

JUNE 1989 \$1.95

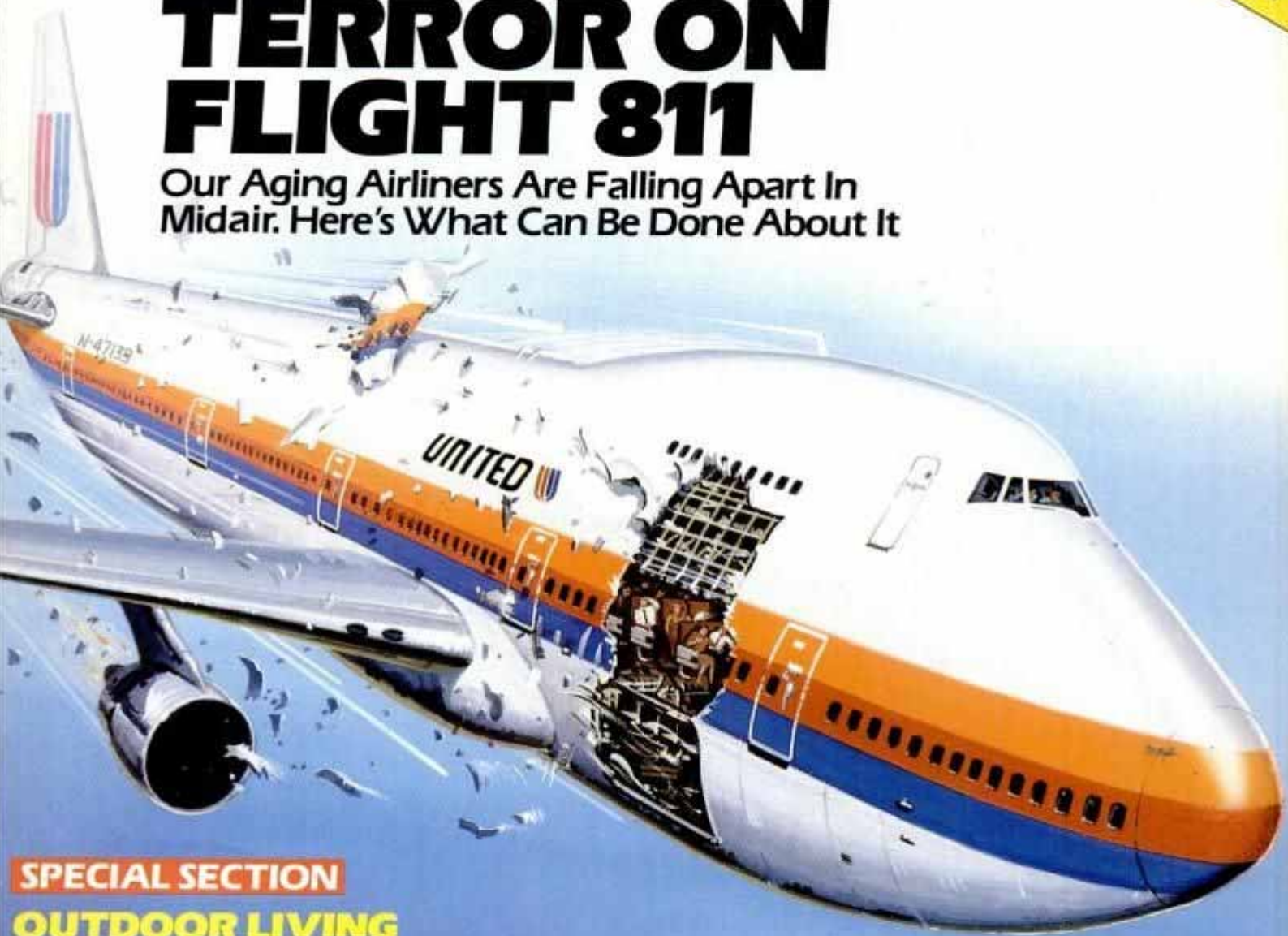
# Popular Mechanics

Driving The Corvette ZR-1: Detroit's Hottest Ever



## TERROR ON FLIGHT 811

Our Aging Airliners Are Falling Apart In Midair. Here's What Can Be Done About It



### SPECIAL SECTION

#### OUTDOOR LIVING IN STYLE

4 Dream Projects For A More Inviting Backyard

- Multilevel Deck
- Lattice Fence
- Wood Walkway
- Serving Buffet



#### HOVERCRAFT FLYERS

Ride 50 MPH On Air Over Anything

#### REAL-WORLD CAR TESTING

Owners Rate The Cadillac Allanté, Ford Probe, Jaguar XJ6, Lincoln Continental





**YOU GOTTA BE TOUGH  
TO STAY #1 FOR 12 YEARS!**

## **TOUGH '89 BIG FORD PICKUP - AMERICA'S BEST SELLER.**

Americans go with the truck leader. For the past 12 years, Americans have chosen tough Ford pickups over all others.\* And they're satisfied with their choice — because Ford has the highest percentage of *repeat* buyers of any full-size pickup!\*\* Last year Ford's F-Series pickups beat Chevy again by a big margin. Ford's built aerodynamic, Hi-Tech and tough — even better for 1989!

**BIGGER ENGINE,  
MORE TORQUE!**

Ford's pickups offer a bigger stan-

dard Six — with 10% more torque than Chevy. V-8s range from most powerful small gas V-8 to biggest diesel in *any* pickup. Only Ford pickups offer four multiple-port electronic fuel-injected engines. When properly equipped, some Fords are rated to tow a 12,500-lb. trailer.

### COMFORT, CAB CHOICE.

Ford offers a complete range of cab choices. There's a Regular Cab, SuperCab and 4-door Crew Cab — with single or dual rear



wheels. The interiors of all Ford cabs are roomy and comfortable.

**BIGGER CARGO BOX,  
MORE PAYLOAD.**

Ford gives you a larger, wider, deeper pickup box than Chevy.



Buckle up — together we can save lives.

On many models, Ford carries more maximum payload than comparable Chevys.

**AUTOMATIC LOCKING HUBS  
— STANDARD!**

Now on Ford F-150 4x4s!

Fords also come with standard equipment the Chevy C/K doesn't. Features like halogen headlamps, AM radio with digital clock, and four gauge package.

All big Ford pickups have gas-pressurized shocks standard — unavailable on any Chevy except K1500. Ford was first with rear Anti-lock brakes, aerodynamic styling, and 4x4 Twin Traction Beam independent front suspension.

**SPECIFICATIONS**

**ENGINES**

145-hp. 4.9L EFI Six  
185-hp. 5.0L EFI V-8  
210-hp. 5.8L EFI V-8  
230-hp. 7.5L EFI V-8  
180-hp. 7.3L diesel

**PAYLOADS**

F-Series 4x2 pickups:  
1575 to 5270 lbs.  
F-Series 4x4 pickups:  
1750 to 4295 lbs.

**CABS**

Regular 3-Man Cab  
Ford 2-Door SuperCab  
Ford 4-Door Crew Cab

**MAJOR STANDARD**

**EQUIPMENT**

Power brakes  
Power steering  
5-speed OD transmission  
Gas-pressurized shocks  
Electronic radio & clock  
Full instrumentation

**TRANSFERABLE  
6/60 WARRANTY.**

Covers you and future owners, with no transfer cost, on major power-train components for 6 years/60,000 miles. Restrictions and deductible apply. Ask your Ford Dealer for a copy of this limited warranty.

**BEST-BUILT AMERICAN  
TRUCKS 8 YEARS RUNNING.**

Based on an average of owner-reported problems in a series of surveys of '81-'88 models designed and built in North America. At Ford, "Quality is Job 1."

Now's the time to buy or lease.

\*Based on calendar year manufacturers' reported retail deliveries through 1988.  
\*\*Based on 1988 New Car And Truck Buyer Study.



**FORD PICKUPS**  
BUILT FORD TOUGH



# WHEN YOU OWN A JOHN DEERE, YOU THINK SATURDAY WILL NEVER COME.

As any John Deere owner will tell you, there's just one thing wrong with Saturday. It only comes once a week.

But that doesn't mean you can't enjoy your John Deere during the week.

Get the feel behind the wheel. Imagine powering up those hills with your durable high torque, overhead valve engine.

Weaving in and around trees and flower beds with

its tight turning radius.

Before you know it, it'll be Saturday. For information or to find your nearest dealer, call 1-800-544-2122.



**NOTHING RUNS LIKE A DEERE®**





### 67 COVER STORY

When nine persons were sucked to their deaths after a midair decompression on United Flight 811, the tragedy created an intense debate over America's aging airliners. —PM illustration by Ed Valigursky



80 Air power



71 Technowriters



74 Owners reports

## SPECIAL: OUTDOOR STRUCTURES

### 83 4 Great Ways To Improve Your Property

- An adaptable multilevel deck
- An easy-to-build lattice fence
- A topographic, serpentine walkway
- A convenient outdoor buffet

### 84 Full Deck

A new deck design with all the trimmings.

### 88 Private Domain

Our sectional fencing system adds just the right level of privacy to your yard.

### 90 Garden Path

Follow your backyard's own geography and leave the straight and narrow behind.

### 93 Bonus Buffet

Bring kitchen counter convenience to entertaining in the great outdoors.



## AUTOMOBILES

### 22 Car Clinic

Got a car question? We've got the answer.

### 32 Inside Detroit

Saturn, GM's departure from styling tradition.

### 36 Imports

The station wagon has evolved into a sport wagon.

### 44 Motorsports

Iowa gets its own Grand Prix.

### 52 Freewheeling

Corvette's liftoff hardtop is back!

### 58 Motorcycles

BMW and Honda revitalize the meaning of new.

### 74 Owners Reports

We wrap up the Probe, XJ6, Continental and Allanté.

### 78 Chevrolet Corvette ZR-1

Our firsthand drive report of America's hottest car.

### 120 Long-Term Test

Pontiac 6000, Ford Festiva and Dodge Caravan.

### 133 Saturday Mechanic

Plugging power steering leaks.

## HOME/SHOP

### 38 Old House Restoration

Exterior painting for historical period homes.

### 95 Home And Shop Journal

Complete your toolbox with a few nut crackers, extend the life of your band saw blades, and more.

### 107 The Better Home

- Install vinyl sheet flooring
- Install a towel bar
- Homeowners' Clinic
- Appliance Clinic

## SCIENCE/TECHNOLOGY

### 13 Tech Update

Marine aerodynamics, high-speed travel and more.

### 18 Science

The fearful consequences of the greenhouse effect.

### 56 Aviation

The Dyna-Cam engine sparks a power revolution.

### 67 Horror In The Skies

How we can keep aging airliners airborne.

## ELECTRONICS

### 46 Electronics

Portable laptops are hot.

### 62 Home Video

On location with the newest in video camcorders.

### 71 Technowriters

Personal word processors type and compute.

## OUTDOORS

### 28 Outdoors

Heading offshore for the peak of sailfish season.

### 80 Air Power

We test a fleet of personal, high-tech hovercraft.

## DEPARTMENTS

4 Editor's Notes

8 Time Machine

7 Letters

152 Notice To Readers

# EDITOR'S NOTES

# Popular Mechanics

**Editor-in-Chief**  
Joe Oldham

**Managing Editor**  
Bill Hartford

**Graphics Director**  
Bryan Canniff

**Home And Shop**

Steven Willson, editor  
Joseph Truini, shop and tools editor  
Thomas Klenck, associate editor  
Norman Becker, Rosario Capotosto,  
Steve Toth, Bob Vila,  
contributing editors

**Automotive**

Tony Swan, editor  
Jim Dunne, Detroit editor  
Mike Allen, assistant editor  
Michael Lamm, Norman S. Mayersohn,  
Mort Schultz, Rich Taylor,  
contributing editors

**Electronics/Photography**

Stephen A. Booth, editor  
Frank Vizard, contributing editor

**Science/Technology/Aerospace**

Timothy H. Cole, editor  
Fred Mackerodt, contributing editor

**Boating/Outdoors**

Joe Skorupa, editor

**Editorial Production**

John Bostonian Jr., art editor  
Deborah Frank, production editor  
Nancy Coggins, art assistant  
Jodi L. Tashman, asst. production editor

**Art**

Alan Andresen, Ann Bennett,  
associate art directors  
Larry Sullivan, assistant art director

**Editorial Administration**

Josephine Caronia, administrative assistant  
Barbara A. Novak, executive assistant

**Editorial Offices**

224 West 57th St., New York, NY 10019  
We cannot be responsible for loss of  
unsolicited queries, manuscripts, or  
photos. For return, they must be accom-  
panied 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 10064, Des Moines, IA 50350. • Should you have any problem with your subscription, please write Joan Harris, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, IA 50350 or call toll-free 1-800-333-4948. Please enclose your mailing label when writing to us or renewing your subscription • Renewal orders must be received at least eight weeks prior to expiration to assure continued service.

Use this address for subscription orders & inquiries. POPULAR MECHANICS, P.O. Box 10064 Des Moines, Iowa 50350.

**L**AST AUGUST, when we published our cover story on metal fatigue affecting older aircraft ("Catastrophe!" page 58), we never dreamed that the problems would escalate as quickly as they have. Since the Aloha Airlines 737 lost part of its roof at 20,000 ft., there have been innumerable instances of pieces of aircraft falling off, peeling away and blowing out. We felt the situation was so grave as to warrant an update. We assigned William Hoffer, our original reporter, to research and write the followup piece, which is this month's cover story ("Horror in the Skies," page 67). The bad news is that most of America's commercial air transport fleet is old and getting older every day. The good news is that the Federal Aviation Administration



Americans in Carcassonne, France.

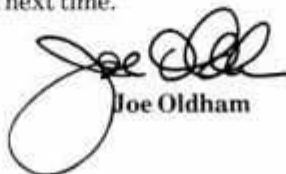
does have a plan to stop the bleeding, and it's already being implemented by the airlines. Hoffer's report makes interesting reading, especially if you're a frequent flyer. . . . There is something almost poetic about a convoy of 375-hp Corvettes roaring through the French Alps and down into the south of France at speeds up to 160 mph—in perfect coordination and, yes, safely. I had a chance to take part in such a drive recently. The purpose was to demonstrate to the world's press that Chevrolet could build a sports car that was the equal of anything in the world—and then some. Chevrolet made its point. Auto Editor Tony Swan was there, too. His account of the drive to Carcassonne begins on page 78. . . . You regular readers have, by now, heard about, and maybe even used, our PM Hotlines—phone numbers you can use to call our editors directly to ask a question, make a suggestion or just say hello. Several months ago, we added a computerized electronic mail system so that your PC can talk to our PC. We'll continue to evolve our reader communications system in the future because we believe that nothing

is better for a magazine than for its editors to talk to its readers. And nothing is better than editors talking to readers in person. Recently, our Home & Shop editorial staff, led by Steve Willson and including Joe Truini, Tom Klenck, Norman Becker and Steve Toth, presented a program to PM readers and other visitors at the Greater New York Apartment and Home Show at the Jacob K. Javits Convention Center here in New York City. Steve and his guys answered questions and helped solve problems related to home maintenance and remodeling. All of our editors will be appearing from time to time in various parts of the country. Look for us and come by and say hello. 'Til next time.

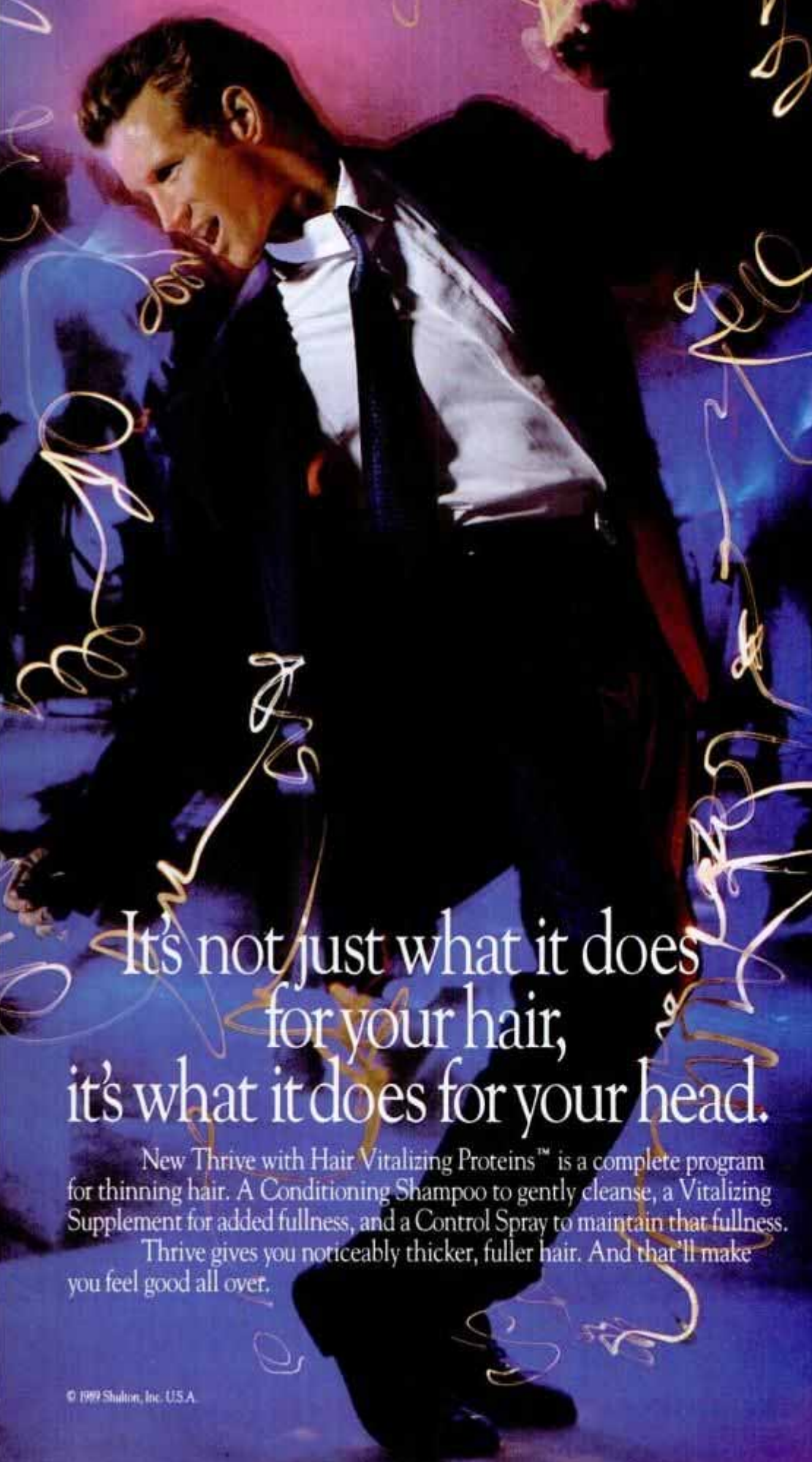


Left to right: Willson, Toth, Becker, Truini, Klenck.

is better for a magazine than for its editors to talk to its readers. And nothing is better than editors talking to readers in person. Recently, our Home & Shop editorial staff, led by Steve Willson and including Joe Truini, Tom Klenck, Norman Becker and Steve Toth, presented a program to PM readers and other visitors at the Greater New York Apartment and Home Show at the Jacob K. Javits Convention Center here in New York City. Steve and his guys answered questions and helped solve problems related to home maintenance and remodeling. All of our editors will be appearing from time to time in various parts of the country. Look for us and come by and say hello. 'Til next time.

  
Joe Oldham

Introducing Thrive for thinning hair.



It's not just what it does  
for your hair,  
it's what it does for your head.

New Thrive with Hair Vitalizing Proteins™ is a complete program for thinning hair. A Conditioning Shampoo to gently cleanse, a Vitalizing Supplement for added fullness, and a Control Spray to maintain that fullness.

Thrive gives you noticeably thicker, fuller hair. And that'll make you feel good all over.

© 1999 Shulton, Inc. U.S.A.

MANUFACTURER'S COUPON EXPIRES 12-31-99

Save \$1.00 On  
Thrive® Conditioning  
Shampoo

(8 oz. size)



This coupon redeemable at stores where THRIVE is sold, including food, drug and mass merchandise stores.

RETAILER: Shulton will reimburse you the face value of this coupon plus 8¢ handling if submitted in compliance with Shulton coupon policy A-1. Copies available upon request. Invoices covering purchase of sufficient stock to cover presented coupons must be shown on request. Cash value 1/20 of 1¢. Send coupons to THRIVE, Shulton, Box 870004, El Paso, TX 88587-0004. Limit one coupon per purchase.

700342



5 12044 62076 7

MANUFACTURER'S COUPON EXPIRES 12-31-99

Save \$1.00  
On Thrive®  
Vitalizing  
Supplement

(2 oz. size)



This coupon redeemable at stores where THRIVE is sold, including food, drug and mass merchandise stores.

RETAILER: Shulton will reimburse you the face value of this coupon plus 8¢ handling if submitted in compliance with Shulton coupon policy A-1. Copies available upon request. Invoices covering purchase of sufficient stock to cover presented coupons must be shown on request. Cash value 1/20 of 1¢. Send coupons to THRIVE, Shulton, Box 870004, El Paso, TX 88587-0004. Limit one coupon per purchase.

700359



5 12044 61076 8

MANUFACTURER'S COUPON EXPIRES 12-31-99

Save \$1.00  
On Thrive®  
Control Spray

(5 oz. size)



This coupon redeemable at stores where THRIVE is sold, including food, drug and mass merchandise stores.

RETAILER: Shulton will reimburse you the face value of this coupon plus 8¢ handling if submitted in compliance with Shulton coupon policy A-1. Copies available upon request. Invoices covering purchase of sufficient stock to cover presented coupons must be shown on request. Cash value 1/20 of 1¢. Send coupons to THRIVE, Shulton, Box 870004, El Paso, TX 88587-0004. Limit one coupon per purchase.

700367



5 12044 63076 6

Материал, защищенный авторским правом

# 6 Rotten Reasons To Use Cuprinol.



Look for the Cuprinol® name on Stains, Deck Stains, Wood Preservatives and Sealers to fight the effects of weather on siding, decks, fences and other exterior woods. No matter where you live, there's no more beautiful way to preserve wood's natural beauty.



**Cuprinol**<sup>®</sup>  
BRAND  
When it's wood against weather.™

For consumer information call Cuprinol® Brand Technical Services:  
800-624-PROS CT: 800-228-7103

Darworth Company  
MIL. CONN. 06107

© 1988 Emery-Bickford Industries, Inc.

6

## Popular Mechanics

### Publisher

Daniel J. Coleman

### Director Of Advertising

Warren R. Schultz

### National Sales Manager

William T. Duke

### Director Of Marketing

Edward Vaquero

### Advertising Offices

#### New York

224 West 57th St.

New York, NY 10019

Brian Broderick, Eastern Manager

(212) 649-3135

Edward W. Baker - (212) 649-3141

Alfred R. duPont - (212) 649-3142

Timothy Poturny - (212) 649-3140

#### Chicago

1 South Wacker Dr.

Chicago, IL 60606

(312) 984-5190

Alan R. Perry, Western Manager

F. Lee Bishop - (312) 984-5194

Daniel F. Kellner - (312) 984-5195

#### Detroit

2301 West Big Beaver Rd.

Troy, MI 48084

Laurence E. Lantz - (313) 649-2981

Donald C. Schulz - (313) 649-2981

#### Los Angeles

3000 Ocean Park Blvd.

Santa Monica, CA 90405

Penn H. Jones - (213) 450-8881

Austin C. Sass - (213) 450-8881

### Direct Response Advertising

224 West 57th St.

New York, NY 10019

Bud Gilbert, Manager - (212) 649-3139

Dan Nunziata - (212) 649-3143

### Business Manager

Agnes P. Maillaro

### Production Manager

Lori Ellwood

### Advertising Production

Patricia A. Tanner - (212) 649-3164

### Classified Sales Manager

Sophie Gronowicz - (212) 649-3167

### Reader Service Department

Norah I. Golad, supervisor

224 West 57th St., New York, NY 10019

(212) 649-3128

### Published by The Hearst Corporation:

Frank A. Bennack Jr., President

Randolph A. Hearst, Chairman

Gilbert C. Maurer, President, Magazines Division

D. Cluys Bahrenburg, Exec. Vice President

Richard E. Deems, Publishing Consultant

POPULAR MECHANICS is published monthly by the Hearst Corporation, 959 Eighth Avenue, New York, NY 10019. U.S.A. Frank A. Bennack Jr., President; Randolph A. Hearst, Chairman; Harvey L. Lipton, Vice-President and Secretary; Edwin A. Lewis, Vice-President and Treasurer. Hearst Magazines Division: Gilbert C. Maurer, President; D. Cluys Bahrenburg, Executive Vice-President; K. Robert Brink, Executive Vice-President; George J. Green, Executive Vice-President; Mark F. Miller, Executive Vice-President, General Manager; Raymond J. Petersen, Executive Vice-President; Thomas J. Hughes, Vice-President & Resident Controller; Daniel J. Coleman, Vice-President for Popular Mechanics.

INTERNATIONAL EDITIONS: CARIBBEAN, MEXICO, SOUTHERN HEMISPHERE

AS A SERVICE TO READERS, Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Due to possible variances 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 plans published in this magazine.

POPULAR MECHANICS • JUNE 1989

Материалы, предназначенные авторскими проектами



# LETTERS

## Better Bathrooms

**Y**OUR April "Bathroom Remodeling" section (Home Improvement Guide, page 93) was great! But I do have a suggestion. On page 118 in your article on medicine cabinets you say "position the cabinets so all the doors swing open the same way." Sixteen years ago my husband installed three medicine cabinets in the same fashion, but the left and right cabinets both open toward the center cabinet. This way you are able to see the back of your head for arranging hairdos, and so on. I could never get along with any other arrangement.

CAROL ANN SCHWINGEL

Thanks for the detailed skylight installation information ("Bathroom Remodeling" section, page 102). Let me suggest that for an added touch of elegance that readers line the light well or shaft (the space between the skylight and the ceiling below) with mirrors. Your one skylight will multiply to an airy roof of lights extending indefinitely in all directions and sunshine will sprinkle into unsuspected corners of your room. (If I sound rapturous, I am. I just did mine that way!)

EARL M. HILL  
MONTGOMERY, TX

## Electronic Mail

FROM: Walter 30  
TO: Joe Oldham  
DATE: 02-09-89 20:34:05  
SUBJECT: Incredible!

Joe, I must tell you that this is the most incredible idea yet by PM. Answers to mechanical questions via computer. I am impressed! Good luck.

WALTER 30

*This "letter" was downloaded off the PM computer soon after we began receiving electronic communications from our readers. Walter is one of the first readers to dial (212) 582-8369 after setting his software to 8 bits, no parity and one stop bit (8-N-1), and 300 or 1200 baud. With his first call, he received his No. 30 identification and chose a password.*

*You can call the PM computer with your technical questions any day between 6 pm and 8 am (only) EDT. Once on the line, you can leave messages for specific editors or direct inquiries and comments to a specific department.*

## Right Bike?

I feel your road test "Touring First Class," (page 80, April '89) is an unfair comparison. What have you got against Harley-Davidson? You tested all the top-of-the-line touring motorcycles, but to represent Harley you chose the FXRT. This is not Harley's top touring bike. What gives? The '89 FLHTC Electra Glide is the right choice. The Ultra has many features the other bikes in the test have, including electronic cruise control, self-canceling turn signals, lower leg fairing and so on. You've done an injustice to Harley-Davidson.

GARY GOODRICH  
GILETTE, WY

*At the time we were planning our road test, Harley-Davidson Motor Co. suggested we run the FXRT model against the other competition. While it admittedly lacks some of the plush touring accommodations of the FL-Series machines, it has the identical drivetrain and Harley spokespeople felt it would be a perfectly credible matchup with the other bikes in our test.*

## Terrific To The Max

Congratulations to PM. Every issue is better than the last. The automotive comparison tests are probably my favorite articles.

Keep up the good work!

DANIEL K. MAX  
OMAHA, NE

## On Top Of The News

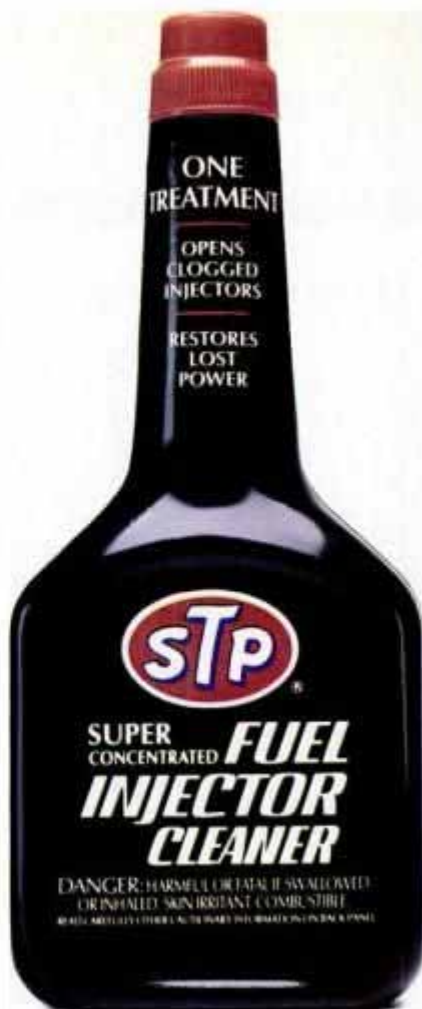
I enjoy POPULAR MECHANICS every month. It keeps me up on things and I'm never disappointed. Your cover story in March ("Big Bird," page 74) provided an excellent history of the 747 jumbo jet and became very much a news story with your update on the tragedy of Flight 103 over Scotland.

The issue was also in my hands on Feb. 24 at the time Flight 811, 42 minutes out of Hawaii, suffered explosive decompression from loss of a cargo door and had to return to the airport severely damaged. Very timely, my friends. Maybe you could carry the story of Flight 811 soon.

GILBERT L. FUNK  
EDMONTON, ALBERTA, CANADA

You got it.

PM



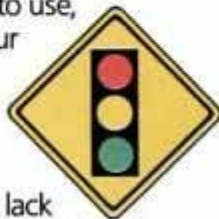
## Confidence booster.

Does your car make you nervous about traffic lights? Does it choke up when you press down on the gas? Does it see red when you see green?

Dirty fuel injectors could be robbing your engine of power.

But one bottle of STP® Super Concentrated Fuel Injector Cleaner quickly dissolves deposits and unclogs grimy injectors. It helps restore lost power and improve acceleration. Helps eliminate tough starts and rough idling, too. And it's so easy to use, just add it to your gas tank.

And better performance under the hood means no more lack of confidence behind the wheel.



**B** FIRST BRANDS

# TIME MACHINE

## 75 YEARS AGO: JUNE 1914



### Delightfully Simple

As PM continued to roam an increasingly complicated century, the magazine took special care to focus on the prosaic. Case in point: Our 1-man "Sharpie," featured on the cover offered large-yacht challenges at a commoner's price. The small flat-bottomed punt featured a simple spritsail rig. A 1-to-1 mainsheet harnessed light, in-shore breezes. Both steering and lateral resistance were achieved by an oar fulcrumed between the toes of the skipper's unshod foot.

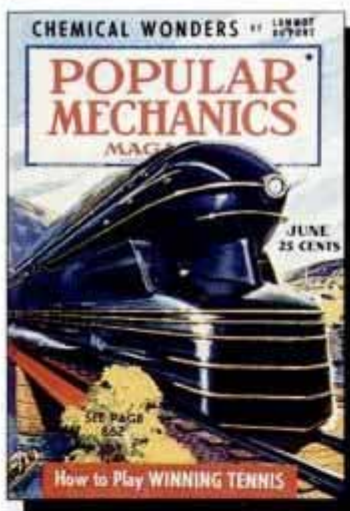
### Simply Complex

We'd already covered the uniwheel gyro train, conceived to skitter down narrow mountain passes on a wire rope. Now the gyro car appeared to demand equal

billing. The ungainly, twin-wheel contrivance used a horizontal gyro spun at 1500 rpm by an electric motor to maintain equilibrium, righting the car with the help of "pendulums and springs."



## 50 YEARS AGO: JUNE 1939



### When Steam Was King

Built by the Pennsylvania Railroad for exhibit at the New York World's Fair, *Pride of the American Railroads* was considered the world's largest locomotive. Noted futurist Raymond Loewy designed the 100-mph behemoth, which measured an imposing 140 ft. from pilot to tender coupler. Four cylinders motivated the 6-4-4-6 engine to a truly muscular 6500 hp, gobbling 50,000 pounds of coal and 24,500 gallons of water in the process.

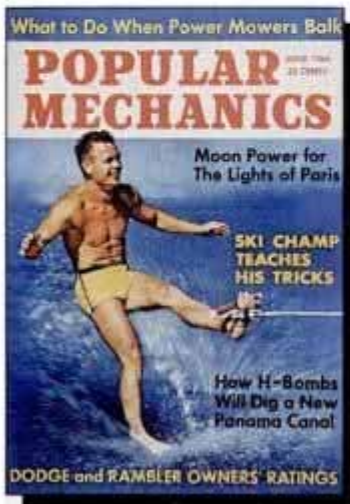
### Thrill Seekers

Some things never change. In this case: PM's early love affair with thrill rides. We reported on the Stratoship, a flight simulator that appeared at the New York

World's Fair. The attraction? A prop-driven car spun around a central pylon counterbalanced by a water tank. The arrangement allowed intrepid riders to experiment with the physics of fun.



## 25 YEARS AGO: JUNE 1964



### A Real Sport

The latest sports equipment and techniques weren't alien to PM's pages—which had presented Arnold Palmer's expert niblick analysis, as well as Jimmy Clark's preview of rear-engined Indy cars. So why not water skis? Twenty-five years ago this month, 1963 Master Trick Skiing Champ Al Tyll told all in his step-by-step instructional guide. Two-ski step-overs—even the difficult but stylish helicopter spin—were now within reach of PM's inquisitive readership.

### Nuking Nicaragua

The polite term was "thermonuclear excavation," and it was envisioned as a means to create a new sea-level canal through the Central American isthmus. Row-charge blasting was the desired technique using deeply placed hydrogen bombs. A refined diffusion method would control debris and gouge out a precisely shaped hole based on size and location of the charge. Nicaragua was a leading site candidate, as well as riverbeds in Panama and Colombia. **PM**



# WE MADE CLOSE COMFORTABLE.

Norelco's patented "Lift and Cut™" shaving system gives you a shave that is skin close—without the blades even touching your skin.

As the hair enters the chamber...



The system lifts each hair...



A split second before a blade cuts it.



The continuous precision-cutting action of dozens of lifters and self-sharpening blades—at thousands of revolutions per minute—gives you a shave like none other.

The Norelco® Lift and Cut shaver. What makes it close, makes it comfortable.

 **Norelco®**



© 1989 Norelco Consumer Products Company,  
A Division of North American Philips Corporation, Stamford, CT 06904

Матеріал з сайту [www.dobryradco.com](http://www.dobryradco.com)



Lights: 11 mg "tar," 0.8 mg nicotine—100's; 10 mg "tar,"  
0.8 mg nicotine—Kings; 17 mg "tar," 1.1 mg nicotine  
av. per cigarette by FTC method.

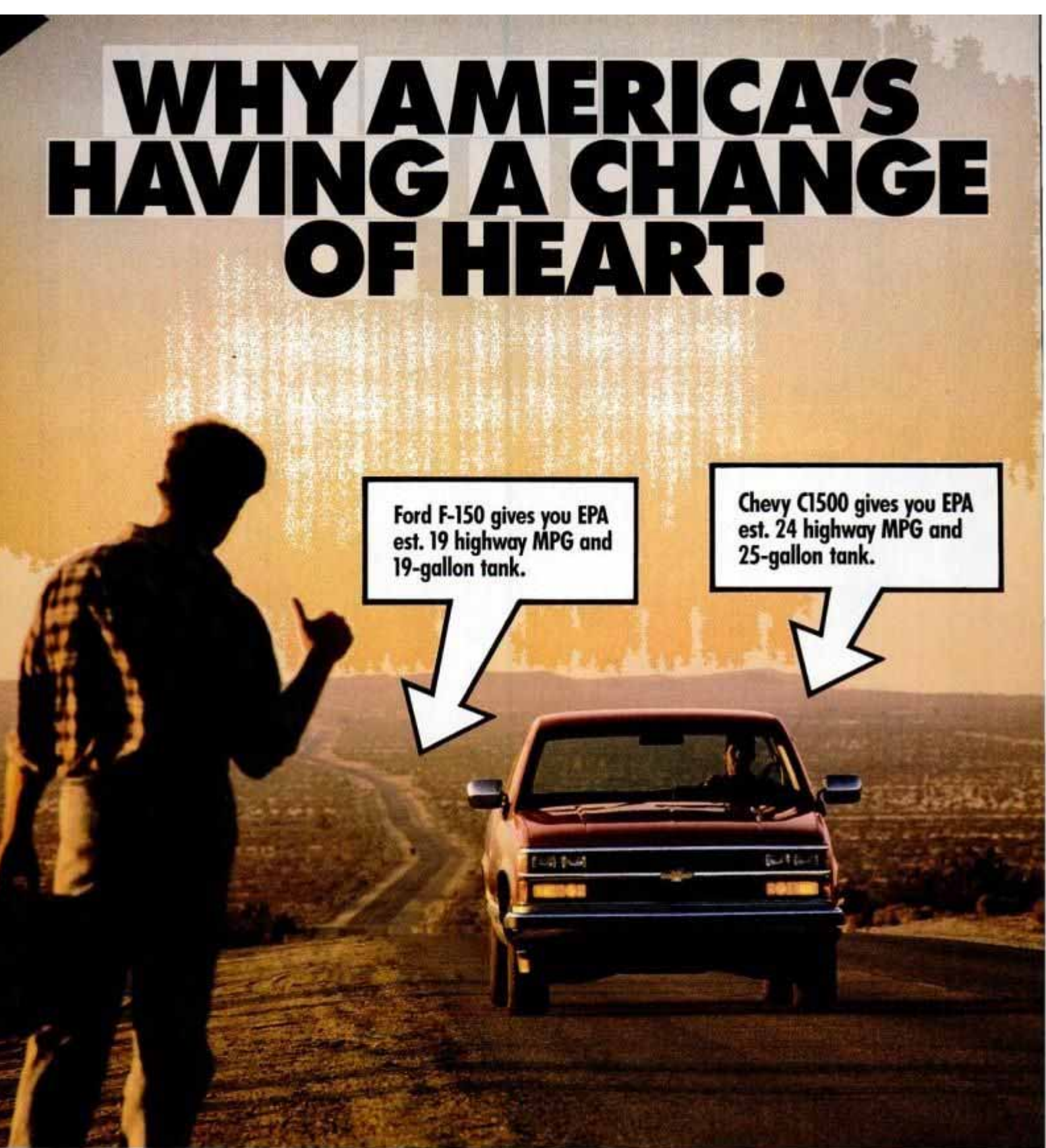
**SURGEON GENERAL'S WARNING: Quitting Smoking  
Now Greatly Reduces Serious Risks to Your Health.**



MENTHOL **Marlboro**

Spirited refreshment.

# WHY AMERICA'S HAVING A CHANGE OF HEART.



Ford F-150 gives you EPA  
est. 19 highway MPG and  
19-gallon tank.

Chevy C1500 gives you EPA  
est. 24 highway MPG and  
25-gallon tank.

How advanced is the full-size Chevy®? So advanced the half-ton gives you a bigger, heavier frame than Ford; more two-sided galvanized steel, more cab room, more standard horsepower and heavier base payload. Yet still beats Ford in gas mileage.

Have you driven the first all-new full-size pickup introduced in this decade? Maybe it's time you gassed up your Ford and took a look. At your Chevy dealer's.

Comparisons based on data available at time of publishing.  
©1988 General Motors Corporation. All Rights Reserved.

Let's get it together... buckle up.

THE *Heartbeat* OF AMERICA  TODAY'S CHEVY TRUCK™

# TECH UPDATE

News Of Tomorrow's Technology Today

## Planesail: New Era Of Wings At Sea

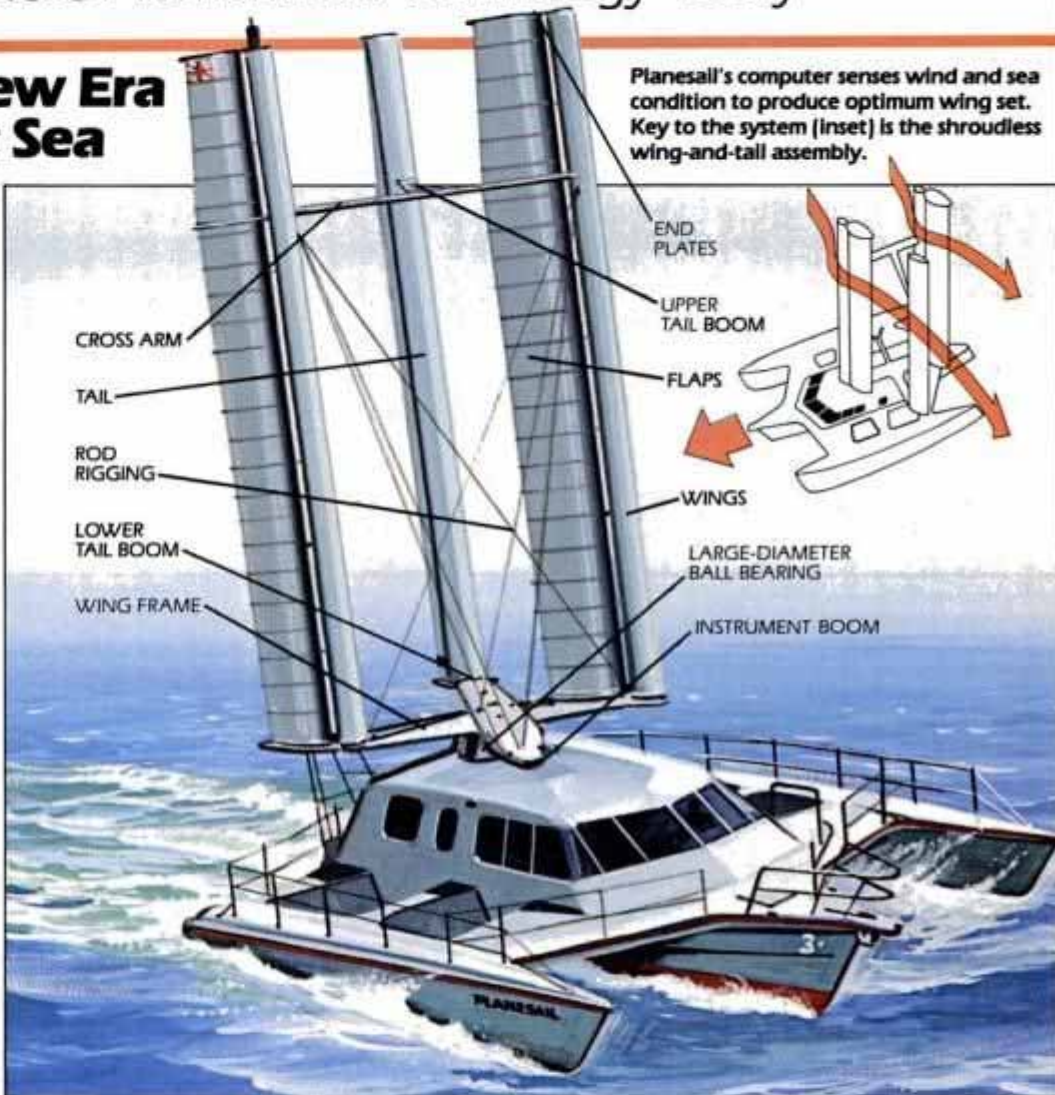
PLYMOUTH, ENGLAND —Lightweight, high-strength materials akin to those found in the aerospace industry, and an innovative computer-aided design, have combined to produce a revolutionary sailing trimaran powered by a rigid wingsail.

Planesail, produced by Walker Wingsail Systems, Inc., is a development of a larger 3-foil wind-harnessing wing system used by oceangoing freighters to reduce fuel consumption.

Twin parallel wings—each equipped with precision-controlled trailing edge flaps—are mounted on a light alloy spar. A single tail foil helps adjust the twin wings according to relative wind direction, and facilitates the neutral weathervane effect the rig achieves at rest. In an effort to fight corrosion and add strength, epoxy glass layups completely encapsulate an aramid honeycomb core in both wing and tail assemblies. Lightly stressed areas are covered with a laminated polyester fabric. The composite construction—mounted on a heavy-duty bearing—needs no supporting shrouds or struts.

Aerodynamic surfaces are controlled by ball-screw actuators akin to those found on the flap controls of an aircraft wing. The actuators can be controlled directly by Planesail's belowdeck helmsman, or by computer, which senses wind direction, wind speed, heading and desired angle of attack to produce an optimum wing configuration. The computer can also govern the thrust to prevent capsizing in gusts.

Belowdeck accommoda-



tions include a master suite with queen-sized berth, complete galley and head facilities and a helmsman/navigation station—where Planesail's lone operator controls the vessel's flight with a single Forward-Neutral-Reverse lever. Moving the lever forward shifts the wing's angle of attack relative to the true wind direction—allowing the necessary aerodynamic forces to accumulate (inset). This 1-handed operation gives Planesail the ability to be sailed short-handed—its real strength.

Editor: Tim Cole  
Assistant Editor: Abe Dane  
Contributor: Mike Fillon, David Lampe

## Highlights This Month

- **Chunnel News**—Locomotive designed for high-speed travel in new tunnel beneath the English Channel.
- **Robotics**—New strides in depth perception advance machine vision.
- **Galileo Probe**—Preparations finalized for exploring the Jovian atmosphere.
- **Man & Machine**—Gaze-oriented display links humans to computers.
- **Precision Navigation**—Fiberoptic gyros help achieve new miniaturization.
- **Your Car's Next Muffler**—Active noise suppression for tomorrow's automobile.

## Chunnel Train

LONDON, ENGLAND—The locomotive that will one day link England and France has finally taken shape. The mock-up will be used to evaluate design concepts—including the driver's seat. The operator's side vision will be intentionally restricted to



A lean, aero shape for trains on the cross-channel line.

limit the stroboscopic effect of traveling past the tunnel's lights at 197 mph.

