

DECEMBER 1992

\$1.95



**EXPERIENCE
HOME
THEATER**
Upgrade Your
Present TV
To A Total
Entertainment
System

Popular Mechanics

STEALTH DESTROYER

The New Face Of Naval Power
For The Next Century

SPECIAL REPORT

IMPORT CAR BUYERS GUIDE

- New Models
- Specs
- Features
- Drive Reports

**BEST OF THE
BEST NEW TOOLS**
Slick And Clever
Hardware That Makes
Shopwork A Breeze



12



RANGER
2.3L

And Will Keep You Up Nights.



This is no ordinary baby. It's the rebirth of

America's favorite compact pickup. Ford Ranger.

THE NEW

193 beautiful new inches of steel. 3,516 lbs.* of Ford tough muscle. It can be powered by an available 4.0 liter V-6 and moves into 4-wheel

1993

drive at the touch-of-a-button. Ranger has a wider stance

as well as improved steering.

Inside, Ranger's good looks continue with a host of refinements. And the roomy SuperCab helps make travel and storage a breeze.

No matter where you're headed,

FORD RANGER.

the new 1993 Ford Ranger is so much fun, this beautiful baby will be sure to keep you up nights.



THE BEST-SELLING AMERICAN TRUCKS
ARE BUILT FORD TOUGH.

*Weight/length for vehicle shown.
Buckle up—together we can save lives.



**Announcing Our
Newest Bundle Of Joy.**

193 Inches

3,516 lbs. 2 oz.



December 1992

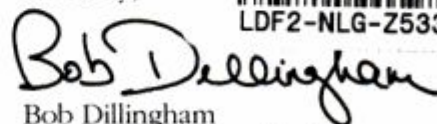
Dear Friends of **Popular Mechanics**:

Popular Mechanics has valued the importance of reader involvement for the past 90 years. This is evident as we bring our 90th Anniversary Year to a close and reflect on some of **Popular Mechanics** greatest accomplishments.

- **PM** kicked off its 90th year in January with a "Learn To Fly Contest." The winner, from over 8,000 respondents, received complete training at a participating flight school.
- In February, **PM** celebrated America's Enthusiasm for Technology with a major "Possible Dreams" exhibition at the world famous Ford Museum. This exhibit runs through January 1994.
- The All-American Mall Tour which started the weekend of March 20, gave our advertisers and readers the opportunity to interact one-on-one, as shoppers picked up samples and viewed demonstrations of products featured in **PM**.
- **PM** confirmed its dedication to auto racing by sponsoring the Archer Brothers Race Team in the Trans-Am Series, which began in May and consisted of 15 races throughout the year.
- **PM** was honored for its 90 years of excellent editorial content and adherence to the magazines mission on June 17, when we received MagazineWeek's Editorial Excellence Award in the men's lifestyle category.
- Wal-Mart acknowledged **PM's** authority in home improvement in July when they licensed the **Popular Mechanics** name for a new private-label hardware program.
- In early November, **PM** participated in the APAA show and gave away a car similar to that which the Archer Brothers raced.
- Mid-November saw the birth of the first **Popular Mechanics Car and Truck Buyers Guide**, which is on the newsstands as you read this.
- This month **Popular Mechanics** will conduct its first focus groups utilizing the recently formed Reader Opinion Panel, consisting of 3,014 Must-Know readers from a response base of over 12,000.

I look forward to you joining us for another year of success as **PM** continues to enhance its interaction with its readers and supporters in the advertising community.

Sincerely,



Bob Dillingham
Vice President & Publisher



LDF2-NLG-2533



CREATIVE PHOTOGRAPHY 105R

If you are looking for a compact 35mm camera simple enough to be used as a "point-and-shoot" yet versatile enough to emulate SLR performance in complex photography, you are looking for the Pentax IQZoom 105R.

With features that include two macro settings, exposure compensation, multiple-exposure setting, time-lapse shooting, bulb timer, multiframe self-timer, and 38-105mm zoom lens, remarkable artistic results are yours to capture.

There is a reason the Pentax IQZoom 105R is the best selling camera in its category: it is the best.

PENTAX CORPORATION
35 Inverness Drive East
Englewood, CO 80112



Actual in-camera double exposure photo taken with the Pentax IQZoom 105R. Flowers photographed using the macro feature from 3'2" at full 105mm setting. Model photographed at 75mm setting using multiple exposure feature.

For best results use Kodak film.



PENTAX

Manufacturing and Servicing Fine Cameras • Lenses • Binoculars • Monoculars • Video

Материал, защищенный авторским правом

Popular[®] Mechanics

DECEMBER 1992
VOLUME 169
NO. 12

54



PHOTO BY DOCK KELLEY

32 COVER STORY

HOME IMPROVEMENT

69 Home And Shop Journal

- **Shop Project:** Anniversary bookcase
- **Tool Test:** Skill scroll saw
- **Restoration:** Preservation briefs
- **New Products:** Hardware show
- **Home Improvement:** Selecting caulk and carpet buying, plus much more

78 Homeowners Clinic Home maintenance Q&A

84 Appliance Clinic Answers to fix-it questions.

SCIENCE/TECHNOLOGY

21 Tech Update

- Drones that shoot down missiles
- New government effort revives Maglev
- Gas-powered launch tube aims for space
- NASA's rockets carry piggyback experiments

32 COVER STORY: Navy's Newest

The *Arleigh Burke* is the state-of-the-art warship.

100 Science A solar surprise from out of the blue.

ELECTRONICS

37 Home Theater

Update your TV into an entertainment center.

112 Electronics A camera for your eyes only.

120 Home Video

TV/VCR combos are getting more popular.

PM's 90th ANNIVERSARY

52 Possible Dreams America's hopes for the future.

118 PM's Senior Subscriber He's been subscribing for 58 years straight!

AUTOMOBILES

48 How To Restore An Old Car

Part 5: Wiring And Final Trim

Our '67 Camaro begins to come together.

54 Special Section: Imports '93

● New Car Buyers Guide

The same old story—more power, more luxury.

● Inside The Imports

New engines take center stage.

102 Corvette Museum A gallery of greatness for America's favorite sports car.

104 Detroit Spy Report The '94 Olds, yes Olds, Aurora. Plus, new pickups from Dodge and Chevy.

108 Alternate Fuel Report:

Ethanol-Fueled Chevy Lumina Farmers grow a new supply of this fuel every year.

110 Motorsports A second-place finish as the series winds down.

AVIATION

114 Flying The Tiger An updated Tiger brings some fun to the entry-level marketplace.

OUTDOORS

44 Adventure: Mississippi River Run

Take one bass boat, add a big outboard and a PM editor, and go for it.

98 Outdoors Workhorse ATVs.

DEPARTMENTS

4 Editor's Notes

8 Letters

16 Time Machine

138 Coming Next Month

EDITOR'S NOTES

● After spending two days on the Navy's newest ship, the USS *Arleigh Burke*, Science/Technology Editor Abe Dane came back with a renewed appreciation of military technology. "This ship is absolutely state of the art," Dane said. "It has everything the Navy knows how to put on a ship to make it stealthy and deadly." With an endorsement like that, we had to make it this month's cover story, which you'll find beginning on page 32. We found the stealth technology most interesting. And while it's still not possible to make a huge warship invisible to enemy radar, the *Arleigh Burke* goes a long way toward making this situation a reality. I think you'll find Dane's firsthand report most interesting. . . . It's getting harder and harder to define the term "imported car." Hondas are made in Ohio, Toyotas are made in Kentucky, Mazdas in Michigan, Isuzus in Indiana, Pontiacs in South Korea and Buicks and Fords in Mexico. So what's an import? With that said, we present our annual guide to all the new "imported" cars, even though some of them are made in the good old U.S. of A. Yes, we admit it's confusing and some people will never consider a Toyota made in Georgetown, Kentucky, to be a "domestic" car. We hope you find the information, beginning on page 54, interesting nonetheless, politics notwithstanding. . . . At first, it sounded like a glamorous, almost dream, assignment to our Boating/Outdoors Editor, Joe Skorupa. Get one of the new bass boats, I said, hook up a mother of an outboard, grab some clothes, a buddy and a camera and



Youngs and Skorupa attack the Mighty Mississippi.

attack the Mighty Mississippi. He'd made some hair-raising runs before in the pages of PM—up the Intracoastal Waterway, from Death Valley to Pikes Peak and to the Yukon among others—and this one seemed almost tame by comparison. But as thousands have learned before him, you should never underestimate the power of the Mississippi River. Skorupa and contributor Jim Youngs made it, all right, but Skorupa conceded later it was one of the toughest assignments he's ever had. To find out why, check out his report beginning on page 44. . . . To all of you who answered my challenge to find PM's longest continuous subscriber, a hearty thank you. I had a great time reading your letters, talking to you on the phone and visiting with many of you personally. But unless you're Clarence Atwood from Wolcott, Connecticut, you're not our winner. See page 118 for more on our most senior subscribers. Till next time.


Joe Oldham

Popular Mechanics

Editor-In-Chief Joe Oldham

Home Improvement

Editor Steven Willson
Associate Editor Thomas Klenck
Assistant Editor Roy Berendsohn
Contributing Editors Norman Becker
Rosario Capotosto
Steve Toth

Boating/Outdoors

Editor Joe Skorupa
Contributing Editor John Wooldridge

Automotive

Editor Tony Swan
Detroit Editor Jim Dunne
Associate Editor Mike Allen
Contributing Editors Don Chaikin
Michael Lamm
Rich Taylor
Rick Titus

Science/Technology

Editor Abe Dane

Electronics/Photography

Editor Frank Vizard
Contributing Editor Stephen A. Booth

Art Department

Graphics Director Bryan Canniff
Sr. Assoc. Art Director Alan Andresen
Associate Art Directors Tom Kane
Suzanne McCreight

Editorial Production

Managing Editor/Prod. Deborah Frank
Art Editor John Bostonian Jr.
Production Editor Robin LaSalle
Art Assistant Nancy Coggins
Asst. Production Editor Kim Cheney

Editorial Administration

Administrative Asst. Josephine Caronia
Asst. to the Editor Barbara A. Novak

Reader Service Department

Manager Norah I. Golad

Editorial Offices

224 West 57 St.,
New York, NY 10019

We cannot be responsible for loss of unsolicited queries, manuscripts, or photos. For return, they must be accompanied by adequate postage.

SUBSCRIPTION SERVICE: Popular Mechanics Magazine will, upon receipt from its reader of a complete new or renewal subscription order, undertake fulfillment of that order so as to provide the first-copy delivery either to the Postal Service or alternate carriers within six to twelve weeks. If for some reason this cannot be done, you will be promptly notified of the issue date that will begin your subscription, with a request for any further instructions you may have concerning your order. Please address all such orders to us at Popular Mechanics, P.O. Box 7170, Red Oak, IA 51591. • Should you have any problem with your subscription, please write Joan Harris, Customer Service Department, Popular Mechanics, P.O. Box 7170, Red Oak, IA 51591 or call toll-free 1-800-333-6948. Please enclose your mailing label when writing to us or renewing your subscription • Subscription prices: United States and possessions, \$15.94 for one year; \$29.94 for two years. Canada and all other countries add \$16.00 for each year.

Use this address for subscription orders & inquiries. POPULAR MECHANICS, P.O. Box 7170, Red Oak, IA 51591.

MAILING LISTS: From time to time we make our subscriber list available to companies who sell goods and services by mail that we believe would interest our readers. If you would rather not receive such mailings, please send your current mailing label or exact copy to: POPULAR MECHANICS, Mail Preference Service, P.O. Box 7024, Red Oak, IA 51591-0024.

AS A SERVICE TO READERS, Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from information published in this magazine.

THE SUCCESSFUL BATTLE IS WAGED FIRST IN THE MIND.

IN ANY CONTEST, SHEER FORCE ALONE WILL NOT ASSURE VICTORY. SUCCESS BELONGS TO THOSE WHO HAVE ALSO MASTERED THE POWER OF THE MIND.

THERE IS A PLACE WHERE YOU CAN DEVELOP YOUR MIND, AS WELL AS YOUR BODY. WHERE THE WISDOM AND TRADITIONS OF OVER 200

YEARS ARE PASSED ON TO THOSE WHO HAVE PROVEN THEY ARE WORTHY.

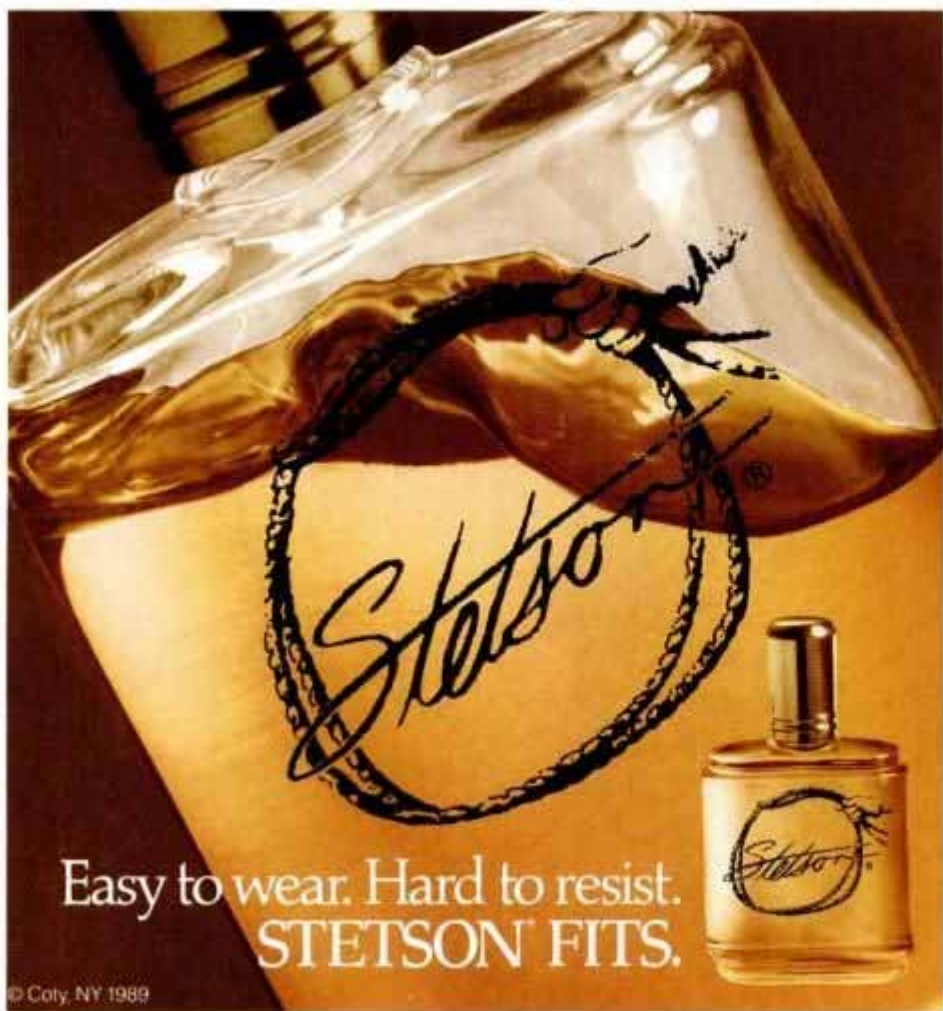
IF YOU THINK YOU'RE READY TO ACCEPT THE CHALLENGE OF BECOMING A UNITED STATES MARINE, MAKE YOUR MOVE.

CALL 1-800-MARINES.



Marines
THE FEW. THE PROUD. THE MARINES.





Easy to wear. Hard to resist.
STETSON FITS.

© Coty, NY 1989

Popular Mechanics

Publisher Robert B. Dillingham

Business Manager Agnes P. Maillaro

ADVERTISING

Director John A. Pagliaro

New York

224 West 57 St., New York, NY 10019

Roger W. Borsett

(212) 649-3140

Michael T. Campbell

(212) 649-3142

Thomas D. Schreckinger

(212) 649-3143

Chicago

1 South Wacker Dr., Chicago, IL 60606

(312) 984-5190

Manager Richard T. Weithas

Rocco A. Smeriglio, Jr.

Detroit

Hearst Magazines Sales, Inc.

2301 West Big Beaver Rd., Troy, MI 48084

(313) 649-2981

Manager D. Craig Rebold

Laurence E. Lantzy

Los Angeles

3000 Ocean Park Blvd., Suite 2008,

Santa Monica, CA 90405

(310) 450-8881

Manager James K. Brink

Atlanta

Collinson and Company, Inc.

4315 Cowan Rd., Tucker, GA 30084

(404) 989-8391

Manager Newton B. Collinson, III

Jonathan M. Kiger

Dallas

Ingersoll, Redding, Kellner & Zeko

16990 Dallas Pkwy., Suite 220, Dallas, TX 75248

(214) 380-0416

Manager Daniel F. Kellner

Dean Zeko

Direct Response

Manager Barbara Jones

(212) 649-3136

Classified

Manager Dorothy Nolan

(212) 649-3167

PRODUCTION

Manager Carole L. Hartman

Adv. Production Mgr. Patricia A. Woods

(212) 649-3164

RESEARCH

Assoc. Director Lisa B. Feinsilver

Published by The Hearst Corporation

FRANK A. BENNACK JR.

President & Chief Executive Officer

RANDOLPH A. HEARST

Chairman

GILBERT C. MAURER

Executive Vice President

& Chief Operating Officer

Hearst Magazines Division

D. CLAEYS BAHRENBURG

President

K. ROBERT BRINK

MARK F. MILLER

Executive Vice Presidents

DANIEL E. ZUCCHI

Senior Vice President

ROBERT B. DILLINGHAM

Vice President for Popular Mechanics

RICHARD E. DEEMS

Publishing Consultant

POPULAR MECHANICS is published monthly by the Hearst Corporation, 169 Eighth Avenue, New York, NY 10019, U.S.A. Frank A. Bennack Jr., President; Randolph A. Hearst, Chairman; Gilbert C. Maurer, Executive Vice President; Victor F. Ganz, Vice President and Secretary; Edwin A. Lewis, Vice President and Treasurer; Hearst Magazines Division: D. Claeys Bahrenburg, President; K. Robert Brink, Executive Vice President; Mark F. Miller, Executive Vice President; Daniel E. Zucchi, Senior Vice President; George J. Green, Executive Vice President; Raymond J. Petersen, Executive Vice President; John A. Rahan Jr., Vice President & Resident Controller; Robert B. Dillingham, Vice President for Popular Mechanics.

MOTORIZED Capsela

SEE HOW IT WORKS!

The Educator approved CAPSELA DISCOVERY SYSTEM entertains kids of all ages while it teaches them basic science concepts and develops critical thinking skills. Within minutes kids snap together the interchangeable parts to create fascinating motorized models and have fun learning what makes cars move, boats float, lights blink, propellers spin and more! Our see-through capsules combined with our "See How It Works" booklet helps kids clearly understand how and why things work. CAPSELA... the HANDS-ON, MINDS-ON way to play!



Accepted by the National Science Teachers Assoc., Washington, D.C.



Available at all fine toy stores

SANYE AMERICA CORP., 450 Harmon Meadow Blvd., Secaucus, N. J. 07094, 201-854-4848

PORTABLE AC POWER PACK

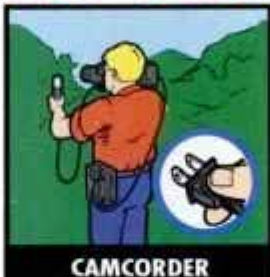
Bonus for orders before the 25th

A • 120 VOLT • AC POWERPACK • TO GO



NOTEBOOK COMPUTER

• Powers 8 w up to 4 hours.*



CAMCORDER

• Powers 6 w up to 5 hours.**



PORTABLE AUDIO

• Powers 4 w up to 8 hours.**

IT'S A • 12 VOLT • DC POWERPACK • TOO



NOTEBOOK PRINTER

• Powers 5 w up to 6 hours.*



CAMCORDER LIGHT

• Powers 5 w up to 6 hours.*



CD PLAYER

• Powers 3 w up to 10 hours.*

*Just plug in, no other adapter needed.

"The best thing that happened to my notebook." —Peter Joel Jakubowski / PE Huntington Beach, CA

AC POWER PACK

120 VOLT • AC • PORTABLE • RECHARGEABLE

AC Module—12 V DC to 120 V AC power inverter. 50 watt continuous power, modified sine wave. Overload and short protection. Weight 3/4 lb, size 1-3/4" X 3" X 7-1/2".

Power Pack Module—Rechargeable up to 1,000 times. 12 volt, 3.0 AH sealed lead acid cell, Recycleable. Overcharge protection, power always ready. Weight. 3 lbs, size 3" X 3" X 7-1/2".

DC Charger—Recharges in vehicle in 1 to 3 hours.

AC Charger—Recharges at home in 4 to 6 hours.

DC Converter—800 mAmp, regulated current. Converts 12 volt DC to 1.5-3-4.5-6-7.5-9 volt DC. 6 plugs, 5.5/2.5, 5.0/2.1, 3.5/1.4, 3.0/1.0, 3.5, & 2.5. For running printer, light, or CD at same time as AC.

Bonus

Optional Solar Charger Kit

Recharges in remote areas in 4 to 6 hours (sunny day). Trickle charges vehicle battery too (sunny day). 15 volt, 6.8 watt, weight. 4.5lb., size 12" X 18" X 1/4".

AC KIT

INCLUDES



**Shoulder Strap and Belt Clip included



To order call toll free:

1-800-955-5014 /Dept. PM2D/24hr.

30 day money back guarantee. 1 year factory limited warranty.

For inquires call 714-241-6800 / M-F / 9-5 / CA time.

For technical info call factory 1-800-544-4124 / M-F / 9-4 / CA time.

PPM Power Products Marketing™

P.O. Box 8999 Fountain Valley, CA 92728-8999

* S & H in continental USA. Extra cost for others. CA residents add tax 7.75%. Allow 1 to 4 weeks for delivery. 2nd day express available. ©1992 PPM



AC Power Pack / AC Kit #06-3232

Valued at \$203.30

Your Price

\$149.95

\$9.95 S&H*

Optional Solar Charger Kit #06-8191

Valued at \$151.44

Your Price

\$99.95

\$9.95 S&H*

LETTERS

You Bet Your Life



I was sorry to see an article about a valuable life-saving tool go so awry. Your article "Life Flight" does a great disservice to thousands of dedicated EMT-paramedics across the country. While the Life Flight helo, and others like it, are a great help, they are only a *part* of the Emergency Medical System. Paramedics who serve on fire department and private ambulances are also an integral part of the system. Contrary to what Dr. Carter has stated, we are able to do much more than "get you to the hospital with a shattered tibia." We carry, and are trained to use, equipment similar to those used by the Life Flight helo, including 23 medications. Paramedics care for patients with everything from an upset stomach and broken ankles to cardiac arrest and major traumas. Your cover picture shows a neatly packaged patient waiting for the helicopter to arrive. Who did this? This is the work we do, and the helo aids us by reducing the transport time to the hospital for critical patients. Emergency medicine is a joint effort between doc-

tors, nurses and paramedics. Articles like "Life Flight" do nothing more than glorify one aspect of this system at the expense of the others.

J. FLORY

FIREFIGHTER/PARAMEDIC
ROSELLE, IL

Jay Carter's statement is an outrageous affront to every skilled paramedic in the United States. Dr. Carter obviously has not been associated with skilled paramedics or simply does not appreciate their skills. About 95% of the more than 200 air medical services in the U.S. have a paramedic and a nurse on board instead of a physician. A paramedic is able to treat any heart arrhythmia or any serious problem that arises as well as a physician in the pre-hospital setting. Granted paramedics have protocols to operate by, but they also are able to act decisively, instantly and above all in the patient's best interest.

ROBERT W. MELLO

FIREFIGHTER/PARAMEDIC
NEW HOME, TX

Being an 8-year EMT veteran with our local volunteer fire department, I have a real problem with Dr. Carter's statement. Who are the ones who keep the critically injured alive until Life Flight can get to

the scene of an accident? Case in point: Last night we were called to assist a neighboring squad at an accident. A 13-year-old girl was pinned. Cleveland Metro Life Flight was called, but all three helos were already busy. They said it would be 15 to 20 minutes before they could get refueled, restocked and to our location. The girl was finally extricated and transported to the nearest emergency room where Life Flight arrived a few minutes later. We do more than transport "shattered tibias."

MELANIE TALLMADGE

EMT-A

JEROMESVILLE, OH

Serving as a paramedic in New York City, I know that air ambulances play a critical role in reducing travel time, and that those aboard are not only committed, but courageous as well. What I found shocking in the "Life Flight" article was the suggestion that only a \$3-million flying emergency room can handle critically ill or injured persons, and that EMTs and conventional ambulances are best relegated to transporting broken bones. The glory may be in the air. The reality, though, is that throughout this country, dedicated EMTs and para-

medics, stuck in traffic, do manage to save lives day in and day out.

ALBERT SINGER

PARAMEDIC

NEW YORK, NY

The cover illustrated an accident involving an 18-wheeler and a car. This is a direct and hard blow to the trucking industry. Truckers have a hard enough time with the railroads on their backs and now this. But the damage has already been done.

AARON MILLER

OPELOUSAS, LA

Haven't you jumped to a rather stupid conclusion? Who said the truck caused the accident? Maybe the trucker was the victim of a bad driver in the passenger car of our fictitious scene.

—Ed.

Alternate Fuels

Our vehicle design course team at the University of California, Davis has developed three specific projects—a Human-Powered Vehicle, a Supermileage Vehicle and a Hybrid/Electric Vehicle. We have been particularly successful with our Supermileage Vehicles. Last year, we successfully competed in all three supermileage competitions



Designed by UC Davis students, these Supermileage Vehicles—*Side FX* and *Shamu* (inset)—set a world's record using methanol fuel.

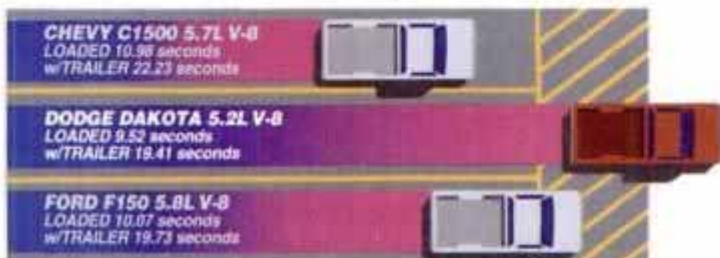
in North America with our two vehicles, *Side FX* and *Shamu*. We won all three competitions, setting an American record of 3313 mpg with gasoline and a world record of 2083 mpg with methanol fuel. Last year's win at the Shell Fuel-
(Please turn to page 10)

Letters are subject to editing for length, style and format.

"Out-powers Ford and Chevy hands down."

- Certified by SCORE International, January 1992

Comparing this Dodge Dakota V-8 to other pickups is easy. There's simply no comparison. Compacts like Ranger and S-10 just can't measure up.



Dodge Dakota 4x2 Club Cab out-paces full-size regular cab pickups 0-60, with 1,150 lbs payload and with 6,040 lbs combined payload and trailer weight.¹

They don't have this Dakota's available payload. Its power. Certainly not the quickness off the line. And we can prove it.

In a whole series of SCORE certified tests, a mid-size Dakota, equipped with a 5.2L

Magnum V-8, flat out-ran the most powerful compacts Ford or Chevy have to offer. Out-accelerating them with loads and without. Even when loaded up with a trailer, too.¹

With that 230 hp power plant pulling for it, Dakota overpowers full-size Ford and Chevy half-tons, as well. Out-running them, empty and loaded. And delivering more horsepower and more available towing than a standard F150 or C1500 pickup.

All in all, it's one very powerful story. Just one more example of how our Magnum engines make Dodge the most powerful line of trucks anywhere.²

Call 1-800-4-A-DODGE
for a free product brochure.



Dodge Dakota LE Club Cab
5.2L Magnum V-8

BUY OR LEASE AT YOUR DODGE DEALER. Buckle up for safety. See limited warranties of dealer, exclusions & restrictions apply.

¹Dakota 4x2 Club Cab out-ran Ford & Chevy compact extended cabs (D60, empty, w/960 lbs payload & w/5,850 lbs combined payload & trailer weight. All trucks equipped with auto. trans. & max. avail. axle ratios. Graph not proportional to test data. ²Overall total combined model scores. All claims and comparisons based on '92 models / data.

a-thon in Toronto, Canada, marks the first American win in this Canadian competition—the largest fuel-economy competition in North America. It was also the first time this competition was won with a Briggs & Stratton lawnmower engine.

BRUCE DUGHI
VEHICLE DESIGN GROUP
UC DAVIS

Regarding electric vehicles, how does the pollution output of internal combustion engines compare to electric? All of today's cars have some type of pollution control. Do they compare to the controls on powerplants and the added burden that would be placed on them? Even operating off-peak, today's powerplants add to air pollution.

DAVID BARKER
DUNSTABLE, MA

Associate Automotive Editor Mike Allen replies: *Not even the EPA has managed to determine if the total energy efficiency and pollution load on the environment from electrical vehicles is better or worse than the best of today's high-mileage, low-pollution cars. Obviously, if the electricity were generated by hydroelectric, solar or wind power, the advantage would go to electrics. Fossil-fuel electric generating plants, probably burning high-sulfur coal from strip mines, are arguably not necessarily a better deal—except for the fact that they shift pollution from high-pollution urban areas like the L.A. basin to somewhere else. Generating electricity the way the French do, mostly with nuclear power, opens another can of worms entirely. The jury is still out on electric/hybrid cars.*

Where They're Made

I enjoyed the piece on Detroit's '93 cars. The chart correctly indicated that Ford Escorts are made in Wayne, Michigan. But many of the Escorts around here are built in Hermosillo, Mexico. Very few people are aware of this, even though it is plainly stated on the sticker.

As a matter of fact, when I was shopping for a subcompact sedan last year, I had narrowed my choice to Escort or Honda Civic. I finally decided to go with the American-built car—the Civic! It has far more domestic content (labor and materials) than the Mexican Escorts.

BOB MURPHY
LOUISVILLE, KY

Four-door sedan and wagon versions of the Ford Escort are made in

IN A CHANGING WORLD,
ONE THING REMAINS ROCK SOLID.

Hermosillo, Mexico. The 2-door coupe and 5-door sedan are made in Wayne, Michigan.

—Ed.

How They're Made

I read with dismay about the "Plastic Pullback" in Detroit Spy Report. I currently own a 1990 Chevrolet Lumina APV and, without qualification, it is the nicest automobile I have ever possessed. It has a versatility that can be matched by few others. Features that attracted me were its plastic body and sleek styling that seems ready to leap into the 21st century. Any pullback in that styling will place the APV into a delivery truck class like the Astro. And sheetmetal for the skin? Ugh. We'll have to worry about rust again.

Why doesn't Chevrolet move the

assembly line in reverse and put plastic on both vehicles, making assembly just as simple. They've given the public something practical and now are reversing themselves. Then they wonder why so many people are buying foreign cars.

NORBERT C. LESLIE
HAMBURG, NY

Cold And Hot Wars

The abundance of articles on military hardware in your magazine is a complete turnoff. Has anyone told your staff that the Cold War is over?

VICTOR GARTNER
GARDNER, MA

Yes, they told our staff. But the word hasn't yet gotten to Saddam Hussein and Moammar Khadafy.

—Ed.

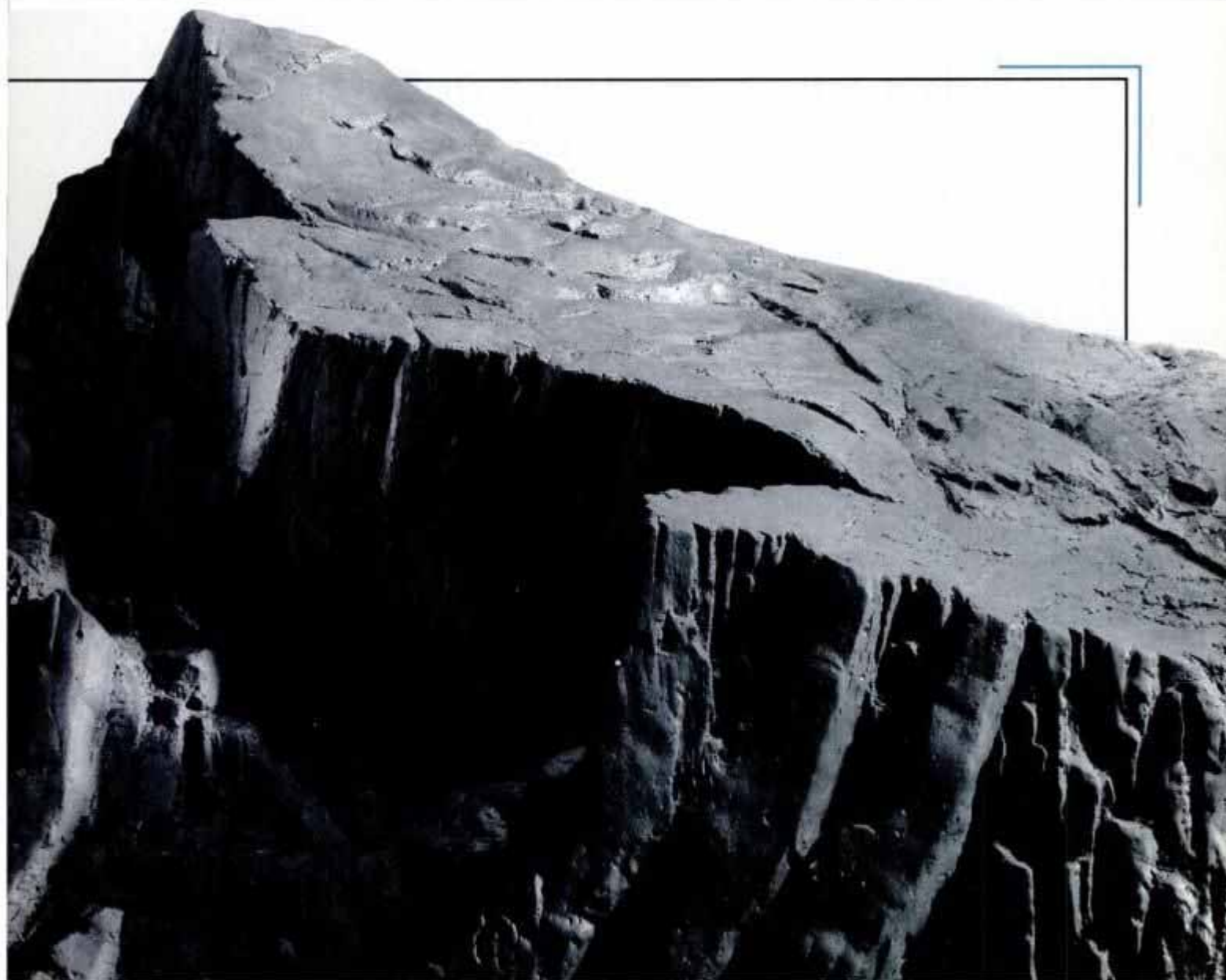
Pipelines

Your mention in Tech Update of using huge bags to carry water from Alaska to California suggests to me that there could be a better way of supplying water to every state in the U.S. All we have to do is build a series of east-west and north-south pipelines about every 50 miles or so, then siphon off excess water from every river in the U.S. when they reach flood stage. The pipes could carry the water to where it was required and it could be stored in deep artificial lakes until it was needed.

HARRY GEORGE FEINSTEIN
NEW HAVEN, CT

Hey, that's a great idea. Why didn't we think of that? Anyone got a spare \$5 billion to build the pipelines?

—Ed.



The financial strength of The Prudential. **Rock Solid.®**

The Prudential 

Материал защищен авторским правом

For those evenings out when
a jacket is required.

Lee presents a jacket designed just for those big nights out. The classic, corduroy collar Lee® Jean Jacket. With a genuine wool blanket liner, a Lee jacket not only keeps you warm, but looking good. A considerable feat, since you don't even have to pick out a tie.

J E A N • J A C K E T



The brand that fits.

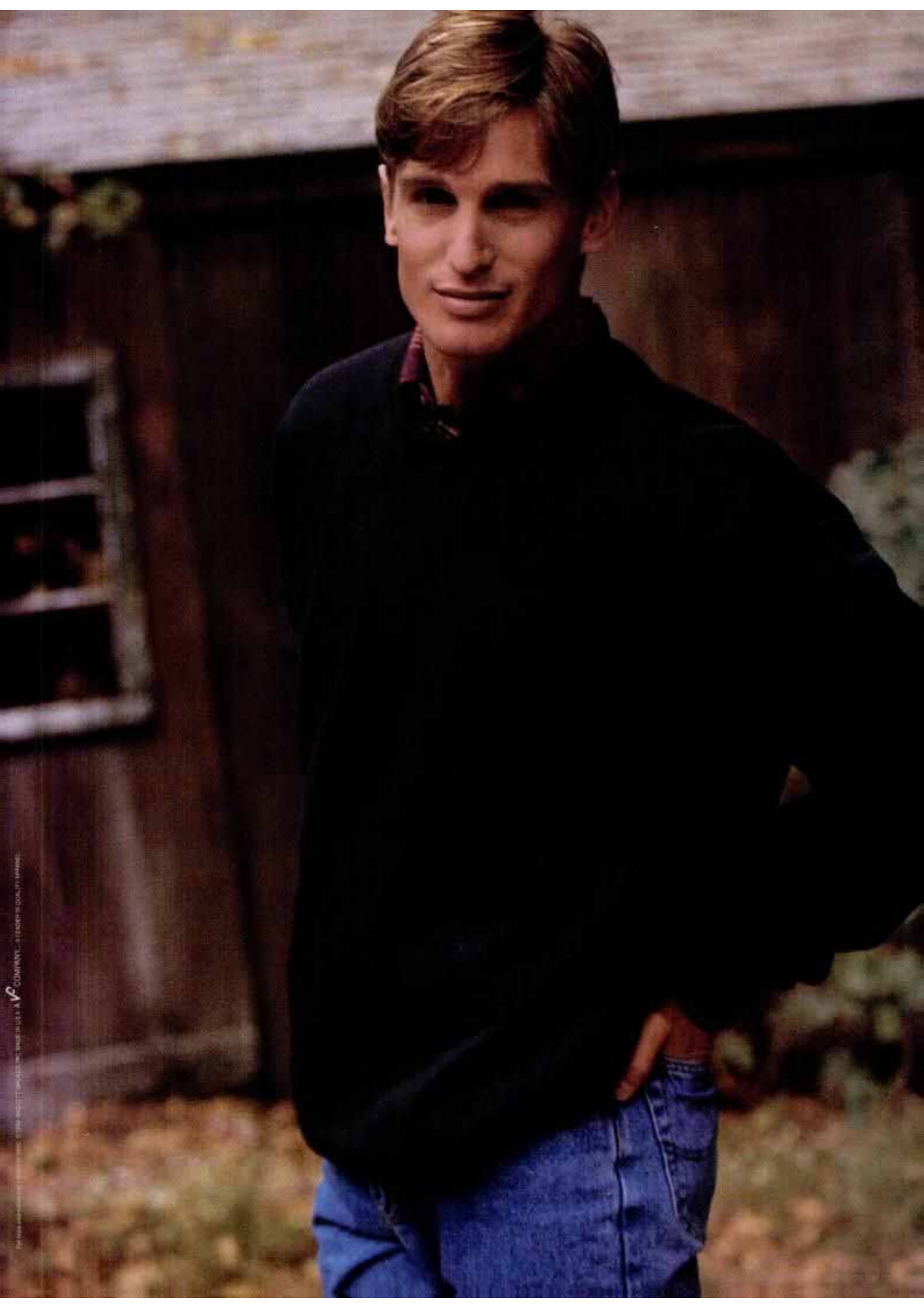
If you really want to take it easy
this weekend, pick cotton.

Lee's new Heavyweight Cotton Sweats make it easier to kick back, relax and make yourself comfortable. They have a higher cotton content so they're not only softer and warmer, but durable enough for hard work or even harder play. So if you want cotton, pick Lee.

H E A V Y W E I G H T • C O T T O N • S W E A T S



The brand that fits.



TIME MACHINE

90 YEARS AGO: DECEMBER 1902

POPULAR MECHANICS

Building Krupp Battleships Under Glass Roof



Keels Of Kiel

Buoyed by a thriving steel industry, Germany launched an all-out naval buildup, much to the alarm of Great Britain. The Krupp steel and armaments empire forged into the business, acquiring the vast shipyards at Kiel. Krupp workers sprang into action to equip new building slips for the coming era of dreadnought-sized battleships. Not only were the slips glassed in for all-weather construction, they featured extensive telephone and electrical networks.

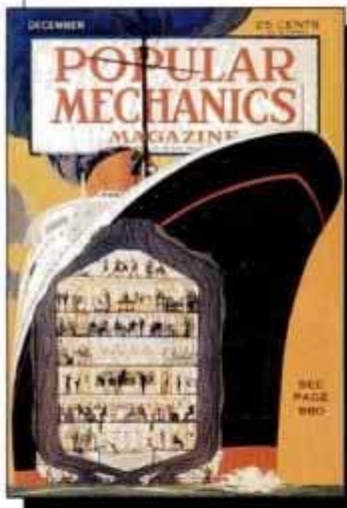


Adios, Amigo

Meanwhile, civilian naval architects were catching up with their automotive brethren, as motorboats approached cars in horsepower and speed. Back then, Amer-

ica's fastest gasoline-fueled launch, *Adios*, hit 24 mph. Built in Brewston, New York, the beamy boat squirted across Lake Onondago on an 8-cylinder engine developing 120 horsepower.

60 YEARS AGO: DECEMBER 1932



Sea Monster

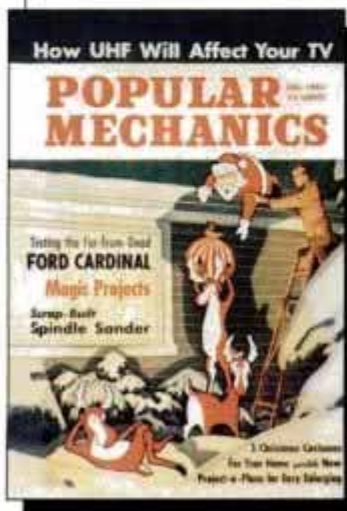
"The largest moving object on this planet has been launched into the sea." Thus we hailed the 79,280-ton oceanliner *Normandie*, then unchristened and known mysteriously as "T-6." Although the hull, with its trademark whaleback bow, was complete, the French took three more years to glitz up the vessel with Versailles-like splendor. Interior dimensions were staggering: The main dining hall, billed as the largest room ever to float, would seat 1000 people.

Vichy Cycle

Of course, the French also displayed their innovative spirit in more modest floating vehicles. The curious cyclometer was a case in point. The amphibious bicycle featured two drum-shaped wheels and four outboard rollers. On land the rollers were raised, but in the water they dropped down to act as stabilizers, keeping the contraption seaworthy.



30 YEARS AGO: DECEMBER 1962



Yule Tools

We detailed a new scheme for do-it-yourselfers to festoon their homes with our Christmas cutouts. Instead of using the grid method, you could simply scissor the patterns out of the magazine, coat them with nail polish and slip them into a standard 35mm slide mount. Then you could project them onto plywood, pull out your saw and starting cutting away. That year's choice of patterns included Santa plunging into your chimney in a *Mercury* space capsule.

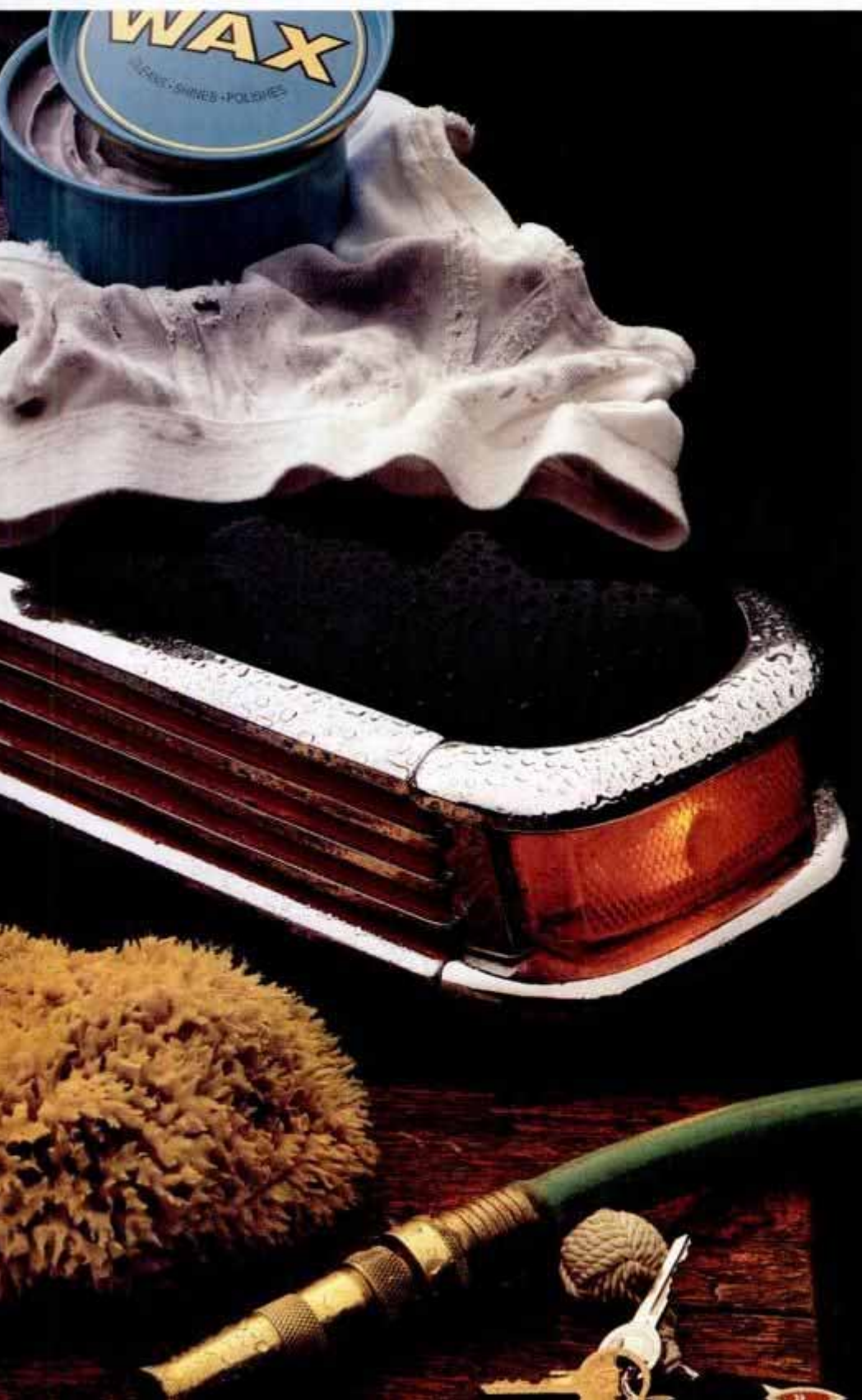
Wing Thing

The wing-in-ground effect, by which a surface-skimming aircraft can boost its lift-to-drag ratio, captivated engineers of the early '60s. Lockheed tinkered with the technology for many years. A proof-of-concept Lockheed watercraft was already hit-

ting speeds of 45 mph. Driven by an outboard engine, the boat skittered across the water on a pair of skis and a 16-ft. wing. Even back then, engineers proposed scaling up to build gigantic transport vessels—an idea that Russian engineers were already pursuing. **PM**



WHAT WILL YOUR UNDERWEAR BE DOING A YEAR FROM NOW?



CHANCES ARE, IF THEY'RE
BVD® UNDERWEAR,
YOU COULD STILL WEAR THEM.

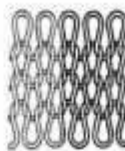
Because our comforts are made to last.

Unlike most of our competitors,
we're picky about cotton.

VERY PICKY.



That's why we **COMB OUR COTTON** so only



the longer fiber remains.

The rest we reject. Then we knit
more of this incredibly soft,

incredibly strong fiber into every square inch
of our briefs, so they'll hold up longer.

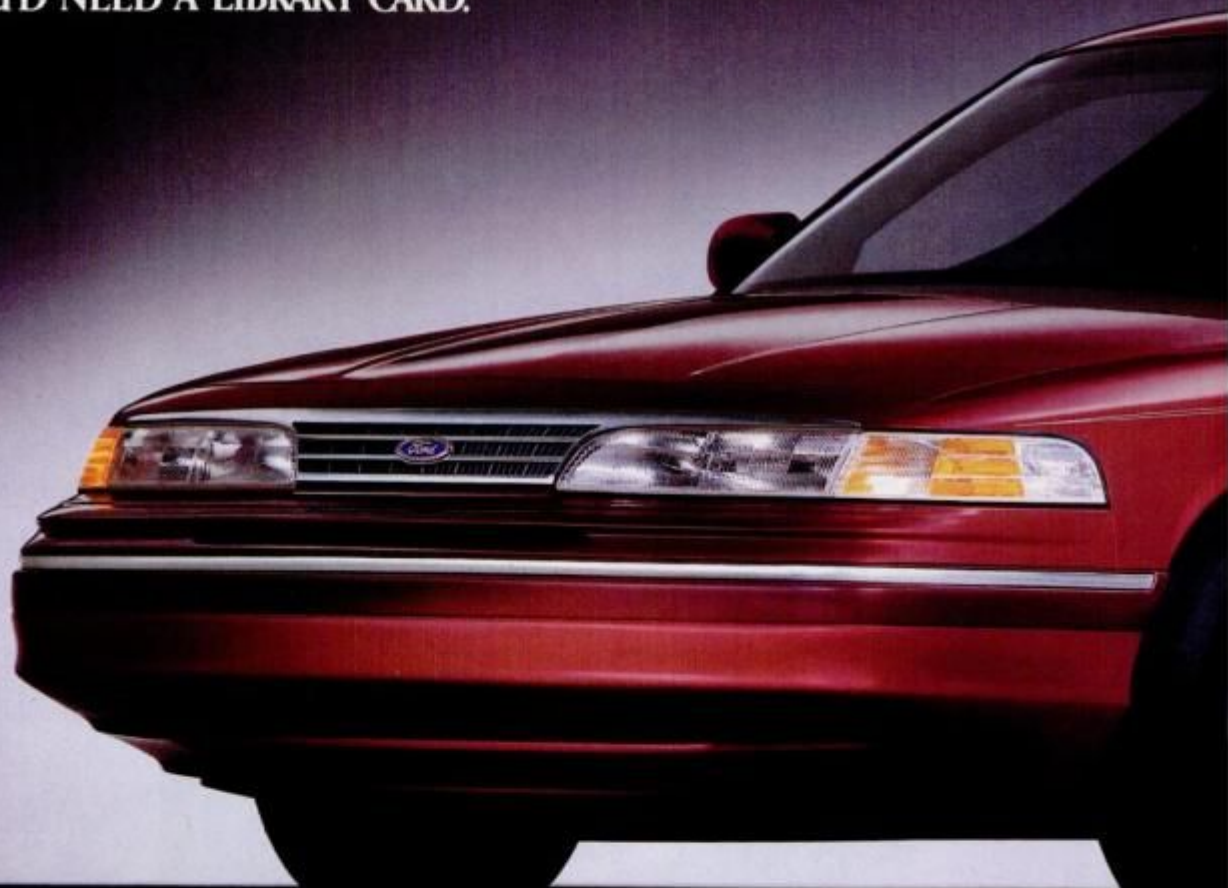
And we **TAILOR ALL OUR SEAMS**
so they'll still be fit and trim when
those others start fraying.



These are just three of the
many reasons you'll enjoy our comforts
long after other underwear have
started second careers
waxing cars.



IF IT WERE ANY QUIETER,
YOU'D NEED A LIBRARY CARD.



FORD CROWN VICTORIA

Unless your job title happens to be "librarian," you're probably not used to spending time in an environment as quiet as the 1993 Ford Crown Victoria. Indeed, a simple turn of the ignition key will tell you that you're inside a

different kind of car. One where silence is golden. And where quality engineering comes through loud and clear.

On the road, Crown Victoria blends contemporary style and deft handling with traditional



room and comfort. And to help keep you secure, Crown Victoria offers a standard driver and available right-front passenger air bag supplemental restraint system. Air bags, in conjunction with properly worn safety belts,

are one of the most effective restraint systems available.

The 1993 Ford Crown Victoria. Now you don't need a library card to immerse yourself in silence.

Buckle up—*together we can save lives.*

**HAVE YOU DRIVEN
A FORD LATELY?**



Not All Rayovac Batteries Are Used In Toys.

The premier flight of the space shuttle Endeavour,
NASA's most successful mission ever.

When the space shuttle Endeavour climbed into the beckoning sky, it carried aloft the ultimate in state-of-the-art technology — including a specially-designed Rayovac battery.

Our advanced engineering made us a natural choice for the mission. That same high technology is yours in all Rayovac batteries. It's there every time you turn on your personal stereo or your kids send a remote control fire truck careening across the carpet on an emergency call. Rayovac turns in one of the best performances on earth or off it.

RAYOVAC[®]

When Performance Really Counts.



TECH UPDATE

News Of Tomorrow's Technology Today



ILLUSTRATION BY MARK MACCANDLISH

Soaring Drone To Shoot Down Ballistic Missiles

HUNTSVILLE, AL—High-altitude unmanned air vehicles are candidates for a variety of jobs, from relaying telecommunications to sampling our tainted stratosphere.

But the Strategic Defense Initiative Organization has drawn up its own role for high-flying drones: heaving high-speed projectiles at Scud-type missiles.

The proposal, as yet unfunded, scales down the Brilliant Pebbles scheme, which stars missile-packing, ICBM-targeting satellites. The idea is to intercept tactical missiles as they rise from their launchers.

While in this boost phase, a missile is easy to track because its rocket burns brightly and the missile itself hasn't

yet released decoys or shed debris. What's more, enemy missiles picked off in boost phase drop warheads on enemy territory.

To accomplish this task, the air vehicle, known as Raptor, would carry a battery of Theater-Application Launch-On-Notice, or Talon, weapons. These kinetic-kill missiles, fired vertically from Raptor's back, would chase down and spear their targets at a speed of Mach 4.

Raptor itself would be a solar-electric vehicle able to stay on station indefinitely.

Rear-echelon commanders would normally control Raptor but it could assume an autonomous operation if hostil-

ities broke out. And if one Raptor fell victim to a surface-to-air missile, another could quickly take its place.

The SDI Organization would like to test-fly some

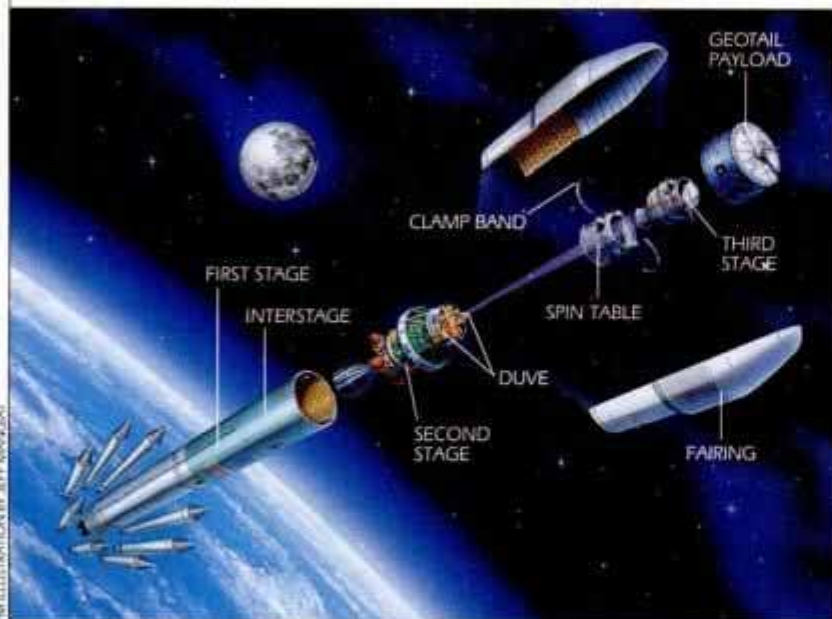
High-flying Raptor volleys kinetic-kill vehicles at Scud missiles in boost phase.

hardware by the end of 1995, first using a turbocharged air-breathing engine.

Highlights This Month

- **Maglev Revival**—Major new government effort to float locomotives.
- **World's Biggest BB Gun**—Gas-powered launch tube aims for space.
- **Robots' Battle Royale**—Top-10 automatons tussle for technical dominance.
- **Space Launch Stowaways**—NASA's rocket stages carry piggyback experiments.
- **Wheeled And Dangerous**—Army's robots can fend for themselves.
- **Radar Brakes**—Grille-mounted antenna to run cars' cruise control.

Editor: Abe Dane
Assistant Editor: Greg Pope
Contributors: Philip Chien,
Paul Eisenstein, Mike Fillon



Components of Delta launch No. 212 included piggyback DUVE hardware.

did double duty by carrying a miniature ultraviolet sensor.

While secondary payloads have ridden on rocket stages before, this one was the first to tap the power, attitude-control and telemetry subsystems of its carrier. The design converted the second stage into an inexpensive spacecraft bus.

Called the Diffuse Ultraviolet Experiment, or DUVE, the hardware consisted of a 148-pound UV telescope-

spectrometer and a 69-pound electronics box. After the Delta's third stage kicked Geotail into its trajectory, the second stage wheeled around to point DUVE at the constellation Grus. The DUVE instrument was looking for remnants of an ancient supernova in that part of the sky.

Ground-based scientists garnered 8 hours of data from DUVE, built by researchers from the University of California at Berkeley.

Small payloads will continue to piggyback on NASA vehicles with excess performance and a few Air Force launches of Global Positioning System satellites.

Payload Plays Piggyback

KENNEDY SPACE CENTER, FL—Last July, when NASA launched the Japa-

nese Geotail satellite (see Tech Update, Sept. '92), the Delta rocket's second stage

G.I. Machines On Wheels

HUNTSVILLE, AL—The Pentagon is auditioning different vehicles in its effort to field wheeled robots for the Army and Marines.

Current candidates include a militarized all-terrain vehicle and a self-steering Humvee. In addition, 14 Surrogate Teleoperated Vehicles (see Tech Update, Sept. '91) are now tooling around military bases to help planners refine the robots' roles and performance goals.

The end product of all this activity will be 1200 Tactical Unmanned Ground Vehicles,

or TUGVs. As currently defined, the vehicles' purpose is to carry out spy and targeting missions, look for "terror" weapons and bust through obstacles. And, yes,

they'll carry standard infantry weapons for self-defense.

Initial TUGV production is slated to begin in 1998.

Pentagon's robotics testbeds include a militarized ATV and the Surrogate Teleoperated Vehicle.



Radar For Road Hogs

SAN DIEGO, CA—For all the talk about smart cars, it

turns out that Greyhound buses will soon gain an edge

in intelligence, at least for the short term.

Workers are fitting each of Greyhound's 2400 buses with an on-board radar system made by VORAD Safety Systems. A grille-mounted antenna will flash a radar beam over the road ahead, scanning for obstacles, while

a second wide-angle beam will probe the area of a driver's blind-spot.

The Greyhound system will tie into the terrestrial equiva-

lent of an airplane's flight recorder. The bus's "black box" will record steering, braking, speed and closing rate with obstacles.

VORAD is already testing its system on a passenger car, linking the radar output with cruise control. That will enable the car to maintain a constant distance away from the vehicle ahead.

The next step, says VORAD, is to connect the radar directly with the brakes, to decelerate the car before the driver has time to react to an obstacle.



VORAD envisions in-car radar speed control with rear-right blind-spot beam.

TO APPRECIATE NORELCO'S SHAVE, YOU HAVE TO LOOK BENEATH THE SURFACE.

It's amazing.

Norelco® can actually shave *below* skin level. As the responsive floating heads adjust to hug every



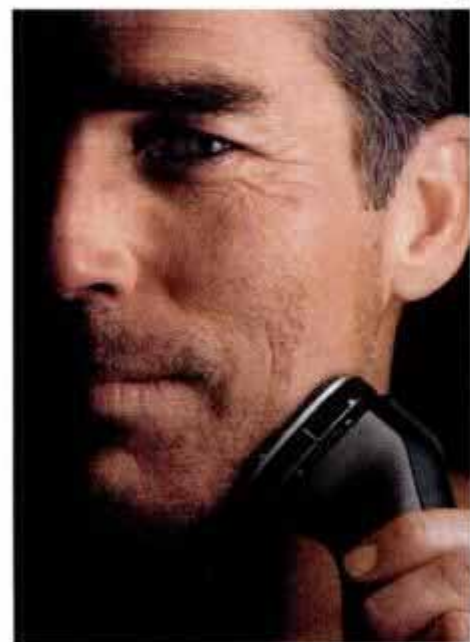
Floating heads move up and down to hug the contours of your face.

contour of your face, your beard is being removed by a

patented technology unique in all of shaving.

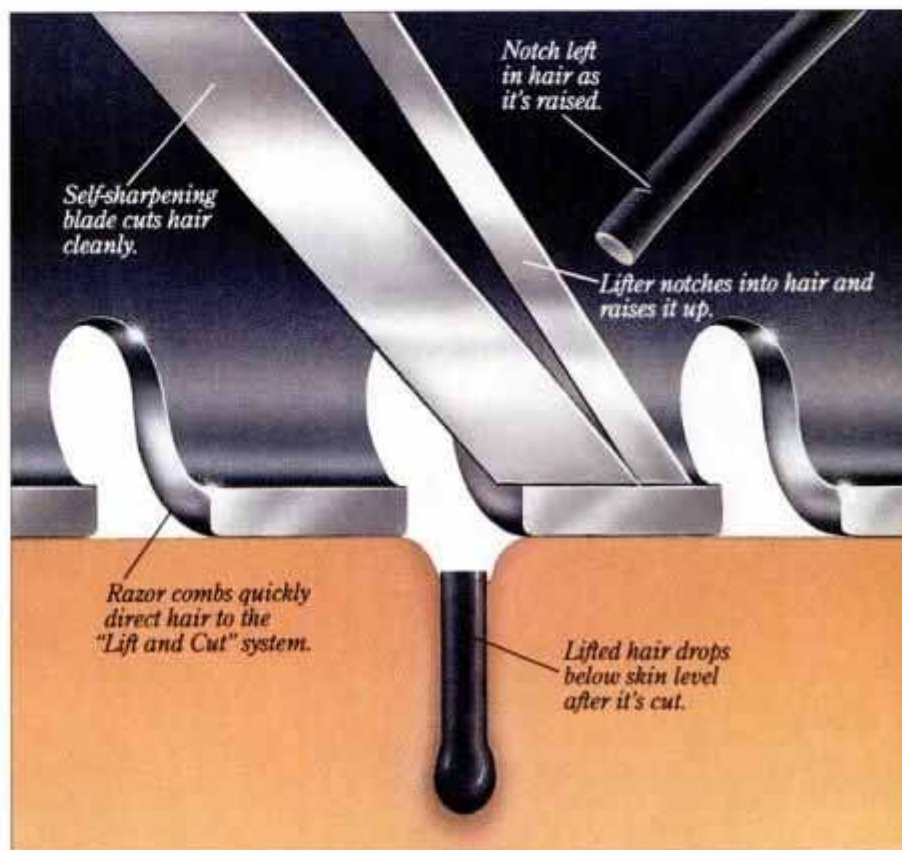
The Norelco "Lift and Cut"™ system.

It consists of a precision lifter in front of the blade that notches into the hair and raises it up. After the blade cuts the lifted hair, the hair shaft can actually drop back below skin level.



The result is a remarkably close shave. And because the blades don't even touch your face, you're also rewarded with exceptional comfort.

Try the Norelco razor. And experience the deep satisfaction of a perfect shave.



Norelco®

We make close comfortable.

The Chesterfield Cigarette Company

DURHAM

NORTH CAROLINA


WE HOPE YOU'LL LIKE
OUR NEW CHESTERFIELD FILTERS
AS MUCH AS WE DO.

Full Flavor King Size: 16 mg. "tar," 1.6 mg. nicotine; Lights King Size:
11 mg. "tar," 1.2 mg. nicotine, av. per cigarette by FTC method.


SURGEON GENERAL'S WARNING: Smoking Causes Lung Cancer, Heart Disease, Emphysema, And May Complicate Pregnancy.

No. 1

Filters

At The Chesterfield Cigarette Company, we take the time and trouble to do things right. 

We remove the coarse stems from every tobacco leaf used in new Chesterfield Filters. Other companies chop 'em up and put 'em back in. 

We don't use cheap filler tobacco in our blend either and we never will.  And, so you get a smoke that lasts a good long time, we pack our new filter cigarettes

with a generous wad of

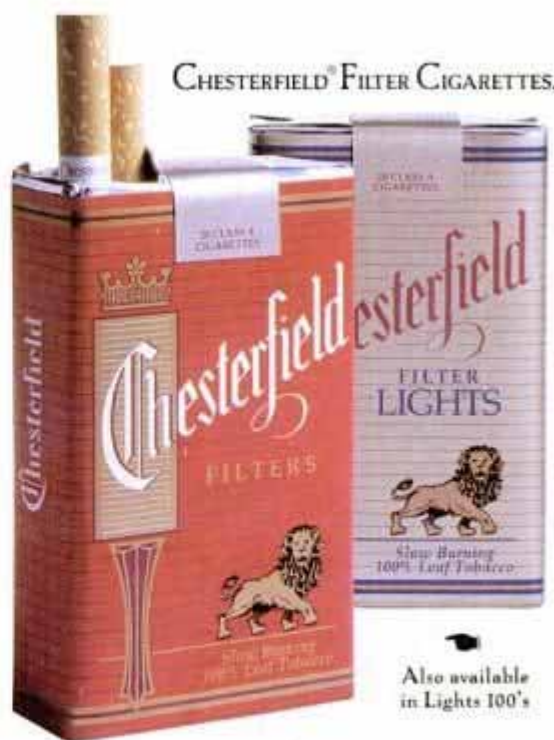
tobacco. 

We reckon it flat-out makes a

better smoke. 

Try them and let us know

what *you* think.



Also available
in Lights 100's

Slow to burn · Sure to satisfy.



Grumman's maglev features hybrid magnet in attractive-levitation arrangement.

concept using attractive levitation, in which the train's lift magnets lie on a flange that curls underneath the guideway. Germany's Transrapid maglev uses the same scheme.

But unlike Transrapid's tight 3/4-in. clearance, the Grumman maglev keeps a 2-in. clearance between magnets and guideway. A superconducting magnetic lift coil opens the larger gap.

In addition, the lift magnets feature an iron core that confines electromagnetic fields. Meanwhile, a small third coil provides trim control and shock absorption.

