up to about one horsepower) or 100 lb. in. (for motors up to 10 horsepower).

THE BEARING ASSEMBLY

Now that we know how the pendulum dynamometer works, let's talk about the hardware. The pendulum, structure, and bearings could be made from junk you may already have. The one in the photo, which I still have and use, is made from a sixty-year-old miniature circular saw that I had as a kid.

A quarter or half-horsepower shop grinder could easily be converted into a good dynamometer. The pendulum should be designed to screw onto the grinder shaft in place of the abrasive wheel, so the tool can be returned to grinder mode after using it as a dyno. The grinder would have to be mounted with the shaft extending over the edge of a bench or saw horse so the pendulum arm will have clearance to swing.

The bearing friction on the pendulum usually won't be a problem in testing internal combustion engines because the vibration of the engine will overcome the friction. In testing electric motors, however, keep the friction as low as possible. If there is noticeable friction, push the pendulum a little to each side while taking a measurement and record the average of the two readings.

Of course you will have to rig some kind of motor mount on the pendulum. For ICs, use a standard commercial mount and bolt it on. For electrics, clamp the motor on any way that works.

Fortunately the shaft of the motor or engine to be tested does not need to be concentric with the axis of the pendulum. As long as the two shafts are parallel, the readings will be accurate regardless of how far apart the shafts are. The initial ninety degree torque reading must be made with the test motor, prop, and tank full of fuel mounted on the pendulum, however.

When testing electric motors, use very flexible leads and arrange them so they will have as little effect as possible on the torque when the pendulum swings.

In testing engines, it is desirable to get at least the fuel tank as close to the pendulum axis as possible, so the amount of fuel in the tank doesn't affect the pendulum balance much. Using a small tank helps. If the tank is not mounted on the pendulum, make sure that the fuel tubing stiffness doesn't affect the torque measurements significantly.

HORSEPOWER

We have been talking about torque, but several times I have sneaked in the word "power," without getting specific. Let's get specific. For those of you who are new to this field, "torque" is twist or turning effort. It is a force times a moment arm, therefore its units are pound-feet, pound-inches, gram-centimeters, or whatever similar units we wish to use. "Work" is force times distance or torque times number of revolutions. Work and torque have the same units and it doesn't matter whether you call them foot-pounds or pound-feet. "Power" is rate of doing work or work divided by time. This says that power is also torque times rotational velocity or rpm.

One "horsepower" is 33,000 foot-pounds of work per minute. The horsepower being developed by a rotating motor is the torque in pound-feet times the rpm times 2 pi divided by 33,000. How did that "2 pi" get in there? Since our power is going around in circles instead of in a straight line, we must multiply by 2 pi, which is the ratio of the circumference of a circle to its radius, which in our case is the radius arm in the torque equation. If that isn't clear to some of you, please take it on faith.

Also, if we measure the torque in pound-inches instead of pound-feet we must put a conversion factor of 12 in the formula. When we combine these three constants the formula becomes $Hp = T \times rpm / 63{,}000$, where

T is torque in pound-inches.

Let's work a hypothetical example or two. If we have a sport two-stroke .40 cu. in. engine swinging a 10x6 prop, it might be turning 11,000 rpm and developing three pound-inches of torque:

3 x 11,000 / 63,000 = 0.524 Hp.

A much hotter engine might swing that same prop at 13,000 rpm but require 5 pound inches of torque to do it. (There will be a *big* increase in torque for a relatively small increase in rpm because the power absorbed by a prop varies as the cube of the rpm. See Mitch's column for January, 1990). Our hot engine example is putting out:

5 x 13,000 / 63,000 = 1.03 Hp.

Note that it took nearly twice the horsepower to increase the speed of the same prop by only 2,000 rpm.

Here we *assumed* some values for rpm and torque and calculated the (assumed) power. To *know* what power we have we must *measure* the rpm with a tachometer and *measure* the torque with a dynamometer before we calculate. As we have discussed, that isn't difficult, but it will cost you a little time and effort.

MOTOR POWER vs PROPELLER POWER

We have been talking about motor power *available*. Propeller power *absorbed* must equal the motor power at any point in time, but it is interesting to study just how prop power and motor power relate. For a discussion of propeller power see *MD&TS* for January, 1990, page 88.

Figure 3 roughly shows the propeller power vs. rpm for two different sizes of prop. It also shows the output power vs. rpm for two different sized engines or motors. The shape of this curve will be nearly the same for an electric motor as it is for an internal combustion engine. You would be able to plot curves similar to these on your own motors from data obtained by a dynamometer.

If we put the small prop on the small motor the intersection of these two curves at point A will determine at what rpm that motor will swing that prop. Now let's put the larger prop on the small motor. The greater prop load pulls the rpm down to the intersection of point B. The performance of the airplane may or may not be increased. The power is a little less, but the larger prop may be a little more efficient.

If we put the big prop on the big motor the curves intersect at point C, and we will surely have better performance. The rpm is less than it was at A, but the power is much greater. Putting the small prop on the big motor, the curves will intersect at D. The power is about the same as at C, but the rpm (and the noise) is much greater. The top speed of the plane may be higher (depending on prop pitch), but the max rate of climb will probably be less. Obviously, a larger engine always improves performance, but the optimum prop, as we know from experience, is usually chosen by trial and error.

Duke Fox offers a handy first-trial guide for choosing the prop *pitch* in his "Duke's Mixture" column in *RCM* for January, 1990. He says the pitch in inches should be about the speed in mph divided by the rpm in thousands.

PARTING WORDS

"Ability is God's gift to man. Achievement is man's gift to God."

Francis Reynolds. Yes I am moving. 3802 127th Ave. N.E., Bellevue, WA 98005; (206)885-2647. ***MB***

HOW TO *Continued from page 37*

No. 53-848A, 36" wide, 22.88 each.

Note that the price quoted is for *each* leg, not for the pair. The shipping weight is between 12 to 14 pounds, also each, depending on the type. Even for two legs, the total is well within UPS limits.

Now for the next item on our shopping list, the workbench top, for which we need only go to the nearest building supplier. It is a door—a flush type door, that is. Very common, quite inexpensive, and within which we have some choices. First of all, the standard door height is 80 inches; which in this case represents the length of our workbench. They come in narrower widths, for use on closets, but we are interested in those of 32 and 36-inch widths, which will be the width of our bench. Available thicknesses are 1-3/16 and 1-3/4 inches. The choice is yours, though I find that the 32-inch wide 1-

too much so for one person to handle conveniently. Probably the greatest disadvantage is that the plywood exterior will require more preparation and protection than the fiberboard door. The only reason for choosing the solid door is that it will support heavier loads, but those imposed by the average model airplane project, including the normal accumulation of parts and pieces and tools, will not overload the hollow core door table top. I have used them for years, and have never had one distort to an unacceptable degree.

For the other parts of your workbench, the top shelves, known in workbench parlance as a "riser," and for the bottom shelf and back, you will need some plywood. My choice is 1/2-inch mahogany. Right, mahogany plywood, for two very good reasons. Believe it or not, imported mahogany plywood with both sides usable is cheaper than "one side good" domestic pine plywood. That is a side benefit; I prefer to work with mahogany because it is what is known as "lumber core" plywood, meaning that the inside is made of close-grained thick plies which cut with a cleaner edge than does the common pine plywood. Marine grade plywood would be good choice, but it is priced completely out of range for this kind of a project. To keep from having to look at raw plywood edges, I put molding on all those edges that are visible. The same place that sold you your door will also have a wide variety of such moldings in many shapes, widths, thickness and even some pre-painted in a variety of colors. I chose a 3/16-inch thick molding with one square and one rounded edge for the plywood and a similar one in 3/8-inch thickness for the door. It is attached with white glue and small finishing nails. When you are marking your plywood pieces for cutting, remember which ones will have the molding attached and consider the 3/16 inch in your calculations.

The first pieces to cut are the lower back and shelf. When cutting the length, consider that the door will grow by 3/4 of an inch with the addition of the edge molding, and these back and shelf pieces will only grow 3/8 of an inch with their thinner molding. Their length should then be 80-3/8 inches, assuming an uncut door. The exact width of these pieces will be determined by your particular set of legs, as there are probably minor variations from one maker to another. The back piece should be cut first, as it goes completely across the available space, resting on the bottom cross pieces. You will have to cut out appropriately dimensioned U-shaped pieces at the top for the cross support on top of the leg. On my bench I installed the legs at 10 inches from the edge of the top—this will determine the location of the cutouts for the legs. It is important that this back piece sit on the bottom leg cross piece and *not* on the bottom shelf, as the resulting joint will be stronger.

The bottom shelf is dimensioned to fit the available space, with one consideration. Remember that, as I have done, you will use this shelf for storage, and as I do, as a foot

3/16 inch thick door is adequate for all my modeling projects, and the 36-inch width can put whatever you place on the far side of the bench a little too distant for easy access.

Then one has a choice of what in the door world is referred to as "solid core" or "hollow core." This is probably self explanatory, the solid core door being made of approximately 1/8-inch plywood panels with soft wood planks and blocks glued together to form the core. The hollow core door, on the other hand, is available with either the plywood or pressed, hard-surfaced, very smooth fiberboard panels. The entire perimeter is of wood, and a heavy cardboard honeycomb is glued between the two panels to maintain the spacing and provide some strength. I will explain the differences to consider at decision time, but the first thing you must know is that if you will have to cut the door—if the completed bench has to go into a space less than 80 inches long—it is best to go with the solid core door. Hollow core doors can be cut, of course, but then you are faced with having to fill in and surface the open end. Not impossible, but to be avoided if it can be done.

Other considerations: the solid core door is more expensive, on the average of $38 in California, and I wouldn't expect greatly different in other parts of the U.S. The hollow core door, on the other hand, is about one-third of that. The solid door is *heavy*,

rest. Therefore the front edge, between the outer edges of the legs only, is supported on a piece of 3/4-inch angle iron, which is another home improvement center product. The relatively soft material cuts easily with a hacksaw, and preparation consists of washing off the protective oil with a solvent, cleaning it with a wire brush, and spraying on a coat of metal primer prior to the final paint which will be applied to the entire table. The final width of the bottom shelf then has to be adjusted to fit with this angle installed. This simply means taking 1/8 inch off of the original measurement. The edges of the shelf outside of the legs, and the outer cross edges are finished with the wood molding.

Both back and lower shelves are attached to the legs with 1/4-inch "carriage" bolts one inch long, lock washers on the leg side, and nuts. Carriage bolts are the type commonly found in hardware sections; they have a fully rounded head without a slot, and a square section for the first part of the threaded portion. The function of this square is to lock the bolt into the wood so that it will not rotate while you tighten the nut. You'll find the legs have a lot of holes; I found it enough to install bolts on alternate sides of the legs at about six-inch spacing.

The back section is now screwed onto the bottom shelf from the rear, using No. 6 round head screws 1-1/2 inches in length. This is an important step, as this joint will support the weight of whatever you place on the shelf and will have to keep it from bowing. Screws should be installed at six-inch intervals, starting from the center outward. To do this properly without missing the shelf, you'll have to mark the back portion 1/4 inch from the bottom and drill twice, first a small hole through the back and about an inch into the shelf to guide the screw, and secondly, a clearance hole for the screw through the rear only. Use a No. 6 washer under the screw head to keep from compressing the wood unnecessarily.

Let us now attach the top—by this time, you will have stopped thinking about it as a door and will be thinking of it only as the top. Anyway, if you chose the solid door, simply purchase some No. 12 screws one inch long, locate, drill for and install them, being careful not to drill up through the top. Washers under the screw heads are a good idea.

