THE TOP GUNS OF SCALE MODELING

MODEL BUILDER

WORLD'S MOST COMPLETE MODEL PUBLICATION

AUGUST 1989

ICD 08545

U.S.A. $2.95

Canada $3.95

volume 19, number 210

Build an R/C Old Timer THE SIMPLEX

JET TRAILS OVER ENGLAND

SuperTigre™

The Choice of Champions!

Internationally known pattern flier Hanno Prettner added to his list of championships with a first place finish at the 1987/88 FAI Pattern World Championships, using a stock SuperTigre S-61 ABC engine.

The United States FAI Pylon Racing Team flew with SuperTigre X-40 engines and scored a convincing 1-2-3 sweep at the 1987/88 World Championships, held in Melbourne, Australia.

There's a reason why veteran competition fliers pilot their aircraft with **SuperTigre** engines – performance. Just ask Hanno Prettner, who flew to the 1987/88 FAI Pattern World Championships using a stock **S-61 ABC** engine, or the United States Pylon Racing Team, who captured the top three places at the 1987/88 Pylon World Championships with **X-40** engines in all three aircraft. This world-beating performance is even more remarkable when you consider that the basic engine designs were not altered by the fliers.

The SuperTigre line of model engines currently holds two World Championships and offers you a rare opportunity to power your airplane with championship performance, right out of the box.

Being on the leading edge yields results.

SuperTigre is also highly competitive in model engine manufacturing and production. They're always on the leading edge of technology, searching for ways to improve the performance of their engines. This passion for performance means improved and more enjoyable flying for you, regardless of the application. Their proven leadership in model engines is clearly demonstrated in such models as the 2-stroke giant scale **S-3000**, popular **S-40**, and innovative **G-40** and **G-49 Sport** engines.

With a line that admirably covers the most popular engine displacements, SuperTigre truly makes it easy for you to discover world-class model engine power. To see the championship performance and exquisite craftsmanship of SuperTigre engines first-hand – visit your favorite R/C hobby retailer.

The popular S-40 engine is a proven performer for most mid-size applications.

Even without modification, the S-61 is an excellent engine for pattern flying.

The 1.8 cu. in. S-3000 engine is the giant scale modeler's first choice for dependability and brute power.

SuperTigre™

DISTRIBUTED TO LEADING RETAILERS NATIONWIDE EXCLUSIVELY THROUGH

GREAT PLANES™
MODEL DISTRIBUTORS COMPANY
P.O. BOX 4021, CHAMPAIGN, IL 61820

New book *"briefings"* from H.A.

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

CIERVA AUTOGIROS: The Development of Rotary-Wing Flight. Brooks. The story of Juan de la Cierva who pioneered the development of the Autogiro. Examines each successive technical step culminating in the development of the "jump take-off". Comprehensive collection of photos, 56 3-view drawings, appendixes. 416 pgs., 6¼" x 9¼", hdbd. 4354C **$35.00**

WALDO: Pioneer Aviator. Waterman. The true-to-life story of Waldo Waterman, Barnstormer, inventor, test pilot. His life as an early TWA pilot, Hollywood flying in the epic of "Hell's Angels" film, winning at the National Air Races and of his perfection of the only successful flying automobile. Captures the flavor, excitement, glory and heartbreak of American aviation 1910-1944. 300 photos, 502 pgs., 6" x 9", sfbd. 1440B **$18.95**

BEECHCRAFT STAGGERWING TO STARSHIP. Ed Phillips. Staggerwing, Twin Beech, Bonanza ... every production and experimental Beech airplane ever flown is documented. Complete warbird coverage of UC-43, GB-1, AT-7, AT-11, C-45, the mighty XA-38 Grizzly. Postwar years including Model 35 Bonanza, Travel Air, military and export models, T-34 Mentors, Barons, Dukes and the legendary King Airs; they're all here plus much, much more. 245 photos, 343-view drawings, technical specifications. 96 pages, 8½" x 11", sfbd. 2012A **$14.95**

THE PIPER CLASSICS. Christy. The fun "Cubs"—simple tube and fabric aircraft. Discusses the evolution of Piper lightplanes—J-3 Cub, J-4 Coupes, J-5 Cruiser, PA-11, PA-18, Vagabonds, Colts, Pacer/Tri-Pacer, even Wag-Aero's CUBy. Also covers, problems, SPECS, rebuilding, maintaining and operating. 101 illus. 160 pgs. 5" x 8". sfbd. 4208B **$13.95**

CESSNA 150 and 172. Clarke. A buyers guide 1141A **$11.95**

CESSNA 172. Clarke. A buyers guide 1140A **$12.95**

THE PIPER INDIANS. Clarke. A model-by-model inspection of the series: the original PA-28 Cherokees - the improved Indians; Warriors, Archer, Dakota - the retractables; PA-24 Comanches, PA-28R Arrows - the hard working sixes, and the Tomahawks, Apaches. Covers where to find, maintenance, specs, refurbishing, and ... all of those ADs and STCs and modifications. 112 photos, 288 pgs., 7" x 10". sfbd. 4213B **$16.95**

WINGS OF CESSNA: MODEL 120 TO THE CITATION III. Ed Phillips. The complete family of Cessna airplanes from the rag-wing 120 to the high-tech Citation III. Experimental ships, one-of-a-kind, the CH-1 helicopter and military models, every one documented with technical changes by model year, specs, performance, total built and serial number data. 229 photos of airplanes and instrument panels plus more than 50 detailed 3-view drawings make this a valuable reference for the buff and modeler. 100 pgs., sfbd. 2011A **$12.95**

CURTISS 1907-1947. Bowers. Complete history of Glenn Curtiss and his companies. Model by model coverage with clear crisp factory photos, historical detail and full specs. Covers early experiments by Glenn Curtiss and exhibition tours. From early flying boats, June Bug, NC-4, Jenny, Hawk fighters and racers, Robin, Condor to the P-40's, C-46 and jet a/c. Hundreds of photos, 637 pgs., 5½" x 8½", hdbd. 3383C **$34.95**

HALF A WING, THREE ENGINES AND A PRAYER: B-17s Over Germany. O'Neil. Five members of one B-17 crew look back on their entire twenty-five missions over Germany during the crisis period of 1943-44. The crew holds nothing back, as they relate how they saw and reacted to the same terrible events—and how they survived, and an overview of the daylight bombing campaign—is a story which deserves to be retold. 70 photos, 224 pgs., 6" x 9". sfbd. 1084A **$14.95**

JACK NORTHROP AND THE FLYING WING. Coleman. The real story behind the Stealth Bomber. (The new B-2 is based on technology developed by Jack Northrop some 40 years ago.) A story of intrigue, sabotage, collusion—written by one of Northrop's close associates. First hand account of the obstacles, personalities, government interference, the confrontation with Convair, and the grit of this most visionary of pioneers. 83 photos, 284 pgs., 6¼" x 9¼" hdbd. 4450A **$24.95**

THE B-1 BOMBER. Holder. The updated story of America's most controversial aircraft to date. History, design details, technological breakthroughs, political upheaval, weapons, terrain-following flight profile and all aspects of its flight testing, production, deployment, plus a look into the future. 125 excellent photos, 11 in color. 102 pgs., 7½" x 9¼". Sfbd. 1035A **$10.95**

LOCKHEED U2R/TR-1: Minigraph 28. Miller & Pocock. Detailed account of this second generation U-2 family. Covers all facets, including flight test, development, and operational service and NASA usage. Forty pages of facts, figures, line drawings, over 200 photos, 8 page gatefold, 4 pages color. 8½" x 11", sfbd. 3264A **$9.95**

TOP GUN, THE STORY BEHIND THE STORY. Watch America's real Top Gun pilots in action over Libya, the Indian Ocean and off the Soviet Union ... in actual dogfights, crashes and MIG confrontations. Listen in on actual air-to-air radio conversation and feel what it's like to fly twice the speed of sound. 35 minutes. V8761 **$14.98**

STRIKING BACK. A video of the famous Ida Grove radio-controlled model airshow. The show is a very real and intense re-creation of South Pacific war action portraying the human struggle to evict Japanese from the islands. Using 1/5th scale aircraft, ships and tanks, the spectacular event includes air battles, sinking ships, paratroops and mucho machinegun fire, exploding flak and giant pyrotechnics. 30 minutes V8764 **$14.98**

GIANTS OF LOCKHEED. Nearly a half hour of exquisite ground and aerial views of the incredible SR-71 Blackbird. Scene after scene shows off this triple sonic, turbo-ramjet powered aircraft, built two decades ago. The next segment portrays the C-130 in all its glory. Then witness the awesome abilities of the C-141 Starlifter and the mighty C-5 Galaxy as they power their way across continents with massive loads. All color, 70 minutes. VHS V8766E **$32.95**

FALCON DOMAIN. The F-16 FIGHTING FALCON, the Air Forces' new air defense fighter and the Navy's new "TOP GUN" aggressor aircraft are featured in this indepth 90 minute feature. You're in the cockpit during breathtaking low level attacks and 9-G dogfighting. You'll fly with the world famous "Thunderbirds" as they do their performance to music. (Color HI-FI, 90 minute) V8728D **$59.95**

THE AIRSHOW. The most spectacular performances of the US Blue Angels, Italian Freece Tricolori, Canadian Snowbirds plus the Brazilian and French national aerobatic teams as the perform at the Canadian Abbottsford International Airshow. Take your seat in the cockpit of the world's fastest and sexiest aircraft as they swoop and soar wingtip to wingtip. Witness exhibitions of the Harrier, Tomcat, Hornet, Concorde and SR-71 Blackbird. 60 min. A REVIEWER'S CHOICE. ..... VHS V8979N **only $19.95**

Pilot Manuals

P-38	1401B	$6.95	B-26	1411B	$12.95
P-39	1402B	$6.95	F-4U	1412B	$7.95
P-40	1403B	$6.95	F-6F	1413B	$7.95
P-47	1404B	$6.95	FM-2	1414B	$10.95
		$9.95	AT-6	1415B	$7.95
P-61	1405B	$7.95	Spitfire	1416B	$3.95
P-63	1406B	$7.95	Hurricane	1417B	$3.95
P-82	1407B	$7.95	Mosquito	1418B	$3.95
B-17	1408B	$8.95	Me262	1419B	$7.95
B-24	1409B	$10.95	F-80	1420B	$7.95
B-25	1410B	$10.95	B-29	1436B	$10.95

U.S. NAVY AIRCRAFT 1921-1941
U.S. MARINE CORPS AIRCRAFT 1914-1959. Larkin. Now back-in-print after 30 years, Larkin's illustrated surveys of Navy and Marine corps aircraft remain two of the most valuable books ever published about these airplanes. More than 1,000 rare photographs chronologically presents detailed descriptions of the aircraft of this period. Both books now printed as a single volume. 612 pgs., 6" x 9", hdbd. 3491C **$27.50**

U.S. AIR FORCE AGGRESSOR SQUADRONS: C & M Vol. 11. Kinzey and Leader. Aggressor pilots-based at Nellis AFB, Nevada; Clark AFB, Philippines; and Alconbury, England—fly Soviet tactics against other Air Force pilots to provide realistic air combat training. Aircraft including T-38s and F-5s, are painted in schemes used by Soviet Union and Warsaw Pack. More than 50 full color and 100 black and white photos, plus official AF drawings depicting camouflage patterns. 64 pgs., 8½" x 11", sfbd. 1154A **$11.95**

MCDONNELL DOUGLAS AIRCRAFT SINCE 1920. Francillon. Discusses the great aircraft from the two manufacturers, such as the World Cruisers, the DC-1, 2 and 3 series, the wartime ships such as the Devastator, the SBD, and the post-war series of DC aircraft, including the Skyhawk and Skyray. Each type described in minute detail with three-view drawing. 480 photos. 640 pgs., 5½" x 8½", hdbd. 3384C **$39.95**

THE MARTIN B-26 MARAUDER. Havener. A controversial aircraft, difficult to fly, with no safety margin, but rugged and heavily armed. Covers the design, testing, its near-cancellation by critics and its outstanding combat history. The author flew more than 50 missions in the "widow-maker," details aerial battles, accompanied by 150 outstanding, never-before-published photos. 264 pgs., 6" x 9". Sfbd. 1079A **$16.95**

BELL AH-1 COBRA VARIANTS. Peoples. Completely describes all variants from mock-up studies to the latest AH-1Ws. Historical coverage, flight test programs and operational aspects is detailed. 250 photos, most never-before-published. 35,000 words of text, side-view line drawings, camoflage schemes, and a modeler's haven of intimate detail. 64 pgs., 8½" x 11", sfbd. 3261C **$12.95**

THE C-130 HERCULES. McGowan. Tactical airlift missions 1956-1975. The C-130 is recognized as the outstanding airlifter of all time. The author, a C-130 veteran, describes the important Vietnam missions ... the resupply of Khe Sanh, evacuation of Kham Duc, C-130 bombers, flare missions and other special missions. A must for Herky buffs. 116 photos, 288 pgs., 6" x 9" 4298A **$15.95**

HORNET. Drendel. The story of the Navy and Marine Corps' newest Fighter/Attack aircraft from design, development and service. With 130 B&E photos, 18 paintings, two 11x16 double page pull-outs of 1/72 scale drawings, and his own experiences in the F/A-18, Drendel has packed 64 with the Hornet mystique. 4110A **$6.95**

F-8 CRUSADER, D&S #31. Kinzey. Vought's F-8 was flown by the U.S. Navy and Marines throughout the Vietnam war. Covers all fighter and reconnaissance versions. Lots of never-before-published photos of cockpit, camera bays, landing gear, engines, armament, and variable-incidence wing. Modelers section gives kit reviews, decals, etc. 223 photos, many in color, plus 3-view drawings. 72 pgs., 8½" x 11". sfbd. 1157A **$9.95**

NEW! Detail & Scale Series
Vol. 32-A-4 SKYHAWK (U.S. Navy and Marine Versions) 1158A **$9.95**
Vol. 30-F4F WILDCAT (All F4F, FM-1 & FM-2 Versions) 1156A **$9.95**
Vol. 4-F-111 AARDVARK (Revised 2nd edition) 1044A **$9.95**

T-28 TROJAN IN ACTION. Adcock. T-28 was the first post-war trainer and served both USAF and USN in training roles. Covers design and development of T-28A, B, C and D. Over 110 photos, 70 detail drawings, 13 full-color paintings. 50 pgs. 11" x 8½", sfbd. 4117A **$6.95**

NEW! In Action Series—
SUKHOI FITTER IN ACTION ... 4118A **$6.95**
CH-47 CHINOOK (April Release) 4119A **$6.95**

MODEL BUILDER

AUGUST 1989

volume 19, number 210

898 West Sixteenth St., Newport Beach, California 92663 Phone (714) 645-8830

CONTENTS

FEATURES

THREE-VIEW

CONSTRUCTION

COVER: The "Jeep" was designed, built and flown by Art Chester; he had flown other aircraft in competition earlier, but first brought the Jeep to the National Air Races in 1933. Modified somewhat, and wearing an entirely new paint job, the Jeep appeared as shown on the cover during the 1936 season. As portrayed, the airplane is just rolling into the turn around a back course pylon on the National Air Race course at Mines Field in Los Angeles. Pressed hard during this turn, Art Chester was in fact beaten by a very narrow margin in several limited displacement classes by Harold Neumann in the Folkerts SK-2 "Toots."

Custom photo prints of this painting will be made available; for information please call or write Robert A. Benjamin Aviation Art, 1222 26th Ave. NE, Olympia, WA 98506, (206)352-2602.

MODEL BUILDER (ISSN 0194 7079) is published monthly by RCMB INC., 898 West 16th St., Newport Beach, California 92663. Phone (714) 645-8830.

Subscriptions: $25.00 per year, $47.00 for two years. Single copies $2.95. Subscriptions outside the US (except APO & FPO) $38.00 for one year only. All payments must be in US funds, drawn on a US bank.

Change of address notices must be received six weeks before date of issue that new address takes effect. Send old address with new. . . old label preferred. Duplicate issues cannot be sent. Postmaster send address changes to Model Builder, 898 W. 16th St., Newport Beach, California 92663.

Second class postage paid at Newport Beach, California, and additional offices.

TWO CHARGERS IN ONE.

5 YEAR WARRANTY*

New! **PRO CHARGE**

DESIGNED & BUILT IN THE USA

- ONE FULL-TIME TRICKLE OUTPUT
- ONE TRICKLE, FAST CHARGE, DISCHARGE OUTPUT
- TIMED DISCHARGE
- AUTOMATIC TRICKLE CHARGE AFTER DISCHARGE
- AUTOMATIC TRICKLE CHARGE AFTER FAST CHARGE
- STRONG VINYL CLAD ALUMINUM CASE
- INDICATOR LIGHT FOR POWER INPUT
- ONE INDICATOR LIGHT FOR EACH POWER OUTPUT
- SIX TO TEN CELL CHARGING CAPACITY
- ACCEPTS EITHER 110VAC OR 12VDC POWER INPUT
- VOLTMETER LEAD CONNECTION JACKS
- FUSE PROTECTED OUTPUT FOR PROTECTION FROM POLARITY REVERSING AND SHORTING
- ALL MAJOR COMPONENTS ARE USA MADE

LIGHT YOUR GLOW PLUG IN THE AIR . . .

. . . with our on-board glow assist units.

- REPLACES TRICKY MECHANICAL LINKAGES
- ADJUSTABLE POWER ZONE FROM IDLE UP TO FULL THROTTLE
- E.G.A.S. CAN POWER ONE OR TWO PLUGS
- MULTI CYLINDER GLOW DRIVER CAN POWER ONE TO FIVE PLUGS
- BOTH UNITS HAVE POWER SOURCES SEPARATE FROM FLIGHT PACK
- POWER TO PLUGS CEASE WHEN FLIGHT PACK IS TURNED OFF.

E.G.A.S.
Order #24135

Multi Cylinder Glow Driver
Order #11627

ProCharge model 1020
Order #10155

DEALER INQUIRIES INVITED!

*5 Year limited warranty
DC charging of 10 cells requires the battery to be under charge condition.

WORLD ENGINES INC.

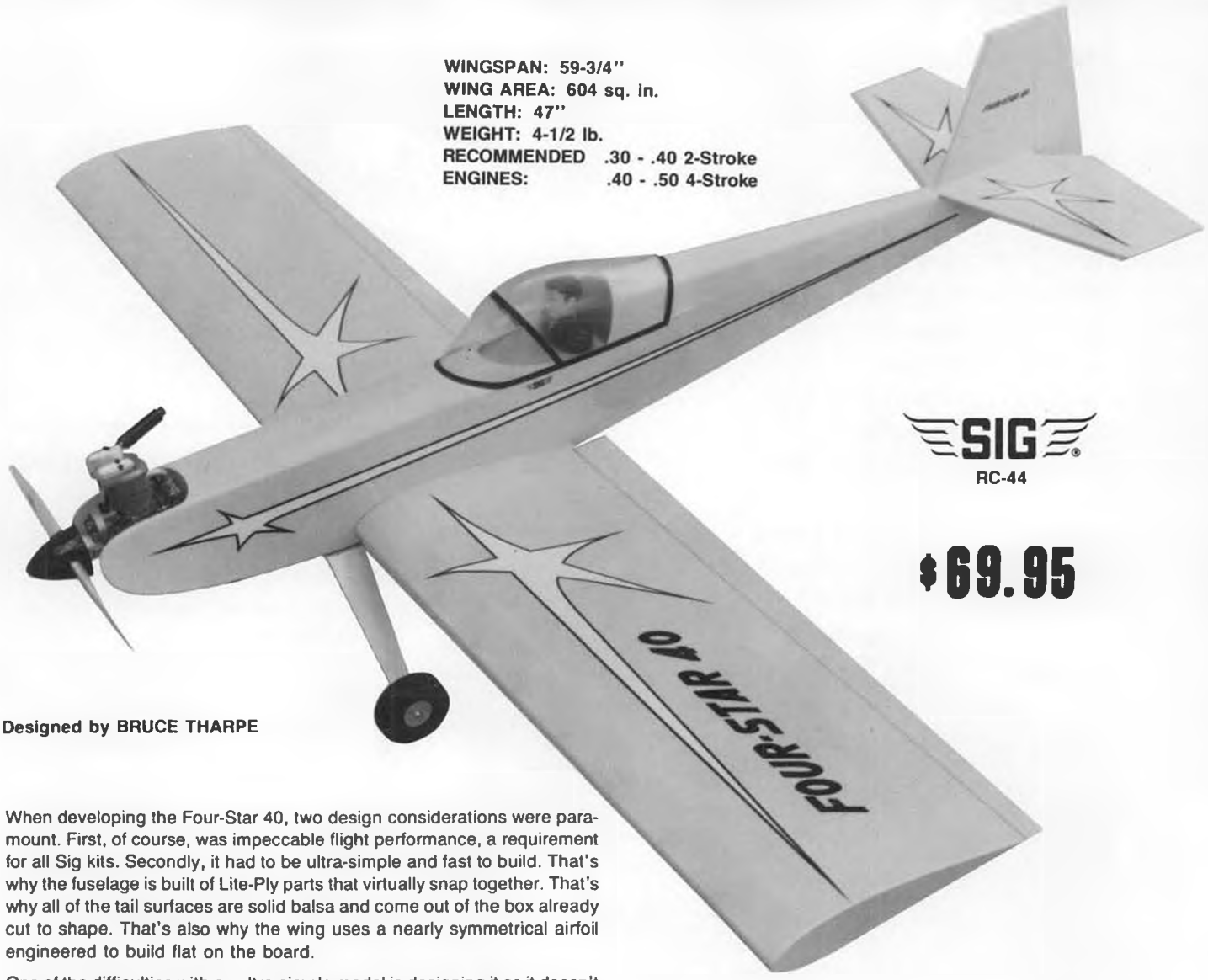
8960 Rossash Road, Cincinnati, Oh 45236
Phone (513) 793-5900 • Fax (513) 793-7337

These products are available exclusively through World Engines' dealers nationwide.

WE THINK YOU WILL GIVE SIG'S NEWEST KIT RELEASE A "★★★★" RATING!

FOUR-STAR 40

WINGSPAN: 59-3/4"
WING AREA: 604 sq. in.
LENGTH: 47"
WEIGHT: 4-1/2 lb.
RECOMMENDED ENGINES: .30 - .40 2-Stroke, .40 - .50 4-Stroke



SIG
RC-44

$69.95

Designed by BRUCE THARPE

When developing the Four-Star 40, two design considerations were paramount. First, of course, was impeccable flight performance, a requirement for all Sig kits. Secondly, it had to be ultra-simple and fast to build. That's why the fuselage is built of Lite-Ply parts that virtually snap together. That's why all of the tail surfaces are solid balsa and come out of the box already cut to shape. That's also why the wing uses a nearly symmetrical airfoil engineered to build flat on the board.

One of the difficulties with an ultra-simple model is designing it so it doesn't look like a "box with wings". The Four-Star 40 uses a curvatious canopy and simple turtledeck stringers to give it a modern, aerobatic look. Wheel pants can be added to give it that final touch of class.

The Four-Star 40 is ideally suited for quiet, efficient four-stroke power, but a sport .40 two-stroke will do the job just as well. A quick look at the specs, particularly the wing area and weight, should have most sport pilots on the edge of their seat. From the opening scenes (plans and instruction book) to the final credits (at the flying field), the Four-Star 40 plays like a classic movie. We think you will give it a ★★★★ rating!

STARRING:

- **LITE-PLY FUSELAGE CONSTRUCTION**
- **DURABLE ALUMINUM MAIN LANDING GEAR**
- **STYLISH MOLDED CANOPY**
- **COMPLETE HARDWARE PACKAGE**
- **PRE-CUT BALSA TAIL SURFACES**
- **LARGE DECAL SHEET**
- **FAMOUS SIG EASY HINGES**

See your dealer first! If not available, call 800-247-5008 toll free for orders only.
For domestic orders under $15 add $2.50 pstg. Over $15 ppd. Latest Catalog - $3.00

VISA MasterCard

SIG MANUFACTURING CO., ... Montezuma, IA 50171

INVITATIONAL TOURNAMENT

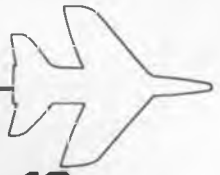
TOP GUN 1

CORAL SPRINGS, FLORIDA

Top Gun Invitational Tournament

1989

at Coral Springs, Florida was a complete success.



Congratulations to *all* who participated with special recognition of the following top 10:

- ★ Bob Fiorenze
- ★ Neil Snodgrass
- ★ Skip Mast
- ★ Cliff Tacie
- ★ Chuck Fuller
- ★ Dick Hansen
- ★ Charlie Nelson
- ★ Bob Frey
- ★ Bob Violett
- ★ Jeff Foley

And a special thanks to all who helped, especially:

Air Age Magazine
Robart Manufacturing
RAM Electronics
Nick Ziroli
R / C Report Magazine
Cox Hobbies
A.M.A.
R / C Condors of Coral Springs
Pacer Technology
Frank Tiano Enterprises
Bob Violett Models
Coverite
Scale Planes Service
Scale Model Research
Airtronics
Coral Springs Jaycees
Loctite
McDaniel R / C
Futaba
Hanger One
Safety Plus
J-Tec
Hobby Shack
R / C Video Magazine

Expanded to four days

1990 is offering 10 entries for team scale as well
Write FTE for details.

See you in 1990!

FTE
FRANK TIANO ENTERPRISES

2460 Southwest 85th Terrace
Davie, Florida 33324

Nationally Televised

Westin Hotel Lowers Rates

Let's Clear The

What Does 1991 Mean?

The Federal Communications Commission authorized 50 channels, spaced 20 KHz apart, for model aircraft radio control operation effective December 20, 1982.

The Academy of Model Aeronautics developed a Phase-In Plan for the new channels which was put into effect January 1, 1983.

All the current numbered channels are spaced 40 KHz apart to allow most of the older radio systems to operate. On January 1, 1991, the remaining channels will be phased-in at the 20 KHz channel spacing as directed by the F.C.C. authorization.

What Are The AMA Guidelines?

The AMA Guidelines for R/C transmitters require that the occupied spectrum shall be better than −55 db at +/− 20 KHz from channel center frequency.

The AMA Guidelines for Receivers require the following criteria:

Proper Operation:
Greater than 10 db signal to noise ratio at detection

Adjacent Channel Rejection:
−60 db or better at +/− 8.5 KHz

Image Rejection:
Greater than −60 db at image frequency

3rd Order Intercept Point:
better than −4 dbm at output of first mixer

Intermodulation Spurious Response:
No loss or spurious response in decoded servo output greater than +/− 20 micro secs when subject to single and two signal radiation as specified

How Do You Know If The R/C System You Buy Is 1991 Qualified?

Before you buy a new R/C system always compare the technical specifications to make sure it totally meets the AMA Technical Guidelines for receiver and transmitter.

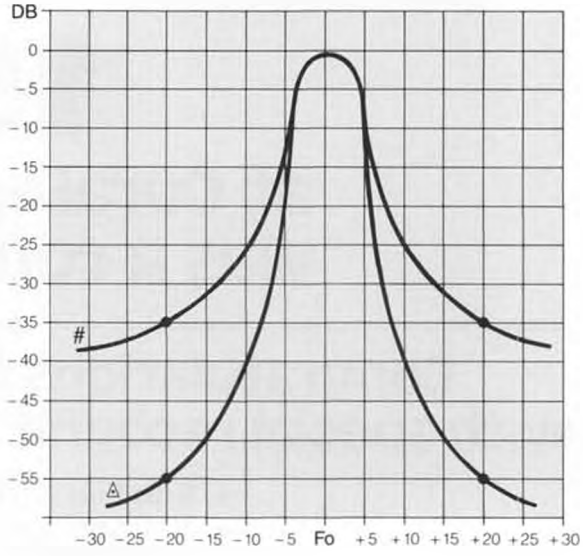
Primary things to consider when evaluating an R/C receiver are:

(1) The receiver bandwidth
(2) Image frequency rejection
(3) 3rd order intermodulation product rejection.

Many R/C receivers currently in use have an excessively wide receiver bandwidth at −30 db of 20 to 25 KHz. They also have a 3rd order intercept point of from −8 to −12 dbm or worse, and an Image Response of 0 db. (Refer to Receiver Bandwidth Graphic)

These receivers are extremely vulnerable to interference from any land mobile or pager transmitters operating 10 KHz away from R/C model transmitters in close proximity. The advent of more commercial transmitters and resultant potential interference makes it imperative that R/C model receivers meet or exceed the technical guidelines set by the AMA.

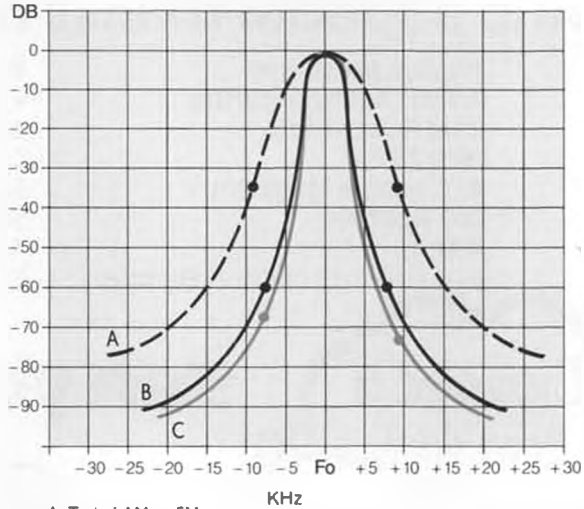
Transmitter Bandwidth Plot



Bandwidth currently required by title 47, FCC regulations

△ AMA technical guidelines requirements, −55db at ±20 KHz

Receiver Bandwidth Plots



— — A. Typical AM or FM single conversion receiver bandwidth.

—— B. AMA technical guidelines receiver bandwidth specification.

—— C. Typical Airtronics super narrow band FM and PCM receiver bandwidth plot.

Air About 1991.

Why Is There So Much Confusion About 1991 Compatibility?

Many R/C manufacturers and importers are making extraordinary claims about their R/C receivers with no substantiating facts to back them up. Most of their highly advertised receivers *do not even meet* the AMA Guidelines requirements!

Nowhere in most receiver advertisements is there mention of actual laboratory test measurements for 3rd Order Intercept Point or other receiver characteristics necessary to fly interference-free at 20 KHz channel spacing.

Many radio control manufacturers and importers are confusing modelers by omitting important facts about their products.

What Happens If I Buy R/C Equipment That Doesn't Meet 1991 Guidelines?

All R/C channels are exclusive frequencies for control of model aircraft on the 72 MHz band. However, there are instances where commercial land mobile or pager transmitters can be as close as 10 KHz to one of our exclusive R/C channels, which potentially can cause R/C interference.

Interference can also be caused by modelers with equipment that doesn't meet minimal F.C.C. transmitter bandwidth specifications. A transmitter with excessive bandwidth can splatter and cause interference to legal R/C units operating in close proximity.
(See Transmitter Bandwidth Graphic)

Important Facts About Airtronics R/C Systems.

Fact #1: Airtronics FM And PCM Aircraft R/C Systems Meet Or Exceed Every AMA 1991 Guideline.

Airtronics 1991 R/C systems are certified gold. Our advanced FM and PCM transmitters and compatible Gold Label Super Narrow Band Dual Conversion receivers have been independently tested and certified as meeting and exceeding all the AMA guidelines and specifications for 1991 narrow band R/C operation.

Fact #2: Airtronics Has The Proof To Back Up Our Claims.

In certified independent tests, Airtronics FM and PCM Gold Label Super Narrow Band Dual Conversion Receivers meet or exceed all AMA and RCMA specifications and guidelines for R/C operation in 1991 and beyond.

Specifications: Airtronics FM and PCM Gold Label Super Narrow Band Dual Conversion Receivers

Receiver:	92965 92785 92985	92765	AMA Guidelines and Measurements
Adjacent Channel Rejection:	Better than – 69.4 db @ + 8.5 KHz – 77.3 db @ – 8.5 KHz	Better than – 81.3 db @ + 8.5 KHz – 69.2 db @ – 8.5 KHz	– 60 db or better @ + 8.5 KHz – 60 db @ – 8.5 KHz
Image Rejection:	– 67.1 db	– 70.8 db	Greater than – 60 db @ Image Frequency
3rd OIP:	+ 5.9 dbm	+ 3.8 dbm	Better than – 4 dbm

Fact #3: Airtronics Offers Complete R/C System Conversions And Upgrades.

We 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. After we convert your unit to narrow band FM it fully meets all FCC type acceptance criteria.

Airtronics is the only major manufacturer currently providing comprehensive R/C system conversions at an economical price. We offer modelers an affordable alternative to expensive product replacement and obsolescence.

Fact #4: Airtronics Is Honestly Meeting The Challenge Of 1991.

Airtronics incorporates the same compatible 1991 technology in our R/C systems from our lowest priced FM to our highest priced PCM.

Our high quality FM and PCM transmitters and Gold Label Super Narrow Band Dual Conversion receivers will give you superior R/C operational capabilities in 1991 and beyond.

We think it's time to clear the air and face the facts. Airtronics challenges all other R/C manufacturers and importers to help end the confusion about 1991.

We Set The Standard.

SUPER NARROW BAND 1991 CERTIFIED

AIRTRONICS® INC

11 Autry, Irvine, CA 92718 (714) 830-8769

FREE SHIPPING

BLACK BARON OPAQ. *$5.69/ roll*

FREE SHIPPING

$19.95 GLOBEE FIREPLUG & CHARGER

NORTHWEST Hobby Supply

Premier Competition Hobby Shop

A Division of Hobby Town Inc.

Pylon Racing Specialty Outlet

ENGINES

	SALE PRICE!!
ENYA	
.21 CX W/M	$66.95
.40 CX W/M	96.95
.45 CX W/M	103.95
GP .45 CX /PUMP	$149.95
.60 XF W/M	121.95
GP .60 XF/PUMP (SE)	$199.95
GP .60 XLF/PUMP (RE)	$204.95
SS25 BB W/M	$63.95
SS30 BB W/M	71.95
SS40 BB W/M	81.95
SS45 RING W/M	93.95
.46 4 CYCLE	$164.95
.53 4 CYCLE	$176.95
.60 4 CYCLE	183.95
.80 4 CYCLE	204.95
.90 4 CYCLE	239.95
R-120 4 CYCLE	289.95
GP R-120 4 CYCLE/PUMP	$319.95
VT-240 4 CYCLE TWIN	659.95
FOX MANUFACTURING	
.19 RC BB	$54.95
.40 RC BB W/M	61.95
.40 RC BB DELUXE	75.95
.50 RC BB	89.95
.15 SCHNL BB CL	$33.95
.19 CL	33.95
.35 STUNT ANN. EDITION	$42.95
.40 CL STANDARD	47.95
.40 CL BB DELUXE	61.95
K & B	
.20 SPORTSER	$37.50
.40 RC W/M	62.95
.45 SPORTSER	49.95
.61 RC W/M	74.95
.65 SPORTSER	59.95
O.S. MAX	
.15 FP RC	$49.95
.25 FP RC	54.95
.35 FP RC	57.95
.40 FP RC	58.95
.40 SF ABC	$115.95
.46 SF ABC	119.95
.61 SF ABC	169.95
.61 RF ABC	$162.95
.32 F (NEW)	$99.95
.50 FSR W/M	129.95
.91 FSR W/M	209.95
.15 FP-S W/M	45.95
.25 FP-S W/M	51.95
.35 FP-S W/M	54.95
.40 FP-S W/M	55.95
.40 VR-P ABC PYLON	$117.95
FS-26 SURPASS	$124.95
FS-48 SURPASS	174.95
FS-70 SURPASS	209.95
FS-91 SURPASS	229.95
FS-120 SURPASS(PUMP)	314.95
ROSSI	
ROSSI 40 ABC W/M	123.95
SUPERTIGRE	
G40 SPORT	$72.95
G49 SPORT	77.95
S40 ABC W/M	92.95
S45 ABC W/M	94.95
S61 ABC W/M	127.95

ENGINES

	SALE PRICE!!
SAITO	
FA 50	152.95
FA 80	191.50
FA 270	629.50
WEBRA	
.28 SPEED ABC	$76.95
.40 SPEED/SE/ABC	112.95
.40 BLACKHEAD	73.95
.40 SILVERLINE	80.95
.50 SPEED	108.95
.61 BLACKHEAD	86.95
.61 SILVERLINE	87.95
.61 SPEED	140.95
YS/FUTABA	
.45 FS	$127.95
.45 FR	127.95
.60 FS	167.95
.60 FR	167.95
120 FS W/ PUMP	357.95

RADIOS

	SALE PRICE!!
FUTABA	
ATTACK 4 NBL W/3	$109.95
5UA AM W/4	$204.95
5UAF FM W/4	234.95
5UAP PCM W/4 (1024)	$279.95
7UAF FM W/ 4	284.95
7UAP PCM W/4 (1024)	394.95
9VAP PCM (1024) S5101	$689.95
JR RADIOS	
MAX 4 AM W/3	$128.95
MAX 5 FM W/4 STD	193.95
MAX 5 FM W/4 507S	248.95
MAX 6 PCM-PATTERN	$315.95
CENTURY 7 (SS) PATTERN	419.95
CENTURY 7 PCM PATTERN	$329.95
CENTURY 7 FM PATTERN	305.95
GALAXY 8 PCM PATTERN	609.95
PCM 9 (SS) PATTERN	563.95
PCM 9 PATTERN	539.95
PCM 10/10 PATTERN	$769.95

For Immediate Shipment:
CALL:
1-800-541-0645
(National Watts, Incl. WA)
Info and Local Residents:
(206) 531-8111

HOURS:
Mon - Fri 10:00 to 7:00
Saturday 10:00 to 6:00
Sunday 12:00 to 5:00
(Pacific Standard Time)

Mail Checks and Money Orders To:

NORTHWEST HOBBY SUPPLY
P.O. BOX 44577
TACOMA, WA 98444

KITS

	SALE PRICE!!
ASTROFLIGHT	
PORTERFIELD	$47.95
VIKING OLD TIMER	29.95
DURACRAFT	
DURAPLANE II	$46.95
DURAPLANE ARF	67.95
DURABAT (NEW)	$58.95
DYNAFLITE	
P51 MUSTANG (40)	$42.95
P51 MUSTANG (60)	61.95
P-47 SPORTSCALE	99.95
F-4U SPORTSCALE	91.95
E Z (ARF'S)	
F-16 (NEW)	$229.95
SPORTSMAN 25H	112.95
SPORTSMAN 25L	112.95
SPORTSMAN 45H	183.95
SPORTSMAN 45L	183.95
SUPRAFLY 60 (W/RET.)	$739.95
DAGO RED MUSTANG	$269.95
ZERO-ZEN	269.95
P51 MUSTANG	269.95
POCKE WULF	269.95
RENO FORMULA L	$139.95
RENO FORMULA M	$139.95
PITTS S2A	$319.95
BUD LIGHT LASER 1/4SC	$949.95
DIABLO 40	239.95
DIABLO 120	419.95
LASER 200 (40)	239.95
EXTRA 230 (40)	239.95
ELEC 1800 GEARED	169.95
FUTABA	
CHIPMUNK ELEC.	$176.95

GOLDBERG
BEGINNER PACKAGE
includes:
NEW CG 'EAGLE II' TRAINER!
O.S. MAX 40 FP!
FUTABA 4NBL ATTCK W/ 4 SERVOS!!

$$ 239.95 $$

ROYAL	
CORSAIR SR. (60-80)	$152.95
BEARCAT (60-80)	152.95
CHIPMUNK 40 ARF	149.95
STERLING	
PT-17	$89.95
TOP FLITE	
P-39 AIRACOBRA	$76.95
P-47 THUNDERBOLT	91.95
P&F BEARCAT	89.95

ASK ABOUT OUR WEEKLY TELEPHONE SPECIALS!!!

NORTHWEST HOBBY SUPPLY

THE EDGE

Quickie 500 Racer
Holder of the NW Quickie 500 Record!!!

Complete Fiberglas and Foam Kit! All hardware and wood included!!

only
$79.95

D.Frank SPORT 40

BRAND NEW SPORT 40

Wood and Fiberglass Kit that features a complete Hardware Kit!!

only
$299.95

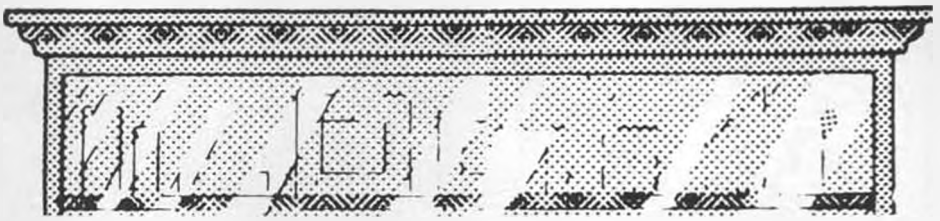
RACING ACCESORIES

PERFORMANCE SPECIALTIES	
FIREWALL MOUNTS FOR:	
OS, ST., K&B AND ROSSI	$15.95
2" ALUMINUM SPINNERS	25.00
2.25" RACING WHEELS	5.95
AXLES / RACING WHEELS	2.70
AIR SHRINK TUBING	2.00
O-RINGS FOR F1 PIPES (10)	5.00
ALUMINUM MOUNTS	
OS VR-P/ST X-40	19.95
SPINNER ADAPT / X-40	2.95
REV-UP PROPS (DOZ.)	28.50
PLASTIC HEMOSTATS	2.00

Payment: Visa, MasterCard, Discover Card, Checks and COD (COD's will be sent *Cash Only!* until an account has been established.
Terms: Please allow 3 to 4 weeks for personal checks and Money Orders, Certified/Bank Checks will be processed immediately. Credit Cards are not charged until we ship your order.
Prices: Prices are valid through July 1989 and are subject to change without notice.
Returns: Authorized returns Only! Returns may be subject to a 15% restocking fee.
Shipping: Minimum shipping charge is $2.50. FREE SHIPPING WITHIN THE CONTINENTAL U.S. WHEN ORDER IS OVER $250.00 (EXCEPT OVERSIZE PACKAGES). COD's please add $3.50 handling charge.
Washington Residents add 7.8% Sales Tax.

OVER THE COUNTER

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



• As our "Chopper Chatter" columnist, James Wang, mentions in his column this month, Kyosho is coming out with three scale fuselage kits for the Concept 30 R/C helicopter, which was the subject of a Products In Use review in our June '89 issue. The three fuselages shown in the accompanying photo are, from left, the Bell Jet Ranger, Hughes 500, and Hughes 300. The stock Concept 30 canopy is shown on the far right for comparison.

These great looking and highly detailed scale bodies are molded from lightweight plastic and can be painted as you see fit. A full set of stick-on decals is included with each kit. The Jet Ranger and Hughes 500 fuselages require a special starter extension shaft and starter cone, which are also available.

No prices were quoted, but you can get this and other pertinent info from Great Planes Model Distributors, P.O. Box 4021, Champaign, Illinois 61820.

* * *

The newest release from Model Rectifier Corporation is the "Flight Command" four-channel R/C system, an inexpensive rig apparently aimed at the sport R/C flier who has no need for all the bells and whistles found on most radios these days. Features on the transmitter include adjustable stick length and tension, and servo reversing on all four channels. Ni-Cd batteries are supplied throughout. Both the transmitter and receiver are designed to meet 1991 specs. Three PK-119 standard servos are normally supplied with the Flight Command system, but you can also get it with PK-130 mini servos, PK-133 high torque servos (coreless motor, ball bearing shaft), or PK-135 contest servos.

Scale fuselage kits for the Kyosho Concept 30, imported by Great Planes Model Distributors.

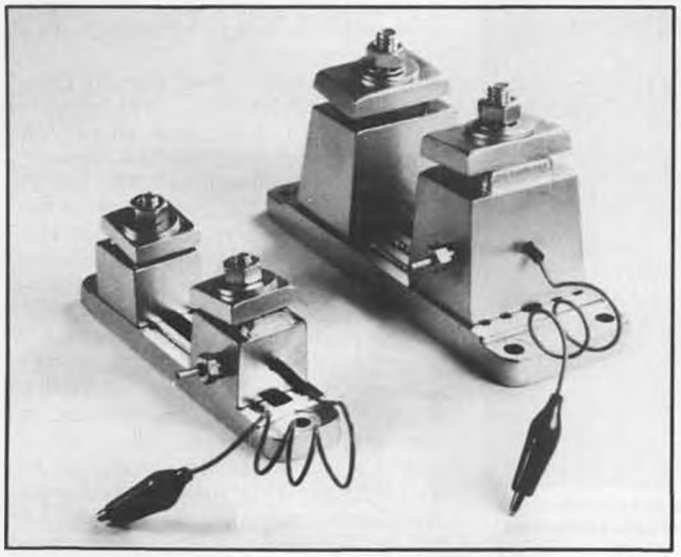
Those modelers with limited budgets would do well to give this system a close look. Check with your dealer or contact MRC directly at 200 Carter Dr., P.O. Box 267, Edison, New Jersey 08818.

* * *

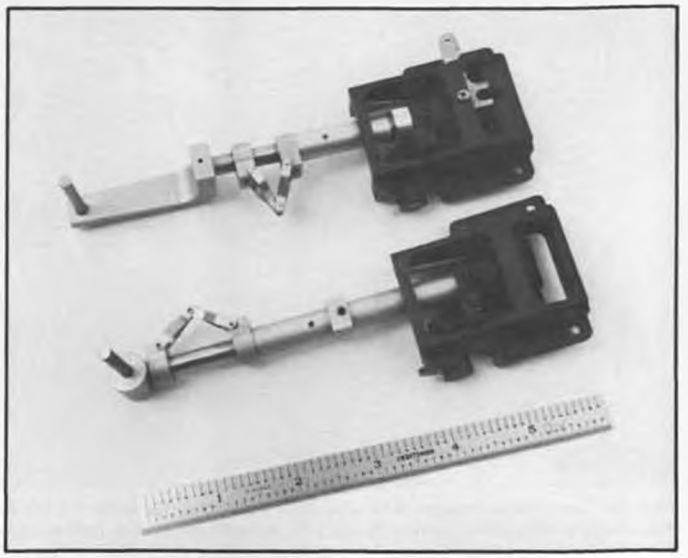
The folks at J'Tec have just introduced what they call "Safe Start" versions of their highly regarded cast aluminum engine test stands. The name comes from the fact that your glow plug starter attaches to a fitting on the back of the stand (check the photo) rather than to the plug itself; a wire lead with an alligator clip attaches to the plug's center electrode to complete the circuit. This way there is no chance whatsoever of having the glow plug starter fall off into the spinning prop—not an uncommon thing

Continued on page 68

"Flight Command" R/C system from MRC.



"Safe Start" engine test stands from J'Tec.



Mechanical retract units offered by Bob Violett Models.

Saturday morning, May 13, at the Second Annual IMS Atlanta R/C Model & Hobby Show was a busy one. Stu Richmond's photo shows some blurred figure movement because of the slow exposure for better depth of field (that's photographer talk).

from Bill Northrop's workbench

• By the time you read this, the 1989 Winter/Spring model show season will have been completed, with the last show, the MARCS, taking place on the weekend of June 3 and 4, in Timmonium, near Baltimore, MD.

The (our) Second Annual IMS Atlanta show was completed just a couple of weeks ago (as of the time this is being written), and was, as expected, much larger than last year's inaugural show. Many more industry folks showed up on their private day, Friday, than had been expected . . . much to everyone's satisfaction. And Saturday, the first public day, looked like a typical Toledo mob scene, even with the extra wide, 10-foot aisles. As for Sunday . . . well, in the good old USA, you just don't try to compete with Apple Pie, Chevrolet (sorry, Ford, it's just an expression), or Mother, and this was Mothers' Day Weekend. Obviously, the show date was not our choice, so we simply had to make the best of it. Incidentally, we had been negotiating with the Georgia World Congress Center for the weekend before Mothers Day for 1990, but the the RCHTA organization anticipated and checkmated us on that one with its just-announced new show in Philadelphia for 1990. Luckily, we were able to have our 1990 Atlanta date switched to the weekend *following* Mothers Day, so plan to join us on May 18, 19, and 20, 1990 (May 18 for industry members only).

We'll have photo and story coverage of the Atlanta show in next month's issue, so we won't try to steal any thunder from that by going into much detail about it now. Just a couple of observations.

Perhaps we one-upped the thankfully small segment of giant scalers who strive for some sort of recognition by having the largest scale model in their block. This year we had a 3/4-scale P-51 on display! Actually ranging somewhere between a homebuilt and an ultra-light, this aircraft constituted a 50 percent increase in the number of man . . . er . . . person carrying aircraft at the Atlanta show from last year. Hazel and Maxey were back with one of their his-n-her matched set of "Spacewalker" homebuilts, and TEAM, INC. displayed a completed Mini-Max ultra-light with added streamlining kit. Fortunately there's always room in Atlanta to display aircraft of this type, and we hope more will join us in the future. The ultra-light aircraft are, for the most part, bigger models, but with the same basic construction methods. It's a natural progression. . . .

It's interesting to note that the P-51, actually called the "5151," which represents the price of the basic kit without powerplant, was designed by a currently active model builder. In fact, Carl Loehle Sr., entered a Peanut Scale model in the Atlanta model display competition, and came away with a trophy! Modelers who date back to at least the early 60's remember Gerry Ritz for his line of gas model propellers and/or that he was a Nordic A/2 World Champion. His "Ritz" wing concept was well known even before that. Well, it so happens that Loehle Aviation, Inc., in Wartrace, TN, was formerly the Ritz Propeller Co. At the time of his death from an ultra-light aircraft accident several years ago, Gerry was manufacturing props for the ultra-light industry, which mostly uses various models of the Rotax engine. Carl

Mike and Carl Loehle brought their ultra-light/homebuilt 3/4-scale P-51 to Atlanta, and it was a real show stopper. Built like a typical model, with wood longeron box frame, ply bulkheads and formers, and wood stringers. Had retracts, Rotax engine, beautiful bubble canopy. They took over the late Gerry Ritz propeller business.

Loehle and son, Mike, have taken over the company, and in addition to the propeller business, are manufacturing the "5151" kits in the former Ritz facilities. Both Wayne Ison of TEAM, and Mike Loehle indicate that they like to participate in the model shows because of the higher percentage of interested and knowledgeable spectators. "They notice the clockwise (left-hand) rotation of the prop and say 'aileron' instead of 'that flap thing on the wing'," Mike said.

There was plenty of activity on the car track this year, primarily because of the efforts of Bolink's Rick Jordan and his wife, Linda. Linda is an experienced car race operator, and was able to coordinate race heats and exhibitor car demonstrations as well. Consequently, spectators saw electric and gas cars, plus gas motorcycles, in live action almost continuously. The boat pond was somewhat less active, as only about three exhibitors were able to run boats and tend to their booths at the same time. It may be different next year. We met with members of the Model Racing Commission of the APBA (American Power Boat Association), who had a booth at the show, and they are planning to design a special small gas powered R/C racing boat just to suit the 32 by 48-foot dimensions of the IMS Atlanta boat pond.

Another feature introduced to the IMS show for the first time this year was The AMA R/C Superstars. This consisted of six of the leading recognized experts in various R/C categories, each provided with a booth, in which they could meet and talk with the attending modelers, offering advice and answering questions concerning their specialty. The group included Brian Agnew (gliders), Horace Hagen (helicopters), Dave Platt (scale), Dave Shadel (pylon racing), AMA President Don Lowe (precision aerobatics), and Keith Shaw (electric power). Considering the late decision to add this feature, and therefore not much advance publicity, it turned out to be popular and will be repeated next year.

Remember the dates for next year, May 18, 19, and 20, 1990, and watch for the photo report coming up next month.

MYSTERY(?) AIRCRAFT

One thing for sure, it isn't necessary to publish something controversial in order to promote letters to our magazine (though that would work too). Frequent scale construction article contributor, Ted Schreyer, sent us an old photo of himself as a youngster, sitting in the cockpit of a racy looking airplane dating back to the 30's, and wanted to know what it was. Taking the easy way out, we published the photo in our June '89 issue and asked our readers to identify the plane.

Actually, the "mystery" was solved before the magazine hit the newsstands, as our *MB* production assistant, Phil Bernhardt, checked his library and easily pinned it down as the Keith Rider R-2 "Bumblebee" as it appeared in 1933. It placed well in 1932-33-34 races and for part of its life, was owned by one George McGrew, the first husband of movie star Jean Harlow.

Continued on page 107

ADVICE FOR THE PROPWORN
—By Jake

Dear Jake:

I fly R/C gliders a lot, and all of my gliders are at least two meters in span. My mom is getting tired of me bringing home such big planes, so she wants me to fly HLG (hand launch gliders).

The problem is, though, that I don't have a micro R/C system, and I need one in order to fly such small gliders.

How can I talk (force) my dad into buying me a micro system for my birthday (I'll be sixteen)?

Bob in Flossmoor, Illinois

Dear Bob:

Well, if plain old pleading and begging don't work, then you might try washing the car, mowing the lawn, or doing other chores around the house to show your dad that you're willing to earn your gift. If that still doesn't work, then start bringing home some of your friends' older sisters and try talking your dad into a new mom. Maybe she'll let you keep the 2-meters.

Jake

* * *

Dear Jake:

What became of the Savoia-Marchetti aviation firm after their heyday in the '20s and '30s?

Aviation History Fan in Azusa

Dear Aviation History Fan:

Savoia-Marchetti split and went on to earn separate fame and fortune in the hotel and salad dressing industries respectively.

Jake

* * *

Dear Jake:

Hello again from your devoted mother.

More bad news, I'm afraid. Your dear Aunt Regina had an accident on the New York State Thruway near Peekskill. No lives were lost, but many vegetables were bruised. The tolltaker has recovered and at last report was not planning to file suit.

You remember Aunt Regina, I'm sure. She was the prettier of the two Meidock sisters. You know, the one with the tungsten teeth. Her Volvo will be in the shop for a week, and her hair will be under repair for an extended period.

The rest of the family is fine and everyone sends their love, except of course, those who remember you. Please write soon, and use big letters. You know how your father likes to read over my shoulder.

Love, Mom

Dear Mother Doe:

Sorry to hear about Aunt Regina's motoring mishap. I'll light a candle for her Volvo. Wasn't she the one who divorced Uncle Erasmus when she found out he wasn't her only husband?

Your Son, Jake

* * *

Dear Jake:

What is a turbulent boundary layer? I've heard that they can cause a lot of drag.

Student in Steubenville

Dear Student:

A turbulent boundary layer is a hot-head who builds border fences out of brick. If you run into one of his boundaries on a snowmobile, it can be a real drag.

Jake

* * *

Dear Jake:

Well, where is it? You keep promising us a Dear Jake book, but it never happens. If a lard-butt cat like Garfield and a lard-butt penguin like Opus can have their own books, then a lard-butt like you ought to be able to get a collection of Dear Jake letters published. How about it?

Avid Reader in Allentown, PA

Dear Avid Reader:

It's not as easy as all that. Opus and Garfield had to break into the lunchbox and T-shirt markets before their books were approved. Glassware giveaways at major fast food franchises also propelled both of their careers. Along those lines, and to do a little advance promoting of my book, I've been trying to convince McDonald's to hand out rub-off game pieces with either a Dear Jake answer or a Dear Jake question on them. Collecting a matching question and answer would win a valuable prize such as a Big Mac, a large drink, or a Yugo.

McDonald's is balking at the idea, claim-

Continued on page 72

BIG BIRDS

By AL ALMAN

ARAMID CABLE

Like so any others, I've used Berkley Steelon nylon coated leader material for bracing, rigging and control cables. It's easy to work with, comes in many different sizes and strengths, and swages permanently when the proper sized leader sleeve is used.

I've been careful to route my receiver antenna away from servos and bundles of wires, and use some sort of noise trap or glitch-buster on long servo leads, and I've been lucky not to have had any "funnies" crop up due to those steel cables being strung out all over the plane.

Well, I still string out cables . . . and I still carefully route the antenna away from those nasty, noisy servo motors and wire bundles . . . and I still use some sort of noise trap or glitch-buster for added insurance against glitches . . . *but I don't use steel cables anymore.*

I know what you're probably thinking, that anything other than steel stretches and can't be used in airplanes. Well, I used to think that too—until I got around to trying Jomar's Aramid Rigging Cable. This is some stuff.

Aramid is made of Kevlar 29 and it's nonmetallic, non-carbon and non-stretch. It's rated at 180 pounds strength, has 29 braids per inch for a round cross-section, and is dyed black and coated with clear urethane for good ultraviolet ray protection. Yeah, you're right about the price—it does cost a bit more, but is one helluva lot less than replacing an aircraft that's crashed because of interference.

Here he is, folks, the only other real Al Alman. It's Al's cousin Al, shown here with his *really* big bird, a Beechcraft twin. This Al flies R/C, too.

What Jomar's Joe Utasi has to say about cables makes sense:

"One of the problems that has started cropping up with the use of stranded steel and music wire for bracing, rigging and control cables is interference with the radio control system's receiver antenna. In radio theory these extra wires constitute what are called 'directors' and 'reflectors,' which can either reinforce or destroy the signal reaching the receiver antenna. Naturally this is not a desirable situation and should be avoided if at all possible.

"The Jomar Aramid Rigging/Control Cable can completely eliminate the chance of radio interference caused by metallic cables or bracing. The primary ingredient in the Aramid mix is Kevlar 29, which is formulated specifically for ropes and cables. It has five times the tensile strength of steel and actually has less 'creep' or stretching.

"Normal elongation under a 50 pound load is less than one percent, and after this initial pre-stress the cable will no longer grow in length and will continue to maintain any given tension. The Jomar cable is designed for a break strength of 200 pounds, more than adequate for model control or rigging use.

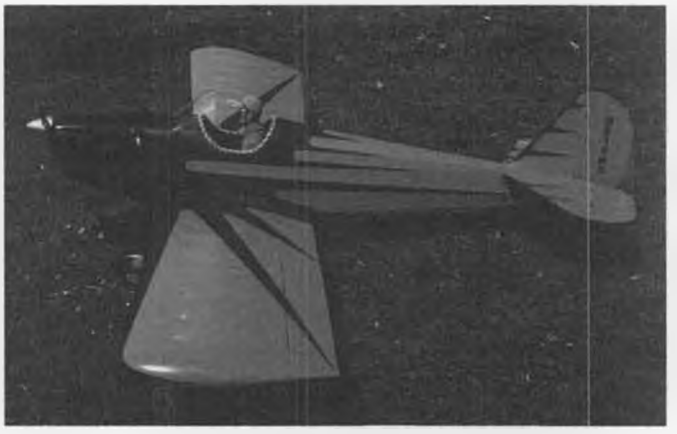
"It is coated with a urethane polymer to prevent degradation from ultraviolet rays. It is impervious to most paints and solvents except for strong mineral acids and alkalies. The Jomar cable is stable over a temperature range of from minus 320 degrees to plus 400 degrees F.

"Though a bit difficult to cut, the trick here is to put the cable in tension while cutting it. It would be wise to use either a new #11 blade or an old pair of sidecutters. The cable is *tough* and will quickly dull a pair of miniature sidecutters.

"The most important factor in installing the cable is the termination, or how you connect the end. Yes, you can just tie the end in a knot, but this will probably reduce the break strength to 50% or less of the maximum rating because of the weak spot that is created.

"One way to fasten the cable is to use a standard 2-56 threaded Kwik-Link. Pass the cable through the Kwik-Link, tie a few knots as a 'safety' retainer, pull the cable back until the knot is 'bottomed-out' and the cable is under some tension, and then fill the threaded area of the Kwik-Link with

Thanks to AMA's hospitality, the IMAA was able to hold its semi-annual board meeting at AMA Headquarters in Reston, Virginia.



Bill Johnson says his Sig Spacewalker flies like a dream at 20 pounds and with Zenoah G-38 power. Gorgeous building job.

AMA Headquarters is quite an interesting place. They have their own mini-museum there, although these photos show just a small part of the models on display.

some thick CA glue and catalyze it with kicker or equivalent accelerator.

"A better way to fasten the cable ends, which allows some adjustability, is to use Du-Bro threaded couplers which come in a variety of sizes. Again, using a thick or slow curing CA glue, completely 'pot' or fill the hollow end of the coupler so as to completely capture the free end of the cable. Tests have shown this connection, when properly cured, to retain the full strength of the cable.

"The cyclic loading from winds and vibrations generate significant tension-tension cyclic conditions that will break down steels. Kevlar cable will outlast steel cables both in operating over sheaves (pulleys) and in the tension modes (rigging).

"The cable can be used over pulleys as small as 3/4-inch diameter and still retain full strength without the fear of abrasion or wear from the flexing Aramid fibers."

Joe has been using Aramid cable glued inside of threaded couplers in his big Nosen Cessna Twin for years with nary a problem—and it wasn't that I didn't believe him, it's just that I had to check it out for myself.

So the first thing I did after receiving my Aramid was to glue one end into a coupler and, after waiting 24 hours, give it a no-holds-barred pull and yank test. Gotta admit that since I'm now a mere shadow of my former self (fifty pounds lighter) I could only give it a 200-pound test . . . but the connection held fast, no matter how I muscled it. My only trouble was finding the patience to wait the 24 hours for a proper cure before trying to tear it loose.

There's no doubt that Aramid cable delivers 100% and is easily worth the extra cost. I especially like the neat, unobtrusive installation that eliminates ugly crimping or swaging. My first all-cable control system in a 90-inch Fokker D-VIII will have clevises (with keepers, of course) at both ends, with the adjustable coupler at the control surfaces.

How do you get your cable or more info? Write or call Jomar Products, 2028 Knightsbridge Drive, Cincinnati, Ohio 45244, (513)474-0985. It's $10 for 20 feet, plus a couple of bucks for packing and shipping.

THE BUDDY SYSTEM

Guess it was about twenty years ago that the buddy-box was introduced to the R/C world. I thought it was a great idea then, and I still feel that way.

This concept certainly made learning easier and far less stressful for the beginner and was equally beneficial for the instructor, mainly because he no longer had to hover over the already nervous student, knowing that sooner than later he'd have to grab the transmitter from the shaky neophyte's hands in order to save the airplane.

With a buddy-box setup, instructing became a real pleasure. Just by pressing or releasing a spring-loaded button on his transmitter the instructor could instantly transfer control back and forth with no strain or pain or yelling or screaming . . . or panic.

Then, for some reason these past few years, buddy-boxing sorta got ignored and lost in the shuffle, so much so that whenever it was mentioned the often heard remark would be, "Who needs it? You can do just as well without it." It was this lack of interest by sport fliers, combined with an attempt to keep prices low, that convinced Futaba and Airtronics to quit making radios with this capability. I never did understand why buddy-boxes lost favor with R/Cers; they are terrific teaching aids.

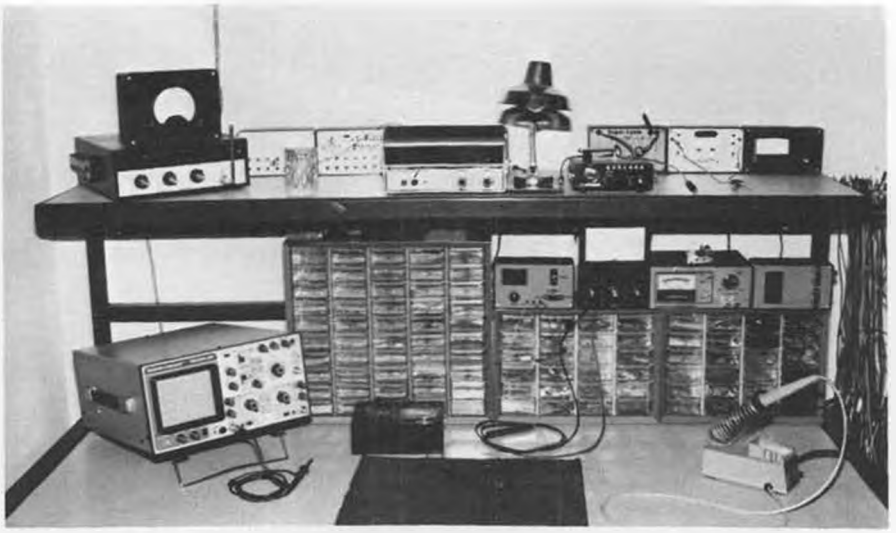
Well, now comes the A.R.B. Company to the rescue. They have very recently marketed "The Buddy System" which, as the name implies, is a training system that can be installed in Futaba and Airtronics radios. (By the time you read this, A.R.B. should have completed installation instructions for all other brands of radios.)