## Seeing-Eye Machine

ROCHESTER, NY—Robotic vision devices have long been able to spot 2-dimensional anomalies on production lines. The drawback: Machine vision can't perceive depth.

But scientists at the University of Rochester are completing work on a new robot that moves its stereoscopic head as humans do to



Moving dual-camera head achieves depth perception.

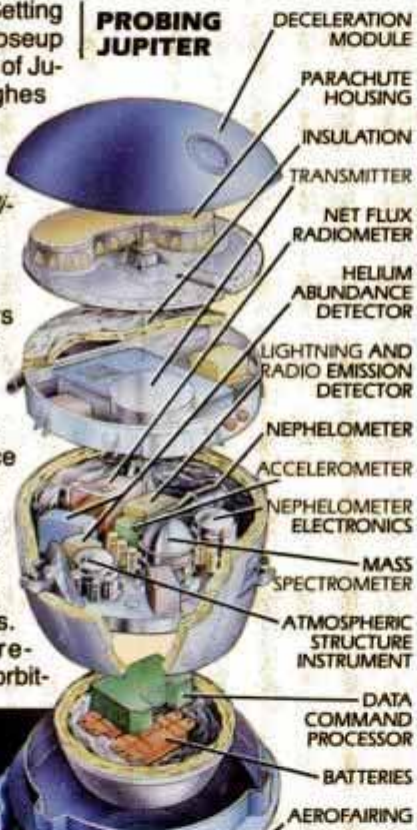
achieve a kinetic depth effect, considered useful in future industrial settings.

## Galileo Poised For 1995 Inspection Of Jupiter

EL SEGUNDO, CA—Setting the stage for the first closeup look at the atmosphere of Jupiter, engineers at Hughes Aircraft Co. and NASA's Jet Propulsion Lab are putting the final touches on the *Galileo* Spacecraft and Probe, which will be lofted in November.

A mission eight years in the making, *Galileo's* most recent modifications are intended to extend Probe life. Delays in America's space program have forced replacement of age-sensitive components such as the Probe's parachute and lithium sulfur dioxide batteries. When the Probe is released, it will send the orbit-

### PROBING JUPITER



Tremendous G-loads will greet *Galileo* Probe's instrument package.

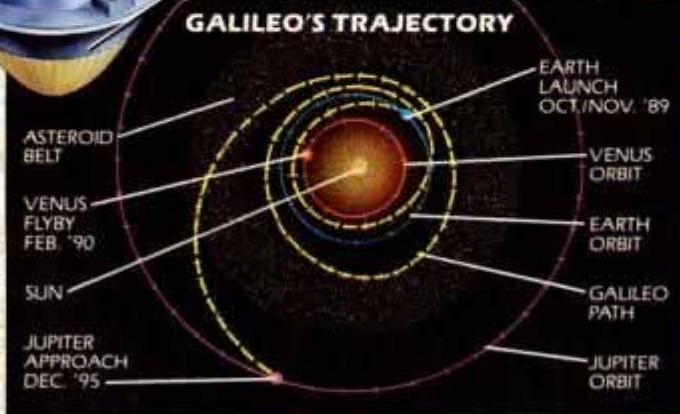
ing spacecraft data on Jupiter's chemical composition, hydrogen/helium ratio, cloud density and temperature/pressure profile for later transmissions to Earth.

The 75-minute, 115,000-mph plummet will subject the Probe to 350 Gs. Deceleration to Mach 1 will take less than 2 minutes, which means the tiny instrument package will briefly weigh as much as an empty DC-10 airliner.

*Galileo's* flight plan is a 48,000,000-mile romp following Shuttle deployment from low Earth orbit. Venus will supply gravity assists on two successive flybys during the 5-year mission. *Galileo* will pass 100 times closer to Jupiter's moons—Io, Europa, Ganymede and Callisto—than *Voyager 2* did, and will send 50,000 photos to Earth as it completes 10 full orbits of our solar system's largest planet.



Entering Jupiter's atmosphere (left) will be the culmination of *Galileo's* swing through the solar system.



LONDON PICTURE SERVICE PHOTO

UNIVERSITY OF ROCHESTER PHOTO

PH ILLUSTRATION BY DON MANNES

HUGHES AIRCRAFT CO. PHOTO

PH ILLUSTRATION AT RIGHT BY DON MANNES; NASA ILLUSTRATION AT LEFT





## Eyes Create Computer Link

COLLEGE STATION, TX—Infrared eye trackers are connecting mind to machine by a route 50 times faster than a keyboard.

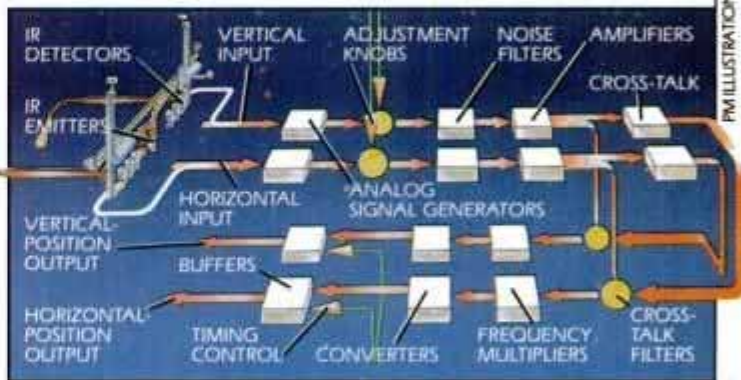
Texas A & M's Dr. Charles Shea has integrated a pair of

detector-equipped glasses to create a system called the Gaze-Oriented Display (G-ODS). The detectors on one eyepiece follow horizontal movement of the eye and iris, while those on the other fol-

low vertical movement. A hard-wired control unit processes detector data.

G-ODS can direct a robot to pick up objects an operator looks at, or help the handi-

capped read by scrolling text automatically. Other applications being explored include mail sorting, microsurgery and communication with stroke victims.



G-ODS control unit produces filtered, digitized signals for input.

## Fiberoptic Gyros Promise New Inertial Guidance

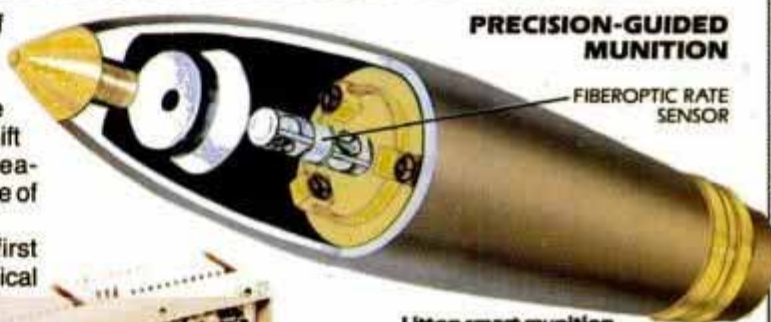
NEW YORK, NY—Coils of optical fiber are being fashioned into tiny laser gyros of steadily increasing accuracy, a technique that may one day reduce the complexity of pinpoint navigation.

Because fiberoptic gyros (FOGs) fit a long optical path into a small space, they are potentially more accurate for a given size than earlier ring-laser gyros. Manufacturing should be comparatively cheap, since FOGs don't require the precisely machined optical path of a ring-laser gyro. The ability to withstand very high G loads adds further to FOG versatility.

Both types of laser gyros retain headings by virtue of the Sagnac effect. When an instrument containing two

contrarotating beams of light is itself rotated, the path of one beam shortens with respect to the other. A relative phase shift results, which can be measured to determine the size of course changes.

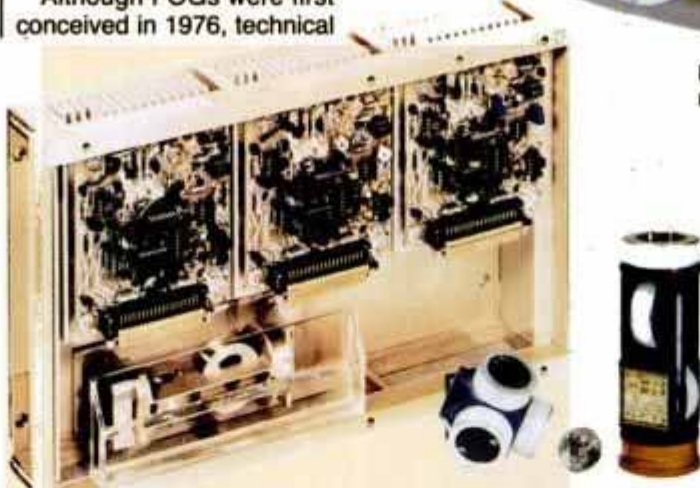
Although FOGs were first conceived in 1976, technical



PRECISION-GUIDED MUNITION

FIBEROPTIC RATE SENSOR

Litton smart munition rate sensor will occupy only 2 cu. in.



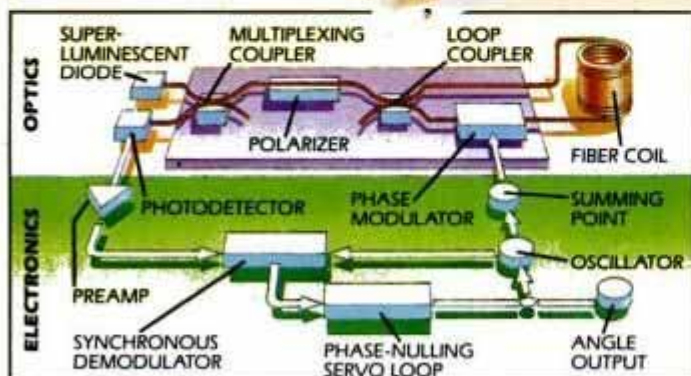
Smiths Industries have a drift rate of about 4° per hour—good enough for tactical missiles or an aircraft attitude/heading reference system. Drift rates as low as .01° per hour have been reported for the latest FOGs. Such performance would permit an aircraft inertial guidance system accurate to within several miles per flight hour.

When accuracy meets the FOG's inherent miniaturization, new efficiencies will be quickly realized.

The FOG size advantage is exemplified in a 3-gyro IMU being developed by Litton for SDI space-based interceptors. The unit will occupy about 1 cu. in. and weigh less than a quarter of a pound.

Litton is also developing a relatively low-accuracy FOG-based rate sensor that can withstand 20,000 Gs for use in artillery-launched smart munitions.

### INTEGRATED ELECTRO-OPTICS

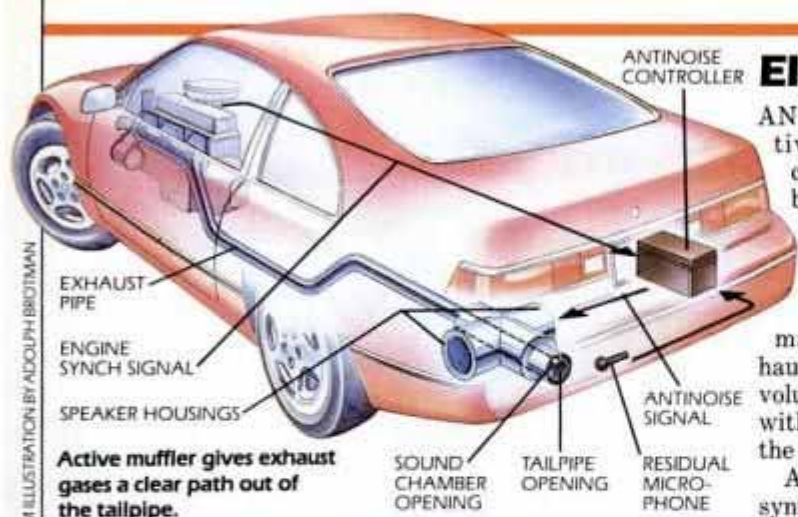


Closed-loop FOG angle output depends on power drawn by phase modulator to cancel rotation-induced phase shift.

Today's operational FOG IMU (left) with mockups of future compact form, and smaller space-based interceptor IMU.

obstacles have slowed realization of their potential for accuracy. Present units aren't as steady as ring-laser gyros, but progress has been continuous, cutting drift rates about a millionfold in the past decade.

FOGs presently incorporated in an inertial measurement unit (IMU) developed by



## Electro-Muffler Cancels Noise

ANN ARBOR, MI—An active antinoise generator could replace power-robbing acoustic mufflers in cars by the mid 1990s.

A prototype built by Walker Manufacturing emits antinoise—sound matched to the car's exhaust note in frequency and volume, but 180° out of phase with it—from an opening at the end of the tailpipe.

A microprocessor-driven synthesizer controls the fre-

quency according to engine rpm readings from a photosensor. Volume depends on input from a microphone by the tailpipe opening.

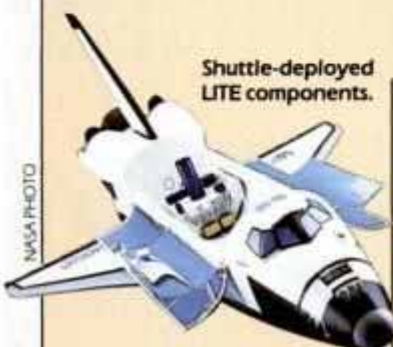
The synthesizer drives two speakers in a housing wrapped around the tailpipe.

In addition to reducing backpressure, an antinoise system allows more streamlined undercar packaging, and might be set up to produce custom exhaust sounds at the turn of a dial.

Active muffler gives exhaust gases a clear path out of the tailpipe.

SOUND CHAMBER OPENING TAILPIPE OPENING RESIDUAL MICROPHONE ANTINOISE SIGNAL

FM ILLUSTRATION BY ADOLPH BRITTMAN



Shuttle-deployed LITE components.

NEW YORK, NY—Light Detection and Ranging (LIDAR) instruments of increasing range and accuracy are aiding in the study of ozone depletion, wind shear, acid rain, global warming and other critical atmospheric phenomena.

Using a laser beam much as radar uses radio waves, the instruments can make measurements that once required sounding rockets and

## LIDAR Probes Distant Atmosphere

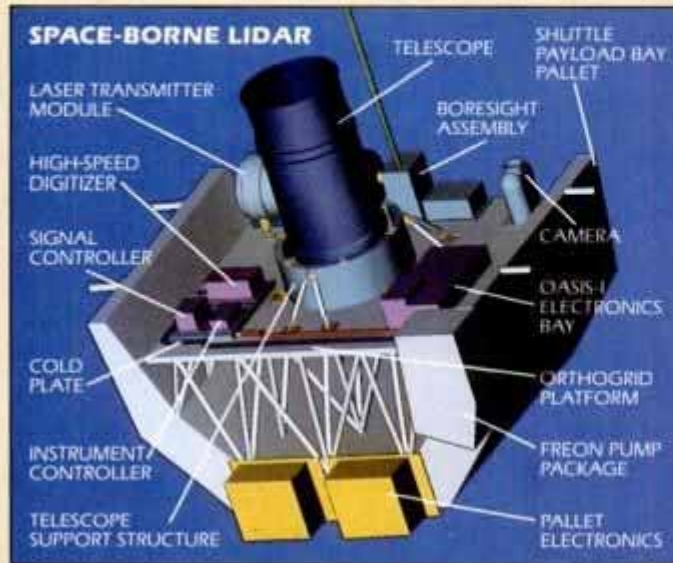
balloons. Laser light scattered back from the atmosphere can yield readings of temperature, wind velocity, barometric pressure, and other meteorological parameters at points hundreds of miles away.

First tested at the end of last year, Air Force Wright Aeronautical Labs' Megalidar is the largest LIDAR in existence. Its 100-in. collimator mirror used to gather back-scattered light is housed in a 5-story building that extends five additional stories underground.

Remarkable for accuracy in measuring wind speeds, the National Oceanic and Atmospheric Administration's (NOAA) CO<sub>2</sub> Heterodyne LIDAR incorporates an oscilla-



Megalidar occupies former large-scale optics test lab.



Modular LITE systems mount on Spacelab Enhanced MDM Pallet.

tor reference beam which permits Doppler measurements of air currents 10 to 30 Km away, even if the air is almost perfectly clear.

The LIDAR In Space Technology Experiment (LITE), scheduled for Shuttle flight in 1993, will lay technological groundwork for space-based LIDAR probes to be used on Space Station *Freedom*.



NOAA Doppler LIDAR.

NASA PHOTO

NASA ILLUSTRATION

AIR FORCE PHOTOS

SPECTRA TECHNOLOGY PHOTO

# Special Report: Managing America's Nuclear Waste

NEW YORK, NY—One hundred nuclear reactors in 30 states produce 18 percent of America's electricity—offering emissions-free power, but not without the specter of environmental damage due to nuclear waste. Nuclear weapons plants also produce highly radioactive byproducts that threaten Earth's resources unless properly disposed of.

The Department of Energy is responding to the urgent need for nuclear waste containment with a 3-part solution that would isolate spent reactor fuel and other forms of radioactive material.

DOE's Integrated Waste Management System (IWMS) would collect radioactive products at a Moni-

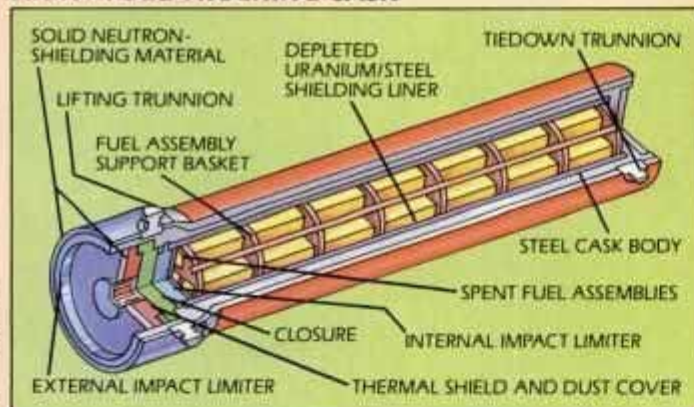


tored Retrieval Storage facility, where the waste—normally in the form of spent reactor fuel rod assemblies—would be stored temporarily, then packaged for transport inside massive truck and

The nation's nuclear wastes would be permanently stored in dry, geologically stable Yucca Mountain (above). Spent fuel (right) would be lowered into receptacles (below).



## SPENT FUEL TRUCKING CASK



Transport cask crash-worthiness involves 80-mph collisions with concrete barrier (below). Steel forms basis of cask design (above).



rail casks. These huge cylinders currently undergoing tests have 6- to 8-in.-thick walls made of various types of shielding material such as lead, steel or depleted uranium. Spent fuel rods are placed inside steel inner cavities and surrounded by the shielding material. Tests will certify the casks' ability to withstand sudden drops, high-speed collisions and fire without a radiation release.

The third phase of IWMS consists of a permanent geologic repository. Studies are currently assessing the suitability of Yucca Mountain, Nevada—100 miles northwest of Las Vegas on the Nevada Test Site—as the permanent resting place for the more than 40,000 metric tons of waste that nuclear plants are expected to produce by the year 2000.

Yucca Mountain has several features considered crucial to successful waste storage, including extremely

dry formations of a rock material called "tuff." DOE scientists conclude that the tuff would trap radionuclides that manage to escape in what little ground water is at the site. Measurements indicate the water table is 1700 ft. below the underground facility, and that it would take ground water at Yucca Mountain from 3400 to 8300 years to travel 1 mile. The nearest discharge point is 30 miles away in the Amargosa Desert. Rock formations in the Yucca Mountain region are considered seismically stable.

Following these evaluations, and presidential approval, the underground waste repository would resemble a typical mining operation, with support buildings, ventilation shafts and administration facilities. Yucca Mountain's ultimate fate would be left to the eons, however, when DOE technicians backfill and seal the filled storage caverns. **TU**

DOE ILLUSTRATION

DOE PHOTOS

DOE ILLUSTRATION

DOE PHOTOS

BY TIM COLE

## Will Earth Become Another Venus?

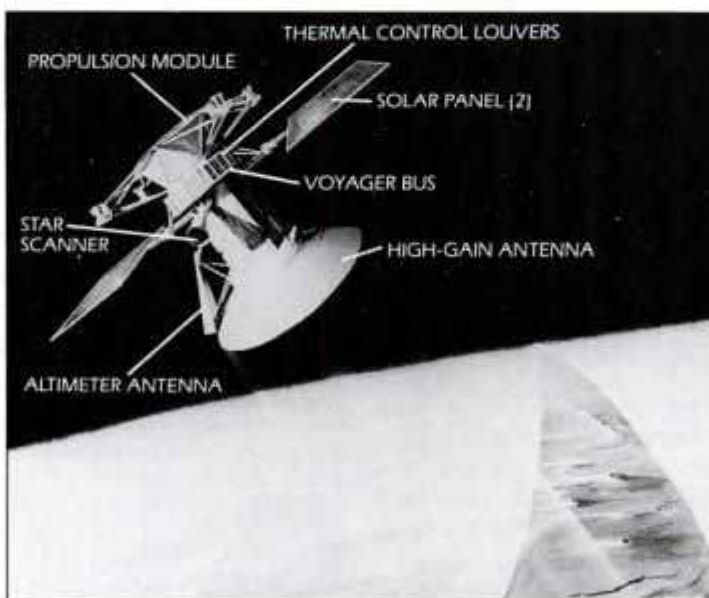
**T**HE climate-altering consequences of the greenhouse effect—the surface warming that results when excess atmospheric pollutants trap the Sun's heat—have raised real fears for the health of planet Earth.

One scenario: By the year 2100, a 3° C increase in temperature could raise sea levels 100 ft. And ultimately—eons from now—we could transform this wondrous planet into a lifeless, cloud-enshrouded Venus, our sister planet that developed much like Earth, yet succumbed to a runaway greenhouse effect. Venus is of an identical size and mass to Earth—but with an atmospheric pressure 90 times greater. The planet's surface temperature approaches 900° F and carbon dioxide forms the principal constituent in the Venusian atmosphere, with a potent fraction of sulfuric acid at higher altitudes.

Significantly, scientists I met in Antarctica a year ago were beginning to detect sulfuric acid droplets during their studies of ozone depletion in Earth's Antarctic stratosphere—an early warning sign?

### Distinct possibilities

Planetary scientists are focusing new attention on the second planet from the Sun, trying to analyze the mechanics of a massive greenhouse effect. In one case, Drs. James Kasting, Tom Ackerman and James Pollack at NASA's Ames Research Center are looking into the possibility that a "wet" greenhouse theory (see illustration) completely dried Venus's oceans. Proximity to the Sun, they theorize, caused 80 percent of the planet's oceans to evaporate.



The shuttle-deployed spacecraft *Magellan* arcs across surface of Venus, its synthetic aperture radar penetrating the planet's cloud layer.

Carbon dioxide and water vapor thus formed Venus's principal atmospheric content. Ultraviolet light broke atmospheric water vapor into hydrogen and oxygen. The hydrogen escaped, further thinning Venus's fragile protective cloud boundary and leading to the complete destruction of what little ocean Venus had left.

Could a massive greenhouse effect—the kind that forever altered Venus—be duplicated here? *Magellan* may find the answer. Ameri-

ca's latest Venus probe builds on U.S. *Pioneer/Venus* and Soviet *Venera* missions. The difference? A unique synthetic aperture radar will permit wide-area topographic sensing of surface elevations to within 50 meters. A high data rate of 268,800 bits per second—compared to only 1200 bits per second for earlier spacecraft—will allow computers on Earth to simulate the kind of accurate radar imagery that could only be obtained using a much larger antenna. *Magel-*

*lan's* antenna—only 3.7 meters across—will, in fact, simulate a radar antenna hundreds of meters across. During the 37.2-minute data-acquisition phase of each orbit on *Magellan's* 243-day mission, the synthetic aperture radar will emit several thousand pulses of radio energy a second. The pulses will penetrate Venus's cloud layer in a 25-kilometer-wide swath, then bounce back to the orbiting spacecraft for processing and transmission. *Magellan* will map up to 90 percent of the planet's surface and will acquire more data than all previous planetary expeditions combined.

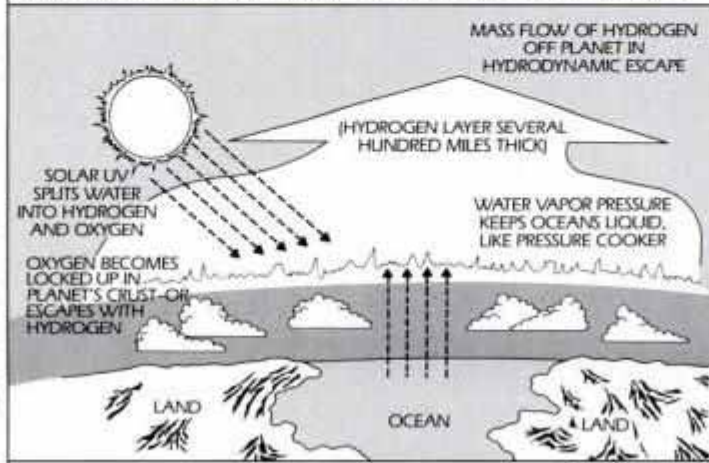
The principal output will be geologic data on wind and water erosion, volcanism, plate tectonics, surface fissures, rifts and faulting. Understanding Venus's surface characteristics is crucial to finding out about the planet's climatology—and perhaps the fate of planet Earth.

### Science and politics

Having thus embarked on a discussion of global climatic change, it's appropriate to explore solutions to what may be the greatest danger of our times.

Helen Ingram of the Udall Center for Studies in Public Policy at the University of Arizona, presented a compelling treatise at this year's annual meeting of the American Association for the Advancement of Science on the policy implications of climate change. Her conclusion: Real efforts won't be made until climate change becomes part of the political agenda, and that won't happen until some of the dire consequences of the greenhouse effect truly hit home. Ingram reports: "Such grave results can be envisioned as

(Please turn to page 21)



One theory for why Venus is so dry: A "wet" greenhouse effect.



Cars Courtesy of Heavenly Bodies International, Inc., New Milford, NJ.



The Symbols of Pride and Prestige.



Besides protecting and beautifying your aircraft, a sleek Liquid Glass finish reduces surface friction for added fuel economy.



On fiberglass boats, Liquid Glass Pre-Cleaner prepares the surface for Liquid Glass by chemically removing salt water haze, oxidized paint, etc. without damaging the gelcoat.

## YOUR PRIZED POSSESSION DESERVES A TOUCH OF 'GLASS.

### Presenting the Liquid Glass™ Total Appearance System.

There's nothing like the exhilaration of seeing your prized auto, boat or plane gleaming with a glass-like, satin-smooth glow. One that turns heads while turning away the elements. And now because of a startling breakthrough in appearance chemical technology, you can apply this "showroom" brilliance in minutes—and enjoy its benefits year 'round.

### Chemical cross-linking...the nucleus of our system.

Unlike other finishing families, the Liquid Glass System works because each highly-refined product chemically bonds with the next. The concept is simple. The results—simply spectacular. All five products are perfectly safe for use on Clearcoated surfaces, and help retard acid rain and hard water spotting. When used together as a Total Appearance System, they cross-link to give you maximum protection and beauty.

Pour on our Liquid Glass Wash Concentrate, Pre-Cleaner and Polish/Finish today—and see how their dazzling glow reflects on you. Then rejuvenate your leather, vinyl and rubber with our Connoisseur's Choice® duo—the miracle cross-linked mixtures with Mink Oil. But don't wait. Once you experience a touch of 'Glass, you'll never settle for less.

**Call now, toll free: 1-800-548-5307 for the name of your nearest Liquid Glass Products Distributor. In N.J., call (201) 387-6755.**

LIQUID GLASS ENTERPRISES, INC.  
P.O. BOX 1170, Teaneck, NJ 07666 USA



© Copyright 1989 Liquid Glass Enterprises, Inc. All Rights Reserved. Connoisseur's Choice is a registered trademark of Liquid Glass Enterprises, Inc.

# PALL MALL FILTERS

The taste breaks through.

KINGS & 100'S.



**SURGEON GENERAL'S WARNING:** Quitting Smoking  
Now Greatly Reduces Serious Risks to Your Health.

16 mg. "tar", 1.2 mg. nicotine av. per cigarette by FTC method.

© The American Tobacco Co. 1988.

the inundation of coastal areas, loss of wetlands, deforestation, more frequent extremes of floods and droughts, intrusion of salt water into freshwater rivers, bays and aquifers, loss of prime agricultural lands, damage to recreational amenities and increased skin cancers."

Will we let it get that bad? Ingram argues that finding a place on the political agenda requires feasible solutions, such as a cut in chlorofluorocarbons, the encouragement of fuel and water conservation, the development of drought-resistant plants and reforestation. More radical solutions may be in order if climate planning fails to become part of our political decision making.

In the end, the real solution will be greenhouse-effect awareness, a widespread consciousness that even small emissions of atmospheric pollution can threaten life on Earth.

### Listening to Atlantis

As we go to press, *Magellan* is scheduled for launch sometime between April 28 and May 27 aboard Space Shuttle *Atlantis*. You may be able to hear *Atlantis*'s astronauts communicate with NASA ground controllers before, during and after the launch by dialing 1-900-909-NASA. Sponsored by the National Space Society (922 Pennsylvania Ave., S.E., Washington, D.C. 20003), this Dial-A-Shuttle service carries a toll charge of \$2 for the first minute, 45 cents for each additional minute.

### Thinking Robots

Two recent developments have helped to speed the creation of intelligent robots—machines that can adapt to changing conditions and environments. The innovations merge neural network computer processing with traditional robotic actuation.

INFANT is one example. It stands for Interacting Networks Forming Adaptive Neural Topographies, a neural robot created by Dr. Michael Kuperstein of Neurogen Laboratories. Kuperstein relied on our knowledge of the brain to design a machine that will walk on uneven terrain, grasp unfamiliar objects and recognize visual, auditory or tactile patterns.

The human brain processes information by gradually strengthening neural connections, or synapses, between neurotransmitters and neuroreceptors. Learning results when permanent changes—called long-term potentiation—take place in the brain, strengthening the synapses between neurons. Neural networks mimic the processing architecture of the human brain by recognizing and retaining subtly altered patterns.

Building smaller, more powerful neural networks may result from new infor-

mation recently advanced by scientists at the University of California, Irvine, that will help computer designers understand how the brain processes information.

Dr. Gary Lynch, professor of psychobiology, recently discovered the interaction of two types of neural receptors that act as a kind of memory switch.

### Space University

NASA recognizes the troublesome prospect of losing many of its professionals to retirement. The agency has instituted "expert" computer systems to siphon off some of the knowledge accumulated when an individual completes nearly a lifetime of space studies.

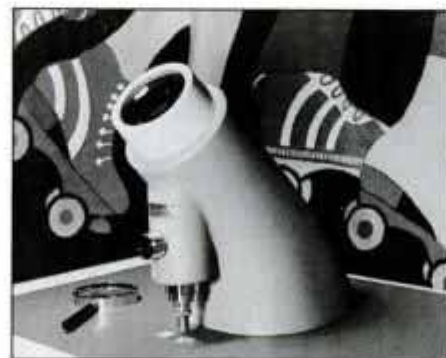
How can we resupply the talent pool at NASA's numerous research facilities? One way to train future space professionals may be through the recently established International Space University, which graduated 104 members of its 1988 class last summer at MIT.

ISU 1989 will be conducted at University Louis Pasteur in Strasbourg, France. Young people from 20 countries, including the People's Republic of China, the Soviet Union and the United States, will convene to discuss resources and space manufacturing, satellite applications, space business, life sciences and other important space issues. Last year's class designed an international lunar base.

More information about ISU can be obtained from headquarters, 636 Beacon St., Suite 201-202, Boston, MA 02215, (617) 247-1987.

### Teaching Microscope

Ideal for classrooms or museums, the newly developed Wentz-Scope has an enlarged eyepiece to give a lot of people a chance to view microscope slide preparations. After reviewing the device at this year's AAAS meeting, I give it high marks for durability, easy 1-knob focus and magnification (to 500X). It's a great way to introduce young people to the microworld. Contact Budd Wentz Productions, 8619 Skyline Blvd., Oakland, CA 94611, (415) 531-1214. **PM**



The Wentz-Scope microscope for group viewing slide preparations and other objects.

# Un-Paralleled Parking.



Introducing the Mazda MX-6 with four-wheel steering.

**mazda**

© 1989 Mazda Motor of America, Inc.

# CAR CLINIC

BY MIKE ALLEN

## Taken To The Cleaners

**M**Y 1986 Plymouth Voyager runs rough lately, and everybody I've talked to seems to think the 6-cylinder engine's fuel injectors are dirty. I've tried switching to ultrapremium fuel, and several in-the-tank cleaners, but that didn't help. The dealer says the injectors have to be replaced, that two of them are almost impossible to reach, and he wants \$1000!

OSCAR HEPFER  
CHICAGO, IL

*I'd be really certain that the injectors are the culprit—look at the high-voltage side of the ignition system, like plugs, wires and the cap. The EGR could be the culprit, too.*

*Replacement may not be*

*necessary—there are several methods of cleaning injectors without removing them from the car. For example, 3M makes a disposable injector cleaner, intended for the professional mechanic, but you could use it yourself. Other systems now available use a pressurized tank to force solvent into the injectors, so you'll have to find a mechanic equipped to handle the job. Your dealer knows how to do this, and the cost should be 50 bucks or less. The solvents used in these cleaners are much too corrosive to just add to the fuel, so they may be effective when the in-tank cleaners aren't.*

*I blanched a little at that \$1000 repair bill, so I pursued the matter. Chrysler in-*

*forms me that the injectors have recently dropped from \$150 to \$69—each—which should bring down the cost of replacement, if necessary. Labor should be less than 2 hours, and Chrysler also reminded me that the warranty extends to 5 years/50,000 miles on any emissions-control part—and that includes the injectors.*

### Oil's Swell

At 28,000 miles I switched my Delta Mini-Motor Home to a 5W-30 synthetic. The 400-cu.-in. Chevy engine, which had never used any appreciable amount of oil, started to consume oil to the tune of 400 miles/quart. At the end of a 4000-mile vacation trip, I switched back to regular mineral oil—and the engine still uses a quart every 400 miles. This is very annoying.

LARRY BARTH  
HEBRON, ND

*Some synthetic oils have different seal-swell characteristics than mineral oils. All oils make rubber seals and gaskets swell slightly, and that usually isn't a problem—in fact, it helps compensate for wear.*

*Synthetics are usually very low viscosity, the reduced friction accounting for their fuel-saving reputation. The thinner oil manages to find more cracks to leak through, because I know of plenty of engines that started to leak when changed over to synthetics. Usually these are engines with lots of miles on them before the changeover, and probably have a few minor leaks already.*

*So—why does your engine still consume so much mineral oil, now that you've changed back? Engineers at Mobil assure me that Mobil 1, their synthetic, has similar*

*seal-swell characteristics to mineral oils. The synthetic you used may not have. A slightly greater amount of seal swelling might even reduce some leaks—but the shrinking after the change back to mineral oil would reverse that.*

*If the missing oil is leaking externally, you'll probably have to replace the rubber-and-cork valve cover gaskets (easy), the intake manifold gasket (not-so-easy), and the front and rear main seals (hard). If the oil is leaking internally and being burned, try replacing the valve stem seals (not-so-easy, but still possible without removing the heads).*

*Still using oil? You've got valve guide/piston/ring/cylinder wall troubles, and you'll have to tear it down. An engine with leaky valve stem seals or guides will usually smoke most noticeably at idle, while leaking rings will generate more smoke under heavy load.*

### Knock, Knock

I just bought a 1984 Chrysler Daytona. If I burn regular gas, which the owner's manual says my car is supposed to, the engine knocks badly on acceleration. I found this out at the first fillup after I purchased the car. I'm not in a mood to pay 40 cents per gallon extra for premium. The dealer says "they all do that," and I'm stuck.

MORTON LAWRENCE  
TOPEKA, KS

*I assume, of course, that the dealer has checked the timing, installed plugs of the correct heat range, and otherwise made sure the car is correctly in spec.*

*Chrysler TSB 14-03-84, which you might bring to his attention, details the installation of Driveability Package*

### Ring Around The Filter

You've just changed your oil filter, and tightened it the requisite  $\frac{3}{4}$  turn. You start the engine to check for leaks, and sure enough there's a steady rain of drips percolating from around the base of the filter. Now you've got to mop up the oil that's coating the filter before you can even think about turning it tighter. Which doesn't help—you've even put a filter wrench onto the thing, it's really tight, and you're trying to figure out if you have enough oil to make it to the nearest fast-lube franchise.

Before you do that, look at the old filter, and check the dirty oil that's in the drain pan. If the O-ring is missing from the old filter, and it's not in the oil drain pan, where can it be?

Very simple, it's trapped in between the new filter and the engine, is probably all wrinkled up, and you'll have to unscrew the new filter, remove the wrinkled O-ring, and replace the filter to seal things up.

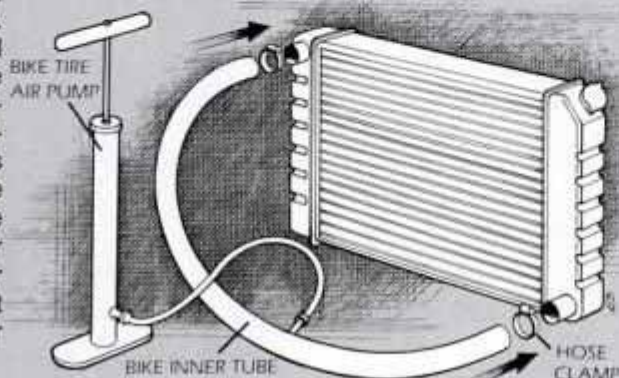




## Putting On The Pressure

Here, according to John Baiguy of Sanford, Maine, is how to make (and use) a testing unit to determine if a radiator leak is the reason for coolant loss. Sure, you can pressurize the system by bringing the motor up to temperature, but then you'll have to crawl all around and under a hot motor.

You'll need an air pump, a bicycle inner tube and a couple of hose clamps. Drain the radiator and disconnect radiator hoses. If you collect the coolant in a clean container, there's no reason not to reuse it afterward. Cut the inner tube to a size that allows you to attach its ends to the radiator inlet and outlet nozzles. Use hose clamps. Fill the radiator with water. Put on the filler cap, and connect the air pump to the valve of the inner tube. Start pumping. If the radiator is leaking, pressure exerted by the air pump will force water from the spot, pinpointing the damage. Sure, a commercial leak detector works, but this method is great for checking junkyard specials before you spend any money. After you've found the leak, you'll have to remove the radiator and take it for repair. If the radiator is okay, try the same trick on the engine side, watching for leaks in the heater core, thermostat housing, and water pump and hoses.



(P/N 4293900). It includes a Vacuum Reducer Valve (P/N 4275688), which installs in the air cleaner. This should cure the spark knock.

If this mod was already made before you bought the car, and everything else is correct, the dealer is partly right—some of them do that, and you're going to have to pay the premium price.

You might try retarding the static timing back three to five degrees, but the lowered mileage might make up more than the difference in the cost of the premium fuel.

## Long, Hard, Oily Days

After a day of long, hard driving, the air filter of my 79,000-mile 1979 Sunbird, with 231-cu.-in. V6 engine, becomes soaked with oil—especially after an hour or two on the expressway. This happened right after I had an oil-and-filter change. Since then I've replaced the PCV valve, all the associated hoses, and the PCV filter in the air cleaner. I am wondering if a defective oil filter is the cause, since some oil filters contain valves to control oil flow.

TOBY RADLOFF  
CLEVELAND, OH

Indeed, some oil filters do contain internal pressure relief valves, to bypass oil if the filter becomes dirty enough to reduce oil flow. This is not your problem.

Older engines tend to get more crankcase blowby as the rings and valve guides wear. Normally, the PCV system

returns this blowby to the air cleaner, where it's sucked into the cylinders and burned. But eventually there's more vapor, in the form of combustion gases and oil vapor, than the system can control.

My guess is that the last oil change was to a lighter-grade, multiviscosity oil. The lighter fractions (5W and 10W) are more likely to boil off at high engine temps, which is what is happening on these longer, high-speed trips. The oil vapor recondenses in the air cleaner as it cools off.

Usually, the PCV filter soaks up the oil vapor, but your engine is generating more than this small filter can handle.

What can you do? Try changing back to 20W-40, or even to a straight 30 or 40 grade during the warm weather.

Still oily? A cylinder leakdown test should tell whether the excess blowby comes from the valve guides or the rings. If it is the guides, you may be able to fix it with a simple valve job.

If it's the rings, and you don't want to do a major engine rebuild, you might get by for a while by routing the PCV line into a sealed 1- or 2-quart tank on the firewall, and then venting that tank to the air cleaner. This will let the oil vapor cool off and condense in the tank—and not in your air cleaner.

Simply discard the oil in the tank, and carefully monitor the oil level in the crankcase. Otherwise, you'll have to live with it, or re-ring the engine, which is the best solution.

(Please turn to page 25)



# An Advanced Way to Tread Water.



Introducing  
the Mazda MX-6  
with four-wheel  
steering.

**mazda**

© 1989 Mazda Motor of America, Inc.

# GIVE YOUR CAR THE PERFORMANCE OF A LIFETIME.

REGANE® PREMIUM™ WITH 40 TIMES THE CONCENTRATION OF ORDINARY GAS TREATMENTS.

A driving performance worthy of applause. It's what you'll get *every time* you pour in Regane Premium Gas Treatment.

With 40 times the concentration of most other gas treatments, Regane Premium thoroughly cleans your entire fuel system. Reduces your need for expensive high-octane gasolines. Helps eliminate knocking, pinging, and dieseling up to 2700 miles. And, keeps your car running like a fine-tuned instrument.

So before you pour in a weaker gas treatment, or pour out a lot of money for a tune-up, try pouring in Regane Premium. For the performance of a lifetime—every time you drive.



Another Quality Product of the Pennzoil Products Company.

## Front-Drive Dilemma

When I owned rear-wheel-drive cars I knew exactly how the front and rear wheel bearings were lubricated and when any periodic maintenance was required. Now that I own front-wheel-drive cars I haven't a clue. I've read the owner's manual from front to back.

Please shed some light on how these bearings are lubricated and when and if any periodic maintenance is required.

LOUIS B. VERGEZ, JR.  
GRETNA, LA

*Without any exceptions that I know of, all modern fwd cars use sealed bearings that can't, shouldn't and don't need to be repacked or adjusted. And by and large, they're good for at least 100,000 miles—or 100 miles or so after you ricochet off a curb hard enough.*

*Rear wheel bearings on fwd cars are generally very similar to front wheel bearings on rwd cars, with inner and outer rollers, replaceable seals, an adjustment nut and cotter pin. Like their counterparts on the front, they should be serviced every 15,000 to 30,000 miles, or whenever you remove the disc or drum for servicing the brakes. The shop manual gives specific intervals and procedures. You'll feel right at home.*

## Ram-Tough Ride

I recently purchased a customized Dodge Ram Van. It came with LT195/75 R15 tires. The instructions in the owner's manual and on the door pillar state that the inflation pressures should be 40 psi for the front and 50 psi for the rear. This makes the van ride as rough as the devil. I have noted that even large full-size vans only have tires that require 35 psi. Can I reduce the pressures to improve the ride?

JOHN DEFIELDS  
COLOMA, MI

*The LT designation in the tire size stands for Light Truck, meaning they were engineered for high load-carrying ability and superlong wear. Soft ride was not a consideration.*

*I suspect that if you look at those van tires that specify 35 psi, you'll find that they carry a P designation, which is for passenger cars. These will have better ride because of the carcass construction as well as the lowered pressures. P-designation tires are standard equipment on many vans and pickups.*

*Don't reduce the LT tire pressures below the recommended values—you'll see accelerated wear, degraded handling and possibly even sudden failure be-*

## DO YOU HAVE A CAR PROBLEM?

*Just ask Mike about it. Send your question to Car Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. While letters cannot be answered individually, problems that are of general interest will be discussed in the column.*

*cause of the increased heat generated by internal friction.*

*If you really need to improve the ride, simply change to a P-construction tire of appropriate size and load range.*

## Shaft Drive

My '78 Catalina has 136,000 miles on the original engine, with no mechanical work ever having been done. Compression testing by three different mechanics has shown different pressures every time. The individual cylinders are always within a few psi of each other, but the average has varied as much as 25 psi! I think these guys are setting me up for a shafting.

JOHN BROOKER  
SPRINGFIELD, MA

*Compression test figures will vary from compression tester to tester, mechanic to mechanic and day to day. It's important that the throttle be held wide open, not just propped slightly open with a screwdriver. Even the barometric pressure will affect readings, with low-pressure days giving slightly lower numbers. The state of the battery and starter motor are a factor—the faster the motor spins, the higher the reading.*

*But all-in-all, what counts mostly is the difference between individual cylinders, and you seem to be fine there. If you were being set up, it would be easy to make one or two cylinders come up short.*

PM

## SERVICE TIPS

■ Some '86 Rangers and Broncos may exhibit rough idle/high-speed misfire because of a chafed No. 2 sparkplug wire, which could be caused by incorrect routing and/or a missing antiabrasion sleeve, according to Ford TSB 87-4-19.

■ Owners of '82-'86 Buick Skyhawks, '85-'86 Somersets and '86 Skylarks may experience a popping noise when their cars are going over large bumps. It's caused by the strut shield rubbing on the spring. Buick TSB 86-3-14 suggests using the softer '87 shield, P/N 22533136.

■ Cadillac suggests that the bolt fastening the air conditioner's evaporator block fitting should not be tightened to more than the specified 12 ft.-lbs. More torque could cause the fitting to crack. TSB 87-77-1.

■ 1985-87 Maximas with manual transmissions that are hard to shift may develop a pinhole and leakage of hydraulic fluid from a brazed fitting on the clutch master cylinder tube. A new assembly, equipped with a rubber insulator at the joint should be installed to correct the condition, according to Nissan TSB 87-095.