The vehicle also includes a simple tilting mechanism.

Concepts from the other design teams will appear in future Tech Updates.

Here Come The New Maglevs

BETHPAGE, NY—Under the government-sponsored National Maglev Initiative

(NMI), four teams of contractors have designed magnetic-levitation transportation concepts.

One of the first to be made public comes from a team headed by the Grumman Corporation. It's the only

Heavy-Duty Robots To Draw Hazardous Duty

WASHINGTON, D.C.—Unmanned heavy equipment continues to command considerable attention from government agencies.

For example, the Air Force is developing a Rapid Runway Repair vehicle. The teleoperated machine will patch craters and clean up unexploded ordnance. Eagle-Picher Industries is building the prototype, slated for

demonstration next year. Meanwhile, the Army and the Energy Department are chipping in on a pair of remote-control vehicles that will seek out and uncover buried hazardous waste or munitions. Working alternately over a site, the machines will perform what engineers have dubbed "scratch and sniff."

A backhoe known as the Small Emplacement Excava-



Scratch-and-sniff duo root out buried hazards (above), while Air Force machine repairs runway via remote control.

tor will do the scratching. The machine is a standard Army vehicle, its hydraulic systems modified for remote control by Oak Ridge National Labs.

The excavator's remote operator will follow data re-

layed from the machine's "sniff" partner. Under development at Pacific Northwest and four other national labs, that vehicle is a small, largely non-metallic buggy. It will carry ground-penetrating sensors over the site to build up a 3D subsurface map. The vehicle will undergo tests in Idaho next June.



IF WE'VE HEARD IT ONCE,

WE'VE HEARD IT

A MILLION TIMES...

"IF ONLY TOYOTA MADE A BIGGER TR



INTRODUCING THE TOYOTA T100.

It's not by chance that Toyota has long been one of America's best-selling compact trucks. It's because of the quality. The reliability. And it's because of the way they last. So it's only natural for people who have owned Toyota Trucks, but who now need a larger truck, to wish that Toyota made bigger trucks, too. And now we do.

UCK!"

Just how big is the Toyota T100? Well, to begin with, it's bigger in virtually every way than our compact trucks. Bigger, even, than so-called "midsize" trucks. The large, roomy cab, for example, allows for comfortable 3-across seating. The double-wall cargo bed will carry 4x8 panels between the wheelwells. And don't worry about the weight. Payloads range as high as 2,570 lbs.*



A winning lineup: Toyota T100 (available in 2WD and 4WD), Toyota Compact 4x4 and 4x2.

But it's not just size that sets this truck apart. The handling of the Toyota T100 is amazingly crisp.

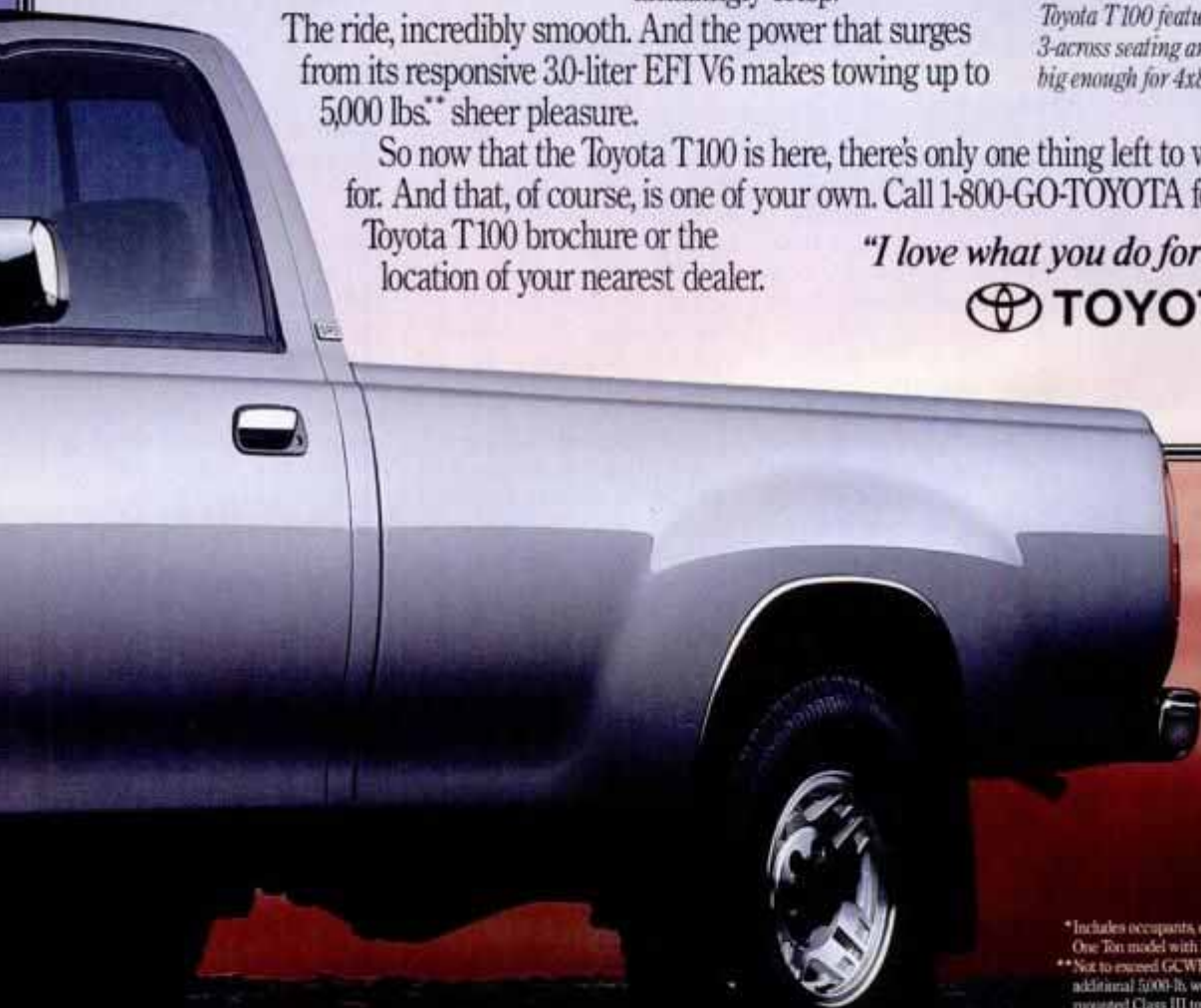
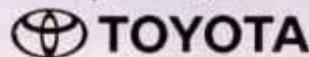


Toyota T100 features roomy 3-across seating and a bed big enough for 4x8 panels.

The ride, incredibly smooth. And the power that surges from its responsive 3.0-liter EFI V6 makes towing up to 5,000 lbs.** sheer pleasure.

So now that the Toyota T100 is here, there's only one thing left to wish for. And that, of course, is one of your own. Call 1-800-GO-TOYOTA for a Toyota T100 brochure or the location of your nearest dealer.

"I love what you do for me."



*Includes occupants, equipment and cargo for One-Ton model with 5-speed manual.
 **Not to exceed GCWR of 10,000 lbs. Requires additional 5,000-lb. weight-carrying frame-mounted Class III tow hitch.
 Buckle Up! Do it for those who love you.
 © 1992 Toyota Motor Sales, U.S.A., Inc.

Robots Find Their Way In San Jose

SAN JOSE, CA—Last July, the nation's best and brightest squared off in a battle of wits and agility. Ranging in

shortcuts were allowed—these robots had to fend for themselves. To do so, the machines put

Diagram shows how Carmel's mind builds maps and plans movement for sensor readings.



Michigan's athletic Carmel trounced all competitors.

size from a wastebin to a refrigerator, the contestants didn't go mano-a-mano: After all, they were robots.

They simply had to negotiate an arena full of obstacles, finding a series of objects along the way. No remote control or other technical

into play the current trends in computer architecture that are now prevailing at top artificial-intelligence labs.

Most prominent is the rapid evolution and spread of so-called subsumption architecture, first conceived at the Massachusetts Institute of Technology.

In subsumption's purest form, a robot's computer intelligence consists of a set of behaviors through which the machine simply reacts to input from its sensors. Each of these behaviors runs independently, rather than channeling information through a central decision-making processor.

Several robots—notably entries from IBM, Carnegie-Mellon and Georgia Tech—used a hybrid approach, with subsumptive obstacle-avoidance behavior grafted into the traditional centralized architecture. These ma-

Runners-up include (clockwise from right) Stanford Research Institute's Flakey, Carnegie-Mellon's Odysseus, Georgia Tech's Buzz and Jacob Milstein's Scarecrow.



chines displayed a talent for buzzing unconsciously around obstacles while staying focused on their ultimate tasks.

And one machine—a crowd favorite—did away with computer architecture altogether. The "Scarecrow"—built by a maverick Jet Propulsion Laboratory engineer and his 5-year-old son—used a purely reactive architecture built out of mechanical relays. The machine simply lurched around the arena like the enchanted broom in "Fantasia," colliding randomly with its goals. Surprisingly, it came in fourth.

The hands-down winner was "Carmel," the University of Michigan's entry, which blazed through the task in 9½ minutes, then broke into the Wolverine fight song. Although its artificial intelligence was fairly traditional, Carmel benefited from juiced-up

hardware: rapid-fire sonar sensors and fast wheel motors.

Having its computer power on board also helped. By contrast, most of the other robots did their thinking on remote computers, sending data and commands back and forth via radio modem. That technique proved vulnerable to interference from the arena's halogen lights and other radio sources.

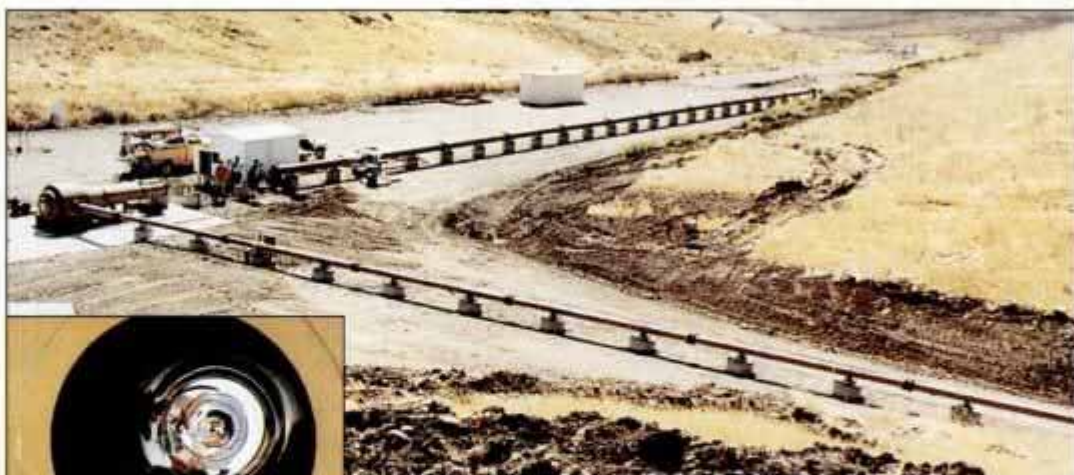
The unanticipated glitch pointed up how far roboticists must still go to make fool-proof, reality-hardy machines. Nevertheless, the event, staged by the American Association for Artificial Intelligence, highlighted impressive strides made in robot autonomy.



Gas Gun Gargantuan

LIVERMORE, CA—An 11-pound projectile whistling by at nearly 9000 mph: No gun has ever fired anything that heavy that fast—until now. At Lawrence Livermore National Laboratories engineers have built the world's biggest gas gun: the Super High Altitude Research Project, or SHARP.

The gun's launch tube stretches half as long as a football field. Nearly twice that length is the pump tube, through which a 1-ton piston races. The piston compresses hydrogen gas to launch the projectile like a huge BB. At either end of the pump tube,



100-ton counterweights roll on railroad tracks to keep the tube steady during the pis-

ton's flight. SHARP's builders plan to move the hardware to Vandenberg Air Force Base and

fire projectiles through the stratosphere. The gun could put its rounds 280 miles above Earth's surface.

Flying Antitank Bombs

EGLIN AFB, FL—The Air Force is developing a new generation of weapons called LOCAAS,

Low-Cost Anti-Armor Submunitions. The bombs would ride in a stealthy air-launched drone

that would glide over the battlefield, distributing its lethal cargo. A Martin Marietta prototype, the LOCAAS weapon would use millimeter-wave radar to find its target, then dive headfirst, setting off a

tandem shaped-charge warhead at the last minute. LTV's competing version would fly over its target and fire the shaped-charge penetrator from its belly. Its seeker would be a laser rangefinder.



LOCAAS prototypes are designed for release from a low-profile unmanned air vehicle.

Muscle Battery For E-Cars

TROY, MI—Today's lead-acid batteries just won't do if electric autos are to vie with gas-powered cars. So says the U.S. Battery Consortium, formed by the Department of Energy, the electric utilities and the big three automakers.

One possible answer: **Flawless mass production will aid acceptance of car-scale Ovonic battery.**

the nickel metal hydride cell made by Ovonic Battery Co. The consortium has given Ovonic a contract to scale up the device for cars.



The goals: 15-minute recharge time, 250-mile range and a reduction to half the size and weight of current battery packs.



Super-Patriot Missile Flies

WHITE SANDS, NM—The Extended-Range Interceptor, or ERINT, is now undergoing flight tests.

The interceptor, built by LTV, features a Rockwell-made radar seeker and Patriot-style ground-based radar for target acquisition. Fired from modified Patriot launchers, ERINT is the last-ditch layer in the SDI Organization's near-term missile-defense scenario (see Tech Update, Sept. '91).

The Marines are expressing interest in testing ERINT for all-purpose air defense.

ERINT pops from Patriot launcher in first flight test to verify structural integrity.



NAVY'S

Cutting-edge combat prowess makes the all-new, all-steel *Arleigh Burke* destroyer the ship to beat on the troubled waters of the 21st century.

BY ABE DANE, Science/Technology Editor
PM Photos by Brian R. Wolff



● It was a bleak December day when the first pieces of *DDG-51* were laid down at the Bath Iron Works shipyard in Maine. Cmdr. John G. Morgan looked on with particular interest. Foreshadowed in that bare outline of steel was his next ship, the first of a new generation of Navy destroyers.

Named for the most famous destroyerman of WWII, the *Arleigh Burke*-class would embody hard-won lessons of war, endless tactical considerations and engineering tradeoffs and everything that technology could do to devastate the enemy while keeping its own sailors safe at sea.

Now, three years later, I'm in Cmdr. Morgan's cabin aboard the *Arleigh Burke*, and he's clearly pleased with the way the ship's come together. "I feel as if I've won the lottery," he says. "There is nothing better than to command this ship."

That reflects more than just a com-

mander's obligatory pride. In the nine months since the ship's commissioning, it has come through trial after grueling trial with flying colors. It matched a perfect gunnery record set 50 years before, fittingly by Adm.



Radar data lights up the CIC's flat panel displays.

Burke himself. Missile firings, torpedo launchings, engineering inspections and sensor evaluations have been similarly successful. For Morgan, the experience evokes Hitchcock's line: "The perfect crime is the one you never hear about."

Balanced and flexible

Historically, destroyers have been the scrappy bantamweights of the fleet. Small, fast and heavily armed, but lightly armored, the "tin cans" were often sent in to do jobs too dangerous for larger ships. In keeping with its lean and mean lineage, the 505-ft. *Arleigh Burke* is 60 ft. shorter and more than 1000 tons lighter than the current *Ticonderoga*-class cruisers. The paring down did away with the two enclosed helicopter hangars and one of the two 5-in. guns carried by the cruisers.

But the *Arleigh Burke*'s combat systems are in many ways superior, representing the absolute last word in technology. And its four GE gas turbines put out 100,000 hp—20,000 more than the *Ticonderoga*. "We have a lot of brute strength," says Morgan. "If you get into a maneuvering situation, that power will help you get out of trouble."

NEWEST



It's all fitted into a short, stocky hull 11 ft. wider than the cruisers'. One of the first clean-sheet designs the Navy has come out with in years, it exploits the latest thinking in hydrodynamics to produce a highly stable weapons platform that doesn't have to throttle back in heavy seas. The Navy is mum about top speed, admitting only to "greater than 31 knots."

Damage control, traditionally a U.S. Navy forté, has been pursued with fanaticism in the *Arleigh Burke*. After 37 sailors died when an Exocet slammed into the frigate *Stark* in the Persian Gulf five years ago, the Navy reconsidered many of its design policies. One result was a shift away from lightweight aluminum superstructures. Only the *Arleigh Burke's* funnels are made of aluminum. All vital areas are protected by at least two layers of steel, augmented by 70 tons of strategically placed Kevlar armor.

For firefighting, fore and aft tanks of aqueous film forming foam (AFFF) concentrate hold 600 gallons each, several times more than ships of this size usually carry. Foam outlets are located on a pipe that forms a com-



Gas-turbine powerplants are derived from DC-10 airliner engines.

plete loop around the ship, so that a break at any point in the line won't interrupt flow to other areas.

AFFF can also be directed through fixed nozzles on the helicopter deck in case of a crash, or through sprinklers in both engine rooms. As a last-ditch

measure, the engine rooms can be completely filled with flame-smothering Halon gas. Saltwater sprinklers douse crew berthing compartments, and a high-pressure spray system called Deluge cools the missile launchers to keep warheads from cooking off.

Wherever possible, the ship's key systems have multiple backups. There are three computer rooms, three generators, and a data multiplexing system distributes machinery control information via numerous pathways. "This is one tough, rugged, brute of a ship," says Morgan. "It can take damage and it can fight back."

Black box magic

While *Arleigh Burke's* ability to take hits is the result of combat experience and thorough engineering, its ability to dish out punishment derives from some of the most exotic black boxes in the fleet. The Aegis Combat System, a complex intertwining of sensors,

NAVY'S NEWEST



pull the overall picture together for the commander, his tactical action officer and weapons officer. Detailed information is read out on banks of CRT consoles lining the room's perimeter.

The consoles are grouped by function into anti-air warfare, antisurface warfare and antisubmarine warfare sections. "We've taken everything and integrated it here to make the room more useful, more user-friendly," says System Test Officer Lt. Jeffrey Pitel.

The CIC crew's primary window on the above-water world is the SPY-1D phased-array radar. Radiating from four panels bolted to the superstructure, its electronically steered beam scans from the wavetops to the stratosphere in sweeps far more rapid than mechanically steered radars can manage. That speed is particularly vital against sea-skimming missiles, which can strike a ship seconds after they pop into view over the horizon.

Supplementing SPY is the AN/SPS-67, a conventional mechanically steered surface search radar. "On any given day, the environment can play tricks with RF energy, so it's nice to have dual sources," says Jobrack.

Information from the radars is routed directly into systems that control the ship's missiles and its 5-in. main gun. Most of the firepower resides in two Vertical Launch Systems (VLS), installed fore and aft of the superstructure. Here, a total of 90 missiles (29 forward and 61 aft) stand below hatches in the deck.

The great advantage of this setup is that commanders can make split-second decisions about the type of missile they want to use. With earlier systems, loading apparatus had to haul the desired weapon up from a magazine below and mount it on a movable above-decks launcher, which would then aim it at the target before it was ready to fire.

Arleigh Burke's VLSs can be loaded with any combination of the most advanced missiles in the Navy inventory. Tomahawk land-attack cruise missiles can strike targets 800 miles inland, guided by a precise terrain-following navigation system. Radar-guided Tomahawk antiship missiles hunt down enemy vessels more than 250 miles away. And Standard missiles streak toward air or surface targets at Mach 2 under the control of the ship's radar and its high-intensity microwave illuminators.

Closer-range surface threats are generally engaged with radar-guided Harpoon cruise missiles, launched from eight fixed canisters angling up from the afterdeck. Salvos of these missiles can be programmed to follow



Clockwise from above: Sonar specialists interpret data. Fantail accommodates a LAMPS helicopter for refueling. Five-bladed props are visible in drydock. Towed sonar array pays out for training.



computers and weapons introduced on the *Ticonderoga*-class, has been refined still further for the new destroyers. Aegis provides a comprehensive, integrated picture of air and surface threats and can react to them with unmatched speed.

Aegis represents the latest step in a gradual progression that has transformed naval warfare over the past 50 years. "It's not like in the war movies," says Weapons Officer Lt. Robert Jobrack. No longer do sailors rush to battle stations on deck while the cap-



tain gives orders from the bridge. When the *Arleigh Burke* sounds general quarters, all hands remain inside, protected from chemical, nuclear and biological contaminants by an overpressure air-filtering system. The commander and his tactical team assemble in the Combat Information Center (CIC), a computer-crammed room sheltered deep in the hull.

There, the many nerve endings of the Aegis system's sensors are knit together. Two large, bright-blue flat panel displays at the front of the room

BATH/ICM/ACR/S/PHOTO



different flight paths toward a target, arriving simultaneously from different directions. The Tomahawks are capable of similar disorienting tactics.

Targets within about 14 miles that aren't judged to be worth the \$750,000 cost of a Harpoon are attacked with the 5-in. gun, which can fire up to 20 rounds per minute. With SPY following the trajectory of the shells and feeding back corrections, it's usually possible to achieve hits by the third round.

Sub hunter

The Navy stresses that the demise of the Soviet Union has not brought an end to the submarine threat. In fact, inexpensive diesel electric submarines now entering service with Third World countries are even quieter and harder to find than nuclear subs.

In response, the ship's most expensive electronics are devoted to fighting in the subsurface arena. The GE AN/SQS-53C hull-mounted sonar goes beyond earlier variants in its ability to exploit different paths of sound propagation, including bouncing signals off the bottom. To pierce the thermal layers that often block surface sonar reception, an 800-ft.-long, passive towed array is spooled out behind the ship on a tether nearly a mile long. Range for these systems



Missiles are lowered into VLS in canisters (above) and stay sealed until launch (top).

extends beyond the horizon, so the first warning of surface threats often comes via sonar rather than radar.

Although the *Arleigh Burke* is equipped with six MK-32 homing torpedoes, the preferred method for at-

tacking subs is to call in a LAMPS III helicopter. Tied in to the ship's CIC by a high-frequency digital datalink, these helicopters use the ship's sonar and their own sonobuoys to find subs then drop torpedoes on them well before they get within striking distance. The helicopters also provide over-the-horizon radar data for attacks on distant surface vessels.

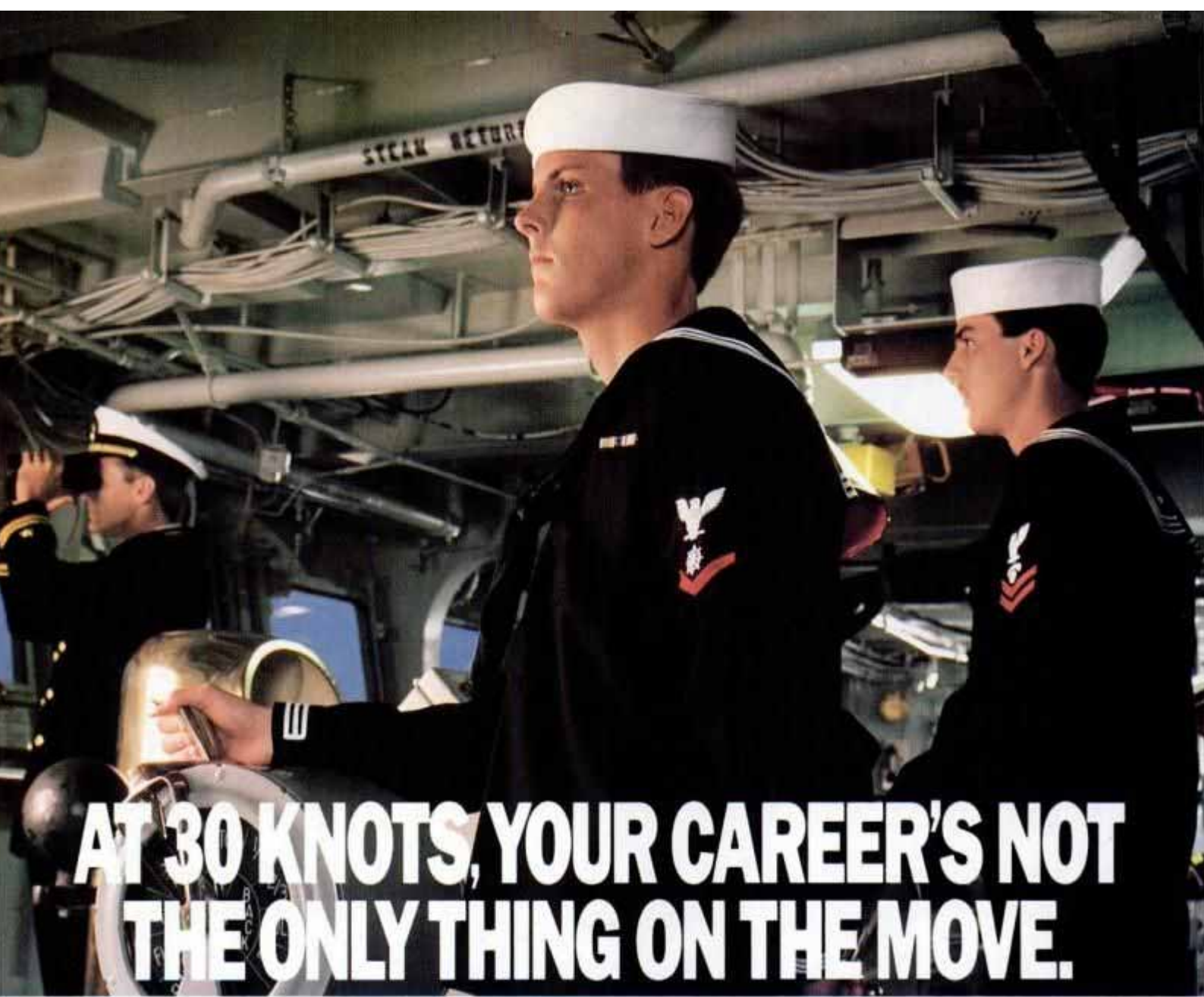
Defense against subs is provided by a towed torpedo decoy, extensive silencing of propulsion equipment and airjets that stream from the tips of the 5-bladed controllable-pitch propellers to reduce cavitation noise.

To evade radar, the ship's superstructure has an angled stealth shape. Infrared signature is reduced by heat-dissipating baffles around the funnels. Last-ditch missile defenses include super-rapid blooming chaff launchers and two radar-guided Phalanx Close-In Weapons Systems that spit out 3000 depleted uranium slugs per minute.

"We're designed to operate in any kind of threat environment," says Morgan, aware that it's impossible to predict what that threat might mean in years to come. "We've built so much capability into this ship," he says. "If the world changes, if the threat changes, we will still provide value and utility to this country." **PM**

HIGH-TECH "TIN CAN"





AT 30 KNOTS, YOUR CAREER'S NOT THE ONLY THING ON THE MOVE.

Talk about the fast track! Today's Navy has what it takes to move both you and your career.

Move you with the excitement of working on some of the world's most sophisticated high-tech equipment. Move your career with exciting opportunities in aviation, electronics, telecommunications and healthcare.

You can get state-of-the-art training in one of over 60 fields. And have challenges, responsibilities and growth potential that other companies can't offer a person your age. You'll learn leadership skills, the value of teamwork and how to handle pressure. The very things you need to chart a successful course into the future.



Teamwork is a part of the Navy experience, whether you're traveling the seas with shipmates or training in one of over 60 fields.

Because in today's high-tech Navy, you only go one way: Full speed ahead.



The Navy's hands-on experience provides a variety of high-tech challenges, like working on this guided missile frigate.

Interested? Talk to your Navy Recruiter today. Or call 1-800-327-NAVY. Then get ready to make your move fast.

NAVY
YOU AND THE NAVY.
FULL SPEED AHEAD.

THE THEATER COMES HOME

Turn your TV room into a home theater with just a few extras.

BY STEPHEN A. BOOTH, Contributing Editor



● You're suspended in time and space, your experience defined by the image before your eyes and the sounds all around you. The combined energy of sound and image sweep away confining walls, and for a few hours, you're transported to another place. Is this theater? Yes. And you're practically on the stage because the theater is in your home.

Sound plays an indispensable part in creating this illusion—the kind of sound that puts you in the center of the action, just as in real life. In fact,

surround-sound has become synonymous with home theater, and it's the most affordable part.

If a movie was originally filmed with a Dolby Stereo soundtrack, all of its surround-sound effects are carried over intact to the soundtracks of videocassettes, videodiscs and even stereo telecasts. At the latest count,

PM WAVE PHOTOS BY LARRY PIERCE/IMAGE BANK

THE THEATER COMES HOME



more than 1500 movies have been made with Dolby Stereo, as well as an increasing number of TV programs and live sports events. That's the free part of home theater.

You still need a way to recover the 4-channel Dolby sound from the 2-

channel stereo soundtracks of tape, disc or telecast. There's plenty of equipment available with circuitry suitable for Dolby Surround-Sound, as it's called for home-theater purposes. More important, the newest gear makes it easier and more afford-

able than ever to adapt your existing setup for home theater.

Lately, the manufacturers of electronics and loudspeakers have introduced "drop-in" products that let you build a home theater on the foundation of the equipment you probably already own. You're part of the way there if you have a fairly recent TV and a hi-fi VCR or laserdisc player. You're almost there if you've got a stereo music system, too. A hi-fi VCR or an older stereo VCR is a must, though, because monaural VCRs can't reproduce a videocassette's stereo soundtrack, and that's where the surround-sound is encoded.

You can, of course, assemble your home theater from scratch, and there might be good reasons for doing so.

One consideration to keep in mind is that when you've introduced the all-enveloping element of surround-sound, the picture on a small-screen TV might become overwhelmed and dwarfed. The disparity between image size and the illusion of largeness created by sound might produce an unrealistic and disconcerting feeling.

Screen size is a relative matter—relative to the size of your viewing room and, particularly, to the distance you sit away from the screen. Manufacturers usually use the viewing distance to make recommendations about screen size. RCA's sug-

Tomorrow's Home Theater

● Television will be more than just a big black box if a new up-and-coming group of product designers has its way. In a project sponsored by Thomson Consumer Electronics Inc., students at the 62-year-old Art Center College of Design in Pasadena, California, probed the future of home theater.

Among the most interesting visions of the future is a design by Hsin-Chien Huang and James Lee, titled "Moonbeam." A large, mirrored surface built into an exterior wall lets you view a TV image outdoors in the backyard but

also relays a signal indoors for more traditional viewing. The exterior unit includes a solar collector for power, a sundial and a satellite dish.

The "belt-line frame" (right), developed by James Elliott and Steven Farb, allows you to easily interchange pieces of equipment as technology evolves. Components swivel in or out depending upon whether or not they are being used. A videophone is also included.

—Frank Vizard



gestions seem the most reasonable. For distances of up to 7 ft., the TV screen should be at least 27 in. measured diagonally, from 7 to 10 ft., 31 in. and, at 10 to 11 ft., 35 in.—the largest tube size. Beyond 11 ft., you're into the projection TV range: a 46-in. PTV for up to 15 ft., and at least 52 in. for greater distances.

PTVs have become an increasingly viable option. Not only is picture quality and brightness much superior to the PTVs of even three years ago, but the newer designs have shed bulk, too. The latest models from Mitsubishi, RCA, Sony and others measure about 21 in. deep—no more than a conventional 25-in. tube TV. So having a big-screen TV no longer means losing half of the real estate in your living room. If you don't want to give up anything more than some pictures on a wall, an LCD (liquid crystal display) projector might be an option. At this writing, Sharp is the only player in the game. The company's XV-P10UP (\$2795) can project a 60-in. picture from a tabletop, as it weighs just 9 pounds and measures less than 9 in. wide × 15 in. long and 6 in. high.

Although home theater is a pretty straightforward concept, you might encounter some confusing terms. These mostly have to do with the different forms of Dolby technology.

The most basic Dolby audio system for home theater is called Dolby Surround. Besides the usual front left and right channels for stereo, it has a surround channel that sends special effects and ambient sound to speakers behind or to the sides of the audience.

Dolby Surround usually uses a 4-speaker setup: two for stereo up front, two for surround in the rear. But this is misleading. It's actually a 3-channel system: The surround channel carries a monaural signal. Although two speakers are used in the rear, they reproduce the same signal. In fact, that's why they're linked to one another by a speaker cable, which you might want to conceal under the floorboards or carpeting or behind a molding. The argument for two surround speakers is that the sound becomes more diffused. With surround-



You can upgrade an existing stereo system for surround-sound with processors like the AudioSource SS Four model.

sound, you're supposed to be aware of the ambient sound, but not be able to pinpoint or localize its origin.

Dolby Surround is sometimes called passive Dolby, and you'll find it on the most modestly priced audio receivers. The improvement is called Dolby Pro Logic. This is a true 4-channel system, but the extra channel is up front and has nothing to do with surround effects. To confuse matters

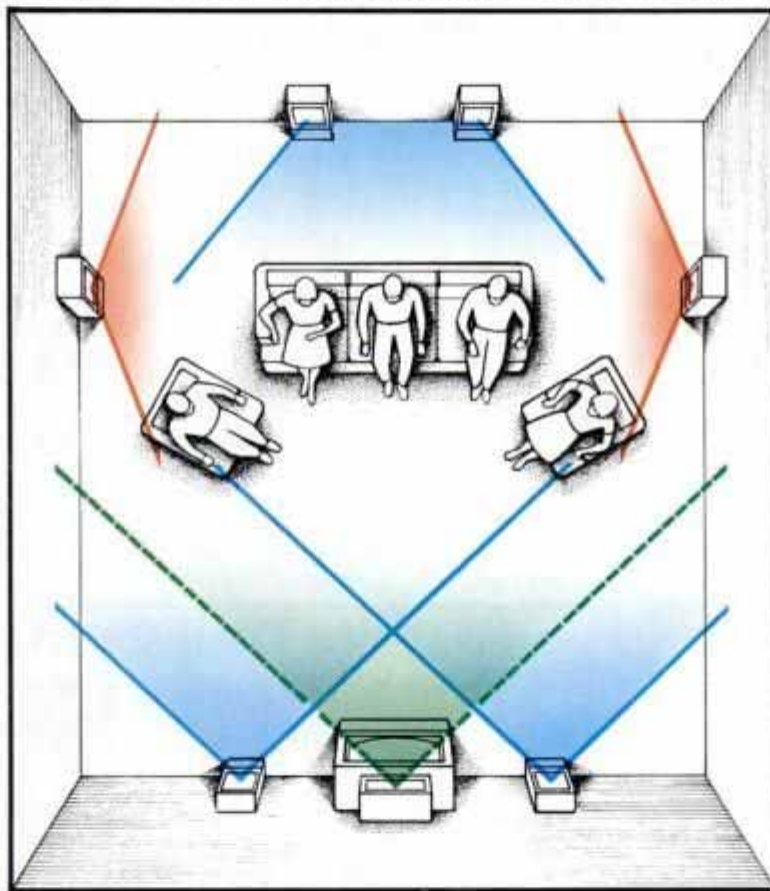
the TV, the center channel speaker (usually called video speakers) must be specially designed for the purpose with magnetic shielding to prevent the speaker's magnets from distorting the picture. In a Dolby Pro Logic receiver or processor, the center channel has its own source of amplification. The power distribution in surround-sound gear is itself often a source of confusion.

A typical Dolby Pro Logic processor might offer 80 watts per channel for the front left, front right and center channels and 40 watts for the surround channel, shared by two speakers. Theoretically, surround-sounds require only about one-tenth of the power of any front channel—they're meant to be sensed but not pinpointed. Accordingly, 8 watts would be plenty for the surround channel.

In the real world, though, the same receivers or processors that produce surround-sound for movies are also used for music listening. And in this non-Dolby application, most experts agree that more power is needed for the various multichannel music modes such as concert hall, cathedral, stadium, club and others found in today's equipment. For music purposes, the correct amount of rear or "ambience" channel power most often cited is about one-third of any front channel.

For the record, Dolby recommends that center-channel amplification be the same as that of each stereo channel. This is to avoid any imbalance up front, especially since many loud sounds occur on-screen.

Keep these power ratios in mind when you're shopping for audio home-theater equipment. If you only plan to use your system for movie watching, you don't need the extra amp power necessitated by the various music



Standard Dolby Surround-Sound uses four speakers. Dolby Pro Logic adds a fifth center speaker. THX positions rear speakers to the side.

further, it uses a fifth loudspeaker.

The added speaker is for the center channel and it anchors dialogue and on-screen sounds to their point of origin. This added circuitry is meant to maintain realism by localizing the appropriate sounds instead of having them ping-pong across your room from the front left and right stereo speakers. The circuitry's "logic" steers stereo and surround effects to the other speakers.

The center channel requires its own speaker, one that sits above or below the TV screen. Because it's so close to

THE THEATER COMES HOME



The Technics THX package includes a surround-sound processor, amplifier and speakers.

modes. In any event, these higher power ratios are usually found in so-called DSP (digital signal processing) receivers and amps. These more expensive components use DSP to create those different room effects. Simpler audio/video components have power distribution more suited to Dolby surround-sound applications.

Yet another form of surround-sound technology is called THX. Originally developed for Lucasfilm, THX is a more elaborate version of the Dolby Pro Logic system. The goals of the THX system include absolute clarity of on-screen dialogue, precise localization of left and right front stereo effects no matter where the viewer is seated and clear but non-localizable surround effects. Much of this is performed by the electronics in the THX processor, but the amplifiers and speakers play a key part, too. For example, both must be designed to handle signals that don't often occur in music but are frequently heard in movies—explosions, for example.

One point where THX is quite specific, compared to the Dolby systems, is in the matter of speaker placement. The surround channel speakers must be placed to the sides of the audience—not behind. Because the audience isn't supposed to pinpoint the surround-sound effects, most THX surround speakers have a dipole design. This means they radiate sound to the front and the rear of the room, thereby diffusing it. Many dipole speakers are for in-wall mounting.

Home THX sound doesn't come cheap. Among the least expensive audio packages is the SC-TH200 from Technics, which includes processor, multichannel amplification and all the necessary speakers plus bass sub-

woofers, all for \$8500. JBL's Synthesis One system goes for \$48,000, but this includes a \$13,000 data-grade front projection TV. Home THX gear comes as separate components, too. For example, Parasound offers the HCA-1206, a 6-channel amplifier with 120 watts per channel (\$1645). And Harmon Kardon sells a THX processor, the AVP-1, for \$2200.

For a very small fraction of the THX sticker, you can add Dolby Pro Logic surround to your existing audio/video system. If you're installing a stereo system from scratch, your options include about two dozen multichannel receivers, some of which are

relatively inexpensive. Sony's entry-level Pro Logic receiver, for example, is the STR-D790 and it lists for \$350. Marry the STR-D790 to five Bose VS100 speakers (\$129 each) and you're into home theater for less than a grand.

Surround-sound receivers with Dolby Pro Logic vary widely in price, features and wattage. Perhaps the most interesting receiver with Dolby Pro Logic is Sony's STR-D2090 (\$1000). It's truly an audio/video component in that it displays graphics on your TV screen to help you adjust and balance the volume levels of the various Dolby channels by remote control. This is a DSP receiver. For video applications, it delivers 75 watts each to the front three channels and 60 watts for surround. For music appreciation only, the front channel amps reconfigure themselves to deliver 120 watts each for 2-channel stereo. The surround amp remains at 60 watts for DSP effects.

If you're looking to add surround-sound to an existing stereo system, there's a selection of surround-sound processors that provide the Dolby circuitry along with power amps for the center and surround channels.

Among the more interesting surround-sound processors are Mitsubishi's HTS-300 (\$600), Kenwood's SS-992 (\$299), Onkyo's ES-600PRO (\$399), the AudioSource SS Four (\$330) and Cambridge SoundWorks PL-100 (\$399).

The AudioSource entry delivers 24 watts to the center channel and the

Build Your Own Bijou



● Want to renovate your family room to the art deco glory of the old Roxy or Bijou? It's possible with one of the prefab, Dream Palaces available from Theatre Design Associates.

After years of creating custom home theaters for the well-heeled, TDA now offers oldtime theaters in modular kits. The kits fit rooms from 12 × 14 ft. to 18

× 23 ft. Art deco and greek classical styles have base stickers of \$34,400 up to \$57,900. A traditional design ranges from \$15,348 to \$24,971.

Dream Palaces come with fabric-covered columns, seats and risers, electronic controls for the sconce lights and even a velvet curtain. For more information, call (718) 398-3874. —S.B.



same to the surround channel, where it can be shared by two speakers. This component also comes with a remote control so you can adjust the channel balance from your viewing position. Onkyo's processor provides 50 watts to the center channel and has two 20-watt amps for surround.

Cambridge SoundWorks' remote-controlled PL100 has a 40-watt center-channel amp and two 15-watt amps for the surround channel. Kenwood's SS-992 delivers 30 watts center and 15 watts surround, with remote control for setup and balancing. One neat trick of this remote control is that when it's used with an existing Kenwood Spectrum 910 or 710 stereo system, the SS-992's remote takes over all volume-control functions.

If you have no audio equipment at all—and don't want a conventional music system—Mitsubishi's HTS-300 Instant Home Theater is for you. You needn't even disturb your TV/VCR connection, as a single cable connects this component to your TV's audio output jack. It delivers 50 watts each to the center channel and front stereo



Cambridge SoundWorks offers a surround-sound processor and three surround speakers in one package.

channels, and sends another 50 to the surround channel to be split between two speakers.

All of these receivers and processors require speakers for their center and surround channels. Many of the same companies offer speakers, too. Cambridge, for example, packages its PL100 with a center-channel speaker

and a pair of dipole surround speakers for \$799.

Some other clever speaker packages are available from Bose and RCA. The Acoustimass-7 system from Bose (\$999) consists of three stacks of the company's tiny cube speakers, plus a hideaway bass module. Bose markets the cubes for deployment front and center, but center and surround work too. For homes that can't accommodate two surround speakers in the rear, RCA's Video Acoustics line includes a model that houses six speaker drivers in a single cabinet, arranged to disperse sound



Sony's STR-D2090 Dolby Pro Logic receiver displays graphics that help adjust balance and volume.



How To Tune Up Your TV

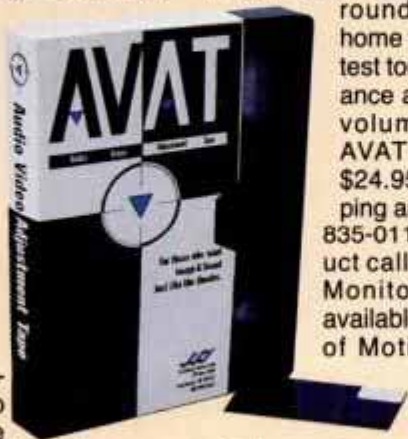
● If you're assembling a home theater around your current television, you can give it a tuneup for as little as \$30 with some of the diagnostic and adjustment aids now available.

The fact is, many of the televisions in homes today do not reproduce pictures and sound as well as they might. Usually, because of aging and misadjustment, the TVs have fallen out of spec with National Television Systems Committee standards.

One easy-to-use remedy is the Audio/Video Adjustment Tape (AVAT) from Scottsdale, Arizona-based J.S. James Video Labs. The AVAT is a VHS cassette that contains more than a dozen digitally mastered picture patterns and sound tests for re-

storing color, focus, resolution and other functions. You make the adjustments with controls on the TV.

AVAT also helps you set up surround-sound for your home theater. There are test tones for stereo balance and front/surround volume and balance. AVAT is sold by mail for \$24.95 plus \$4 for shipping and handling; (800) 835-0110. A similar product called the Receiver/Monitor Setup Tape is available from the Society of Motion Picture and



Television Engineers for \$32; (914) 761-

1100. Laserdisc owners might want to consult *A Video Standard* from Reference Recordings. The laserdisc costs \$70. To order, call (800) 336-8866.

—S.B.

without localization. A package including front and center speakers costs about \$2000.

When you buy a speaker package from a single manufacturer, you can expect a matching sound character among the group. When you're adding a different brand or model to your current speakers, this probably won't be the case. So what? Purists, especially the THX camp, maintain that speakers should have a matching tonal character, so that a difference in the surround channel speakers doesn't bring your attention to them.

If you're mixing rather than matching, you can minimize the effect of a mismatch by trying different speaker placements. Aim the surround speakers away from your seating position. Reflect the sound off walls to disperse it, even place the speakers on their backs so they fire upward—the sound isn't supposed to be direct in any case. Then, sit back and enjoy. You probably won't notice much difference in tones when those waves crash and the surf breaks across your room. **PM**

Remember How Your Father Remember What A Crab He



\$13,622*

Now you can afford to get away every weekend in a rough and rugged Jeep Cherokee. Because Cherokee offers legendary Jeep

toughness at a price you won't have to work weekends to afford.

You'll get an impressive 2.5 litre engine, four-wheel drive, and

*MSRP excluding title, taxes, destination charges, and options shown. Price correct at time of placement. **See limited warranties, restrictions, and details

Материал, защищенный авторскими правами

Always Worked Weekends? Was?



Chrysler's exclusive Owner's
Choice Protection Plan.**
To find out how you
can get out of the office



and into the great outdoors,
call 1-800-JEEP-EAGLE.
And who knows, one week-
end you might even convince

your father to get away with you.

There's Only One Jeep... 
A Division of the Chrysler Corporation.

at dealer. Jeep is a registered trademark of Chrysler Corporation.

Buckle up for safety.

Моторное, защищенный авторским правом



MISSISSIPPI EXPRESS

The Big Easy to the Twin Cities—1700 miles in a 20-ft. bass boat on the Mighty Miss.

BY JOE SKORUPA, Boating/Outdoors Editor

• For 1200 miles the Mighty Mississippi rolls by our boat on its own terms. The days are long and hard, but filled with passing paddlewheelers, 1000-ft. barges, antebellum mansions and immense stretches of pristine wilderness. At dawn, a sheen of mist clings to the still, flat water. Later, the hot July sun climbs above the levee and sharpens the contrast on an endless string of channel markers that guide us around submerged wing dams and



sand bars. After four days of life on the Mississippi, co-pilot Jim Youngs and I are beginning to feel like true river men of old. Then, we pull into Hannibal, Missouri, the headquarters of Mark Twain Inc.

"They always seem to go a bit too far," says Jim, as we carry our bags past the big neon sign of the Mark Twain Hotel (now a restaurant). Twain was born in Hannibal in 1835, and the town goes to extraordinary lengths to make sure you never



PHOTO BY GUY GARDY



Opposite page: The *Cajun Queen* joins the PM team for part of the trip (top) as we get ready to pass New Orleans (bottom). This page: Auxiliary fuel in the red jugs feeds the high-speed PM rig (top left). Don't leave home without maps, charts and VHF radios (top right). Early morning launching in Lake Ponchartrain (above). With no boat facilities, St. Louis isn't much of a marine gateway (left). It's a fine line between fact and fiction in Hannibal, Missouri (far left).

forget it. During our brief search for a motel, we pass Tom Sawyer's picket fence (astonishingly in mint condition), the Mark Twain Dinette, the Becky Thatcher Book Store, the Twainland Trolley and several historic markers



Ultimate bubba boat

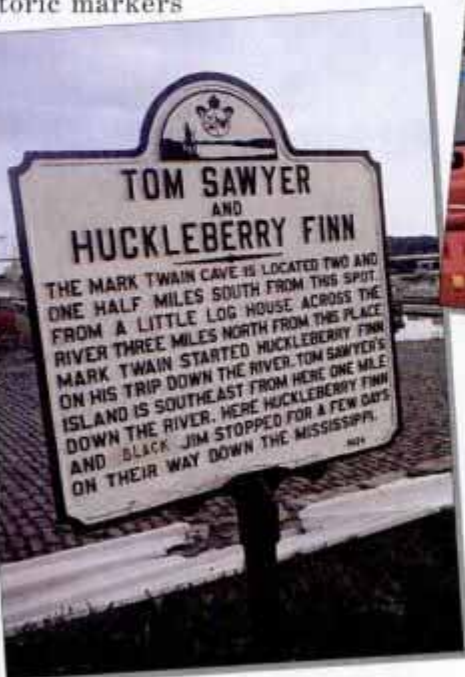
"You must be serious fishermen," shouts the lockmaster from high up on the concrete retaining wall. Inside the massive lock, our 20-ft. rig feels about as big as a corn cob in an empty grain elevator.

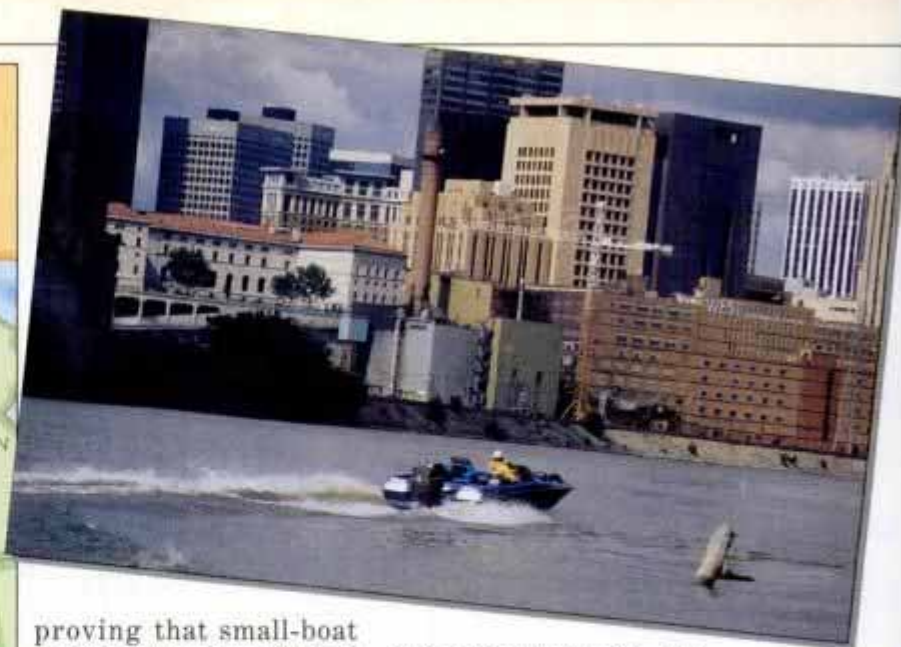
"No," I yell back. "We don't even have fishing rods."

"Really? Then what are you doing out in a bass boat in the pouring rain?"

Good question. Especially since it's a chilly 50° F today in Wisconsin. But there's a note of skepticism in the lockmaster's voice that's clearly uncalled for. I've been asked this question a dozen times since departing from New Orleans six days ago, and I

and bronze statues. When we finally arrive at a motel—the Clemens—it's completely filled. No problem. A clerk makes a call and books us into the nearby Tom & Huck's. Jim and I glance at each other and smile. What did we expect? This is the 1990s. Locks and dams have tamed the once-wild river, and Mark Twain has become the Elvis of Hannibal.





proving that small-boat owners are only as limited as their dreams. I'm slick and quick. And, in PM's inimitable man-and-machine style, I'm conquering one of the world's greatest rivers. So that, Mr. Lockmaster, is why I'm in a bass boat on the great Mississippi on a cold and rainy Wisconsin day. And, if I hadn't had hypothermia at the time, that's exactly what I would have told him.

Sport cruiser

By the end of the first day on the river, it became clear that the metal-flake blue 20-ft. Astro DCX (dual console) rig wasn't really a bass boat after all. Oh, it was clearly one of the flashiest hot

Lake Ponchartrain, the Astro DCX became something more—a low-to-the-water, high-performance Mississippi sport cruiser.

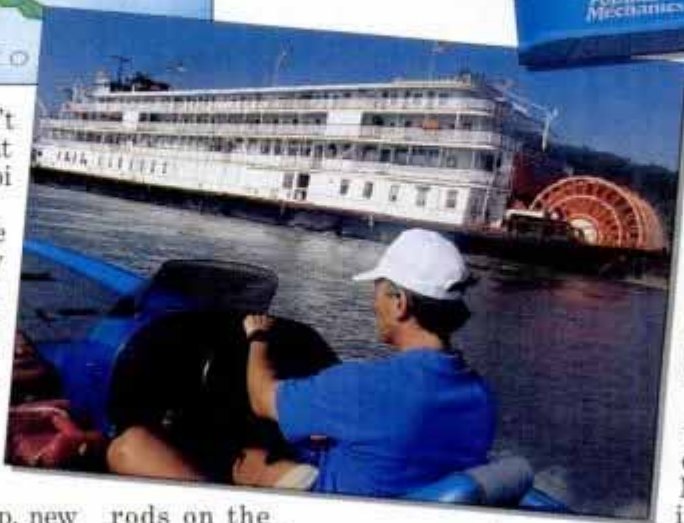
Every feature on the up-scale Astro DCX is ingeniously designed for cruising. For example, the glove compartment is well suited to become a communications locker for stowing handheld VHF radios and cellular phones. The deep in-dash cooler is ideal as a map



can't help but wonder: Hasn't anyone ever taken a bass boat 1700 miles up the Mississippi River before?

The idea made perfect sense to me when I planned it in New York several months ago. I imagined it as the quintessential heartland adventure in the quintessential heartland boat. Or put another way, the ultimate trip through bubba-land in the ultimate bubba boat. Is that so hard to understand?

Besides, I'm driving a sharp, new top-of-the-line 1993 Astro DCX bass rig, equipped with Mariner's first 200-hp EFI outboard. I'm torture-testing advanced equipment. I'm



rods on the water, and its layout was marvelously designed to satisfy the tournament fisherman's every possible need. But once the PM river-running team left

and chart box. The adjoining aft livewells are superbly conceived as a food and beverage locker on one side and a trashwell on the other. All in all, the Astro DCX has more stowage space for cruising (or fishing) than any two bass boats on the water. We didn't even come close to filling it.

The stepped corridor between the two consoles is another truly inspired feature. Not only is it great for holding a couple of big tournament-style tackle boxes—its intended purpose—but it's equally useful as a bilevel auxiliary fuel deck that can hold up to 36 gallons of gas

in portable jugs. Without it, the PM sport cruiser wouldn't have made it as far as Baton Rouge.

Other important cruising features are: the large luggage hold (formerly the twin-hatch bow compartment), the spare parts and toolbox (formerly the starboard rod locker), the fender and line hold (formerly the port rod locker) and the flip-down snack table (formerly the folding center cockpit seat). These features and the 200-hp Mariner, which gave the PM river runners a top speed of nearly 60-

"I'm married, but this isn't my wife. What do you think of that?"

"Does your offer of help hinge on my answer?"

"Heck, no."

"Good. Then let's discuss it on the way to the gas station."

Much has changed on the Mississippi since Mark Twain's time, but the river is still populated by colorful characters. The two lovebirds swore us to secrecy and went far out of their way to give us a hand. Without their generous help, we'd have never made it to Cape Girardeau, Missouri, by sundown.

In many ways, the Mississippi is a cruising boater's nightmare, and it has two fundamental problems that make it highly unlikely that conditions will improve any time soon: 1. It's a heavily used commercial artery and 2. It's a dangerous and unstable floodplain. The result of this situ-



day through Friday. We ran into trouble by running from 7 am to 7 pm for seven days straight. The day we met the amorous couple was a Sunday. We tried calling all the potential fuel points between Blytheville, Arkansas, and Hickman, Kentucky—a distance of 112 miles—but no one answered their tele-

phones. There were quite a few other experiences that didn't make our 10-best list. These include: frequent battering from northbound towboat wakes, thrilling afternoon lightning and thunderstorms in the humid south, a full day of cold and rain in the north, a morning's worth of chemical-emissions-induced headaches in the New Orleans-to-Baton Rouge industrial corridor, hours of frustration getting through 25 locks and a unique 2-day episode of bank-to-bank floating debris.

In the end, like true river men, the PM team learned to take things as they come, even if that meant driving around logs as big as red-

(Please turn to page 116)

Opposite page: The twisting 1734-mile route (far left). Reaching St. Paul, Minnesota (top right). Dwarfed by one of the 25 barge-size locks (middle right). And passing the *Mississippi Queen* on the upper river (bottom right). This page: Redwood-size debris (above). If it's cold and raining it must be Wisconsin (top right). Fuel stops were rare but amusing (right). And at our final destination in St. Paul, it's time for a cold one (bottom right).

mph fully loaded, made the Astro DCX the envy of the waterways between the bayous and the Land of 10,000 Lakes.

Far and fuel between

"Hey, is there a gas station nearby?" I shout to a man and woman who are standing on the levee somewhere around the Arkansas/Missouri/Kentucky border. After a hard drive from Memphis, Tennessee, the PM river runners are down to their last 6 gallons of auxiliary fuel.

"Do you need gas?" asks the man.

"Yes. I need gas."

"Well, come on over. There's a gas station about a mile away. I'll give you a ride."

"Great," I say, pulling the boat up to the bank.

"You know, I've got a secret to tell," he says smiling at the woman by his side.

"Really?"

"This isn't my wife."

Long wary pause. "Oh?"



ation is that common amenities, such as marinas, fuel docks, marine stores, motels and even towns are in surprisingly short supply. This is especially acute on the 900 miles of the lower Mississippi, from New Orleans to Cairo, Illinois, and the upper river is only slightly better.

Part of the difficulty arises from the Mississippi River work schedule of 9 am to 5 pm, Mon-



HOW TO RESTORE

Part 5: Wiring And Final Trim

BY RICH TAYLOR, Contributing Editor; PM Photos by Jean Constantine



Ken Barnes (top) fits a new taillight assembly. Above, he's installing our rechromed windshield header.



Ready for the headlight assembly, the grille and wiring harness are in place and underhood panels are painted correct semigloss black.

AN OLD CAR



● This is the fun part! After six months of what was sometimes exasperating dirty work, we're up to the final assembly stage on the 1967 Camaro convertible that we're restoring. It's taken a tremendous amount of time and effort to get to this point, but it's also been terrifically rewarding to bring such a neat old car literally back from the dead. There's really no other satisfaction like it.

To celebrate this milestone in our long-term project, we thoroughly cleaned the shop and repainted the walls and floor while the Camaro was out at the local painter being colored Matador Red. Psychologically, it's a boost to be working in a freshly redone shop. Practically, it's easier to keep the Camaro clean if the shop is dust-free, too. We also cleaned all our tools and organized our cache of Camaro parts so that we'd be ready to go to work the minute the car returned from the painter.

After old No. 4524 was returned from being painted, our first step was to gently clean off the inevitable overspray on wheelwells, hood hinges and other conspicuous spots. We used just a dab of lacquer thinner on a clean, soft shop towel for gentle cleaning. We've been very careful not to touch the fresh paint on our car—modern lacquers stay soft and scratch easily for weeks after painting. We also padded our lift posts with plastic bubble-pack to keep from inadvertently chipping the car doors when they're open.

Then we started final assembly by threading new wiring harnesses from the firewall forward to the headlights and back to the taillights. Like most of our other specialized Camaro parts,

these came from D&R Classic Automotive in Naperville, Illinois, one of General Motors' licensed suppliers of restoration parts for GM cars.

With the wiring in place, we could start the satisfying process of bolting on the big pieces that give any car its distinct personality. General Motors' Service Parts Operations still has crash parts, such as taillights and bumpers, available at surprisingly reasonable prices. Following our philosophy of preparing small subassemblies before installing them on the car, we assembled and tested each taillight unit before bolting it in using new Wurth hardware. Then we installed the rear bumper using all-new hardware from General Motors.

Next we lifted the car up on our Eagle Equipment lift and installed the new fuel tank. To preserve its fresh-from-the-factory look, we first sprayed the tank with clear lacquer. We used new tank hangers to hold it securely and new antirattle cushions, as well. While we had the Camaro up in the air, we also routed new stainless-steel fuel and brake lines. The stainless-steel lines cost more, of course, but they'll also last for the lifetime of the car.

Simply installing the new taillights, gas filler, trunk lock, rear bumper and rear spoiler completed the entire back of the car in one busy morning. We also installed a reproduction trunk floor mat and a refurbished spare tire holddown. When we add the spare tire, the trunk will also be finished. New weatherstripping finished off the trunk opening and neatly hid our weld marks.

Other quick and easy bolt-ons were

the wheelwell moldings and the RS stainless-steel rocker panel moldings. These dressed up our Camaro astonishingly. Working our way forward, we installed the fake grilles in the hood that distinguish an SS Camaro from a run-of-the-mill V8. Next, we assembled and tested each of the complicated hideaway headlight units, which help identify this Camaro as an RS. These diabolical assemblies can be extremely difficult to properly adjust and, consequently, can take hours of fiddling to get just right. It's easier to do it off the car, then install the ready-to-run assembly.

The RS grille is a surprisingly tricky piece. In order to fit the grille, you must loosen the lower valence panel, snap the grille in place, raise both into place together, then readjust the fit of the valence panel, fenders and hood. What should be a 2-minute job ends up taking 2 hours. After the valence was finally back in place—with three excruciating chips in our fresh paint job—it was time to add the front spoiler and its three sturdy support rods.

As a relief from fighting with the front of the car, we turned to the windows. Our windows were supplied by OEM Glass of Bloomington, Illinois. OEM is incredible. They can actually supply glass that not only duplicates the factory parts, but is even etched with the proper codes for your particular car. Details like this amaze your friends, and win concours.

The Camaro windshield is held in place by silicone tape. The trick here is to run the tape along the edges of the glass rather than the frame, balance the glass on the bottom retaining



Ken carefully fits the SS vents to the newly painted hood. The finish is still quite soft at this point.



Lots of new wiring and controls, new pedals and a rare \$500 steering wheel spill up the dash area.

HOW TO RESTORE AN OLD CAR



Tired vent window frames were stripped, straightened, filled and rechromed before reassembly with new glass and weatherstripping.



Completed subassemblies of window mechanisms and glass are ready to be installed.

clips, line it up side-to-side and snap it into place. If you do it wrong, a piece of safety wire dragged around the edges is the perfect tool for freeing the glass from the adhesive. Remove the tape with lacquer thinner, clean the glass, retape and try again.

With the new windshield in place, you can reinstall the windshield moldings. On the Camaro, most are stainless steel. These are pure "unobtainium," and invariably have 25 years worth of dings and dents. The recommended procedure: Start by straightening the parts as much as possible by hand. Then hammer out the dents—we use mar-free plastic mallets sold by Eastwood. Cut down the high spots with a flat file, then sand with a DA sander and 220-grit paper. Follow this with a good buffing on the buffing wheel and polishing with Simichrome polish. I know this sounds like a terrible thing to do to an irreplaceable piece of trim, but it really works.

The largest area of chrome trim on these early Camaros is the windshield header. We had ours stripped and rechromed before reinstallation. At the same time, we had the frames for the front vent windows rechromed. Fitted with new weatherstripping and new glass from OEM, these added dramatically to the finished appearance of our doors. While we were in the vicinity, we added the correct 1967 "bowtie" rearview mirrors to the doors and also installed new door handles and locks from D&R.

We spent a long time on the side window mechanisms. We'd completely stripped the inside of each door when we first disassembled our car, months ago. Now we bead-blasted and painted each unit, relubricated the operating parts and reinstalled them in the doors and rear quarters. Only after each was properly operating did we equip it with glass and new weatherstripping. Working steadily,

this took literally days to accomplish, and from outside, you couldn't see the difference.

The same thing was true of the tangle of wiring and controls in the dash. You spend tedious hours upside down with your head in a footwell and have nothing to show for it except that the turn signals blink again. Quicker gratification came with the installation of a genuine 1967 Camaro 3-spoke fake-wood steering wheel. Steve Drueck at D&R came up with this rare piece, a \$500 item if you can find one.

You'll remember that we fitted our Camaro with a 345-hp H.O. 350 V8 from Chevrolet. This is essentially the hot Corvette LT1 engine fitted with a carburetor instead of fuel injection. We used Accel accessories—starter, alternator, distributor, spark plug wires and wire looms.

The H.O. 350 comes without exhaust manifolds. Our friend Reeves Callaway donated a set of late-model Corvette exhaust manifolds. It was a

simple matter to weld up the air-sensor holes, which aren't needed on this "pre-smog" engine. Getting them to fit was a little more difficult. On the passenger's side, no problem. On the driver's side, we had to cut and re-weld the exhaust port flange to bring the manifold closer to the block. We also cut and patched a section out of one runner to clear the steering box.

Once modified to fit, we had the manifolds stripped and plated with High-Temperature Coating by HPC in Manchester, Connecticut. This gave our manifolds a semigloss silver finish that's tough, heat-resistant and more attractive than either traditional header paint or chrome.

It seems to be human nature to want to make changes, without considering the ramifications of the changes in other areas. This way of thinking is almost endemic among members of Congress, for example. Unfortunately, we were no exceptions. When you bolt a new H.O. 350



The trick here is getting the two pieces on the fenders to line up with the piece on the door.



Pesky window winders must be inserted and adjusted through small holes in the door. Sore forearms are an occupational hazard.



All window mechanisms are repeatedly tested before glass is installed, then tested again before interior trim panels go on.

V8 and TH700 transmission into a 25-year-old Camaro, almost everything has to be changed. Take the driveshaft, for example. Connecticut Driveshaft in Milford, Connecticut, shortened our driveshaft 2.375 in., equipped it with new U-joints and balanced the whole assembly.

The exhaust system was even more complicated. Walker makes an exhaust system for almost any car, except a 1967 Camaro with a late-model V8. We started with a Walker 430 system that fits all 1967-'69 Camaros with small-block V8s. We used the stock crisscross muffler, tailpipes and arches to clear the rear axle. That took care of the open end.

For the engine end, we ordered Walker's 40449 pipes, designed for the late-model Corvette. On the Corvette, these join to form a Y into a single exhaust pipe. We cut off ours to make duals, rewelded the manifold flanges to get the right angle, then connected the Corvette header pipes

to the Camaro exhaust using 2.25-in. pipe that we had custom bent.

In 1967, the hot street tires were Firestone Super Sports Wide Ovals—the ones with the little red stripe in the sidewall. Coker Tire has these in repro, in the correct size of D70-14. Of course, we had to have GM's famous rallye wheels, 14 × 6s. As far as we're concerned, these are just for show—skinny bias-ply tires are just not up to the demands of modern-day driving. Our alternates are state-of-the-art Goodyear Eagle NCT 60s, in size P235/60ZR15. We've mounted these on 15 × 7 rallye wheels.

Except for a few minor details—and a shifter—our Camaro is pretty much finished. Of course, we still have to install the top and the interior. Next month, we'll show you how we fitted new carpets, seats, door panels and the convertible top. And in two months, you'll see our Camaro complete and ready for testing on the dyno . . . and the dragstrip. **PM**



Grille, lower valence panel and spoiler took a lot of time and patience to align properly.