This just-finished Balsa USA Sopwith Pup is proof of Fritz Bruning's expert building skills. Maiden flights are reported to have gone nice and easy, with just a bit of trim required.

The Buddy System (TBS) was originally designed for use with Airtronics and Futaba radios of six channels or less. These radios have available mounting holes that are currently not being used when shipped from their respective factories.

I wondered about the soldering and in-

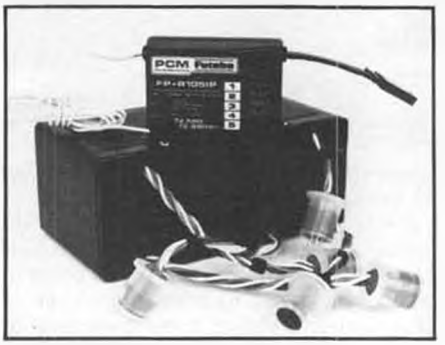
Continued on page 69



R/C, USSR style! Would you believe this Russian Cynpahap 838 system was considered "modern" in that country as recently as 1983? Four channels, no bells and whistles at all.

Electronics Corner

By ELOY MAREZ



The Cynpahap receiver, with a Futaba Conquest receiver perched on top for size comparison. Note the large number of conductors in the servo leads and the monster plugs at the end of each.

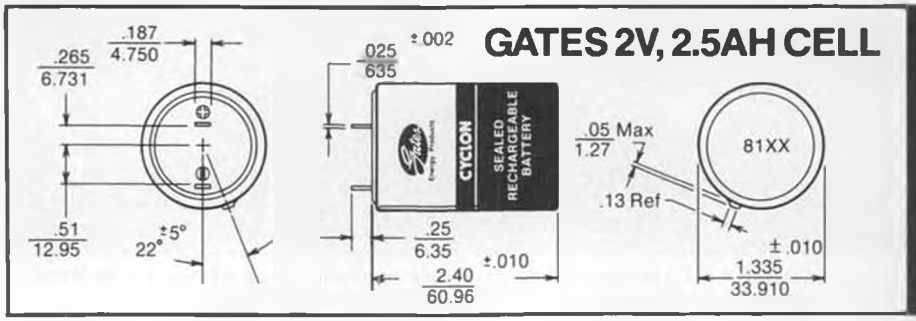
• I know ours is not primarily an electronics hobby, though if my mail is any indication, there are a lot of you out there in MB-land who share my interests in both phases of R/C modeling. My mail also tells me that a lot of you peruse all of the electronic columns in each month's model press, and that you abhor the deviations from known standards—some as old as Marconi—and new monthly acronyms to replace them with. The results are only the creation of more confusion in what is by nature confusing enough to the untrained reader who is trying to improve his knowledge by reading our stuff in the first place.

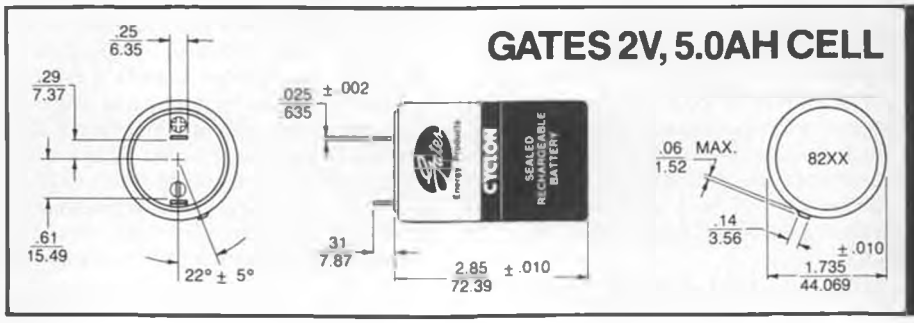
I cannot help but wonder if those inventions are not born only from ignorance of the real standard units and phraseology. I sure hope the practice does not grow and one of these months we don't get to read about someone's newest flying creation describing the wingspan in cubits and the wing loading in pennyweights per square hectare.

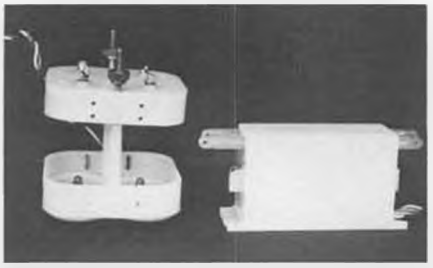
Gar-bage! But maybe I am the one who is out of step, and the way to *real* model writer's fame is to dazzle them with inventive prose, no matter how senseless and confusing. Guess I'll have to try it on you; let me know if I impress you if, instead of using well established and known terms like "glitches," I use words like, for example, "control surface perturbations." Yeech!

I DO HAVE A CLAIM TO FAME!

Back in January '84, I shared with you a cover picture of a rather comely blonde lady and my 1/3-scale CAP-20. One of the two is now in the running for the title of "Most Traveled," or something. The CAP has a Kavan FK-50, which did a creditable job of flying it. Mr. Franz Kavan, owner of the company who makes the engine in Germany, saw the model and wanted to borrow it for the annual trade show in Nuremberg. I was not overly excited about crating and shipping my airplane to Europe, but Mr. Kavan finally made me an offer I couldn't refuse, and I sold him the







One of the Russian linear output servos and the receiver battery box; dimensions are given in text. The system is made for dry cell operation, the box shown being designed for C-size cells.

airplane.

Well it made it to Germany, where it graced the Kavan booth at the next Nuremberg Fair, after which it was flown there by my good friend Helmut Dressendorfer. It then went to Japan for the big trade show there, after which it was also used in flight demonstrations. After that, the same took place in Taiwan, and then it was back to Germany for a while. As I write this in late April, my CAP-20 is in Bagdad, Iraq, as part of the Kavan entry in an R/C demonstration. Helmut is also along, to handle the chores on the sticks, which he does quite capably. I never thought about it until right this minute, but it is a good thing that he is a Mode One flyer, as my CAP was definitely built as a Mode One airplane. Sure hope that while it is in Iraq it doesn't get stepped on—or something—by a camel.

That's the story of my well-traveled airplane. The blonde? I couldn't get her even to San Diego, and that's only eighty miles away!

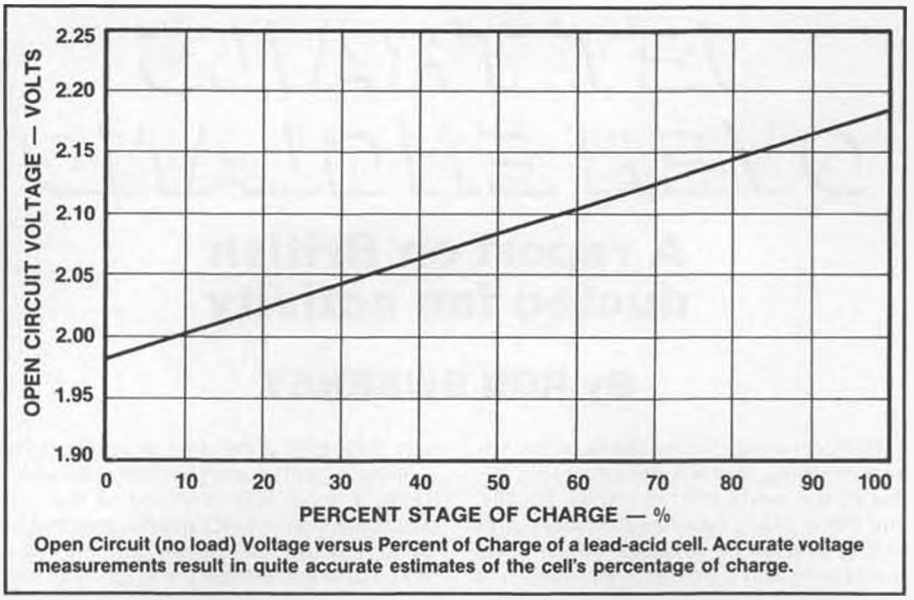
I HAVE A FEW MILES ON ME ALSO

Once upon a time I found myself a somewhat unwilling guest of the staff of the American Embassy in Moscow. Unwilling because I would gladly have passed up a couple of their cocktail parties and dinners for a chance to meet some Russian modelers and ham radio operators. It wasn't all a loss though, as I was fortunate enough to get myself invited aboard a TU-104, one of the first Americans to have this experience. The TU-104 was new at the time, and the first Russian jet airliner, though the reason for the glass bombardier-type nose was never explained. The real surprise to me was upon reaching the flight deck, to find it almost completely equipped with communications and navigation equipment as familiar to me then as modern R/C systems are now. Familiar except that instead of "Collins Radio" and English markings, there were other brands and Cyrillic characters all over it. The Russian entry into the commercial jet age included copies of equipment that had been in use even back in WWII!

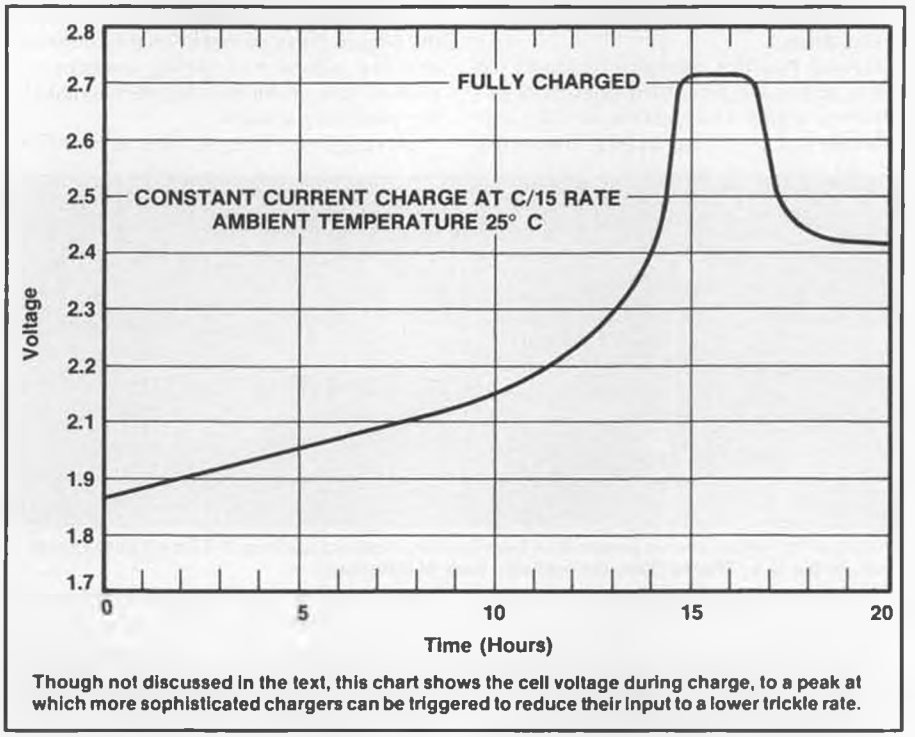
My personal experiences in that country, though relatively short, confirmed what I had and have since read: that though the Russians have made all of the technological advances we know of in aviation and space, they have not kept a similar pace in consumer products. Behold a Russian R/C system, circa 1983. True, it is not today's, but compare it with what we were flying back then—that was the year Futaba introduced its 8-channel PCM.

This particular Russian system is named Cynpahap 838, and is large and actually crude by the standards we knew at that time even in systems less sophisticated and expensive than Futaba's PCM. The transmitter is of typical large European design; 6-7/8x9-3/8x2-3/16 inches thick, with long 2-1/4 inch sticks in a gimbal protected with an accordion rubber boot. The lack of precision starts here, with 3/32-inch of play at neutral. One interesting feature is the dual socket antenna mount, which allows the antenna to be mounted at 90 degrees upright to the front of the case, or straight out

Continued on page 85



Open Circuit (no load) Voltage versus Percent of Charge of a lead-acid cell. Accurate voltage measurements result in quite accurate estimates of the cell's percentage of charge.



Though not discussed in the text, this chart shows the cell voltage during charge, to a peak at which more sophisticated chargers can be triggered to reduce their input to a lower trickle rate.

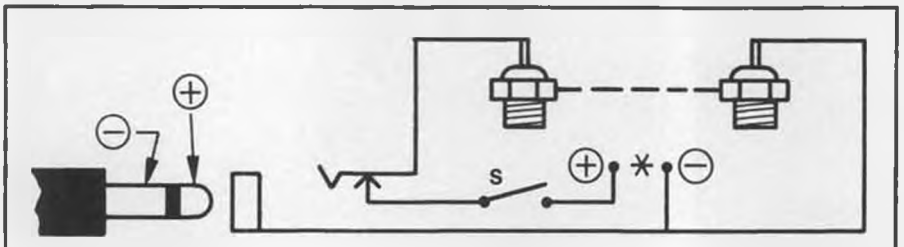


Diagram for the use of a two-volt lead-acid cell to provide glow plug power at idle for twin-cylinder engines. Internal battery is connected at *; switch "S" can be throttle actuated to set turn-on point. External three volt supply or glow driver can be connected through switching phone jack and plug (Radio Shack #274-255 and 274-1536) for starting purposes. See text.

JET TRAILS OVER ENGLAND

A report on British ducted fan activity

By RON SWEENEY

Our correspondent's partially finished scratch-built X-29 spans 48 inches, is 84 inches long.

• In economic circles there is a well-known saying, that if America sneezes the rest of the world catches a cold. Equally, and this is a fact: weather conditions prevailing over on the U.S. side of the pond eventually reach Britain, mercifully in a diluted form since we rarely experience the extremes of conditions that can occur in the states.

Having had the mildest of winters for many years, we now find ourselves experiencing gale force winds, which naturally rule out any flying activity. The saving grace in this instance being that, providing you can escape the never-ending domestic chores, building programs can accelerate and reap the benefits of those blustery Saturday and Sunday winter weekends.

As I write, the physical act of fan flying is so far removed from reality at this moment in time that as a primer for the forthcoming season I thought a commentary on what the year will hold might whet the appetite and shake off the winter gloom, hopefully fully dissipated at the time of publication.

Being a small country by American standards, it is possible to attend all the fan events held in the U.K., and this year that is the goal of myself and my son Andrew. Since I only get to meet the majority of my fan friends at the various meetings, I keep contact either by phone or letter during the winter. This year has been no exception and the prospect of seeing some of the models now under development is making me positively salivate.

Having been interested and involved with fan models for many years, I feel that we are now witnessing the development of the third generation of both engine and aircraft design, and even at this stage there is some divergence of opinion on the eventual path to be taken.

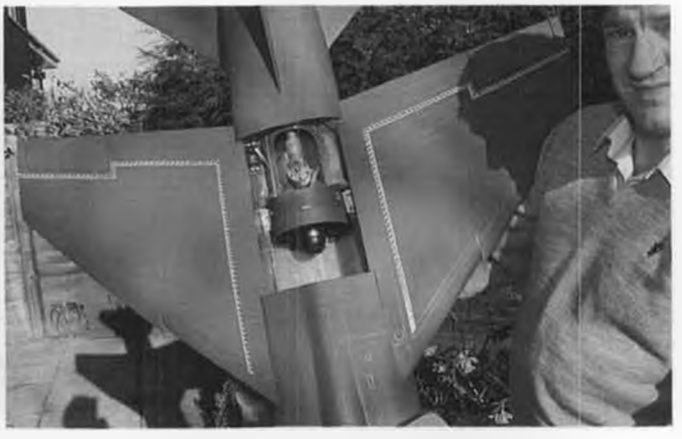
A K&B 7.5/Thorjet fan combo powers Ron Sweeney's 8-3/4 pound Northrop F-20, built from Thorpe plans. In the U.S., Thorpe plans are available from Bob Holman.

Early models and engines were chosen because they possessed those features most likely to yield success with a minimum of development.

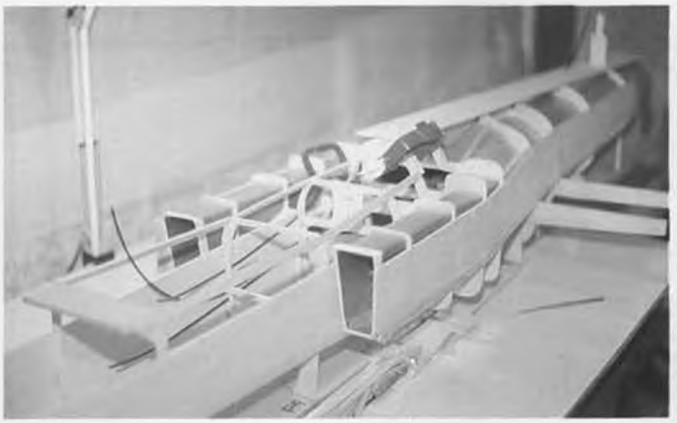
Once an acceptable model and engine combination had been found it was only natural that people would want to improve and diversify. I feel that the majority of this development has been the result of two ingredients: the tremendous advances in engine technology both in power and controllable rpm, and the range of modern fan assemblies now available. Perhaps one avenue where more work could be done is in the area of glow plug technology since this is still an area of vulnerability. (It is nice to hear that McCoy is now selling a purposely designed fan engine plug.) I have omitted two other factors deliberately, that of noise and engine speed, about which further qualification is necessary.

The quest for performance improvement started the moment P.E. Norman successfully achieved his first free flight ducted fan powered glider sometime in the late forties or early fifties. Engine improvements manifested themselves in the form of increased power achieved by increasing the rpm. A regrettable byproduct of this development is an increase in noise, the suppression of which has not yet reached universal acceptance. Fortunately all is not lost, and those who pursue the high speed route will find that the pioneers of high fan speeds are also responding to the attendant noise problem. Bob Violett

Ron Sweeney's F-1 Mirage, also built from Thorpe plans.



Close-up of the K&B 7.5/Thorjet fan in Sweeney's Mirage.



Two more shots of the partially completed Grumman X-29, to use a Picco .80/Byrojet fan setup. The full-size X-29 is said to be so unstable that the pilot could not even begin to fly it without help from on-board computers. Let's hope this one handles a little easier!

and Tom Cooke, so I am told, are both heavily involved in this area. Since Bob was probably responsible for the development of the first true fan engine it is only natural for us mere mortals to expect him to be at the head of silencing technology and to hopefully reap the commercial benefits of his efforts.

There is, however, an alternative route; anyone visiting Genke in Belgium last year would vouch for the fine performance of the Bauer fans. These units, although only turning at 17,000 to 18,000 rpm, provide incredible thrust with very moderate noise levels. A whole variety of models on show used these fans and regardless of type, exhibited stunning rates of climb from take-off and appeared at their best with heavily loaded models. Without exception the noise levels were very moderate. As with the Byron fans, the Bauer unit appears happy to accommodate engines from sporting .60's up to the awesome Picco and Rossi .90's.

While some flying does take place throughout the winter months, it is a fact that the majority of building work takes place during this period. I personally spend a good portion of the summer months repairing my winter creations. Hopefully this year's offerings will break the run of bad luck my pals and I experienced last year.

Perhaps an analysis of those events and the steps we have taken this year to avoid a recurrence of those situations would not go amiss.

What happened? The Swinderby fan fly saw the loss of my four-year-old Mirage. Cause? Flying too low overhead and in a very strong crosswind. Reason for crash? Loss of height orientation caused by the strong wind blowing the model into an overhead pass. I suspect that elevator authority was also suspect since I was using strake controls at the time. Lessons

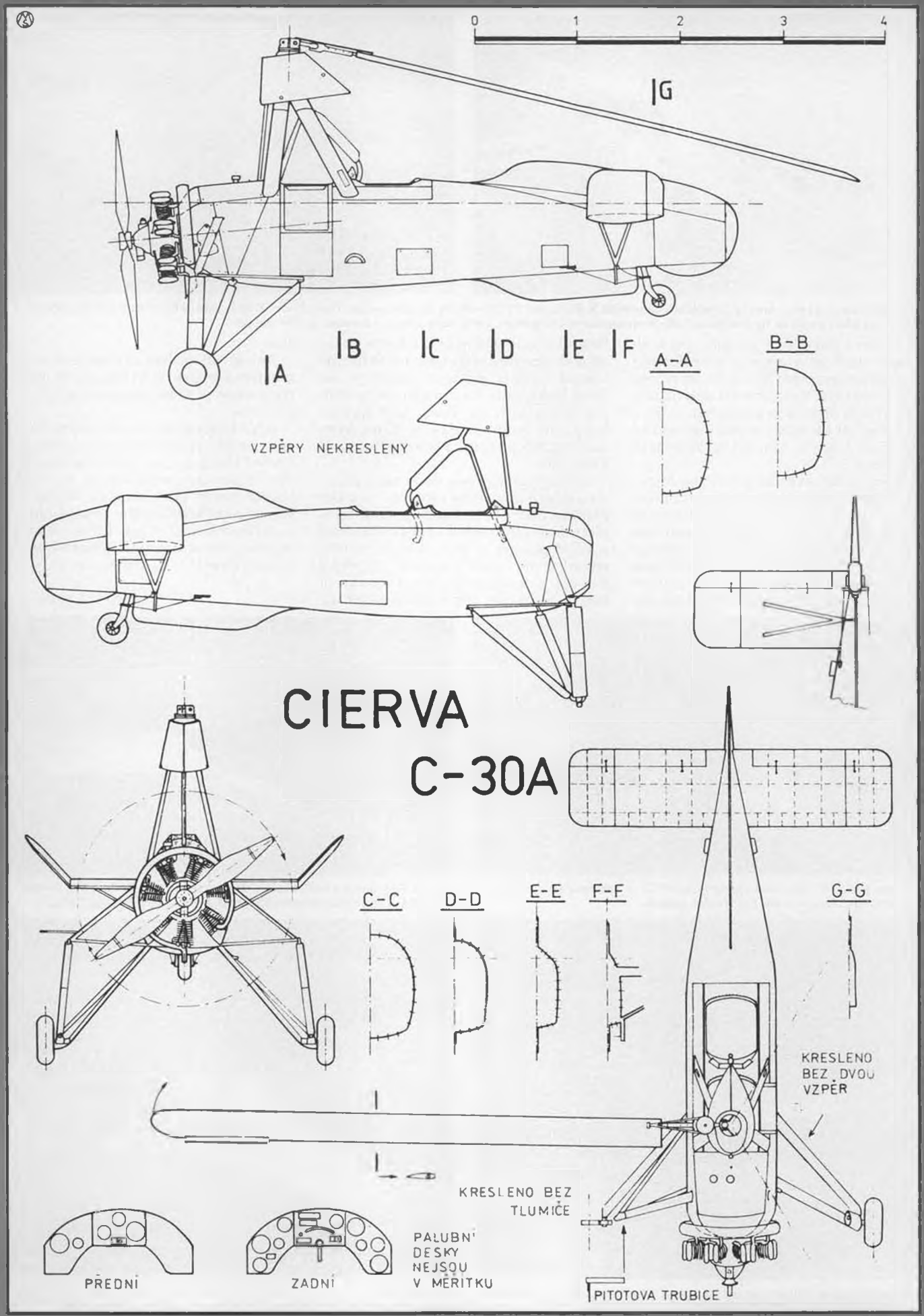
Continued on page 106

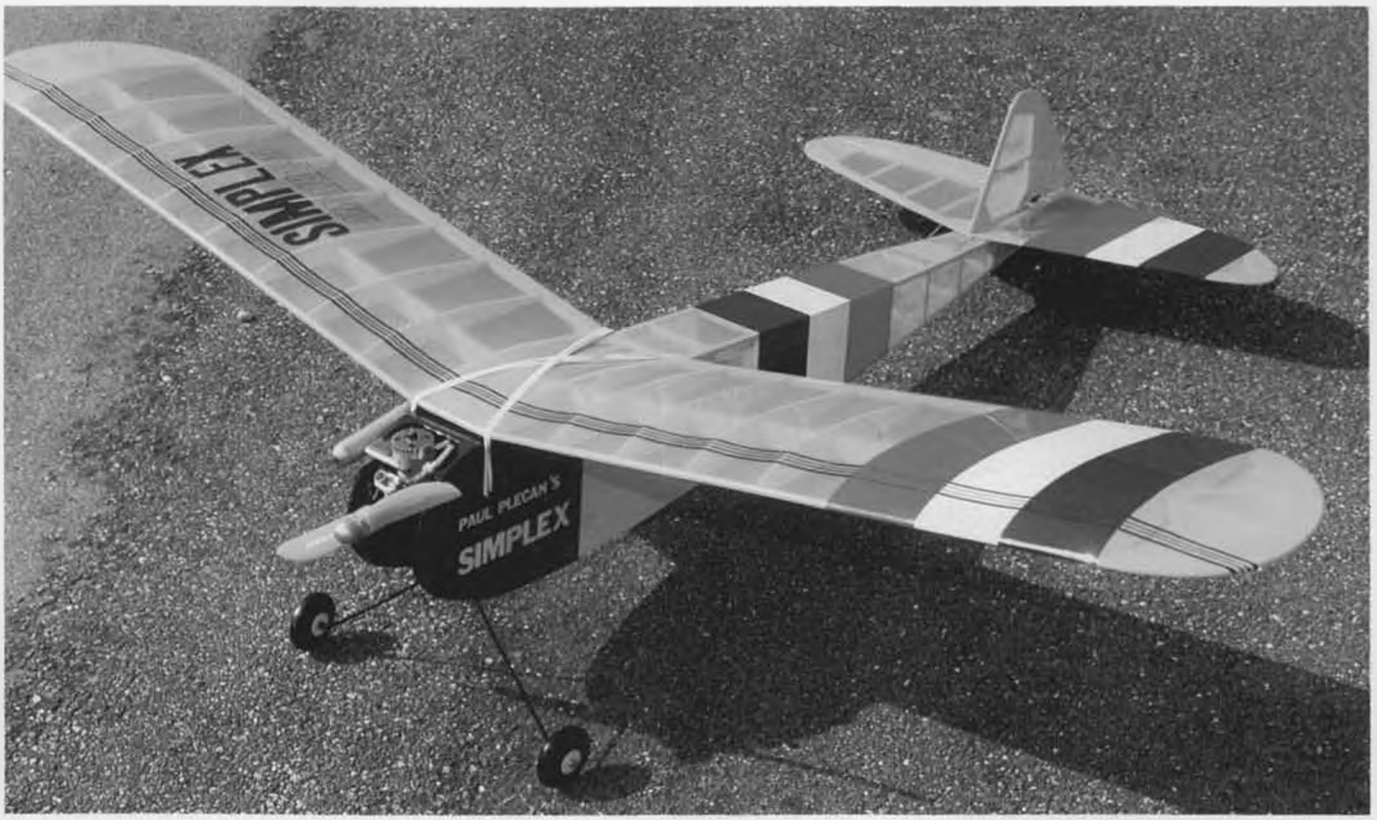
Graham Dennets converted a prop-driven F-16 (a Leicester Models kit) to a ducted fan using a K&B 7.5/Thorjet system.

Two of Reg Smith's own-designed scratch-builts include a Mig 25 (two O.S. 46's with Turbax/Micromold fans) and English Electric TSR2.

Interesting SAAB Gripen canard jet fighter with O.S. .46/Thorjet power was scratch-built by John Richards.

The famed Alex Cornish Trestrail's scratch-built F-15 features a fiberglass fuselage and two O.S. .25/Kress RK 720 fan systems. Great flier!


0 1 2 3 4
G
A B C D E F
A-A
B-B
VZPĚRY NEKRESLENY
CIERVA
C-30A
C-C
D-D
E-E
F-F
G-G
KRESLENO BEZ DVOU VZPĚR
KRESLENO BEZ TLUMIČE
PŘEDNÍ
ZADNÍ
PALUBNÍ DESKY NEJSOU V MĚŘÍTKU
PITOTOVA TRUBICE



Paul Plecan's 1941 SIMPLEX

By STU RICHMOND... It's a widely accepted fact that Old Timer free flights with radios installed make excellent R/C trainers, and the Simplex is one of the best. Ultra-simple to build, too.

• Much of the fun of reading model magazines is the chance to see and study construction articles. The first thing I do each month when *MB* arrives is check out the center spread and then look over the remaining plans.

We model builders owe much to the talented handful of plans tracers and draftsmen who do the needed work for construction articles to appear in print today. In the late '30s and into the '40s, Paul Plecan traced and drafted many modelers' plans for publication. You can bet that at times he must have been fed up with the designer's complications and intricacies. When Paul designed his own few models they reflected his urge for non-complication. His Simplex was the peak of simplicity. A quick look at the Simplex plans shows this to be the epitome of fast, easy construction.

I've always been sensitive to the R/C training needs of newcomers to our hobby. When I found the Paul Plecan construction article for his Simplex in a 1941 *Air Trails* magazine, it seemed well worthwhile to scale up the plans and build it, but to incorporate equally simple modifications like hardwood wing spars, about 7 degrees of downthrust along with 3 degrees of right thrust, about 40 percent of the fin converted to moving rudder and about 15 percent of the stab converted to elevator and sheet balsa sides up front locked together by a plywood servo tray. I figured the resulting Simplex would probably be about the simplest building and flying R/C trainer in the air—and I was right. Rank beginners have had fun with my prototype.

Hand launching the Simplex is easy, especially in a slight breeze. Stu recommends this instead of ROG takeoffs, as the forward wheel location makes for tricky ground handling. Maybe a tailwheel would help?

The 12x6 Antique series Master Air Screw prop parallels the shape of the old Flo-Torque props of the 1940s. K&B Sportster .20 turns this prop at 5000 rpm max, 1400 rpm idle.

Flights average 20 minutes with the K&B Sportster .20 on a 4-ounce Sullivan slant front tank. We've had lots of long thermal flights. We've had to cut the power to idle and spiral down repeatedly from Florida thermals lest we lose the model visually. Flying buddy Ed Stone got the Simplex into a Florida boomer (thermal) of the greatest vertical rise rate we'd ever seen. He flew it the highest it's ever been!!

A few building notes:

1. The 1/4-inch wide by 3/4-inch high wing spar *must* be of spruce or bass for adequate strength. It may require gluing together two or three pieces to get up to final size. Strength is then plenty as the model will hardly loop and won't be aerobatic.

2. The tail should be built of firm but very light balsa as there is practically no nose moment to counter the weight behind the wing spar. Balance point should be at the wing spar.

3. Trust me—one elevator is sufficient and simplest. Yes, full "up" does give a bit of right turn and full "down" gives a bit of left turn. No problem near neutral.

4. Construction is well-suited for today's iron-on coverings and is *not* strong enough for silk and high-shrink dope.

5. Keep all your radio gear as far forward as possible. My 500 mAh battery pack is right behind the landing gear and my model balances right on the wing spar with no extra weight added.

A few aerodynamic notes:

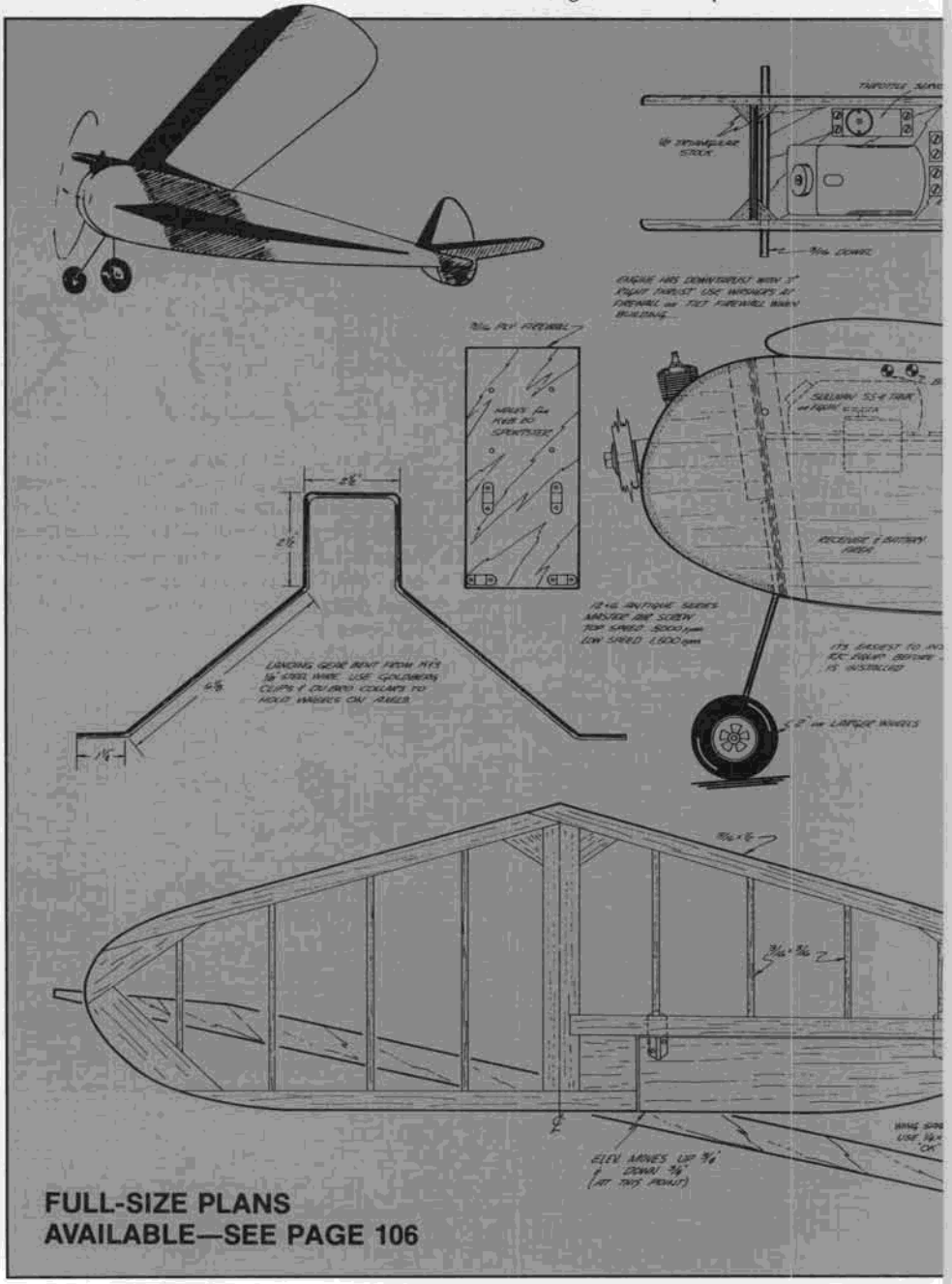
1. Most of the drag from any normal model wing comes from the wingtips—same on full-size aircraft. By adding washout to each wing panel the drag is minimized at high speed and increases at nose-high lower speeds. Modern jet fighters, Piper Cubs and 747's all feature washout. The Simplex benefits from washout similarly. Just twist the covered wing and heat with your heat gun until you attain the specified washout shown on the plans.

2. These plans show the correct downthrust and about three degrees of right thrust, which helps counter the torque of the big prop.

3. Original plans showed a 13-inch prop on a Dennymite engine. This replica flies best with a Master Air Screw Antique Series 12x6 that even looks like the old Flo-Torque props. My engine is adjusted to not exceed 5000 rpm and it idles all day at a fantastic 1400 rpm. I chose a new K&B Sportster .20 due to the muffler's excellence in annoyance suppression (no, I don't like the word "noise"). This engine, in conjunction with the 12x6 at 5000 rpm yields quietude that surely rivals electric flight! The prop/rpm combination yields two to three times the climb rate of current ferrite electrics.

4. You can easily surpass 15 to 20 minutes of flight time every flight on the four-ounce fuel load.

5. The wing loading is so low it lets the Simplex fall in the "super plane" category on Francis Reynolds' interesting cube loading chart. Yes, there is a relationship between carrying capacity and the volume inside our wing covering. The Simplex's cube loading is so low compared to electric



that you'll actually be able to enjoy armchair R/C flying due to the neat slow floating flight.

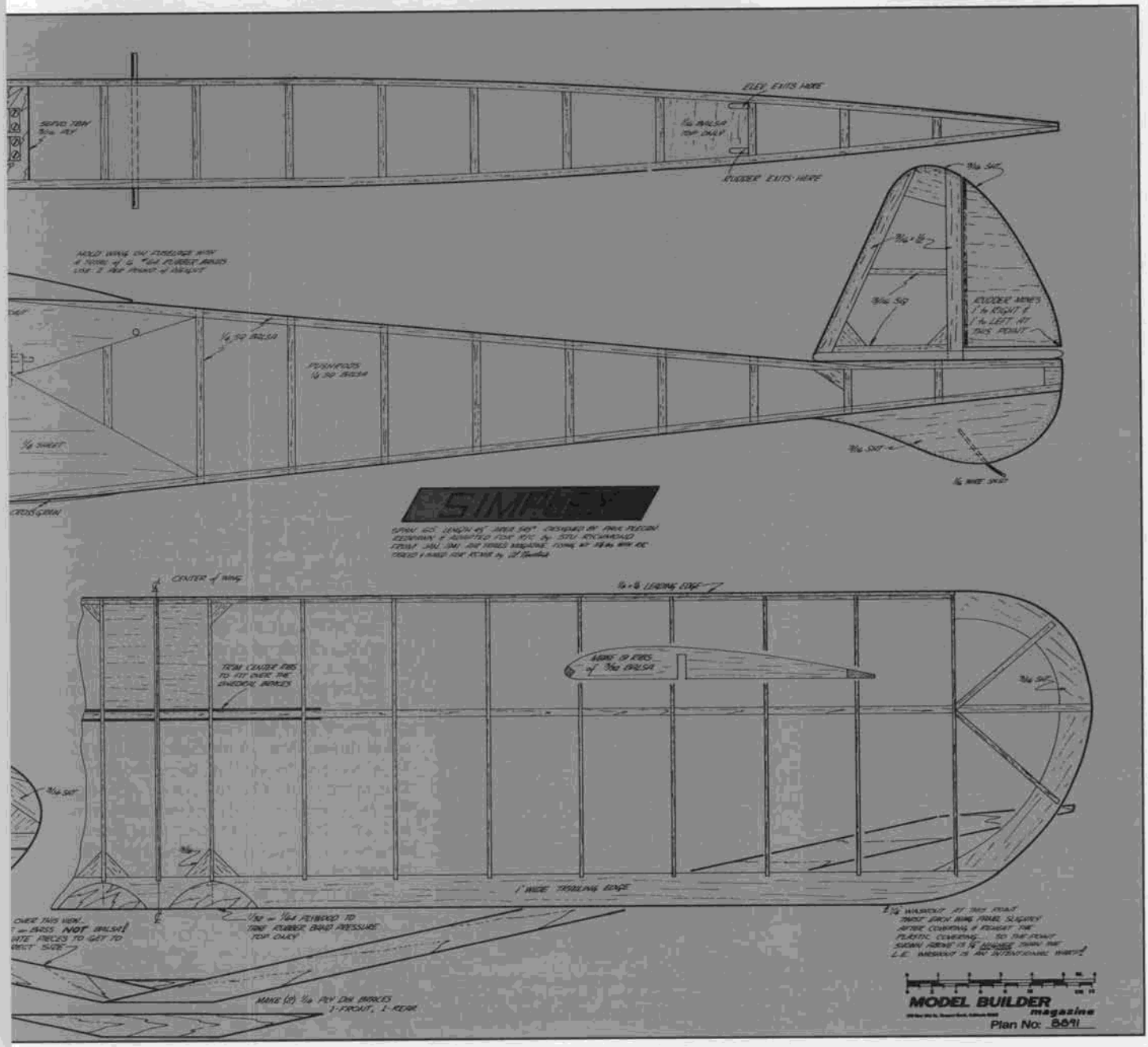
6. Adding the automotive striping tape near the 10% chord point on the front/top surface of the wing has an aerodynamic turbulating effect. The tape acts like a multi-spar wing and increases the thermal floating abilities. For maximum fun, don't omit the tape.

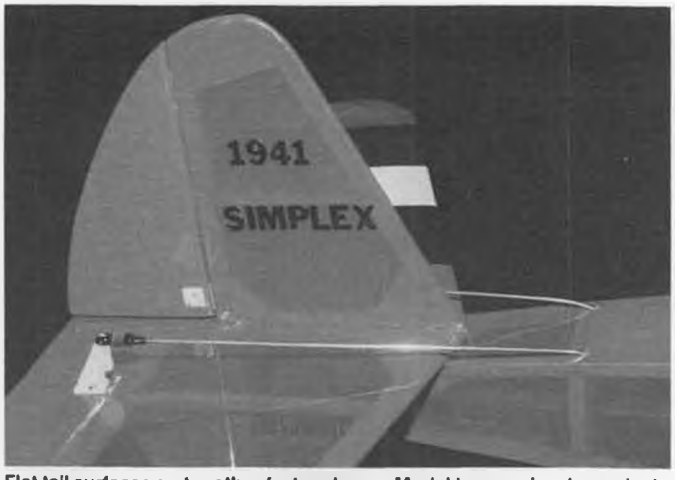
A few engine notes:

1. Models tend to fly best when the proper propeller size is matched to the flight characteristics of the model . . . and then an engine is added to turn the prop at the desired rpm.

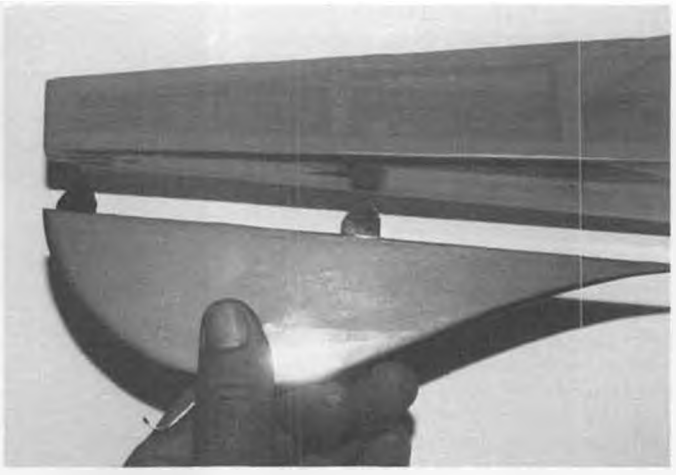
2. The original $7.95 Dennymite from 1941 probably wouldn't turn the 12x6 much or any faster than my K&B Sportster. Any of the .15 to .20 two-cycle engines should be suitable. The new O.S. .26 Surpass four-cycle ought to be a delight. My K&B peaks the 12x6 at 5800, and I've intentionally richened it a bit and the throttle barrel

Stu used transparent yellow film on the top of the wing and stab, opaque dark blue on the bottom. Dark colors make for excellent in-flight visibility, especially at high altitudes.





Flat tail surfaces go together fast and easy. Model has an elevator on just one side of the stab, works fine.



Two small tabs of .007" carbon fiber strengthen the sub-fin mounting to the fuselage.

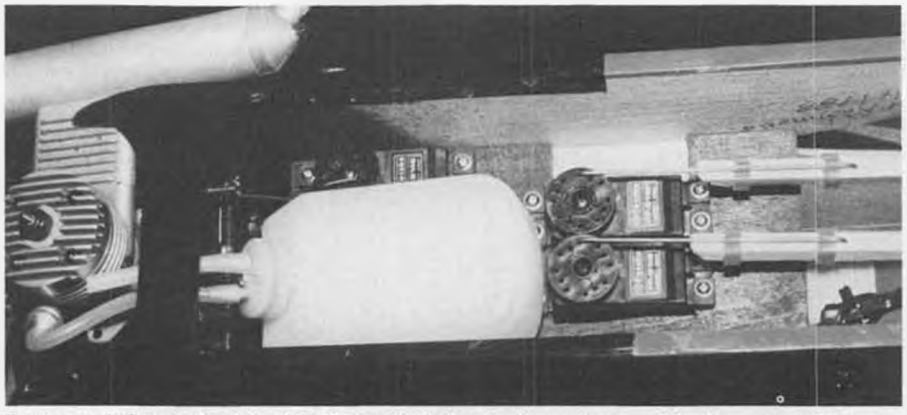
opens less than full to get the 5000 maximum rpm I've chosen to make the climb "not too steep."

3. I've now used two gallons of Byron's new fuel. Each gallon yields over thirty tankfuls/flights. The K&B has now run well past fifteen hours which I feel is an average engine's lifetime. The top of the piston is still shiny-clean, and after three or four chokes and one or two flips the engine is running every time. With slow running at a slightly rich setting you should expect your engine to give many fun-filled air hours in a Simplex.

4. If you can't get your idle slow enough, try a K&B 4520 idle bar plug or one of the new Fox Miracle Plugs.

A few flying notes:

1. This is a true free flight design from the 1940s. It is easy and economical to build and absolute fun to fly. I've had more plan requests locally than for any model I've built to date. It won't do aerobatics, but it yields slow, leisurely flying and just may be one of the finest R/C beginner's models in the air!



For proper balance, the radio should be mounted as far forward as possible. Four-ounce Sullivan slant tank gives an average flight time of 20 minutes!

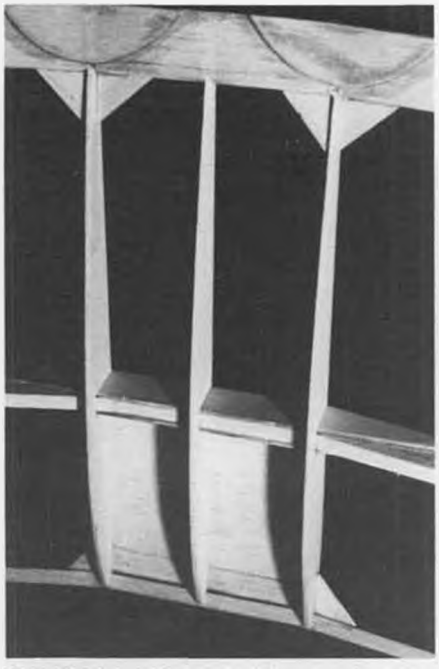
2. The Simplex should always be hand launched directly into the wind. Don't try a takeoff as the wheels are simply too far forward (they were placed forward originally to protect the prop on landing).

3. If the prevailing wind is 5 to 10 mph slip a shim of 1/16-inch balsa under the wing's trailing edge to make the model fly faster. If the wind is 10 to 15 mph use two such shims—if over 15 mph you probably shouldn't fly. The shims make the Simplex fly faster so you can get upwind easier.

4. Be sure to cover the bottom surfaces with black or dark blue to get maximum high altitude visibility. Florida's soaring buzzards are black all over and visible. Light bottom colors tend to get lost at high altitudes.

5. This model, like most vintage designs, wants to climb steeply at high power and descends slowly with idle around 1500 rpm or with no power. Level flight with the 12x6 is maintained around 3000 rpm. By dropping the high power rpm back to 5000 from a 5800 peak I've partially minimized the steep climb tendency at full throttle. Altitude, as in a Piper Cub, should be controlled by throttle rather than elevator. An easy way to dump altitude in a hurry is to cut power and use full rudder throw to spiral down. With so much drag being so far above the thrust line, the pendulum-like swing caused by full power pointing the nose up isn't fully controllable with elevator. Please remember, Paul Plecan designed the Simplex to climb quickly with its engine running.

Today the Simplex is a superb R/C fun machine. You can float from thermal to thermal, you can loaf along in circles, ovals, or figure eights, you can teach almost anybody to fly R/C. And these R/C equipped Old Timers make wonderful formation flyers. Paul Plecan really understood the KISS (Keep It Simple, Stu) principle! •



Wing spar has 1/16" ply doublers on both sides. Spar must be spruce or basswood, *not* balsa, for adequate strength.

The K&B .20's spider mount works ideally. An aluminum or glass-filled nylon radial mount or hardwood beam mounts can be substituted for other engines.

The 1989 TOP GUN Invitational Tournament

By AL TUTTLE... A report on this new and most prestigious R/C Scale competition, held on April 21, 22, and 23, at Coral Springs, Florida. Only the very best scale modelers were invited to participate.

• The first Top Gun Invitational Tournament is now history and by the enthusiastic response of the competitors and the spectators, it appears that this tournament could become one of the premier scale events in the country.

Forty-four well known scale modelers were invited to attend and thirty-nine showed up to do battle. The flying site sported a brand new 450 foot long asphalt runway and the weather was superb the entire weekend. The winds were gentle and down the runway early in the mornings and then tended to gradually shift 180° as the day progressed. Consequently, the wind was either an asset or a detriment, depending on the time of day a contestant flew.

Entries were judged on Friday, starting at 8:00 a.m. and continued throughout the day, finishing up around 6:00 p.m.

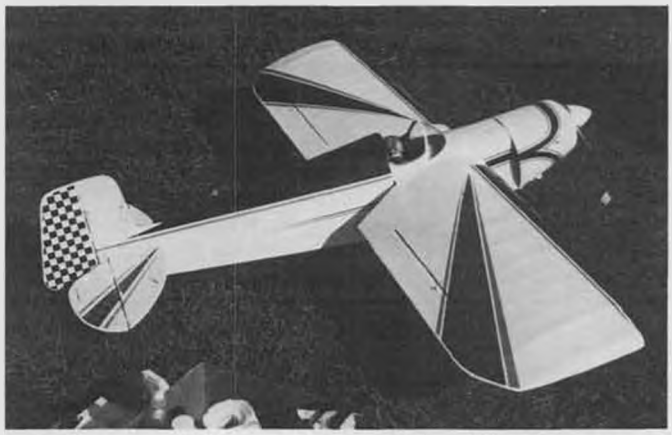
Top static points (91.14) went to Dave Platt and his 1/5.5-scale Japanese A6M5C Zero fighter. Dave claims to have built the model in six weeks!

Pilots' choice for best civilian aircraft went to Steve Sauger with his 1/5-scale Aeronca Sedan. This model has to be seen to be believed. Bob Violett won best military with his North American F-86 Sabre jet. Landing gear problems plagued Bob throughout the weekend, otherwise he would have finished higher in the standings.

Big B-17 flown by Tom Street of Texas.

There were an inordinate number of crashes. I witnessed eight and was told that

Left: Bob Fiorenze captured the "Top Gun" award with this magnificent ducted fan model of the F-18 Hornet. Above: Bob's Hornet streaks by on a low pass.



Second place went to Neil Snodgrass for his "Special" aerobatic model, which in full-size is actually a heavily modified Piper Super Cub!

Some mighty fine scale models here. That's Canadian modeler Gerry Fingler's beautifully trimmed Hawker Seafury in the foreground.

TOP GUN INVITATIONAL TOURNAMENT
CORAL GABLES, FLORIDA APRIL 21, 22, 23, 1989
RESULTS

NAME	AREA	AIRCRAFT	PLACE	STATIC	RND. 1	RND. 2	RND. 3	RND. 4	TOTAL
Bob Fiorenze	Florida	F-18	Top Gun	88.95	95.50	90.25	0	93.13	183.26
Neil Snodgrass	Maryland	Special	2	88.77	54.50	68.50	81.25	91.50	175.12
Skip Mast	Michigan	C-130	3	90.21	82.75	76.00	78.75	86.50	174.84
Cliff Tacie	Michigan	Savoia	4	86.69	70.75	91.50	83.50	84.54	174.69
Chuck Fuller	California	PT-22	5	85.03	93.50	82.50	85.75	83.88	174.66
Dick Hansen	Oregon	Jenny	6	87.92	75.50	0	89.00	82.50	173.67
Chuck Nelson	Massachusetts	Waco	7	90.21	71.00	78.25	77.00	87.00	172.84
Bob Frey	Arizona	P-47D	8	87.32	80.63	90.00	79.75	76.25	172.64
Bob Violett	Florida	F-86	9	89.30	75.00	0	90.00	76.50	172.55
Jeff Foley	North Carolina	Zero	10	85.81	71.50	70.00	77.50	93.50	171.31
Shailesh Patel	California	Hellcat	11	87.32	88.50	77.25	64.00	0	170.20
David Platt	Florida	Zero	12	91.14	57.25	77.75	80.00	75.75	170.20
Bill McCaulie	Florida	FW190D9	13	83.65	78.75	88.00	73.50	76.50	169.03
Don Srull	Virginia	Eindecker	14	85.33	71.75	78.50	86.00	74.75	167.58
Bob Heitkamp	Arkansas	Stuka	15	88.36	82.00	75.75	71.50	0	167.24
Diego Lopez	California	Hellcat	16	88.24	74.00	76.75	81.00	56.00	167.12
Bob Underwood	Virginia	PE-2	17	86.62	76.00	0	80.00	78.00	165.62
Shane Cramer	California	P-47D	18	83.16	83.00	81.25	77.00	0	165.23
Jack Buckley	Massachusetts	CAP-10B	19	82.69	25.75	79.00	84.00	72.25	164.19
Bob Hanft	Florida	Nieuport	20	84.71	74.25	77.00	80.00	75.25	163.21
Ted White	Texas	P-47D	21	75.49	83.25	75.75	81.50	91.50	162.87
Steve Sauger	Michigan	Aeronca	22	90.21	68.00	62.65	77.00	65.75	162.71
Mel Santmyers	California	Staggerwing	23	87.32	64.75	58.00	77.00	73.25	162.45
Wayne Siewert	Minnesota	Mooney	24	89.19	52.00	63.50	63.25	80.50	161.19
Brian Omeara	?	Spitfire	25	83.95	78.50	76.00	70.75	56.00	161.19
Tom Czikk	New York	P-40C	26	84.87	73.50	64.50	75.25	0	159.25
Dan Parsons	Arizona	DH Hornet	27	76.17	73.25	87.00	77.00	64.00	158.17
Charles Chambers	Florida	P-51D	28	90.02	69.75	60.75	18.00	0	157.27
William Carper	?	P-47D	29	80.97	75.00	66.75	75.50	77.00	157.22
Chuck Collier	Arizona	Staggerwing	30	80.73	71.50	77.50	51.75	0	155.23
John Guenther	Indiana	Spitfire	31	83.46	70.50	27.50	69.25	7.00	153.34
Tom Street	Texas	B-17	32	70.59	60.75	76.50	87.50	73.75	152.59
Mike Kulczyk	Texas	F-105	33	85.57	47.50	0	0	0	109.32
Jeff Troy	Virginia	Bleriot	34	85.40	6.75	0	8.75	0	93.15
Art Johnson	Florida	B-26	35	89.10	8.00	0	0	0	93.10
George Rose	New Jersey	P-6E	36	88.73	0	0	0	0	88.73
Gerry Fingler	Canada	Seafury	37	84.68	8.00	0	0	0	88.68
Frank Tiano	Florida	P-39	38	84.84	0	0	0	0	84.84
Mario Yederlinic	Florida	Hurricane	39	83.06	0	0	0	0	83.06

Last place award went to Gerry Fingler of Manitoba, Canada.

a total of ten had occurred. This is really something when you lose a quarter of the entries, especially with this level of competition! Several of the crashes appeared to be complete write-offs, but knowing the dedication of these modelers, we will probably see these same planes back in competition before the season is over. Some of the incidents appeared to have been caused by a lack of concentration or confidence in flying ability. Some were also just plain bad luck.

The person who gets my "sticktoitiveness" award is Jeff Troy. Jeff crashed twice! On Jeff's first round, the servo that controlled the wing warping on his magnificent Bleriot gave up the ghost and the model spiraled down into the woods off the end of the runway. The model was recovered and Jeff spent the rest of the day

The hard-luck contestant of the meet had to be Jeff Troy, whose Bleriot XI was the victim of two separate crashes. Model features wing warping for roll control and is normally a fine flying machine.

Chuck Collier's Beechcraft Staggerwing is a smooth performer.

Best Civilian Aircraft award went to Steve Sauger's Aeronca Sedan. Model tied with two others for second highest static scale score.

and evening repairing the damage. On the third round the following day, Jeff made a beautiful takeoff and turned onto his downwind leg to set up for his first maneuver, when the airplane seemed to expire and went straight in. Jeff thought that one of the flying wires let go. Needless to say, the plane was somewhat of a mess!

Art Johnson lost his B-26 on takeoff when his ailerons stopped working. The resulting crash caused a large amount of damage.

Mike Kulczyk lost his ducted fan F-105 when the engine flamed out shortly after takeoff. Mike set up the plane for a picture perfect wheels-up landing in the grass. Shortly after touching down and as the model was sliding on the grass, it hit a grassy hummock and literally exploded! Mike promises it will fly again. Incidentally, Mike is a former F-105 jock with several thousand flying hours in the Thud.

California's Chuck Fuller took fifth place honors with this PT-22 and consistently excellent flying.

Gerry Fingler, from Manitoba, Canada, crashed his Seafury on takeoff. The powerplant just didn't seem to be putting out. Gerry won the last place trophy, which was a fair amount of cash.

George Rose crashed his Curtis P-6E Hawk on Friday, so he didn't get to compete Saturday and Sunday. George said he "Dumb Thumbed" it. Too bad, as George normally does a super job of flying the Hawk.

Just some of the many trophies and merchandise prizes that were awarded at the end of the meet. Contest received strong support from the modeling industry.

Charles Chambers destroyed his gorgeous P-51 shortly into his third round.

Frank Tiano crashed his P-39 attempting to take off during the first round. I heard it was the first flight for this bird. The damage did not look too awfully bad and I'm sure

Continued on page 106

Below: Bob Hanft's Nieuport 28C-1.

Left: Ted White placed near the middle of the pack with his P-47D Thunderbolt.

Mike Kulczyk's F-105 waits its turn with Bob Heitkamp's Stuka and Charles Nelson's Waco biplane.

CHOPPER CHATTER

By JAMES WANG

• This month we will begin to discuss helicopter stability and control theory, and we will also look at what new helicopter goodies were shown at the 1989 Toledo Show.

Helicopter stability and control theory is very important because a good understanding can help you fine tune or modify your helicopter, and improve your flying by knowing the machine's flight dynamics. We will start by defining the helicopter axis system, defining static and dynamic stability, and explaining the two major reasons why helicopters are harder to fly than airplanes.

Any rigid body (a brick, a spaceship, or a model helicopter) possesses six degrees of freedom as it moves in three-dimensional space. A body possessing six degrees of freedom means its motion can be described by combinations of six different, simple movements. The six degrees of freedom are moving fore-and-aft, side-to-side, up-or-down, pitching, rolling, and yawing. The first three are called *translational motions*, and the last three are called *rotational motions*. See Figure 1. A helicopter only has four controls (pitch cyclic, roll cyclic, collective, and tail rotor); thus, how can only four controls control six motions? The reason is that helicopters are very unique, in the sense that the fore-and-aft translational motion can only be produced by pitching action. Thus, as the pilot moves the cyclic control stick forward, the helicopter will rotate nose down first, then begin to move forward. Similarly, the side-to-side translational motion is a consequence of rolling action. As the pilot moves his cyclic stick to the left, the helicopter will first roll to the left, then it will slide left. Therefore, the pitch cyclic and roll cyclic each control two degrees of freedom, while the collective controls a purely vertical motion and the tail rotor controls a purely nose-left or nose-right yawing action. It is this coupled translational and rotational motion that make up the first *real* reason why helicopters are difficult to fly.

Helicopter cyclic controls require the human brain to mentally compute four orders of time integration to predict the outcome of any cyclic input. Let's see what four orders of integration means as the pilot applies a left cyclic stick input. Step 1: the pilot pushes the cyclic stick left, which causes the main rotor disk to tilt to the left, which generates an aerodynamic rolling moment to roll the helicopter to the left. Step 2: the helicopter starts to roll left at a constant velocity, say 30 degrees per second. Step 3: after the pilot has held the stick left for, let's say, 1/2 second, the helicopter will appear tilted to the left at a certain angle. This means the main rotor disk is also tilted to the left and the rotor thrust will pull the helicopter fuselage to the left. If the pilot releases the cyclic stick at this time, the helicopter will remain at this attitude and will accelerate to the left. Step 4: the helicopter quickly accelerates left from 0 feet per second to maybe 10 feet per second. Step 5: after a second or two, the helicopter will have translated horizontally to the left by many feet. Between each of these five steps exists a mathematical time integration that the pilot's mind is automatically computing. He has converted rotational moment to rotating velocity, then rotating velocity to rotational angle, which gives lateral acceleration; then the brain integrates acceleration to get lateral velocity, and finally integrates the lateral velocity to get the lateral distance traveled. Figure 2 illustrates the sequence of motions after a left cyclic input.

All helicopters are inherently unstable, which means that if the pilot takes his hands off the controls, the helicopter will drift away. Airplanes are more stable. A paper airplane will tend to glide in a pretty

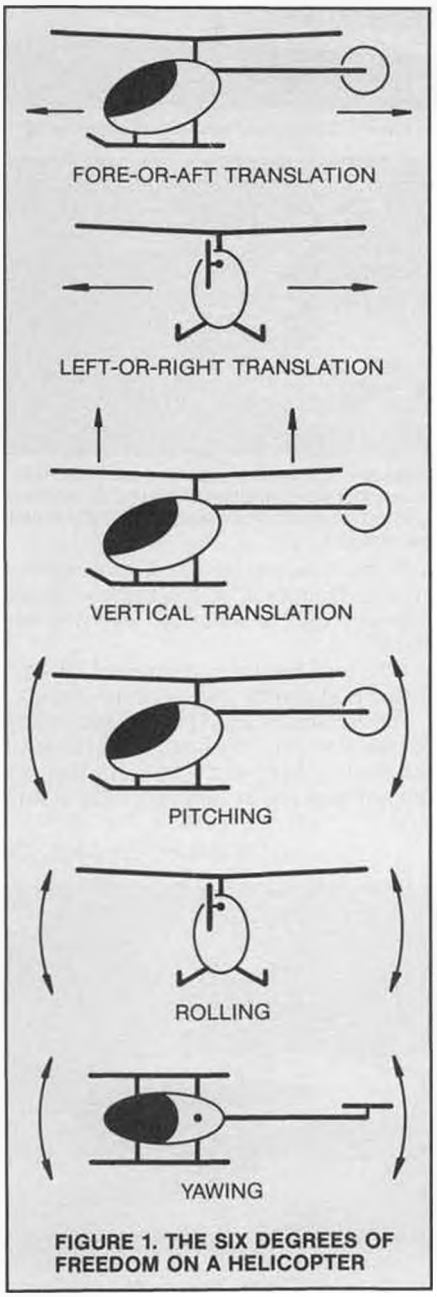


FIGURE 1. THE SIX DEGREES OF FREEDOM ON A HELICOPTER

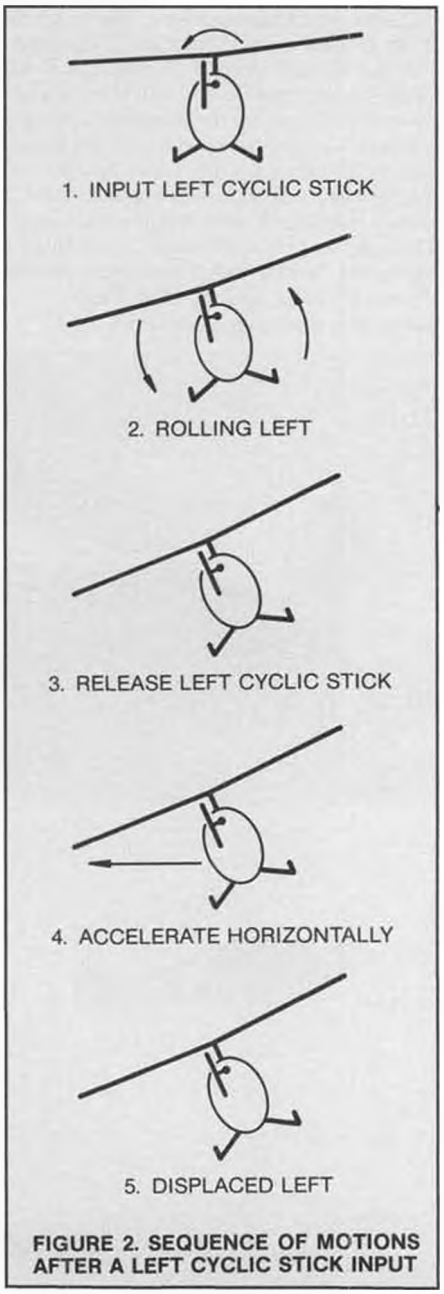


FIGURE 2. SEQUENCE OF MOTIONS AFTER A LEFT CYCLIC STICK INPUT

straight trajectory. A helicopter without a pilot will spin, whirl, spiral, and soon roll into the ground. Helicopters are unstable because they have a high energy rotating mass above the fuselage which generates precession and nutations to wobble the fuselage. We will study how the main rotor makes helicopters unstable in future issues.