The hollow core door has to handled in a slightly different manner. My preferred way is to make 1-1/4 inch holes with a hole saw in the bottom surface of the top, at the proper locations, and epoxy in lengths of 1-1/4 inch diameter hardwood dowel. The legs are them screwed into these dowels. This requires having the hole saws and equipment to accurately cut the dowels. If these items are on hand, I suggest you use this method. An alternate method, one which does not require special tools, is to use some fasteners called "hollow door anchors," which are made to firmly attach clothes hangers and other fittings to this type of door. These are threaded expanding type fasteners, for which a 1/4-inch hole has to be made. They are first pressed into the hole, then screw is tightened which expands the device and locks it in place. The screw can then be removed; what is left is effectively a threaded metal stud. These and countless other small hardware items are sold nationally in small packages under the "VSI Fastener" company label. Get some No. 8 fasteners, which are too little for the 1/4-inch holes in the legs, so get some washers also. The appropriate type of washer in this case is called a "fender" washer, which is distinguished by its large diameter and small hole.

Well, now we've got our basic workbench, and could actually stop there if you like. Except, of course, for the painting. However, the "riser" part is a useful feature, and I suggest that having come this far, we go the rest of the way. Like all the rest of the bench, the dimensions of the riser are not cast in stone either. The ones I used and which are suggested here fit my needs, and look in proportion to me. Change them for any reason that you may have. Like the bottom parts, the riser pieces are cut from 1/2-inch plywood, and the edges finished with molding. The back piece is first screwed to the top, after which the other pieces are added and screwed together. As in the case of the bottom pieces, drill first for the screw hole and second for the clearance hole. Strictly for esthetic reasons, the side panels can be screwed on with oval head screws and VSI finishing washers, which are large thick washers with a countersunk hole for the screw head. Two of three appropriately sized vertical spacers are installed between the top and the shelf to provide support and rigidity.

Using that hole saw mentioned earlier, I drilled a number of clearance holes through which electrical wires can be run to the rear of the workbench for any electrical items such as clocks, radios, etc., which might later be placed permanently on the top or bottom shelves. Make as many or as few as you like, placing them where they might best fit *your* needs.

Painting the workbench is being discussed almost last, though it was being done and has to be done as you go, as the sub-pieces have to be painted before being installed. No Formula One model class of paint job is necessary, though a decent one will protect and enhance your finished product. Obviously, sanding is the first step, after which a coat of water-based primer should be brushed on. After another light sanding, you can brush, or if you have the equipment, spray on a coat of enamel. I used and can recommend "Rust-Oleum Wood Saver Moisture Resistant Enamel" in Ash Gray No. 7186, which is a semi-gloss in a shade closely resembling the metal leg color. Follow the directions on the can for applying and for equipment cleanup. All the plywood pieces had the molding applied before painting. Since I chose not to paint the top, but did paint the top edge molding to keep the scheme constant, this molding has to be painted separately before being added. *cont.*

The top? To prevent engine oil and coffee cup stains, I gave mine first a coat of K&B Hobby Poxy Finishing Resin followed by a light sanding and a coat of Hobby Poxy clear. In this case, you can simply pour the material on and spread it thin with a folded-up piece of cheesecloth. Wearing a throw-away rubber or vinyl glove while doing so is definitely recommended.

Now that your customized workbench is all assembled, the only thing left to do is wire it—also according to your needs and specs. I strongly recommend that you wire the front sockets; whether or not you connect the rear ones might depend on how many other outlets you have and need in the area of the workbench. I personally feel that it is almost impossible to have too many, so I connected all four. There is a slight difference as to what can be installed in the two types of legs mentioned. The U-shaped leg is wide enough to hold the metal boxes that electrical outlets are normally installed in. For safety reasons, they should be used. The contoured legs, however, are not wide enough for these boxes, and the outlet has to be installed directly into the leg, leaving the rear of the outlet and some "hot" connections exposed. Though they are not located where they will normally be touched, there is always that one-in-a-million chance, and I would certainly cover them in some manner. A simple but effective safety is simply a piece of thin plywood or any other insulating material, cut to the width of the leg flanges, and held on with double-sided tape. That same stuff that you can use to install servos and which will let go if fuel ever gets to it is perfectly OK for this application.

So you've now got a workbench that will certainly be the envy of your kitchen or card table modeling buddies. It didn't take all that long, and what time you did invest you will probably save during the construction of your next model because of the convenience and efficiency you now have. Enjoy! ***MB***

CORNER *Continued from page 38*

R/C systems. This feature could be built into our transmitters and also into the wiring harness of the receiver and flight pack, whereas the small LCD meter would be mounted in the fuselage alongside the charging jack. The cost shouldn't be too prohibitive, as the price of the entire Norelco is not much higher than other brands of razors without those features. I think you'll have to admit, it would certainly be worthwhile."

Definitely interesting features; let's take a closer look at them in relation to our R/C equipment. First, let's not miss the point that neither of these items, obviously of advanced design and engineering, is U.S. made; JVC is Japanese, and Norelco is either Dutch or German. The first question here is, "What happened to good old American ingenuity?"

In fairness to the R/C equipment makers, and not forgetting that the leaders there are not American either, similar features are to be found on some of our equipment. For example, Airtronics features what it describes as a "modular plug-in transmitter battery" on a number of its current units. It is a clever totally encased battery that plugs in to the lower back on the transmitter and becomes part of the case without any protruding pieces. Additionally, the battery is now available in a 700 mAH capacity module, the same size as the original 500 mAH unit. A major step forward—and one which has been carried one more step and made available for airborne batteries; again at the same size and weight as 500 mAH batteries. This one is definitely worth keeping in mind for replacement purposes, no matter what brand of radio you might own.

The battery module on the Airtronics transmitter locks in place securely with two sliding tabs. The electrical connections are made with an integral pin and socket connector, all as reliable as can be. There are other transmitters with easily replaceable batteries located under sliding doors, but the connections are dependent on flimsy leaf spring contacts that I for one do not care to trust any of my airplanes to. According to Murphy, if it can go wrong, it will!

On the subject of extended transmitter operating time, a somewhat different approach has been taken by the German Multiplex company, whose equipment is sold here in the U.S. by Beemer R/C. The latest Multiplex, the mc3030 transmitter operates on only six cells, without any apparent reduction of radiated power or system range. The lesser number of cells makes room for larger ones—1800 mAH units in this case, which, coupled with an obviously advanced electronic design, results in a claimed operating time of *over eight hours!* I don't know many people who need quite that much, but wouldn't it be nice to have the safety margin?

Now, the LCD display battery voltage indicating display, and audio warning. Such items also exist on some current R/C equipment—the Multiplex mc3030 just mentioned, for example. It does have the LCD bar graph display similar to what our friend in Jersey describes, though it is not marked in percentage. Instead, for accuracy, it also includes digital data down to .01 volt. The beep-beep occurs, not when the battery needs charging—by then it's too late for R/C use—but when fifteen minutes of operating time remain. Other LCD equipped transmitters also include these battery voltage indicating features, at least of the numerical type and though I am not intimately familiar with all of them, it is such a simple thing to do that I'm sure it is found on them all.

What both you readers and Bob Marin are now asking is, if features such as these are

now out of the development stage, why aren't they to be found on most R/C equipment? The answer is quite simple: the majority of the R/C buyers, those who represent the bulk of the market, are not willing to pay for these and other refinements. Such goodies are available, as already stated, on top-of-the-line equipment, for those few who are willing to pay for them, but those few are not enough to support any of the major manufacturers who must then turn to the cheaper priced mass market for survival.

Let me state that I am not against the type of features that Bob describes. To me, they represent something else that, if I learn to use them, and use them intelligently, can add years to the life of my airplanes. Just as strongly, even more so, I am against cheap radios. At best they are a risk, and a detriment not only to the individual but to the hobby in general. Oh, I can see the other viewpoint—if one flies an Ugly Stik or a piece of PVC drainpipe, I guess its longevity is not a factor. However, safety is. But to build, I mean to actually build, to construct, to *create* an airplane, and then trust it to a cheap radio is pure folly.

Cheap radios are made from cheap components—with shorter lifespans than those of higher qualities. They have to be cheap. Bob is correct in that the major problem with R/C equipment is batteries, to which I will add, not only their misuse, but their quality. Second in line in the cause of radio equipment failures is the servo motor. Coincidentally, these are also the two most expensive components in R/C systems, and naturally the ones on which the maker of inexpensive equipment must focus his cost cutting efforts.

Bob makes a point of the fact that his NiCd equipped razor can be fully charged in one hour. An attractive feature in many cases, I'm sure. Yet, cost rears its ugly head again. It is a fact, quick charge batteries cost more than the slow charge types. Think about this carefully now—are you sure that the airplane that you cut out every piece for, the one you shaped and sanded, primed and painted—are you sure you want to trust it to radio equipment *in which the two components most likely to fail are of the cheapest variety available?*

Cost is another factor when it comes to the sales volume of any product. Electric razors are precise and complex little devices, relatively inexpensive because they sell by the millions. Most every man shaves, even if not with an electric razor, but most every man does not fly R/C. Even with a cheap radio! A better example is probably the television set. Look at how many quality sets are available at prices less than a good R/C system, and yet they are larger, complex and often with remote controls and other prestige type features. Again, most homes have a TV set; most homes do not have an R/C system.

Believe it or not, while some of us look at things like these, as Bob seems to, as a means of obtaining greater security and reliability, too many others see them as gimmicks or "bells and whistles," and often dismiss them with "I don't need things like that." Batteries again are great airplane killers. How many airplanes have you ever seen equipped with back-up systems, of the type that switch in an auxiliary battery if the main one fails to produce power for any reason? Darn few, I'll bet. Back-up systems work, and could save many airplanes, and compared to the cost of an airplane, are practically free insurance. R/Cers, for some reason, are reluctant to part with money for items for which they cannot see an immediate necessity or advantage. I guess crashing is like a car accident or getting cancer from smoking—it's only going to happen to the other guy.

I don't mean to say, or even to imply, that I think Bob Marin is wrong in asking "why not?" We should! I've only tried to point out another side that I know of only too well. Unfortunately, as in so many similar cases, I don't know the solution, except that when R/Cers stop buying cheap radios, they will no longer be produced.

Beginners to R/C is another of the subjects touched on in the previous letter, and one to which much ink has been devoted in the model press. Think about it—it has to be a confusing and intimidating thing when one is exposed to the complexity of the radio control hobby as it exists today. I like to think that those of us in the magazine field do some good, but let's face it, the rank beginners, those who need the most help, don't buy many magazines, and if they do, one or two issues is not going to help much. They need books; and there are a couple I would like to recommend.

First, for the complete beginner, there is *The Beginner's Guide to Radio Control Sport Flying.* It covers basics about construction, flying, engines, radios; all in nontechnical, easy to understand language. I know that few of you who read this column need this one, but keep it in mind for any newcomers you may meet who are looking for proper guidance.

Secondly, there is **The Advanced Guide to Radio Control Sport Flying.* This one is more suited to those who have one or two airplanes' worth of experience and are looking to learn yet more. It covers electrics, the more sophisticated radio equipment, scale, giant scale, ducted fans, and helicopters. Again, not enough to prepare you for the Masters, but exactly what you need to keep you guided properly.

Both books are published by TAB Books, and are authored by the well-known Doug Pratt, himself an active builder and flier and by no means a typewriter modeler. Doug's position as AMA's Special Projects Director certainly attests to his experience and abilities. These books should be on the book rack at all decent hobby stores. If you have to depend on the mail for your supplies, try Ace R/C, who stocks them both at $9.95 each.

It's time to pack as soon as I get this printed and in to *MB*. It is time for me to head south once again, to the annual Tropical

Fun-Fly, down in Costa Rica. What can I say—it's a dirty job, but someone has to do it. Right? Adios. Eloy Marez, 2626 W. Northwood, Santa Ana, CA 92704. ***MB***

EXCALIBUR *Continued from page 40*

but the model still moved around. On windy days, the Excalibur lost its arrow-like tracking quality in forward flight. It bounced around side-to-side and exhibited mild Phugoid oscillations (up and down oscillations) in forward flight. The sideward motion may be due to the large flat side area of the canopy and overall tall profile. (Side-to-side oscillation is called Dutch Roll. Dutch Roll oscillation exists on every flying vehicle, airplane or helicopter. Each helicopter design has its own Dutch Roll oscillation frequency and decay rate. That's one of the reasons different models handle differently, and why some models handle better than others.)