SOURCE LIST

Some of the suppliers for this project:

- Auto Body Specialties, P.O. Box 455, Middlefield, CT 06455; (203) 346-4989 (Body parts)
- B & M Automotive Products, 9152 Independence Ave., Chatsworth, CA 91311; (818) 882-6422 (Engine and drivetrain components)
- Campbell-Hausfeld, 100 Production Dr., Harrison, OH 45030; (513) 367-3130 (Air compressor and air tools)
- Chevrolet Division, General Motors Corp., 30007 Van Dyke Ave., Warren, MI 48090; (313) 492-8855 (Engine and transmission)
- Coker Tire, 1317 Chestnut St., Chattanooga, TN 37402; (800) 251-6336 (Repro tires)
- Custom Auto Sound, 808 West Vermont, Anaheim, CA 92805; (800) 888-8637 (Replacement car radios)
- Daytona Mig, 1821 Holsonback Dr., Daytona Beach, FL 32117; (800) 331-9353 (Mig welder)
- D & R Classic Automotive, 31 W. 208 Diehl Rd., Suite 107, Naperville, IL 60563; (708) 369-2030 (Camaro restoration parts)
- DTS, 22250 Schmemman Rd., Warren, MI 48089; (800) 521-0628 (Ring and pinion)
- Eagle Equipment Co., 23 Wetherill Place, Plainville, MA 02762; (800) 535-0016 (Lift)
- The Eastwood Co., 580 Lancaster Av., Frazer, PA 19355; (800) 345-1178 (Specialized restoration tools)
- Echlin/Accel, Box 142, Branford, CT 06405; (203) 481-5771 (High-performance ignition products)
- Gearbox Grannies, 3944 Indian Ripple Rd., Dayton, OH 45440; (513) 429-5642 (Even more specialized restoration tools)
- General Motors Service Parts Operations, 6060 W. Bristol Rd., Flint, MI 48554; (800) GM USE US (Body, suspension and trim parts)
- Goodyear Tire and Rubber Co., P.O. Box 9125, Akron, OH 44305; (216) 796-2490 (Temporary tires)
- Jones Racing Products, Route 611 and Annawanda Rd., Ottsville, PA 18942; (215) 847-2028 (Engine accessory drives)
- Kanter Auto Products, 76 Monroe St., Boonton, NJ 07005; (800) 526-1096 (Springs, shock absorbers)
- Minisport, Jackson Hill Rd., Sharon, CT 06069; (203) 364-0311 (Auto restorations)
- OEM Glass, P.O. Box 362, Route 9 East, Bloomington, IL 61702; (800) 283-2122 (Auto glass)
- PST, P.O. Box 396, Montville, NJ 07045; (800) 247-2288 (Suspension bushings, antisway bars)
- Sharon Auto Body, Route 343, Sharon, CT 06069; (203) 364-0128 (Finish bodywork and painting)
- Rallye Wheel Components, 3633 Lancaster Dr., Eugene, OR 97404; (508) 689-6867 (Rallye wheels and trim)
- TIP Sandblast Equipment, P.O. Box 649, Canfield, OH 44406; (800) 321-9260 (Sandblaster, bead blast cabinet, paint sprayer)
- Walker Manufacturing, 1201 Michigan Blvd., Racine, WI 53402; (800) 767-DYNO (Exhaust system)
- Wurth USA, 93 Grant St., Ramsey, NJ 07446; (800) 526-5228 (Fasteners)



POSSIBLE DREAMS

America's hopes for the future are realized through technological progress.

BY MARY SEELHORST

● POPULAR MECHANICS' 30th anniversary issue cover personified the March of Progress, striding confidently into the future. Inside, dozens of inventors, business leaders and scientists poured out their dreams of inevitable, wonderful technological progress that would surely provide a better future. "Progress Never Stops," read one headline. "The Past Assures The Future," declared another. Yet in 1932, the nation was only at the beginning of the long, bleak path through the Great Depression followed by the terrible upheavals of World War II.

Despite these troubled times—or

Mary Seelhorst is curator of the "Possible Dreams" exhibit at Henry Ford Museum & Greenfield Village in Dearborn, Michigan.

perhaps because of them—many Americans in the 1930s and '40s looked forward to a future made better by technological progress. Henry Ford Museum & Greenfield Village takes a look at America's technological optimism in "Planning the World of Tomorrow," a section of the exhibit "Possible Dreams: POPULAR MECHANICS and America's Enthusiasm for Technology."

Planned before the 1929 stock market crash, Chicago's 1933 "Century of Progress" World's Fair celebrated the rise of consumer culture with jazzy, angular architecture and the futuristic, machine-age look of streamlined products. "Possible Dreams" displays World's Fair souvenirs that capture the look and the

optimism of the times. For many of the fair's visitors, these souvenirs were reminders of their first exposure to the highly designed, machine-age environment promoted as the look of tomorrow. Many more people saw the fair through the eyes of POPULAR MECHANICS in an extensive 1933 photo essay. We've reproduced that essay in the exhibit, along with many of PM's futuristic covers and optimistic commentary.

One of PM's more prominent commentators was industrial designer Walter Dorwin Teague. "A better world than we have ever known can and will be built," he confidently declared in his 1940 article. As a relatively new and increasingly important profession, industrial designers were often the focus of POPULAR MECHANICS articles. Like Teague, many designers believed that people's lives could be improved by applying scientific principles to the design of everyday environments: "Our better world may be expected to make equally available for everybody such rare things as interesting, stimulating work, emancipation from drudgery and a gracious setting for daily life." Manufacturers banked on the streamlined look, hoping to tempt consumers with their products by designing fresh new versions of old wares.

The blue, mirrored finish of
(Please turn to page 119)



Susan Pacheco-Baker,
Ford Mechanical Engineer

"Some of our best customer input comes from employees."

Because our employees are customers too, they want the same thing in a car or truck as you do. So at Ford Motor Company we encourage everyone, in every area of the company, to share their ideas. And it's this kind of thinking that has resulted in vehicles like our Ford Explorer having one of the highest customer satisfaction ratings in the industry. People know a good idea when they see it.



Ford • Lincoln • Mercury • Ford Trucks

QUALITY IS JOB 1.™ IT'S WORKING.

Buckle up—Together we can save lives.

Always insist on genuine Ford Motor Company collision repair parts.

© 1997 Ford Motor Company. All rights reserved.

POPULAR MECHANICS
IMPORTS
1993

FAST FORWARD

The import crop roars into 1993 with better handling and more horsepower across the board.

BY TONY SWAN, *Automotive Editor*



MAZDA RX-7

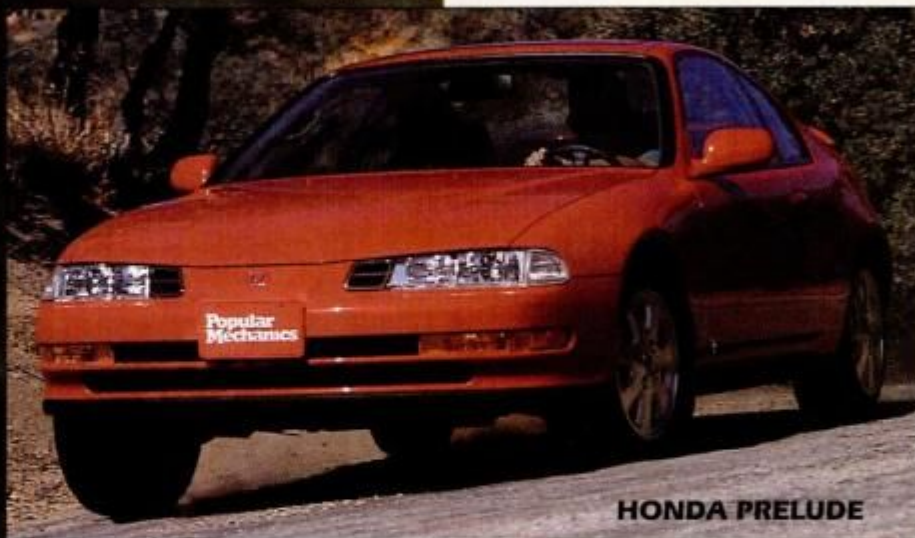


BMW 325is

● Although there's increasing emphasis on safety features and a widespread changeover to non-CFC refrigerants in air-conditioning systems, the dominant theme for the 1993 import car market is the same as it's been for several years: more power from engines with improved efficiency and better handling to go with it.

The net-net on this trend is cars that are simultaneously safer and more fun to drive.

One explanatory note before we launch into our brand-by-brand rundown on what's new. For our



HONDA PRELUDE

PHOTO BY RON HUSSEY

purposes here, import means any car, truck, sport/utility or minivan from a manufacturer headquartered outside the United States. As a result, we include a number of cars—Mazda's new MX-6 and 626, for example—built in the U.S. with sufficient domestic content to qualify as domestic vehicles.

Acura

You won't see much in the way of new sheetmetal from Honda's luxury car division for '93—but that doesn't mean the Acura guys haven't been busy.

An early example (mid-'92) of this

activity is the **Integra GS-R**. By adding Honda's **VTEC** (Variable Valve Timing and Lift Electronic Control) system, the Acura engineers have squeezed **160 hp** out of the GS-R's 1.7-liter dohc 16-valve Four.

There's also more muscle en route for the **Legend Coupe**, due early next year. Although we hadn't seen this car by press time, we know Acura's power wizards have found **another 30 hp** in the Legend's 3.2-liter sohc 24-valve V6, raising output to 230. Bolted to a **new 6-speed manual transmission**, this setup promises to keep the Legend ahead of its pursuers.

Audi

Audi is putting on its own power play for '93, replacing the 130-hp 2.3-liter Five that powered the '92 Audi 80 with a **172-hp sohc 2.8-liter V6** borrowed from the Audi 100. There's more wheelbase and a stiffer platform to go with the power increase, as well as a new (we use the term advisedly) model designation: the **Audi 90**.

BMW

BMW's only fresh sheetmetal for '93—the new **3-series coupes** (318i and 325is)—came along at midyear, but as we say goodbye to '92, the boys from Bavaria do have some interesting updates for existing models. Tops under this heading is an **all-new 4.0-liter dohc 32-valve aluminum V8** rated at 282 hp. The V8, BMW's first since 1965, replaces the 3.5-liter straight-Six in the big 7-series sedan, which makes it the **740**. There's a **new 5-speed automatic** to go with it.

Other BMW techno-goodies include new ellipsoidal halogen headlamps and variable cam timing for improved low-end torque in the company's 2.5-liter dohc 24-valve Six (3-series and 525i).

Ferrari

Do you need a new Ferrari? Probably not. Do you want a new Ferrari? But of course. Ferrari's new one for '93 is the **512 TR**, which is essentially an update on the Testarossa. Highlights include revised styling, improved braking, a stiffer chassis and more muscle—**421 hp** from the 5.0-liter dohc 48-valve aluminum Flat-12.

Honda

Count on Honda to put a new spin on an established idea. For '93, it's the **Civic del Sol**—a subcompact targa-top coupe that offers convertible fun without the inconvenience of a convertible top. It also offers one of the best open-top wind management sys-



**ACURA
LEGEND**

tems in the business (see our First Drive Report below).

The **Civic Coupe** is another newcomer to the family. Sharing the Civic Sedan chassis, the Coupe borrows its sporty front-end styling from the smaller Hatchback, but is otherwise new. This is the first true coupe—with a real trunk—in the Civic's 20-year history. Along with a wide range of powertrain and other options, it gives the Civic lineup more variety than anything in its class.

Redesigned last year, Honda's Prelude sport coupe also expands its capabilities with the addition of the **Prelude Si VTEC**. Applied to the Si's 2.2-liter dohc 16-valve Four, the VTEC system boosts peak output by 30 hp, to 190—more muscle than any U.S. market Honda ever offered. If you still

think of the Prelude as a paper tiger, drive this one. It's the real thing.

Elsewhere at Honda, the **Accord** line—one year away from a major overhaul—gets a luxury edition, the SE. Included are leather upholstery,



AUDI 90

premium Honda/Bose sound, dual front airbags and antilock brakes.

Hyundai

Although there's an all-new Sonata on the near horizon, Hyundai's major news for early '93 is underhood. The

subcompact Elantra gets a new 124-hp 1.8-liter dohc 16-valve 4-cylinder engine option, while the little Scoupe coupe offers a turbo upgrade. Available in normally aspirated (92 hp) and turbocharged editions (115 hp), the 1.5-liter sohc 12-valve Four is Hyundai's first home-grown engine.

Infiniti

Introduced in early '92 as a '93 model, the new J30 makes the strongest statement yet on behalf of Nissan's luxury division. Styled at Nissan's U.S. design studios in La Jolla, California, the J30 is distinctive, potent (with 210 hp from its 3.0-liter dohc 24-valve V6) and ultra-posh. It also includes antilock brakes and dual front airbags as standard equipment.

This is a thoroughly competent

FIRST DRIVE REPORT

HONDA CIVIC DEL SOL

● With due respect to Honda's engineers, we're suspicious of the del Sol's origins. Anything this much fun had to have been conceived by Walt Disney's imagineers.

Based on the Civic platform, which was all new for '92, the del Sol is a targa-top coupe that puts fresh-air fun into the U.S. Honda lineup for the first time ever.

The convertibility factor is painless. Unlock the 24-pound aluminum panel, stow it in the trunk (a nifty rack is built into the underside of the decklid) and you're in sun city. And you've still got trunk space left over.

Neat as the lift-and-stow top is, though, what really sets the del Sol apart is its wind management system. Honda invested a lot of wind-tunnel time figuring out how to provide sun-in-face without wind-in-hair. The entire design, including the mirrors, was shaped to reduce buffeting. And it works. By adjusting the power rear window, you can tune airflow to produce calm in the cabin no



matter how fast the scenery is moving.

Fast, of course, is a relative issue here. The del Sol won't make us forget the hot-rod CRX, which it replaces. But there's more than enough scoot to keep you from getting bored. The base engine is a 102-hp 1.5-liter sohc Four, and the Si edition rides behind a 1.6-liter dohc 16-valve Four with Honda's VTEC valvetrain, good for 125 hp.

We're always in favor of a little more power. But either way, the del Sol's fun quotient is high.

—Rick Titus

Specifications

Layout	Front-engine, front-drive
Body style	2-seat coupe
Engine	102-hp sohc 16-valve I4
Transmissions (Std., Opt.)	5M, 4A
Wheelbase	93.3 in.
Track, f/r	58.1/57.7 in.
Length	157.3 in.
Width	66.7 in.
Height	49.4 in.
Min. curb weight	2277 lb.
Brakes (Std.), f/r	Disc/drum



HONDA CIVIC COUPE

highway-gobbler, but for those who want a sportier edition there's the J30t (for touring), which adds stiffer suspension tuning and Nissan's Super HICAS 4-wheel steering system.

Land Rover

We used to call it Range Rover of North America, but the arrival of the limited-edition Land Rover Defender 110 for 1993 also precipitated a change of the parent company's historic title. A longtime favorite of safari masters—as well as the British military—the U.S. Defenders combine Land Rover's superb go-anywhere 4-wheel-drive system with excellent ground clearance and 3.9-liter V8 power (180-hp and 227 ft.-lb. of torque).

Though it's a trifle stiff and spartan compared to other compact sport/uti-

lity vehicles, the Defender thrives on rough stuff that would stop just about anything else.

Meanwhile, the engineers have been busy with the Range Rover, re-

wheelbase) edition, the bigger Range Rover also has bigger muscles, with a 4.2-liter version of the aluminum V8 rated at 200 hp and 251 ft.-lb. of torque.



LEXUS LS 400

Lexus

You have to look hard to see the differences in the first styling update of the LS 400. The original was so popular that the facelift was limited to a revised grille and body-color side-cladding. Functional changes include bigger brakes and fatter V-rated tires on 16-in. wheels. Plus, dual airbags are standard.

fining its already excellent full-time 4wd system with a new electronically adjustable air suspension system, enhanced by traction control. Available in the new County LWB (for long

Mazda

Once a purveyor of conservatively styled, quietly competent automobiles, Mazda has suddenly become an industry pacesetter. The latest in a 3-

FIRST DRIVE REPORT

NISSAN ALTIMA

● Nissan's contribution to the outstanding array of midsize sedans for 1993 is this stylish newcomer, which replaces the Stanza.

Beyond whatever image considerations were involved, the new name is appropriate, because the new car has little in common with its predecessor. The Infiniti-inspired sheetmetal is far more distinctive than the boxy old Stanza, and the roomier interior is fitted out with better materials and improved seating.

We're also impressed with the new chassis. Like all of Nissan's recent offerings, the Stanza was built on a very solid platform. Nevertheless, the Altima's front-drive chassis is stiffer, a trait that pays off with improved handling precision, which in turn makes the new car more fun to drive.

Nissan has elected to shun a V6 engine option. Altimas get their go from a new 2.4-liter dohc 16-valve Four rated at 150 hp and 154 ft.-lb. of torque—more power than competing Fours and enough to provide respectable acceleration.



The new engine drives the front wheels through a 5-speed manual transmission (standard for most trim levels) or a 4-speed automatic, mated to a viscous limited-slip differential. The limited-slip provides better bite in hard cornering, reducing the understeer common to many front-drivers.

The basic disc/drum brake system is competent, but we prefer the all-disc setup with its optional ABS. Any way you spec it, though, you can expect an attractive bottom line on the window sticker. —Tony Swan

Specifications

	Front-engine, front-drive
Layout	4-door sedan
Body style	150-hp dohc 16-valve 2.4-liter I4
Engine	5M, 4A
Transmissions (Std., Opt.)	103.1 in.
Wheelbase	57.7/57.3 in.
Track, f/r	180.5 in.
Length	67.1 in.
Width	55.9 in.
Height	2765 lb.
Min. curb weight	Disc/drum
Brakes (Std.), f/r	



MAZDA MX-6

year series of home runs are the stylish new MX-6 sport coupe and midsize 626 sedan, cars that make their predecessors look very old-fashioned indeed. Sharing the same front-drive platform, both cars are a little bigger than the cars they replace, and also slightly lighter. The platform, shared with Ford's new Probe, is significantly stiffer, and this, coupled with front suspension revisions, provides impressively precise handling.

The engines—a 118-hp 2.0-liter dohc 16-valve Four and a sparkling 2.5-liter dohc 24-valve V6 rated at 164 hp—are also new. A driver's-side airbag is standard on all models, and antilock brakes are optional.

Attuned to Mazda's new strategy of skimming the top of carefully selected markets with designs that set their owners apart from the crowd and a driving experience that goes well beyond mere transportation, both cars



MAZDA 626

look very much like winners.

Winner is a word that also applies to the new RX-7. Introduced earlier this year, Mazda's senior sports car goes from pleasant to potent in one sizzling swoop. With sequential twin turbos feeding the 13B rotary engine, there's 255 hp on tap. Add that to a substantially stiffened chassis, reduced curb weight and raceworthy braking with standard antilock and you have the ingredients for a supercar. And that's what the RX-7 is.

Mercedes-Benz

If power is a major component of prestige, Mercedes is even more prestigious for '93. In addition to other refinements—and a handsome new convertible (see our First Drive Report below)—the 300 series gets two major horsepower infusions. The first is the 300E's 194-hp 2.8-liter dohc 24-valve straight-Six, with 36 hp more than the 2.6-liter Six it replaces. The other 300 models get a new 217-hp dohc 24-valve Six, a 40-hp

FIRST DRIVE REPORT

MERCEDES-BENZ 300CE CABRIOLET

● Mercedes-Benz uses one word—*ambience*—to describe its design goal for the new 300CE Cabriolet. And after several days of touring and tearing around the German countryside—including Autobahn stretches at 140 miles per hour—we think we understand what they were after.

Specifications

Layout	Front-engine, rear-drive
Body style	Convertible
Engine	217-hp dohc 24-valve 3.2-liter I6
Transmission	4A
Wheelbase	106.9 in.
Track, f/r	59.1/58.7 in.
Length	183.9 in.
Width	68.5 in.
Height	55.2 in.
Min. curb weight	4025 lb.
Brakes, f/r	Disc/disc, ABS



We also think they hit the target. Here's a convertible with so much internal integrity that its handling is indistinguishable from its steel-topped stablemates.

Considering M-B's engineering track record, this doesn't exactly surprise us. It's no secret that creating a convertible requires more than a hacksaw. The 300CE's chassis was given a major dose of torsional stiffening, to compensate for the lack of roof struc-

ture, and the windshield frame was strengthened to act as a front rollover bar. A second bar, hidden behind the rear seat, automatically pops up when disaster threatens, à la M-B's SL roadsters.

Mercedes *ambience* never comes cheap. The 300CE may be available for less than \$80,000 per copy, but not by much. That's pretty expensive fresh air—but it's not bad for an instant classic. —Rick Titus



MITSUBISHI MIRAGE SEDAN

gain over the old 3.0-liter version.

The SL roadster lineup also gets a boost with the addition of M-B's magnificent 389-hp 6.0-liter dohc 48-valve V12, and the new S-Class family has been expanded to include an elegant new coupe. Introduced in early '92, the coupe offers two engine options: a 315-hp dohc 32-valve V8 (500SEC) or the V12 (600SEC).

Mitsubishi

Mitsubishi's biggest news for '93 is small—the all-new Mirage. Available in coupe and sedan editions, the all-new (new platform, new multilink rear suspension) cars offer more room, attractive styling and even more attractive prices.

Coupes are powered by a 92-horsepower 1.5-liter sohc 12-valve Four, which is also the base engine for the sedans. A 113-horsepower 1.8-liter 16-valve Four is a sedan option.



MITSUBISHI MIRAGE COUPE

Another significant Mitsubishi upgrade for '93 is the availability of more muscle for the Expo minivan family. The little Expo LRV's 1.8-liter sohc 16-valve Four stays the same at 113 hp, but the bigger Expo's 2.4-liter dohc 16-valve Four (an Expo LRV option) jumps from 116 to 136 hp.

Nissan

Goodbye Stanza, hello Altima. Nissan's new midsize entry represents a fresh sheet of paper inside and out: a new chassis, even more rigid than the commendably stiff Stanza platform, distinctive new sheetmetal that echoes Infiniti J30 styling and a contem-

FIRST DRIVE REPORT

TOYOTA COROLLA

● Hey, the Toyota Corolla just grew up. It's all-new for '93, and Toyota took this opportunity to make the Corolla bigger on the outside and inside. In fact, it's so much bigger that it's no longer classified as a subcompact. Now it's a compact and, frankly, sets new standards for cars this size. It's one very classy small car.

But it's not just a new body. Everything on the '93 Corolla is new—engines, gearboxes, interiors, everything. And despite the addition of a driver's-side airbag and an optional antilock braking system, the new Corolla is still pounds lighter than its predecessor.

A huge improvement was made in quietness. The interior is a full 5 decibels quieter at 60 mph than the '92 model, thanks in no small part to Lexus technologies that have trickled down to the Corolla—like the use of composite resin asphalt sheeting in a steel sandwich for body panels, foam-rubber in-



sulation and liquid-filled engine mounts.

Two engines are available. Standard on base Corollas is a 1.6-liter twin-cam 16-valver rated at 105 horsepower. Upscale DX and LE models have an all-new 1.8-liter, 16-valve electronically fuel-injected Four rated at 115 hp.

On the road, the new Corolla feels like a larger, more powerful car. Yes, it's a lot like its big brother, the Camry, and that means luxurious. We spent a full day in a variety of Corollas, roaming the Adirondack Mountains in upstate New York. The ride and handling are excellent, and the 1.8-liter engine is quite capable. The '93 Toyota Corolla def-

initely moves the needle in the small-car sweepstakes. —Joe Oldham

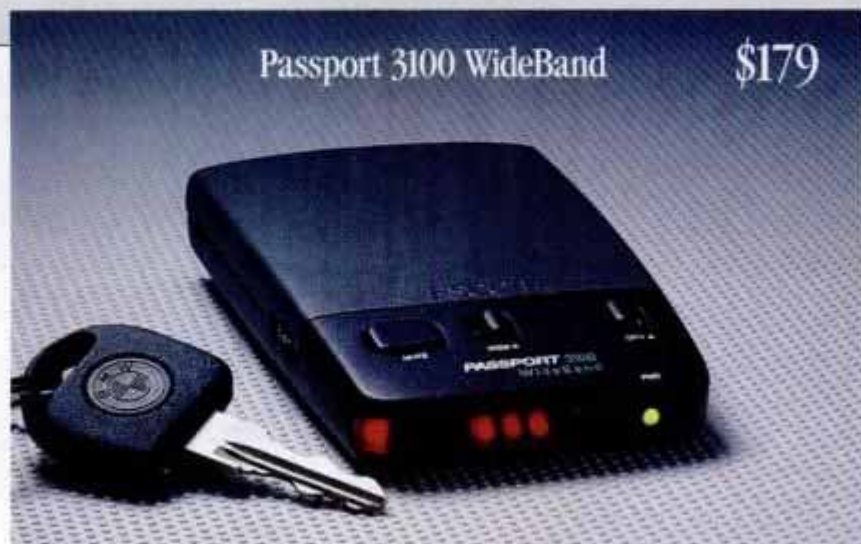
Specifications

Layout	Front-engine, front-drive
Body style	4-door sedan
Engine	115-hp dohc 16-valve 1.8-liter I4
Transmission	4A
Wheelbase	97.0 in.
Track, f/r	57.5/57.1 in.
Length	172.0 in.
Width	66.3 in.
Height	53.5 in.
Min. curb weight	2304 lb.
Brakes, f/r	Disc/Drum, ABS (opt.)

(More Imports '93 on page 62)

7 Ways To Delight

1



Passport 3100 WideBand

\$179

For Total Radar Coverage

Passport 3100 WideBand is the perfect choice for drivers who own a two-band detector and are ready to step up to the latest, most complete radar technology available. Passport 3100 WideBand detects every type of traffic radar currently used today, including X, K, Ka, Photo radar and Stalker.

All wide band detectors are not created equal. Some actually "miss" part of the broadcast signal at selected frequencies — like a radio that can't pick

up every station. But Passport 3100 WideBand doesn't miss a thing. If radar is there, you'll know it instantly.

Passport 3100 WideBand: radar detection at its best.

FEATURES: *Digital Signal Processing • Long range detection • Anti-falsing circuitry • Signal strength meter • Mute button • Band selector switch • Visual and audible alert system • City/highway switch*

2



\$199

Passport 3200 WideBand offers additional features and accessories. Call today for more information.

4



\$99

Passport 2200 is a full-featured X and K band radar detector. Combining incredible value with superior detection performance, Passport 2200 will delight the driver in your life.

FEATURES: *Digital Signal Processing • Long range detection • Visual and audible alerts • Dim switch • Signal strength meter • K-band indicator • Mute switch • City/highway switch*

5



\$79

Passport 2100 offers great X and K band performance at a very affordable price. Easy to understand and use, Passport 2100 is a perfect choice for the first-time user or for the person who's ready to step up to Escort quality.

FEATURES: *Long range detection • Visual and audible alerts • Signal strength meter • Mute switch • City/highway switch*

6



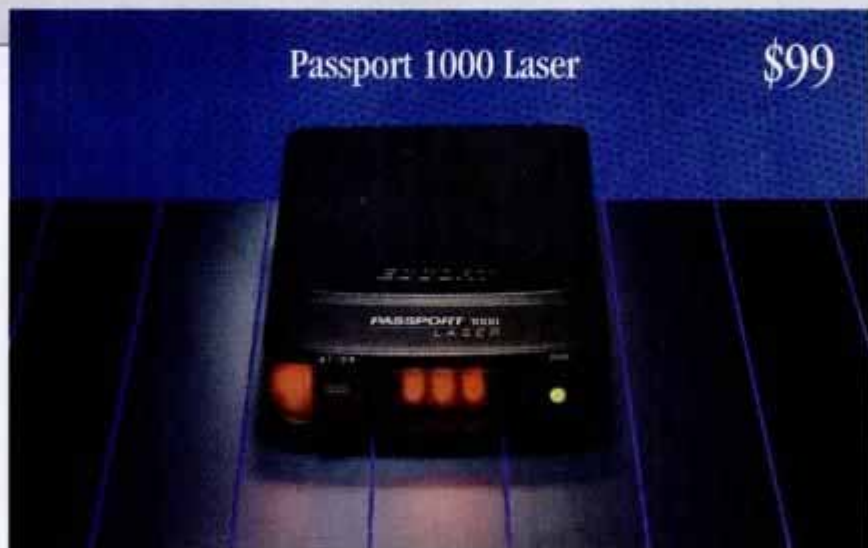
\$49

Passport 2000 is a good, basic X and K band radar detector. It doesn't come with a lot of fancy features, but it does have the quality for which Escort is known. And its price makes Passport 2000 the perfect stocking stuffer.

FEATURES: *Alert light • Audible alert tone • City/highway switch*

Your Favorite Driver

3



Passport 1000 Laser

\$99

The Worlds First – and Best – Laser Detector

Passport 1000 Laser provides complete protection from the new laser technology. If your favorite driver already owns a radar detector, this is the perfect gift.

A radar detector doesn't pick up laser. If your favorite driver doesn't have a laser detector, he's not fully protected. Passport 1000 Laser works with a radar detector to provide complete radar and laser protection.

While laser manufacturers have spent a lot of time claiming that laser is

undetectable, Passport's complex circuitry finds it easily. In fact, Passport 1000 Laser can detect a laser signal up to 2 miles from the source.

Passport 1000 Laser, innovative technology – available first from Escort.

FEATURES: Long range laser detection • Digital PRT detection • Pulse Width Discrimination • Signal strength meter • Dark mode • Adjustable volume • Compatible with most radar detectors

WHAT IS LASER?

Laser guns calculate speed by transmitting short pulses of light energy and measuring the time it takes for the reflection to return. Once transmitted, the laser signal is dispersed due to atmospheric particles such as dust, water vapor, and car exhaust. Passport 1000 Laser's complex circuitry easily detects this dispersed signal.

7

Our Holiday Guarantee

We want you (and your favorite driver) to be 100% satisfied with your purchase.

We back each Passport with a 30-day trial period which we will begin on December 25, 1992 – even if you buy right now!

If your favorite driver isn't absolutely delighted with Passport, return it within 30 days and we'll refund your money. You can't lose.

How to Order:

Call us toll-free
24 hours, 7 days a week
1-800-433-3487

For discounts, full product support and more, ask about our *EscortPlus Club*®

By Phone:

Call us toll-free at 1-800-433-3487

By Fax:

Fax your order to 1-513-247-4820

By Mail:

Mail your order to

ESCORT

▶ Department 5068D2
5200 Fields-Ertel Road
Cincinnati, Ohio 45249

Make check payable to Escort.

Shipping & handling is additional. OH res. add 6% tax.

* Overnight shipping available

ESCORT
The Innovative Edge.™



porary new interior. Altima's mechanical particulars and excellent road manners are detailed in our First Drive Report on page 57.

Nissan's other major news for '93 is the new front-drive Quest minivan. After a couple of false starts, this one—with its smooth 150-hp V6 power and carlike driveability—looks like a home-run for Nissan. Along with its Mercury cousin, the Villager, the Quest mirrors the traits that have kept Chrysler's minivans on top since 1984. And when it comes to convertibility of seating to cargo space, the Quest, with its removable center seats and clever sliding rear seat, has the edge.

Nissan introduced convertible versions of its 240 SX sport coupe and 300ZX sports car earlier this year, as well as updated styling for its popular Hardbody pickups.

Subaru

Although Subaru's model lineup is unchanged at year's end, look for a Loyale replacement in Subaru showrooms in early '93. Bigger and roomier than the Loyale, the new Impreza will ride the same platform as the Legacy sedan. It'll also have a bit more power—110 hp—from its 1.8-liter sohc 16-valve opposed-Four. Like all Subaru, all-wheel drive will be an option. The Loyale will continue to be offered through most of '93.



ISUZU TROOPER



LAND ROVER DEFENDER T10

Toyota

A pair of newcomers, both highlighted in our First Drive Reports, are Toyota's '93 headliners. The new Corolla family—sedan and wagon—gets

a bit more horsepower and a lot more room, moving up to the compact class in the process. All-new and significant apply here.

Even more significant—and equal-



WHERE THEY'RE MADE

●Where will your next car be made? We think it's always interesting to know. Although you'll see a number of vehicles on this chart that are assembled in the United States—some whose local content qualifies them as domestics—for our purposes import applies to vehicles with parent companies that are headquartered outside the United States.

—Jim Dunne

ACURA

Integra Suzuka, Japan
Vigor Sayama, Japan
Legend Sayama, Japan
NSX Tochigi, Japan

ALFA ROMEO

Spider Turin, Italy
164 Arese, Italy

ASTON MARTIN

Volante Newport Pagnell, England

AUDI

90 Ingolstadt, Germany
100 Neckarsulm, Germany

S4 Neckarsulm, Germany
V8 Neckarsulm, Germany

BENTLEY

Continental Crewe, England
Brooklands Crewe, England

BMW

3-Series Munich, Germany
Regensburg, Germany
5-Series Dingolfing, Germany
7-Series Dingolfing, Germany
850i Dingolfing, Germany

FERRARI

348 Modena, Italy

Mondial Modena, Italy
512 TR Modena, Italy

HONDA

Accord Marysville, OH
Sayama, Japan
Civic/Civic del Sol E. Liberty, OH
Alliston, Ontario
Suzuka, Japan
Marysville, OH
Prelude Sayama, Japan

HYUNDAI

Elantra Ulsan, S. Korea
Excel Ulsan, S. Korea
Scoupe Ulsan, S. Korea
Sonata Bromont, Quebec
Ulsan, S. Korea

INFINITI

G20 Oppama, Japan
J30 Oppama, Japan
Q45 Tochigi, Japan

ISUZU

Amigo Fujisawa, Japan
Impulse Fujisawa, Japan

Pickup Lafayette, IN
Fujisawa, Japan
Rodeo Lafayette, IN
Stylus Fujisawa, Japan
Trooper Fujisawa, Japan

JAGUAR

XJ-S Coventry, England
XJ6 Coventry, England

LAMBORGHINI

Diablo Sant Agata
Bolognese, Italy

LAND ROVER

Range Rover Solihull, England
Defender 110 Solihull, England

LEXUS

ES 300 Tsutsumi, Japan
LS 400 Tahara, Japan
SC 300/400 Tahara, Japan

LOTUS

Esprit Norwich, England



TOYOTA MR2

ly all-new—is the T100 pickup. Bigger than American compacts like the Dodge Dakota, Ford Ranger and Chevy S-10, the T100 is the first import pickup to invade what has previously been all-American turf.

Although most other Toyota lines are largely unchanged for '93, a voluminous new station wagon has been added to the Camry family. The stylish MR2 sports car also got some attention with a mid-'92 rear suspension revision that makes it quicker and more stable in hard cornering.

Volkswagen

After four decades, Volkswagen has finally abandoned its original Microbus/Vanagon approach to the minivan, replacing it with a contemporary front-engine, front-wheel-drive design—the new EuroVan. Gone too is the old flat-Four engine. The Euro-



SUBARU IMPREZA

Van is hauled by a torquey 2.5-liter sohc inline Five, but its real strong suit is interior volume, more than anything in the class.

On the power front, Volkswagen will offer its nifty VR6 engine as an option for the Passat sedan. Introduced earlier this year in the Corrado sport coupe as a replacement for the G60 supercharged Four, the 178-horsepower sohc 2.8-liter engine is an innova-

tive design, featuring an extremely narrow angle (15°) between cylinder banks and a common cylinder head for both.

Look for this engine to be offered in the recently redesigned Jetta III.

Volvo

New usually has a familiar shape at Volvo, and that's the case with the new 850 GLT. The car strongly resem-

MAZDA

323	Hiroshima, Japan
626	Flat Rock, MI
929	Hiroshima, Japan
B2200/B2600	Hiroshima, Japan
Miata	Hiroshima, Japan
MPV	Hiroshima, Japan
MX-3	Hiroshima, Japan
MX-6	Flat Rock, MI
Navajo	Louisville, KY
Protegé	Hiroshima, Japan
RX-7	Hiroshima, Japan

MERCEDES-BENZ

190-Class	Bremen, Germany
	Sindelfingen, Germany
300-Class	Bremen, Germany
	Rastatt, Germany
	Sindelfingen, Germany
S-Class	Sindelfingen, Germany
SL	Bremen, Germany

MITSUBISHI

Eclipse	Normal, IL
3000GT	Okazaki, Japan
Diamante	Okazaki, Japan

Expo/Expo LRV	Okazaki, Japan
Galant	Nagoya, Japan
Mirage	Kurashiki, Japan
Montero	Nagoya, Japan
Pickup	Nagoya, Japan
Precis	Ulsan, S. Korea

NISSAN

240 SX	Kyushu, Japan
300ZX	Shatai, Japan
Altima	Smyrna, TN
Hardbody	Smyrna, TN
Maxima	Oppama, Japan
NX1600/2000	Tochigi, Japan
Pathfinder	Kyushu, Japan
Quest	Lorain, OH
Sentra	Smyrna, TN

PORSCHE

911	Stuttgart, Germany
928 S4	Stuttgart, Germany
968	Nekersulm, Germany

ROLLS-ROYCE

Corniche	Crewe, England
Silver Spur II	Crewe, England

SAAB

900	Trollhattan, Sweden
	Uusikaupunki, Finland
9000	Trollhattan, Sweden

SUBARU

Impreza	Gunma, Japan
Justy	Gunma, Japan
	Kaohsiung, Taiwan
Legacy	Lafayette, IN
	Gunma, Japan
Loyale	Gunma, Japan
SVX	Gunma, Japan

SUZUKI

Samurai	Kosai, Japan
Sidekick	Ingersoll, Ontario
	Kosai, Japan
Swift	Ingersoll, Ontario
	Kosai, Japan

TOYOTA

T100	Hamura, Japan
4Runner	Hamura, Japan
Camry	Georgetown, KY
	Tsutsumi, Japan
Celica	Tahara, Japan

Corolla	Cambridge, Ontario
	Fremont, CA
	Takaoka, Japan
Land Cruiser	Kanto, Japan
MR2	Kanto, Japan
Paseo	Takaoka, Japan
Pickup	Fremont, CA
	Tahara, Japan
Previa	Higashi-Fuji, Japan
Supra	Tahara, Japan
Tercel	Takaoka, Japan

VOLKSWAGEN

Corrado	Osnabruck, Germany
EuroVan	Hannover, Germany
Fox	Sao Bernardo, Brazil
Golf	Wolfsburg, Germany
Jetta	Wolfsburg, Germany
Passat	Emden, Germany
	Brussels, Belgium

VOLVO

240	Goteborg, Sweden
	Ghent, Belgium
850	Ghent, Belgium
940/960	Goteborg, Sweden
	Uddevalle, Sweden
	Ghent, Belgium



VOLKSWAGEN PASSAT



VOLKSWAGEN EUROVAN

engine, producing 168 hp and 162 ft.-lb. of torque, enough to move this big sedan to 60 mph in about 8.5 seconds.

Also new is the semi-independent rear suspension, featuring semi-trailing arms and directional bushings. Volvo calls it Delta-link, and the benefit is subtle rear-steer effect with-



bles its 940 and 960 stablemates both inside and out with its familiar angular lines. However, there's definitely new hardware beneath the subtly revised sheetmetal. The 850's front (yes, front) wheels are driven by a new 2.4-liter dohc 20-valve 5-cylinder

out the peculiar feel and mechanical complication that goes with some rear-wheel-steering systems. The net is an impressively agile Volvo.

As you'd expect of a new Volvo, there are several leading-edge safety features: Dual airbags, antilock brak-

ing and 3-point seatbelts for all five passengers are standard. More significant, Volvo's patented Side Impact Protection System gives the 850 exceptional crashworthiness—good enough, in fact, to meet 1997 federal standards. **PM**

FIRST DRIVE REPORT

TOYOTA T100

● Toyota's long-awaited big pickup isn't quite as big as everyone expected—but it's certainly big enough to make waves. With dimensions slightly smaller than American full-size trucks like the Ford F-150 and Chevy C/K series—but bigger than the Dodge Dakota—the new T100 has created its own turf. Toyota calls it an intermediate.

Although U.S. compacts like Dakota, Ford Ranger and Chevy S-10 can be ordered with more muscle, the T100's small-size advantage is likely to pay big dividends with contractors and construction workers. There's enough space between the T100's wheel wells for your basic 4 x 8-ft. slab, something that can't be said for the others.

In its first year on the market, the T100 is available in one body style—standard cab, long bed. It's available with either 2- or 4-wheel drive, and has a standard payload capacity of 1150 pounds (the 2wd One Ton capacity is 2550 pounds). Transmission options are a 5-speed manual (standard) and 4-speed automatic.



On the road, the T100 is typically Toyota—quiet, smooth and comfortable. The cab is roomier than Toyota's compact pickup, and the interior trim says quality. Rated at 150 hp and 180 ft.-lb. of torque, the T100's 3.0-liter sohc V6 has more grunt than competing standard powerplants, enough to justify a 5000-pound towing rating. It's also exceptionally smooth, and there's enough power to get most jobs done without noise or struggle.

—Tony Swan

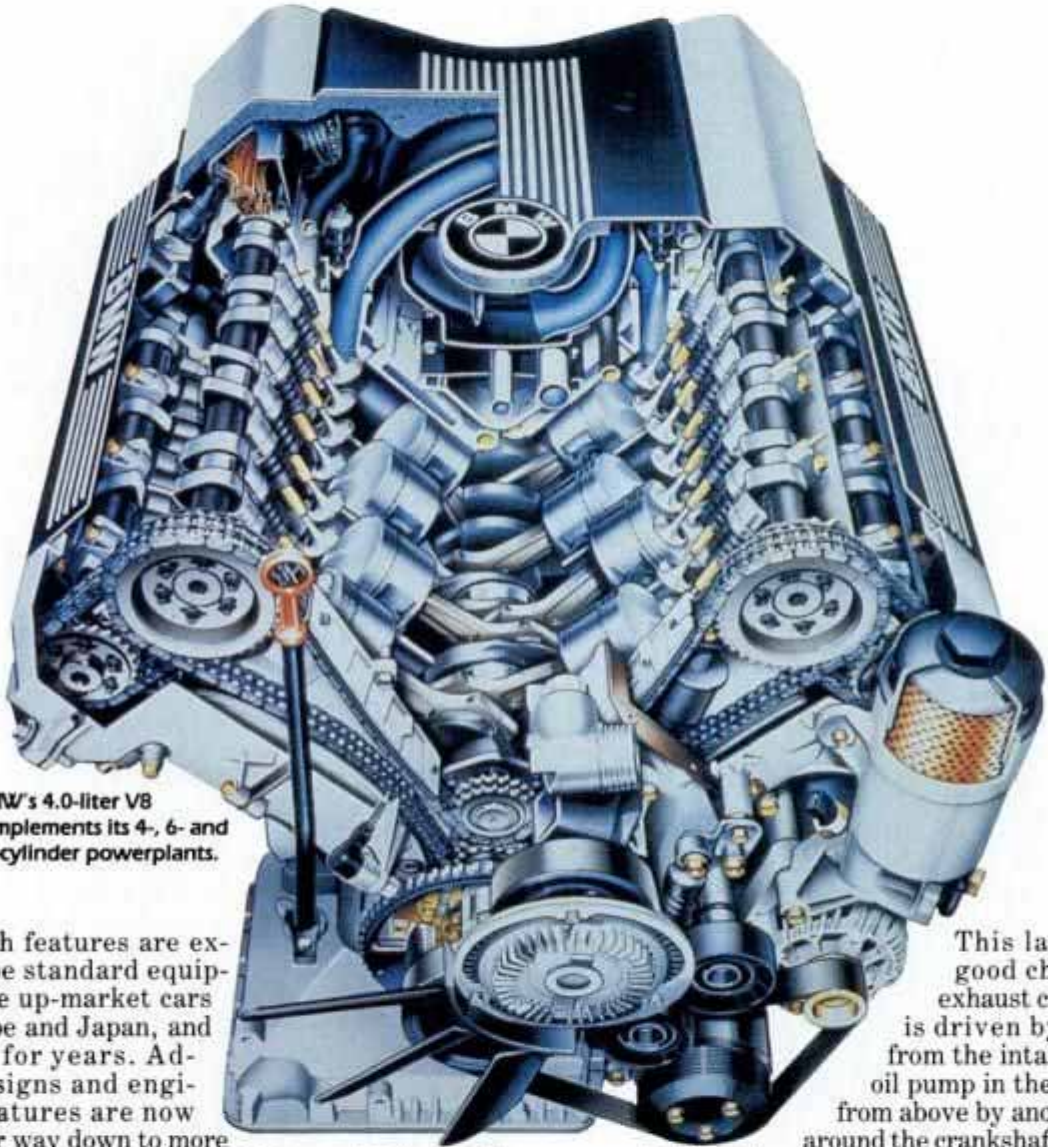
Specifications

Layout	Front-engine, rear-drive
Body style	Std. cab, long-bed pickup
Engine	150-hp sohc 3.0-liter V6
Transmissions (Std., Opt.)	5M, 4A, 4wd
Wheelbase	121.8 in.
Track (2wd), f/r	61.6/63.7 in.
Length	209.1 in.
Width	75.2 in.
Height (2wd/4wd)	66.7/70.1 in.
GVWR (base 1/2-ton)	5000 lb.
Brakes, f/r	Disc/Drum, Rear ABS

INSIDE THE IMPORTS

Plenty of refinements to complement a couple of breakthroughs.

BY PAUL WEISSLER



BMW's 4.0-liter V8 complements its 4-, 6- and 12-cylinder powerplants.

● High-tech features are expected to be standard equipment on the up-market cars from Europe and Japan, and have been for years. Advanced designs and engineering features are now finding their way down to more price-sensitive markets. The 1993 model year rings in a few really revolutionary breakthroughs—but plenty of improvements right down to the bottom of the product lineup.

BMW

BMW, which has inline Fours and Sixes and then a V12, saw an obvious gap in between and fills it neatly with a pair of 4-valve all-aluminum V8s for the 7-Series cars. One is the world's smallest mass-production V8—a 3.0-liter engine that develops 218 horsepower. It comes down the same line as

a 4.0-liter 286-horsepower big brother, but won't be immediately available in the U.S.

The engines have twin overhead camshafts per bank and a V-shaped chain drive designed to fit in the limited distance between the front engine mounts. The V-shaped routing also clears the valley between the banks at the front of the engine for a tuned-intake air system. One chain forms a V-wrap around the crank sprocket and both intake cam sprockets, then continues down in a second V to an idler gear just above the crank sprocket.

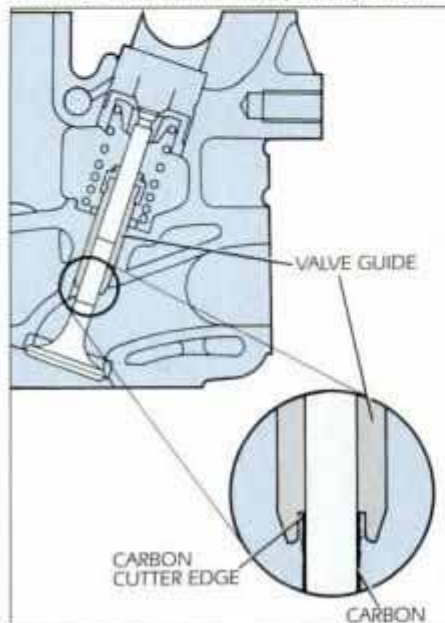
This layout provides good chain wrap. The exhaust cam on each bank is driven by a short chain from the intake cam, and the oil pump in the sump is driven from above by another short chain around the crankshaft.

Long chains tend to be noisy, which is why some manufacturers still use belts. But BMW's new engines have an answer: The intake sprockets have a rubber ring bonded to each side, just below the outer circumference. As the chain link moves down to engage a sprocket tooth, it pushes down on the rubber rings, which absorb any impact that would produce noise.

Adding to the overall quiet is an all-plastic intake manifold, which smooths the airflow and contributes to more uniform filling of the individual cylinders. BMW has been a pio-

neer in plastic intake manifolds. The smooth runners also contribute to more uniform filling of the cylinders.

The combustion chamber is entirely in the cylinder head, but it's precisely machined in by die cutters, not cast. So there's virtually no cylinder-



Mazda 626 uses the knife-like edge on a valve guide to scrape carbon accumulation from valve stem.

to-cylinder volume difference. The pistons, under tight quality control, are from a single supplier, so there's no real size variation. Result: The compression ratio is extremely consistent from cylinder to cylinder. The maximum variation is 0.1 point in the 3.0-liter's 10:1 ratio and 0.13 in the 4.0-liter's 10.5:1. This not only helps the engine run smoothly from idle on up, but also means the ignition timing can be aggressively advanced, because there's less need for the computer timing schedule to compensate for spark knock from end-of-tolerance-stackup cylinders. There's also less triggering of the knock sensors to retard timing, which would cut performance.

The transmission oil cooler also serves as a cold transmission fluid heater. It's not built into a radiator tank, but instead is separate and mounted at the bottom of the engine where it is part of the engine-coolant warmup circuit (while the thermostat is

closed and the coolant in the radiator remains cold). So the warming coolant in the engine and the oil cooler heats up the cold transmission oil almost immediately, for smoother cold-drive-away shifts. When the engine is warm and the stat opens, the oil cooler then performs its more conventional function of keeping transmission fluid temperatures down.

Honda/Acura

North-south front-drive powertrains are less subject to idle shake, and, therefore, are considered easier to mount than transverse engines and transaxles. In fact, many have had just three mounts (one at each side and a third at the transmission).

But the '93 Acura Legend, which had five mounts for ultra-smoothness last year, is pushing the envelope with a 6-mount system for '93. At the front are three mounts—one solid rubber (under the crank pulley) and two air-gap designs that serve as fore-aft shake stops—a hydraulic mount on each side close to the rear of the engine (to reduce fore-aft, side and vertical shake) and the usual solid mount at the rear of the transaxle. This mounting arrangement also is effective in restraining engine movement on accel and decel. The '92 setup had one hydraulic mount on each side in front, one solid rubber on each side at the rear of the engine and the solid rubber transmission mount.

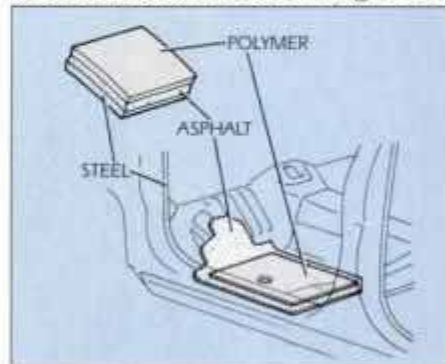
Nissan

Although Mercedes-Benz and BMW are the industry leaders in converting air-conditioning systems to the new R-134A refrigerant, Nissan is clearly the Japanese leader. Already changed are the Maxima, Altima, Pathfinder, the pickup and the J30 In-

finiti. By mid model-year, the 240 SX and the Infiniti G20 will be added to the list. The Q45 Infiniti is next, but may not make the conversion until later in '93, when the '94s are about ready to debut.

Mazda

The new 2.0-liter 4-valve 4-cylinder in the '93 Mazda 626 and MX-6 develops only 118 horsepower, but it has a feature intended to maintain its performance as it accumulates mileage. The



Toyota uses layers of heat-cured polymer resin to "preload" asphalt sound-deadening on floorboards.

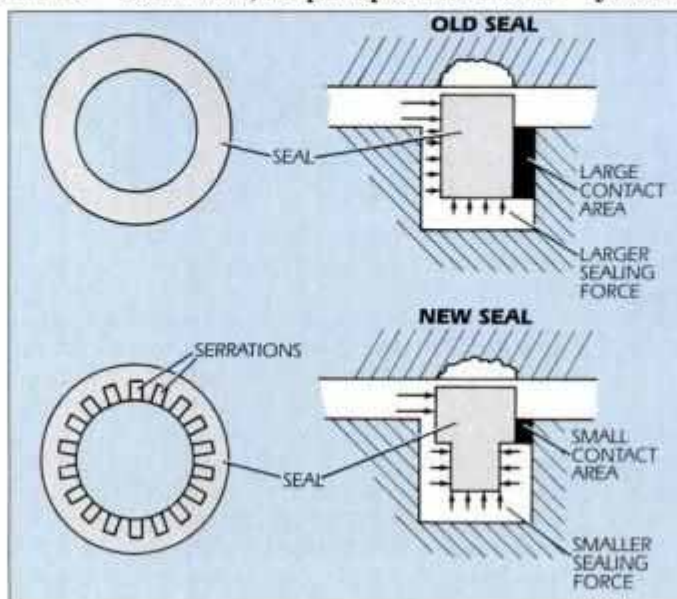
lower ends of the valve guides are notched in, and a knife-like surface is machined into the edge. The "knife" scrapes any carbon accumulation from the valve stem as the valve opens and closes. This may not sound significant, but carbon accumulations on the intake valve stems absorb fuel and can cause driveability problems in almost all makes of cars.

Mitsubishi

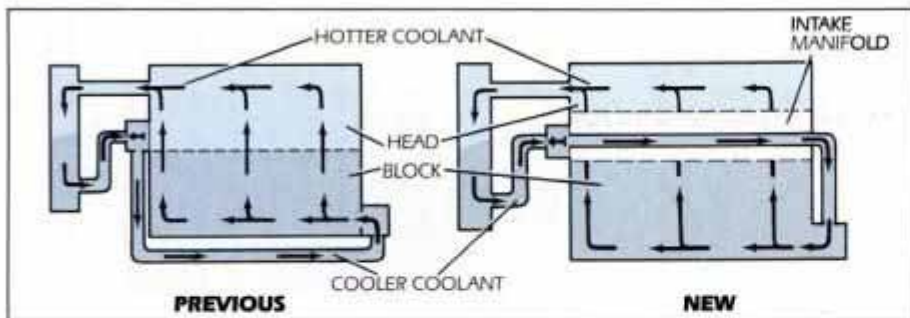
If you don't know when to back off the pedal in a hard turn, the computer in the '93 Mitsubishi Diamante does. It simply won't let you push the car beyond its capabilities, as part of a system that goes one better than acceleration slip and traction controls.

The computer reads signals from all the engine sensors, plus sensors for lateral acceleration, steering-wheel angle, road speed and—from the antilock brakes—the speed of individual wheels. If the car is being pushed too hard in a turn, the engine computer reduces power first by retarding ignition timing, then by intermittently closing down fuel injectors. You can mash the pedal to the floor, but the computer has the last word.

If you're determined to go far off-road with a 4wd Mitsubishi Montero, the top-of-the-line SR model will have



Seal on Subaru Impreza trans is serrated for better sealing, longer life.



Toyota's 4-cylinder engines cool intake valves first, then route water into the cylinder block.

an optional locking rear differential for '93—to go with a locking center differential. In fact, it can only be engaged when the center differential is locked and the vehicle is going slower than 4 mph. Can't expect the driver of a top-of-the-line model to yank hard on still another lever, so there's just a switch to flip. The vehicle's electronics trigger a mini electric air compressor to provide the muscle for the lock-up clutch.

Saab

While other carmakers decide where to locate engine knock sensors and whether to use one or two, Saab has figured out a way to eliminate the part altogether, by sensing knock in each cylinder on the 9000 Turbo. As soon as combustion is complete, the engine computer triggers the ignition system again, providing a low-voltage discharge across the spark plug gap. Some of this current feeds back to the engine computer. In software, the computer converts the feedback into an indicator of incomplete combustion caused by knocking or misfire. The computer then adjusts fuel flow or turbo boost pressure if necessary. The system works by following the principle of ionization—the process by which atoms or molecules gain or lose electrons—which affects the flow of electricity through a gas.

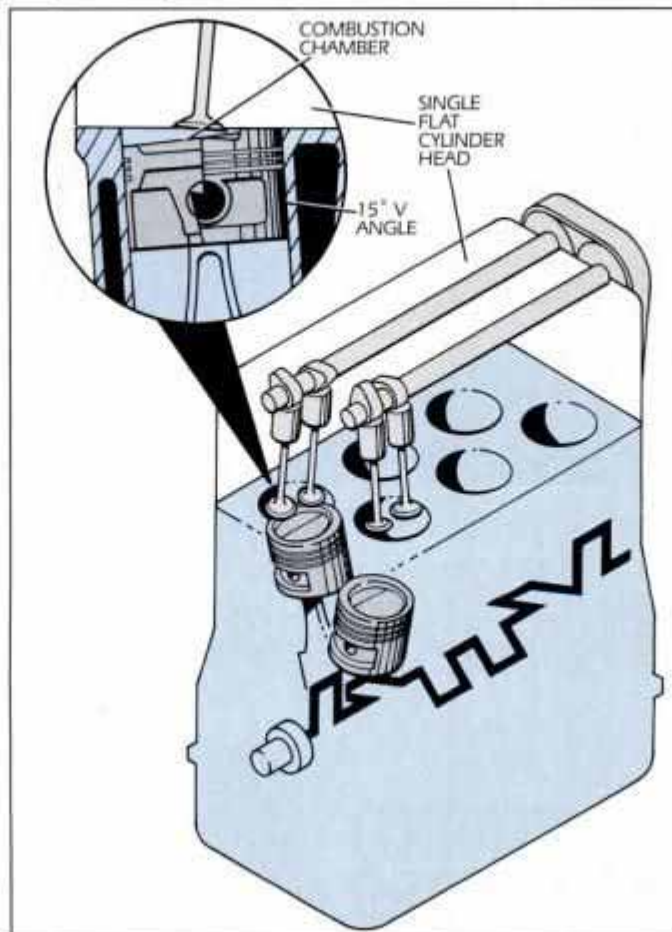
Subaru

Can a smaller sealing area really provide a better seal, with longer component life? It does on the automatic transmission for the '93 Impreza, Subaru's replacement for the Loyale, coming out this spring.

The Impreza, built on a downsized Legacy chassis, uses several automatic transmission-shaft sealing rings with a serrated inner edge. The serrated area can't

seal, so the total sealing area is reduced. However, the reduced sealing area is between one side of the ring and its groove in the shaft, which actually was a high-friction area from the oil under pressure from the other side of the ring. Now the oil can flow freely around the entire serrated area, creating a pressure balance on both sides of the seal. A small contact area still remains—enough to do the job with reduced friction.

The primary job of the rings is to seal between the shaft and the transmission case or clutch housing. The reduced friction means the seal has less of a tendency to spin with the shaft and dig into (and wear) the transmission case or clutch housing. The serrated area decreases the oil pressure's outward push against the ring, which also reduces wear on the



The 6-cylinder VW inline V has 15° angle between cylinder banks.

transmission case or clutch housing from the ring.

Toyota

The Corolla may be a lower-middle-class car, but if you look under the skin (in fact, between some layers of "skin") you'll see sound-deadening and vibration-dampening materials similar to what Toyota has been putting in its Lexus models.

High-strength sheet steel eliminates creaks from underbody members and "oil canning" noises from the hood and door panels. Almost the entire floor pan is covered with asphalt sheets to stop buzzes, with the passenger compartment floor pan sheets topped by layers of heat-cured resin to improve their absorption of vibration. The dash panel (firewall) has a double steel panel with an air gap for vibration absorption, covered in full on the passenger compartment side by a plastic pad with a backing of layers of felt, both for vibration absorption and sound insulation.

Both 1.6-liter and 1.8-liter 4-cylinder engines have a modified reverse-cooling system. Instead of coolant flow from the radiator into the block and then to the head, the coolant flows first to the cylinder head's intake ports, where it provides extra cooling to reduce intake air temperature. So

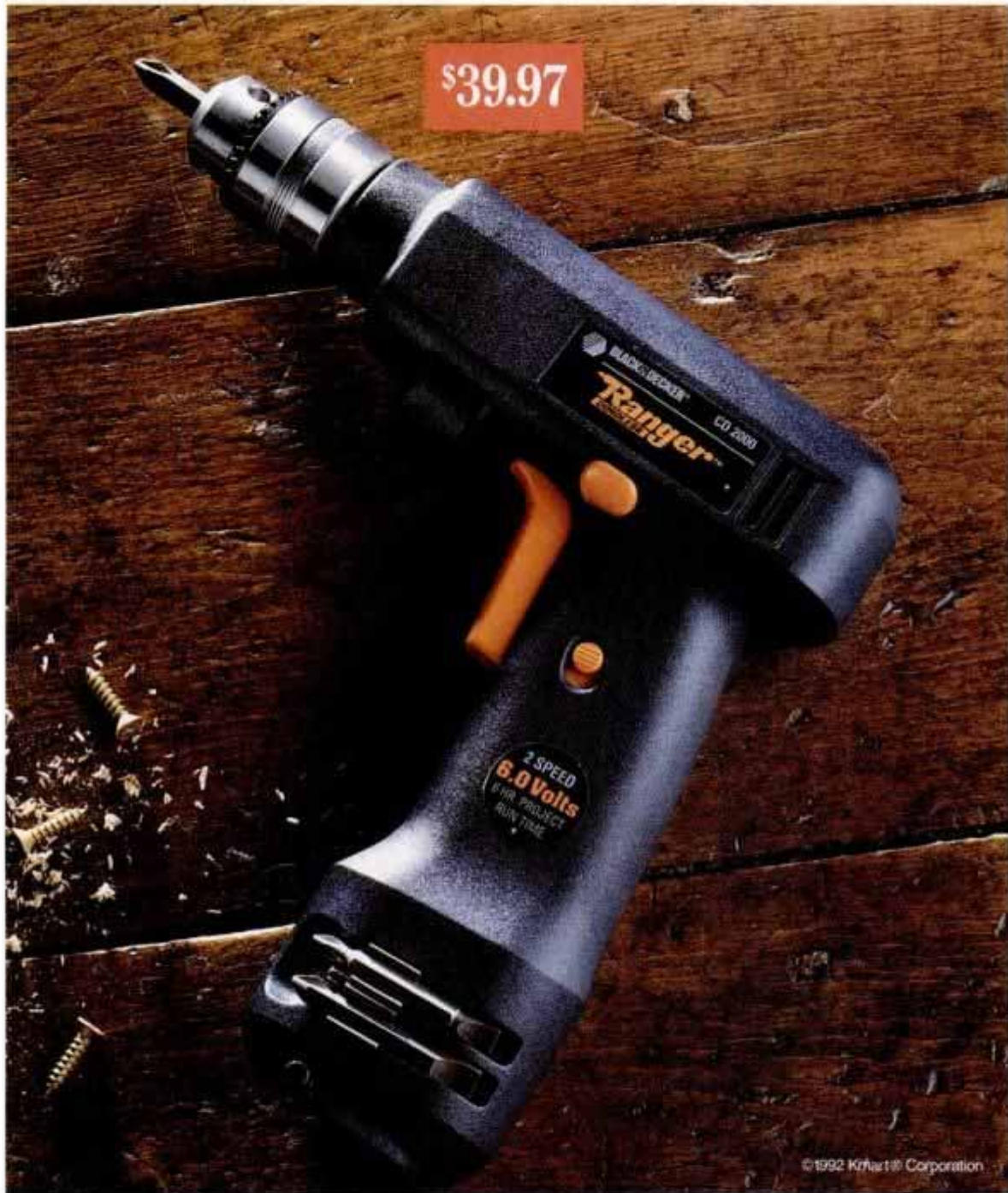
the cylinders get a denser charge for better performance, and less chance of knock. The coolant next flows into the cylinder block, then up to the exhaust ports of the head (and finally to the radiator).

Toyota's new T100 full-size pickup truck shows some of the same quieting treatment as the Corolla, plus aero mirrors and flush edges for reduced wind noise, carlike use of polyurethane foam chunks in door pillars and roof and reinforcement of the vibration-prone steel panel behind the seat. The air-cleaner assembly in the 150-horsepower 3.0-liter V6 is an oversize design (10-liter capacity compared with 5 liters in other applications) to reduce acceleration noise from the intake airflow.

Volkswagen

Volkswagen's new EuroVan figured to have a problem producing enough heat in cold weather. Its 2.5-liter transversely mounted 4-cylinder is an efficient engine

It'll put a hole in everything except your pocket.



Black & Decker 3/8-inch Cordless Ranger Drill/Driver with tote. Puts power right in your hand. With a 5-cell, 6-volt recharger for 6 hours of extended use, without the need for clumsy extensions. Plus, a high torque, 2-speed reversible motor and compact, lightweight design. A great Christmas gift for fixer-uppers. On sale for just \$39.97, December 6-19, 1992, at all U.S.A. Kmart stores. The quality you need, the price you want.



**BLACK &
DECKER™**



HOME&SHOP JOURNAL



SHOP PROJECT

AN ANNIVERSARY TO REMEMBER

A bookcase completes our 90th anniversary furniture series.

BY NEAL BARRETT

● Many of us love books and magazines. Whether our passion is classical literature, science fiction, Victorian

romance or a collection of PM that spans the decades, we need a place to keep our valuable reading material.

Often these treasured possessions are stuffed away in boxes for lack of adequate space. To help solve this common problem, we present this handsome bookcase, the last in our 4-part commemorative furniture se-

ries. The bookcase is constructed of solid curly maple and its adjustable shelves are deep enough, not only to accommodate standard and large format books, but also to provide display space for art and photographs.

It has a solid, paneled back that allows it to be used against a wall or as a room divider. And like the other pieces in our series, it's finished with a rub-on oil that's easy to apply.

Color photo: John Griebisch
Black-and-white photos: Neal Barrett
Technical art: Eugene Thompson

Making The Sides

Begin construction by selecting the lumber to be used for each part of the bookcase. Rip and crosscut to rough size the stock for the case side panels. Keep in mind that the side panels are cut to finished dimension after glue-up. Use the jointer or a sharp hand plane to smooth and square the edges of panel stock to ensure tight, sound glue joints.

Lay out the position of joining plates 6 to 8 in. on center along the mating edges of the stock, then use a plate joiner to cut the slots (Photo 1). Use a flat surface, such as the top of a table saw, as a registration surface when cutting the slots. Hold the stock and the plate joiner firmly to the table when cutting the plate slots.

Apply glue to the stock edges and plate slots (Photo 2). Insert the joining plates and clamp the pieces together. Scrape off any glue squeeze-out after 15 or 20 minutes.

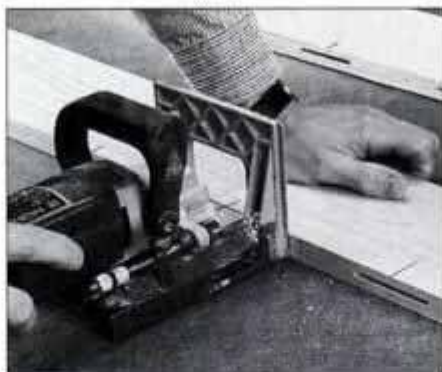
When the glue is fully cured, scrape all panel surfaces smooth. Rip and crosscut the panels to finished size (Photo 3).