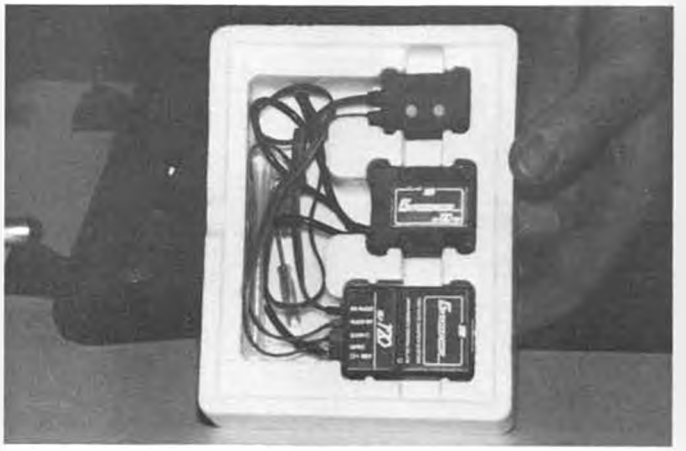
Most people believe that helicopters are difficult to fly because they are unstable. That is not true. The human brain is very powerful, and has no problem controlling an unstable system. For example, try to balance a broomstick upside down in your palm. This is an unstable situation, but after 30 seconds of practice almost everyone can do it. The second *real* reason why helicopters are difficult to fly is because they have too many unstable degrees of freedom. The broomstick can only fall to the left or right, or forward or back. Helicopters have six unstable possibilities. They can drift left or right, fore or aft, up or down, or pitch, roll or yaw spontaneously. Fixed-wing airplanes also have six degrees of freedom, but they are much easier to control than helicopters because out of the six degrees of freedom, only the pitch and roll actions are very slightly unstable, the other four are inherently stable. Thus, helicopters are more difficult to fly than airplanes only because the pilot's brain has to process a greater number of unstable actions at the same time.

The stability of helicopters changes as they start to fly faster. Usually, helicopters

At Toledo '89, Gorham Model Products had 12 experts on hand to answer questions. Shown below is the Rebel, GMP's latest, an inexpensive .40-.45 size machine for beginners.

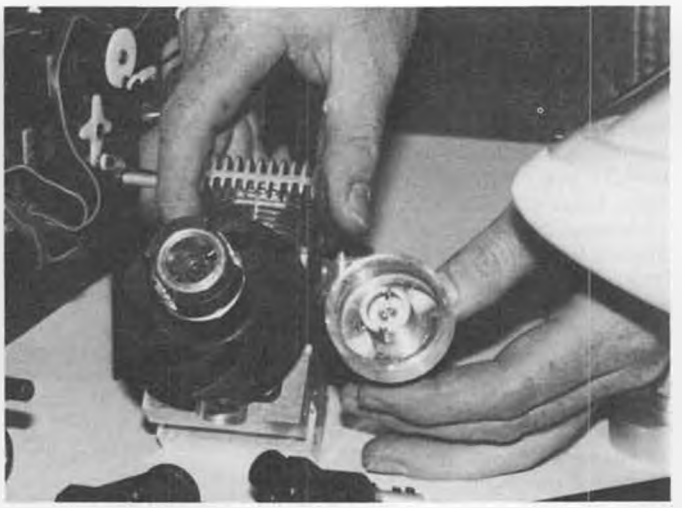
Also on display at Toledo was the new GMP FAI rotor head, a beautifully designed and built piece of machine work. Absolutely no slop, and it has a 90% Bell-Hiller mixing ratio for superb stability. Not inexpensive, but for those who demand the very best, this is it.

Schluter's new .60 size competition machine is called "Magic," seen here with Schluter reps Mark Powelson, Vince Canzanese, and Randy Gibson.



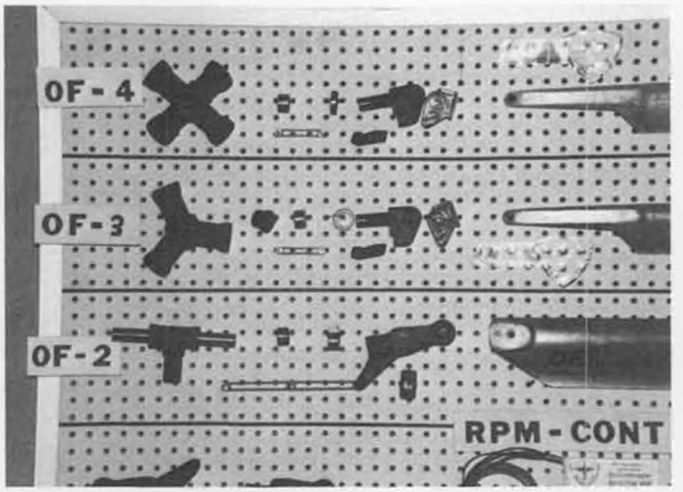
New helicopter radios include the JR Max 7 programmable system (left) and the JR 120 electronic yaw rate gyro (above). Available later this year.

Frank Dykes shows off the new .60 size Kait Excalibur aerobatic chopper. Features a "K-5" molded plastic rotor head. Look for it this summer.



The self-aligning clutch on the Excalibur. Our columnist plans to discuss the importance of clutch alignment in a future "Chopper Chatter" column.

The Wik Products bearingless tail rotor for GMP, Schluter, and Helm helicopters. Call Wik importer, Mr. Tigerstrom at (718)793-4416 for more info.



The two, three, and four-bladed hingeless main rotor heads and fiberglass blades made by Wik in West Germany.

are most unstable in hover, then they become more stable as they move into medium fast forward flight. But the stability decreases as the speed becomes very fast. The reason is that in forward flight the horizontal and vertical fins help stabilize helicopters and make them behave similar to airplanes. However, in very high speed forward flight, the main rotor generates so much more instability that the fins can no longer null out the rotor's detrimental effects.

The horizontal tail is an important parameter on helicopters, as it improves the dynamic stability in forward flight. Basically, the horizontal tail on a helicopter serves the same three purposes as the tail on an airplane:

1. Provides a download in forward flight to improve the static stability of the vehicle.

2. Provides a restoring force if the fuselage attitude is disturbed in forward flight. This improves the dynamic stability of the vehicle.

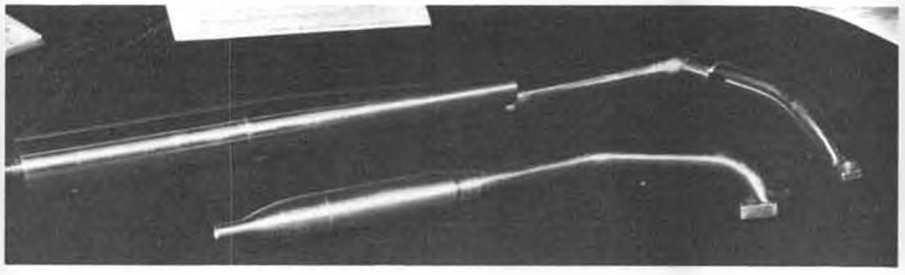
3. Provides aerodynamic damping to dampen any fuselage pitching oscillation in hover or forward flight. This also improves the dynamic stability.

What is the difference between static stability and dynamic stability? *Static* stability means that if you take your hands off the controls, a more statically stable aircraft will stay on course longer. For example,

Miniature Aircraft Supply has a complete line of helicopter exhaust systems to meet your every need.

"Skytech" rotor tachometer is available from Miniature Aircraft Supply.

This Hughes 500 is one of three scale retrofit body kits that Kyosho is importing for its popular Concept 30 helicopter; the others are a Bell Jet Ranger and Hughes 300. All are molded plastic.



MACs Products has two new .30 size tuned exhaust systems, to fit the Kyosho Concept 30 and GMP Shuttle. For flat-out speed, these are the pipes to use.

throwing a piece of paper folded into a paper airplane will have much better static stability than simply throwing a flat piece of paper because the paper airplane will at least glide in a nice straight trajectory. Good *dynamic* stability means that if the vehicle is disturbed it will tend to return back on course. A good paper airplane, if disturbed by a small gust, will level out by itself.

Almost all fixed-wing airplanes are statically and dynamically stable. All helicopters are statically stable in hover and medium fast forward flight, but are dynamically unstable in hover. In forward flight, most well-designed helicopters can become dynamically stable if a sufficiently large horizontal stabilizer is employed. Hence, helicopters become easier to handle in forward flight. That's also why the handling qualities of helicopters in forward flight resemble those of airplanes. I think the GMP Cobra, Hirobo Shuttle, and Kyosho Concept have just the right size horizontal tail. The Schluter Champion and Miniature Aircraft X-Cell can become even more dynamically stable in forward flight by having a slightly larger horizontal tail surface. I have made new ones for them using 1/8-inch plywood. The shape and planform of the horizontal stabilizer are not critical, it's the area that's important. Many other

Continued on page 86

These are Airtronics' new Vanguard six-channel FM and PCM helicopter radios, with new SG-X gyro in foreground. To be released later this summer.

The .30 size helicopter market is getting very keen. Kyosho, GMP, E&G and now MAS (shown here) all have Hughes 500 style bodies.

One of the immaculate models on display at Toledo '89 was this BK-117, builder unknown, featuring a Wik Products four-bladed hingeless rotor.

Mike Robin's awesome looking Sikorsky SH-60B uses X-Cell mechanics, a Schluter four-bladed head, Rossi .61 engine, and weighs 14 pounds. Drops torpedos and has blinking LED's on the instrument panel.

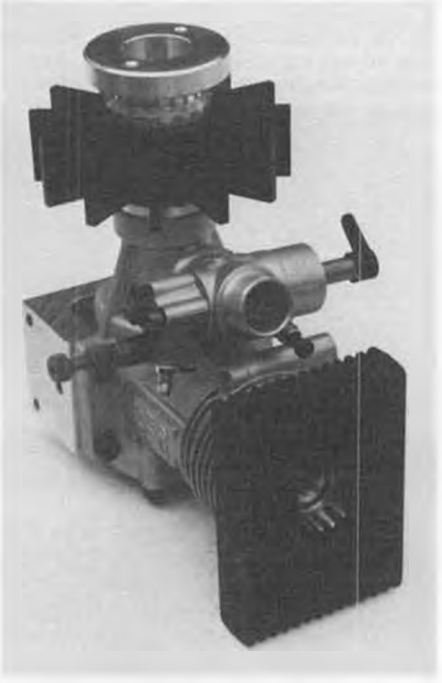
The GMP Special Edition Stork O.S. .61 RF-H & SFN-H Engines and the Futaba 7UHP PCM Radio

The Stork is one sexy looking machine. Smooth, slick lines make it one of the fastest stock .60 size helicopters available—our author's does 65 mph plus.

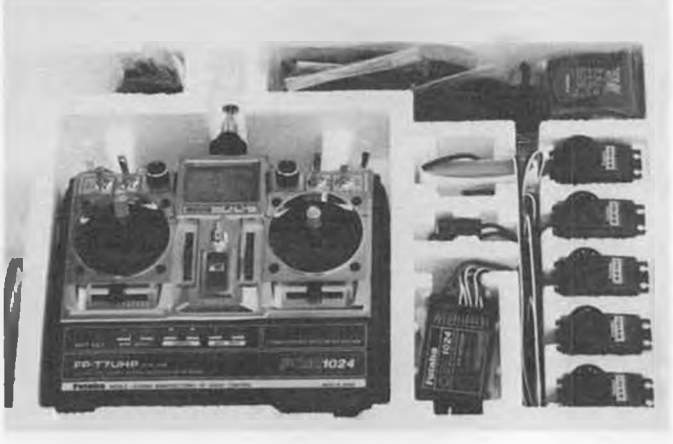
• The GMP Special Edition Stork has been on the market since late 1987. It is designed as a high-performance novice to intermediate R/C helicopter. I have logged over 400 flights on my Storks since spring 1988, and I love them! The Stork is the fastest of all the stock helicopters that I own (65 to 70 mph with an O.S. Long Stroke .61 engine). It is also one of the slickest looking pod-and-boom helicopters. Best of all, the DDF head design makes the Stork extremely smooth and stable, and thus very enjoyable to fly. For beginners I recommend it as *the* helicopter to get, if you want a large .60 size machine. I also recommend it as a smooth, penetrating, and non-wild-aerobatic machine for intermediates and experts. You can often find it on sale at around four hundred dollars, which makes it one of the least expensive .60 size helicopters on the market.

This review was originally started several months ago for *International Helicopter Magazine*, but IHM is currently going through internal restructuring and has stopped publication temporarily. Since then I have put many more flights on my Storks which permits more information to be added in this review. This review is probably the only kit review that has been written with over 400 test flights to back it up. Furthermore, after at least 10 spectacular crashes, I can tell you the Stork is very crashworthy. After every crash, it would rise like a Phoenix from the ashes and be ready to fly the next day. It takes a licking and keeps on ticking. But before I tell you all about Storks, let me give you a quick rundown of my experiences with GMP machines.

I have known the Stork's designer, John Gorham, for thirteen years. I have to say he might not make the world's top 100 R/C helicopter pilots list, but he is a damn good helicopter designer. I believe that due to his full-size aircraft engineering background (he was chief designer of the Lockheed L-1011's control system), he really has a feel for the engineering aspect of an R/C helicopter. Back in the mid '70s we were both flying Schluter Helibabies in Los Angeles. Almost every weekend he would have new modifications or new

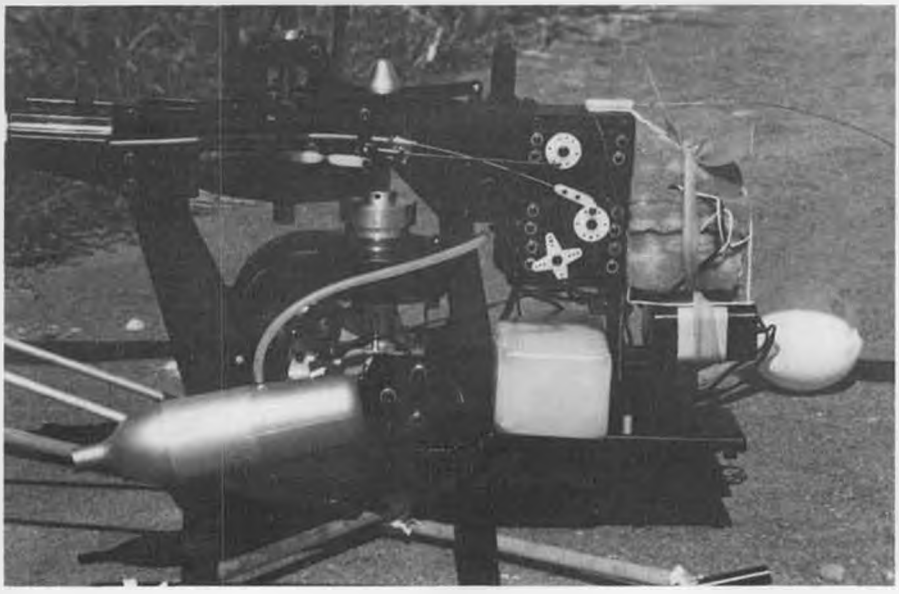


The O.S. .61 SFN-H short stroke helicopter engine is a very smooth runner rated at 1.7 horsepower, more than enough to make the Stork get out and really perform.



The Futaba 7UHP system comes with a 1000 mAH Ni-Cd receiver pack, which is big enough to run both the on-board radio and a yaw rate gyro. The S5101 servos replace the old S130's. Five servos are supplied.

Always after more speed, our author added a fairing in front of the mixer and swashplate to reduce profile and parasitic drag.



One of our author's Storks is equipped with a Supertigre .60H engine and swing muffler. The S.T. doesn't have quite as much power as the O.S. but it doesn't cost as much either. Note the GMP base loaded antenna glued to the top of the servo tray—highly recommended.

The soft, individually flapping DDF main rotor head gives the Stork extremely docile hover and forward flight characteristics.

ideas on his Helibaby. In 1977 John became the U.S. distributor of the German Schluter helicopter kits. He was a clever businessman, and combined with the aerobatic capability of the Schluter Heliboy, his business grew rapidly. In 1979 John started a career in designing some of the most popular R/C helicopters that we fly today, like the inexpensive Cricket; the competition winning Competitor, America's most popular mid-size machine; the Cobra; and the most successful flybarless helicopter, the Legend, which was reviewed here last month.

John might not be the best R/C helicopter pilot, but his son, Robert Gorham, really impresses the &@%$ out of me. Besides being an FAI and AMA national champ umpteen times, Robert routinely puts his GMP machines through some unbelievable anti-gravity maneuvers! One of the craziest that he has performed is to do a nose-in hover and then kiss the nose of his helicopter. Another stunt he does is to hover his fixed-pitch Cricket a foot away from him, then hold the transmitter in his right hand and reach out with the left to do an in-flight needle valve adjustment. Please, do not try these yourself! I don't even recommend that Robert try them again. However, I think these examples say it all about how much faith he has in his dad's machines.

The Special Edition Stork is one of John's more recent creations. It is a highly modified Hirobo BBC Stork. The Stork was originally designed for beginner and intermediate fliers. The original Hirobo Stork, which is sold only in Japan, incorporates a rear exhaust O.S. .46 engine; John redesigned the helicopter for .50 to .60

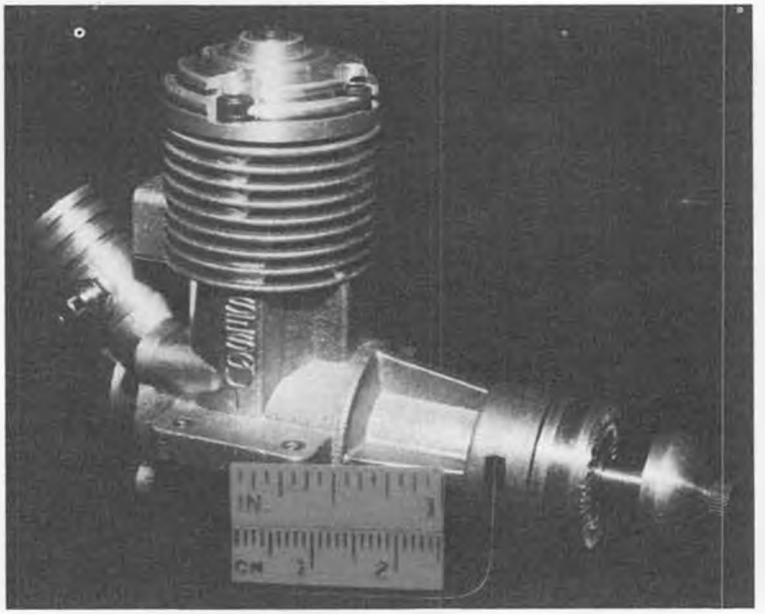
Continued on page 99

The Stork's large size and stability make it an excellent machine for the novice to learn forward flight. Big helicopters are less affected by wind and are easier to see. The training skid system is a must for beginners.

Our author uses the GMP Legend's tail rotor assembly on one of his Storks because he likes the all-metal construction and triple bearing blade grips.

Free flights aren't the only models that land in trees—see text for story.

ENGINES OF THE WORLD
...by Stu Richmond



1.5cc DIESEL

• SO YA WANNA MAKE MODEL ENGINES MAYBE? Read on—this month's column is for you!

In the early 1980s there was a move by the FAI to reduce the engine size from 2.5 cubic centimeters of displacement down to 1.5 cubic centimeters . . . from a .15 down to an .09. A number of engine makers designed new products to the 1.5cc size and this month's engine came into production. But the FAI (may stand for Federation of Antiquated Ideas) failed to make the change for the world's model builders and the .09 size failed to materialize as a world class engine. But from this FAI inaction evolved 350 production Sesqui .09 diesel engines. They are the result of brilliant collaboration between Ivor F and Gordon Burford in Australia. In 1987 I visited the production shop behind Ivor's home, saw all the intricate machinery and special tooling and lots of semi-finished parts. But production has ceased with only the 350 Sesqui engines completed.

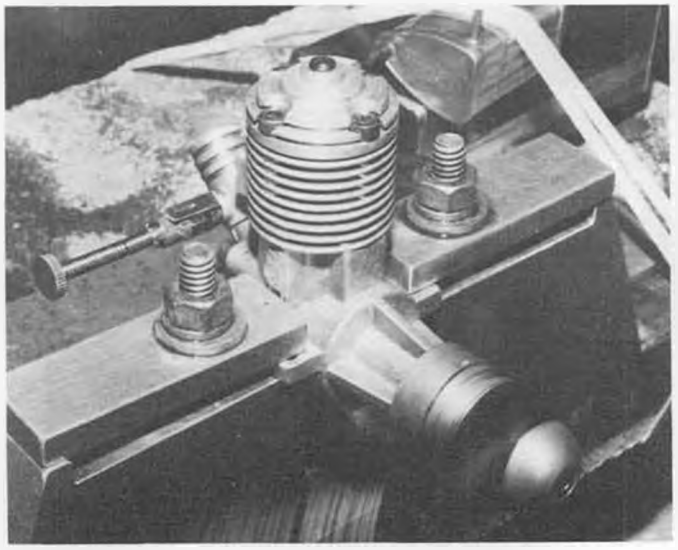
Each engine was delivered with a mimeographed sheet telling of the trials/tribulations/aggravations encountered in building the Sesqui . . . I thought you'd enjoy the following lines from Ivor's hilarious sheet:

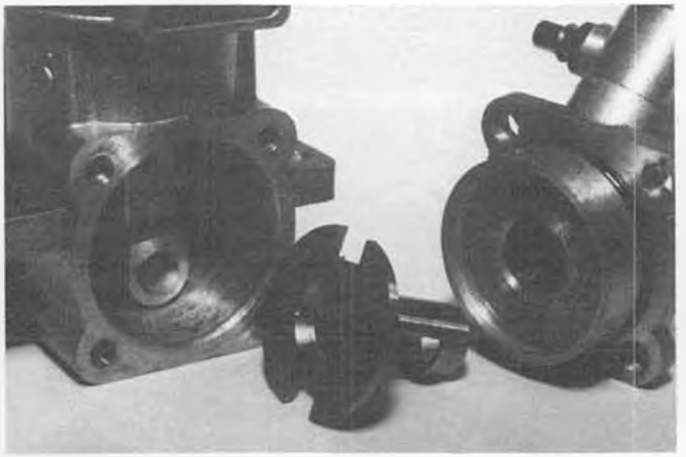
"Here at last is your Sesqui—I thought you'd like to know some of the vicissitudes of a mug's venture into the cold hard world of production engineering—all my training has been in what the academics call the 'humanities' so when I started this little caper I couldn't tell a hawk from a handsaw, let alone a slot drill from an end mill. I probably still don't know much about any of the four except some of them cost more if you break one. We looked at all sorts of machinery in auctions and new machinery houses, private sellers, Government disposals, etc. You name it—we looked at it. We weren't able to buy a used hand-op Capstan or CNC or even a good auto lathe. Thank heaven for the Taiwanese—Lin Huang made a superb L30 Capstan—the spindle is the other end from the tailstock, I think. And we'll buy four drill presses sez Gordon. Four, I yelp, what for? "How many holes in a conrod?" asks Burf. "Two," I reply guessing wildly. Drill the big end, drill the little end, ream the big end, ream the little end, wattaya wanna do, change the drill after every ten rods or what? We buy four drill presses! And a power press fifteen tonner. And four thousand feet of high tensile 7/16 alloy bar that's old stuff, like Ministry of Defense from 1942—good stuff—for conrods. Twenty-six operations in a conrod sez Gordon. And we buy a Bridgeport mill that's too big to come in any way except over the roof of the house on a forty-ton crane. Drop a ton and a half of mill from that height and it sure is likely

UNIQUE FEATURE: This is the final commercial model engine produced in Australia. Three hundred and fifty were completed in 1982. Was manufactured in expectation of an FAI engine displacement change that never occurred. Superb design/ manufacture.

VITAL STATISTICS: 3-1/8 inches long to the face of the prop driver, 1-1/2 inches across the mounting lugs, 2-1/2 inches high. Modern Schnuerle porting designed for high performance. Compression ignition. Crankshaft rides on two ball bearings. Rear induction through a windowed drum intake valve. Weighs 4-2/3 ounces.

Continued on page 64





Above: Induction through the rear crankcase cover is via a windowed drum intake valve. Rear cover is sealed with an O-ring.
Left: Here's Sesqui #311 turning a 7x4 Master Airscrew at 13,050 rpm. Diesel fuel has about 50% more energy per pound than glow fuels.

PLUG SPARKS

By JOHN POND

1. A neat 1/2A version of the Canadian "Wasp," built by Bob Milligan, who designed the original back in 1939. The well-proportioned model is an excellent flier. Too bad the Wasp doesn't quite qualify as an Antique, as it could really give the Lanzo Bombers and such a run for their money!

• This month's column will mark a departure from the standard format of contest reporting. This was tried in the June issue with the article on Joe Elgin and it was found this style of reporting on models and their designers was of great interest. On that basis, we will continue with this as the lead article, with contest reports interspersed as space allows.

First off, this idea is not new as this columnist has borrowed heavily from Jim Walston, the newsletter editor of *SEKS Talks.* This particular article came about as Walston attended the 1987 U.S. Free Flight Champs and happened to have a reservation at the Topper Motel. Deciding to have dinner at their restaurant, Jim was seated among a half dozen modelers engaged in a bull session about flying models. Most all were Californians (Walston is from Georgia) so most of the fellows were not acquainted with each other. Imagine the surprise Jim had when he mentioned the Canadian design, the Wasp, that he had always wanted to build, when an unassuming voice piped up and said, "That was my design."

Walston lost no time in acquainting himself with Bob Milligan, the Wasp's designer. Turns out, Bob was originally from Canada and now can be reached at P.O. Box 1854, Lancaster, California 93534, and is a member of the SCAMPS. Here is what Bob has to say:

"The Wasp was initiated during that period when Carl Goldberg came out with his Zipper. As best I recall, I decided to build a Pylon Class B model without the fancy elliptical fuselage. I made my plans to be simple (I consider simplicity as more reliable) and rugged. To the best of my recollection, the #1 model was started in late fall of 1938.

"As it turned out, the #1 model had too little dihedral. Ray Smith and Harry Lucas of Model Craft (Ontario) saw the model at a meet and decided that they wanted it in a kit. The #2 model showed improvements with increased dihedral and minor changes that made a good contest model of this design.

"In the 1939 National Exhibition Contest the model registered a modest 3:32 for 6th place in a 30-second open type contest.

"Immediately after this contest, WWII came along and I enlisted in the RCAF in September 1939. This saw the last of my modeling days as the war lasted six years. I was constantly reassigned and moved around so do not know the fate of the two Wasp models I had built. If I remember correctly, I told my mother to give the models to the YMCA Boys Club where I taught model building.

"It was not until 1948 that I flew again. This was at the International Wakefield meet at Akron, Ohio, where I obtained a fourth place.

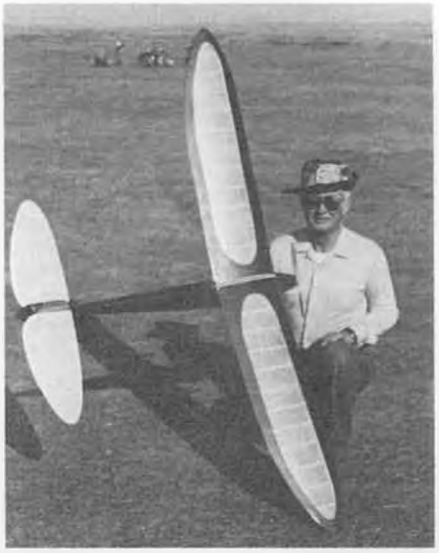
"I finally got back into models in the winter of 1986 at Taft and have been into the Wakefield event heavily. I did take time out to build the 1/2A Wasp, a small Powerhouse, and two old time Wakefield models."

Photo No. 1 is a good close-up of Bob Milligan's 1/2A version of the Wasp sitting on the hood of his car. In Photo No. 2, Bob is seen in 1987 at the Lancaster (desert) area with this same model.

Of course, Bob had to build the big one too, as can be seen in Photo No. 3. Bob is holding his Wasp carefully built to the old plan, complete with a Brown Jr., the original power. Sal Taibi, seen on the left, seems to be saying, "Will that model handle all that power?" Note the original number 98L (L=Life) from Canada's MAAC. This pic was taken in July 1987. Credit should be

2. Originally from Canada, Bob Milligan now lives in Lancaster, California (see text for address), and is an active member of the SCAMPS F/F club.

3. Sal Taibi gives Bob's full-size Wasp the once-over. With a Brown Jr. up front, this five-footer really performs. Note triangular fuselage aft of pylon.



4. Eut Tileston was the overall high-point winner at the Southwestern Regionals, at Eloy, Arizona.

given to photographer Mike Hughson for a nice job!

For those modelers hoping to have this design approved as an Antique, we have been unable to find any dates on this ship, on the plans, or other prints and photos. The fact the model was patterned after the Zipper indicates that as an Antique it is extremely marginal. The announcement of the Zipper did not appear until the April 1939 issue of *Model Airplane News*. Allowing a 90-day lead time in advertising plus time for the kit to get into production makes for further confusion as to an exact date.

Before closing, Bob wanted to make this observation: "Just had a phone call with another Canadian, John Bortnak, of Calgary, Alberta, who reports he has been highly successful with the Wasp. He was SAM Free Flight Champ at La Junta in 1983, Madera in 1985, and at Lawrenceville in 1988."

SOUTHWESTERN REGIONALS

This traditional "first of the year" contest for the western sunshine states was set back this year from January to February 4-5 to avoid some of the bad weather that has plagued this meet for the last three years.

Sad to report, but the 39th Southwestern Regionals did suffer from high winds and cold weather after the opening registration day of Friday, which featured simply beautiful weather. Photo No. 4 is presented showing overall sweepstakes winner Eut Tileston with a well-built Megow Commander (this shot taken at a Waegell Field NCFFC Contest). No question about the quality and flying quality of his models: superb!

Photo No. 5, taken at the Southwestern Regionals, again shows Tileston in the foreground with two of his models, a Bunch Scorpion Major and a scaled version of the New Cyclone Lancer. Good shot of the lineup of models. Plenty of Bombers can be seen!

5. A general view of the R/C O.T. pit area at the 1989 Southwestern Regionals, held at Eloy Airport, Eloy, Arizona. Actual flying was done off of the airport runways. The HAPI Engines hangar in the background was the site of a MECA Collecto that took place during the meet. Photo by Joan Bekins.

We would be remiss if we didn't publish Photo No. 6 showing hard working C.D. Dick Bringgold getting his Lanzo Bomber ready to go. "Bo" Buice of Texas assists.

One model not seen too often is the Schmaedig Stick Gas Model originally published in a 1937 issue of *Model Craftsman*. Photo No. 7 shows Bob Angel stepping briskly over his Schmaedig model, an Ohlsson 60 event entry. Flew well in the wind.

Naturally, with the weather not cooperating, other things had to go wrong, like the advertised Italian restaurant going belly-up. Oh well, nothing fazes Dick and he promptly commandeered another facility. Good time had by all!

Just as we were wrapping up this report, a half-dozen or so photos came in from Cliff Schutz, one of the members of the San Diego Aeroneers who attended the meet. We have selected Photo No. 8, showing Larry Young of Mesa, Arizona, with his colorfully decorated Dallaire Sportster. Larry is a chiropractor and this is his favorite form of exercise.

ENGINE OF THE MONTH

This month's subject is another rare engine unearthed by Peter Mann, 36 Syndenham St., Guelph, Ontario N1H 2W4 Canada. The Banshee engine was designed and manufactured by George M. Barrett in London, Ontario, Canada in 1945 and 1946.

Mann notes there were two versions of the Banshee. Barrett called the first the Model 45 (made in 1945), which was produced from sand castings, some of these with the almost undecipherable names of "Barrett London" on the crankcase front, and with thin tapered mounting lugs.

The second version, the Model 46, was produced in larger numbers in 1946. These

6. S.W. Regionals C.D. Dick Bringgold (right) has other duties besides Contest Director. Bo Buice of Texas lends a hand. Photo by Joan Bekins.

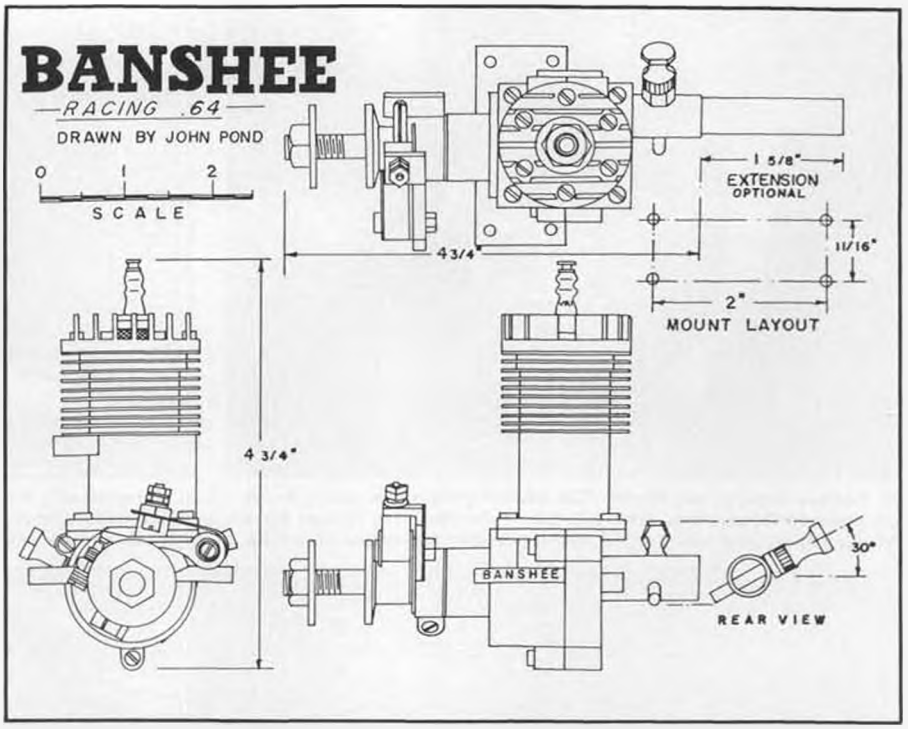
7. Bob Angel's O&R .60 powered Schmaedig Stick, held here by Don Bishop, is eligible for a number of SAM R/C events. Joan Bekins photo.

investment casting types did not carry any name on the crankcase, which featured thicker mounting lugs. This is the model we are displaying this month.

The number of engines produced and sold in the 1945-46 period is not known, as all records were lost or destroyed as a result of water damage from a severe rain storm. Barrett has stated that as many as one hundred engines were sold, but Mann has knowledge of only three Banshees in the Toronto area. Peter further states he knows of only one Banshee seen in model airplane competition in the late forties. He further points out the engine was probably being used more in power boats, as originally intended.

The sole distributor for the Banshee engines was Model Craft Hobbies, of Toronto (some call it "Ontario Modelcraft" to differentiate from Barney Snyder's Modelcraft in California). Barrett states they received a number of his engines during this period. Mann has checked the Model Craft advertisements in the model airplane magazines of that time and has been unable to find any ads listing the Banshee.

A thorough check of Model Craft catalogs and price lists (which are in the files of Easybuilt Models, Ontario) have failed to turn up any records. Of interest is the fact that Easybuilt Models is the successor to Model Craft. The only dated material relating to the engines are letters stating that the production of 1,000 engines was turned over to the Weatherhead Co., which produced 1,000 parts and castings for the Banshee. However, all these items reverted to Barrett in late 1946 as the Weatherhead Co. was unable to complete their portion of the agreement. No further Banshee engines were produced by Barrett, who kept all the parts. From these remains and new parts, "new" Banshees are now being produced. Of interest to collectors is that Barrett also has the original instructions and parts brochure along with the original box labels.



(Peter Mann wants to point out at this time that he is *not* an agent, wholesaler, distributor, or otherwise connected in any financial way with current Banshee production and sales. Pete will be glad to share information with any interested modeler or engine collector.)

To correct some of the deficiencies revealed from running the engine, new parts are as follows:

1) Cast iron piston replacing the built-up steel piston. (Some of the original 1946 batch had cast iron pistons.)

2) The cam/drive washer has been changed from aluminum to steel.

3) Production of new rotary valve disc with porting changed to correct an original porting error.

4) Lengthened intake tube with venturi to improve air flow to crakcase. This will be an optional feature, as it is not essential.

Pete Mann reports the engine requires no special techniques, starting easily on a 4:1 gas/oil mixture (super unleaded gas and heavy-duty outboard oil), a 3:1 gas/oil mixture (super unleaded gas and SAE 70 oil, and SIG FAI glow fuel.

For the technically minded, there is some vibration to be noted; Barrett felt this would not seriously affect boat operations. The bore of .950 inch and stroke of .900 inch give a displacement of .604 cubic inches. This has been increased to .64 as the engine cylinders are being refinished. Compression radio is 10 to 1 with operational speeds from 3,000 to 15,000 rpm claimed.

Present price is $195.00.

The engine has been tested and approved by the SAM Engine Review Board and is therefore legal for all SAM competition.

8. Beautifully built and decorated Dallaire Sportster was flown at Eloy by Larry Young of Mesa, Arizona. Uses an Enya four-stroke with 77 Products ignition conversion. Photo by Cliff Schutz.

FIFTY YEARS AGO, I WAS . . .

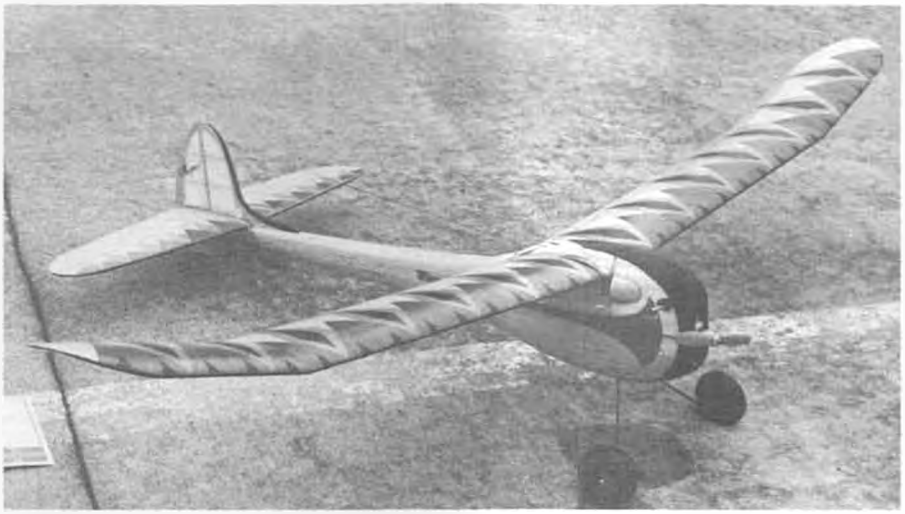
Actually, we should change the name of this section to "Modeler of the Month," a rather clever way adopted by SAM 100 to introduce their membership to the fellows who make up their chapter. Such is Raymond "Ray" Sherman, as selected by John Delagrange, newsletter editor. Ray likes to call himself the original "Hangar Rat."

Ray started building model airplanes in 1928 at the age of 8. He built them from wooden cigar boxes. (Classy! This writer used old wooden apple crates!) His first attempts were for non-flying models of the "Spirit of St. Louis" and the "Bremen," both transatlantic flyers.

At 12 years of age, Ray bought his first kit, a high-wing Ideal Monoplane. At 13, Ray became a "Hangar Rat" at Lancaster, Pennsylvania, one of those young fellows who would do most everything to be able to spend his time around airplanes. He loved to wash, polish, grease, and oil such old airplanes as the Waco 10, Westbrook LW, Fairchild 22, and the Aeromarine

9. Holmes Airport, Long Island, 1936, and the gang is seen with a Brown Jr. powered Dennyplane. From left: Bill Seidler (builder), George Hoza, Heinie Kopecz, and John Targos. John is now the proprietor of Argo-USA.

10. Good-looking Andrew Peterson "Cruiser" by Ed Smull was scaled up 150% to make it large enough for an O.S. .40 four-stroke. Model features a high aspect ratio wing and long tail moment. Ed reports it's a fine flier.



11. A very nice building and tissue trimming job on this Bill Winter "WOG," built for R/C and powered by an O.S. four-stroke. Photo was submitted by Sven Olov-Linden, of Orebro, Sweden.

Klemm.

By the time 16 years of age arrived, Ray had soloed in an Avro Avian and got his pilots permit, issued in those days by the Pennsylvania Department of Commerce.

Bill Northrop will love Ray, as he quotes: "A real airplane has two wings, an open cockpit, and drags its tail on the ground." Ray's selection of his favorite airplane is a difficult one as he admires both the Fairchild 22 and the SE-5.

On flying models, Sherman says the best flying plane he had was the Comet Sparky, probably the longest continuously kitted model. This is the highest compliment that can be paid to the designer, Ed Lidgard, who is still active!.

Prior to the war, Ray worked in the Vought Sikorsky plant at Stratford, Connecticut, where he was employed to repair and rework damaged parts. The factory produced the F4U-1, the first of the Corsair bent-wing fighters.

Most of his career was spent as a radio and TV technician and also in the photo finishing business with partner Gene Eshback. Retiring in 1982, Ray was still building model airplanes.

Ray is now 69 years of age and has been married to Reba, his wife, for 49 years. To their credit, they can count two children, seven grandchildren, and four great grandchildren.

Ray's health has not been the best in the past several years, so modeling has been somewhat curtailed. He says he is feeling better every day since his triple bypass operation last October. He plans to get out as much as possible to be with the gang at contests and fun-flys.

Come to think of it, whether you fly or not, the camaraderie of SAM members is what it is all about anyway. Amen to that!

SAM NEWS

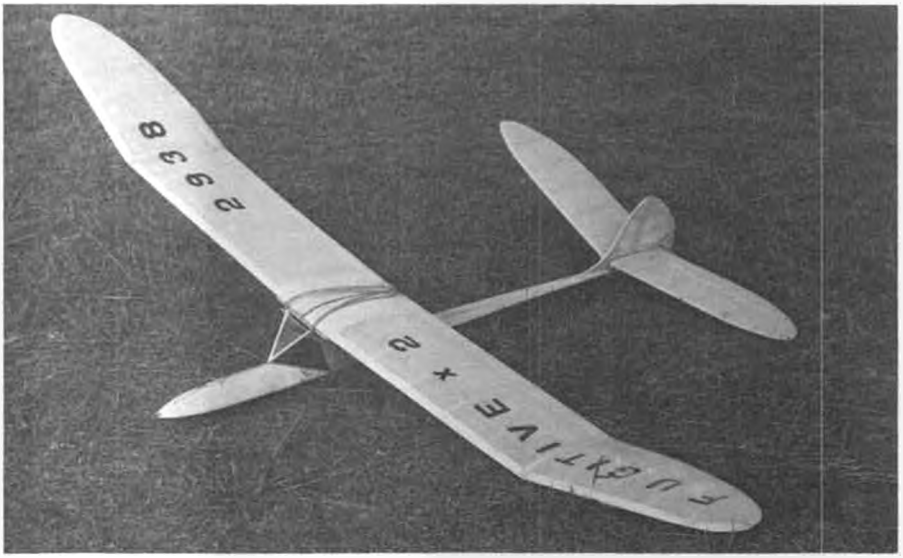
Bill Schmidt reports that he has received a letter from Dave Duncan of Cox Hobbies, thanking him for assistance in the development of the Cox 1/2A Texaco engine. This is probably the first time a major model engine manufacturer has worked in close cooperation with SAM.

Schmidt further states the production engine is internally and dimensionally the same as the early Cox QRC and Golden Bee engines with a .062 diameter carburetor throat. The .062 carb gives a more positive needle valve setting. This is important in 1/2A Texaco!

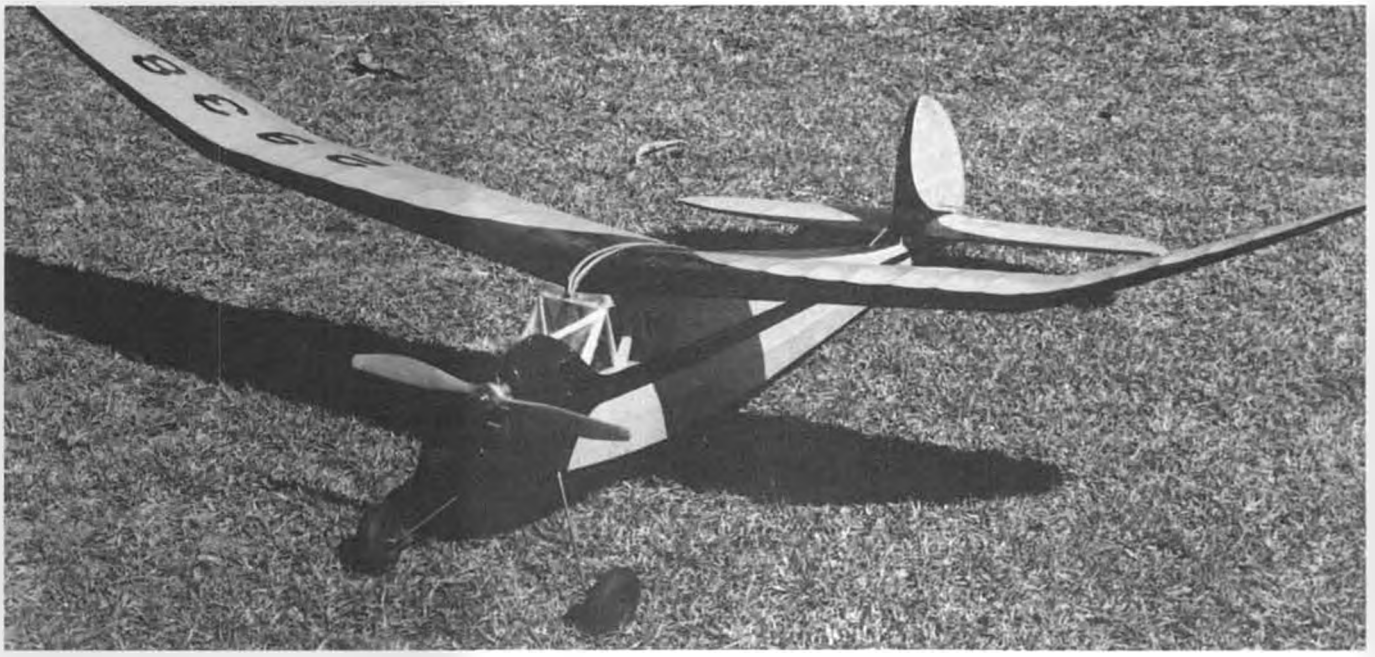
READERS WRITE

The latest letter from John Targos, proprietor of Argo USA, contained an old photo of John and the boys. This was discovered by his wife, Millie.

As can be seen in Photo No. 9, the gang consists of Bill Seidler, George Hoza, Heinie Kopecz, and John Targos. The site is the Holmes Airport on Long Island in 1936.



12. Bruce Abell built this interesting double-size "Fugitive" sailplane, a 1946 English design. Features cable operated control surfaces. Bruce is the glider columnist for Australia's *Airborne* magazine.



13. Glider man Bruce Abell also flies gas, as shown by this photo of his Mk. II Comet Clipper. O&R .60 turns a homemade 14x6 prop. Pretty color scheme is cream with red trim. Alas, it exists no more.

The model is a Dennyplane built by Seidler and powered by a Brown Jr. The kit was bought by Bill at Bloomingdale's Department Store in Manhattan. You are looking at four very proud teenagers. Those were the days for excitement!

MORE READERS WRITE

Received Photo No. 10 from Ed Smull, 6597 S. Newland Circle, Littleton, Colorado 80123, showing Ed with his 150% scaled-up version of the Peterson "Cruiser." The reason for this particular scale was the need to make a 900 square inch wing, necessary for an O.S. FS-40 glow engine. Wingspan came out at 96 inches with an overall weight of 62.5 ounces.

Ed sez the model is a real piece of cake to fly and won two or three meets last summer.

SWEDEN

Sven Olov-Linden, Hovstavagen 15, S-703 63 Orebro, Sweden, who is one of the main editors of their club publication, *Old Timer*, sends in Photo No. 11 showing what looks like a Bill Winter "Wog" (short for Pollywog). This design was recently approved as an Old Timer by the SAM Board of Directors.

AUSTRALIA

With the Old Timer R/C Glider event gaining popularity in California, it is with considerable pleasure that this columnist is able to run Photo No. 12 showing an English O.T. glider, a double-size "Fugitive" as built by Bruce Abell, 17 Ferguson St., Cessnock, N.S.W. 2325 Australia.

The photo, by Arthur Gorrie, was taken in front of the registration building for the MAAA Nationals at Amberly AFB, Queensland.

Bruce also reports his hot flying Ohlsson .60 powered Comet Clipper is no more. Seems like the battery pack failed as the

Continued on page 70

14. Old Timer "Jumbo" rubber scale! This nicely built Bay State Curtiss Robin belonging to Bud Perry, of Texas, spans a whopping 70 inches. Must be a real thrill to see this lightweight take to the air.

15. SAM 28 newsletter editor, Dick Brace (left), in the company of Chet Lanzo (center) and SAM president Jim Adams at last year's Lawrenceville SAM Champs.

R/C SOARING

By BILL FORREY

Photo from the BARCS 1988 "Interglide" meet in England shows German modeler Reinhard Werner with his "Fit-Fit" flying wing. Configuration is very similar to the Raven featured in our January 1982 issue.

IS F3B (STILL) A VIABLE EVENT?

Boy, there's a loaded question! It's guaranteed to raise either heated, emotional responses or indifference wherever it comes up.

Personally, I like the event's concept. I feel that F3B is the ultimate test of soaring pilot, soaring machine, winch, and like-minded flying buddies (an often overlooked but essential ingredient). F3B is the "Ironman" event of R/C soaring. It has the three major elements of thermal duration, distance flying, and speed. The only other FAI model soaring event which offers these elements is F3H cross-country racing. F3H is the best emulation of full-size soaring. F3B comes close, however, and it has the advantage of being run on a single flying site as opposed to all over the countryside. Thus, it is more conducive to observation by competitors and spectators.

However, F3B has its problems.

Like other forms of competition in the real world, it's getting more professional all the time. It takes a greater commitment to win. Specialized talents and increasingly bigger bucks are required to be competitive at any level above the local club.

F3B model building requires knowledge of composite materials and advanced molding techniques. The majority of sailplane fliers who are traditional balsa hackers are typically uncompetitive.

In the recent past, F3B winch building required extensive knowledge of welding and electro-mechanical engineering to get the most power and therefore the highest launch from a specified maximum battery size (It just happened to match a German tank battery). It now requires access to European (e.g. Bosch) 15 ohm automotive starters. Believe it or not, this is a step in the right direction. However, winches will never be even close to equal until they are organizer supplied and tested, an idea that works in the U.S., but lacks the all-powerful European seal of approval.

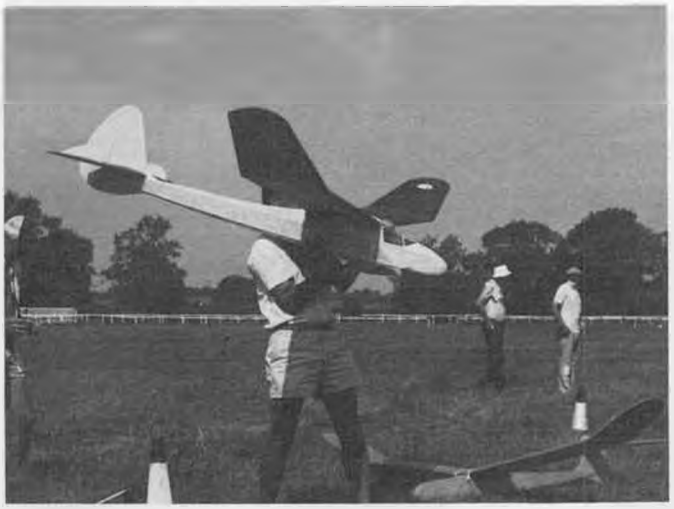
F3B involvement these days is a *team* effort from the start (building models and winches) to the finish (actual competing). Lone eagles have it very tough!

Finally, although it's not a prerequisite, it surely helps to be rich and single (or divorced) if you plan to be serious about F3B. Families can rightfully feel jealous of this-time consuming hobby/sport.

F3B is also labor intensive when it comes down to *planning* and *running* any significant contest. You need flaggers, timers, a surveyor to properly set up the 150 meter course, field equipment managers, officials to police and direct spectators and competitors, knowledgeable scorekeepers, radio impound personnel, and a contest director who knows the rules and is not himself a competitor.

Then there are the political issues! Each country has its own ideas about the flying rules in this complicated event, and they are more than vocal when it comes to persuading other countries. Attend a multi-country F3B committee meeting sometime if you doubt me! I did at York, England, in 1983. CIAM/F3B Chairman Dan Pruss had his hands full preventing World War III!

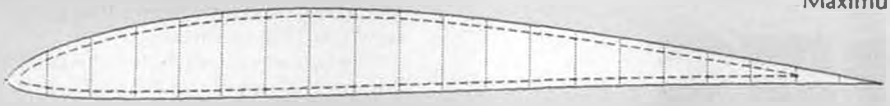
BARCS F3J rules require hand towing, thus all fliers get as equal a launch as possible. Flight groups can consist of a dozen or more fliers in each round. Text has more details on F3J rules. All photos on this page are by Sean Walbank.



Interglide meets feature a special class for Vintage sailplanes, an event that is growing in popularity in the U.K. Seen here is an enlarged "Ivory Gull," built and flown by Joe Hanna.

Nicely built Bird of Time variant by George Chastell spans about 12 feet and sports an interesting V-tail arrangement.

EPPLER 193



Maximum Thickness . . . . . 10.1% at 31% chord
Maximum Camber . . . . . 3.7% at 45% chord

Line No.	Station %	Upper coord.
1	0.03	0.190
2	0.47	0.915
3	1.34	1.740
4	2.65	2.608
5	4.38	3.487
6	6.53	4.352
7	9.06	5.181
8	11.97	5.957
9	15.22	6.663
10	18.78	7.284
11	22.62	7.805
12	26.70	8.213
13	30.97	8.487
14	35.40	8.603
15	39.98	8.487
16	44.67	8.332
17	49.46	7.954
18	54.31	7.436
19	59.19	6.808
20	64.05	6.112
21	68.84	5.381
22	73.48	4.642
23	77.92	3.914
24	82.10	3.214
25	85.95	2.558
26	89.41	1.957
27	92.45	1.415
28	95.02	0.932
29	98.67	0.220
30	100.00	0.000

Line No.	Station %	Lower coord.
1	0.00	0.000
2	0.13	-0.375
3	0.82	-0.838
4	2.04	-1.252
5	3.79	-1.588
6	6.05	-1.841
7	8.80	-2.010
8	12.03	-2.098
9	15.70	-2.112
10	19.78	-2.061
11	24.23	-1.955
12	29.00	-1.807
13	34.04	-1.628
14	39.28	-1.430
15	44.67	-1.224
16	50.15	-1.019
17	55.63	-0.824
18	61.06	-0.645
19	66.36	-0.486
20	71.48	-0.350
21	76.34	-0.239
22	80.88	-0.153
23	85.05	-0.091
24	88.79	-0.048
25	92.05	-0.018
26	94.79	-0.010
27	97.00	-0.032
28	98.64	-0.034
29	99.65	-0.014
30	100.00	0.000

Credits: "Foiled Again" program by Cygnet Software.

The Sailplanes International Osprey 100 would make an excellent choice for the proposed FAI/F3J Thermal Duration event. An English design for an English contest format. Fitting!

From Alabama's Rick Durden comes this photo of his reduced Olympic 650, scaled down to AMA Class A hand-launch size. Rick says it flies well at 15 oz., 430 sq. in.

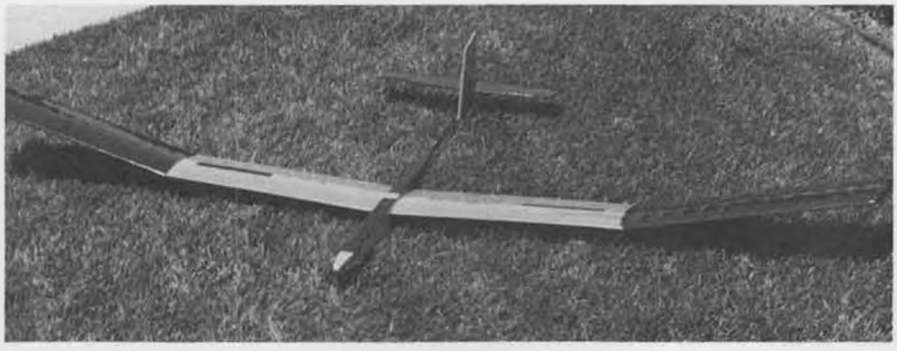
Further, F3B technical subcommittees and juries have historically been anti-U.S. Almost every time we have sent teams to world championships there has been something for the other teams to complain about: high-starts(!) in 1979, two-motor winches in 1983, mechanically stored energy winches in 1985. . . . These were all legal *until* it came down to flying against the Europeans. Their M.O. was to wait until we had finished selecting our teams and were committed to winch/aircraft systems, then they outlawed our launching devices. They used the "FAI safety catch" to get their rules passed between FAI law-making periods. These launching devices were no more dangerous than any other devices used where the model reaches altitude before being released. The end result was the same: they won the "winch war" and we launched lower than the Europeans.

By contrast, when the U.S. held its FAI World Championships in Sacramento in 1981, the Canadian team brought with them a truly unsafe launching style and a monster winch. We allowed the system because the winch wasn't technically illegal, and the rules said nothing about releasing at low altitude. The winch was called the "Mother Flinger." Their single design planes were called FMFs (you can guess what that means). The winch had two batteries, a monster motor, and a very narrow winch drum that built up line speed in the blink of an eye.

The Canadians' horizontal launching style broke their under-engineered wings at near ground level and threw fuselages and other parts at anyone near the turnarounds with very little advanced warning. They eventually gave up their horizontal launch in favor of the normal high-altitude release because they were running out of aircraft to fly. It was their launching style and aircraft structure which were unsafe, not the winch. We didn't change the rules on the Canadians, but it seems the rules have always been changed on us.

I think you will probably agree with me

Continued on page 90



Harry Weitz's original "Peapod" design uses a fiberglass arrow shaft for the tail boom, which proved to be too flexible. Lengthening the fuselage pod solved the problem.

ALL ABOUT ARFS

By ART STEINBERG

• At the IMS show, held early this year in Pasadena, California, I was making my usual rounds of the manufacturer and dealer booths, trying to get a handle on what was new and interesting, and gathering fodder for future columns. As usual, there were many new and fascinating ARF developments, and I can promise my readers that, as time and space permit, we will be introducing revolutionary advances in our sport/hobby in many issues to come.

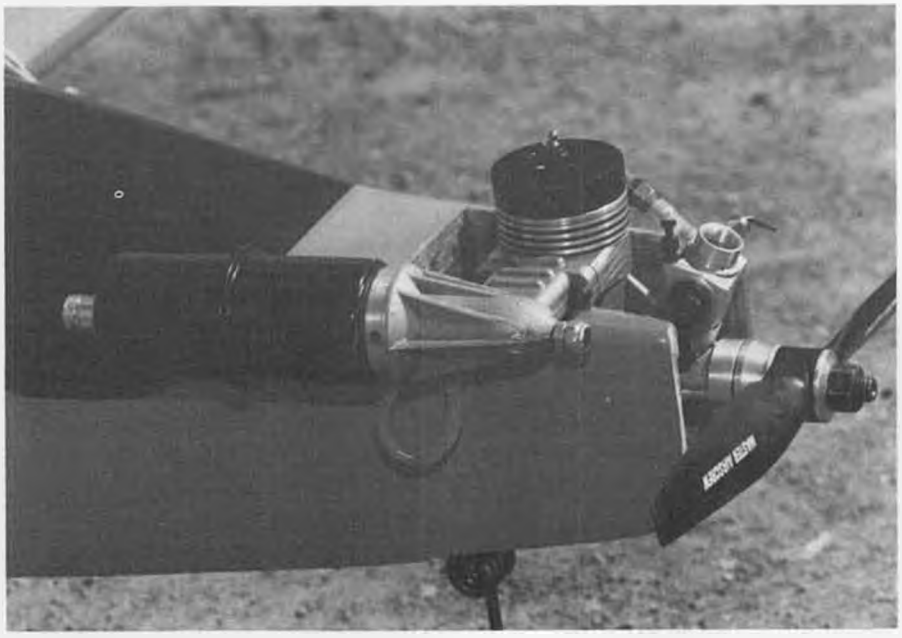
As you may begin to suspect by now, one product virtually jumped up and seized my rapt attention, an ARF so beautiful as to be really one-of-a-kind. It happened when I stood before the Thorpe Engineering booth, and I found myself mesmerized by a model displaying such an exquisite finish that it didn't occur to me that I was looking at an ARF! Actually, the model wasn't at all unconventional in appearance, as it was pretty much a nicely proportioned high winged cabin type affair with a tricycle landing gear and the usual style of tailfeathers to which we have all become accustomed. However, if you have always yearned for a professionally finished airplane with the quality paint job you find only on pattern planes and formula racers, then this is the one for you. The model is called the "Starhawk," comes in a high-visibility overall chrome yellow, and the only embellishments are the black windows and the eye-catching screen printed Starhawk logo on the wing.

I spoke to Doug Thorpe, the brains behind this fabulous model, and he readily explained how the finish of the model was attained. All parts of the Starhawk are constructed of choice grades of balsa and plywood, except for the wing, which is balsa sheeting over foam. Here and there a bit of solid hardwood is utilized, such as in the main landing gear supports and in the motor mounts. When the basic wooden structure is complete it is sanded to a smooth finish. Next, the entire airframe is covered with doped-on silkspan, which imparts a great deal of strength to the surfaces, and is probably second only to fiberglassing where durability is desired. The silkspan is then filled and sanded, and finally a number of coats of acrylic paint are applied, resulting in a glossy finish which can be compared to any professional paint job around. Finding myself greatly enthusiastic over this most attractive model, I arranged for Doug to ship one to me for evaluation, and in a few days I found myself in my workshop opening the newly arrived carton.