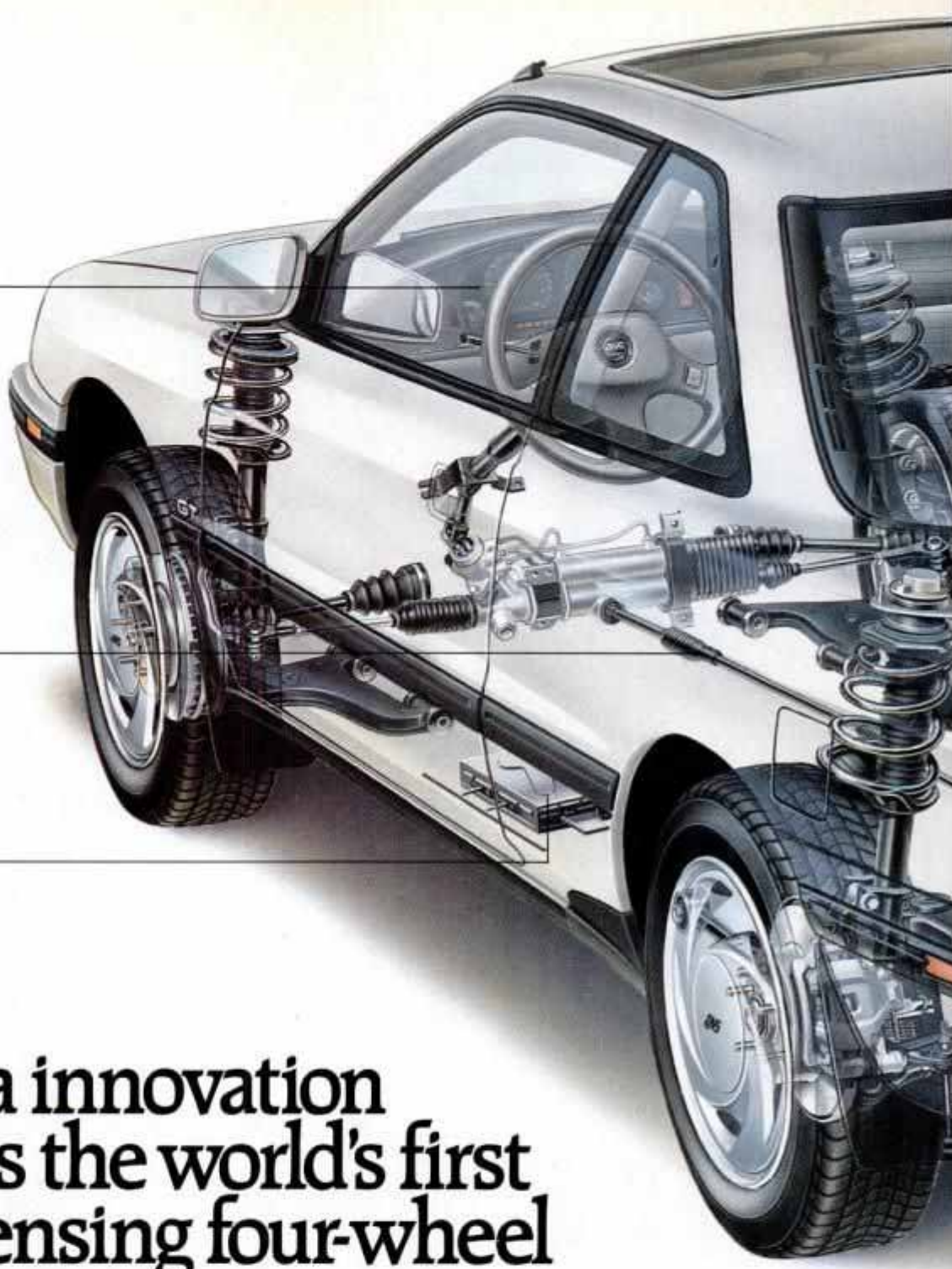
# The Best Car for U.



Introducing  
the Mazda MX-6  
with four-wheel  
steering.

**mazda**

© 1989 Mazda Motor of America, Inc.



*SPEED SENSORS:*  
monitor speed  
and send data to  
control unit.

*STEERING ANGLE  
TRANSFER SHAFT:*  
rotates the gears in  
phase control system  
to coordinate front  
and rear wheels.

*CONTROL UNIT:*  
gives signals to the  
stepper motor to  
control rear-to-front  
steering angle ratio.

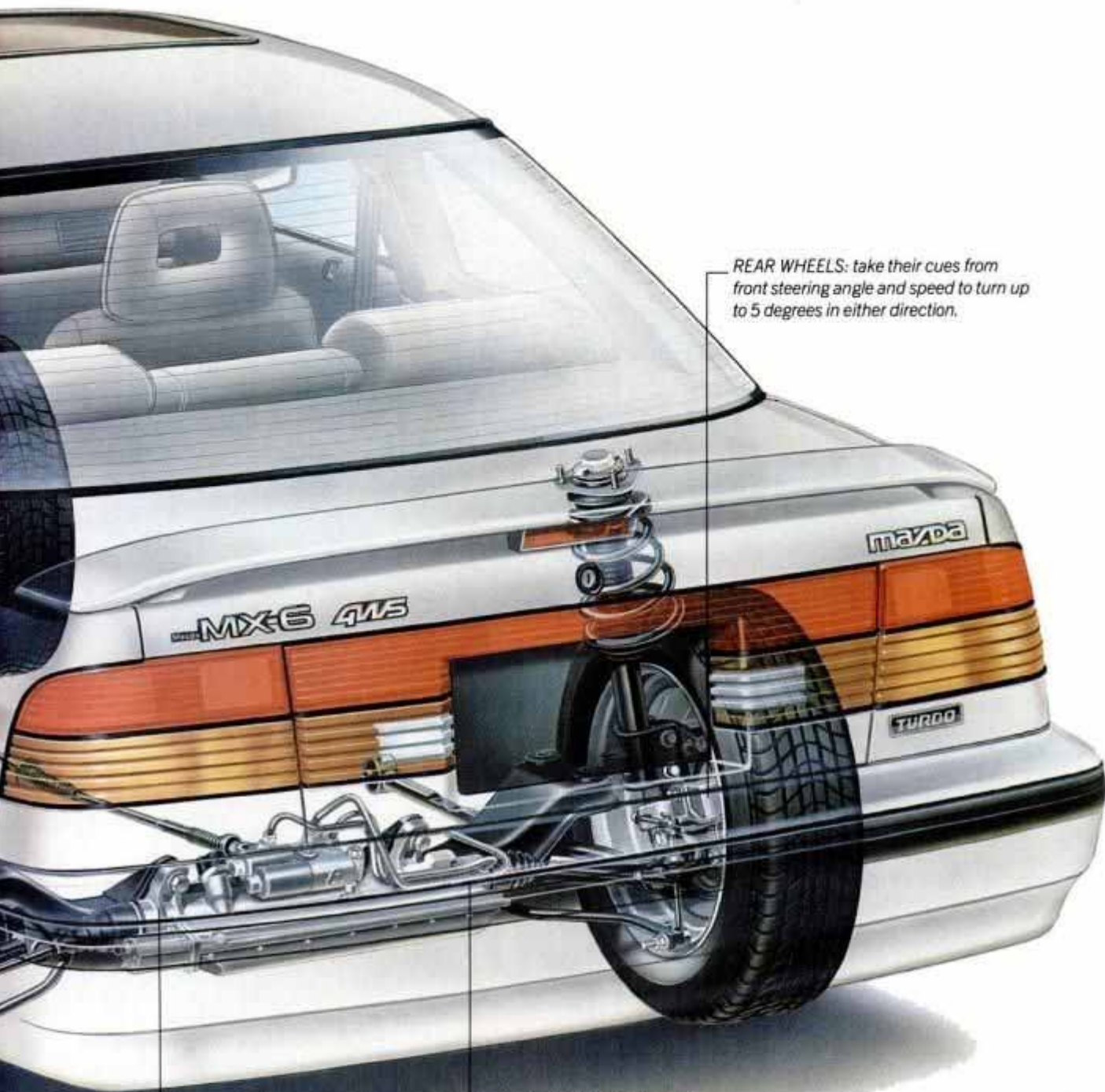
# Mazda innovation produces the world's first speed-sensing four-wheel steering system.

Imagine yourself on an undulating, serpentine ribbon of road. Now imagine driving it in a car engineered with the world's first speed-sensing four-wheel steering system: the turbocharged Mazda MX-6 4WS. An automobile so advanced in its handling capabilities, you may think it's in synch with your every thought.

Simply put, the connection between you, the car, and the road is significantly heightened,

because this exclusive Mazda innovation enables all four wheels to steer. Above 22 mph, the rear wheels steer in the same direction as the front wheels for exceptionally quick response in S-curves or lane changes. And that unsettling body motion you'd normally feel during these maneuvers is reduced. In its place, a comfortable feeling of confidence and control.

Below 22 mph, the rear wheels steer in the



*REAR WHEELS: take their cues from front steering angle and speed to turn up to 5 degrees in either direction.*

*POWER CYLINDER: moves the rear wheels with hydraulic pressure from control valve.*

*CONTROL VALVE: applies pressure from the power steering pump to control rear steering angle.*

opposite direction of the front wheels to provide increased maneuverability for situations such as U-turns and parallel parking.

The turbocharged Mazda MX-6 4WS. It takes handling precision, control and performance to levels that can only be described as "exhilarating." And more importantly, raises your personal driving enjoyment to a level even beyond.



**mazda**

# OUTDOORS

BY JOE SKORUPA

## Go Fishing, Young Man

**O**UR NEW President, George Walker Bush, didn't actually say, "Let's get into the fishing mode, young men and women." Not in so many well-chosen words.

But deeds speak louder than words. Atlantic salmon fishing in Maine. Surfcasting in Palm Beach. Bonefishing in the Keys. Bass Fishing in Alabama. Our main man in Washington is a fishing machine. I wouldn't be surprised to learn that plans are in the works for a new addition to the President's official transportation fleet—Center Console One.

Because of the President's love of the fishing mode, and the media attention drawn to it, the coming decade will be known as the era of the angler or the fishing '90s. At least that's the way I prefer to interpret the tea leaves. So within days of the Bush inauguration, I was in Palm Beach placing a Transderm Scop patch (an antiseasickness adhesive disc that gradually releases scopolamine



Grady-White's innovative Marlin 28 hangs out with the big boys and gets a double sailfish hook up.

into the blood stream) behind my ear and preparing to head offshore for the peak of sailfish season.

### The morning after

At 6 am, I received a wakeup call and crawled out of bed with all the energy of a man encased in lead. My mouth was filled with sand and my head as stuffy as a wall-

mounted trophy. No, I didn't misbehave the night before. I was experiencing the *normal* side effects of the Transderm Scop patch.

If you've never used this popular drug (scopolamine is a powerful belladonna alkaloid), you're in for a treat. In addition to grogginess and dry mouth, other entertaining side effects are blurred vision, disorientation, dizziness, itchy eyes and, after three days, the effective duration of one patch, possible hallucinations and memory disturbances.

Some people might think it's easier to just say no. But many old salts, who should have earned their sea legs years ago, are devoted users.

"Anybody can get seasick," says Mark Travis, our captain and game-fish guide. "I'd never gotten sick until one time I was about 100 miles out in the Gulf of Mexico for a 3-day fishing trip. The very first day I got sick as a dog and it stayed with me throughout the trip. I was so miserable that if there was a gun on board, I'd have put a bullet in my head. Ever since then, I've worn the patch."

### Jupiter and beyond

We headed out of Lake Worth Inlet into the face of a norther blowing 3- to 5-ft. waves, with an occasional 6-footer thrown in for good measure. Our destination was about 20 miles north, opposite the Jupiter Inlet. We ran hard into the chop for the first 40 minutes and experienced ideal conditions to test the rough-water ride of one of the most innovative new boats on the market, Grady-White's big fishing machine, the Marlin 28.

Unlike a vast majority of 25- to 35-ft. offshore boats, the Marlin 28 is designed for a specific power package—twin V6 outboards. No compromises were made to accommodate inboard or sterndrive propulsion systems, which means this isn't just a generic walkaround fishing hull scaled up from a smaller version and fitted with outboard brackets.

No, the Marlin 28 is unique because its power system was known (estimated at 800 to 840 pounds) and as each component of the boat was added, such as cabin, fuel

(Please turn to page 30)



Up close and personal with the dolphin better known as mahimahi.

"IT'S  
SLIPPERIER  
THAN  
TEFLON"

# WHY BUY A NEW CAR WHEN YOU DON'T HAVE TO?

## USE **Tufoil**<sup>®</sup> AND YOUR ENGINE WILL LAST... AND LAST...AND LAST!

You've seen the price of new cars...they go up every year! Cars get flimsier... prices get higher...it never seems to end. There are lots of reasons to keep that nice car of yours on the road as long as possible.

Now it's easy to make your engine run better, last longer. Just add TUFOIL to the crankcase. You don't have to shake the container or add an engine flush. Just pour it in and drive away.

Your throttle will get silky smooth...acceleration will improve. One customer said his car "takes off like a scared rabbit!"

TUFOIL works wonders for all known engine oils. It's actually slipperier than Teflon<sup>®</sup>. (according to a famous US government laboratory.)

You'll get astonishingly fast starts on cold mornings with both diesels and gas engines. The Canadian government tested TUFOIL at its cold regions lab. They showed faster cranking and significant fuel savings with TUFOIL.

I keep getting telephone calls from owners of very expensive German diesels wanting to buy stock in our company. They say their diesels are accelerating like nothing they've ever seen before. One said he doesn't have to down shift any more on an annoying hill in his area.

Your car can have more power like that too.

What about additives that claim to be one time treatments that will last the life of an engine? Well, I've been following the scientific literature on lubrication for a very long time. As far as I know, there isn't a shred of scientific evidence for such a claim. So don't believe it!



TRY ONE 8 OZ BOTTLE OF TUFOIL FOR 30 DAYS OR 1000 MILES

If you don't notice quieter-smoother operation, quicker starting, snappy acceleration. Just send us proof of purchase with a note describing the year and make of your car. We'll refund your money immediately.

Send for TUFOIL today and prove to yourself the amazing increase in your car's performance. Fill in the coupon today or call TOLL-FREE any time, 24 hours a day.

1-800-922-0075.  
(in New Jersey, call 201-825-8110.)



### Stay in tune with your car!

Engines last longer with TUFOIL... Our 1976-476 T-Bird is now at 190,000 miles and purring.

A bunch of customers' cars have now passed 250,000 miles.

Several months ago, a nice man I'd never seen before walked into my office, big smile on his face, sat down and said, "Would you believe 340,000 miles on a Tufoil engine?" He went on to rave about how well his engine has been running all these years. I couldn't get a word in edgewise.

It made me very proud.

Recently, a truck driver called in with over 1,000,000 miles on a diesel using TUFOIL - Wow!

A customer from Vermont added 10% TUFOIL to his sticky mechanical transmission, called in and said he couldn't believe it... "Shifting is like slicing butter now!", he said.

SAAB owners are writing letters praising TUFOIL in their "NINES" magazine. They report spectacular improvements in their engines and transmissions!

Don't forget! TUFOIL is the result of over 15 years of research and development. The U.S. government has awarded us 6 patents so far...so have Germany, England, France and Canada.

No other lubricant even comes close.

One customer put it nicely when he said, "You can hear it...you can feel it!"

PS--Our loyal customers wrote this ad for us. Its full of their comments!

Thanks!

FREE... Products based on TUFOIL technology. Check one with each order of 2 bottles or a quart. Check 2 for each gallon order. Values range from \$3.98 to \$9.95.

- TUFOIL Gun-Coat — Super rust inhibited, smooth action
- TUFOIL Compu-Lube — Low viscosity for computer mechanisms
- TUFOIL Lightning Grease — Easily sheared grease for instruments
- TUFOIL Lubit-8 — General purpose, household use lubricant

FREE brochures...

- 30 Questions/Answers about TUFOIL
- "Fun with Superconductors"—we're leading that field too!

See NASA Tech Briefs for technical details, 1986, 1987 and 1988.

©1987 Fluoramics, Inc.

FLUORON<sup>®</sup> is reg. T.M. of ICI Americas Inc.  
TEFLON<sup>®</sup> is reg. T.M. of DuPont<sup>®</sup>  
TUFOIL<sup>®</sup> is reg. T.M. of Fluoramics  
U.S. Patent No. 4,294,518  
U.S. Patent No. 4,224,173  
U.S. Patent No. 3,933,656  
Other U.S. Patents issued and pending.

When  
POPULAR MECHANICS  
tested TUFOIL, it reported  
"TUFOIL is absolutely  
spectacular!"

YES

rush my TUFOIL order:

- ONE 8 oz. bottle... treat one car for \$14.25 (plus \$3.50 shipping and handling). See money back guarantee.
- TWO 8 oz. bottles... treat two cars for \$25.00 (plus \$4.00 shipping and handling) **SAVE \$6.00**
- ONE Quart bottle... treat 4 cars for \$34.95 (plus \$4.00 shipping and handling)
- ONE GALLON... treat 16 cars for \$125.00 (plus \$6.00 shipping and handling.)

We ship within days!

\*over the single bottle price **BIG SAVINGS**

**Fluoramics, Inc.** PM-69

103 Pleasant Avenue  
Upper Saddle River, N.J. 07458

My check or money order for \$ \_\_\_\_\_ is enclosed.  
Charge my credit card.

Am. Express  MasterCard  Visa

Card No. \_\_\_\_\_

Exp. Date \_\_\_\_\_

Signature \_\_\_\_\_

Name \_\_\_\_\_

Address UPS Shipping Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

(N.J. residents please add 6% sales tax). Canadians:  
Call for the name of our Canadian distributor.

# HONDA'S COMMITMENT TO HIGH IS NOT CONFINED TO THE



## **OUTDOORS** (Continued from page 28)

tanks, galley, helm, bait wells and so forth, closely approximated weight distributions could be set. The result of this innovative approach, plus the boat's yacht-like, 32-ft. 7-in. overall length (which includes integrated outboard bracket and bow pulpit) and 10-ft. 7-in. beam, takes the walkaround offshore fisherman concept to a new level.

### **The gang's all here**

Finding our fishing spot wasn't hard. About 50 charter boats were already there. Another 50 showed up before the day was through. It was a friendly gathering about 3 miles offshore with much trolling, kite flying (for airborne bait presentation) and backing down (on hooked fish) taking place in a relatively small but productive area of water.

It's always tough to describe how a boat rides through rollers, especially if it's well-designed. It's much easier when the hull dogs it up on plane or bangs hard on reentry or throws water in your face.

The Marlin 28, of course, did none of these things. Our test boat came equipped with twin 225-hp, V6 Yamaha Excels (approximately 800 pounds). These torquey, high-tech engines popped the boat on plane within a few

seconds. Top speed with the Yamaha engines is in excess of 45 mph, but we never pounded out anything beyond 40 mph, and even this only briefly.

Although wind and water conditions dictated how fast we could comfortably run, the Marlin 28 kept pace with all the Rybos and Merritts and custom sport-fishermen that joined us on our morning run out of Sailfish Marina.

The Marlin 28 rides light enough to leap at the touch of the throttles, but has heft enough (7000 pounds of dry weight) to slice through rollers without riding up and then banging down with a jolt. Spray was a problem only for boats running alongside us and a little aft. Like all Grady-Whites, the Marlin 28 is a champ at deflection.

### **Taking the bait**

We were running live goggle eyes (bait-fish worth their weight in gold during sailfish season) and had two hits before lunch. The first one just toyed with the bait—batting it with its bill and then holding it loosely in its mouth. This isn't the ideal situation to set a hook, but I tried anyway—three hard, rod-bending tugs. No luck. Bait and fish were gone.

The second hit was more lively. It took the bait hard, so I quickly set the hook. In an instant, the sail leaped into

the air like an acrobat, spinning and twisting in spectacular gyrations. At about 100 ft. out, it looked like a solid 4-footer, approximately 40 to 45 pounds.

The first run was away from the boat. Then it ran to port. Both maneuvers forced the reel to sing at top speed. The sail's final run was directly at the boat. I reeled in line like mad, but was only fighting the drag. Sensing the line go slack, the fish shot out of the water, spit out the hook and waved its tail in our faces. It was gone, as easy as that.

Unfortunately, a storm front was brewing on shore and closed in after lunch. Lightning forced us to make an early getaway. Given sufficient reason to open up the throttles, we ran on top of the waves without getting beaten up and smoked the big charter boats back to the marina.

### **The outboard advantage**

With downtime on my hands, I took the opportunity to crawl through the boat and ponder the question: Why outboards? For years offshore owners opted for inboard power because of fuel economy and long engine life. Accessibility for service and boat speed (slowed by weight of the heavy blocks) were sacrificed, but were considered a small price to pay.



# PERFORMANCE PAVEMENT.



Honda automobiles and motorcycles have won a reputation for engineering excellence that extends from the highway and the racecourse to your own backyard.

The Honda riding mower, for instance. Its efficient Overhead Valve engine is mid-mounted to permit stability and maneuverability far superior to typical rear-engine mowers.

The Honda HT3813 lawn tractor meets the challenges of extensive yard care with liquid-cooled, twin-cylinder power. Plus, Honda's exclusive Mechanical Autoclutch Transmission (MAT™), allows clutch-free gearshifting.

To make a leisurely drive of mowing your lawn, visit your Honda Riding Mower or Lawn Tractor Dealer. Ask about convenient financing and Honda's 2-year limited warranty. For the nearest dealer, check the Yellow Pages or call the number below.

**HONDA**  
**Power**  
**Equipment**

**1-800-426-7701**

For optimum performance and safety, we recommend you read the owner's manual before operating your Honda Power Equipment. © 1989 American Honda Motor Co., Inc.

Outboards, however, have come a long way in the past few years, notably trendsetting Yamaha engines, and Grady-White decided it was time to capitalize on their inherent advantages. Especially, with a boat designed to appeal to fishermen trading up from smaller rigs. (The Marlin 28 measures just 28 ft. from bow to aft bulkhead and it comes with an unyacht-like price, about \$63,000 without engines.)

The Marlin 28's integrated outboard bracket, which moves the engines well out of the fisherman's way, is a functional and stylish design element. (The captain of a custom Rybo, the Cadillac of South Florida, radioed us at sea to say, "Hey, is that the new Grady-White? Just wanted to say you're looking real good out here.") It also permits the engines to tilt completely out of the water for corrosion protection and incorporates a swim platform for accessibility.

The aft bulkhead has an integrated, 40-gallon livewell with a raw-water pump that kept our goggle eyes alive and kicking for three days. It also has a transom door for pulling in the big ones.

Like all Grady-Whites, the Marlin 28's 60-sq.-ft. cockpit is a masterpiece of design. Leaning fishermen are supported at midhigh by 28-in.-high gunwales and anchored by teak toe rails. There

are many superb features, such as 70-gallon fish box, bait-rigging station, built-in tackle boxes and more. Equally well designed are the helm and cabin, which is a true overnigher with 6 ft. 6 in. headroom and two large double berths (one under the helm).

But several superlatives should be saved for the Marlin 28's fundamental construction. Every joint is beautifully finished, all hardware is through bolted, piano hinges are used for each vertical hatch and about \$1000 of foam is injected between the hull and inner liner, which adds strength as well as flotation. Construction values like these enable Grady-Whites to maintain their high resale value for years.

### Catch and release

The morning of the second day dawned with the norther blowing a few knots stronger. We headed out into 5- to 7-footers, with the occasional eight thrown in for good measure. Not a problem for the Marlin 28.

Due to the windy conditions fewer boats converged on our productive spot, so we had more room to maneuver. But we could only run three lines, instead of four, because they quickly entangled in the blustery wind.

Not long after we arrived, I had a sail

on line and set the hook. It flew into the air and performed a stunning full gainer with a three-quarter twist (I gave it a 10). The fish then headed for the bottom and made its final run straight at the boat. It spit out the hook with a flourish and, much like yesterday's similar-sized fish, it was gone.

Before I could get depressed, a different reel began to sing. A 10-pound dolphin fish (mahimahi), was attracted to our bait by all the commotion. It hit the goggle eye hard and I set the hook deep. This time, despite a number of hard runs, including two at the boat, the fish was mine. I brought the fish up to the boat's side, considered its dollar value back at the dock for a moment, and then released it to swim off to freedom.

This marked the end of my President Bush-inspired fishing adventure, because, like the day before, the storm clouds rolled in and it began raining cats and dogs. We hung around for a while and then decided to call it an early day.

But I learned two important things on this trip. The first is that President Bush's fishing mode has something going for it and I intend to get more into it in the future. And second, if the President is looking for a good candidate to become Offshore Fisherman One, the Marlin 28 is an ideal choice. **FM**

# INSIDE DETROIT

BY JIM DUNNE

## The Slick New Look Of Saturn

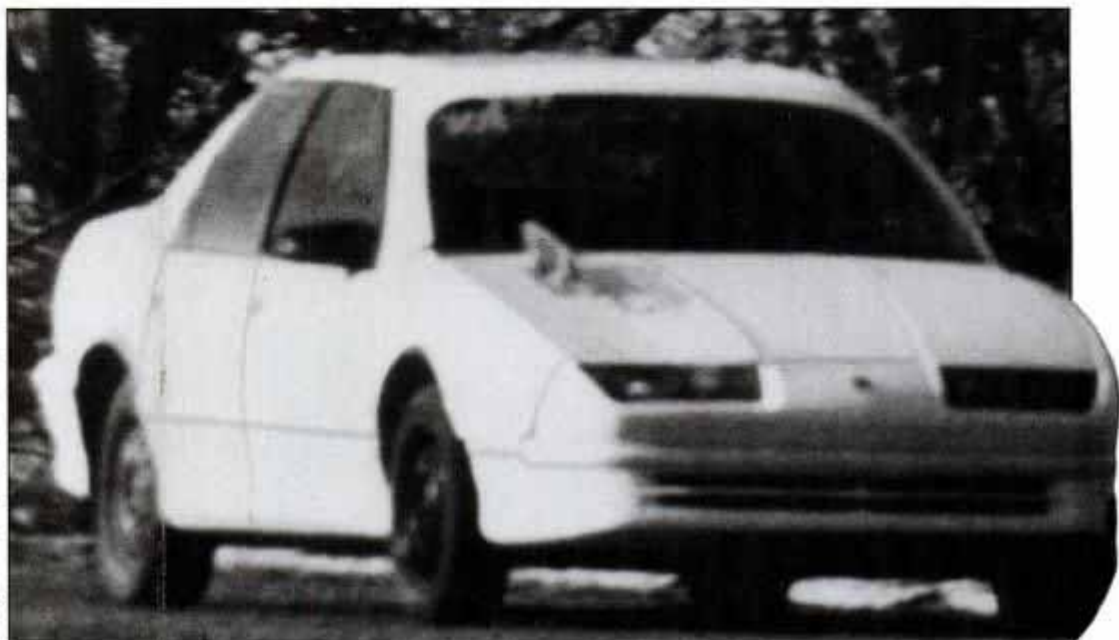
**S**TYLING of GM's 1991 Saturn sedan is different from the usual GM model, as reflected in the spy photograph at right. But even as unusual as this prototype looks, further nuances are in store.

When Saturn hits the showrooms in the fall of 1990, shoppers will see more glass, and a number of other departures from GM's styling traditions. The windshield almost wraps around to the door opening in the production car, a design touch that's hidden in this prototype by a false fitting on the windshield post.

A similar disguise is used at the rear where most of the backlite is covered by an angular cap.

Saturn will mix and match steel and plastic body panels to an extent that has never been done before. Body pieces that lie in a mostly horizontal position will be made of steel—items like the hood and roof. Vertical panels, like the doors and fenders, will be plastic.

Power for the new car will come from two variations of a new 1.9-liter aluminum engine with steel cylinder liners. The basic version will be a standard overhead-cam valvetrain, while the high-performance edition will use twin cams and 16 valves.



Though regularly exposed in spy photos, Saturn may still have styling surprises for its 1990 debut.

### Cool New Marquis

A prototype 1991 Mercury Grand Marquis is part of a fleet of cars undergoing engine cooling tests at Ford's proving grounds in Dearborn. Note in the photo that the front third of the car has the styling of a 1991 car, while the rear two-thirds is straight 1989 production sheetmetal.

The use of the hybrid 1989 lets Mercury test the cooling efficiency of the new front end, well before the time

when complete prototype bodies become available.

In this prototype, Mercury is testing Ford's new 4.6-liter V8 engine, the powerplant that will show up in the

turn. Next year the last of GM's undersize E-body cars will get more bulk, and offer more prestigious size to the luxury coupe buyer.

The 1990 Toronado will be



GM plans to restore Toronado prestige with a longer look in '90.

1990 Lincoln Town Car this fall. As for the 1991 styling of the Marquis, the chrome bumpers are gone, replaced by plastic types, and headlights are formed shapes with composite lenses. Note the low hood line and soft, Taurus-like edges in the body panel styling.

### Toronado Bulks Up

Two years ago it was Eldorado. This year it's Riviera. Soon it will be Toronado's

longer from bumper to bumper, and add some sheetmetal to the rear quarter panel. The result will be a car that appears, from the rear, more like the Toronados of old, instead of the tail-between-the-legs shape that was introduced in 1985.

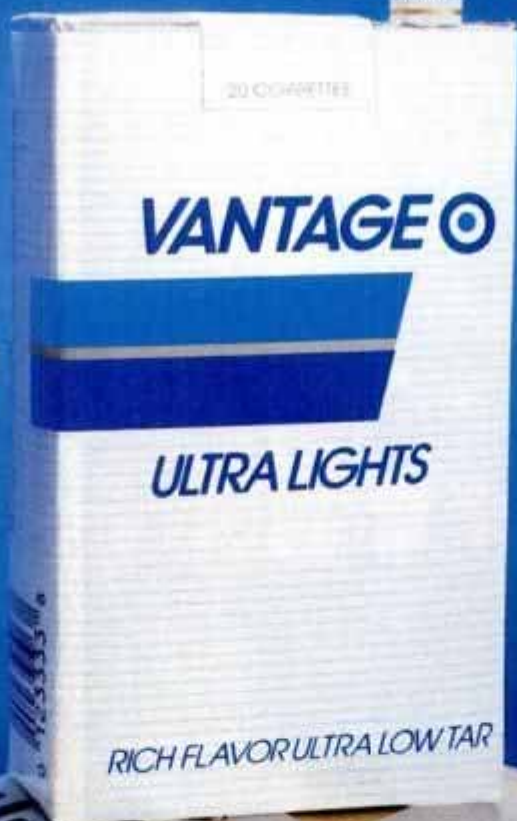
The quarter panel on the 1990 will stretch at least 6 in. more to the rear, and the tail-lights will be split in two sections instead of forming one ribbon across the back.

*(Please turn to page 34.)*



Development mule reveals Mercury's plan for 1991 Grand Marquis.

# TAKE ADVANTAGE



5mg

10mg

RICH TASTE  
AT 1/2 THE TAR

SURGEON GENERAL'S WARNING: Quitting Smoking  
Now Greatly Reduces Serious Risks to Your Health.

5 mg. "tar", 0.4 mg. nicotine av. per cigarette by FTC method.

© 1989 R. J. REYNOLDS TOBACCO CO.

Материал, защищенный авторским правом

The car has huskier appearance at the front, as well, though the hidden headlights and grooved bumper will be carried over from the current edition.

## Dodge Trucks —And Jeeps

Dodge plans to bolster its truck division by offering more variations in the pickup and utility vehicle class over the next two years.

In addition to the newly introduced and exclusive Dakota pickup convertible, Dodge will add a club cab to its Dakota lineup this fall.

Then, in 1991, Dodge will offer its own version of the new Jeep ZJ, an update on the Jeep Cherokee. (Jeep will also offer a ZJ, and continue to build the Cherokee alongside the new utility truck for a couple more years.)

The light truck market has grown faster than the sedan market in the past five years, and Dodge wants to be at the forefront of new vehicles coming in the next few years. With Ford and GM bringing out 4-door versions of their compact sport/utility vehicles in 1991, Dodge will remain competitive.

Later, when higher performance ver-

sions are built for Chrysler's prestige sedans and sports cars, you can look for overhead cams and 4-valve cylinder heads.

## Form-Fitting Mufflers

That's what you may be ordering as a replacement on your 1990-model automobile. Muffler manufacturers like AP Parts of Toledo have come up with pressed steel mufflers of angular forms that fit the shape of the underside of the car more closely. They even fit into small nooks and crannies where oval mufflers would never fit.

One design is shaped like a slice of pie—triangular and about 4 in. thick.

Insiders claim that at least six 1990 models, including the Lincoln Town Car and Jeep Cherokee, will have the new-type muffler. In those cases, the shape is rectangular.

The new muffler has a lot of advantages for AP that the customer never sees. It takes half as many parts to assemble—no baffles or end caps to put together—and requires one-sixth the number of assembly operations.

## Driveline Decisions

Forget about advanced techniques like turbocharging, supercharging or multi-valve or variable valve. The big decision in engine development in the coming years will be front-wheel drive versus rear drive—or more precisely, north/south versus east/west engine layouts.

Chrysler is planning to straddle the fence by building a chassis that will fit both front- and rear-drive cars. That means a fore-aft engine layout in place of the transverse alignment Chrysler now favors.

Ford is firmly committed to rear drive for its bigger cars and models like Mustang and Thunderbird.

GM will keep rear drive for big Cadillacs, Caprices and a 1992 Buick Roadmaster.

Meanwhile, Corvette, Camaro and Firebird will stick with putting power on the road through the rear axle.

What does it all have to do with engine development? Rear drive gives more space for installing engines than 4 cylinders, and allows additional room for optional transmissions. If you haven't followed the prestige car trends in recent months, you've missed the endorsement the Japanese have given to rear-drive models. The new Infiniti and Lexus cars are driven through the rear wheels, following the tradition of all the important European luxury/sports models.

From all the evidence, it appears that rear-wheel drive is the trend of the future for the better (more expensive) cars, thanks to its "enhancement of the driving experience." **PM**



## ORDINARY PEOPLE. EXTRAORDINARY RESULTS.

Results that come from a conditioning Furniture Refinisher that nourishes as it refinishes.

The ordinary person: Ellen Whitehead, software designer. The extraordinary result: Well, just look at this dresser.



"Formby's\* Conditioning Furniture Refinisher helped me dress up my dresser."

Ellen told us, "I've always treasured my antique dresser. And Formby's Conditioning Furniture Refinisher helped me bring back its beauty."

It's the only refinishing product that gently dissolves away the old varnish, lacquer or shellac, then conditions to help prevent drying and cracking for lasting beauty. All without stripping or sanding.

Fortunately, you too can get great results with all Formby's products. No one has a more

complete refinishing system to make wood care easier.

To learn more and receive our free booklet, "Formby's Secrets of Successful Refinishing," write the Formby's Workshop, Olive Branch, MS 38654. Let our 3 generations of wood care expertise help you spruce up your wood.



# PEOPLE WRITE TO PENNZOIL®

*Straight answers from the automotive experts.*

## Two-Cycle Homework

**Q.** I am a student doing a consumer report for my chemistry class. I would like to know the chemical difference between water-cooled, and air-cooled two-cycle engine lubricants.

C.G., Providence, NC

**A.** Oils designed for water-cooled two-cycle engines, such as Pennzoil® Premium Outboard 2-Cycle Oil, contain additives called ashless dispersants. These additives are free of metallic ash compounds. High-quality outboard oils are labelled NMMA TC-W II™.

On the other hand, Pennzoil® 2-Cycle Oil for Air-Cooled Engines, is properly formulated for air-cooled application, and contains calcium detergents. This type of oil is referred to as "low ash oil" in many owner's manuals.

Due to the different operating temperatures and conditions of water-cooled and air-cooled two-cycle engines, different additives are required for maximum engine protection.

## Now, Voyager

**Q.** I have an '88 Plymouth Voyager with a V-6 engine, which now has 8300 miles on it. Recently, when changing my oil, I found a thick, white deposit on the filler cap, and inside the valve cover. The oil looked normal. Can you explain what happened?

F.W., Burlington, IA



## By Don Johnson

*Vice President, Product Engineering  
Pennzoil Products Company*

**A.** The white deposit is an emulsion, caused by moisture accumulation in the cooler areas of your engine. This can be caused by excessive short trip driving, a thermostat which is stuck open, or a plugged PCV valve. If none of these appear to be the cause, arrange for a qualified mechanic to check for a coolant leak.

## Detergents In Pennzoil

**Q.** I'm writing to ask about your 10W-30 and 10W-40 motor oils. Do these oils contain detergents? There's no mention of detergents on the bottles.

M.H., Williamston, SC

**A.** Yes. They both contain detergent additives. All Pennzoil Motor Oils exceed the highest performance levels, as established by the American Petroleum Institute (API).

## Racing Oil For A Regular Car

**Q.** Do you think for normal driving, a racing oil would be beneficial, and worth the added expense?

E.D., Perryville, MO

**A.** No. I don't believe that it would be beneficial for you to switch to a racing oil for your vehicle. Racing oils are designed for the lubrication of high-performance competition engines. Many contain special additives that make the oil compatible with a variety of competition fuels such as methanol and nitromethane.

## EDITOR'S COMMENT

Selecting the proper two-cycle oil is a critical factor in maximizing engine life. Using an oil designed for air-cooled engines in an outboard (water-cooled) engine, can result in spark plug fouling, port plugging and piston seizure. Using an outboard oil in an air-cooled engine can cause piston ring sticking in heavy duty service. No single oil can do it all. So be sure to follow the engine manufacturer's recommendation, and use the proper oil in each application.

## WE'RE OPEN TO QUESTIONS

*about motor oils, lubricants and engines. However, you can tell us a few things, too. Maybe you've discovered something about motor oils or lubricants. Or you have a special reason for being a Pennzoil fan. We would like to hear from you. Write to: Don Johnson, Pennzoil Products Company, P.O. Box 2967, Houston, TX 77252-2967.*



*World Class Protection®*

# IMPORTS

BY BILL HARTFORD

## Wagon Lode

**I**F YOU love to drive, love to practice your art on the long and winding road, but have to make do with one, practical car, you've got a growing number of choices in an overlooked category.

It's the wagon.

Quite accurately, "sports" has replaced "station" as the word for defining these vehicles. They are derived from some of the world's best European sports sedans, and compromise little in the way of performance and handling. So, don't be too quick to fall for those fashionable utes, 4x4s and vans. They'll haul, but you'll never again experience the feeling of really *haulin'*.

### Peugeot 405

The newest wagon—Sports-wagon, as Peugeot calls it—is the 405. The difference between two versions—the DL and S is in degree of luxury and number of power options. Both fwd models mount the 1.9-liter 110-hp, fuel-injected, overhead-cam Four, and offer 5-speed or 4-speed automatic.

Standard equipment for the DL is impressive, even though it's the base model: air conditioning, Clarion sound system and power antenna, central door locking, roof rails, 4-wheel disc brakes and Michelin all-season steel-belted radials. On sale this summer, the front-wheel-drive 405 wagons



Peugeot 405 Sportswagon, in DL and S trim, goes on sale this month.

should be priced between \$15,000 and \$20,000.

For the higher sticker on the S model, the seats are upgraded to leather and are wired for heat, the wheels go to light alloy, windows get power operation, dual remote mirrors get power and heat, and for long trips cruise control takes over for your right foot—or the left, if you've ever sought relief in that contorted, unsafe way.

Peugeot's esteemed rear-wheel-drive 505 workhorse may be a cavernous wagon with a more conservative profile, but with its 160-hp intercooled turbo Four, it rockets a huge payload down the road. And, with independent suspension all around, it keeps its four feet squarely on the ground.

### Audi And BMW

Two of the hottest sports sedans introduced during the past year are Audi's 80/90 models and BMW's new 5-Series. Audi is testing a wag-

on version of the 80/90 4-door sedans, and BMW is considering a 5-Series wagon that would join its 3-Series wagon that's already sold in Europe. The year-old 3-Series wagon, a popular choice in 1-car European families, isn't considered as having a marketing niche here, but a 5-Series sport wagon may. If it's 535i-based with a 208-hp 3.5-liter Six, it'll do 0 to 60 mph in 8 seconds, have a top speed of 140 mph,

### Tried-And-True

An automaker doesn't come to have *the* classic wagon overnight. In the case of Volvo, the Swedish company founded in 1927, the development began in 1960 with its first wagon, the P 210 A. The world really took notice with the '68 145 S. The easily recognized descendants of the 140 Series are the current 240 DL and GL (starting at



BMW 5-Series would be the most exciting wagon of all.

and be King of the Wagons.

An Audi wagon of 80/90 designation would be no slouch, either. With 2.3-liter Five and front-wheel drive, or Quattro all-wheel drive, it would offer superb drivetrain with exceptionally smooth aerodynamics—delivering a  $C_d$  close to the sedan's 0.31.

For the here and now, though, Audi has its wagons in the 100/200 Series—a fwd 100, or sure-footed and fast 200 Turbo Quattro, both with the famous Five.

\$18,000). But now outnumbering the familiar oldtimers are the 740 and 760 5-doors, the new shape of Volvo wagons. For '89, the \$21,000 value-leader is the 740 GL, with 114-hp, 2.3-liter, ohc Four. The hottest is the \$33,000 turbocharged 760 GLE. The intercooled turbo nets 175 hp and towing capacity is 3300 pounds.

And let's not forget the exquisite, elegant Mercedes-Benz 300 TE. However, the price of entry, 50,000 U.S. dollars, is a wagonload. **PM**



Audi 80/90 wagon would offer choice of fwd or all-wheel drive.

# Save Gas, Save Engine with 'POLY'

**GUARANTEED LOWEST PRICE** (see details below)

The following introduces one of the most fully tested and proven gas saving, friction-reducing engine treatments ever to reach the market!

## The Secret is "Poly"

"Poly" is short for polytetrafluoroethylene (TFE), the slipperiest substance known to man. (1981 Guinness Book of World Records). Petrolon Corporation, makers of Slick 50, invented a way to permanently bind this slippery chemical to your engine with one treatment. Just one quart of Slick 50 can reduce engine friction, increase gas mileage and horsepower and reduce engine operating temperature, causing your oil and engine to last longer...plus it reduces metal wear, defraying costly overhauls.

## Years of Testing and Use Have Proved it True!

Slick 50 has been thoroughly tested in independent laboratories and out on the road:

The March/April 1982, p. 35 issue of "Consumer Digest" magazine stated, "Slick 50 does reduce engine heat and ordinary wear, and our informal tests indicate that it will improve gas mileage by about 2 or 3 miles per gallon."

One of the country's most respected research institutes reported applying a powerful ultrasonic cleaning process to a Slick 50 treated engine and were surprised at its permanence. "We actually expected the Petrolon Slick 50 TFE Resin coating to also be removed, but later found it was still there."

TUV, a German testing laboratory with credentials every bit as prestigious as our Underwriters Laboratories, tested Slick 50 in 1986. They found substantial increases in both gas mileage and horsepower. Their tests showed that these gains were due to a reduction in friction.

The Federal Aviation Administration has fully accepted a similar product for aircraft—Slick 50 Aircraft Piston Engine Treatment (F.A.R. #33.49). This FAA endurance test simulated 1400 hours of engine use.

The power technology laboratory at a leading southwestern university stated, "Slick 50 does increase horsepower and decrease fuel consumption in tests done at the university."

The Space Shuttle Columbia uses the chemical "poly" in its gears and bearings because it is the only chemical lubricant which can withstand the heat and corrosive elements of space.

Perhaps most dramatic of all is a torture test overseen by the Automotive Services Council for Pennsylvania and shown on WTVE television. Three cars with 75,000 to 129,000 miles on them were treated with Slick 50. Six months later the oil was drained from each vehicle, and the cars driven without the oil plugs for about a half hour. The water temperature never rose and the engines sustained no apparent damage.



## It's Easy to Treat Your Engine

A few minutes before oil and filter change, add the engine flush you get free with each order to clean out the engine. Let the engine idle for 5 minutes. Then drain the oil, change the filter and add the proper amount of oil, less one quart. Add one quart of Slick 50, drive for 30 minutes, and leave it in the crankcase for at least 3,000 miles. As the engine operates, the oil carries the "Poly" between the parts where it is burnished into the pores of the metal.

## Only One Treatment Necessary

It's permanent, so you do it only once, not each time you change oil. One quart of Slick 50 will treat all standard 4, 6 and 8-cylinder gasoline and diesel engines.

## Works with Most Oils

Slick 50 will work with all petroleum-based oils and all synthetics compatible with petroleum-based oils with the exception of graphite oils. However, once an engine is treated, you can go back to a graphite type if desired.

## 4 Ways Slick 50 Saves You Money

Your actual percentages may vary depending on your driving, vehicle condition, weather and geographic location, but no matter what your conditions, Slick 50 can:

1. Increase mileage
2. Increase horsepower (small economy cars and large RV's really need this)
3. Reduce operating temperatures, thus increasing the lubrication and life of the oil and engine.
4. Minimize or eliminate costly overhauls by reducing engine wear

Up to 90% of the engine wear on a car can be caused by lubrication starvation cars experience when first started before the oil begins to circulate. Slick 50 can eliminate this problem for less than the cost of two tanks of gas.

## Slick 50 Will Not Affect Your Warranty

Slick 50 is suspended in an excellent grade of petroleum oil which meets or exceeds every manufacturer's engine warranty requirements. In addition, this oil carries an American Petroleum Institute service classification SF-CC-CD.

## There's No Risk with Our Money Back Guarantee

Use Slick 50 for 3000 miles. If you don't notice an improvement in engine performance, return your invoice with a short note telling why, for a prompt full refund—no questions asked.

## Profit from Selling Slick 50 Yourself

Here's an opportunity to make handsome profits. Having such solid test results from major institutions make Slick 50 easier to sell than many other products. Free dealership information is sent upon request.

## GUARANTEED LOWEST PRICE!

If at time of purchase you have seen Slick 50 advertised in a current magazine at a lower price, we will beat that price by \$2.00 per quart.

For purchase or further information call toll-free 1-800-525-8624, ext. 6 (in California 1-800-233-9559) or send to: Progressive Energy Corporation, 255 South Bent Avenue, #B2, Dept. PM689, San Marcos, California 92069.

Yes, I want to improve my car's performance and save my engine—rush me risk free:

- One Slick 50 at \$39.95 + \$4.00 shipping and handling. Calif. Residents add 7% Sales Tax.
- Give me free shipping and handling for my order of 2 or more at \$39.95 each.