The case sides have a false bottom rail fastened to them with glue and joining plates. This false rail is $1\frac{1}{8}$ in. thick, so it looks like standard rail and panel construction. However, its grain runs vertically (parallel to the side panel) so it will expand and contract with changing humidity at the same rate that the panel does. This greatly reduces the chances of a crack developing in the side panel due to moisture movement.

To make the false rail, rip, crosscut and glue together a panel about 12 in. wide \times $9\frac{1}{2}$ in. long. Clamp the panel to the bench and cut a $\frac{3}{16}$ -in.-wide chamfer across its top and bottom edges (Photo 4). Next, crosscut the workpiece to form two false rails. Cut the plate slots in each rail and the panel. Test fit the pieces before assembly (Photo 5).

Rip and crosscut the case legs to dimension from 10/4 stock. Lay out the curved taper on two sides of each leg as indicated in the plans. Use the band saw to cut the legs to shape, then clamp each leg to the workbench and remove the saw marks with a belt sander or a sharp hand plane (Photos 6 and 7).

Lay out and cut the joining plate slots in the side panels and legs. Then apply glue to the joint between the leg and the panel, in the plate slots and on the plates (Photo 8). Assemble each side, and clamp the assembly together until the glue sets.



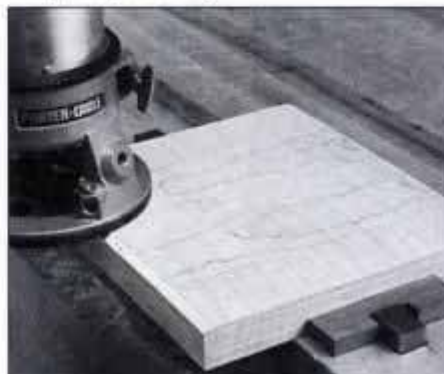
1 Cut the joining plate slots in the strips that form the case sides. Use a benchtop or table saw as a work surface.



2 Apply glue to the slots and edges of the strips. Install the joining plates and clamp the pieces together.



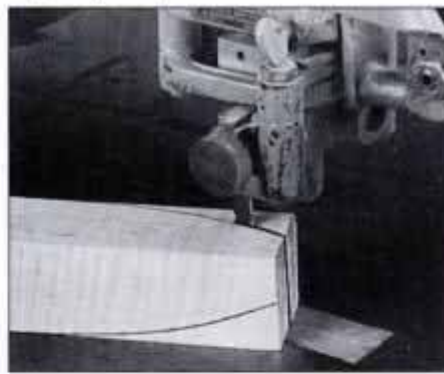
3 Use a sliding crosscut table on the table saw, or a circular saw and guide, to cut the panels to length.



4 Glue up the stock that forms the false rail, and cut a chamfer on its end-grain edges. Rip the panel in two.



5 Cut joining plate slots in the side panel and false rail. Insert the plates then glue and clamp the two together.



6 Use a band saw to cut the taper on the leg blanks. Stay just to the waste side of the line and cut slowly.



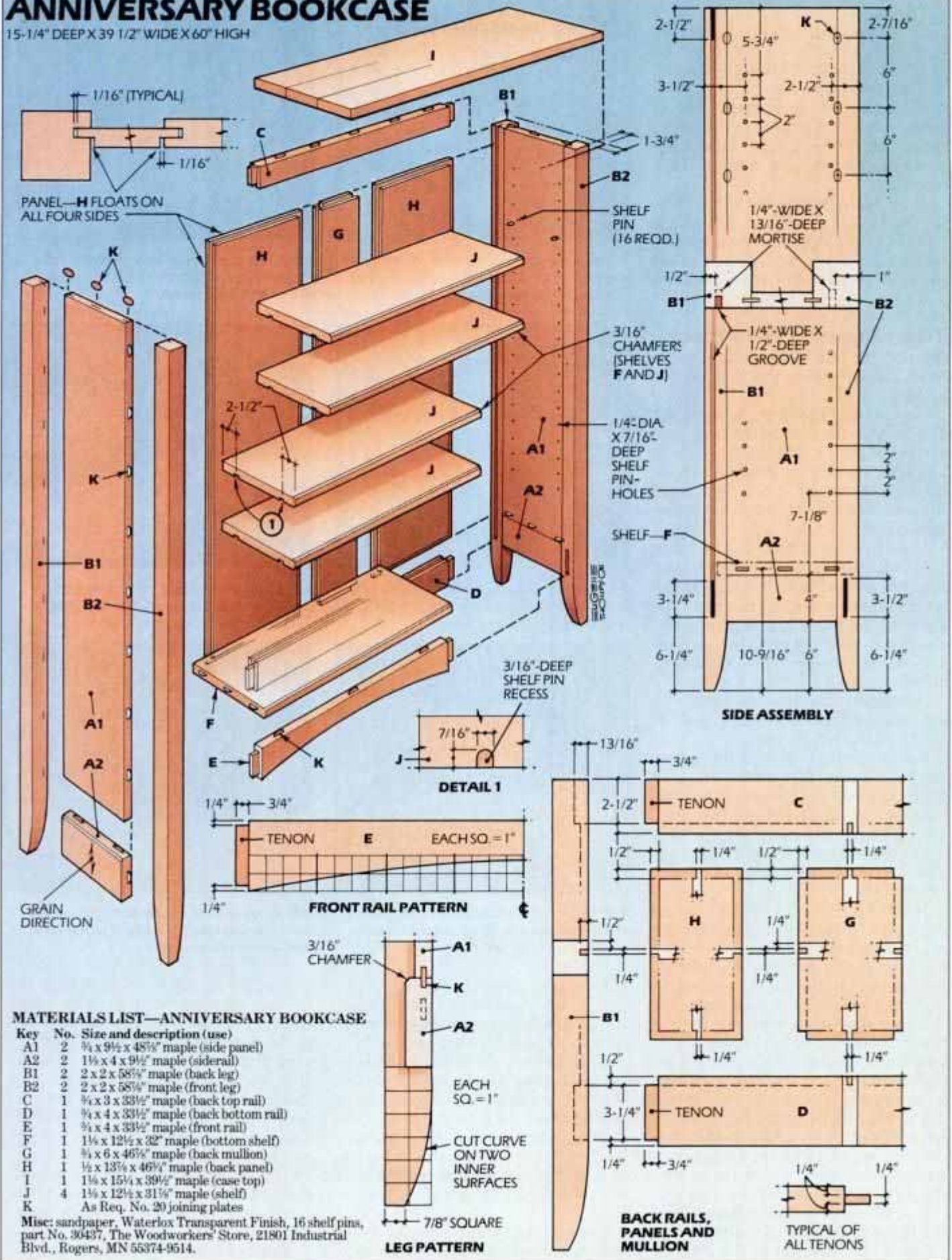
7 Clamp each leg to the workbench and use a belt sander or hand plane to remove saw marks and refine the curve.



8 Cut matching joining plate slots in the legs and case sides. Apply glue as before then clamp the assembly together.

ANNIVERSARY BOOKCASE

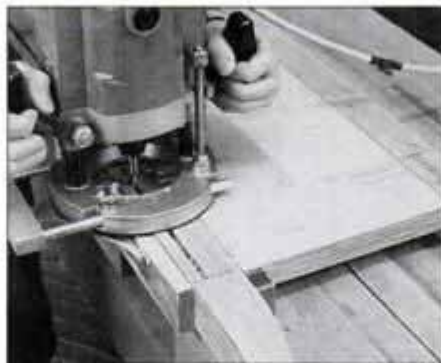
15-1/4" DEEP X 39 1/2" WIDE X 60" HIGH



The panels that form the case back rest in $\frac{1}{2}$ -in.-deep grooves in the side assembly. Cut these grooves with a $\frac{1}{4}$ -in.-wide straight bit in the router, and use an edge guide.

Note that there are mortises at both ends of the groove to house the tenons on the back rails. Adjust the router depth to $\frac{13}{16}$ in. and cut these mortises.

Move to the front of the side assembly, readjust the edge guide and cut the $\frac{13}{16}$ -in.-deep mortises for the front rail. Square the ends of all mortises with a sharp chisel (Photos 9 and 10).



9 Use a plunge router, straight bit and edge guide or a drill press to cut the rail mortises in the case sides.



10 Use a sharp chisel to square the ends of the mortises. Butt the chisel to the pencil line and chop down.

Top, Shelves And Back

Rip and crosscut stock to size for the front and back rails and back center mullion.

Also rip and crosscut the stock for the shelves, the top and the back panels. All stock should be cut slightly oversize, then cut to finished size after glue-up. Scrape smooth both faces of each workpiece after it is cut to finished size.

Use the dado blades in the table saw to cut the tenons on the rail and mullion ends (Photo 11). Since the dado blades leave small ridges on the surface of the tenon, it is good practice to cut the joints just a bit oversize and pare the tenons to fit with a sharp chisel.

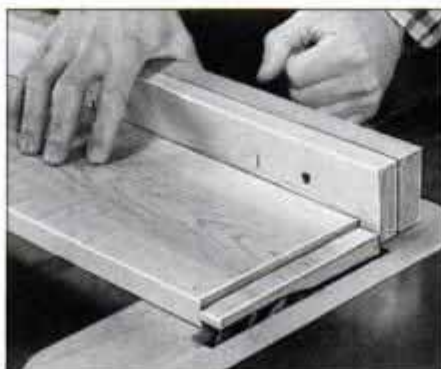
Also bear in mind that the tenons on the rails are $\frac{3}{4}$ in. long while those on the mullion are $\frac{1}{2}$ in. long.

Lay out and cut the arched shape on the bottom edge of the front rail. Use the band saw to cut the shape, staying just to the waste side of the line. Then, smooth the cut edge with a spokeshave and a scraper, working down to the line on several passes (Photo 12).

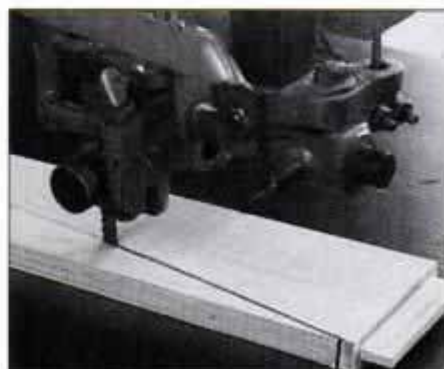
Hold the mullion between bench dogs, and use the slotting cutter in the router to cut the $\frac{1}{4}$ -in.-wide \times $\frac{1}{2}$ -in.-deep groove in the edges of the mullion (Photo 13). Repeat the procedure to cut the groove in the back rails.

Apply glue to the joints and assemble the mullion and back rails. Use a long bar clamp to pull the joints tight and check that the assembly is square by comparing opposite diagonal measurements. If the assembly is out of square, shift the clamps so they are closer to parallel with the longer diagonal measurement. Check the assembly for square, then let the glue set. Shave off any glue that squeezes from the joints when it turns rubbery.

Mark the location of the joining plate slots for the bottom shelf joint.



11 Use the dado blades in the table saw to cut the tenons on the front and back rails and back center mullion.



12 Use the band saw to cut the arch on the front rail. Clean off the saw marks with a scraper and spokeshave.



13 Secure the mullion to the workbench and use a slotting cutter to cut the groove that holds the back panels.



14 Clamp a straight piece of scrap across the case side. Butt the plate joiner to it and cut the plate slots.

Clamp a straightedge guide to the side to help position the plate joiner, and cut the slots by plunging the plate joiner downward (Photo 14).

Mark and cut the slots for the joining plates that fasten the top to the rest of the cabinet. These slots are located along the top edge of the case sides and the top edge of the top rail. Also mark and cut the slots in the top edge of the front rail and on both ends and along the front edge of the bottom shelf.

Make a template for the shelf pinholes from a scrap piece of plywood or Masonite. Note that the pinholes are

located $2\frac{1}{2}$ in. from the front edge of the case side and $3\frac{1}{2}$ in. from the back edge of the case side. Clamp the template to the case side and bore the shelf pinholes (Photo 15). Use a depth stop on the drill bit to ensure proper hole depth. You can wrap tape around the drill bit in case you don't own a commercially made stop collar, but be careful you don't push the tape back on the bit as you bore. Next, use a straight bit and edge guide to rout the rabbet around the edges of each back panel (Photo 16).

The bottom edge of the rabbet should slide smoothly into the groove

in the sides, mullion and rails. Before cutting the rabbet around each panel, set the router and make a test cut on a panel. Test the rabbet for correct fit using a grooved scrap block. The groove should be cut with the same slotting cutter used on the mullion, back rails and sides.

If you find the test block does not slide on the edge, set the router to take a very fine shaving and make another pass along the rabbet. Slide the block along the perimeter of each panel after you are done cutting the rabbet to make sure they will fit the legs and rails, too.

Assembly

Presand all case parts with 120- and 220-grit sandpaper, then wipe them down with a tack rag.

In order to avoid a frantic rush during the case assembly, proceed in stages. You will glue and clamp together subassemblies that will then be assembled into the whole bookcase. First, apply glue and joining plates to the front rail. Set the bottom shelf in place and clamp the parts until the glue sets (Photo 17).

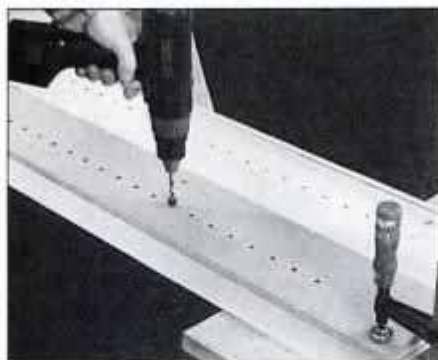
Next, place one case side on a set of padded sawhorses and apply glue to the mortises for the top and bottom back rails. Spread glue on the matching rail tenons.

Next, position one of the back panels in the case side groove. Be careful not to get glue in either the groove or on the panel edge. Slide the rail-mullion assembly over the panel and into position in the case side. Use bar clamps to pull the joints tight.

In the same operation, apply glue to the joining plate slots that join the bottom shelf to the case side. Also apply glue to the mortise in the front edge of the case side (the mortise for the front rail). Spread glue on the matching front rail tenon. Slide the joining plates into their slots and assemble the bottom shelf and front rail to the side. Clamp the assembly, check it for square and let the glue harden (Photo 18).

After the glue has set, remove the clamps and slide the second back panel into position. Apply glue to the remaining joints and clamp the second side in the same manner.

Position the case face down on sawhorses. Apply glue to the joining plate slots in the top edge of the case and the slots in the top. Install the case top with joining plates and use long bar clamps to pull the joints tight (Photo 19). Use cauls to spread clamping pressure across the top.



15 Make a template from sheet material and clamp it to the sides. Bore the shelf holes in the case sides.



16 Cut the rabbets in the back panels using a router, straight bit and edge guide. Move the router slowly.

Next, with a straight bit in the router table, cut the notches in the bottom of the shelves to engage the shelf pins (Photo 20). Also cut the chamfers on the shelves (Photo 21).

Sand the shelves with 120- and 220-grit sandpaper, then finish sand all parts with 320-grit paper. Dust the shelves off with a tack rag.

Using a clean rag, apply three coats of Waterlox Transparent finish to the bookcase, leaving a damp surface with each coat. Let it dry overnight, and scuff it lightly with 320-grit paper between coats. Rub out the last coat with 4/0 steel wool.



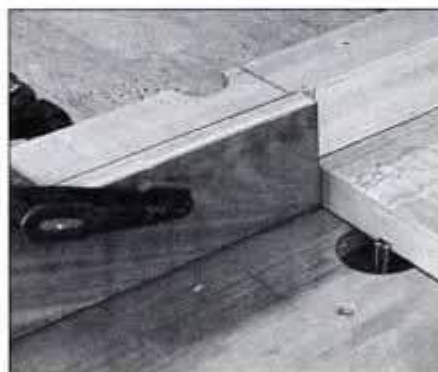
17 Assemble the bookshelf in stages. First, glue and clamp together the bottom shelf and the front rail.



18 Glue and clamp the back rails and mullion. When the glue is dry, slide in a back panel. Clamp this to a side.



19 When base assembly is complete, glue and clamp the top to the assembly. Cauls spread the clamping pressure.



20 Use a small straight bit in the router table to cut the notches in the shelves. Clamp a stop to the table's fence.



21 Hold each shelf to the workbench then cut a chamfer on the top and bottom edge on the front of each shelf.

TOOL TEST
SKIL
SCROLL
SAW

TEXT AND PHOTOS BY
 ROSARIO CAPOTOSTO,
 Contributing Editor

● Skil's entry into the benchtop tool market clearly shows that this company can make more than portable power tools. Among its line of small-scale stationary machines is the new model 3330 16-in. Scroll Saw. I recently tested this unit and was quite impressed with its performance.

Zigzags, curves and curlicues are the basic cuts for which any scroll saw is designed. I got right down to business with what I consider to be the real challenge—making these cuts in thick hardwood.

Using a 10-point blade tensioned to the limit, I was able to make clean, smooth cuts through tough 1½-in. ash and hard maple with ease. Fitted with a very narrow, 20-point blade, I accomplished intricately detailed tight-radius work to perfection in thin wood and metal.

The saw is well built and features a substantial 1.6-amp induction motor housed in a cast-iron base, and it has a sturdy cast-aluminum table. The model 3330 weighs a hefty 43 pounds—a contributing factor in the saw's relatively quiet, vibration-free operation. The maximum depth of cut is 2 in. at 90° and 1 in. at 45° (the maximum table tilt to the left). The saw has a ¼-in. stroke and accepts both pin and plain-end blades. Blades too narrow to have pins are held in place with special adapters.

While the throat capacity is 16 in., stock of unlimited length can be cut by installing the blade in the side-cutting position. Other features include an effective dust blower, a storage compartment for blades, Allen wrenches and blade adapters and a built-in blade-length gauge that aids in securing the blade adapters at the correct distance apart. The saw also has a dust-collection port and a 2-step power switch that guards against accidental starting.

One minor flaw with the model 3330 concerns the holddown foot that keeps the stock firmly pressed against the table. While it's sturdy, it's not springy. This means that uni-



The Skil 3330 Scroll Saw has a 1.6-amp motor, 16-in. throat depth and a ¼-in. stroke. It can handle thick hardwood or fine-detailed work. The cast-iron base makes for a quiet, vibration-free saw.

formly thickened stock is held properly, but stock with variations in thickness isn't. You'll have to re-adjust the foot as necessary to compensate for changes in thickness.

This is a good machine, capable of

handling just about any scrolling job, provided that the blade is tightened to maximum tension. The tool retails for about \$170. For more information, write to Skil Corp., 4300 West Peterson Ave., Chicago, IL 60646. **PM**



The Skil saw has a 2-position insert to handle both pin and plain-end blades. Narrow pin-less blades are held by adapters.



With a maximum capacity of 2 in. at 90°, this saw easily handles intricate cuts in thick hardwoods and softwoods.



With the blade installed in side position, you can handle stock of unlimited length. The table measures 10 × 15 in.



The table tilts to 45° for making bevel cuts. The holddown foot tilts to match the table and hold the work securely.

RESTORATION EXPERT RESTORATION ADVICE

BY LOUISE PARISI MCGOWAN

● Of all the reasons to own an older home, the foremost is certainly an appreciation of the building's character. Built in a time when basic materials were simple, technology was accessible and craftsmanship was more than just a word on an advertising brochure, these structures document our history as well as provide shelter and comfort. However, when the time comes to repair your older home, the key word is restoration—returning the structure to, and maintaining, its original character.

Having the right information at the right time can mean the difference between a restoration project that's a tribute to your old house and one that's not. This is true whether you're a purist striving for museum-quality restoration or you simply want to maintain the character and period flavor of your old home.

To this end, the series of Preservation Briefs, published by the Preservation Assistance Division of the National Park Service, can help. Researched and written by preservation experts, the series covers a myriad of topics.

The information is based on *The Secretary Of The Interior's Standards For Rehabilitation And Guidelines For Rehabilitating Historic Buildings*—the federal government's guide for projects that qualify for preservation tax-incentive programs. These standards call for preserving as much of the historic character of a property as possible. Therefore, the information presented in the Preservation Briefs emphasizes repair, rather than replacement, of deteriorated historic features. They're good guidelines for anyone contemplating restoration work.

As of this writing, there are 27 Preservation Briefs. Some are very specific and technical, while others simply serve to increase awareness about a particular restoration concern. The topics span a broad range of issues, including energy conservation in old buildings, historic roof repair and replacement and stucco and plaster repair. There are briefs on repairing wooden-shingle roofs, preserving



If you're fixing up an older home—and want to maintain its character—the Preservation Briefs are an excellent source of information. The pamphlets are written by restoration experts and cover a wide variety of topics.

pigmented structural glass and terracotta, preserving old barns and rehabilitating storefronts. There's even one that deals with aluminum and vinyl siding on historic buildings.

We'll focus here on those that address some of the more common old-house problems. These include cleaning and repainting masonry and fixing old wooden windows.

We'll also cover two briefs that handle the problems of identifying and preserving the architectural integrity of a building—a topic of prime importance to anyone interested in building restoration.

A masonry trio

Anyone who is contemplating cleaning a masonry structure would be wise to consult briefs 1 and 6: *The*

Cleaning And Waterproof Coating Of Masonry Buildings and Dangers Of Abrasive Cleaning To Historic Buildings, respectively. The first brief discusses ways to clean masonry using water, chemical and mechanical or abrasive means. The potential problems associated with each cleaning process are discussed. This particular brief also does a good job of explaining the difference between waterproof and water-repellent coatings, and why, in most cases, they aren't necessary for old masonry structures.

The second brief, as its name implies, goes into great detail about sandblasting. It discusses the variables involved in abrasive cleaning and explains how different building materials, like brick and building

stone, respond to it. You'll understand why sandblasting should almost always be avoided.

If you own an old brick house, you're probably plagued with areas of soft, crumbling mortar joints, and understanding the correct mortar mix and how to apply it are the first steps in solving the problem. To this end, Preservation Brief 2, *Repointing Mortar Joints In Historic Brick Buildings*, is a good guide to preparing for and scheduling this often time-consuming project. Whether you plan to hire a contractor to do the repointing work or to do the job yourself, this pamphlet will prepare you for the task ahead. From the visual examination of the old mortar to the actual work—joint and mortar preparation, filling and tooling—it does an excellent job of explaining what's involved in repointing an old building.

Wooden window fixes

Repairing drafty wooden windows is often a project high on the list for those restoring older homes. Brief 9, *The Repair Of Historic Wooden Windows*, discusses the technical issues involved in planning historic window repair. Work begins with a physical inspection of each unit that includes an evaluation of the window's paint, frame, sill and sash, along with any glazing problems and missing or broken hardware.

The brief then divides the repair plan into three broad categories or re-

pair classes: routine window maintenance, structural stabilization and parts replacement. The routine maintenance section covers most of the easy, though labor intensive, tasks necessary to keep windows working smoothly and looking new. This includes paint removal, sash and frame repair, reglazing, weatherstripping and repointing.

Stabilization and parts replacement discusses ways to repair wood that's partially decayed or weathered. The techniques are simple and can be performed with products you should be able to find at most hardware stores and home centers. Techniques to waterproof and patch decayed wood and build it up before repainting are explained.

The third repair class—splices and parts replacement—requires a bit more skill and expense. This section deals with the removal and replacement of frame and sash parts that have deteriorated beyond the point of repair.

Building character

Two more briefs we'll discuss deal with a subject that's not only fascinating, but the basis for all architectural restoration work. That is, identifying and preserving a building's character both inside and out.

If you're interested in restoration, not simply a rehab with the possible destruction of architectural features, Preservation Briefs 17 and 18 make

good background reading.

The first, *Architectural Character: Identifying The Visual Aspects Of Historic Buildings As An Aid To Preserving Their Character*, discusses a 3-step process for evaluating a building. This includes an inspection of both the building's overall appearance and details, along with a look at its interior spaces, features and finishes. Various photos illustrate the process and a handy checklist is included to take you through the steps.

The second brief, *Rehabilitating Interiors In Historic Buildings*, suggests general ways to approach interior restoration work in historic buildings. This handy reference includes many tips and recommendations for interior restoration. For example, it recommends the avoidance of several common practices, including furring out walls to add insulation thus changing a room's proportions and installing dropped ceilings below ornamental ceilings or in high-ceiling rooms.

If there's a Preservation Brief available on a project you're contemplating, whether you plan to do the work yourself or hire a professional, you'd be wise to refer to it before the work begins. They only cost \$1 each (some are available in sets at reduced rates). For a complete listing, consult the *Catalog Of Historic Preservation Publications*. It's available from the National Park Service, Preservation Assistance Division, Box 37127, Washington, DC 20013. **PM**

BOOK REVIEW

OLD-HOUSE JOURNAL CATALOG

● If you're restoring an older home, or you simply want to accent your new home with traditional accessories or materials, you've probably found the local hardware store less than sympathetic. Well, the products you're looking for are available somewhere, and one of the most useful and convenient tools for locating them is the *Old-House Journal Catalog*. Published by the same folks responsible for the *Old-House Journal*, a periodical that's almost required reading for do-it-yourself restorers, this catalog contains more than 1500 companies with products and services appropriate for houses built between 1750 and 1940.

The catalog is organized in two parts: a product and service section and a company directory. Under each specific product category in the product and service section, you get a list

of companies and the state that each is located in. Once you've found the company you're interested in, you turn to the company directory for more detailed information, including the range of products offered and how you can buy them. The catalog even contains advertising for more information about certain companies.

The long list of products and services is impressive and comprehensive. While you would expect to find architectural millwork and bathroom fittings, you will also find everything from adzes and archeological surveys to handmade window glass and weather vanes.

The *Old-House Journal Catalog* costs \$19.95 from *Old-House Journal*, 2 Main St., Gloucester, MA 01930. For OHJ subscribers, the cost is \$15.95. —Tom Klenck



PRODUCT TEST

**3M
 SYNTHETIC
 STEEL WOOL**

TEXT AND PHOTOS BY
 ROSARIO CAPOTOSTO,
 Contributing Editor

● Finishing and refinishing have become two of the most popular do-it-yourself activities around. And one of the most basic tools for these chores is steel wool. However, if you've ever experienced—as I often have—the frustration and annoyance of getting slivers of steel wool snagged in the pores of open-grained wood during finishing or finish-removal operations, you'll welcome 3M's new Synthetic Steel Wool pads.

Actually a variation on 3M's successful Scotch-Brite pad—a household product that's already found its way into many workshops—this product is constructed of tough, non-woven synthetic fibers. However, it also contains abrasive particles that enable it to handle the tough cleaning chores usually relegated to steel wool.

The result is a pad with all the benefits of steel wool and none of the drawbacks. The stuff is easy on the hands, it won't rust, splinter or shred and it can be rinsed and reused.

3M claims that its synthetic pads outlast ordinary steel wool, resist clogging and can be used in any traditional steel wool application.

The pads come in four grades that correspond to standard steel wool grades: 000 (extra fine), 0 (fine), No. 2 (medium coarse) and No. 3 (coarse). I tried each grade for the recommended applications with excellent results. I used a No. 2 pad followed by a No. 3 to effectively strip a varnished surface down to the bare wood. An extra fine, 000 pad worked nicely with rubbing compound and oil to rub a lacquer finish satin smooth. And, I found that heavy rust was readily removed with a coarse No. 3 pad—and a healthy dose of elbow grease. Rinsing the pads after use returns them to a like-new condition.

An important and welcome feature for woodworkers is the nonrusting quality of these synthetic steel wool pads. With today's trend toward environment-friendly water-based finishes, traditional steel wool is often an invitation to disaster because any small



3M Synthetic Steel Wool pads come in four grades, ranging from extra fine (000) to coarse (No. 3). The grades correspond to traditional steel wool grades.

sliver left in the grain can turn into a rust spot when the finish is applied. This new high-tech alternative is compatible with both solvent- and water-based stains and finishes.

Each grade of 3M Synthetic Steel Wool pads comes in a package of six 2

× 4-in. pads. They're available at hardware stores and home centers for less than \$3 per package.

For more information, contact 3M Do-It-Yourself Division, 3M Consumer Products Group, Box 33053, St. Paul, MN 55133. **PM**



Working from coarse through fine grades, the synthetic pads completely stripped old, flaky varnish without chemicals.



The extra-fine pad is ideal for obtaining a hand-rubbed, satin finish. Here the pad is used with oil and rubbing compound.



The coarse pad is best for removing heavy rust from metal. 3M claims that the synthetic pads last longer than steel wool.



After use, the pads can be rinsed to a like-new condition. They're compatible with water- and solvent-based finishes.

HOMEOWNERS CLINIC

BY NORMAN BECKER, P.E., Contributing Editor

Controlling Roof Moss

Will stretching a copper wire across a roof help to control moss the way a copper ridge cap can?

ROBERT JASINSKI
HOLLAND, MI

Not only is moss on a roof ugly, but it can grow so vigorously that it raises and loosens shingles making the roof vulnerable to water penetration during a driving rain or snow melt.

You can control moss by spraying the roof with chemicals available in nurseries and garden supply stores. If you use these chemicals, follow the manufacturer's directions because most of them are toxic to humans, corrosive to metals and harmful to plants.

Another way to control moss is to stretch bare copper wires horizontally about every 5 ft. along the butts of the shingles. Also stretch a copper wire along the ridge. Rain and snow melt will carry the leachate from the copper wire down the roof.

Copper leachate is corrosive to metal, so protect the inside of steel gutters with gutter paint.

Heating System Replacement

I would like to replace the existing forced-air central heating system in my house using an existing water heater as a source of hot water. Also, what are the disadvantages of central water heating systems?

LEONARDO ISRAELI
PACIFIC PALISADES, CA

The main disadvantage of forced hot water heating systems applies to homes in areas with freezing temperatures during the winter. In the event of an extended power failure, the distribution piping could burst.

Another disadvantage is that the system cannot provide for a central humidification system the way a warm-air heating system can.

The BTU (heat) output of a water heater per hour is considerably less than that needed to adequately heat most homes. This setup is more effective in heating an addition than a whole house.

If you use the water heater to supply hot water to baseboard radiators, you will need to keep heating water separate from the domestic (potable) hot water system. That is, you will have to install a second water heater to provide domestic hot water.

Keep in mind that for domestic hot water, the temperature range is from 120° to 140° F (it is usually set at 120° F since 140° F is scalding temperature). For a heating system, the normal operating range is between 180° and 200° F. If you operate the water heater at the lower temperature range (120° to 140° F), you will need more radiators or baseboard convectors per room—at a greater initial cost.

Another reason to separate the potable water from the water used for heating is that during the summer there is no water circulation in the heating system piping. Bacteria grows in this warm stagnant water.

If the two systems are not separate, this water contaminates the potable water when the heating system is turned on.

Foil Radiant Barrier

I would like to install a foil radiant barrier in my attic. There are batts of insulation between the ceiling joists with another 2 in. of blown-in insulation on top of that. I need the foil barrier more to keep the attic cool than for heat, and I would like to lay it on top of the insulation. Can I install it this way?

JAMES CULLIHAN
GREENVILLE, TN

For readers not familiar with them, a foil-faced radiant barrier reflects radiant heat from the sun away from the attic, reducing the amount of air conditioning necessary to cool the rooms below (See "Radiant Barriers," page 60, Sept. '92).

Don't install the barrier on the existing floor insulation, because in most cases it acts as a vapor barrier and causes condensation problems. Instead, the barrier should be attached to the underside of the roof rafters. The joints should not be sealed so that moisture accumulating in the cavity between the roof deck and the radiant foil barrier can escape. If only one side of the foil barrier is shiny, install that side face down. This prevents dust from settling on the surface and lowering the barrier's reflective capability. According to tests, dust accumulation can reduce the barrier's performance by 50%.

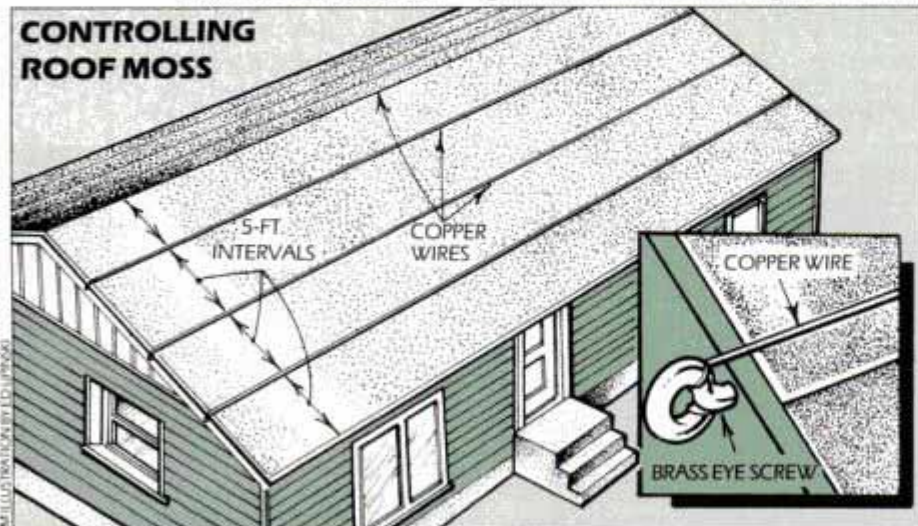
To allow for air circulation behind the barrier, leave a gap at the bottom and top of the rafters. The industry trade group that oversees radiant barriers specifies a 3-in. gap at the eaves and a 3-in. gap on each side at the ridge (6-in. total gap at the ridge).

Finally, install a radiant barrier according to the manufacturer's instructions. For other standards and information regarding radiant barrier installation, contact Roy Akers, President, Reflective Insulation Manufacturer's Association, 4471 E. Santa Ana St., Suite F, Ontario, CA 91761.

PM

DO YOU HAVE A HOME-MAINTENANCE OR REPAIR PROBLEM?

Just ask Norman about it. Send your question to Homeowners Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. While letters cannot be answered individually, problems of general interest will be discussed in the column. For more home-repair and maintenance help, get PM's Home Care Guide, \$5.95 postpaid. Send your order(s) to Popular Mechanics, Box 1014, Radio City Station, New York, NY 10101.



You can stop moss from growing on a roof by running copper wire along the roof, spaced as shown. Leachate from the wires kills the moss. Fasten the wires with eye screws.

**HOME
 IMPROVEMENT**

**CAULK
 BUYING
 GUIDE**

BY GENE AND
 KATIE HAMILTON

● They say variety is the spice of life—but not when you're struggling to decide which caulk is the best to buy. Choosing the right caulk for the job from a selection of tubes spread across a 10-ft. wall display in your home center can be downright intimidating. A single tube of caulk can cost anywhere from a buck and a half to \$14. It's not difficult to figure out that you won't get much for \$1.50, but what's the difference between a \$4 and a \$6 tube?

Not only does the price of caulk vary widely, there are new formulas appearing on the market every year. And the product claims are astounding. It's not uncommon to find caulk with a 50-year or limited-lifetime warranty. However, these claims shouldn't be used as a criteria for judging performance. Anyone who's done a fair amount of caulking knows that the real expense is in preparing the surface, not the caulk used. At best, most manufacturers will replace the tube of caulk if it fails—you have to perform or pay for the labor to redo an unsatisfactory job.

Many shapes of caulk

Caulk is a sealant and comes packaged in several forms. The most common type is a semiliquid substance packaged in a 10½-fluid-ounce tube. One tube of caulk should fill a roughly 48-ft., ⅛-in.-wide × ¼-in.-deep gap. This type of caulk is applied with a caulking gun that utilizes a trigger mechanism to push the caulk out of the tube. Caulk also comes in larger tubes for professional use, and in smaller squeeze tubes for quick jobs.

In addition to the tube-packaged types, caulk comes in a solid-putty form called rope caulk that's used to temporarily plug gaps or fill large voids. Another type comes in narrow strips ready to be pressed into place along bathtub tile joints or around a sink. Foam caulk comes packaged in an aerosol-type dispenser and is best for filling large voids, such as holes in



walls where pipes pass through or the spaces between windows and wall framing.

Types of caulk

Regardless of what the caulk is called, what it is made from is the most important consideration in determining what it's best suited for. What you want the caulk to adhere to and where you want to use it should determine the characteristics of the caulk you buy. For example, to caulk joints around doors and windows requires a sealant that's both flexible and long lasting, has good adherence to siding (wood, aluminum and vinyl), will resist extreme weather conditions and, if it's not painted over, will withstand UV radiation from direct sunlight. To seal flashing around a chimney, the caulk must adhere to masonry, roofing shingles and metal flashing, and stand up to the elements unpainted. The warm, wet conditions of a bathroom require a caulk that resists mildew and withstands moisture.

The package label should provide you with the information you need to determine if a particular caulk is suitable for your project. If it's not going to be painted, check to see if the caulk comes in a selection of colors so you can match it with adjacent colors of siding and trim paint. If you can't find a match, some caulks are also avail-

able in a clear formula.

The label should also state whether the caulk is paintable or stainable, what kinds of paints and stains it's compatible with and whether it requires priming before painting. The drying or curing time before painting should also be specified.

If you're working in cooler weather, check the recommended application temperature range. Some sealants can be applied at any temperature, while others require a minimum of 40° F or higher. In some cases, reading the label won't give you a clear idea of exactly how well the caulk will perform. To help you choose the best caulk for the job, we've grouped them in eight categories based on formula type, listed along with some of their basic characteristics.

Tripolymer, copolymer and compound latex caulks

If cost isn't a consideration, then the new tripolymer or copolymer caulks (about \$4 to \$6) are the best choices for versatility and durability. Proflex by Geocel and Lexel by Sasho are multitask sealants designed to adhere to dissimilar surfaces, such as metals, glass and untreated and treated wood. With excellent adhesion properties and more elasticity than other caulks, these newly developed seal-

ants can replace some specialty caulks, such as butyl-rubber and asphalt caulk. However, these new formulas are also flammable and should be applied with caution and proper ventilation.

The high-end latex caulks, such as 230 by DAP, are also multipurpose caulks. The most popular formulas are latex-base variations, or combinations with silicones and acrylics. They are easy to use, clean up with water and are almost as durable as the polymer formulas.

Silicone caulks

Just as expensive are the 100% silicone caulks (about \$4 to \$6). These are the best choice when sealing damp, high moisture areas. They shrink very little, remain flexible, are water resistant and have good bonding power for joining dissimilar surfaces. They also can be applied in cold conditions. This is the best caulk to use around bathtubs, showers and sinks. Some silicones don't hold paint well, however, and they don't bond well to rot-resistant woods such as cedar, red-

wood and pressure-treated wood. As such, they're not as versatile as the compound-latex and polymer formulas.

Acrylic latex and compound-vinyl caulks

In the midprice range are the acrylic latex formula caulks (about \$2 to \$3). These are the best all-around buy for many uses inside and outside, and they feature simple, water cleanup. As silicones are added to the formula, the caulk becomes more durable.

Included in this general category

Caulking Tips

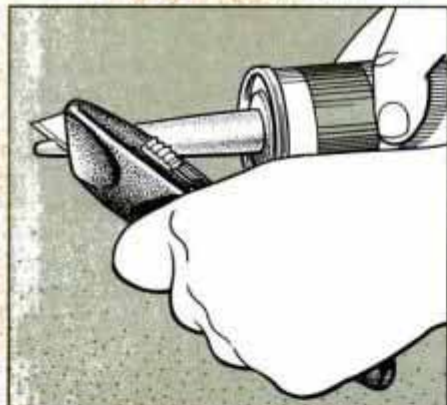
● Once you've bought the right caulk for the job, getting it out of the tube is a fairly straightforward process. To start off, cut the tube's nozzle at a 45° angle (Fig. 1). The size of the gap you're filling determines how far up the nozzle to make the cut—the higher the cut, the wider the bead of caulk. Note that joints more than 3/4 in. wide and deep should be filled with a foam-rope backer or oakum to provide a base for the caulk. After cutting the nozzle, press a long nail through the opening to break the seal inside the tube.

Many caulking guns have a plunger rod with notches that the trigger engages to push

out the caulk. To install the tube, first turn the rod so the notches face up and then pull the rod all the way out. After the tube is in place, rotate the rod so the notches face down, and squeeze the trigger until the caulk moves into the nozzle. Lay down a bead of caulk by holding the gun at a 45° angle, pressing the trigger and moving the gun at a steady rate (Fig. 2). When the bead is finished, turn the plunger rod so the notches face up to reduce the tendency for the pressurized caulk to continue flowing out of the nozzle. To ensure that the caulk adheres to the surface, always remove all old, loose caulk, paint and dirt from the area before applying new caulk (Fig. 3).

Deep, wide gaps are best filled with foam

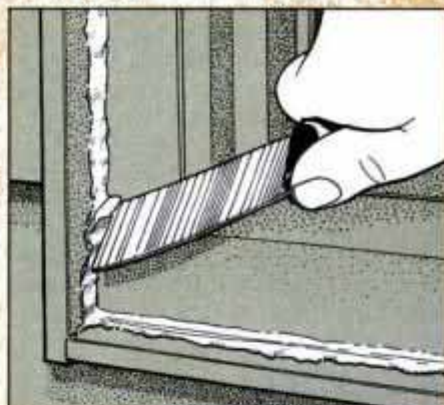
caulk. Wear goggles and gloves for this job, and use the long applicator tube to reach into confined spaces (Fig. 4). This type of caulk is especially useful for sealing the gaps between window casings and adjacent framing. Sealing cracks in interior woodwork is generally done after priming. Use a water-cleanup caulk and smooth the application by running a wet fingertip along the bead (Fig. 5). After the caulk is dry, you can apply the finish coat of paint. For seasonal protection around window sashes, storm windows and exterior gaps, inexpensive rope caulk is pressed into the gaps. This nonhardening caulk won't stick and should be removed when warm weather arrives (Fig. 6).



1 Use a sharp knife to cut tube nozzle at a 45° angle. Cut higher up nozzle for a wider bead. Press a long nail through the nozzle to break the seal in the cartridge.



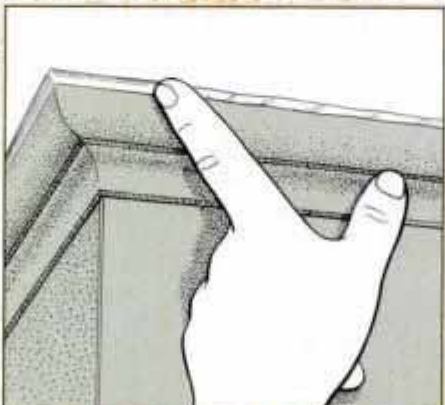
2 Hold tube at 45° angle to run bead along joint. Use gentle trigger pressure and progress slowly. Then, turn plunger rod so notches face up to reduce excess caulk flow.



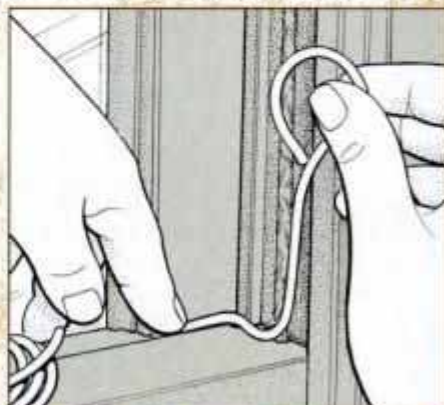
3 Before caulking, always scrape away all loose caulk, paint and dirt so new compound will adhere to the surface. Some caulks require priming before application.



4 Foam caulk is best for sealing large gaps, such as between a window and wall framing. Wear goggles and gloves for safety.



5 Caulk joints between wood trim and walls before finish painting. Use a wet fingertip to smooth and press caulk into joint.



6 Gaps between window sashes are filled with rope caulk in fall. After winter, non-sticking rope caulk is easily removed.

Corners. Nooks. Crannies. Notches. The powerful new Ryobi Detail Sander takes care of all your sanding details. Its triangular head gets into places other sanders can't reach. And its oscillating action produces extra fine finishes, virtually

eliminating finger sanding.

Optional add-on accessories turn this versatile tool into even more of a small wonder. Besides sanding, you can use the Detail Sander for



removing light rust from intricate surfaces – like ornamental wrought iron furniture and railing – with the Metal Finishing Pad.

Remove paint and adhesive from glass and wood easily with the Scraper Blade. Wax and polish tight spots and angles with the Wax/Buffering Pad; ideal for car detailing.



Remove paint and varnish from hard-to-reach surfaces easily with the Stripping Pad. Or smooth bare wood and prepare newly painted surfaces between finish coats with the Finishing Pad.

The Ryobi Detail Sander. It's fast, versatile and easy to use. For even more details, stop by your Ryobi dealer today or call 1-800-525-2579.

Made in USA by Ryobi

RYOBI

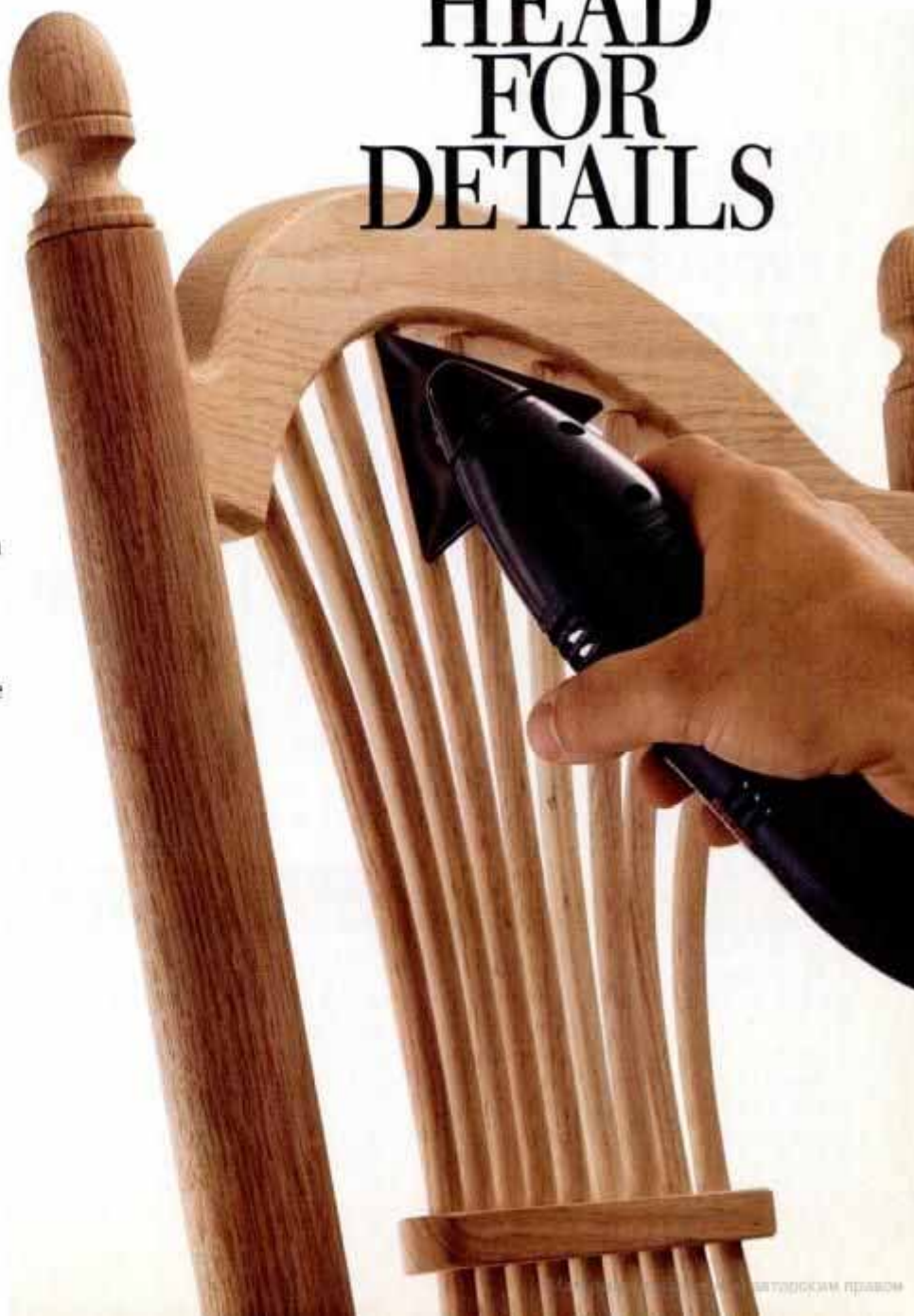
Making Innovative Concepts A Reality™

Ryobi America Corp., 5201 Pearman Dairy Road, Suite 1,
Anderson, SC 29625-8950

© Ryobi America Corp. 1992



A HEAD FOR DETAILS



are adhesive caulks such as Polyseam-seal by Darworth and Phenoseal Vinyl Adhesive Caulk. In addition to sealing cracks, these caulks act as light-duty construction adhesives that join dissimilar materials. Replacing a loose ceramic tile, setting ceramic soap dishes and installing vinyl baseboard molding are just a few of the jobs adhesive caulks can handle.

Oil-base and plain latex caulks

These inexpensive caulks (about \$1 to \$2) have been around for years and are suitable for indoor use only. Although oil-base caulks are inexpensive, they're not always the best buy because they have a limited life and require mineral spirits for cleanup. Plain latex caulks, on the other hand, are easy to apply and clean up with water. They're suitable for interior uses, such as caulking woodwork when painting, but they are not a good choice for areas exposed to the weather.

Butyl-rubber caulks

This type of caulk is in the medium price range (about \$2 to \$4) and is tra-

ditionally used to caulk masonry-to-wood or metal joints. It's also good for caulking glass-to-metal joints and sealing aluminum and galvanized gutters. Butyl-rubber caulks require mineral spirits for cleanup, and are more difficult to work with than the newer formulas. Tripolymer and copolymer caulks can be used for similar applications.

Polyurethane and polysulfide

Both of these formulas are expensive, high-performance caulks (about \$4.50 to \$14) used primarily in marine applications. They have excellent adhesion properties and are waterproof. However, they are toxic until cured and precautions must be taken to provide proper ventilation and skin protection during application. Strong solvents are also required for cleanup.

While the expensive polysulfide formulas are generally reserved for marine use, Franklin International makes a popularly priced polyurethane formula that is suitable for use around the home, and Titebond Wood & Window Caulk is a good choice for

redwood and cedar siding. Polyurethane caulks have excellent adhesive properties.

Foam caulk

The best way to fill large cracks in difficult-to-reach areas is with foam caulk. However, it's sensitive to UV radiation, so it must be painted if it will be exposed to sunlight. The foam sticks to just about anything and is messy to work with, though. And it can cause skin or eye irritation, so wear eye protection and use the pair of plastic gloves that are provided with the product.

Rope caulk

Rope caulk is an inexpensive, nonhardening, solid caulk used to temporarily fill cracks. It's best suited for plugging gaps between window sashes and doorjamb during the winter. Because it's designed not to adhere, it can easily be removed when the warm weather arrives. Rope caulk will last for a season outside, so it can be used to plug cracks between storm windows and other small gaps on the exterior of your house. **FM**

PRODUCT REVIEW

EDGECRAFT SCISSORS SHARPENER

● Dull scissors are often tolerated—and suffered—in many households due to a lack of sharpening know-how, or the unavailability of a professional sharpening service. And, sometimes you don't really realize how dull your scissors are until you try a new pair.

If this rings true, there's a good chance you'll be interested in the Edgecraft ScissorPro 500—a scissors sharpener designed to enable you to get professionally sharpened, like-new scissors simply and easily.

The unit is comprised of two motor-powered, rotating diamond-abrasive discs—one coarse and one fine. A magnet and plastic hold-down spring adjacent to each disc holds the scissor blade against the disc at the correct sharpening angle.

Both discs are designed to suit the bevels found on standard scissors. A special accessory also is supplied for sharpening knife-edge-type scissors that have a smaller edge bevel angle.

Although this sharpener does a fine



job on most standard scissors, it won't sharpen hair-styling scissors, pinking shears, manicure scissors, serrated-blade scissors, tin snips, scissors greater than 12 in. long, or any blade that doesn't readily fit in the sharpening position.

The Edgecraft ScissorPro 500 Diamond Hone Sharpener is available at hardware stores, department stores and through mail-order distributors for about \$50. For more information, contact Edgecraft Corp., Limestone and Southwood roads, Avondale, PA 19311, or call (800) 342-3255.

—Rosario Capotosto



ScissorPro 500 has two sharpening grades. Scissors are placed in magnetic holder and drawn across rotating diamond-coated disc.



Originally, the Seagram Family kept their *finest* whisky for their *Very Own* (hence V.O.). But in the *spirit* of the season, we've gift-wrapped it specially for *you*.

V.O.



The Smooth Taste of Canada's Finest

APPLIANCE CLINIC

BY STEVE TOTH,
 Contributing Editor

Gas Dryer Squeals

My 10-year-old Sears Kenmore gas dryer has a squealing problem. It is model No. 110.7793010, serial No. F81102697. When I start it up from a cold start, it squeals for 2 to 3 minutes, then the squealing stops. Sometimes it squeals a little during the drying cycle. Is there a dried bearing or something else that needs to be greased or replaced?

C.R. SHELTON
 MT. VIEW, CA

The squealing noise is most likely coming from a dry bearing on the idler pulley assembly. This dry bearing is probably putting a drag on the pulley, preventing it from turning freely.

To check the pulley, unplug the dryer from its electrical power source. Then snap open the front lower access panel by grasping the sides of the panel at the top and pulling it out and down. Now, lift the panel off the bottom clips and away from the dryer.

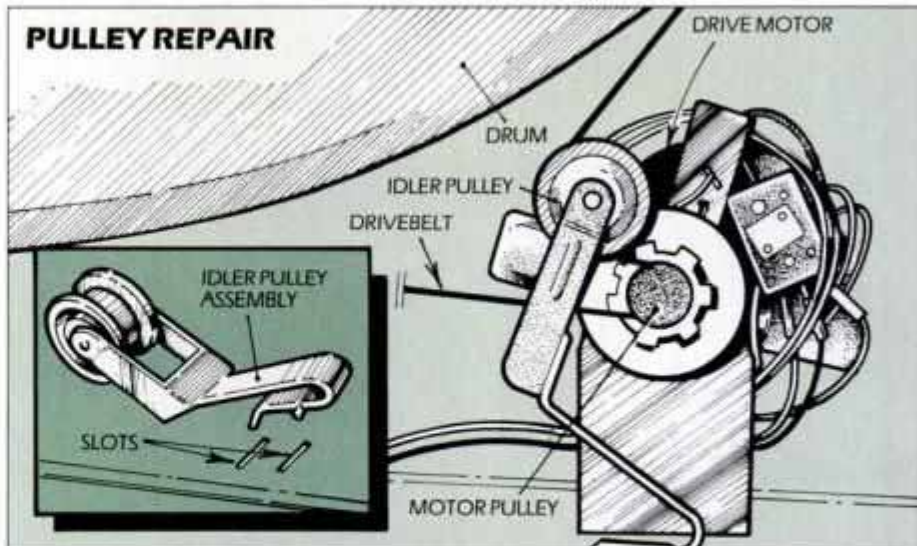
At the right rear of the opening is the drive motor, idler pulley assembly and the drivebelt going under the idler wheel and over the drive motor pulley. With one hand, push the idler pulley toward the motor to slacken the belt. With the other hand, remove the drivebelt from the drive-motor pulley and slip the belt out from under the idler pulley.

Lift the idler assembly up and out of the slot in the base of the dryer. Squirt a little lightweight household oil on the pulley shaft to make the pulley turn freely. Turn the wheel back and forth to make the oil work its way into the bearing. The wheel should spin freely.

If lubricating the wheel does not help, replace the idler assembly. Stop by your local Sears repair parts center or any appliance parts store and ask for a new idler assembly, part No. 691366. It costs about \$15.

To reinstall the belt, first put the toe of the idler pulley assembly in its slot in the dryer base. Hold the pulley assembly to the base of the dryer with one hand, grab the belt with the other hand and form a loop. Pass the loop

PULLEY REPAIR



A dry bearing on the dryer's idler pulley will cause the pulley to squeal. To lubricate the bearing, you must remove the idler pulley assembly.

under the idler pulley and over the motor pulley while pushing the idler pulley up and to the right. Slowly release the tension on the idler pulley assembly.

Next, turn the drum counterclockwise (facing the dryer's front) to be sure the belt tracks properly on the idler pulley and the motor pulley. Next, install the access panel. Plug the dryer back into its power source and test run the machine.

Erratic Thermostat

I have a Chambers Model W gas range that has an erratic oven thermostat. The thermostat is a Wilcolator type M-8. Can you suggest a source for this part or someone who could rebuild it? UNSIGNED

I know of no source for a new Wilcolator type M-8 oven control for your Chambers range, but to put new life into your vintage range you can remove your old thermostat, package it and send it to a thermostat control rebuilder. The two companies listed below still have parts for the old Wilcolator control and may be able to rebuild your control.

Contact one of the following: C.W. Byers, Thermostat and Control Rebuilding, 3541 N.W. 49th St., Miami, FL 33142, or Controls Service Co., 1545 N. Western Ave., Chicago, IL 60622.

Problem Burner

I have a Whirlpool gas-fired dryer, model No. LD17801K1, serial No. M63702382 with a problem burner. When the dryer is started, the burner ignites to bring the drum temperature to the dial setting. But as the dry-

er goes through the cycle, the burner shuts off. The ignition glows and I hear the solenoid click, but no gas is admitted to the burner.

I checked the airflow, tested the coil leads for voltage, the solenoid coils for continuity, and checked for binding in the gas valve. Everything checked okay. I'm stumped. What can be the problem?

KENNETH CHRUN
 MOBILE, AL

Sounds as if one of the three coils on the gas valve may be causing your problem. Sometimes a coil will test good with a voltage/ohmmeter when it is cold or at room temperature, but as soon as you apply voltage to it, the winding begins to heat and expand. After years of use, the fine wires in the coil can pull apart as they expand, causing an open circuit in the coil. When this happens the burner shuts down.

As the wire cools, it again makes contact, completing the circuit in the coil. The burner starts up again and works for a while.

This problem is sometimes very difficult to diagnose. To correct it, you need to install a gas-valve coil assembly kit, Whirlpool part No. 279137, that costs about \$45. It's available from any Whirlpool or appliance parts distributor in your area. The kit includes three coils, all necessary wires and connectors and an instruction sheet. FM

DO YOU HAVE AN APPLIANCE PROBLEM?
 Just ask Steve about it. Send your question, along with the model and serial numbers, to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. While letters cannot be answered individually, problems of general interest will be discussed in the column.



WE JUST MADE ALL RADAR GUNS OBSOLETE.

Introducing the new Cobra 3 band/wideband radar detector:



Cobra, the industry leader in radar detectors, presents TRAPSHOOTER® STEALTH 3 band/wideband. It detects both the X and K spectrum. And offers the most complete Ka wideband coverage available with the Cobra HyperSweep™ frequency scanning system. For dealer location call 1-800-COBRA 22.

Cobra
TRAPSHOOTER 3
STEALTH™
WIDEBAND
Innovation that's clearly ahead.

Cobra Electronics Group,
Division of Dynascan Corp.

LASER
ADAPTABLE

You are invited to defend your right to use radar detectors. Contact RADAR, 4949 S. 25A, Tipp City, OH 45371. 1-800-448-5170.

Матеріал захищений авторським правом

At These Prices You Can Really Clean Up.



54⁹⁶
Every Day

10-Gallon Wet/Dry Shop-Vac®
Vacuums wet or dry, indoor or out, 1.75-horsepower motor. Attachments included. #707-17

78⁹⁶
Every Day

12-Gallon Blower Shop-Vac®
Two-horsepower motor, plastic body converts to powerful portable blower. Comes complete with attachments and two-year warranty. #333-46

35⁹³
Every Day

Six-Gallon Wet/Dry Shop-Vac®
1.25-horsepower motor, vacuums wet or dry, indoors or out. Comes complete with attachments. #600-02-27

Six-Gallon Blower Shop-Vac®
1.5-horsepower, plastic body, converts to powerful portable blower. Includes attachments. #333-06-27



Shop-Vac® Dry Filters
Five-pack of durable paper filters for all model Shop-Vacs. #901-01

194
Every Day

Shop-Vac® Foam Filter Sleeve
Fits all model Shop-Vacs. #905-85

324
Every Day

Shop-Vac® Reusable Dry Filters
Three-pack of washable, durable filters. Fits all model Shop-Vacs. #901-07

324
Every Day

54⁹⁶
Every Day

shop-vac



WAL★MART®
ALWAYS THE LOW PRICE.



© 1992 WAL-MART

Материал, защищенный авторскими правами

HOME
IMPROVEMENTCARPET
BUYER'S
GUIDEBY GARY AND JIM BRANSON
PM Illustrations by
George Retseck

● Because it provides a unifying focus that ties together walls, window treatments and furnishings, carpet may be the single, most important, element used in interior decoration. Carpet adds color and texture, provides soundproofing, insulates cold floors and offers underfoot comfort. But, shopping for carpet can be frustrating and you may be confused by the wide variety of choices available. To ensure that you make the right decision, be sure to choose your carpet dealer carefully and take the time to understand not only the basics of buying carpet, but also the ins and outs of carpet construction and proper care.

Choosing a carpet dealer

Finding a reputable dealer shouldn't be difficult. Most department stores will have an established track record, so they'll be around to answer any future complaints you may have. If you shop at one of the national department stores, you should get what you pay for, and may pick up a bargain if you watch for sales. An established neighborhood carpet store with a record of satisfied customers is also a good choice.

Approach discount carpet outlets with caution. If their deals sound too good to be true, they probably are neither good nor true. Never take the salesperson's word alone for carpet quality. Always ask to see the carpet sample specifications book and check the carpet manufacturer and the construction information. A dealer who has rolls of carpet in the showroom, but can't provide sample books may be selling seconds—carpet that has a manufacturing defect. Some seconds may only show pattern errors that won't affect the wear characteristics of the carpet, but others are discounted due to problems with adhesives or other materials. These problems may affect the life of the carpet.

Recently a new source of consumer carpet sales, the wholesale telephone



carpet business, has shown rapid growth. Many shop-by-phone carpet dealers can provide a wholesale price quote for any carpet you want to buy, but you'll have to provide the legwork in order to provide the company with the name and description of the carpet in question. Some of these companies sell carpet only to a contractor or other large-volume account, while others solicit consumer business and sell in any quantity. A few shop-by-phone dealers will even send out sample books.

The advantage of buying carpet over the phone is that you may get wholesale prices, and you may avoid paying sales tax if the carpet is bought out of state. You will, however, have to pay shipping costs to your home.

When you've located a dealer and obtained the carpet sample books, check the carpet construction specifications for manufacturing information. Pay special attention to the brand name, warranty, style, density, weight and pile content. These are the variables that affect quality.

As with most purchases, buying

carpet and selecting a dealer based on price alone may be only a short-term economy. The few extra dollars saved now are a small reward for carpet that doesn't live up to your expectations over the long term.

Carpet style

The most common carpet construction is called tufting. Tufting machines pierce the carpet-backing material with loops of yarn which form the carpet pile. If the loops of yarn are uniform in size and height, the carpet is a level-loop pile. Berber styles are level-loop carpets that have tight loops and maximum fiber density. Carpet with loops of uneven height is called multilevel loop. If some of the loops are cut and the carpet pile height is even, it's called cut loop. If some loops are intact and some are cut, but the pile height is uneven, the pile is called random shear.

If all carpet pile loops are cut and form a uniform ½-in.-high pile, the carpet is called Saxony. A Saxony pile that's more than ½ in. high and less dense may be called velvet, plush or



textured plush. A carpet that has a mixture of straight tufts with twisted or curled tufts is called frieze. Friezes or twists, with their curled tufts, form a resilient textured pile that resists matting, doesn't show footprints and is sometimes referred to as trackless. Be sure these fibers are heat set to preserve the resiliency of the pile. The most durable carpets are the loop-pile carpet styles, so choose one of these for carpeting high-traffic areas such as hallways and stairs.

Density and weight

Density and weight also help determine carpet durability. Density refers to the number of fibers found in 1 sq. in. of carpet, and is referred to as either stitches per inch (spi) or stitches per 3 in. (divide by three to get stitches per inch). The number of stitches shown should be a minimum of 9 to 10 spi for residential carpeting, 5 to 6 spi for berbers and 10 to 12 spi for level-loop or commercial carpets. After checking the specifications book, bend the carpet sample so it forms a 90° angle and check how much backing material you can see. The less visible the backing, the tighter the fibers and the more durable the carpet.

Also, check the carpet's pile yarn weight. Select a carpet that has no less than a 40-ounce pile weight (higher pile weight is better) for Saxony, plushes or berbers. Buy commercial carpets that have a minimum 26-ounce pile weight. Note that pile weight refers to the weight of the carpet pile only. The total weight of the carpet, which includes the pile plus the backing, will also be listed.

Pile content

The carpet specifications will also list the type of fiber used in the carpet construction. This may be shown as pile content, pile yarn or simply as pile. The pile content is also an important guide to carpet durability and maintenance.

Carpet yarn or fiber may be nylon, olefin, polyester, polypropylene or natural fibers such as wool or cotton.

Early polyester pile carpets were prone to matting and premature wear, but dealers now say that today's polyesters are more durable and crush resistant. Polyester fibers are sometimes used in a blend such as a polyester/nylon blend.

The most durable carpets, including commercial and long-wearing berber styles, are made with olefin fibers. Carpets made with pure olefin may feel rough to the touch, however. Berber carpets are also available in olefin/nylon blends or in 100% nylon construction. The olefin blends or pure nylon fibers feel softer than pure olefin. Nylon fibers are also durable,

easy to clean and they resist matting, so nylon is always a good pile choice.

Carpet pad

A quality pad can extend the carpet's life, prevent the carpet from slipping and improve its feel underfoot—the pad choice can be as important as the carpet itself.

Pad materials range from felt and single-color plastic foam, to rebond and solid rubber pads. A pad that's too thick may interfere with good balance and may prove hazardous to the elderly or unsure of foot. A pad that's too thin may wear more quickly or deteriorate from impact, causing the

Carpet Care And Cleaning

● Carpet costs represent a major portion of your decorating dollars, so it makes sense to follow good care and cleaning procedures. The following tips will help you extend the life of your carpet:

- Use a quality pad to cushion the carpet.
- Use commercial-type mats at entry doors.
- Don't wear street shoes indoors.
- Don't walk barefoot on carpet—natural skin oils soil carpet and retain dirt.
- Clean up food or beverage spills immediately. Use a white cloth, dampened with water, to wipe up minor spills.
- Invest in a quality, upright vacuum cleaner. Cheaper canister-type units often do not have sufficient power to remove deep-down dirt and grit.
- Vacuum frequently—a carpet that bears heavy traffic should be vacuumed daily.
- Have the carpet restretched if it shows any wrinkles or puckers.
- Shade carpet from direct sunlight to reduce fading.
- Move furniture frequently and put pads under legs to avoid dents.
- If dents occur, remove them with a steam iron. Hold the iron about 2 in. above the carpet to steam the fibers. Then, brush and raise the fibers with your fingertips. Don't let the hot iron touch the carpet.
- Have the carpets professionally cleaned to avoid a buildup of detergent residue. Professional equipment uses hotter water, stronger detergents and has better suction than typical home-use equipment.
- Have a protective application of Scotchgard sprayed onto the carpet after cleaning.