Of course, fuselage inertia, canopy aerodynamic shape and rotor design all add up to give a particular flight characteristic. These parameters particularly influence the longitudinal stability (pitching motion) of the helicopter. A redesign of the above three items may improve the gust response of the Excalibur, but would degradefs the nice static stability it has. So, again, designers have to work with tradeoffs. I have yet to see a perfect machine for all weather conditions, and for all flight maneuvers. The X-Cell 60 seems to do better than others in the wind. The Schluter Magic seems to do better on calm days. Its large rotor diameter, very stiff rotor flapping, and high rpm (1600-1650) improve hover stability on calm days. This combination improves vehicle damping.

Increased vehicle damping is desirable because it causes any fuselage oscillations or motions due to gusts or other perturbations to decay rapidly. For example, you are doing the FAI nose-in hover circle maneuver, a gust hits the model and jitters it. A model with plenty of vehicle damping will stop the jittering almost immediately. A large amount of vehicle damping is also desirable because when you feed in a cyclic command, the model will respond smoothly and not abruptly. If the model design does not have sufficient vehicle damping inherently, you can add some by installing two extra rate gyros, one for the roll axis and one for the pitch axis. The drawbacks are that they add weight, cost money, and are disallowed in FAI competition. Now you see why it is important to design the models so they have plenty of inherent vehicle damping. Please note, vehicle damping is *not* what some refer to as "tightening the rubber damper to get more damping." That is a total misconception by modelers. Tightening the rubber damper or O-rings makes the rotor head stiffer, which may lead to improved vehicle damping and numerous other effects, such as increasing the angle-of-attack instability in high speed forward flight. The flybar on a model helicopter generates some artificial damping to help stabilize the vehicle.

On windy days, the Magic's large rotor disk, high rpm, and stiff head become detrimental. These three factors together may improve the vehicle damping tremendously, but also make the model more sensitive to gusts (we will explain the physics behind this in a future "Chopper Chatter" column). However, I recently installed a set of Excalibur paddles on my Magic, which made the Magic extremely stable in both calm and gusty conditions. Thus, I highly recommend the Kalt paddles for Magic owners. These paddles make the Magic, already one of the smoothest forward flight helicopters, even smoother.

Of all the helicopters, the Magic and Excalibur handle most similarly to .60-size pattern airplanes. They track well. These two models are more suited for a smooth flying style, rather than the aggressive type of turn-on-a-dime hot-dogging maneuvers. The X-Cell and Legend are smooth too, but they can really zip around. In fact, I recommend everyone try a set of Kalt paddles on their helicopters, whether it's an X-Cell, Legend, or Cobra, etc. Do remove the original flybar weights when using the Kalt paddles, otherwise the model will be too stable. You will notice the cyclic response will become slightly softer and the roll rate will be reduced slightly, but the stability will improve drastically. This is ideal for competition and general flying. However, for the extreme hot-doggers who want super fast cyclic response, then you better stay with your old thin paddles.

In summary, if I know I will be competing in a neighborhood where the wind is 10 mph or less, I will probably pick the Excalibur or Magic. If the wind is 10 mph or more, then I would choose the X-Cell or the Magic, but only if the Magic has a set of Kalt paddles on it. The stock thin paddles on the Magic make it sensitive to gusts. If the wind or gust level is unknown, and I could bring only one model, I would probably bring the GMP Legend, as it does fairly well all around. It does not outshine the others in any particular wind conditions, but it performs satisfac-

torily in all conditions without bias.

The above observations only relate to my own Magic, Legend, X-Cell, and Excalibur. They were all built in stock form; yours may handle quite differently, depending on your pitch curves, control throws, blade weight, etc. But the inherent characteristics, such as gust response and static stability margin, will not vary too much. It's like a Honda Civic will always behave like a Honda Civic. You may change tires, add spoilers and anti-sway bars to modify the handling quite a bit, but without changing inherent properties such as wheelbase, body style, weight, entire suspension geometry, gear ratio, etc. the Civic will hold on to its inherent characteristics.

(Now you know why I have built 33 helicopters in the past 14 years. I just love tinkering and checking them out. I keep all my models, and most of them are in flying condition, so I can compare them. The best part is that building and flying model helicopters helps develop physical sense and intuition that I need for designing full-size helicopter rotor systems, which is my real job. If I had not been doing model helicopters, I would be quite lost just staring at a bunch of computer numbers that supposedly describe helicopters theoretically.)

One last point. The Excalibur comes with very soft main rotor head rubber O-rings. Try a set of stiff Kalt O-rings, they improve the cyclic response slightly, but they definitely reduce the air resonance oscillation tendency on the Excalibur.

Now let's talk a little about radios. At the Philadelphia Show, Kevin Burner, of Hobby Dynamics, explained to me all the features on the new JR 347 radio. He was talking to me like the guy in the Federal Express commercial—information was coming at transonic speed. He went on for 10 minutes to explain the features. Seems like he really knows the system. Guess what, he wrote the helicopter section of the manual for the JR 347! If he wrote the manual half as well as he explained it verbally, that will be a great manual. I will let you know more on the JR 347 when it comes out in June. For now, let me say the most impressive feature, also something that none of the others have, is its unique trainer system. Like conventional trainer systems, two similar radios can be linked together via a trainer cord. The beauty of the JR 347 is that the instructor can allow the student to learn one control function at a time. For example, the instructor can retain control of the collective and cyclic, while the student's transmitter will only control the tail rotor. After the student masters the tail rotor, the instructor can allow the student's transmitter to be functional in tail rotor and collective. This is great for teaching hover. With this system a proficient helicopter pilot can let an R/C airplane pilot try helicopter flying in forward flight by allowing the airplane guy to have only the two cyclic controls. The rationale is that helicopters in forward flight handle very similar to airplanes; cyclic controls behave just like elevator and aileron.

In our next review we will examine the new X-Cell 60 Custom kit in detail. The major differences between the custom kit and the regular kit are extra ball bearings, shaft-drive tail rotor (very smooth), and some other small items. We will also check out the JMW Pro gyro and see how it stacks up against the delightful JR-120. Adios! ***MB***

FAIRCHILD *Continued from page 43*

the heads stripped out of mine before they were all the way in. They were replaced with slot-headed sheet metal screws of the approximate same size.

Regarding the assembly instructions, I found them to be rather sparse, consisting mainly of line drawings with appropriate notations along the way. For instance, where it shows the servo installation, nothing is said about installing the rubber grommets and brass eyelets on the servos first, before screwing them to the plywood servo tray. The eyelets can't be used anyway, as the provided screws are too big to fit through them.

A minor correction concerning the receiver is that the rudder and elevator plug-ins are reversed from those depicted in the instructions. I might also point out that although the four wing-strut brackets have the same part number (17), there is a difference between the front and rear due to different strut angles. In the unlikely event one really gets stuck on a problem, Cox has thoughtfully provided a toll-free info line (800-451-0339) to bail you out. Really, the video helps out quite a bit here, as it has a number of close detail shots of the model. Speaking of the video, I could find no fault, it's excellent. I only wish Cox had added some extra footage at the end showing more of their products in action, such as their new flying saucer! *(No charge for that good advice! wcn)*

Completed and ready to fly, the model weighs 28 ozs., giving it a wing loading of 16-1/2 ozs. per sq. foot from its 38 inch, 250 sq. in. wing. The pushrod clevises were installed in the outermost holes on the control horns and this has provided sufficient throw for the control surfaces. I might add that the rather stiff hinges can be limbered up by lightly scoring them on both sides with a razor blade. *(Careful with this! Cox would not be responsible if you cut too deep. wcn)*

In flight the model is fairly quick and will loop, rudder-roll, snap and spin with ease. I really can't recommend this model as a trainer, but it should be no problem for anyone who has mastered the powered-glider type of ship, or has a competent and patient instructor alongside.

The Ranger engine provides plenty of power and runs about 5-6 minutes on a full tank. I found that turning the muffler so that it exhausts down instead of up (you must partially unscrew the cylinder with one of the wrenches supplied to accomplish this) keeps the vast majority of the oily goop from the engine either in the cowl or on the

Peter Westburg's
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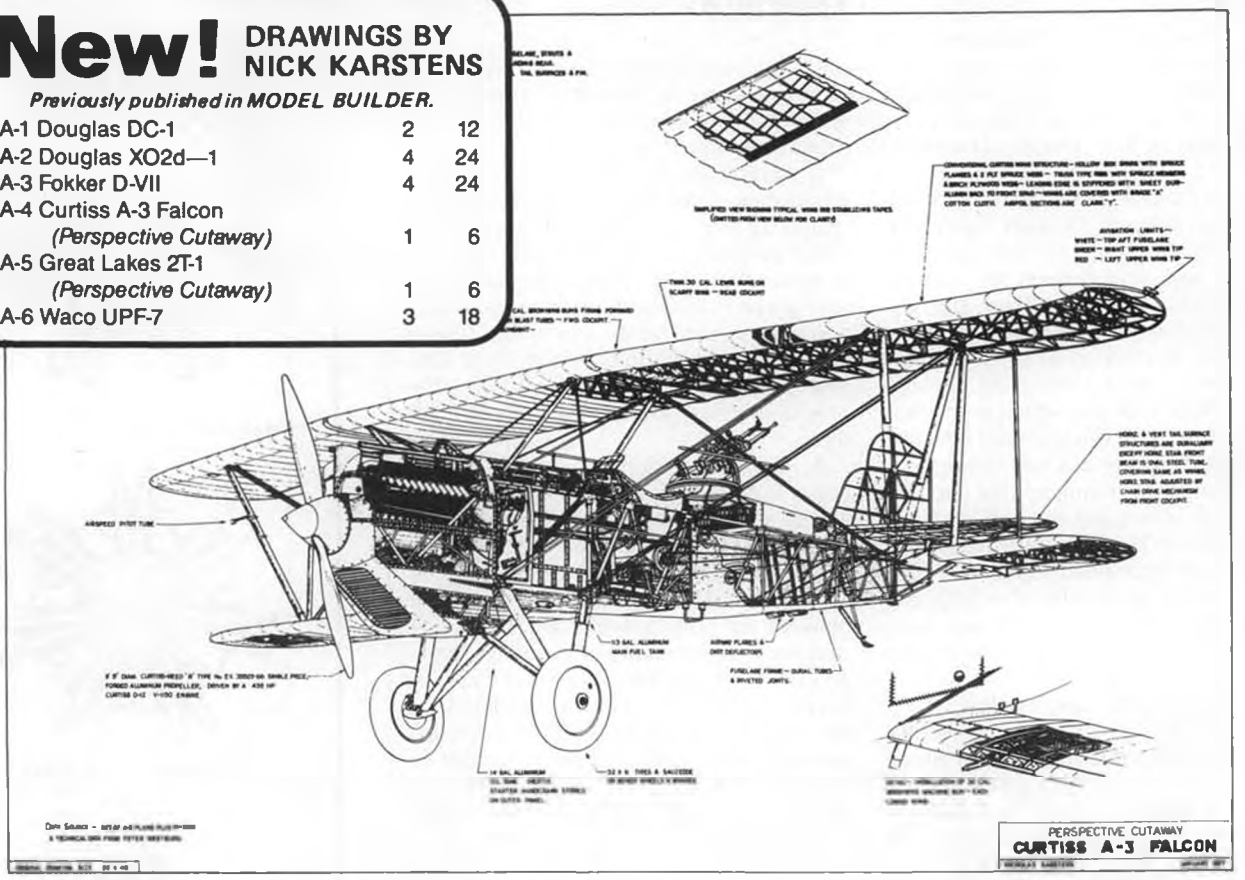
KA-4 Curtiss A-3 Falcon *(Perspective Cutaway)*	1	6
KA-5 Great Lakes 2T-1 *(Perspective Cutaway)*	1	6
KA-6 Waco UPF-7	3	18