The box was somewhat on the plain side for such an elegant airplane, but the manufacturer maintains that the money was spent on the model, not on the packing carton. In any event, I did wonder how that glass-smooth finish survived the trip via UPS, and on opening the carton and examining the contents, I found not even one hairline scratch on the entire surface of the Starhawk! Actually, there wasn't any way the finish could have been damaged, as every component was completely wrapped in a sheet of thin foam rubber material, and that is what I consider outstanding attention to detail.

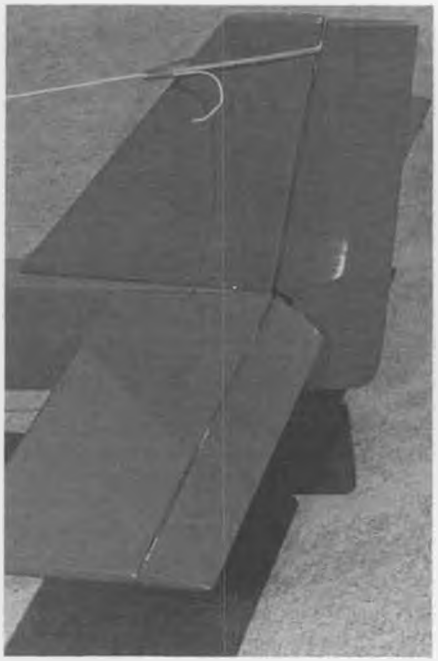
Assembly couldn't be much easier, as the basic components consist of only four main parts: the fuselage, the horizontal stab with elevators pre-hinged, the vertical stab with rudder unhinged (because the rudder hinge is glued as the last step in assembling the tailfeathers), and a complete wing which is supplied in one piece with aileron hinges and torque rods installed. The wing comes with a precision cut hole into which I mounted the aileron servo, resulting in a really neat flush mounted installation. Not having to connect two wing halves saves a lot of work, and the joint is perfectly smooth and completely invisible. This is a unique feature in an ARF of this size.

This month our columnist reviews the "Starhawk" as produced by Thorpe Engineering Corp. Clean lines make for snappy performance. Oversize wheels were fitted for operating off of a dirt strip.

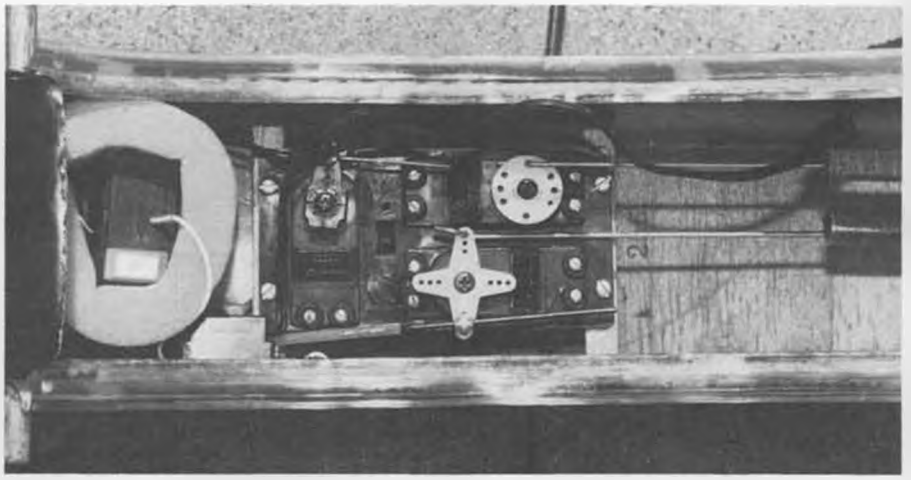


Our author powers his Starhawk with a Rossi .40 equipped with a J'Tec "Snuf-Ler" muffler, which does an excellent job of taming down the Rossi's notoriously loud exhaust. No drop in rpm, either.

Included with the Starhawk was a finished set of hardwood pushrods with threaded rods on the rear ends and Z-bends on the servo ends. The rest of the miscellaneous parts consisted of a breakaway plywood motor mount, a set of wire tricycle landing gear, a pair of wing hold-down dowels, two hardwood servo tray mounts, and two hardwood aileron servo mounts. The only other hardware supplied was a couple of landing gear clamps and a nose gear steering arm. The builder has to furnish his own wheels, collars, clevises, and assorted fasteners. These were easily located in my spare parts drawers, and should not prove to be any significant expense to the average experienced modeler who has accumulated an assortment of odds and ends. Another nice touch was that the throttle and nosewheel steering pushrods were already in-



The generous size of the Starhawk's control surfaces provides excellent response to control inputs.



Plenty of room available in the fuselage radio compartment. Note the factory registration number 296 on the floor of the fuselage.

stalled, eliminating the necessity of drilling through the firewall and attempting to get the angles right. The excellent ten-ounce fuel tank was also factory installed, and the brass tubing which protruded through the firewall was properly labelled so that it was impossible to mistake the fuel line for the vent outlet. I considered this to be just another example of really sophisticated engineering on the part of Doug Thorpe.

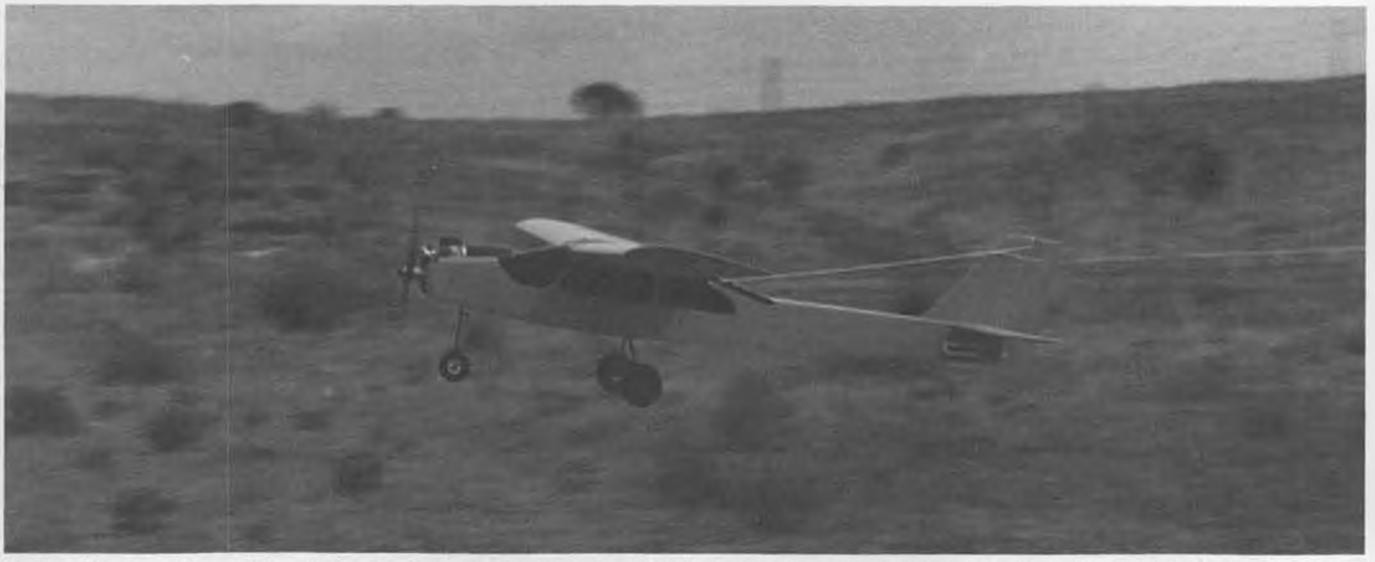
OK, now let's get down to brass tacks and start assembling this beauty. My model was from a very early run, and with it came a sixteen-page instruction pamphlet complete with checkoff boxes as each assembly step is completed. The pamphlet also lists suggested hardware which is not supplied with the kit, and a list of tools considered necessary for assembly. Aside from the usual directions pertaining to engine and radio installation, gluing on the tailfeathers, mounting the landing gear, etc., mention is made of how to modify the model from tricycle gear to taildragger configuration, and how to change the rubber band wing hold-down system to the bolt-on method. The pamphlet even goes into "cosmetic maintenance" of the model and explains how to keep the paint finish sparkling. And to top off the cake with a real touch of class, each model is affixed with a permanent serial number. The last page of the pamphlet contains an "owner's application" which is to be filled out by the purchaser and mailed back to the manufacturer. This records your model's hull number with the manufacturer, and in return you will receive a "Certificate of Completion" and a free subscription to the *Talon* newsletter. Thus far I felt that Thorpe Engineering was making a genuine effort to put out an exceptional product and to establish a close working relationship with its customers.

Actually, I must confess that I found the instructions largely superfluous, as assembly was very conventional and everything just seemed to fall together. I don't recall any ARF that went together as simply and easily as the Starhawk. All this is because so much of the work has already been done for you.

The manufacturer suggests a .40 or .45 size engine, and that seemed about right to me. I selected a Rossi .40 from my stable, as I had just equipped it with a J'Tec "Snuf-Ler" in an effort to quiet down its horrendously loud exhaust. I also wanted to use the Rossi because it runs a few ounces heavier than most other engines of equal displacement, and I suspected that the Starhawk might tend to be a bit on the tail-heavy side due to the painted finish. Assembly went so rapidly that the entire job was accomplished in about three hours, and if one were in a hurry it could probably have been done in just two hours.

Each Starhawk sports this distinctive logo silk-screened on the wing.

Continued on page 81



While performing a low and slow fly-by, the Starhawk demonstrates its ability to remain stable and not drop a wing. Also available from Thorpe is a low-wing version of the Starhawk, as well as a set of ready-to-use floats. Text has details.

ELECTRIC POWER

By MITCH POLING

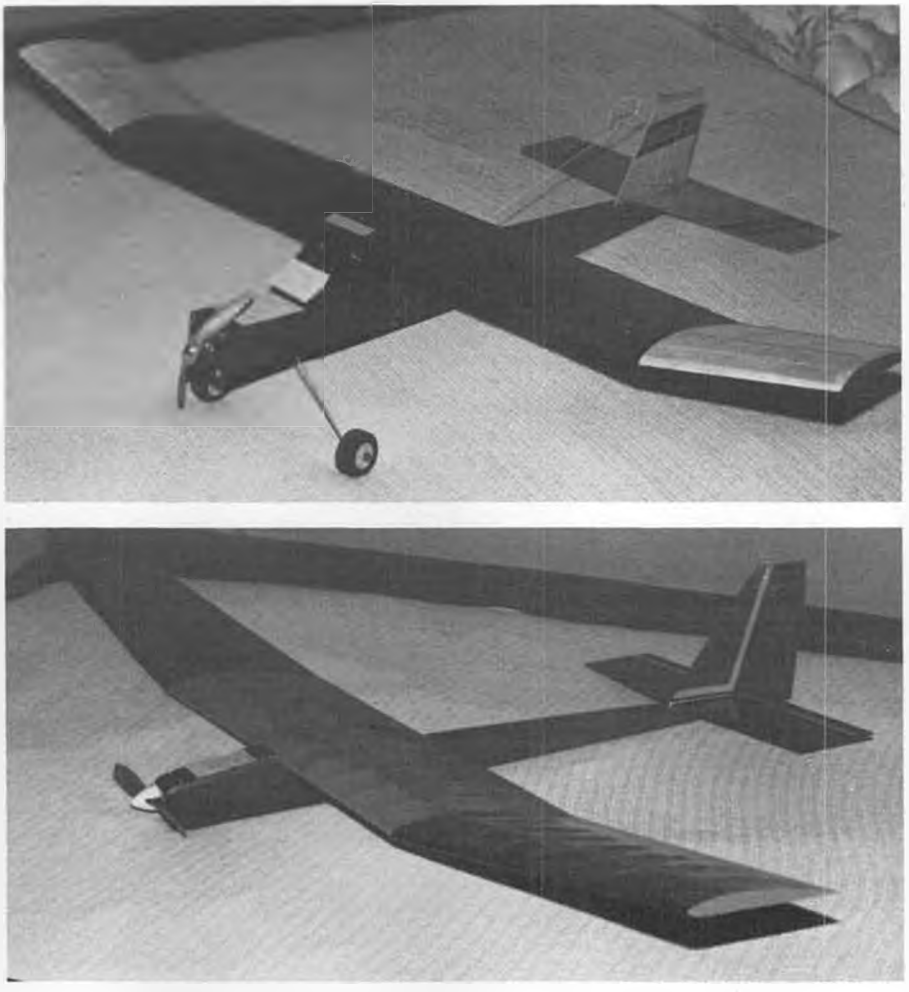
Homemade fuse holder for ultra-small electrics mounts in the fuselage side with the terminals exposed on the outside; plugging a fuse in place automatically turns on the motor. Simple and light, and it gives the added protection of having a fuse in the circuit—a good idea on *any* size electric. Photo from Jack Dobbins.

• As mentioned last month, I flew my Electro Flea with the Hi Line IMP 30 motor and was well pleased with it. The Flea is my own design, 25 in. span, 113 sq. in. wing area, and flies very well in small areas. In fact, I designed and flew it in 1976 when I lived in an apartment, so I could fly it in the vacant lot next door! At that time it was powered by an Astro 020 and I used the Ace Baby rudder-only system (no longer made). Flying weights were between 11 and 12 ounces, depending on the motor pack. The IMP 30 only needs three cells, which saves nearly an ounce compared to a four-cell pack.

This time I put in two World Engines S-22 servos and a High Sky electronic on-off switch, plus a tiny 50 mAH SR receiver pack. (The World Engines S-22 servos, by the way, were definitely in the "best bargain" class, at less than $20 a servo. They are almost as small as the Cannon servos, and weigh about .6 ounces. Indy RC sold them, but apparently they are not stocking them any more. I did get a flyer saying they had a few left, so if you want them, order soon!) I used the Ace Olympic V system for control. All-up weight was 12 ounces with three 550 mAH Sanyo cells for power and a 5-1/4x3 Top Flite nylon prop. I am not sure that this prop is made anymore, but Graupner (imported by Hobby Lobby) makes an equivalent size. This combination has given me many happy and pleasurable flights. There is not enough power to loop from level flight, but a shallow dive will produce loops. Snap rolls are slow, and try to turn into a spin. The strong point of this combination is just doodling around the sky like a little bird.

The field that I fly in is a semi-natural park, a former Navy air base that was turned over to the city. The runways were taken out, and much of that area is brush, small trees, and grass. There is also a soccer field there which has short grass. I fly the 05 and larger planes from the soccer field. I usually fly the small 020/40-watt planes in the brush area, since the tall grass prevents damage to motor shafts and props. All the small planes are hand launched, as I usually do not have landing gear on them. If I were flying where there was pavement, I would use a landing gear. Anyhow, since this field is in the center of a large urban area, there is lots of potential radio interference, and I have experienced it quite often at this particular field with most radios. It has always been glitches in the form of unexplained elevator or throttle twitches, and never total loss of control, but it is enough to make you worry. The Ace Olympic V receiver, even though it is not a 1991 receiver, has been totally immune to interference, and it is the receiver I use at any field that gives "funnies." However, it is not a "mini" receiver, so to save weight I removed the case and used battery shrink wrap to cover the receiver. The 2-1/2 inch wide shrink wrap does a good job. The receiver then weighs 1.1 ounces and uses less room, though it is still about twice as large as a mini receiver.

I am very impressed with the High Sky (3929 Kansas St. #9, San Diego, California 92104) electronic on-off switch as well. It is a very simple device and uses a relay to turn the motor on and off. High Sky says it can handle up to 50 cells! The price is $19.95 for the non-connector block version, and $24.95 for the connector block version. I got the latter, but since I am flying the little ones, I needed to get the size and weight down. I removed the connector block and the case and covered the on-off controller with shrink wrap. This made it very compact and it weighs only .8 ounces. This on-off controller has been completely reliable, loses no rpms, generates no heat, and is very rugged. I recom-



Two of Jack Dobbins' mini-electrics are the Little Big Bird (top) and a scaled-down Airtronics Eclipse powered with the geared power system used in the MRC Cessna 177.

mend it.

The Hi Line motor turns the 5-1/4x3 prop at 11,150 rpm at 10 amps from three 550 Sanyo cells. This is very impressive for three cells, so I decided to try two cells! To make a long story short, the Electro Flea, even at ten ounces, one servo and the on-off controller, didn't fly. Not enough power. (The only plane I have ever been able to fly on only two cells was the Mattel Super Star at eight ounces with an Ace Baby rudder-only outfit. The Super Star was discontinued many years ago, much to my regret. It was fifteen years ahead of its time.)

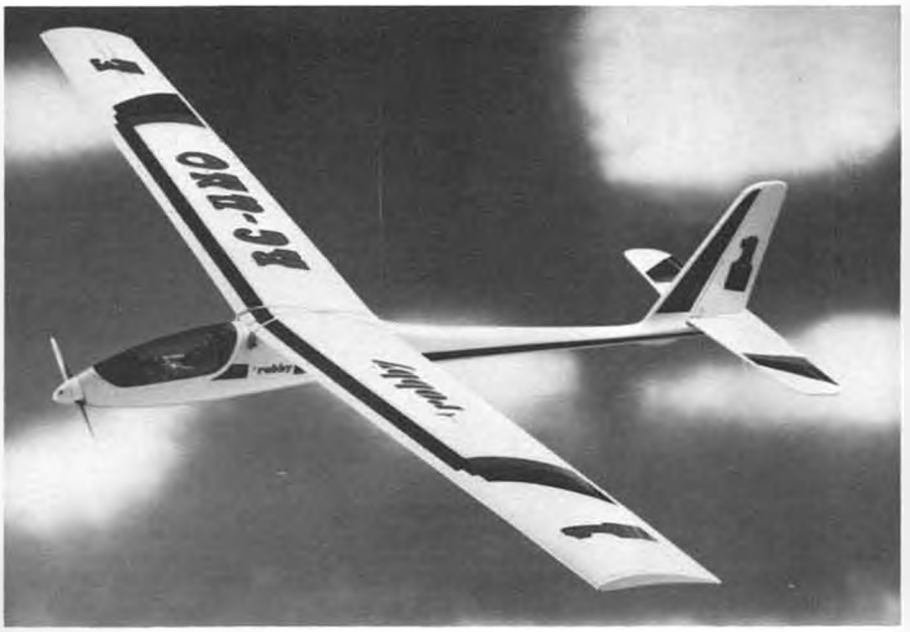
Anyhow, the Hi Line motor represents one approach to 40 watt motors: high current and minimum cells. Despite the high current, four to five minute flights are routine on the 550 mAH cells. Since the battery pack is small due to the low cell count, it is very easy to install in little planes. I

The miniature electronic speed control from Benson Hobby Products—see text for details.

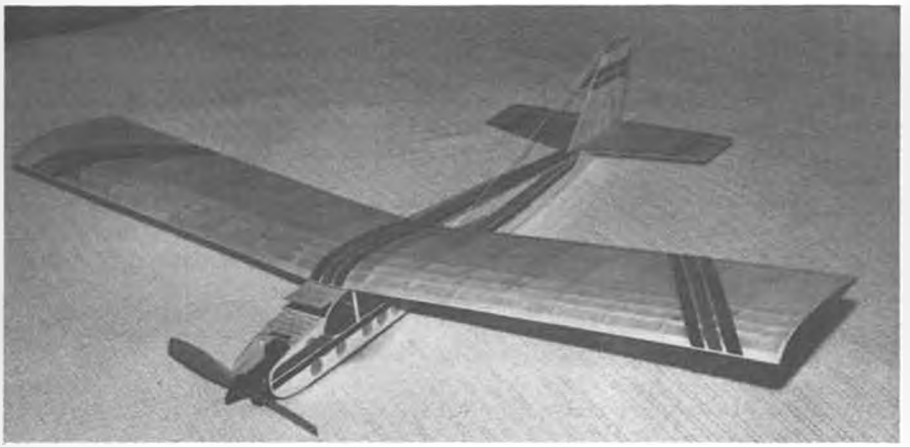
recommend it for planes in the Electro Flea size. I understand that Hi Line is also about to introduce a slightly larger motor, about 60 watt size (035). I am looking forward to trying this motor, judging from the performance of the IMP 30.

I have also been flying the Schoolboy with the Peck-Polymers (Box 2498, La Mesa, California 92044) Silver Streak motor. This motor is about 50 watts, a strong 020 size, and uses six 550 mAH Sanyo cells. The Schoolboy has a 30-inch span, 167 square inches, and weighs 20 ounces. I have flown it on six cells before, fifteen years ago, when I was using rewound windshield washer motors for small planes. At that time, of course, I was using the Ace Baby rudder-only radio. (Those windshield washer motors, by the way, were impressive quality, with heavy motor shafts which did not bend, five poles, and excellent brushes. I sure liked the unbendable motor shafts.) Anyhow, this time I installed the World Engines S-22 mini servos, and made a mistake! I installed the servos about ¾ of an inch from the back of the cabin. Presto, not enough room for the radio, motor pack, and receiver batteries. So I ripped it all out and reinstalled the servos back as far as they can possibly go. Now everything fit. I strongly recommend that servos be shoved back as far as they can go in the

Continued on page 74



Robbe's new "RC Uno-E" is a highly prefabricated electric motorglider complete with molded fuselage, ready-built wings, motor, electronic motor timer, prop, glue, paint, and tools.

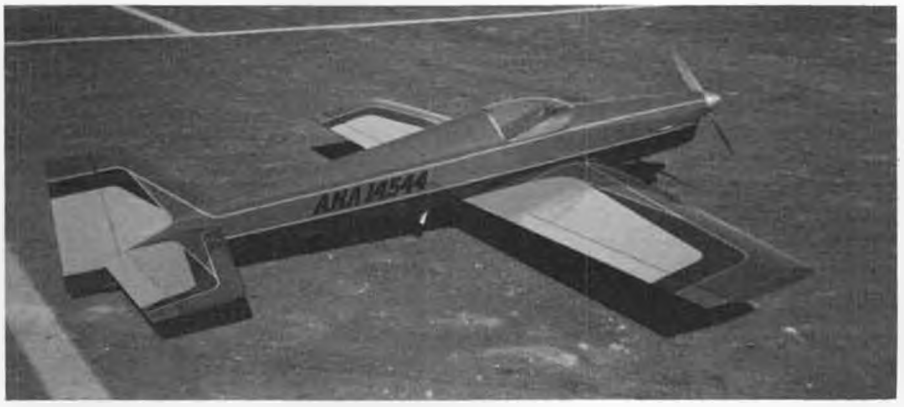


Cute scaled-down Great Planes PT-Electric by Jack Dobbins uses the MRC Cessna 177 power system. Radio is a two-channel Futaba with receiver case removed, and S-133 servos. A real fun flier.

Three of the power systems used by Jack Dobbins are, from left: MRC's Cessna 177 geared unit, the Hi Line IMP 30 direct drive motor, and the geared system from the Cox "Kitty."

Pattern Flying

By DICK HANSON



Beautifully finished "Runaround" FAI ship by Jerry Calvert took top honors in the Pattern category at this year's Pasadena IMS Show. Jerry is an active FAI contestant in the Southern California area.

• Are you an avid contest flier? One who hits every pattern contest within a day's drive? For some of us, this is pure bliss. We meet old/new friends, compare notes and equipment and test our skills and ideas with other avid hobbyists.

For some of our friends, the contest urge is a little different. Their skills are rewarded by equipment suppliers who are keen on showing their products in a favorable light.

That these "professionals" exist is no surprise to regular contest fliers. The amount of support they receive may surprise (stun) some, however. Every sport has its pros and some openly identify themselves as team contestants. International sports are heavily sponsored. It isn't cheap to fly halfway around the world.

Is this really fair to the enthusiast who competes on a limited or fixed budget? No, not really. But life itself isn't really fair to everyone. The best we can do is try to make the situation work for us. For instance, if the guy who beats you is sponsored, you have an excuse! Excuses relieve tension and enable you to prepare for "next time." Better yet, take an objective look at professionalism.

First, recognize that it is a logical product of any sport which requires equipment that must be purchased. Manufacturers know that products which win, sell. They will, therefore, supply equipment and/or provide money or favors to those who can and will show their stuff in the winner's circle. There is no stopping it. Nor should there be!

Here's why. When you accepted that first free tube of glue, you crossed the line of amateur to pro. The Olympic Games people have made this very clear.

There simply is no way to clearly split the two categories. Even if it were possible, what would be gained? Separate classes? That would really be a mess. Imagine a contest with twenty contestants and twenty-five classes. Most of the Pros are likable, friendly types who provide help and good advice to the newcomer. Some Pros even ask that any prizes they receive be distributed to others, such as the "hard luck" contestant.

Of course, there are other Pros who are not so benevolent.

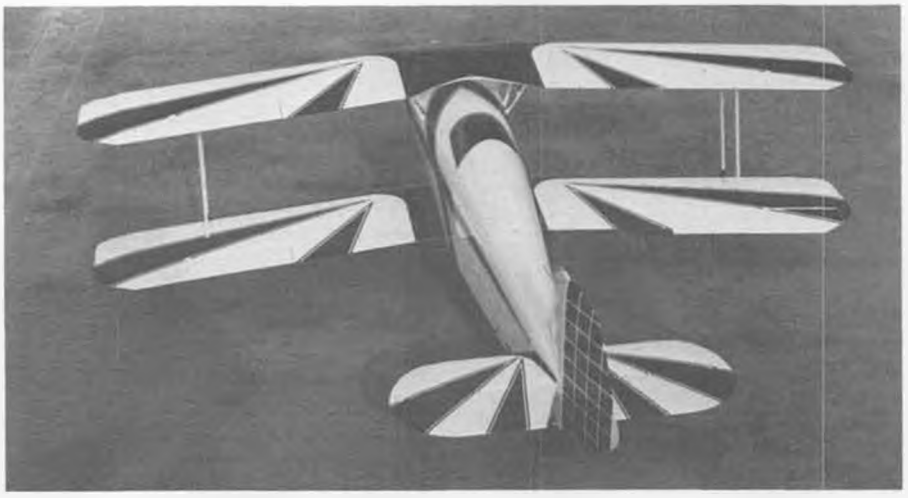
It is more than a little upsetting to see your $20.00 entry fee being used to buy another prize for the Pro who gets these same prizes gratis. The bottom line is, if you have any ideas about pro vs. amateur, present them to the Rules Committee and encourage support.

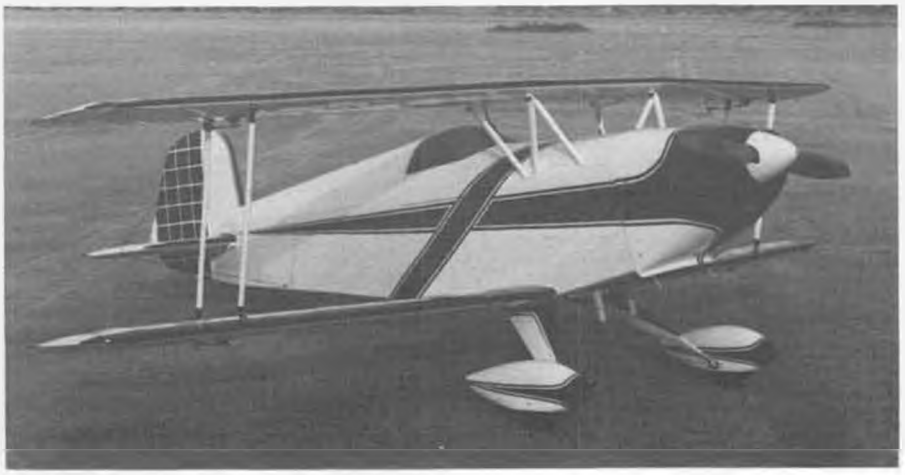
* * *

Last month we presented an open letter concerning engine rules. The point was that engine size need not be specified. The rules of size, noise and weight hold the models to a desirable limit.

Also, the inclusion of the 1.2 four-cycle engine creates a situation where the models designed specifically for that engine can be larger than those models which were intended for use with .60 two-cycle engines.

We have all seen the trend to score the larger model higher than the smaller design. For example, a .40 powered setup is usually scored lower for no other reason than that it is not considered a competitive engine. I see a real possibility that the 1.2 four-cycle will become the only desirable





Two views of Jim Moser's latest version of the Bucker Jungmann, built at 1700 sq. in. for T.O.C. type Pattern competition. Model is almost exact scale and weighs in at 17 lbs. with a Tartan Twin.

Continued on page 66

MODEL DESIGN & TECHNICAL STUFF

By FRANCIS REYNOLDS

COMPOSITES IN PERSPECTIVE

We promised to discuss the materials and processes aspects of the design of Sea Fli XI, our example design project. Let's also put the whole field of alternate materials and composite structures in perspective, as this modeler sees it at this time. I say "at this time," because the field is changing rapidly and so are my opinions of it, depending on what I have been able to learn and on my personal building successes and failures with composites to date. These opinions are considerably different from what they were six months ago.

FIBERGLASS ON FOAM

If you read the construction article on Sea Fli XI in the May 1989 *Model Builder*, you will remember that I built it entirely of foam and fiberglass, with no balsa whatsoever. That was a test to see if I could do it, and was not based on a particular dislike for balsa.

My criteria for model materials and processes include strength-to-weight ratio, density, construction time, availability, water absorption (in seaplanes, which I mostly build), appearance, handling ruggedness and model life, and, to a lesser degree, materials and equipment costs. Keep these in mind so you will know where I am coming from.

Sea Fli XI cost me very little in dollars, but it took at least as long to build as it would have with conventional construction. It required a lot of messing with gooey stuffs and a lot of sanding, filling, and finishing, which I personally don't care much for. The resulting airplane is adequate for sport flying, but its finish is far from show quality. I could have made it look better, but that would have required still more time in the type of efforts I am not fond of. It is structurally plenty strong, and its weight is about the same as it would have been if it were built of balsa. Perhaps its greatest value to me is in the practical lessons it has taught me about composite model structures.

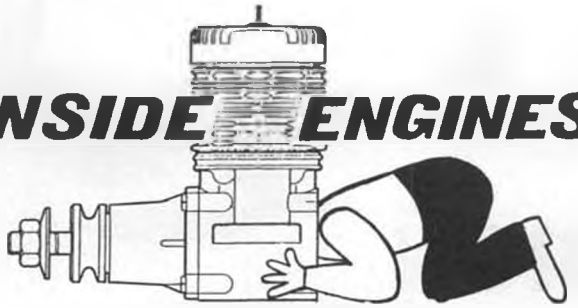
Cutting out the foam cores goes quite fast when one uses pivot-point cutting with a tapered wire (Model Design & Tech Stuff, Feb. 89), but then the work begins. Fiberglassing over foam cores by hand without molds and without vacuum was a slow process for me. Balsa construction is clean, neat and easy by comparison, and balsa structures can be finished to good surface quality in much less time. The reason for this is that balsa is smooth to start with.

"This is the time of the composites revolution. I built my first fiberglass wing about 1948, but I have learned more about successful composite model structures in the past year than in all the time before that."

Continued on page 94

An original design built by our author several years ago featured foam wing, fuselage, and tail surface cores covered with .008" Mylar. See text for pros and cons of this construction.

Nice looking C/L P-51 was built by Chuck Felton. You'd never know it is made almost entirely of corrugated cardboard. This is an excellent example of what can be done with non-standard materials, once the proper techniques are mastered.

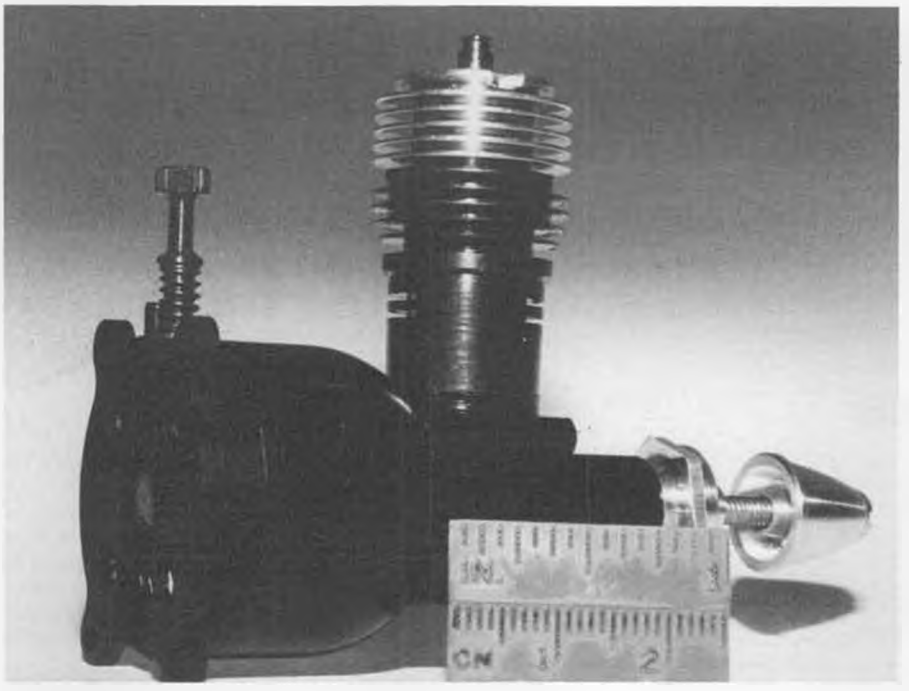


INSIDE ENGINES

WITH **STU RICHMOND**

Texaco .049

1/2A DURATION ENGINE



The similarity of the Texaco .049 to the Black Widow and other Cox reed-valve engines is obvious, yet it differs from the others in a number of ways. It's designed for long runs, not brute power.

• The Society of Antique Modelers (SAM for short) has grown rapidly as its aim to bring back the nostalgia of old time modeling has reached around the world.

I called upon Joe Beshar, a past SAM president, for comments about the Old Timer movement, the Texaco-sponsored fuel allotment contests of the 1930s, and the introduction by Cox Hobbies of their new "Texaco .049" special duration engine. Excerpts of his reply follow:

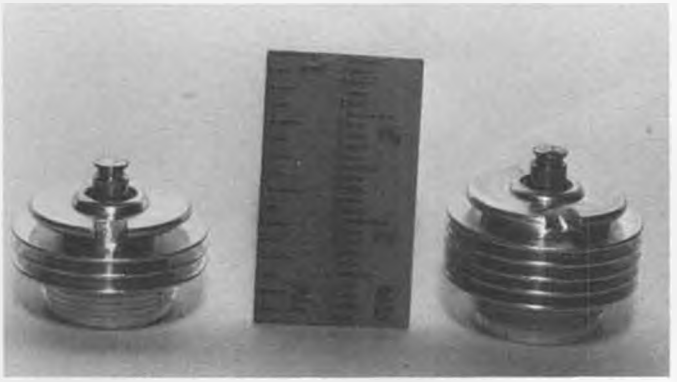
"The R/C Texaco event in 1/2A size is, I believe, the best all-around event in the Old Timer movement. It is docile, fun-loving and really is a contest that relates to our free flight heritage. The 1/2A Texaco (fuel allotment event) model, although now glow engine powered, preserves the vintage performance image. The new 'Texaco .049' by Cox acknowledges the low performance of our older vintage engines and simply extends the run duration which is ideal for the 1/2A Texaco flier. I do believe the introduction of this engine will contribute to the event growing. When the flier tries it I am sure it will be well received.

"The first Texaco-sponsored model contest was at Roosevelt Field, New York, in 1933 and had no fuel restriction limits. In 1934, 1935 and 1936 the contests allowed 1/4 fluid ounce of Texaco gasoline fuel per pound of model flying weight (7 pound limit) and were held in Akron, St. Louis, and Detroit. In 1937 the fuel allotment was reduced to 1/8 fluid ounce per pound and in 1938 the last Texaco-sponsored event limited engine runs to thirty seconds."

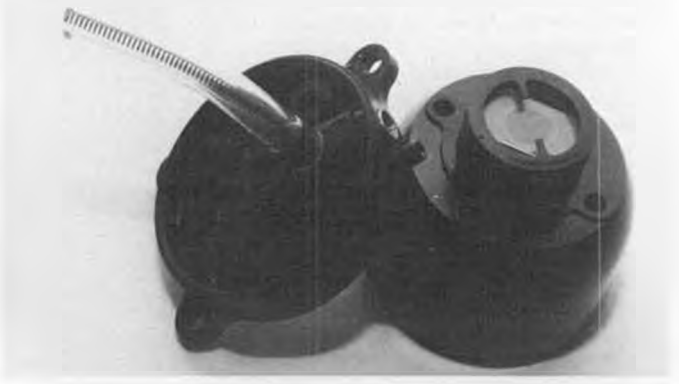
Joe, we thank you for your comments and the history of the Texaco Company's sponsorship of model airplane flying.

Joe included a current set of 1/2A Texaco event rules for R/C Old Timer flying. They allow virtually any pre-1943 design faithfully following the outline of the original model. Scaling is allowed. Wing loading minimum is eight ounces per square foot and the power must be by a Cox reed-valve engine, unmodified, with a standard eight cubic centimeter fuel tank capacity. Maximum prop diameter is eight inches. Three attempts are allowed for two official flights—a perfect score is two 15 minute flights. Ten bucks mailed to SAM, c/o Bob Dodds, 209 Summerside Place, Encinitas, California 92024, will get you a year's SAM membership and a rulebook.

Let's look at this new engine that Cox has tailored for the 1/2A Texaco event. The

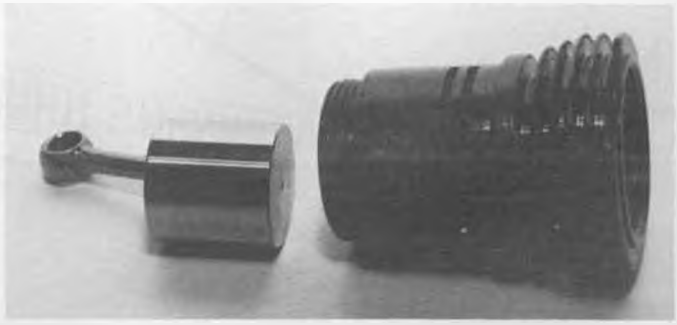


On the left is the standard Cox #325 glow head with three cooling fins, as used on the Black Widow. The new Texaco .049's #315 glow head has five cooling fins that provide added cooling.

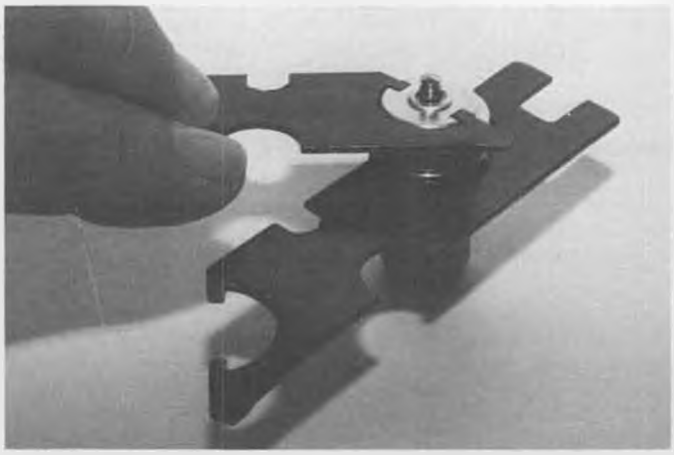


This view shows the special tank and new lightweight backplate. Top hat style retainer for the reed valve replaces the old spring retainer.

These three parts are specially designed to allow bigger props to turn at slower speeds for longer duration on only 8cc of fuel. The center piece fits the Cox 7x3-1/2 prop originally made for .09 engines.

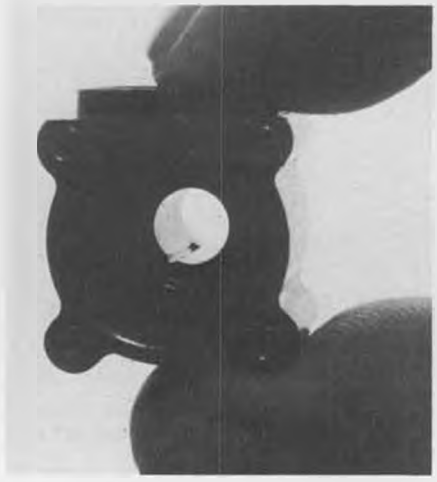


The success of Cox engines is largely due to the precise machining of their pistons and cylinders. The whole piston is copper plated, then the O.D. is ground to finish. Cylinder has slight taper—piston fits tightest at TDC.



Here's the correct way to tighten the Cox glow plug with the two provided wrenches. Don't attempt to loosen a hot glow plug; cool it first to get maximum contraction in the steel cylinder.

The turned aluminum insert fits into props made for larger engines and provides precise centering. The combustion chamber of the #315 glow plug matches that for the high performance Cox Tee Dee .049 engine.



Looking into the back of the crankcase we see the narrow channel that provides lubrication for the shaft. Simple and effective.

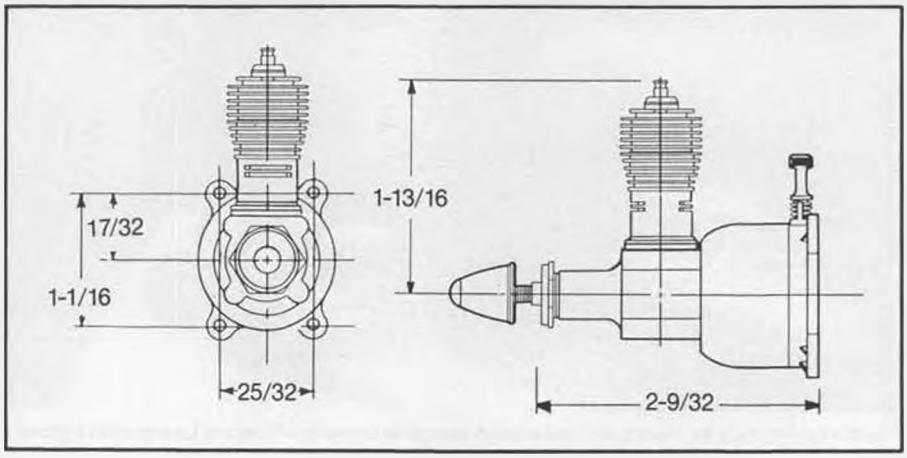
simplest way to make a model engine run longer in duration is to use a bigger diameter prop—like a seven or eight-inch diameter on a Cox .049 Black Widow. The engine will turn slower (fewer combustion cycles per minute) and the tank of fuel will then tend to last longer. But these small engines are designed to turn five to six-inch props, and they tend to overheat with bigger props. Also, the rate of airflow past the carburetor will be lower since the rpm decreases with bigger props. The low airflow rate fouls up fuel feed and running becomes inconsistent. By adding more aluminum and two more cooling fins to the #315 glow head the overheating problem with bigger diameter props is solved.

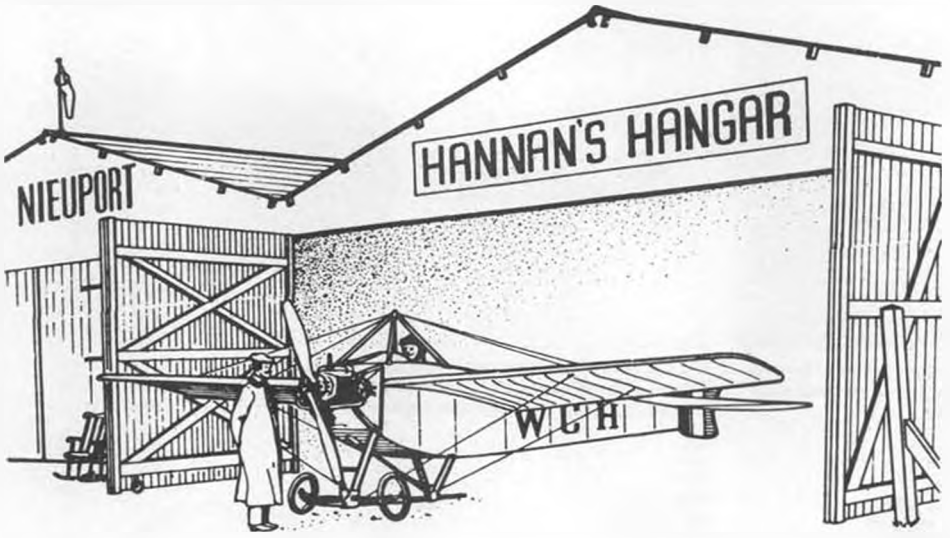
By reducing the airflow diameter to 1/16 inch in the special fuel tank, the air velocity is kept high at lower rpm and the fuel feed stays consistent for smooth engine runs. This is exactly what the large bore Super Tigre 2000, 2500, and 3000 engines use . . . lots of head finning for cooling and an undersize carb throat for fine fuel draw—it works well on big and small engines too! A third special part is the aluminum bushing that fits the hole in the Cox 7x3-1/2 prop this engine is designed to use. The bushing centers the prop precisely on the engine's 5-40 prop bolt. All other parts of the Texaco .049 engine appear to be either standard or newly upgraded parts for the rear intake Cox .049 engines.

The Cox pistons are made of leadloy (leaded steel) and are produced on screw machines. They are copper plated overall to promote even heating/cooling and the walls are then centerless ground to finished size. It's a simply brilliant process, as is the piston's shine! The finished piston/rod assembly weighs a scant three grams. The piston diameter measures .4056 inches and it is .4025 inches high—just high enough so there is no sub-piston induction like the Black Widow has. Sub-piston induction allows extra intake of combustion air for more power, but it can also allow fuel to escape, which would reduce the run duration for the 8cc of fuel this engine carries.

The crankshaft is a marvel of precision. The journal's rear bearing is ground to .2173 inch diameter—the front to .2172 inch diameter. The section of the journal between the two bearing surfaces is relieved to .2000 inch diameter. This relief minimizes rotational drag as the shaft spins

Continued on page 77





"There has not yet been an aeroplane that could not be improved."

• Our lead-in line this month, author unknown, was sent in by Merv Buckmaster, editor of the Australian *Airborne* magazine.

OUR INTERNATIONAL HOBBY

The aforementioned Merv defines modeling as "a natural part of life." And so it is for many of us in various parts of the world. It is, of course, air travel that permits such a ready interchange of model building information, and helps surmount the artificial political barriers. And, isn't it interesting to note how many modelers prefer to build aircraft designed in countries other than their own? Our photos this month, with a couple of exceptions, give some indication of the universal nature of what we do.

Even though few can afford to travel to far-flung lands, the price of an air mail stamp will take your ideas there! And speaking of stamps, why not take advantage of the aviation theme types plentifully available now? Certainly they are much more interesting to your correspondents than a portrait of some expired politician. . . .

JUST IN FROM SWEDEN

Sten Gustavsson writes: "With my monthly copies of *Model Builder* and the inspiration you guys provide, I feel the California sun shining on our grey winter skies. Rest assured your stuff is fondly appreciated."

STEALTH CUP

Dan Walton, of Kansas, sent us a remarkable drinking cup featuring stealth bombers on its sides. When filled with a hot beverage, the aircraft slowly disappear, becoming visible again as the contents are consumed or allowed to cool.

THOUGHTS FOR TODAY

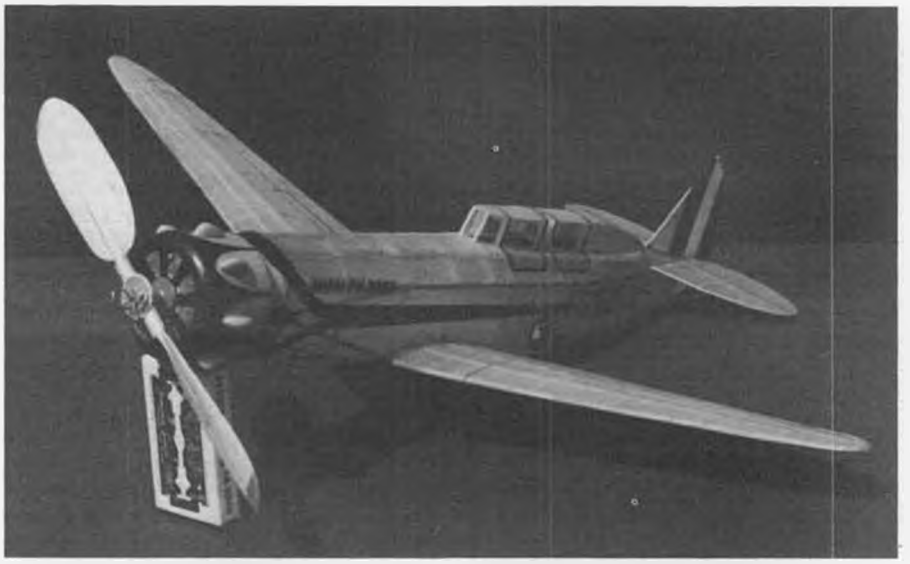
"Pick a hobby as you would a lifetime companion." Frank Zaic. And about Peanuts and Pistachio model plans: "They look so innocent and cuddly that one cannot help but try to give them substance and introduce them to the real world, with hope that someday they will feel the freedom of the air."

S.B. Pell of New Jersey comments: "I don't understand free flight. That's why I still build hand-launched gliders. I love free flight; I just don't understand it."

Paul McIlrath, of Iowa, says simply: "Free Flight For Effer!"

NFFS AWARDS

The National Free Flight Society has announced its 1989 inductees to their Hall of Fame, which include Bob and Sandy Peck, of Peck-Polymers, who have promoted model building in all its many forms, with special devotion to helping beginners. It is relatively rare to induct a team to the Hall of Fame, however in Bob and Sandy's case, they are truly inseparable.



Nicely done Peanut scale Italian Nardy FN 305-D racer weighs in at only 10 grams. Built by Bruce Holbrook, of Israel.

Unique French Farman "Post Card" has enough wing area to give the Fikes and Laceys a run for their money. Built by Jake Larson of Florida, from plans by Ulises Alvarez of Uruguay.

Johnny Clemens is a lifelong promoter of modeling in all its many facets, and has served as the driving force behind many important programs, such as the AMA Museum, in addition to operating his own famous hobby shop for many years. In spite of major setbacks from time to time, Johnny exhibits a most optimistic outlook and a polished sense of humor.

Edward Naudzius is a prolific designer, builder and flier who has demonstrated his winning ways. He was instrumental in establishing the Plymouth competitions and has specialized in teaching propeller carving.

F.L. Swaney was inducted to the Hall of Fame posthumously. He was instrumental in establishing the two West Coast AMA Nationals, and devoted considerable time to assisting new modelers into our favorite

How's this for enthusiasm? Action shot taken in Czechoslovakia by Tonda Alfery shows junior modeler Martin Jahudka launching a Curtiss P-40, in Chinese markings, under Lubomir Koutny's watchful eye.

International modeling: Benno Sabel (left) of Germany compares notes during a visit to Ichiro Yamada, of Japan. Both are outstanding F/F scale modelers.

This CO_2 powered Heinkel proved to be a long-term project for England's Pete Redhead; model was started in 1973, was finally finished and flown during late 1988!

hobby.

The NFFS awards will be formally presented at the U.S. Lawrenceville Outdoor Championships during June.

TEN MODELS OF THE YEAR

Other awards are announced each year by the NFFS for ten outstanding model categories. Charles Caton's "Hummin Bird" was selected in the Large Power class; Glenn Schneider's "Booger II" was picked for the Small Power division, and Roger Gregory's "Bandwagon" took Large Rubber model honors.

In the International division, Stefan Rumpp, of West Germany, scored with his "S-11 Allround" F1A Nordic, while Jim Quinn's "Fantasy" captured Wakefield accolades. Stafford Screen's "Silhouette" was singled out as the outstanding F1C Power entry.

For Indoor Intermediate Stick, Earl Hoffman's "Symphony" was the winner, while in Scale, Don Srull's astounding electric Do-X flying boat rightfully garnered the judges' approval.

Special category winners were Ron Williams' magnificent book, *Building and Flying Indoor Model Airplanes.* Now out of print, it is hoped that it may soon be reprinted. Bill Winter once singled out this volume as the best model book ever written.

And finally, Emmanual Fillon was recognized for his tireless efforts in producing more than forty Peanut Scale drawings of French civil aircraft. Our congratulations to all these outstanding free flighters!

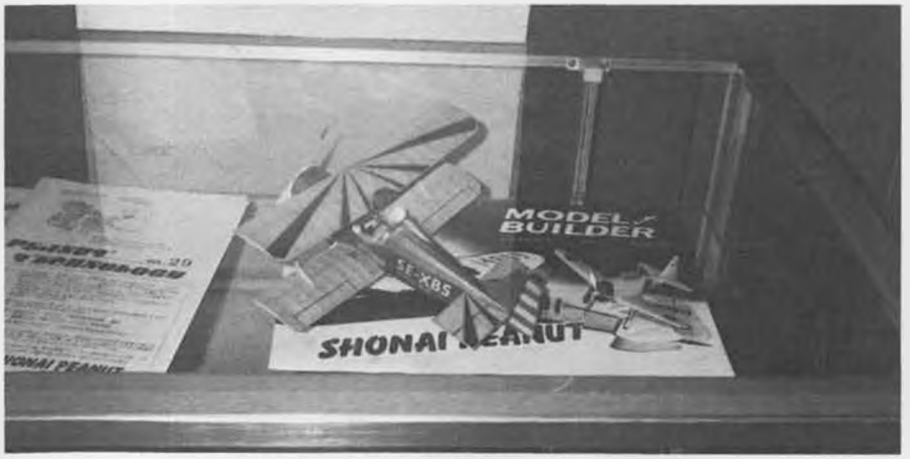
TOXOPHILITIES?

Sounds poisonous, but it isn't. Nope, it has to do with people who are fond of bows (as in bows and arrows). Herb Weiss, who points out that some of the world's first model helicopters were operated by bow-power, as long ago as 1784, thinks the same principal might be applied to indoor stick models. It seems he encountered some data permitting analysis of the energy storage values for various types of wood. Apparently the best English bows, in the Robin Hood tradition, were made from yew wood, which ranks above hickory and possibly bamboo. Herb's calculations indicate that a properly harnessed yew bow could yield about 1/30th the power of the best rubber and says: "Well, with the indoor stick model duration record close to 60 minutes, that suggests that a simple indoor stick model, bow-powered, might fly for one to two minutes. That's a good magnitude for some hot competition. There are many ways the bow might be positioned on the model. The idea is to arrange things, if possible, so that none of the stress in the bow has to be absorbed by the rest of the model structure. What do you think?"

FAREWELL, JOE

Southern California lost one of its most avid model builders during April, with the passing of Joseph Havlik at age 73. Joe

Continued on page 64

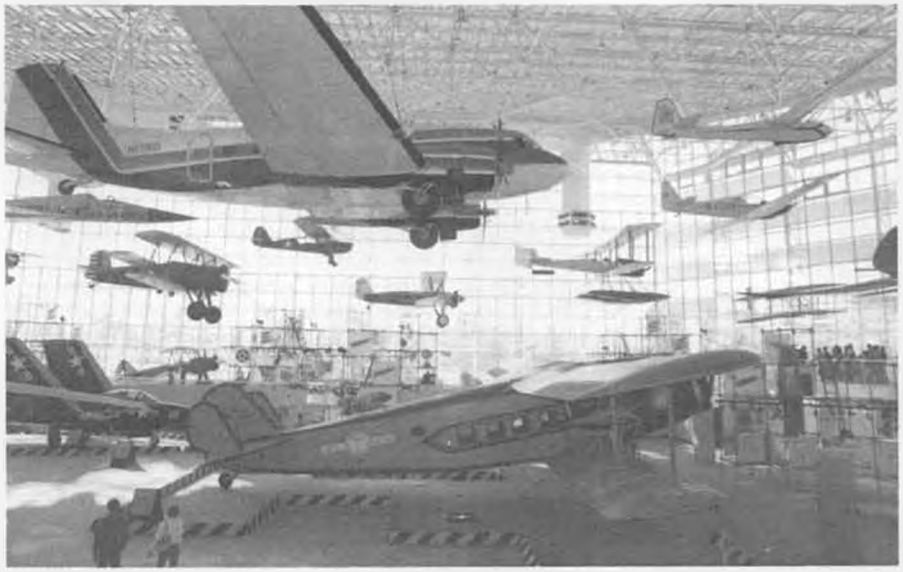


This month's "Hangar" column has a truly international flavor. Here we have a Swedish Andreason biplane built from an American Peck-Polymers kit, by Yoshindo Harada, of Japan, displayed atop a copy of our favorite magazine! Photo by Shoichi Uchida.

Control Line

SPREADING THE WORD

Few activities can generate the interest of casual spectators the way control line model aviation can. Start flying—even in an out-of-the way location—and people just seem to materialize to watch. A few actually become so captivated by the activity that they begin to pursue it themselves.



An interior shot of the Museum of Flight in Seattle, Washington, where the Seattle Skyraiders C/L Club helped put on a model show last October. A great way to promote the hobby to the public.

Small wonder that some alert C/L clubs have made use of their flying's public relations value in an organized way. They organize demonstrations that bring the activity before large numbers of people. Some clubs have their own air show teams; others put the fliers and crew members together on an event-by-event basis. Demonstrations range from informal flying sessions to highly orchestrated shows.

Careful attention to follow-up is important in getting those interested spectators flying—it's essential to let spectators know how to contact club members, get information about building, and get directions to the flying field.

Here at *Model Builder*, we've recently received reports of a couple of flying shows from active clubs on the West Coast.

The Gilroy Model Airplane Club of Gilroy, California, put on quite a show for the patients of the Veterans' Hospital in Palo Alto, California, on February 12. Besides entertaining the patients, the demonstration raised $239 for the Veterans' Welfare Fund with a raffle and food concession.

"The patients enjoyed the show and food," writes Michael Hawk, secretary-treasurer of the GMAC. "The pilots had the most fun. The highlight of the day was three-up carrier, and of course the crowd loved the combat demo."

The activity was supported by the Western Associated Modelers, and was directed by Dave Sawyer. The relatively new Gilroy club hosted its first contest on April 16.

Also worthy of note, though this report languished in your columnist's "urgent" file for quite a while, was the demonstration put on by the Seattle Skyraiders last October. The Skyraiders have an active show program, performing annually at the February Northwest Model Expo. The October show was something special. Here's a report from Jim Cameron:

"The Seattle Skyraiders (the C/L club in the Seattle area) from time to time does demonstrations to spark interest in the hobby. Last October the Museum of Flight was hosting a model aircraft weekend, and asked if we would come and take part.

"There were many clubs on hand from the area. Free flight, radio control, control line and plastic model builders all had booths with many aircraft of all sizes on display. R.F. 'Steve' Stevenson was there with about six large cases of his engine collection, which now is at over 2,000.

"Along with the static display we also had the AMA video 'Wired for Excitement,' which shows many kinds of control line flying. Frank Macy came up from Portland, Oregon, with some of his Jim Walker Fireball equipment. He even had a *Model Airplane News* with the first Fireball advertisement in it.

"We were also able to put on a limited flight demonstration. We could use 52-foot lines or smaller, so most of the larger planes had to be left on static display. Wesley Mullens did some solo mouse racing, and did a great job of popping balloons with a little .15-powered job. Dick McConnell had another .15-powered plane which flew like a slow combat job, so the crowd liked that. I also flew some of Frank Macy's Fireballs, and John Hall put on a good show with a three-line .15-powered carrier plane.

"I think everyone had a good time and other clubs should think about doing something like this. I have been a part of many shows of this kind and I can't remember how many people told me that they did that 20 years ago. He is the type who might want to do it again tomorrow."

The most effective demonstration is one that on the one hand impresses people with the ultimate performance of our best models, and on the other hand reveals that the average person can make a start in modeling. It has to look exciting on one end of the spectrum and easy on the other. It can appeal to the common fascination with aviation of all kinds as well as to the competitive nature of many people.

The Eugene Prop Spinners, my home club, has put on many demonstrations over time. Schools, community festivals and the like offer great opportunities. Among the more exciting demonstrations done by the Prop Spinners have been several shows at a

Part of the Seattle Skyraiders' display at the Museum of Flight. All types of C/L models were shown. Both photos on this page are courtesy of Jim Cameron.

Three-up carrier was one of the most entertaining demos for the spectators at the air show/fund raiser put on by the Gilroy Model Airplane Club in Palo Alto, California, earlier this year. The three pilots are, from left: Gary Buffon, Ernie Reece, and Don Chandler. Photos by R.L. Hawk.

full-scale air show (the Creswell Air Fair) where we performed before several thousand spectators. Undoubtedly the biggest thrill has been the periodic shows done in Autzen Stadium in Eugene, Oregon, where the University of Oregon Ducks play football. The Autzen shows, last done by the Prop Spinners about five years ago, were part of the annual Fourth of July fireworks display put on by a local service club. As the crowd filled the football stadium and waited for night to fall, the Prop Spinners flew. Astroturf has got to be the world's best takeoff and landing surface!

A typical wide-ranging control line show might have some, or all of the following elements:

- Precision aerobatics flights to show beauty of the planes and the grace of the maneuvers.
- Some unusual flying activities by sport-type airplanes or competition planes used in unusual ways such as three-up carrier formation flying, prop hanging, etc., to show the capabilities of the planes and perhaps a little humor.
- Some "go-fast" flying to demonstrate the thrill of speed and competition.
- Some mock combat—always the real crowd pleaser as one activity that is instantly understandable to the spectator. It's important that the combat activity be fairly well orchestrated *mock* combat. You don't want fliers getting carried away in heavy competition that could lead to a flyaway in front of a big crowd.

Mix in some contrast and some clever commentary on the public address system to get the crowd interested.

The nose trim on George Lieb's Formula 40 speed ship should be good for an extra ten mph at least. Power is a K&B .40 with a few Nelson parts thrown in for good measure.

A sample program might start with a stunt flight that will cause some oohs and aahs with the pretty plane and maneuvers, but the crowd will be relaxed. Then fire up a fast combat plane, and watch and listen as the crowd comes alive. Mix in a race (make sure the commentator explains the laps, the pit stops, the cold start, etc.). Show your prop-hanging style, some balloon busting, or similar sport activity. Call a volunteer out of the crowd and, with an instructor helping, try to get him a successful flight on a club trainer. Do your mock combat match, and drop in a world-class stunt flight and maybe present a big finale—six planes in the air at once, or somebody who can fly three at once.

When working in front of a large crowd, keep your demonstration moving. One flight should go up within seconds of the previous one coming down. If the engine won't start, or there's some other technical problem, scrap the flight and move immediately to the next one.

Keep in mind that service clubs, festivals, museums, air shows and the like are always on the lookout for new ways to entertain their audience, and a control line flying demonstration can fill the bill. Control line has the advantage over many other forms of modeling in that it can be done in a confined space, which is just what many event organizers are looking for.

AUTOGYROS REVISITED

A recent column about autogyros generated a fair amount of response; apparently autogyros have in the past been a popular C/L subject and a number of old designs exist.

One of the responses is from John Miske, publisher of a wide variety of plans for old time airplanes.

John provided a photocopy of an advertisement from the late 1940s for a kit for an autogyro, described as "America's First Auto-Giro Model." It was made by Edco Model Planes and was intended for Class A, B or C engines (what a range!). The price was $7.50, less wheels. Edco also made C/L kits of the Meteor, a speed plane, and a scale model of the North American Navion. (The Navion later was kitted in semi-scale profile form by Sterling.)

Here are John Miske's comments:

"I saw Ron Fentiman's request for Cyclone plans in the latest *MB* and have mailed him a copy of our OTS (Old Time Stunt) repro plan list which includes a few non-stunt types including the Cyclone. I have also enclosed a list for your info.