The protective barrier built into the carpet will break down in time—especially in high traffic areas.

● Save the carpet warranty and any other information that came with the carpet. Also save a remnant for carpet repair, or to use as a sample if you have a warranty problem.

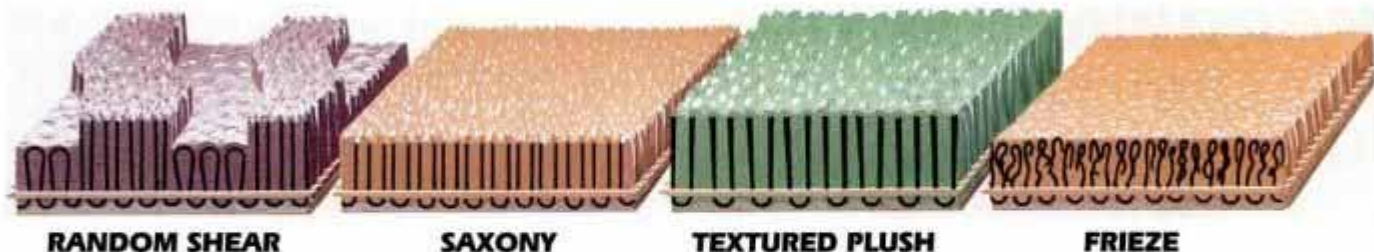
Carpet cleaning

Before renting a carpet shampoo machine, consider the pros and cons of having the job done professionally versus doing it yourself.

Check out the price of the rental equipment and add to this the cost of detergent. Then, compare this number with several professional cleaning rates. Although the dollar cost makes doing it yourself attractive, don't forget that you'll have to pick up and deliver the equipment—as well as do the actual work. Professional cleaners can usually do a better job and frequently offer attractive packages that include special rates on Scotchgard treatment as well as reduced rates on additional rooms.

The most common mistake homeowners make when cleaning their own carpets is failure to remove all of the cleaning chemicals from the carpet. Shampoo residue that's not removed can become gummy and trap dirt, resulting in a carpet that needs to be shampooed again far too soon.

Carpet shampooing attachments are available that fit wet/dry shop vacuums. These are useful for cleaning spills before they set into the fiber and for handling high-traffic areas that become soiled before the rest of the carpet. But, for overall carpet cleaning, it's best to call in a pro. —G.B.



carpet to wrinkle or even split at the seams. The best test for pad comfort is to lay the pad and carpet samples on the floor and walk on them.

For most applications, choose a 6- to 8-pound rebond foam pad. Rebond pads are made from multicolored foam particles bonded together with adhesives. Rebond pads will not lose their resiliency as will inferior pads.

To save money on your carpet pad, check the Yellow Pages under Carpet Installers, Equipment and Supplies. You can often buy the pad at half price from these wholesale-only dealers, but you may have to buy an entire roll (40 yards). Don't be put off by the fact that the dealer sells wholesale—most will sell to the walk-in trade.

Selecting the carpet

If durability were the only criterion for carpet selection, you could simply pick the carpet with the best wear characteristics.

However, other factors, including budget and style, will help shape your final decision.

When making your carpet choice consider your lifestyle. Active families will need more durable carpets than retirees or working singles, and carpet traffic will vary from one area to another. While halls and stairs require high durability, bathroom carpet must be stain resistant and easy to clean. And, the luxury of a Saxony or the texture of a random plush may sway you more than the utility of a

commercial or berber style.

Another crucial factor is carpet color. If possible, bring wallpaper and paint samples, or other examples of your home's color scheme to help you make a color choice. Bring home a carpet sample or large remnant of the carpet and place it in the room that it's intended for. Color shifts will occur between sunlight and night lighting, so check the carpet's color under different conditions to be sure of an appropriate match.

When considering price, compare only carpets of similar style and construction. And whatever your choice, remember that proper cleaning and care can greatly extend the lifespan of any carpet.

PM

TOOL TEST

SEARS RIP FENCE GUIDE

● The new Sears table saw rip fence guide is a clever and inexpensive jig designed to both hold stock securely and safely for a variety of cutting operations, and act as a guide for set-

ting blade height and angle. It fits most table saw fences that measure up to 2 in. wide by 3 1/8 in. high. Made of high-impact polystyrene, the jig is designed to slide along the fence while

holding the work for accurate cutting. When used with the holddown stick accessory that comes with it, the jig safely feeds the work and keeps your hands well away from the blade.

Additional features include reference scales for setting blade height in 1/8-in. increments, and the front and back of the jig are angled at 90° and 45° respectively for setting the two most commonly used blade angles.

The guide has an auxiliary stock support that holds the work at 90° or 45°. In



For tenons, open mortises and lap joints, stock is clamped to jig side. Mitered or 90° work can be handled.

conjunction with a clamping plate, the stock can be held securely when making tenons, open mortises and lap joints in square or mitered work.

I tried the above cuts and found the jig worked satisfactorily, provided I was careful to exert hand pressure straight down while advancing the guide along the fence. Any inadvertent side thrust can cause the jig to tilt slightly, which impairs the accuracy of the cut.

The Sears model No. 3237 Fence Guide System costs about \$20. For more information, contact Sears Roebuck and Co., Dept. 903, B1-221B, 3333 Beverly Rd., Hoffman Estates, IL 60179.

—Rosario Capotosto



The Sears Fence Guide System slides along the table saw fence as it guides and holds stock. Holddown stick (included) keeps your hands away from blade. Jig also has provisions for setting blade height in 1/8-in. increments, and 45° and 90° blade angles.

PHOTOS BY ROSARIO CAPOTOSTO

NEW TOOLS
HARDWARE SHOW

BY ROY BERENDSOHN, Assistant Home Improvement Editor

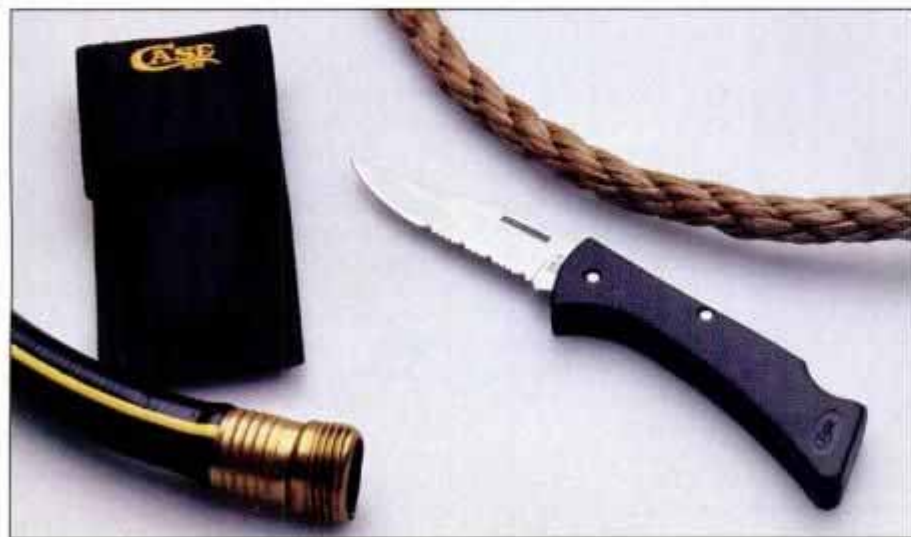


Plunge In

Bosch has introduced what may be the most sophisticated plunge router available. The 2-hp model shown is equipped with dial speed control from 12,000 rpm to 23,000 rpm. It has a lever lock to help you change bits quickly and with a single wrench. And, its collet is self-releasing, so when you loosen the collet nut, the bit drops free. The tool also has a micro-fine adjustment knob (top inset photo). With

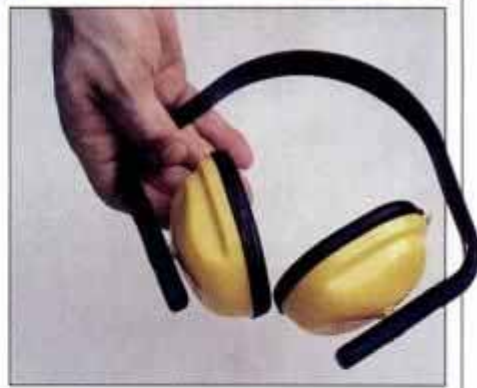
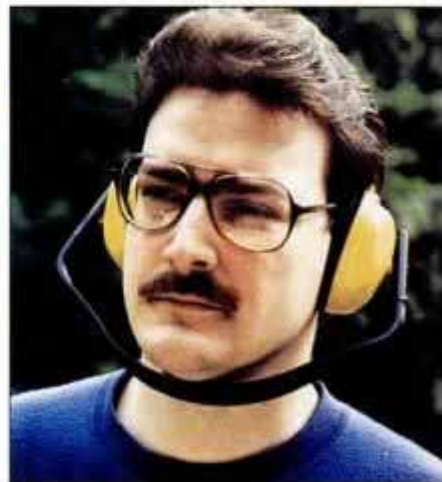
it, you can fine-tune cutting depth in .004-in. increments.

To insert a routing template in its base, just push aside a lever and insert the template (bottom inset photo). It costs about \$260 (its fence costs about \$32 extra) at industrial suppliers and hardware stores. For more information, write Robert Bosch Power Tool Corp., 100 Bosch Blvd., New Bern, NC 28562.



Now Hear This

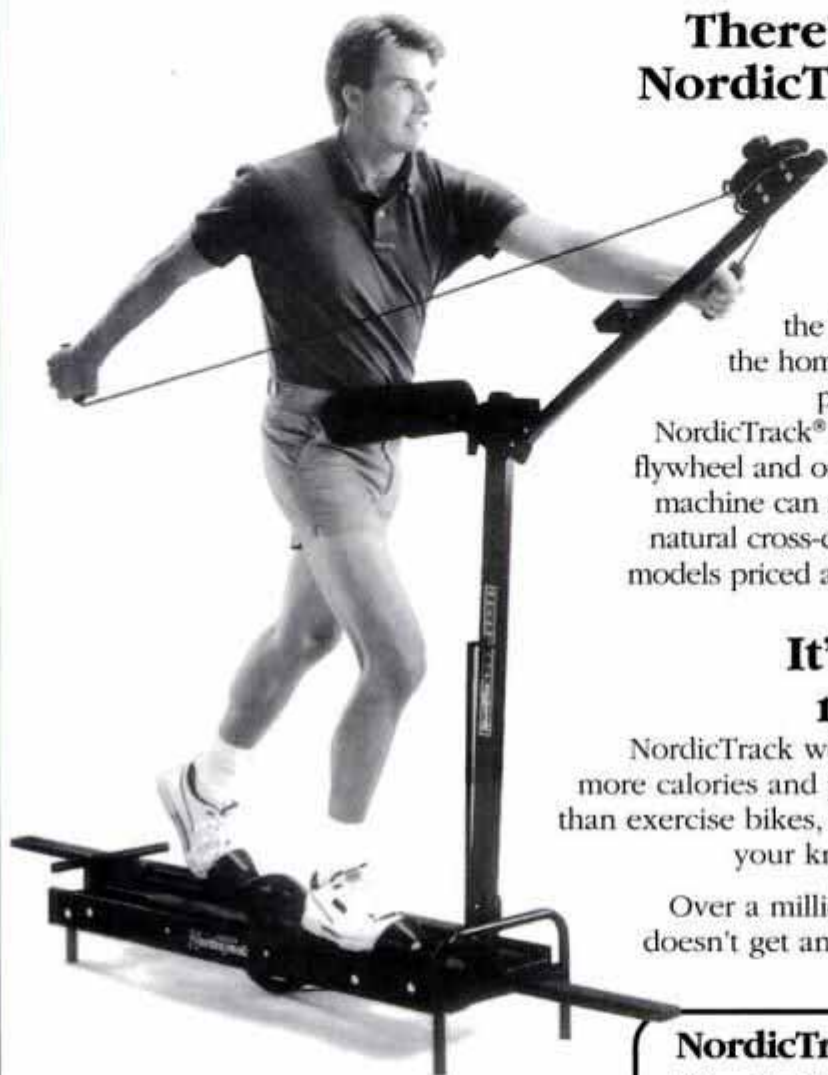
These fully adjustable ear protectors are the most comfortable we have tried, which means that they are also the most likely to be worn. The muffs swivel and slide on their flexible plastic headband. You can wear them with the band up, under your chin or behind your head. Each earpiece is made from a soft and pliable foam that conforms to the shape of your ear. They cost about \$18 (plus shipping) through The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374.



Just In Case

Case designed its Caliber line of knives to handle nearly any cutting chore you can perform with a knife. Their high-carbon stainless-steel blades have a staggered serration which, Case says, makes the knife an ideal tool for cutting synthetic and natural fiber ropes, hoses and other tough materials. The blades are satin finished by a glass bead blast. The knives' handles are made from Poly-penco Nylon 101, a material that is said to resist everything from high impact to chemicals. The knives cost \$30 to \$40 at hardware and sporting goods stores. Write Customer Service, W.R. Case & Sons Cutlery Co., Owens Way, Bradford, PA 16701.

You can afford a NordicTrack. Why settle for anything less?



NordicTrack Challenger model shown.

There's good reason why the NordicTrack® cross-country ski exerciser is known as "The World's Best Aerobic Exerciser."™

For over 17 years, NordicTrack has been the leader at bringing cross-country skiing into the home. While lesser cross-country ski exercisers provide an awkward "shuffling" motion, the NordicTrack® cross-country ski exerciser uses a patented flywheel and one-way clutch mechanism that no other ski machine can match. It's simply the best at simulating the natural cross-country skiing stride. And with NordicTrack models priced as low as \$299.95, there's no reason to own anything but the best!

It's the affordable way to meet your fitness goals.

NordicTrack works all the major muscle groups, burning more calories and providing a better cardiovascular workout than exercise bikes, treadmills and stairclimbers. It's gentle on your knees, joints and back. And it's easy to use.

Over a million people already know that exercise just doesn't get any better than NordicTrack. At these prices you can own a NordicTrack:

NordicTrack Excel.....only \$499⁹⁵!

NordicTrack Sequoia.....only \$399⁹⁵!

NordicTrack Challenger.....only \$299⁹⁵!

Models priced from \$299⁹⁵ to \$1,299⁹⁵

**Order today.
And get
a \$49.95
electronics
package for FREE.**



Order today, and you'll get more than "The World's Best Aerobic Exerciser"™ — you'll get a free \$49.95 electronics package! We just improved our Challenger, Sequoia and Excel models to accept the Performance Track Electronic Speedometer/Chronometer, which helps you accurately track your distance, time and speed. It adds value to every workout...and it's yours for free if you order a Challenger, Sequoia or Excel before December 31, 1992.

This offer not valid with any other offer.

30 day in-home trial!

NordicTrack
A CML Company

For a **FREE VIDEO** & Brochure, Call

1-800-328-5888 Ext. 27512

NordicTrack, Dept #27512,
104 Peavey Rd., Chaska, MN 55318

- Please send me a free brochure
 Also a free video VHS Beta

Name _____

Street _____

City _____ State _____ Zip _____

Phone () _____

©1992 NordicTrack, Inc., A CML Company. All rights reserved. NordicTrack reserves the right to change prices and specifications without prior notice.



Forceful

The Sawforce 400 is a 7¼-in. circular saw designed for the homeowner, but it has features normally found on professional circular saws. For instance, the saw is powered by a 12-amp 2½-hp motor. The saw's motor shaft rides on ball bearings, and changing the blade is simplified with a spindle lock button. Press the button to lock the arbor shaft in position and back out the arbor bolt.

It has a built-in blade wrench (bottom photo) that doubles as a square and an adjustable kerf indicator. It costs about \$140 at hardware stores and home centers. For information, contact Black & Decker, Communications Dept., 701 E. Joppa Rd., Towson, MD 21286.

Vise Squad

Record's multipurpose vise lives up to its name by providing up to 7 in. of jaw capacity. With the sliding jaw positioned on the front of the vise, you have 3½ in. of jaw capacity. Remove the sliding jaw and insert it on the vise's back, behind the fixed jaw, to expand the opening to 7 in. The cast-iron vise is equipped with flexible polypropylene jaws that conform to the shape of the workpiece. It costs about \$49 at hardware stores and home centers and in woodworking catalogs. For more information, contact Record Tools Inc., 1915 Clements Rd., No. 1 Pickering, Ontario, Canada L1W3V1.



Pen Light

Powered by butane lighter fuel and held like a fountain pen, the Portasol C1C can be used as a soldering iron, a miniature blow torch and a hot knife for cutting and sealing the ends of synthetic rope. The tool comes with a flint igniter and a chisel tip. A fine-point tip and a hot knife tip are sold as accessories. To increase the tool's versatility, its temperature is adjustable and combustion fumes are treated with a catalytic converter.

It costs about \$19 at hardware stores and home centers. For more information, write Cooper Tools, P.O. Box 728, Apex, NC 27502.

Get The Point

The FireStone knife sharpener is designed to put a nice sharp edge on a knife in minutes. Hold the sharpener at the edge of a bench or table and draw a knife across its ceramic stones. A couple of strokes sharpen the blade. The 2-stage model in the background of the photo has a pair of finishing stones to polish the edge. The 2-stage model costs \$25 and the single-stage model costs about \$20.

They are sold through sporting goods stores, hardware stores or direct from FireStone Div., McGowan Manufacturing Co., 25 Michigan St., Hutchinson, MN 55350.



Hip Tool Box

Here's a workbelt designed and priced for the do-it-yourselfer. It's lighter than traditional workbelts with leather pouches, and the woven polypropylene belt is adjustable so it can fit waist sizes up to 49 in. The belt closes with a quick-release buckle and a variety of nylon pouches slide on and off the belt. The model shown has two pouches and snap-in tool holder. The hammer loop is riveted to its nail pouch. The belt shown costs about \$15 at hardware stores and home centers. Write Buddy Belt, DuraStren Corp., 1 W. Front St., Red Bank, NJ 07701.



MUST LIQUIDATE!

AT FAR BELOW DEALER COST!

ALL 3 FOR ONLY \$447
You save \$1,249.00!
Plus FREE S/H
when you buy all three.
 Give Item # C3782-7682 for the set.

Less Than 29¢ on the Dollar!
New, in Factory Sealed Cartons!

Ryobi®
Over-Engineers
Making Too Costly To
Produce. C.O.M.B. Now
Authorized to Liquidate.

NO CORDS, NO HOSES, NO HASSLES!

Are you knotting 50' extension cords to deliver power from the outlet to the site? Getting a purr on tough jobs when you need a roar? Then look carefully at RYOBI, the Rolls-Royce of gasoline powered tools, and the unbelievable offer being made here today.

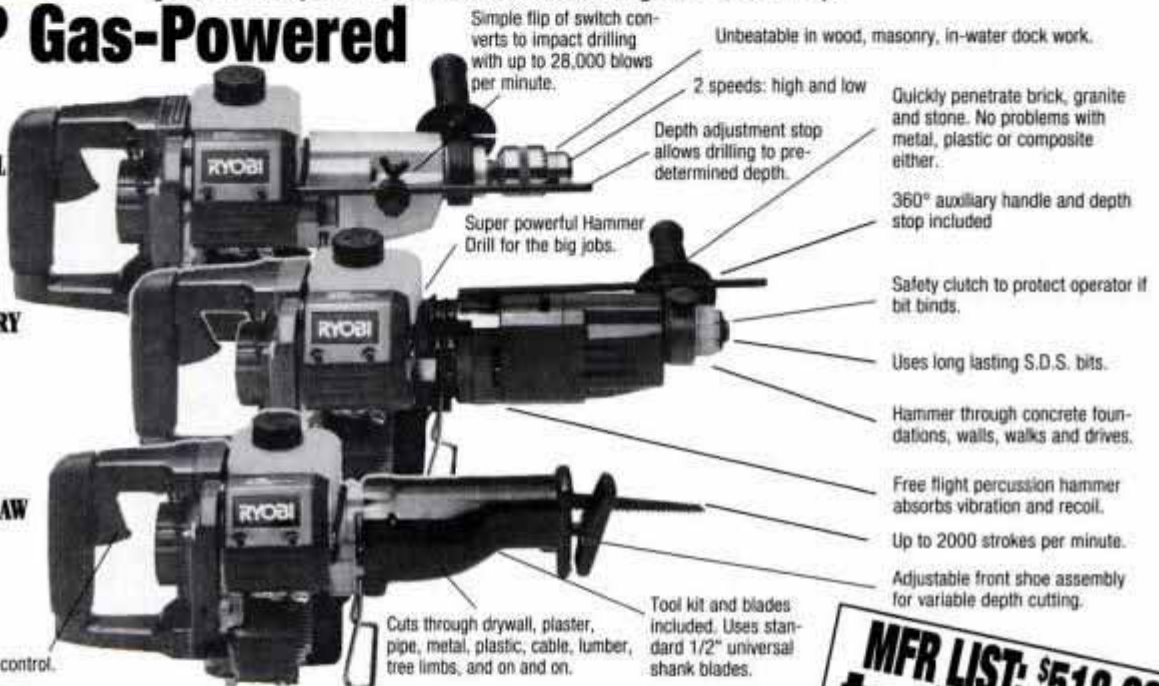


1/2 HP Gas-Powered Tools!

1/2" IMPACT DRILL
 Ryobi List: \$518.00
At C.O.M.B. \$149
 Item # C3617-7682
 S/H \$7 Each

PNEUMATIC ROTARY HAMMER DRILL
 Ryobi List: \$660.00
At C.O.M.B. \$149
 Item # C3616-7682
 S/H \$7 Each

RECIPROCATING SAW
 Ryobi List: \$518.00
At C.O.M.B. \$149
 Item # C3615-7682
 S/H \$7 Each



LOOK AT THESE STANDARD FEATURES!

- Weighs only 12 pounds
- 15.9 cc, 2-cycle engine
- Solid state electronic ignition for fast, easy starts
- Recoil starter
- All position diaphragm carburetor functions at any angle
- Hardened Steel gears for long life
- Variable speed throttle
- Die cast aluminum cylinder head for increased heat dispersion and reduced weight
- Durable ball bearing construction
- "D"-style handle designed to isolate vibrations
- Lightweight large capacity fuel tank won't rust and is gas and heat-resistant
- Convenient built-in tool rests
- Air cleaner with polyurethane foam filter

RYOBI OVER-ENGINEERS, MAKING TOO COSTLY TO PRODUCE

The Japanese have a thing for quality and Ryobi Japan went overboard, even by their own standards. Petro-powered, fully portable, silky smooth and legendarily durable Reciprocating Saws, Hammer Drills and Rotary Hammers so over-built that their costs soared to three times what the American market would bear! The solution? Typically bold. Send the accountants home, ignore the ledgers, and sell the lot without regard to cost.

BRUTE-FORCE POWERFUL IN ANY WEATHER

If you ever use power tools outdoors, or in the weather, or around water, or under the pressure of a deadline, or over an extended period of time, you'll know the value of totally portable no-holds-barred quality, and the feel of it, too. No need for cords or pick-up mounted generators; the power is in your palm! These are brute-force powerful, commercial-grade tools, built to operate all day long on concrete, masonry, cable, pipe, timbers — the tough jobs.

BUY BELOW COST!

If you don't think this is a fantastic deal, check the Grainger's catalog for prices! Even at \$518 to \$660 each, these tools are worth their asking price. But when you can **BUY BELOW COST** at 29 cents on the dollar, only \$447 gets you all three tools! There are over 100 Service Centers nationwide (list in box) and each unit is backed by C.O.M.B.'s 30 day satisfaction guarantee. Not surprisingly, supplies are limited so call now!

MFR LIST: \$518.00
to \$660.00

OUT THEY GO!
4 Monthly Payments of

\$39*
or \$149 Each

Shipping/Handling \$7 Each.
 *Payment Plan includes S/H. MN residents add 6.5% sales tax. TN residents add 8.25% sales tax. Monthly Payment Plan available for Visa, MC, Discover & C.O.M.B. Card purchases only.



AUTHORIZED LIQUIDATORS®
 of Bankruptcy Merchandise and
 Manufacturers' Overproduction

1-800-438-COMB

Segment # 1463116

COMB Corp., Authorized Liquidator

720 Anderson Avenue, St. Cloud, MN 56395

Send _____ Ryobi Gas-Powered Tool(s), Item # _____, at \$ _____ each, plus \$7 S/H (Add 6 1/2% sales tax for MN delivery, add 8.25% sales tax for TN delivery). Sorry, no COD orders. Please state segment number 1463116.

My check or money order is enclosed.

PLEASE CHECK: C.O.M.B. CARD VISA MC DISCOVER

Account No. _____ Exp. _____ / _____ / _____
 Name _____ Apt. # _____
 Address _____
 City _____ State _____ ZIP _____
 Phone (_____) _____
 Sign Here _____



See You Next Spring

While you're planning that masonry project next spring, consider the Odjob to mix materials—its manufacturer says the device can mix a bag of concrete or mortar in 30 seconds. The 5-pound barrel uses helix-shaped interior baffles to ensure thorough mixing. It's made of high-density polyethylene, so it won't rust. Its screw-on lid is sealed with an O-ring and the lid acts as a measuring container for the water you add. It costs about \$35 at hardware stores and home centers. In Canada, write Scepter, 170 Midwest Rd., Scarborough, Ontario, Canada, M1P 3A9. In the United States, call (800) 387-6018.

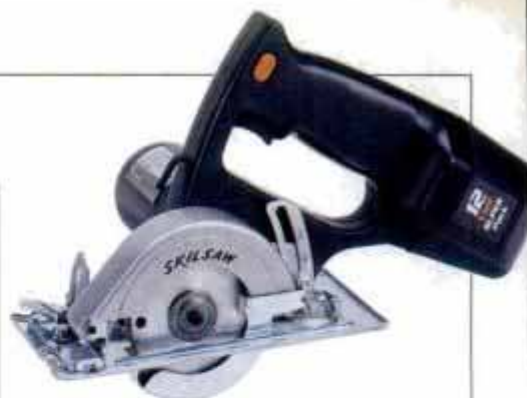
Round 'Em Up

Keep pesty power cords in their place with these rubberlike plastic restraining straps. The multiposition straps can be attached to a cord with a cable tie (included) or they can be left unattached so you can remove them when you want. Known as the Lasso Organizers, they come in a variety of sizes for cords, rope and hose. Wall-mount models are available also—some are big enough to hang a hose, while others are sized for a flashlight.

They cost from \$1.50 to \$3.70



at hardware stores and home centers. Write Super Glue Corp., 184-08 Jamaica Ave., Hollis, NY 11423.



Small But Powerful

Skil's 12-volt 3 $\frac{3}{8}$ -in. cordless trim saw can cut stock up to $\frac{15}{16}$ in. thick, and its blade can tip to 50°. It has an adjustable line-of-cut indicator, a push-button blade lock and a locking lever for depth-of-cut adjustment. It costs about \$170 at hardware stores and home centers. A tile-cutting version of the saw comes with a built-in water bottle and costs about \$190. The battery packs and rechargers are compatible with Skil's Top Gun 12-volt cordless drills. Both saws will be available in January and February of 1993. Contact Skil Corp., 4300 W. Peterson Ave., Chicago, IL 60646.

Pocket-Size Precision

The Ultralevel 10 is a pocket-size electronic level with a liquid-crystal display that tells you which direction to tilt it to bring it into level or plumb. It beeps when level or plumb is reached. The tool is equipped with a low-battery indicator (batteries are included), and it has a battery saver that shuts off the tool if it goes unused for 4 minutes. Its built-in magnet lets you attach it to iron pipe, railings and appliances and other steel surfaces. The 10-in.-long model costs about \$35 and a 6-in.-long model costs about \$20 at hardware stores and home centers. Write Zircon Corp., 1580 Dell Ave., Campbell, CA 95008.



Right On Track

Saw Trax provides a rigid, sliding mount for your circular saw or router to ensure an accurate cut. You mount the power tool on its carriage with the wingnut clamps provided, position the workpiece under the guide rails and against the extruded aluminum stops. Then, push the power tool over the workpiece. Saw Trax uses industrial-quality roller bearings and its chromed-steel guide rails have $\frac{1}{8}$ -in.-thick walls so they don't deflect as you slide the carriage. With 30-in. rails, it costs about \$300, with 44-in. rails, about \$350 (plus shipping) from Tinkerdel Inc., P.O. Box 1170, Kennewick, WA 98544.





In This Corner

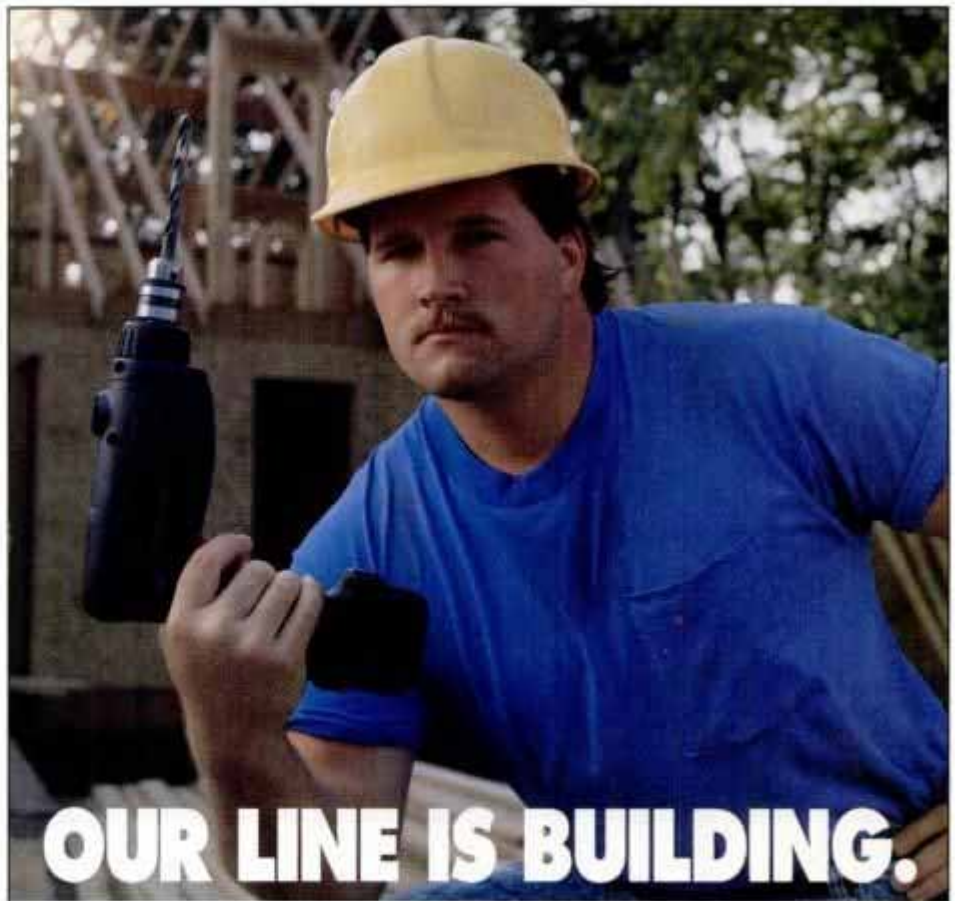
Using the Ryobi Detail Sander you can easily sand into corners and, with some add-on attachments, you can strip and scrape paint or wax and polish most hard-to-reach spots. The triangular head moves at a rate of 7600 strokes per minute. Sanding, stripping and polishing pads, as well as the scraper blade, attach to the head with self-adhesive backs. The sander costs \$60 at hardware stores and home centers. For more information, write Ryobi America Corp., P.O. Box 1207, Anderson, SC 29622.



A Good Tip

Vermont American's 29-piece screwdriver set covers just about any threaded fastener you can remove or install with a screwdriver. It contains magnetized straight, Phillips, hex-head, clutch head, Torx and square drive tips. Also included in the kit is a hex-shank adapter for use in an electric drill and another adapter for using the bits with a ratchet wrench. The kit costs about \$42 at hardware stores and home centers. For more information, contact Vermont American, P.O. Box 340, Lincolnton, NC 28093.

(More New Tools on page 96)



OUR LINE IS BUILDING.



MM 9657

Day after day, Master Mechanic Professional cordless drills are boring, driving and now even pounding away.



MM 9180

That's right, pounding. Our 12 volt cordless hammer drill is built to give - and take - a pounding.



MM 8330A

We've also added contractor grade saws to the Master Mechanic Professional line.

Included is a circular saw with a thin kerf carbide blade and a 20 amp switch, a ten inch compound miter saw, and a ten inch bench table saw.

You will find these and other contractor grade Master Mechanic Professional power tools at thousands of participating True Value Hardware Stores nationwide.



MM 8028C

MASTER MECHANIC
Professional

You CAN DO IT WITH
True Value
HARDWARE

CABLE T.V. CONVERTERS

WHY
PAY A
HIGH
MONTHLY
FEE?



All JERROLD, OAK, HAMLIN, ZENITH, SCIENTIFIC ATLANTA, PIONEER and all specialized cable equipment available for shipment within 24 hours. 60 Day Guarantee. QUANTITY DISCOUNTS AVAILABLE. MC/VISA or C.O.D. telephone orders accepted.

Send self-addressed stamped envelope (60¢ postage) for FREE CATALOG

**MIDWEST
ELECTRONICS INC.**

P.O. Box 5000
Suite 311 (PM)
Carpentersville,
Illinois 60110

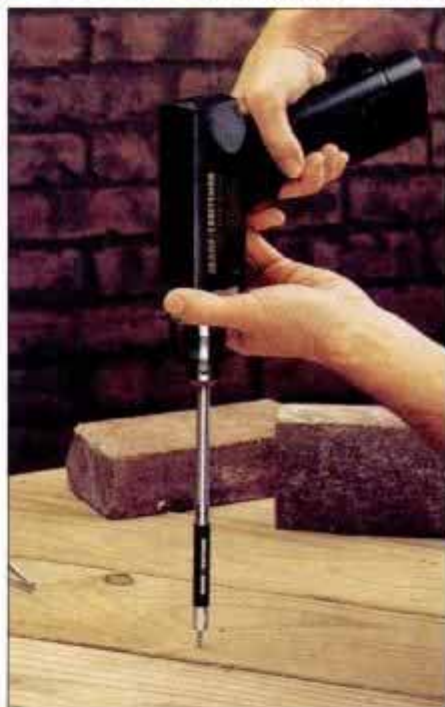
INFORMATION/ORDERS

**1-800
648-3030**

Note: Decoders and Descramblers must not be used without authorization by your local cable operator.

NO ILLINOIS ORDERS ACCEPTED

HOME&SHOP JOURNAL



Two Inexpensive Sears Accessories

This router pad is a simple device to prevent the workpiece from sliding across the workbench. It's made of a molded rubber-like nonabsorbent plastic that provides a surprising amount of friction. It measures 22 in. wide x 32 in. long.

The main component of the Outdoor Project Kit is a sleeve that chucks into your electric drill. It telescopes to 3 $\frac{5}{8}$ in. and it's accompanied by five $\frac{1}{4}$ -in. hex shaft magnetized Phillips bits. Put the bits in the sleeve to drive a screw. The sleeve seats around a screw and holds it upright. Both tools cost about \$10 at Sears stores. Write Sears Roebuck and Co., Dept. 903, B1-221B, 3333 Beverly Rd., Hoffman Estates, IL 60179.

When "razor sharp" isn't good enough
you need the *Diamond Hone™* Sharpener.

Chef'sChoice®
professional
110



Up to twice as sharp
as a razor blade

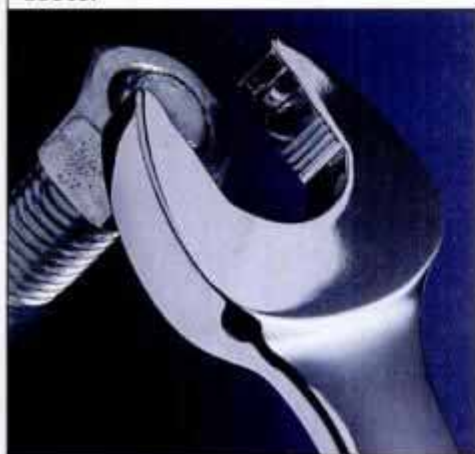
Triple Bevel Tvtzor Edge
stays sharp up to 3 times
longer than professional edges.

For a store near you call Edgecraft Corp., 800-342-3255

from
EdgeCraft
World Leader in Cutting Edge Technology™

Flanking Maneuver

Flank Drive Plus open-end wrenches use eight small serrations along the wrench head to distribute turning force along the face of the nut or bolt head—not just its corners—greatly reducing the likelihood of stripping the fastener's corners, according to Snap-On. Each wrench is formed in a screw press from a high alloy steel that is hard yet ductile. An 11-piece chrome-plated wrench set (3/8 in. to 1 in.) costs about \$333 through Snap-On distributors or direct from the company. Call (800) 866-5748. For more information, write Snap-On Tools, 2801 80th St., P.O. Box 1410, Kenosha, WI 53141.



In The Palm Of Your Hand

Porter-Cable took a fresh look at finish sanding and introduced these two 5-in.-dia. sanders. Both are random orbit types, so they don't leave swirl marks on the sanded surface. The model on the left (\$125) pulls dust through its perforated disc and traps it in a canister. Its discs use hook and loop material so they can be removed and reinstalled. The model on the right (\$109) does not have a dust collector and it uses pressure-sensitive adhesive-backed discs. Both tools are sold at Porter-Cable Power Tool distributors. For more information, contact Porter-Cable Corp., 4825 Highway 45 North, P.O. Box 2468, Jackson, TN 38302. **PM**



As Seen in

PM
Popular
Mechanics

*This product feature mark is available for advertiser use.
Contact your PM sales representative for details.*

Get Relief From Back & Neck Pain

The Back Machine™ Massages and Stretches Your Pain Away—Right in Your Own Home!

A Conservative Therapy, Comprehensively Applied

The Back Machine combines the most effective ways to attain relief from back and neck pain into one easy to use, safe unit designed to help you return to a more normal, pain free life. And it feels good, even if you hurt.

How The Back Machine Works:

- *Massage* – Soft rollers massage muscles, increasing circulation, reducing muscle spasm, tension and stress.
- *Stretching* – Muscles are passively stretched, increasing flexibility and reducing pain.
- *Traction* – Mild traction restores spine length and pliability, relieving disc pressure.
- *Mobilization* – Restoration of movement occurs and promotes alignment of the spine.

Five Years of Clinical Use

Tested for over five years by doctors, physical therapists, and chiropractors, *The Back Machine* has been proven safe, effective, and comfortable.

60-Day Home Trial

We're so confident you'll experience relief from back and neck pain that we offer *The Back Machine* with an unconditional 60-day money back guarantee.

Call or Write Today For
**FREE BROCHURE
AND VIDEO**

1-800-433-5599



YES! I want to relieve my back pain.

Please send me a FREE brochure and Video.

VHS BETA

Name _____

Address _____

City _____

State _____ Zip _____

Evening Phone () _____

Back Technologies

2525 West Casino Road

Everett, WA. 98204

1-800-433-5599

© 1992 Back Technologies, Inc. Dept. 759

WORKHORSE ATVs

BY JIM YOUNGS



● You don't waste time when there's work to be done. In quick succession, I grab a chain saw and hitch a stake-bed trailer to a new Yamaha Kodiak 4x4 ATV. Then I head for a stand of hardwood trees to collect firewood. When I return, I swap the log-filled trailer for a flatbed loaded with hay bales and head out to the pasture to feed the horses. By the time I return, my partners have another Kodiak loaded with a full complement of camping and fishing gear. I quickly unhitch the empty flatbed and squeeze the throttle for a fast run down a backcountry trail to one of the best fishing holes around. All work and no play isn't this ATV rider's idea of a good time.

Versatility is what 4x4 ATVs are all about. They're not only go-anywhere transport mules, but a growing number of accessories, such as trailers, mowers, snowplows and weed sprayers, have transformed them into highly specialized workmates. And when the work is done, the chameleon-like beasts strip down for recreational action and provide a good measure of sporting fun.

Both Kawasaki and Yamaha recently introduced rugged 4x4 ATVs in the big 400-cc range, which is quickly becoming the heart of the utility ATV market. PM attended both roll-outs and here's what we found.

The brawny Kodiak

Yamaha's new Kodiak 4x4 ATV is equipped with a 387-cc air-cooled 4-stroke engine that has a thermostatically controlled fan to keep things cool when the work gets hot. With a dual-range 5-speed transmission, it has a

total of 10 forward speeds, plus reverse. Yamaha uses a torque-controlled differential up front to put the power where it's needed and still allow easy steering. Stopping is provided by front and rear drum brakes that are sealed against mud and water.

Riders benefit from the Kodiak's large fender flares that tend to keep the saddle clean and dry in muddy conditions. Its front and rear racks are stout enough to carry large, heavy loads, something I have tested on several occasions. The Kodiak tips the scale at 604 pounds, and has a towing rating of 900 pounds.

Pulling the fully loaded hay wagon and log trailer seemed effortless for the sure-footed Kodiak. So much so that I never had to shift into the low-range set of gears, even though the trail led through a small stream with steep banks and a soft, boggy field.

The swampy Bayou

The Kawasaki Bayou 400 proves that rugged utility doesn't have to come at the expense of leading-edge technology. The new Bayou is powered by a 391-cc 4-stroke 4-valve engine that drives a full-time 4-wheel-drive system through a 5-speed gearbox. Like the Kodiak, the Bayou has a thermostatically controlled fan, but it uses a heavy-duty liquid cooling system and a double-row radiator to keep temperatures in line.

The Bayou employs a shaft drive on both the front and rear ends. It also has a limited-slip front differential to compensate for unequal, side-to-side traction and to allow for easier steer-



The split personality of the new Yamaha Kodiak: sporty (top) and utility (above).

ing. An automatic clutch makes shifting easy and the extra-low first-gear ratio gives the Bayou stump-pulling performance when needed. The big Bayou carries impressive load capacities, with the front rack capable of handling 88 pounds and the rear rack 154 pounds. With a weight of 595 pounds, the Kodiak is rated to tow up to 1100 pounds.

A friend of mine is currently planning to hunt elk in a spot high up in the Colorado Rockies that's closed to all off-highway vehicles except ATVs. ATV-only trails are relatively narrow, very primitive and require little initial construction or follow-up maintenance. The choice for hunters on trails like these is either to take ATVs or horses. Because of his age and for the convenience of being able to cover long distances, my friend has decided to outfit himself with an ATV—a choice that's becoming increasingly popular with hunters today.

Kawasaki and Yamaha offer a wide variety of hunting accessories for ATVs. These include hard-case gun scabbards that mount to the rear rack, complete camouflage body covers, spotlights and side extensions to increase rack carrying space.

Swiss Army knife of 4wds

In addition to the accessories already mentioned, one glance at the Yamaha and Kawasaki catalogs makes it readily apparent that ATVs are the Swiss Army knives of 4x4 vehicles. Throw in the goodies found in aftermarket catalogs and it's a wonder we ever got anything done without ATVs. By adding a tilt-bed trailer, a snowplow, a weed sprayer and maybe a pull-behind sweeper, I could easily keep my yard well maintained throughout the seasons.

Ranchers and farmers have more reason to appreciate the work-saving potential of a fully accessorized ATV. In recent years, they've discovered the benefits of using ATVs for a wide variety of chores, including hauling irrigation pipe, herding cattle and repairing fences. Specialized accessories for ranchers and farmers include heavy-duty sprayers, barbed-wire dollies and toolboxes. In addition, trailers are readily available to ac-

terrain, there are products available to serve your needs. If your off-road riding is particularly rugged, there are electric winches, skid plates, grab bars, grip protectors, headlight guards, radiator guards, floorboard extensions and brush guards. For less-rugged riders, there are a host of safety, comfort and convenience items available.

Both Yamaha and Kawasaki also have an abundance of personalized items to tailor ATVs to any individual's taste. These items include grips, handlebars, whip antennas and add-on graphics. In addition, essential riding wear, such as helmets, gloves, boots and eye protection are offered. For the man who must have everything, the catalogs also offer riding apparel, après-riding apparel, T-shirts and lifestyle gear. Naturally, these items aren't for everyone, but they do make the point that many ATV enthusiasts divide their time equally between work and fun.

During either activity, riders should always be aware of the potential damage that wide, deep-lug ATV tires can inflict on the environment, especially in soft, muddy conditions. If you take your ATV onto public lands, always follow local regulations and signs posted on the trail. Also, stay on designated paths and follow the principles set forth by *Tread Lightly!*, the environmental organization that promotes low-impact off-

roading. To find out more about environmentally conscious and ethical ATV riding, contact *Tread Lightly!*, 298 24th St., Ogden, UT 84401, (801) 627-0077.

When used with specialized accessories, chameleon-like 4x4 ATVs are the hardest working brutes around and among the most fun, too. **FM**

**New GM tests prove!
Imitation Parts
still aren't up to**

Corrosion Scratch Test

Imitation Fender *Genuine GM Fender*

5-time NASCAR Driving Champion Dale Earnhardt has bent up more than a few fenders on his GM Goodwrench® Lumina®. So he's an expert on replacement sheet metal:

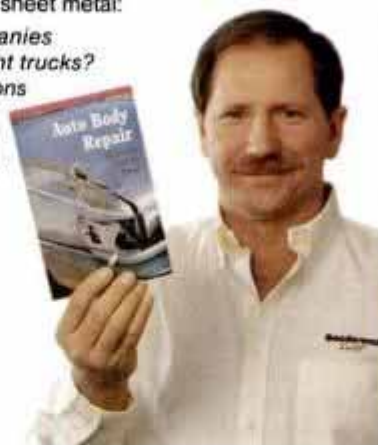
"Did you know that some insurance companies specify imitation parts for GM cars and light trucks? It's true, even though many of those imitations don't come close to GM standards for fit, finish and corrosion protection. So before you get your fender fixed, get the straight facts in this free brochure. And insist on genuine GM replacement sheet metal with the lifetime limited warranty."

For your free *Consumer's Guide to Auto Body Repair* and details about the lifetime limited warranty, see your GM dealer. Or call 1-800-GM USE US.

General Motors Parts



© 1992 GM Corp. All Rights Reserved



commodate such common equipment as log splitters, generators and pumps.

Despite its utilitarian design, you can't ignore the sporty side of ATVs. Perhaps the largest segment of the ATV accessory business is in performance equipment. If you want to make your ATV go faster, handle differently or run better over a specific

A SOLAR SURPRISE

BY ABE DANE, Science/Technology Editor

● Strolling across the verdant campus of Princeton University, chemistry grad student Lori Vermeulen stumbled onto something that may change the world. A tiny sample of white powder she was carrying had turned blue in the summer sun.

It was puzzling. "Blue isn't your normal, run-of-the-mill color for these compounds. When they decompose, they turn yellow, brown, red, but they don't turn blue," says assistant chemistry professor Mark Thompson, Vermeulen's faculty adviser at Princeton.

What Vermeulen had found was more than some arcane chemical novelty. She and Thompson soon determined that the only possible cause of the color change was electrons jumping from one molecule to another, creating a negative charge. Bottled up inside the sample was solar energy, derived by a process hitherto unknown.

Thus, in one serendipitous stroke, a whole new avenue of inquiry had sprung up in the search for an affordable way to harness the limitless, pollution-free power of the Sun. Vermeulen's blue powder offered an alternative to the expensive photovoltaic cells and elaborate solar dynamic power systems that have monopolized research efforts for decades while gradually plodding toward practicality.

Out of the blue

Almost as startling as the discovery's potential is the humbleness of its origins. Vermeulen's compound is a mix-

ture of everyday lab chemicals originally concocted as part of routine electron transfer chemistry experiments. "We thought we would have to make something a little more complicated for it to work," says Vermeulen.

An outgrowth of research into layered zirconium phosphonates that Thompson had been pursuing for half a dozen years, the substance consists

count for many of the compound's unique characteristics.

What happens when sunlight strikes it is only partly clear. Thompson and Vermeulen suspect that an electron orbiting one of the molecules, probably a chloride ion, is excited to the point where it careens out of its orbital and lands in the viologen layer. Then a zirconium phosphonate gives up an electron to replace the

one lost by the chloride. That's the theory, anyway. All that Thompson and Vermeulen can say for certain is that electrons from somewhere are hooking up with the viologens.

In itself, this is nothing unusual. It's a typical example of electron transfer, in which a donor molecule (zirconium phosphonate) gives up an electron to an acceptor molecule (viologen), creating an electric potential. The transfer accounts for the color change, which is characteristic of a whole class of materials that are subject to what are called photochromic effects.

But Vermeulen's compound differs in that taking it out of the sunlight doesn't fully reverse the color

change. Instead of fading back to its original color, as photochromic compounds typically do, it fades only to a lighter blue.

That remaining color reflects the fact that electrons have not returned to their original places. Somehow the structure of the compound blocks the normal process of back electron transfer, and some electrons remain trapped in the viologen layer. Thus some of the Sun's energy remains



Professor Mark Thompson and Lori Vermeulen hold samples of their compound, one of which has turned blue, indicating stored solar energy.

of zirconium phosphonate and viologen-halide. The ingredients are dissolved in hydrofluoric acid, then heated for a week to form a powder. This simple process causes the zirconium phosphonate molecules to crystallize into parallel slabs, with the viologens sandwiched in layers between. Chloride ions from the viologen-halide dot the surfaces of the zirconium phosphonate layers. This plywood-like molecular structure appears to ac-

trapped in the compound.

The energy remains there for months, or even years. The challenge that now dominates Vermeulen's and Thompson's attention is getting the energy out in a usable form. What makes it difficult is that the same tight molecular structure that traps electrons in the viologen layer also keeps out chemicals that might react with the viologen and harvest its energy. Currently, the researchers are looking for ways to open up that structure. "What we'd like to do is have a solid that's like Swiss cheese," explains Thompson.

This may or may not be easy to accomplish. "It's going to involve some luck," Thompson says. "It could happen tomorrow. It could happen in 10 years."

If they succeed, Thompson believes it would be possible to develop a sort of solar-powered, constant flow reactor. Water, oxygen or some other common substance would be pumped through the sun-sensitive compound. There it would be catalyzed into hydrogen or hydrogen peroxide that could be burned as fuel. This would be far cheaper than electrolyzing water into hydrogen with power from photovoltaic cells, a process long promoted by solar energy advocates.

Another focus of Thompson's and Vermeulen's research is increasing the zirconium viologen compound's efficiency. In its current form, it harnesses only the light way down at the blue end of the spectrum. Moving its sensitivity into the middle of the visible band would give it a lot more power to work with. The scientists are confident that they can do this with minor variations, and in fact believe they have already made some improvements on the original compound.

As it stands now, the compound converts about 3% of the sunlight that strikes it into chemical energy. Current photovoltaic cells are several times more efficient, but are so much more expensive that, unless space is at a premium, zirconium viologen would still be a better deal. "This is tremendously cheaper than those types of technologies," says Thompson.

For Vermeulen in particular, it's all pretty heady stuff. She's in her second year of graduate school and already her work's been published in *Nature*, one of the world's most prestigious science journals. She hasn't lost touch with what's important about it, though, and sums up the satisfaction of her work in simple, level-headed terms. "I always wanted to do something with the potential to be useful," she says. **PM**

FASTEN YOUR SEAT BELTS!

Four Action Packed Videos From Popular Mechanics

America's New War Machines (#8225)
An inside look at today's smart weapons systems

America's Fighter Planes (#8399)
See top fighter jets in action. Plus...
Top aces relive their most dangerous moments.

All-Time Greatest Stock-Car Finishes
(#8144)
Featuring Richard Petty, David Pearson,
Darrel Waltrip, Ron Bouchard, and Many More!

Great Hollywood Chase Scenes (#8143)
Heart-stopping scenes from Die Hard, Robocop II,
The French Connection, and Many More!



Call Now! 800-241-9111 ext.250
To order by credit card

Only
\$10⁹⁵
each

*Plus \$3 each for shipping and handling

Dept. PM122

AUTOMOBILES

CORVETTE'S GALLERY OF GREATNESS

BY CLIFF GROMER



TM ILLUSTRATION BY MICHAEL KOESTER

● Chalk up another milestone for the Corvette (as if America's world-class sports car didn't already have enough to its credit). Now, added to the Vette's world speed records and racing victories is museum status—the National Corvette Museum, to be specific, an 80,000 sq. ft. facility built on 33 acres, and devoted to the preservation of Corvettes past, present and future.

There may be other single-marque museums around, and some European automakers, such as Daimler-Benz, have great displays of their products' evolutions. But what makes the Corvette Museum especially significant is its grass-roots base. Conceived in 1988 by the National Corvette Restorers Society (NCRS), the \$12-million facility, scheduled for its grand opening in Bowling Green, Kentucky, in August 1993, is being funded through private sources—Corvette owners, enthusiasts and interested companies.

Aside from showcasing Corvettes in all their power and glory, the National Corvette Museum will offer a number of other amenities.

Studious types will want to browse through the Bill Mitchell (designer of the Sting Ray) Library. If you want to find out something—anything—about Corvettes, this will be the place. Picture a technical research library packed with the largest collection of technical data, books, trade journals, professional papers and

visual aids relating to the Corvette found anywhere—all for public use.

The museum grounds will be generous enough to field any number of activities including car shows and swap meets. And an outdoor, 5000-capacity amphitheater for sports shows and concerts is also in the works.

By far, the museum's biggest draw will be the Corvettes themselves. The cornerstone of the display will be the one-millionth Corvette to be produced—a white convertible with red interior, duplicating the colors of the very first Corvette, which was hand-built in Flint, Michigan, on June 30, 1953. Chevrolet will take No. 1 million on a 2-year promotional tour before donating it to the museum. In addition, 1953 model, No. 262 of the 300 built, has been donated to the museum by a private collector.

Documenting the Corvette heritage will be Corvette models past and present, and also the spirit of Vettes to come. Futuristic concept cars will add to the Corvette mystique. Special editions will include prototypes, custom models and one-of-a-kind Corvettes from various eras.

The more than 40 Corvettes on display



TM PHOTO BY CLIFF GROMER

Corvette Museum Annex currently displays several unique Vettes.

will not be behind ropes and stanchions in a sterile environment. Rather, the cars will be arranged by period—'50s, '60s, '70s—and set in a nostalgic scene like a drive-in or diner. Just ratchet your mind back to the good old days when the local hot feet were the terror of the boulevard in these classic Corvettes. The car displays will be rotated on a regular basis, so there always will be something fresh for a return visit.

Racing has always been a big part of Corvette lore and legend, and these special high-winding small-block and maxicube big-block Corvettes that shaped motorsports history find their own niche.

A miniature design center



Zora-Arkus Duntov breaks ground in a Corvette bulldozer.

will probe Corvette styling with a display of miniatures, clay models and design sketches. You can even design your own Corvette in a special area equipped with a computerized interactive modeling, layout and drafting CAD/CAM system like those used by today's auto designers.

Still another display area gets under the Corvette skin to focus on the essence of Corvette appeal—performance. Here you'll find out what makes a Corvette tick in a dynamic display of moving components and cutaways.

If there's one name familiar to all Corvette enthusiasts, it's Zora-Arkus Duntov, father of the Corvette. Duntov helped design and engineer the powertrains and suspensions that transformed the Vette from a sporty boulevard cruiser into a true thoroughbred race car and respected street supercar. Duntov rates his own special place in the museum—the Zora room. In it, you'll find photographs, historical information and samples taken from his drawings and notes, as well as concepts, posters and memorable quotes.

A big part of the Corvette hobby today is restoration. Concourse judging fields at Corvette meets across the country get larger every year. The museum will play a part in this scene with a special restoration area. Here you'll find special display cars and learn the finer points of Corvette restoration through hands-on seminars. An answer line will also be available to help with any restoration problems.

Ground breaking for the museum was completed on June 5. None other than Zora-Arkus Duntov did the honors, driving a bulldozer disguised as a Corvette. The legendary Corvette designer carved a swathe on the prime piece of real estate located at Exit 28 off I-65, just south of the Corvette assembly plant in Bowling Green, Kentucky. The land was a gift from two Bowling Green, and one Louisville, Kentucky, citizens.

Until the museum is completed, operations are being handled by the National Corvette Museum Annex located at 2800 Scottsville Road in Bowling Green. This temporary home has limited displays for visitors. Since its opening in a Bowling Green shopping center in 1990, the annex has logged more than 20,000 visitors from every U.S. state and 17 foreign countries.

Anyone can be part of this celebration of the Corvette. Contributions to the museum are tax deductible. More information is available by writing the National Corvette Museum, P.O. Box 1953, Bowling Green, KY 42102, or calling (502) 781-7973. **PM**

F A M I L Y

YOU NEVER LOSE SIGHT
OF WHO YOU'RE
REALLY WORKING FOR.

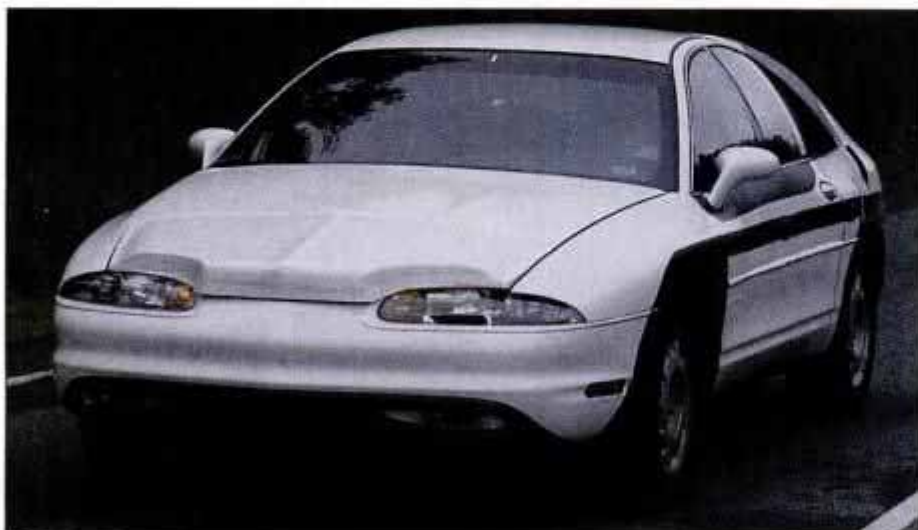
© 1992 MEM Company Inc., Northvale, N.J. 07647

English Leather
A Man's Cologne

English Leather
FOR ALL THE RIGHT REASONS.

DETROIT SPY REPORT

BY JIM DUNNE, Detroit Editor



Olds Aurora

• That's the new name of Oldsmobile's next luxury sedan, the 1994 replacement for the Toronado/Trofeo. Yes, Aurora is the same name Cadillac used for one of its concept cars two years ago. But the new Olds is a completely different design. Aurora will be built as a 4-door sedan only and will replace the Ninety Eight sedan in Olds' lineup. Like other GM divisions, Olds is cutting down on the number of models it offers. So add the Aurora, drop the Ninety Eight. As reported earlier, the Aurora will have the same front-drive chassis as the Cadillacs. Aurora will even use a detuned version of Cadillac's 4.6-liter dohc 32-valve Northstar V8 in combination with an electronically controlled 4-speed automatic.

Dodge Pickup

Dodge will offer a major departure in pickup truck styling when this T-300 full-size Dodge Ram is officially unveiled as a 1994 model next year. The aggressive front-end styling has been likened to the big Ford 9000-series Aeromap highway tractor. Note the long hoodline. It's specially designed to house a cast-iron V10 engine based on the 480-cu.-in. aluminum-alloy engine used in the Viper.

This new full-size pickup will not be teamed with a Ramcharger sport/utility truck. Ramcharger will be dropped from the Dodge line for at least one year. Dodge may build an all-new Ramcharger with the T-300's

front-end styling, starting in late 1994 as a 1995 model. Also, production of a crew cab version of the T-300 will be delayed until 1995, as Dodge concentrates on startup production of the



1994 Dodge T-300 sports an engine bay roomy enough for cast-iron version of Viper V10.

standard pickup. Plans for a large Suburban-type vehicle on the T-300 chassis are uncertain.

Riviera-De Ville '94

Buick Riviera and Cadillac De Ville will be newly designed for 1994 too, and both will share many chassis parts with the Aurora as well. While De Ville and Aurora will have V8 en-

gines, the Riviera will stick with its 3.8-liter V6. But the Riv will get a powerful supercharged version of the V6, placing the car on a performance par with its sister sedans from Olds and Cadillac.

Chevy S-10 Pickup '94

Major changes are set for Chevrolet's (and GMC Truck's) compact pickup trucks next year. In addition to all-new styling that features more rounded sheetmetal and a sloping hood, the cab and cargo box will be revised. Shoulder room—currently a tight squeeze for three passengers—will be wider by almost 3½ in. An inch or so will be added to hiproom and headroom, while legroom will remain unchanged. Cargo boxes will be an inch and a half deeper with 17½-in. sides.

The base engine for the S-10 and S-15 will be a 2.2-liter Four, while the 4.3-liter V6 will remain the only option.

With the introduction of the S-10, all three domestic truck builders will have newly designed pickups on sale in time to compete against Toyota's new midsize T100 truck, reducing the T100's edge in size.

Chevy S-10 Blazer '95

GM plans to wait a year before introducing its new versions of the small

This heavily disguised prototype may or may not be recognizable to you as the next Ford Mustang. Based on the current Fox platform, it may sport some version of the 4.6-liter V8 from the Crown Vic or Lincoln Mark VIII.





GM's S-10 and S-15 pickups get rounder, wider sheetmetal to stay in the running in the recently ignited pickup war.

Chevy Blazer and GMC Jimmy. The vehicles will use the same front-end styling as the 1994 compact pickups, but the body shape will be all-new for 1995. Look for a flareside body to be added to the S-10/S-15 pickups at the same time. Delays in the introduction of the new GM sport/utility trucks are caused in part by the short supply of driver's-side and passenger's-side airbags.

Chrysler's Sport Coupe Connection

Don't look for a Thunderbird-like 2-door body style in the Chrysler LH line (Vision, Intrepid, Concorde). Chrysler insiders say any future

sporty coupes will be supplied through its Diamond Star hookup with Mitsubishi, the same place it gets Eagle Talon and Plymouth Laser. LH is strictly a 4-door model line now and you'll see at least two more sedans coming out in that platform. The top-of-the-line New Yorker will be on sale as a 1994 model, and the luxury Imperial will follow that car by at least a year.

Pickup Battle

Ford is planning to meet Dodge's new V10 pickup truck engine with a V10 of its own. At least, that is one proposal at Ford truck headquarters. Like GM and Chrysler, Ford is being aggressive in protecting its place in the pickup truck market. It does not want to be left behind if the V10 in the 1994 model T-300 Dodge becomes an engine of choice for pickup truck buyers. So, while Ford has not made the final decision about a V10, its planning for future pickups includes that option. V10s deliver more power than V8s, and can be built on the same machin-

ing lines—at the same cost as the V8s.

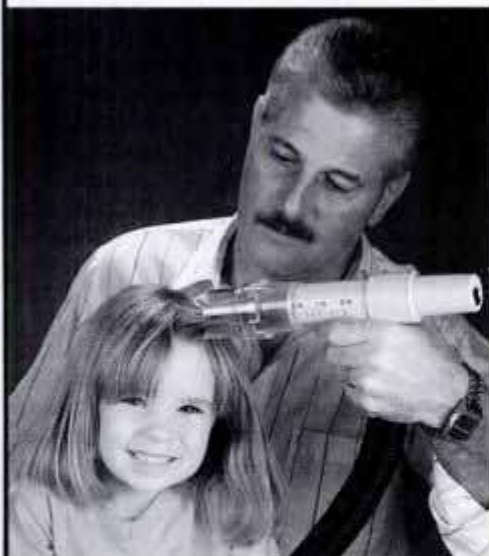
Thinner Pipes

How's this for getting down to small details? Exhaust pipes between the engine and the catalytic converter will be made of thinner steel—as an aid to cleaner emissions. Thinner pipes heat up faster than thicker metal pipes. The hotter pipes carry exhaust gases to the catalytic converter at higher temperatures. And, since converters work most efficiently with hot exhaust gases, emissions levels quickly get down to legal standards. The thinner pipes work best during cold engine startups, when exhaust gases are relatively cool. As a precaution, exhaust pipes will be double-walled, with the outer pipe acting as a shield against outside corrosion.

1994 Mustang

Ford will bring back some of the styling cues of the original Mustang when it introduces this completely restyled model next fall. The 1994 version has the same side sculpturing and fake air intake as the 1964 original. And the roofline is also an update of earlier Mustang models. Ford will build both the coupe and the convertible again next year. **PM**

SAVE \$\$\$, ENJOY FAMILY FUN WITH VACUUM HAIRCUTTER



Great for all styles. Layers, tapers, feathers, collects clippings. Use with ANY household vacuum. Includes all you need for haircuts. Blades driven by powerful electric motor. Plugs in outlet via long cord. Electric cord passes through hose for easy handling. Blades stay sharp for years but are easy to change and inexpensive.

As seen on TV... now improved:

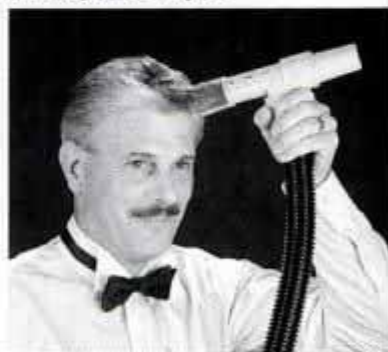
- Precision-dial gives ANY LENGTH YOU DESIRE, not 1/2 inch steps
- Precision-dial replaces loose parts
- Shortest cut: 1/4 inch; Longest cut: 25 inches (waist long)
- Angled adapter gives perfect layered and tapered styles
- Great for curly...even afro-hair
- Excellent for pets

As seen on TV... now for less:

~~\$149.99~~ \$85.00

Full money back guarantee

Use Robocut for 30 days. If not fully satisfied, you should return it for 100% refund.



ROBOCUT

The original since 1985.
Thousands used from Germany to Japan.
MADE IN U.S.A.

CALL NOW 1-800-825-0139

F A X 1 - 3 0 3 - 2 2 6 - 4 5 5 8

VISA / MC
DISCOVER
COD

OR MAIL TODAY \$85 plus \$9 s&h to: Robocut Co., 3608 Jaguar, Fort Collins, Co 80525, U.S.A.

If you feel the need to spend more, you can always stash a few grand in the glove compartment.