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WE-2 Boeing F4B-4/-3	4	24
WE-3 Boeing P-12E	3	18
WE-4 Curtiss A-8 Shrike	3	18
WE-7 Curtiss Gulfhawk 1A	2	12
WE-8 Curtiss N2C-2 Fledgling	4	24
WE-9 Curtiss O-1B/A-3 Falcon	3	18
WE-10 Curtiss P-1B Hawk	3	18
WE-12 Curtiss XP/YP-23	3	18
WE-13 Curtiss SBC-4 Helldiver	4	24
WE-14 Czech Avia B-534	2	12
WE-15 Davis D-1K	2	12
WE-16 Douglas O-25C	3	18
WE-17 Douglas O-31A/O-31B	3	18
WE-19 Douglas O-38/O-38B	2	12
WE-20 Douglas O-43A	3	18
WE-21 Douglas O-31C/Y10-43	3	18
WE-22 Douglas O-46A	3	18
WE-25 Fokker D-17	3	18
WE-26 General Western Meteor	1	6
WE-28 Grumman F2F-1	3	18
WE-29 Grumman F3F-2	3	18
WE-34 Stearman 4E Mailplane	2	12
WE-36 Travel Air 2000	2	12
WE-37 Waco ATO Taperwing	2	12
1/10 scale: 1.2" = 1 ft.	Shts.	$
WE-1 Berliner/Joyce P-16	4	24
WE-5 Curtiss BFC-2 Goshawk	4	24
WE-6 Curtiss F9C-2 Sparrowhawk	4	24
WE-11 Curtiss P-6E Hawk	4	24
WE-24 Fiat CR-32	3	18
WE-27 Great Lakes Trainer	4	24
WE-30 Hawker Fury Mk I	4	24
WE-31 Hawker High Speed Fury	3	18
WE-32 Hawker Persian Fury	3	18
WE-33 Monocoupe 90A	2	12
WE-35 Swedish Sparmann P-1	2	12

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California residents add 6¼% sales tax.

bottom of the fuselage; away from the decals.

Now lets talk about prices. The model/radio/video combo has a *suggested* retail price of $349.95. I emphasize *suggested,* as the real world price, depending on where you shop, of course, should be *considerably* lower. This also applies to the model, which may be purchased without the radio and video (suggested retail $199.95) and the radio alone (suggested retail $139.95).

Overall, I found the Fairchild 24 and Cobra radio system to be excellent products worthy of Cox's fine reputation. ***MB***

ASCENDER *Continued from page 45*

these companies, Ace RC, still exists today... and even then it was at Box 301, Higginsville, MO!

The first Ascender was flying in 1955 (that's 35 years ago!) and was considered a top pattern contender, even capable of performing all maneuvers in the 1957-58 AMA stunt pattern list. It was billed as the "West Coast Favorite," with several hundred having been built from Dale's plans before it was published. The original was flown with a K&B Torpedo .19, using a compound escapement on rudder, a three-position escapement on throttle (by way of a hand-built combination exhaust and intake choke system... there were no "RC" engines back then), and a trimmable-only servo (nicknamed "mail box") on elevator, all controlled by a three-channel Babcock BCR4 radio. (Turns out that Babcock was just around the corner from RCMB's present office location!)

At the time of publishing, Dale had installed a five-channel C.G. radio, using a new neutralizing Bonner servo on rudder instead of an escapement, still a trimmable servo on elevator, and the three-position (high, cruise, and low) escapement on throttle. Power for the 5 pound, 4 ounce model was usually a K&B .29 or .35, more than enough for its needs back then. As Dale was planning to install an eight-channel Orbit reed radio a little later, the proposed aileron location was indicated on the plans. A word of explanation here. Eight channel in those days meant *FOUR* control functions, as it took two channels to run a servo in each direction. You can imagine the confusion that existed as proportional came into the picture! Newcomers to the hobby were reading about 10-channel reed systems that moved four controls plus trim on only one of them (elevator), and four-channel proportional radios that accomplished the same thing plus trim on *ALL* of them!

Trimmable-only elevator control may seem odd to some RC modelers now, and even more so back then. But in those days of lighter and slower flying aircraft, it had many practical points. The airplane could be trimmed for pitch attitude in flight (no big deal now, but nonexistent back then). If four blips of 'up' gave you the loop you wanted, then four blips 'down' would get you back to neutral. We later witnessed flying of a four-cylinder McCulloch-powered Norair military target drone that spanned 11 feet and cruised at better than 150 mph, that was flown with trimmable elevator *and* trimmable aileron, though the aileron also had gyro assist. The Norair engineer accepted my challenge and proceeded to perform beautiful loops, Immelmans, Cuban Eights, and rolls... much more than the straight passes with 180 turnarounds at each end as required for gunnery target practice.

Construction of the Ascender is very conventional ("straightforward," as they say), with an alternate rib pattern for those who don't want to mess with internal spars. The major construction difficulty for experienced builders, as far as we're concerned, is the carved and hollowed fuselage hatch that goes over the center section of the wing. These plans come from our "build it someday" collection. Note the addition of a dorsal fin, to help balance out the profile area distribution. No technical aeronautical engineering design backup for this, it just "looked better" to me.

To save you some head scratchin', the station numbers are located in the top view of the fuselage, and the temporary Former 1 and 1/4-inch ply firewall are shown upside down. Also, copying a trick we picked up from Jim Schmitt at Great Planes Model Mfg., the full size plan prints we offer will show the wing and stab plan upside down, so that when you turn the plan around to lay it on your building board, you can read the copy without twisting your neck. Ain't that clever?

Even if you're not interested in the Ascender for its Vintage RC value, it would still make a nice general sport/pattern aircraft that's just a little out of the current rut. Eh... what's 35 years? ***MB***

EAGLE *Continued from page 47*

the full-sized one, so on the way home I found a bookstore which had several volumes on the F-15. I bought *Modern Military Aircraft: F-15 Eagle* by Lou Trendel, published by Squadron Signal Publications. I'm certainly glad I did. To my surprise, the model was extremely close to 1"= 1' scale, and the kit model could be made to look like a stand-off or sport scale F-15 with a little decoration.

THE McDONNELL DOUGLAS F-15 EAGLE

It was the need for a high-tech dogfighter in the 1960s that gave the F-15 its start. Other jet aircraft were designed with nuclear war in mind, e.g., the F-4 Phantom and the F-111 Bomber. An agile fighter was needed in the conventional air war over Vietnam. The need for a lightweight, high powered, maneuverable, air superiority fighter was what led McDonnell Douglas to design the F-15. The prototype first flew in July 1972 and went into squadron service in January 1976—too late for the Southeast Asia War.

The Royal Saudi Airforce, the Japan Air Self Defense Force, the Israeli Air Force, and the U.S.A.F. operate F-15s both as interceptors and as bombers (the F-15E bomber can carry a 24,500 lb. payload). This versatile aircraft is also modeled in kits by Bob Parkinson as the Regal Eagle, an .80 powered ducted fan, that will accelerate straight up, I understand, and the Vector Eagle, a .45 size ducted fan, and now the Fun Fli Eagle 40 using a conventional motor in the nose with a propeller.

FUN FLI F-15 EAGLE 40 KIT

The 38x11x8-inch box that the kit comes in is very impressive and makes one wonder how much of the airplane is already built. The answer to that is "none." The large box is necessary because of the foam wing cores and the protective pieces of foam from which they have been cut, plus the vacuformed cowling, canopy, cockpit pieces, tail cones, and jet engine shrouds. The kit is very complete with two large plan sheets and a step-by-step instruction booklet which includes black line three-views of the F-15 and a drawing showing the U.S.A.F. two-tone gray camouflage that I used on my F-15. There is adequate wood in the kit to build the model without scrimping. The quality of the kit is excellent, with light, stringy sheet balsa, a complete parts package and formed 5/32-inch wire landing gear. As with most kits the wheels are not included. Unfortunately, no mention on the plan or drawing indicates what size to use. I found that a 2-1/4 inch wheel for the nose and 2-1/2 inch mains looked about right and were quite adequate on a grass field. The tail cones, engine shrouds, cockpit rear fairing, and cockpit interior pieces are vacuformed from styrene and are a reasonable thickness, but I felt they were a little delicate so I epoxied glass cloth inside them to keep them from splitting from normal wear and vibration. The canopy and cowling appear to be molded from clear lexan and are extremely tough.

Even though this is really a very straightforward kit to build, and it does go together quickly, I would advise the novice builder/pilot to get some experience with a conventional R/C model first even if jets are the only thing he wants to fly. This model flies very well but is not a first time flier model airplane.

Construction, as I have mentioned, is step-by-step and holds nor surprises, if the booklet supplied with the kit is followed. I did just that, even though I wanted to forge ahead in my own way. I'm glad I stayed with the instructions.

Every detailed step is not included but the sequence of doing things is, and for that reason mainly it is not a beginner's kit. You don't just shake the box and out comes a beautiful model. You have to work for what you get, but the result certainly is a source of pride and satisfaction.

There were some things I found I wasn't happy about with the kit, such as not enough of some things or others that were missing or too weak or did not quite fit. Often problems

like this are the fault of the builder too. The main problem I found was the lack of rudders to steer the model at takeoff when the nose wheel is off the ground and before the ailerons are effective. There is plenty of fin area. I plan to cut scale rudders out of the fixed fins and hook them up to the nose gear servo. The problems were all mentioned to Bob Parkinson and he was pleased to receive the input on this new kit. Future kits will have the corrections. Frankly, compared to the good things about this jet, the problems I had were very minor.

One of the things I appreciated most was the predrilled holes in the fuselage sides for 1/4-inch dowel line-up pegs, which fitted into the pink foam wing cores and also lined up the 1/4-inch balsa stabilizers. They really make the job much simpler and insure a good flying airplane.

There are several ways to go when sheeting the wing cores: a) 1/64 plywood; b) Bob Parkinson's plastic "Jetskin"; and c) 1/16 sheet balsa. Probably the Jetskins would be best since there is no grain and they are easier to finish, however I chose the 1/16 balsa because the rest of the airplane is balsa and I wanted to use a butyrate dope finish. No wing sheeting is provided; Bob tells me that the inclusion of wing skins as stated on the box label was an error.

The K&B Sporster is a large looking motor for a .45 and is quite pleasing to the eye. Its weight is comparable to most engines in the .40 range and it swings a 10x6 prop very well. The special backplate spider-mount looked interesting, so I elected to use it. This mount necessitated some 3/4-inch ply spacers between it and the firewall to bring the propeller out where it would clear the cowling. I could easily trim them to get side or down thrust if needed. The muffler extension is plenty long enough to keep the muffler from interfering with the cowling. I like the way the exhaust nozzle can be rotated away from the airplane. A tube extension can be added to it, if you wish to take the glop down to the rear. I drilled the muffler extension for a pressure tap since the model calls for a two-tank system. With the motor so far forward, a balance problem would develop with the diminishing fuel load near it. Up front, behind the firewall and level with the carburetor is a two-ounce tank which is kept filled from an eight-ounce tank back near the center of gravity. It is pressured by the muffler. Frankly, I wondered if it would work. The .45 ran very well on it indeed, and I experienced no problems.

FLYING

The F-15 came out at six pounds with the tanks empty but otherwise ready to fly with my trusty Ace Silver Seven radio mounted as far back as possible. I chose to finish my model with a dull camouflage, so I used balsa filler coat, Sig Koveral and butyrate dope. Heat-shrink film would be lighter but this model has plenty of wing area and can comfortably carry the extra weight.