"Back in the June 1988 issue, someone was looking for autogyro info. The enclosed flyer (came in the kit) shows what was flying in the mid-to-late 40s. I located a kit more recently and have considered reproducing the plans if anyone is interested. It's not OTS, but they were fun to fly. The pic on the flyer shows the engine inverted. But the kit plans show an upright version.

"A set of our genuine, original, unmodi-

Continued on page 72

Free Flight Scale

By FERNANDO RAMOS

• Where is the year going? Seems as though it was just yesterday that the year started. I guess when you are having fun, the time just goes streaking by! Presently, I am preparing a model for the AMA Nats. This is the first time that I have competed in the Nats since the last time they were held in California. I think that was in 1983, and prior to that, it was 1967!

Since the Nats are going to be on the West Coast this year, I thought it would be a great opportunity to fly my Bellanca up there. Mac McJunkin is planning to go along with me. I have never flown that far north before, and I am really looking forward to the trip. Naturally, I will have a full report in this column when I get back.

Since I have been doing some research for this year's Nats, it probably would be a good idea to share with you some of the sources of information that I use in order to find the proper documentation. Enough has been written on how to go about setting up your documentation, but I want to cover some of the best sources that I have found for reference material.

I realize that many of you who enjoy scale modeling do not necessarily want to compete, but still would like to make a fairly accurate model. I also realize that some of you are content with just putting on whatever detail is provided on a plan regardless of accuracy. This is OK; after all, we are doing this for fun! However, I feel that you are missing an opportunity to discover more and greater subjects as a search for a particular plane takes place.

We all have our favorite subjects, and in a lifetime we probably couldn't get them all built. Yet, by looking around in different sources of information, one can broaden his scope. More challenging subjects should be considered as one's building skills improve. I have seen this often at the Flying Aces Nationals, where modelers have improved by mega-leaps from where they first started.

I truly enjoy all types of aircraft except jets; I can't relate to them in any shape or form. Give me two wings and fabric and I am in my element. World War One machines fascinate me from several standpoints. I can just imagine what it must have been like in any of the Dawn Patrols! Since I build a fair amount of these types of aircraft, my number one source is *WWI Aero.*

This fantastic journal is printed four times a year, and it is worth the wait! The cost is $20 per year, however you can donate whatever you want above that amount as they can always use it. They always include a section for modelers that is usually very interesting. It is unbelievable how many people are actually building full-size replica WWI aircraft.

Some of the usual features covered are cockpit details of many of the more popular aircraft. These are invaluable when you go into the super detail mode. Another plus is that many different types of engines are covered, providing the necessary details one needs. On top of all this, there are 3-views that you just don't see anyplace else.

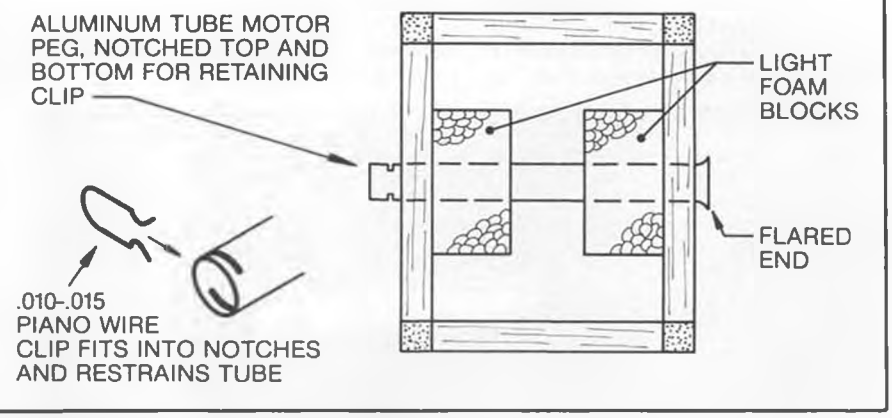
For further information on *WWI Aero,* contact Leonard Opdycke, 15 Crescent Rd., Poughkeepsie, New York 12601.

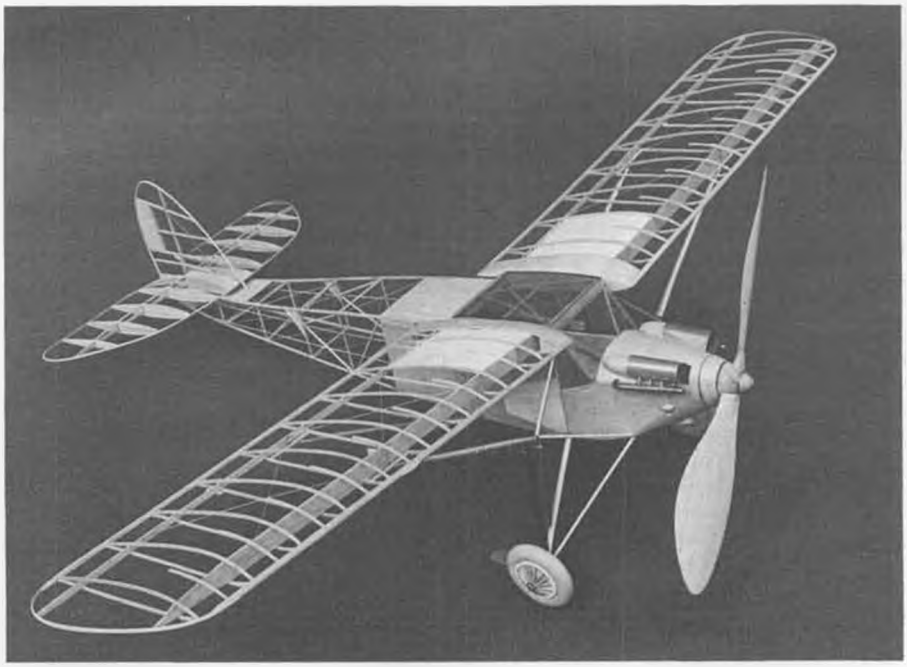
Another great source of WWI material is a fairly new (to me) publication called *Over The Front.* This is another quarterly publication that is issued by the League of WWI Aero Historians. It is printed on very high quality paper. There are 3-views, different types of paint schemes, many photographs, and interesting stories. The subscription rate is $25 per year. If you are interested, checks should be made payable to The League of World War I Aviation Historians, P.O. Box 260327, Plano, Texas 75026-0327.

I love British airplanes—all types! Fortunately there are many British magazines that come out each month covering the whole gambit. My favorite magazine is *Aeroplane Monthly.* They have a pretty

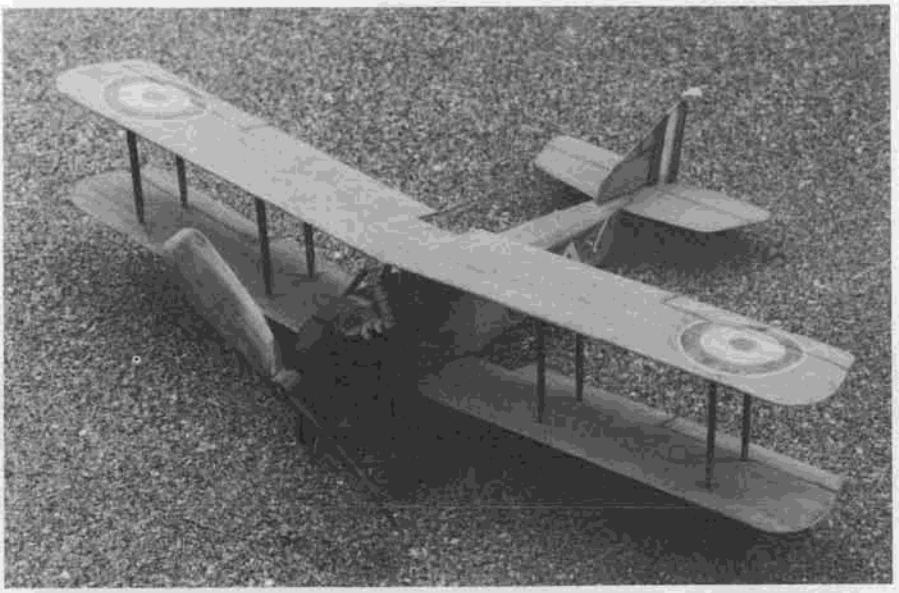
Continued on page 76

MOTOR PEGS REVISITED





Framework details are shown to good advantage in this pre-covering shot of master modeler Bill Noonan's rubber powered DeHavilland "Hawk Moth," featured as a construction article in our December 1977 issue (Plan No. 12772, $9.00). Built to 1"=1' scale, it spans 44 inches and has proven itself to be an outstanding flier.



ARMSTRONG-WHITWORTH FK-8
"BIG ACK"

By TOM NALLEN JR.

... Here's an interesting and relatively obscure WWI machine designed for the Flying Aces Peanut Mass Launch event. Layout and moments are ideal for F/F scale.

• This WWI Royal Flying Corps recon ship is simple, yet distinctive—obscure, but not unknown. Best of all, it has a great nickname: "Big Ack."

The design featured in this article qualifies to fly in the Flying Aces Club WWI Peanut Mass Launch event. Built light and true, this ship will give those SE-5s and D-7s a run for their money. If you haven't yet experienced the thrill of flying shoulder-to-shoulder in open combat, grab your helmet and goggles and head for the flight line. But first . . . to the building board. You've got to build your own mount for this aerial joust.

Here are some hints to help you pull it all together before the next dawn patrol.

WINGS

Make a rib template and cut out all ribs from medium 1/32 sheet balsa. Select straight and stiff lengths of 1/16 square balsa for the leading and trailing edges and the spars. Cut out four wing tips from medium 1/32 sheet and begin assembly.

Anyone who has ever built a free flight biplane knows that strut attachments are a key design element. A good approach on small models such as this is to fabricate a "pocket" in the wing rib at each strut-to-wing attachment point. This is done by notching the top or bottom of the appropriate wing ribs before assembly and cementing short lengths of 1/32 square balsa alongside each notch. During final assembly, the strut ends are inserted into these pockets and cemented, thus creating a rigid structure.

After the wings have been assembled flat on the building board, cut the dihedral breaks in the leading and trailing edges and block up each wing tip 1/2 inch. Cement the dihedral breaks, add gussets and lay in the spars, beveling the ends to ensure a good fit. After the cement has hardened, lift the wings off of the board, shape the leading and trailing edges and fine sand the entire structure.

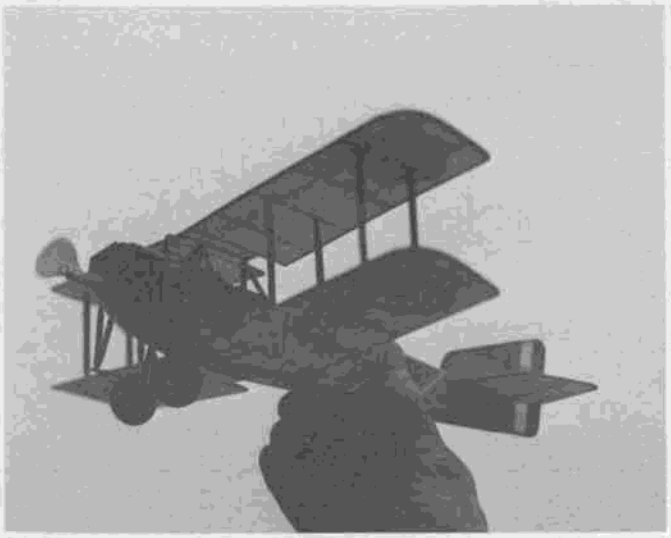
TAIL

The angular tail assembly is fairly simple to construct. Light wood is used here with gussets added to provide strength. Again, sand the completed structures and set aside for covering later.

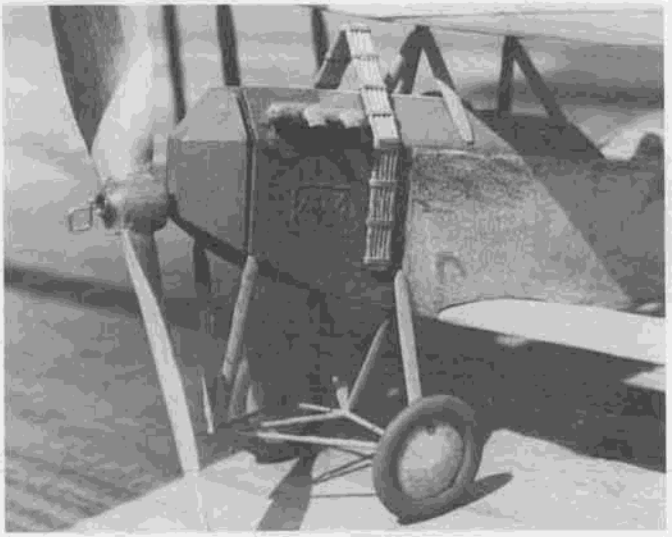
FUSELAGE

Begin by building two identical fuselage sides on the board. Use straight and stiff lengths of 1/16 square balsa for the longerons and softer wood for the uprights (and crosspieces later). Gusset where indicated on the plan and fill in the nose section with soft 1/32 sheet balsa. When building the fuselage sides, consider the structural loads involved and select wood accordingly. For example, the rear motor peg support should be hard balsa while the remaining uprights in the aft end can be much lighter. In general, use stiffer wood in the forward sections and softer

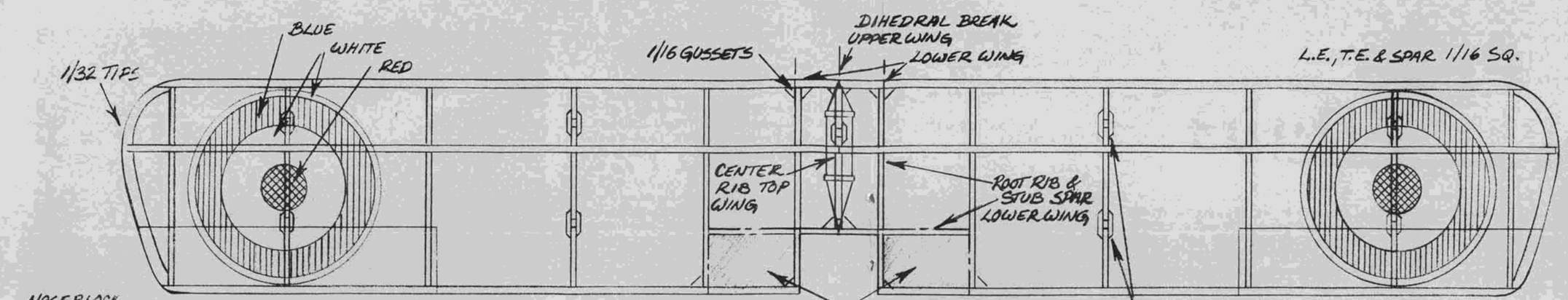
Continued on page 67



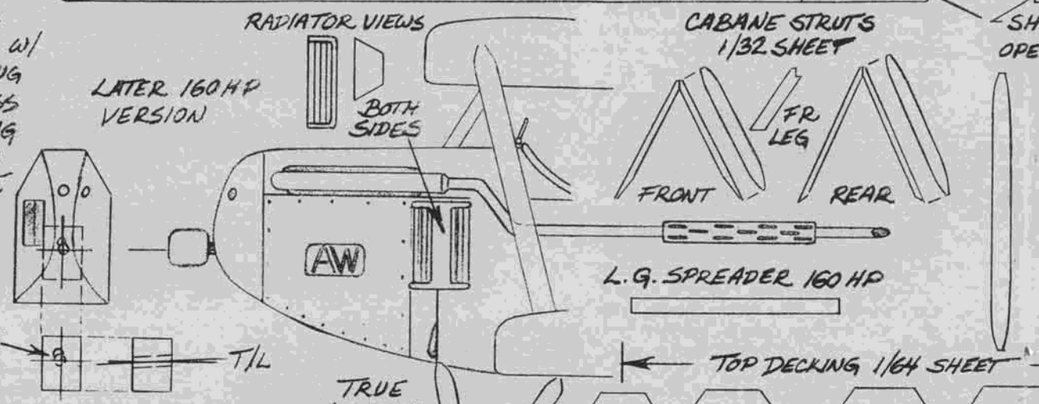
A realistic color scheme was obtained using dyed Japanese tissue—see text for details on how this is done. Insignia and markings were cut from colored tissue and applied with a spray adhesive.

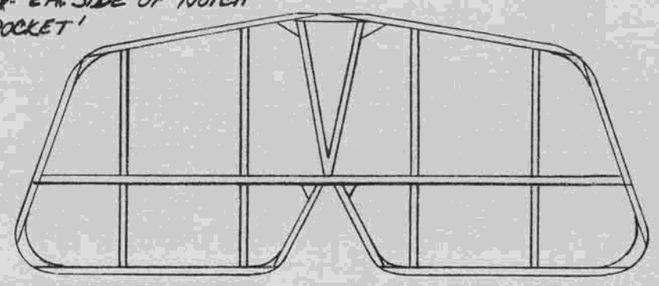


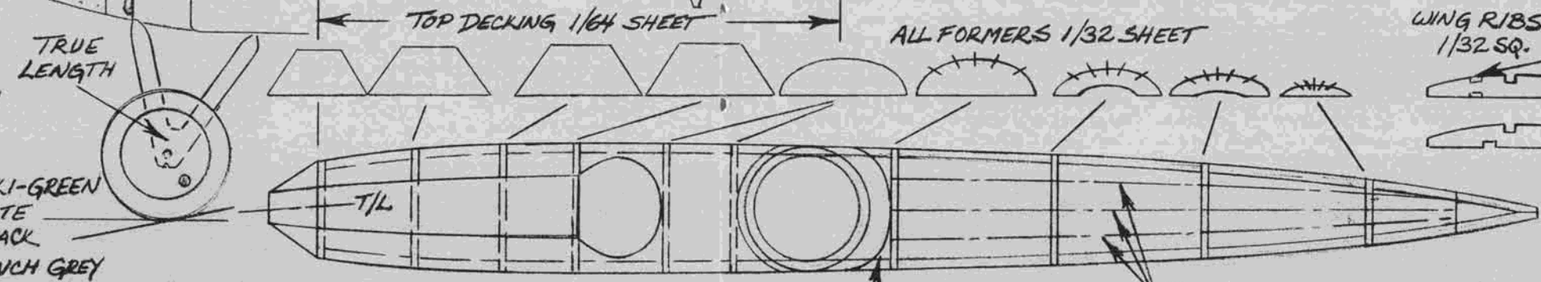
Strut arrangements and cowling details of the 120-hp "Ack" are clear in this photo. Plans also show details of the later 160-hp variant, which had a more conventional nose and landing gear.

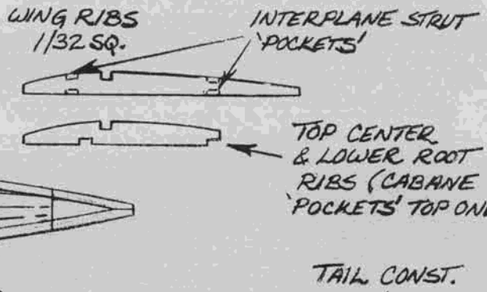


NOSEBLOCK
BALSA BLOCK W/ 1/4 SHEET PLUG
1/16 O.D. BRASS TUBE BUSHING
NOTE DOWN & LEFT THRUST.



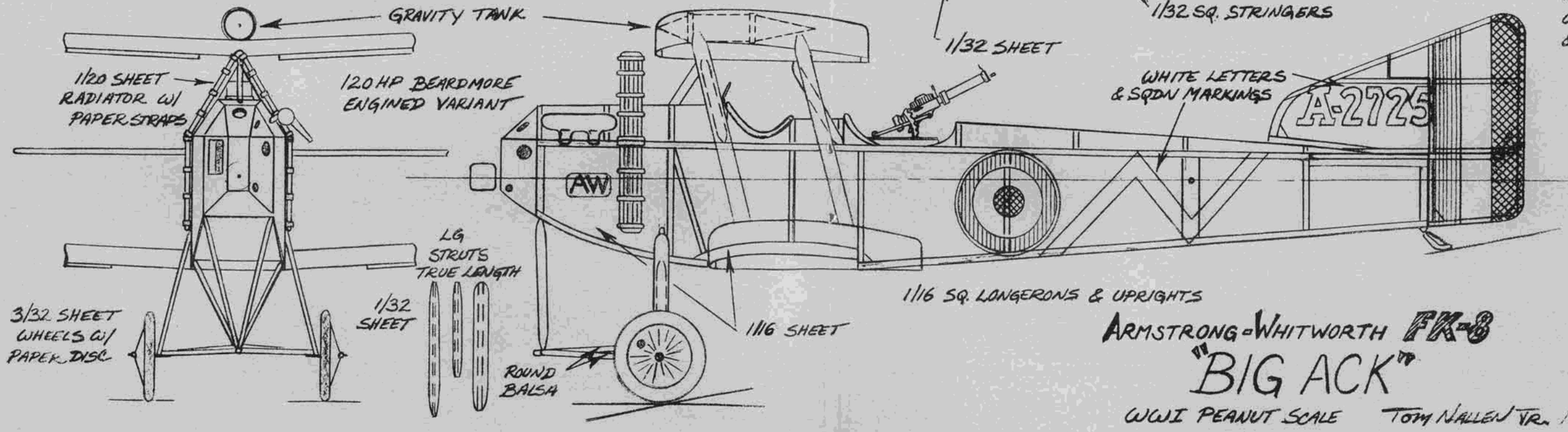






REFERENCE: JAN. 1962 M.A.N. P31

COLOR SCHEME
FUSE & ALL UPPER SURFACES: KHAKI-GREEN
UNDERSIDES OF ALL SURFACES: WHITE
COWL & TOP DECKING TO REAR 'PIT: BLACK
ALL STRUTS: FRENCH GREY



ARMSTRONG-WHITWORTH FK-8
"BIG ACK"

WWI PEANUT SCALE TOM NALLEN TR. 1988

Free Flight

By BOB STALICK

• Free flighters love airfoils. Over the years that I have written this column, one of the most popular monthly features has been Darned Good Airfoils. Since I am not an engineer or airfoils expert but a writer and free flighter, I am not able to provide the inside and outside of each of the sections that have been included on a monthly basis; however, I have read just about everything that I have found in the model press about airfoils, and I believe that I have a good understanding of what works and what characteristics are important to the various kinds of free flight models we fly today. Consequently, when I come across a publication that gives many different kinds of airfoils that could be useful to our form of the hobby, it is like finding a gold mine. Such a publication came to my attention just a couple of months ago. It is entitled, appropriately enough, *The Comprehensive Reference Guide to Airfoil Sections for Light Aircraft.* This guide contains 634 different airfoil sections with coordinates and Lift/Drag coefficients as well as Center of Pressure scales. Although these 634 sections are intended for full-scale aircraft, many of the examples are those that are often used by modelers. All of the sections included are in graph form, but are quite small, measuring about 1.5 inches in chord, so a good quality enlarging copier will be needed to bring the size up to one that can be used by free flighters.

ESTIMATED SINK RATES OF DETHERMALIZED MODELS

MODEL TYPE	WING AREA (sq. in.)	WEIGHT (oz.)	WING LOADING (oz./sq. in.)	DT SINK RATE (fpm)
Wakefield	240	8.1	.034	600
P-30	120	1.8	.015	264
Coupe	160	3.0	.019	335
HLG	50	1.2	.024	423
1/2A	220	6.0	.027	476
A-2	450	14.5	.032	565
A-1	230	7.8	.034	600
FAI Power	500	26.5	.053	935

The book does not list an author, but the publisher is Aviation Publications, 217 E. Washington St., P.O. Box 357, Appleton, Wisconsin 54912. The price tag on the one that I have is $19.95. The publication was brought to my attention by *Model Builder* reader Tom Sandwick of Portland, Oregon. It is my intent to feature some of the appropriate free flight airfoils and select other information in the publication in future issues of this column. If you want the full effect, however, I suggest that you order the book today. The abovementioned price does include postage, and it may cost more now, as Tom's was purchased in 1988. He bought his from the Experimental Aviation Association. At any rate, you airfoil freaks can get your jollies all in one neat package through the mail. How's that for convenience?

Now, on to some of the regular features.

AUGUST MYSTERY MODEL

Once upon a time, during the heyday of free flight, a number of smaller and more obscure publications dedicated to this facet of the hobby sprung up around the country. California had two such magazines of note. One of these, *The Western Modeler,* published this Class A/B gassie for the new glow .19 and .23 engines on the scene. The designer was to later achieve national and international fame for his gas model designs. Some of the features of his other more famous models can be found in this month's Mystery Model, such as a crutch built triangular fuselage section, built-up high pylon, and the use of a rearward center of gravity.

If you think you know the name of the model and the designer, write it on a sheet of paper and drop it in the mail to Bill Northrop's attention at *Model Builder* magazine. First one in Bill's hands with the correct answer wins a one-year free subscription to this here magazine.

AUGUST THREE-VIEW—
"BUGGERED-UP 'MY COUPE' "
by Fred Pearce

One of my favorite F/F newsletters is the

The scene is the annual Strat-O-Bats Misery Meet held in March of this year. That's snow that Greg Davis is kneeling in as he readies his modified 1/2A Air Express 330. Model features a rear fin and flat-bottom airfoils.

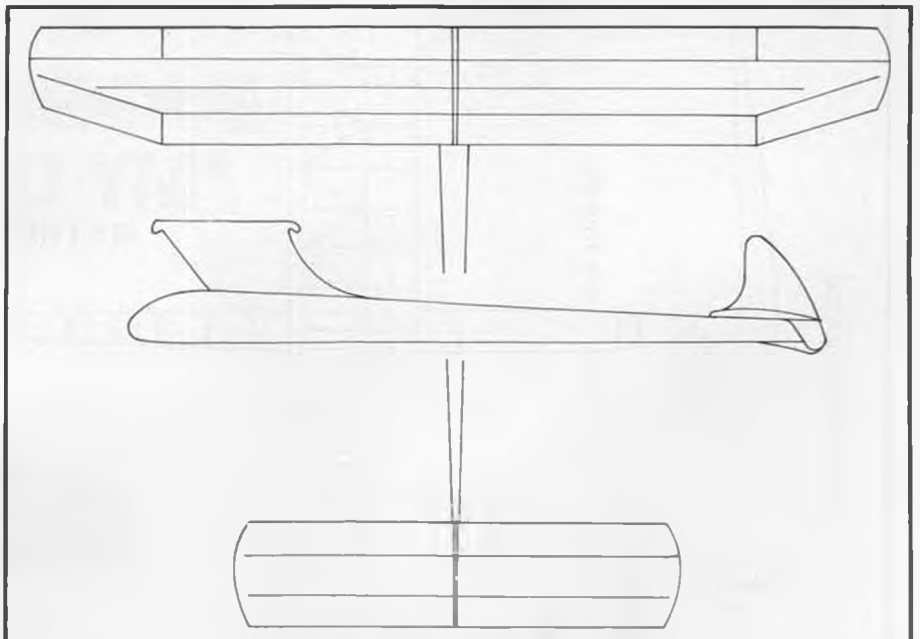
Brainbuster, edited by Abram VanDover of Newport News, Virginia. In the March issue, Abram featured the following tidbit about doubling your free flight fun:

"If your building time is limited, along with space, budget, and other such things, this might be the model or models for you. With two fuselages you can fly both Coupe and Mulvihill. Just use the same wing, stab, and front end assembly for each one. Of course the Mulvihill does use more rubber; an old 40-gram Wakefield motor will do. It's a good way to get in two events with the least effort."

The "Buggered-Up 'My Coupe' " is a takeoff of Bill Vanderbeek's NFFS Model

Ross Thompson, the reigning Pee Wee 30 flier in the Northwest, is seen here with his Pot Belly 1/2A ship. It's a fast climber with a hot Tee Dee .049 and only a 220 sq. in. wing.

of the Year, the "My Coupe." What Fred Pearce did was to take the basic My Coupe design and modify it (bugger it up) so that it could be used as a Mulvihill as well. The three-view shows both the Coupe fuselage as well as the larger one. All other components can be used for either the Coupe or the Mulvihill. The model has been around for quite awhile, as Fred won first place in the 1975 Nationals with this design. Since the rules governing both of these events are essentially unchanged as of now, you might consider giving this dual purpose model a try for your upcoming rubber powered free flight competition. Good luck with it.



AUGUST MYSTERY MODEL

AUGUST DARNED GOOD AIRFOIL—THE L.W.F.

This is one of the sections contained in the reference guide detailed earlier in this column. This section was tested at M.I.T. in 1919 and has a number of characteristics that should make it suitable for free flight power model use. Specifically, it has a sharp leading edge, which would provide natural turbulation; it has a 7.15% highpoint located at the 30% chord location; and it features very slight undercamber to assist in the glide. So, even though the section has been around for a long time, it is still worth investigating for fast climbing, lightweight AMA gas type ships. The charts indicate that it is not overly tolerant to changes in incidence angles, with the optimum appearing to be between 2.5 and 4 degrees positive.

I would think that a flat-bottomed stab airfoil with a rounded leading edge would be desirable to use with this section in order to improve trimability. Might be worth a try on your next gas model design.

DETHERMALIZING MODELS OUT OF THERMALS,
by Bob Klipp and Chris Matsuno

Recently, Bob Klipp wrote about his ex-

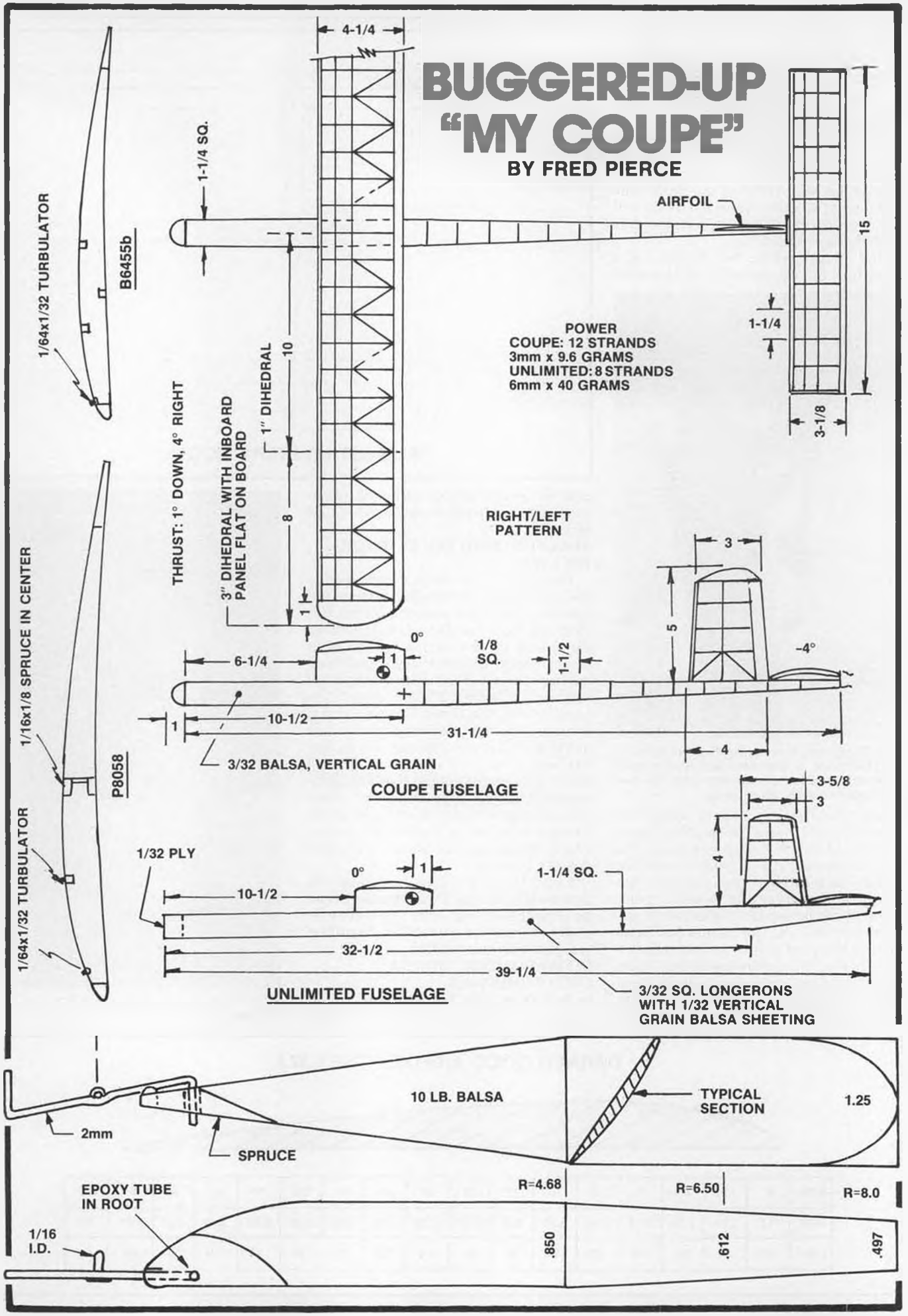
Marlin Mixon flex his Teacher's Pet P-30 at the '89 Misery Meet. Does it look cold? It was.

DARNED GOOD AIRFOIL—THE L.W.F.

STA.	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
UPR.	.47	1.70	2.50	3.79	4.65	5.31	6.25	6.88	7.15	7.03	6.64	6.06	5.12	3.79	2.31	1.43	.23
LWR.	.47	.04	.06	.18	.29	.35	.51	.61	.70	.63	.51	.39	.31	.18	.10	.06	0

BUGGERED-UP "MY COUPE"

BY FRED PIERCE



periences with full-sized sailplanes in thermals. Bob is the editor of the *Turbulator*, newsletter of the Kirkwood Thermaleers of Kirkwood, Missouri. Chris Matsuno followed up with his observations of models in thermals. The following is their article, in two parts, on this fascinating subject. First, Bob's thoughts:

"As free flighters, the subject of thermals is basic to us. We've all had a model go up in a boomer, cruising smoothly in circles until it DTs. As some of you know, I fly full-scale sailplanes. In mid-July, I flew on a day with big fat cumulus clouds, and the lift was great. I frequently circled in 500 ft./min. (fpm) lift, and others told me they occasionally saw 800 fpm.

"What interests me is that if a thermal can push a 700-pound sailplane up at 500+ fpm and give it a real tossing around, why do our models generally circle rather smoothly, and how can merely popping the stab up usually bring them down?

"One more thing. In soaring the theory is that, when seeking lift, if you let the sailplane 'have its head,' it will glide between thermals. The idea is that unless you glide directly into the core, you'll fly into the thermal's perimeter. The lift under the wing on the core side will be stronger, and that wing will be raised a bit more than the outboard wing, and the ship will turn away from the thermal. So, in effect, unless you take care to hold your heading, you will end up weaving your way along between thermals. When the variometer indicates you've entered lift, you try to detect a wing rising and turn into that wing and start trying to center in the thermal.

"So, maybe our models rarely enter the core of a thermal? Perhaps most times they're in the fringe areas and the DT is effective. And, I'm sure we've had models circle half in lift and half out and end up getting kicked out entirely. They also seem to find their way into the core and really start to go up. And those that go O.O.S. even after the DT? Do any theorists want to expand on this?"

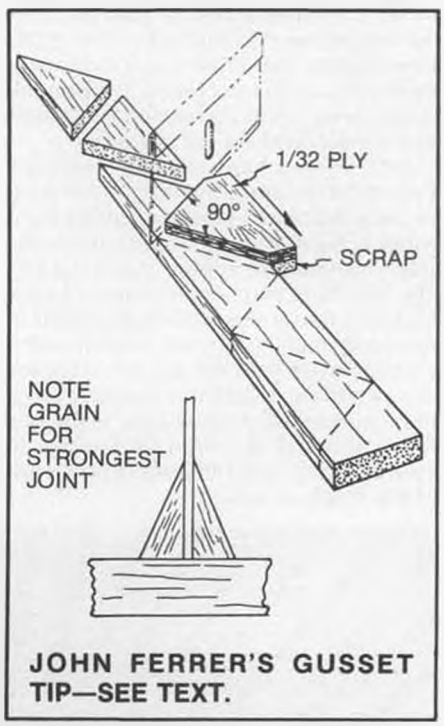
At first glance you probably thought this was some sort of canard, but it's not. It's an all-balsa 1/2A ship built by Keith Hoover in 1961 as an experiment in VHTL (very high thrust line) design. Note the tiplets and dihedralled stabilizer. Holland Hornet engine. More details in text.

Now comes part 2—a response to Bob Klipp by Chris Matsuno.

"Getting to Bob's thoughts on models DTing out of thermals. I can't explain why models seem to circle smoothly in thermals. One reason could be that at the altitudes our models reach, thermals are not as strong and turbulent as they apparently become at higher altitudes. One might also theorize that at higher altitudes, the change in lapse rate, temperature and pressure may combine to make the air more unstable.

"I also can't explain why a full-sized sailplane apparently will turn away from thermals, when it is clear that models do seem to end up centered in a thermal at times. (The model glides around, clearly in neutral or down air, hits a bump, starts to maintain altitude, then starts going up, and DTs at several hundred feet. Of course, sometimes, as Bob says, the model is kicked out of the lift.)

"On models DTing out of thermals, I do have some thoughts. It's a simple matter of the sinking speed of the DTed model vs. the rising speed of the thermal. Whenever my models DT, I always try to note the time, estimate the model's altitude and stop the watch when the model touches down. These figures may not be 100% accurate in the heat and excitement of contest flying when the model DTs at several hundred feet and you are busy chasing it. But when trimming on calm mornings or evenings, I think my altitude estimates are reasonably accurate.



JOHN FERRER'S GUSSET TIP—SEE TEXT.

"Based on many flights, I estimate that the sinking speed of a DTed Wakefield is approximately 10 fps (or 600 fpm). Therefore, as long as the thermal is rising at less than 600 fpm, the model will eventually come down.

"Let's assume we launch a Wake into a thermal going up at a constant rate of 200 fpm. Actually the rate probably changes,

More Misery Meet action shows Mark Sexton with his .020 Replica Comet Mercury. Ship is a great flier with a Cox Tee Dee .020.

Continued on page 78

the INSIDERS

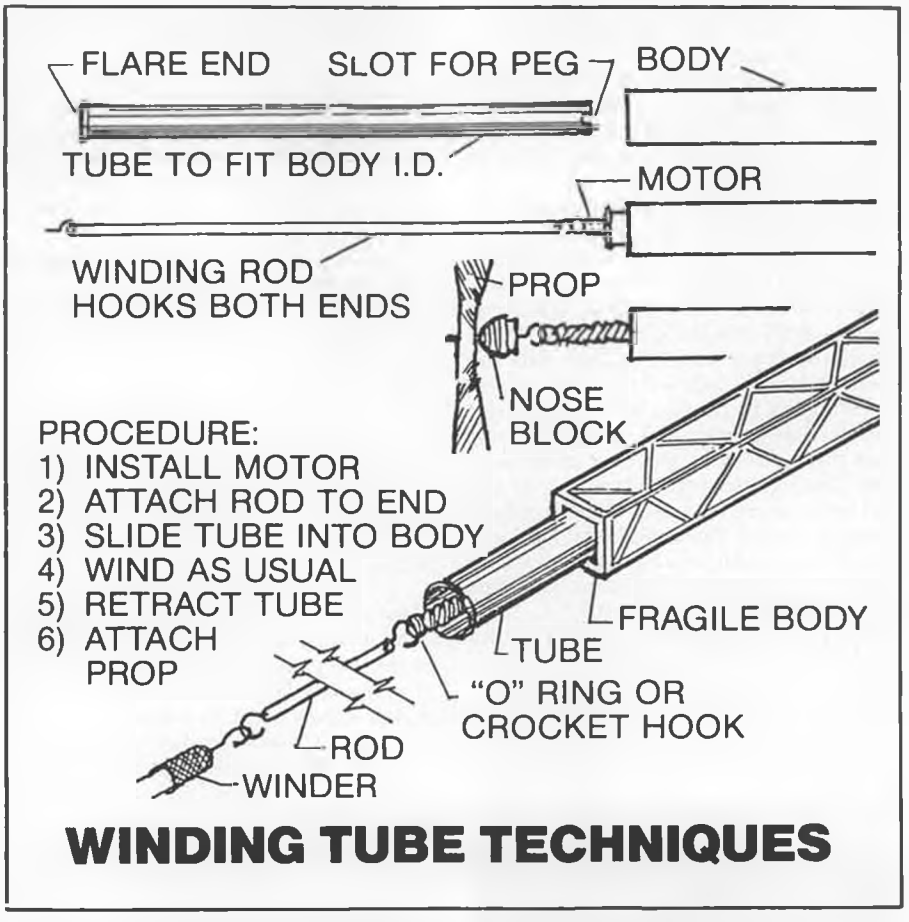
INDOOR FLYING REPORT

By DAVE "VTO" LINSTRUM

WINDING TUBE TECHNIQUES

The use of winding tubes to protect fragile rubber model fuselages (fragile is anything less than a metal or fiberglas/Kevlar reinforced body) was developed by British fliers in the late fifties to let them wind huge chunks of gumband in incredibly fragile warren truss/tissued "Open" rubber models. The techniques as they apply to indoor rubber models are much the same, with appropriate modification of the tube size, materials, and adaptation to the less powerful winders and motors that we "Insiders" use. Those models whose motors can be wound off the model, on a torque meter or winding post, do not need to have winding tubes, of course. These are limited to F1D Microfilm, "A" ROG Intermediate Stick, Easy B and the Novice Penny/Pennyplane classes. Despite the sturdy body, most Federation ROG fliers also wind off the model as well.

Let's say you have a fragile Bostonian, Peanut, FAC Scale or Manhattan, and want to pack max turns into that rubber for a winning flight (or max torque if that is the way you measure rubber performance). The first thing you needto make is a tube (or tubes, for various models) that will fit in the nose opening of your models and is slightly longer than the distance from the rear peg to the noseblock. This will allow it to be inserted all the way back to the peg (you can notch the tube for the peg to insure seating) and still protect both ends of the fragile structure.



WINDING TUBE TECHNIQUES

It doesn't get any better than this! An end zone view inside the huge Kibbie Dome, site of the 1989 Nats indoor events. Photo was taken by Tom Stalick. More details in text.

What to use for a tube? Starting with Pistachios and Peanuts, plastic soda straws are often suitable. For larger models, thin-wall aluminum or plastic tubes can be used. Some thin-wall PVC irrigation tubing is good, and you can "roll your own" tube with a sheet of drafting mylar, rolled on a mandrel and taped with nylon filament tape. Look around for the tube to do the job, sizing it to the model and motor.

Next you must make a winding rod or wire that will connect your winder hook to the end of the rubber motor. This can be an aluminum rod (welding rod, etc.) with hooks securely fastened to each end, or a sturdy piece of music wire with loop ends that will slip through the winding tube. Be sure your rod or wire is at least an inch or two longer than the tube so that you can retract the tube onto it after you have put in the last turn. The winder, rod (wire), and tube are removed from the rubber as a unit when the prop is attached.

Finally, to make that delicate operation easier, you may wish to attach an O-ring to the end of the rubber. If you don't do this, you must release a few turns while holding the rubber near the end, to make a small loop to attach to the prop shaft. Don't use a Morton-Thiokol booster O-ring, just a little one will do! These tiny rings can be obtained from small parts suppliers.

If you use these techniques (see the illustration showing a generic body, tube, etc.) you will protect those fragile models from what happened to our winning Bostonian when we did not bother with a tube at MacDill; a broken loop of Pirelli thrashed around in the back of the body,

trashing it. So be wise, wind up with a tube inside!

DOME THE '89 INDOOR NATS

As announced in last month's column, the 1989 AMA Indoor Nats will be held in a magnificent 144-foot college arena in Moscow, Idaho. MB F/F columnist Bob Stalick set his spy network in action, so this month we have secret spy surveillance photos and a secret agent report smuggled at great risk from Moscow. Here is the field intelligence from Superspy Stalick:

Re: Kibbie Dome Information and Photos

Gentlemen:

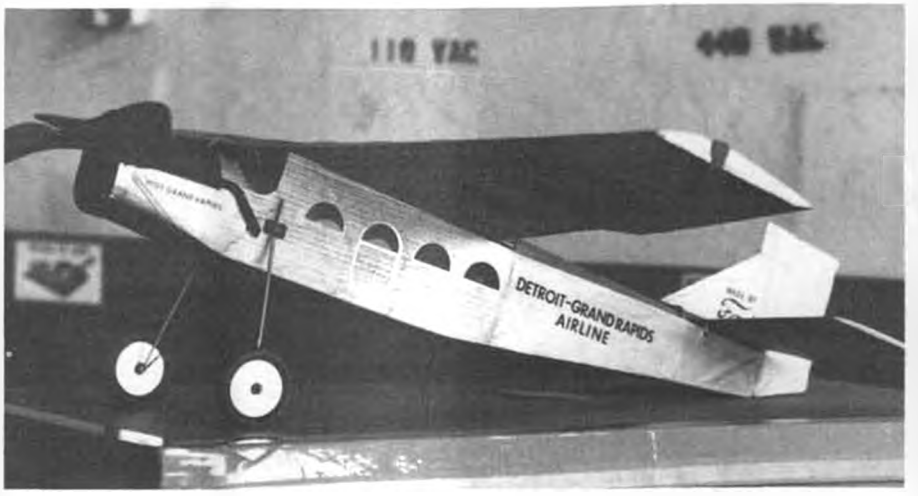
As each of you is aware, the AMA has decided to hold its indoor events at the 1989 Nationals at the Kibbie Dome in Moscow, Idaho. This arena is on the campus of the University of Idaho and is one of the premier indoor modeling sites remaining in this country. The following information and accompanying photographs should be published in your respective magazines or newsletters if at all possible. I know that the time may be too short to make this possible, but I am also aware that the decision to use the Kibbie Dome was just made within the past two weeks, so time is of the essence.

After the decision to use the Dome was made, I contacted my son, Tom, who is an engineering student at the University of Idaho and an amateur photographer. He took a series of photos inside and outside the Dome in late February. They arrived yesterday and I am forwarding them to you for your use.

First, I would like you to be aware of the dimensions and other features that make the Dome uniquely suitable for indoor model flying. So, here goes:

According to information published by the University of Idaho, "The William H. Kibbie ASUI Activity Center construction was started on February 3, 1971 and seats 18,000 plus another 5,000 when bleachers are erected in the end zones. The arches span 400 feet from side to side and the center height from the football field to the underside of the roof is 144 feet. Enclosed in the mammoth structure are slightly more than four acres, and a fourteen story building could stand inside. The ceiling is

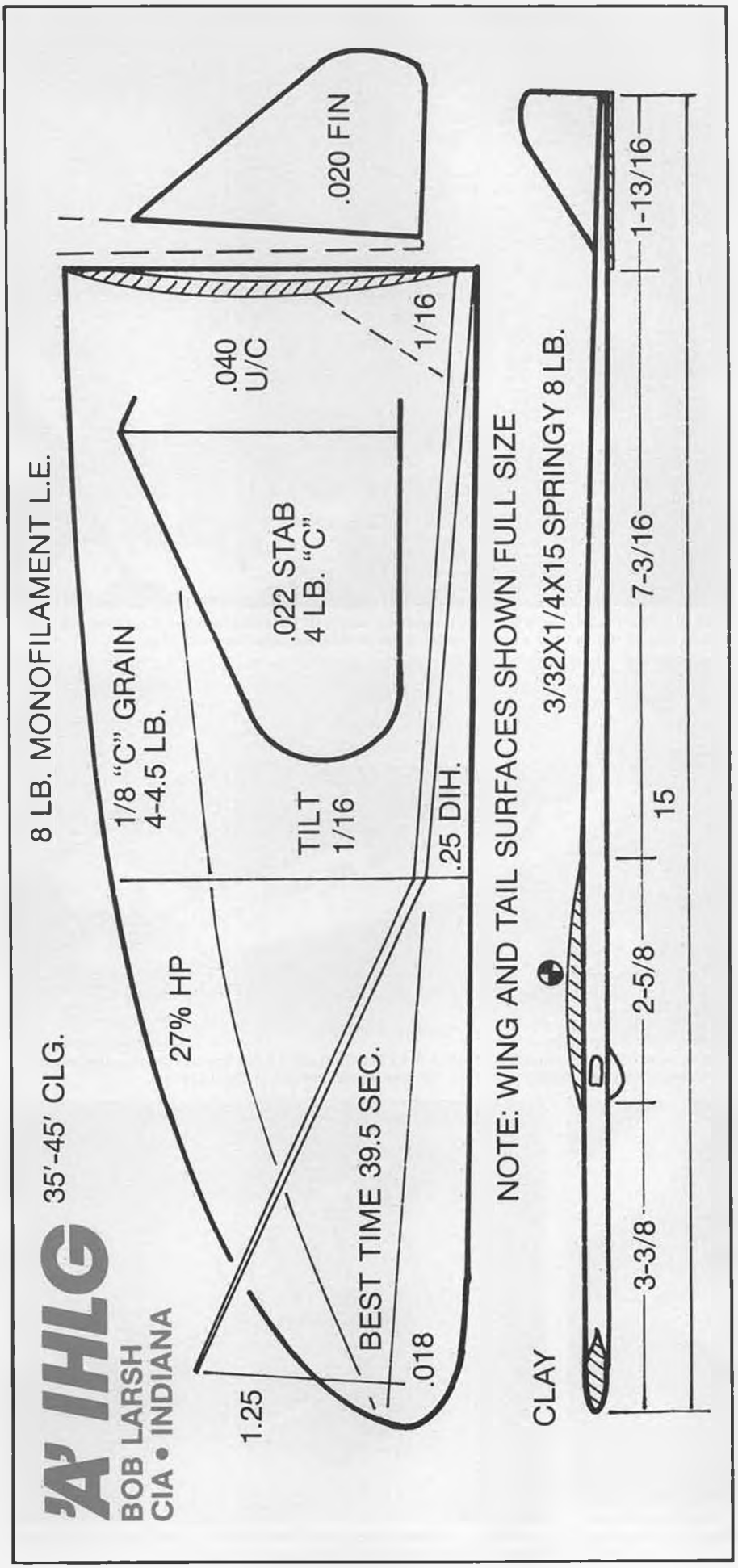
Like all indoor models, Easy B's require a delicate touch. NFFS founding father, Carl Fries, transfers a fully wound motor from a torque meter to his condenser paper covered ship.



Highly detailed 36" Coconut Scale Ford A.T. by Millard Wells is a real beauty. Color is silver overall, with simulated corrugations as per the full-size aircraft. Photo by Jake Larson.

Well-known German rubber scale modeler, Benno Sabel, also dabbles with indoor duration models such as this beginner's F1D ship. Nice shirt ya got there, Benno!

Cute Caproni-Pensutti triplane by Rich MacEntee flies well despite zero dihedral. Photographed by Jake Larson at MacDill AFB.



composed of 'clouds' of acoustical tile; 800 of them are suspended separately about three feet below the roof structure. Each unit, or cloud, contains 144 square feet of surface area.

"The facility was dedicated on October 11, 1975 and additional work was completed in the early '80s to add a weight room and other athletic facilities. The Dome is used for football, basketball, track and other activities, including an indoor rodeo. The synthetic turf used for football games is rolled up at the end of each season and stored against one wall. The floor dimensions are approximately 400 feet long by 170 feet wide by the aforementioned 144 feet in height. Seating fans out and up on either side for the length of the football field.

"The general entrance to the Dome is through double doors that are located on the upper level. This serves to seal the interior of the Dome against the effects of the Idaho winter weather, which can become quite severe. Parking is abundant near the Dome for similar reasons. The weather conditions for Moscow, Idaho during July are similar to the weather in the Tri-Cities area, so expect it to be hot and dry, which should assist competitors in improving their flight times.

"Moscow, Idaho is located on the border between Washington and Idaho. It is serviced by a small commuter airport located midway between Pullman, Washington and Moscow. Pullman is a sister city located about 8 miles due west of Moscow. Moscow can also be reached via car from Spokane, Washington—located approximately 85 miles nearly due north, or from the Tri-Cities—located approximately 120 miles due west via a number of non-freeway roads. (I have taken this trip dozens of times and have found the easiest and most attractive route is to drive through Kahlotus, Washtucna, and Colfax.)

"Once in Moscow, the closest two motels to the campus and the Dome are the University Inn and Cavanaugh's Motor Inn. The University Inn can take reservations at 1-800-528-1234. The cost of either motel is in the mid-$50.00 range for a room for two. Both are very nice facilities with many comfort features, including swimming pools."

So, there is more information than you can possibly use, but I figured that from this letter, each of you might glean enough material to write a brief article for your publications. Since I am quite certain that no one has yet provided you with either this information or useable photographs, I hope I have been helpful.

If you need additional information, I am home most weekday evenings and can be reached at (503)928-8101 or during the days at my office (503)687-3481.

Here's to a great 1989 Indoor Nationals.

Bob Stalick

SUPER SLIPPERY SHAFTS

One of the often ignored but still important factors in max flight time for indoor models, Bostonians, Embryo, Manhattans, etc., is the proper lubrication of the prop shaft. A slippery shaft will give you more energy transfer with less friction loss. John

Aviation At Its Best

ZENITH BOOKS™

AVIATION FAVORITES

Stealth Bomber: Invisible Warplane, Black Budget
Sweetman, with foreword by Tom Clancy. The revolutionary new B-2 unveiled in 120 b&w photos that are the first detailed pictorial record in print. Sweetman delivers a thorough technical analysis of this revolutionary new plane and its capabilities. This is the definitive source on this incredible airplane. 176 pgs., 157 b&w ill.
113329AP $14.95

Combat Aircraft Recognition
March. An invaluable guide to combat aircraft. Details the many aircraft likely to be seen at operational airfields or at the many European and U.S. airshows open to the public. Each type of aircraft is illustrated in full color and information on specifications, service and recognition are provided for the expert and amateur alike. 144 pgs., 150 color ill.
113321AE $9.95

Flying Models: Favorites of the Fifties
Sneed. A wonderful collection of plans for the model planes of the fifties. Over 100 popular planes with captions that offer insight into each design. Excellent for anyone wishing to recreate one of these fantastic planes or for just reminiscing. 94 pages of b&w ill.
113714AE $17.95

U.S. Navy Air Wings: Flamboyant Markings 1965-75
Francillon & Lewis. Skyhawks, Crusaders, Vigilantes, Phantoms & Skyknights wearing some of the most flamboyant aircraft markings ever. Vivid color photos & high quality printing bring these imaginative birds home to you. 128 pgs., 122 color ill.
113326AE $14.95

Vought F-8 Crusader
Mersky. One of the all-time great naval combat aircraft, the supersonic F-8 Crusader was the last in a proud line of single-seat, gun-armed fighters from Vought. Here is the full story with 160 b&w illustrations and 12 pages of color. 200 pgs., 160 b&w ill., 12 color pgs.
113706AE $22.95

Focke-Wulf Fw190 - Ta152: Aircraft and Legend
Nowarra. Recently translated from German, this book chronicles the history of this brutal-looking and effective fighter from conception and development to the production of the Ta152. Detailed looks at all the variations, armament, engine, specs, performance, and combat roles. 250 + photos & line drawings. 160 pgs.
113503AE $19.95

Lockheed Blackbirds
Throckborough & Davies. The story of the Blackbirds - the SR-71 Habu, the U-2 Dragon Lady, the TR-1 & ER-2 all currently flying throughout the world. First-hand accounts from Blackbird pilots that portray these daring spyplanes at work. Illustrated with many unpublished photos & scale drawings. The most revealing book yet published on USAF reconnaissance planes. 144 pgs., 250 ill.
113469AP $18.95

NEW RELEASES

Cowboys of the Sky
Lhota. The legendary A-2 leather flight jacket was worn by the daring pilots of WWII. Now the Department of Defense is reissuing the A-2. Here is the fascinating history of these jackets and the story of Avirex, the official supplier of the new generation A-2. Told in over 300 new and wartime photos. 157 pgs., 306 ill., 201 in color.
113825AP $29.95

Modern Jet Fighters
International Defense Images. 125 stunning color photographs & an in-depth analysis of state-of-the-art fighter technology. Includes the latest F-16 upgrades, an unprecedented detailed analysis of the MiG-29, Israeli fighters & spaceplanes. 96 pgs., 125 ill.
113851AP $19.95

Vintage Aircraft Nose Art 1990 Calendar
12 full-color and 24 b&w photos capture the fantastic nose art of WWII bombers. Inspired by the stunning *Vintage Aircraft Nose Art* book. 24 pgs., 36 ill.
113931AP $9.95

Complete Book of WWII Combat Aircraft
Angelucci & Matricardi. This exemplary book presents in full-color art and accurate detail the 178 aircraft from all countries that played a crucial role in the battles of WWII. Filled with fine reproductions in poster size and quality. **Originally published in 8 volumes at $143.60. 416 pgs.**
113805C ..... SPECIAL $39.95

Warbirds Worldwide
Excellent color photography and well-written, informative articles make this publication a favorite of aviation experts and enthusiasts alike. Each contains 75 + photos.

No. 5. Contains articles on The Old Flying Machine Company, Bombertown U.S.A., Filming The Battle of Britain, the Wirraway trainer, and more. 48 pgs., 84 ill.
113322AE $9.95

No. 6. Features the warbirds at Oshkosh '88, plus excellent articles and color photos on the Douglas Skyraider, Yak F-AZNN, and Bombertown pt.2. Battle of Britain pt.2. 48 pgs., 120 b&w ill., 6 color pgs.
113523AE $9.95

No. 7. Features an exclusive report on the rebuilding of several RAF Spitfire gate guards, plus Tigercats, Corsairs, the Reno Report, and the conclusion of "The Battle of Britain" Stlbd. 8 1/4"x 11", 48 pgs., 72 photos, 12 in color.
113793AE $9.95

No. 8. The inside story of a summer on the air show circuit in a P-51 Mustang, plus Spitfires, Corsairs, Venom rebuild, Tempest, and more. 48 pgs., 155 photos, 15 color.
114018AE $9.95

Special Edition: Jets. Contains the same excellent coverage and high-quality photos of the regular publication but focuses on the great jet warbirds. Includes Lightnings, Sabres, Skyhawks, MiG Alley's MiG-15s, a MiG-21 profile, and more.
113794AE $9.95

Aircraft Archives
A must for modelers and enthusiasts! Detailed information on each aircraft, plus cutaways, three-view drawings, cockpit diagrams, weapons, specs, and performance data. Excellent! 96 pgs., 52 photos, 96 drawings.

Postwar Jets, Vol.1. Includes Harrier, Tornado, MiG-21, F-100, Lightning and Mirage.
112487AE $16.95

Postwar Jets, Vol.2. Includes A-7E Crusader, F-4 Phantom, F-105 Thunderchief, Sea Harrier and 18 more.
113008AE $16.95

Postwar Jets, Vol.3. Includes Skyray, DeHavilland Vampire and Swallow, MiG 11 and 21, Saab J.29, Tupolev Tu-104, and 11 more.
113493AE $16.95

Fighters of WWII, Vol.1. Covers Spitfire, Hellcat, Thunderbolt, Typhoon, Bf109, Zero and ten more.
112739AE $16.95

Fighters of WWII, Vol.2. Covers P-51 Mustang, Spitfire, Messerschmitt Bf109, Focke-Wulf fw190 and 10 more!
113009AE $16.95

Bombers of WWII. Includes B-17G Fortress, Dauntless, Lancaster Mk I & III, B-24J Liberator, Ilyushin Stormovik, and 16 more.
113492AE $16.95

Aircraft of WWI, Vol.1. Covers the Allies. Bristol, De Havilland, Sopwith, Vickers, SPAD, Thomas Morse and more. 35 planes.
113852AE $16.95

Aircraft of WWI, Vol.2. Covers German planes. Albatross, DFW, Fokker, Pfalz, Roland, Staaken and more. 35 planes.
113853AE $16.95

Classics of WWII. Includes Martin Baker MB5, Gregor FDB1, Heinkel He51, Focke-Wulf Fw190, Boeing-Stearman PT13-18, Piper Cub, Polikarpov Po2 and more.
113854AE $16.95

R/C & MODELING

Basics of Radio Control Helicopters
Tradelius. An easy to understand, helpful guide to getting started in R/C helicopters. From buying to flying. No experience necessary. 96 pgs., 129 ill.
113837B $9.95

Radio Control Handbooks
These books contain everything the R/C modeler needs to know about his respective topics. From selecting the model or equipment, through installation & construction to finishing & flying. 64 pgs.

Basic Radio Control Flying, Boddington
113850AP $9.95

Building From Plans, Boddington
113601AP $9.95

Covering Model Aircraft, Peacock
114015AP $9.95

Flying Scale Gliders, Gardner
113849AP $9.95

Installing R/C Equipment, Smoothy
113599AP $9.95

Moulding and Glass Fibre Techniques, Hollands
114016AP $9.95

Operating Radio Control Engines, Boddington & Winch
113848AP $9.95

Setting Up R/C Helicopters, Day
113600AP $9.95

Scale Model Ships
Smeed. Devoted exclusively to working scale model ships and boats of all types for the novice or intermediate builder. Covers choosing and building ships from kits, plans, and drawings. Chapters on design, construction, and radio control. 144 pgs.
113423AE $17.95

How to Choose R/C Model Engines: Make the Right Choice For Your Plane, Boat or Buggy
Pratt. Comprehensive guide to over 150 different engines. Covers specs & performance rates the engines, & installation advice.
112306AP $12.95

R/C Model Airplane Design
Lennon. How to design & build your own R/C airplanes. Not highly technical, but very complete. Canards & tandem wings, flying boats, gliders & tailless planes.
111070AP $16.95

Radio Control: Handbook of Theory & Practice
Newell. Background theory & basics covering R/C theory together with precise construction details. Includes circuit schematics. 135 pgs.
107501A $24.95

Schluter's R/C Helicopter Manual
The bible on flying R/C choppers. Basics of helicopter technology, rotors & dynamics, flight training, performance calculations & building techniques. 256 pgs., 100 + ill.
107492AE $21.95

Designing & Building Composite R/C Aircraft
Lambie. Complete guide showing how to build strong, lightweight & beautiful models. Foam, balsa, fiberglass, kevlar, polyester & epoxies. 240 pgs., 250 ill.
112492AP $16.95

R/C Ducted Fans: How to Build & Fly Your Own Jet Successfully
Fanelli. An expert shows you the secrets of building your own ducted fan. Construction, finishing & flying without crashing. 176 pgs., 150 ill.
112388AP $12.95

Beginner's Guide to Radio Control Sport Flying
Pratt. A must for anyone thinking of getting started in the hobby. Completely details everything the novice needs to know about building from scratch or kits. Covers building & flying trainer planes, perf planes, gliders, scale models, giant scale models, ducted fans (jets) & helicopters. 144 pgs., 80 ill.
112989A $9.95

Selecting R/C Systems & Components for Your Airplane/Boat/Buggy
Pratt. Gives you a complete rundown of all the products on the market & helps you determine which are best for your model. 122 pgs., 44 ill.
112459AP $11.95

How to Choose Ready-to-Fly Airplane Kits: Making the Right Choice
Pratt. Analyzes all the off-the-shelf models on the market & tells you which is best for your skill level. 112 pgs., 62 ill.
112491AP $12.95

Squadron Signal "In Action" Series
Aimed at the buff, historian, and modeler. Each volume contains approximately 110 photos and 14 full-color prints showing unit markings, insignia, paint schemes, nose art, etc. Excellent detail with cutaways, exploded views, sectional drawings, model and variant details. Each is approx. 50 pgs., 150 ill.