CHEVROLET CAPRICE CLASSIC

With its newly restyled silhouette, limousine-like ride and a wealth of standard features, Caprice doesn't look like one of the most affordable full-size cars in America. Life is full of surprises, isn't it?

Rarely has fiscal restraint been this luxurious.

Feel the support of the generously padded seats.



Adjust the standard tilt steering wheel and air conditioning to your liking.

Look into the vanity mirror. And tell yourself that you bought the new Chevrolet Caprice Classic purely for economic reasons.

Caprice's standard V8: Proof that power can be used responsibly.

You're an adult. You don't need horsepower to impress



your friends. But when accelerating smoothly up a steep incline with a full trunk, or towing a trailer along a winding coastal highway, Caprice's 5.0 Liter V8 will make a powerful impression on you.

An investment as safe as it is attractive.

Caprice's flowing lines hide a heart of steel. A safety cage



incorporates "crush zones" engineered to help absorb impact in a collision. Rigid side-guard door beams add an extra measure of protection in case of side impact. And every Caprice offers the security of a full-perimeter steel frame, driver's-side air bag* and standard anti-lock brakes (ABS). Without a doubt, you can spend more on a new



luxury automobile. Or you can buy Caprice Classic, and take comfort in the knowledge that you have spent your money wisely. But then, what else would you expect from the Heartbeat of America?



**THE HEARTBEAT
OF AMERICA™**



*Always wear safety belts, even with air bags. Chevrolet, the Chevrolet Emblem and Caprice are registered trademarks of the GM Corp. ©1992 GM Corp. All Rights Reserved. Buckle up, America!



AUTOMOBILES

THE ALTERNATE FUEL REPORT: ETHANOL-FUELED CHEVROLET

BY JIM DUNNE, Detroit Editor



● Mix it, but don't drink it. Ethanol fuel mixed with gasoline powers this Chevrolet Lumina sedan being tested by GM Engineering at the Technical Center in Warren, Michigan.

You can drive this car with a mixture of 85% ethanol, 15% gasoline—or with a mixture containing greater portions of gasoline, up to 100% pure gasoline.

On the road, with mostly ethanol in the tank, the car accelerates like it would with a peppier version of Chevrolet's 3.1-liter V6 gasoline engine. It's slightly quicker off the line, and has more muscle overall than the plain-Jane Chevy.

Its performance secret is ethanol's 115 octane rating combined with a larger, cooler charge of fuel and air in the combustion chamber for each firing of the spark plugs. The actual horsepower advantage over pure gasoline in the engine is 3% to 4%. Torque ratings are about 4% greater, too.

Sniff the fuel tank and you can detect the slightly sweet smell of alcohol. Put your nose to the tailpipe when the engine is first started, before the catalytic converter heats up, and you get a sweet odor. Later, as the engine runs warmer, there is virtually no odor being emitted.

Ethanol has two major advantages over gasoline. In addition to its higher

octane, it burns cleaner, and that means less air pollution—or lower costs for cleanup devices like catalytic converters. And, it is potentially available in a never-ending supply.

Ethanol is refined from biomass—grain, like corn for example. Farmers can grow new fuel each year. But GM experts say there is not enough grain produced in the United States to meet the demand of a full fleet of ethanol vehicles. What's needed is a breakthrough that allows etha-



3.1-liter V6 has been graced with virtually no internal changes to support dual fuel usage.

anol to be refined from wood products. When that happens, ethanol could take the place of all imported fuels



Fuel sender senses proportion of ethanol, high-capacity injectors, alcohol-tolerant plastic and metal parts.

that go into your car's gas tank.

Comparatively, ethanol has only two-thirds of the energy of gasoline. So you travel only two-thirds as far per gallon. And, at the present time, ethanol costs two to three times more than the price of gasoline.

There are some other problems besides the cost. In cold weather and with a cold engine, ethanol is balky. It has low volatility, so it doesn't vaporize easily. Cold engines will not fire up quickly. Crank the engine too long in cold weather, and the liquid ethanol fouls the spark plugs, causing engine flooding.

GM made a number of changes in the Lumina fuel system to adjust to mixed fuel. Like most alcohols, ethanol chemically attacks the materials normally used in gasoline systems. Lumina fuel tanks are stainless steel, and lines are made of tougher materials. Many plastic and rubber parts, like O-rings, were substituted with alcohol-tolerant alternatives.

Fuel-injector timing must allow for longer open periods to deliver more fuel on each firing. And, the fuel pumps must have increased capacity to run at higher output levels for longer periods of demand.

A unique part of the system is a sensor that measures the amount of ethanol in the fuel mixture. Its signal directs the injectors to set for longer or shorter durations. In addition, the percentage of alcohol in the fuel mixture is displayed on the instrument panel to keep the driver informed—remember that alcohol gives less mileage and range than gasoline.

Total cost to the customer of a fully equipped ethanol upgrade is about \$2000. That's one reason GM has a less-than-ambitious sales goal for the ethanol Luminas. It expects to sell about 50 this year to fleets in Illinois and Wisconsin, and some more if ordered by the federal government.

Don't mistake the ethanol in this car with methanol, another alternative fuel that GM and other auto companies are developing for cars. Methanol is a product made from coal or natural gas—nonrenewable resources. However, its practical use in passenger cars is more advanced. Several thousand methanol/gasoline-powered cars are in service now—mostly in California government fleets.

To learn what life is like with a methanol-powered car, we're conducting a 6-month evaluation of a flex-fuel Lumina in California. Like the ethanol Lumina, this car is set up to run on methanol/gasoline mixtures of up to 85% methanol. Look for our report in a future issue. **PM**

SOMEDAY ALL HANDGUNS WILL BE THIS GOOD.



While other companies were improving upon the technology of the past, GLOCK was busy perfecting the technology needed for the 21st Century.

Polymer technology.

You can see it in the complete line of GLOCK semiautomatic pistols. Hailed by police and sport shooters alike, these remarkable handguns fire even the most advanced ammunition with unflinching accuracy.

Find out for yourself what makes the GLOCK pistols so good. And why they have been setting new standards for simplicity, reliability, cost effectiveness and safety.

Contact your nearest dealer for a free GLOCK brochure. Or write or call GLOCK, INC. today.

ATTENTION:

All responsible firearms owners practice basic firearm safety.

Thoroughly read and understand the users manual that is supplied with your firearm. Never use any firearm unless you completely understand its operation and safety features.



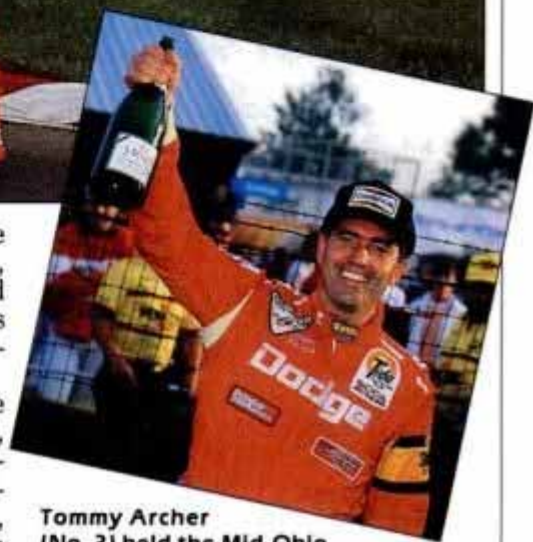
GLOCK,® INC.

P.O. Box 369 • Smyrna, Georgia 30081 • (404) 432-1202

Fax: (404) 433-8719 • Telex: 543353 Glock Atl UD

HONOR BOUND

BY TONY SWAN, Automotive Editor



Tommy Archer (No. 3) held the Mid-Ohio pack at bay for a second-place finish and a bottle of victory circle champagne.

● With its final round—the Kenwood/POPULAR MECHANICS Sears Point Trans-Am Classic—yet to be run, two things are clear about the '92 season.

First, neither Tommy nor Bobby Archer will win the SCCA Tide Trans-Am Tour driver's championship. That honor, to be settled at Sears Point, was down to Jack Baldwin and defending series champ Scott Sharp.

Second, both Tommy and Bobby are going to go home with a number of honors and achievements for their first season in a major-league racing series. Though their Shellzone/POPULAR MECHANICS Dodge Daytonas haven't carried them to the kind of finishes they'd like—1-2 every time out—they've posted a record most series newcomers would envy.

Mid-Ohio revival

The season's penultimate round, at the Mid-Ohio Sports Car Course, set the stage for the Sears Point finale. After a disappointing midseason, the

Archers got back into the thick of the fight with an excellent 2-6 finish, keeping Dodge on the heels of Ford for second in the manufacturer's championship. It also elevated Tommy to third in the driver's standings.

Starting from the second row of the grid, which he shared with Baldwin, Tommy quickly found himself surrounded by Camaros. Besides Baldwin, who charged into an early lead, there was Sharp, Trans-Am veteran Greg Pickett and Paul Gentilozzi, winner of the Portland round.

Running a conservative race, Baldwin grabbed the lead early, to assure himself of the point that goes with leading a lap, then settled into a steady pace, netting him fifth place—one spot behind Sharp but eight points ahead in the standings.

Tommy settled into a race-long dice with Pickett, with Gentilozzi glued on his rear bumper. And that's the way it wound up. The Joey Arrington 310-cu.-in. Dodge V8s ran strong from wire to wire, producing enough muscle for Tommy to hold off the pack—but not quite enough to close with Pickett. When the checkered flag fell, the margin between first and second was a scant 2.457 seconds.

While this was going on, Bobby found himself embroiled with Sharp and Baldwin, chasing them home for sixth place.

"I pedaled that thing as hard as I could," said Tommy, "but I just couldn't quite catch Greg."

Besides his first victory of the 1992 season, Pickett became the first Trans-Am driver to win races—19 in all—in three different decades.

Podium

Although neither of the Archers care much for trophies commemorating anything other than victory, Tommy was clearly pleased to join the champagne festival on the Mid-Ohio victory stand. It was his first podium finish since his second-place run at Portland, way back in June.

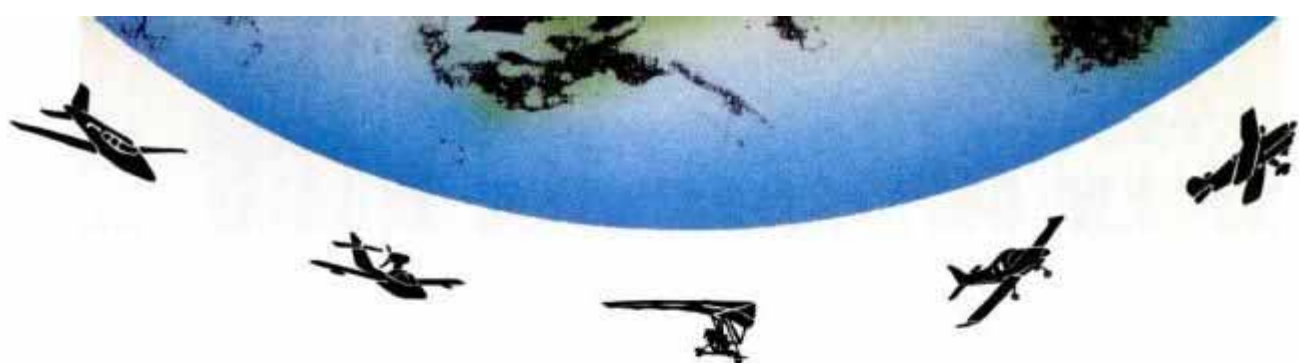
And even though the championship has eluded them, the Archers' Mid-Ohio results guarantee that 1992 Rookie-of-the-Year honors will be a family affair. The brothers stood 1-2 (Tommy-Bobby) in the Trans-Am rookie standings after Mid-Ohio, well ahead of other contenders.

Tune in next month for our season wrapup.

FM



Bobby Archer's Dodge Daytona at Mid-Ohio weigh-in.

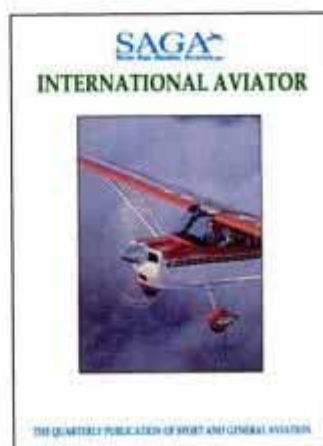
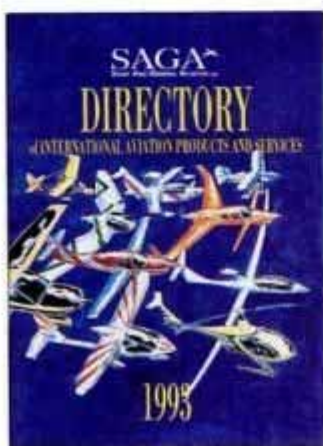


THE WORLD of SPORT and GENERAL AVIATION comes to America in February, 1993
with the introduction of two new publications:
-1993 SAGA International Directory of Aviation Products and Services
- SAGA International Aviator Quarterly Magazine

WHERE and HOW to buy an aircraft from \$2,500 to \$250,000...
"WHO'S WHO" in the world of Sport and General Aviation and how to contact them...
aviation suppliers, organizations, schools, museums, regulations, events, manufacturers...

The 1993 SAGA International Directory of Aviation Products and Services is a comprehensive collection of information for aviation enthusiasts and pilots around the world!

Available in February 1993, the 300-page SAGA Directory will bring you more than 700 color photos, over 2,000 manufacturers, aircraft descriptions, complete specs, prices—all that you could possibly want to know about the world's aircraft currently available, from flat designs to "ready to fly." You'll enjoy homebuilts and certified designs, ultralights and sailplanes, helicopters and motor-glders, aerobatic airplanes and paragliders. You'll read about training facilities, upcoming international aviation events, avionics' suppliers and more. The SAGA Directory is not only complete, accurate, up-to-date, and pleasant to read, but it's also a useful tool you will refer to time and time again.



As International barriers fall and the pleasures of sport flying spread throughout the world, SAGA looks to the future of aviation with its new, full color, high quality, quarterly magazine: SAGA International Aviator. Each issue will take you to a new corner of the world in the company of experienced pilots and in collaboration with the world's leading aviation writers and photographers.

Fly with SAGA International Aviator from Alaska to Australia, from Spain to South

America, through China, Africa and the former Soviet republics. You'll marvel at the breathtaking pictorials and incisive articles highlighting what to see, who to meet, and what to know to fly anywhere light aircraft can take you. Whether you're an experienced pilot or simply enjoy the beauty and excitement only flying can offer, SAGA International Aviator covers your world.

Become a charter subscriber today and save more than 35% off the cover-price by calling our TOLL FREE NUMBER (1-800-446-SAGA), or complete this coupon and mail or fax it today.

If you order both SAGA International Directory and SAGA International Aviator magazine, you'll also receive a beautiful, stained glass airplane miniature handcrafted in Italy, especially for SAGA readers.

The PERFECT GIFT
for the holidays!

SAGA
SPORT AND GENERAL AVIATION, INC.

SAGA Sport and General Aviation, Inc.
U.S.A. Hdqtrs: 6851 Highway 73 Evergreen, CO 80439
Tel. (1) 303-674-5086 - Fax (1) 303-674-8289
European Branch: Italy, Via Sabbionara 5,
40064 Ozzano Emilia, (BO)
Tel & Fax (39) 51 796982

1-800-446-SAGA
(1-800-446-7242)

Name _____

Address _____

City _____ State _____ Zip _____

First issue of SAGA International Aviator - \$5.95 (\$10.00 value)

1993 SAGA International Directory, \$9.95 (\$14.95 value) 1993 Subscription-SAGA International Aviator (4 issues), \$30.00 (\$40.00 value)

1993 SAGA International Directory & 1993 Subscription-SAGA International Aviator plus the "Welcome Present", \$39.95 (\$54.95 value)

Place me on your mailing list to receive more information.

Enclosed is my check or money order to SAGA Sport and General Aviation, Inc.

Please charge my VISA Mastercard Card# _____ Exp. _____ Authorized Signature _____

Foreign add \$3 (Directory), and \$12 (Int. Aviator) per year for surface mail; or \$6 (Directory), \$24 (Int. Aviator) for airmail.

ELECTRONICS

I ONLY HAVE EYES FOR YOU

BY FRANK VIZARD, Electronics Editor

● Poets have written about the power of a glance and the impact of the spoken word but while these human attributes may be effective in literature, they've had little impact when it comes to controlling technology—until now.

In a development that may have implications beyond the product itself, Canon will soon offer for sale a camera that has a focusing system controlled by the user's eye. All you do is look through the viewfinder and train your eye on the portion of the picture that you want to be the subject of your composition. Similarly, checking depth of field is also as simple as looking at a spot in the viewfinder.

The eye-controlled focus system in the Canon A2E works by tracking the movement of the user's eyeball once it is pressed against the viewfinder. Doing the tracking is a pair of infrared light-emitting diodes (iREDs) built into the eyepiece. While these iREDs illuminate the eyeball, their intensity is very low—roughly equivalent to the amount of sunlight reflected into the eye from a shiny object on a sunny day.

The infrared light reflected from the eye into the viewfinder is refracted by a beam splitter through a condenser lens onto a CCD sensor. Here, an image of the eyeball is formed, as are a pair of corneal reflection images called P-images.

The image of the eyeball is then compared against the eyeball calibration image stored in memory.

Calibration is done by selecting the calibration mode on the camera and then looking at a group of tiny squares through the viewfinder. There are five calibration settings that can be stored in memory so there can be more than one user of the camera. Different settings are also necessary for the photographer who sometimes shoots with his glasses on and at other times with his glasses off.



Checking depth of field works in a similar fashion. Just look at a depth-of-field checkmark in the upper left corner of the focusing screen. Aperture values reflect setting made on the main dial.

Eyeglasses and contact lenses were a problem anticipated by Canon engineers. While two iREDs generally do most of the tracking of the eyeball, two outer iREDs spring into action when the ghosting sometimes caused by eyeglasses and contact lenses occurs. Ghosting causes P-images and images seen by the pupil to overlap, making accurate tracking of the eyeball difficult. When ghosting occurs, a second, outer pair of iREDs is used to move the ghost image to the outside and enlarge the P-image interval, making tracking accurate once again.

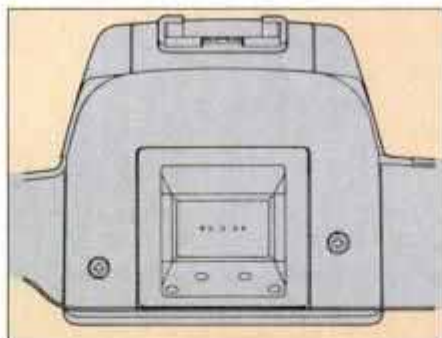
The A2E also compensates for differing eyeball sizes and the position of eyes in the head. Axis of vision is typically offset from the axis of symmetry by an angle of 5° to 7° toward the nose.

If the A2E eye focusing system has a limitation it is that the system only works when the camera is held horizontally. Turn the camera for a vertical shot and the system defaults back to a standard autofocus system.

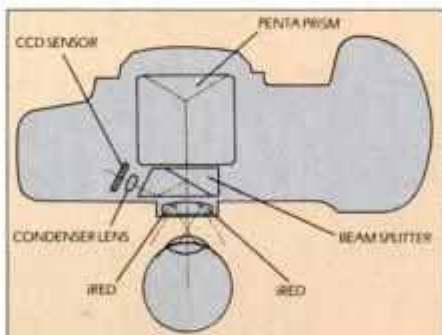
The Canon A2E will have a list price of \$1200. It should be on the market by year-end.

Do What I Say

"Just do it" may be a sneaker company slogan but it's also a phrase we sometimes wish could be addressed to a machine. Take the videocassette recorder, for example. In order to record a program for viewing at a later date, you're generally required to go through a tedious set of instructions. As often as not, you botch the job, recording a morning cartoon instead of an evening thriller. It would be so much simpler if you could just start



In the Canon A2E, infrared diodes (below) track eye movement. Eye calibration is done by focusing on squares in the viewfinder.



An infrared light reflection recreates the eye's image on a CCD sensor for comparison against a stored image.



This remote control lets you speak to your TV, VCR and cable box.

with the channel number and say: "Four. Wednesday. 8 pm to 9 pm."

Well, that's exactly what you can do with the VCR Voice programmer from Voice Powered Technology Inc. The VCR Voice remote control also allows you to vocally command your television and cable box. All you do is press the VOICE button and speak into the built-in microphone. Your vocal command is converted into an infrared signal beamed toward the designated component.

In our hands-on test, we found the initial setup to be a little time-consuming, but no more difficult than any universal remote. The VCR Voice programmer must learn the infrared codes used by your dedicated remote control. This learning process is done by aiming your dedicated remote at the infrared receptors at the base of the VCR Voice programmer. You then push a sequence of buttons as detailed in a very easy-to-understand instruction booklet.

Likewise, the VCR Voice programmer must learn to recognize your voice. You simply repeat a series of words presented on the LCD display until the word "saved" appears on the screen—a process that takes only a few minutes. In our evaluation we programmed the unit with a single male voice. Nevertheless, the VCR Voice programmer responded to an unprogrammed female voice as well.

During playback, the VCR Voice programmer allows you to fast forward through commercials by saying, "Zap it." The tape fast forwards for about a minute before resuming play.

Most functions, of course, can be controlled manually so you don't have to talk all the time. We do wish, though, a slow-motion function button had been included on the remote.

The VCR Voice programmer lists for \$169 and can be ordered by calling (800) VCR-VOIC(E).

PM

SKI AT HOME FOR THE HOLIDAYS!

Introducing the NordicSport™ Downhill. It brings all the thrill and excitement of the slopes into your workout routine — and into your living room! It's a challenging and exciting workout alternative for exercise variety and cross-training.



The NordicSport Downhill is the best way to trim your hips, thighs and buttocks, all while you get a vigorous aerobic workout that's exciting and fun! Give the gift of a lifetime of fitness this holiday season — The new NordicSport Downhill!

Made with Graphite Edge™ technology!

Best of all...it's from NordicTrack!

30-day in-home trial

nordic sport
by NordicTrack

For a FREE Video and brochure

Call **1-800-445-2231** Ext. 67TL2

or write: NordicTrack, Dept. 67TL2, 104 Peavey Road, Chaska, MN 55318

© 1992 NordicTrack, Inc., A CML Company • All rights reserved.



THE WORLD'S ONLY HANDS-FREE PHONE.

- **Voice Activated.** (Answer without touching)
- **Automatically disconnects.**
- **Clear, excellent reception.** (as far away as 50 feet)
- **200 name memory speed dial.** (alphabetic recall search - no more guess work)
- **Records all outgoing calls.**
- **Long distance blocking**
- **5 Programmable alarm clocks.** (for important medication or appointments)

**PERFECT FOR HOME OR OFFICE
IDEAL FOR THE HANDICAPPED**

**Order
Now**

- **Elapse time.**
- **Last number redial**
- **Plus many more options.**

Just send check or money order to:

TEMASEK TELEPHONE CO.

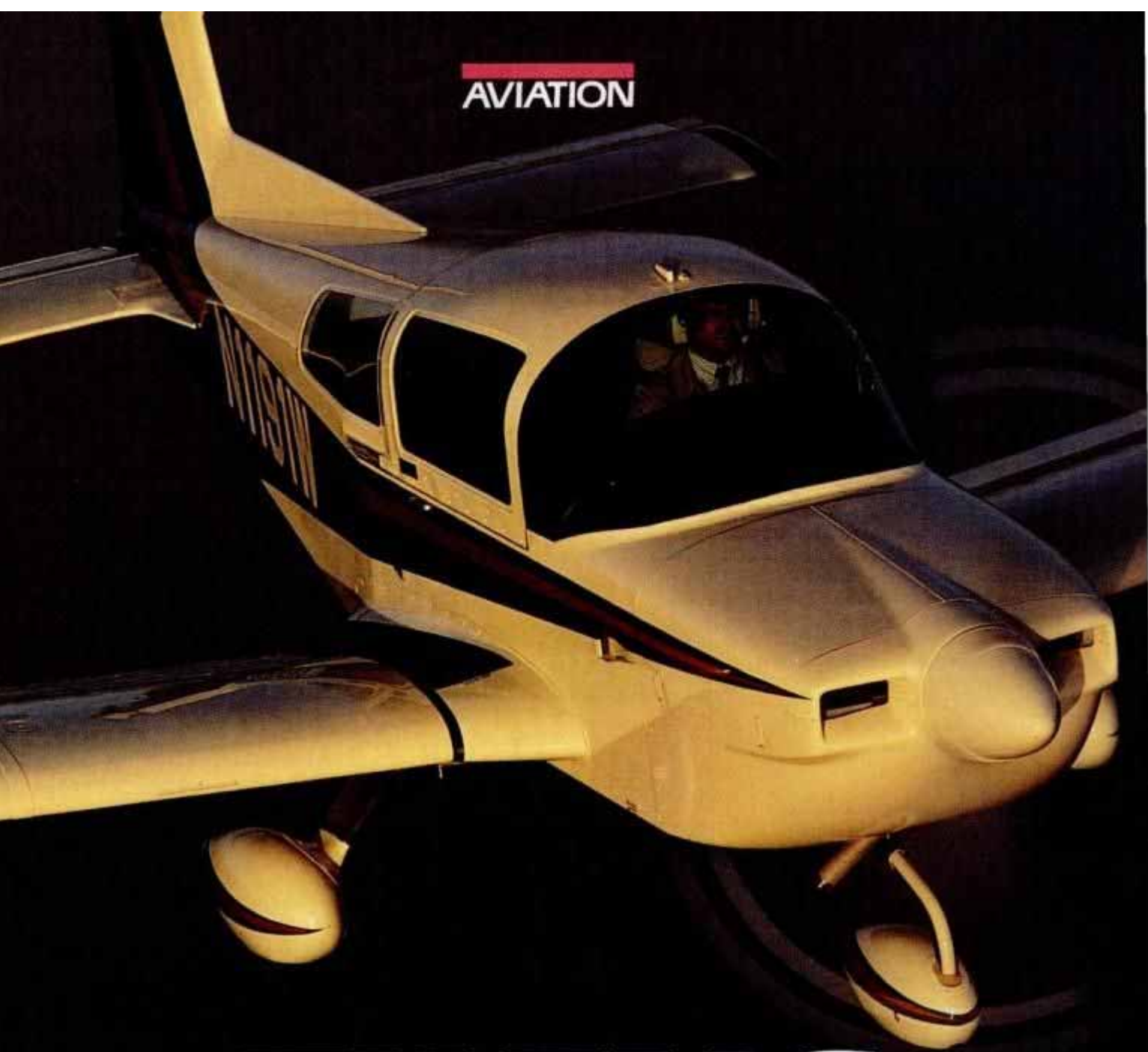
260 E. Grand Avenue #19
So. San Francisco, CA 94080



**TEMASEK
TELEPHONE INC.**

Or call: **1-800-HELLO-2-U**
43556 2 8





FLYING THE TIGER

The updated Tiger brings pep to a fun-starved, entry-level marketplace.

● I was on the phone with Bob Crowley, the head of American General Aircraft Corp., discussing my upcoming factory visit and Tiger flight. Just to reassure him that his spanking-new airplane would be in safe hands, I mentioned that I had logged a good bit of time in the Tiger and its siblings. He seemed so pleased to learn of my familiarity with the breed that I added, "In fact, I was at the rollout."

BY WILLIAM GARVEY
PM Photos by Russell Munson

"You mean you were here back in April of '90?"

"No. I mean I saw the original rollout."

"Oh, wow."

Yeah, wow. It is a sad commentary on the state of general aviation that Mr. Crowley's Tiger—the freshest

and most welcome newcomer to the world of factory-built light aircraft in a long, long time—actually first emerged from its nascent hangar 18 years ago as the Grumman American Tiger. While there are many reasons for the stupefying decline in light-plane production during the past decade, Crowley and his cohorts intend to do what they can to reverse that trend. So far, they're succeeding.



class delivers as much as a Tiger.

With fixed-pitch prop, bolted-down gear, free-castering nosegear and no doors at all, the Tiger rivals the revered Cub for simplicity of design. Yet its 4-passenger cabin, fold-down rear seats, 550-nautical-mile range (plus 45-minute reserve) and 139-knot cruise put it in another category altogether. By way of comparison, I once owned a 4-place airplane that delivered about the same speed but needed 20 more horsepower, a constant-speed prop and retractable gear to do it.

Although Jim Bede began design work on the series back in the '60s, the Tiger is very much a contemporary machine. Not only is it fiscally correct for this era of mean and lean, but even after all these years it's still technologically innovative, boasting rivet-

less bonded metal wings, aluminum honeycomb construction, fiberglass gear and a tubular spar. And all that comes without sacrificing either style or fun. Truth is, the Tiger is the most rakish light plane manufactured. And since it's legal to

cruise with the canopy open, the Tiger is the only one you can fly without a roof over your head, barnstormer-style.

To test the new breed of Tiger, I traveled to Greenville, Mississippi, where American General occupies a vast new hangar complex built, then promptly abandoned, by Boeing in the 1980s.

A close inspection reveals that American General has altered the Tiger only slightly from the original. One of the most significant differences is the installation of a 28-volt electrical system to accommodate the heavy instrumentation desired by most pilots today. Also noteworthy is the replacement of the original McCauley prop with a 75-in. blade from Sensenich, a move that eliminated an operational restriction and an airworthiness directive.

The only really noticeable changes to the exterior are the addition of a red plastic sleeve to house the anti-collision light at the top of the fin, and that the single nose-mounted landing light has been replaced with beams enclosed in both wingtips.

Inside, the panel is clean, logical and our test airplane (S/N 10095) was loaded with everything from a KLN88 Loran to S-Tec autopilot with altitude hold. Bendix/King avionics are standard, but the in-house radio

shop is able and eager to customize. A VFR Tiger with minimal radios lists for \$120,000. IFR machines begin around \$133,500.

Two front office changes worth noting are the replacement of the familiar plunger primer with an electrical switch—a nice feature—and the installation of a center power quadrant housing too-long levers for carburetor heat, throttle and mixture—this whole apparatus seems out of proportion and should be redesigned.

There's not much to say about preflight and startup, and that taciturnity is meant as a compliment. The airplane is wonderfully simple—an attribute that pays dividends in reliability and safety. AGAC has added a couple of speakers up front, which is a plus, but I've never met a light airplane that couldn't be made more pleasant with a good headset, and the Tiger is no exception.

The free-castering nosegear forces you to stab the brakes more during taxiing, but you get the hang of it pretty quickly. After a runup, we centered on the active, slid the canopy shut (ours was balky, but to be fair, this was its production test flight) and stoked the 180-hp Lycoming O-360. Even though it was a warm and humid Mississippi midmorning, the lightly loaded Tiger—there were just two aboard—popped off in a few hundred feet, and we were quickly climbing at 950 ft. per minute with the airspeed holding at 90 knots.

At altitude, I went through a series of clean and dirty stalls, steep turns, climbs, rapid descents and slow flight, and the Tiger showed itself to be a pussycat. With power back and yoke in my chest, the airplane just waffled down, fully controllable all the way. Throughout all regimes, controls were light and response nimble. And that's in a true 4-place, 140-knot cruiser that sips avgas at just 10 gallons per hour. Yes, Crowley and colleagues may see their money again.

And when they do, they have plans for spending it. When they acquired the Tiger, they also bought the rights and tooling for the Cougar, a light twin that had its line halted seemingly moments after it had begun. Since schools are desperate for a new, inexpensive twin trainer and none are being built, Crowley thinks the timing may be perfect for the Cougar's reintroduction.

But first and foremost, the goal is to get the Tiger in steady, quality production. Crowley is confident all of that is close at hand. As for the airplane's appeal, there seems to be little question that the market is ready to hear the Tiger roar again. **PM**



A sleek, simple design gives the Tiger good speed without retractable gear. Inside, there's a customizable panel and room for four, plus baggage.

American General was created to fill the void created by the exit of Grumman American, Cessna, Beech and Piper from the light, single-engine market. AGAC's founders figured that as the overall fleet of existing aircraft aged, a good, factory-new airplane would have strong buyer appeal. They put their money on the Tiger, which had been out of production since 1979. Their decision is looking like a smart-money bet.

Crowley says that the Tiger is without question the best possible airplane to reintroduce to the market. And notwithstanding protestations from some Cessna 172/182 and Piper Cherokee fanatics, it's hard to disagree with him. No airplane in its

**STOP
JAMMING ME!**

**IF YOU RENT MOVIES
THEY'RE JAMMING YOU TOO!**



ClearImage \$59.95 + \$5 S/H

Rented video tapes usually contain a jamming mechanism called Macrovision. This mechanism is designed to prevent you from copying tapes. However, it also often results in a blurry or streaked picture when viewing a tape.



Video Stealth \$99.00 + \$5 S/H

ClearImage defeats the jamming, leaving you a crystal clear picture. ClearImage is digital, state-of-the-art 100% guaranteed and effective. Comes with a 3 year warranty. For Super-VHS users try our Video Stealth

CABLE TV BOXES

General Instruments Oak
Zenith Eagle Jerrold
Stargate Tocom
Scientific Atlanta Starcom



1 year warranty.
30 day money
back guarantee.
Low Prices.
7th year in business.
Thank You.



**FREE
CATALOG**



ORDER TOLL FREE

1-800-624-1150
(402) 554-0417



M.D. ELECTRONICS
875 So. 72nd St. Ste. M
Omaha, NE 68114

MISSISSIPPI EXPRESS

(Continued from page 47)

woods while passing 1000-ft. barges in the freezing rain. It wasn't all paddlewheelers and historic hamlets, but the tough times have a way of fading into the background at journey's end.

Conquering the big muddy

Despite good preparation and excellent support from the people at Astro and Mariner, the PM river runners must admit they were a bit skeptical at the start of the trip. Can a bass boat really handle more than 1700 miles on the Mississippi River? Within an hour of launching, we had an answer, and it was an emphatic yes.

Bass boats are notorious for being flat-bottomed kidney pounders, yet the Astro 20 DCX (\$20,500) crossed miles of barge wakes and storm-whipped white caps with amazing softness. Not only that, it never threw a drop of spray into the cockpit, even in serious crosswinds. The truth is that the Astro isn't only as fast as lightning (top speed is 65 mph without cruising gear), but it has the best rough-water hull of any bass boat in its class.

The Mariner 200 EFI was equally impressive. Right out of the box, it ran fully loaded against a constant 3 mph to 4 mph current for about 70 hours in a period of six and a half days. It started every morning with the turn of a key and didn't hiccup or cough once, which is due to the smooth-running Mariner EFI system.

To cope with the long distances between fuel stops, it was crucial that the Mariner give us a minimum of 2.5 mpg under optimum running conditions. To our surprise, it averaged more than 3.0 mpg during these stretches, which is an amazing feat considering that we ran at 5000 rpm and carried two passengers and a 500-pound load of gear. In all, we burned just 594.4 gallons of gas and 13 gallons of oil, which is very impressive for a V6 outboard.

From the Industrial Canal, in New Orleans, to the Watergate Marina, in St. Paul, the PM river runners traveled exactly 1734 miles in just under a week. If we'd traveled between the same points by car, it would have been 900 miles in about 24 hours. By air, just 750 miles before lunch.

Although the PM team wound through oxbow after oxbow, suffered the slings and arrows of outrageous weather, ran into sand bars, dinged the prop on a wing dam and fought through a forest of floating debris, given the chance to do it all over again we'd pick the river route every time. Even in a bass boat.

PM

**HO! HO! HO!
FLOW! FLOW! FLOW!**

This Christmas, go with the flow. The high flow K&N Filtercharger®. This American-made air filter is not only reusable and environmentally-friendly, it also delivers:

- Up to twice the air flow
- Up to 15 extra horsepower
- Unique oiled cotton and wire mesh construction
- 10 year/1,000,000 mile warranty*

So this holiday season make sure Jolly St. Nick brings you a K&N Filtercharger. And have yourself a "Flow! Flow! Flow!" Merry Christmas!



Call 24 hours a day
INFONOW
1-900/773-7300
*See listing. Must be 18.
Enter access code: 58-73-70
InfoNow uses AT&T lines.
Line problems? Call DCI 315/279-9600

Santa's helpers - Be sure to give the right K&N Filtercharger. Call InfoNow to access our 24 hour-a day interactive Fax Catalog. Instantly retrieve specific application information for 90-92 model vehicles! Available by direct mail. Prices from \$22.50 *See complete warranty for details.

INSIDE THE IMPORTS

(continued from page 67)

(so it doesn't produce a lot of waste heat) and it has a lot of exposed surface that radiates much of what is available. So VW installed a close-fitting shroud and adapted a solution from diesel trucks, which have the same problem: radiator shutters. There are two plastic shutter modules—one behind each of the two radiator fans—and when they're closed (as in very cold weather), they block airflow through the radiator. So the engine coolant doesn't give up any more heat as it flows through the radiator, and there's enough to feed into the passenger compartment.

If the coolant does get warm enough, it radiates heat into the air around the shutter assemblies—each of which contains a thermostat, something like the one used for the cooling system. As the stat warms up, a wax pellet expands and pushes on a plunger to operate a link that opens the shutter to allow normal airflow through the radiator.

The Passat, VW's thus-far unsuccessful effort to sell against the Accord, Camry, etc., gets an engine that's almost as short as a V6 and almost as narrow as an inline Six—VW's innovative 2.8-liter VR-6, introduced earlier this year on the Corrado sport coupe. It has a single aluminum cylinder head over two banks of cylinders set at an incredibly narrow 15° angle on a cast-iron block. This compares with 60° or even 90° for other designs and, of course, two cylinder heads. The design was chosen because it was the only way VW could get 6-cylinder performance into existing engine compartments designed for a 4-banger. The narrow bank angle also gives the engine the good balance characteristics of an inline Six.

Although just 2-valves, the Passat's VR-6 has a 10:1 compression ratio and produces 172 hp at 5800 rpm and 173 ft.-lb. of torque at 4200. It proves you can get well over 60 horses per liter without four valves per cylinder. At least 85% of the torque is available between 2000 and 6000 rpm.

There are two overhead camshafts, but that's one for each bank of three cylinders—each camshaft has six lobes to open the two valves in each cylinder. Both cams are spun by one double-roller chain that wraps around an intermediate shaft sprocket, which itself is driven by a single-roller chain from the crank sprocket. Chain drive was chosen to provide the strength for a diesel version in the works.

The VR-6 is installed in the top-of-the-line GLX. The standard 4-valve 4-cylinder produces 134 horsepower at 5800 rpm. **PM**

TECHNICAL BOOKS

RARE!

Discover hundreds of unusual, high-quality technical books that you'll NEVER see in any book store! Both newly written & reprints of rare old books! Your satisfaction guaranteed! Here are just a few—

CHARCOAL FOUNDRY

Build a furnace from a five gallon pail that can melt aluminum, pot metal and brass using grocery-store charcoal. Cast machine parts, ingots, art objects. All the secrets! Book 163 \$6.95



BUILD A METAL LATHE

Build a precision 7" metal cutting lathe without the need of precision tools! Cuts to 1/1000". It's true! Prototype cost about \$50! Definitely not a toy! Detailed paperback! Best seller! Order a copy! Book 177 \$8.95

BLACKSMITH SHOP & IRON FORGING

From 1906! Complete text on forging of iron with hammer and anvil. Make bolts, tools, even steam engine repairs! Details on all tools and procedures. Great illustrations. Order a copy! Book 4074 \$6.50

ADVANCED MACHINE WORK

Learn the secrets of a master machinist. This 800 page "Bible" shows everything from using a micrometer to running lathes and milling machines. Make bolts, bronze bushings, twist drills, mandrels, worm gears, keyways, taps and much more! Loaded with illustrations. Dynamite hardcover book! Book 4236 \$25.95

RUN THREE PHASE MOTORS ON SINGLE PHASE

Three different proven methods in use since the turn of the century. All details. Best-selling booklet. Booklet 81 \$3.00

STEAM ENGINE DESIGN

Engineer's formulas and diagrams from 1896! Design an engine to meet your needs. Rare info! Book 4104 \$9.95

CHEMICAL CROSS REFERENCE

Translate old fashioned chemical names into modern names. More than 2000 terms extracted from books back to the early 1800's. Rare reference material! Book 20170 \$4.95

ADVANCED METAL PROJECTS

Complete plans, diagrams, parts lists and how-to to build foundry & forge, airtight woodstove, blade sharpener, large pro-quality wood lathe, and more. Not for beginners... Unusual! Book 4686 \$8.95

and many others...

CATALOG!

Write for your copy of Lindsay's 88 page Technical Books catalog and see what you've been missing! Send \$1.00 (US & Canada) or \$4.00 foreign airmail. Write today!



LINDSAY PUBLICATIONS

PO Box 538-EMT, Bradley IL 60915

Send the books I've marked. A check, money order, or my Mastercard/Visa card numbers are enclosed in payment. And send a catalog at no charge.

Send just a copy of your latest jam-packed catalog. A dollar is enclosed.

Name _____

Address _____

City _____ State _____ Zip _____

NH Northern
Where the Pros and Handymen Shop
Sale Prices Good Thru 12/31/92 Key #12095

POWER-UP, HEAT-UP, LIGHT-UP & PROTECT!

Invisible Pet Containment System

High-tech way to keep your pet in your yard! Lets him move about your property. FREE video, transmitter, receiver/collar, 500' of insulated boundary wire, flags and more. Item# 3547



Sale \$389.99



Sale \$26.99

Barrel Stove Kit

Kit converts any 55 or 30 gallon drum (not included) into a wood burning heater. Includes door, legs, collar. Item# 16160



Sale \$12.99

Fasco Blower

115 V blower turns at 3400 RPM, moves 200 CFM. Use for solar distribution, exhaust or ventilation systems, etc. Used take-off in very good condition. Item# 0434



Sale \$43.99

Duct Booster

Increases heated or cooled air flow to "problem" rooms up to 50%. Installs in ducts 5" in diameter or more and in rectangular ducts at least 3" W x 4" D. 40-Watt Fasco motor moves 300 CFM free air, 51 Amps. 120 vac. UL listed. Item# 18000



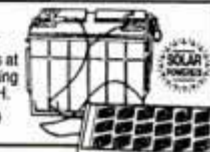
17,065 BTU Ceiling Heater

Built-in automatic thermostat. 17,065 BTU/hour. 14"W x 12 1/2"H x 12 1/2"D. 17,065 BTU/hour. Ceiling mount bracket included. Item# 17303

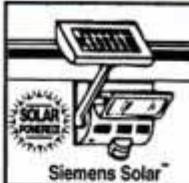
Sale \$184.99

Solar-Powered Battery Maintainer

Keeps your 6 and 12 V batteries at full charge. 36 solar cells. Blocking diode. 11 1/2"L x 9 3/4"W x 1 1/4"H. Item# 33431



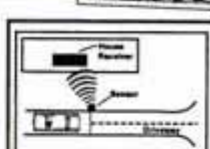
Sale \$54.99



Solar SENSOR LIGHT™ Automatic Security Light

Turns on when it detects heat and motion up to 35' away in a 120° arc. Fluorescent bulb lasts over 5 years. Position solar panel up to 14' away. Guards your property up to TWO WEEKS without sun! Mounting bracket and bulb. Item# 33433

Sale \$124.99



WIRELESS Driveway Sensor™

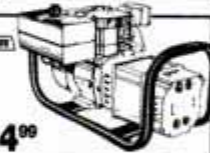
Sensor detects heat and motion within 50' and sends a radio signal up to 300' to receiver in your home. Uses a 9 V sensor, 110 V receiver. 9 V battery not included. Item# 33168

Sale \$179.99

4000 Watt Generator

8 HP Tecumseh engine has cast iron sleeve. Two 120 V and two 240 V outlets. Item# 16425

Sale \$434.99



Shipping not included.

Send or call for your FREE 136-Page DISCOUNT CATALOG!

ORDER TOLL FREE

1-800-533-5545

Fax: 612-894-0083

Name _____

Address _____

City _____ State _____ Zip _____

Key #12095 SEND TO: NORTHERN,
P.O. Box 1219, Burnsville, MN 55337-0219

ANNIVERSARY

SUBSCRIBERS WITH SENIORITY

BY CLIFF GROMER

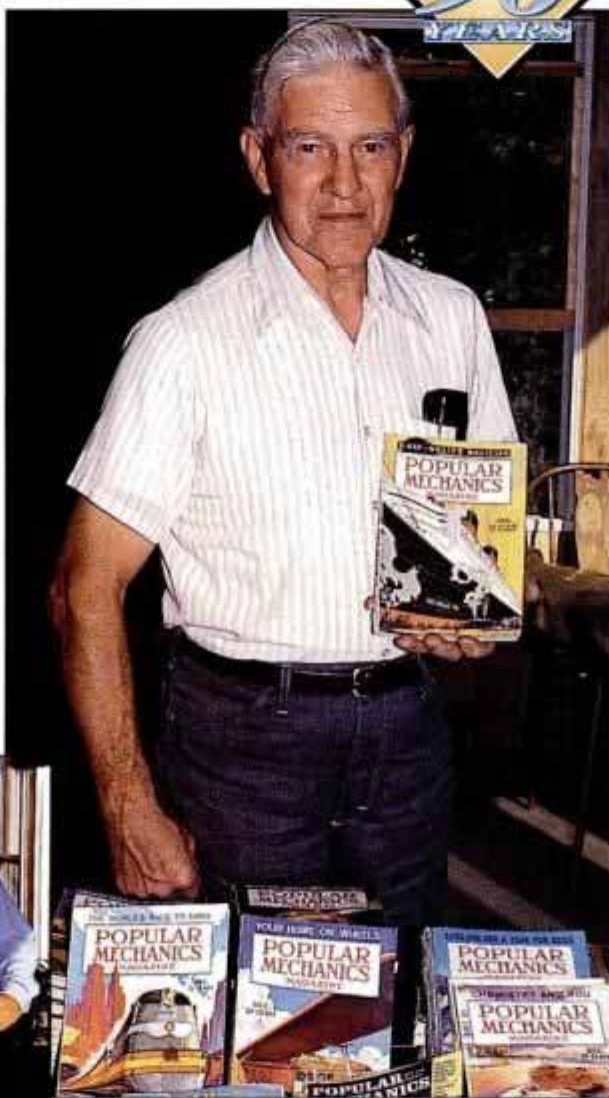
● In the April 1992 issue, as part of our 90th anniversary celebration, Editor Joe Oldham announced that he was looking for the POPULAR MECHANICS reader who has been the longest continuous subscriber. He promised that there would be a prize and an article about that reader in the magazine.

The response was almost overwhelming. Longtime readers swamped us with stories about their loyalty as subscribers, and even relatives of longtime readers besieged us with mail about their fathers, grandfathers or great-grandfathers and their huge collections of years and years of POPULAR MECHANICS.

In the end, we had to ask for some kind of proof of longtime readership since our own records did not go back far enough to verify subscriptions.



And that's where Clarence Atwood of Wolcott, Connecticut, came through. Not only has he been a subscriber since January 1935, but he had every issue to prove it! His mother and his aunt each bought him a subscription (one for PM, the other for *Popular Science*) for his 13th birthday. And Atwood has continued renewing ever since, and subsequently dropped the competition. When he first started reading PM, Atwood was interested in electronics and he built several one-tube radio sets that were featured in the magazine at the time. Over the years, Atwood's interests



Clarence Atwood has been subscribing to PM since January 1935, and qualifies as our longest running continuous subscriber. Atwood received a check from Editor Joe Oldham for all the money he's spent on subscriptions—\$345—plus a free lifetime subscription.



Runners-up Mr. and Mrs. Eugene Tetzloff.

expanded to include woodworking (he built his own house) and powerboats. He especially enjoys reading about powerboats and how various automotive-related problems are solved, and he relates them to his own vehicles (he maintains his own cars, trucks and tractors).

As our winner, Clarence Atwood's prize includes total reimbursement for all his subscription payments since January 1935—the princely sum of \$345—plus a lifetime subscription to PM.

Stanley H. Bartles, of Flemington, New Jersey, would have been our second-place winner. His subscription issues dated back to December 1935. Unfortunately, Mr. Bartles just recently passed away.

Our third senior subscriber is Eugene L. Tetzloff, of Kouts, Indiana. A subscriber since March 1945, Tetzloff received his first subscription as a birthday present from his new wife. In 1947, when POPULAR MECHANICS ran a feature on the plans and construction of a model home that the magazine built in Aurora, Illinois, Tetzloff drove over to take a look. He liked what he saw, sent away for the blueprints and built his own PM project house in his spare time. Of course, being a carpenter by trade didn't hurt much either. The Tetzloffs still live in that same house built from PM plans.

Back in the '50s, when their two children were young, and before they bought their first TV, Tetzloff says everyone used to sit on the davenport with their own issue of PM and read what was going on. That was the family entertainment at the time. Hey, we can't make up stuff like this.

As our runner-up senior subscriber, Tetzloff receives a lifetime subscription to POPULAR MECHANICS.

Thanks to all of you who wrote in to tell us about your subscriptions, and thank you all for your many years of loyal readership.

PM

EXHIBIT (Continued from page 52)

Teague's famous "Sparton" radio reflects the ideals of modern design from an exhibit case full of redesigned products. Nothing was too small or insignificant to benefit from the attention of the designers PM called "The Beauty Engineers." Visitors can see a cigarette pack designed by Raymond Loewy, a coffee can by Egmont Arens and an alarm clock by Henry Dreyfuss. Automotive design models are also displayed here, including a plaster scale model of the famous 1948 "step-down" Hudson.

Do-it-yourselfers too could possess the new look, perhaps by building PM's streamlined dog house. For the exhibit, we've recreated the "rather showy affair of a distinctly modern type" from 1940 plans. But even PM admitted that "most dogs won't be fussy about the architectural details."

Dog architecture notwithstanding, most of PM's technological forecasts focused on big-ticket items—homes and transportation of the future. "The designer's freedom from traditions, from the fetters of habit, is what makes his knowledge helpful to the automotive engineer and the architect," declared a 1932 article.

Yet sometimes the designer and engineer were one and the same person. William Stout was an engineer with a keen sense of design. His turquoise blue Stout Scarab automobile—a gently rounded, rear-engined "wingless plane car"—is the centerpiece of "Planning the World of Tomorrow."

Stout elaborated his design principles in several articles for POPULAR MECHANICS. "Turtles," he wrote, "offer the best models for motor-car streamlining. Fish travel with pressure from the front; automobiles, like turtles, are subject to crosscurrents." Perhaps Stout also had turtles in mind when he designed the car's interior. Like a turtle carrying its home on its back, the Scarab is "a living room on wheels," complete with a table, a movable chair and a wide bench seat that could double as a bed.

Although it never went into production, the car stands today as a symbol of its times, when the crosscurrents of science design and belief in technical progress converged to reshape the world.

For an automotive buff, the Scarab alone is worth the trip to Dearborn, Michigan. But even without it, "Planning the World of Tomorrow" is one of the most thought-provoking sections of the exhibit.

We now live in the future predicted in those optimistic days. Where stand those dreams today? Come relive some past visions of the future in "Possible Dreams."

PM

\$2

For PM Readers Only

\$2 DISCOUNT OFF YOUR MUSEUM ADMISSION

This offer is exclusively for readers of Popular Mechanics. Get \$2 off the regular price of admission for you and everyone in your party when you visit Henry Ford Museum & Greenfield Village and the "Possible Dreams" exhibit in Dearborn, Michigan. Better still, make your visit a mini-vacation. Hotels in the area can accommodate any budget. Call Henry Ford Museum & Greenfield Village today for your \$2 discount vouchers and free information on cost-saving hotel packages and other things to see and do in the area. The toll-free number is (800) 343-1929.

This offer expires December 31, 1992 and is not valid with any other discount.

\$2

"By Far The Most Comfortable Mattress I've Ever Slept On!"

Richard Shafer,
Baltimore, MD



• Adjust Firmness to Fit Your Exact Needs

• Unique air-cushion design contours to your body, providing superior back support and comfort.

• Research shows 94% of back pain sufferers report Select Comfort gives them the back support they need to get a better night's sleep.

Unique Support System.

Select Comfort's unique air support system lets you control the feel and firmness of your bed — simply by pushing a button. Your mattress can be firmer than the firmest innerspring or softer than the softest featherbed...helping you sleep more comfortably, reducing back pain and muscle aches, and providing true support. Change the firmness whenever you like to meet your exact preference.

No Risk 90 Night Trial.

We are so confident that you will find Select Comfort to be the most comfortable mattress money can buy that we offer our "Better Night's Sleep Guarantee." Take 90 nights to sleep on a Select Comfort. If you aren't completely satisfied, return it for a full refund.



Select Comfort provides proper back support and contours to your body, distributing weight evenly.



Innerspring mattresses create pressure points and uneven support.



Waterbeds rely on displacement and can cause a "hammock effect," bending your spine unnaturally.

Variable Firmness = Great Sleep.

Your Select Comfort conforms to your body's natural shape so your back muscles don't strain to hold your spine straight. Because air support is the closest thing to floating, you'll wake up rested and ready for the day.

Discover why 96% of Select Comfort users recommend it to family and friends.

"I am a doctor and often come home exhausted. This mattress is the most comfortable I've tried."

Dr. Connie Horn, M.D.
Clarksville, Ohio.

Call or Write for a
FREE BROCHURE AND VIDEO
1-800-831-1211

YES! Please send me a FREE Information Packet & Video.

Name _____
Address _____
City _____ State _____ Zip _____
Evening Phone (____) _____

Select Comfort
CORPORATION

9301 75th Ave. N. Brooklyn Park, MN 55428
1-800-831-1211

© Select Comfort 1992

Dept #70

HOME VIDEO

TV/VCR COMBOS

BY STEPHEN A. BOOTH, Contributing Editor

● The TVCR is an idea whose time has come. This electronic hybrid combines a television receiver and a videocassette recorder into a single chassis. Actually, it's an idea that has come full circle. The first home VCR was a combo: Sony's 1975 Betamax came housed in a 19-in. console TV.

In the early days of home video, however, TVCRs didn't make sense. Most homes already had a TV, and the VCR was a pricey add-on. But now that VCRs are as commonplace as toasters in American homes, the combination is gaining ground as a second system for the bedroom. Its portability makes it well suited for duty on the patio or in the vacation home, and DC-powered models have the TVCR going mobile in campers, RVs and boats.

TVCRs typically come in small-screen sizes, ranging from 5 to 20 in. Besides portability, one obvious advantage of the monocoque combo is the lack of wiring headaches, since the TV and VCR are connected internally. One obvious disadvantage is that if one component fails, the whole unit must go to the shop. This isn't as much a gamble as it used to be. TVs have a long history of reliable operation. And lately, manufacturers feel confident that VCRs, despite their many moving parts, have achieved a similar degree of reliability.

Accordingly, what was once a novelty is now a growing product category. More than 50 TVCR models are available today from companies such as Emerson, Funai, Goldstar, Hitachi, Instant Replay, Magnavox, Memorex (Radio Shack), Panasonic, Quasar, Samsung, Sony, Symphonic and Ten-Lab.

Simplicity is the strong suit of TVCRs: You won't find a lot of fancy

programming features or special effects in the VCR portion.

A survey of manufacturer's lines shows that most TVCRs incorporate basic 2-head decks with monaural sound, especially in the 13-in. and below screen sizes. Some larger-screen models up the ante to a 4-head VCR,



permitting slow motion, freeze-frames and other effects. Samsung's new 19-in. VM6405 (\$830) is one such model. Lately, as TVCRs have become more popular, some brands have supplemented the bare-bones audio with hi-fi stereo sound. Quasar's 20-in. SX1420 (\$900) is an outstanding example.

More esoteric TVCRs are available for special applications. For example, Panasonic's PV-M2050 (\$1100) is a 20-in. model that also plays tapes recorded in the PAL and SECAM broadcast systems used in other parts of the world. Instant Replay and Ten-Lab specialize in TVCRs capable of playing or recording in these formats.

A potential shortcoming of the TVCR's simplicity is that most have only a single TV tuner. This means

you can't watch a show on one channel and record something from another station. On some models, the TVCR locks up when the recording timer is engaged, just as a VCR does. Consequently, you shouldn't preprogram the unit to record if you want to watch TV in the meantime. Most TVCRs do have an instant-record button, however.

Despite their portability and recording ability, most TVCRs probably are used in semipermanent locations, for playing prerecorded and rented tapes. Accordingly, most have cathode ray tube (CRT) screens and VHS-format decks. Of all the CRT-based TVCRs available, only Sony's EV-DT2 (\$1200) and Memorex's Model 17 (\$800) use 8mm videotape. Both models have a 5 in. screen. In CRT models, 5 in. is as small as they come. Below this size are the personal portables that use flat LCD screens. Many of these, especially the VHS models, don't qualify as TVCRs because they don't have a TV tuner.

A subcategory of the TVCR is the TVCP, a combo TV and videocassette player, with no recording ability. These range in screen size from 5 to 13 in., and typically run on DC power as well as AC, thereby lending themselves to use in RVs. A word to the wise here: Carefully measure the stowage space available in the RV, because a TVCR or TVCP is likely to eat up more height or depth than a standard TV of the same screen size.

Also, for the record, squeezing two components into one doesn't necessarily shrink the price. Suggested retail prices on TVCRs range from \$500 to \$1000 or more, and although these frequently are discounted, you might be able to buy a separate, no-frills TV and VCR for the same price or less. **PM**

Start a money-making career in video/audio servicing!

Only NRI gets you started fast with real-world training designed around state-of-the-art equipment you keep!

NRI's newly expanded training covers all the latest advances in home entertainment electronics, then takes you inside today's high-tech equipment as you learn to troubleshoot, diagnose, and service the complete home entertainment system included in your course: 13" color TV, programmable VCR, and integrated audio rack system. Only NRI makes it so easy to start a new career, earn part-time income, even start a video/audio servicing business of your own!

Billions of dollars of video/audio equipment means big opportunity for you

There's never been a better time to get involved in home entertainment electronics. Experts predict that consumers of video/audio equipment will spend over \$26 billion by 1995 as product manufacturers race to fill the demand for increasingly sophisticated technology.

This explosive acceleration of new product innovation means new opportunities for you in video/audio servicing. And NRI prepares you to take advantage of those opportunities by giving you the skills to troubleshoot and service a full range of TV, video, and audio equipment.

The most advanced, most complete video/audio training ever offered!

You start with lessons that give you a strong foundation in electronics fundamentals, mastering the basic circuits and components at the heart of today's video/audio equipment.

Then you build on that foundation as you explore the high technology of digital controls, CDs and digital audio tape players, advanced TV systems, cable TV, VCRs and camcorders, even microprocessors.

Best of all, you're prepared for the technology of today and tomorrow with hands-on training designed to give you invaluable practical experience.

Hands-on training with this incredible array of home entertainment equipment gives you the skills you need for success.



State-of-the-art equipment included in your training makes theory come to life

Only NRI gives you so much real-world equipment ... all yours to train with and keep! Get hands-on experience as you work with a complete, high-tech home entertainment system: a 13" color TV with remote, a programmable VCR, and an integrated remote-controlled audio system including AM/FM tuner, 100 watt amplifier, CD player, dual cassette player, turntable, speakers, and audio rack cabinet.

Theory comes to life as you learn to perform component-level diagnosis and service on advanced technology audio equipment ... conduct in-set demonstrations of TV circuits and components ... and discover first-hand how to maintain and service today's commercial VCRs.

Plus, NRI custom-produced videos

show you in close-up detail how to test, troubleshoot, and service TVs and VCRs like a pro.

No experience necessary ... NRI builds it in

You need no previous experience in electronics to succeed with NRI. Step by step, you accumulate the knowledge and practical experience that will make you uniquely qualified for today's opportunities in home entertainment electronics.

You learn at your own pace and on your own time. And all throughout your training, you have the full support of your personal NRI instructor and the entire NRI technical staff.

FREE catalog tells more

If the coupon is missing, write to NRI Schools, McGraw-Hill Continuing Education Center, 4401 Connecticut Avenue, NW, Washington, DC 20008.

SEND TODAY FOR FREE NRI CATALOG

NRI Schools

McGraw-Hill Continuing Education Center
4401 Connecticut Avenue, NW, Washington, DC 20008

For Career Opportunities
approved under GI Bill
 check for details



Check one FREE catalog only

- | | |
|--|--|
| <input type="checkbox"/> TV/Video/Audio Servicing | <input type="checkbox"/> Desktop Publishing & Design |
| <input type="checkbox"/> Microcomputer Servicing | <input type="checkbox"/> Electronic Music Technology |
| <input type="checkbox"/> Computer Programming | <input type="checkbox"/> Home Inspection |
| <input type="checkbox"/> Telecommunications | <input type="checkbox"/> Automotive Servicing |
| <input type="checkbox"/> PC Applications Specialist | <input type="checkbox"/> Basic Electronics |
| <input type="checkbox"/> Programming in C++ with Windows | <input type="checkbox"/> Bookkeeping & Accounting |

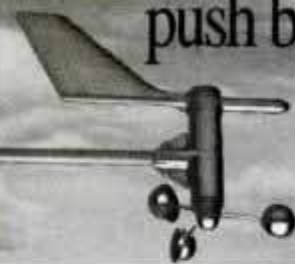
Name (Please print) _____ Age _____

Address _____

City _____ State _____ Zip _____

100-122

In case of weather,
push button.



Now you can have complete weather information literally at your fingertips with the Weather Monitor II. Sophisticated in design, yet easy to operate, it's as miraculous as the weather itself.

FEATURES INCLUDE:

- Inside & Outside Temps
- Wind Speed & Direction
- Inside Humidity
- Time & Date
- Barometer
- Wind Chill
- Alarms

- Highs & Lows
- Instant Metric Conversions
- Outside Humidity & Dew Point Option
- Rainfall Option
- Optional PC Interface



WEATHER MONITOR II

THE PROFESSIONAL HOME WEATHER STATION

Order today: 1-800-678-3669 • PM624X
M - F 7 a.m. to 5:30 p.m. Pacific Time • FAX 1-510-670-0589
MC and VISA • One-year warranty • 30-day money-back guarantee

DAVIS INSTRUMENTS 3465 DIABLO AVE., HAYWARD, CA 94545



**WASTING MONEY
LOSING HEAT
DRAFTY WINDOWS
COLD & WIND**



**FOR ALL YOUR WINDOW INSULATING NEEDS,
BUY FACTORY DIRECT FOR BIG SAVINGS.**

Easy to install and excellent for low cost insulating and weatherization of porches, patios, windows and doors.

Used in: Homes • Schools • Churches • Trailer Homes • Business • Hospitals

We Stock:

- 100% Clear Films in Many Sizes
- 2-Sided Tapes
- PVC Snap-in Fasteners
- Solar Control Films
- Complete Kits

**FREE CATALOG
Call or Write
1-800-325-2826**

**ENERGY ARSENAL
P.O. Box 2792
Ivlyland, PA 18917**

Satellite-TV FREE

100% Satisfaction Guarantee

56 Page Catalog Buyer's Guide



- All Major Brands
- Complete Systems
- Accessories.
- Huge Savings
- Easy Installation
- Complete Instruct.

Let Us Help You Select Your New Satellite TV Entertainment System

Over 40,000 Satisfied Customers

1-800-334-6455

Int'l 218-730-6231 Fax 218-730-6879

SKYVISION INC.®

1020 FRONTIER DRIVE
FERGUS FALLS, MN 56537

INSTALL OR UPDATE YOURSELF!



**FOR ONLY
\$24.95
PLUS
\$4.00 P&H**

TELESCOPE WITH TRIPOD & FINDER SCOPE
— POWERFUL 45 x 40MM LENS —
ALMOST 2 FEET IN LENGTH
FAMILY FUN • BIRD WATCHING
S*T*A*R G*A*A*Z*I*N*G
BRINGS THE WORLD CLOSER TO YOU
GREAT CHRISTMAS GIFT IDEA!!
SEND CHECK OR MONEY ORDER TO:
K.J. CARP
325 ERMA LANE, CAPE MAY, NJ 08204

GREAT IDEA!

"This has to be the most attractive and practical way yet to cover a pickup bed."

A key locked roll-up hard cover that's weathertight.



for free brochure on the **ROLL-TOP-COVER™**

call or write: Pace-Edwards Co.
100 Commercial Street
Centralia, WA 98531

1-800-338-3697

CHRISTMAS SALE!

Save on cable rental fees!

**CABLE TV
DESCRAMBLERS
WE'LL BEAT
ANY PRICE**

**JERROLD-TOCOM-ZENITH
HAMLIN-OAK-PIONEER
SCIENTIFIC ATLANTA**

- 24 HOUR SHIPMENTS!
- MONEY BACK GUARANTEE!
- QUANTITY DISCOUNTS!

MASTER CARD / AMEX / VISA / C.O.D.



Have make and model number of equipment used in you area ready.

CALL TOLL-FREE

1-800-284-8432

CABLE WAREHOUSE

10117 West Oakland Park Blvd.,
Suite 515, Sunrise, FL 33351

NO FLORIDA SALES

Never Lose Your Credit Card Again



Credit Mats...an ingenious new credit card security device with built-in electronic sensors in each compartment alerting you immediately if you've forgotten to replace your credit card, driver's license or bank card. Holds up to seven cards. Available in black or burgundy. Only \$12.95 + \$3.95 S&H. Add \$5 For Genuine Cowhide

RING!!

To Order Call Toll Free

800-233-8600

Great Gift Idea

or send payment to: HMA PO Box 125 Inwood, NY 11696-9998

**"COVER-IT"™
INSTANT GARAGES
ALL WEATHER SHELTERS**



BUY FACTORY WHOLESALE AND SAVE!
FREE DOORS!
18x20x8 \$1999
12x20x8 \$1469
STARTING \$199 Protection for Cars, Trucks, Boats, RV's, Motorcycles, Paint Booths, Docks, Pools, Worktops, Gov't & Industrial Contracts, Sand Blasting, Camp or Temporary Shelters, Walkways, Hot Tubs, and More! HEAVY DUTY Steel Frame. Durable Zipper Cover with Zipper Door. Sizes available to 80' wide, 40' high, 100' long. Withstands Wind, Sun, Sog & Snow. 100% Water Proof. Assembles and Anchors Easily. No permit required. Covers last up to 20 years. SHIPPED TO YOUR DOOR! DEALERS AND EXPORTERS WELCOME!
CALL 1-800-922-8244 EXT. 202
NOW 1-303-582-8601
Fax # 1-203-723-8356

ENJOY HEARING



SAVE \$800

FREE CATALOG!
All-In-The-Ear Hearing Aid

Nothing over, under or behind the ear.
No Cords • No Tubes • No Wires
Simple slip-in fit. Full-range volume control.
45 Day Trial • No Salesman will call on you.
REQUEST YOUR FREE CATALOG/Write Rhodes Hearing Today:

RHODES HEARING
20131 Ohio St., Brookport, IL 62910
or Call 24 Hours/day 1-800-468-3100

TURBO REPAIR KITS
For Your TURBO CAR OR TRUCK

- SAVE \$\$ BY REBUILDING YOUR TURBO!!
- EASY-TO-FOLLOW INSTRUCTION INCLUDED
- VIDEO ALSO AVAILABLE
- OR SEND IT TO US, FOR COMPLETE IN-HOUSE REBUILDING SERVICE!
- KITS AVAILABLE FOR 90% OF ALL DOMESTIC & IMPORTED OEM TURBO CARS!
- WE USE NOTHING BUT OEM QUALITY PARTS!!