Check  C.O.D.  Visa/MasterCard  
Card # \_\_\_\_\_

Exp. Date \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_  
(Give street address if possible for UPS delivery)

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**PEC**  
Progressive Energy Corporation

255 South Bent Avenue, #B2, Dept. PM689  
San Marcos, California 92069

CALL NOW, TOLL FREE 1-800-525-8624  
IN CALIFORNIA, TOLL FREE 1-800-233-9559.

©1989 Progressive Energy Corp.

# OLD HOUSE RESTORATION

BY BOB VILA

## Exterior Period Painting

**E**XTERIOR painting is one of the most noticeable parts of any restoration. Because it has a major impact on your home as a whole, whether you're striving for historical accuracy or not, it's a subject that deserves a close look.

Today, many well-known paint companies have made the search for historical colors relatively easy for the old-house owner. There are some pretty impressive collections of color available that will please even the most demanding restorer.

### Taking it back

There are basically two ways to deal with an exterior restoration paint job. For those who are striving to take their old house back to its original (or close to original) state, scientific analysis of paint chips to determine the original colors used is a possibility. Usually, this entails having chips of paint taken from various parts of the house for analysis by an architectural coatings specialist. He or she can then advise you on selecting paints available today that replicate those originally used.

As part of the process, documentary research is also done on the property. Any papers, photos, newspaper articles, letters or other materials that can help discern what the facade originally was colored are a great help in this detective work.

Since most period homes were painted more than one color, paint samples must be taken from several different parts of the structure. Depending on the period of the house, this may include the wood siding, window trim,

*Contributing Editor Bob Vila is host of public television's "This Old House."*



Victorian exterior paint schemes can feature dark, earthy color tones that clearly separate porches, trimwork, windows and doors from the rest of the building.

fascia, cornices, shutters and so forth.

Although paint analysis is often used when restoring museum-quality houses and other buildings, it's an expensive proposition for the average old-house owner. But if you won't settle for less than an original restoration (and have the budget for it) it's the way to go.

Probably, the more common way to approach the past paint puzzle of one's home is to look for historical or cultural precedents. By this, I mean deciding to take the structure back to paint colors that, although they may not have been used on your particular building, are historically appropriate and accurate for the building's style.

Of course, you have to be familiar with the architectural style of your old house before you can go any further on your own. If you don't already know what you've got, an afternoon of research at the local library should be enough for you to make an educated guess. Unfortunately, many houses aren't clearly one style or another, but have a combination of details of several types. But by studying its architectural characteristics, like the trim, roof, windows and porches, you should get a pretty good idea which style your house best resembles.

### Choosing colors

Once you know what style your house is, it's time to see what colors are appropriate

for your historical paint job. Many of today's major paint manufacturers offer a line of historical paint colors. Some of these colors, based on original paint samples taken from historic buildings, are truly authentic. Others may be modified a bit to appeal to modern tastes. Unless you're striving for a museum-like recreation, these slight adaptations in paint color shouldn't bother you.

Period research shows that specific colors were more likely to be used during certain periods than others. Of course, there were no hard and fast rules for exterior paint color throughout history. There was and is always room for an eccentric, someone who may have used

*(Please turn to page 42)*



# How one air conditioner handled the heat in the toughest challenge of all

by  
General Chuck Yeager, USAF Ret.  
Test Pilot



General Yeager is our nation's most respected test pilot.

The folks at Day & Night say they've got a pretty fine air conditioner in their new Reliant. But I don't believe we should take their word for it.

Sure, they built it from top-quality materials, constructed the compressor valves out of hardened steel, the exterior valves from brass, the cabinet from galvanized steel. Then they checked it out and rechecked it out in one of the most sophisticated air conditioner research facilities on the planet.

## Mother Nature's Lab

Next, they torture-tested the Reliant, set it out on the beach and just left it there. That may seem strange but, you see, they figured if it could stand all that salt air, it could stand the conditions in your backyard.

## One More Test

But no matter how much they did in the lab, Day & Night's engineers couldn't be really sure the Reliant air conditioner would do the job till it faced a real live challenge.

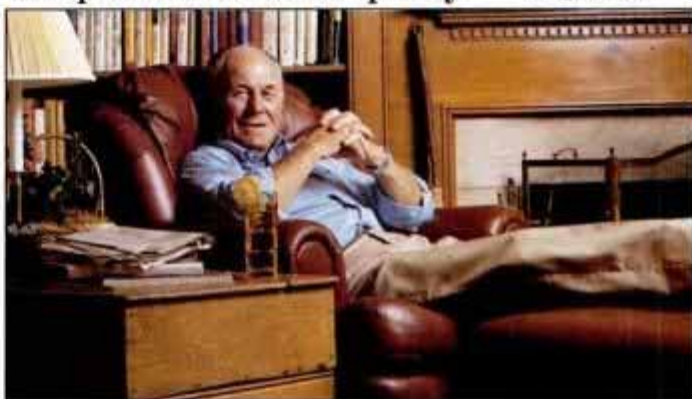
It had to pass the toughest challenge of all: the Yeager test.

Nothing too fancy, just me, a comfortable recliner and a scorching hot day. See, I don't

much care how it did in the lab if it can't take the sweat off my brow.

Let me tell you, I've tested jets for the Air Force for quite some time and I know high technology and good engineering when I see it. And I'm gratified to report that all of the quality

The Reliant undergoing the grueling Yeager test.



of the Reliant air conditioner shows in its operation.

## Thumbs Up

It's quiet (purrs like a kitten), efficient, dependable and built to last. That means it'll get you cool and keep you cool. Where it really counts, the Reliant proves it has the right stuff.



The right stuff  
to last.

If you'd like to check out the performance of the Reliant for yourself, just stop by your Day & Night dealer. For the right air conditioner at the right price, just call 1-800-HOT-SALE.



Introducing our newest air conditioner, the 1989 Day & Night Reliant.



To ensure our air conditioners can withstand the elements, we expose experimental models to corrosive salt air.

# 1-800-HOT-SALE

# INTRODUCING THE NEW PLYMOUTH ACCLAIM LX. A WORLDBEATER.



HERE'S TO YOU, AMERICA. 0% FINANCING OR \$500 CASH BACK

ACCLAIM PRICING STARTS AT \$9,920\*

**7/70** Protects engine and powertrain for 7 years or 70,000 miles and against outer body rust-through for 7 years or 100,000 miles. See copy of limited destination charges. †On dealer stock. Short term annual percentage rate financing for qualified retail buyers through Chrysler Credit. Other rates

TO HAVE V-6 POWER,  
AVAILABLE ROOM FOR SIX,  
ULTRADRIVE 4-SPEED AUTOMATIC TRANSMISSION,  
OVER 50 STANDARD FEATURES,  
THE LONGEST POWERTRAIN PROTECTION IN ITS CLASS.  
TO COMBINE THE BEST OF ALL WORLDS—  
TAKES A WORLDBEATER.



ON EVERY NEW ACCLAIM!

LX MODEL SHOWN, \$13,195\*

warranty at dealer. Restrictions apply. \*Sticker prices exclude title, taxes and available as length of contract increases.

BUCKLE UP FOR SAFETY.

PLYMOUTH   
SATISFY THE CUSTOMER

color that differs greatly from the norm. Remember, too, that exterior paint colors may include a regional statement. By this, I mean there are sometimes different interpretations of period colors based on the part of the country you live in. For example, I've seen Victorian colors interpreted differently in New England than they are in San Francisco. The former may treat the exterior in a rather subdued way while the latter, the so-called Painted Ladies, use bright, almost psychedelic colors to enhance the period detail of these structures.

Keeping this in mind, I can give some generalities on what colors were likely to be used for different-style houses. One of the best collections I've seen of colonial paint colors is the Martin-Senour Co. (Cleveland, Ohio) Williamsburg paint collection. Historical research done on some structures in this colonial capital found that many of the houses were painted more than one color, rather than the common white most of the homes in this era were assumed to be.

In addition to white, you'll find various shades of gold and tans, yellowed green, grays and blues, and reds and

dark browns that can be appropriate for painting a colonial home in period colors. Interestingly enough, contrasting colors were sometimes used for shutters, doors, window trim and sashes.

The late Federal through Neoclassical period is marked by the use of lots of white paint, often coupled with green shutters. (The popular use of white on Greek Revival homes was supposed to imitate classical marble). Houses built in the early Victorian era saw much use of pale earth tones, like grays, pinks, tans and yellows. It was during this time that the practice of using a different color to highlight the building began—a way of exterior decoration that continued through the rest of the Victorian era.

The late or high Victorian era—that time that most of us simply refer to as *Victorian*—is when the dark, musty or muddy colors seemed to prevail. The colonial revival followed and with it a return, in the late 19th and early 20th century, to light pastels and, of course, white.

### Getting help

Remember when choosing paint colors for your restoration that the sometimes intricate architectural details were meant to be shown off to their full potential. When painting an old home, where you put the paint is as important as what colors you choose.

If you're painting a Victorian home yourself, a good book to use as a guide is *Victorian Exterior Decoration/How To Paint Your Nineteenth-Century American House Historically*, by Roger W. Moss and Gail Caskey Winkler (Henry Holt and Co., New York, NY).

If you're interested in learning more about creating a Painted Lady, a good book to check out is *Daughters Of Painted Ladies/America's Resplendent Victorians*, by Elizabeth Pomada and Michael Larsen (E. P. Dutton, New York, NY).

There is professional help available, too, when it comes to choosing a period palette. Your local historical society may know of a historical color consultant in your area. (There's also a list of color consultants in the back of *Daughters Of Painted Ladies*.) Sometimes, a color consultation can be done by mail with the use of photos—a cheaper alternative than an in-person visit.

Whether you decide to take the exterior coloration of your house back scientifically to its original colors or historically to its correct period, make sure you can live with the resultant color scheme. Understand your own color preferences before you begin, so not only will you be proud of the finished result, but comfortable living within its walls.

PM

## BEFORE YOU DO HOME WORK, DO YOUR HOMEWORK.

Plan and organize your home improvements before you plunge into them. Get help from ORTHO, the most knowledgeable source in the business. ORTHO has just added two new titles, *How to Build Additions* and *How to Design & Remodel Children's Rooms*, to an impressive do-it-yourself list that includes the

famous *Home Improvement Encyclopedia* (more than 300,000 copies sold!). You'll find over 30 easy-to-use, informative ORTHO How-To titles at your favorite retail store.

For a free catalog on the complete library of ORTHO BOOKS, write: Ortho Information Services, P.O. Box 5047, Dept. D-6, San Ramon, CA 94583.

The advertisement features a collection of ORTHO books and a Chevron logo on a wooden surface. The books shown include:

- How to Design & Remodel Children's Rooms* (orange cover)
- How to Build Additions* (purple cover)
- ORTHO'S HOME IMPROVEMENT ENCYCLOPEDIA* (large brown cover)

The Chevron logo is positioned above the text "ORTHO INFORMATION SERVICES". The background includes a white pencil sharpener, a blue pencil, and various tools like a hammer and a saw.

# GET BETTER ACQUAINTED



Introduce yourself to a WETJET and introduce yourself to living. Smooth, comfortable cruisin' for one or two. The powerful, Brut® engine easily achieves speeds up to 40 mph. And WETJET is designed to get you there and back safely.

Get acquainted with your nearest WETJET dealer, or contact WETJET for more information.

WETJET INTERNATIONAL LTD.  
23 Washburne Ave.  
Paynesville, MN 56362-1647  
612-243-3311

MEMBER OF  
**PWIA** POWERBOAT  
INDUSTRY  
ASSOCIATION  
© COPYRIGHT 1989

**WETJET™**

A M E R I C A N M A D E

# DISCOVER RENTING

Your A.R.A. rental store can help whittle that big project down to *your* size

Before you call a contractor or carpenter about the project you thought was too big to handle, visit your nearby A.R.A. rental store. The rental professionals there can offer expert advice and equipment.

From cement mixers to extension ladders. Paint sprayers to nail guns. Your rental store can offer fast, inexpensive ways you can do more of the work yourself... and save more money.

Check out the nearest A.R.A. rental store listed in the yellow pages. That big project might be just your size after all... once you Discover Renting!



american rental association  
1900 - 19th Street.  
Moline, Illinois 61265  
(309) 764-2475

We rent only the very best.

## Sale! DISCOUNT PRICES ON WORKSAVERS!

Sale Good Thru 6/30/89

<b>4000 Watt Continuous Generator</b>		<b>Famous Brand Gas Engines</b>	
8 HP Tecumseh engine has cast iron sleeve. Recoil start. Item # 16425.		Largest selection! Thousands of engines in stock. 3 - 23 HP. Horizontal and vertical shaft.	
		5 HP #6051 Sale <b>\$139.99</b>	
		8 HP #6081 Sale <b>\$199.99</b>	
		10 HP #6010 Sale <b>\$239.99</b>	
		Shipping and Handling not included	

Send for your

**FREE**

Discount Tools, Parts & Equipment Catalog!

Save  
**20 to 50%**  
Famous  
Name Brands!



Send for your **FREE 140-Page Discount Tools, Parts and Equipment Catalog!**

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_  
State \_\_\_\_\_ Zip \_\_\_\_\_

Northern, Key #80892,  
P.O. Box 1219, Burnsville, MN 55337-0219

**NH Northern®**  
Where the Pros and Handymen Shop  
**ORDER TOLL FREE**  
**1-800-533-5545** In MN 612-894-8310

# MOTORSPORTS

BY TONY SWAN

## Des Moines Set To Stage A Street Race

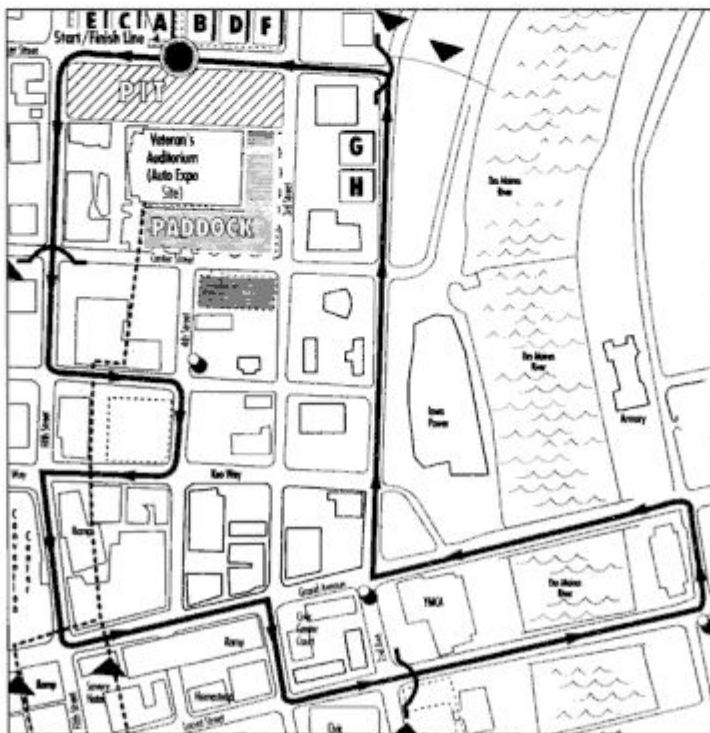
**W**ITHOUT putting too fine a point on it, Des Moines isn't exactly regarded as the crossroads of Western civilization. Particularly if your concept of Western civilization includes a lot of fun.

Go ahead, roll your list of America's top 10 urban fun centers. Did Des Moines make the cut? As far as that goes, would you even be able to point to Des Moines on a North American map?

Well, in case you can't quite place it, Des Moines is in the middle of Iowa, and it's tired of its bucolic image. And that's why there's going to be a Greater Des Moines Grand Prix this summer—July 7-9, to be precise. The Des Moines Chamber of Commerce, and its Convention and Visitors Bureau subsidiary, figure three days of street racing is going to do wonders for the way the rest of the world regards Iowa's state capital.

The course looks like one that will demand more of horsepower and brakes than handling finesse, although there are some significant elevation changes along the way. However, the basic combat technique figures to be full throttle followed by maximum braking followed by full throttle again—like driving a cab in New York.

This shouldn't be interpreted to mean that the Des



New Des Moines street course requires hp and durable brakes.

Moines show will produce parades. Brake wear should provide plenty of excitement, for spectators and competitors alike.

The racing lineup also suggests memorable action. The Sports Car Club of America will be Des Moines' sanctioning body, and four of SCCA's hottest series will be coming to town for the occasion—Trans Am, Super Vee, Corvette Challenge and Coors Racetruck Challenge.

Each of these series produced memorable racing last summer, and it figures to be a good show. If you can't make the show in person, you can get a look at the action on ESPN, which will do a live telecast of the Trans Am race on Sunday, July 9.

### Ford F1

It's the year of the engine in Formula 1, with several manufacturers scrambling for supremacy under a new

set of competition rules that all but outlaw turbocharged powerplants.

Ford's new entry is an exceptionally compact 75° 3.5-liter V8. The design and development of the new engine was handled by Cosworth, the British firm that ranks as F1's all-time winner, despite the recent rise of Honda.

With dimensions of 20.5 in. high × 23.4 in. long × 23.3 in. wide, the new engine was designed for use in the new Benetton B189.

The new engine had an impressive first outing, propelling the Benettons of Johnny Hebert and Alessandro Nannini to 4th and 6th places, respectively, in the Brazilian Grand Prix.

### Department Of Statistics

As a motorsports fan, it may please you to know that you're a member of a continually expanding group—the

largest spectator group on Earth.

According to statistics released recently by Goodyear, attendance at 16 major North American racing series topped the 10-million mark for the first time in history, up almost a million over 1987, an increase of almost 10 percent.

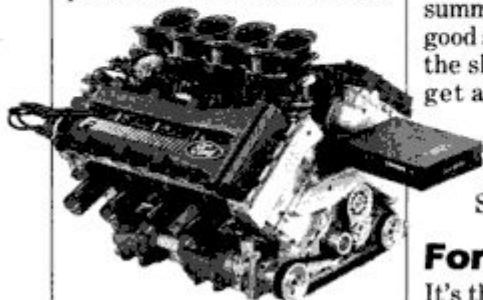
Goodyear's accounting took in weekend totals from 258 events, where 10,504,104 fans pushed through the turnstiles. Since this was 10 fewer events than 1987, average attendance was up 14.1 percent, from 35,676 to 40,714.

NASCAR was the big winner, drawing over 3 million for the first time in history, a 19-percent increase over 1987. It was also a whopping per-event increase—104,976 versus 88,417.

Indy Car racing also turned in big numbers, with over 2.1-million attendees, though the percentage of increase over 1987 was only 3.5 percent. However, even though an enormous chunk of Indy Car attendance comes from the Indianapolis 500, the per-race average did climb from 136,867 to 141,600.

Formula One continues to be the world's favorite. Although NASCAR drew more fans overall, F1's per-event attendance figure of 158,947 is the world's best, and up almost 8 percent over 1987. Total F1 attendance was just over 2.5 million for 16 events around the globe.

Other significant draws included drag racing, which pulled in close to 2 million (1.2 million NHRA, 566,000 IHRA), IMSA, up to 50,000 per event (14 in 1988) for the first time, and SCCA Escort Trans Am, which bumped its total from 612,300 to 726,400, an increase of 18 percent. **PM**



Compact new Ford Formula 1 engine, a 3.5-liter V8, is exclusive to Benetton for 1989.



**Your father has always expected  
great things from you.**

But not necessarily on Father's Day. The one day of each year your father has graciously accepted whatever you've presented to him, be it a tie, a box of golf balls or a mere excuse.

Which brings us to this Father's Day and an opportunity to do something unprecedented.

Give him the Braun shaver. The gift that will go beyond his expectations not only on Sunday but will continue to do so 365 days of the year.

Quite a promise. Quite a demonstration of engineering.

Note its thin profile. Designed to fit the face as comfortably as the hand.

The rubber knobs on its grip actually quiet motor noise as well as provide a firm hold.

And its unique foil is ultra-thin and platinum-coated to help provide a smoother, closer shave.

Braun's rechargeable shavers even charge in an hour instead of twenty-four

and perform equally well with or without a cord.

All of which have made Braun the best-selling foil shaver in the world.

And according to fathers everywhere, the best gift.

**BRAUN**

Designed to perform better.

# ELECTRONICS

BY STEPHEN A. BOOTH

## Laptops: Two For The Road

**P**ORTABLE computers have come a long way in the past year, and two carryables from Zenith Data Systems and Mitsubishi Electronics illustrate just how much the genre has improved.

Portables, not too long ago, were either the stuff of dire necessity or status symbols, purchased by on-the-go journalists who needed one, or fast-laners who liked to be seen with one in the first-class cabin.

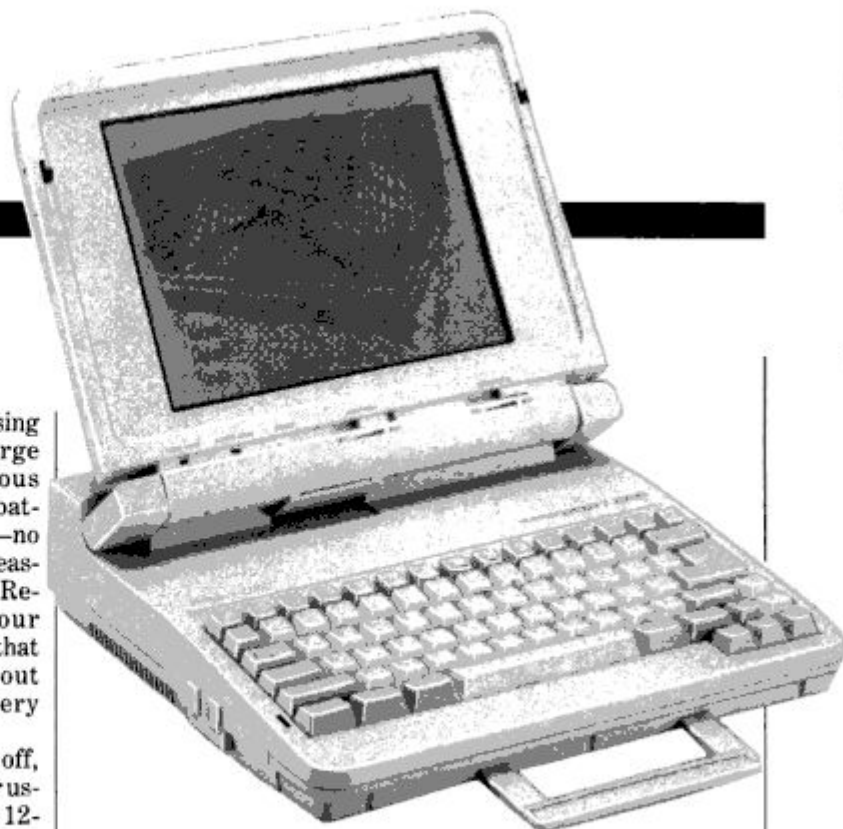
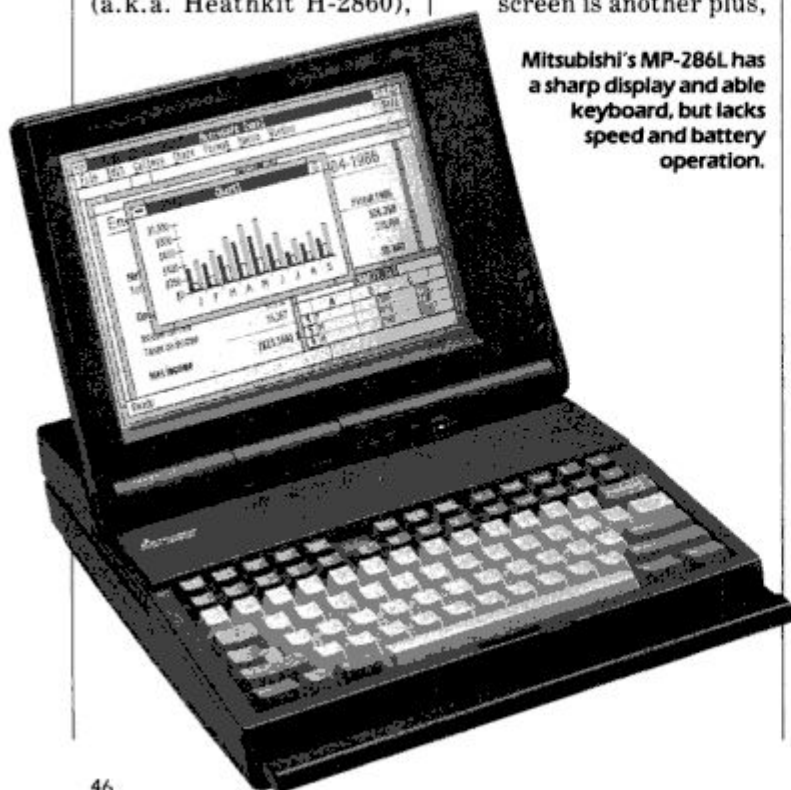
Today portables are the hottest sector of the PC industry, and for good reason. Advances in display, data storage and power consumption technology have put awesome computing power into amazingly compact packages. These units, smaller than typewriters, can handle virtually any computing task that a desktop computer can.

Zenith's SupersPort 286 (a.k.a. Heathkit H-2860),

with its AT-level processing power, excellent and large display, rapid, capacious hard disk, and long-life battery, is a portable that—no small achievement—can easily serve as your only PC. Recently, Ron Scibilia, our computer expert, found that there's much to like about this machine, and not very much to quarrel with.

What's to enjoy? First off, the SupersPort is a power user's delight with a fast 12-megahertz, zero wait-state racehorse processor. This means that your commands are executed nearly instantaneously: The processor needn't wait for the usually slower memory to catch up. This is especially true with the Zenith/Heath's speedy 27-millisecond hard-disk memory (either 20 or 40 megabytes—good for the equivalent of either 12,000 or 24,000 typed pages). The unit's large backlit LCD screen is another plus,

Mitsubishi's MP-286L has a sharp display and able keyboard, but lacks speed and battery operation.



We built this Heathkit HS-2860, identical to Zenith's SupersPort 286.

offering easy-to-read, blue-on-blue characters on a 6 x 8-in. display that resembles desktop units. Other high-end portables can, arguably, match the SupersPort's processing power and screen. But no other unit, with the exception of Compaq's pricier SLT/286, gives you the untethered utility of this model. Plug in the modular battery pack, which adds about 4 pounds to the unit's 10 pounds, and you have up to 4 to 6 hours of AC-free operation, enough for a serious extended computing session.

Flaws? Laptop keyboards have always been problematic, and this unit's, despite a good typing feel, could benefit from dedicated HOME, END, PAGE UP and PAGE DOWN keys. These functions are now accessible only by depressing a separate FUNCTION key. All in all, though, this is an excellent design, and a good value despite a premium price tag. The 20-MB model is \$4999, the 40-MB model is \$5599.

Mitsubishi's first entry into the laptop wars, the MP-286L, is another able unit. It indicates that Mitsubishi is likely to be a "comer" in the laptop market—once it gets its act together.

The unit's strong points are its fast 80286 processor, which runs at either 12 MHz with one wait-state or at 8 MHz with zero wait-states, and its superb page-white LCD screen, which uses so-called cold-cathode backlighting for either a white-on-black or black-on-white display. The screen is slightly larger than the SupersPort's and, to this writer, even easier on the eyes. Keyboard feel on the MP-286L is excellent, lending itself to fast typing.

But the MP-286L falls short of the SupersPort in several ways. For one thing, it's strictly a wall-bound, AC-only unit—and somewhat hefty at 16 pounds. Secondly, though an overall good performer, it lags slightly in processor speed because of its one wait-state operation at 12 MHz, and loses considerably more ground because of its relatively sluggish (75-millisecond) 20-MB hard disk.

Lastly, but possibly most important of all, its keyboard suffers from awkward key placement. Such oft-used keys as those controlling cursor movements, DELETE and INSERT are undersized and

(Please turn to page 48)





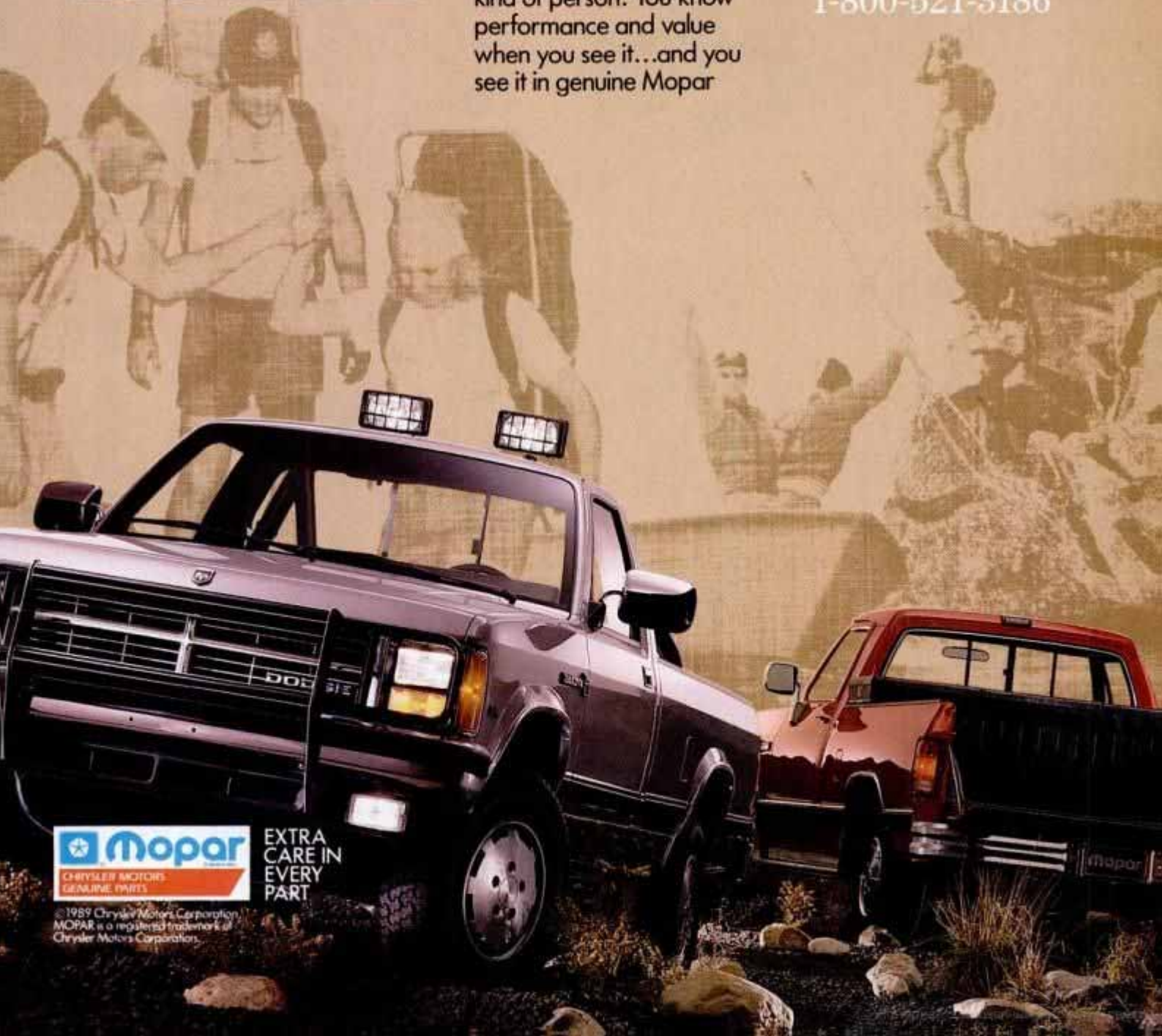
# MOPAR

**ACCESSORIES**

DESIGNED  
TO FIT YOUR  
LIFE-STYLE.

You don't buy a truck because you're a "stick-in-the-mud"! You want a truck because you're a fun-loving, hard-working, hard-playing kind of person. You know performance and value when you see it...and you see it in genuine Mopar

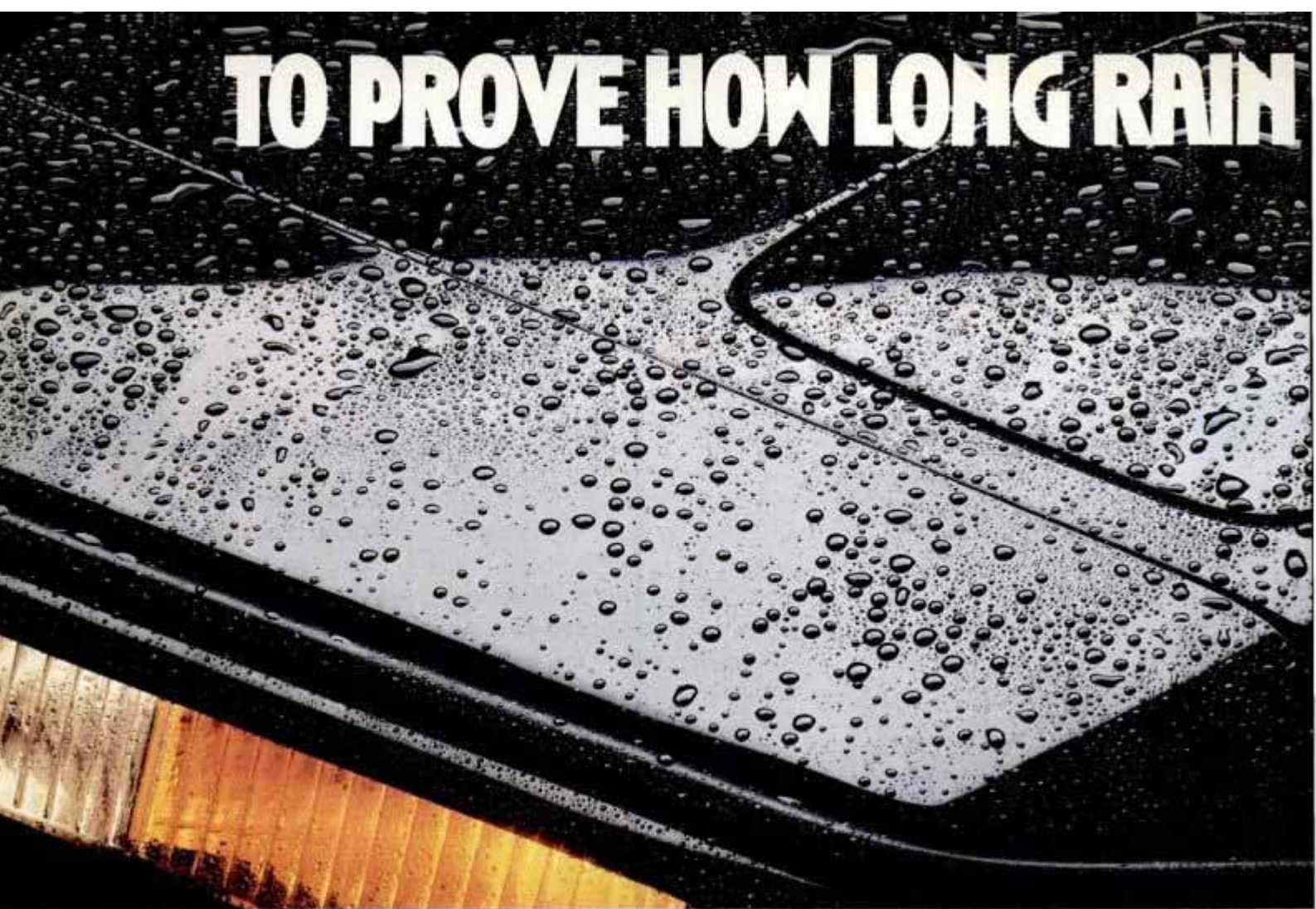
Accessories. See your Dodge Truck dealer or, for a free copy of our 1989 Mopar Accessories Brochure, call toll-free:  
**1-800-521-3186**



EXTRA  
CARE IN  
EVERY  
PART

© 1989 Chrysler Motors Corporation  
MOPAR is a registered trademark of  
Chrysler Motors Corporation.

# TO PROVE HOW LONG RAIN



## **ELECTRONICS** (Continued from page 46)

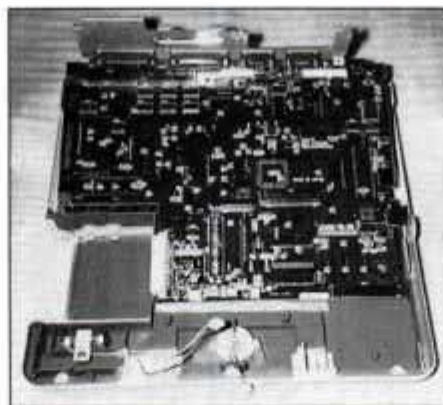
relegated to the top of the keyboard—too far up for an easy reach. Function keys are at the top of the keyboard, too, split somewhat illogically into two rows, with F9 through F12 positioned above F1 through F8. With its keyboard reconfigured, this could be a good unit for users who don't need great speed and battery-powered operation, given its reasonable \$3995 price.

### **Build Your Own Computer—We Did!**

Once upon a time, no self-respecting, self-reliant he-man would dream of owning a store-bought piece of hi-fi gear. And for good reason: Dream as you might, the tuner or amp of your fancy couldn't be bought. It had to be built from parts supplied by mail-order houses such as Allied, Dynaco, Knight, Lafayette, Tandy and Heathkit.

Times change, and what used to be known as hobbyist electronics grew into consumer electronics. The volume efficiencies of mass production bumped the kit companies to the sidelines. Truth is, today you can buy just about any electronics item for less money than it would cost you to build it.

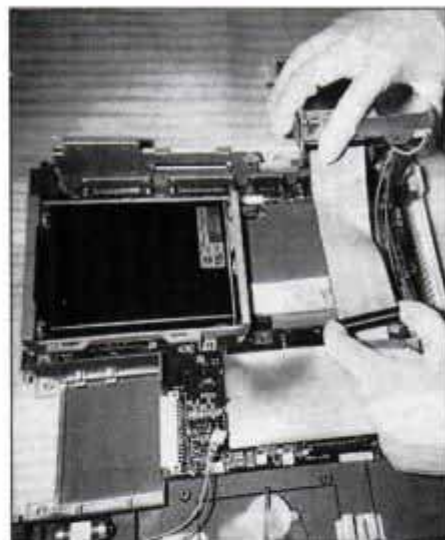
But as the old saying goes, "Money isn't everything." Some people just like doing it themselves for doing's sake, and



The HS-2860's main circuit board comes preassembled. You install it and everything else with two Phillips screwdrivers.

the folks at Heathkit understand this sentiment. The Benton Harbor, Michigan-based company recently renewed its commitment to the DIY philosophy with a line of top-quality home audio kits—tuners, amps and preamps designed by the highly regarded Harman/Kardon company. And realizing that computers are to the 1980s what hi-fi was to the '50s and '60s, Heathkit now is offering a line of desktop and laptop models you can cobble yourself.

The company's Spring '89 catalog boasts nearly a dozen computer kits, beginning at about \$1800. The selection includes the portable HS-2860 (\$2799).



Be sure the blue stripe of the floppy-drive ribbon wire is on the left when attaching it to the computer's main circuit board.

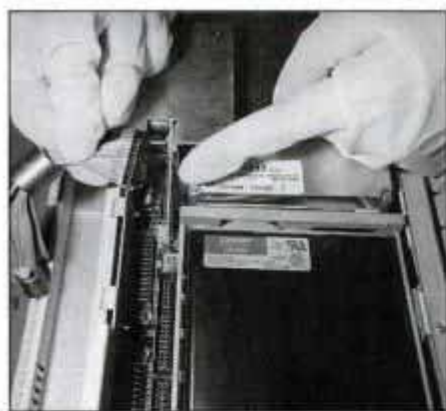
Because laptops are now the hottest segment of the personal computer market, we gladly accepted Heathkit's challenge to build one ourselves. And because using a laptop without hard-disk storage is a little like shooting hoops without high-tops, we opted to include Heathkit's 20-MB (megabyte) hard disk (Model HA-2860-2, \$679). The hard disk is good for about 12,000 typed, double-spaced pages of copy—or about

# RAIN DANCE LASTS, JUST ADD WATER.

First, wax your car with Rain Dance. Then wait for rain. Even if it takes a while. The water will still bead. Longer than with any other car wax. Rain Dance. The longest lasting protection you can buy.



© Armor All Products Corporation, 1989. Rain Dance is a registered trademark of Armor All Products Corp.



Before attaching the multiwire LCD screen cable to the circuit board, make sure the cable lies flat. This aids final assembly.

3-million words. For \$3478 and about 4 hours of your time, you can write a lot of magazines on this 10-pound marvel.

For the record, Heathkit is a division of Zenith Electronics—the Chicago-based supplier of computers to Uncle Sam. The HS-2860 is identical to Zenith's highly rated SupersPort 286, reviewed by Ron Scibilia earlier in this column. Factory assembled, the HS-2860 with 20-MB drive costs \$4999. For the money you'll save assembling it yourself, you can splurge on the two Phillips screwdrivers you'll need.

"Assembly" is the best word to describe the labor you'll exert. Heathkit



You'll perform diagnostics after you assemble the HS-2860. Heathkit supplies the test disk. Allow four uninterrupted hours.

rates the job at Skill Level 1. Neither soldering iron nor oscilloscope is needed to build your think-tank-with-a-handle. The main circuit board, for example, comes factory-assembled. Patience, though, is the third-hand you'll need.

Heathkit, as usual, does a marvelous job of writing and illustrating the step-by-step building procedure. But the engineers aren't kidding when they urge you to read instructions t-h-o-r-o-u-g-h-l-y before you begin. This way, you can anticipate the next step, and avoid painting yourself into a corner.

In all, we encountered only four tough steps. The first is when you install the 3.5-in. floppy-disk drive: You must be

sure to connect the ribbon wire so that its blue stripe is on the left side, and then fold the ribbon cable as instructed.

Perhaps the one operation where an extra hand or two would be welcome is when you must connect the power supply circuit board to the main circuit board. Here, several items must come into alignment at the same time. This takes more dexterity than you might think. Because the power cables from the floppy-disk drive and hard-disk drive run between the power supply circuit board and the floppy drive, they create a press-fit that makes it difficult to maneuver the circuit board into alignment. Be patient: You'll get it eventually.

You'll meet the next hurdle when you try to connect the cables from the keyboard and the LCD screen to the circuit board and then snap together the two halves of the outer case. Gentle hands are a must in these situations.

Finally, comes the diagnostics procedure. Heathkit provides the test disks—you supply the time. Try to allot yourself about 4 hours without interruption. This is our only gripe about the otherwise-admirable assembly manual: Heathkit ought to print a boldfaced notice regarding how long this critical procedure requires, so you don't start something you can't finish before you leave for Tuesday night bowling. **FM**

# FREEWHEELING

BY TONY SWAN

## A Weather Option For The Corvette

**I**F THE ONLY thing that's been keeping you from ordering your new Corvette roadster is the relative incompatibility of convertibles and harsh weather, Chevy has a cure, albeit a pricey one. It's a ferro-aluma-resin composite that weighs only 64 pounds and carries a suggested retail of \$1995, which works out to \$31.17 per pound.

Manufactured by ASC, the top is sandwiched steel and aluminum reinforcement between inner and outer skins, with resin and polyurethane filler. The resulting structure is then heat-treated and finished off in various Corvette production body colors.

The finished top includes mounting hardware and can be attached without removing the car's tonneau cover. Also included are weatherstripping and a heated backlite.

Chevy claims the new hardtop, the first the company has offered since 1975, easily meets federal roll-over standards.

### Carflicks

If you like movies with cars at their centers, Hollywood must be tapped into your desires, because there's a batch of 'em in progress.

Two of them focus on racing—"Indy," whose subject matter you can probably guess, and "Born to Run," which takes a look at the Daytona 24-Hour, among other events.

"Born to Run" will star Tom Cruise, who has been doing some racing under the Paul Newman/Bob Sharp umbrella.

Both racing films are due to go into production during the summer.

Probably the best box office bet is "Pink Cadillac," with Clint Eastwood playing



New lift-off hardtop for Corvette roadsters is the first offered by Chevy since 1975.

a bounty hunter and sexy Bernadette Peters riding shotgun. "Pink Cadillac" is due for summer release by Warner Brothers.

Robin Williams will also be associated with tailfins as a New York City car salesman in "Cadillac Man," which was due to go into production in May, while another comic, Andrew Dice Clay, uses a humbler ride in "Ford Fairlane." Clay plays a detective

some time. After all, averaging 132 mph in continuous running for over two weeks isn't exactly a trophy dash. The logistical preparations alone resemble requirements for a small invasion, and the durability demands are prodigious.

Apparently no one bothered to tell Fuji Heavy Industries about the monumental difficulties of such a run, though, because the Su-

Legacy's 16-valve flat-Four are not yet available in the U.S. Neither are quick-fill 37-gallon fuel tanks.

Other modifications included shorter springs (for reduced ride height), stiffer shocks, a deeper airdam (to reduce high-speed lift) and a roll cage.

However, all these modifications to the basic Legacy RS sedans fell within the rule structure of the Federation Internationale de l'Automobile (FIA), the international motorsports governing body which sanctioned this run, as well as the Saab run in 1986.

Which means the record is, in fact, a record—until the next contender comes along.



Subaru Legacy record run lasted 18 days, averaging over 138 mph.

unraveling a murder in the Los Angeles rock 'n' roll music community. "Ford Fairlane" is in production now and is due for release by 20th Century Fox.

Even Walt Disney is burning rubber, with a comedy called "The Red Ferrari." The plot in this one has a 16-year-old girl indulging her longtime fantasy by renting a Testarossa. Watch for a fall release.

### Subaru's Record Pace

We were inclined to believe that Saab's 1986 speed record for 100,000 kilometers was one that would stand for

baru parent company decided to challenge the Saab record with its new Legacy sedan.

Using Nissan's new 5.7-mile Arizona Test Center oval, near Phoenix, Subaru ran three new turbocharged Legacy sedans continuously for just over 18 days last January, averaging 138.78 mph over the 100,000-kilometer (62,000-mile) distance.

The average included pit stops, and is the equivalent of crossing the U.S. more than 20 times.