CH-47 Chinook
113901A $6.95

Sukhoi Fitter
113902A $6.95

OV-1 Mohawk
113900A $6.95

Spad Fighters
113927A $6.95

Building and Flying Model Aircraft
Schleicher & Barr. An outstanding and complete introduction to assembling and flying model aircraft for the beginner. Abundantly illustrated, precise and clear. From choosing equipment, to set-up, to simple flying, combat maneuvers and aerobatics. 166 pgs., 168 ill.
107494C $5.95

The Complete Modelling Workshop
Catchpol. An excellent book concentrating on the techniques used to create stunning dioramas. A must for the military modeler especially. 66 pgs., 208 ill.
113907A $6.95

Plastic Modeller's Handbook
Barber. Modeling tips, tricks, & techniques. Aircraft, ship, and automobile modeling are each addressed in their own sections. Topics include painting, adhesives, accessories, customizing, detailing, special techniques, products, sanding, weathering, dioramas, super detailing, manufacturers, suppliers, and much more. 224 pgs., approx. 150 ill.
113806AE $22.95

Flying Model Helicopters: From Basics to Competition
Day. Become a better pilot with detailed instruction on training, advanced flying, aerobatics, competition flying & more. 192 pgs.
110761AE $21.95

Sportflier's Guide to Finishing & Detailing Model Airplanes
Troy. Written specifically to answer the sportflier's questions on the materials, products, and techniques that will provide a beautiful, professional-looking finish. A thorough how-to guide that provides fast, easy techniques for finishing and detailing R/C model airplanes. Includes airframe preparation; fiberglass cloth and polyester resin; iron-on coverings; dope, silk and silkspan; the cockpit; landing gear; painting; personalizing your model and more. 160 pgs., 200 ill.
113619AP $12.95

Radio Control Giant Scale Aeroplanes
Boddington. Chapters include Selecting the Model: How They Fly; Kits, Plans or Own Design; Materials and Adhesives; General Construction; Wings and Tailsurfaces; Engines and Ancillaries; Rigging and Struts; Radio Control Systems; Detailing; Float Planes, and much more. 246 pgs.
113246AE $21.95

Introduction to Electric Flight
Peacock. Learn the ins & outs of clean, silent power. Details all aspects of electric R/C flight. 144 pgs.
112643AE $19.95

Model Aircraft Aerodynamics
Theory of flight applied to models. Tables of optimum airfoil sections, the scale effect in model planes, performance, trim stability, etc. Revised ed.
111933AE $27.95

Rubber Powered Model Airplanes: Basic Handbook Designing/Building/Flying
Ross. A comprehensive guide to rubber powered modeling. Tools, materials selection, construction, finishing, flight trimming, competition & design are all covered. Well illustrated with clear, concise directions & discussion of the fundamentals of rubber powered flight. 144 pgs., 80 ill.
113330AP $12.95

Aerodynamics of Model Aircraft Flight
Simons. If you're building or thinking of building your own plane you must read this. No math, no formulas, just a clear understanding of what makes the plane behave & misbehave so you can be a better modeler. Includes design, props, controls, wings & more. 144 pgs., 80 ill.
112668AE $18.95

World-Class Aviation Books

113377	AAF: Off. WWII Gd to Army Air Forces	SPECIAL 9.98
113366	Aces High	19.95
112988	Advanced Gd to R/C Sport Flying	9.95
113280	Air Power. VHS	39.95
113310	Air Power. Vol. 6. 90 color min. VHS	39.95
113298	Air War: Modern Jet Fighters. VHS	39.95
113304	Air War Vietnam. Vol.1. 60 color min. VHS	29.95
113308	Air War Vietnam. Vol.5. 60 color min. VHS	39.95
113008	A/C Archives: Postwar Jets. Vol. 2	16.95
113331	Aircraft Weaponry of Today	25.95
113328	Alaskan Props. Osprey Colour Library	14.95
113910	**ALBATROS D.II WINDSOCK FILE #11**	NEW 12.95
113844	**AMAZING MODELS: BALLOON POWER**	NEW 7.95
113845	**AMAZING MODELS: RUBBERBAND POWER**	NEW 7.95
113296	America's Top Guns. 57 color min. VHS	32.95
113679	Asian Airpower: Exotic Warplanes In Action	14.95
113066	AV-8 Harrier. P.I. Detail & Scale	8.95
113838	**A-4 SKYHAWK: DETAIL & SCALE #32**	NEW 8.95
113148	Basics of Radio Control Boat Modeling	9.95
113926	**BENT & BATTERED WINGS 2: USAAF/USAF DAMAGED A/C**	NEW 8.95
113064	Boeing B-52 Stratofortress	10.95
113656	Boeing 747	8.95
113217	British Civil Aircraft 1919-82. Vol.II	45.00
112637	Canada's Air Force Today	40.00
103028	Carrier Aviation	12.95
113609	Cherry Point: 'Can Do' and Harrier II: Superbase #6	14.95
113620	Cobra: Tank Killer Supreme	14.95
107638	Complete Manual of Electric Propulsion Systems	12.95
113302	Cry of Battle. 99 color min. VHS	49.95
113584	C-130: The Hercules	12.95
113400	Dec. 7, 1941: Japanese Attacked Pearl Harbor	22.95
113323	Deci: NATO's European Combat Range: Superbase #4	14.95
113426	Dive Bombers in Action	29.95
113707	Douglas A-1 Skyraider	22.95
113873	**A DREAM OF WINGS: AMERICANS & A/P 1875-1905**	NEW 14.95
113680	Eject! Eject! History of the Ejection Seat	21.95
113356	Encyclopaedia of Military Models	19.95
113071	Escort: The P-51 Mustang! 60 min. VHS	39.95
113909	**FAIREY SWORDFISH MKS I-III: AEROGUIDE CLASSICS #4**	NEW 10.95
112942	The Fighting Lady. 60 min. VHS	32.95
113284	Flight Into Hell. 33 min. VHS	39.95
112940	Flying the AH-1G Cobra Gunship. 65 min. VHS	32.95
109981	Flying R/C Models Video. VHS	39.95
113905	**FORCES '89**	NEW 17.95
113538	Getting Airborne Volume I	12.95
113539	Getting Airborne Volume II	12.95
107588	Giant Steps: Book of Giant R/C Aircraft	12.95
113610	F-8 Crusader: Detail & Scale Series. Vol. 31	9.95
113657	F-16 Fighting Falcon	8.95
113911	**HANRIOT HD.1 WINDSOCK FILE #12**	NEW 12.95
113773	Ill. Directory of Fighting A/C of WWII	15.95
113800	Ill. Directory of the US Air Force	SPECIAL 16.98
113809	Jane's All the World's A/C 1988 89	165.00
113797	Jane's Fighting A/C of WWII	SPECIAL 25.98
113872	**JANE'S FIGHTING SHIPS OF WWII**	SPECIAL 25.98
113255	KoKu Fan April 1988	6.50
113912	**KOKU-FAN FAMOUS A/P OF THE WORLD: BOEING B-17**	NEW 6.95
112984	KoKu Fan February 1988	6.50
112985	KoKu Fan January 1988	6.50
113256	KoKu Fan March 1988	6.50
113915	**KOKU-FAN MONTHLY: FEB 1989**	NEW 6.50
113913	**KOKU-FAN MONTHLY: JAN 1989**	NEW 6.50
113621	KoKu Fan Monthly: May 1988	6.50
113254	KoKu Fan No.41: U.S. Forces Japan/5th AF 1945-88	17.50
113744	**KoKu Fan No.42: Japanese Imperial Army/Navy A/C**	17.50
113743	**KoKu Fan No.45: U.S. Navy Fighters of WW2**	17.50
113906	**KOKU-FAN #46, U.S. ARMY AF FIGHTERS WWII**	NEW 17.50
113228	Lancaster at War: 7	28.95
109661	Learng to Fly R/C Model Airplanes	9.95
113225	Lightning	19.95
113561	Lockheed U2R/TR-1 Minigraph No. 28	10.95
113486	The Martin B-26 Marauder	16.95
113218	McD Douglas F/A-18 Hornet Aeroguide #20	9.95
113325	Miami Props	14.95
113753	MiG Kill Markings of Vietnam War: C&M V.12	14.95
113314	Military A/C. Vol. 1. No. 1. 60 min. VHS	39.95
112960	Military A/C. Vol. 1. No. III. VHS	39.95
113611	Mildenhall: Multi-mission Task Force: Superbase #5	14.95
112991	Miramar: Home of "Top Gun": Superbase #2	14.95
110681	Manual of Electric R/C Cars	14.95
113483	Model Car Building: Advanced Techniques	9.95
113632	Model Car Building: Getting Started	9.95
113774	Modern Carriers	14.95
113775	Modern Fighters	14.95
113363	Modern Military A/C: Hornet	6.95
112990	Nellis: Home of "Red Flag": Superbase #1	14.95
113917	**NIEUPORT AIRCRAFT OF WWI: VINTAGE WARBIRDS #10**	NEW 9.95
113219	Panavia Tornado F Mk2/Mk3 Aeroguide #21	9.95
113908	**PANAVIA TORNADO GR MK 1: AEROGUIDE #24**	NEW 10.95
113401	Pleiku: Helicopter Warfare in Vietnam	19.95
109786	Pocket Gd A/C Markings & Commercial A/C	SPECIAL 9.98
113607	Pocket Gd Military A/C & World's AF	SPECIAL 9.98
109373	Radio Control Buyer's Guide	11.95
107617	Radio Control Slope Soaring	24.95
107584	Radio Control Thermal Soaring	29.95
113324	Ramstein: Headquarters of the USAFE: Superbase #3	14.95
113764	R/C Wheels: Hottest Action. 30 min. VHS	14.95
113792	Sopwith Camel: King of Combat	29.95
112755	SwissAir: Aircraft Over Five Decades	75.00
113624	These Men Are Dangerous: Early Yrs of S.A.S	24.95
113790	Top Gun Jets. Approx. 30 min. VHS	14.95
113460	Top Gun: Story Behind the Story. VHS	14.95
113614	USAF Aggressor Squad: Colors & Markings #11	11.95
113065	U.S Navy CAG A/C Colors & Markings: Fighters	14.95
113415	Warbirds Ill. No.48: Soviet Airpower today	9.95
113417	Warbirds Ill. No.49: F-105 Thunderchief	9.95
113678	Warbirds Ill. No.51: Canberra & B-57	9.95
113782	Warbirds Ill. No.52: German Jets of WWII	9.95
113788	Weapons of War Video. 45 min. VHS	14.95
112992	World Super Carriers: Naval Air Power Today	14.95
112898	World's Greatest Paper Airplane & Toy Book	6.95
113628	Vietnam: Combat from the Cockpit	24.95
113781	Vietnam Helicopter Handbook	10.95
113416	Vintage Warbirds No.9: WWI in the Air	9.95
112907	VIP's Directory of Giant Scale Plans	11.95
113821	Vought's F-8 Crusader, P.2: Navy/Marine RF-8 Photo-Recon Squadrons	10.95
111979	400 Great R/C Modeling Tips	9.95

Order Toll Free

1-800-826-6600

WI & Canada use 1-715-294-3345.

10-DAY MONEY-BACK GUARANTEE. LIBRARY ORDERS & DEALER INQUIRIES INVITED.
Items can be charged to Mastercard, Visa, American Express · Optima. SHIPPING & HANDLING CHARGES are $3.95. The fee charged covers cost of shipping 4th class bookpost or UPS. We will ship the best way. NO CODs. Residents of CA, HI, IL, KS, MA NE, NM, NV, TX, & WI please add your state's sales tax. Prices & availability subject to change.

ZENITH BOOKS — Also available at fine hobby stores.

P.O.Box 1/ MB089 OSCEOLA, WISCONSIN 54020

Send Item numbers: PLEASE PRINT

Include $3.95 handling. Residents of CA, HI, IL, KS, MA, NE, NM, NV, TX, & WI please add your state's sales tax.
Enclosed is my check or money order for $ _____
Charge to my: ☐MC ☐VISA ☐AMEX ☐Optima
Acct. # _____ Exp _____
Cardholder's Signature _____
Name _____
Address _____
City _____ State _____ Zip _____

ORDER CODE: MB089

Visit our office & warehouse at 729 Prospect Ave Osceola WI

Tudor of MIAMA, an "old silver fox" of indoor flying, discovered "Super Lube" in the fishing tackle department of a local store. This stuff is really slick, as it has Teflon in it. Super Lube comes in two forms, a little tube with cap, or a syringe with a metal needle. It is manufactured by Synco Chemical Corp. in New York. Look for it in your local tackle shop or sporting goods department, and put a little on the nose of all your rubber models. It is longlasting and won't attract grit.

CORNFILE YOUR BALSA

The little emery boards many modelers use to shape balsa and foam are fine for many projects, especially those where only fine sandpaper grit is needed. However, where initial rough sanding is sometimes needed, such as on foam wheels or nose blocks, these may take too long. Jake Larson of St. Petersburg, Florida, a new flier at the MIAMA MacDill meets, discovered that Dr. Scholl's has black grit files for corns that are just the right thing for roughing out shapes on his models. These come in coarse and medium grit and are available at drugstores. Try one next time an emery board just won't cut it. •

EOTW. . . . . . *Continued from page 32*

to dent the china cabinet. The slings don't break—the mill is safely in place—all for conrods."

"DEMCO—they've imported this superb cylindrical grinder into Australia. Marvellous. The price is slashed. No buyers. DEMCO ships it to New Zealand. The Enzedders won't buy it either and it ships back to Australia—we buy it for cylinders, pistons, contra-pistons, shafts and drum valves—very useful size at less than half price.

"Borg-Warner is closing a plant—it's a cold miserable day for the auction. We get fifteen chairs and twenty steel wastebaskets for nineteen dollars—and a workbench and four-inch-wide vise for fifteen more."

The expensive acquisition of more machinery is described and then Ivor continues with this superb advice:

"I hope all of this will serve as advice to those who are about to embark on making their own motors. Go ahead by all means—but realize what you're getting into. Remember, Duke Fox, Gordon Burford, Gig Eifflander et al, got into the act when a *week's* wages for a motor was the going rate. If you can get a *day's* wages for the same product these days you're doing well. Gordon and Duke learned the hard way and they were born at the right time. True pioneers. You can't have that same deal! If you're interested in the ego trip, then make a dozen engines, jobbing out what you don't have the machinery for.

"On the Sesqui, it's as good as I can do—which is short of what *you* could have done. You can reverse the carb intake and drum through 180 degrees. Surprisingly we could measure no difference in revs with the motor sucking all that dirty exhaust back down its throat. Our best specimens turned 17,800—the worst were 15,000. Give me another $250,000 and I can make them all turn 17,800—best of luck and thanks!"

The production run of 350 Sesqui engines was finished in 1982; all the precision machinery is still in place and itching to be used. Ivor told me he effectively gave up about 4,000 man/hours and $30,000 in cash on the Sesqui project, mostly because the FAI change to one and a half cubic centimeters never took place. And where'd the name "Sesqui" come from? *Sesqui*, in Latin, means "one and a half," like one and a half cubic centimeters in displacement. Although many of these engines are still flying "down under" in Oz, they are quickly becoming collectors' rarities. Ivor gave me Sesqui number 3 during my visit to him, and I bought Sesqui number 250 at the auction at the 1987 Australian Nationals.

And about all that machinery in Ivor's shop: he's planning on producing jewel-like reproductions of the early British Elfin 1.49cc diesels. There's a real market for nostalgia model engines. The first dozen Elfins are done for prototyping (I have serial number 5) and number 1 sold at auction for $300.00! You can reserve your repro Elfin 1.49 for under $100.00 including air-mail delivery by writing to Ivor F, P.O. Box 11, Doonside NSW 2767, Australia.

And if you're "into" diesels, Eric Clutton, who advertises here in MB, has received the new series of Gig Eifflander PAW English engines for sale in the USA. •

Hannan. . . . . *Continued from page 49*

became a professional modeler at age 14 with the sale of a patent model, and later was employed by Consolidated Aircraft and in his own hobby shops before becoming a ship modeler for the U.S. Navy Electronics Lab. In spite of building models for a living, Havlik also devoted his spare time to model aircraft in their many forms. Most recently he had restored some vintage models for the collection of the History of Model Aircraft division of the San Diego Aerospace Museum. Ray Crowell, who delivered the eulogy at Joe's funeral, characterized him as "sharing" and "caring." Our condolences to his relatives and many friends.

NEW COVERING MATERIAL

Solarfilm, of England, is marketing a new type of heat-shrinkable synthetic tissue for covering models. Called "Litespan," it has a pronounced grain similar to Japanese

tissue, yet is waterproof, fuel resistant and airtight. The covering is applied with another Solarfilm product called "Balsaloc," which is first brushed on the structure where the covering will be adhered. The Litespan is tacked in place using an iron, and may be applied to open structures or solid balsa or plywood areas, including shallow compound curvatures.

Although the material can be painted, it is available in nine colors. Weight is approximately one ounce per square yard, comparing favorably with doped Modelspan.

Distribution in the United States is through Cannon Electronics.

NOW THAT'S CLASS!

During a recent Arizona model contest, the heat drove many of the contestants to removing their shirts, according to Tom Arnold. Walt Mooney, known for wearing a tie during his flying activities, also removed his shirt, however his tie remained in place! Yes, we have pictures, and no, we're not going to publish them. . . .

END OF AN ERA

The world-famous Frank Zaic Yearbooks will no longer be orange! It seems the company that made the covers has stopped production of that color, so future Zaic publications will be tan. Well, OK, but we must admit the orange had appeal (a-peel?).

HOW'S THAT AGAIN?

Aerodynamicist/hydrodynamicist Bruce Carmichael wrote to say:

"Since retiring, in spite of flying off in all directions on numerous projects, I have actually completed and flown in my living room, an Easy B indoor model. This is the lightest, slowest-flying model I have ever built, and the first for more decades than I care to remember. I built a beautiful heavy cardboard box with 1/8-inch square spruce in all the corners to protect it. The box looks considerably better than the model, but does not fly quite as well."

COPTERS SANS TAIL ROTORS

Ed Whitten favored us with an extensive article regarding the new McDonnell-Douglas "Notar" helicopter which does not have a tail rotor. The concept is an old one, of course, however it has never been totally debugged in the past. The idea is to force air through slots in the tail boom in such a way as to offset the torque reaction of the main rotor, augmented by the air circulated around the boom from the rotor's downwash.

Georges Chaulet, of France, experimented with the system in model form some years ago. Sounds to be time to revive it!

FUR FLIERS

Responding to our book review about flying squirrels a few issues ago (February), Bill Pinkston remarked: "I see clearly now I should have been building flying squirrels all these years, if they are *supposed* to land in trees!"

By an interesting coincidence, the Canadian Post Office has recently issued a flying squirrel postage stamp.

FLYING PHILATILISTS

We know there are numerous stamp collectors in our model building audience, so here's your chance to boost *both* hobbies: James P. Darracott, 14511 St. Germain Dr., Centreville, Virginia 22020, is circulating petitions favoring a U.S. postage stamp commemorating model airplanes. Such stamps have previously been issued by several other countries, why not ours?

If you care to help support the effort, send a pre-addressed stamped envelope to Jim. And review our first Hangar item again. . . .

THE GOOD OLDE DAYS?

Don Campbell, of Detroit, Michigan reminisces: "I remember building my Comet Curtiss Coupe (10-cent kit) while using a dull razor blade to cut the tiny curved balsa pieces. Each one split as it was cut, and had to be glued back together. Real tears of frustration flowed, but my dad told me to stick with it and not let the job beat me. I did, and when the model was completed, I was the proudest kid on the block. By current standards it wouldn't rate a second look, but back then it was my pride and joy!"

COLLECTORS' ITEM

According to the *Arizona Antique News and Southwest Antiques Journal*, the world's most valuable matchbook cover is a design issued in 1927 to commemorate Lindbergh's transatlantic flight. Only two are known to exist!

THOSE WWII I.D. MODELS

Ralph Dodsworth, of Canada, wrote in

to point out that the high school craftsmen who constructed models for the U.S. Navy's World War II aircraft identification program received "ranks" according to their output. For example, the honorary rank of Lieutenant JG Aircraftsman was earned by building five models, including one twin-engined type and planes of at least two nations.

To become an Admiral Aircraftsman required the building of 50 models, each of a different type. Wonder how may Admiral model builders there were? It must be recorded somewhere. . . .

SPEAKING OF AWARDS

Bob Dick, of Covina, California, suggests: "How about presenting a jar of peanut butter to the model which does the most spectacular crash at each meet?" Well, it would be a useful prize that wouldn't need dusting after use. . . .

CAMPBELL CATALOG

Lee Campbell, apparently no relation to the Don Campbell mentioned earlier, offers a catalog of free flight model kits, accessories and supplies. This 24-page compendium is packed with descriptions of kits for hand-launched gliders, rubber-powered models, old timers, and competition gas designs. Supplies listed include Japanese tissue, folding propeller kits, finishing materials, CO_2 and electric motors, rubber, and model plans. One dollar will fetch a copy for you from: Campbell's Custom Kits, Box 5996, Lake Worth, Florida 33466. Please tell Lee that *Model Builder* sent you.

RARE RIGGING

Tom Matterfis, of Florida, and Sam Welch, of Utah, both informed us that the often hard-to-find genuine silk thread so useful for rigging small models is available at many fishing supply shops specializing in artificial fly-tying. It is ideal for rigging models, since it is non-fuzzy, unlike many types of thread, may be water-shrunk to tighten, and has sufficient strength to function as a load-carrying member. Although much more costly than ordinary thread, we find it far superior. The most common colors seem to be black and grey (which we pretend is "natural metal color").

BILL BROWN INTERVIEW

Autogiro guru George Townson attended high school with Bill Brown, of Brown Junior ignition and CO_2 engine fame, and sent us a clipping from the *Pennsylvania Centre Daily Times*. Featured was an interview with the 77-year-old Brown, who made his first engine in 1930, and accounted for about 50,000 produced between 1934 and 1940. Said Bill: "You know, there's really more demand for model airplane engines now than ever . . . it's not kids who want them either. It's boys in their 60s and 70s—boys who don't grow up."

PARTING THOUGHT

"The first rule of intelligent tinkering is to save all the pieces." Aldo Leopold, quoted in the Patagonia outdoor clothing catalog, via Mark Fineman. •

Pattern. . . . . *Continued from page 44*

engine simply due to its power advantage.

I have been experimenting with engines which have the same power potential as the 1.2 four-cycle single cylinder design. The first possibility is the 1.2 four-cycle twin! This is a very smooth running setup which, I am certain, could easily evolve into a desirable aerobatic powerplant.

I have flown the 1.6 O.S. twin using props that allowed it to unload to the 10,000 rpm range. This setup really works but it is not cheap! A much less expensive alternative is the S.T. .90. I tested this engine directly against the O.S. .61 long stroke. Same prop and fuel, and both on their original mufflers. The .61 turned the prop at 9,500 and the .90 hit 11,000. The prop was an APC 12x1O I got from Mack's Models in San Jose. It is a new design that is very quiet running and works extremely well in this speed range. We also tested this prop on the O.S. .91 Surpass and it seems very well matched. It turns 10,000 on the ground. In the air it is practically silent. Also, it goes like a shot!

When you put a tuned exhaust system on the S.T. .90 you get a powerplant which exceeds the 1.2 four-cycle in power output. I was able to get 8,000 rpm on a 15x10 Master Airscrew. I also got 11,000 rpm on the D.W. 12-1/2x12 which pulled extremely well on an 8 lb. Runaround we were using as a test bed. Except for the large exhaust system required, we found the S.T. .90 to be a great aerobatic model engine.

There are other engines available (two-

strokers and four-strokers) which will produce the power necessary for an FAI model *providing* we eliminate the displacement rule. After all, variety is the spice of life.

I have received some feedback on the open letter. The majority of comments are in favor of allowing other engines, at least engines comparable to the 1.2 four-cycle in power. The complete removal of any engine size rule makes some contestants fear that the models would get too large and too expensive. I still believe that a rule change is necessary to prevent one type of engine from monopolizing the activity. Just as the expensive pumped, piped .60 has been the overwhelming setup for the last few years, the 1.2 four-cycle (even more expensive) promises to be its successor unless a rules change allows larger two-stroke types (which should also be less expensive). Think about it. •

Big Ack.... *Continued from page 53*

wood aft. When the cement has hardened, lift the sides off the board and make certain that they are identical. If so, proceed to build the basic fuselage "box," trying to keep the structure as square as possible. I find it easiest to start from the tail post, working forward with the fuselage upside down on the building board. The straight upper longerons help to maintain a square section as you work forward adding crosspieces. When the fuselage box is completed, fill in the underside of the nose section with soft 1/32 sheet. Also, cement hard 1/8x1/8 balsa strips inside the nose crosspieces and uprights. These last pieces must be hard enough to withstand regular removal of the noseblock and those inevitable rough landings.

Turtledeck formers are cut from 1/32 sheet. Formers 1 through 5 have no stringers, but are covered in two sections with very thin sheet balsa. I used 1/64 sheet for the decking. The cockpit section is installed first, trimmed and then followed by the front top section. At this time, rough out the noseblock from medium block balsa, cement the 1/4 sheet plug to the rear face, drill out the assembly and insert the 1/16 O.D. brass tube bushing. Drill the block with a few degrees of down and left thrust as shown on the plan. Bring the noseblock to a snug fit and finish shaping. The fuselage is completed by notching and mounting the rear formers and laying in the 1/32 square balsa stringers. The entire fuselage is now sanded and readied for covering.

COVERING

Store-bought green tissue is never quite right for WWI ships. I dye my own using white Japanese tissue taped to a frame and pre-shrunk with a sprayed water and RIT olive drab dye mixture. The results are worthwhile. Use a sturdy frame and masking tape the tissue all around as taut as possible. Spray the dye mixture onto the tissue and gently wipe off the excess with a Kleenex. Be careful not to tear the wet tissue. Let dry, then cut the dyed tissue from the frame and cover the model, shrinking the tissue once again with a light water mist. Cover the undersurfaces of the wings and stabilizer with white tissue to simulate the clear doped undersurfaces typical of Allied machines in WWI.

LANDING GEAR

I prefer the early version of "Big Ack" with the birdcage landing gear and venetian blind radiator. However, the plan also shows the more conventional landing gear and detail of the later 160-hp variant.

That spidery landing gear is actually quite sturdy. The two main legs are mounted on a bamboo core, while the remaining sections are fine piano wire wrapped with thread and cemented at the joints. All of these "core" pieces are embedded and cemented into the sheeted nose and then covered with balsa struts. It really isn't as complicated as it seems.

Start by fashioning a length of 1/32 square bamboo and embedding a section into each fuselage side at the proper angles. Cement at the fuselage joint and trim each leg to the proper length. Using the plan front view as a pattern, bend and cut the front and rear "V" sections from .010 music wire. Cement these to the fuselage using a pin to make the mounting holes in the nose. Next, mount the axle wire and the final triangular connecting piece, fastening each connection with light thread and a drop of epoxy or CA. To finish the job, make up the balsa struts,

then notch and cement them to the bamboo and wire frame.

ASSEMBLY

The FK-8's tripod cabane arrangement makes wing mounting and alignment relatively easy. Cut all interplane and cabane struts from medium 1/32 sheet balsa. Sand each strut to the proper shape and cross-section, then finish with a coat of sanding sealer followed by another once-over with fine sandpaper. Finally, apply a thinned coat of "reefer gray" Floquil model railroad paint. All of the FK-8's wing and landing gear struts are painted reefer gray.

Assemble the V-shaped cabane structures on the building board. While the cement is drying, cut out the small square of tissue covering each interplane and cabane strut "pocket." Lift the cabane assemblies from the building board and cement each to the fuselage top decking, making sure that the forward assembly is in front and vice-versa. Cement the forward leg to the front cabane assembly and gently test fit the top wing. The apex of each cabane assembly should rest in the center rib pockets. If all is OK, set the fuselage aside and let the cabane-to-fuselage joints dry.

Cement the lower wing into the fuselage wind saddle. Apply glue sparingly to the top wing cabane strut pockets and fit the top wing to the cabanes. Temporarily fit the outer bay interplane struts into their pockets and check the wing alignment. True things up and put the model aside to let the wing attachment points set. When ready, cement and install all of the interplane struts and the tail.

TRIM

FAC mass-launch events such as WWI Combat require all entries to be at least moderately detailed. That typically means all of the markings, accurate color and at least some of the more distinctive fittings.

My model is finished to these standards, however, much more could be done to enhance your "Big Ack's" character. For example, a Scarff ring with Lewis gun would really look great.

FLYING

My FK-8 flies best with a 14-inch loop of 2mm rubber turning a 5-inch diameter hardwood prop. A bit of clay may be needed to balance the model at the top wing spar. My model turns left under power and left in the glide. Remember this when lining up for the mass launch; if you're on the far right and turning left, you'll likely find yourself in quite a melee right off the launch!

Have fun, that's what this event and indeed the Flying Aces Club is all about. •

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

to see happen, especially on those four-stroke engines with forward facing glow plugs.

The small J'Tec "Safe Start" engine test stand, Cat. No. JT-TS1SS, will handle anything up to a .60 and sells for $19.95. For bigger engines, Cat. No. JT-TS2SS is available for $36.95. Most hobby shops will be able to get them for you, or you can order direct from J'Tec, 164 School St., Daly City,

California 94014.

* * *

Bob Violett Models has a new mechanical retract unit designed to be very light and with a very low profile (less than one inch), which makes them especially well suited to ducted fan jet models with their thin wings. Design features include side actuation that keeps the pushrod clear of the wheel, scale looking drag link operation, and the ability to accept scale diameter struts such as the ones shown in the photo, which are specially manufactured by Impact Engineering to fit the BVM Sabre, Aggressor II, and Viper. The retract units are normally supplied with 5/32-inch spring steel struts.

The nose gear unit is available in both standard and 90° twisting types. Retraction angle is said to be not critical because the "up" lock is provided by the proper geometry of the actuating rods on the servo output wheel. (BVM recommends using the powerful Futaba 136G retract servo.) The retract mechanisms themselves are molded from carbon fiber filled nylon and are indeed quite light in weight; the quoted figures are 1.2 ounces apiece for the mains and 1.7 ounces for the nose unit.

For more information and pricing contact Bob Violett Models, 1373 Citrus Rd., Winter Springs, Florida 32708. •

Big Birds. . . . *Continued from page 13*

stallation, mainly because many of us aren't all that handy when it comes to using the proper tools and techniques needed for the smaller, delicate electronic circuitry. According to A.R.B.'s Larry Zucker, TBS is simple to install and requires little or no prior soldering skill. There are three basic steps:

A) Unsolder the black battery wire from the battery contact and solder it to the TBS hookup wire (the one with the shrink tube on it).

B) Solder the remaining TBS wire to the battery contact where the black battery wire was removed.

C) Unsolder the lead wires from the TBS interrupter assembly, pass the lead wires through a previously drilled hole and resolder the lead wires to the interrupter assembly.

Larry pointed out that all the electronics used in this system and the techniques shown in the installation manual were field-tested and proven for well over 12 months prior to introducing the TBS.

A.R.B recommends that radios be of the same make because most manufacturers use different control circuits, and mixing even slightly incompatible circuits could lead to problems. However, TBS can be used with different model radios from the same manufacturer provided that each radio has adequate area available for installation of TBS components. They also recommend that the kit be bought for radios of six channels or less because this leaves pre-drilled access holes in the proper locations for both the switch and the jack installations.

And one further note: the "instructor" and "student" transmitters do not have to have the same number of channels in order to use the system.

Okay, what does this system cost? How about $34.95 for the complete TBS kit. This includes: pre-assembled switch and jack assembly, pre-assembled jack and interrupter assembly, a completely assembled TBS buddy cord, a circuit completion plug (for student radio charging and solo flying), solder, and a fully illustrated step-by-step installation manual and user's guide.

The tools required are: Phillips head screwdrivers, soldering pencil or small soldering gun, a hand drill with 3/16 and 9/64-inch drill bits, a pair of common pliers, and a #11 knife.

I looked over a copy of the installation manual and user's guide and TBS does appear to be a rather simple retrofit. The step-by-step instructions are clear and easy to understand and nicely supplemented by eight photos.

Any questions you might have can be answered by: A.R.B: Company, 8825 Roswell Road, Suite 613, Dunwoody, Georgia 30350, (404)993-6983.

VINYLWRITE CUSTOM LETTERING

Art Morgan finished painting his Nosen J-3 Cub, but ran into trouble when he started looking for the "right" numbers to decorate his plane with. Not only were the proper size numbers almost impossible to find, but what he could scare up were the wrong style . . . and getting them on in correct alignment and spacing was a bear.

But then, as in all good stories with happy endings, Art found this great machine and a computer, and Voila! Vinylwrite was born.

He sent a few samples, and I was impressed with them. Up to that point I'd been aware of Vinylwrite but had sort of ignored them because I didn't think they had anything I'd be interested in.

I've since changed my mind for three reasons: his product is unmistakably top quality; his prices are *nice* . . . so nice, in fact, that I didn't choke when looking over the listing in his very extensive info pack; and his lettering does fill a definite need. Now you can step out and customize your latest project easily and inexpensively. So, rather than being a chore, "N" numbers, AMA numbers, IMAA numbers, pilot's names, planes's names, etc., become a simple and economical pleasure.

Art has both the military block and machine block lettering (the latter being used on most prewar civilian aircraft) as well as script and plain block styles. Add to that 17 great colors (most of which are either exact or very close matches to opaque MonoKote) and sizes up to nine inches for an outstanding selection to chose from.

For the info pack, write or call Vinylwrite Custom Lettering, 16043 Tulsa Street, Granada Hills, California 91344, (818) 363-7131.

A WORD (OR TWO) ABOUT IMPOSTORS

Over the past few years there have been a number of portly people professing to be me. All of them have had a beard and a few even went so far as to wear old, bleached

bib-overalls in an attempt to fool strangers.

However, since I'm now fifty pounds lighter these rotund impostors will have a tough time, indeed, convincing anyone that they're me, old bibs or not. And if you're still not sure, check out the guy's face. Look for the keen, hawklike features of one who was born to fly.

But . . . you may run into someone without a beard or bibs who also claims to be the real Al Alman. And he probably is. Y'see, there really are two of us. The other guy is my cousin, Allen, who's pictured with his Big Bird. And yes, he's also an R/Cer.

THOUGHT OF THE MONTH

I had scruples when I was young, but I got over them and haven't been bothered since.

Guess just about everyone is doing more flying and less building right now. Remember that no matter where you are, in the shop or out at the field, *safety is the bottom line!* And do keep those letters, cards and photos coming.

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

Plug Sparks *Continued from page 37*

model was going up under full power. It never fails, full down!!

What the heck, might as well let you, the reader, in on the model as we don't get too many shots of the Mk. II version of the Comet Clipper. Photo No. 13 shows the difference between it and the Mk. I slab-sider; fuselage height has been reduced and the wing given polyhedral. All in all, a clean looking model, but surprisingly, the Mk. I version seems to fly better. Figure that one out!

OHLSSON .23 EVENT

With the Ohlsson .60 event enjoying an unprecedented popularity, Don Bekins, of SAM 27, in his capacity as R/C Contest Director for the 1989 Las Vegas SAM Champs, is actively promoting an event devoted strictly to the Ohlsson .23 engine, both sideport and front rotary types.

Howard Osegueda will be the Event Director and has offered to donate an Ohlsson .23 Perpetual Trophy in honor of Irwin Ohlsson. The trophy is scheduled to be awarded by Irwin at the SAM Champs Awards Banquet.

Rules are simple: Four attempts to make three officials of five minutes each. Engine runs are 25 seconds for front rotary valve and 35 seconds for sideport engines. Minimum wing area is 450 square inches. Should be fun!

"BIG" RUBBER MODEL

Just received Photo No. 14 showing the Bay State version of the Curtiss Robin. If memory serves correctly, this company was the forerunner of Guillow.

The model was intended as a combination rubber and gas model; however, no indication of how to mount a gas engine was given. Bud Perry, 12000 Sawmill Road, Woodlands, Texas 77380, who built the model, says this is the biggest rubber powered model he has ever built.

The model is quite light and has not been fully wound to date because of high winds. Bud says he is eagerly looking forward to fully wound performance on a nice day.

SAM 28

Here is a brand new SAM chapter, known as the Flying Circuits (F/C) Old Fort Flyers. Dick Brace, of 6121 North Hampton Pt., Fort Wayne, Indiana 46815, is the newsletter editor. Right now they are meeting on the second and fourth Wednesdays of the month at various sites.

Photo No. 15 shows what Dick looks like in the company of Chet Lanzo and Jim Adams, SAM president. This photo, sent in by Richard Colter, was taken at the 1988 Lawrenceville SAM Champs. Colter also reports a "Breakfast Club" get-together is held every Sunday morning at the Speedway Cafe in Fort Wayne. Call Dick at (219) 485-8673 on how to get in on the fun. Wives are welcome! Matter of fact, there is a separate group for them: WOOFF (Wives of Old Fort Flyers). How about that!

THE WRAP-UP

This month, through the courtesy of Ken Sykora, who writes under the pen name of "King Sugar," we present a fable entitled "Replay," that appeared under his name in the SCIF newsletter.

Once upon a time, there was a kid; just an average kid, but he suffered from one idiosyncrasy: he was crazy about airplanes in general. He was completely absorbed by model airplanes specifically.

Thus it was, he spent all his available money on model airplane magazines. He read all the articles, studied the pictures and plans, trying to learn all he could about the building and flying of model airplanes. Every nickel and dime he could earn by mowing lawns, doing odd jobs, etc. went into the purchase of model supplies.

His models were crude and didn't always fly well, but he kept trying. When he read about those long contest winning flights, he wondered if he would ever get his models to fly like that.

Then, one day at the local "hobby shop" (in those days, generally one counter and a few shelves at the back of the local hardware store), he walked in and saw that some of the "older guys" were there. They were discussing a big contest they were going to the next day.

The kid stood there, open mouthed, at the edge of the conversation, clutching his nickel's worth of balsa sticks and absorbing everything he could hear. They talked about the events they were going to enter, and how they were going to win. The kid's eyes got bigger and bigger as all this *real* modeler talk washed over him.

"UFO"™

HAS LANDED

-IDENTIFICATION HAS BEEN MADE -

MODELERS WORLD WIDE KNOW THAT "UFO"™ IS THE ONLY

User-Friendly Odorless

INSTANT GLUE.

"UFO"™
- *WILL NOT FUME*
- *HAS NO ODOR*
- *DOESN'T FOG PLASTIC*
- *FOR ALL MODELING USES*

& "UFO"™ - *BONDS WHITE FOAM WITHOUT PRIMER*

IS THIS REALLY TRUE ???

Out of the thousands of calls and letters we've received about "UFO"™, many of you asked "Is this really true?", or "Will it really bond foam"?. Although we understand that a product that is **User-Friendly**, **Oderless** and **Bonds White Foam** is revolutionary, the "Is it really true"? questions, opened our eyes to the fact that many of you didn't believe the ad. And, if this was the case how many of Satellite City's other ads, over the years, have some of you seen as just so much hype? **Let's set the record straight.**

When Satellite City advertises:

"HOT STUFF"™ is the Original Hobby Instant glue"

"HOT STUFF"™ products are the only instant glues used on the *"Voyager"*

"SPECIAL 'T'™ was tested by Scale R/C Modeler and found to be TWICE AS STRONG as the next best hobby instant"

"'HOT STUFF'™ products are the BEST INDUSTRIAL GRADE"

"UFO"™
- *WILL NOT FUME*
- *HAS NO ODOR*
- *DOESN'T FOG PLASTIC*
- *FOR ALL MODELING USES*
- *BONDS WHITE FOAM - WITHOUT PRIMER*

"All "HOT STUFF"™ products are GUARANTEED 100% for ability to bond"

"HOT STUFF"™ products are AMERICAN products"

- IT'S TRUE! -

NO HYPE

NO BALONEY

You might very well ask HOW we do it. But you'll never have to wonder IF

- IT'S TRUE! -

We pride ourselves on our products, our service and the fact that our ads tell it like it is. If you make it a point to use "HOT STUFF"™ products - you already know all of this. Tell a friend why you make a point of using "HOT STUFF"™ products.

Satellite City **P.O. Box 836, Simi Valley, CA. 93062 (805) 522-0062**

After awhile, the shop owner (an old, old modeler) began to notice the kid's rapt attention. The owner grinned and inserted himself into the conversation of the older modelers. He said it sounded like they were sure going to do a lot of flying. That meant a lot of chasing to get all the flights in all those events. Then he indicated the kid, with a nod and knowing wink.

The older fellows all turned and looked at the kid. He blushed and gulped. Then the biggest fellow (the one with the car!) said sure, they could always use a good model chaser. Could the kid be ready outside his house at 6:00 a.m.?

The kid ran all the way home, it seemed to him, without touching the ground. But this was nothing compared to the next day at the contest! All the way to the meet in the overcrowded car, he soaked up the "big guys" talk. He learned a lot of new words, not all of them modeling words.

From the time they arrived and unloaded, he was chasing models. All day long; out he would go and as soon as he returned they would hand him a cold Nehi soda pop, and send him out again. It was a long day and on the way back, he fell asleep. When he got to his home, the big guys (impressed by the kid's enthusiasm) asked him to join the club.

The rest is history. The kid became a real modeler and very proficient at it, too. But the kid grew up, went into the service, then to college, got a job, got married, and had kids of his own. Modeling was put on the back burner.

Finally, he retired and found time to get back to modeling. One day, at the flying site, just as he was ready to launch his fully wound rubber model, he heard a voice behind him, "Hey Mister, can I chase for you?"

He turned to see a freckle face kid clutching a crude little rubber model. He studied the bright eyes and the crooked grin for a moment. Long forgotten memories came flooding back to him and he smiled, remembering.

"You bet, kid," he said, "When you get back, we'll have a cold soda and then we'll fly your model, OK?"

"Gee, thanks!" said the kid, not yet fully realizing that a door was opening for him. •

Jake..... *Continued from page 11*

ing that none of my answers ever match the questions. I've pointed out to them that that's the point, and that they won't ever have to give away any of the prizes. But so far, they're still not interested.

One other update on the status of my book. A marketing study by the publisher on printing costs and projected sales volume indicates that in order to break even, the book will have to sell for $785.00 a copy. That doesn't sound out of line, does it?

Jake

* * *

Dear Jake:

Me Chief Bellicose Buffalo. Me plenty tick'em off. Me cover R/C with plastic film. She hav'em many wrinkles, like old squaw. Me lay plane in camp fire to shrink'em out wrinkles. Poof! R/C go up in smoke. Me plenty tick'em off. You tell Bellicose Buffalo what he do'em wrong, or he cut Jake man's gut with Uber Skiver. How!

Chief Bellicose Buffalo in Fort Apache, Arizona

Dear Chief:

Me know how, but you apparently don't. You most likely had the temperature of your camp fire somewhat above 300 degrees Fahrenheit. If you consult the instructions that came with your covering material, you will probably find recommended application and shrinking temperatures in the 225 to 300 degree range. Coverite makes a very handy surface temperature thermometer for use during the shrink covering process. If you get one of those, you'll be able to carefully monitor your camp fire's temperature before you toss another airplane into the flames.

Jake

•

Control Line *Continued from page 51*

fied (that's a dig at those who want to change everything) OTS rules are also enclosed. We will send a free copy to anyone who sends a self-addressed envelope with a 45-cent stamp on it.

"P.S.: We are not in the plan business per se. Back when we first got OTS going (1969-70) our members complained about not being able to find plans for the event. One thing led to another and . . ."

The club John refers to is the Garden State Circle Burners, a pioneer in the Old Time Stunt competition. Besides OTS rules and available plans, John can provide a list of planes eligible for OTS under the GSCB rules. Write him at 415 Clifton Blvd., Clifton, New Jersey 07013.

(For those who *do* like to change everything, you might want to take a look at the current rules for OTS being used in some parts of the West, which have been updated from the original GSCB rules. Copies are available from your columnist, whose address is at the end of the column.)

More yet on autogyros, etc., this from Ryan Grimm of Everett, Massachusetts:

"You mentioned autogyros in your March-April 1989 column. I just built and flew a 'Little Juan' from plans available from Hannan's Runway. I had these blown up 141% and 200%, and the larger one may make a good R/C model. I also understand

there was a C/L model called the Gyro-Tyro (or Tyro-Gyro) around 1951. Autogyros are one of the things I'm curious about, along with multi-cylinder ignition engines. About six or seven years ago I got plans for a Morton M-5 from the Model Engine Collectors Association. Someday I'm going to make a couple."

(Here, Ryan asks for information about plan sources for autogyros. John Miske, above, is one. Some others were listed in the November 1988 control line column in *Model Builder*. I must confess that after that column was written, I received some others from readers. Unfortunately, I moved subsequently, and some of my correspondence was lost in the move. Therefore, my list is far from complete. I would encourage anyone with a ready list of plans to write to Ryan and send him a copy.)

Ryan continues:

"I'm an active builder/flier . . . member of the Navy Carrier Society. I fly C/L stunt, scale, carrier and combat, R/C sport scale and F/F rubber scale. I let hobby shop owners know I buy stuff for C/L and F/F.

"I also have a local hobby shop carrying C/L supplies (Perfect, Goldberg, Sig, etc.) and have persuaded five people, including the shop owner and a 1/4-scaler, to build and fly Lil' Wizards with Babe Bee .049s. They are now hooked. Good for kids, too, lots cheaper than R/C.

"I recently wrote Gerald Schamp and his Cascade Control Line Stunt Shop, from which he sells precision stunt kits and supplies. I lamented to him that not only do most people have no knowledge of 'Oh, yeah, those planes on strings,' few hobby shops are willing to talk about C/L; they'd rather push the high-profit R/C stuff.

"I have hung seven small 1/2A C/L models from my local shop's ceiling, which has drummed up more interest (and sales) for the shop. I'll soon hang up a Gieseke Nobler, a C/L carrier model and a couple of slow combat models with streamers attached.

"Oh—hobby shop insurance may not cover loss or damage of your models, unless they are on consignment. Check this out locally.

"The address of Gerald Schamp is: 931 Calapooia S.W., Albany, Oregon 97321, (503)928-0430.

"My local hobby shop is Hobbies Etc. Ltd., 153 Main St., Everett, Massachusetts 02149, (617)389-3331.

"Another piece of information I have found almost priceless: A local artists' and drafting supply company, Charrette Corp., 31 Olympia Ave., Woburn, Massachusetts 01801, (617)935-6010. Their reprographics division in Cambridge, Massachusetts (phone (617)495-0200) has a photocopy machine that will reproduce down to 45.1% in one step and up to 200% in one step in 1/10 of 1% increments, up to 36 inches wide. Cost of reproduction on plain paper is $1.60 per square foot. The same machine will also print on Mylar and other materials. Need a 400% blowup? Run it through twice at 200%.

"I had a three-view of a Focke-Wulf FW-200 'Kurier' (Courier) from John Pond's Old Time Plan Service, blown up 152-1/2%, so now I have plans for a four-engine control line German bomber! It will use Cox .049s with throttles, Perfect No. 3 fuel tanks, and J-Roberts three-line controls. Charette Reprographics also does blueprinting. Charette Reprographics, 44 Brattle St., Cambridge, Massachusetts 02138.

"Have you suggested that almost any R/C or F/F model of sufficient size can be modified to fly C/L? I've flown Guillow's FW-190, Stuka, P-38 and B-17 on control lines. The P-38 was fully sheeted with 1/32 balsa, had twin Enya .09s, Goldberg retracts and the usual J-Roberts control system."

Ryan's suggestion for displaying C/L planes in hobby shops is one that could be used anywhere, because most hobby shop owners are happy to display any well-constructed, good-looking model. Anything that attracts interest will help them sell their products. As Ryan has found out, most hobby shops are glad to search out the products C/L fliers need if they are made aware of our existence and the products we need.

If you have had a good experience with your local hobby shop and would like to pass the word along to other readers in your area, drop me a line.

A GALAXY OF CHOICES

Even as I sit here writing this column, the mail carrier brings further evidence of the resurgence in availability of new control line products. Here is a flyer from Control Line Classics announcing the availability of the Galaxy, another in their Nostalgia Profile series. It has a 45-inch wingspan, a 400-square-inch wing and a 28-inch length. It's designed for .19 to .40 engines. Price is $37.95 plus $2.50 shipping.

CLC also produces kits for the Super Pow Wow and Oriental stunters previously mentioned in this column. Write Control Line Classics, 1788 Niobe Ave., Anaheim, California 92804.

A few days ago (at this writing in March) we also received news of a fiberglass and carbon fiber propeller supplier along with some very informative literature about the characteristics, advantages and disadvantages of different kinds of propellers.

In addition to a wide variety of ready-made props for racing, combat, stunt, free flight and R/C sport flying, Jim Carpenter offers to make glass or carbon copies of your own favorite prop. For information, write Jim Carpenter, 4R Arrow Drive, Salem, New Hampshire 03079.

MISCELLANY

For pure excitement, it's hard to match the sensation of involvement with the flight of a Formula 40 speed airplane. This event was created to make a place on the speed circle for the top AMA racing plane, the rat racer. The result is a hybrid speed plane that has a fixed landing gear and uses two lines, a sort of control line drag racer.

The competition is pure speed, but because it uses a proto start, acceleration is vital as well. Most of the planes hit their top speed within a half lap; timing is 14 laps (1/2 mile) from a standing start. It presents a thrilling challenge for the pilot to handle the rocket takeoff and get the plane quickly into the pylon as required for accurate

measurement. Though a flight takes only a few seconds, the pilot gets a workout.

This leads us to the mailbag and a photo of George Lieb's latest F-40 beast, an inverted-rat-style plane with ferocious shark's teeth painted on the cowling. It's powered by a K&B .40 with Nelson parts as well. Later we may get a report on its performance. George, of Omaha, Nebraska, is hoping for 150 mph plus.

One last item to fan the flames of a long-burning fire. Control line fortunately has many participants interested in keeping current fliers knowledgeable about the event's history.

As might be expected, this leads to some lively debate about who was more important as a pioneer/inventor/etc. We won't get into any opinions about that, but will pass along a note from Robert Lockwood of Napa, California, who was responding to a recent column in which names of legends like Jim Walker, Oba St. Clair and Bob Smurthwaite were mentioned.

"May I respectfully point out that Merrill Hamburg and his articles in *American Boy* magazine really introduced flying models to American youth. They introduced balsa wood, Japanese tissue, Ambroid glue, banana oil and bamboo to us kids in 1927.

"So, hurray for Jim Walker! And please, a pat on the back for Merrill Hamburg."

Anyone who introduced flying models to American youth—in 1927 or now—is OK in our magazine!

Questions, comments, contest announcements and reports, and photos always are welcome. Send to: John Thompson, 1520 Anthony Ave., Cottage Grove, Oregon 97424. •

Electric. . . . *Continued from page 43*

cabin area in these small planes. I use servo tape for installation, as this uses minimum space. I always use CA glue on the balsa side of the foam tape to hold it firmly. The glue on the foam tape holds well to servo cases, but not so well to balsa; the CA glue cures this problem. I highly recommend the new UFO CA glue from Satellite City, by the way. It is a pleasure to use it, no more wincing when you get hit by acrid fumes. I never had any reactions to the fumes other than occasional eye irritation, but I do not miss this! An extraordinary bonus with the UFO glue is its ability to bond foam with no preparation whatsoever. I have tested this thoroughly, and it works great! Rejoice, those who have foam planes, repairs are now easy, light, and clean. It really makes foam repair easy. Now you don't have to hang your head when somebody says with authority, "Foam planes are hard to repair." It isn't true anymore.

But back to the subject. I changed my trusty SR 175 mAH receiver battery from the traditional 2x2 to a flat pack configuration. I have come to the conclusion that the flat pack configuration is really the only way to go for receiver packs, as it fits better and into more places than the 2x2 configuration. Heat-shrink wrap is now readily available in hobby shops in many widths for repacking batteries, thanks to the popularity of electric cars. I find that the 1-1/2, 2-1/2, and 3-1/4 inch widths are very useful, and I always have some on hand. Heat-shrink makes the battery pack look neat and professional, and there is no need to glue the cells together. Thanks to the heat-shrink, I do not hesitate to reconfigure a pack when it becomes necessary.

I did not use a separate on-off in the Schoolboy; instead I connected the rudder to the on-off switch, full right for off, full left for on. More on that later! The 550 Sanyo 2x3 six-cell battery pack fit just right into the cabin after all this careful fitting of pieces. I used the Olympic V receiver.

The Schoolboy flies well with the Silver Streak motor. I had to turn it off a couple of times per flight so that it would not get too high to see. On the 550 cells, flights are in the six minute range. I used an SR 900 pack as well; this gave eight to ten minutes. The Silver Streak is the opposite from the Hi Line motor, in that it uses more cells and less current. This gives long run times and higher efficiency, but you do have to find room for the extra cells. I find both approaches work well.

One item that does concern me on both motors is the motor shafts; they look like they will bend easily. Both motors have a long prop holder which looks like it would make the shaft even more vulnerable. So far I have had no problem, but perhaps I will install a landing gear after all!

I did get into trouble with having the on-off switch coupled to the rudder. There was so little room in the Schoolboy's cabin that I didn't try to use the High Sky on-off switch. I flew when there was a fairly strong wind, and on a hand launch, the plane veered to the left. I gave it hard right, and then, no power! There was no altitude left to turn it again to the left; if I had, it would have cartwheeled. I had to accept watching it come down hard in the parking lot and slide into a barrier. No damage. So, of course I had to try it again, and of course the same thing happened. This time when it hit the barrier it damaged a wing tip and cracked the nose. My conclusion is that if I ever use rudder again for on-off, left rudder will be for off and right for on, since the motor tries to turn the plane left on takeoff. However, I think I now favor using elevator as on-off, full up for on, full down for off. Usually the coupled on-off works well for me, though it doesn't for many. It works best if you have large control throws, so that you don't need to use extreme throw most of the time. I do not use trims for on-off, since it is too hard to get back to the right trim afterwards.

Jack Dobbins sent a lot of ideas for small planes. His homemade fuse holder works well as an on-off switch as well. The fuse holder is made from printed circuit board material and two female spade lugs, and is easy to make. It is mounted in place in the plane; the fuse is plugged in from the outside. This is a popular idea and works well. The 10 to 15 amp fuse is a good size for most small planes. Jack uses the mini speed control or the bump-on, bump-off electronic switch made by Benson Hobby Products (7119 N. Chimney Rock Place, Tucson, Arizona 85718). The bump-on/off

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

The first "rookie-to-ace in eight flying days" that is ALSO repairable.

RC is suppose to be fun—not terror filled anxious moments.

Introducing the first ARF that is truly repairable—yet meticulously handcrafted, one by one, using easily repaired balsa and foam construction.

Easy to fly the first time. . .easy to move into aerobatics. . .easy to repair.

NOTICE:

Because STARHAWKS are meticulously handcrafted they remain in limited supply. See your hobby dealer soon for delivery details.

st★rhawk™

Thorpe Engineering Corporation

1715 East Fairfield
Mesa, Arizona 85203
(602) 964-1398

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

switch works on the same principle as the mechanical link I use; extreme control throw in one direction turns the motor on, the other throw turns it off. The control is tiny, about the size of a postage stamp, and weighs only 12 grams with the Jomar 22 gauge high flex wire. Jack likes it and the Benson mini speed control, which is the smallest electronic speed control I have heard of. It too is the size of a postage stamp, and weighs only 7 grams (1/4 oz.) with the Jomar 22 gauge wire. It will handle up to 11 amps. Jack says he is quite pleased with it in his planes.

For radios, Jack uses the Cannon mini systems, World Engines S-22 servos, Futaba S-133 servos, Futaba mini receivers, Royal Products Vanguard receivers, and Novak mini receivers. For motors, he uses the geared system from the MRC Cessna 177, Hi Line IMP 30, Cox "Kitty" geared system, LeMans AP-29, Astro 020/035 with gearbox, Astro 020 cobalt, and the VL geared systems. Battery packs range from 270 to 600 mAH, three to six cells. Last but not least, Jack scales down popular planes to the 020 and 035 size (24 to 36-inch span). Some of his scaled-down planes include the Little Big Bird, Airtronics Eclipse, mini PT Electric, and mini Challenger. Jack did not specify the weights or spans on these, but they will be within the parameters I mentioned.

Jack obviously likes the little ones, and so do I! You can fly little planes almost anywhere. They are easy to transport, and require very little support equipment. When I take mine out, I almost feel like I must have forgotten something, as there just doesn't seem to be enough stuff tagging along! And, no, little planes are not "tricky" in the air, they are easy to fly if they are good designs.

One last item, then enough! Francis Reynolds, who writes the "Model Design and Technical Stuff" column in this magazine, wrote me for a challenge: compare electric systems directly to gas. Well, I can, but I have a problem, in that I do not know what rpm and props are now used on gas engines. I am interested in "on the field" data, not manufacturer and product review numbers. I would like to know what prop and what rpm on what engine is doing the right job for the plane you fly. Anyone who is flying gas and sends me a letter telling what these numbers are would have my thanks. I am interested in any size engine data, from .020 to 1.20, two-cycle and four-cycle. Wish I could offer some sort of reward, but about all I can afford is a thank you, or tips on electric power if you ask for them! Well, here's hoping for some good info. Till next time, fly little electrics and have a ball! •

F/F Scale. . . *Continued from page 52*

good cross-section of subjects from WWI, between the wars, WWII, and a smattering of modern. They provide a fair amount of color with some sensational paintings that will knock your socks off! Usually provided are some outstanding 3-views on a variety of subjects. The one drawback is that it is the costliest of all the ones I get each month ($4.00).

Interesting . . . as I check the inside cover of *Aeroplane Monthly* for the address, it says that a subscription in the U.S. is $29.70. That certainly doesn't work out to be four bucks a copy. I know the hobby shop owner isn't overcharging, since the magazine comes from the distributor with a sticker marked four dollars. I guess I will have to send in my money for a subscription! The address is: Aeroplane Monthly,

Room 214, Prospect House, 9-13 Ewell Road, Cheam, Surrey SM1 4QQ, England.

Another British magazine is *Wingspan*, published every two months. It is also printed on exceptionally high quality paper. A 3-view is featured each month. The March/April '89 issue featured the DeHavilland DH-16. When was the last time you saw a 3-view of that aircraft? The featured plane in this same issue is the Gloster Gladiator and, along with pictures and text, there are two pages of color plates of this beautiful biplane. This is typical of what to expect from each issue. The subscription price is 15 English pounds and it has to be sent by International Money Order in Sterling. Send to Wingspan Publications, 5 Riverside Woodburn Moor, near High Wycombe, Bucks HP10 ONU, England. Don't you love English addresses?

Last, but certainly not least, is still another British magazine, called *Fly Past*. This magazine keeps one up to date on what is happening in the area of aircraft restoration, particularly WWII types. There is lots of color, great cockpit shots, and the magazine is not solely restricted to just WWII machines. There is quite a bit of information on a variety of aircraft. The sticker added to the magazine says $3.50, but the subscription price quoted for the U.S. is $49.00. Don't know what to tell you on this one but maybe your local hobby shop might handle it for you. The address is Sky Books International Inc., 48 East 50th St., New York, New York 10022.

There are many more that could be added to this list, but these are worthwhile publications you will undoubtedly enjoy. They are not the type you cut up and file away! It is too bad there are no American publications that come close to covering the same subjects as well as the aforementioned do.

* * *

MOTOR PEG TIPS

There is nothing worse than having your motor peg slip and come forward inside the fuselage with a full head of energy provided by the wound motor! I'll never forget the time I had just finished a Jumbo rubber model in preparation for a big contest. The first time I wound the model, the peg slipped and gutted the entire fuselage.

I'd like to pass on a couple of hints that will alleviate that problem and also keep your rubber centered on the motor peg. Refer to the illustration. After choosing the size of aluminum tubing you will be using for the peg, take a wooden dowel and nicely round one end. The dowel has to be a bit smaller in diameter than the I.D. of the tubing. Insert the dowel just slightly into one end of the tube and swirl it around firmly but carefully. What you are trying to do is flair the end of the tube. You can also do this for DT tubes. Fortunately, I have a tubing flaring tool, making this an easy task.

Next, insert the tubing through the fuselage as far as the flared end will allow and make a mark on the tube right next to the fuselage on the opposite side. With a fine file, or perhaps a Zona saw will do, make a slit on the top and bottom of the tube where you marked. This is followed by making a small clip, as shown in the illustration. Make several, as you know you will end up dropping a few in the grass. The whole setup takes very little time and is neat and effective. It sure beats wrapping a rubber band around the fuselage and attaching it to either end of the tube. I've successfully used this method on old time Wakefield models also.

I got this next idea from Don Srull. Don takes some super-light foam and glues a small block of it on either side of the inside of the fuselage, where the motor peg passes through. Leave enough clearance in the middle for inserting the motor stuffing stick. This keeps the motor centered while unwinding. Give it a go!

Just want to remind you of the Flightmasters Flying Aces style contest to be held August 12 and 13. See the June issue of *MB* for complete details. •

Inside ..... *Continued from page 47*

on a blanket of oil/fuel mix in the crankcase.

As you look into the rear of the all-black crankcase and sight down the shaft's bearing surfaces you'll see a clever lubrication slot at the five o'clock position. The shaft-to-bearing surface fits are so precise you'd swear the crankshaft was supported by two precision miniature ball bearings! It's almost like the crankcase was Teflon coated, like a frying pan. The black surface is only anodizing, but it feels super slippery. Run your fingers over this black surface next time you visit your local hobby shop . . . slippery/smooth compared to other metal surfaces.

The cylinder is totally standard, and internal threads hold the glow head. A pair of #21530 wrenches fit "flats" on the top of the cylinder and the top of the glow head for tightening/changing/loosening. The wrenches are used in unison, as the photo shows. The new glow head is .1100 inches taller than Black Widow and Tee Dee plugs and provides two more cooling fins. Seven and eight-inch props would cause the normal Black Widow to overheat, and that advances the ignition timing to cause detonation which is damaging to all engines. The additional cooling seems to work well. In an emergency a #1702 plug could be used but listen for the "crackling" sound of detonation . . . avoid a lean setting.

The holding frame for the Mylar reed intake valve has been cleverly re-engineered—these newer engines have a black plastic "top hat" shaped piece that holds the .0045-inch reed in place against its seal. About the only thing that makes these reed intake Cox engines run erratically is when a speck of dirt gets behind the reed and won't allow it to seal against the backplate on the piston's down-stroke. Another sign of dirt behind the reed is when the engine will only run when primed and refuses to draw fuel. The new design makes it easier than ever to clean the area behind the reed. And I'd suggest you don't do anything dumb like removing the screen over the air intake in the hope of hopping up this engine. The screen is there for dirt protection and does not restrict the airflow past the reed . . . trust me!

The prop driver has a machined hex to

engage an optional nylon ratchet and starter spring. The test engine finger started beautifully but you may like the spring starter, which is part #5135010S (silver plastic) and #20335 for the matching spring for $1.20 total. The Texaco .049 will also run in reverse, and other part numbers will give you a "backwards" spring starter.

The engine's cylinder is also machined from leadloy. The top of the bore measured .4054 inches and the bottom measured .4060 inches. The cylinder taper is sufficient that the test engine, when cold, held compression for a second or two before leaking out.

And now for performance. Break-in was with a pint of Cox #551 Super Power Fuel that contains a generous percentage of castor oil. With a full tank and a tiny prime and the needle opened 2-1/2 turns the engine started with a few flips and ran varying from 8000 to 8500 rpm on the 7x3-1/2 prop. After about 30 seconds it seemed to level out at 8600 to 8700 rpm and ran a bit rich for that first tank of fuel. The second tankful was 7.8cc (as were all other refills) and the second start, after a tiny prime, was on the *first flip!* I was impressed! The second tank ran out with a surprising burst of rpm at two minutes and twenty seconds (2:20). The third tankful was a repeat. The engine was allowed to cool fully between runs. Around the fifth tankful I leaned the needle valve down to two turns open from closed and measured 10,100 to 10,300 rpm and the run was 2:55.