SEND \$3.00 FOR 1992 CATALOG

TURBO CITY
Performance Headquarters (714) 639-4933
1127 W. KATELLA AVE., DEPT. PM, ORANGE, CA 92667

CABLE TV DESCRAMBLERS
★ CONVERTERS ★
and ACCESSORIES.

SAVE MONEY. DON'T RENT!

PANASONIC, JERROLD, OAK, PIONEER, SCIENTIFIC ATLANTA AND MORE. LOWEST PRICES. FREE CATALOG.

CABLE READY COMPANY (800) 234-1006

BUY ONE AND WE'LL MAKE YOU AN EXCLUSIVE DEALER

max 6 wheel drive **ATV**
Amphibious 2 and 4 passenger models



(21-years-old and over, Please)
No Money Down. As low as \$110 mo.
Call Toll-Free 1-800-255-2511
(From anywhere in the U.S. or Canada)
Recreatives Industries, Inc.
60 Depot Street, Buffalo, NY 14206

CABLE TV DESCRAMBLERS
Jerrold-Scientific Atlanta Oak-Zenith-Toocom

1-800-729-1776
FREE CATALOG
FRIENDLY, COURTEOUS SERVICE!
NOW CARRYING
VCR's, T.V.'s, HOME & CAR AUDIO

TKA ELECTRONICS
7914 WEST DOGGE RD #334 OMAHA, NE 68114

REAL... NOT A DREAM

1929 Mercedes Replica



1952 MG-TD Replica



FIBERFAB INTERNATIONAL, THE COMPANY THAT LEADS IN PRODUCT ENGINEERING AND INNOVATIONS, OFFERS THESE EASY-TO-ASSEMBLE REPLICAS. CREATE YOUR OWN AUTOMOTIVE LEGEND TODAY AND MAKE YOUR DREAM A REALITY. For more information and a Complimentary Color Brochure write Fiberfab International, 6807 Wayzata Blvd., Minneapolis, MN, 55426 or CALL 1-800-328-5671 In MN (612) 546-7336 015-L-2

Wood-Mizer
World's Largest Manufacturer of Portable Sawmills

Own a Sawmill!
Start a Profitable Business!



Save money cutting your own lumber, make money cutting for others.

1-800-553-0219

32 Page Full Color Catalog - \$2.00
66-minute demonstration video-\$10.00
MasterCard or Visa accepted
8180 West 10th Street • Dept. D77
Indianapolis, Indiana 46214-2400

SUITCASE UltraLight®
Personal Aircraft of '90's
HIT OF '92 OSHKOSH AIR SHOW

NO FAA PILOT LICENSE IS REQUIRED



3 Model Compound RUDDER/ELEVATOR
FOLD-UP HINGES
HIGH LIFT FLAPS AILERON SLATS
LEADING EDGE JET SLATS
YOKE CONTAINS ALL FLIGHT CONTROLS

FEATURED IN —
SPORT AVIATION and POPULAR SCIENCE

3 Models to choose from Complete Kits (less Engine & Prop) \$7500.
Video Assembly
Financing Available 20% down*. Balance 3 yr.

RUSSIAN AMERICAN AIRCRAFT CO.
LODI AIRPORT, DRAWER "B" ACAMPO, CA 95220
Tel - (209) 369-9126 FAX (209) 369-9143

© 1992 SUITCASE ULTRALIGHT is a registered™ of RAAC Inc. *On Credit Approval

GREAT XMAS GIFT!

ONLY \$19.95!



New electronic maintenance computer
Fits any car or truck.
Never "forget" again. CARE MATE provides audio and visual alerts to your car's maintenance needs. Simply set it to match your own driving habits. CARE MATE does the rest, monitoring 28 vital functions. App. 4"×4"×1".
No complicated installation necessary. Just insert batteries and affix to dash with materials provided.
Only \$19.95 plus \$4 shipping & handling.

Send check or money order to:
CARE MATE, INC.
3533 Deepwood Drive
Lambertville, MI 48144
Money back if not satisfied.

RACKLOCKER
CALL FOR FREE BROCHURE (408) 988-4002
IRONMASTER INC. SANTA CLARA, CA.



Lock Down Security Easy Opening



All Steel Construction 1200 LB. Lumber Rack

Now you can do something about the weather

Low as \$119

Our new Home Weather Station helps you plan your day, safeguard your family and property by alerting you to local weather conditions that often vary from distant forecasts.

Tells you to: Warn loved ones when wind chill threatens frostbite... Secure outside belongings against unexpected gusts... Protect plants when an alarm signals dangerous heat or cold... Increase watering when rainfall is too low—and much more.

Designed to far outlast all others, the ULTIMETER II gives you over 20 most-wanted features including:

- Wind Speed and Direction
- Temperature • Chill factor
- Alarms • Highs/lows/times/dates • Metric/English
- Quick-Mount (no tools) masthead mounting • Fast, easy "Point & Plug" direction calibration (pat. pending) • Optional self-emptying rain gauge • 30-day money back guarantee • One-year warranty • PLUS \$30 introductory savings:

Home Weather Station reg. \$179 ... only \$149
As above, without wind direction sensor \$119

Del. in US, add \$8.25 shipping & insurance. NJ res. add 6% tax.

VISA/MC phone orders: 800-USA-PEET (872-7338).
Or send check, m.o. or credit card no. and exp. date to:

PEET BROS. COMPANY 601-212M Woodland Rd.,
W. Allenhurst NJ 07711

Free Brochure *Our 17th Year* ©1992 Peet Bros. Co.

BUILD A BIKECAR

The Amazing Mini Car You Can Build with Bicycle Parts!
Electric Motor and Pedal Powered! Fun to Drive!
Easy to Build!

Save Gas! Have Fun!
SEND TODAY!
Card Orders
Send all Numbers
Exp. Date Separate

Fully Illustrated & Detailed
PLANS \$11.95
Satisfaction Guaranteed or Your Money Back. Check, M. Order
BIKECAR CORP. P.O. BOX 72, OCALA, FL 34478



NEW! WONDERWINCH RW4000

Patented technological breakthrough.
Motor inside drum for most compact 4,000 lb. utility winch.
12 volt or 24 volt.

Multiple Uses Include:

- Loading and general utility
- Light Duty self recovery
- Farm/ranch use.

Call: 1-800-283-9740

For the nearest dealer.



Ramsey Winch
PO Box 581510 • Tulsa, OK 74158

Worldwide Cable

CABLE TV DESCRAMBLERS

THE MOST ADVANCED TECHNOLOGY IN CABLE EQUIPMENT:

- BASE BAND
- JERROLD
- PIONEER
- TOCOM
- HAMLIN
- ZENITH
- SCIENTIFIC ATLANTA
- OAK

FOR OUT OF THIS WORLD PRICES CALL
WORLDWIDE CABLE
1 800-772-3233
FREE CATALOG AVAILABLE

1291-A POWERLINE RD., SUITE 109
POMPANO, FL 33069
MC / CDD / VISA No Florida Sales

CONVERTERS DESCRAMBLERS TEST MODULES

Se Habla Espanol
BEST WARRANTIES/BEST GUARANTEES
#1 IN CUSTOMER SATISFACTION
FOR FREE CATALOG OR TO ORDER CALL:

1-800-833-2915

For Technical Assistance or Information
call: 407-336-8538
NU-VUE ELECTRONICS
1861 Savage Blvd., #105, Port St. Lucie, FL 34953

Make \$25 to \$100 per hour

with **Badge-A-Minit**

Yes, it's really possible by making and selling bright colorful Badge-A-Minit buttons. Buttons are proven money-makers at fairs, conventions or anywhere people congregate. They're inexpensive, fast and easy to make with Badge-A-Minit!

Send for a FREE color catalog or order a Starter Kit, only \$29.95 plus \$2.95 shipping (IL residents add \$1.87 tax)

BADGE-A-Minit, Dept. PM1292, 348 North 30th Rd., Box 800, LaSalle, IL 61301, Phone 800-223-4103




What Is He Doing?

He's making a concrete flower pot... and so can YOU!

Make and sell your own ornamental concrete items. Order your book about 425 aluminum molds, prices and production trade secrets from the world's largest mold manufacturer.

Book only \$10

CONCRETE MACHINERY CO., INC.
P.O. Box A99, Hickory, NC 28603



Do-It-Yourself Kits

Factory Direct Clocks and Furniture
Also Assembled and Finished

- Grandfather Clocks, Mantel and Wall Clocks
- Curios, Tables, Chairs, Desks, Cradle...and more!
- Solid 3/4" Black Walnut, Cherry, or Oak
- Heirloom Quality
- Solid Brass West German Movements and Dials
- Money Back Guarantee



I am interested in
 Do-It-Yourself Kits
 Finished Clocks
 Finished Furniture

SEND \$1 FOR COLOR CATALOG

Name _____
Street _____
City _____
State _____ Zip _____
(Please Print)

EMPEROR CLOCK COMPANY
World's Largest Manufacturer of Grandfather Clock Kits
Dept. 4509, Emperor Industrial Park
Fairhope, Alabama 36532 • Phone 1-205-928-2316

MicroRacer Schuco

#1043

Formula Mercedes

For the first time in decades Schuco Micro-Racers (DIE-CAST, CLOCKWORK MOTOR CARS) are once again available! Here is the "Pocket Rocket", the fastest clockwork car in the world. Formula Racer is 4" long, weighs 5-oz., scale 1:45. Made of heavy die-cast metal, features: fast key-wind clockwork motor, brake lever and clutch for freewheeling, precision Micro-screw steering via knurled tailpipe, rubber tires and nose bumper. Colors: blue, red, green, yellow, silver - specify. Order #1043, \$45.00 + \$5.00 shipping from:

MC/Visa & Cod Call **1-800-821-5157**

DutchGuard, Dept. PM12
PO Box 411687
Kansas City, MO 64141



PRIME TIME CABLE COMPANY

CABLE TV DESCRAMBLERS

Converters, Accessories.

Name Brands • Great Service
Immediate Delivery
Lowest Prices

Call For **FREE Catalog: (800) 777-7731**

HIGH POWER .177 CAL. AIR GUNS

High Velocity Air Rifle w/ Scope
30 DAY MONEY BACK GUARANTEE

This sleek rifle is a real powerhouse with multi-pump action, rifled barrel, and a high power 4x15 scope.

The steel powered .177 cal. multi-action firing ensures extreme accuracy (includes 10 15 shot clips)

Call .45
\$49.95 ea.

ORDER NOW! 1-800-486-5971
or send cash, check or money order to:
FEDERAL ARMS • 1500 SELBY AVE. • ST. PAUL, MN 55104
OFFER GOOD WHILE SUPPLIES LAST



LEARN COMPUTERS!

Home study: become an expert with the personal computer for home or business use. Free literature: call 800-223-4542.

Name _____
Address _____
City _____ State _____ Zip _____

School of Computer Training, Dept. KP129
2245 Perimeter Pk., Atlanta, Georgia 30341





Last Chance At 92 Inventory
Save Up To 40%
25 x 39 30 x 41 40 x 59 60 x 139



FREE SIX MONTHS STORAGE
800-888-4606

BUILD YOUR OWN HELICOPTER!
From your backyard to open-sky adventure!

- Simple low-cost assembly • No license needed • Several helicopter kits & plans available

Helicopter Plans \$14.95
Intell. Experimental Book . . . \$11.95
All New Catalog/Kit Info. . . \$10.00
SPECIAL! All 3 items: Only \$19.95
add \$2 postage, Postage add \$3 S&H

HELICRAFT
P.O. Box 50
Riderwood, MD 21139

Credit card order line: 1-811-893-4300

GO KARTS LARGEST SELECTION DISCOUNT PRICES

FUN KARTS • MINIBIKES
ALL TERRAIN KARTS
ENGINES • KITS • PARTS

88 PAGE CATALOG \$39
Order the catalog by phone on VISA or MasterCard or mail \$3.00 to address below. Catalog sent by air Class Mail.

KW KART WORLD DEPT M PHONE
1488 MENTOR AVE., PAINESVILLE, OHIO 44077 (216) 267-5588

NOW! Get in on the PROFITS in SMALL ENGINE REPAIR

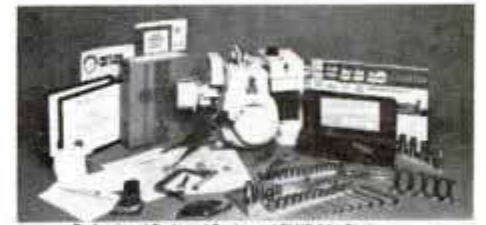
Work part time, full time — right at home — we help you every step of the way.

No doubt about it... as a small engine pro, you can cash in on the huge demand for qualified men in one of America's fastest growing industries. You'll be able to command top hourly rates of from \$25.00 to \$30.00 per hour — and that's just for labor.

Plenty of business waiting for qualified men. 65,000,000 Small Engines Are in Use Today!

That's the official count from the Engine Service Assn., and one-million new engines are being built each month. With Foley-Belsaw training, you can soon have the skill and knowledge to make top money servicing these engines.

Start your own money making business!



Professional Tools and Equipment PLUS 4 hp Engine
All YOURS TO KEEP . . . All at No Extra Cost.

NO EXPERIENCE NECESSARY!

You don't need to be a 'born mechanic' or have any prior experience. Lessons are fully illustrated . . . so clear you can't go wrong, and with our famous 'learn-by-doing' method you get practical 'hands-on' experience.

Foley-Belsaw Institute, 5301 Equitable Rd Dept. 52189, K.C., MO 64120

YES, please send me the FREE booklet that gives full details about starting my own business in Small Engine Repair. I understand there is No Obligation and that No Salesman will call on me.

FREE BOOKLET! Send for your copy today!

NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____

WHY RENT? SAVE! SAVE!

CABLE TV DESCRAMBLERS
JERROLD • OAK • HAMLIN • ZENITH
PIONEER • SCIENTIFIC ATLANTA
READY-TO-SHIP!
6 MONTH WARRANTY! ABSOLUTELY LOWEST WHOLESALE / RETAIL PRICES!
MASTER CARD • VISA • AMEX • C.O.D.
FREE COLOR CATALOG!
1 (800) 950-9145

JP VIDEO 1470 OLD COUNTRY ROAD, STE-315
PLAINVIEW, NY 11803
NO NY SALES - PM

DOPPLER TECHNOLOGIES
STEALTH 2000
"MAKES ANY VEHICLE ELECTRONICALLY INVISIBLE TO POLICE RADAR"

S-2000 ONLY \$199.00 REG. \$299.00

100% NO TICKETS GUARANTEE
Call for details

- 100% LEGAL
- OPERATES ON X, K, AND KA BANDS
- UTILIZES STATE OF THE ART "PASSIVE RE-RADIATION" TECHNOLOGY.
- PROTECTS FROM ALL INSTANT ON RADAR

ORDER TOLL FREE: 1 (800) 374-4001

DOPPLER TECHNOLOGIES
P.O. BOX 2061 • STILLWATER, MN 55082-0968

FREE STUFF!!!

Amazing directory reveals hundreds of manufacturer and government giveaways you can get **FREE FOR THE ASKING!!!**

Sports items, auto care, hobby & craft kits, stamps, novelties, cards and more. For your exciting sample issue rush \$5.00 to, or subscribe: 1 yr/4 issues only \$14.50, 2 yrs/8 issues \$24.95.

FREEBEE MAGAZINES,
715 Main Street, Suite 3P, Buffalo, NY 14203-1321

WOOD HEAT

WOOD FURNACES
HEAT YOUR ENTIRE HOME
Call 1-218-326-6786 or Write
Charmaster®
2307A HWY 2W.
GRAND RAPIDS, MN 55744

GREAT ENCOURAGEMENT FOR SHIPWRIGHTS!

All gentlemen shipwrights who want to provide for themselves amusement and satisfaction through the traditional craft of ship modeling, an opportunity now offers to acquire, through the minimal cost of one Colonial Dollar (\$1.00) a catalogue of fine ship model kits.

Send \$1.00 for a catalog to:
MODEL EXPO, Inc. Dept. PM13
PO Box 1000, Mt. Pocono, PA 18344

FLUSH UP TOILET
To Above Floor Drain
Install It Yourself - Anywhere
No Digging Up Floors
Write McPherson, Inc., Dept. 16
Box 15133, Tampa, Florida 33684

CABLE TV "BOXES" WHOLESALE PRICES!

CONVERTERS • DESCRAMBLERS
REMOTE CONTROLS • ACCESSORIES

CALL FOR A CATALOG NOW!

—BEST PRICES—
—BEST WARRANTIES—
—IMMEDIATE SHIPPING—
—CREDIT CARD OR COD—

LAKE SYLVAN SALES, INC.
SORRY, NO MINNESOTA SALES

1-800-800-4582

CALL US FIRST - YOU'LL CALL US LAST!

FRICION WEDGE™
ENGINE TREATMENT

SUPER CONCENTRATED WITH DuPONT TEFLON™

PATENTED PROCESS POSITIVELY (+) CHARGES TEFLON PARTICLES, FOR EVEN INTERNAL COATING!

ONE-TIME TREATMENT GUARANTEED 70,000 MILES OF PROTECTION

The easiest, most economical way to:
INCREASE MPG ★ REDUCE EMISSIONS
MORE HORSEPOWER ★ EASIER STARTS
LONGER ENGINE LIFE ★ LOWER TEMPERATURE
★ QUIET A NOISY ENGINE ★

FOR INFO CALL: **1-800-886-8860**
TO ORDER, SEND **\$24.95** TO:
COMPULINE CORP.,
2 CARLTON AVE., E. RUTHERFORD, NJ 07073

NAME _____
ADDRESS _____
CITY/ST/ZIP _____
PHONE _____
 check MO visa master card
card # _____ exp. date _____

CABLE T.V. EQUIPMENT
Why Pay High Rental Fees?

Replacements for all models. 60 day unconditional money back guarantee. Low Prices. Ship within 24 hours. S&AE for free catalog. Visa, MC, COD. Let our experience work for you.

1-800-243-3967
SKYLINE SYSTEMS INC.
114 S. Euclid Ave.
Park Ridge, IL 60068

LEARN GLASS REPAIR
EARN \$90 AN HOUR!

REPAIR CRACKED WINDSHIELDS FOR PENNIES
CALL NOW! FREE BOOKLET: 800-695-6294

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

NVS CORPORATION • OPTICLER SYSTEMS
DEPT. PM, 48 SPRINGVALE AVE., LYNN, MA 01904



**What
Makes Us
Better,
Makes
You
Stronger.**

Call NordicTrack today to find out how our new strength trainer is 5 ways better than Soloflex®.

NordicFlex Gold™ offers patented isokinetic resistance to help you build a better body... a stronger body. Take advantage of the superior linear motion, expert training materials and workout convenience of NordicFlex Gold.

Best of all, it costs 1/3 less than Soloflex®.

Plus, the NordicFlex World-Class™ Edition offers additional features to enhance your performance including Power Meter electronics.

30-day in-home trial

NORDIC FLEX Gold



To Order **1-800-445-2360**
or for more information, call Ext. 0K1L2

or write: NordicTrack, Dept. 0K1L2
104 Peavey Road, Chaska, MN 55318

© 1992 NordicTrack, Inc., A CMI Company • All rights reserved.
Soloflex is a registered trademark of Soloflex, Inc.

**STORAGE BUILDINGS
WORKSHOPS & MORE
MANUFACTURER DIRECT
LIMITED OFFER**



**EASY DO-IT-YOURSELF CONSTRUCTION
PACKAGES INCLUDE STEEL
FRAMES, SHEETING AND HARDWARE**

30 x 36
Value \$6,181
NOW \$3,169

36 x 48
Value \$9,763
NOW \$5,016

40 x 60
Value \$13,942
NOW \$7,293

46 x 72
Value \$18,875
NOW \$10,316

Some Other Sizes Available

MIRACLETRUSS®

1-800-843-8275
FAX 612-544-1835

Made in America

PM

OWN A MACHINE SHOP

Do your own machining and shop work with a Smithy 3-in-1 Lathe • Mill • Drill



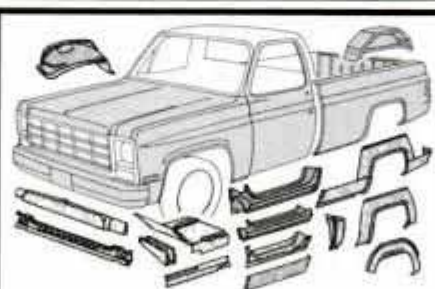
FIX IT YOURSELF!

Easy to use!
Save Money!
Save Time!
As low as \$995



For FREE Fact Kit
Call:
1-800-345-6342
(Ask for operator PM)

or write:
Smithy Dept PM
Lathe • Mill • Drill
3023 E. 2nd Street
The Dalles, OR 97058



STEEL RUST REPAIR PARTS

Restore your car, van or truck to showroom condition with TABCO parts. Over 100,000 domestic and foreign parts, available for immediate delivery.

Send \$5 for illustrated, 150-page catalog with instructions to install TABCO parts. Refundable with order. Shipped 1st Class. Dealer inquiries invited.

TABCO (216) 248-5151
FAX (216) 248-8979

30500 Solon Industrial Pkwy. Dept. PM Cleveland, OH 44139

**MAKE UP TO
\$26.00 an HOUR**

**START YOUR OWN
MONEY MAKING BUSINESS**

Hundreds of FOLEY-BELSAW trained men have succeeded in this fascinating and highly profitable field...

You Can Do It Too! ... BE A

LOCKSMITH

**FREE
BOOKLET**



Never before have money-making opportunities been so great for qualified Locksmiths. Now lucrative regular lock and key business has multiplied a thousandfold as millions seek more protection against zooming crime. Yet there's only one Locksmith for every 17,000 people! Train FAST at Home — Collect CASH PROFITS Right Away. You're in business ready to earn up to \$26.00 an hour a few days after you begin Foley-Belsaw's short-cut training. Take advantage of today's unprecedented opportunities in Locksmithing for year-round EXTRA INCOME in spare time — or full time in a high-profit business of your own. Hundreds we've trained have done it. So can YOU! All tools plus professional Key Machine given you with course. These plus practice materials and equipment, plus simple, illustrated lessons, plus expert supervision, plus business-building guidance will enable you to KEEP THE MONEY COMING IN! Ideal for retirement — good jobs, too.

SEND FOR EXCITING FACTS — NO OBLIGATION!
PRO KEY MACHINE YOURS TO KEEP FREE

This machine can add up to \$200 a month to your income... it won't cost you a penny extra with your training.

FIND OUT ABOUT IT
RUSH COUPON TODAY

There is NO OBLIGATION • NO SALESMAN Will Call... ever!

FREE FOLEY-BELSAW INSTITUTE
8301 EDGEMOOR RD., DEPT. 12222
KANSAS CITY, MO. 64123
PLEASE RUSH FREE BOOK "Keys To Your Future"

NAME _____
ADDRESS _____
CITY-STATE-ZIP _____

SEND FOR
YOUR COPY
TODAY!

**30 DAY NO
RISK TRIAL**

ALL SPECIAL TOOLS
AND EQUIPMENT
INCLUDED



FOLEY-BELSAW INSTITUTE
8301 EDGEMOOR RD., DEPT. 12222
KANSAS CITY, MO. 64123

Affordable, Personal HELICOPTER

- Easy Start in One Week
- 40 mph Top Speed
- No Airplane!

Revolution Helicopters
11111 E. 1st Ave. Suite 100
Denver, CO 80231
ORDER NOW!
Minimum Order \$10,000
(816) 792-1011

Complete Info Package \$18
1 1/2 Hour Action Video \$20
PAL, Hi-Fi Stereo Video \$45
*Shipping orders over \$100 free

**Mini
500**

CONCRETE DOME KIT

Build Your Own...
• House • Shop • Office • Store

Concrete Domes Are...
• Super Strong • Energy Efficient
• Cost Efficient • Permanent

Monolithic Constructors, Inc.
PO Box 479 • Italy TX 76651

**Info Pak
VIDEO/BROCHURE
\$19.95**

TELESCOPES? WHY PAY MORE FOR LESS?

8" Astronomical Telescope Complete
Ready-to-use. Only \$275. Other
sizes available. Send for free
34-page packet & telescope tester

COULTER OPTICAL, INC. P.O. Box K, Dept. P.M.
Loylwild, CA 92549 Phone (714) 659-4621

Automate Your Home

Voice Command, Wireless Remote, Telephone and
Automated Control for hundreds of devices in your home

Unique Phone, PC, Security, Surveillance, Audio/Visual, products.
Unusual gift ideas for the person who has everything.

Free catalog: 1(800) SMART-HM (714) 642-6610
Home Automation Systems
21 Seaside Dr., Newport Beach, CA 92663

**WATER BALLOON LAUNCHER
120 YARDS!! ONLY \$12**

• FANTASTIC OUTDOOR FUN FOR ALL AGES
TO ORDER: Call Toll Free
1-800-441-1047
VISA/MC — or send check to:
BLASTER — 13218 Jessica Dr., Spring Hill, FL 34808
Every Order Shipped Next Day!
Made in U.S.A. \$3.00 P & H **MONEY BACK GUARANTEE**

TV DESCRAMBLERS

BEST BUYS BEST SERVICE

BULLET PROOF
CABLE TV TESTED
Call or send for your FREE
Wholesale catalog:
Multi-Vision Electronics
2730 So. 123rd Ct. #108
Omaha, NE 68144
1-800-835-2330

Steam Models

"FASCINATING WORKING STEAM MODELS"
Complete "WILSON & MANN" line. Over 100 different models. Trains, Marine Cars, Trucks, Stationary Fire Engines & Accessories. Stunning, large 34 page colored Catalog \$6.95 Refundable.
SALES • PARTS • SERVICE
LARGE DISCOUNTS
PHONE: 813-475-1171
YESTERYEAR TOYS & BOOKS, INC.
Dept. W-8 Box 537 Alexandria Bay, NY 13607

**VOLKSWAGEN
RESTORATION PARTS**

■ BUG ■ GHIA ■ TYPE 3 ■ BUMROOF
■ BUS ■ RABBIT/GOLF ■ CONVERTIBLE

FREE CATALOG
WEST COAST METRIC, INC.
(800) 247-3202
FAX (310) 325-9733
24002 FRAMPTON AVE., PM
HARBOR CITY, CA 90710

Great money in VCR repair!

Home study. Learn high-profit repairs
without investing in high-tech instruments.
FREE BOOKLET: 800-223-4542.

Name _____
Address _____
City _____ State _____ Zip _____

The School of VCR Repair, 2245 Perimeter
Park, Dept. VP129, Atlanta, Georgia 30341

STATEMENT OF OWNERSHIP

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Required by 39 U.S.C. 3685). 1A. Title of publication: Popular Mechanics. 1B. Publication No.: 530-390. 2. Date of filing: Oct. 1, 1992. 3. Frequency of issue: Monthly. 3A. No. of issues published annually: 12. 3B. Annual subscription price: \$15.94. 4. Complete mailing address of known office of publication: 224 West 57th Street, New York, New York 10019. 5. Complete mailing address of the headquarters of general business offices of the publisher: 959 Eighth Avenue, New York, New York 10019. 6. Full names and complete mailing address of publisher, editor, and managing editor: Publisher: The Hearst Corporation, 959 Eighth Avenue, New York, New York 10019. Editor: Joe Oldham, 224 West 57th Street, New York, New York 10019. Publisher: Robert B. Dillingham, 224 West 57th Street, New York, New York 10019. 7. Owner: The Hearst Corporation, principal office, 1209 Orange Street, Wilmington, Delaware 19801-Stockholders owning or holding 1 percent or more of total amount of stock of The Hearst Corporation are: Trustees of Trust created under the Will of William Randolph Hearst, Deceased, namely: Frank A. Bennack, Jr., Millicent Hearst Boudjadjji, John G. Conomikes, Richard E. Deems, George R. Hearst, Jr., John R. Hearst, Jr., Randolph A. Hearst, William R. Hearst, Jr., Harvey L. Lipton, Frank Massi, Gilbert C. Maurer, Raymond J. Petersen, J. Kingsbury-Smith, the address for all of the foregoing being 959 Eighth Avenue, New York, New York 10019. Those having a beneficial interest in the Trust mentioned above are: William Randolph Hearst, Jr., Phoebe Hearst Cooke, George R. Hearst, Jr., Randolph Apperson Hearst, David Whitmire Hearst, Jr., Millicent Hearst Boudjadjji, John Randolph Hearst, Jr., William Randolph Hearst, II, Joanne Hearst Lawrence and Deborah Hearst Gay. 8. None. 9. For completion by nonprofit organizations authorized to mail at special rates (Section 423.12 DMM only) The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes (Check one) Has not changed during preceding 12 months. Has changed during preceding 12 months. (If changed, publisher must submit explanation of change with this statement.) 10. Extent and nature of circulation. A. Total no. copies (net press run): Average no. copies each issue during preceding 12 months, 2,008,926; actual no. copies of single issue published nearest to filing date, 2,021,475. B. Paid and/or requested circulation: 1. Sales through dealers and carriers, street vendors and counter sales: Average no. copies each issue during preceding 12 months, 254,768; actual no. copies of single issue published nearest to filing date, 240,163. 2. Mail subscription (paid and/or requested): Average no. copies each issue during preceding 12 months, 1,363,912; actual no. copies of single issue published nearest to filing date, 1,384,800. C. Total paid and/or requested circulation (Sum of 10B1 and 10B2): Average no. copies each issue during preceding 12 months, 1,618,680; actual no. copies of single issue published nearest to filing date, 1,624,963. D. Free distribution by mail, carrier or other means samples, complimentary, and other free copies: Average no. copies each issue during preceding 12 months, 34,842; actual no. copies of single issue published nearest to filing date, 27,000. E. Total Distribution (Sum of C and D): Average no. copies each issue during preceding 12 months, 1,653,522; actual no. copies of single issue published nearest to filing date, 1,651,963. F. Copies not distributed: 1. Office use, left over, unaccounted, spoiled after printing: Average no. copies each issue during preceding 12 months, 9,658; actual no. copies of single issue published nearest to filing date 9,267. 2. Return from News Agents: Average no. copies each issue during preceding 12 months, 345,746; actual no. copies of single issue published nearest to filing date 360,245. G. Total (Sum of E, F1 and 2-should equal net press run shown in A): Average no. copies each issue during preceding 12 months, 2,008,926; actual no. copies of single issue published nearest to filing date, 2,021,475. 11. I certify that the statements made by me above are correct and complete. Signature and title of Publisher: Robert B. Dillingham.

STATEMENT OF OWNERSHIP

SHOP - TASK

MILL • LATHE • DRILL
The Original Home Machine Shop
Designed in USA by Shoptask



3 Models to Choose
Best quality, best price
3 Axis Power Feed Available
12 Month Warranty
100% Parts Supply
All Tooling Available

17" Swing
11 x 18 Mill Table

1-800-343-5775

FREE CATALOGUE

DEMAND THE BEST

SHOPTASK P.O. BOX 7531-TACOMA, WA 98407
SINCE 1981

PROFESSIONAL MACHINIST TOOL SET



ONLY \$79.50

(\$125.00 value)

INCLUDES:

1" Micrometer with carbide faces, .0001" reading, 6" dial caliper with .001" rev reading and 4-way measurements and a 6" chrome plated rule from one of America's leading manufacturer's of measuring tools.

MONEY BACK GUARANTEE

Call Toll Free
1-800-594-9077

MULTI TOOL & SUPPLY, INC.
423 W. California St.
Ontario, CA 91762

***** PRESENTING *****

CABLE TV DESCRAMBLERS

***** STARRING *****

JERROLD, HAMLIN, OAK

AND OTHER FAMOUS MANUFACTURERS

• FINEST WARRANTY PROGRAM AVAILABLE
• LOWEST RETAIL/WHOLESALE PRICES IN U.S.
• ORDERS SHIPPED FROM STOCK WITHIN 24 HRS.
• ALL MAJOR CREDIT CARDS ACCEPTED

FOR FREE CATALOG,
ORDERS & INFORMATION 1-800-345-8927

PACIFIC CABLE CO., INC.
7325 1/2 Reseda Blvd., Dept. 1769
Reseda, CA 91335

Earn \$4,000 Per Month From Your Home With A Computer!



Begin part-time and still retain the security of your present position. We offer 20 services you can perform for your community from your home. No experience necessary—easy to learn. We provide training and computer. For FREE explanation cassette and literature call:

1-800-343-8014, ext. 532
Computer Business Services, Inc.

Remove Rust FAST!

Glass Bead Cabinet 34" w x 22" d

Removes rust, paint and scale from hard to reach pitted areas and crevices with no damage to metal. Leaves a satin factory finish. 23" h work area - plenty of room to clean small parts, wheels, tools, guns, toys, etc. Powerful trigger gun blasts sand, glass bead or any other abrasive-recycles automatically. Works on any 3 HP air compressor (5HP is better). FULLY ASSEMBLED except bolt on legs and funnel. Includes 24" gloves, 12"x24" lens, 3 nozzles.

7cfm @ 80psi air required.

\$349 Free UPS U.S. 48

Accessory Kit.

Huge 45" high, 85cfm vacuum to remove dust, (or you can use your shop vac), light kit (mounts in cab), 25 lbs. abrasive, 5 extra nozzles. Reg. \$266.25. Special price w/780 purchase. \$189

TIP SHIPS QUICK

Order by Mail or 1 800 321-9260 for fast delivery.

30 Day Unconditional Money Back Shop Trial.

Ship to: Name _____

Address _____

City _____ St _____

Zip _____ Phone _____

Visa Mastercard Check/Money Order

Card No: _____ Exp. _____

FREE 100 Pg. Catalog

780 Cabinet (FREE UPS-US 48) \$349

H-179 accessory kit (FREE UPS-US 48) ... \$189

UPS shipping-U.S. 48 States. Order manufacturer direct: TIP SANDBLAST EQUIPMENT, Dept PM,

7075 Rt. 446, PO Box 649, CANFIELD, OH 44406



12-20 gauge steel. Made in USA

\$349

Your air hose

Order by Mail or 1 800 321-9260 for fast delivery.

30 Day Unconditional Money Back Shop Trial.

Ship to: Name _____

Address _____

City _____ St _____

Zip _____ Phone _____

Visa Mastercard Check/Money Order

Card No: _____ Exp. _____

FREE 100 Pg. Catalog

780 Cabinet (FREE UPS-US 48) \$349

H-179 accessory kit (FREE UPS-US 48) ... \$189

UPS shipping-U.S. 48 States. Order manufacturer direct: TIP SANDBLAST EQUIPMENT, Dept PM,

7075 Rt. 446, PO Box 649, CANFIELD, OH 44406

MAIL THIS COUPON FOR FREE FACTS! GET A DEGREE AT HOME

50 ways ICS can help you get a better job

Rush free facts and color brochure on how I can train at home for the career I have chosen. I understand I am under no obligation and no salesman will visit me. CHECK ONE BOX ONLY!

ASSOCIATE IN SPECIALIZED BUSINESS DEGREE PROGRAMS

- Business Management
- Accounting
- Business Management with option in Finance
- Business Management with option in Marketing
- Applied Computer Science
- Hospitality Management

ASSOCIATE IN SPECIALIZED TECHNOLOGY DEGREE PROGRAMS

- Mechanical Engineering Technology
- Civil Engineering Technology
- Electrical Engineering Tech.
- Industrial Engineering Technology
- Electronics Technology

CAREER DIPLOMA PROGRAMS

- Computer Programming
- Computer Programming/COBOL
- Personal Computer Specialist
- Computer-Assisted Bookkeeping
- High School Bookkeeping
- Secretary
- Medical/Dental Office Assistant
- Legal Secretary
- Fashion Merchandising
- Hotel/Restaurant Management
- Auto Mechanics
- Child Day Care
- Legal Assistant
- TV/VCR Repair
- Surveying & Mapping
- Catering/Gourmet Cooking
- Fitness & Nutrition
- Small Business Management
- Drafting
- Air Conditioning & Refrigeration
- PC Repair
- Electronics
- Travel Agent
- Police Sciences
- Private Security Officer
- Art
- Wildlife/Forestry Conservation
- Animal Care Specialist
- Diesel Mechanics
- Electrician
- Interior Decorating
- Motorcycle Repair
- Gun Repair
- Photography
- Journalism/Short Story Writing
- Dressmaking & Design
- Florist
- Teacher Aide

Name _____ Age _____

Address _____ Apt. # _____

City/State _____ Zip _____

Phone (_____) _____

ICS International Correspondence Schools
Dept. APBS82S, 925 Oak Street, Scranton, PA 18515

SURVEILLANCE

COUNTERMEASURES Electronic Devices

Miniature Transmitter Kits.. \$29.95 & up Voice Changers, Vehicle Tracking, Touch Tone Decoders, Phone Scramblers, Phone Recording Systems, Bug & Phone Tap Detectors!

CALL IDENTIFIER device • displays callers phone number, stores phone number with date & time of call...\$49.95 & up

FOR CATALOG SEND \$5.00 TO...
P.O. Box 337, Buffalo, NY 14226 (716) 691-3476

Two day flight instruction course available to all. Feel the Thrill... Fly an "AIR COMMAND" **GYROCOPTER**

- * ULTRALIGHT, NO LICENSE REQUIRED
- * CRUISE 63 MPH, SLOW FLY 8 MPH
- * TAKE OFF 150' LAND IN 15'
- * SINGLE AND TWO SEAT MODELS
- * SLEEK FIBERGLASS CABIN OPTIONS
- * GARAGE STOWABLE, CAR TOWABLE
- * 1,000+ QUICK FIT KITS SOLD

25060 HANCOCK AVE., Suite 103-300 MURRIETA, CA 92562

CATALOG \$10
VIDEO \$20
OR BOTH \$25
NO C.O.D.'s

AEROSTAR CA

POCKET WORK SHOP

Contains: Fish scaler, file & rule, 4 screwdrivers, sharp knife, wirecutters, awl punch, pliers & can opener.

LIMITED SUPPLY.

Send \$19.95 + \$3.00 S&H to:

Sharon Ent., Box 2452, Brandon, FL 33509
Florida residents add 6.5% sales tax



VISA **CABLE T.V. DESCRAMBLERS** MasterCard

---LOWEST PRICES--- CNC Concepts Inc
P.O. Box 34503
-Money Back Guarantee- MPLS, MN 55449

BIG SALE 9-5 CST MON-FRI

Please have MODEL used in your area when calling
DEALERS WANTED EARN EXTRA \$\$\$

1-800-535-1843

FREE Satellite TV Buyers Guide/Catalog

1-800-350-0256
(805) 652-0255
FAX: (805) 652-2190

2316 Channel Dr. Ventura CA 93003

WYDE-EYE

IMPROVE YOUR TV, VCR & STEREO'S REMOTE PERFORMANCE BY 150%

Easily attaches to any appliance in seconds
Allows the remote to be used from almost any angle in the room

Only \$4.95 plus \$1.05 S&H to:
South Hills Electronics, Suite 293 Dept. PM4
130 Skyline Drive, Ringwood, NJ 07456

Heavy-Duty Van Ladder Rack

*Hot dipped galvanized
*Multiple crossbars
*One piece truss sides
*Standard rack has 500# capacity, H.D bracket kit increases capacity to 750#

\$199⁹⁵

Complete Catalog of commercial van & pick-up truck racks, equipment, security boxes, and accessories \$3.00 refundable order

KEYSTONE VAN & EQUIPMENT CO.
1 800 551-8449

SKELETON KEY

FITS MOST LOCKS (bottlocks, doorlocks, & some padlocks)
Amaze Your Friends
With A Lock Picking Demonstration.
You get 3 sized tension keys, the slide pick & precise instructions.
OBEY: this device is to be used for demonstration purposes only.
Satisfaction Guaranteed or Full Refund

To get this powerful & exciting kit send only \$9.75 to & allow 2 weeks from
Safe Marketing Co * 90 W. Montgomery Av Dept 366PM * Rockville, Md 20850

BE A LOCKSMITH

EARN WHILE YOU LEARN—SEND FOR FREE BOOK
Big opportunities. Big profits. Earn quickly. Full or part time. Learn at home, it's easy. Do real jobs while you learn. All Tools—Materials Supplied. Approved by NJ Dept. of Education. Send name and address for FREE book. No salesman will call.

LOCKSMITHING INSTITUTE CTI COMMERCIAL TECHNICAL INSTITUTE
Div. Commercial Technical Institute
116 Fairfield Road, Fairfield, NJ 07004
Dept. 110-122

Men — Don't have unprotected

DIVORCE!

Get extensive help from —
MEN'S RIGHTS ASSOCIATION
17854 Lyons Forest Lake, MN 55025
\$3 brings info & newsmagazine

CRACK REPAIR OVER A FOOT LONG

PATENTED PROCESS HUGE DEMAND! JUST LOOK AROUND YOU

Be Your Own Boss **Ultra B-O-N-D, Inc.** Determine Your Own Future

1 (800) 347-2820
11151 Pierce Street, Riverside CA 92505

CORVAIR

Hot Rod, Buggy, or Stock. We stock OVER 8000 parts in our GIANT 400 page illustrated catalog: Rushed - \$5.00
CLARK'S CORVAIR PARTS, INC.
Rt 2, Box PM, Shelburne, Ma. 01370
(413)625-9776

SINGERS! REMOVE VOCALS! Unlimited Backgrounds™

From Standard Records & CD's with the Thompson Vocal Eliminator™ Call for Free Catalog & Demo Record.
Phone: (404)482-4189 Ext 61
Singer's Supply, Dept PM-1
7986 Hightower Trail
Lithonia, GA 30058
24 Hour Demo/Info Request Line (404)482-3485 Ext 61
Singer's Supply - We Have Anything & Everything For Singers

ANY NAME ST

Genuine street sign with any name (max 10 letters)
For childrens rooms, garage, parking space or den.
Great gift. Aluminum sign 6" x 30" white on green.
\$24.95 Call 1 800 235 6646 ext 581 Visa/MC
Allow three weeks for delivery

ADVERTISEMENT

WORTH WRITING FOR

615 NOTHING LIKE IT ON THE MARKET

Ryobi's BT3000 Precision Woodcutting System is an extraordinary table saw that's dramatically different in concept. It combines the performance of a stationary tool with the convenience of a portable table saw. Advanced engineering offers more features, greater precision and more versatility than any other tool in its price range. Free Brochure

616 FILTRETE

3M Filtrete (TM) High Efficiency Clean Air Filters remove 97% of dust, pollen and mold that circulates in your home. They clean the air 20 times more effectively than ordinary furnace/AC filters. Brochure \$1.00

617 GENIE GARAGE DOOR SAFETY GUIDE

A valuable guide to protecting your family and personal belongings. Explains the ins and outs of garage door opener maintenance. From Genie. Free

618 SMART LEVEL

Smart Level reads all angles — not just level and plumb — making jobs that involve stairs, roofs and drainage simpler. Digital display provides decimal point precision and can be recalibrated to factory perfect accuracy with the touch of a button. Color brochure describes this versatile, professional level. Free

619 WINDOW AND PATIO DOOR FACTBOOK

Full-color brochure provides information on custom combinations, planning a project, choosing a contractor, and much more from Andersen Windows, Inc. Free

620 STARTING YOUR ENGINE

Slick 50 Engine Formula, from Petrolon, Inc., protects car and light truck engines against wear at start-up. A single application treats metal surfaces of moving engine parts directly with super-slippery PTFE. Independent lab tests have shown that

Slick 50 reduces engine wear by 50 percent for 50,000 miles. Free Brochure

621 GLOCK INC.

Hailed by police and sport shooters alike, find out why the remarkable Glock pistols are setting new standards for handgun simplicity, reliability, cost effectiveness and safety. Send for the Glock semi-automatic, safe-action pistols and accessories catalog and also receive "The Basic Rules of Firearm Safety" booklet. Free

622 GIFTS FOR HER

You've sent flowers. You've bought candy. You've considered lingerie, but... Introducing GIFTS FOR HER. An eight page collection of elegant romantic lingerie from Guy Laroche Paris... Choose from a list of over 100 participating stores. 1-800-Hotline also available. Or order directly from the catalogue itself. Buying lingerie for her has never been easier. \$1.00

623 MANNINGTON VINYL FLOORING

Mannington Gold (TM) looks beautiful and acts beautifully. And it's so tough and durable that it's the only floor with the No Questions Asked (TM) Guarantee. If during the first year, you're dissatisfied with your floor, Mannington will replace it free. Send for warranty details and a color brochure with Mannington Gold Floors. \$1.50

624 A BETTER WAY TO BUILD A FLOOR

The Silent Floor® system from Trus Joist MacMillan is a beautiful alternative to bumpy, squeaky floors. Brochure explains how The Silent Floor® system is engineered and guaranteed to stay flat, solid and quiet for the life of your home.

625 HOBBYIST CATALOG

Edmund Scientific's 112 page catalog contains over 3,200 products for the hobbyist, gadgeteer, and educator - featuring telescopes, weather instruments, fiber optics, magnifiers, high-tech science toys, plus many items suitable for science-fair projects. Free

Popular Mechanics 12/92
Box 1718, Sandusky, Ohio 44871-1718

This Coupon Expires February 28, 1993

Please see that I receive the items checked below

- | | | |
|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> 615 | <input type="checkbox"/> 619 | <input type="checkbox"/> 623 \$1.50 |
| <input type="checkbox"/> 616 \$1.00 | <input type="checkbox"/> 620 | <input type="checkbox"/> 624 |
| <input type="checkbox"/> 617 | <input type="checkbox"/> 621 | <input type="checkbox"/> 625 |
| <input type="checkbox"/> 618 | <input type="checkbox"/> 622 \$1.00 | |

Total money for priced items \$ _____

Service Charge \$ 1.00

Total money enclosed \$ _____

Total items requested _____

Name (Please Print) _____

Address _____

Town _____

State _____

Zip Code _____

(Please send cash, check or money order made out to POPULAR MECHANICS. No stamps, please)

Note: Popular Mechanics processes your requests for the above information and forwards these inquiries to the organization making the offer. Each company mails the material directly. Your order will be on its way to you within 90 days.

CLASSIFIED ADVERTISEMENTS

Dorothy Nolan, Classified Manager

Karen O'Rourke, Asst. Classified Manager

Rates: \$10.20 per word. 10 word minimum.

Bold Face Type—\$1.00 extra per word. (First word automatically set in Bold Face Type). **Gray Background**—Flat rate of \$50.00 per advertisement. **Centered Headlines** (5 words or less)—\$50.00 per line. Our **FEBRUARY** issue closes on **DECEMBER 4TH**. (On sale date is **JANUARY 12TH**). All advertising is payable in advance by check, money order or credit card. Advertisers wishing to charge their MasterCard, American Express or Visa accounts, please be sure to include number and expiration date. Send order and remittance payable to: Popular Mechanics, Classified Advertising, 224 West 57th Street, New York, NY 10019. Be sure to indicate classification under which advertisement is to appear.

Advertisers using a P.O. Box number must furnish complete name and street address for our records. To avoid delay in the publication of your advertisement, please send samples and descriptive materials with your request if your advertisement does not state clearly what is being offered. For additional advertising information call 1-212-649-3167 or FAX: 1-212-586-5562.

**PLEASE NOTE: WE HAVE 142 CLASSIFICATIONS TO CHOOSE FROM.
FOR OUR LIST WRITE TO ADDRESS ABOVE AND REQUEST OUR ORDER FORM.**

PUBLISHER'S MART BOOKS & PUBLICATIONS

PUBLISH YOUR POEM! Join other successful writers. Satisfaction guaranteed. **PUBLISHER PROVIDES COMPLETE, SIMPLE INSTRUCTIONS.** \$4.00. Order now! Robert Lee Publications, Dept. PM, RR1 Box 725, Lake Luzerne, NY 12846.

JFK Assassination Solved? \$3 and **SASE:** Lancer, Box 56, Loxley, AL 36551

FALSE CHILD ABUSE ALLEGATIONS, Pat Patterson, Box 472pm, Monrovia, CA 91017.

"SHARPENERS REPORT" Monthly Newsletter. Valuable Tips—Sources—Buy/Sell Used Equipment. Free Brochure. Skog Company, Dept. PM12, P.O. Box 22559, Minneapolis, MN 55422

"ANARCHIST COOKBOOK" Available again! \$25, delivered. Barricade Books, Box 1401-X, Secaucus, NJ 07096.

FUEL FROM WATER. Energy independence with hydrogen. Amazing free report. Merit, Box 694, Louisville, KY 40201

900 NUMBERS MAKE MONEY! Outstanding guidebook, free recorded details 1-800-369-1410.

FREE BOOKLETS: Life, Death, Soul, Resurrection, Pollution Crisis, Hell, Judgment Day, Restitution. Bible Standard (PM), P.O. Box 67, Chester Springs, PA 19425.

BLUEPRINT READING MADE EASY - Book #AR-71-5 from Business News Publishing, \$31.95. To order, call 1-800-837-1037.

FREE, interesting, illustrated self-improvement book catalog. Long **SASE** to: Mike Powers, P.O. Box 20363, Roanoke, VA 24016

INTERESTING BOOK. "How To Land An Airplane For The Non-Pilot." Pictures, Diagrams. \$9.95. Albers, P.O. Box 1613, Alexandria, VA 22313

HOW TO OBTAIN ACCREDITED COLLEGE DEGREES FROM MAJOR UNIVERSITIES THROUGH MAIL. \$9.95. C. Roger Cooper, P.O. Box 677265, Orlando, Florida 32867-7265.

SURVIVAL, survive disasters, \$2.00 **SASE** for booklist: Box 73, North Bend, OR 97459

INVESTIGATORS Information Sources. Reverse Directories. Unlisted Phone Numbers. Tracing Auto License Plate Numbers. Skip Tracing. 300 Sources. \$12.95 Plus \$2.50 S/H. Griffen Publications, 22335 Marine View Drive So., Suite 268, Des Moines, WA 98198

HOW TO PROFIT DURING THE COMING ECONOMIC AVALANCHE! Free Information: Freedom Quest, 4305 Harrison Blvd., Suite 276-PM, Ogden, Utah 84403.

CAMCORDER TIPS for holidays, weddings, anytime. \$3 to: DPG InfoServices, 5110 Ridgefield, Suite 108-222, Bethesda, MD 20816

LIVE Twice As Good On Half The Money. Guaranteed. Infosource, 4047 Lelah Lane P.M.D., Millington, TN 38053

55 ANSWERING MACHINE SCRIPTS and TIPS, home and business. \$5.00 ANSWER4ME, Box 92206, Lakeland, FL 33804-2206.

MATH, ALGEBRA, STUDY SKILLS Workbooks, \$11.95 each. **COLLEGE TEACHER,** Box 3477, Littleton, CO 80161-3477

REPUBLICAN INSIDER, Newsletter. What's happening inside republican politics. News, Views, interviews by leading Republicans. 1yr \$15. Sample \$2.50. Republican Insider, Box 327, New Lisbon, NJ 08062

"101 GREAT BUSINESS IDEAS" from CPA who's seen them working for others. \$10.95. Bradford, 1012 Mopac Circle, Austin, Texas 78746

"WRITING—MADE SIMPLE" A guidebook for those who don't like to write but need to. \$7.95 postpaid. T.J. Fournier Associates, 621 N. Fourth Ave., Ann Arbor, MI 48104

SHOW TOS Mailorder **BUSINESS** booklet. \$9.95. R.K., P.O. Box 3526, Center-Line, MI 48015

INTERESTED IN CLASSIFIED ADVERTISING?
READ POPULAR MECHANICS Latest Edition of "TIPS ON HOW TO MAKE MONEY THROUGH CLASSIFIED ADVERTISING". This Informative 24-Page Booklet Will Show You The Do's And Don'ts of Classified Advertising And How You Can Make It Work For You. So Order Today. Only \$1.00 Plus You'll Receive A \$2.00 Coupon Refundable With Your First Order. Send To: **POPULAR MECHANICS CLASSIFIED,** Dept. SG, 250 W. 55th Street, New York, NY 10019

MAGAZINES

NATURISM LIFESTYLE: FAMILY RECREATION. Magazines, videos from around the globe. Infopak \$3. Lifestyle-PM, Box 661266, Los Angeles, CA 90066

CATALOGS

51,000 Catalogs Listed. Sources for Anything! \$5.95. Directory, Box 92452N, Atlanta, Georgia 30314

GROW Your Business. We bring business school professors to you on videotape. Price: \$30.00 a tape. Send for a free catalog to: Berkeley Group, 235 Montgomery St. #846, San Francisco, CA 94104. Try our MBA series on video. It works.

SELF PROTECTION! Crime is on the increase. Send \$2 (Refundable) for catalog of low cost personal security products. PineTree Products, P.O. Box 686, Barnegat, NJ 08005

"SMALL ENGINE PARTS" catalog \$1. Smith's, 513W Spring, Weatherford, TX 76086

CHRISTMAS GIFT SHOPPING

FREE! "Gift World" catalog. Send **SASE** to: MMS-PM, 2314 Grant Drive, Arnold, MO 63010-2514

HOLIDAY GIFTS UNDER \$10! (200 homemade and store-bought ideas) Send \$3 for list to: Zap Spoon, 14232 Marsh Lane #402, Dallas, TX 75234

12 IN 1 Scissors. Unique gift. Great for home, camping, gardening. Guaranteed. \$10.95. Esber Co., 21712 123rd St. E., Sumner, WA 98390.

TIE TOTE packs up to 10 ties wrinkle free. Made of sturdy nylon, leather trim with see-thru window. Can be hung on closet rod or clothes hook. Measures 29"x7". Comes personalized with your initials. Order! \$14.95 + \$2.00 S/H promptly. AMG Publishing, 117 West Harrison, 8th Floor-Dept. A469P, Chicago, IL 60605.

SANTA'S SURPRISE - AMAZING EDUCATIONAL GIFT AND SANTA'S PERSONALIZED LETTER. \$3.00 each: IPM, Box 1181-P, Hammond, IN 46325

CAMERAS - New Concord Pocket 118 Mini Flipflash \$8.99; 110 Electronic Flash \$14.99; 110EF Telephoto \$18.99; 35mm Outdoor \$9.99. Special Xmas Offer. Plus \$2.49 S&H Each Camera. J&S Enterprises, 33338 Aguadulce Cyn. Suite 169, Aguadulce, Calif. 91350

MUSICAL GLOVES! GREAT GIFT! Gloves that magically play music at the touch of fingertips! Plays 8 notes of the scale! \$22.95 pair, delivered. Major, POB 1456, Torrance, CA 90505. (2 sizes Child or Adult)

DISCOUNT "As Seen On TV" Items. Catalog (refundable) \$1.00/SASE ASOT, 18484 Preston 102-121, Dallas, TX 75252

PC SOFTWARE TRANSLATES TO FRENCH \$69.95, SPANISH \$129.95. PRACTICAL, EDUCATIONAL, FUN. 800-243-4470.

ELVIS PRESLEY'S-MARILYN MONROE'S WILL, authentic, fascinating, revealing. \$14.50. Great gift, 2 or more \$12.50 each. B.P., 1105 N. Wishon, Fresno, CA 93728.

SAVE BIG \$ ON GROCERIES! Great Christmas gift! Free information. LSASE to: Gail's Coupon Service, Box 6832-PML, New Albany, IN 47151.

WONDERFUL GIFT. Publisher's over-run of Joe Rich's best seller, Understanding My Computer. Fun to read and understand. Great for people afraid of computers. Great for computer users, wanting to be experts. Send \$7.99 to: The IFT Group, Box 40, Waban, MA 02168.

STRENGTHEN hands, increase coordination, and relieve stress with solid Stainless Steel Spheres. Great Aid For Quitting Smoking!!! Includes pouch and giftbox. \$14.95. KL Enterprises, 10940 S. Parker Rd., #436-15, Parker, CO 80134. MC/Visa 303-752-7077.

FINALLY! Hand Sander that simply works! Handcrafted, fine wood. Uses long lasting, 3"x18" changeable sanding belts. Belt included. Money back guarantee. Pat. Pend. \$10.95 + \$1.50 P&H. ABOECO, P.O. Box 3332, Napa, CA 94558

AUTOMOBILES

\$225 DAILY "CHROME PLATING" Auto Parts, Motorcycles, inexpensive, easy, (Free) information. Chrome Finish, Box 2285, Waldorf, Maryland 20604

SOLAR BATTERY CHARGER. No more jumper cables. Safe. Easy-to-use. 5 year warranty. \$29.95. PG Marketing, P.O. Box 11885, Lynchburg, VA 24506.

(Continued on next page)

AUTOMOBILES

(Continued from preceding page)

GOVERNMENT SEIZED Vehicles from \$100. Fords, Mercedes, Corvettes, Chevys. Surplus. Buyers Guide. (1) 805-962-8000 Ext. S-20024

VAPOR Carburetor Triples MPG. Free Information. H&A, R2 PV, Bowling Green, MO 63334

ELECTRIC CAR BOOK tells all about low-pollution cars 800-468-4322

10 BIG money saving tips you should know before buying a new or used car! Send \$10 plus \$1 p&h to: J&R Enterprises, P.O. Box 2937, Anderson, IN 46018

RADAR JAMMER

"NO MORE TICKETS." New Technology Makes Cars Invisible To Radar Yet 100% Legal \$195.00. Call Phantom Technology 1-800-8RADAR2.

JEEPS-\$60.00, CARS... Trucks, More. Government Surplus Bargains. Directory - \$3.00. Anita Laird, 18786 San Quentin, Lathrup Village, MI 48076.

HOW TO RUN YOUR CAR WITHOUT GASOLINE! AMAZING DETAILS FREE. SEND SASE: NEVER AGAIN, BOX 21169, CLEVELAND, OHIO 44121

FREE INFO - NEW PLUSH DASH COVER forms to contours, desired shapes, inexpensive, many colors, other uses. Auto Interior Products, 2023 West Morningside, Phoenix, Ariz. 85023

CHEAP! FBI/US. SEIZED 89 Mercedes \$200 - 86 VW \$50 - 87 Mercedes \$100 - 65 Mustang \$50 - Choose from thousands starting \$25. **FREE** Information-24 Hour Hotline. 801-379-2929. Copyright #NY19GJC

MAGNETIZE YOUR OIL FILTER Extend Engine Life. Improve Motor Efficiency. Super Magnetic External Filter Strip Traps Particles No Filter Can Catch. Reusable Forever. Send \$35.00 Visa Accepted. Magnetic Filtration, Box 369, Danville, WA 99121. 604-545-9795.

U.S. SEIZED Cars, Trucks, Boats, Electronics. To 90% Savings. Free information (305) 434-9230

FACTORY RADIO'S & VCRS Repaired Auto & Home \$45.00. (518) 686-3128

AUTO SUPPLIES & EQUIPMENT

ALTERNATOR/Generator Rebuilding Book. Price: Hedelund Engineering, 7505 Barkentine, Las Vegas, NV 89128

ALTERNATOR REBUILDING KITS GM 1973-1985 internal regulator up to 70 amp \$16.95. A & S Kits 1-800-925-8096.

WINDSHIELD REPAIR KIT, Original Crackstopper. Do it yourself. Save \$50 on average repair. Instantly stops spread of windshield cracks. Fast easy application. \$9.95. Dysa, Inc., 9 Union Square, Southbury, CT 06488.

NEW! WATERBOY AUTOMOTIVE BEVERAGE SYSTEM Enjoy cool refreshment in your car at the push of a button! 'How To' Guides - Complete Kits - Distributorships - Free Information. Box 370895, San Diego, CA 92137-0895.

MOBILE HOMES

AVOID costly misunderstandings. Be informed. Manufactured Homes Guide. Free Brochure. D.S. Manuscripts, P.O. Box 1309P, Venice, FL 34284-1309

BICYCLES, SUPPLIES

ZIPPER BICYCLE ENGINE KITS 20 MPH Over 100 MPG 714-847-8253.

NEW, Revolutionary Mountain Bike! Flat-free tire, 21 speeds, unbreakable frame! Amazing video and brochure on most affordable lowest maintenance bike in the world! Only \$6 shipping/handling! Call 1-800-631-2100 Limited offer/pm

NEED HELP Figuring the Cost of your Advertisement?? Call us at 212-649-3167 or send us a FAX (212-586-5562) and we'll FAX Back with a Price Quote.

MOTORCYCLES, MOTORSCOOTERS & GO-KARTS

GO KARTS, Minibikes & ATV's. Assembled, Kits, Parts, Engines. Discount Prices, Large Selection. 88 Page Catalog \$3.00. 216-357-5569. Kart World, Dept C., 1488 Mentor Ave., Painesville, Ohio 44077.

GOKART Detailed Plans \$10.00 + \$2.00 postage. MXK Racing, 800 Bulls Rd., Elma, NY 14059

AVIATION, HANG GLIDING

INCREDIBLE powered parachute book! Only \$16.70. Waitz Publishing, Box 6086-W, Fall River, Mass. 02724

AIRPLANE, Hang Glider Design Brochure \$1.00. McCoy Aircraft, Box J, Suite 243, Manhattan Beach, CA 90266

BOOMERANGS ... HI-TECH DESIGNS! Incredible Returns. Amazing Fun. **FREE CATALOG**. BoomerangMan, 1806-1 N. 3rd., Monroe, LA 71201-4222

BE THERE! IN THE COCKPIT! Unique ultralight video! Remote controlled, swiveling mini-cams! Aerobatics! Floats! Up close! Exciting! Info on: How? Where? etc. \$39.95. Blue Max, 9642 Hardwood, Baton Rouge, Louisiana 70818

AIRBOATS. Hovercraft Supplies. Plans, Propellers, Engines. Catalog \$3.00. Sportsraft, Box 640M, Meeker, Oklahoma 74855

BUILD YOUR OWN WOOD ULTRALIGHT AIRPLANE. No License Needed. Over 1000 Solid Kits And Plans. Info \$6.00. Team, Rt.1, Box 338P, Bradyville, TN 37026

HOVERCRAFT

DEALERSHIP information \$11, Kits, VW Plans. Neoteric, Terre-Haute, Indiana, 47807-2394. (812) 234-1120.

QUIET New Fast Hovercraft. Catalog \$2. Box 281M, Cordova, IL 61242

HOVERCRAFT plans, 3 to 160hp. Information, \$5 (refundable). Sevlec, Box 846, Monroe, WA 98272

SCAT Parts Catalog \$5.00 Refundable. GPL, 2859 Cormorant, Delray, FL 33444-1068

CB'S, RADIO & HAM EQUIPMENT

POLICE-FIRE SCANNERS. CB's. MARINE 2WAY. ANTENNAS. HPR, BOX 19224PM, DENVER, CO 80219

DIRECTORIES: Secret Scanner Frequencies! Federal Agencies, etc. Big Catalog. CRB, Box 56-PM, Commack, NY 11725.

CB MODIFICATIONS! Frequencies, sliders, FM, amplifiers, books, kits, repairs, high-performance accessories. Catalog \$2. CBCI, Box 31500M, Phoenix, AZ 85046

LAND/General Mobile Radios, CB's, Scanners, Radar Detectors, Marine Transceivers, Auto Alarms Catalog. \$2.00. Rays, Box 14862PM, Ft. Worth, TX 76117-0862

ELECTRONICS

TINY MATCHBOOK VIDEOCAMERA, Under \$200!!! Tiny TV Transmitters!! R/C Airborne, Helicopter Microvideo! Surveillance! Catalog, \$3.00. SUPERCIRCUITS, 13015 Debar Drive, Austin, TX 78729

BUGGED? PHONETAPPED? Free Catalog Counter-Surveillance Equipment tells you Fast! 1-800-732-5000

SURVEILLANCE-COUNTERSPY EQUIPMENT Transmitters, detectors, phone security, night vision. **MORE! HUGE CATALOG \$5.00 (REFUNDABLE)** Guardian, P.O. Box 906, Dept. P, Salt Lake City, UT 84110

SEXY? The Real "SPYSMART", NO JUNK, Good Electronics, Transmitters, NightVision, Surveillance, Cellular. Catalog \$5.00. OPERATIVE SUPPLY, P.O. Box 2343M, Atlantic Beach, N.C. 28512

LONG PLAY CASSETTE RECORDERS, Voice Activated. 12 Hours/Cassette. Other Surveillance/Countersurveillance. Devices. Catalog \$3.00. Productive Electronics, Box 930024, Norcross, GA 30093

COMPUTERS & SOFTWARE

BLUEPRINT To Assemble PC Computer - \$25.00 Parts Available At Discount. Micro Supply, 423 37th St., Bellaire, Ohio 43906.

PRINTER RIBBON RE-INKING KIT \$5.00. Joseph Whitehead, 7005-12 Terry Dr., Knoxville, TN 37924

SAVE on IBM Software Engperform Calculator Autoloan Calculator, Triexp Calculator Carpaint Tracker \$3.95 each or Four for \$9.95. Motorhome Mgr., Boat Mgr., Bicycle Tune, Vacation Planner \$3.95 each, Four-\$9.95. Air conditioning Repair, House Builder, Drafting Layout, Gardner Assist. \$3.95 each, four-\$9.95. Golden Valley Aero. 612 West Kearney, Fresno, CA 93706. (800) 233-1689 / (800) 448-2370 Visa - M/C - Discover.

SATELLITE - TV

FREE DETAILS! INSTALL IT YOURSELF! Complete systems, upgrades. Orbitek Satellite Communications, Box 264-M12, Bohemia, New York 11716-0264. (516) 589-1292.

SUPER LOW PRICES. FREE U.S.-INTERNATIONAL CATALOG. SATMAN 800-472-8628

FREE Catalog - Lowest prices world wide. SKYVISION, 1022 Frontier, Fergus Falls, MN 56537. 1-800-334-6455.

TV, VIDEOS & VIDEO EQUIPMENT

NOTICE: USE OF CERTAIN ITEMS IN THIS CLASSIFICATION REQUIRES STATION AUTHORIZATION.

CABLE, WIRELESS AND SATELLITE DESCRAMBLING. 1992 Edition. Turn-ons, Circuits, Bypasses. \$15.95. VIDEO-CIPHER HACKER'S MANUAL Includes Plus. New. \$15.95. SCRAMBLING NEWS, 1552 Hertel, Buffalo, NY 14216. (716) 874-2088. Catalog \$1.