After some pictures were taken, I decided to fire up the K&B .45 to see how it would run. With the open cowling giving it plenty of cooling, I decided to break it in in the air, rather than bench run it. Both tanks were filled from the front one. After several choking flips of the prop to get fuel into the cylinder, it started right off and ran rather rich. I needled it in until it was two-cycling, then backed it off to a four-cycle and taxied it around to get the feel of the airplane. Throttle response was good even though there wasn't enough power for takeoff with the motor that rich. I tweeked the needle in a bit further and tried a few takeoff runs but needed still more power. I filled the tank and let the motor cool off. This time, with it leaner, I hoped there was enough power for takeoff but once I got the nose gear off the

ground, there were no rudders to steer it. After several attempts with the motor leaned a little more each time, it was finally airborne through the empty pits and parking lot. Luckily, Jim Semple, who was taking the pictures, and I were alone at the field. Using ailerons to steer, the airplane was a pure joy to fly. It almost seemed as if it were suspended on a wire while I flew it in large circles, doing the occasional gentle maneuver. Aside from being somewhat nose heavy, everything worked perfectly even though the motor was running rich. The landing was very smooth and controllable. I flew it a second time, a trifle leaner, and after the same trouble on takeoff, it flew so well I could easily visualize it as a full-scale jet, since the motor and prop didn't show. Panic set in when the engine stopped, but with little effort except back pressure on the stick to compensate for nose heaviness, it glided in dead stick like a lightweight trainer. A faulty glow plug caused the motor to stop but it ran well after the plug was replaced.

I heartily recommend this kit to anyone who would like to try a jet for the first time but is wary about spending a lot of money. I think it would be an excellent transitional model from conventional propeller airplanes to ducted fans. It's a good value for the money. The K&B .45 Sporster has my vote for a quiet, dependable, and inexpensive power source. It won't replace a hot ABC .46, but it certainly is the thing for the sport pilot. The kit and motor are good, you'll like them. ***MB***

ARFS *Continued from page 53*

ease of flying for beginners.

An appeal for an Old Timer model was made in this column, and the response from our readers was both immediate and highly generous. Angus Crosby, of Van Nuys, California, donated a beautiful Quaker, covered with MonoKote in a very attractive color scheme. This airplane is nicely built and just right for training purposes. Even donations of cash came in, and the first was from Ron Parker, of Houston, Texas. His letter was written under the letterhead of the HOUTEXINS R/C Club, and expressed so well what we are trying to do, that it bears printing here:

"Dear Art,

"In the February 1990 issue of *Model Builder* I read a very interesting article of yours: *All About ARFS*. I feel you do a great service to the modeling public with your helpful reviews of these latest offerings. In this article you also mentioned Bud Lavagnino and his use of R/C to help 'turn around' young offenders.

"I grew up in a major urban area, Detroit, and know the pressures and perils that many young people face in today's world. Commending Mr. Lavignino and his work was a credit to your insight as to what the R/C hobby can do to maybe make a small portion of this world a little better.

"I wish all my co-members in SAM would take my lead and donate a small amount of money to Mr. Lavignino's work. I don't have a plane to donate (I share your ideas about the worth of O.T. R/C in training) but maybe he can find a way to use a cash gift.

"Keep writing those fine articles. Best regards, Ron Parker."

Yes, Ron, I think you expressed perfectly how many of us feel about this great hobby/sport, and the powerful influence for good that it can exert when introduced to young folks. And by the way, Bud also received a donation of a fine four-stroke engine which was just the thing he needed for the Quaker. His students have already logged many enjoyable hours of flying instruction, and all this became possible because of the concern and willingness to help displayed by the modeling fraternity.

ARFS IN ACTION

I dropped by one of the local fields recently just to see what was going on, and as I approached from a distance, I could see an R/C airplane burning up the sky. Actually, the highly skilled pilot wasn't just pushing the sticks around wildly as so many of us do, but he was executing a number of pattern type maneuvers in a thoroughly professional manner. Though a bit on the smallish side, I assumed the model he was flying was a pattern plane. I arrived at this conclusion because it looked just like one, with its multi-hued color scheme and rakish lines.

Besides, it flew as they say "like on rails," straight and steady.

As I pulled up and parked near the flight line, the model was just coming in for a landing, touching down like a feather without a hint of a bounce. I recognized the talented pilot to be Ray Sprouse, a young Navy man from Fallbrook, California. As Ray was shutting down the engine, I took a closer look at the model, and to my surprise, found that I had been looking at an ARF! The model was the Telstar 40 distributed by Hobbico, and it looked even better close up than it did in the air. The specifications of the Telstar include a wingspan of 58 inches, about 594 square inches of wing area, and a weight of 5.5 pounds.

When I asked Ray how he liked the plane he was as enthusiastic as anyone I had ever heard talking about a model. He felt that the quality of the Telstar kit was outstanding. Everything fit perfectly, he said; the parts just seemed to fall together. Ray has had quite a bit of experience in assembling a great many ARFs, so I asked him to compare the Telstar to other fine kits he had put together. He felt without a doubt that this was one of the best ARFs he had ever had from a building viewpoint, and when he eventually flew the model he found the performance to be flawless. For power, Ray installed an O.S. .46 SF two-stroke engine, which is quite a little powerhouse in its own right. It was an excellent match for this really hot performing model. At the IMS show in Pasadena earlier this year I was talking to the Hobbico people about the Telstar, telling them how impressed I was with its performance. They agreed that they also thought it was a fine model, but they did ask me to pass along a word of caution to my readers. The specified engine for this model states that a "two-stroke .40 or .45, or .60 four-stroke" is required. *Do not expect this model to perform well on a standard .40 engine!* The hot .45 Ray used was ideal, but ordinary sport .40 engines will barely drag this model through the air. As a high performance airplane, it has to be moving quickly to do its thing!

Watching Ray fly the Telstar 40 was a pleasure. Ray made it look so easy, that I thought this model should be the basis of a full report, and perhaps we will do such an evaluation later on. In the meantime, Ray is still sizzling across the skies with his handsome looking model.

ARFS ACROSS THE SEA

Just a few days ago I received a most interesting phone call from a gentleman visiting this country from Czechoslovakia. He wanted my recommendations for different ARFs to take back with him, and I thought the idea was unusual, to say the least. I guess that if one is an R/C fanatic he goes on with the hobby, even though the government is falling all around him. Anyway, he thought it was a real kick that you can just pick up the phone and get right through to a magazine columnist. We chatted for a long time about ARFs (I do not limit the time of my phone conversations when someone else is paying for the call), and he seemed pleased with my advice. Then he asked me about engines, and what I thought of diesel powering his ARFs. Well, I told him that like most Americans, I had little experience with diesel engines, so I couldn't advise him about them. I didn't tell him that just a few weeks ago I managed to get an .09 diesel running for a friend, but really didn't know what I was doing. I couldn't get it to lean out properly, and the idle was terribly inconsistent. Anyway, it would be unfair of me to draw any conclusions from just this limited experience. I have seen a number of R/C planes flown very well on diesel power, and in the right hands I am sure it is an excellent way to go.

As we continued our discussion, my caller told me that the real problem was glow fuel. He said it was not available in his country and he would have to use another power source. I asked him if he had ready access to gasoline, and he said there was no problem with that, so I suggested he get a couple of glow engines and have them converted to electronic ignition, then he could run them on a gasoline/oil mixture. He loved the idea, and said that is the way he was going to go. Ever since then I have been thinking about his problem, wondering if I steered him in the right direction. Do any of you readers out there have any other ideas I can give this fellow?

THE PATTERN TEK SUPERSTAR

No, the spelling of this new pattern ARF is correct. Though it is an accurate copy of the famous Suprastar as designed by the eminent pattern flyer, Hanno Prettner, this model is called the "Superstar." It doesn't come quite ready to fly right out of the box, but a great deal of the work has been done for the builder. The fiberglass fuselage is finished, and the fiberglass sheeted wings are of an innovative type of construction, with a lightweight hollow foam core. Ailerons are already hinged, and the horizontal stab is constructed of balsa with a fiberglass outer layer. All this adds up to state-of-the-art construction, and I believe that the Pattern Tek folks have a real winner on their hands.

Applying paint to the Superstar is left up to the builder, and this is where one can let go and get as wild as one wishes. The fiberglass surfaces seemed smooth enough to go directly to primer and paint without any particular surface preparation. We should be seeing a lot of these Superstars showing up at pattern competitions this year, and in the hands of an experienced pilot it will be a hard combination to beat.

It's time to head back to the workshop to put the finishing touches on a very unusual ARF. With any luck, we'll be bringing you a full report on it in the near future. Meanwhile, send your comments to 2267 Alta Vista Drive, Vista, CA 92004 (please include SASE for a reply), or phone me at (619)726-6636. My FAX number is (619)726-6907. ***MB***

HANNAN'S *Continued from page 59*

extract: "... an all-consuming passion which excludes (almost!) all other spare time activities."

ALSO FROM ARGUS

Scale Model Airplanes, by David Boddington—surely that must be entitled Scale Model *Aeroplanes* in the British edition? Although aimed primarily at R/Cers, this book could also be very useful to F/F and C/L scale modelers, since much of the contents is applicable to all three categories. David explores the "whys" as well as the "hows," pointing out that scale models have often been "hidden in layers of mystique and myth," which he carefully explains away, and offers practical gems of advice such as these: "Never be afraid of aerodynamics—you may not understand it all, but what does sink in will be useful information." And: "With scale design, the dimensions, layouts and profiles are all preordained and they have to be copied as accurately as possible."

He also issues the vital caution for beginners to avoid those tantalizing but difficult-to-fly subjects until they have gained some experience. The problem, of course, is that many easier-to-fly subjects are so esthetically boring that it is unlikely anyone can be really enthusiastic about building them. Yet, a novice who fails with a more seductive-looking subject may abandon the hobby altogether. If flying is such a problem for beginners, why not just build static-scale models? David points out that they are "... destined to remain forever earthbound." After all, what are airplanes for?

The chapter dealing with research is particularly important, explaining, for example, that one should have access to the full-size prototype if truly world-class results are expected from one's scale model. And this masterpiece of understatement: "Commercially-produced scale drawings vary enormously in accuracy standards." We found only one questionable statement: "Rest assured however, that someone, somewhere, has some information on your particular model prototype." (Do you agree, Claude McCullough?)

Boddington is a firm believer in testing unusual prototypes in the form of small all-balsa profile gliders before completely committing to a complex full-size R/C model. Colonel Bob Thacker would be the first to agree!

The operation of flying scale models is carefully examined, and this small extract should serve as an example of just how practical David's advice is: "... there is a temptation to ignore the golden rule of `never fly with a rearward C of G' and prove you are immune to the laws of physics. You are *not* and you will surely pay the penalty."

Scale Model Airplanes and *Flying Radio Control Gliders* may be obtained directly from the publishers, Argus Books, Argus House, Boundary Way, Hemel Hempstead HP2 7ST England.

SPEAKING OF BOOKS

Mike Patti, of Somers, New York, sent us a school textbook entitled *Holt Mathematics.* Intended for second-graders, it is filled with fascinating exercises calculated to be fun rather than the "total drudgery" math texts reluctantly recalled from our own youth. Featured on the Holt book cover is a bright red rubber-powered "stick" model. Although the artist was apparently a non-modeler—the landing gear is *behind* the wing, far aft of the center of gravity—the verve and excitement of free flight model flying has been well portrayed.

ON THE SUBJECT OF MATH

Herb Weiss notes: "So many books nowadays say `For persons without a background in mathematics' that I wonder if there would be any place for books `For persons without any background at all.'"

PRODUCT PLUGS

Lots of activity in the marketplace this past few months, and some items brought to our attention are:

Modeler's Pins. Lawrence Freeborn and son offer custom-made pins for model builders, at very reasonable prices. We agree with their slogan: "Pins are one of your basic tools—treat yourself to the best." These are the best we've ever employed, and made in various gauges, pin lengths and handle diameters. Two dollars will bring you actual samples, making it simple to decide which will best suit your purposes. Write to: Freeborn, 3416 Ethelwood Dr. Jeffersontown, KY 40299.

Superior Props. Remember the machine-cut, pre-carved propellers featured in old-time, rubber-power model kits? A modern equivalent is available now. The difference is that these may be ordered in your own choice of diameters from 4 to 12 inches, pitched to your requirements, and made to your specification of soft, medium, or hard balsa. Reverse rotation props are also offered, meaning you can obtain opposite-hand props for twin-engine models. Only minimal finishing is required, and the same firm offers other types such as folding props, prop blades, and prop forms. A stamped, self-addressed envelope will bring a brochure from: Superior Props, 2412 Tucson Ave., Pensacola, FL 32526.