The instructions say the Texaco .049 will turn the 7x3-1/2 prop at 9100 to 9600 rpm. I was already exceeding that as measured by two tachometers. With more running and cooling the engine really came alive. After about a dozen runs with cooling I was now recording 10,500 to 10,700 and a tweak of the needle could get 10,900 . . . *a full 1300 rpm abpve specs*, which is a lot of power, but it wouldn't hold that speed as the tank level ran down. When set for 10,500 after starting, the engine ran beautifully as the tank ran its level down and runs averaged about four minutes; the tachs measured 10,900 as the tank ran dry. My test engine was running far above quoted rpm, but for a somewhat shorter duration of run. It was simply converting 7.8cc of fuel to power at a rate somewhat faster than quoted. Starting was best with the needle opened one half turn from the 10,500 run position, and then turned to the 10,500 setting where it happily churned out four to four and a quarter minutes of high-climbing power.

I was curious to see if changing fuels would yield runs approaching the quoted five to six minutes duration. Three different fuels that contained 15% nitro and castor/synthetic oil blends were tested. In each batch of tests the rpm was adjusted to 10,500 after starting and the tests showed no gain, as follows: Powermaster Plus had runs averaging 3:46; Red Max had runs averaging 3:57; Byron's Sport had runs averaging 3:54.

Cox's #551 Super Power Fuel has more nitro than these three fuels and also contains more castor oil. The castor provides ultimate lubrication to the ball-and-socket joint between the connecting rod and the piston. Also the #551 fuel, with all castor, may seal the intake reed better and account for the longer recorded run times. I recognize the three non-Cox fuels may cost a bit less, and they may also allow leaner settings and consequent longer runs than recorded above. But the name of the game is fun, and consistency also helps, and when you divide 7.8cc into a sixteen-ounce can of Cox Super Fuel you're only dealing with pennies. I'd stay with the Cox #551 fuel for ultimate engine protection in this case.

All through the testing, I had mostly one-flip and two-flip starts. Nothing came loose, nothing failed. The glow plug looked shiny-new with no sign of losing its coil's brightness. In efforts to get longer engine runs I even tested a Master Airscrew 8x4 (7100 rpm) and a Rev-Up 8x3 (8700 rpm) but neither ran longer that the Cox 7x3-1/2 prop. And frankly, in the case of this engine, I'm delighted with getting more rpm for a slightly shorter run time. It's a sure way to get higher . . . and that's where the thermals and fun are.

After your day's flying with Cox #551 fuel, I'd suggest you give the fuel tank a squirt of WD-40 via the red tube, then a short prime of WD-40 too. Start the engine and run out the WD-40. That will flush out the castor of the Cox fuel so it won't tend to gum up if left for a long period. It will also thoroughly protect your Texaco .049 with a light internal coating of kerosene that prevents rust and corrosion and makes later starting easier.

The Cox Texaco .049, engine number 4506, is in your local hobby shops as you read this and sells for about $25.00. It is made in the United States by Cox Hobbies, 1525 E. Warner Ave., Santa Ana, California 92705. They even have a toll-free courtesy line, (800)451-0339, to answer questions and take orders for parts not stocked by your local hobby dealer. •

Free Flight. . *Continued from page 59*

but for simplicity, let's assume it's constant. Assume also that the model climbs 250 feet on the motor run in still air. But since it is

climbing in the rising air, its altitude after 3 minutes will be 600 ft. + 250 ft. or 850 feet. Assume then the model DTs and sinks at 600 fpm. However, since the air is still going up at 200 fpm, the model's net sinking speed will be 400 fpm. Therefore, at that rate, it will take 127 seconds to come down. Add that to the 3 minute max, and you have a 5 minute flight. This fits in very nicely with real life.

If the thermal were going up at 400 fpm, the model would be at 1450 ft. at 3 minutes, and after DT would have a net sinking speed of 200 fpm. The model would then take 7:15 to come down, making it a 10 minute+ flight. Again, this is not uncommon.

"If we can assume that the DT sinking speed is proportional to wing loading, using the Wakefield as a baseline, we get the sinking speeds shown in the accompanying chart. Note: The A-2 DT sink rate can vary greatly since many spin when DTed, and I have no data on sinking speed of a spinning DTed A-2."

WING TIPLETS REVIEWED AND COMMENTED UPON
by Keith Hoover

In my early Frank Zaic Yearbook days, I used to spend hours contemplating the designs that Frank presented, and not only did those articles keep me enthralled, they spawned many discussions with my fellow clubmates. One of the frequent contributors to the later Zaic books was Keith Hoover. I recall Keith's designs well, as he built those weirdo VHTL (very high thrust line) ships. I got so turned on to them that I tried one out myself.

Well, after the March/April 1989 issue of *Model Builder* hit the stands, the featured three-view VEE Concept ½A ship apparently stirred some of the old timers, like Keith Hoover, out of their doldrums. Elsewhere in this issue is a picture of one of Keith's designs complete with tiplets, as on the VEE Concept. Keith supplied the following comments, as well:

"The picture is of my second VHTL model with Jedelsky (all balsa) surfaces and forward fin, tip fins on the wing and stab. I believe this one was pictured in Zaic's yearbook of about 1963, a follow up on my Hi-Liner. A more recent use of the tips, over 20 years later, was on a conventional 1/2A design. It echoes my good experiences with Garami's Strato Streak, built when I was a high school senior and equipped with an Arden .099. The directional and spiral stability of Tippy were super—and my intent of the design. The climb was straight, corkscrew around a near vertical flight path. Unfortunately, I don't have a picture of my own high thrust line 1/2A of some 10 years ago—V-dihedral and 21 degree angled tip fins and a Koster 7% airfoil. It flew away from me last summer."

CAMPBELL'S LATEST CATALOG

For those of you who think that Lee Campbell's shop only produces kits, you should be aware that the new catalog contains 24 pages of free flight supplies. Campbell's Custom Kits, P.O. Box 5996, Lake Worth, Florida 33466 is the business, and even though about half of the new publication contains Lee's kits and the kits of several other manufacturers, it also features hobby books, supplies, electric motors, timers, and all kinds of other goodies—many of them for the rubber model flier. If you are interested in Lee's line of free flight goodies, drop him a line along with a check for two bucks. Ask for Catalog Number 10, and tell him that *Model Builder* Free Flight sent you!

A COUPLE MORE TIPS FOR YOUR MODELING PLEASURE

Elsewhere in this column, you will find another sketch from the Brainbuster's newsletter. This one is from John Ferrer. It shows how to cut those triangular gussets that are needed at the wing rib where it joins the trailing edge. John shows how to cut them out to get the right grain direction and how best to use them to strengthen this joint.

One additional tip for you regarding gussets: don't throw away those scraps of wood that you have left over after you've cut out the other parts. Use these odds and ends for gussets. My flying buddy, Al Grell, cuts gussets from all his scrap sheet and tosses them into a box so that when he needs to use them, they're just waiting there for him.

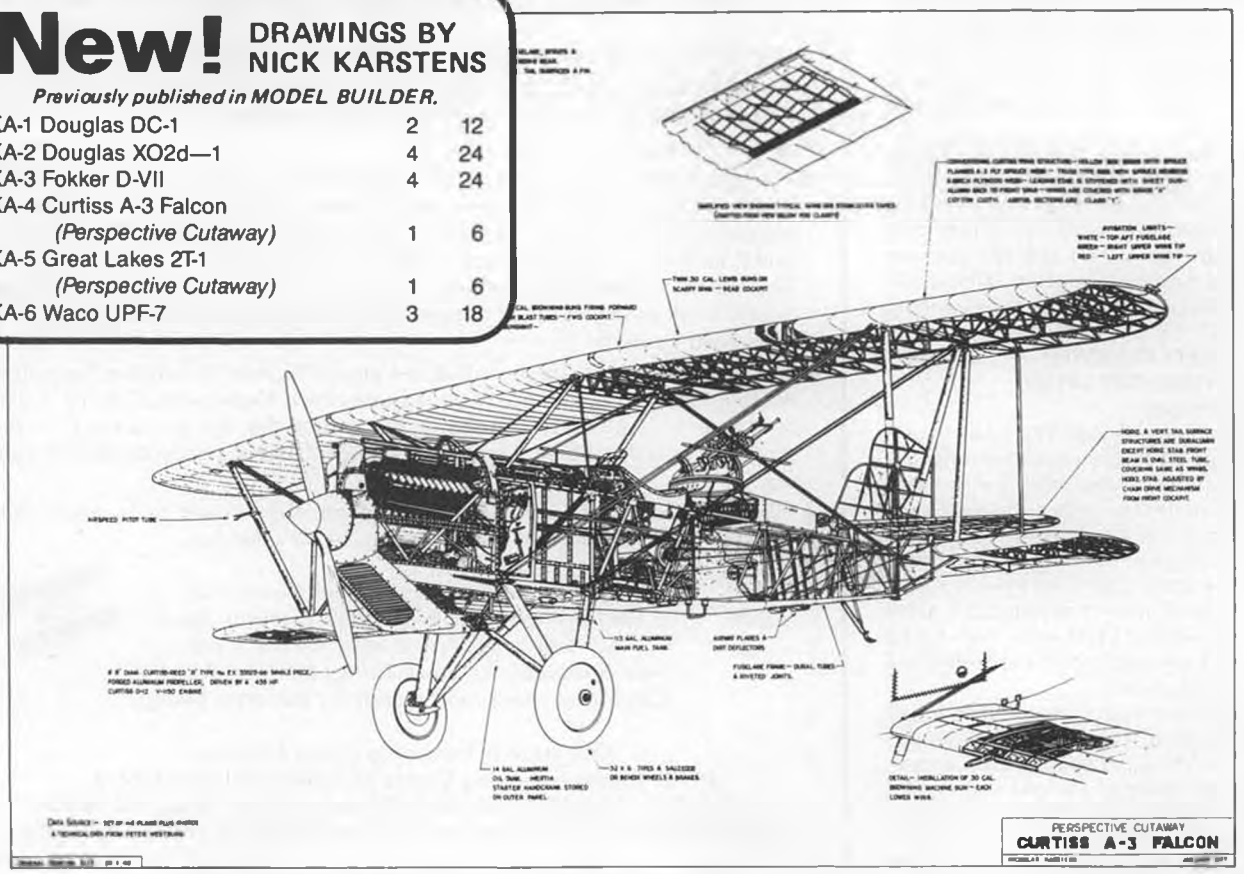
Another tip for your consideration involves the storage of model engines that are boxless and temporarily waiting to be installed in a model. One storage device

Peter Westburg's
SCALE VIEWS

New! DRAWINGS BY NICK KARSTENS

Previously published in MODEL BUILDER.

KA-1 Douglas DC-1	2	12
KA-2 Douglas XO2d—1	4	24
KA-3 Fokker D-VII	4	24
KA-4 Curtiss A-3 Falcon *(Perspective Cutaway)*	1	6
KA-5 Great Lakes 2T-1 *(Perspective Cutaway)*	1	6
KA-6 Waco UPF-7	3	18



SUPER-ACCURATE AIRCRAFT DRAWINGS. USE FOR SCALE DOCUMENTATION AND/OR FOR DEVELOPING MODEL CONSTRUCTION PLANS. ALL DRAWINGS ARE 28 x 40 INCHES BORDER- TO-BORDER, AND ARE SCALED AS LISTED BELOW.

1/24 scale: ½" = 1 ft.	No. of Shts.	$
WE-18 Douglas O-35/B-71	1	6
WE-23 Douglas XO-36/XB-7	1	6
1/12th scale: 1" = 1 ft.		
WE-2 Boeing F4B-4/-3	4	24
WE-3 Boeing P-12E	3	18
WE-4 Curtiss A-8 Shrike	3	18
WE-7 Curtiss Gulfhawk 1A	2	12
WE-8 Curtiss N2C-2 Fledgling	4	24
WE-9 Curtiss O-1B/A-3 Falcon	3	18
WE-10 Curtiss P-1B Hawk	3	18
WE-12 Curtiss XP/YP-23	3	18
WE-13 Curtiss SBC-4 Helldiver	4	24
WE-14 Czech Avia B-534	2	12
WE-15 Davis D-1K	2	12
WE-16 Douglas O-25C	3	18
WE-17 Douglas O-31A/O-31B	3	18
WE-19 Douglas O-38/O-38B	2	12
WE-20 Douglas O-43A	3	18
WE-21 Douglas O-31C/Y10-43	3	18
WE-22 Douglas O-46A	3	18
WE-25 Fokker D-17	3	18
WE-26 General Western Meteor	1	6
WE-28 Grumman F2F-1	3	18
WE-29 Grumman F3F-2	3	18
WE-34 Stearman 4E Mailplane	2	12
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

ORDERING INSTRUCTIONS (Minimum order: $10.00)

U.S. orders, including APO and FPO, add 20% of total order for shipping and handling. Overseas orders (includes Canada and Mexico) add 50% of total order. Remit payment by International Money Order or U.S. funds, drawn on a U.S. bank. Please, no cash or C.O.

D.s. Master Card or VISA include card number, expiration date, and signature. Add 5% to credit card orders. Send payment to RCMB INC., 898 West 16th St., Newport Beach, CA 92663. Phone (714) 645-8830.

CALIFORNIA RESIDENTS ADD 6% SALES TAX

that I use is a Ziploc bag. These are inexpensive and can be sealed airtight for use over and over again. They have one added feature in that they are clear and you can see just what you have inside of each one. I have also used those little cotton shoe mitts that some of the fancier hotels give away when you rent their rooms. These mitts are perfect for soaking up any liquids that tend to leak out of those used engines. The only problem with them is that they are not transparent.

AMERICA'S CUP FAI F/F CONTEST SCHEDULE FOR 1989

Al Hotard is publicizing the 1989 FAI contest schedule for the America's Cup. If this competition piques your curiosity as a contestant or if you would just like to go to observe, there is a contest near you. Those that follow contain the date, place, and contact person for your information.

- June 10-11: Fiesta of Five Flags at Pensacola, Florida. Contact Tom McLaughlan, 4140 Fern Ct., Pensacola, Florida 32503.
- June 19-23: U.S. Outdoor Champs at Lawrenceville, Illinois. Contact Richard Smith, 7252 Redondo Ct., Cincinnati, Ohio 45243.
- July 1-2: 14-Round FAI at Denver, Colorado. Contact Bill Gibbons, 7422 Clubhouse Rd., Boulder, Colorado 80301.
- July 1-2: Bong Field FAI Invitational at Brighton, Wisconsin. Contact Mitch Post, 6801 N. Waukesha, Chicago, Illinois 60646.
- July 8-9: Toronto FAI International at Camp Borden, Ontario, Canada. Contact Dave Sugden, RR 1, Enniskillen, Ontario, Canada L0B-1H0.
- July 8-9: Western FAI Challenge at Spanaway, Washington. Contact Steve Helmick, 2104 Aberdeen Pl. S.E., Renton, Washington 98055.
- July 22-23: Intercity FAI at Wright Patterson AFB, Dayton, Ohio. Contact Martin Richardson, 7130 Clay Beck Dr., Huber Hts., Ohio 45424.
- August 6: Ontario FAI Championships at Camp Borden, Ontario, Canada. Contact Doug Rowsell, 448 Cranbrooke Av., North York, Ontario, Canada.
- Oct. 7-8: California FAI Invitational at Taft, California. Contact Juan Livotto, 13212 Lake St., Los Angeles, California 90066.
- Oct. 7-8: Autumn Cup FAI at Seguin, Texas. Contact Frank Parmenter, 4106 Sequoia Trail E., Georgetown, Texas.
- Oct. 7-8: Sky Scraper International Challenge at Galesville, New York, Contact Bob Hatschek, 316 Grosvenor St., Douglaston, New York 11363.
- Oct. 14-15: Sierra Cup at Sacramento, California. Contact Roger Simpson, 2525 Queenwood Dr., Rancho Cordova, California.
- Nov. 19-20: Patterson Challenge at Taft, California. Contact Bill Hartill, 7513 Sausalito Ave., Canoga Park, California 91307.

THE END

That's it for another month. Hope you enjoyed the column. Please tune in next month, because if all goes well, you will find a big surprise in the form of the August three-view. See you all then. •

ARFs..... *Continued from page 41*

The elevator was automatically parallel with the wing without my having to make any adjustments in the alignment, a very rare event in assembling most ARF model aircraft. The only modification I found necessary was to shorten the pushrods by about three inches, as they were too long. I understand this is being corrected in future kits. When assembly was complete I had to stand back and gaze at the Starhawk in abject admiration, as it was the prettiest thing to ever take form in my workshop.

I was curious to know how close to specifications my model had turned out, so I checked the instruction pamphlet, but could find nothing relating to weight and measurements on the Starhawk. The plain box also yielded no information, so I decided that I would have to figure them out on my own. First I measured the wing and its chord, arriving at a wingspan of 56 inches, then calculated the wing area to be 564 square inches. What I really wanted to know was the wing loading, so I grabbed the kitchen scale which I appropriated from my wife years ago, and kind of winced a bit when I came up with an overall dry weight of 6 lb. 10.5 oz. This is a bit heavier than I usually like to see a .40 size model, but it was not entirely unexpected, considering that the wing is solid foam and balsa, and that silkspan covered with an expert paint job doesn't make for light weight. Anyway, a few quick calculations indicated that the wing loading was a solid 27 oz./sq. ft. I did not expect the Starhawk to be much of a floater, but I decided to postpone any further opinions until after the flight tests.

Next on the agenda was a careful check of the C.G. location. The instructions recommend that this balance point be placed 2-1/2 to 2-3/4 inches aft of the wing's leading edge, and without any ballast mine came out to be exactly 2-5/8 inches behind the leading edge of the wing. Actually, this did confirm that we might have had a tail-heavy condition if a lighter powerplant than the Rossi had been selected.

Control surface throws were set up in a conservative manner for the initial flights, with the ailerons adjusted for 1/4 inch up and down, elevator 3/8 inch up and down, and rudder at maximum throw, which came out at one inch each way (manufacturer recommends 1-1/4 inch each way on the rudder).

As the Rossi had been sitting in storage for about a year waiting for its next assignment, I thought it prudent to see that it was in proper running order. As always, the Rossi started immediately, and after a few seconds I shoved the throttle forward and tweaked the needle to full revs. I could hardly believe how quiet it was running with the J'Tec Snuf-Ler! Gone was the earsplitting shriek of the 100 decibel exhaust, replaced now by a much more reasonable reading of 88 on the decibel meter. Without taching the engine it was obvious that it had not given up any power in achieving this miraculous noise reduction, and once again I found myself thoroughly sold on this remarkable product from J'Tec.

Using my 160-foot concrete driveway, I commenced taxi testing and kept it up for about a half-hour. The purpose of this is twofold. First, it gets me completely familiar with ground handling a new model, and secondly, any latent bugs or vibration problems will usually be exposed before you are airborne. In this case, nothing appeared out of order, ground tracking was straight and true, and sudden turns at high speeds did not result in ground loops. Actually, ground stability was excellent at all times. As all preparations for flight tests were now complete, the Starhawk was thoroughly cleaned and put on charge for the following morning.

Unfortunately, my primary flying field

was closed for model activities for a few days, so I was forced to forego using my usual paved runway. Testing commenced at my emergency auxiliary field, an excellent open site with a fairly good dirt runway. However, weather conditions were less than satisfactory as the sky was overcast and the heavy winds were gusting up to thirty knots at a direct right angle to the runway. Some of the other models on the apron were actually being picked up and blown ten or fifteen feet.

Perhaps somewhat foolishly, I decided to go ahead and put the Starhawk into the air. A quick range check proved that the electronics were behaving properly, so the Rossi was fired up and after a few seconds it was running strongly on the usual brew of five percent nitro. I was pleased to find that the model was able to taxi surefootedly to the takeoff point even while the other parked models were being shaken up by the strong crosswinds. As the throttle was firewalled the Starhawk began accelerating, and after about sixty feet a little up elevator lifted her gently off the runway, wings level, and flying in a perfectly straight path. A few circuits of the field were made at about three hundred feet, and the only required trim was some down elevator. The responses were excellent, much like a well-behaved pattern plane, and the factory control throws seemed to be ideal for me. The Starhawk felt very solid and comfortable to fly, and it was decided to land for refueling and the cranking of some mechanical down trim into the elevator.

The first landing proved that bringing this ship in is a piece of cake. In spite of the poor wind conditions the model just maintained its approach glide as if it were a full-scale airliner, and with a hint of backstick she flared and touched down as gently as you could wish, all the time keeping the wing rock steady with no tendency to tip stall at slow speed. All my fears about the model being overweight were completely gone by this time, and I now felt fully confident in the Starhawk. By the time refueling was completed the winds had become more gentle, so the next flight was begun, the first few minutes of which were dedicated to low passes for the camera. When the photos were all taken, the Starhawk was once again flown up to aerobatic altitude and put through an extensive array of maneuvers, and it was soon determined that there was nothing this model couldn't do. Because of the symmetrical wing section, inverted flight required practically no down elevator compensation. Rolls, snaps, and spins were no trouble at all, and these were performed at a medium rate of response, and recovery from even the most violent maneuvers was automatic when the sticks were returned to the neutral position. However, I have no doubt that if the control throws were increased and the C.G. was moved a bit toward the tail I would have had a real tiger on my hands.

At full throttle this baby really moved through the sky at high speed, partly due to its clean configuration, and partly due to the powerful Rossi. However, if you prefer flying at slower speeds, the Starhawk is not fussy. When cut back to half throttle she just putted along in as stable a manner as ever. I would hazard a guess that any current .40 size engine will provide sufficient power for this model, and I have no doubt that some of our more adventurous fliers will mount a strong .60 in the nose. As it was, the Starhawk proved itself one of the smoothest and most reliable sport planes I have ever flown, and it was certainly second to none when it comes to ARFs.

When flying was over for the day I deeply appreciated that smooth finish which cleaned up perfectly with a quick spray of glass cleaner and a paper towel. I'm highly pleased to have the Starhawk in my stable, and I expect to have many pleasant flights during the months to come. So, if you have some flying experience under your belt and are beyond the trainer stage, give some serious consideration to this ARF. For an evening's work and a surprisingly reasonable investment, you too can rack up a lot of flying fun.

Now that Thorpe Engineering has presented us with this most outstanding product, they are definitely not resting on their laurels, but are forging ahead with one new blockbuster after another. For example, they have recently made available an alternate wing design for the Starhawk which is interchangeable with the original wing. The new wing has the same configuration as the original, but the airfoil has a flat bottom. By having both wings you can quickly convert the Starhawk from a high-performance sport model to a more docile trainer-type airplane.

Another accessory that can be ordered for your Starhawk is a fine set of floats. These are completely finished in the same yellow acrylic paint and display the identical smooth finish as the model for which they were designed.

Not only has Thorpe Engineering presented the R/C flying fraternity with one of the finest ARFs available today, but they have seen fit to offer us a low-wing version of the Starhawk, complete with open cockpit and transparent windshield. Needless to say, this model also comes in the same yellow paint finish, and I almost drool when I think of how delightful it would be to mount this low-winger on a set of their floats!

OK, so you say I've sold you on Thorpe Engineering and their products, but wait just a moment, as you haven't yet heard the entire story. How about a state-of-the-art, full blown .60 size pattern plane, set up for retracts, with a fiberglass fuselage, wing and tail surfaces of foam sheeted in balsa, and finished in an even more eye-catching acrylic paint job? Yes, this model is here and available now, and once again the cost is so downright reasonable I don't know how they are going to keep up with the demand! Are you interested? Your dealer can order any of these products for you, but if you want more information, contact Thorpe Engineering, 1715 E. Fairfield, Mesa, Arizona 85203, telephone (602)964-1398.

That's it for this issue, we've got the wheels chocked and the wings tied down

PACER TECHNOLOGY (ZAP)

* * * * * * * * * * * * * * * * * *

Scale Masters

invites you to the

1989 SCALE MASTERS CHAMPIONSHIPS

SEPTEMBER 14-15-16-17
ST. LOUIS, MISSOURI

HOSTED BY ST. LOUIS RADIO CONTROL ASSOC. & SPIRIT OF ST. LOUIS R/C CLUB

* *

CONTEST DIRECTOR:
Charles Baker (314) 278-3874
124 Gran Teton
St. Peters, MO 63376

CONTEST MANAGER
Nathan Fogel (314) 296-0242
2935 Highland House Villas
Arnold, MO 63010

AMA RULES with these exceptions—
1. Giant & Sport Cale combined
2. 2 mechanical options
3. Proto taxi out and back 1 maneuver

* *

1989 REGIONAL FLY-OFFS

VOLUNTEER STATE SCALE MEET (May 5-6-7)
Middle Tenn. R/C Society
Stan Alexander, CD (615) 834-1879 (After 5 pm)
3709 Valley Ridge Dr., Nashville, TN 37211

MINT JULEP SCALE MEET (May 19-20-21)
Southern Indiana R/C Modelers
John Guenther, CD (812) 967-2814 (After 5 pm)
R.R. #3, Box 297A, Borden, IN 47106

FORTY NINER QUALIFIER (May 27-28)
Woodland, CA
Walt Price, CD (707) 448-8252
450 Meadowview Dr., Vacaville, CA 95688

TUCSON SCALE MASTERS REGIONAL (May 27-28)
Tucson R/C Club
Bill Hempel & Bob Angus (602) 747-3792
7025 East 21st St., Tucson, AZ 85710

GEORGE W. MEYERS MEMORIAL (June 2-3-4)
Chatfield State Recreation Area
Dean L. Sadler, CD Home (303) 232-0529 Office (303) 238-1201
11655 Applewood Knolls Dr., Lakewood, CO 80215

EGYPTIAN R/C CHAMPIONSHIP (June 10-11)
Sky Squires R/C Club
Lynn Elston, CD (618) 985-4177 or 6876
R-3 Box 153, Carterville, IL 62918

KING ORANGE SCALE (June 10-11)
Dr. Bill McCallier, CD (813) 932-0622 or 882-3604
10501 Sago Rd., Tampa, FL 33618

NORTHWEST SCALE MASTERS (June 16-17-18)
Farragut Park Idaho
Jim Baxter, CD (509) 928-3114
E. 13003 Guthrie Dr., Spokane, WA 99216

WESTERN CANADIAN SCALE MASTERS REGIONAL
(July 8-9)
Gerry Fingler, CD (204) 663-1051
287 Rutledge Cr., Winnipeg, Manitoba, Canada R3W 1J8

WESTERN SCALE NATIONALS (June 16-17-18)
Scale Squadron of Southern California
Gordon L. Truax, CD (714) 525-7926
324 N. Michael, Fullerton, CA 92633

NEW ENGLAND SCALE CHAMPIONSHIPS (July 15-16)
James S. Brogna, CD (508) 869-6474
Contest Manager Jack Buckley (508) 481-0955
65 Devens St., Marlboro, MA 01752

A.M.A. NATS (July 21-22-23)
John Guenther, CD (812) 967-2814 (After 9 pm)
Route 3, Box 297A, Borden, IN 47106

ALASKA SCALE QUALIFIER
Jim Terrell, CD (204) 582-2037 Days (204) 663-1051 Home
2432 Loussac Dr., Anchorage, AK 99517

SOUTHERN SCALE MASTERS QUALIFIER (August 5-6)
Midcites R/C Club Field, Arlington, TX
Buddy Irwin, CD (805) 723-3598
Harold Staats, Co-CD (812) 268-3915 or 282-4217
1621 Wade Dr., Bedford, TX 76032

ROYAL CANADIAN SCALE AIR FORCE (August 5-6-7)
Bruce Bender, CD (403) 456-2440
15708 - 119 St., Edmonton, Alberta, Canada T5X 2P5

SCALE FLYERS OF MINNESOTA CHAMPIONSHIPS
(August 12-13)
Bill Cowette, CD (612) 537-6027
4075 Jersey Ave. No., Minneapolis, MN 55427

RIVER CITY SCALE CLASSIC (August 12-13)
Phil Renfro (502) 937-4165
Mike Floyd (502) 637-4444
7307 Gaymont Dr., Louisville, KY 40214

S.P.A.R.K.'S SCALE MASTERS (August 19-20)
Melvin Katz, CD (215) 676-7618 or 739-9780
9200 Bustleton, Cabot 805, Philadelphia, PA 19115

* *

SCALE MASTERS CHAIRMAN
HARRIS LEE
5046 Mycenae Way, Oceanside, CA 92056 — (619) 945-3961

* *

Support the SCALE MASTERS CHAMPIONSHIPS by using our sponsors products.

for this month. Join me next time and I'll lay a whole new trip on you. You can always contact me at 2267 Alta Vista Drive, Vista, California 92084, telephone (619) 726-6636. •

Electronics. . *Continued from page 15*

towards the right, as is shown in the photos.

The receiver is massive and for good reason, but first the dimensions: 2-3/16x 4-1/4x1-13/16 inches. The servos are also on the large side; 1-9/16x2-3/8x7/8 inches, with push-pull linear outputs, four of them in all. The lack of mechanical quality evident in the transmitter gimbal design, which we would definitely not accept now or would have even in 1983, is also seen in the rest of the equipment, particularly in the servos.

Circuit-wise, there are no surprises for those of us who were around in the Orbit/ Kraft/EK days. The schematic (which is included in the manual), though slightly strange in appearance, is quite similar to the second generation of U.S. digital proportional equipment made by the above companies. The reason for the extremely large receiver is that it also contains the electronics for the servos—all four of them. The servo then contains only the motor and the pot. This requires a five-wire harness, in this case terminated with rather large and unreliable looking plugs. Delving further into the circuits, one finds a complete discrete component servo amplifier containing 12 transistors. The transmitter is also built without the benefit of IC's, though the receiver uses them in the audio and decoder stages. The system is intended for dry cell power, with the airborne battery case being made for C-size cells, and depending on spring contacts and knurled nuts for its mechanical integrity.

Definitely not narrow band—the system is on 27 MHz. I wonder if they are bothered by "Old Buddy's" and "Ten-four's" and other Russian equivalents of CBers?

Without a doubt, we used similar circuits in our early days also, but not in '83. Mechanically, even our earlier analog proportional equipment was of higher quality than this. Let's face it, you guys are spoiled!

AN URGENT S.O.S.

Park Abbott, of Santa Rosa, California, writes:

"HELP! I'm a novice when it comes to electronics of any kind. I have a general idea about charging my Ni-Cds thanks to you and the R/C industry in general.

"The problem here is that I've acquired some booster batteries for my glow-plug and ignition engines. So far they work great but I can't really tell when the current is up to where it is supposed to be, after they are charged.

"I have an Ace HD-500 charger I use for other applications and would like to use it to charge these boosters. These boosters are Gates sealed rechargeable batteries, 2 volt, 5.0AH, X Cell, P/N 0800-0004.

"These batteries work great for boosting my Ohlsson .60 in my Lanzo Bomber and my .049 in my 1/2A models. At 2.0 volts the glow plug holds up OK.

"The problem is I can't tell when the batteries are up to their peak in amps or close to it. What do I do? I have a good Fluke meter so where do I go from here? I can use the HD-500 (I guess) but at what rate and for how long? Can I use a resistor in parallel? What value, etc."

The cells that our friend Park is asking about are better know as "gel" cells, probably because the first ones to become generally available were those manufactured by a company by the name of Globe Battery, who names theirs "gel/cell," without capital letters. In the true battery configuration, with six cells to total up to twelve volts, they quickly made a bad name for themselves amongst modelers, who, unlike Park who asks for proper charging procedures, generally mistreat them with the approach that if a little charge is good, a lot of charge is *really* good. In short, the average user tends to overcharge these cells seriously, a condition which they don't care for and from which they will not recover. Other battery users, though, giving them the care they deserve, have found the sealed lead-acid battery a dependable power source, even for critical applications such as alarm and emergency lighting systems. Such uses, which call for periodic battery replacement regardless of condition, have also made them readily and inexpensively available through industrial surplus suppliers. The 5.0AH capacity cell mentioned is fairly common, but more so is a 2.5AH type in the common "D" cell

size, which in my opinion has more uses for our purposes.

More about that later, but first a clarification in Park Abbott's letter. He refers to "current," a common mistake which I have shared here, in reference to "capacity." One is the actual flow in amps or fractions thereof, the other is the total available for use. One is stated in amperes (A, mA, uA), the other in ampere-hours (AH, mAH). The terms are not correctly interchangeable.

Refer now to the drawings of the two cells, which are not to scale and for which you have to refer to the dimensions for true size relationship. The ratings given are the amp-hour ratings at the ten hour rate; i.e., a 2.5AH cell will provide 250 milliamps (.250A) for ten hours. Generally speaking, a faster discharge rate will result in proportionally lessened capacity (1.8AH in 1.0 hour) while a slower rate will result in some increase (2.7AH in 20 hours).

Now for what Park really wanted to know: how to charge the things! Well, like the liquid electrolyte lead-acid battery, and unlike Ni-Cds, this more modern cousin has a decided readily visible voltage to state-of-charge ratio. Refer to the graph so labeled; with an accurate voltmeter and without any load applied to the battery, a quite acceptable estimate of the cell's charge condition can be made. The figure obtained is claimed to be within 20% if the reading is made within 24 hours of the cell being charged or discharged, increasing to 5% if the measurement is made within five days. The discharged voltage of these cells is determined by the load under use, however it is recommended that the no-load cell voltage be kept at 1.6 volts or higher. Consistent discharge past that point will result in chemical changes within the cell which will affect its capacity and ultimately lead to cell failure.

As with all rechargeable cells, there are a number of methods which can be used to bring them back to useful life. There are also different charge rates which can be used, and this type of cell will accept rates as high as 5C (5 times capacity), though the higher the rate the more stringent the requirements to prevent overcharging. The constant voltage method is favored, during which the cell is subjected to a non-varying voltage. This is the type of charger normally furnished with R/C systems to be used with Ni-Cds, as it results in slowly decreasing charge rates as the battery state of charge increases due to the natural increase in cell resistance. Depending on the actual charger and battery being charged, such a charger can be left connected for even days at a time without real cell damage—but again, it is not a matter of more is better, so try to remember to unplug things after the recommended time.

The constant current method, one which continues to supply the battery with a preset current regardless of time or battery condition, can also be used, but more care is recommended. In this case, poor memory will lead to poor battery capacity, due to overcharging. The Ace R/C HD500 mentioned is this type, a constant current charger, and it is quite adequate for this application, as it is for many other R/C related charging duties.

Though the recommended rate is C/3 (1/3 capacity), which would be 1.66 amperes for the 5.0AH unit in question, the Ace HD-5OO is limited to half an amp, which will be acceptable except that it will take longer. Assuming a completely discharged cell, our calculator comes up with a 10 hour requirement (5AH/.5A).

What about a "topping off" charge for the partially discharged cell? Well, referring back to our no-load chart, we can calculate the state of charge, determine the required amount to bring it up to full, and adjust the time accordingly. However, I have a recommendation: that five-amp cell is going to light a glow plug for easily two and as much as three hours—and if your engine hasn't started yet, give it up! Don't push it, charge conservatively. I would calculate for 80 to 90%, which will be more than enough for a weekend's flying and then some. I apply the same logic to my twelve-volt starter battery and have been using the same one for years.

Now for that 2.5 amp cell, it is ideal for in-flight glow plug power for twin-cylinder engines. I've shared this with you before, and as a matter of fact, I used it in the CAP-20 previously mentioned, but there are always new readers, and who remembers everything anyway? First, though, let's look at its use for a single plug as Park is doing. Like the common overcharging of the sealed lead-acid battery, this is another case of too much of a good thing. My May column included a discussion and solution to this matter, and I won't bother to use the space on the same subject again this soon, though I recommend a rereading.

Now, the use of a two-volt cell on a twin is another matter. In the circuit shown, it won't work as a starting battery, but does an excellent job of providing a keep-alive voltage to the plugs while the engine is at idle. In the series hookup shown, the two volts are equally divided between the two plugs, and disregarding wire losses, each plug will receive one volt. This is enough to provide enough heat to keep the engine idling merrily away, without any chance of shortening plug life with extended periods of unnecessary voltage. Try it, you'll like it! And it was all done without any non-industry standard phraseology or nonsensical acronym inventions.

Next month? Who knows, but tune in just in case something interesting comes along. Eloy Marez, 311 Mesa Dr. #10, Costa Mesa, California 92627. •

Choppers. . . *Continued from page 29*

models on the market will have much better forward flight stability if the tail area is increased by 20 to 50%.

The two tip fins on the Cobra's hori-

zontal tail also improve the tail's effectiveness by raising the effective aspect ratio of the horizontal tail. The tip fins trick the air into believing that the horizontal tail is actually spanwise longer. The principle is that the tip fins prevent the high pressure airflow on top of the horizontal surface from spilling over to the bottom surface. The effectiveness of the tail surfaces can also be improved by mounting the horizontal and vertical tails further aft. This lengthens the leverage arm for the tail surfaces. Full-size helicopter research has shown that the horizontal tail should be located at about the 85 to 90% blade radius location on the tail boom. This ensures that the horizontal tail is far enough aft and not underneath the tip of the blade, where rotor downwash is the strongest. This also ensures that the tail surface will always be under the main rotor downwash in hover or forward flight. The full-size Bell 222, in its preliminary design stage, had its horizontal tail on top of the vertical tail, like the MD 500. But flight tests showed that when the helicopter translated from hover to forward flight, the horizontal tail would suddenly get engulfed in the rotor downwash and cause the helicopter to suddenly pitch nose-up. The other benefit of having a large tail underneath the main rotor downwash is that when in hover, it causes a download on the tail, so you need some forward trim to balance it; then once you move into forward flight, you need to hold less forward stick.

Many people have tried adding rate gyros to their helicopter's pitch and roll servos, but discovered that they don't really improve the handling qualities drastically because adding damping alone is insufficient to improve the model's handling qualities. You need to add some restoring force, too. Restoring force is what helps restore the vehicle's attitude after a disturbance. Some modern full-size aircraft use integrating gyros to provide extra restoring force artificially. On models, the reason why we need a rate gyro only on the yaw axis and not on the pitch and roll axis is because we have a flybar, which acts like a rate gyro and also as a washout-integrating gyro to help us. The flybar gives us the desperately needed damping and restoring force. The new flybarless GMP Legend flies fine without a flybar because if a helicopter is designed carefully, then the required restoring force can be reduced and the inherent damping can be built-in with careful selection of blade weight, chordwise and spanwise CG, airfoil shape, rotor rpm, rotor size, rotor teetering stiffness, shaft height, fuselage inertia, etc. Thus, a flybarless helicopter requires a more thorough design process. A well-designed flybarless helicopter can be just as pleasant to fly as a flybar equipped helicopter, but with a different flying technique.

We will talk more about theory in a future Chopper Chatter column, but right now let me present you with a photo tour of the R/C helicopter related products displayed at the 1989 Toledo Model Expo. The Toledo Show is an annual event held in April at the Toledo Sports Arena. The small Ohio town really comes alive during the three days. Anybody who is somebody in the modeling community goes there to rub elbows and check out the hardware. The sports arena is an indoor building consisting of two large rooms. Each room is about the size of a decent size high school gym. I was there on a Saturday, when the rooms were packed with visitors and manufacturers. I felt like I was in a can of sardines. People had to elbow their way to get close to the booths to see what was displayed on the tables. But I really enjoyed the visit. If there was no crowd, then it wouldn't be fun.

So, what's new? New helicopter radios were covered in my International Modeler Show report in the May issue. This time, let's review what's new in helicopter kits and accessories. Let's go through the manufacturers alphabetically. In helicopter kits, GMP had the largest booth, with 12 people manning it. They must be pretty serious to ship 12 people from around the country to Toledo to answer visitors' questions. Jack Dunkle, a former AMA scale helicopter champ, was one of GMP's team members. He displayed a gorgeously painted red and white Bell 222 body with Shuttle mechanics. In the booth there was also a sharp looking Nova body for the Shuttle. Besides the Bell 222 and Nova, there are fiberglass Jet Ranger, Hughes 500, and Ecureuil fuselage kits for the Shuttle. The British national helicopter champ, Len Mount, was at the GMP booth to answer questions. A very courteous fellow, he will be flying GMP's new "Elite" Legend in the World Champs this summer. The Elite Legend is a limited production, super high quality helicopter which will be available this summer. It has a super high quality underslung flybar rotor head, new frames, and tight control setup. It will not be in complete kit form, but rather will come as a complete upgrade package which you can attach to your Legend's or Competitor's tail assembly. The idea is that people who buy the Elite package are experts who know what they are doing. The price for the precision Elite package will be high.

For the uncompromising flier, GMP showed a very well done gel-coated, reflex airfoil fiberglass blade. They gave me a set to test, and I will tell you the results in a future column. GMP also showed their new .40/.45 size very inexpensive and stable Rebel helicopter.

Kalt helicopters of Japan are distributed in the U.S. by Hobby Dynamics. Mike Ciolli, Kevin Burner, and Jerry Kaplan were at the Hobby Dynamics booth to show the new Kalt helicopters and JR radios. There will be a Cyclone II introduced this summer. It is designed for beginners and intermediates, and it is very similar to the Cyclone. Both are for .50 size engines, have plastic side frames, and share many parts. However, the Cyclone II has a new canopy design, toothed belt drive tail rotor instead of a flat belt drive, and a built-in autorotation clutch. The Cyclone II kit will retail at around $540. A Cyclone II almost-ready-to-fly version with Webra .50 installed will be available for about $830.

For the intermediate to advanced pilot

there will be a new kit called Excalibur. This is a pod-and-boom helicopter with a two-piece self-aligning clutch, molded plastic servo tray, and the same superb metal tail rotor gearbox as on Kalt's flagship, the Omega.

All the traditional metal Kalt rotor heads will fit these two helicopters, but they come with a new molded K-5 plastic rotor head. I haven't flown them yet, so I don't know how well they fly. They will be available in a couple of months.

Seems like every helicopter manufacturer is selling their own tool kits. Hobby Dynamics showed a Kalt helicopter tool kit which contains pliers and few other tools in a molded plastic case. Hobby Dynamics also showed the new JR "Max 7" helicopter radio. No information was revealed on price and availability. A new JR 120 electronic yaw rate gyro was displayed at the show, but again, price and availability are unknown.

Kyosho just hopped into the model helicopter business in 1988. Kyosho is very fortunate to have a good helicopter as its first one. The Kyosho Concept 30 helicopter was reviewed in the June '89 *Model Builder*. Seems like Kyosho will be a permanent member in the R/C helicopter arena because by summer '89, it will introduce to the U.S. three ABS plastic scale bodies for the Concept 30: the Bell Jet Ranger, a Hughes 500, and a Hughes 300. Their price will be something over $100 each. There will also be a pull-type recoil starter for the Concept, which will eliminate the need for a 12-volt electric starter to start the engine. There will be two types of weighted wood blades for the Concept 30 for improved autorotation. One is a one-piece wooden blade which weighs 77 grams per blade, the other is a three-piece laminated wood blade which weighs 62 grams per blade. (The stock foam blades weigh 75 grams each.) Other optional parts are main blade feathering ball bearings, stiffer flapping rubber for quicker cyclic response, an aluminum starting cone, and black colored tail booms. MACs Products, a well-known manufacturer of quality mufflers and tuned pipes, showed a special .30 size tuned exhaust system for the Concept, and one for the GMP Shuttle. These two helicopters, when powered by .30 to .32 engines, are already rocketships. With the pipe they will reach sub-light speed.

The Miniature Aircraft Supply booth was manned by Tim and Ted Schoonard. Tim was overwhelmed by people asking questions. They had a lot of products to show. MAS showed five new types of high quality fiberglass blades. They will sell for $139.95 a pair. The five designs differ from each other only slightly; I wonder what their flight differences will be? Tim said he hasn't flown them all yet. MAS will also be importing a new line of miniature exhaust systems for the Concept, Shuttle, and for their new .30 size X-Cell, which is a scaled-down version of the successful X-Cell 60. There are only 48 new parts, and there are 128 parts that are borrowed from the X-Cell 60. The main rotor head, main gear, etc. are all from the 60 kit. The 60 size main rotor head looks pretty beefy and healthy on that little helicopter. To help keep the weight down, the main shaft is hollow, and the swashplate is plastic. I like the 10mm hollow shaft, it looked very robust. To keep the cost down, the thrust bearings are not included in the main rotor or tail rotor hubs, but you can buy them as options. It does have a two-piece self-aligning clutch which eliminates the need for dial indicator to align the clutch shaft. The engine can be removed easily by loosening four bolts. The kit will be out late this summer with a retail price of around $450. The other interesting new MAS product is a strobe-effect tachometer to measure main rotor rpm. I have tried one, and I like it. At $165 it is pretty expensive, but it is very accurate and safe to use.

Robbe Model Sport showed off the brand new Schluter "Magic" .60 size helicopter. We are building one now, and soon will be giving you a full report. The Magic retails for $799. It has a spring loaded starting cone system that disengages the starting cone from the clutch shaft to minimize vibration; a very nice idea. All the parts are of the usual German high quality. There is also a Magic Ranger kit which includes a Jet Ranger fuselage. Besides the Magic, Vince Canzanese, of Robbe, showed off a beautifully painted Bell 222 body for their Schluter Junior. To compliment their popular .60 size Champion and Scout helicopters, Robbe introduced a new fiberglass blade for their .60 size machines. I will tell you more about these blades in the Magic review. With the growth of intermediate and expert fliers in U.S., high quality fiberglass blades are becoming popular.

The next show report will concentrate on helicopter engines. Since a picture is often better than a thousand words, browse through the pictures to see some of the other helicopter products revealed at the Toledo Show. To maintain a strong coverage on R/C helicopters, we also prepared a GMP Stork review in this issue. In the next few months we will look into gear mesh, sources of helicopter instability, how helicopter fuselage damping is generated, and rotor blade tip shape design theory. We will also report on the Schluter Magic, Futaba 1024 nine-channel radio,

The Challenger Series from Aristo-Craft
1991 TECHNOLOGY TODAY

Complete R/C Systems Engineered for Novice and Expert

Our goal is to give the R/C community the highest quality, most technologically advanced products at the most reasonable prices. To do that, we've combined your valuable comments with our research and design to produce the Challenger series. This series of R/C systems addresses the needs of both the first-time flier and the high-time pro.

CHALLENGER 455/456
A Breakthrough in 4-Channel Price and Technology

The best in ergonomically designed transmitters, it fits in your hand like a fine camera. Folding antenna, side straps, finger grips, servo reversing, dual rate, fail safe.

455 PCM (FM)	2 servos	ARI02-455	$114.95
456 PCM (FM) w/Ni-Cd	3 servos	ARI02-456	$174.95
457 PCM (AM)	2 servos	ARI02-457	$ 94.95
458 PCM (AM) w/Ni-Cd	3 servos	ARI02-458	$134.95

CHALLENGER 550
5 Channels of PCM For Serious Sport Fliers

A do-everything system for those seeking the latest PCM technology. Equipped with servo reverse, dual rate and user programmable fail-safe system, the 550 is known for long range, smooth instant response and glitch-free signals. Comes with three servos, receiver and Ni-Cd battery pack. ARI02550 $219.95

CHALLENGER 720+ (FM)
An Advanced System for the Advanced Pilot

7 Channels, dual rate, channel mixing, servo reverse, quick change transmitter frequency module, dual conversion crystal filter receiver, you name it, the 720 has it. With three servos, Ni-Cd pack and receiver. ARI0720+ $219.95

CHALLENGER SERVO 422
Our Standard 2-Bearing Unit

Smooth, dual oilless bearing unit with indirect drive for gear train protection. ARI03422 $14.95

SEE THE CHALLENGER R/C SYSTEMS AT YOUR LOCAL HOBBY SHOP.

Write for the Aristo-Craft Catalog of R/C Equipment and Kits *(include $2 for handling and postage)*

ARISTO-CRAFT

ARISTO-CRAFT/Polk's Model Craft Hobbies, Inc. 346 Bergen Ave., Jersey City, NJ 07304 (201)332-8100

"Quality Products and Sensible Prices Since 1935"

GMP's Rebel and Cricket helicopters, and Hobby Lobby's MFA 500. •

Soaring. . . . *Continued from page 39*

that there are too many problems with F3B for it to ever become a popular flying event in the U.S. These aren't just American problems; F3B is not very popular in the United Kingdom, Canada, or just about anywhere except West Germany (where it is the national form of soaring) and maybe Austria.

I used to fly F3B, back when a Gemini MTS or Sagitta 900 was still competitive at the regional level. Back then a six-volt, long-shaft Ford starter and a 12-volt battery constituted a relatively "hot" winch. However, I lost interest in participating in F3B when it started getting intensely technical, time consuming, expensive, and when potential host clubs were experiencing "F3B Burnout" and were no longer volunteering their members or sites (a condition which is still prevalent in the U.S. today).

I think that those modelers who have residual positive feelings toward the multi-task concept, support the U.S. F3B Team (I agree with this), but have lost all interest in participating in F3B activities and have backed off for some or all of the above reasons.

There are a few guys who are still flying F3B and who hope it will live on in spite of everything. They acknowledge that F3B needs more grassroots support to survive. These die-hard fliers and their highly respected boosters (most notably Jim Gray, Randy Reynolds, Gus Peleuses, Don Edberg, and Byron Blakeslee) are currently putting forth an admirable effort to formulate and nurture "Sportsman F3B" type events. It is hoped that these low-key events will stimulate the much needed grassroots support. I hope they succeed. I will participate if the opportunity arises. But I have my doubts about it being a long-lived experiment, because *any* multi-task event, no matter how restricted the model designs are, no matter how equal the winches are, is still going to have to be run by a club with sufficient volunteers. These guys are likely to say, "What's changed here?" It will still be a labor-intensive, boring contest for the volunteers who are frequently yelled at for their flagging or timing errors, occasionally almost the targets of pilots going for that one last lap at the far sighting device, and infrequently rewarded for their trouble. It will probably end up that the fliers will be the only volunteers. Historically, F3B contests where the competitors do most of the field work have tended to be the events with the most arguing, protests, and distracted flying.

If the supporters of Sportsman F3B can somehow reduce the necessity of volunteer manpower, I think it has a good chance of succeeding. That's a *big* "if."

There is hope, however, for a potentially popular alternative to F3B (or even the somewhat successful F3H cross-country event) as the internationally recognized soaring event which biannually selects a U.S. Champion, and alternately a World Champion. That event is the recently proposed FAI-F3J.

INTERNATIONAL THERMAL DURATION, F3J: BARCS INTERGLIDE COMPETITION RULES

Every year in England there is a highly popular and successful glider competition hosted by the British Association of Radio Control Soarers (BARCS). It is their equivalent of the old Soar Nats in this country. They call it the Interglide. It is international in scope as it welcomes and draws participants from many countries on the Continent. Because it is a thermal duration event, and because thermal duration is without a doubt the most popular form of soaring in the U.S., it follows that it will stand a good chance of being popular here too.

What makes the Interglide special is that it uses "Percentage Slot" rules. These rules have been flown for 15 years in England. They are fully worked out and well accepted.

Thanks to two recent letters, one from English soaring editor and publisher, Sean Walbank, and one from Terry Edmonds, the U.S. soaring representative to AMA President Don Lowe (our CIAM voting delegate), as well as conversations I've had with John Lupperger, soaring editor for *M.A.N.* who has discussed Percentage Slot rules at length with his British modeling friends, I have the basic low-down on what all of this is about.

It is my understanding that the Percentage Slot rules were submitted to the FAI/CIAM officials at the 1989 Plenary Meeting for consideration as an internationally recognized soaring event, like F3B or F3H. It has been given the name F3J: RC Thermal Duration Gliders.

As in the BARCS Interglide rules, a ten minute "slot" of time is given a rather large flight group. The object is to fly longer within the time slot than the other pilots in your group. Scoring is man-on-man. If the air is bad in your round, it's equally bad for the guys you will be scored against. Weather luck is minimized.

You can launch at the start of the ten minutes, or you can wait, gambling that any lift found by the early launchers will not sustain them for the full time slot. From what I hear, few British pilots take off immediately. They prefer to visually scout the air for lift or piggyback off more adventurous souls who find lift!

One relaunch is permitted, provided that the model is back on the ground within one minute after the initial launch.

Your plane must be on the ground at the conclusion of the time slot. There is a 30-point penalty for overflying the ten minutes. You get a zero for the flight (no landing points either) if you haven't landed within one minute of the end of the time slot.

Launches are by 150-meter hand tow in a designated launching area, only. No pulleys or other mechanical devices can be used to gain an advantage, and casting off a model under tow is disallowed.

Flight School.

It's elementary with the Professor.

Go to school with the Professor, the radio control trainer that makes electric flying easier than ever.

Extremely stable design and ARF assembly are just a few of the features that make the Professor ideal for novice flyers.

The complete Professor kit comes out of the box ready to assemble.

Clean, quiet flying excitement is as close as the schoolyard. Let Futaba and the Professor show you how simple it can be.

Advanced, lightweight materials are used for the fuselage for exceptional strength and rigidity. And built-up, pre-covered wing, tail and stabilizer eliminate the need for special assembly skills. Simply join the wing halves, attach stabilizer, tail and pre-installed linkages. Mount the propeller to the gearbox of the powerful Mabuchi RS540SH motor, install radio and batteries and you're ready for takeoff.

PROFESSOR SPECIFICATIONS	
Length	35.04" (890mm)
Wingspan	48.82" (1240mm)
Area	446.5 sq. in
Weight (w/rec. system)	39 oz.
Motor	RS540SH w/3:1 reduction gearbox
Recommended system	Futaba 4NBL/MCR
REQUIRES: 7.2v/1200mAH NiCd battery pack and charger, 2-4 Channel radio control system (electronic speed control optional).	

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

Electrifying fun for the more advanced pilot. Aerobatic Hirobo/Futaba Chipmunk (Available soon).

Futaba

Futaba Corporation of America
4 Studebaker/Irvine, CA 92718
714-455-9888

Hand towing is generally very easy if there is a light breeze. If there is enough wind, you sometimes don't even need to move to tow an aircraft aloft! The point here is that everyone gets a near equal launch.

Landing bonus points are possible. There are two bonus circles, each of 12.5 meters radius (25 meters diameter). If any part of the model (but it must not have fallen off!) lands inside your assigned circle, a 25-point bonus is earned. If the entire model is inside the circle, 50 points are earned.

There are also two qualifying "landing" circles concentric with the bonus circles. You must land in your designated landing circle to get *any* score for the round. This circle has a large 75 meter radius (150 meter diameter). Hitting this huge circle is somewhat like our club rules about getting back to the flying field! It should be very easy.

You are scored by your point total (one point per second, plus bonuses, minus penalties), divided by the best point total of the flight group. The winner of the group gets 1,000 points, everyone else is normalized to 1,000. Thus the "Percentage" in the event's name.

Many qualification rounds are flown (minimum of three). Then, two 15-minute slot fly-offs are used to determine the winners among the top nine pilots.

The model you fly can be any sailplane which meets standard FAI rules. You may have a backup sailplane. You must be able to fly either plane on either of two frequencies. This is necessary due to possible conflicts in man-on-man flying.

That is it in a nutshell. FAI-F3J R/C Thermal Duration Gliders sounds like it has great potential for success. I believe it merits trial runs by clubs all over the U.S.

F3J is simple to organize. There are no courses to set up. A minimum of helpers are needed. There are no winches to mess with. Scoring is a simple formula. There are no winch-associated hassles: no illegal motors, batteries, etc. to check; no delays caused by rat's nest tangles or pop-offs; 12 or even 18 fliers could be in a single time slot and all could launch simultaneously. Landing officials only judge whether a model is in or out of a circle.

F3J is simple to fly. Launch when you want, find lift and stay in it long enough to outfly your opponents. Land gently in a big circle.

F3J equipment is cheap. Any thermal duration kit sailplane is competitive. Hand tow line can be cheaply bought at fishing tackle shops. An old fishing reel can serve to bring it in. A flag or parachute completes a world-class competitive launching system.

F3J is a challenge. It is not easy to stay up for ten minutes, if that's what it takes to beat an opponent. Sometimes two or three thermals need to be found. You could end up searching the entire sky for lift. You could make a mistake and launch first (and alone) into a big sky full of almost dead air that puts you on the ground in three minutes. Meanwhile everyone else sees the lift you just flew through at 20 feet, and they launch way up high in the core. There is more strategy to this event than a casual glance reveals.

Thanks, Terry, for sending the info. Now, on to a small portion of the letter from Sean Walbank which gives a glimpse of the types of models flown at Interglide.

"Enclosed are some photos taken at last year's Interglide '88. This is the BARCS big, biannual competition for thermal soarers.

"In what was a dismal summer, the weather for Interglide '88 was superb—high 80s, little breeze, and lots of sunshine. The site was the Warwick Racecourse—you'll remember how good racecourse sites are after York in '83? (Lots of green grass and open spaces! wrf.) The flying conditions were superb.

"Interglide is intended to promote international participation to BARCS rules, and this year we had an entry from Germany—Reinhard Werner, who flew his Fit-Fit flying wing. Reinhard is now hooked into BARCS rules flying and intends to return in '90 with a full German team.

"How about promoting a U.S. team to come over also?

"I didn't do very well in the Open event, but did manage second in Hand Launch Glider flying a Flinger."

HIGH TECH HOW-TO VIDEOS

Two issues ago I mentioned a trio of how-to videos on making fiberglass molds, cutting foam core wings, and vacuum bagging wings with fiberglass. Having since received two of the three for review, I can

say that the tapes are well worth your investment. They are very thorough, omitting nothing, and each one lasts almost 90 minutes.

In that column, the address and phone number of Channel 1 Productions was somehow left off. To find out more about these highly informative videos, contact Julian Tamez, 19827 Bishops Gate, Suite No. 1, Humble, Texas 77338, or phone (713) 540-3944 or (713)278-4575 for his pager service.

LOW REYNOLDS NUMBER AIRFOIL VIDEO

I recently received a copy of another video tape which was pretty interesting from a scientific standpoint. It came from John Donovan, of Selig/Donovan airfoil fame. It was a partial report of the wind tunnel testing which has been going on at Princeton for about two years. The tape thoroughly covered *how* the testing was done, but not very much of what the testing revealed. This will be left to *Soartech*, a technical journal published by Herk Stokely and crew at the Tidewater Model Soaring Society sometime this summer (possibly as early as June).

To quote from John's letter, "The testing is finally finished! Following two years of setup, more than 1,200 hours of tunnel time were used to test 60 airfoil sections, yielding 130 polars. Your support of this program is greatly appreciated, not only by Michael, Dave, and I, but also by all of the modelers who will use the data.

"We apologize for the delay. Like everything else, experimental work generally takes longer than expected, in this case by at least a factor of two. Nonetheless, the testing was completed in January, at which time the video tape was made. In mid-January, Michael left for Penn State, and I moved to St. Louis where I am working at the McDonnell Douglas Research Labs. All of us are currently working on the writing of *Soartech*, and hope to be finished by June. We feel confident that it will be worth the wait.

"To offset some of the debt incurred by Michael and me during the latter part of the project, we intend to have more copies of the video made—this time professionally—for sale at $20.00 each. This type of firm works on a volume basis. Thus, we will accumulate all orders for the video until September. Assuming we have at least 30 orders, they will then be filled through a production house; otherwise, we will refund your money."

All interested parties may contact John Donovan at 754 Stone Canyon Drive, Manchester, Missouri 63021. Your support is greatly appreciated! (Like that zip code? It reminds me of one of their more successful airfoils, the S3021!)

TOP EIGHT SLOPE SITES OF THE WEST

That is the title of an entertaining and informative video which reports on about twelve different slope soaring sites from Australia to Colorado. It rates the top eight sites in descending order, saving the best for last. Most of the rated sites are in California, but there are a few in Oregon, Washington, and Hawaii, too. The film shows a good deal of flying with the various sites in the background. Maps are provided on tape which show the precise location of each site in case you wish to visit one or two. I found it to be very relaxing viewing as the flying is set to good music.

If it sounds interesting to you, contact Mark Foster, 826 Oneonta Drive, South Pasadena, California 91030, (213)257-4573. Tapes are $25.00 each, postage and handling included.

HAND LAUNCH SIZE OLY 650 . . . er, OLY 1.5

I love getting letters like these! Those scratch-built projects and kit mods make very interesting reading. The following letter was received lately from a Rick Durden of Birmingham, Alabama.

"Bill—Enclosed are two photos of my 'Olympic 1-1/2.' I wanted to build an Oly for years, and was also curious about hand launched R/C. The answer was to scale down the Oly to 430 square inches. At 15 ounces, she is a bit heavier than I planned, but is still a delight. She goes up like a rocket on a high-start. The wing tips and tail can be taken apart for vacation trips.

"Keep up the excellent work. Thanks — Rick."

And thank you too, Rick!

There has been a small rash of miniaturized sailplanes being flown lately, the Gentle Lady, Sophisticated Lady, and Gnome 2M variants being the most common. The 60-inch AMA Class A sailplane is

fairly popular with the troops, it would seem!

OF PEAPODS AND SKYWALKERS

Harry Weitz of San Diego has contributed to this column a couple of times before. His latest letter was received actually quite some time ago, but space to run it has been scarce, until now.

"On page 35 of the November '88 *MB*, I noticed a model built by Dick Vader utilizing a pod and boom. Interesting, that on about February 1, 1988, I built a sailplane called 'Peapod' which utilized the same mode of construction (photo enclosed). I do not know Dick Vader.

"Peapod is 100 inches in span, an aspect ratio of 12.2, weighs 42 ounces, uses the Eppler 193 airfoil in a polyhedral wing planform with spoilers. For pure soaring, this section is as good as any I have come across. It does not penetrate like a Selig 3021 or Eppler 205, but in moderate wind it is hard to beat.

"I found that the boom, made of a 5/16-inch O.D. fiberglass arrow shaft, was quite flexible, especially during launch. Care must be taken during the flight mode. The inside of the boom (approximately 1/4-inch I.D.) contains the antenna passage and a tube for the stabilator and the rudder. I fly it quite often."

By phone one night, Harry told me that the photo shows a later modification to the fuselage pod. Evidently the arrow shaft flexed far too much and caused handling problems. Harry simply extended the rear of the pod a few inches so that the exposed shaft was much shorter and less likely to flex. Problem solved! Thanks for the contribution, Harry.

AIRFOIL OF THE MONTH: EPPLER 193

This is an old stand-by section which has been floating around the sky for many years. Sean Bannister of England has probably done more to make this section famous than any other single designer because it is still his favorite choice for the Algebra series of gliders. The Algebra F3B model which Sean flew at the Sacramento World Champs in 1981 outperformed most other ships in duration and distance, and flew admirable two-lap speed runs which kept Sean among the top contenders. The Algebra designs are kitted in England with your choice of E193 or S3021 airfoils even today!

THIS JUST IN

Steve Moskal, president of SOAR (Silent Order of Aeromodeling by Radio), writes to say that his club will be holding a multi-task contest at their sod farm in Oswego, Illinois, on August 5-6. Saturday will be practice day and Sunday will be run with *modified* F3B rules. The intent is to give those fliers even mildly interested in F3B a chance to learn in a (hopefully) low-key environment.

Interested fliers should contact Tom Kallevang, 1315 Paddock Dr., Wheeling, Illinois 60090.

TIME TO GO!

Keep those letters coming! Send photos of your favorite project and an educational writeup, and I promise you some space in these pages of MB! Bill Forrey, 3610 Amberwood Court, Lake Elsinore, California 92330, (714)245-1702. •

Tech. Stuff. . *Continued from page 45*

Glass on even well-sanded foam gives a disappointingly rough surface. The technique I have been calling the "miracle method," where a sheet of thick Mylar is in contact with the fiberglass surface during the cure and then removed, yields a smooth high-gloss finish automatically; but it is difficult to do well without vacuum bagging.