To paraphrase Oldsmobile, these were not your father's Legacys—or yours, either. Turbo versions of the

### Radar Revelations

Since microwave bombardment is colorless, odorless, tasteless and otherwise undetectable to human senses, it falls into the general realm of spooky scientific stuff we don't fully understand and therefore accept almost without question.

You've probably reflected on this very subject as some police officer somewhere was politely writing you a radar ticket. It's one of life's more helpless feelings. You're not at all sure you were traveling at the rate of speed he's scribbling onto the citation, but there it is, locked in and flashing on his radar unit's

(Please turn to page 55)



# TWO BODIES, ONE SOUL.

These two machines share a great deal more than just a name. The one on the top likes to win at the track. It's the specially modified Daytona Shelby that posted IMSA GTU victories this year, dusting competitors like Porsche and Nissan in the process. The one below likes to run on the street. It's the Daytona Shelby you'll find at your Dodge dealer. Available over the counter with 174 intercooled turbocharged horsepower. Multi-point fuel injection. Vented high capacity 4-wheel disc brakes. Speed rated 16" tires. And a close-ratio 5-speed Getrag gearset. So what's the connection? Simple. At Dodge, soul-stirring performance is what we're all about. And whether we're at the races or on the road, we don't hold back. For anything. Or anyone. **770**



**THE NEW SPIRIT  
OF DODGE**

THE PERFORMANCE DIVISION OF CHRYSLER MOTORS  
BUCKLE UP FOR SAFETY.



# Bissell Floor Sweepers. Made to Follow Your Family's Footsteps.

Keep life's little messes under control, with a Bissell Floor Sweeper. It's great for quick clean-ups, removing pet hair and cleaning hard-to-reach places. All with no bags, cords or hoses to get in your way. It's so easy to use, kids can clean up messes themselves. Keep your carpet and bare floors looking good. Follow your family's footsteps, with a Bissell Floor Sweeper.

Available at better stores everywhere.

**BISSELL**  
FLOOR SWEEPERS®

digital repeater. It *must* be true, right?

Not necessarily. Police radar is far from infallible, and the good folks at Cincinnati Microwave, manufacturer and purveyor of Escort radar detectors, want you to understand just how fallible it can be.

To accomplish this, the company has issued a 4-page pamphlet titled "Traffic Radar," which, to quote from its statement of intent, "explains the principles and limitations of traffic radar."

Section headings include "How radar works, Types of traffic radar, Why radar gets wrong readings, Common operator errors," and, as you might expect, "How radar detectors work."

If you've had radar on your mind lately, this illuminating little booklet is a good read. It could even give you some foundation for a legal defense—assuming you fall into the wrongly cited category, a classification that Cincinnati Microwave estimates to be 30 percent of all radar-based citations. The booklet is available free of charge. Just call Cincinnati Microwave at (800) 543-1608.

### Burly Bugs

While the era of the Volkswagen Beetle is unquestionably gone, many of the cottage industries it spawned are still alive and thriving.



Burly Industries Volkswagen Beetle customizing kit draws on late '30s Ford coupes.

Burly Industries, of Mendon, Utah is one of them, a Volkswagen Beetle customizing and accessory house that opened its doors two years *after* the Bug's final year in the U.S. market, which was 1976.

Like most Bug customizers, the Burly line is designed to make the basic VW look like something else. The company's latest offering, for example, is intended to give your Bug the look of a '32 Ford Deuce Coupe, including the familiar radiator shell with its long vertical grille teeth.

Since kits such as these are intended just for fun, it's silly to critique the au-

thenticity of the resulting look.

However, we were taken with the graceful appearance of one of the other Burly Bug conversions, which replicates the styling of late '30s Ford 5-window coupes.

If you've got a beatup old Bug sitting around somewhere, you could certainly do worse than this. The Burly kits are designed to fit standard Bugs from 1938 onward, although we certainly wouldn't recommend adulterating a restorable oldie—say pre-'60s—in this manner.

You can send \$1 to Burly Industries, Box 10, Mendon, UT 84325 for a catalog, additional information and details. **FM**



HOW TO CONVERT POUNDS

TO OUNCES.

It's a very simple equation. Just buy \$8.00 or more of Stanley tools, and we'll give you a coupon good for a 2-liter jug from Coleman. Free.

You'll also get a chance to win the Ultimate Coleman Campsite in the Stanley Great Outdoors Giveaway. So enter today.

You could end up a very happy camper. **STANLEY** helps you do things right.

# Power Revolution

BY FRED MACKERODT, Contributing Editor

**Y**OU JUST came down from Mars, setting foot on Earth for the first time. A '57 Chevy drives up and you ask the proud young man behind the wheel: "Gee, what pushes that thing?"

Getting out and popping the hood, he answers: "A 283 4-stroke V8 internal-combustion reciprocating engine."

You look in at the maze of wires and tubes and pipes and plugs, scratch your head with the seven fingers on your middle hand, and remark: "Gee, that's weird."

The point of this unlikely parable is that the only reason today's engines look okay to us is that we've been looking at them for a hundred years. We're used to seeing them that way. Otherwise, even your simplest everyday automobile engine with all its gears, pistons, cams and rods going up, down, forward, back and sideways, presents a pretty unusual mechanical picture.

There's nothing to say that



Dyna-Cam's test bird logs air time for research and development.

powerplants with different configurations won't work just because we're not used to seeing them that way. In fact, a different type of setup might even be able to work better.

Enter the Dyna-Cam. At first glance, this barrel-shaped engine looks odd, with six double-headed pistons running parallel to the crankshaft, two sets of 6-shooter cylinders at each end that look more like they might have been dreamed up by Samuel Colt than Henry Ford, and a strange looking

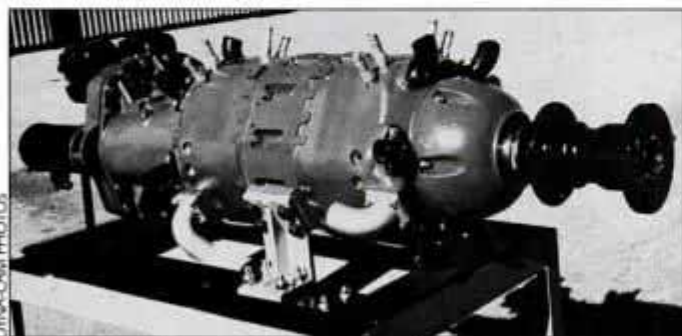
cam-type arrangement smack in the middle. If the Dyna-Cam engine seems different for what it has, it's also unusual for what it doesn't have. No connecting rods, no wrist pins, no conventional crankshaft or camshaft, no rocker arms or pushrods, no timing gear or chain, and none of the nuts, bolts and retaining rings needed to hold all this missing mechanical paraphernalia together.

The six pistons shuttle back and forth between the two cylinder blocks, firing on both ends. Rollers mounted

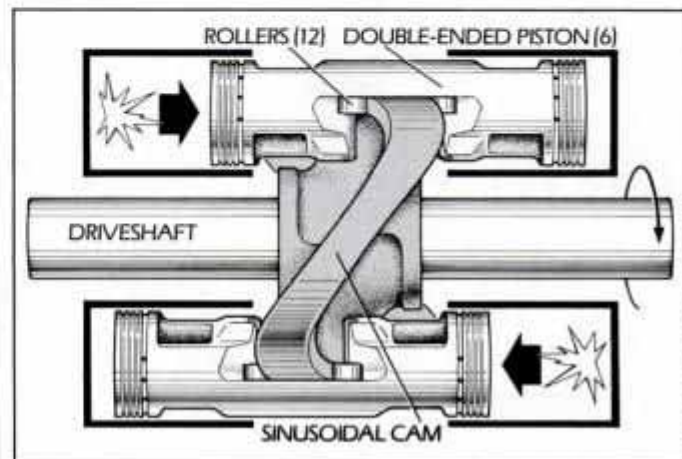
in the center of the pistons transmit the power to the central sinusoidal cam which is part of the driveshaft. The cam converts the back-and-forth motion of the pistons to the rotary motion of the driveshaft. The driveshaft also powers grooved discs at both ends which operate conventional poppet-style valves.

But what does this have to do with aviation? There are people out there who will attest that not only does the Dyna-Cam work, but that it is the long-sought "perfect powerplant" for general aviation airplanes. They offer a number of arguments.

First of all, the engine presents a very small, naturally aerodynamic profile—only 13 in. across the block, 16 in. with the manifolds and fuel distribution system installed. It is lighter than a conventional reciprocating engine of equivalent power. It is also, according to its current developers, turbine-smooth.



Two of six double-ended pistons (right) illustrate the Dyna-Cam's unique power/compression cycle, which turns a driveshaft via a sinusoidal cam. The arrangement fits neatly in the Dyna-Cam engine block (above), which lends itself to applications that demand streamlining.



PM ILLUSTRATION BY GEORGE BETSOCK



## The Dyna-Cam difference

But probably its most important advantage is that, because of its 12 power pulses per revolution, the Dyna-Cam develops massive torque at very low speeds, maximum twist coming at only 1200 rpm.

The slow-turning Dyna-Cam without its huge torque output can drive a very broad, efficient propeller. Part of the problem in developing it has been in finding a propeller to use the power it produces. The benefits of slower prop speeds include much quieter operation.

The next question is the same one Wilbur asked Orville: "Will it fly?" Not only will it fly, it has already flown, and it's already been certified by the Federal Aviation Administration.

But first, a little background. The direct ancestor of today's Dyna-Cam was the 1916 brainchild of two brothers by the name of Blazer who worked for Studebaker in South Bend, Indiana.

Karl Herrmann, a German immigrant and mechanical whiz who rose to become head of Studebaker engineering, bought the Cam-Drive idea from the Blazers in 1936. Under contract to the U.S. Army Air Corps, he built a few prototypes and the first working model that ran in 1940.

Dr. Herrmann, who made a fortune

on his patents—one of which was for the main roller bearing used in the Hoover Dam—continued to sink money into the Cam-Drive. In 1957, he ran one in a test cell for 150 hours, gaining FAA certification in the process.

In 1961, the engine was flown for the first time by Piper Aircraft in a Comanche. The test was a fiasco, according to the current developers, because the installation was done wrong.

Then in his 80s and disheartened by the failure, Dr. Herrmann gave up on his beloved engine. He died in 1983 at 102 years of age.

When the test at Piper failed, Herrmann sold the plans and parts to a longtime employee and mechanical engineer, Ed Palmer. From here on, the Dyna-Cam became a family project with son Dennis and daughter Patricia joining in. Lazlo Makk and Ambrose Hope are the fourth and fifth persons in the quintet currently developing the engine.

A breakthrough occurred in 1987. A 210-hp version of the engine flew for 7 hours in a Piper Arrow, attracting renewed interest from Piper Aircraft. At the time, Dyna-Cam Industries based in Redondo Beach, California, and Piper announced a 9-month test program involving 10 engines which was to have culminated with Piper beginning pro-

duction of the engine in 1988. The two companies were unable to agree on terms, however, and the Dyna-Cam team was again left to go it alone.

While the 1987 test flight was deemed a success, there were a few problems. Overheating again occurred but this was solved with the addition of yet another radiator, and also a new water pump. Carburetor ice was also a problem. Explains Lazlo Makk: "Using the small Stromberg carburetors we had on the engine at the time was the equivalent of trying to run a fuel dragster with the fuel system from a lawnmower." A fuel-injection system has since been developed which solves the icing problem and also results in a 30-percent increase in horsepower. A revised magneto ignition system has also been developed.

## Flight tests

At the very end of March, Dyna-Cam began a series of flight tests. According to Dennis Palmer, "the engine is as smooth as glass, the new injection system is working great, the new cooling system is terrific, and there's gobs of power." The company now has six orders for the engine. The price is in the \$25,000 range, about half of what a similarly powered Continental or Lycoming would cost. **FM**



# HOW TO CONVERT FEET



# TO LITERS.

It's a very simple equation. Just buy \$8.00 or more of Stanley tools, and we'll give you a coupon good for a 2-liter jug from Coleman. Free.

You'll also get a chance to win the Ultimate Coleman Campsite in the Stanley Great Outdoors Giveaway. So enter today.

You could end up a very happy camper. **STANLEY** helps you do things right!

MAKING THE PROFESSIONAL® The design of the POWERLOCK® Tape Rule case is a registered trademark of The Stanley Works. © 1989 Stanley Tools, Division of The Stanley Works.

# BMW Powers Up, Honda Covers Up

BY NORMAN S. MAYERSOHN, Contributing Editor

**T**HE WORD "new" is constantly manipulated to take on a multitude of definitions, depending on the user. To an automotive advertising copywriter, for example, 1989's "totally new car" might be little more than revised grillework. But in the world of motorcycles, new is likely to signal the release of a vehicle no one even dreamed might be in the works.

Here are two that may catch you unprepared—a flashy, radical sport machine from normally conservative BMW, and a futuristic, modestly powered touring mount from the no-holds-barred folks at Honda. That's the upside-down way things are this year, as manufacturers seek to expand their buyer populations while simultaneously matching wits with misguided legislators and insurance companies.

BMW's bold K1 represents a welcome shift in philosophy on the company's part. With good reason, BMW has until now steered clear of the superbike battlegrounds, conceding a horsepower edge to the Japanese brands while emphasizing the road manners, reliability and longevity of the German boxer Twins and inline Fours. But the K1 narrows the power gap, graduating to a 16-valve head and Motronic engine management which together raise the output of the 1000-cc engine to the 100-hp level.

The bodywork of the BMW K1 leaps past the familiar lines of the K100 series as



BMW's K1 (above) challenges Japanese superbikes with 16-valve head and 100 hp. Honda's Pacific Coast PC800 (below) is sheathed in ABS plastic and has liquid-cooled V-Twin, shaft drive.



well, into the territory of formula-racing clones.

The front fender and integrated rear storage compartments are both part of the aerodynamic package, pulling the  $C_d$  as low as .34 with the rider tucked in. Floating front brakes, wider tires and an improved fork design all add credence to the sporting profile of the K1.

You'll have to wait until mid-summer before BMW's ultimate Gentleman's Express arrives in the U.S. It will be equipped with ABS as

standard equipment, and though the price hasn't been set as of yet, you'd better be ready to put aside \$13,000.

The picture over at Honda, meanwhile, has shifted focus away from single-purpose sport bikes, moving toward multipurpose cycles. For example, the highly regarded Hurricane 1000 is not in the 1989 lineup at all, but a stunning

new vehicle known as the Pacific Coast PC800 has been added.

Honda styled the Pacific Coast specifically to attract the nonenthusiast public, raising its acceptability by cloaking every mechanical detail in softly rounded body panels. Its design is intentionally car-like, in an attempt to eliminate any stigma which may be attached to conventional motorcycles.

The Pacific Coast power source is an 800-cc liquid-cooled V-Twin closely related to the Shadow cruiser-bike engine.

The rear section contains a large luggage compartment, and power delivery is via shaft drive. At a dry weight of 550 pounds the PC800 may be a bit massive for first-time cyclists, but the real test of rider conviction will come when they read the bottom line—\$7698.

## Multipurpose Appeal

The Honda Transalp, new to American riders for '89, is an even more versatile device. This dual-purpose cycle melds the roadworthy traits

*(Please turn to page 60)*



Honda Transalp thrives on pavement or off.

# POLYSHIELD™ QUALITY STANDS ALONE



POLYSHIELD's outstanding products help protect the investment in your vehicles, boats, and aircraft. A distinctive line of car care products conceived and formulated to the highest standards of quality, POLYSHIELD™ products work together for enhanced effectiveness. POLYSHIELD™ Car Polish's advanced, *no-wax* formula leaves a tough shieldcoat that bonds to any non-porous surface, and produces a shine with a unique deep gloss. POLYSHIELD™ Car Polish provides the best protection against dirt, pollution, and the universal problem of *acid rain*. An excellent companion product, Leather Life™ is a protective dressing that restores and beautifies leather, vinyl, and rubber, thus preventing aging and cracking. Each of our cleaners is specially formulated to do a specific job. For surfaces with oxidized paint, POLYSHIELD™ Pre-Cleaner is your best bet. POLYSHIELD™ Leather & Vinyl Cleaner should be used to clean surfaces before applying Leather Life™. To clean your car, plane, or boat, POLYSHIELD™ Car Wash does a most effective job. POLYSHIELD™ Car Care Products: a quintet of quality. The more quality we put into our products, the more quality you get out of our products.



**POLYSHIELD Products Inc.**  
Dumont, NJ 07628

For ordering information:  
USA: 1-800-228-7659  
NJ: 201-501-0080

© POLYSHIELD Products Inc., 1988

Материал, защищенный авторским правом

# THE PERFECT FIT: YOUR TOYOTA AND TOYOTA QUALITY DEALER SERVICE.

It's no puzzle at all keeping your Toyota running like new. Just treat it to Genuine Toyota Parts and Dealer Service. When you buy a Toyota, you buy quality. And your Toyota dealer is always ready to help you keep it that way. For more information about Toyota products or service, contact your Toyota dealer or call 1-800-331-4331. Get More From Life... Buckle Up!

**TOYOTA QUALITY**  
WHO COULD ASK FOR ANYTHING MORE!



**MOTORCYCLES** (Continued from page 58)

of a 583-cc liquid-cooled V-Twin engine with the back country necessities of long travel suspension and generous ground clearance. The Transalp gets a frame-mounted fairing and plush ride quality, to make highway travel painless.

At \$4498 it offers talents which could lure buyers of 4wd sport/utility trucks.

Honda's tribute to yestertech is the GB500, a British-style nostalgia trip, right down to clubman handlebars, and air-cooled 500-cc Single. If you insist, you can even kickstart this thumper.

Offsetting that appeal to traditionalists is the CB-1, a thoroughly high-tech sport bike. All the performance credentials are here, but the costly aero bodywork was left off for a purposeful bantamweight in the Hawk GT mold.



FZR600 gives Yamaha a serious contender in the middleweight sport bike class.

## The Yamaha Perspective

Take a look at the latest offerings from Yamaha if you'd like a pinpoint definition of the word new. The FZR1000, a fresh design in 1987, has been revised from the ground up, including entirely new engine castings and a completely reworked chassis. Only the red, white and blue paint is similar to previous FZR1000s. The price tag has swelled to \$7599, but if the bottom line makes you pause after you've seen the FZR1000 firsthand, you shouldn't be considering this machine anyway.

At long last Yamaha will enter a serious contender in the 600-cc sport bike class, the FZR600. The engine is derived from the Genesis family, but uses four valves, rather than five as seen on the larger displacement models. Framework is once again the efficient Deltabox design, rendered in steel instead of aluminum.

Revivals are popular at Yamaha in '89, and they're worthwhile ones at that. The FJ1200 is back, still a sensible performance mount that owners can expect to maintain themselves. The XT600 dual-purpose bike returns, also.

## The Harley Priority

New isn't such an important priority around Harley-Davidson, an outlook that seems to serve this motor company well. Sales of the rather upscale ma-

chines are doing fine and this year's model juggling shows evidence of that success. The just-introduced Tour Glide Ultra Classic and Electra Glide Ultra Classic will lighten your wallet by about 13 grand apiece. Outfitted to directly challenge the Japanese luxury touring rigs, they offer such amenities as electronic cruise control, an 80-watt sound system, and self-canceling turn signals.

## Superbikes Step Up

Suzuki continues to direct much of its new-model energy into the sport bike segment with the GSX-R and Katana models. For '89 the GSX-R1100 has been made over with the 1127-cc oil-cooled Four from the Katana, and upgrading to the clutch and connecting rods. The carburetors come from the GSX-R750, as does much of the geometry of the aluminum framework. Everyone should sit up and take notice of the Suzuki GS500E. It might just signal the return of the universal appeal motorcycle. A smooth running, counterbalanced 2-cylinder engine gives it sufficient power for most riders' needs and clean, generic styling won't force buyers to commit themselves to cruiser or road-racer stereotypes. A pat on the back to Suzuki for this ideal beginner's mount—particularly at \$2999.

## Son Of Ninja

Kawasaki won't stray far in '89 from its proven model choices. The Ninja family tree, though, will extend its 750-cc



New Ninja ZX-7 brings ZX-style race-readiness to Kawasaki's 750 range.

branch with the all-new ZX-7. This one is virtually racetrack-ready, and may exist just to qualify for competition in the production classes.

The aluminum E-box frame design of the ZX-10 has been adapted to the 750 version, adding a double-braced alloy swingarm and hefty 43-mm fork tubes. Swingarm angle, rear ride height and even wheelbase can be varied thanks to an adjustable swingarm pivot.

The Ninja engine architecture has been massaged, too, with bucket tappets, lighter components and a stainless steel 4-into-1 exhaust system.

Kawasaki reportedly plans to add electronic antilock braking to the Concours sport-tourer later this year. **PM**

TOYOTA TRUCKS

# PICKUP A WINNER.



MOTOR TREND MAGAZINE.

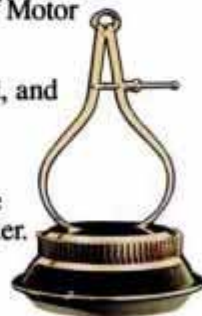
## TRUCK OF THE YEAR

Everybody loves a winner. Especially a winner like the newly redesigned 1989 Toyota 4x2. Just named "Truck of the Year" by the editors of Motor Trend magazine.

In test after test, the Toyota pickup out-cornered, out-accelerated, and out-and-out blew away the field of tough competitors.

And this coming on the heels of yet another outstanding Toyota Truck landslide victory. In January, 4Wheel & Off-Road magazine named the Toyota 4x4 SR5 V6 "4x4 of the Year." No mean feat, either.

So if you don't want to settle for anything but the best, pick up a winner. Toyota.



Call 1-800-GO-TOYOTA for more information and nearest dealer location.

**TOYOTA QUALITY**  
WHO COULD ASK FOR ANYTHING MORE!

Get More From Life... Buckle Up!  
Shown with optional equipment.  
© 1989 Toyota Motor Sales, U.S.A., Inc.

Материал, защищенный авторским правом

# Camcorders On Location

BY FRANK VIZARD, Contributing Editor

**J**UST 25 years ago, John Huston filmed "Night of the Iguana" near Puerto Vallarta, Mexico. The film featured Richard Burton, Ava Gardner and Deborah Kerr, three of the brightest stars of the day. The filming itself made headlines owing to the presence of Burton's off-camera love interest, Elizabeth Taylor, who stayed with him during the production. The local movie house in Puerto Vallarta, in fact, still bears the actress's name, as I discovered during my pilgrimage to the site.

"Night of the Iguana" is available on video cassette, but I thought it would be fun to mark the film's silver anniversary with some private outtakes of my own, made with a video camcorder. The quality of the video would be important, as I'd want a long-lasting vacation souvenir. But I wanted to use a camcorder that would be small and light enough to travel easily. After all, I didn't have the luxury of a film crew to haul my equipment for me.

VHS-C and 8mm camcorders are generally less weighty than full-size VHS models. In the interests of experimentation and the promise of excellent picture quality, I chose to use a Super VHS-C camcorder. The compact-size VHS-C format has been around for years, but Super VHS-C camcorders are only now becoming widely available.



Sharp's VL-C77UA camcorder, shown about one-third its actual size, delivers Super-VHS quality.

Super VHS promises better picture resolution than conventional VHS. Compared to about 250 lines of horizontal resolution for VHS, Super VHS provides about 400 lines. Higher resolution means your videos will have finer detail. Super VHS circuitry also has a second benefit in that it helps to reduce screen noise.

While some technical improvements are not always apparent to the eye, the benefits of Super VHS were noticeable even gazing through the viewfinder of the Sharp VL-C77UA Super VHS-C camcorder I used.

The VL-C77UA (\$1999) allows you to record both in the Super VHS and conventional VHS formats. It measures about 5 x 6 x 9 in., and weighs 3.2 pounds loaded with a rechargeable battery and a video cassette—light

and small enough to carry easily along the Bahia De Banderas beachfront.

Operating the VL-C77UA proved easy as well. Resting just above the 8X zoom lens are the unit's focus, white balance and backlight compensation buttons. Each of these controls can be set to operate automatically, or can be set for specific conditions. The white balance, for example, can be set on automatic, or for either natural or artificial illumination. The VL-C77UA has a low-light rating of 9 lux. The quality of the footage of Puerto Vallarta traffic crossing the Cuale River bridge at night appeared to justify the VL-C77UA's claim to low-light sensitivity.

Aside from the zoom lens and record buttons positioned near your shooting hand, all the other important

controls for the camcorder are positioned on its back panel. These controls include all of those found on any VCR, as well as some that make the VL-C77UA a little special.

Most noteworthy is the variable high-speed shutter, adjustable for  $\frac{1}{1000}$ ,  $\frac{1}{500}$  and  $\frac{1}{250}$  second. Normal shutter speed is  $\frac{1}{60}$  second, which is fast enough to record most motion. The high-speed shutter settings come in handy when you want to record a swift paddle-swing in a game of Vitesse on the beach at Punta Mita. Using the normal shutter speed gives you a slightly blurred swing, while the high-speed shutter settings capture fast-motion for a blur-free picture.

The high-speed shutter feature works best in outdoor daylight. Sharp's manual actually warns against using the high-speed shutter mode in fluorescent lighting, which induces flickering in the picture.

I used Maxell's Super VHS-C videotape during shooting, and I was pleased with the performance of the tape and the camcorder. Colors, such as the bright orange dresses worn by a pair of Mexican women on their way to work, were recorded accurately. Detail and color improved as I narrowed the

(Please turn to page 64)



# Live on the edge.

Push yourself to the brink of mental and physical limits in Adventure Training. Serve with the Army National Guard elite two days a month and two weeks a year. And put it all on the line for the thrill of a lifetime. For more details, fill out this coupon and mail it in today. Or call toll-free 800-638-7600.\*

\*IN HAWAII: 737-5255; PUERTO RICO: 721-4550; GUAM: 477-9957; VIRGIN ISLANDS (ST. CROIX): 773-6438; NEW JERSEY: 800-452-5794. IN ALASKA CONSULT YOUR LOCAL PHONE DIRECTORY.

© 1995 UNITED STATES GOVERNMENT AS REPRESENTED BY THE SECRETARY OF DEFENSE. ALL RIGHTS RESERVED.

MAIL TO: Army National Guard, P.O. Box 564, Hanover, MD 21076

NAME \_\_\_\_\_  M  F

ADDRESS \_\_\_\_\_

CITY/STATE/ZIP \_\_\_\_\_

AREA CODE PHONE \_\_\_\_\_ US CITIZEN  YES  NO

SOCIAL SECURITY NUMBER \_\_\_\_\_ BIRTH DATE \_\_\_\_\_

OCCUPATION \_\_\_\_\_

STUDENT  HIGH SCHOOL  COLLEGE  
PRIOR MILITARY SERVICE  YES  NO

BRANCH RANK AFM/MOS

The information you voluntarily provide, including your social security number, will be used for recruiting purposes only. Your social security number will be used to analyze responses to this ad. Authority IOU9C-603.



A1PMLE\*\*069NP

# Army National Guard

*Americans At Their Best.*

# ZUD ZONES

There are many Zud Zones around the house and garage where Zud with its unique formula dissolves away rust and tough stains. Those obstinate stains you've given up on. Zud® even works where Comet® and Ajax® fail on baths, toilet bowls and basins.

**The tougher the stain the more you need Zud.**



**When stains are too tough for ordinary cleansers.**

## HOME VIDEO (Continued from page 62)

gap between me and my subjects. Unfortunately, I couldn't find some of the subjects I wanted to videotape. Iguanas seem to be in short supply these days, although there are plenty of smaller lizards around—you often have the opportunity to shoot them using indoor light, in fact.

### Dubbing help

With any camcorder, picture problems are more likely to occur later, when you try to dub your video movie onto another tape. Dubbing is not strictly necessary, as Super VHS-C tapes can be played by connecting the camcorder directly to a TV. Adapters are also available so that the small Super VHS-C cassette can be played in a Super VHS home VCR.

Chances are, though, that you'll want to dub your video movie onto a full-size VHS or Super VHS cassette for the sake of convenience, or to make copies for friends and relatives.

If you do dub, the VL-C77UA has some features that will help minimize the unavoidable degradation of picture quality. The VL-C77UA has an S-video output, in addition to a standard audio/video output. If your VCR has an S-video input, this connection will yield a better tape copy than the standard

audio/video coaxial connection.

Another feature for use in dubbing is the VL-C77UA's EDIT switch. Normally, a video signal goes through several stages of noise-reduction processing before reaching an output jack. While this processing improves picture quality on your TV, it also weakens the signal. The EDIT switch acts as a signal booster so that signal strength is maintained during dubbing to another tape. This feature is particularly useful if you're recording in the EP mode. Dubs from slow-mode EP recordings are more likely to yield noisy pictures.

The only major problem I experienced in Puerto Vallarta was how to get myself in the video. Fortunately, the viewfinder on Sharp's VL-C77UA can be tilted upward as much as 90°. Being able to angle the viewfinder allowed me to record my elongated shadow at sunset on the beach at Punta Mita.

By slowly zooming into the center of my shadow, the movie fades to black. When it comes time to edit the tape, I'll be at the end.

### Upward Mobility

Video cassette recorders have become almost as commonplace in American homes as color televisions. The video industry believes household penetration is as high as 61 percent. This suggests



Dubbing features of Panasonic's PV-4900 consider camcorder users.

that many people will soon be ready to buy their second VCR.

You might want to invest a few dollars more the second time around for a better machine. Better VCRs are not characterized solely by higher price tags. Most of the VCRs bought the first time around were simple 2-head machines. The next level upward is inhabited by 4-head VCRs. The extra two video heads are used for special effects such as slow motion and noiseless freeze-frames. Four-head machines are more reasonably priced than they were a few years ago, and now include features that were seen previously on only the most expensive VCRs.

Among the most innovative of the new 4-head machines on the market is Panasonic's PV-4900 (price not available at press time). The PV-4900 provides the jitter-free stills and slow-motion effects characteristic of 4-head machines. In addition, the PV-4900 features on-screen programming.

Another noteworthy feature of the



PV-4900 is its Auto Tracking function. Some tapes, as any veteran VCR user knows, can suffer from incorrect tracking, a state that usually requires you to manually adjust the tracking knob until the picture is satisfactory. The PV-4900 takes care of this chore automatically.

The PV-4900 has lots of other features, but one of the best is the Synchro Edit function. The cord necessary to use this feature is optional, but worth the investment. The cord connects two VCRs via special input jacks. Once the connection is made, the start and stop times of a master and dubbed tape can be synchronized through the PV-4900's controls, thereby ensuring smooth edits.

Magnavox, meanwhile, offers new 4-head models marked by simplicity in construction. The new VCRs all use a single microprocessor chip that promises both improved control of the tape



Hitachi's VT-3044 uses on-screen programming to guide you through all VCR functions.



You'll see slow-motion action at a variety of speeds with Sharp's VC-A607.

transport and improved reliability owing to the reduction of moving parts in the machine. The new machines—models VR9840AT, VR9845AT, and VR9846AT—cost between \$450 and \$490.

Another new 4-head VCR is Hitachi's VT-3044 (\$430). In addition to a multitude of features, the VT-3044 takes on-screen programming to new heights. The VCR's "Intelscan" feature presents 16 pages or screens of directions covering every aspect of the VT-3044's operation, including troubleshooting.

Nearly every major company offers a 4-head VCR. Some features may vary from unit to unit. For example, Sharp's VC-A607 (\$580) offers variable speeds of slow motion, as well as a 57-function remote control so that you'll never have to leave your seat.

### Video Bookmark

There's a small stack of video cassettes next to my VCR with a lot of programs on each of them. They are shows I re-

corded because I wasn't able to watch them when they aired. The only problem is that the tapes have been lying there for months and I haven't a clue as to what's on them.

What I lacked when I recorded those programs was a Showfinder, a handy log for keeping track of the programs on each tape. The Showfinder tape log resembles the prime-time television charts seen in most newspaper listings. All you have to do is write in the name of the show and block out the amount of time it occupies. Not only do you know what's on the tape but you also know how much blank space remains for recording more shows.

Like most systems of any value, the Showfinder charts require a little effort to set up. The trick to the system is matching the counter numbers on your VCR to ½-hour increments.

Showfinder Jr. (\$13) comes in a video cassette-sized box for easy storage with your tapes. There's room in the binder for listing 300 programs. Refills cost \$4 per package. There's also a larger 11 × 11.5-in. binder that keeps track of 500 shows (\$25, and \$4 for refills). A third variation packages 25 labels (\$4) that you apply directly to your video cassette boxes. Now if I only had the time to watch all the shows I've recorded! **PM**

## The beauty of Thompson's® Wood Protector is the way it protects the beauty of wood.

Thompson's® Wood Protector has a unique way of keeping your house beautiful, no matter how ugly the weather.

In fact, that unique way is really three ways. Thompson's protects against mold and mildew, water damage, and helps prevent fading and greying. What's more, Thompson's crystal clear waterproofing protection even gets better with age. With just one coat, your wood can have a longer life expectancy than you ever expected.



Powerful water-proofer to protect against splitting, cracking and rotting.

Protective sun-screens to help prevent fading and greying.

Strong mildicides to protect against mold and mildew.



# Flavor.

Let's not beat around the bush. Flavor is what Merit's all about. Real, satisfying flavor. Take-a-puff, rewarding, down-to-your-toes flavor. It's what you love about smoking. It's what you get from Merit. And because of Enriched Flavor,<sup>™</sup> Merit delivers all this taste with even less tar than other leading lights. If that sounds like your kind of cigarette, just say the word.

**Enriched Flavor,<sup>™</sup> low tar. A solution with Merit.**



**SURGEON GENERAL'S WARNING: Smoking By Pregnant Women May Result in Fetal Injury, Premature Birth, And Low Birth Weight.**

© Philip Morris Inc. 1988

Kings: 8 mg "tar," 0.6 mg nicotine av. per cigarette by FTC method.

Материал, защищенный авторским правом

# HORROR IN THE SKIES

An explosive decompression over the Pacific focuses attention on America's aging fleet of airliners. Here's what science, industry and government are doing about it.



BY WILLIAM HOFFER

**O**N FEBRUARY 24, United Airlines Flight 811 departed Honolulu International Airport at 1:53 am, enroute to Auckland, New Zealand. One hundred miles

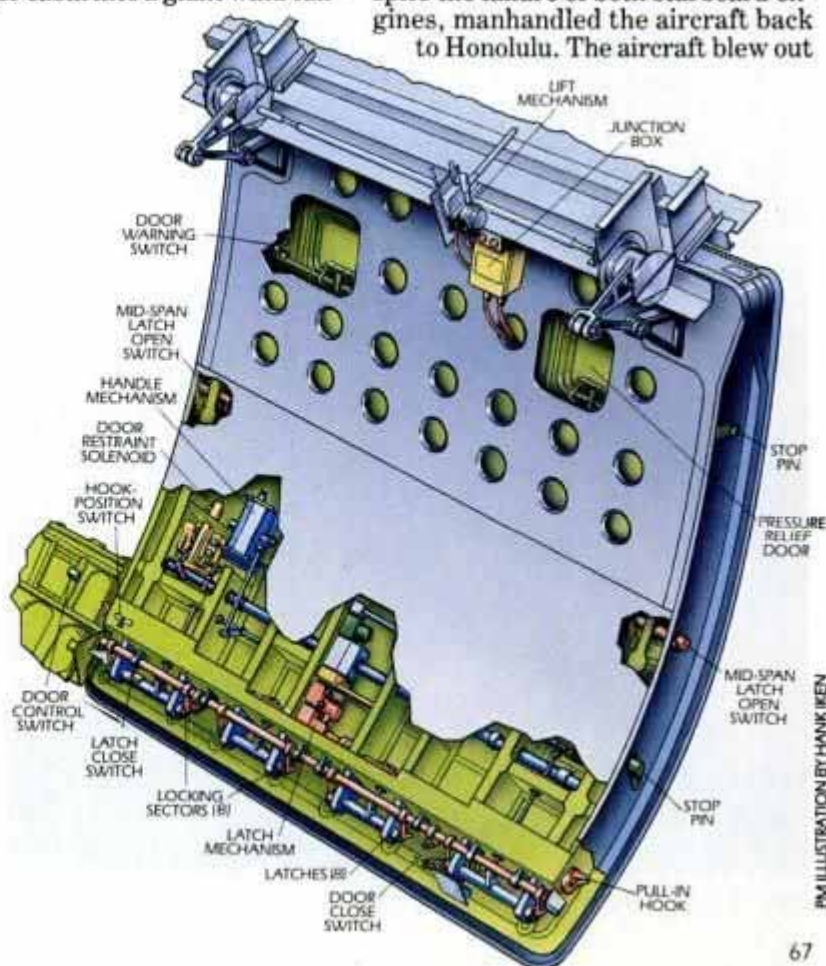
south of Honolulu, as the Boeing 747 gained altitude and the cabin continued to pressurize, an explosion ripped a 10 x 40-ft. hole in its right side, adjacent to the forward baggage area. The resulting decompression turned the passenger cabin into a giant wind tun-

nel. Nine persons were sucked to their deaths and 27 more persons were injured.

Capt. David Cronin took the stricken plane rapidly down to 4400 ft., dumping fuel along the way, and, despite the failure of both starboard engines, manhandled the aircraft back to Honolulu. The aircraft blew out



A crippled United Flight 811 rests safely on the Honolulu tarmac following the presumed inflight failure of its forward cargo door (right).



WIDE WORLD PHOTOS

PM ILLUSTRATION BY HANK IKEN

## HORROR IN THE SKIES

ROBERT NICHOLS/BLACKSTAR PHOTO



Prelude: The Aloha Boeing 737 on the ground in Maui after its midflight breakup.

several tires, but landed safely at 2:33 in the morning.

As of this writing, mechanical or structural failure is the prime suspect, and there is major concern that the age of the aircraft was a contributing factor.

About 2300 of the 8000 commercial jets operated by U.S. airlines have already celebrated their 20th birthdays. They are known as high-time or geriatric aircraft and many experts, including the manufacturers, point to that 20-year milestone as the time when an aircraft really begins to show its age. If it is to be kept flying safely, the aircraft requires a significantly upgraded maintenance, inspection and replacement schedule.

The United Airlines tragedy, and other recent incidents, have created an intense debate as to whether or not the proper procedures are being followed. According to Rep. Tom Lewis (R-Fla.), ranking minority member of the House Science, Space and Technology Committee, our inspection procedures for older planes "have gone to pot."

Tom McSweeney, acting deputy director of Aircraft Certification Services for the Federal Aviation Administration, disagrees. He acknowledges that there is reason for heightened attention to the issue of

aircraft longevity, but he declares, "At this point, there's not a problem. All the efforts we are doing are to make sure that, in the future, flying remains safe."

Airline officials face a dilemma similar to a basic family question. The older your family car, the more miles chalked up on the odometer, the more likely it will need maintenance and repair. As the years pass, the cost of those repairs may increase even as the value of the car decreases.

A jetliner is larger and more costly, but no different in this respect. For example, the Boeing 737 was designed for a service life of about 20 years, but U.S. airlines now have more than 200 737s in the air past that date. And with aircraft, it's not just a matter of years but also of duty cycles. A duty cycle is a takeoff, pressurization, depressurization and landing. The number of duty cycles an aircraft has been subjected to is often more significant than the absolute age of the plane. A 737 costs around \$25 million these days. So it is in the economic interest of an airline to prolong the life of its current fleet if it can do so at reasonable cost and without compromising safety.

But can it? There is a limited but growing number of incidents that scream "No!", at least under current

## A 727's \$600,000 OVERHAUL

Preventive maintenance on aging Boeing 727s may stop cracks before they happen.

### Window Frames

Cockpit window posts doubled up for extra strength.



### Door Stops

To withstand force of high air pressure in airborne plane, door stops replaced with stronger ones.

operating conditions and maintenance procedures.

### Signs of turbulence

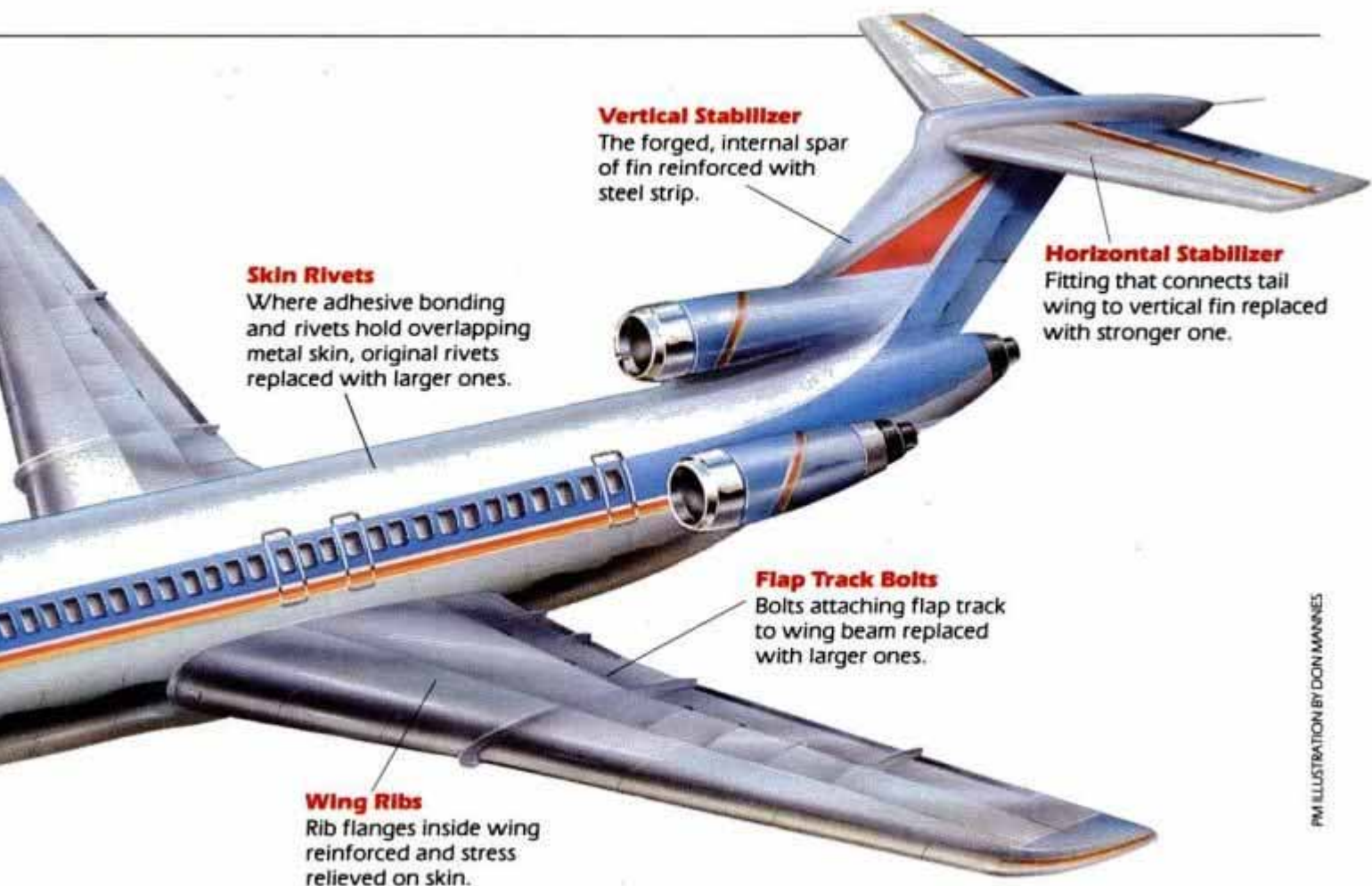
In December 1985, a British Airways 747, a high-time aircraft with more than 55,000 hours in the sky, was on approach to Boston's Logan International Airport, when pilots attempted to lower the flaps. They heard a loud noise and felt the plane roll to the left. The crew managed to bring in the aircraft safely, and an inspection revealed fractured bolts at the point where the flaps attach to the wings. What particularly concerned investigators of the National Transportation Safety Board was that these fractured bolts were so-called "infinite life" bolts and were, therefore, not required to be inspected.

In November 1986, a tower operator at Newark International Airport called a Delta Airlines L-1011—one of the older models in the fleet—back to the gate after he saw smoke coming from the right wheel brake. The smoke turned out to be kerosene vapor from a fuel tank leak. Investigators found that the rear spar between the wing root and the landing gear had cracked completely through. Here was a 7-in.-long fatigue crack undetected by routine inspection.



BOEING PHOTO

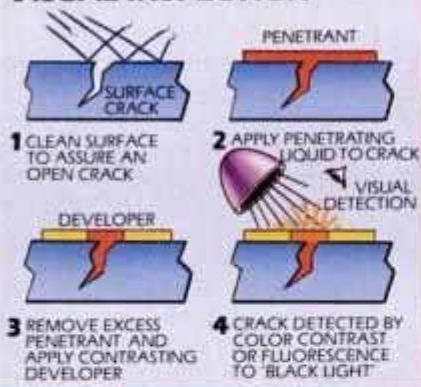
Flight-cycle testing at Boeing hopes to spot pressurization anomalies.