New Lidberg Plan. For Jumbo Scale enthusiasts, Al Lidberg has released construction drawings for a Focke-Wulf TA-152H. Spanning 40 inches, this high-aspect ratio model is a very fine performer, suitable for rubber, CO_2, 1/2A gas or electric power. Drawn in Al's usual polished manner, the plan is accompanied by complete instructions and color information. Lidberg offers many other model plans as well as scale documentation, so why not send him $1 for a complete list? Write to him at 614 E. Fordham, Tempe, AZ 85283.

Fillon Flyers. Emmanuel Fillon, one of France's most innovative model designers and past winner of the Wakefield Cup, has developed another in his continuing series of Peanut Scale model plans, the Potez .25.AZ. This charming vintage biplane served

in a variety of roles during its 1929-1934 career, and thus offers a variety of possible color and markings choices, as well as your preference of in-line or radial engines. Although captions are in French, the drawing clarity is such that experienced modelers should have no particular difficulty in translation. Since M. Fillon offers a wide variety of model designs, including his remarkable "Soufflant" rubber-powered jet, we suggest you send $2 for complete illustrated brochures and price lists. E. Fillon, 60 rue du Bocage, 83700 Saint Raphael, France. As usual, we ask that you credit *Model Builder* when contacting any of the sources we mention. Thank you!

REALLY BIG MODEL!

Both Ed Whitten and Mark Fineman sent clippings relating to the giant (60 foot span) remotely controlled aircraft being constructed at Harvard University by John Langford, designer of the human-powered Daedalus, and James Anderson. To be powered by lithium batteries, the craft, dubbed the "Perseus," was built with the intent to conduct research on the so-called ozone hole high over Antarctica, during late 1991.

STEALTH BLIMP, ANYONE?

An equally intriguing project is the "stealth blimp" intended for truly silent reconnaissance missions. A key figure in the craft's construction is famed model builder Bill Watson, who has extensive experience in model blimps, the human-powered Gossamer Condor, Gossamer Albatross, and other pedal-powered planes as well as the blimp he constructed for comedian Gallagher. Our thanks to Ken Hamilton for keeping us up to date on this fascinating concept.

MORE FAREWELLS TO WALT

Tributes to the late Walt Mooney continue to arrive from places as far away as England, Czechoslovakia, France, Japan, the Soviet Union, and testimonials have appeared in numerous publications. We would like to share a few of these touching words:

"It is hard to believe there will be no new Peanuts, no new Bostonian Wests, no new sport designs from the drafting board of this kindly genius." Ed Whitten, Junior Flight in *Model Aviation*.

"It just won't seem right to pick up an issue of *Model Builder* and not find a Mooney plan in it... we all have suffered a great loss. May Walt ride in that heavenly thermal forever." Lin Reichel, Flying Aces Club newletter.

"... We all lost a great friend and companion on March 1st. Everyone who knew Walt loved the guy. He was always so full of life, and spread excitement and enthusiasm in each person he touched. Thanks, Walt, for spending some time with the gang here in Phoenix." Dave Smith, *The Arizona Cactus Squadron News*.

"Am wretchedly saddened to hear about Walt Mooney—hope they have plenty of prewar Japanese tissue where he is!" Frank Scott, Dayton, Ohio.

"The legacy of his beautiful and clever creations will continue to inspire and bring joy to many generations of hobbyists and artists." Glen Geller and Tony Naccarato, *Blacksheep Squadron News*, California.

"I really think Walt was probably the most prolific, published model airplane designer of them all. It was a great thing he did... enough for three biographies, in his different fields of activity: His career in aviation, his full-scale aircraft `hobby career,' and his model career." Jim Alaback, Rancho Bernardo, California.

"All of us will miss his Peanut parade in *Model Builder*, but most of us fortunate enough to call him friend, will miss him just being here." Tom Schmitt, *MAX-FAX News*, Washington, D.C.

The Japanese *Peanut Technology* newsletter, produced by Jiro Sugimoto, Kazuhiro Suzuki, Shoichi Uchida and the Nagoya model club members, devoted virtually an entire 16-page edition to Walt, including marvelous photographs and a Peanut plan for Walt's own Piper Vagabond.

We close our column with this commentary by Georges Chaulet, of Antony, France: "About our friend Walt, it will be a trou (hole) in the model world. But some people do have so much intense personality that they remain with us permanently. We love to think they are still with us." Amen. ***MB***

INDOOR *Continued from page 61*

Santa Monica. Several members of the indoor group (The Blacksheep) in Burbank, California, have been flying old-timer replicas in profile sheet form at our sessions. It seems to be a real crowd pleaser. I have received several letters from around the country showing interest in this type of indoor. One of those to respond was Ed Lamb, from Bellevue, Washington. He reports that two contests were held for Oldtimer Indoor Challenge. The Topeka Model Aircrafters is running an event for Baby R.O.G. using similar rules. The SAM 56 club in Wichita, Kansas, is also considering an oldtimer indoor event.

Andy Tagliafico has made arrangements for a regional indoor contest at the Kibbe Dome in Moscow, Idaho, on August 3, 4 and 5. Ed Lamb reports that he will run the Oldtimer Challenge there. There may be a user fee for the building of $25.00 per flier, for the three days. If you would like to enter this meet or would like to help sponsor this undertaking, contact Ed. He also states that he will send the rules for the Oldtimers Indoor Challenge to any group interested in holding such a contest. Write to Ed Lamb at 15911 S.E. 42nd Place, Bellevue, WA 98006. I intend to make up a packet of about five indoor oldtimer plans to distribute to interested modelers.

Well, I've got to start building for the next indoor meet. See you next time. Write and tell me all your local news and include photos for the column. Send to Ken Johnson, 16728 Bermuda St., Granada Hills, CA 91344; (818)368-0448. ***MB***

FREE FLIGHT *Continued from page 65*

6. The F1C (Power) noise proposal to require ear protectors was defeated as inadequate. The subcommittee is now considering requiring a simple chamber silencer. Some tests are being considered before such a change is made.

7. World Championships Proposals were received. At present, they appear as follows:

a. CSSR firm proposal for Junior F1A, 0 and C in 1992.

b. Yugoslavia confirmed F/F F1A, B and C, July 1-10, 1991 at Zrenjanin—75 km N-NE of Belgrade.

c. Poland tentative F1D in 1992.

d. Argentina tentative F1D in 1994.

e. USA tentative F1A, B, and C in 1993 at Lost Hills.

f. Hungary tentative F1A, B, and C in 1995.

PROPELLERS—Some Sources

I just received a couple of propeller blanks from Superior Props, 2412 Tucson Ave., Pensacola, FL 32526. These are rubber model props that are ready for finishing. The producer, Ed Wickland, has developed an ingenious solder-free linkage system that eliminates all of the usual wire bending that scares off newcomers. These are the closest to foolproof props that I have ever seen. Superior makes props in all sizes up to 28-inch diameter. These props come in a variety of pitches as well. They also stock one-piece prop blanks from four to 14 inches in diameter. I can attest to the quality of the wood used as well as the workmanship. Z-bars and other tools are also sold. If you are not acquainted with these products, send a SASE to Superior Props for your very own catalog.

Bob Hatschek noted in the *Flyoff Newsletter* that rubber model props and/or prop assemblies can be obtained from a variety of other sources as well, so in addition to Superior, you may want to look into these suppliers: Blue Ridge Models, P.O. Box 429, Skyland, NC 28776; FAI Model Supply, P.O. Box 3957, Torrance, CA 90510; Starline International, 6146 E. Cactus Wren Rd., Scottsdale, AZ 85253.

A CONFESSION

This confession is difficult for me to make, given my longtime love of free flight; however, unless I tell it myself, my "friends" may beat me to it. A couple of weeks ago, I entered three free flight models in the annual Benton County Model Expo, and as a consequence, I was automatically entered in a drawing for some equipment provided by the sponsors for exhibitors. Well, when the drawing was held, I ended up winning the grand prize—an Airtronics Vanguard FM radio control unit. This unit is a four-

CLASSIFIED ADS

IMPORTANT INSTRUCTIONS: Noncommercial (personal items) rate is 40 cents per word, with a minimum of $6.00. Commercial rate is 50 cents per word, with a minimum of $10.00. No ad agency discounts allowed. Phone number counts as two words, name and address counts, abbreviations count as whole words and will be spelled out. All ads are payable with order and may be for any consecutive insertion period specified. Send ad payment to: MODEL BUILDER, Classified Ads, 898 W. 16th St., Newport Beach, CA 92663.

HELICOPTER SCHOOL, five days and nights, all equipment supplied plus room and board on a 67-acre airport with lodge used exclusively for R/C training. Located in North Central Florida. Owned and operated by Ernie Huber, five time National Helicopter Champion and Helicopter designer. Get the hands on training you need NOW! Send $2.00 for complete package to R/c Flight Training Center, P.O. Box 727, Crescent City, FL 32112-0727.

FABULOUS COLLECTION of rubber scale plans, Peanuts to Jumbos. Large SSAE for list to: Martin Bradshaw, PO BOX 761, Placitas, NM 87043.

SCALE RUBBER PLANS. Over 50 Collector's quality plans. Scale 3/4" to foot. Spans to 34" 1950s to 1940s Golden Age, American Military, British, French, German, Japanese $6.00 each PPd. SASE for list. Flying Scale Inc., 1905 Colony Rd., Metairie, LA 70003.

1930s MODEL SHOP! Sawed prop blanks, WWI/Balloon/Streamline balsa wheels, Hinoki wood, color nitrate, slicks, 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, CA 91409.

WANTED: Pre-1950 model airplane engines and model race cars. James Clem, Box 524, Sand Springs, OK 74063 (918)245-3649.

"THE SPORT OF R/C SKYDIVING" Send SASE for FREE illustrated booklet. Bob Patterson, Box 662MB, St. Croix Falls, WI 54024

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O Box 15143, Amarillo, TX 79105. (806)622-1657.

TORQUE STANDS: Measure engine horsepower .049 to .60 or .15 to 1.2 Precision machined from bar stock, adjustable engine mount, $300 or $385. For 1/4 scale engines measure up to 5 horsepower at 8,000 rpm, $6.5 Postpaid U.S.A. Armstrong Research & Technology, 2123 4th Ave. North, Irondale, AL 35210

FREE RC CAR PARTS CATALOG. One of the largest selections. 1-800-HOBBY-98. Hobby Stop, 10002 Aurora N., Seattle, WA 98133.

STUNT KITE—Too windy to fly? Try a stunt kite. Does loops, eights and more. Plans and instructions $5 cash or Money Order. D. Spratt, 15 Creekside Lane, Rochester, NY 14618.

EVERYTHING FROM THE NEW Anson AEROPLANS II, ($11.50 Postpaid) to PEANUTS & PISTACHIOS #4 ($7 postpaid) to ZAIC BOOKS! Archives, Datafiles and much more. Complete brochures $1 (your buck back with first order). HANNAN'S RUNWAY, BOX 860, MAGALIA, CA 95954

MAKE A BEERCAN BIPLANE, 9 inches long, with 14-inch wingspan. Instructions, photographs, patterns. $10.95 plus $1.00 postage. Kit Nine, Box 72104, Marietta, GA 30007

FIVE NEW CONTROL-LINE KITS All balsa and plywood. Randolph butyrate and nitrate dope, finest quality aircraft finish. Send $1.00 for prices. ABC Hobby Supplies, P.O. Box 2391 Clarksville, IN 47131.

OLD BUZZARD'S SOARING BOOK: 13 of Dave Thornburg's best essays on RC glider flying and design 160 pages. 50 illustrations. $16.45 postpaid. Pony X Press, 5 Monticello Drive, Albuquerque, NM 87123

SCALE DOCUMENTATION—Drawings, photo packs, monographs, unusual aircraft. Illustrated catalog: $2 pp. Bill Young, 8105 Teesdale, North Hollywood, CA 91605.

HELP—Novice trying to build scale helium dirigible for purpose of taking outdoor aerial photographs without leaving the ground. Any ideas?? Call collect (513)891-3594 or write Charles Lineback, 10921 Reed Hartman, Cincinnati, OH 45242.