A major reason why composite construction seems a bit slow and difficult is that we are comparing it with some very good model materials and processes that have been developed over a long period of time. We have prefinished balsa in any weight, thickness, and size; flat, smooth, strong plywood in many thicknesses; Sig's Lite-Ply; the CA glues in several viscosities; Satellite City's new UFO foam-compatible CAs; and the prefinished and heat-shrinkable films and fabrics with integral adhesive. The competition has gotten rough. We model builders have been spoiled.

The structural qualities of a skin of fiberglass on low-density foam cores such as beaded foam and blue type SM foam, also leaves something to be desired. For instance, in a crash of Sea Fli XI, I put a compression crease in the wing, which had

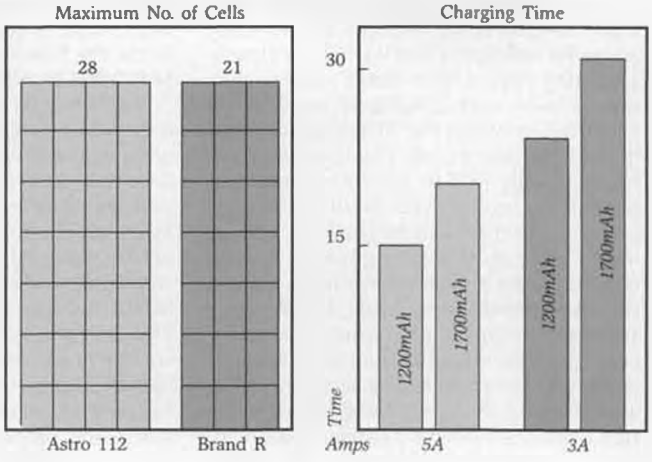
Charge the Big Ones Fast

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

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

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

DC/DC CHARGER COMPARISON



AstroFlight INC.

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

to be repaired. The problem is that white beaded foam and blue foam are too low in compression strength to support the fiberglass well enough to develop its full strength. Stronger foams are readily available, but usually can't be used for solid cores because they would make the model too heavy.

You will find fiberglass-only skins over foam cores on some ARFs and custom-built wings for sailplanes, but if you look closely you may find a thin sheet of stronger, denser foam, such as Rohacell (see May '89 MD&TS), between the fiberglass skin and the beaded-foam core. That layer of strong foam, usually 1/16 to 1/8-inch thick, supports the glass so most or all of its compression strength can be realized, adding much more overall strength than it does weight. Some individual modelers also go the strong-foam-layer route, but it represents more steps in the construction process and more building time. Actually, when we skin a foam-core wing with balsa and then apply light fiberglass over the balsa, we are making a similar sandwich, and a very good one. Here, use the softest balsa you can find to keep the weight down, since the balsa is now supporting the glass, and the glass will provide most of the strength.

Glassing is work, however. Sheeting foam-core wings with 1/64 plywood or veneer is also structurally excellent, but easier. These two wood skins are about the same weight as 1/16 balsa, but they are hard so they do not need to be fiberglassed to provide a ding-resistant surface. Shrink-film over balsa on a foam core is comparable in total effort, but more subject to dents from dropped screwdrivers. For applying any kind of skin to foam cores, vacuum bagging is highly recommended. It is easier, will come out better looking, and will be much stronger because the skin-to-foam bond will be much better. With vacuum, squeegeed-on epoxy seems to be the best skin-to-core adhesive.

SANDWICH WING SKINS

A still higher strength-to-weight ratio method of designing a fiberglass-skinned wing is to eliminate the solid foam core, substitute a very simple internal structure, and use skins consisting of a thin sheet of Rohacell or other strong foam, with a layer of fiberglass on both sides of it. The result is structural sandwiches top and bottom with light, free, easy-to-shape air in the middle. This construction is much more difficult for the home builder, however. It almost requires special molds as well as vacuum bagging. I have seen a number of sandwich wings and other model parts which were molded professionally in this manner, usually for sailplanes. They are beautiful, strong, light, and true.

PROPORTIONS

In composite design, the selection of the type of foam for the core and selection of the thickness for the epoxy/fiberglass or other skin, to optimize the strength-to-weight ratio of the structure, is a rather sophisticated engineering problem requiring a computer. Most modelers guess at it based on cut-and-try experience. They may or may not come close. When we all learn more, as the result of testing and mistakes, we will design stronger, lighter, easier-to-build composites.

KEVLAR AND CARBON

Some composites are made with Kevlar fabric instead of fiberglass. This aramid fiber by DuPont is stiffer and stronger in tension than glass fiber, but weaker in compression. It can increase strength or reduce the weight of a model slightly with careful engineering, but since our hobby is more art than science at this point, there is usually no guarantee that Kevlar adds much but cost. It is also considerably harder to work with than glass.

Properly used, carbon fiber will greatly improve both strength and stiffness. Carbon wing spar caps and inserted graphite tow (unidirectional fibers) are good examples. Graphite is one crystalline form of the element carbon (diamond is the other). The high-strength man-made fibers are interchangeably called by either name.

CORRUGATED CARDBOARD

Last December I discussed foamboards and corrugated cardboard, which are of course sandwiches. I said then that cardboard or "pasteboard" has pretty fair strength-to-weight ratio and "free" can't be beat for price, but cardboard models usually look very crude. There are exceptions, I have learned. I got a letter from Chuck Felton, with photos of seven of his corrugated-cardboard scale control line models. "Crude" doesn't fit them. For

standoff scale, they look very good. Have a look at his P-51. Chuck had a construction article published in *Model Builder* in the Oct. '88 issue on his cardboard Hawker Hurricane. In that article he discloses the many techniques he has developed over the past ten years in building with cardboard.

I ran some tests on a piece of corrugated board from a small furniture box. It was .15-inch thick and weighed 2.02 oz./sq. ft. (about the same as Artcore or balsa of the same thickness). I rolled a strip of it into a tube 2.5 inches in diameter by 2.0 inches long and compression tested it (without waterproofing it). It supported 120 pounds parallel to the corrugations, fully as much for its weight as the best results I have had with epoxy glass/foam-core sandwich tubes of various compositions but similar size. In a shear test (perpendicular to the corrugations), the cardboard did poorly however. It gave 13.3 lb./lineal inch ultimate. In comparison, 1/8-inch Artcore (again same weight) gave only 6.7 lb./in.; 1/64 plywood (also about the same weight), gave me a shear strength of 10 lb./in. Medium balsa gave 30 lb./in. shear strength! Balsa is undoubtedly the best for shear webs.

THERMOFORMED ABS

Many kits and ARFS include vacuum-formed (thermoformed) parts of acrylonitrile-butadiene-styrene (I like to show off), or similar thermoplastic sheet material. This is an inexpensive way to make commercial parts, but such parts, especially whole fuselages, are weak and/or heavy compared to fiberglass parts. My materials data file shows ABS, polystyrene and PVC to have about the same strength-to-weight ratios as medium balsa, but epoxy/fiberglass, polyester/fiberglass, and cyanoacrylate/fiberglass laminates are many times better. Note that most such formed plastic parts have plywood or other additions or doublers to make them strong enough. Fiberglass fuselages usually need little or no beefing up.

SHEET PLASTIC SKINS

I once skinned a foam wing core with .01-inch thick colored high-impact polystyrene sheet. It wasn't impact resistant enough. In a case of dumb thumbs or pilot-error altercation with the ground, the ground wasn't hurt, but the polystyrene wing skin exploded! There must have been hundreds of bits of plastic flying through the air, most of them less than a square inch in area.

There are two readily-available thin plastic sheet materials which I feel do show promise as foam-wing and fuselage skin materials, however: polycarbonate and Mylar. Polycarbonate is very strong and tough, and it can be glued or solvent welded easily. I haven't had time to skin a wing with it yet. Mylar is even stronger, but its problem is that it is difficult to glue. I did cover foam cores for the wing, fuselage, fin, and stabilizer of an original design with .008 Mylar many years ago. Have a look at the photo. It was a good airplane, but a bit crude at the bonded edges. I put a lot of flights on it and still have the wing. The Mylar is painted only on the inside of the skin. This is an interesting method applicable to any clear skin material. The surface finish is the original high-gloss ultra-smooth surface of the material itself, with the paint showing through from inside. No sanding or priming are required and every paint job turns out perfect because we look at the side of the paint which is against the perfect material surface. It does require a good bond between the paint and the plastic however, since that bond will be in series with the skin-to-foam bond. Note the windshield in the photo. It is not a separate piece of plastic but an integral part of the Mylar skin, which I masked inside to keep the paint off.

SATELLITE CITY TAPES

If you haven't seen Satellite City's Video Tips yet, I highly recommend them. These tapes give much useful information on model airplane building. The first one is the basics of using cyanoacrylate glues. In #2 Bob and Bill Hunter, Nationals-winning modelers themselves, show all kinds of advanced techniques with these materials, including using CA to bond and fill fiberglass. The tape even shows how to make perfect fiberglass tubes rapidly and easily. I qualify as a very experienced modeler, but I learned a lot from this tape. Refer to Satellite City's regular ads in *Model Builder*.

Speaking of using CA for fiberglass bonding, the stuff costs more than epoxy or polyester resin, so there may be a limit to the area of glass you will put down with CA, but it is the fast way to make patches, wing center joints, etc. I also find it very handy, when fiberglassing large areas, to stretch the glass cloth and bond down the edges with instant CA, then to epoxy-bond the main area of the cloth. If there is any chance of the CA contacting foam, make *sure* you use Satellite City's foam-friendly UFO CA. (By the way, in case you haven't heard, CA debonder is nothing but our old friend nitromethane. If you mix your own glow fuel and have some nitro on hand, you also have cyanoacrylate glue remover on hand.)

SOURCES

Look in your yellow pages under "Fiber Glass." There are hundreds of glass and resin suppliers all over the country. Some cater to the special needs of the modeler. One that does, including stocking carbon cloth, is Tacoma Fiberglass Products, 2406 Port of Tacoma Road, Tacoma, Washington 98421, (206)272-1258.

Ron and Karen Wagner of Hi Performance Sailplanes, 17902 N.E. 156th St., Woodinville, Washington 98072, (206) 487-1721, have a wide selection of composite materials and will build custom composite wings and fuselages by vacuum bagging.

Matt Gewain of Composite Structures Technology, 3701 Inglewood Ave. #268, Redondo Beach, California 90278-1110, (213)542-7393 sells the standard composite materials plus Kevlar fabric and thin Rohacell foam sheets.

George Sparr of Aerospace Composite Products, P.O. Box 16621, Irvine, California 92714, (714)250-1107 has a very wide selection of composite materials which he showed me at the N.W. Model Exposition in February. They stock a big variety of carbon fiber tubes and rods, glass/foam and carbon/foamsandwiches, glass and carbon/balsa core sandwiches, Art Cor foamboard, exotic fabrics, etc. Send an SASE for their catalog.

Noal Rossow and Dave Mroz of Composite Aircraft Engineering and Supply, P.O. Box 866, Lapeer, Michigan 48446, (313) 664-3330 have a nice selection of goodies, including wood veneers for wing skinning and 14-mil Mylar sheet for miracle method use. They specialize in vacuum bagging. Noal and his partner Dave got a good write-up on their composite services in the January issue of *Model Builder* in Bill Forrey's R/C Soaring column. I have now received one of their "Sucker Kits," which is a very simple and inexpensive setup for making composite model parts and includes an easy-to-use hand vacuum pump.

I also have their video tape ($39.95) on making all kinds of composites with vacuum, and a few other good tips. It is one of the best videos I have seen in the modeling business. I highly recommend it. I have two suggestions, however. The video shows Noal sucking on a tube to get excess air out of the bag before he starts applying the pump. I wouldn't do that. Use a vacuum cleaner before the vacuum pump. Epoxy fumes as well as excessive contact with the stuff can be *bad*. Let's not inhale it! My other suggestion concerns the bag itself. Noal and Dave struggled quite a bit to get their loose assemblies into the bag and aligned properly before applying the vacuum. I think it is easier to build a bag around the assembly by placing the assembly on one half of a sheet of plastic, folding the other half over the top, and sealing the three edges with caulking tape, instead of just the end of a pre-made bag.

Many of the owners of these composites companies are competition sailplane modelers who have gotten into composites in an effort to make better models for their own use. They are dedicated to the hobby.

STAINLESS WIRE SOURCES

Three or four of you wrote to give me sources for hard stainless wire for foam cutting, in response to my inquiry. Aircraft safety wire, guitar strings, and fishing leader were all suggested. I now have some Berkley (not the model company) .015-inch diameter hard stainless leader, which is just right. It is available from commercial fishing equipment companies.

INDOOR MODELS

My mind-set in this column is usually R/C since that is my personal bag, but I don't want to completely ignore the other phases of modeling. It occurs to me that

composite materials as we have been studying them don't apply very well to rubber-powered and indoor models. The problem is the matter of density, which we discussed in the October '88 column of MD&TS. Balsa becomes harder to beat as the size of the plane goes down. It would be difficult to build a composite structure lighter than a balsa spar for a microfilm-covered duration indoor model.

When we think about it, the name of the game in designing such planes is to make them weigh as close to zero as possible, so that the power required is also close to zero, so that the rubber motor will keep unwinding close to forever. The microfilm is invisible except for reflections, and the gossamer structure is hard to see from any distance. The almost weightless model flies silently. If these models get much lighter they are going to disappear and be undetectable. The problem the competitor will then have with the officials will be to prove that he has a model and that it is flying.

WEIGHT SHEETS

In the construction article on Sea Fli XI in the May issue I talked about keeping weight sheets. You may have missed it, but even if you didn't it is worth repeating. For each of my airplane models I keep a record of the weight of all major parts, down to the last gram. (I use a gram balance, but any fairly accurate scale would be fine.) On a foam wing, for instance, I weigh and record the weight of the foam core, its weight after sheeting, after glassing or covering, after priming, and after painting. This allows me to go back, sometimes years later, and see which were the major weight contributors in that particular type of construction so I can intelligently design lighter next time. It usually takes two sheets of paper per model to record all of this. These old weight sheets are invariably used a lot when I am designing a new plane. The final weight of the model is of course the bottom line, but to know *why* it weighs what it does, I have to be able to see the details. Yes, it is a little extra work, but well worth it in my goal to become a better designer.

SUMMARY

Composite structures have a lot to offer in model airplane building. They can provide much higher theoretical strength-to-weight ratios than balsa, but in practice these gains aren't always realized because of our ignorance in design and our crude manufacturing methods and poor quality control. Interestingly, in full-scale aircraft, composites are replacing aluminum, a higher density material, and again achieving better strength-to-weight.

This is the time of the composites revolution. I built my first fiberglass wing (for a control line stunt model) about 1948, but I have learned more about successful composite model structures in the past year than in all the time before that. I personally intend to approach the design of my models with an open mind, and use whatever material and structure seems best for the application of the moment.

Remember, happiness is the pursuit, not the catching (unless you are pursuing the last bus on a rainy night). I wish you happiness in your pursuit of the perfect model design.

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

Stork..... *Continued from page 31*

engines. New .080-inch aluminum frames were made in the U.S. for his Special Edition Stork. The new frames have the engine cylinder facing the tail for easy access to the glow plug. The new frames are extremely sturdy and pretty. John also added a cone start feature, a strut landing gear instead of wheels, and a more aesthetic canopy. The end result is a fast and slick aerobatic machine with far superior handling qualities as compared to the original Stork.

During the past 12 months I have tried four different engines on my Storks: the O.S. .61RF-H Long Stroke, O.S. .61 SFN-H Short Stroke, O.S. .50 FSR-H, and the Supertigre .60H. My first Special Edition Stork is powered by an O.S. .61RF-H rear exhaust with pump. Without the pump the O.S. puts out 1.8 horsepower; with the pump the engine puts out 2 horsepower. Talking about power, my Stork really *moves*. With this combination, the helicopter zips across the sky as if on rails at 70 mph. By moving the left stick only, I can make the Stork move up and down like a yo-yo. By moving the right stick, the Stork

does loops with ease. However, the rolls are slow. This is because the soft DDF head does not transfer all the rotor rolling moment from the rotor head to the fuselage. This head design consequently gives a soft and smooth control feel that is very suitable for beginners.

Being a fanatic R/C helicopter modeler for so long, nowadays I really enjoy pushing my helicopters to the limit. Thus, I have replaced the thick and heavy Hiller control paddles that came with the kit with the thin and light paddles used on GMP Cobras and Competitors. The thin paddles do not reduce the stability, but make the Stork very lively. It will now roll rapidly.

The stock tail rotor system is very responsive. Full left or right tail rotor stick produces very fast pirouettes. Recently I replaced the original Stork tail rotor assembly with the GMP Legend's tail rotor assembly because the Legend unit is of all metal construction and has triple ball bearings in the tail rotor blade grip for ultra-precise control. The Stork is like the milder brother of the popular fully aerobatic Legend. They both have belt driven tail rotors and a similar appearance, but the Stork is about 10% bigger, and has very docile handling that is perfect for beginners.

The engine mount is pre-drilled to fit most of the .50 and .60 size engines on the market. The O.S. .50 provides adequate power for hover, forward flight, and mild aerobatics, but I love seeing my Stork just peel out vertically the moment you punch the throttle. Therefore, after 20 flights, I replaced the .50 with a .60. I am using a Hirobo bottom muffler on my rear exhaust O.S. .60. This muffler gives the Stork an aerodynamic and compact look. However, if you are looking for that extra bit of power, then I suggest that you put on a Magna pipe or a Hatori pipe.

How do the three .60 size engines compare? The .61 Long Stroke gives brutal power. The ABC, pump, and pipe combination gives so much power that the stock autorotation bearing failed once. Of course, I am partially responsible for that because I constant punch full power from hover to enjoy the sheer acceleration. I heard a rumor that the Long Stroke engines are shakers and generate excessive vibration that can crack helicopter frames. Well, after hundreds of flights and multiple crashes, the Stork frames still did not crack. In hover, there are no bubbles in the fuel tank to indicate vibration. Furthermore, I usually check engine vibration and clutch shaft alignment by holding the tail boom while the engine is idling on the ground (make sure the other hand is holding the main rotor head). My Long Stroke did not generate any more vibration than the other test engines.

The O.S. .61 SFN-H helicopter engine was also tested in the Stork. The SFN-H engine is of the same design as the original O.S. .61 FSR-H engine introduced in the early '80s. It has been put back into production due to public demand. For ease of fitting it into modern helicopters, the SFN-H has the same crankcase and mounting dimensions as the Long Stroke. The spec sheet says it has 1.7 horsepower, versus 1.8 for the Long Stroke. Did I notice that .1 hp difference? It's hard to make a conclusion because the SFN-H is of short stroke design, which means it likes to operate at high rpm, while the Long Stroke is designed for torque at lower rpm, and horsepower is defined as rpm times torque. My feeling is that pilots who want good acceleration maybe ought to pick the Long Stroke. Helicopter kits that have high gear ratios (like the Champion, with a ratio of 10:1 or higher) will benefit from the SFN-H. I think low main gear ratio helicopters, like the GMP King Cobra, Competitor, and Legend (ratio of 8.6:1) might be great for the Long Stroke.

The Supertigre .60H is the least expensive engine among the three. It runs smoothly, idles well (which is important when using throttle hold to practice autorotation), has a good carburetor, but is slightly less powerful. The price even includes a swing muffler, which can be rotated to direct the exhaust in any direction. It would be nice if the O.S. helicopter engines also came with such a swing muffler. Great Planes will be importing a new Supertigre .60 helicopter engine later this summer. The present .60H has been discontinued because the heat sink does not fit inside most helicopters' fan shrouds,

and the prop backplate washer is too big also. My suggestion for sport fliers who want to buy a Stork is to fit a strong, new .50 engine, or better yet, a mild .60 engine.

Beginners always ask what helicopter they should start on. Well, if they have the money and a place to fly, then the bigger the helicopter, the better. The Stork is perfect for beginners. It is a .60 size machine, so it is larger and heavier and thus less affected by wind than small helicopters, and it can be seen readily when learning forward flight, or doing your first loop at 500 feet. The Stork is extremely stable both statically and dynamically. It has a tall main rotor shaft which generates good static stability; the drawback is that a tall shaft tends to bend in a crash. The Stork has pleasant dynamic stability characteristics because it has a high Bell bar feedback ratio (close to 80%). The Stork's Bell-Hiller mixing arm is a crossover design that sits on top and across the hub.

The smoothness in hover is also attributable to the Hirobo DDF rotor head. DDF stands for *Dual-Dampened-Flapping*. The DDF head has a separate feathering shaft for each of the two main rotor blades. This allows each individual blade to flap up and down independently. The advantage is that if there is a sudden gust, only one blade will be affected. On a teetering rotor (probably 80% of the R/C helicopter models in the world have a teetering rotor) the whole rotor disc will tilt. On the DDF rotor head the stiffness of each blade's flapping motion can be individually adjusted by the flier. By making the rotor stiffer, more control moment from the main rotor can be transferred to the fuselage, thus a faster roll rate and pitch rate are obtained. The rotor's stiffness has also been increased by designing the individual blade flapping hinges to be 1/2 inch away from the shaft. Designers call this *flapping hinge offset*. Full-size helicopters almost always have some flapping hinge offset to increase the control power. In this case, the 1/2 inch of offset provides only a minuscule increase in control power, but it allows the blades to flap independently for smooth flight characteristics. The Stork's rubber dampers inside the main rotor head are purposely designed to provide very low springlike stiffness to give a docile hover. The softness is great for FAI hover maneuvers, too. The other benefit of having a soft rotor head is that it minimizes vibration transfer from the main rotor head to the fuselage. This means the main rotor system does not have to be as critically balanced as a stiff rotor system. For example, on a DDF type rotor head, the blades may be 1/2 inch off track, or one blade may be slightly lighter than the other, but still the fuselage will not vibrate significantly. This is the reason why all U.S. designed full-size helicopters have relatively soft main rotor head systems. The drawback is that a soft rotor head cannot perform very high "g" or near zero "g" maneuvers.

(I want to point out that there is a common mistake made by nearly all modelers and manufacturers. The rubber that provides the springy action in our rotor hub should *not* be called "damping rubber" or "damper," because technically the rubber is providing *spring stiffness* to the main rotor to increase the rotor's moment transfer to the fuselage, not damping. In full-size helicopters the flapping stiffness is provided by an angular spring or a steel flexbeam or composite elastomeric flexbeams. And they don't call them damping flexbeams! They are *springy* flexbeams. For example, on the GMP Cricket, it's the little .5mm diameter piano wire that provides the spring action to the main rotor teetering movement. For example, on the GMP Cobra, you compress the rubber inside the main rotor hub to increase the flapping *stiffness*, not damping, to give you a more springy action. Same thing on the Schluter and X-Cell rotor heads; you can add shim washers to compress the O-rings in the hub to increase the *stiffness*.)

One of the many nice features on the Stork is that the servo tray is pre-formed of metal and some plastics parts, so there is no time consuming woodwork and painting. All Futaba, JR, and Airtronics servos will drop in there perfectly. The servo tray and in fact the whole helicopter comes beautifully anodized gleaming black. This projects a mean and nasty image. Another neat feature is the servo tray includes a small aluminum panel pre-cut and predrilled to fit the receiver switch and the gyro switch. I would like to see this feature included on all future helicopter designs.

The Stork is one of the best packaged model helicopters on the market. No parts missing. Loctite is included too. All the parts come independently packaged in plastic blister packages. The mechanics of my first Stork were put together by my friend Richard Baker in one day, and this is only the second helicopter that he has built. The instructions are full of drawings and explained in 28 easy-to-follow steps.

The Special Edition Stork has one of the sleekest looking canopies of any R/C helicopter. (I wish it came pre-tinted. Maybe they can mold these out of tinted plastic?)

The Stork has a toothed-belt drive for the tail rotor. There is almost no way that thing can slip. The correct tension on the belt is when you can squeeze one side of the belt about ⅛-inch inward. I find that my belt drive tail rotors on the Stork and Legend freewheel even smoother than my shaft-drive GMP Cobra.

Note that the Stork has an octagonally shaped tail boom. The purpose of this is to prevent the tail boom from rotating. This is an extremely sturdy tail boom, but a boom strike on a miscalculated autorotation is still going to dent it severely. However, the boom can be replaced in a few minutes because it is just a hollow tube. This is a definite plus for the belt drive tail rotor system. A shaft drive tail rotor requires wood disks and brass tubing to be fitted inside the tail boom.

The tail rotor control mechanism is different from the traditional GMP and Schluter tail rotor mechanisms where traditionally the tail rotor pitch is controlled by a wire through the middle of the tail rotor shaft. The Stork's tail control is more like the Heim and X-Cell, with a sliding ball bearing outside of the tail rotor shaft. I like this arrangement much better than the old wire-through-the-hollow-shaft design. The tail rotor response on the Stork is phenomenal. You can even do pirouettes in slow forward flight. But with the gyro rate gain turned up, the Stork can hold its heading in hover for a long time. Recently I replaced the stock Stork tail rotor assembly with the Legend's, resulting in even crisper helicopter heading control. The Legend's tail rotor unit is lighter, more compact, and the tail rotor blade holders employ three ball bearings to give ultra-precise tail blade pitch control.

Even though my Stork is not a heavy helicopter (mine is slightly over nine pounds), I wish the landing gear on the Stork used beefier struts, like those on the GMP Competitor. The fuel tank could be larger too. There is plenty of space for you to put a bigger one in yourself. I don't like having only 10 minutes of flight time available because that's when I am just getting warmed up for some serious aerobatics. With some of my friends, though, 10 minutes seems to make them plenty happy and sweaty.

On the Stork, Shuttle, and many other helicopters, some people might worry that since the collective and cyclic control arms have no ball bearings, the washout unit will develop some slop and result in control sloppiness. In flight you will not notice this because all the moving parts are loaded, so they are not free to slop around. The Champion has plastic bushings for the control bellcranks, too, but you can buy a set of ball bearings from GMP to update the Champion and make it even smoother. GMP does not have any ball bearing update kits for the Stork. Since the control is very crisp already, you probably should not try to modify it. As long as you keep the bushings clean, and keep the bolt holding the plastic bellcranks snug, then these bushings will serve you well.

The control linkage on the Stork is very similar to the proven Cobra/Competitor setup. The collective is controlled by raising or lowering the swashplate. On the Cobra/Competitor and the Heim helicopters, raising or lowering the collective will produce unwanted cyclic trim changes. These unwanted trim changes are totally eliminated on the Stork with the new parallel I-arms. During bench setup, I can see the swashplate tilt as I move the collective, but in flight, the trim changes are too negligible for the average pilot to notice.

How about crashworthiness? Automobile manufacturers like Mercedes and Volvo constantly advertise their crashworthiness on television. I think this is an issue neglected by all the reviewers of new kits. While I was hovering my brand new Stork on the third flight the radio suddenly went to full throttle and left cyclic, toward the trees. To get the helicopter down from the tree, we had to tie a rope between the tree and the trailer hitch on a car to bend the tree down. Surprisingly, the Stork's damage took less than four hours of repair work. After the crash we gave the helicopter and the radio a thorough checkout. Everything seemed to be fine. Other modelers had been complaining about glitches so we thought the crash was due to radio interference. However, the next time we went out it was a history replay. Thirty seconds into the flight, the helicopter went full throttle and full left cyclic into the ground. Now we were quite upset.

Again it took less than four hours to repair the Stork. The next time we got smart; we weighted down the helicopter with heavy wood logs and bricks so it could not lift off. Not to our surprise, the radio went wild again. The radio was sent back to Steve Helms at Futaba immediately. The lesson here is that if it is a new radio, you should check it by running the helicopter while it is firmly strapped down, or fly it at a place away from spectators. The problem was later traced by Futaba to a defective gyro. I have flown Futaba equipment for 15 years and this is the first time that I have had to send a new or old Futaba radio back for service. Since then the gyro has never failed.

Originally the Stork had a Futaba 7FGHi gold series radio, then a new Futaba 7UHP 1024 bit PCM radio was installed. The new 7UHP is very nice. It comes with five S5101 servos and a 1000 mAH receiver battery pack as standard. The S5101 servos are brand new servos that replace the old S130 design. If you still have some old S130 servos, I suggest that you open it up and put a drop of cyanoacrylate glue on the tiny blue color disk sitting in the center at the bottom of the electric motor. Under vibration, the blue disk can vibrate out, and the motor shaft can slide down and stop working. Yes, it has happened to me in flight and caused crashes, but since I added the CA glue the S130 has worked flawlessly.

The 7UHP transmitter has a liquid crystal display for displaying the programmable settings. The 7UHP is a third generation helicopter radio; there are no trim pots to adjust. Instead, all helicopter settings such as dual rate, exponential rate, pitch curves, engine hi-idle setting, and throttle hold settings are all programmed into the transmitter by pushing six buttons on the front of the transmitter. The Futaba 7UHF transmitter has the same features, but it has the traditional PPM (pulse position modulation) coding system, while the more expensive 7UHP can operate on either PPM or PCM (pulse coded modulation). Personally, I think today's modern radios are extremely reliable regardless if they are PPM or PCM coding, or AM or FM transmission. The 7UHP with five servos retails for $799.95, and the 7UHF with four servos retails for $649.95. A detailed description of Futaba programmable radios will be discussed in an upcoming comprehensive look at the nine-channel 1024.

Modern helicopter transmitters have six to eight switches on the front and top, some long ones and some short ones. Have you ever broken one of them? When my 7UHP was only one week old, I accidentally bumped the rudder dual rate switch and broke it. I thought I could probably replace the switch myself. Well, the switch is soldered to the PC board and the entire board must be removed to change the switch. I sent the radio back just to replace one switch. The moral of this story is to get yourself a transmitter carrying case to protect your investment. The case also prevents people touching your trims.

While the transmitter back was opened, I had a look at the inside of a modern radio. Very impressive! There is only one chip, and it is probably a Futaba custom designed VLSI chip. Besides the one chip, there are about 30 smt (surface mounted technology) capacitors, diodes, and resistors. The clean solder job indicates these are all robot assembled PC boards.

I really like the adjustable tension on Futaba transmitter sticks. I like to fly with a very weak tension because when flying a model helicopter, especially when you constantly switch from hover to forward flight and back, your sticks are rarely at the center. You want a soft feel on the sticks. I learned this from Robert Gorham. He once flew with my JR transmitter and com-

CLASSIFIED ADS

IMPORTANT INSTRUCTIONS: Non-Commercial(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, 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., Newport Beach, CA 92663.

Flying Scale Inc., 41 rubber scale, collectors quality plans, $6.00 each. SASE for list. Spans 17" to 34". Military, Golden Age, French, British, German, Japanese. 1905 Colony Rd., Metairie, Louisiana 70003.

WANTED: Would like to buy a model: CURTISS ROBIN Airplane. Richard C. Harrison, P.O. Box 753, Fort Smith, Arkansas 72901. Phone (501) 646-5863.

WANTED: Ignition model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, Oklahoma 74063; (918)245-3649.

WANTED: SPARK IGNITION MODEL AIRPLANE engines circa 1930-46. Fair, competitive prices. Tom Forsythe, 318-12th Ave., Box 141, New Glarus, Wisconsin 53574; (608)527-2066.

1930s MODEL SHOP! Sawed prop blanks, WWI/Balloon/Streamline balsa wheels, Hinoki wood, color nitrate, sticks, tissue, bobbins, prop hinges, bamboo, old Scale/Contest plans, and more! Illustrated mail order catalog: $2. Oldtimer Model Supply, P.O. Box 7334, Van Nuys, California 91409.

4"x8" vacuum former with self-contained heat source. Easily constructed from local materials. Plans $12.00. Complete unit $42.00 postpaid. GRACO MODELS, Box 18358 Kearns, Utah 84118.

Everything from AUTOGIROS to ZAIC BOOKS! Send $2 for complete catalog of publications, plans, cards and more. HANNAN'S RUNWAY, P.O. Box A, Escondido, California 92025.

ANTIQUE & OLD TIMER PARTIAL KITS also custom 1/4-scale kits, any plans. Send large SASE for each price list wanted. MC, Visa accepted. Klarich Custom Kits, 2301 Sonata Dr., Rancho Cordova, California 95670. (916) 635-4588.

MAKE A BEERCAN BIPLANE, 9 inches long with 14-inch wingspan. Instructions, patterns, photographs. $9.95. Kit Nine, P.O. Box 72104, Marietta, Georgia 30007.

NEW! VOLUME 4, PEANUTS & PISTACHIOS! Packed with plans, photos & pointers, $5.50. Still available but going fast, Volume 3 @ $5 and Volume 2 @ $4.95. Add $1.50 postage and packing (one, two or all three books). California orders add applicable sales tax. HANNAN'S RUNWAY, P.O. BOX A, Escondido, California 92025.

SPECIALIZING IN MAJOR DECALS, also kits and supplies. For personal service and good prices, send $1.00 for catalog to: Clark's Aircrafters Supplies, 501 Raintree Condo's, Malvern, Pennsylvania 19355.

IGNITION AND GLOW ENGINES. Collectors, runners, used, new. Sell, trade, buy. SASE for large list. R. L. Eierman, 504 Las Posas, Ridgecrest, California 93555; (619)375-5537.

MODELA CO_2 ENGINES FOR SALE, $34.95. Send check or money order. Also: original Czech plans for CO_2 engines. Paul Svec, 305-1765 Lawrence Ave. E., Scarborough, M1R 2X8, Ontario, Canada.

ANTIQUE MODEL IGNITION PARTS CATALOG, No. 1, 1989. Timers, Tanks, Needle Valves, Cylinders, Point Sets, Pistons, Drive Washers, Plugs, Operating Instructions, Engine Plans, Kits. Engines: Atwoods, Atoms, K&B, Delong, Contestor, Others, 1,000 Parts. $8.00 PP, Foreign $16.00. Chris Rossbach, R.D. 1, Queensboro Manor, Box 390, Gloversville, New York 12078.

PLANS ENLARGED — Large Scale Specialists, PC Model Software. Free catalog. Concept Technology, P.O. Box 669D, Poway, California 92064. (619) 486-2464.

CLASSIC COMBAT MODEL PLANS: Quicker, Reactor, Wow, Renegade, etc. SASE for list. Barry Baxter, 6490 Sonora Way, Cypress, California 90630.

BUILD YOUR OWN low cost adjustable foam cutter. Make solid or hollow core wings, fuselages, tail surfaces, etc. FREE foam sources, "hard shell" techniques, foam samples, latest airplane plans list, new R/C Skydiver plus much more. Send business SASE. Foam Scale Models, Box 662MB, St. Croix Falls, Wisconsin 54024.

ENGINE VIBRATION ISOLATOR MOUNTS. Four rubber mounts with 10-24 socket head bolts, $6.50. Penron Products, Box 13051, Arlington, Texas 76094-0051.

SELL your ship models at huge profits to discriminating buyers. Expert craftsmen only. Write: Worldwide Broker, Box 1, Littlestown, Pennsylvania 17340.

IMPORTED DIESEL ENGINES — world's best selection: Current production Aurora, Cipolla, D-C, Enya, KMD, Mikro, MK-17, MVVS, PAW, Silver Swallow & USE Diesels. Also Mills and Taplin Twin replica diesels and very special imported glow engines. Catalog — $1.00. CARLSON ENGINE IMPORTS, 814 E. Marconi, Phoenix, Arizona 85022.

OLD TIMERS built by Dale Myers. Beautiful — light — transparent — electric or gas. Lanzo's Record Breaker 96" — Pacer "C" — Strato Streak 66" — Berkley Currier Sportster — Pacific Ace 72" — Schoenbrun's "Gladiator" — Diamond Demon — Playboy Sr. 80" — New York Aero Nuts "Rambler." Dale Myers, RD # 3, Stewartstown, Pennsylvania 17363 (717) 993-6246.

SCALE DOCUMENTATION. PLAN ENLARGING. Photopacks, three-views, drawings for 1800 aircraft. Super Scale R/C plans for Giant, Sport. 82 page catalog $4.00. Scale Plans and Photo Service, 3209 Madison Avenue, Greensboro, North Carolina 27403. (919)292-5239.

POSITION WANTED. Full-time position wanted in hobby shop. Mature 48-year-old, 35 years in aviation. Modeler of 40 years. Will relocate anywhere. Please call (207)646-1544. Mr. Frank Martin, P.O. Box 683, Ogunquit, Maine 03907.

"EASE-OF-FLYING RATINGS of R/C Trainers," evaluates 30 popular trainers. $2.00. Jim Waterman, 3818 Deerfield Dr., San Antonio, Texas 78218.

WANTED: Hasegawa metal model kit of the "Clerget Rotary Engine." Call or write Richard Tabler Jr., 24 Thorndike St., Arlington, Massachusetts 02174. (617)641-1089.

RAZOR BLADES, SINGLE EDGE, carbon steel, first industrial quality. $5.00 per hundred plus 10% shipping. COBBIE'S, RR 2, Box 454-A, Staunton, Virginia 24401. (703)885-8036.

"BEAN ROCKS" by WILLAIRCO, $6.95 per dozen. Beginners, roll-your-own, duration rockets for jet models and matching kits (U-2, F86K, F84, etc.). Send SASE to WILLAIRCO, P.O. Box 90533, Atlanta, Georgia 30364.

SCALE DOCUMENTATION: Aircraft photos and photo packs, civil, military, warbirds, etc. Detailed close-ups, nose art, unit badges. Catalog $1.50. AirPhoto, Dept. MB, 3 Leelynn Circle, Londonderry, New Hampshire 03053.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649 191st Ave. S.E., Issaquah, Washington 98027.

Randolph Butyrate and Nitrate dope. Twenty-three colors. Three new all-wood control line kits, or plans only. 1950s style kits, complete. Scratch-builders supplies. Send large 45-cent SASE. ABC Hobby Supplies, P.O. Box 2391 Clarksville, Indiana 47131.

MAILING LIST: Over 300 model manufacturers listed. Use to contact to support your contest, newsletter, etc. List $25.00, $30.00 with mailing labels. Robert Furr, 8147 Read St., Omaha, Nebraska 68122.

ATTENTION INDOOR FLIERS! Fast and powerful motorized rubber band winder. Battery powered. $10 postpaid. Electric Winder, 1441 E. 54th Place, Chicago, Illinois 60615.

WOW! GREAT FLYING ENTERTAINMENT! Rubber powered LIL' DEVIL. Acrobatic or straight flights. Stable in wind. 9-1/2 inch wingspan. Easy stick fuselage. $3.00 for plans and instructions, $10.00 for kit. Guaranteed Wonder Wing Air Works, 184 Madrona Rd., Boulder Creek, California 95006.

AEROINDEX. Comprehensive index to EVERY plan in Model Builder, 1971 to 1988. $4.75 Postpaid. Aeroindex, Box 5124, Hamden, Connecticut 06518.

Model engine builders! Materials, tools, Titan .60 engine kits, display stands. Send SASE for list. Orven Sales, 2050 Christina St., Salem, Oregon 97304.

YOU CAN BUILD Corsairs, P-40 Warhawks, P-51 Mustangs, A6M5 Zeros, Float Planes, Biplanes, Triplanes, and more. All from beer or pop cans. Beautiful and unique models. Brochure $2.00 credited toward plans order. B.C. Air Originals, 725 S. 12th St., Hangar 114, Bismarck, North Dakota 58504, (701)258-7423.

NEW! REARWIN "Cloudster" (send SASE) or $3.00, REFUNDABLE for Catalog/News, accurate/detailed 1930's aircraft plans by Vern E. Clements, 308 Palo Alto Dr., Caldwell, Idaho 83605.

FITZPATRICK ENGINES. The new Fitzpatrick 61-ABC is available and in stock. Please order direct. Highest quality engine in the world. Double ball bearing. Muffler included. Lifetime warranty. $298.00 plus $4.95. S&H Fitzpatrick, 2120 Bentley #303, West L.A., California 90025, (Tel. 213-477-2092.)

INDEX TO ADVERTISERS

plained that the sticks' centering force was too strong. On the JR Century 7 you have to pry open the springs to loosen them up. Once I loosened the springs I found that my hover became a lot less jittery. I believe that stiff stick tension can cause pilot induced oscillation. P.I.O. occurs frequently on models and full-sized helicopters. It simply means the pilot is over-correcting the helicopter's motion.

The Stork certainly passes the crashworthiness test with high marks. The helicopter reassembles quickly and the parts were reasonably priced. What good is an R/C helicopter if it costs an arm and a leg to buy parts and nothing can take a beating? For a frequent crasher like me, this is important. One bit of advice before you start your engine for the first time is to remove your canopy. New engines have a lot of compression; my starter has often slipped on the starting cone and left permanent scars on the canopy.

The autorotation bearing come as standard equipment, and it is the same one as on the Shuttle. With the stock wood blades, the Stork does not have enough rotational inertia for good autorotations (each blade only weighs about 110 grams). I replaced the stock blades with a weighted set from the GMP Legend helicopter. I only used 3/4 of the lead weight that came with the blade, thus each blade weighs 150 grams. Now the Stork does beautiful autos. It now has enough inertia to hover for a second before touchdown, and I can now guarantee nine out of ten times that I can auto it into a four-foot pad. Intermediates will enjoy learning the autorotation maneuver with the Stork. I suggest that every Stork owner use 150 gram weighted blades, as they improve hover and forward flight stability and smoothness. I have tried less weight, but 150 grams seems to be best. Make sure you epoxy the lead weights into the pre-cut slot securely! I have also tried wider chord rotor blades, but they make collective control too sensitive. The weighted, narrow chord GMP Legend blades seem to work best.

The bottom line is, if you are a beginner or an expert looking for a smooth and easy hovering machine with stable and penetrating forward flight performance and sharp, hi-tech looks, then give the GMP Special Edition Stork a try. I like its slick lines and blinding speed. My beginner friends like its smoothness and docility. It does feel similar to an overgrown Shuttle or Concept 30 because they all have a soft, independently flapping main rotor head design. It builds quickly and flies great, does beautiful autos with weighted blades, and it is less expensive than many other helicopters of comparable size. However, please remember that the Stork is designed as a smooth, docile, and fast machine. Piloting a Stork may give you the same feeling as driving a Ferrari at 140 mph. The Stork does have one of the fastest tail rotor responses of any .60 size helicopter, but for hot-dog fliers who want a .60 size machine with super fast roll rate and snappy aerobatic ability, then you are better off with a Legend, Competitor, Cobra, X-Cell, Scout, Champion, or Kalt Omega.

Need technical help? GMP has a telephone hotline to answer all your building and flying questions. Call (818)992-0195.

For more information on the abovementioned products please contact:

- Gorham Model Products, 23961 Craftsman Road, Calabasas, California 91302.
- Futaba Corp. of America, 4 Studebaker, Irvine, California 92718, (714)455-9888.

Anyone in the Southern San Joaquin Valley, California who is interested in indoor flying at the College of the Sequoias' gymnasium, Visalia, contact Chuck Neeley, (209)625-3011 or Dave Hodges, 34337 Road 168, Visalia, California 93291, (209)798-1963.

NOWLEN AERO Peanut Scale Classics: Wright Type A $6.95, Nieuport 11, Deperdussin $10.95, Bristol Scout $13.95, Aerodrome $7.95. $2.00 S & H any size order within U.S., 139 Boardwalk B, Greenbrae, California 94904.

NOTICE: NEW Full-Size Plan prices are now in effect. Send a long, self-addressed envelope for your list of revised plan prices.

MODEL BUILDER

All Full-Size plans purchased from *MODEL BUILDER* Magazine include a reprint of the construction article, if building instructions were part of the article.

SEND TO: MODEL BUILDER PLANS SERVICE
898 W. 16th St., Newport Beach, CA 92663

Minimum order: $10.00

NEW ORDERING INSTRUCTIONS

U.S. orders, including APO and FPO, add 20% of total order for shipping and handling. Overseas orders (includes Canada and Mexico) add 50% of total order. Remit payment by International Money Order or U.S. funds, drawn on U.S. bank. Please, no cash or C.O.D.'s. Mastercard or Visa include card number, expiration date, and signature. Add 5% to credit card orders. California residents add 6% sales tax.

No. 8891 SIMPLEX **$12.50**
Paul Plecan's 1941 F/F design, adapted to R/C. Easy to build and fly. Stu Richmond.

No. 7891 TIGERCAT Mk. II **$15.00**
Very pretty scale-like low-wing sport model. 60" span, .65 4/c. By Bob Benjamin.

No. 7892 STINSON MODEL "U" **$12.00**
Profile scale C/L version of the colorful 1930s airliner for three 1/2A's. By Mike Keville.

No. 1173-O.T. TRENTON TERROR **$8.50**
Gas job from 1938 Flying Aces. Span 72". Simple lines. Designed by Mickey DeAngelis.

No. 6891 SEA FLI XI **$12.50**
Composite foam/fiberglass R/C seaplane for .60 to .90 power. By Francis Reynolds.

No. 1174-O.T. LANZO STICK **$7.50**
Rubber stick winner, '40 Nats. 4-1/2'. Still good in Unlimited. By Phil Bernhardt.

No. 5891 HUMONGOUS SAGE HEN **$21.50**
The ultimate R/C trainer. Big 84" span, .40-.45 power. Bruce Edwards and Al Alman.

No. 589-O.T. G.E. CABINETTE **$7.50**
Cute 36" cabin ship from 1942 M.A.N. originally powered by Atom .09. Frank Ehling.

No. 34891 PRETTY BIRD **$12.00**
Simple, lightly built 58" sport R/C ship for .40-.48 four-strokes. Alex McLeod.

No. 3489-O.T. SUPER STOFER **$6.50**
Half-A version of Harold Stofer's 1939 pylon model. 34" span. By Jose Tellez.

No. 2891 NORD 3202 **$10.00**
Scale model of French primary trainer, for .19 to .25 power. By Ted Schreyer.

No. 2892 1/3 GIPSY MOTH **$25.00**
Plans blown up from original 1/4-scale design by Bill Northrop. Ten-foot span.

No. 289-O.T. ALERT **$10.00**
Very competitive 53" B/C pylon design by Michael LaTorre, from Dec. '42 A.T.

No. 1891 DAYDREAM BIPLANE **$23.00**
A big, easy-flying sport scale designed for a .65 4-stroke. 60" span. Benjamin.

No. 1891-O.T. LI'L MISERY **$7.50**
An interesting fuselage pod-model from '42 with 50" span. By Cohen & Worth.

No. 12881 R/C GUFF **$25.00**
Pioneer R/C aircraft, won '38, '39, '40, '47 Nats, now in Smithsonian. Walt Good.

No. 11881 THE WHISP **$10.00**
Simple R/C hand launch glider for slope or park flying. 49-inch span. By J. Tank.

No. 11881-O.T. CLASS C GLIDER **$7.50**
A Joe Weathers classic-glider design from Flying Aces, 1939. Wingspan is 30 inches.

No. 10881 HAWKER HURRICANE **$17.00**
A control line sport scale for .30 to .40 engines, made of cardboard! C. Felton.

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

Top Gun. . . *Continued from page 25*

Frank will have it ready for the season.

Mario Yederlinic never did get his Hurricane airborne, even though he tried on three of the rounds.

When the smoke cleared, Bob Fiorenze, with his magnificent ducted fan F-18, handily earned the title of "Top Gun." Bob elected not to fly the third round as he felt that because of the lack of wind, the 450 foot runway was marginal and he didn't want to risk the model. Bob also won a trophy for the highest flight score. It was obvious that the crowd *and* judges liked the airplane. It is large, flashy, makes lots of noise and Bob is a master at presenting a superb flight demonstration.

Second place went to Neil Snodgrass with his Special. This is a 1/4-scale model of a 1964 modification of a Piper Super Cub rebuilt for aerobatic competition. In fact, it doesn't look anything like a Cub as the plane was modified to a mid-wing configuration. Neil did a superb job in building and flying this machine.

Third place went to Skip Mast and his venerable C-130.

Frank Tiano was the instigator and promoter of this event and it was obvious that he had done his homework. Prizes were in the form of not only trophies and merchandise, but cash as well. Because this was the first event, there were a few rough spots to iron out. All in all, it was a good contest and should shape up into a premier event as time goes on.

One last thought: Why not Top Gun judges for the Top Gun competitors? •

Fans. . . . . *Continued from page 17*

learned? 1) Fly higher and always turn into the wind at the end of each pass; 2) Learn to use less than full throttle; and 3) Wherever possible, close couple all controls. My rebuilt Mirage (now with scale wings) employs individual servos to each elevator and a single servo set in the wing root. Additionally I have a direct coupled throttle servo. No rudder control exists since ground steering is achieved through a servo mounted on the drop-off dolly. This model is an excellent but extremely fast flyer and has been re-engined with a K&B 7.5 to replace the original O.S. .46, the blow being provided by a Thorjet 45 fan unit. Weighing in at 7.5 pounds, the model should give a spritely performance.

Crash No. 2, Woodvale International Rally: exit my pride and joy, my F-20 Tigershark in front of 6,000 people. Cause of crash? Lack of elevator response in a high-speed turn. Reasons? Twofold. Once again, the use of cable strakes does cause slight flexing no matter how good an installation is made. When the servo is three feet from the control surface, you're asking for trouble. I must point out that the model had been flown very fast and very successfully on many previous occasions with this arrangement without any suggestion of trouble. The principal culprit on this occasion, however, was my own lack of thoroughness in the preflight checks. For those of you already involved in the competition circuit you will be familiar with the following situation: Arrive at 7:30 a.m (a bag of nerves), register model, hand in transmitter, await flight slot (in my case 2:30 p.m.), call to the flight line at 2:00 p.m. and wait, nerves deteriorating by the minute. Transmitter is handed over as the previous competitor lands. Preoccupied with concern over getting the engine started, I never checked the rate switches, and guess what? They had been accidentally knocked into the low setting, which I had never used. The F-20 had been flight tested and trimmed on one set of control movements. On low rate there was hardly any throw. We earned minimum marks for a superb takeoff and none for the subsequent nose-first landing on the second turn—how humiliating. Lessons? Once again, close couple all control surfaces and write down and rigidly adhere to a tried and tested preflight check list, and if you are the type who suffers from embarrassment, don't fly in front of a crowd, especially if you have to thread your way through that crowd with an armful of balsa fragments to get to your car. Once again the F-20 has been repaired.

The third and final crash of the year occurred at Wroughton when we damaged a superb scratch-built F9F8 Cougar. Once again the main culprit was the weather, the wind being both gusty and strong. However, many other fan flyers flew throughout the day with no problems, so the real and admitted reason was engine unreliability. I had rushed to repair the Cougar loaned to me by my friend Mike, and hastily fitted my normally reliable O.S. .46/Turbax combination. You guessed it, we never had a chance to set up the unit in the model prior to the event, and try as we could we were unable under the less than ideal weather conditions to establish 100% reliability.

The engine cut while in the air with several other models flying and well upwind. It had stalled at six feet of altitude before we could make any effective decisions on recovery and the model cartwheeled in the long grass, incurring some repairable damage. Lessons learned here are *never* fly with an unreliable power unit, if possible don't fly with too many airborne models for company (it's difficult to hear your own engine), and although you can look forward to an event for many weeks, be prudent when it comes to making decisions with regard to the weather. If in doubt, don't fly.

I'm sure every one of the preceding problems has been experienced by you all at one time and another. Mine cost me several months of repair time which has delayed my other projects and at the end of the day left me as a mere spectator when others happily screamed around the sky. I make no mention of the additional costs and lost time pursuing repairs. One of the few areas of our hobby where I am reasonably proficient is repair work. It's a boast I am not proud of. If you practice anything often enough you eventually become good at it. I wish I had swapped the experience and listened to the preceding advice. Perhaps I would now have some of the half-finished projects I have littering my workshop up and flying.

So what does the season hold for us this year? I think that the popularity of fan flying is spreading rapidly. I know of at least four new converts in my own club. Several of my telephone friends have kept me abreast of their own developments. Alex Cornish-Trestrail, the guru of fan flying over here, has almost completed his Mig-29 Fulcrum, designed around his highly successful O.S. .25/Kress fans which proved so reliable throughout last year in his highly acclaimed F-15 Eagle. At the other end of the scale, Chris Gould of Concorde fame has test flown his giant Partenavia Tornado powered by twin Byrojet/Rossi .81s. The model has an 85-inch wingspan and a wing loading of 60 ounces per square foot. The aircraft has flown successfully and I can't wait to see this one perform. Chris hasn't missed yet and can always be relied upon to bring something different. His foam and brown paper Concorde is positively spectacular in the air.

John Richards finally sorted out his SAAB Gripen and received deserved congratulations when he demonstrated it in front of a mixed American and British audience at R.A.F. Woodbridge last September. I look forward to seeing this highly technical model again this year.

Reg Smith never fails to please, and several of us who saw the unfortunate demise of his TSR2 implored him to repair it—I hope he will not disappoint us. His Foxbat no doubt will be making many more flights this season along with his excellent F-8 Crusader. It's about time the Thorpe Brothers came up with another prototype since there will be a waiting list of customers for their excellent plans.

As time goes by the list of suitable prototypes is constantly extending, with a personal favorite of mine, the Lightning, nearing completion in the skillful hands of Phil Boyden. The model uses the moldings prepared several years back by Peter Nye, who himself is developing his new enlarged BAE Hawk to compliment the excellent carbon fiber molded Panther which pleased everybody last year. Peter designs around the O.S. .77 and Dynamax system and it's a pleasure to see his pilot, Bob Ryan, using only 1/2 throttle for the majority of his flying and still turning in a fair turn of speed. This ability to fly on half power is a function of good design and reliable and adequate power output. Two important spinoffs to this are long plug life and lower noise levels. I think that is worthy of serious consideration.

Gerry Jackman, the pioneer of miniature gas turbine development, will be on the circuit this year, and while he appeared with his "Bar Jay" model at Abingdon last year, he did not fly but pleased the appreciative crowd with two very impressive engine runs. Gerry is currently in the process of constructing two new engines and was pleased to hear of the parallel U.S. developments.

For my own part, I'm pinning my hopes on my X-29, now almost ready for test flying. I only wish I could build more quickly. Many other modelers I know have spent the long winter months constructing new and exciting models mostly using traditional methods, and I intend to cover their activities on film and in prose as the season progresses. I think this year's events will once again prove the ingenuity of the individual and produce some spectacular flying. It's nice to know that this same situation will also occur simultaneously in many countries around the globe, and in anticipation of the forthcoming season I wish you all safe and satisfying flying. •

Workbench. . *Continued from page 11*

As it was too late to retract the identity request, it wasn't long after the June issue appeared that answers began pouring in, many including photo copies of book and magazine articles about the Golden 1930's Era of aviation racing in the USA. We certainly want to thank all of you who took the time, trouble, and expense to respond to our request. We'll try not to be so trigger happy the next time a puzzler comes along.

However, we do have another question, of a model building nature this time, and will offer a repairing tip as advance payment.

WHAT IT'S ALL ABOUT

First the repairing tip. Free flighters who read club newsletters may have already read this, but there are lots of others who probably haven't. It first appeared (I believe) in the "Satelite," edited by Ralph Prey for the San Valeers FF club, San Fernando Valley area, Los Angeles, California. Ralph explained that during the Las Vegas VAMPS Annual he suffered a tear in the silk on the wing of his Lucky Lindy 800 Nostalgia model, about two inches long, and then another half inch at a right angle, forming an "L" shaped tear. Sal Taibi came by as Ralph was lamenting his problem and said, "Oh that's no problem. Here, let me show you how to fix that." He cut a piece of Saran Wrap a little larger than the "wound" and then applied cellulose glue, like Ambroid, along the torn edges. Next he laid the Saran Wrap on top of the entire "L" shaped tear. The part of the tear that usually curls as a result of the tear sucked right up against the Saran and the glue spread out evenly over the entire two sides of the tear. Sal then gently pulled the Saran tight in all directions while the silk tear held itself tightly up against the Saran. "There," said Sal, "Leave it there until it's dry, then pull the Saran off the tear."

Ralph impatiently waited until the glue

dried, which didn't really take too long in that dry Las Vegas air. When he removed the Saran, the repair was perfect . . . no gaps, no curls, and you could hardly see where it had been torn. Sal's final comment was, "Don't throw the Saran Wrap away. You can use it over again!"

Okay . . . payment in advance, courtesy of Sal Taibi and Ralph Prey. Now the question. I have some old free flights on which the tissue is long gone, except, of course, where it was attached to the balsa frame with dope. To mention a few, there's an Earl Stahl's "Hurricane," a Wally Simmers' "Dyna-Mo," and a V-Tail "Thermic 50," all built before WW-II, but still in good condition (except for the covering) . . . Oh, also a Berkeley Musketeer B, built in 1946 just a few months after military discharge.

My question, Mr. Anthony, how can I remove that hardened covering without damaging the framework? I've tried soaking areas in thinner for short and long periods (not very long, as the thinner evaporates so fast). Sanding with something course and strong enough to cut the doped paper is risking damage to the wood underneath. I once heard of sealing the framework in a plastic dry cleaner bag with an open can of thinner, and leaving it for 12 to 24 hours, but haven't tried it yet.

HELP!!

CORRECT COMBAT

Old flying buddy and former fellow member of the Delaware R/C Club, Bill Lehn, wrote in to comment on R/C Combat, as mentioned in our May '89 column. Bill says their AMA Show team, the Buckeye Aero Squadron, has been flying combat for many years, as part of their show. They use a one-of-kind aircraft called the Combox for this display, and for safety reasons, throttle is a required control function. As Bill points out, an aircraft with two ounces of fuel aboard that has suffered a hit early in its flight and with no means of killing the engine, could be a very uncontrollable lethal weapon, and we have to agree. To the group in Jasonville, Indiana, which is planning an R/C Combat championships in October, we strongly urge you to revise your aircraft specs to require the inclusion of throttle control!

THINGS TO DO

An all electric fly-in will be held at the Tammany Aero Club field, Goodbee, Louisiana, located across Lake Pontchartrain from New Orleans, on September 30 and October 1, 1989, sponsored by the Tammany Aero Club. There will be fun flying, a scale event, demonstration flights, workshops, swap shop, prizes, Cajun cookout, etc. For more information and registration, contact Boyd O'Brien, P.O. Box 7153, Metairie, Louisiana 70010, phone (504)835-5212, or Ben Mathews, 101 Mulberry Dr., Metairie, Louisiana 70005, phone (504)833-5589.

PSSST NEWSLETTER

Roger L. Wathen Sr., 3242 N. DeQuincy St., Indianapolis, Indiana 46218, has taken on the task of pulling together all U.S. modelers interested in Jetex power. Into his third year, Roger has been publishing a newsletter called the "Pssst Off Sheet," which contains letters, comments, sketches, plans, ideas, etc., all related to Jetex power. Roger presented us with a copy of No. 13, which also includes a list of new subscribers. Among the 43 names listed are quite a few who are well known and active modelers. If you'd like to get in on the psssting, send Roger eight bucks for six issues. If you're in Canada, send nine, and if you're overseas from the North American continent, send eleven.

IN CLOSING

The following doesn't relate to model building in any way whatsoever and I hope it never does. But apparently Jim Alaback, Editor of the San Diego AERONEERS newsletter "Aero News," and I, have the same warped sense of humor, as he picked up the following from the National City, CA Chamber Newsletter, and I'm picking it up from him. There's a cartoon of a real grungey hippie couple; he with granny glasses, hair all over his face and head, sandles, rolled up dungarees; she with polka dot slacks, bare feet, stringey hair hanging all over her face and down to her elbows. He's saying, "I'll run over and pick up my unemployment check, food stamps, job training and placement check, and then run by the university to see what's holding up my federal education grant. Meanwhile, you go to the free clinic to check on your scabies and pick up my new glasses. Then we'll meet at the Federal Building at noon for the mass picketing of the stinking establishment." •

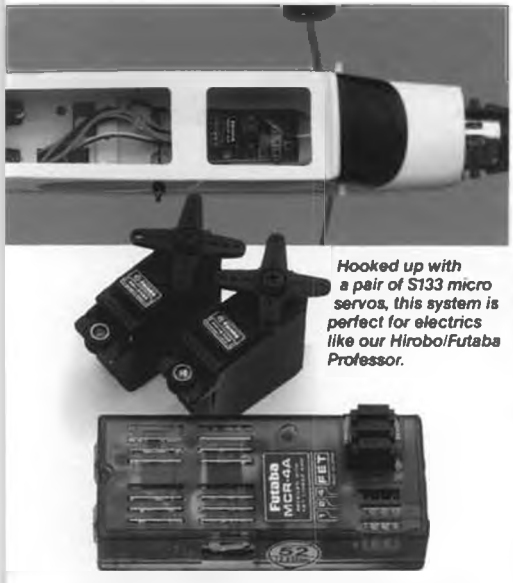
FOUR BY FOUR.

THE ATTACK 4NBL

Our newest 4 channel system has something for everyone. In fact, the Attack 4NBL is such a versatile performer we've customized it for all kinds of radio control fun.

ATTACK ELECTRIC

The 4NBL/MCR system is destined to become a favorite with electric flyers. This Attack system comes complete with our new MCR-4A integrated receiver/speed control. This remarkable device incorporated a four channel receiver and a MOSFET speed control into one very compact, very light and very efficient package. It also incorporates BEC to eliminate the need for, and extra weight of, a receiver battery.



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

The MCR-4A four channel receiver/MOSFET speed control weighs just 1.5 oz. and can easily handle 280 to 540 size electric motors. 1.24" x 2.92" x 0.63".

SILENT ATTACK

There's a 4NBL system for sailplane flyers, too. With the Attack glider package you get a pair of S133 servos, R114H four channel receiver and a 250mAh NiCd pack. Again, when size and weight of the airborne package is critical, Attack is the answer.

Transmitter/T4NBL				
RECEIVER	SERVOS	BATTERY	FREQUENCY	TYPE
MCR-4A	S133(2)	BEC	72MHz	Electrics
R114H	S133(2)	NR-4K	72MHz	Sailplanes
R114H	S148(3)	Dry Case	72MHz	Aircraft
R114H	S148(3)	Dry Case	75MHz	Truck/Boat

ARF ATTACK

Looking for the perfect system for ARF and conventional sport aircraft? Once again, it's Attack to the rescue with a high value package including R114H receiver and three S148 servos.

4X4 ATTACK

There's even a surface Attack 4NBL system on 75MHz. Supplied with three S148 servos and R114H receiver, this ground and sea outfit has what it takes for gearbox-equipped 4x4's and RC boats.

The ergonomically designed T4NBL transmitter features comfort contoured case and adjustable length control sticks.

No matter which 4NBL system you choose, you'll also get our new four channel Attack transmitter.

Loaded with extras like adjustable stick gimbals, servo reverse switches and a rechargeable NiCd pack, the T4NBL transmitter also features a comfort contoured case and neck-strap for fatigue free operation.

Futaba.

Futaba Corporation of America
4 Studebaker/Irvine, CA 92718
714-455-9888

Now you don't have to settle for anything less than MRC

Performance features you'd expect from MRC at a price you wouldn't.

It's remarkable that you can buy these systems with an abundance of performance features at this price. It's even more remarkable that they come from MRC...the people who know R/C cars, the company that puts reliability and high technology into everything they design. Now it all comes together in a pair of two channel radios for car or boat that offer the quality and performance you'd expect from MRC...at a price you wouldn't.

MRC's two channel dual stick radio at remarkable pricing.

Top Gun, MRC's two channel wheel unit with advanced high tech features.

See them at your hobby dealer.

MRC™

Model Rectifier Corporation
2500 Woodbridge Ave.
Edison, N.J. 08817