DESCRAMBLER KITS. Complete cable kit \$44.95. Complete Satellite kit \$49.95. Add \$5 shipping. Free Brochure. Summit PM, Box 489, Bronx, NY 10465

CABLE-TV EQUIPMENT

CABLE Converters, Accessories Below Wholesale! Immediate delivery from giant stock! COD orders only. 1-800-995-1749.

CABLE DESCRAMBLERS! Build your own Descrambler for LESS than \$12.00 in Seven EASY Steps. Complete Instructions \$10.00. Radio Shack Parts List and FREE Descrambling Methods that COST NOTHING To Try Included. Harrywhite, P.O. Box 1790, Baytown, Texas 77520.

CABLE TV EQUIPMENT. Most types available. Special: Oak M35B \$39.95. No catalog. COD orders only. 1-800-822-9955.

TOCOM'S-DPV72'S-DPV872'S All Your Cable Needs Best Prices. 1-800-942-6649

CABLE TV Descramblers illegal or NOT. Send for the laws that concern this issue. Consumer Cops, P.O. Box 2939, Columbus, OH 43216. \$10.95

CABLE TV CONVERTERS/DESCRAMBLERS! ZENITH, TOCOM, JERROLD, SCIENTIFIC ATLANTA, ETC. AT HAND IS QUALITY, WARRANTY, AND FREE CATALOG. DAZYTRONICS, P.O. BOX 408, PIKEVILLE, TN 37367. CALL NOW! 800-841-0278.

PROFESSIONAL Cable/Satellite Descrambler. Universal Kit Works On ALL Systems! Shasta Electronics, P.O. Box 1806, Groton, CT 06340-1806

PREVENT DESCRAMBLER DAMAGE. DON'T BITE THE BULLET!!! Snooper Stopper Data Pulse Blocker \$33.95. With Surge Protection \$44.95 ... Wireless Video Sender \$54.95. VCI 1-800-925-9425.

CABLE R.V. Signal Theft how it can go undetected. \$10. Backstar Library, 23205 Gratiot, Eastpoint, MI 48021

CABLE Test Chips. Puts cable box into full service model \$29.95 to \$59.95. 1-800-452-7090, (310)867-0081.

"**CABLE T.V. CONVERTERS**" Jarrod®, Zenith, Pioneer, Oak, Scientific Atlanta, And Many More. 12 Years Experience gives Us The **ADVANTAGE**. VISA/MC. AMEX. COD. Advantage Electronics, Inc. 1-800-952-3916, 1125 Riverwood Dr., Burnsville, MN 55337

CABLE TV Descramblers! **ABSOLUTELY THE LOWEST PRICES!** All major brands. **CABLE PRICE CLUB** 1-800-377-9742.

NEW SCIENTIFIC ATLANTA model 8580 converter/descrambler w/remote. **REPLACES** most Scientific Atlanta models. Works on most Scientific Atlanta cable systems. Wholesale price \$229.00. Call Phil at Universal Products 1-800-438-2030

TOCOM Descrambling Chips. Only \$35. For information. Call 1-800-725-1198.

CAMPERS & TRAILERS—KITS, PLANS

BUILD YOUR OWN - Travel Trailer - Fifth Wheeler - Motorhome - Campers - Plans - Patterns - Kits - Catalog \$1. Glen-L, 9152 Rosecrans, Box 1804/RV2, Bellflower, CA 90706. 310/630-6258.

172 TRAILER PLANS Motorcycle, Utility, Car, Construction - Strong, Streamlined, easily built. Catalog \$4.00. (Refundable). Tag-Along, Box 15107, Salem, OR 97309

BOATS, OUTBOARDS, TRAILERS, & KITS

LIGHT SENTRY™ Automatic anchor light switch. 12/24v. Free Brochure 1-800-262-4670.

(Continued on next page)

BOATS, OUTBOARDS, TRAILERS, & KITS

(Continued from preceding page)

BOAT KITS - PLANS - PATTERNS - AMERICA'S LARGEST COMPLETE LINE - 6/70' - Powerboats - Sailboats - Trimarans - Dinghies - Houseboats - Hydroplanes - Tunnel-hulls - Duckboats - Canoes/Strippers - Kayaks - Dorries - DISCOVER no dryrot epoxy boatbuilding - HUGE ILLUSTRATED CATALOG \$3.00 (Airmail \$5.00), includes Free Epoxy/Fiberglass/Supplies Catalog - Book "Amateur Boatbuilding", \$6.00 - CLARKCRAFT, 16-P Aqualane, Tonawanda, NY 14150

EVINRUDES — NEW 1991 Bargains - Top Brands ... all sizes ... \$2.00 handling ... Scott McCulloch parts ... Electra Marine, 610 Merrick Road, Lynbrook, New York 11563. INFLATABLES.

BOAT PLANS - PATTERNS - KITS - Unsurpassed selection - 7'55' - Hydroplanes - Canoes - Kayaks - Rowingboats - Duckboats - Dorries - Sailboats - Houseboats - Quick/simple Stitchengluie. Tremendous savings! 168-page DESIGN BOOK - \$4.00 AIRMAIL. Includes Free "Boatbuilding Supplies" catalog, "Epoxy Manual" \$2. GLEN-L, 9152 Rosecrans, Box 1804/PM2, Bellflower, CA 90706. 310/630-6258.

RODHOLDER Plans, \$3.00 SASE. Ray, 10313 Braemar, Crosby, TX 77532

AIRBOAT PLANS, ONE-MAN, Unique easy, Inexpensive, Complete 18 page plans \$12.00. S.V. McCarthy, 7 Garth Ave., Ewing, N.J. 08638

WINTERIZE Your Outboard Yourself. Complete Details \$6.00. "At The Dock" Outboard, 112 Bridge St., Salem, Mass 01970.

ATHLETIC EQUIPMENT/BODY BUILDING COURSES

BIGGER, More Powerful Muscles - faster!! Free Booklet! Universal, Box 6694A, Detroit, Michigan 48240

BIGGER, Powerful muscles - faster!! Using secret dynamethod. Free booklet. Hercules, 1223 Borg-M, Temperance, Michigan 48182

GUNS, DECOYS, HUNTING

OKLAHOMA AMMUNITION COMPANY BUY DIRECT AND SAVE Many popular calibers: rimfire, centerfire-handgun and rifle ammunition. For free price list and ordering information write or call us: 4310 W. Rogers Blvd., Skiatook, OK 74070. (918) 396-3187.

ENGINES, MOTORS

NEW LAWNMOWER ENGINES starting at \$67.50. SASE. DMI, 208 Pine Street, McRae, GA 31055. (912)668-2080.

TOOLS FOR SALE

BOLTS, SCREWS, TOOLS, WHOLESALE, DIRECT. Guaranteed. Catalog \$2.00 (Refundable). Camelot, Dept. 44, Box 65, Bristol, Wisconsin 53104

DISCOUNT and hard to find tools, wholesale prices, hundreds of items catalog \$2.00. J and F, Box 70372, Department P, Ft. Lauderdale, Florida 33307

MACHINERY, TOOLS & SUPPLIES

LATHES, Engine & Toolroom Models Available. Catalog \$1.00. Blue Ridge, P.O. Box 536-V, Hurricane, WV 25526. (304) 562-3538

HOBBYISTS improve your LATHE with the ultimate tool-post system! KRF, Box 783C, St. Joseph, MI 49085. 616-429-7050

FOUNDRY SETS Supplies, Brochure \$1.00. Pyramid Products, H.O.C.-1 P.O. Box 21, Niland, CA 92257. (619) 354-4265.

LATHES - INDUSTRIAL/HOBBY FROM \$350.00, METALS, SUPPLIES. LARGE CATALOG \$2.00. CAMPBELL TOOLS, 2100-D SELMA RD., SPRINGFIELD, OHIO 45505. 1-513-322-8562.

4" METAL Cutting Lathe \$121.70. Taig, 12419 Nightingale, Chandler, AZ 85249

NEW Catalog - HUNDREDS of plans - FREE tap drill chart - Steel - Brass - Aluminum - Shop Supplies - Computer Control your machines Send \$2.00 - CEI, RR#1, Box 183PM, Cameron, IL 61423

AUTOMATE your lathe using a home computer! For schematics, instructions and software send \$19.95 to: GMP, 8973 Tourelles, Anjou, Quebec, Canada, H1J 2A5

FREE details! Low cost tools for turning screws better. Shockey's Secret, Box 24042-PM, Dayton, OH 45424-0042

LUMBERJACK chain saw sawmills - power-feed. Brochure \$2.00. Brown Engineering, Box 40, West Point, CA 95255

ENERGY SAVING

FREE ENERGY! Fuel-less Motors and Generators. H&A, REP, Bowling Green, MO 63334

AFS RADIANT BARRIER - EASY INSTALLATION Energy Savings - Non-Toxic - Everlasting Home Comfort, Reduce summer attic heat by up to 30%. Helps prevent winter heat loss. Government tested and approved. Brochure and product sample - Send \$1.00. AFS - ADVANCED FOIL SYSTEMS - (800) 421-5947, 4471 E. Santa Ana St., Suite F, Ontario, CA 91761

GENERATOR FLASHLIGHT - Needs no batteries! Generate light by squeezing lever. 5"x2" with carrying strap. Water repellent. Rush \$12.95 to: PennGrove Selections, Dept. 216M, 1210 Bethlehem Pike B8, North Wales, PA 19454

FIREPLACE FORCED-AIR HEAT-EXCHANGER. Build for \$30.00 from local materials and common tools. Information \$1.00. Plans \$10.00. Thermotronics, Box 568, Bonaire, GA 31005-0568.

WOODSTOVE ENVIRONMENTAL CERTIFICATION, Canadian and US. How To, \$11.95 plus \$3 P&H. ENVI Products, Box 21, Westholme, BC, Canada, V0R 3C0

TURBOCHARGE your gas clothes dryer. Easy inexpensive kit saves time/money. SASE: RANM, Box 27753, Santa Ana, CA 92799

SOLAR & ALTERNATE ENERGY

NEW! BUILD AMAZING LIQUID PISTON ENGINE from pipe fittings. Easy plans, Free information. ABCO, Box 306-M12, Seminary, MS 39479

GIANT SOLAR PANELS \$44.00 EACH! Excellent Prices! Solar Equipment/Accessories. Free Information/S.A.S.E., Catalog \$3.00. Quad Energy, Box 690073, Houston, TX 77269. (713) 893-0313.

SOLAR Powered Products. Catalog \$1.00. ALLEGORY CORPORATION, P.O. Box 9918-PM, Berkeley, California 94709

SAVE 6 TO 15% ON HEATING COSTS. Solar Heating Drapery Opening Indicator-New Patented device tells when to open or close draperies to save energy. \$240.00 or \$5.00 for manual. Solartek, Inc., 451 East Roosevelt Road #218, Lombard, IL 60148

SOLAR Collectors You Construct. Send Stamp. 10909-PML Hayvenhurst, Granada Hills, CA 91344

SAVE heating \$\$ with easy to build, forced air solar panel. Uses common materials. Plans, pictures, materials list, \$12.50. Dave Grieder, RR1 Box 11, Carlock, IL 61725

FREE Energy!! Solar Power For Rechargeable Batteries. Easy to build plans. \$9.95. R&S, 4040 Creditview Unit 11, Mississauga, Ontario L5C 3Y8

THIS IS A SCREENED AD!

LET Your Advertisement Achieve The Same Effect! For An Additional \$50.00 Per Advertisement You Can Order Our Screening Process. Same Price Applies To All Advertisements No Matter What Size, Small Or Large. For More Information Call POPULAR MECHANICS CLASSIFIED—1-212-649-3167.

HOME CRAFTSMAN

MAKE WOODEN TOYS, whirligigs, banks, door harps, dollhouses, clocks, music boxes, weather instruments, crafts, furniture with our plans, kits, supplies—Catalog \$1.00—(800)-848-4363—Cherry Tree Toys, Belmont, OH 43718-0369

FULL-SIZE PROFESSIONAL PLANS Catalog \$3.00. Over 200 plans for building fine furniture. Furniture Designs, Inc., CP-92, 1827 Elmdale Ave., Glenview, IL 60025.

ORNAMENTAL IRON SUPPLY Catalog. Quality parts, ships, weathervanes \$3. Future Focus, P.O. Box 576(A), Mt. Aukum, CA 95656

1000 WOODCRAFT PATTERNS! Huge assortment, fun, profitable projects. Sample pattern + Catalog \$2.00 - ACCENTS (BP-122), Box 7387, Gonic, NH 03839

PLANS, BLUEPRINTS, PROJECTS

CROSSBOWS TO WHIRLPOOLS - Easy, inexpensive plans. Catalog, \$1 to: Informational Resources, Box 3572, Grand Rapids, MI 49501-3572.

TIRED OF PAYING HIGH LIQUOR STORE PRICES? Interested in new home projects? Order now for the BOOZE MASTER STILL plans. Make your own types of ALCOHOL and GASOHOL. Send \$9.95 plus \$2.00 S&H to: D.B.&Co., 305 Nahani Street Suite 271, Kailua, HI 96734.

BUILD PULL OUT ACCESS TRAY in your existing cupboards. Inexpensive, easy construction. No more groceries-utensils hidden in lower rear cupboards. Pictured plans \$5.00. AP Associates, 6844 Lindsley Ave., Andover, Ohio 44003.

NEW! Build shop equipment of PVC Pipe. Information. G.F. Mullineux, P.O. Box 77, Otego, NY 13825.

FOR THE HOME

SAVE \$200 - \$400 A YEAR! On water heating and plumbing costs. Revolutionary patented product available direct from manufacturer at over 70% off retail! Send \$29.95 plus \$4.95 shipping to: HydroDynamics, P.O. Box 508, Redmond, WA 98073. Money back guarantee.

HEATING BILL GETTING YOU DOWN? Save 30% per year on your electric or oil costs for only \$9.95 using parts available in your local hardware store. Plans by return mail or fax. Full kit available for \$29.95. (508) 751-8988

WHOLE HOUSE HUMIDIFIER less than \$20.00 in materials. Save on heating bills. Complete plans \$6.95. P.O. Box 1361, Granite City, IL 62040

NEW BY WATERTEK SJV-44 DECALCIFYING HUMIDIFIER WATER FILTER PATENT PENDING. ELIMINATES MINERAL BUILD-UP, KEEPS FURNACE HUMIDIFIER 90% CLEANER. Send \$22.95 to: Watertek, P.O. Box 171, Sterling Heights, Michigan 48311-0171.

CENTRAL Vacuum Hose Attachments Pipe Units. 405-439-5550. Fax 405-439-5900.

ROOFING

STOPPING FLAT ROOF PROBLEMS SINCE 1978 liquid applied fiberglass reinforced acrylic roofing system. Waterproofs asphalt, metal, new sheathing. Call Polar Seal 1-800-343-7663. "Weekdays 8-5 CST"

PLASTICS

CASTOLITE Liquid Plastics. Crystal clear, colors. For casting, embedding, coating, fiberglassing, repairing and reproducing with our Mold Making Supplies. Catalog \$2.00. CASTOLITE, Dept. 920/PM, 4915 Dean, Woodstock, IL 60098.

RUBBER COMPOUNDS, techniques. Make masks, molds, toys, parts. Catalog. \$1.00: Handmade, Box 16713 (A12), Memphis, TN 38186-0713.

DO IT YOURSELF

LASERS, Great For Visual Effects Use, Experiments Etc. Free Catalog, MWK Industries, 198 Lewis #PM, Corona, CA 91720 714-278-0563.

BELT BUCKLES for coins, stones, jewelry mountings, cut stones, clock works. Wholesale catalog \$1.00. Eloxite, Box 729, Wheatland, Wyoming 82201.

HEATED WIPER BLADES. Complete instructions Send \$14.95 to: Wiper Warmer Systems, P.O. Box 017, Canton, Ohio 44707-0017

WET BASEMENT? Cured by interior method. Details \$5.00. Debruin, 2711 E. Colvin St., Syracuse, N.Y. 13224

PROFESSIONAL Carpet Stain Removal Kit, Three Components, Complete Instructions, Virtually Any Stain. \$11.99, \$2.95 Shipping. Professional, 107 RR 620 South, Box 27-D, Austin, TX 78734.

ELECTROPLATING Textbook. Electroplate Metallics/Non-metallics. \$14.95. Details Free. Tropix, Palm Bay, FL 32906-0095

PLASTIC Prototypes. Do-it-yourself introductory kit. \$6.95 to: DSD Marketing, 888 W. County Rd. D. #102, New Brighton, MN 55112.

10,000 LB. WEIGHT DISTRIBUTING RECEIVER most late model domestic full-size pickups \$79.95 plus shipping. 1-800-795-HITCH M-S 9-6 EST.

HOME IMPROVEMENT VIDEOS, Landscaping, electrical, decorating, decks, lawn, sprinkles, garage, alarm \$29.95 each. 215-579-4876.

SELF PUBLISH "HOW TO" BOOKS. Free information. Publishing, 522 Myrtle, Arlington, Texas 76018

ARTS, CRAFTS, SUPPLIES

"GETTING Started in Stained Glass." \$1.00. Whittemore, Box 2065T, Hanover, Mass. 02339

(Continued on next page)

ARTS, CRAFTS, SUPPLIES

(Continued from preceding page)

CLOCK WORKS, beading supplies, rockhound supplies, belt buckles, cut stones. Wholesale catalog \$1.00. Eloxite, Box 729, Wheatland, Wyoming 82201.

MINI-quartz clock movements as low as \$1.75 complete! Posters, epoxy, videos, kits, plans - over 2000 items! Wholesale catalog \$3.00 (credited) Steebar, P.O. Box 463-P, Andover, NJ 07821-0463.

NEON ART, Complete Illustrated Study Course. FREE INFORMATION. Neon, 522 Myrtle PM122, Arlington, Texas 76018

CARTOONING, COMMERCIAL ARTS, SIGN PAINTING

LEARN to be a professional cartoonist. One dollar brings full details. Cartoonorama, P.O. Box 854PM, Portland, ME 04104

FREE books, lessons, sign painting & cartooning. Nutwood Publishing, 2407 N. Broadway, St. Louis, MO 63102.

MODELS, MODELS SUPPLIES

STEAM ENGINE KITS power models at savings to you! Send \$2.00 for catalog. PM Research, Inc. Dept. 7, 4110 Niles Hill Road, Wellsville, NY 14895

MAGIC TRICKS, JOKES, VENTRILOQUISM

VENTRILOQUIST Supplies, Instruction, Information FREE! Dummy Catalog \$2.00. Maher, Box 420-PM, Littleton, Colorado 80160.

FREE! World's Leading Novelty Catalog. 1600 Jokes, Tricks, Science, Sports, Hobbies. Johnson-Smith, F-01, Bradenton, FL 34206-5500

FREE! Four Sensational Catalogs. **MAGIC**, Jokes, Novelties. World's Best Selection. **HUEY'S**, POB 505, Wallis, TX 77485

AUCTIONS

GOVERNMENT AUCTIONS DIRECTORY, ANY STATE. \$7.00 to: Joe Wisike & Associates, Box 24106, Apple Valley, MN 55124

ANTIQUES, RELICS, ETC.

FREE List to Serious Collectors. 300,000 Indian Artifacts, Spears, Pots, 50,000 Minerals And Fossils. Caddo Trading, Box 669, Murfreesboro, Arkansas 71958

STAMP COLLECTING

FREE Giant Bargain Stamp Collecting. Full Of All The Latest Offerings On Worldwide Stamps, Accessories And Supplies. Baseball Cards, Postcards And Banknotes. Plus You'll Receive Stamps On Approval. Buy Only What You Like, Return Balance, Satisfaction Guaranteed. Jamestown Stamp Company, Inc., Dept. E122PM, Jamestown, NY 14701-0019

FREE sample plus catalog. Jefferies, 3480 Middlebelt, West Bloomfield, MI 48323

50 DIFFERENT Old U.S. between 1861 and 1939 - \$1.00. Ed Roush, Box 3734, Mansfield, Ohio 44907.

OLD U.S. stamps on approval. Sherman, Box 15355E, Philadelphia, PA 19111

FOUR Foreign sets 25c. Request approvals. R.G. Sales, Box 1065-M, Jamaica, NY 11431

10 OLD Mint U.S. Commemoratives, 25c! Approvals. Global, Box 7429-P4, Olympia, WA 98507.

U.S. OFF PAPER FANTASTIC MIXTURE FULL POUND \$23.00, 5 POUNDS \$100.00 POSTPAID. MONTALTO, 437 GOLDEN ISLES DRIVE, HALLANDALE, FLORIDA 33009

"PENNY Stamp Approvals." Regardless Catalog. Kloster, 4164 52nd St., San Diego, CA 92105

LIQUIDATING Tremendous Old Accumulation. Bargain Lists. Free. Alatalo, Maynard, MA 01754

PLAYS, SONGS, MANUSCRIPTS

CASH Royalty! Songs Composed From Your Poems. Broadway Music Productions, Box 7438, Sarasota, FL 34278

MUSIC INSTRUCTIONS & INSTRUMENTS

ACCORDION Top Brands, Cordovox. Buy Direct Tremendous Discounts. Trades, accepted. Free brochure. PM, Accordion-O-Rama, 16 West 19th Street, New York, NY 10011. Phone 212-675-9089.

ACCORDIONS, CONCERTINAS, Button boxes, new, used, repairs, trades, credit cards. Castiglione, Box 405, Warren, MI 48090. Catalogs 313-755-6060-800-325-1832

TELL Every Musician You Know We're Looking For Unknown Amateurs For Possible Recording Contract. Call Earl. 1-800-926-9559. Free Call. Recorded Message. Day/Night. No Obligation.

SELF IMPROVEMENT

RICH Man's Secret! You never heard or read a message like this before! Author of amazing new book just paid nearly \$1 million personal Income Tax (\$943,286.00)! Not long ago he struggled just to pay rent! Revealing Free Cassette Tape and follow-along Workbook can be your key to wealth and success too! Send \$2 to help defray first class p&h cost to: Secret, 911-D Bryant Place, Ojai, CA 93023-3301

EDUCATION & INSTRUCTIONS

BECOME A PARALEGAL HOME STUDY. P.C.D.I., AT-LANTA, GEORGIA. FREE CATALOGUE. 800-362-7070 DEPT. LP127.

INVESTIGATION CAREER. Quick home study. Become a professional. (800) 272-6680.

FREE VIDEO External BA/BS, MS/MBA, PhD/LAW - Accredited. Financial Aid. (800) 759-0005 Ext. 617 LaSalle University, Mandeville, LA 70470-4000

GREAT PAY AND EXCELLENT TRAVEL BENEFITS. FAA Certified Airframe and Powerplant Mechanic Course takes just 14 months. Offering a top quality, accredited program at a lower cost. Financial aid available to those who qualify. Housing available. **TWO LOCATIONS IN TEXAS.** Call for information packet. 800-678-0700

PARALEGAL GRADED CURRICULUM. Approved home study. Most affordable and comprehensive. 100 years of legal training. Free catalog. (800) 826-9228. **BLACKSTONE SCHOOL OF LAW**, P.O. Box 871449, Department PM, Dallas, TX 75287.

NONRESIDENT UNIVERSITY DEGREES. Bachelor's, Master's, Doctorates. Accredited, inexpensive, fast. Credit for life experience. Free sixteen page booklet. Dr. John Bear, Costedoat & Bear Book Sales, P.O. Box 826PM, Benicia, CA 94510. (800) 835-8535.

TERMPAPER assistance. 19,278 papers available! 306-page catalog—rush \$2.00. Research, 11322 Idaho, #206MK, Los Angeles 90025. Toll-Free Hotline: 800-351-0222 (California: 310-477-8226)

JESUS Tracts. You Multiply. Broadcast. 1709 Fredricksburg Ave., Lakeland, FL 33803

BE A LOCKSMITH. Money-making Career Opportunity. Send for a Free Book to the Locksmithing Institute, Dept. 310-122, Fairfield, NJ 07004

FULLY APPROVED UNIVERSITY DEGREES! Economical home study for Bachelor's, Master's, Ph.D., **FULLY APPROVED** by the California Superintendent of Public Instruction. Prestigious faculty counsels for independent study and life experience credits (5000 enrolled students, 400 faculty). **FREE INFORMATION**—Richard Crews, M.D. (Harvard), President, Columbia Pacific University, Department 2E8D, 1415 Third Street, San Rafael, CA 94901. Toll free (800)227-0119; California: (800) 552-5522; or (415) 459-1650.

LOCKSMITHING, Universal School of Master, Correspondence and Shop Training. Box 214652PM, Sacramento, CA 95821

SCHOOLS

WORLD WIDE COLLEGE OF AUCTIONEERING, INC. (formerly Reich) Term soon. Free catalog. **COL. GORDON E. TAYLOR**, Box 949, Dept. 19, Mason City, IA 50401. 515/423-5242

HIGH SCHOOL AT HOME, NO CLASSES. LOW MONTHLY PAYMENTS. INFORMATION FREE. EST. 1897. CALL 1-800-228-5600 OR WRITE AMERICAN SCHOOL, DEPT. #345, 850 E. 58TH ST., CHICAGO, IL 60637.

DETECTIVE Home Study Course. Free lapel pin, certificate, great future. Professional Investigator School, Dept. CP, P.O. Box 41256, Los Angeles, CA 90041

EMPLOYMENT INFORMATION

GUARANTEED WORK! Assemble easy products at home! Excellent pay! 1-800-377-6000 ex7035

HELP WANTED

OVERSEAS. To \$1000 Daily! **FREE** list. **ZINCPO**, Box 585, Dearborn, MI 48120

GUARANTEED Work! Top Pay! Assemble easy products at home. 1-800-377-6000, ex7030.

EASY Work! Excellent Pay! Assemble Products At Home. Toll Free 1-800-467-5566 Ext. 5038.

OVERSEAS ... \$30,000 - \$75,000+. Free Report! Employment, Box 5730-AZ, Lighthouse Point, FL 33074.

\$329.84 Weekly, Assembling Our Products At Home. Toll-Free Information: 1-(800) 333-3294.

WORK AT HOME! EXCELLENT PAY! Easy Product assembly! Toll Free 1-800-873-6365 Ext. 5011.

\$200-\$500 WEEKLY Assemble products at home. Easy! No selling. You're paid direct. Fully Guaranteed. **FREE** Information-24 Hour Hotline. 801-379-2900. Copyright #NY19GDH

NEW PRODUCTS

NEW! MAGNETIC ACCUPRESSURE INSOLES give whole body health benefits ... increased energy ... reduced muscular aches and pains ... \$9.95 pair includes shipping. Major Intl.-Q. POB 1458, Torrance, CA 90505 (specify M/W shoe size). Also: Magnetic Therapy booklet \$14.95.

FOR INVENTORS

WORK DIRECTLY WITH REGISTERED PATENT ATTORNEY AND ENGINEER

WITH thirty-one years combined engineering and patent experience. U.S. and international patent applications. **PATENT** and **DEVELOP** your idea with the experience of an expert. Call or write for free **CONFIDENTIAL DISCLOSURE, RECORD OF INVENTION** and **148 PAGE BROCHURE**. Introduction to Industry, Marketing Plans, Overseas Production, Prototypes and Research Ready Available. Also specializing in Copyrights and Trademarks. **LESS THAN ONE HOUR FLIGHT TIME TO U.S. PATENT OFFICE—TOLL FREE FROM U.S. AND CANADA** 800-367-7749 or write: **MICHAEL I. KROLL** Registered Patent Attorney, U.S. Patent registration #26,756; 171 Stillwell Lane, Syosset, New York 11791. Outside USA (516) - 367-7777 - FAX: (516) - 692-2787.

PATENT AND DEVELOP Your Invention. Registered Patent Agent and Licensed Professional Engineer. Send for **FREE PATENT INFORMATION** Every Inventor Should Have. Richard L. Miller, 12 Parkside Drive, Suite-M, Dix Hills, NY 11746-4879. (516) 499-4343

PATENT IT ECONOMICALLY! Free details. Licensed since 1968. Raner Associates, 2008 Fondulac, Richmond, VA 23229.

INVENTORS! Can you patent and profit from your idea? Call **AMERICAN INVENTORS CORP.** for free information. Serving inventors since 1975. 1-800-338-5656.

PATENT Search. Rapid Patent, The World's Largest Private Provider Of Patent Documentation. Located Next To The U.S. Patent Office. Offers Low Cost Manual And On-Line Computerized Patentability Searches. Fastest Service. Satisfaction Guarantees. For Information And Estimated Costs Call 1-800-336-5010 Ext. 31

PATENT SEARCHES. FREE Details. PatentFinders, Suite 185-B, 3220 N Street, N.W., Washington, D.C. 20007.

INVENTIONS, ideas, new products. We submit to industry. Call 1-800-288-IDEA.

ACCUSEARCH Specializes in Thorough, Prompt, Inexpensive Patent Searches. 1-800-999-5498.

REGISTERED PATENT ATTORNEY. D.A. Kettlestrings. Free Information. 1-800-966-7577

INVENTORS! Your first step is important. For **FREE** advice, call **ADVANCED PATENT SERVICES**, Washington, DC, 800-458-0352.

HAVE AN IDEA? INVENTORS for **FREE INFORMATION PACKAGE/FREE REVIEW**, call **FREEDOM MARKETING INC.** 800-932-4298.

INVENTORS Don't Be Fooled - Call Our Inventors Club 1-800-466-1793.

AVOID "SCAMS" - Free Government reports exposing invention marketing companies. 1-800-428-5779.

ALL New Ideas/Products Free patenting, development, licensing package, call Davison & Associates 1-800-677-6382.

LOW COST PATENT SERVICES By Experienced Inventor/Engineers. Your Idea May Become A Profitable Invention. Free Information. **"INVENTORS HELPER,"** P.O. Box 276, Bergenfield, N.J. 07621

INVENTOR? Free Eureka Solutions International invention/idea kit. Free Industry Access Review. 1-800-547-7885.

INVENTORS: Free information on offering your invention for sale. Kessler Sales Corporation, C-5-FI-2, Fremont, Ohio 43420.

(Continued on next page)

FOR INVENTORS

(Continued from preceding page)

TRADEMARK and Copyright application information \$10.00. JLE, 13815 NW Milburn, Portland, OR 97229-5713

MARKET RESEARCH conducted to help sell inventions to manufacturers, companies and investors. Reasonable fees. **NEW PRODUCT MARKETING SERVICES** 609-428-4752

PROTECT YOURSELF, AVOID COSTLY MISTAKES! Outline for seven steps essential from invention to sales. Send \$39.95 to: MarketSource One, 33290 West Fourteen Mile, Suite 495, West Bloomfield, MI 48322

INVENTORS—NEVER SHOW YOUR IDEAS TO STRANGERS! Breakthrough prepatent protection/marketing method perfected over 29 years by nonprofit Inventors Assistance League. Avoid scams—save thousands! Learn idea's value within sixteen weeks! Free information—24 hours: 1-800-846-3228

FREE protection forms and information kit. Affiliated Inventors Foundation: 1-800-525-5885.

INNOVATIONS HOTLINE: New Products, Patents For Sale, Inventors Services. Free Information 1-800-343-IDEA.

EXPERTS TELL YOU WHAT TO INVENT. Government-sponsored reports identify future needs - from widgets to spacecraft. Full report; \$7.00. Dawnflights, Box 250, Wantagh, NY 11793

INVENTIONS WANTED

CASH/Royalty paid for ideas and inventions. Ideas protected. P.O. Box 6516-B, Lafayette, IN 47903

INVENTORS: If you have an invention for sale or license, write for free booklet explaining how we can help you. Kessler Sales Corp., C-5-IW-2, Fremont, Ohio 43420.

INVENTIONS DEVELOPED & MARKETED. Licensed Professional Patent Engineer. U.S. Patent Office Former Examiner. Manufacturers Representative. Patmart, Suite 702PM, Woolworth Bldg., New York, NY 10279.

REAL ESTATE

CALIFORNIA Land. \$50 Down. \$50 Monthly. PM, Box 35291, Los Angeles, 90035.

COUNTRY REAL ESTATE CATALOG—United National's NEW 200-page catalog features the best bargains in country real estate across America! Wilderness lands & retreats, farms, ranches, historic homes, waterfront properties & more. Send \$5 to: UNITED NATIONAL REAL ESTATE, 4700-PM Bellevue, Kansas City, MO 64112, or call 1-800-999-1020. Visa/MC accepted.

GOVERNMENT HOMES from \$1 (U repair). Delinquent tax property. Repossessions. Your area (1) 805-962-8000 Ext. GH-20024 for current repo list.

BIG Profits Nationally. Real Estate Foreclosure, Reposs. Free Report. AI, P.O. Box 490, Danville, CA 94526-0490

NEED HELP Figuring the Cost of your Advertisement?? Call us at 212-649-3167 or send us a FAX (212-586-5562) and we'll FAX Back with a Price Quote

BUY IT WHOLESALE

BELTS, Buckles, Hat Tacs, Jewelry, More. Complete line fast sellers. Big Profits. Complete dealer set up. Color catalog \$1.00. Anchor, Box 3958-PMR, North Providence, RI 02911

ROLEX PRESIDENT/SUBMARINER Replica Watches. Top Quality. Wholesale Prices. Brochure. 1-800-553-4334

CLOSEOUT Jewelry & Craft Supplies. (Catalog 50¢). Rousseis, 107-1631 Dow, Arlington, MA 02174-7199

VACUUM CLEANERS "Discount Prices" New Rainbow \$699.95 Nozzle \$149.95, Kirby, Filter Queen, Tri-Star, Panasonic, Royal, Oreck: ABC Vacuum Warehouse, 6720 Burnet-PM, Austin, TX 78757. (512)459-7643.

5,000 PRODUCTS, ASIAN FACTORIES, Deal Direct. Free Report. Greenbush Marketing, 19 Delehunt, E. Greenbush, NY 12061

SPAS WHOLESALE, The American Dream Spa: Seats 4 adults. \$1795.00. Call 1-800-235-7665

EARN MONEY selling Gold and costume jewelry, rings, watches-Buy Direct. 130% Below Retail. Catalog \$1.00. Anka-PM, 40 Freeway Drive, Cranston, RI 02920

ADVERTISING AGENCIES, ADV. SER. MAILING LISTS

ACTIVE NEW "HOTLINE" NAMES! GUARANTEED! FAST DELIVERY! MIXED STATES! 200/\$20; 500/\$35; 1000/\$55. DEALER'S CO-OP, BOX 526-PM, GRIFFITH, IN 46319-0526. 1-(800) 992-9405

PRINTING PRESSES, RUBBER STAMP OUTFITS

TYPE for printing and stamps. Catalog \$2.00 deductible. Quaker City Type, R.D. 3, Box 134, Honeybrook, PA 19344

PRINTING Presses, New and Used Supplies. List \$1.00. Turnbaugh Printers Supply, Mechanicsburg, PA 17055

CLOCKS, WATCHES, OLD GOLD, JEWELRY

HIGHEST CASH for Gold, Jewelry, Gold Teeth, Rings, Diamonds, Watches, Silver, Platinum, Mail Articles Today. Free gift with information. Chicago Gold & Precious Metals, 10 South Wabash, Dept. 458, Chicago, 60603.

TAKE NO CHANCES. Deal with oldest, most reliable firm in old gold business. Established in 1934. We buy Gold, Silver, Platinum, Diamonds, Highest Cash. Free Information: Rose Industries, 29-A East Madison, Chicago 60602

BUYING STAINLESS ROLEX "DAYTONA" COSMOGRAPHS \$3000.00. Purchasing Quality Wristwatches By Rolex, Patek, Vacheron, Cartier, Audemars. Call Don Meyer Anytime 1-800-833-3159. 12900 Preston Road, #500, Dallas, Texas 75230

AMAZING WATER WATCH Runs on ordinary tap water. Free information 1-800-452-1923.

TREASURE FINDERS

BURIED TREASURE - Sensitive equipment allows locating from distance. Brochure free. Simmons, Box 10057-MA, Wilmington, NC 28405.

HOME BASED BUSINESSES

FREE appliances, cameras, cosmetics, etc.. **EASY PROFITS.** Learn reclaiming secrets. Rush \$11. Excell Enterprises, 1006 Ford, Kerrville, TX 78028

PROFITABLE OCCUPATIONS

FREE information Starter & Alternator Rebuilding. Box 422, Seymour, TN 37865

PLASTERCRAFT ... Profitable Home Business 3000 Molds Available. Details. Lynette, 6251C Mentpark, Mentor, Ohio 44060.

BUSINESS OPPORTUNITIES

IMPORT-Export opportunity, profitable world-wide, mail order business from home, without capital. We ship plan for no risk examination. Experience unnecessary. Free Report. Mellinger, Dept. W270C, Woodland Hills, California 91367

\$225 DAILY "CHROME PLATING" Auto Parts, Motorcycles, inexpensive, easy. (Free) information: Chrome Plating, Box 2285, Waldorf, Maryland 20604

LET The Government Finance your small business. Grants/loans to \$500,000. Free recorded message: 707-449-8600. (KZ3)

BEFORE you buy or invest, you should know about "The Switch". Be safe, not sorry. Eye-opener report! \$5.00. Ferretes Research, 11529 Davenrich, Santa Fe Spring, CA 90670

WORK AT HOME! Sell homemade booklets through classified ads. Sample, information \$1.00 to: Books, Box 358, Kennedale, TX 76060-121

REAL ESTATE APPRAISER CAREERS. Home Study. P.C.D.J., Atlanta, Georgia. Free Literature. 800-362-7070 Dept. RP127.

HOME Import/Export/Mail Order business. Free Report. Inca Galleria, Dept. D121C, Box 282, Woodland Hills, CA 91365. (818) 884-4414.

PROFITABLE Gold Foil Printer. Personalize business cards, pencils, matches. Free details. Gold, POB 24986 (GC), Tampa, FL 33623

REPAIR CRACKED WINDSHIELDS. Become independent, your own boss. It's easy. Training, patented equipment. Free valuable report. 1-800-321-2597. Glas-Weld Systems, Box 5755-D, Bend, OR 97708.

MAKE Rubber Stamps. Highly Profitable. Free details. Stamper, POB 22809 (GC), Tampa, FL 33622

HYDRAULIC JACK REPAIR MANUAL, CATALOG \$10.00. HYDRAULIC PARTS SUPPLY, BOX 4157, BROWNSVILLE, TEXAS 78520-4157

RECYCLE METALS. NO, NOT BEER CANS! Easy \$458 weekly! Free information. Recycler, Box 681804, Franklin, TN 37068-1804

PIANO Tuning quickly learned with home study courses. Diploma granted. American Tuning School, 17050 Teller Drive, Morgan Hill, Calif. 95037.

\$392.00 From Square Foot Plywood. (Huge Demand) \$1.00. (Refundable). Woodwin-PM, POB 859, Bridgewater, Mass. 02324-0859

LEARN Sewing Machine Repairing. Men, Women. Lucrative Profits. Gresslin Correspondence School, Box 5104, Spencer, Iowa 51301.

NEW! GROW EXPENSIVE PLANTS. SELL FOR 2,000% PROFIT. Free information. Growbiz, Box 306-M12, Seminary, MS 39479

TAKE PICTURES for profit. Camera Ventures, Box 771, Lamar, CO 81052

MAILORDER Books. 1,000% Profit. Selectco, Box 1140, Clearwater, FL 34617

\$500.00 FROM ONE SACK CEMENT! FREE Picture Proof. BRINCO, Box 401092-M, Hesperia, CA 92340

BIG PROFITS! REPAIRING WINDSHIELDS and plate glass. \$70,000 yearly. Call 1-800-441-4527 for FREE details. Glass Technology, Inc., Dept. 12P, 434 Turner Dr., Durango, CO 81301

\$40,000 ON 1/2 ACRE! New Hydroponics - inexpensive, pleasant, practical! Free information. Robin's, Box 681804, Franklin, TN 37068-1804

\$1,000 WEEKLY AIR TOOL REPAIRING. Instructions, Parts and Tools Wholesale. Free Details. Box 534, Wichita Falls, TX 76307

MAKE YOUR DREAM COME TRUE. EARN \$75,000 YEARLY REPAIRING CRACKS IN WINDSHIELDS AND PLATE GLASS. NOT REPLACING THEM. CALL 1-800-826-8523 (US/ CANADA): THE GLASS MECHANIX INC., 5313 NOB HILL ROAD, SUNRISE, FL 33351

START A Million Dollar mail order business. We drop-ship 2955 best selling products. Lowest below wholesale prices. Immediate delivery. Spectacular home business opportunity. Free Book. SMC. 9401 De Soto Avenue, Dept. 20-48, Chatsworth, CA 91311-4991.

\$1,000'S POSSIBLE, FREE. Stamped envelope: Progress, Box 93248, Los Angeles, CA 90093.

HOME Assembly Work Available! Guaranteed Easy Money! Free Details! Homeworkeer, Box 520, Danville, NH 03819.

GET RICH! Secret law smashes debts—brings Cash, Credit!! Details 50¢ (coin). Wealthkit/B, Box 32398, PBG, FL 33420

BUMPERSTICKER Printer, Cheap, simple, portable. Free details. Bumper, POB 22791 (GC), Tampa, FL 33622

\$300.00 PER DAY for MAILING LETTERS! Details 50¢ (coin). Moneymakers/B, Box 32368, Palm Beach Gardens, FL 33420

\$400.00 DAILY from your telephone answering machine!! Never talk to anyone! Details 50¢ (coin). CommTech-B, Box 32398, Palm Beach Gardens, FL 33420

NEON, COURSE WITH FREE VIDEO! NEONICS, BOX 4410, ARLINGTON, VIRGINIA 22204

NEW! 2000% PROFITS - in Moldmaking/Casting. Free information. Castcrafter, Box 16586(M12), Memphis, TN 38186-0586

\$2,000 DAILY From Your Telephone Answering Machine! I've made over \$1,000,000 using mine! (303) 674-2219. Recorded Details

\$200 - \$500 weekly—AT HOME! No gimmicks—Details 50¢ (coin). Homeworkeers-B, Box 32397, PBG, FL 33420

VINYL'S where the money is! Professionally repair, recolor or furniture. Quick, easy. Two \$20 jobs a day earns you \$1,000 a month. Homes, cars, offices, restaurants. Start earning in a few days. Details free. VIP, 2007 Montrose, Chicago 60618.

RECYCLE! (AMAZING PROFITS MADE) Reconditioning Automobile Batteries! (Free) Information! Battery Outlet, Box 3300PM, Hickory, N.C. 28603-3300.

BUY Wholesale! Direct from factories. Hong Kong, Taiwan, Philippines. Free Report. Key-Ways, Box 86884-PM, Portland, OR 97286

RECORD VIDEOTAPES ... At Home. \$5,000 Monthly Possible. No Pornography. Free Details. Write: CMS Video Company, Dept. 17, 210 Lorna Square - #163, Birmingham, AL 35216.

COUNTERTOPS: Spot Repair Burned and Damaged Areas WITHOUT REPLACEMENT! Quick, easy to \$600/day. Change Countertop Colors WITHOUT REMODELING! Details Free! 206/256-9742. Renew-All, Box 4506-PC, Vancouver, WA 98662.

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

HOW To Make Extra Money Buying And Selling Anything. FREE, EXCITING EXAMPLE! Biekiewicz Publishing, Box 175H2, Greenfield Center, NY 12833-0175

DISCOVER SUCCESSFUL MINI STORAGE SECRETS. Create, market, operate. Free details. Action, Box 21M, Sturgeon Bay, WI 54235-0021

"HOW MAIL ORDER FORTUNES ARE MADE", Free Details. Bakers Publishers, 543 Kitti Waka, West Columbia, S.C. 29170

ASSEMBLE Products At Home. Many opportunities paying High Weekly Profits available without investment. Businesses-B, Box 9008, Baldwin, New York 11510-9008

IDEAL WOODWORKING BUSINESS. \$150 Daily! Pine, 897-3 Mammoth, Manchester, NH 03104

SIX DYNAMIC New Business Plans! No Big Investment! Spare Time! Davis-A7, 1804 Lemonwood, Mesquite, TX 75149.

SELLING Popular Magazine Subscriptions Make Big \$\$\$ Your Expense Minimal. Suite 3A, 94-20 66th Ave., Flushing, NY 11374

RECONDITION AUTOMOBILE BATTERIES! Low Investment, Profitable, Homebased, Easy. Free Details. Batteries, Box 2738PM, Zanesville, Ohio 43702.

WANT to stay home and make money? Write to: Diamond, 5025-C Rapido, Houston, Texas 77033.

FREE REPORT—How To Get \$25.00/Pound For Your Scrap Aluminum. Write: Americrap-PM1292, Alexandria Bay, New York 13607-0127

EARN \$35/HR. FREE Information. Photo Statues, 814 S. Regent Cir., Brandon, FL 33511, 813-681-8853.

LEARN BATHTUB REGLAZING \$500.00/\$1,000.00 net weekly. \$4,500.00 complete training. Tub Doctor 314-966-8866.

HONG KONG products/Sell for huge profits! Guaranteed! \$16.95 to order or name/address for information to: Tropical Publications, P.O. Box 2456, Galveston, TX 77553-2456

WE OFFER World's Best 12 shot rubberband shooters wholesale/retail. Details (800) 888-0704. HumZinger, 1702 Industrial Highway, Cinnaminson, NJ 08077

FORECLOSURES! Everything to know to buy houses, land, etc. **WAY** below wholesale! Don't Pay more for this info elsewhere. \$39.95. Rowe Systems, Box 684244, Austin, TX 78768-4244

JOIN HOME-WORKER'S ASSOCIATION—Get "Guaranteed Legitimate" home-employment offers! (Many Choices!) Write: Association-PM1292, Alexandria Bay, New York 13607-0250

MAKE homemade "How-to/opportunity" booklets. Mine have earned \$436.097. Money never stops. Free information. Booklets, 507J Oak Drive, Friendswood, TX 77546

15,000 PRODUCTS. BUY LOWEST PRICES Direct From Factories. Free Report. Reco, 40023 Vernon Road, Gattman, MS 38844

MAILORDER MAGIC! NEW profit ideas revealed! Free information! Colvin, 1696E Lawhorn Road, Cassatt, SC 29032

FREE BOOK reveals referral income secrets! Kurth, 610 West Park #405, Albert Lee, MN 56007.

\$1804 MONTHLY Buy/sell used cars (spare-time) **FREE** Details. Autonet, 507 Oak Drive, Friendswood, TX 77546

EASY cash income. Giant profits from small homemade booklets. Perfect home business. Free proof! Eagle Publishing, Box 834P, Casper, WY 82601.

MAKE Thousands at the **BEACH** Doing What Others Aren't! **FREE** Details. Switzer, POB 555786, Orlando, FL 32855.

IMPORT-Export PROFITS! Report Details How-Without Capital. \$3. Duffy, 245 Lakeview, Suite 177, Clifton, N.J. 07011.

HOW TO CASH IN ON THE EXPLODING TELEPHONE SERVICE BUSINESS. Send Name, Address to: A.R. Publications, 1130 Manzanita Avenue Dept. 22, Palm Springs, CA 92264 or FAX 619-320-5551.

HOMEWORKERS DESPERATELY NEEDED! But don't get caught in the Homework Fraud Trap! Hundreds of legitimate companies want to employ you Now! Free Report! Long SASE to: Consumer Network, Dept. 4A, Box 8138, St. Paul, MN 55108.

BIG MONEY REPAIRING AUTO WINDSHIELDS. Supplies and information. Grubbs Glass Patch, P.O. Box 243, Monticello, AR 71655. 1-800-243-2213

DALLAS Company Offers Perfect Business Opportunity. Fantastic Earning Potential With Worldwide Information Network System. Exciting Products. No inventory. Intro-Pak, \$1.00. Renaissance Vision, 10555 St-Hubert, Montreal, Quebec H2C 2H9.

PRIVATE INVESTIGATION TRAINING! BIG INCOME! OWN BOSS! FREE INFORMATION. PROBE, BOX (PM) 2133, BEVERLY HILLS, CALIFORNIA 90213-2133.

\$25,000+ Backyard, Garage **SNAIL** Raising! Sell Fancy **RESTAURANTS** \$8,000Z. \$200 Startup. Carl's, 5712-PM Cooper Road, Indianapolis, IN 46208

\$800 WEEKLY POSSIBLE! Working at Home! 37 Different Opportunities. Rush \$1 and self-addressed stamped envelope to: E. D. R., P.O. Box 1778, Stow, Ohio 44224-0778

"SELL Money!" Become Loan Broker! Free details. Dept. PM-221, Financial Planning, 126 13th St., Brooklyn, NY 11215. (718)-768-6803 X200 (24Hrs.) FAX (718)-965-3400

BATHTUBS. \$2500.00 Per Week. Bathtub Reglazing. Low Overhead. Big \$\$\$, 1-800-462-6338.

FREE! ... 365 Moneymaking Reports. Reportco, Box 2047, Greenville, SC 29602-2047

PROFITABLE HOBBIES. Stuffed toys, detailed diagrams, \$3. Other categories, free catalog. Felix Group, P.O. Box 11355, Beverly Hills, CA 90213

BIG Profits In Auto Security. No Experience Necessary. 1-800-238-2155. 24 hrs

INCREDIBLE PROFITS! Your own home business. **FREE** Literature. Bautista, Box 34221, Bethesda, MD 20827-0221

#1 MONEY Maker Spare Time! No selling! No inventory! Publicly documented seven week \$19,919 income! Free audio cassette and Report reveal everything. Real Money, 911-PM Bryant Place, Ojai, CA 93023

\$250.00 daily recovering Pool tables. Free Information **SASE BILCO**, 1304 Algonquin #112, Algonquin, IL 60102

ATTENTION AUTO BUFFS!!! Join North Americas newest, most innovative motor vehicle and parts locator service, by becoming our marketing agent! No computer experience necessary, but knowledge of the auto service sector would be very helpful! Call 1-800-387-6084!

INTERESTED

IN CLASSIFIED ADVERTISING?

READ POPULAR MECHANICS Latest Edition of "TIPS ON HOW TO MAKE MONEY THROUGH CLASSIFIED ADVERTISING". This informative 24-Page Booklet Will Show You The Do's And Don'ts of Classified Advertising And How You Can Make It Work For You. So Order Today. Only \$1.00 Plus You'll Receive A \$2.00 Coupon Refundable With Your First Order. Send To: **POPULAR MECHANICS CLASSIFIED**, Dept. SG, 250 W. 55th Street, New York, NY 10019

MONEYMAKING OPPORTUNITIES

ADVERTISE Free. 21,300 Magazines, Newspapers, Radio & Television. \$5.95. Directory, Box 1448TN, Redoak, GA 30272

HOME Employment Guide. 900 income. **SASE** \$3.00. Junior, 3978B Glacier, Napa, CA 94558.

\$\$\$ Need To Make Money! For Information On How To Start A Successful Business Of Your Own. Send \$2.00 To: Pinetree Products, P.O. Box 686, Barnegat, NJ 08005

BUY GOLD CHEAP Extremely profitable business. Rush \$10.00 Cash/MD. Goldblizz, 52A-650 Terminal Avenue South, Nanaimo, BC Canada V9R 5E2

MAKE \$2,500 weekly in your mailbox. Free details. Write: Info, 30205 Sunny Slope, Box 4, Sanger, CA 93657

\$1000/week! Self-employed. No franchise fees. Wonderful opportunities. Send \$1: Johnson Enterprises, 4944 Old Mountain Park Rd., Roswell, GA 30075

\$200-\$500 WEEKLY, assembly-clerical. Homework, 1517DM Wilmot, Tucson, AZ 85712

MAILORDER OPPORTUNITIES

MILLIONAIRE Mailorder Expert Reveals Moneymaking Secrets. Free, exciting hour cassette: Mel Powers, No. Hollywood, California 91609

BALDING

HAIR TRANSPLANT SUCCESS SECRETS: Instructional guide, \$8.00. A.M.S., P.O. Box 5035, Old Bridge, N.J. 08857

HAIRPIECES FOR MEN

HAIRPIECES Save \$ Write Perry King, 2730 Octavia St., San Francisco, CA 94123

OF INTEREST TO ALL

FREE PRIVACY CATALOG. Cash income opportunities. Secret loans. New identity. Eden, Box 8410-PC, Fountain Valley, CA 92728. 1-800-338-8484

PERSONAL ALARM WITH LIGHT Protects: Joggers, Seniors, Women, Students Compact. \$15.00 ppd. Arlington Trading Post, 7332 Dogwood Rd., Baltimore, MD 21244. Satisfaction Guaranteed.

MONEY Saving Tips, free sample. Send large SASE to: Beach Computer Aid, Department M-11, 313 First Street, Colonial Beach, VA 22443.

OUTLAWS sourcebook of forbidden devices/knowledge. Write: #365-X, Penfield, NY 14526-0365

DETECT DEADLY Carbon monoxide in home/car with Heads Up Carbon Monoxide Detector. Send \$4.95 to: Sunburst, Box 1276, Jamaica, N.Y. 11423

OF INTEREST TO MEN

SPORTS-SPORTS-SPORTS Pro choices by Pro handicappers the best action. 1-900-438-0314. 20¢ per call.

GOVERNMENT SURPLUS

BUY cars, trucks, motorcycles, computers, even houses dirt cheap from the U.S. Government. 24 hour recorded message. Call 313-927-5057 ext. 110

LOANS BY MAIL

IMMEDIATE CASH LOANS! Borrow \$1,000 - \$75,000. Regardless of credit or income - No Collateral required! **SAME DAY PROCESSING.** Call Toll-Free 1-(800)-452-9889.

NEED-A-Loan \$500-\$100,000.00 Bad Credit No Problem 1-800-441-3012

SIGNATURE Loans Must Have Checking Account & Steady Job. 1-800-445-0680.

LOANS BY MAIL. Free Application! Quetzal Co., Box 537, Walla Walla, WA 99362

MONEY Problems? Free Book describes Loans, Cash, Government Grants, other benefits, available to individuals. Associates-AX, Box 9008, Baldwin, New York 11510-9008

FEDERAL LOANS for small businesses now available. (800) 777-6342 for free details.

BORROW \$100-\$100,000! Fast! Confidential! Glendale, Box 260279, Plano, TX 75026 - 1-800-444-6599

FREE Money!!! \$25,000.00 Monthly from Government and Private Foundations. We helped secure \$400,000 last month! Free Application: Grants, POB 1606-PM12, Ozark, AL 36360. (205) 774-0990. Ext: PM12.

NEED HELP Figuring the Cost of your Advertisement?? Call us at 212-649-3187 or send us a FAX (212-586-5562) and we'll FAX Back with a Price Quote.

PERSONAL

YOUR LOVER'S GLAMOUR PORTRAIT Painted From Photograph. Samples. \$5.00. Hevener, Route 2, Farmville, VA 23901

REMAILING SERVICE

CONFIDENTIAL Mail Receiving, Forwarding Worldwide. MailPost, 2421-M Pratt, Chicago, Illinois 60645. (312) 764-0100.

REMAILING - Receiving - Forwarding - KAP Remails, 611 W 112 St., New York, NY 10025

EYEGLASSES

CLIP eyeglasses to pocket, clothing, without bulky case. \$5.00. Eyeglass Clip, 34 Bradley Avenue, Hamden, CT 06514

WANTED MISCELLANEOUS

GOLD, Silver, Platinum, Rhodium, Tantalum, Samples Evaluated Free. Ore Assaying Service. Call Wholesale Terminal Toll Free: 1-800-932-1010

BUYING Tungsten Carbide, Moly, Tantalum, Gold, Silver, Platinum 1-800-321-6914.

FINANCIAL

REFINANCE Kit. Includes book "Seven Easy Steps for Refinancing Your Home". Save thousands on your Mortgage. \$14.00 + \$3.00 S&H. Financial Publishing Corp., Box 24444, Jacksonville, FL 32241-4444.

BEAT HIGH INTEREST! List of low interest Credit Card issuers, credit tips, and information. Send \$10.95 to: **CREDIT TREND**, P.O. Box 3564, Salem, OR 97302

GOODBYE to high insurance premiums! Proven Plan Saves \$500.00-\$1500.00. Guaranteed! \$6.00. McNew Enterprises, Rt. 5, Box 192, Gonzalez, TX 78629

COMPUTER-Erase bad credit free instantly, legally. Free details: Gold(PM), 13950 Ventura, Sherman Oaks, CA 91423

HEARING AIDS

HEARING AIDS - GUARANTEED LOWEST PRICES! No huge commissions. Home trial, terms. All makes. We're the oldest, biggest, best. Custom instrument specialists. Free information, 1-800-323-1212. Lloyds-PMC.

FREE HEARING AID CATALOG- Save 1/2 by mail! Write: "MoneySavers", 36658PM-12 Apache Plume Dr., Palmdale, CA 93550

FREE HEARING AID CATALOG-HUGE SAVINGS By Mail, **FREE** 30-day Trial. Amazing Technology, 531 Main Street, Suite 335-M9, El Segundo, CA 90245. Call 1-800-382-0002.

CONTACT LENSES

WHOLESALE Contact Lenses. All Brands. Example: Acuvue Disposables-\$17.00. Bausch & Lomb Softlens-\$11.00. 1-800-521-3511.

TOBACCO

CIGARS, Tobacco, Pipes, Chew. Free Catalog. Erie Tobacco Co., 1828 Euclid, Cleveland, Ohio 44115

SCIENCE & CHEMISTRY

"EXPERIMENTER" LABORATORY CHEMICALS GLASSWARE, Catalogue \$2.00. Established 1953. HAGENOW LABORATORIES, 1302 Washington, MANITOWOC, WISCONSIN 54220

TRAVEL AND RESORTS

SAVE 50% On Hotels Worldwide on business and pleasure. Introductory offer! Free details: Travel Connections, Box 7250M, Edmonton, Alberta, Canada T5E 6C8.

SPECIAL SERVICES

INFORMATION. On anything. Ferguson Research Specialists, 60-15 Woodside, Woodside, New York 11377.

HERBS

HERBS - Yohimbine Pau d'Acro Others Catalog \$1.00 (Refundable). "One stop center." Jude Herbs, Box 563PM, Huntington Station, NY 11746

RECYCLING

\$200 month parttime. Informative booklet showing how to capitalize on recycling. \$9.95. Recycling Publications, Box 273, Savage, MN 55378

HYDROPONICS

INDOOR GROWING. Moneymaker! Greater yield than outdoors. Minimal maintenance! \$1 gets catalog and \$5 Coupon. Higher Yield, 29211-P N.E. Wylie Rd., Camas, WA 98607.

FLOWERS, PLANTS & NURSERY SUPPLIES

CACTUS, Succulent Catalogue, 50¢. Over 1,000 varieties. Henrietta's Nursery, 1345-H N. Brawley, Fresno, CA 93722-5899

RECIPES, COOKING, ETC.

MY HUSBAND'S FAVORITE CAKE from scratch. Easy recipe. SASE \$2.00. G.L. Publishing, Box 363, Kimberley, B.C. Canada V1A 2Y9

FESTIVE HOLIDAY COOKIES! 5 Favorite Recipes. \$3.00. Nancy Lohr, 301 E. Georgia, Connellsville, PA 15425

DELICIOUS MICROWAVE PRALINES, FUDGE, PEANUT BRITTLE. \$5/LSASE. 5102 Olana, Houston, Texas 77032

NEW York Style Cheesecake, Walnut Mocha Torte \$3.00 each, \$5.00 both. Send check, SASE to: Aunt Martha's Kitchen, Box 228, Oscoda, MI 48750

300 ways to prepare Christmas salads, sandwiches, and stuff for the folks! Rush \$2. sa2se. Amethystine, Box 366, East Aurora, New York 14052.

73 EXOTIC HAWAIIAN DRINK RECIPES. \$5.00. Eric Shimp, 78-507 Puuiki St., Kailua - Kona, HI 96740.

EXQUISITE Xmas Cakes and Fruit Pudding Recipes, \$3.00. Scotts, P.O. Box 133, Streetsville, Ont. Canada, L5M 2B7.

COOKIE LOVERS 25 DELICIOUS 60 Year Old Recipes \$5.00. M.G.F. Enterprises, Box 1241, Grand Forks, ND 58206-1241.

CHOCOLATE LOVER'S TRIFLE Scrumptious. \$3 SASE. B. Brinegar, Box 1419, Round Rock, TX 78680

AUTHENTIC CHINESE RECIPES less fat/higher fiber \$5.00. Wok This Way, POB 2712, Huntington Beach, CA 92647

LOW Fat Cinnamon Roll Recipe. Send \$2.00/SASE to: T. Boswell, 1623 4th St., Colorado Springs, CO 80907

SWEDISH Mazarin Cake recipe Send \$2.00. Moms House, P.O. Box 6216, Franklin, N.H. 03235

WINEMAKING, BEERMAKING, ETC.

FREE! LARGE INFORMATIVE CATALOG. Cottage Brewing, Box 14098-RC, Rochester, NY 14614.

BEERMAKERS-Winemakers Free Catalog. Fast Service. Free Recipes. Cellar-M, Box 33525, Seattle, WA 98133, 800-342-1871

FREE, Homebrewer's catalog, Brewery, 1300 Quincey, Minneapolis, MN 55413. 800-347-4042.

BEER, WINE make your own. Free catalog, quality supplies, excellent fast service. Beer & Wine Hobby, 180 New Boston Street, Woburn, Mass. 01801. 1-800-523-5423

WINEMAKERS - BEERMAKERS: FREE ILLUSTRATED CATALOG OF SUPPLIES. SEMPLEX, BOX 11478P, MINNEAPOLIS, MINNESOTA 55411

WINEMAKERS - BEERMAKERS - Free Illustrated Catalog - Fast Service - Large Selection - Visa/Mastercard - (816) 254-0242 - Kraus, Box 7850-L, Independence, Missouri 64054.

FREE BEERMAKING BOOK-Catalog. Finest Equipment, Ingredients. Fast Service! 1-800-852-9545.

FREE CATALOG! GREAT PRICES! FAST SERVICE! SEBASTIAN BREWERS SUPPLY, 7710 91 AVE., VERO BEACH, FL 32967. 1-407-589-6563.

KENTUCKY MOONSHINE 104 proof - the smoothest made. Precise plans and recipe \$10.00. P.O. Box 1428, Cadiz, KY 42211

HANDCRAFTED BEER! Complete instructional manual for beginners. Send \$5.00. Surf Brewing, Dept. 110, P.O. Box 273, Kula, HI 96790

ENGLISH Beermaking Kits. Free Catalog. JHP, Box 3000-311, Chino, CA 91708. 714-627-3739.

SECRETS OF WINEMAKING, Free Catalog. Slaters, Box 118, Port Townsend, Washington 98368

DISCOUNT PRICES! Quality supplies make your own. Cedar Vintage, 92 Portsmouth Ave., Exeter, NH 03833. Free catalog 1-800-758-5565.

If You Want To Know More About All The New '93 Cars And Light Trucks, You Must Have It!

POPULAR MECHANICS NEW CAR AND TRUCK BUYERS GUIDE 1993

Written by the automotive editors of Popular Mechanics, this is the only publication that contains photos, prices, specs, options and features for every 1993 car and light truck sold in America. Every new car—domestics, imports, economy, family and sports. Every new truck—minivans, sport/ utilities, pickups, vans.

PLUS THIS EXCLUSIVE! Owners Reports On 16 Popular Cars And Trucks From The People Who Own Them!

Send check or money order for \$4.95 to :

Popular Mechanics
PO Box 7168
Red Oak, Iowa 51591

Name _____

Address _____

City _____ State _____ Zip _____



ORDER NOW FOR JUST \$5.95 BY CALLING 1-800-333-4948
OR BY MAIL FOR \$4.95 USING THE COUPON ON THIS PAGE
(prices include all shipping, handling and postage.)

Please allow 6-8 weeks for delivery.

COMING NEXT MONTH



TM PHOTO BY REVOLUTION HELICOPTER

Build Your Own Helicopter

Your own helicopter in just two weeks. A rotorhead design breakthrough opens up a new world of affordable kit helicopters that weigh just 300 pounds and fly 100 mph.

On Golden Wheels

Banned from international competition for eight years, Lotus Sport's radical, forkless bicycle finally was allowed in this year's Olympics, where it struck gold.

Home Survival Guide

Everything you need to know about buying home insulation. Plus, save a bundle on common plumbing repairs.

Time For A Change

The latest super watches tell you when to come in out of the sun and offer special features for specific sports.

GM's New Ponycars

Chevy Camaro and Pontiac Firebird are totally new from the ground up for the first time in 11 years. We evaluate the newest versions.

Cars Of The President

In January, the president-elect will ride to the steps of the Capitol to take the oath of office. What will he ride in? Here's the story on the special wheels of U.S. presidents.



**Give us
this much
space.
And we'll
heat your
whole
home.**

The new Silhouette™ gas furnace from Ruud® stands just 34" tall and weighs 20% less than a standard furnace.

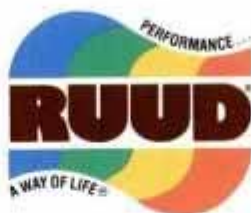
But don't let its size fool you. It packs a lot of heating power—capacities from 50,000 to 150,000 Btu—all the while saving you money, thanks to two big factors.

First, the way it's designed. Our new patented heat exchanger is built to run quietly, efficiently, comfortably...and compactly. And operating our small wonder are top-quality electronic furnace controls and components from world-class companies like Honeywell.

Second, the way it's fueled: with economical natural gas which also happens to be one of the cleanest, most dependable fuels you can use.

So unless you've got space to spare, look into the new Silhouette. In addition to its small size and fuel-saving features, you'll find it comes

backed by a 20-year limited warranty on the heat exchanger. For more information, call 1-800-848-RUUD.



Clean natural gas. America's best energy value.



Powerful Stock/Options. Chevy S-10 Tahoe Extended-Cab.

Up to \$1900 in option package savings.*

4.3L V6, the biggest V6 you can get, standard in 4x4.

Room for four with available rear jump seats.

Rear-wheel anti-lock brakes standard.†

More than 98% of all Chevy trucks sold in the last 10 years are still on the road. Over the years, no other truck is that dependable, foreign or domestic.**

Chevrolet. The Most Dependable, Longest-Lasting Trucks.

LIKE A ROCK



For more information call 1(800)962-2868.

*Based on M.S.R.P. of Preferred Equipment Group BAA6 versus equipment purchased separately. Maximum savings on 2WD model \$1900. Maximum savings on 4WD model \$1484. See your dealer for details. †On 4WD models rear-wheel anti-lock brakes operate in 2WD only. **Based on full-line truck company registration data 1982-1991. Excludes other GM products. Chevrolet, the Chevrolet Emblem and S-10 are registered trademarks and Chevy and Tahoe are trademarks of the GM Corp. ©1992 GM Corp. All Rights Reserved. Buckle up, America!