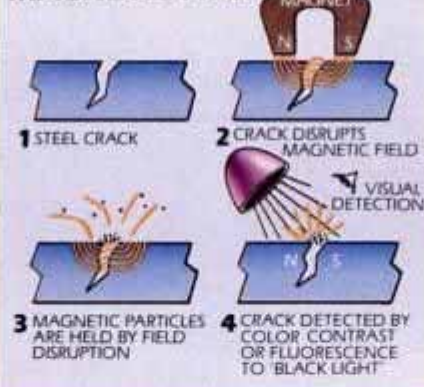
PM ILLUSTRATION BY DON MANNES

## AIRPLANE FLAW DETECTION TECHNOLOGY

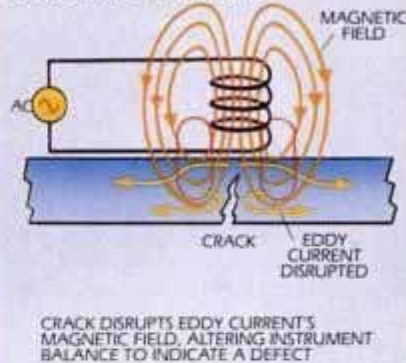
### VISUAL INSPECTION



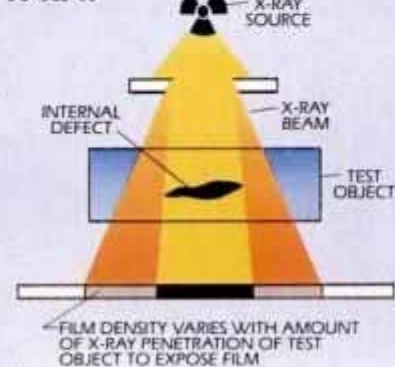
### MAGNETIC FIELD



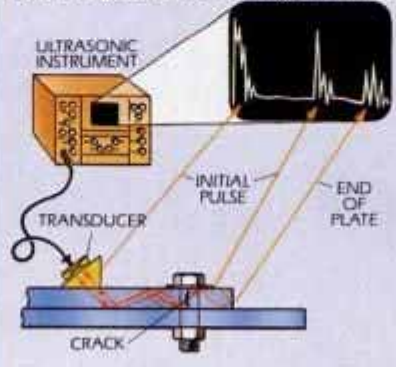
### EDDY CURRENT



### X-RAY



### ULTRASOUND



The weapons in the arsenal against inflight structural failures include a handful of sophisticated monitoring tools. Top (left to right): Visual inspection techniques are facilitated by a dye penetrant that exposes cracks to the naked eye. Disruption of a magnetic field also exposes cracks. Similarly, analyzing the localized disruption of an electrical eddy current can spot flaws. Bottom (left to right): Conventional X-ray and, increasingly, ultrasound devices can also help extend the life of aging airplanes. The method used depends on the thickness and location of the part in question.

PM ILLUSTRATIONS BY HANK IKEN

# HORROR IN THE SKIES

## When Disaster Strikes

NASA LANGLEY PHOTO



A micrographic view of a failure in progress shows an indentation at the crack initiation site. Spotting these fatigue-induced voids is critical to keep America's air fleet flying.

In November 1987, a British Airways 747 flight crew heard a loud bang during the takeoff roll from Heathrow Airport. They were past the fail-safe point, so they completed takeoff, dumped fuel and returned safely to London, where inspectors discovered a failed support bracket on the left wing landing gear of the 16-year-old aircraft, due to extensive corrosion in an area of the plane never subjected to disassembly inspection.

These incidents were prelude to two tragedies that brought the issue to the fore. On April 28, 1988, an Aloha Airlines 737 experienced a sudden structural collapse while cruising at 24,000 ft. (see "Catastrophe!", page 58, Aug. 88). A huge section of the upper fuselage ripped open and peeled back. One flight attendant died and 61 passengers were injured. The aircraft in question was a veteran, having logged 90,000 takeoff and landing cycles—the second highest number recorded by any jetliner operating in the free world.

Inspectors held out hope that the Aloha incident was an anomaly, caused by the excessive use of the plane and exacerbated by a saltwater environment. This may not be the case. Subsequent inspections of the aging 737 fleet discovered previously undetected cracks in nearly half of the existing aircraft.

Until that accident, airlines had tended to operate upon the philosophy that a jetliner could be flown safely into the unlimited future for as long as it was properly maintained and inspected. But former FAA administrator Allan McArtor remarked, "The Aloha accident didn't surprise the industry, it stunned the industry." He explained that the 737 broke apart in a manner that had never been observed during fatigue tests in Boeing laboratories, and it was caused by cracks so tiny that they are difficult to detect during the routine visual inspections upon which many airlines rely.

The Aloha plane was one of the first 291 Boeing 737s made using a cold bonding process to join the skin sec-

tions—where they meet along the fuselage. The bonding adhesive provides the strength to the joint, which is also riveted. In the cold bonding process, the adhesive that joins the skin together is cured at room temperature. The technique might have resulted in considerable debonding over a period of time, which went undetected. When an area of a skin joint becomes debonded, greater loads than intended must then be carried through the rivets. Furthermore, moisture can creep in, and corrosion starts. Corrosion not only reduces the thickness of the skin, but it causes the joints to loosen and crack in fatigue.

### United 811

After the Aloha Airlines incident, industry groups, such as the Air Transport Assn. and the Aerospace Industries Assn., formed the Airworthiness Assurance Task Force, charged with the job of arriving at a consensus maintenance and replacement schedule to forestall future problems with aging aircraft. "There was," says the FAA's McSweeney, "a compelling need to get the experts together and begin a dialogue."

That dialogue was in progress on February 24 when United Airlines Flight 811 partially disintegrated over the Pacific Ocean, and a scrutiny of the aircraft's history underscored the need for action.

The aircraft was the 89th of 205 747-100s built by Boeing and was delivered to United Airlines on November 3, 1970. The 18-year veteran had completed 15,000 cycles and logged nearly 58,000 hours in the air, and it had a history of problems that accelerated over time.

Back in 1980, maintenance workers found a crack in one of the stringers of its inner structure. In 1982, a main tire assembly fell off, the failure blamed upon a fatigue crack. In 1984, multiple cracks were found in the inner skin near the cockpit area. In 1986, cracks were found in the fuselage frame forward of the cockpit. Six months later, during a comprehensive 4-day inspection, a right wing flap was found to be in contact with the No. 3 engine pylon—removing the pylon, workers found a 4-in. crack and another 1-in. crack in the inner structure. Only one month after that comprehensive inspection, passengers and a flight attendant reported that they saw portions of the leftside spoiler fall off during a landing in San Francisco.

There were more recent and continuing maintenance hassles with the right forward cargo bay door that, apparently, failed during the fateful flight. On December 5, 1988, intermittent problems were experienced with the electrical door-closing mechanism. It was repaired, but failed again on December 13 and 22. It was fixed in Chicago on December 23, after which no further trouble was reported until February 24, when the plane was at 20,000 ft. over the Pacific Ocean. The forward cargo door of all 747s had been the subject of an airworthiness directive on July 1, 1988, ordering the door's latch lock sectors to be inspected within 30 days and for special doubler plate reinforcements to be installed within two years. Six of United's 31-plane 747 fleet had undergone the corrective treatment. Flight 811 was among those that had not. All told, some 16 service difficulty reports were filed concerning the aircraft during the past five years. Draw your own conclusions that a United Airlines spokesperson characterized that number as "about average."

This latest incident caused the Air Line Pilots Assn. to rethink its stated position that an airliner can be maintained and flown safely for an indefinite period. Experts and laymen alike are wondering whether current inspection schedules, and the needed repairs they identify, are adequate for an aging fleet of U.S. jetliners.

(Please turn to page 115)

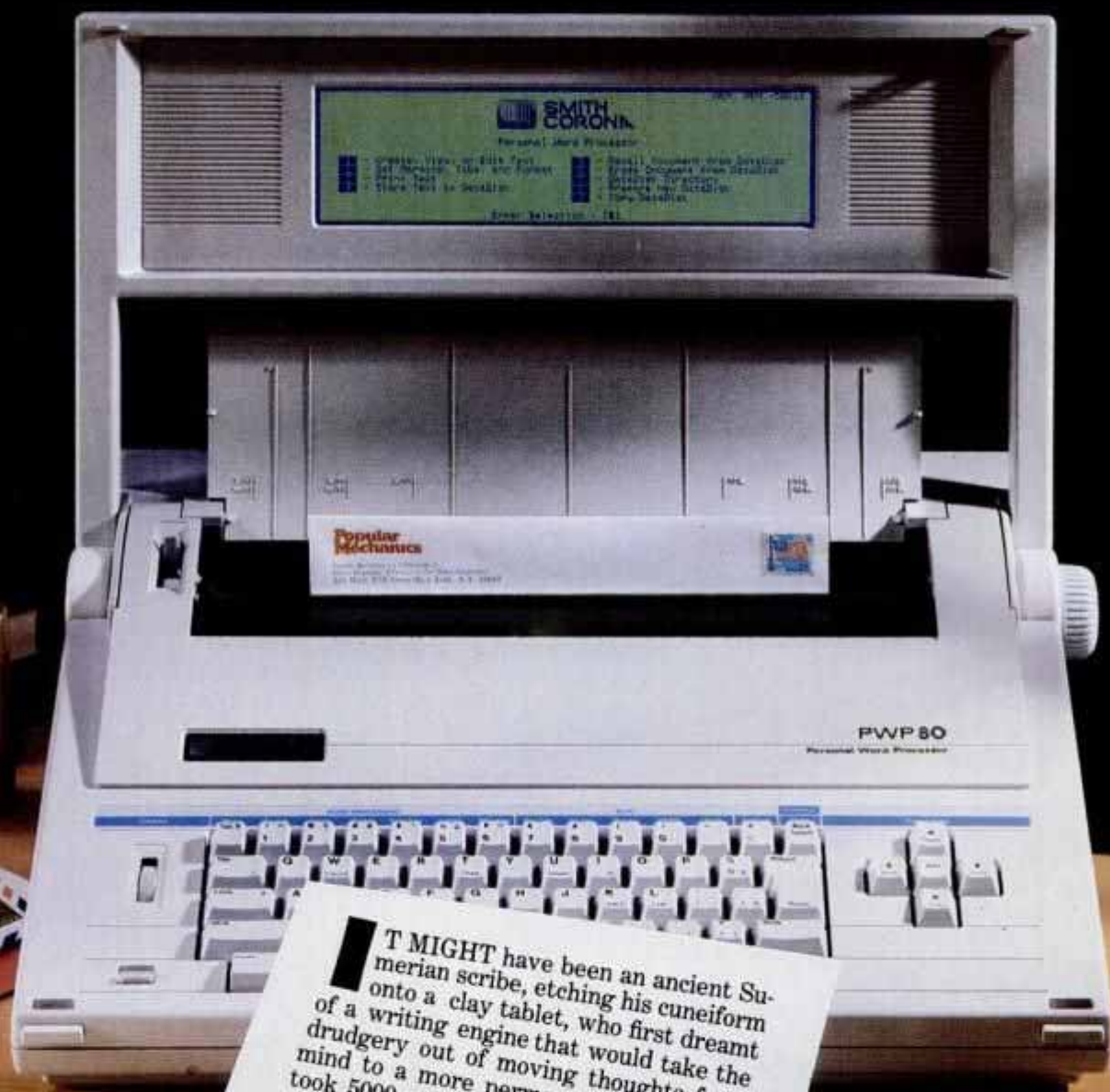


This reengined DC-3 belies the notion that all airplanes are destined for the scrap heap.

# TECHNOWRITERS

Home and portable word processors give you the convenience of computers with the simplicity of typewriters.

BY RON SCIBILIA; PM Photos by Spencer Jones



**I**T MIGHT have been an ancient Sumerian scribe, etching his cuneiform onto a clay tablet, who first dreamt of a writing engine that would take the drudgery out of moving thoughts from mind to a more permanent medium. It took 5000 years, though, before Samuel Clemens (a.k.a. Mark Twain) could finally fret over typos and learn to pitch wadded-up paper into a waste basket. The Christopher Sholes-designed typewriter, manufactured by Philo Remington in 1874, was the first stab at making that 5-millennia-old dream of a writing machine a reality. A century later, writing went electronic—and became word processing. Wang Laboratories, in 1976, introduced its first word processing system, which combined custom software, a video display and data storage on magnetic disks.

## SMITH-CORONA PWP-40 (\$599)

**DISPLAY:** Backlit LCD; 8 lines/  
80 characters.

**STORAGE:** 3-in. disk; 100KB.

**PRINTER:** Daisywheel.

**FEATURES:** Dictionary;  
Page Preview.



**BROTHER WP-55 (\$1049)**  
**DISPLAY:** 8-in. CRT; 15 lines/91 characters  
**STORAGE:** 3.5-in. disk; 120KB  
**PRINTER:** Daisywheel  
**FEATURES:** Dictionary; detachable keyboard; optional spreadsheet

matting software (stored in a permanent memory for greater speed and ease of use), a computer-like video display screen showing a sizable chunk of text at one time, unlimited data storage using magnetic media, a built-in printer. Tagged at \$799, the Videowriter provided a new alternative to consumers torn between typewriters and personal computers.

Since the Videowriter, several other companies have launched their own versions of mass-priced, dedicated (electronics jargon for specialized) word processors. Some are designed as turbo typewriters, built around what is essentially a typewriter chassis. Others opt for the breadbox look of a transportable computer, with video display up front.

### Different needs

Today's personal word processors, whether 1-piece or 2-piece systems, are optimized for ease of use and bent on a single purpose—writing. Compared to computers, they barter power and versatility for simplicity and straightforwardness. In short, they aren't for everyone, and prospective purchasers must carefully consider their own needs, present and future.

Among the most popular 1-piece word processors on the market today are the Magna-

Aimed at corporate typing pools, the Wang WPS systems didn't pretend to court the average wordwright: Prices started at a Fortune 500-level \$12,000. But a year later the Apple II personal computer arrived, marking the next step toward typing without tears. With 16,000 bytes of memory and no display (you could use your home TV), it sold for \$1195—not cheap but no longer prohibitive.

Though the personal computer introduced affordable word processing to the masses, it also scared off many potential buyers with its fearsome notion of "computing." To many, that word meant "mathematics." What millions wanted was a better typewriter—an easy-to-use, easy-to-buy product that melded the typewriter's hard-copy output with the brains and correctable display of a computer, all at a price hundreds of dollars below the cost of an IBM PC clone with word processing software and printer.

Enter the personal word processor, which made its debut in 1985 with the Magnavox Videowriter. This was the first 1-box writing machine—the word computer was carefully avoided—to combine all the elements of a true word processor: on-board text-editing and for-

vox Videowriter Models 160, 360 and 460, the Smith-Corona PWP 40 and 80, the Brother WP-55 (also known as the WP-500), and the Panasonic KX-W1500. Two-piece systems, with video displays separate from the main typing unit, include the Smith-Corona PWP 100, and AT&T's WP7700.

Ranging in suggested retail price from \$549 for the Magnavox Videowriter 160 to \$1099 for Brother's WP-55/WP-500, any of these personal word processors will satisfy the casual writer who needs to produce an occasional letter or a short report and wants a nicely formatted, typo-free document. But more demanding users, especially those who contemplate using a personal word processor for business, will want to compare features more closely. Sharing much in common, these units differ in subtle—and not so subtle—ways.

### How much memory?

Take data storage, for example. All but the Magnavox Videowriter 160 (which relies on battery-backed internal memory chip to hold up to 15 pages of text) include a floppy disk drive to store words.

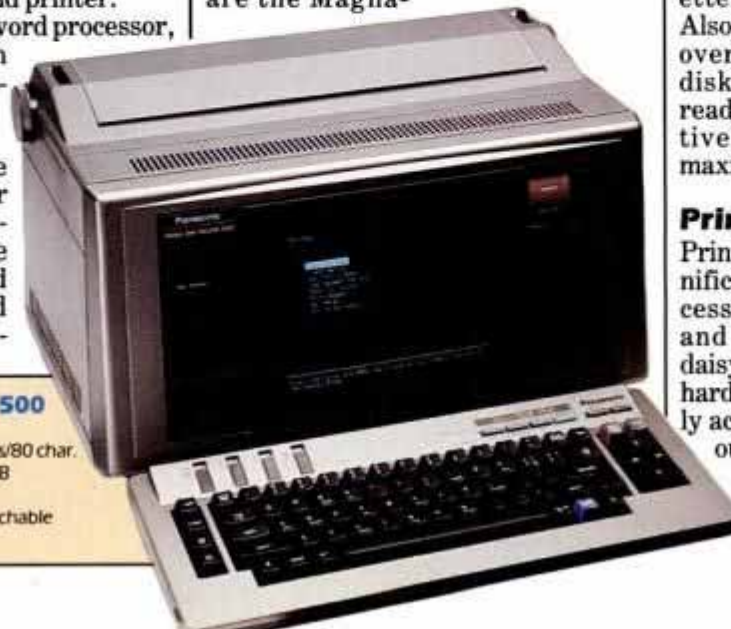
But disk capacities vary broadly—from 100,000 characters (about 50 double-spaced typewritten pages) for Smith-Corona's PWP 40 and 80 all the way up to 353,000 characters on Panasonic's KX-W1500 and an even greater 640,000 characters (about 320 pages) on AT&T's WP7700.

While Brother, Panasonic, AT&T and Magnavox use the now-familiar hard-shell 3.5-in. microfloppy diskette, Smith-Corona has opted for even tinier 3-in. hard-shell diskettes on its PWP 40, 80 and 100. Though smaller and lighter, the 3-in. diskettes have two disadvantages. They require a jacket for protection because the diskette exposes the magnetic surface. Also they need to be physically turned over to access the other side of the diskette, for either formatting or reading/writing of text. This effectively limits document length to a maximum of about 25 pages per disk.

### Printing style

Printer output is another area of significant difference among word processors. Panasonic, Smith-Corona and Brother use typewriter-like daisywheel printing mechanisms for hard copy. This satisfies the commonly accepted standard of letter-quality output: "Does it look typed?"

Magnavox's Videowriters, on the other hand, employ thermal transfer technology, in which a print head uses heat to



**PANASONIC KX-W1500 (\$899)**  
**DISPLAY:** 8.5-in. CRT; 25 lines/80 char.  
**STORAGE:** 3.5-in. disk; 353KB  
**PRINTER:** Daisywheel  
**FEATURES:** Dictionary; detachable keyboard; mailmerge



melt ink in a matrix of dots onto standard bond paper. Magnavox contends the thermal transfer approach makes for a far quieter machine—which it does—along with providing greater flexibility in using different character sizes and fonts. But critics question whether such output is truly letter-quality, even with an impressively large 24 × 36 matrix of dots forming each character. They also cite limited ribbon life as another liability. In place of thermal transfer, AT&T employs the more traditional impact dot-matrix printer in its WP7700, using an 18 × 24 matrix to improve standard dot-matrix print quality. AT&T's rationale: far greater printing speed (up to 90 characters per second, about five to six times that of the daisywheel units) plus the ability to use a range of typefaces in varying sizes.

### Software smarts

Software differences among the word processors are equally critical. You can count on any of these units to deliver solid word processing capabilities with the usual array of basic functions, such as search-and-replace, block copy, move, delete and so on. All have competent spell-checkers, with dictionaries ranging from 50,000 to 77,000 words.

But only two companies, Magnavox on its Model 460 and Smith-Corona on its PWP 80 and 100, include an integrated thesaurus—a useful writing tool for students and writers. These Smith-Corona models also include an Enhanced Grammar Right system to flag punctuation errors and over-used words, and monitor commonly confused words and grammatical phrases. A Graphic Page View shows you how the document looks before you print it.

More important—for those planning to use a personal word processor for serious business correspondence—is mail-merge, the ability to generate form letters from a master list of addressees.

This possibly critical capability is found in the Panasonic KW-W1500, Magnavox Model 460, Smith-Corona PWP 100 and AT&T WP7700.

Brother, meanwhile, has tried to address the issue of business software by marketing an add-on spreadsheet, the PO-9 Personal Organizer (\$149), that provides up to a 20-column by 65-row grid with basic arithmetic operations and 13 built-in formulas. Though hardly in the same league as Lotus 1-

### SMITH-CORONA PWP-100 (\$899)

**DISPLAY:** 12-in. CRT; 25 lines/80 characters  
**STORAGE:** 3-in. disk; 100KB  
**PRINTER:** Daisywheel  
**FEATURES:** Dictionary; thesaurus; punctuation check; Page Preview; mailmerge

2-3, the PO-9 can certainly handle light-duty calculations. Its files also can be converted to word processing format for printing with text documents.

### Flexibility

For shoppers trying to decide between a personal word processor and a personal computer, there are other facts to note.

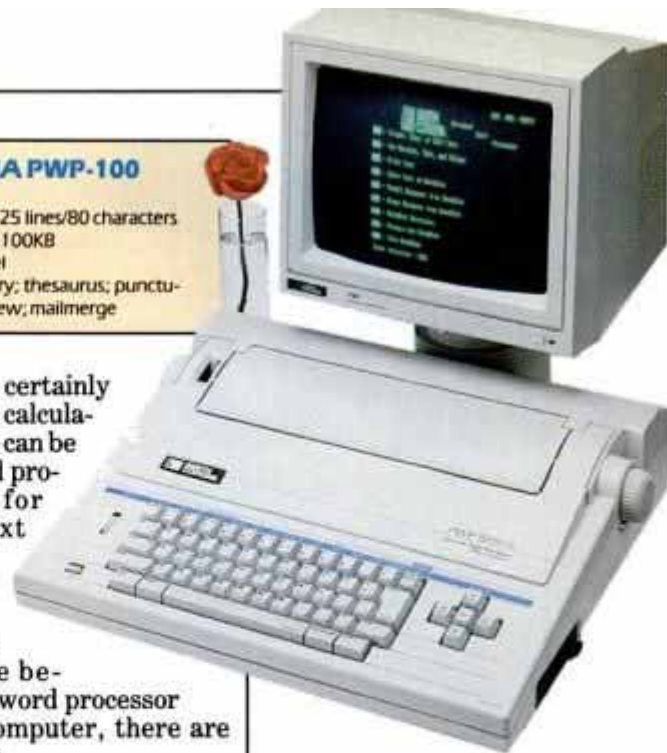
These are essentially closed systems, aimed at the writer whose need is for simple printed output. While all of these models are able to handle relatively long document files, changing paper on extended print jobs is likely to be a tedious task. Only the Magnavox Videowriter 460 accommodates an optional 100-page sheet feeder unit

communications capability. None of these units comes with a serial interface, precluding the use of a modem or an external fax board for telephone transmissions—or even hard-wire data transfer of text to another machine. With more data now being transmitted electronically rather than via the printed page, writers with “due yesterday” deadlines might want to think twice.

### Conclusion

So who should buy a personal word processor? Probably anyone whose writing needs are likely to require—and be satisfied by—a better-grade of typewriter. That purchaser will gain the flexibility to correct and revise, at a relatively small cost premium.

Shoppers on very tight budgets will also appreciate these units: A low-end PC system



### MAGNAVOX VIDEOWRITER 160 (\$549)

**DISPLAY:** 10-in. CRT; 24 lines/80 characters  
**STORAGE:** Internal memory; 30 KB  
**PRINTER:** Thermal-transfer dot matrix  
**FEATURES:** Dictionary

(\$199), and none offers pin- or tractor-feed paper handling.

Lack of file-format compatibility with other machines, whether PCs or other word processors, might also trouble some would-be buyers. There's currently no way to exchange data diskettes with a personal computer, or a word processor of another brand.

Yet another potentially serious design limitation is the absence of com-

puter, display, software, printer—will cost twice as much. People with limited work space, too, will certainly like the fact that these machines, 1-piece units especially, can be stored away easily and retrieved without hassle.

Lastly, buyers who can't imagine any computer being friendly will surely appreciate the rapid up-and-running time of this new generation of writing machines.

# OWNERS REPORTS

The Probe, XJ6, Continental and Allanté log 4 million miles.

BY MICHAEL LAMM, Contributing Editor



LINCOLN  
CONTINENTAL

**S**OME CARS provoke more interest than others. And that's certainly the case with the four cars that are wrapped up in this month's owners report.

## Ford Probe

Built in Flat Rock, Michigan, the Probe is a joint venture between Mazda and Ford. The mechanical parts are shared with the Mazda MX-6 coupe built on the same line. Available with the 12-valve sohc Mazda Four, the Probe can be had in normally aspirated, turbo, manual or auto trans, and three trim levels—GL, LX or GT. The MX-6's optional 4-wheel steering is not available on the Probe.

Most of the owners we surveyed couldn't say enough about the Probe's styling. Appearance easily topped our respondents' list of specific likes.

On the downside, a few owners revealed that the Probe's aerodynamic shape forced air and water into the passenger compartment. Rain and windshield washer fluid will blow in if the window is open even a little bit. Devoid of rain guards, the sleek styling has an upside—average of highway fuel economy is 32 mpg. Several respondents also reported an unusual absence of bugs smeared over the windshield, which says that air is flowing over the Probe, rather than hitting the glass.



JAGUAR XJ6

Behind styling, handling ranked as the second-best-liked feature. Power and performance were the fourth and fifth best-liked features, right after the excellent economy. Even the non-turbo cars seemed to have more than adequate go.

Asked about quality, 97.8 percent rated Probe workmanship good to excellent, a satisfaction rate well above most domestics.

Front-seat comfort, general spaciousness and silence pleased most drivers. They also agreed that the Probe is essentially a 2+2, with the rear reserved for children or cargo.

Complaints, and there weren't that many, had to do primarily with sales and service. Probes were in very short supply for a while, and many dealers tacked on as many options and extras, such as undercoating and paint sealer, as they could. Few buyers were able to beat the sticker, and many paid substantially more.

There were the usual complaints about poor servicing, but even in those instances the owners seemed to feel that the problem stemmed from the dealer's inadequacies rather than the Probe's. A large proportion, just over half, of the principal drivers were women, and many of them were critical of the handling they received from both the sales and service de-





FORD PROBE

partments. In fact, the number of responses to our survey that listed mechanical problems was a record low, so low that the ranking of problems wasn't statistically significant.

It seems the Probe has made a lot of friends for Ford.

### Jaguar XJ6

In our previous Jaguar owners report (page 76, Aug. '79), we summed up our survey by stating: "Jaguar owners enjoy their cars—sometimes through gritted teeth."

That seems to be almost as true today as it was a decade ago. The sticker price is now twice as high as it was in 1979, but most owners' emotions haven't changed much. Jaguar styling still stirs the soul, the car's ride/handling/comfort prompt as much praise as ever, minor mechanical problems still crop up too often, dealers still manage to irritate customers—and most owners *still* love their cars through gritted teeth.

Rigorous campaigns to boost Jaguar reliability and dealer image have borne fruit to some extent. When we asked 1988 owners about workmanship and dealer service, the results were 15 to 20 percentage points above Jaguar's 1979 figures. According to our survey, excellence of workmanship has risen 15.4 percentage points

and owner opinion of service excellence is up 18.3 percentage points.

Even so, XJ6 drivers let us know that their cars haven't shed all of their former vices. And as before, electrical glitches topped the list.

Ride, silence, comfort, handling and overall performance received high marks, but one complaint with early 1988 models centered on sluggish acceleration. According to 23.5 percent of our respondents, early versions of the new XJ6 series needed more power off the line.

In response to owner grumbles, the factory soon raised compression and added 14 horses to the 3.6-liter, 24-valve aluminum inline Six. They also

modified the ZF torque converter for better off-the-line response. And 1989 models received a lower axle ratio (3.58:1 instead of 2.88).

Owners generally praised riding and driving comfort, but suggested a few detail improvements. The power window and mirror buttons are too close together and sometimes cause confusion. The ignition switch stands too near the wiper stalk, so the wipers are easily turned on by mistake. The vacuum-fluorescent digital portion of the instrument panel washes out in strong sunlight (speedo and tach are analog). The driver's power seat won't adjust without the engine running, and lacks a memory feature.



CADILLAC ALLANTÉ

## OWNERS REPORTS

The electric door locks have to be unlocked by hand. And some owners didn't like the horn on the end of the turn signal stalk.

But even with all they indulge, they do it gladly, and the majority of Jaguar buyers say they wouldn't be happy with anything else.

### Lincoln Continental

Back in 1982, when we last polled Continental owners, Lincoln quietly set the standard for the American Customer Satisfaction Index, despite the humble Ford Fairmont underpinnings. How does the new 1988 Continental compare on CSI?

On every category, CSI either increased or remained the same. Well, except for one—new Continental owners weren't as pleased with the dealer's service, reflecting perhaps higher expectations on the owner's

part as much as anything else. The all-new Continental sports several firsts—a V6, fwd and the absence of the trademark spare-tire hump in the trunklid. Sure, there hasn't been an actual spare in the hump for a generation, but there was some concern about losing a distinctive signature.

Styling, however, remains one of Continental's strong attractions, both in the eye of the owner and passers-by. Owners also appreciate the silky, high-mileage, 3.8-liter engine, which is a complete and apparently successful redesign of the earlier Ford V6. In spite of some concern about lack of V8 motivation, complaints about sluggish acceleration came from fewer than one respondent in six.

Fwd and the variable-assist/variable-ratio steering came under praise for their combination of road feel and controllability under every road con-

dition. The ABS was greatly appreciated, as well. But the highly sophisticated computer-controlled air suspension undoubtedly helped make the ride and handling second and third of the most liked features, especially after a running change cured a tendency to bottom out on bumps.

Some owners did complain the air suspension tended to settle noisily after parking the car, hissing loudly enough to attract attention from passers-by, and also hanging up on the occasional curb.

Interior ergonomics got generally good marks, particularly the cavernous rear seating room. The only sore points were the hard-to-read digital dash, and lack of small object storage.

As we mentioned, dealer service was a high spot in our last Continental survey, with 95 percent of owners rating service operations as good to ex-

## SUMMARY OF OWNERS SURVEYS\*

### FORD PROBE

<b>Total miles driven</b>	1,507,713	<b>Comfort</b>	21.9	<b>Rear seats:</b>		<b>Two cars</b>	31.7
<b>Average miles per gallon:</b>		<b>Specific dislikes:</b>		Excellent	22.5%	<b>Three cars</b>	13.4
With 5-speed manual:		No complaints	25.4%	Good	41.2	<b>Four or more cars</b>	19.3
In town	25.9	Seating comfort	9.6	Average	29.8	<b>Makes of other cars owned:</b>	
On the highway	32.4	Tight seatbelts	8.1	Poor	6.5	Ford	40.5%
With 4-speed automatic:		Lack of rear headroom	5.7	<b>Had any mechanical trouble?</b>		Chevrolet	17.3
In town	25.6	Water blows in open windows	5.7	No	87.3%	Mercury	9.8
On the highway	31.2	<b>What changes would you like?</b>		Yes	12.7	Pontiac	8.7
<b>Probe series:</b>		No changes	36.9%	<b>What type of trouble?</b>		Nissan	6.9
Probe GL	47.2%	Revise shoulder harness	8.6	Electrical system	17.6%	Dodge	6.9
Probe LX	30.9	Power seats	5.6	Transmission	17.6	<b>Would you buy a Probe again?</b>	
Probe GT	21.9	Add rain deflectors	4.3	Air conditioning	14.7	Yes	73.6%
<b>Transmission choices:</b>		More powerful engine	3.9	Shift mechanism	11.8	Maybe	20.4
5-speed manual	54.6%	<b>How much did you pay?</b>		Engine stalling	8.8	No	6.0
4-speed automatic	45.4	Average	\$13,673	<b>Did you repair it yourself?</b>		<b>Would you buy a different Ford next time?</b>	
<b>Why did you choose the Probe?</b>		Range	\$10,149-18,000	No	91.2%	Maybe	51.6%
Styling	91.4%	<b>Workmanship opinion:</b>		Yes	8.8	Yes	26.0
Price	24.9	Excellent	71.4%	<b>Dealer repairs satisfactory?</b>		No	22.4
Handling	24.1	Good	23.7	No	55.6%	<b>Principal driver:</b>	
Performance	14.4	Average	1.9	Yes	44.4	Female	52.8%
Economy	7.8	Poor	0.4	<b>Dealer service opinion:</b>		Male	45.7
<b>Specific likes:</b>		<b>Comfort opinion:</b>		Excellent	33.3%	Equal	1.5
Exterior styling	82.5%	Front seats:		Good	42.1	<b>Age distribution of owners:</b>	
Handling	47.0	Excellent	67.4%	Average	13.8	Under 29 years	33.6%
Economy	27.1	Good	27.8	Poor	10.7	30-49 years	44.2
Power	25.9	Average	3.3	<b>Number of vehicles owned:</b>		50-plus	22.2
Performance	21.9	Poor	1.5	This car only	35.4%		

### JAGUAR XJ6

<b>Total miles driven</b>	1,145,512	<b>Not enough headroom</b>	6.1	<b>Average</b>	5.1	<b>Four or more cars</b>	22.3
<b>Average miles per gallon:</b>		Shoulder harness	6.1	Poor	0.0	<b>Makes of other cars owned:</b>	
With 4-speed automatic:		<b>What changes would you like?</b>		<b>Had any mechanical trouble?</b>		Oldsmobile	16.9%
In town	17.3	More powerful engine	20.0%	No	50.6%	Mercedes	15.5
On the highway	23.0	No changes	16.6	Yes	49.4	Cadillac	14.2
<b>Why did you choose the XJ6?</b>		Add seat memory feature	6.9	<b>What type of trouble?</b>		Chevrolet	14.2
Styling	72.0%	Less complicated a/c controls	6.2	Electrical system	22.5%	Ford	11.5
Quality/workmanship	17.3	Revised shoulder harness	6.2	Automatic transmission	17.5	Jaguar	10.8
Luxury/status	16.7	Change horn location/sound	5.5	Brakes	15.0	<b>Would you buy a Jaguar XJ6 again next time?</b>	
Ride	12.0	<b>How much did you pay?</b>		Air conditioner	15.0	Yes	64.0%
Owned Jaguars before	11.3	Average	\$43,944	Trip computer	12.5	Maybe	23.8
Performance	10.7	Range	\$37,250-52,000	<b>Did you repair it yourself?</b>		No	12.2
<b>Specific likes:</b>		<b>Workmanship opinion:</b>		No	93.9%	<b>Would you buy a different Jaguar next time?</b>	
Exterior styling	77.8%	Excellent	58.6%	Yes	6.1	No	50.3%
Ride	44.4	Good	35.2	<b>Dealer repairs satisfactory?</b>		Maybe	41.2
Comfort	43.8	Average	5.6	Yes	55.8%	Yes	8.5
Handling	32.7	Poor	0.6	No	44.2	<b>Principal driver:</b>	
Performance	15.0	<b>Comfort opinion:</b>		<b>Dealer service opinion:</b>		Male	54.0%
Interior decor/styling	12.4	Front seats:		Excellent	38.5%	Female	42.2
<b>Specific dislikes:</b>		Excellent	67.3%	Good	39.7	Equal	3.7
Sluggish low-speed acceleration	23.5%	Good	26.7	Average	17.3	<b>Age distribution of owners:</b>	
Weak a/c performance	11.4	Average	4.8	Poor	4.5	Under 29 years	1.2%
Poor dealer service	9.1	Poor	1.2	<b>Number of vehicles owned:</b>		30-49 years	33.5
Noisy brakes	8.3	<b>Rear seats:</b>		This car only	10.3%	50-plus	65.2
No complaints	7.6	Excellent	54.5%	Two cars	37.0		
		Good	40.4	Three cars	30.3		

\*Percentages might not equal 100% due to rounding or an insufficient amount of data.

cellent, but that number has slipped to 84 percent. Previously, 81 percent said the dealer had repaired their car satisfactorily, and that number has dropped to 63 percent. That may be some indication of the sophistication of the systems on the newer vehicle, and the difficulty the industry is having training mechanics. However, the number of actual mechanical difficulties encountered are so low as to make these numbers statistically suspect.

## Cadillac Allanté

Expensive, and worth it. That's what most Allanté owners say about this newest of Cadillacs. Not that everything's perfect in Allanté land, but it's close enough, even at the \$55,000-plus sticker price. With cars like this, price becomes one of the luxuries. Call it sticker pride. If the car didn't say, "Hey! Look what I bought!" the own-

er probably wouldn't have bought it.

The Allanté picked up most of its points on styling and fun, in spite of the fact that 73 percent of the owners were 50 or older, with the convertible/removable hardtop being a big plus. Some Allanté qualities that made owners feel young made others feel old, with specific complaints about the stiff steering and tight ride quality. Raising the unpowered convertible top was a sore point, also.

One Allanté perk virtually all owners relish is dealer service. More than half our respondents rated service as nothing but excellent.

In spite of its Italian-built body, the Allanté is mechanically pretty much an Eldorado clone, so service technicians should find few surprises.

Although there were a number of complaints relating to window seals, which should all have been replaced

under warranty by now, more than 80 percent of our owners rated workmanship as excellent or good. People who are paying \$50,000 and more for a car have high expectations, so build quality must indeed be high.

Of general pros and cons, short drivers complained about poor rearward vision, especially in early cars with taller headrests. Others complained that the outside mirrors were too far back on the fenders to spot other cars to the rear. The driver information center came under fire for being difficult to read in bright light, while the Delco/Bose sound system received almost universal praise.

Another high point involved the attention-getting qualities of the car, with owners reporting coming out of stores to find curious admirers full of questions. "What's that?" they ask. "Money talks?" **PM**

## LINCOLN CONTINENTAL

<b>Total miles driven</b>	1,203,903	<b>Poor</b>	0.8	<b>Good</b>	39.3	<b>Average</b>	11.2
<b>Average miles per gallon:</b>		<b>Why did you choose the Lincoln Continental?</b>		<b>Average</b>	3.2	<b>Poor</b>	5.1
With 4-speed automatic:		Styling	60.0%	<b>Comfort opinion:</b>	0.4	<b>Number of vehicles owned:</b>	
In town	18.1	Owned Lincolns before	20.4	Front seats:		This car only	21.1%
On the highway	24.3	Comfort	9.2	Excellent	71.7%	Two cars	47.1
<b>Continental series:</b>		Front-wheel drive	9.2	Good	25.2	Three cars	16.9
Signature series	80.5%	Quality/workmanship	8.8	Average	2.7	Four or more cars	14.9
Standard Continental	19.5	Ride	8.8	Poor	0.4	<b>Makes of other cars owned:</b>	
<b>Major options chosen:</b>		<b>Specific likes:</b>		Rear seats:		Ford	23.8%
Moonroof	66.9%	Exterior styling	59.5%	Excellent	61.2%	Chevrolet	15.5
Overhead console	52.3	Ride	44.8	Good	36.7	Mercury	15.5
InstaClear windshield	52.1	Handling	38.4	Average	1.6	Lincoln	12.1
Electric seats with memory, power lumbar	40.8	Comfort	35.3	Poor	0.4	Cadillac	12.1
JBL sound system	29.1	Economy	10.3	<b>Had any mechanical trouble?</b>		Pontiac	9.7
Keyless entry system	10.5	<b>Specific dislikes:</b>		No	71.2%	<b>Would you buy a Lincoln Continental again?</b>	
<b>How do you rate your Continental's computer-controlled air suspension system?</b>		Instruments fade in bright light	21.1%	Yes	28.8	Yes	75.3%
Excellent	37.6%	No complaints	16.2	<b>What type of trouble?</b>		Maybe	20.1
Very good	23.6	Engine lacks power	14.1	Electrical system	21.6%	No	4.6
Good	21.2	Noises and rattles	7.6	Suspension bottoming	12.2	<b>Would you buy Ford-Lincoln-Mercury again?</b>	
Satisfactory	10.4	No automatic antenna	7.0	Trip computer	8.1	Maybe	45.3%
Fair	4.4	<b>What changes would you like?</b>		Keyless entry system	8.1	No	36.4
Poor	2.8	No changes	25.2%	Moonroof motor	8.1	Yes	18.2
<b>How do you rate your Continental's antilock braking system?</b>		Digital instrument contrast	19.3	<b>Did you repair it yourself?</b>		<b>Principal driver:</b>	
Excellent	36.9%	More powerful engine	7.3	No	94.6%	Male	64.3%
Very good	29.7	Automatic antenna	6.0	Yes	5.4	Female	28.3
Good	18.2	<b>How much did you pay?</b>		Yes	63.2%	Equal	7.4
Satisfactory	14.0	Average	\$28,389	No	36.8	<b>Age distribution of owners:</b>	
Fair	0.4	Range	\$23,800-33,000	<b>Dealer service opinion:</b>		Under 29 years	0.8%
		<b>Workmanship opinion:</b>		Excellent	35.2%	30-49 years	22.2
		Excellent	57.1%	Good	48.5	50-plus	77.0

## CADILLAC ALLANTÉ

<b>Total miles driven</b>	561,171	Lack of power	6.1	Yes	37.4	Three cars	25.0
<b>Average miles per gallon:</b>		<b>What changes would you like?</b>		<b>What type of trouble?</b>		Four or more cars	20.3
In town	16.8	No changes	21.6%	Electric windows	32.7%	<b>Makes of other cars owned:</b>	
On the highway	22.6	Power-top mechanism	17.2	Convertible top	24.5	Cadillac	76.6%
<b>Why did you choose the Allanté?</b>		More powerful engine	9.4	Battery	20.4	Chevrolet	25.8
Styling	75.9%	Better rear vision	8.6	Electrical system	16.3	Lincoln	13.7
American origin	24.2	Nonleaking top	6.9	Weak or noisy a/c blower motor	10.2	Mercedes	13.7
Performance	10.5	<b>How much did you pay?</b>		<b>Did you repair it yourself?</b>		Ford	12.9
Handling	8.9	Average	\$53,800	No	93.7%	<b>Would you buy a Cadillac Allanté again next time?</b>	
Prestige	6.5	Range	\$46,500-60,000	Yes	6.2	Yes	63.8%
<b>Specific likes:</b>		<b>Workmanship opinion:</b>		<b>Dealer repairs satisfactory?</b>		Maybe	20.0
Styling	79.3%	Excellent	58.6%	Yes	77.8%	No	16.2
Handling	45.9	Good	33.6	No	22.2	<b>Would you buy a different Cadillac next time?</b>	
Comfort	27.0	Average	6.2	<b>Dealer service opinion:</b>		Maybe	43.5%
Performance	18.0	Poor	1.6	Excellent	50.4%	No	28.7
Power	16.2	<b>Comfort opinion, overall:</b>		Good	32.2	Yes	27.8
<b>Specific dislikes:</b>		Excellent	61.5%	Average	12.4	<b>Age distribution of owners:</b>	
Effort erecting soft top	25.3%	Good	33.8	Poor	5.0	Under 29 years	0.8%
No complaints	16.2	Average	2.3	<b>Number of vehicles owned:</b>		30-49 years	25.8
Poor rear vision	16.2	Poor	2.3	This car only	6.1%	50-plus	73.6
Convertible top leaks	9.1	<b>Had any mechanical trouble?</b>		Two cars	34.8		
Steep price	6.1	No	62.6%				



**ZR3**

**Firsthand Drive Report****CHEVROLET  
CORVETTE ZR-1**

**O**VER THE centuries, the medieval fortress city of Carcassonne, in southwestern France, has seen plenty of strange comings and goings, including desperate battles involving a lot of smelly guys in tin suits. But it's safe to say there have been few events to rival the show that Chevrolet created earlier this year as a dozen shark shapes rumbled through the ancient gate and across the drawbridge.

This unlikely tableau marked the official launch of one of the most eagerly awaited performance cars in American history—the Corvette ZR-1 (or, more properly, the ZR-1 option on the Chevrolet Corvette).

Chevrolet elected to hold its ZR-1 press introduction in France for two reasons. The car got its first public showing at the Geneva Auto Show in early March, about a week before the press preview, and the region offered a variety of challenging roads with a more casual level of traffic enforcement than anywhere in the U.S.

Given this car's vast capabilities, that last part was important. Getting to the ZR-1's limits is an activity that requires (A) plenty of space and (B) official leniency. And so it was that 12 new ZR-1s growled across the moat and into a misty March morning.

What followed was a day of high-speed pursuit over hundreds of miles of gorgeous French countryside, followed by a second day of track activities at the Goodyear Mireval test facility at Montpellier. And what emerged was an unshakeable conviction that Chevrolet has hit the mark squarely. The ZR-1 is a giant step ahead of any production sports car ever built in this country. It combines everyday good manners with performance potentials that equal or surpass the world's most exalted thoroughbreds. And if \$50,000 seems a bit steep, consider what you'd have to pay for a Ferrari Testarossa.

It speaks well for the basic excellence of the Corvette design that most of the ZR-1 story is under its hood. Aside from the massive rear tires, the



Heart of new ZR-1 is 4-cam, 32-valve, 5.7-liter LT5 V8, capable of roughly 375 hp. Slick-shifting ZF 6-speed sends power to rear wheels.

ZR-1 is essentially a high-tech engine swap, substituting the all-new 32-valve aluminum LT5 V8 for the old cast-iron pushrod small block L98 V8.

Chevrolet initially sought to economize here, hoping to avoid the fearful tooling costs that go with any new engine, let alone one intended for a low-volume sports car. Thus the first mandate to GM's Lotus subsidiary was to design 4-valve heads for the small block.

But it soon became clear that this tactic could not produce a powerplant that would simultaneously meet output, emissions and fuel economy requirements, an all-but-incompatible trio that had already eliminated several other candidates, including turbo V6s and a twin-turbo V8. Lotus was given an almost-clean sheet of paper. Only the L98 bore centers were preserved, partly as a packaging consideration. Although displacement is essentially the same at 5.7 liters, the

LT5 has a slightly smaller bore and slightly longer stroke.

Drawing on the extensive racing experience Lotus has accumulated with twin-cam multivalve engines, the aluminum alloy block is contemporary, but hardly revolutionary. The open-deck design is sand cast (at Mercury Marine), and uses Nikasil-plated cylinder liners in place of the more common cast iron. The aluminum liner choice was dictated by the need for close tolerances and optimum ring sealing, and Nikasil—a nickel-silicon alloy—provides superior wear characteristics.

Evidence of the LT5's power potential can be seen in the massive lower end of the engine. The block casting includes external ribbing, for extra strength, and the lower crankcase assembly, also cast aluminum, incorporates cast-iron bearing cap bolts.

Main bearings are substantial at  
*(Please turn to page 104)*

# AIR POWER



We conquer land, sea and air in a test of personal hovercraft that gives new meaning to the term all-terrain.

BY JOE SKORUPA, Boating/Outdoors Editor  
PM Photos by Brian King



Fleet of high-tech hovercraft puts on an air show in Miami's Biscayne Bay. Flying in formation [above] from left to right are Scat II, Neoteric Racer and Scat HP. DynaSurf (left), a prototype by Nimac, powers ashore among the mangroves.



**T**HE FLEET RUNS in loose formation toward the saltwater flats of Miami's Virginia Key. The water is less than a foot deep and getting thinner. Sandbars appear. We run over them and surprise a flock of snowy egrets perched in the mangroves. The water becomes little more than a glaze over white sand. We run on.

Finally, we make shore and head single file down a twisting, partially submerged trail. We bank left, then right, then down a long straightaway to a cul-de-sac where we spin a tight 180° turn and head back the way we came. We reach deep water moments later, then roar out to sea.