You deserve "METICULOUS 1930's SCALE AIRCRAFT PLANS" by Vern Clements (MB). 308 Palo Alto, Caldwell, ID 83605 Catalog/Photos/News/Info $3.00 refundable. BERKELEY, CLEVELAND, etc., replica kits, duration rockets for jet models. Send two stamps to: WILLAIRCO, 2711 Piedmont Road, NE. Atlanta, GA 30305.

PEANUT TO JUMBO SCALE model plans for rubber, CO2, electric. Unusual subjects, good fliers. Catalog #1.00. A.A Lidberg, 614 E. Fordham, Tempe AZ 85283.

R/C BEGINNERS, save time, money and frustration! Read "EASE-OF-FLYING RATINGS" and learn which R/C trainers are hands-off easy to fly, which are terrible (and why). $3.00 plus 45 cents postage. The most extensive flight-testing project ever conducted in this hobby. Over 30 trainers evaluated. Guaranteed to be the most enlightening R/C publication that you will ever read. Jim Waterman (MB), 3818 Deerfield, San Antonio, TX 78218.

"KING SIZE FUN SCALE MUSTANG" plans set for .90 - 3.0 eng. Span 90", area 1450 sq.in., 11-14 lbs. Price $35.00 plus $5.00 shipping. 4 1/2" spinner $20.00, canopy $20.00. An easy to build and fly Sunday flyer. Free brochure with SASE. Order from Fun Scale, 220-65 Camino Corto, Vista, CA 92083, or phone (619) 726-0154.

MODEL ENGINE BUILDERS! Titan .60 kits, supplies, tools, aviation literature. SASE for lists Orven Sales, 2050 Christina St NW Salem, OR 97304.

WANTED: SPARK IGNITION MODEL AIRPLANE engines circa 1930-46. Fair, competitive prices. Tom Forsythe, 318 12th Ave., Box 142, New Glarus, WI 53574 (608)527-2066.

SCALE DOCUMENTATION: PLAN ENLARGING. 87 Super-scale Giant, Sport R/C construction plans, three-views, cutaway drawings. 70,000 documentation photos in stock. 100 page catalog $5.00 ($9 Air overseas). Jim Pepino s Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403 (919)292-5239. Visa, MasterCard.

TRADE—New Cox .010, props, plugs, for Brown A23 motors, new, used. Thomas Ogden, 27 Cortland St., Norwich, NY 13815.

ENGINES, IGNITION, GLOW, DIESEL. New, used. Sell, trade, buy. SASE for list. R. Eierman, 504 Las Posas, Ridgecrest, CA 93555. (619)375-5537.

channel rig that has all of the latest features, so I'm told.

So, what to do with it. I am sure it is valuable to someone. I am sure that I could use it in some manner, but how? I am sure I could trade it off to someone who has what I would really like to have. Oh, the ignominies of it all. Do any of you, dear readers, have some suggestions? If so, please contact your F/F columnist, Bob Stalick, 5066 N.W. Piccadilly Circle, Albany, OR 97321.

THE END OF ANOTHER COLUMN

Well, that about wraps it and ties it for another month. Hope you enjoy the good weather that should be just around the corner even here in the northwest. Catch a thermal for me the next time you get to the field. ***MB***

CONTROL LINE *Continued from page 67*

we read a solid 23,200 with spikes to 23,300 when messing with the needle. On a Grish 5x3 (one of the newer white props) we recorded 25,300 with spikes to 25,400.

"The motor seemed to have a happier sound to it when twisting the Grish prop, although flying with the Cox prop showed no more signs of being loaded with too much prop than a real healthy Cox engine does on this prop. Still, the motor/model combo being used did appear to fly a little better with the Grish prop, where we normally prefer the Cox prop on Cox engines. I do know the Soviets really sneer at the Cox props.

"Earlier tests now appear to have been hampered a bit by my sticking in a couple of extra head shims. When Alexander Gievsky handed me the motor, he asked what percentage of nitro we used at the Nats. When told it was 40 or 45%, he hesitated and suggested 30% for his engine. When further told that we were using 12% oil, he kinda rolled his eyes and suggested 20%. So of course I came home and socked the heavy nitro/light oil blend to it, but did slip in extra head gaskets, each of which loses about 150-200 rpm. Yes, the next step is to try a remachined head from Kustom Kraftsmanship.

"Interestingly enough, going to a 10% nitro, 16% Klotz, 4% bean oil, 70% methanol mix only cost around 1,200 rpm on either prop. I'm not a motor whiz by any means, but was expecting a larger drop than that.

"So while one of the three prototype Gievsky .049s is outrunning my two best Cox engines, the fact is it's still a prototype. On the other hand, I've written to Alexander telling him the motor is fine, but we need more power. And he seems up to the challenge.

"I built my first F2D model in years, the previous effort being an FAI Nemesis (gad, there wasn't even an F2D event back then, was there?), just to have something on which to fly the Gievsky 2.5cc motor. As previously mentioned, one motor has been dedicated to a full-boogie test program, which means that I wanted a hot-rod on short lines. Punched the venturi to .210 and with only 10% fuel and a Soviet flying prop we see

INDEX TO ADVERTISERS

28,600 just prior to launch. The model is pretty good and the motor is a killer, just screaming its guts out in pulling through all the maneuvers with never a hint of bogging down. Next step will be a good shot of nitro.

"Which brings up an interesting question: If the 2.5cc likes to rev in excess of 28K with the unrestricted venturi, why are we fiddling with an .049 in the 25K range? Shouldn't we be looking at motors and props operating around 30K to 31K? Don't worry; I will be sure to ask that question of Alexander!"

Dan's description of his testing program teaches another lesson to fliers looking for top performance in whatever type of flying interests them, particularly those in competition: There is no substitute for testing different combinations of equipment and fuel.

It's sometimes puzzling to see a flier out at a contest unnecessarily running an obviously substandard prop or fuel, for example. It prompts a couple of questions: Have they tested other combinations? Have they examined the competition?

A general rule of thumb for new competitors: If your equipment isn't performing up to the competition, there are two things to do to catch up:

1) Take a look at your toughest competitor's equipment. Talk to your competitor and find out what he's using and why.

2) Take what you've learned and do some testing on your own. Test your competitor's setup against your own—and then try some other combinations as well. You'll improve.

That leads to Thompson's First Rule of Beginning Competition: *Find out who's winning contests and copy everything they do.* When you get good enough to beat them with their own techniques, then you can start experimenting with your own advancements.

A TRUE OLD-TIMER

Moving from the fast and furious world of combat to the slow and graceful realm of precision aerobatics, we have a couple of notes from the world of Old-Time Stunt.

First, from George Lieb of Omaha, Nebraska, we have a photo of his Old-Time Stunt plane, the "Triumphant."

We knew that George certainly is an all-round modeler, having corresponded with him over the years. Recently in this column we featured a photo of George's ferocious Formula .40 speed plane.

But it's even more impressive to realize that, in this case, it isn't just George's plane that's a genuine old-timer. As the plane's designer, George qualifies as an old-timer himself. To prove it, he enclosed a copy of the original magazine article and plans.

"I designed and built the original," George writes. "That makes it very authentic. It (the new plane) is also powered by an Atwood Triumph .49 engine like the original, is constructed the same, uses the original silkspan and dope finish in the same color and design. I don't like MonoKote-type coverings on old-timers. It's pretty, but not very authentic.

"This plane was originally built and flown in 1948, and published in the December 1949 issue of *Air Trails*. Because things were changing very fast during this time, it won't fly as well as later designs allowed in old-time stunt, but I'll have fun flying my own design."

That brings us to the results of the successful Vintage Stunt Championships II last winter. Many will recall that in 1989, Mike Keville and friends in Southern California organized a nostalgia event that brought old-time aerobatics superstars from around the country for a weekend of flying and reminiscing.

Direct Connection, the newsletter of Southern California's Knights of the Round Circle, reports on this year's event, held in Keville's new home town of Tucson, Arizona.

The event brought out 38 fliers for two days of flying old-time stunt and the newer event, nostalgia stunt.

The winners and their planes were:

Old-Time Stunt: Ted Fancher, flying an All-American Sr.

Nostalgia Stunt: Kaz Minato, Shark 45.

Spirit of '52 Award: Art Adamasin, Yo-Yo.

Concourse: Kaz Minato, Shark 45.

High-point Ignition: Jim Lee, Nobler.

Long Distance: Dick Woolsey, of New York, who flew an All-American and a Nobler.

Among those attending the second Vintage Stunt Championships was former World Champion precision aerobatics flier Bob Hunt, who flew a Rienhart "International." This is noteworthy because of an article in the April edition of *Prop Wash*, the newsletter of the Garden State Circle Burners, the New Jersey club that originated Old-Time Stunt. In that article, author John Miske describes the first ever old-time stunt event, sponsored by the Circle Burners in October of 1970 as part of the club's 12th Annual Model Air Show. The winner of the open class was none other than Bob Hunt, flying a Veco Mustang.

Those with nostalgia about nostalgia may want to attend the 20th anniversary of that

first old-time stunt contest, scheduled for October 7 during the 32nd Annual Model Air Show. OTS-related events will be old-time stunt, old-time stunt phase II (for designs with coupled flaps and elevators), Fox .35 stunt and nostalgia stunt. There's also a beginner stunt event using the new AMA beginner class pattern. For information, contact John Miske, the Circle Burners president, at 415 Clifton Blvd., Clifton, NJ 07013.

In another nostalgia-related matter, we've received some inquiries about how to find plans for old Veco stunters mentioned by Joe Wagner, who contributed to the April column. Send inquiries to Joe at P.O. Box 15, New Wilmington, PA 16142.

And speaking of old-timers, there's a contest coming up for old-time combat. It's called "Doc's OTC," and it's being put on by Doc Passen, combat flier and maker of the Dox Generix line of kits. The date is October 4 in Jasonville, Indiana.

The flyer explains that old-time combat is meant to be the combat version of old-time stunt. Any airplane is legal, but the intent is that they be those designs used before 1962, such as the T-Square, VooDoo, Winder, Flite Streak, etc. Any fuel system will be allowed, but engines must be non-Schnuerle, plain-bearing .36 cu. in. maximum displacement engines sold in the U.S. before 1961. Lines will be .018, 60 feet long.

For information, write Doc at P.O. Box 111, Jasonville, IN 47438, or call (812)665-3723. Don't forget to ask for his Dox Generix catalog while you're at it. For old-time combat plane plans, write Barry Baxter, 6490 Sonora Way, Cypress, CA 90630. He has plans for more than 25 planes at $6 each. His phone number is (714)761-0672.

It's not officially an "old-timer" event, but the Northwest Sport Race Drizzle Circuit has just completed its 12th year, so it's not a youngster any more. At five contests a season, the winter racing circuit now has seen 60 days of competition!

Tom Strom and Dick Salter, the S&S Racing Team of the Seattle, Washington area, took the Northwest Sport Race championship trophy and perpetual trophy, beating Jim Cameron of Bremerton, Washington, and the Wayne Drake/Blake Jensen team of Troutdale, Oregon.

S&S also took the Northwest Super Sport Race series in a come-from-behind effort, edging out Oregon's Nitroholics Racing Team (John Thompson and Mike Hazel) by one point. Dick McConnell of Seattle was third.

S&S took fast-heat trophies in both events, with a 4:10 in sport race and a 3:26 in super sport.

Because of low attendance in the 1989-90 series, the fliers were examining options for 1990-91 during the spring. The one under most serious consideration was to add a "secondary" event—something other than the two mainstay sport racing classes—as was done in the circuit's early years. The fliers also reached agreement that the new super sport rules, using the sport .40 engines, were successful in the Drizzle Circuit trial and the .40 will be made a permanent part of the rules.

Rules for Northwest Sport Race and Northwest Super Sport Race are available from John Thompson (address below).

Here is a history of Drizzle Circuit champions:

1978-79: Northwest Sport Race (old rules)—Mike Hazel.