This was my first hovercraft adventure and it was an eye-open-

er. I've boated in Biscayne Bay dozens of times, but this made it seem like a new world. I went where no boat could go. I explored shallows, sandbars and even dry land, all inaccessible to any other kind of craft.

Over the past few years, personal hovercraft have come of age. Manufacturers are now producing affordable, reliable, turn-key sport vehicles. There's even a growing race circuit. So the time seems right for a PM test of four single-engine, 2-up sport machines from three of the top builders.

Over a period of three days we ran the fleet through a wide range of wind, water and land conditions to learn about their strengths and weaknesses. Here are the results.

### Scat II

The Scat II is the lightest, least intimidating and most forgiving craft in the fleet. It also sports the lowest price (\$4995), making it a superb entry-level machine.

The first thing flyers notice about hovercraft (not just the Scat II) is that they're *loud*.

The second thing you notice is that hovercraft don't

actually turn, they arc. The Scat II is actually very responsive, as hovercraft go, but this refers to wide sweeps rather than G-force turns. Flyers quickly learn to lean hard into turns using their body weight to tighten the pivot point.

One of the most interesting design elements of the Scat II is its bow-high bubble (air cushion) profile—about 1 in. higher in the bow than the stern. This is done to reduce the possibility of plowing in, which occurs when the bow strikes the water.

Other features of note on this easy-to-use machine are 428-cc, 35-hp Cuyuna engine, lanyard stop switch, direct drive (no belts), four cleats and removable gas tank.

### Scat HP

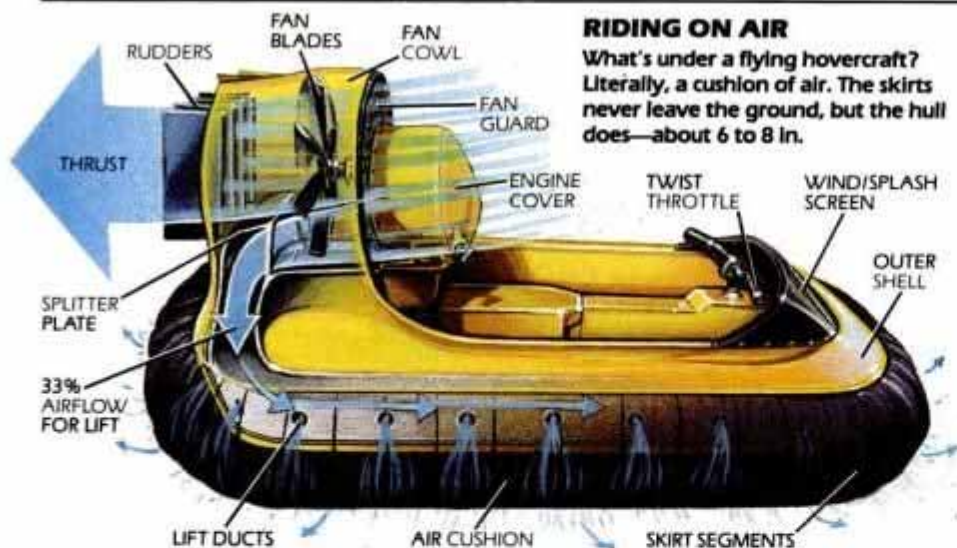
The Scat HP is the Scat II's more powerful brother. Both feature similar hulls, outer shells and standard features, such as Scat's distinctive bow-high bubble and direct drive. The main difference is the torquey 496-cc, 52-hp Rotax engine that powers it to fleet-leading top-end speed and hole-shot times (200-ft. runs begun on water from a dead stop).

If the Scat II is the fleet's superb entry-level machine, the



## RIDING ON AIR

What's under a flying hovercraft? Literally, a cushion of air. The skirts never leave the ground, but the hull does—about 6 to 8 in.



HP is the next logical step up. Increased power makes it an ideal 2-up rider and a jack rabbit in getting over the hump, a term that refers to a water-displacement effect that slows forward progress until the craft climbs over it.

The increased power of the HP adds only 60 pounds, so the responsive machine whips around like a roadster in corners and nails a 180° turn with conviction, a technique for achieving a high-speed stop.

The HP comes with an electric start, digital engine-hour counter, tach, temperature gauge, handrails for the passenger, and a \$7495 price.

## Neoteric Racer

The Racer's similarities to the Scat HP include weight, top-end speed and engine displacement and horsepower, but the differences are striking. It comes equipped with a twin bucket system, unique among the fleet, that neutralizes thrust air by diverting it forward. Close the right bucket, by pressing a foot pedal, and the craft turns right. Close the left side and, well, you get the picture.

By combining bucket action with body English, the Racer becomes a highly maneuverable craft. Close both buckets and it achieves something no other craft can do—reverse.

The Racer is also distinguished by stator blades aft of the fan, electric start, engine-hour counter, temp gauge, tach and fuel gauge.

Strangely, the Racer is the only craft in the fleet to sport a flat air bubble. This means that its bow is closer to the water and more prone to plowing in. It also means it's harder to get over the hump, a fact borne out in its sluggish hole-shot times.

### Hovercraft Plans

If you want to build your own hovercraft, you need look no further than the pages of POPULAR MECHANICS. See "Hot-Rod Hovercraft" (page 92, May '86) for a description of Tri-Flyer, 75-mph multipassenger machine; and "Build Our Air-Cushion Pegasus" (page 62, Jan. '84) for a description of a "flying saucer." Plans for both are featured in PM's Plans And Ideas catalog (\$2 from POPULAR MECHANICS, Box 1014, Radio City Station, New York, NY 10101).

Aside from exposed battery and bucket cables in the cockpit, the Racer is a well-built craft that offers enough challenge and complexity to satisfy intermediate flyers.

## DynaSurf

DynaSurf is a prototype—literally the No. 2 vehicle out of R&D—built in Japan by Nimac. Retail craft, which will incorporate many modifications, won't be ready until the fall. But let's look at what's already been achieved.

DynaSurf sports the fleet's largest body and biggest engine, a 600-cc, 81-hp Kawasaki 4-stroke. Enormous power gives it tremendous stability and 2-up riding capacity.

But the added power doesn't fully compensate for the increased weight (fleet-leading 585 total pounds). Greater mass generates greater momentum. Consequently, DynaSurf's turning radius and stopping time (in a 180° spin) are the longest in the fleet.

Other problems to be addressed in future models are frequent engine breakdowns (probably due to insufficient marinization), overly long bow skirt segment (tearing means complete loss of bubble), clumsy side-to-side handlebar steering (instead of a joystick), and flimsy skirt material.

On the upside, this is the fleet's quietest machine, due to stators and acoustic holes in the fan cowl. Other noteworthy features are handrails for the passenger, electric start and ability to use unmixed, regular gas.

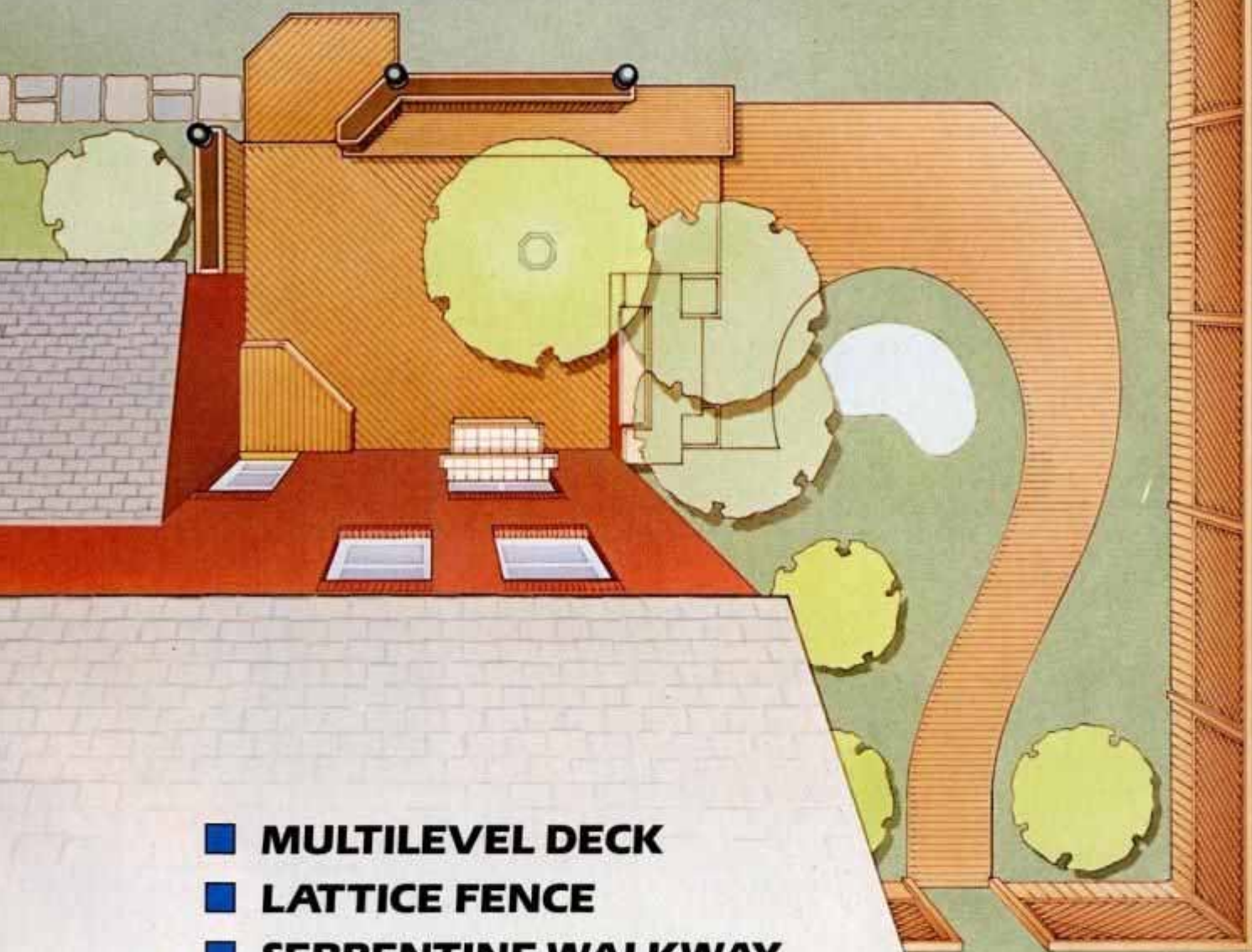
The test team looks forward to coming advances in the DynaSurf and the rest of the fleet. To our newly educated eye, Scat seems to have put the most R&D effort into perfecting a reliable, user-friendly craft. Neoteric seems to be aiming for a sophisticated, high-tech approach. DynaSurf seems to be seeking stable 2-up riding and high-performance power. **PM**



SPECS AND DIMENSIONS					TEST RESULTS			
MANUFACTURER MODEL/PHONE	ADDRESS	LENGTH/WIDTH WEIGHT/FUEL	ENGINE cc/hp	PRICE AS TESTED	AIR CUSHION HEIGHT (in.)	TOP END SPEED/COMMENTS	HOLE SHOT 200-FT./COMMENTS	HANDLING/COMMENTS
<b>Scat HP</b> (305) 274-SCAT	10621 N. Kendall Dr. Miami, FL 33176	9'6" x 6'2" 390 lb./6 gal.	Rotax, electric start 496 cc/52 hp	\$7495	8.36" avg., 1.25" higher in bow	39.5 mph wants to fly	8.49 sec., high bow and torquey engine defeat hump	True tracking in straightaways, like a roadster in turns
<b>Neoteric Racer</b> (812) 234-1120	1649 Tippecanoe St. Terre Haute, IN 47807	11'6" x 6'8" 390 lb./6 gal.	Fuji, electric start 438 cc/50 hp	\$9996	6.25" avg., flat bubble bow to aft	39 mph, stators increase thrust efficiency	11.55 sec., low bow makes it harder to climb hump	Buckets add maneuverability, tracks well in wind
<b>Scat II</b> (305) 274-SCAT	10621 N. Kendall Dr. Miami, FL 33176	9'6" x 6'2" 330 lb./6 gal.	Cuyuna, pull start 428 cc/35 hp	\$4995	7.31" avg., 1 in. higher in bow	35.5 mph, sprightly for small engine	8.92 sec., bow-high profile helps over the hump	Predictable, responsive, least intimidating
<b>Nimac DynaSurf</b> (516) 434-1580	180 Adams Ave. Hauppauge, NY 11788	12'7" x 4" 585 lb./6 gal.	Kawasaki, electric start 600 cc/81 hp	\$9995	6.25" avg., 1 in. higher in bow	38 mph, future prototypes will probably be faster	9.84 sec., although heavy, bow-high profile helps	Good for 2-up riding, but handles like a limo

# OUTDOOR STRUCTURES

Four Great Ways To Improve Your Property



- MULTILEVEL DECK
- LATTICE FENCE
- SERPENTINE WALKWAY
- PLUS:** OUTDOOR BUFFET

# FULL DECK

A new deck design with all the trimmings. Adapt it to your home and build it yourself.

BY EUGENE AND ELIZABETH THOMPSON

**O**NE OF THE great advantages of owning a home is owning the space around it. Let's face it, whether your house is on a postage-stamp lot or a multiple-acre estate, if it weren't for this space, your house wouldn't be much more than a condo.

Think of the space around your house as an outdoor room. A room where fences mimic walls, the floor transforms from stable deck to undulating lawn, halls are interpreted as tasteful walkways, and the ceiling, of course, is only limited by the sky above—a defined area that accents the natural environment while acting as an extension of the household living space.

This is the outlook that inspired the deck design, featured here, and the fence, walkway and outdoor buffet ideas that follow. All of the projects are built with pressure-treated lumber. Where screws are specified, we used Fastap Plus screws. These have a special Dacrotized coating and an innovative auger tip for fast installation with a powerdriver and Phillips-head bit. For more information on these screws, contact Fastpac, Inc. at 17903



Entrance to the deck area is by way of a spacious lower platform. A similar unit on the main deck affords easy access to the house.

Arenth Ave., City of Industry, CA 91748. As an alternative, you could use galvanized drywall-type screws.

While the deck that we built was created to complement our specific home, the basic design could be adapted to any situation. Rather than make drastic changes to our backyard, we designed our deck to incorporate existing trees and shrubs and wrap around our masonry barbecue.

When planning your deck, first make a scale drawing on graph paper. Incorporate the features that suit your needs and dimension the deck appropriately for your space. Don't forget to lay out your lighting and outlet requirements and plan to use dedicated circuits with GFCI (ground fault circuit interrupter) breakers. Check with your local building inspector to see if your ideas conform to the building code and then create a list of materials. Also, before you begin, note that all of the deck and planter trim pieces are rounded on the upper outside corner. You should form these edges with a router and 1/2-in.-rad. bit before cutting the stock to exact length.

## Setting the posts

First, drive stakes at the deck corners and use mason's line to indicate the perimeter. Determine that the layout is square by checking the corners as follows: Measure 3 ft. out from the corner along one edge and 4 ft. along the adjacent edge. The distance—on the diagonal—between these two points should be 5 ft.

Then, build batter boards outside and parallel to the deck perimeter, for aligning the posts. Batter boards are long boards nailed to stakes driven squarely into the ground. On the boards, lay out the position of each 2x8 that will be carried by a post. Determine the post positions by running

mason's line from the batter boards to corresponding beam positions marked on the house.

Dig roughly 8-in.-dia. post holes to below the frostline. The in-ground planter is constructed around doubled 4x4 posts so these holes will have to be larger. Secure the doubled posts together with 1/4-in.-dia. x 6-in. lag-screws.

Lay about 4 in. of gravel in all the holes, insert the posts and brace them





to stakes driven in the ground. Double check that they're plumb, square and aligned with the mason's line. Then, pour the concrete, sloping the top surface to shed water.

### The in-ground planter

Once the concrete has set around the doubled posts, remove the braces and trim the posts to  $\frac{3}{4}$  in. less than the total planter height. Use 3-in. screws to fasten a 7-in.-long 2x4 cleat to the in-

side face of each post. Then, fasten the planter bed 2x4s to the cleats and bore the drain holes as shown.

If you're installing a light in this planter, secure the junction box to the post and above the bed. After the planter is finished, install a partition that separates the box and fixture from the main planter bed area. Run enough wire from the box to connect to the rest of the planned lighting circuit. Sheath the planter sides with

horizontal 1x6 boards secured with 2-in. screws.

Miter the top 2x4 trim exactly to length and secure with  $1\frac{1}{2}$ -in. lag-screws driven from the inside of the 1x6 boards. Then, add 4-in. galvanized corner braces to keep the corners tight. Install the vertical 1x4 boards as shown on the drawing. Leave a  $\frac{1}{4}$ -in. gap between each board and the next, and between the board ends and the trim.

# OUTDOOR STRUCTURES

## Framing the main deck

Use a chalkline to mark a level line on the house wall that indicates the top of the deck. Measure 1½ in. down to find the ledger position. If your house has wood siding, install metal flashing under the siding and bend to lie on top of the ledger edge. Cut the 2x8 ledgers to length and secure them to the house with lagscrews and washers.

If you're fastening to a masonry wall, first install expansion shields of an appropriate size for the lagscrews. Bore the anchor holes with a carbide-tipped bit and tap the anchors in place with a hammer. Once the ledgers are secured, transfer the framing positions to them. The short-wall ledger in our installation is lagscrewed to the in-ground planter as shown.

Clamp the main support beams to the posts, check for level and secure them to the ledger with galvanized joist hangers. Lay a straight 2x8 across the beams to ensure that they lie on the same level plane. Then, clamp in place the shorter beams that extend from the midsection of the deck. Secure beams to posts with ¾-in.-dia. × 8-in.-long carriage bolts, washers and nuts.

Use joist hangers to install the 2x6 and 2x8 joists that fit in between the beams. We used 2x6 stock to create a square frame around the tree. Mark and cut the bench posts 15½ in. above the framing and the planter posts 36 in. above the framing. The posts at the midsection are cut flush. Complete the main deck framing by installing the angled 2x8 joist that fits between the planter end posts as shown. Lay out and install any additional wiring and junction boxes according to your layout.

Next, frame the lower platform 4 in. below the main deck using 2x4 stock. Use a line level to transfer the platform frame height from the main deck to the platform posts. After the framing is done, cut the posts flush with the 2x4s.

## Laying the deck

Begin by laying diagonal 2x4s on the lower platform starting with the piece adjacent to the angled 2x8 joist. Miter one end to fit against the main deck framing and overhang the other end to be cut off when the decking is done. Secure with 3-in. screws. Install the remaining boards leaving a ¼-in. space between each board.

Trim the deck boards flush with the framing. Cut the trim that fits around the platform and continues around the in-ground planter. Miter all corners and install with 3-in. screws.

Before laying the main deck boards, install the 2x4 trim that runs

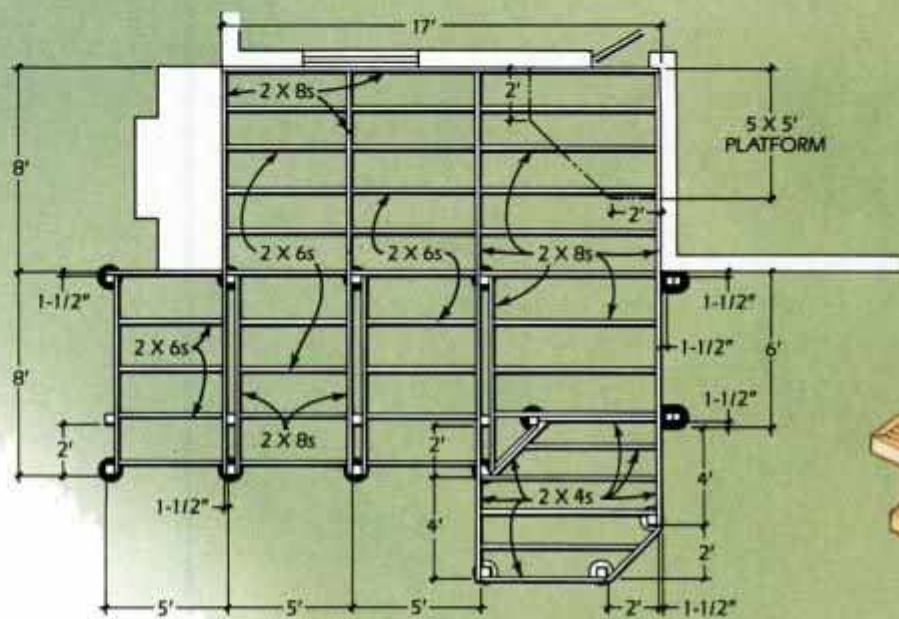
along the front edge of the deck so that it protrudes 1½ in. above the framing. This serves as a stop for the angled deck boards that can't be trimmed later due to the posts.

When laying the deck boards, plan any necessary joints to fall on the framing and stagger joints in adjacent rows. Where we decked around the existing tree, the hole was cut in an octagonal shape. When the decking is complete, cut the board ends flush with the perimeter framing and install the remaining 2x4 trim.

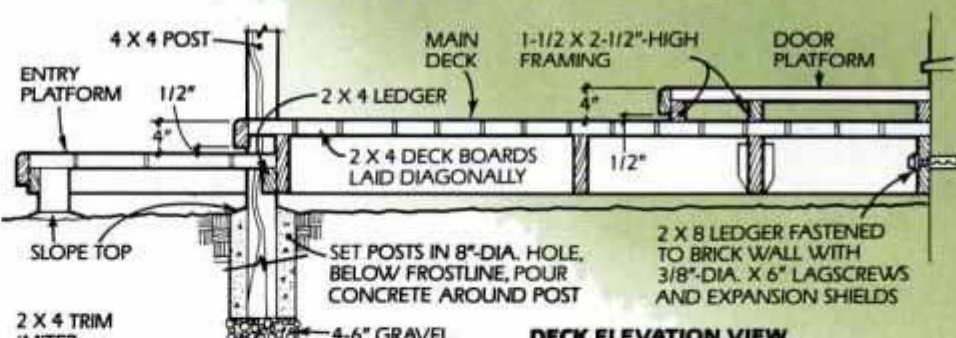
The 4-in.-high entry door platform is framed with 2½-in.-wide stock ripped from 2x4s. Secure it to the deck as shown, lay the deck boards and install the trim.

## Building the bench/planter

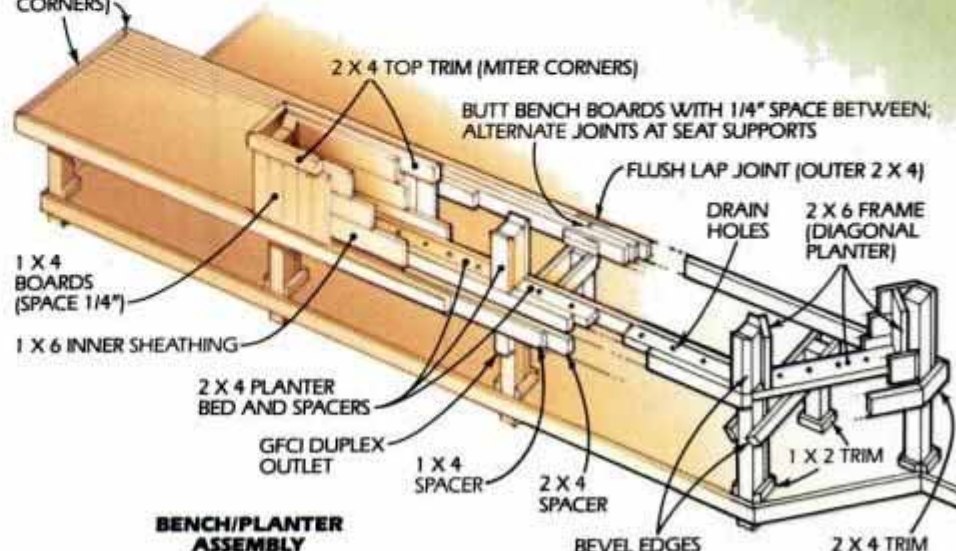
Cut the 2x4 bench supports as shown in the drawing. Clamp the first pair in place so the top edges are ¼ in. above the bench post top and the pieces are level. Secure with two ¼-in.-dia. × 7-in.-long carriage bolts per post. Install the remaining supports in the



POST AND FRAMING LAYOUT



DECK ELEVATION VIEW



BENCH/PLANTER ASSEMBLY

same way, checking that they're all on the same level plane. Bevel the seat support adjacent to the angled section. Next, install the 2x4 spacer that rests on the seat supports on the side of the planter opposite to the bench. The end that joins the angled planter section is trimmed at 45° and the other end is flush with the last post. Install a second 1x4 spacer directly on the 2x4 in the same way.

Install two similar horizontal spacers, one on each side of the main planter section and 3/4

in. above the first spacer. Cut 2x4 stock for the long planter beds. Bore 1/4-in. drainage holes and secure the beds between the spacers with 3-in. screws.

We then mounted the junction boxes for the lighting. The wiring runs up the inside face of the posts and is covered by 2x4 stock with a channel cut along the centerline. The wire is routed to the box via holes bored in the posts as shown.

Cut and install the six vertical spacers, two per post, on the long planter section. Miter the top ends and bevel the edges of the pair adjacent to the angled planter section. Frame the an-

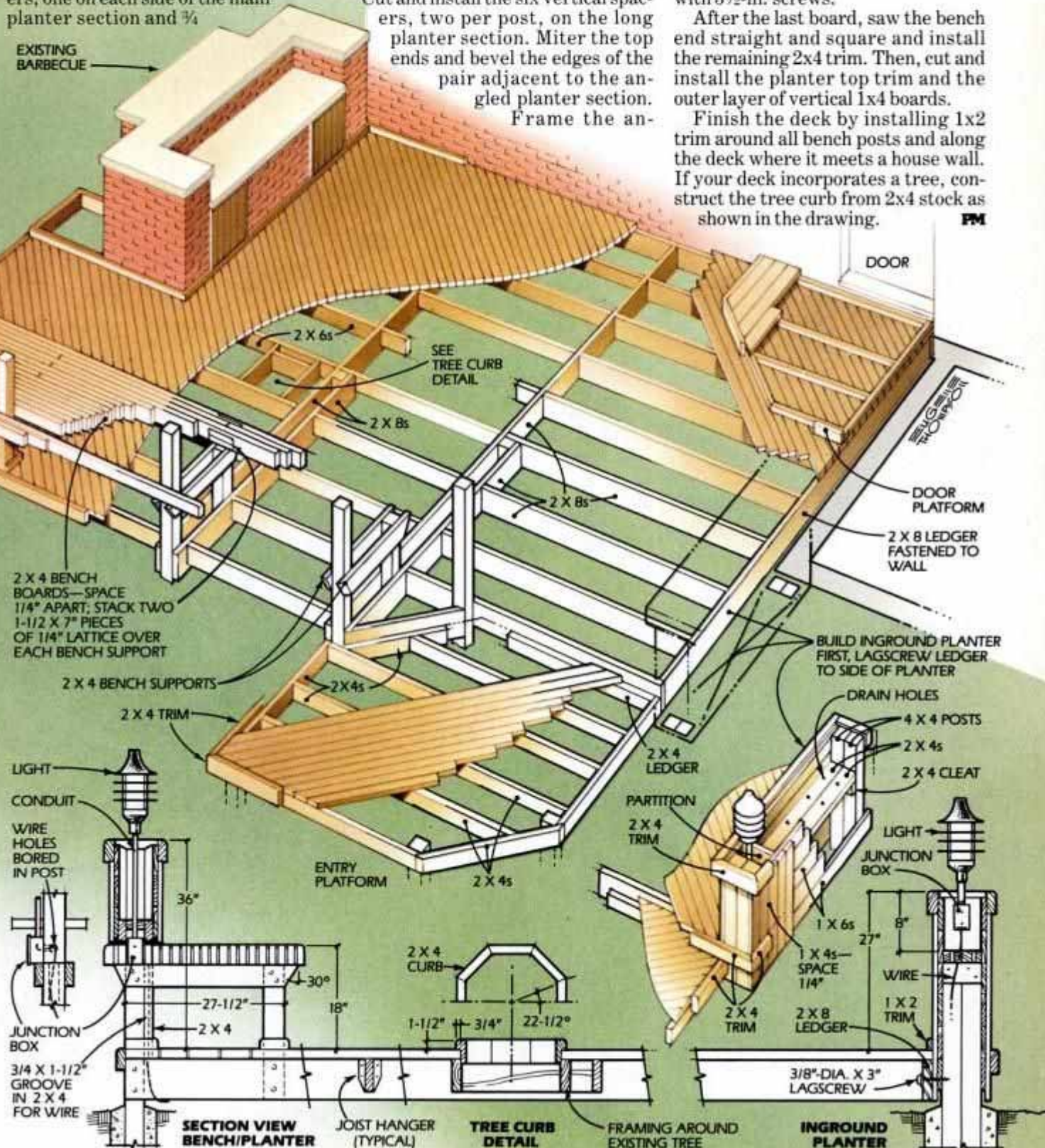
gled section with 2x6 stock, carefully fitting the bed around the posts and securing with screws. Then, sheath the planter with 1x6 boards.

Before installing the bench boards, secure the outside section of 2x4 trim to the 1x4 spacer. Then, begin laying the 2x4 bench boards spacing them with 1/4-in.-thick x 8-in.-long strips of lattice. Stack two strips edge to edge between the boards over each support. Fasten each board to the last with 3 1/2-in. screws.

After the last board, saw the bench end straight and square and install the remaining 2x4 trim. Then, cut and install the planter top trim and the outer layer of vertical 1x4 boards.

Finish the deck by installing 1x2 trim around all bench posts and along the deck where it meets a house wall. If your deck incorporates a tree, construct the tree curb from 2x4 stock as shown in the drawing.

PM



# PRIVATE DOMAIN

Make the back forty your own with our easy-to-build sectional fencing system.

BY EUGENE AND ELIZABETH THOMPSON

**I**F GOOD fences make good neighbors, then we have the solution for making your neighbors the friendliest people around. Our 6-ft.-high fence adds just the right level of privacy to an outdoor living space.

The fence is composed of 4x4 posts that support light and airy lattice panels. The lattice is available at building suppliers in a standard 4x8 panel size. Like the rest of the lumber that we used, it comes pressure treated for long life. Beneath the lattice is a skirt of vertical 1x6 boards that makes an ideal backdrop for a decorative border of flowers.

To make the gardening chores easier, we installed 2x4s around the flowerbed area. This keeps the lawn at bay and, because the 2x4s are pressure treated, you'll never have to worry about deterioration.

The main fence and border components are secured together with steel framing connectors. We used Teco Ty-Plates for the flat connections and Teco framing angles where the borders join the posts. Use galvanized drywall screws or the Fastap screws mentioned in our deck story to join all members.

## Planning your fence

First, use graph paper to make a scale drawing of the area to be fenced in. Divide each straight run of fence into equal segments of 96½ in. or less. This dimension is derived from the standard 8-ft. lattice panel length—the extra ½ in. is for clearance and makes the installation easier.

To start construction, drive a stake at the ends of each run of fence. Stretch a string between them along the fence line and measure off the post positions. We used 8-ft. posts set into 2-ft.-deep holes. A posthole digger, available at most equipment rental dealers, makes the job easier. Dig the holes 4 to 6 in. deeper than required

and add gravel to bring the hole to a 2-ft. depth. Then, cut a notch in the top of each post to accept the 2x4 top rail as shown in the drawing.

Insert a post into the first hole. Adjust the height by trimming the post bottom, or removing or adding gravel. Secure two diagonal braces—one

at right angles to the fence and one in line with the fence—to stakes driven into the ground. Adjust the braces so the post is plumb. Place the braces on the outside of the fence so they won't be in the way when the skirt and the top rails are installed. Install the remaining posts in the same way using a line level to adjust each post to the height of the first.

Cut the 2x4 top rails to length so the joints are centered on the posts. Temporarily clamp the rails in place and double check that the fence is straight. Then, backfill the holes, firmly tamping the soil with a heavy steel bar. Secure the top rails with 3-in. screws and reinforce end-to-end joints with framing plates as shown.

Next, attach the cap rail to the top rail with 3-in. screws on 16-in. centers. Use 20d galvanized nails where the cap rail joins the post tops. Bore nail pilot holes to prevent splitting.

## Building the skirt

First, secure the 43½-in.-long 2x2 nailers to the posts flush with the in-



PHOTO BY HUMPHREY SUTTON



side post faces. Butt the top ends against the top rail—the bottom ends indicate the height of the skirt.

Carefully measure the exact distance between the posts and cut pairs of 2x4 rails to fit each section. If your ground is level and straight, simply secure 20-in.-long 1x6s to the rails with 1½-in. screws as shown in the drawing. If your ground varies between the posts, or if it slopes slightly, cut each board to conform to the ground leaving a 2-in. space between the board and the ground. Then, attach the skirts with the framing plates as shown in the drawing.

### Installing the lattice

Cut each lattice panel to ½ in. less than the distance between the posts. Position the lattice on top of the 1x6 skirt boards and clamp in place. The lattice is attached with 1¼-in. galvanized finishing nails. Bore pilot holes for nailing the lattice to the top rail, 2x2 nailers and top rail of the skirt. Then, secure the lattice.

The trim that surrounds the lattice is made from 1½-in.-wide strips ripped from 1x6 pressure-treated boards. Miter to exact length the 1x2 trim stock that frames the lattice. Install the trim with 2-in. screws on 12-in. centers. Bore and countersink all screw pilot holes to avoid splitting the wood.

### Flowerbed border

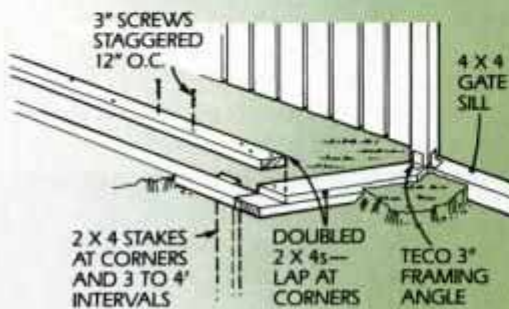
To lay out the border, run a string parallel to the fence to indicate the inside edge of the bed. Where the fence

has an opening or gate, run a string diagonally to the gate post. Then, remove the sod to make a 3½-in.-wide trough along the border line. Dig away enough soil so that a 2x4 will lie flush with the surrounding grass.

Dig roughly 16-in.-deep holes spaced at 3- to 4-ft. intervals along the flowerbed line. Install pressure-treated 2x4 stakes in the holes and check that the stakes are on a straight line. Use a scrap piece of 2x4 laid in the trough to mark the exact stake height, cut the stakes to length and install.

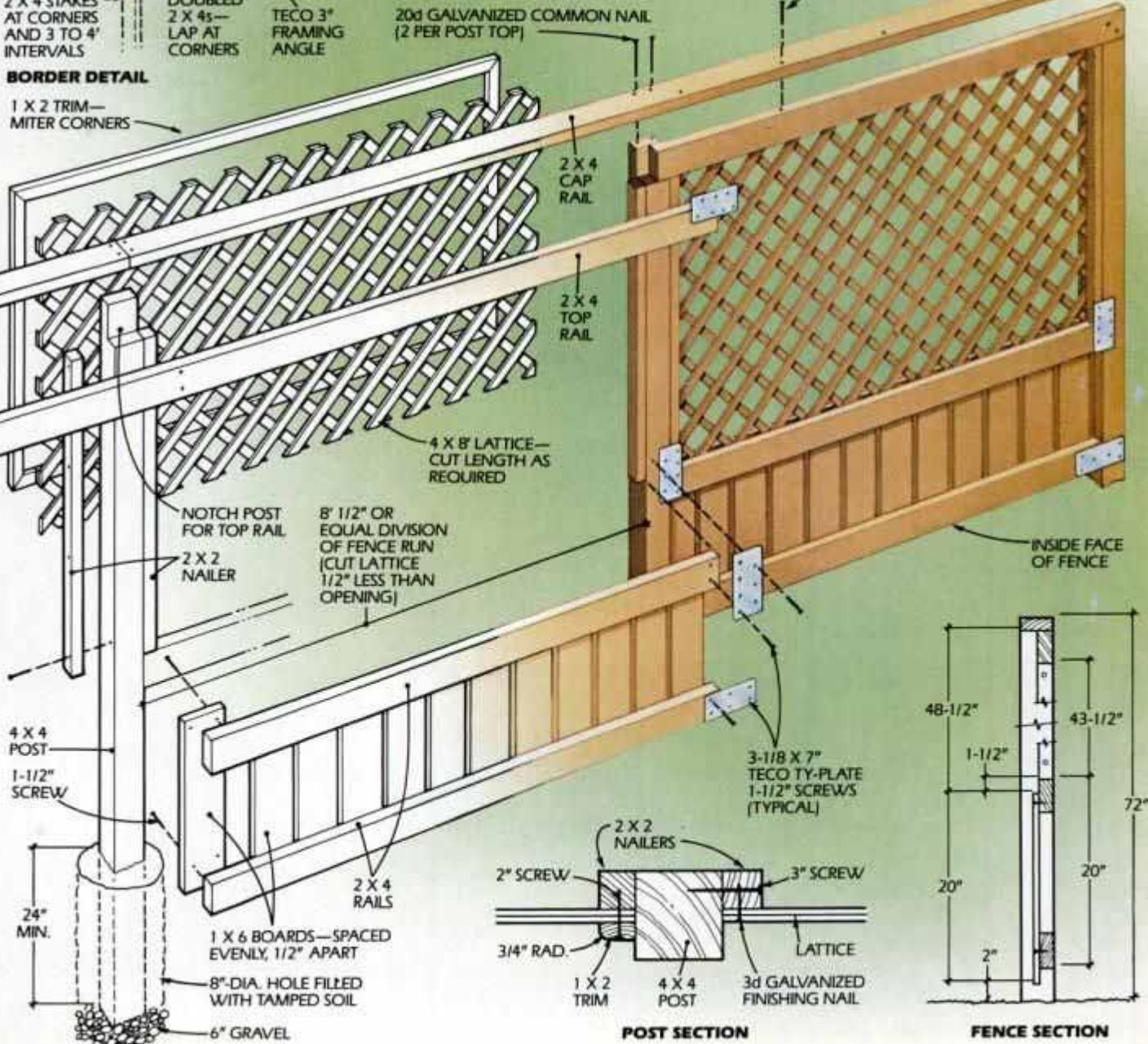
Cut the border 2x4s to fit and secure the bottom layer to the stakes with 3-in. screws. When installing the top layer, lap the joints as shown in the drawing. Connect the border to gate posts with framing angles and 1½-in. screws.

FM



### BORDER DETAIL

1 X 2 TRIM—MITER CORNERS



POST SECTION

FENCE SECTION

# GARDEN PATH

An easy-to-build walkway that leaves the straight and narrow behind.

BY EUGENE AND ELIZABETH THOMPSON

**T**HERE'S a reason why back country roads are never straight. They evolved from paths and trails that conformed

to the natural topography and landscape. If your backyard is like ours, it, too, has its own geography. And, the route from your back door to the driveway or street may be anything but straight.

Our serpentine walkway is designed to follow the natural path through our yard. Although your backyard may have a different shape and its own unique features, the principle is the same. Even if your space is plain and unlandscaped, designing and building a curved walkway like this may set the theme for future outdoor projects that are sure to make your yard a garden of delights.

This walkway is actually more than a simple path. In our design, it wraps around a rock garden and small pond as it joins the main deck. At this point it widens and becomes a small, low-level deck in its own right.

## Planning the walkway

First, lay out your house and yard on graph paper. Then, add the walkway, adjusting the shape as necessary until it suits your requirements. If your design includes trees or shrubs, plan the framing that surrounds these fixed features as shown in the drawing on page 92.

Working from your scaled layout, determine the distance of the curved walkway at various points from a fixed yard feature such as a house wall or fence. Then, from the corresponding points on the actual wall or fence, measure out the appropriate distances taken from your layout and drive stakes at these points. Run mason's line between the stakes and rough out the actual curve by spreading a line of garden lime on the ground. Walk the area to get a feel for the space. When you're satisfied, it's time to start building.

## Building the framework

The majority of the walkway is framed on 4x4 sleepers that rest on 4x4 posts cut nearly flush to the ground. The postholes are dug at least 2 ft. deep with gravel at the bottoms



Edges of the walkway (above) are capped with edge banding to conceal the deck board ends and highlight the curve. Gravel next to walkway makes lawn maintenance easier. The overall shape of the walkway is determined by yard and landscaping features such as a rock garden (below).



PHOTOS BY HUMPHREY SUTTON



for drainage. The actual height of the posts will depend on any irregularities in the ground level.

If your walkway will be attached to a main deck, as ours was, support this end using a 2x4 ledger lagscrewed to the deck beam. The ledger is placed 5½ in. below the level of the main deck. On our layout, this ledger extends beyond the walkway and begins the framing around our masonry barbecue. The outboard end of the ledger is screwed to a post that's flush with the top of the ledger and in line with the barbecue as shown.

After laying out the position of this post, measure 6 ft. out from the main deck and install the next set of posts. We then completed the framing back to the main deck and barbecue using 2x4 stock and a 4x4 sleeper for supporting the beginning of the curved

walkway edge. Use expansion shields and lagbolts where the framing joins masonry. We also installed the framing around two trees in preparation for decking and to support the tree curb as shown.

Continue to install posts at 6-ft. intervals, following your layout and using our design as a guide. Use mason's line stretched between each post position to determine the height of the posts. Double check that the post tops lie on a uniform plane with no bumps or irregularities. Lay 4x4 sleepers on the posts, perpendicular to the direction that the planking will be laid. Secure them to the posts with framing plates such as Teco Ty-Plates.

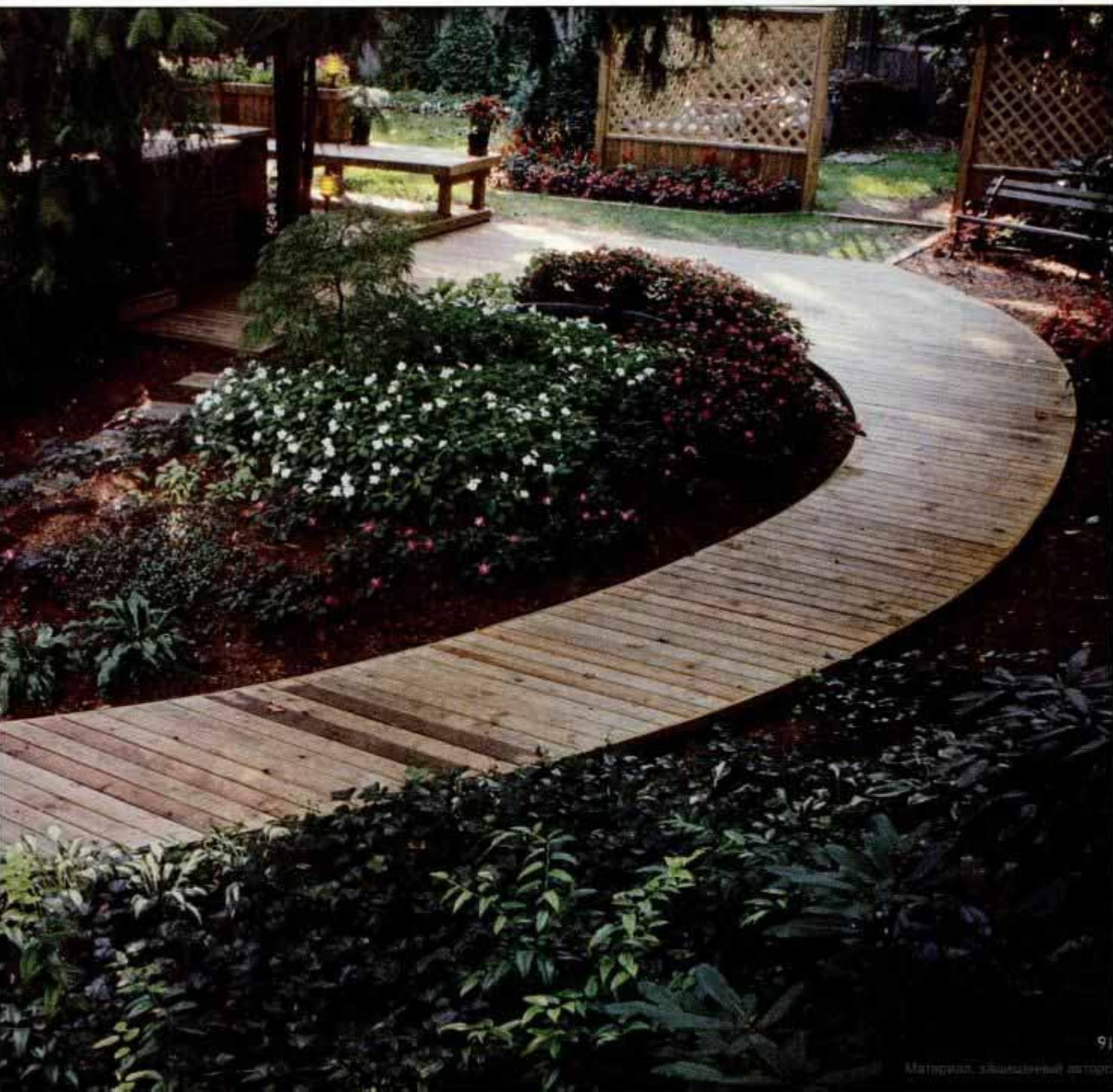
Where necessary, frame between the posts and sleepers with 2x4 stock. Space the 2x4 framing that's at right angles to the decking on 2-ft. centers.

Use 3-in. screws to secure the 2x4 framing.

### Laying the deck

After the framing is complete, begin cutting 2x4 stock to length for the deck. Plan the joints to fall on the 4x4 sleepers and stagger the joints between adjacent rows. Use 3-in. screws to install the boards and maintain a ¼-in. space between the 2x4s. Allow the decking to overhang the intended curved edges of the walkway about 12 in.

To lay out the actual curved cutting line, we used ¾-in.-dia. flexible PVC pipe bent to the desired curve. Pipe connectors allow you to lay out a curve as long as necessary. The pipe is held in place at the walkway ends with shims wedged between the deck boards. As you bend the pipe in place,



# OUTDOOR STRUCTURES

insert wedges where necessary to bring the curve to the desired shape. When you're satisfied, trace the curve with a soft-lead pencil and remove the PVC pipe.