1979-80: NWSR (old rules—John Thompson.

1980-81: NWSR—Dick Salter. Northwest Super Sport Race—Mike Hazel.

1981-82: NWSR—Dick Salter. NWSS—Mike Hazel.

1982-83: NWSR—Greg Beers. NWSS—Dave Green.

1983-84: NWSR—Dave Green. NWSS—Dave Green.

1984-85: NWSR—Beers-Cole Racing Team. NWSS—Dave Green.

1985-86: NWSR—Dave Green. NWSS—Dave Green.

1986-87: NWSR—Dave Green. NWSS—Dave Green.

1987-88: NWSR—Dave Green. NWSS—Wayne Drake.

1988-89: NWSR—Wayne Drake/Blake Jensen. NWSS—Nitroholics Racing Team.

1989-90: NWSR—S&S Racing Team. NWSS—S&S Racing Team.

As always, contributions of club news, contest schedules and reports, photos and questions are welcome. Write John Thompson, 1520 Anthony Ave., Cottage Grove, OR 97424. ***MB***

WORKBENCH *Continued from page 7*

and when you stall it on takeoff and stuff it into the ground in a pure case of pilot-error, big daddy will buy you another one. OK, junior, slip on a clean diaper, we're going flying!

COVER INSERT STORY

As explained on the Contents page, the insert photo taken by Linda Mas shows her husband, Mike, performing his latest feat with an RC helicopter... a single-point inverted landing! The helicopter is a stock Altech Marketing/Hirobo Shuttle ZX, and Mike thoughtfully inverted the name of the engine used to power the model, just for the photo! The only modification to the helicopter is the addition of a 2-1/4 inch steel "landing gear" shaft inserted in the main rotor hub, which supports the helicopter during the landing.

In Mike's words, "While the Single-Point Landing is somewhat straightforward in nature, considerable effort was required to perfect the maneuver, such as shaft height, rpm, swashplate timing, landing, and control techniques. If the machine's not set up right, or if touchdown occurs too rapidly, severe oscillations are introduced into the rotor head, causing the system to be uncontrollable.

"The complexity of the maneuver stems from the fact that during touchdown, the main rotor system becomes a fixed, stationary point, and hovering is accomplished by the fuselage, an exact opposite of conventional steering where the fuselage is the fixed point and the rotor moves during a control input. To complicate matters even more, during touchdown the control system becomes approximately 45 degrees out of phase while inverted, making control extremely difficult. A similar reaction to this phenomenon can be felt when a helicopter is sitting on its skids and cyclic control is introduced during run-up; as you push the stick forward, the result is forward and right."

Incidentally, Mike has never used an invert switch on his radio system for upside-down flying... not for the first inverted flight, or ever since... says it's too confusing. The only invert switch he does use is located between his ears! By the way, he says he has something else up his sleeve, just in case the single-point inverted landing becomes too commonplace! *continued*

TRADE LEAKS

One of the highlights of the Kyosho/Model Builder RC Helicopter Challenge weekend in Champaign, Illinois, June 9 and 10, 1990 (report coming up in the October issue), was the first live demonstrations of electric powered RC helicopters soon to be available in the U.S. from both Kalt and Kyosho. According to Mike Ciolli, president of Hobby Dynamics Distributors, which is also located in Champaign, along with Great Planes Model Distributors, Great Planes Model Mfg., and Horizon Hobby Distributors, the Kalt "Whisper," as the electric heli is to be called, will be the first one available to the U.S. modeling public.

Just prior to writing this column, we called Mike to confirm further information on the release of the Whisper, and he gave us the following details. The Kalt Whisper will be available to dealers by August 15, 1990. The prices that follow are strictly suggested retail, but it should be remembered that marketing competition will cut these figures considerably. Check discounts through your normal supplier. Retail for the Whisper kit will be $299.99, including the electric motor. A semi-assembled ARF version will retail for $349.99.

Hobby Dynamics will also offer a Whisper "Flight Pack," consisting of four JR 305 Mini servos, a 9.6-volt 1100 mah rechargeable battery pack, gyro, and speed control, for $439.99 retail. Separately, the servos are $59.99, the pack is $61.99, the gyro $114.99, and the speed control $79.99. Optional equipment will include a cobalt motor, JR 3035 servos, an auto-rotation feature, and a tether for ground power flying. A peak-detecting charger will also be available for $160. With discounts, the Whisper and Flight Pack could possibly go for $550 to $575.

Note that we called this item "Trade Leaks." We invite all *Model Builder* advertisers to take advantage of this introduction to a new department in the magazine. Before new product releases are sent to us for publication in our "Over the Counter" column, most manufacturers and distributor/importers have tentative schedules for release of new items. After the date is established, advertising and product release information has to be assembled and produced. With production and lead times, it can take several months to get the word out to the buying public about future items. "Trade Leaks" gives you the opportunity to reduce your lead time to as low as 45 days. As soon as you're set, call us and we'll tell you how soon your latest scoop will be seen by the buying public!

THINGS TO DO

A big one for all RC scale slope soaring types, particularly those in Southern California, is the second annual Torrey Pines Scale Slope Soaring Fun Fly, scheduled for September 1-3, 1990, San Diego, California. Sponsored by the Torrey Pines Gulls, the first annual, held on Thanksgiving weekend, registered more than 60 pilots who brought over 100 scale gliders to fly and display. About 200 spectators witnessed the activity at this most famous west coast slope soaring site, where full size gliders, then RC gliders, and then hang gliders, have all enjoyed the fantastic lift and scenic beauty of the sharp-rising Pacific coast bluff and the sandy beach below (to say nothing of the sunbathers who prefer a tan without bathing suit marks!).

As reported by Charlie Morey, in his *Slope Soaring News* publication, he, along with other members of the Gull's steering committee; Gary Knapp, Jerry Miller, Bill Liscomb, Joe McBride, and Angelo Orona, have put together a very special three-day weekend, including an official hotel with special event rates, a Friday night social get-together, a Saturday night banquet with a guest speaker, a collection of prizes donated by the hobby industry, and adjustments to the flying site based on feedback from some of last year's fliers.

In case some RCers are not aware, scale slope soaring has taken on a whole new meaning in the last few years. To the uninitiated, scale gliders means just that... Minimoas, Schweizers, ASWs, etc. Nowadays it's PSS... Power Slope Soaring... powerless scale models of powered airplanes, ranging from WW-II prop fighters such as P-51s, F-8F Bearcats, and Zeros up to and including F-20 Tigersharks, F-18 Hornets, F-4 Phantoms, and the like. In a recent British magazine, we saw photos of a magnificent nine-foot span B-52, made of balsa-covered foam. Flight shots were very impressive. Engine pods separated for grass landings, which are gear up... no gear!

It'll be a little late to register to fly when you read this, but still possible if you act quickly. Call Jerry Miller at (619) 450-1683, or Charlie Morey at (213) 494-3712, for further information.

• • •

This year's Northrop Flying Wing Contest was rained and blown out along with the National Free Flight Society's whole National Championships on Memorial Day Weekend. We haven't heard if anything is being done about the Championships, but Chief CD Carl Hatrak has rescheduled the Flying Wing contest for October 7, 1990 at Condor Field in Taft, starting at 0730 and ending at 1400 (that's 7:30 a.m. to 2:00 p.m., if you're still on a 12-hour clock).

Remember, this is an all free flight contest only, with four events; Rubber Power, Glider (164 ft. towline), Scale (any power, 20 second official), and Power (25 second engine run for gas, 35 second motor run for electric). Any questions or comments, contact Carl at 3825 W. 144th St., Hawthorne, CA 90250.

Incidentally, since *Model Builder* began sponsoring this contest about four or five years ago, we've had various RCers ask about having some RC events at the contest. Strange thing is though, that since we mentioned the idea, along with some suggested categories, in the magazine about a year ago, we've heard zilch. Nothing can kill an idea quicker than total silence.... ***MB***

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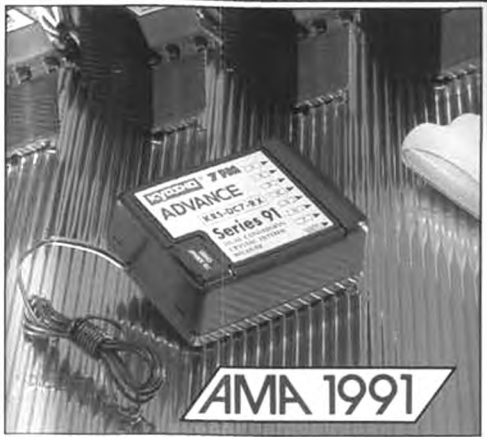

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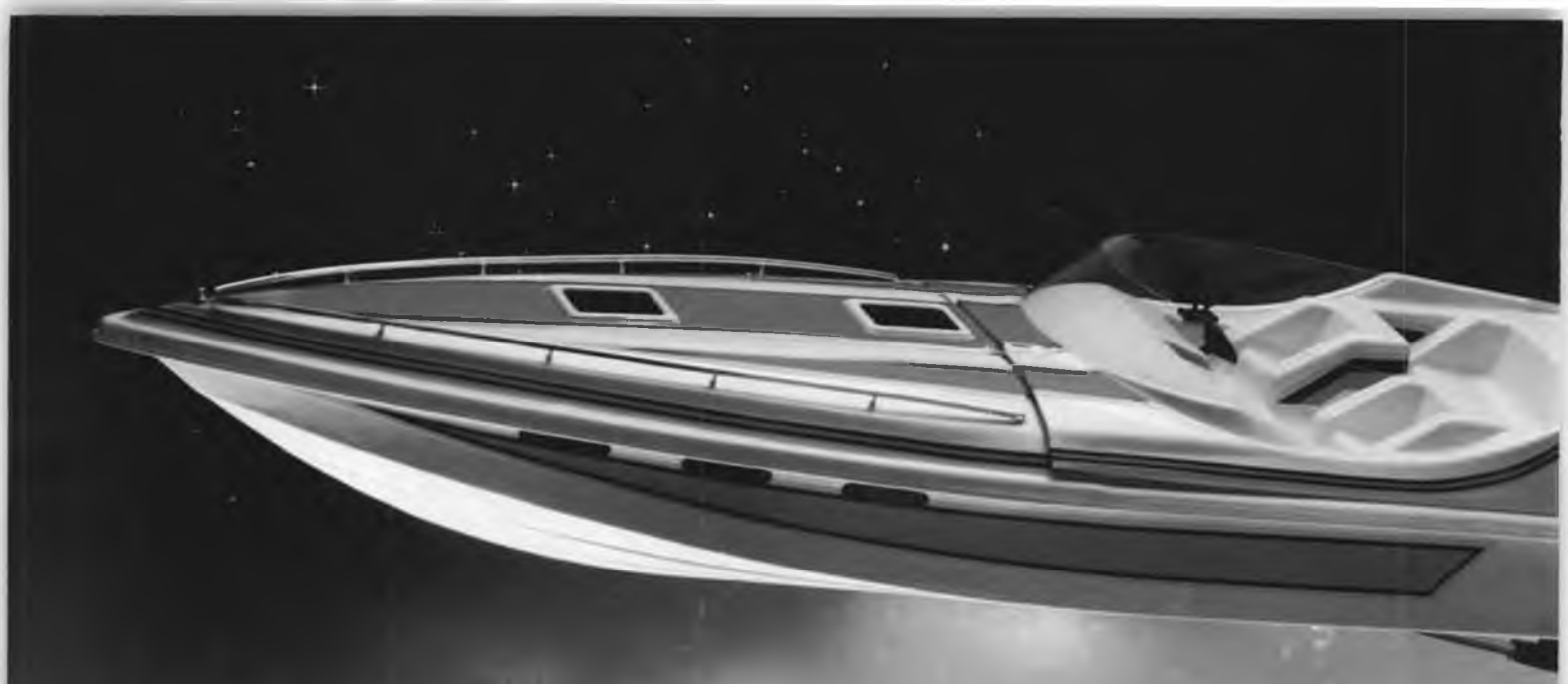

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