Use a heavy-duty sabre saw or reciprocating saw to cut the decking to the curved line. Then, remove any irregularities on the curved edges with a belt sander.

## Banding the edges

To give the curved edges a neat appearance, we applied a banding of pressure-treated wood as shown in the drawing. It's applied in two layers to make the bending easier. Rip 1x6 stock to make 1½-in.-wide strips. Then, use a table saw to resaw the

strips in half giving ¾-in.-thick × 1½-in.-wide banding stock.

Apply the first band layer with 1½-in. galvanized finishing nails keeping any joints centered on a 2x4 end. Then, install the outer layer with 2-in. finishing nails. Keep the rough-sawn surface in and join pieces at least 16 in. from a first layer joint.

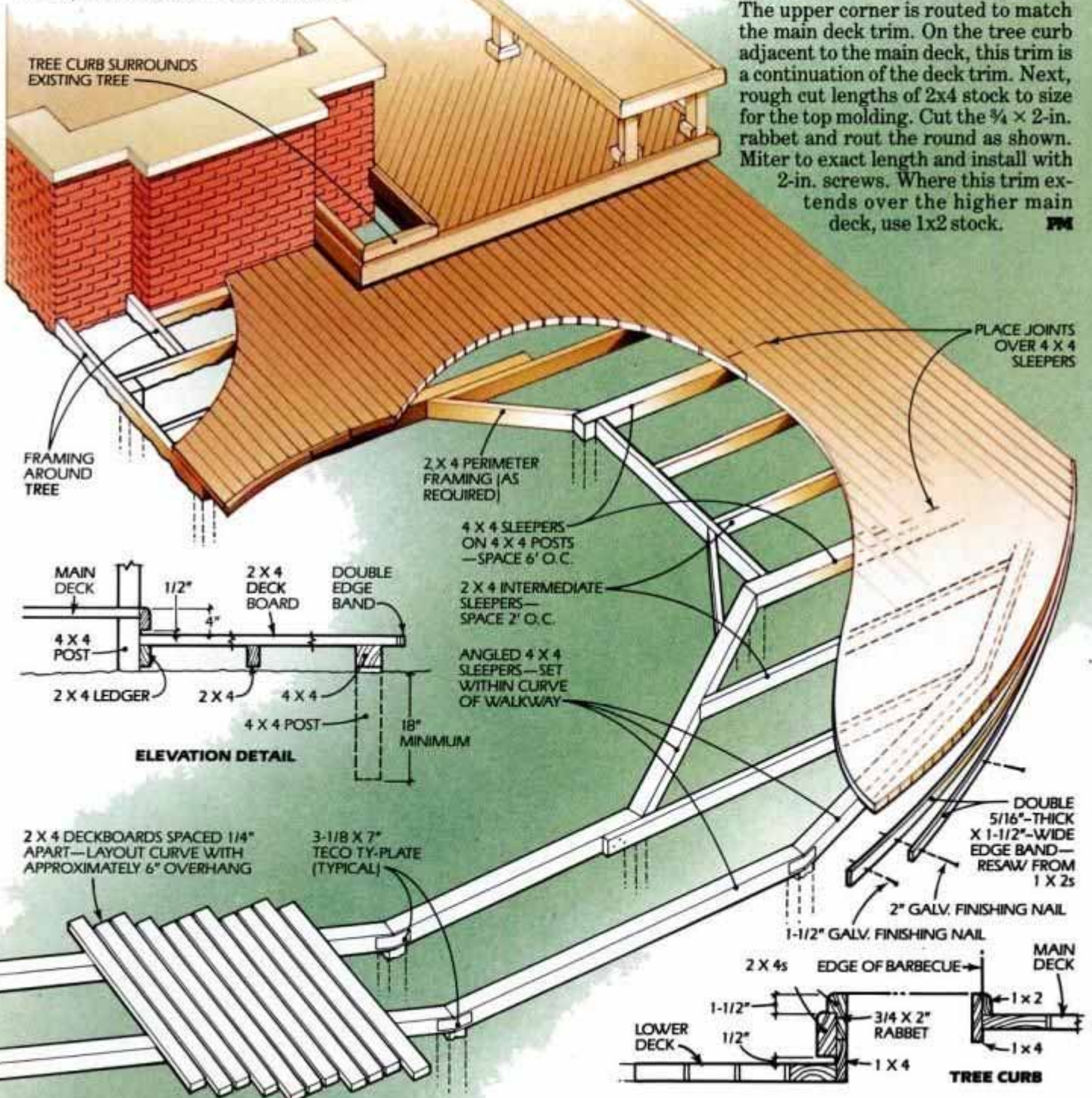
Try to avoid placing the joints where the curve changes abruptly—the ends of the banding will be

easier to secure on the flatter parts of the curve. Sand the banding and gently round the corners.

## Building the tree curb

This feature highlights the area around the trees and visually ties the walkway to the main deck. Begin by installing 1x4 boards inside the perimeter of the framing with 2-in. screws. Where one side of the tree curb abuts the main deck, attach the 1x4 so it protrudes 1½ in. above the deck. On the walkway level, align the bottom edge of the 1x4 flush with the underside of the walkway deck.

Then, miter 2x4 stock to be secured ½ in. above the deck and to the 1x4 frame as shown in the tree curb detail. The upper corner is routed to match the main deck trim. On the tree curb adjacent to the main deck, this trim is a continuation of the deck trim. Next, rough cut lengths of 2x4 stock to size for the top molding. Cut the ¼ × 2-in. rabbet and rout the round as shown. Miter to exact length and install with 2-in. screws. Where this trim extends over the higher main deck, use 1x2 stock. **PM**



# BONUS BUFFET

Our super buffet brings kitchen counter convenience to the great outdoors.

BY EUGENE AND ELIZABETH THOMPSON

**W**E LOCATED this buffet beneath our wide kitchen window so food and utensils could be passed easily from the kitchen to the deck area. It serves as a central space for food preparation and contains the switch for our outdoor lighting and two outlet receptacles.

To build the buffet, first cut and assemble the 2x6 base as shown. Attach the 2x2 trim to the base front and sides. Then, cut and install the 1x6 floor boards leaving a 1/4-in.-wide space between each board. Bore any necessary holes for wiring.

Next, cut the top and bottom 2x4 side frame members to the exact width of the frame. Cut the side frame members 1 in. shorter than the height of the frame. Use a table saw to create a 1/2-in.-deep x 1-in.-wide rabbet on both edges of each piece. Cut a 1 1/2-in.-wide rabbet on the ends of the top and bottom pieces and assemble the frames as shown. Cut the 1/2-in. plywood panels to size, make any necessary cutouts for electrical boxes, and bore holes for the wire that passes through the frame. Then, install the inside panels and secure the end assemblies to the base with lagscrews. Run the wiring, secure the boxes and install the outer panels.

Cut the pieces for the 2x4 top frame. Notch the ends of the front piece, as shown, and assemble. Toenail the top frame to the side assemblies and install 1x6 boards along the buffet back as shown. Leave a 1/4-in. gap between the boards. Then, install the 1x4 boards over the sides in the same way. Rip 1x6 stock to 4 1/2 in. wide for the vertical front facing boards, cut to length and secure with 2-in. galvanized finishing nails.

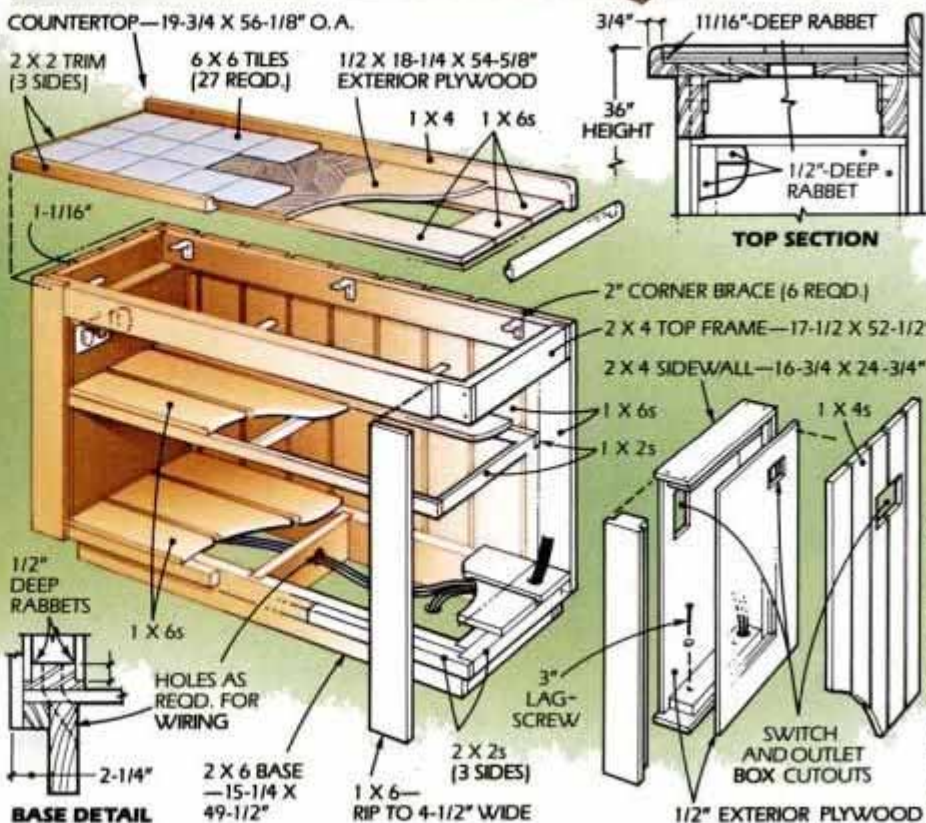
Use 2-in. corner braces to attach the 1x6 boards to the top frame. These boards act as a base for the buffet top. Then, cut and screw in place the 1/2-in.-thick plywood top. Rabbet

the 2x2 trim stock and rout the 1/2-in.-dia. round on the outside corner, as shown in the drawing. Miter the trim to fit and install with finishing nails.

To thoroughly seal the plywood before installing the tile, apply a marine epoxy to the top. After it has cured, trowel on the tile adhesive following the manufacturer's instructions and lay the 6 x 6-in. tiles in place. Prepare the tile grout with an acrylic extender suitable for wet conditions and available at your tile dealer. Float the grout in all joints. As it dries, wipe away the excess with burlap or other coarse cloth. After the grout has dried for two or three days, apply a silicone sealer to all joints. **FM**



PM PHOTO BY HUMP-REY SUTTON





## FOR THE SAME REASONS NO ONE WOULD PAINT THIS CAR WITH A BRUSH, YOU SHOULDN'T PAINT YOUR HOUSE WITH ONE.

Look what happens when this car is painted with a brush. You get drips, brushmarks and uneven coverage. That's why, when you paint your house, you should use one of the revolutionary new Wagner Power Painting systems.

***We've always been faster. Now we're even better.***

Not only are we up to 80% faster than old fashioned brushes and rollers, but our powerful new forced-air cooled motor creates a finely atomized spray for a smoother, more professional finish. Make quick work of siding, shutters, fences, decks — even wicker furniture.

***No one can match our improved features.***

Our new backpack paint container is perfect for big jobs. And our exclusive new push-button selection of spray pattern widths gives you precise, electronic control.

We even have three different specialized spray tips, including a new

Wide Angle tip for large paint jobs, a new adjustable stain tip for improved performance with oil-based stains, and a durable all-purpose ceramic tip with a lifetime guarantee.



***The best way to paint. Period.***

The new Wagner Power Painting Systems give you faster, more professional results on almost any painting job. So kick the brush habit. There is no better way to paint.

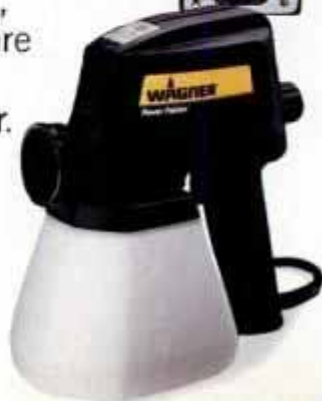
For more information, check the paint or hardware department of your local home improvement retailer.

Push  
button  
electronic  
control



# WAGNER

***Not just a whole lot faster.  
A whole lot better.™***

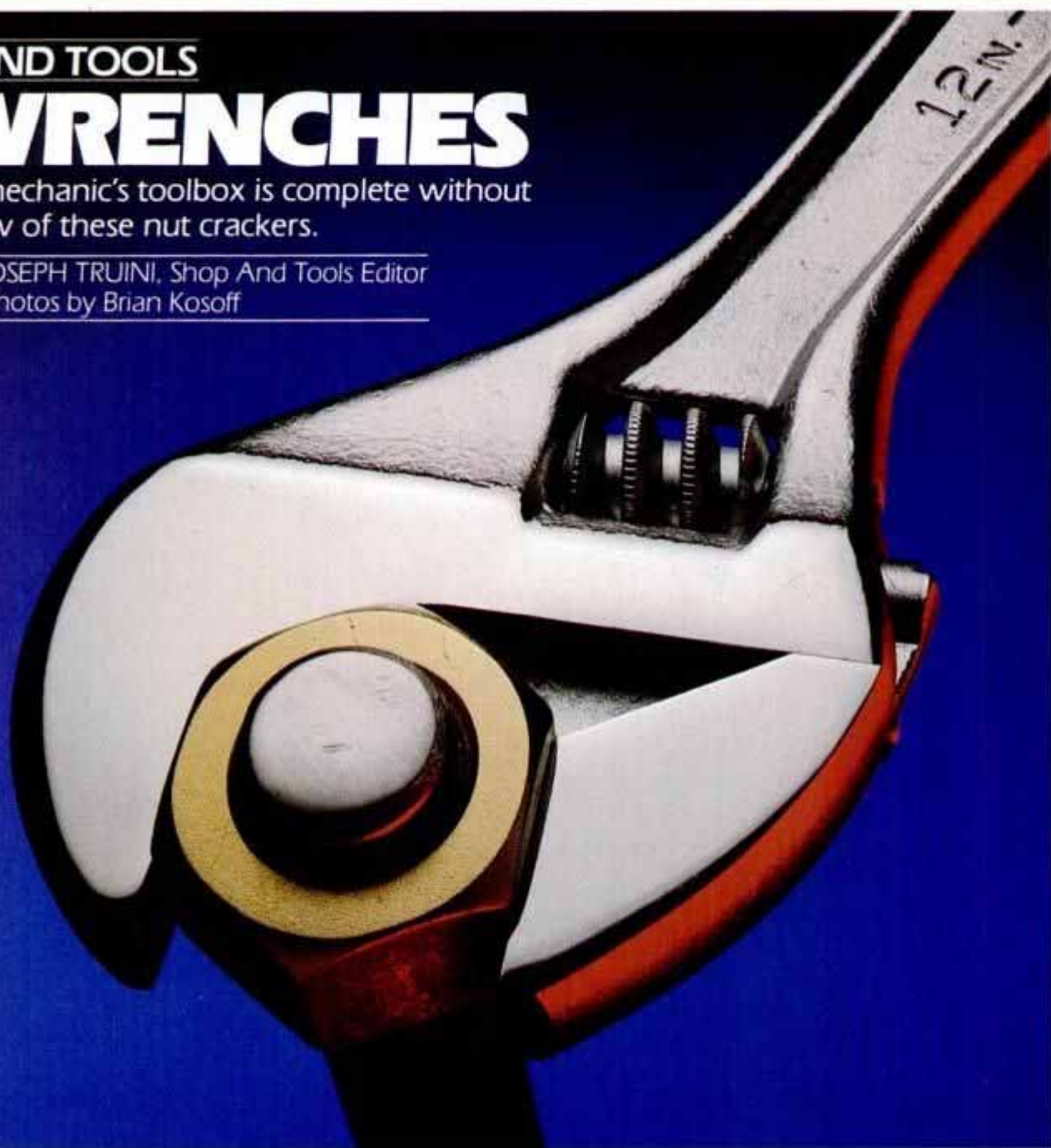


**HAND TOOLS**

# WRENCHES

No mechanic's toolbox is complete without a few of these nut crackers.

BY JOSEPH TRUINI, Shop And Tools Editor  
PM Photos by Brian Kosoff



**W**RENCHES are simple, basic hand tools that enjoy a blue-collar reputation—tough, dependable and hardworking. Generally speaking, the main function of a wrench is to hold, tighten or loosen nuts, bolts, screws and pipes. The adjustable wrench and open-end wrench are the most common types. However, the 15 wrenches shown here represent a small sampling of the wide variety of styles

and sizes available. Note that while some wrenches are good, general-purpose tools, others are designed to perform very specific tasks.

Wrenches are available in both American standard inch and metric sizes. It's also worth noting that wrenches are often more affordable when purchased in sets. For example, at Sears you can get a good starter set of nine open-end wrenches (that's 18 sizes ranging from 1/4 in. to 1 1/2 in.) for

less than \$30. If bought separately, however, these same nine wrenches would cost about \$58.

### Basic wrench rules

To many do-it-yourselfers, wrenches may be more aptly called knuckle busters. If you've ever had a wrench slip while you were pulling on it, you know what we mean. And while it's true that even Mr. Goodwrench has probably scratched a knuckle or two,



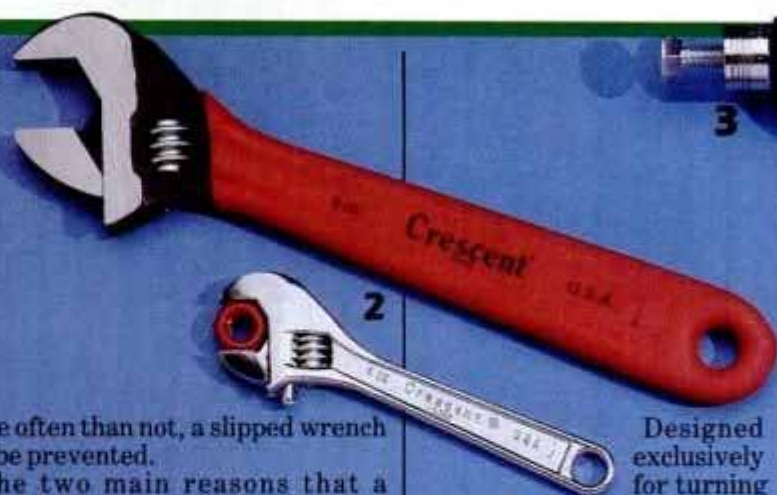
more often than not, a slipped wrench can be prevented.

The two main reasons that a wrench slips is that either the nut is coated with grease, paint or other substance, or an ill-fitting wrench is used. Therefore, the No. 1 rule is to always use the properly sized wrench on a clean fastener. Also, never use an adjustable wrench if you have the right size open-end, or better yet, box-end wrench.

Here are some other wrench rules that will make life easier. When using an adjustable wrench, always pull so that pressure is exerted on the wrench's fixed, upper jaw. Never use a length of pipe on a wrench handle as an extension for extra leverage. Instead, use a larger wrench. To help free a nut or bolt that's rusted, apply penetrating oil to the fastener, wait a few minutes, and then try to loosen it. Never hammer on a wrench.

Ratchet wrenches and sockets are indispensable for many jobs, especially automotive repair. Again, it's economical to buy a basic starter set and then add other sockets and accessories as you need them. Keep the sockets free of grease and oil and clean them regularly with paint thinner. Finally, some wrench handles come with a plastic coating. In most cases, this coating is for comfort only. It is not intended as protection against electrical shock. There are other wrenches and screwdrivers that have a high dielectric insulation on the handle and shaft. However, even this insulation is designed for secondary protection only. Don't depend on any insulated tool to protect you entirely from electrical shock. Now let's take a look at each of the wrenches shown here.

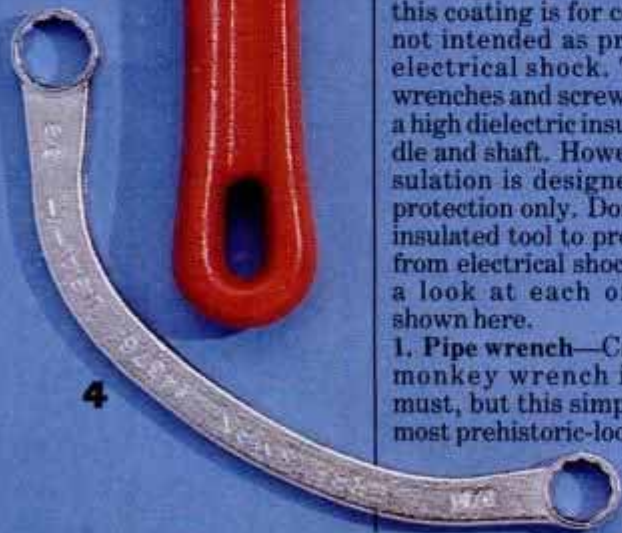
**1. Pipe wrench**—Call it a monkey wrench if you must, but this simple, almost prehistoric-looking tool is a finely engineered, extremely effective wrench.



Designed exclusively for turning and holding pipes and fittings, the pipe wrench is every plumber's best friend. The 18-in. straight pipe wrench shown is made by Rigid (the Cadillac of plumbing tool manufacturers) and it features heavy cast-iron construction, I-beam handle and full-floating hook jaw with spring suspension that grips and releases instantly. The maximum pipe capacity is 2½ in. and it weighs 5¼ pounds. Rigid offers straight pipe wrenches in 10 sizes ranging from 6 in. to (wow!) 60 in. The 18-in. model shown costs \$25.70. For details, contact Ridge Tool, 400 Clark St., Elyria, OH 44035.

**2. Adjustable wrenches**—An invaluable addition to any toolbox, an adjustable wrench provides a wide range of capacity in a single, compact tool. The Crescent adjustable wrenches shown include an 8-in. wrench (\$13.60) that features a black phosphate finish and plastic-coated handle that ensures a good grip even in sweaty, oily conditions. The 4-in. wrench (\$13) represents Crescent's line of chrome-finish adjustable wrenches. This tiny turner has a maximum opening capacity of ½ in. It's also available in 6-, 8-, 10- and 12-in. sizes.

For details, contact Cooper Tools, Box 30100, Marketing Services, Raleigh, NC 27622.







6



7

**3. O-ratchet wrench**—At first glance, this may appear to be a regular ratchet wrench, but look again. The O-Ratchet wrench allows a bolt's shaft—up to  $\frac{7}{16}$  in. dia.—to pass right through its head. This allows you to work on long bolts where a conventional ratchet wrench would bottom out. Other features include alloy steel construction with nickel-chrome plating, contoured handle for increased comfort, thumb-operated socket release button, and a knurled wheel for running nuts on and off quickly. The

pro-quality,  $\frac{3}{8}$ -in.-drive O-Ratchet wrench comes in an 18-piece set—sockets from  $\frac{5}{16}$  in. to  $\frac{3}{8}$  in.—for about \$142. A 19-piece metric set costs \$148.

For details, contact Ravencrest Tool, 1362 Exchange Dr., Richardson, TX 75085. Or, call toll-free: (800) 456-3067.

**4. Obstruction wrench**—Also known as a manifold wrench, this boomerang-shaped box-end wrench is designed for use in tight spots where no straight wrench can go. It has two 12-point openings:  $\frac{5}{16}$  in. and  $\frac{3}{8}$  in., and a matte finish that provides a nonslip grip. It's sold at larger Sears stores and through the current Sears catalog for about \$10. Although it's designed for automotive work, this is a handy wrench for any toolbox. Contact Sears, Sears Tower, Dept. 703-PM, Chicago, IL 60684.

**5. Ratcheting box-end wrenches**—Here are a couple of work-saving tools that combine the supergrip fit of a box-end wrench with the convenience of a ratcheting mechanism. The two Sears tools shown are an offset ratcheting box-end wrench, and

straight ratcheting box-end wrench. The 6-point offset wrench has its ends angled 25° which provides clearance when swinging the handle. It has  $\frac{1}{2}$ -in. and  $\frac{9}{16}$ -in. openings and costs \$6.50. The straight ratcheting box-end wrench shown has two 12-point openings ( $\frac{3}{8}$  in. and  $\frac{7}{16}$  in.) and costs about \$5. Both wrench styles come in sizes ranging from  $\frac{1}{4}$  in. to  $\frac{3}{8}$  in. For details, contact Sears, Sears Tower, Dept. 703-PM, Chicago, IL 60684.

**6. Pocket Socket**—Here's a new version of the old reliable adjustable wrench. Called the Pocket Socket, this versatile 8-in. wrench (\$17) adjusts from  $\frac{3}{16}$  in. to  $\frac{1}{4}$  in. and features a 4-sided, sure-grip jaw. A knurled thumbwheel adjusts the jaw's opening and the pass-through head fits over long bolts and screws. The handle is offset slightly to provide clearance and reduce the chances of skinned knuckles. Also, 10-in. (\$23) and 12-in. (\$30) models are available. Contact Worthington Technologies, 6969-I Worthington Galena Rd., Worthington, OH 43085.

**7. Offset pipe wrench**—As with a standard straight pipe wrench (No. 1), this offset pipe wrench is used to hold and turn pipes and fittings. The unusual offset design—the jaw opening is parallel to the tool's handle—allows you to reach and work in tight, confined areas where,



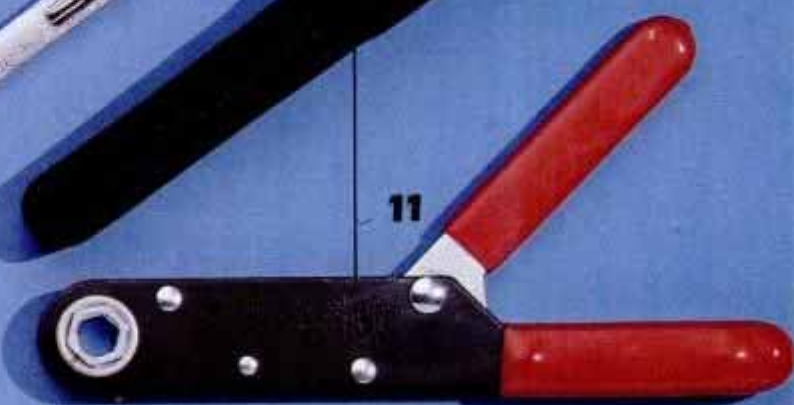
8



9

10

11



# It seems we just a major refinishing



With new Scotchgard™ Wipe On Poly Finish from 3M, you can get the beauty of tung oil and the protection of a polyurethane finish in an easy-to-use, wipe-on formulation. And you get a world of other benefits too.

Because you don't use a brush, you don't get brush marks, bubbles, stray bristles (or the finger prints that come from chasing



stray bristles). All you get is that beautiful, hand-rubbed appearance. And there's no need to re-prepare the surface between coats.

The secret is our patented, ultra-thin formula. This finish penetrates three times deeper than other brands to bond with the wood's natural fibers.

The result is a finished surface that combines the natural beauty of hand-rubbed wood with protection that's superior to

# Just wiped out this problem.



ordinary polyurethanes.

It's a new approach to a tough old problem. And, as good as it is, it's just part of the 3M Wood Refinishing System. From stripping and surface preparation, to finishing and right on through cleanup, 3M is there with the right tools and products to make the job go better—and to make the project look better.



So try new Scotchgard™ Wipe On Poly Finish, Safest Stripper™ Paint and Varnish Remover, and all of the other easy-to-use 3M wood refinishing tools and products on your next project. For the name of the dealer nearest you, just call us toll-free at 1-800-548-6527.

Because this is one finish that's going to rub you the right way.

**3M**

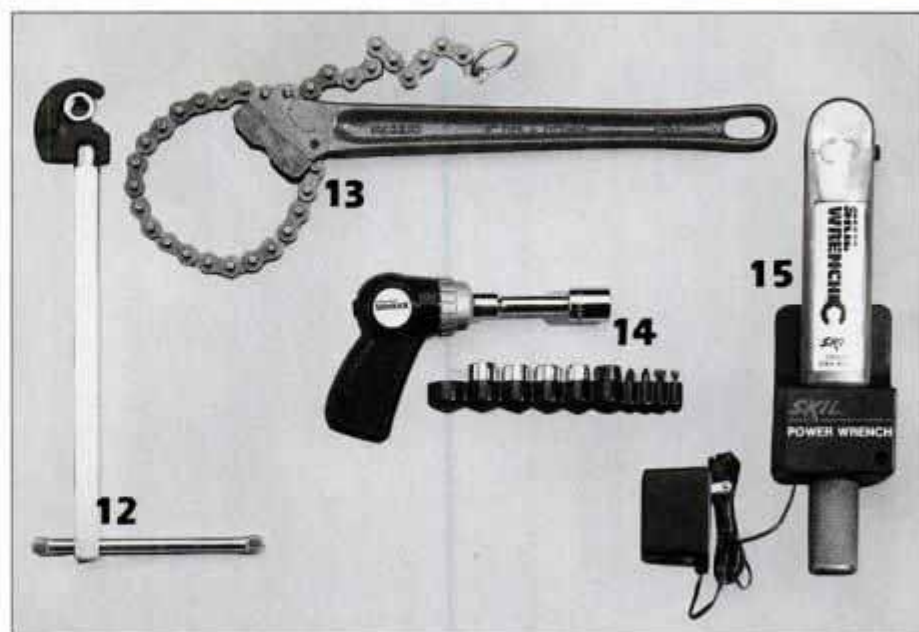
because of the limited space, a straight pipe wrench won't work. The 14-in. wrench shown (\$27.60) has a 2-in. pipe capacity, features heavy-duty, cast-iron construction and weighs 2¼ pounds. Contact Ridge Tool, 400 Clark St., Elyria, OH 44035.

**8. Nut splitter/wrench**—Here's a specialty tool that's really two tools in one. First, it's a heavy-duty adjustable wrench that has superior nut-busting strength. It comes with a flat-tipped carbon-steel grabber bit that's used to loosen stubborn, rusted nuts that no other wrench will even budge. And if that fails, switch to the sharpened splitter bit (shown in wrench) and crack off the nut without ruining the threads. To tighten the splitter/wrench for either turning or splitting a nut, use a ¾-in. open-end wrench fitted onto the hexnut in the middle of the tool. The splitter/wrench accepts nuts up to 1 in. dia. and costs \$16.99 postpaid from Leichtung, 4944 Commerce Pkwy., Cleveland, OH 44128.

**9. Ratcheting pipe wrench**—The Jaws power-grip pipe wrench has two unique features that you won't find on a standard pipe wrench. First, its head rotates a full 360° allowing it to work in tight spots. Secondly, a ratcheting mechanism built into the head speeds tightening and allows the handle to be positioned at any angle to the jaws for the best leverage. The 10-in. wrench has a jaw capacity of 1½ in. and costs \$30. A 14-in. model (\$35) with a 2½-in. capacity is also available. For more information, contact Metwest Co., 1843 Rochelle Dr., San Jose, CA 95124.

**10. Open-end/socket-end wrench**—Here's a winning combination: an open-end wrench and a 12-point socket in one tool. This popular wrench is sold through the current Sears catalog in seven sizes ranging from ⅜ in. (shown) to ¾ in. On each tool, the open-end and socket are the same size. Also, the socket swivels about 115° allowing you to work on awkward, tough-to-reach nuts and bolts. Prices for individual wrenches range from \$9.49 to \$11.79. A 6-piece set costs about \$50. For details, contact Sears, Sears Tower, Dept. 703-PM, Chicago, IL 60684.

**11. Squeeze wrench**—This unique ratchet wrench works without swinging the handle. By simply squeezing together the plastic-coated handles, the socket rotates. The compact, thin-head design and squeeze-ratchet mechanism makes it an ideal tool for working in very tight, close quarters.



To reverse the socket's rotation, just flip over the tool. For final tightening or to loosen a stubborn nut, grip the fixed, straight handle and use it as you would a regular box-end wrench. The Squeeze wrench is sold in a 22-piece kit that includes five standard inch sockets (¼ in. to ½ in.), five metric sockets (9 mm to 13 mm), and two slotted screwdrivers, two Phillips and six hexkey bits with an adapter. It comes in a plastic case and costs \$32.95 postpaid from Elton Industries, Box 2347, Fullerton, CA 92633.

**12. Basin wrench**—Designed to make a plumber's life a little easier, this specialty wrench is used on hidden, hard-to-reach nuts found under sinks, faucets and toilets. The wrench features a 10-in.-long, chrome-plated shaft; sliding bar handle; and a spring-loaded, quick-grabbing jaw that adjusts from ⅜ in. to 1¼ in. The forged, alloy-steel head swivels 180° for tightening or loosening and to gain the best hold onto the nut. The spring-loaded jaw releases on the back rotation to permit a quick, ratcheting action. The basin wrench shown costs about \$15.75. For more information and details, contact Ridge Tool, 400 Clark St., Elyria, OH 44035.

**13. Chain wrench**—This medieval-looking item is akin to the pipe wrench. Designed for holding and turning pipes, the chain wrench can also grip irregular-shaped workpieces. The 14-in. wrench shown (\$31) has an 18½-in.-long chain that adjusts for a pipe up to 5 in. dia. Simply wrap the chain around the pipe and then insert the chain pins into the locking hooks on the wrench. Push down to

turn the pipe and then pull up to reposition the handle. For more information and details, contact Ridge Tool, 400 Clark St., Elyria, OH 44035.

**14. Ratcheting nutdriver**—This versatile, pistol-grip ratcheting tool belongs in the toolbox of every homeowner and apartment dweller. The Sidekick is a ⅜-in.-drive ratchet that comes complete with five sockets (⅜ in. to ⅝ in.), a 3-in.-long extension, and four screwdriver bits—two slotted and two Phillips. The pistol-grip shape provides excellent leverage for turning stubborn nuts, screws and bolts. Other features include an up-front spinner for quick nut running, a molded vinyl socket holder and a FORWARD/REVERSE switch located on the back of the tool. The Sidekick, as shown, costs about \$16.60. Contact Fiskars, 7811 W. Stewart Ave., Box 8027, Wausau, WI 54402.

**15. Power ratchet wrench**—Here's the latest in wrenches—Skil's new cordless, battery-powered ratchet wrench. The ⅜-in. drive wrench is powered by a rechargeable, 3.6-volt, nickel-cadmium battery. Depress the power button to drive the socket at 120 rpm for quick nut running. When locked off, it can be used like a manual ratchet wrench to loosen stubborn nuts and bolts, and for final tightening. The 11¼-in.-long, all-aluminum housing can withstand 150-ft.-lbs. of torque, according to Skil. A plug-in, wall-hung charging stand recharges the battery in about 3 hours. The Power wrench accepts standard ⅜-in.-drive sockets and costs about \$50. Contact Skil, 4300 W. Peterson Ave., Chicago, IL 60646.

# A TOOL THAT LETS YOU CUT CORNERS... THE DREMEL MOTO-TOOL.<sup>®</sup>

... AND SAND, AND POLISH,  
AND GRIND, AND SHARPEN,  
AND DRILL.

## HOME AND SHOP JOURNAL

### TOOL TEST

## LIFE EXTENSION FOR BAND SAW BLADES

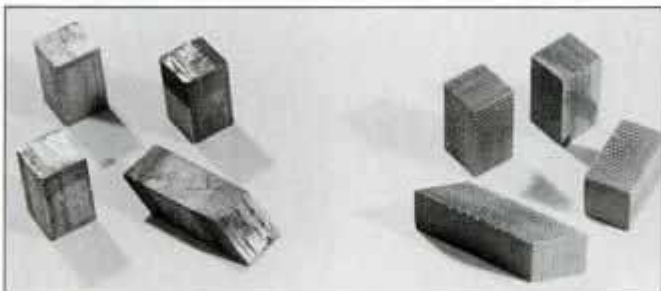
**Y**OU PROBABLY haven't given much thought lately to the steel guide blocks in your band saw. However, they serve an important function. The four steel blocks keep the blade in line and free from twisting. This provides greater control during cutting and prevents the blade from wandering from the cutline. The problem, though, is that the blade regularly comes in contact with the blocks. This metal-to-metal contact produces friction, heat and metal fatigue—all bad news for the blade.

To prevent heat buildup and prolong blade life, you can replace steel guide blocks with Cool Blocks. Made of graphite-impregnated phenolic laminate, Cool Blocks

run cooler and won't dull or damage the blade. In fact, you can set Cool Blocks so that they lightly touch the blade for optimum control.

Cool Blocks come in nine sizes and are sold in 4-block sets for \$12.25 post-paid. To order, contact Garrett Wade, 161 Avenue of the Americas, New York, NY 10013. Or, call toll-free: (800) 221-2942. Be sure to give dimensions of the original steel blocks.

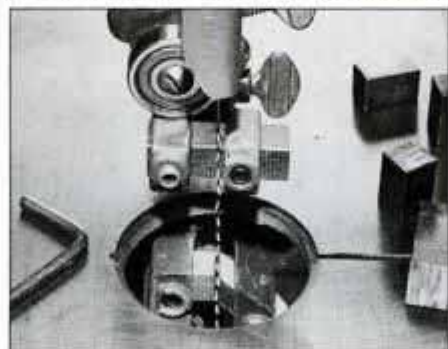
—Rosario Capotosto



Replace original steel guide blocks (left) with nonmetallic Cool Blocks (right). Phenolic laminate blocks contain graphite lubricant.



Use a dollar bill as a spacer when installing guide blocks. Slip bill on each side of blade. Push in block until it lightly touches the bill.



Here's the completed installation. Note that there are four guide blocks—two above the saw table and two positioned beneath it.

Whether you have corners to cut or axes to grind, the Moto-Tool is right for the job. It converts from a cutter to a grinder to a polisher—with just the change of a bit.

Which lets you shave time and money off the job because you can accomplish a wide variety of tasks without a handful of tools. From the front door to the back yard and everywhere in between.

For starters, you can fit a lockset in no time flat with the sanding drum. The Moto-Tool is so compact it makes sawdust fly in places where other tools barely scratch the surface.

If the surface is metal, the Moto-Tool is perfect for the job. Like sharpening your lawn mower blades in one clean sweep. Simply drop in the grinding stone and let the 30,000 RPM Moto-Tool do all the work.

That's the kind of powerful speed you need in the garage to remove rusty screws from a license plate. Just slip in the cut-off wheel to reslot the screws or use the same bit to cut them off in seconds.

The Moto-Tool makes quick work of do-it-yourself projects in every corner of your house—without cutting corners on precision and accuracy.

So, whether you're fixing up or finishing off, get the Dremel Moto-Tool. It will put you on the cutting edge.



**DREMEL<sup>®</sup>**  
Gets the job done bit by bit.

© 1988 Dremel

# Who needs a Campbell Hausfeld® Air Compressor? Let's have a show of hands.



You need one. Because there's almost no end to the jobs you can do easier and faster with a Campbell Hausfeld Air Compressor.

You can inflate tires, sport balls and rafts. You can spray paint, fertilizers and pesticides. You can clear water lines and gutters. You can use it with nailers, staplers, sandblasters,

sanders, drills and impact wrenches. And the list goes on. Campbell Hausfeld, America's favorite air compressors. See the complete line of air compressors, tools and accessories.

For more information and the name of your local retailer, call **1-800-634-4793.**



**CAMPBELL  
HAUSFELD**

Since 1836

© Campbell Hausfeld 1989

**NEW PRODUCT REVIEW**

**FIRST AID  
FOR FURNITURE**

**K**EEPING your furniture looking like new is an on-going battle—especially if you have children. Even normal daily activities in the most careful home will produce their share of wear and tear on furnishings. However, repairing any damage as soon as possible is the key to preventing the rundown, worn-out look.

The Wood Medic repair and touch-up kit is a first-aid kit for furniture. It's designed for concealing minor scratches, nicks, cigaret burns and gouges in wood, vinyl, leather and plastic laminate. The Craftsman's kit shown contains six concentrated pigment powders: pine, oak, walnut, mahogany, maple and graining powder. Also included: a liquid mixer, crayon-like fill stick, artist brush, reusable plastic mixing tray, 4/0-steel wool,



Furniture repair kit has all you need to touch up scratches, nicks and gouges. Six different powder pigments match most surface colors.

600-grit abrasive paper and brush cleaner.

Most minor repairs require simply mixing the matching-color pigment with the liquid mixer and lightly brushing it onto the scratch. Obtaining the exact color match takes some trial and error, but the pigment doesn't change color as it dries, so the color you mix is very representative of the final shade.

We did find, however, that the brush included in the kit wasn't stiff enough for precise repairs. We got excellent results with a No. 3 sable brush purchased at a local artist supply store. Use the fill stick to fill in deep scratches and gouges. Then, brush on matching-color pigment to conceal repair and seal the surface.

The Craftsman's repair kit shown costs about \$15 from mail-order woodworking supply firms. A larger Master Craftsman's kit (\$23) is also available. For details on all Wood Medic products, contact Wood Life Ltd., 9331 Park La., Franklin Park, IL 60131. Or, call toll-free: (800) 942-6500. —Rosario Capotosto



The first step is to add liquid mixer to a well in the plastic mixing tray. For most minor scratches, you'll need only a few drops.

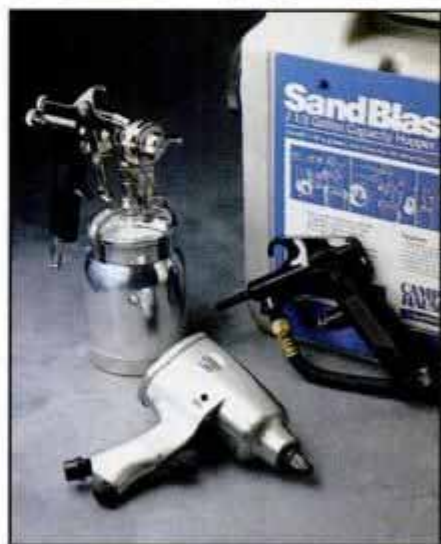


Wet the brush with liquid mixer and then dip it into the pigment to pick up some powder. Mix the pigment and the mixer, as shown.



Once you've achieved the correct color, apply the mixture to the scratch with a small artist's paint brush. Use light, short strokes.

**Free  
air tool**



Choose an Impact Wrench, Spray Gun or Sandblaster (\$50 Value) when you purchase a Campbell Hausfeld U.S. Air® or Power Pro® 2-5 HP Tank Mounted Air Compressor.



Choose a Blow Gun with Hose or a Drain Cleaner (\$25 Value) when you purchase a Campbell Hausfeld Tank Mounted Power Pal® or Super Pal® Air Compressor.

Get your Free Air Tool mail-in coupon at your Campbell Hausfeld retailer. The coupon has all the details. Free Tool Offer expires June 30, 1989.



Since 1836

© Campbell Hausfeld 1989

## CORVETTE ZR-1 (Continued from page 79)

2.76 in. (70 mm), and the forged steel connecting rods are each 2.1 pounds heavier than their L98 counterparts.

The really interesting stuff, though, is located atop the new block—four chain-driven overhead camshafts, two per cylinder bank, 32 valves with self-adjusting direct-acting hydraulic lifters, and a 2-stage induction system, all of which is pretty exotic hardware to be residing under the hood of a Corvette.

While multiphase induction systems are seeing widespread use in 4-valve engine designs, the ZR-1 setup

does have an interesting tweak. At low speeds, the small central port of a 3-port throttle body feeds the 16 runners of the port-injected system. The larger secondary ports open fully when engine speed hits 3500 rpm, when the driver opens the throttle 80 percent or more, or both.

The cam lobes governing the secondary ports are profiled for more duration than the primaries, effectively providing variable cam timing—and, of course, lots of power at the upper end of the rpm range.

The thoughtful touch that Chevy

has added to all this engineering is a cockpit lockout feature for the secondary throttles. By flipping—and removing—a key on the console, the owner can make sure that kids and/or parking attendants aren't tempted to explore the full range of the ZR-1's heady capabilities. With the secondaries shut down, LT5 output is reduced by about 55 percent.

We're saying about, because at press time Chevrolet still hadn't released official output numbers, pending final EPA certification. The unofficial forecast is for 375 hp and 370 lb.-ft. of torque, a little less than Chevy's original 400-hp target but more than enough to propel this car into some pretty exclusive company.

To be succinct, this car is a rocket. The ZR-1 can hit 60 mph in just over 4 seconds, and 100 mph in less than 10. We ran a standing-start quarter-mile in 12.78 seconds with a trap speed of 112.7 mph. At the dragstrip, that puts the ZR-1 squarely into super stock race car territory. A Ferrari Testarossa or Porsche 928 S 4 would be left in the Corvette's tire smoke.

### 0-100-0

Another impressive performance index involves more than go-power. The ZR-1 can go from 0 to 100 mph to 0 in about 14 seconds—roughly the time it takes an L98 coupe to get to 100—and is a tribute to the ZR's combination of muscle, brakes and tires.

Tires, of course, represent the only other functional distinction between the L98 and ZR-1 versions of the Corvette. The 275/40ZR-17 fronts are shared with the current car, but the massive 315/35ZR-17 rears were developed by Goodyear strictly for the ZR-1's extra power. They do their job well. It takes intent to get wheelspin, and the huge contact patches augment the already formidable adhesion of the regular Corvette.

Chevy engineers like to say that all these factors add up to 1.0—1.0 G, that is. With its enormous vented disc brakes (13.0 in. front, 12.0 in. rear), bolstered by a new Bosch antilock system, the ZR-1 will pull over 1.0 G deceleration rates. And the combination of fat tires and sophisticated suspension provides a skidpad capability of 1.0 G-plus.

Although it's also available with the L98 Z51 coupe, that sophisticated suspension merits some mention here. Bilstein's FX-3 Selective Ride Control, an advanced cockpit adjustable shock absorber system, costs roughly \$1500 as an L98 option, but is standard equipment on the ZR-1. The electromechanical system offers three cockpit presets—Touring,

# SMART BUY: HAND TOOLS WITH A FUTURE.

Tools that stay on the job. That will be as dependable years from now as they are today. Tools precision made by specialists backed by over a century of forging only the best. CHANNELLOCK.

**CHAN NEL LOCK**

FOR YOU WHO WANT THE BEST



© 1988 CHANNELLOCK, INC. • Meadville, PA 16335 • Send for free catalog



Sport and Performance—and six automatic damping adjustments within each range.

The system varies the rates according to vehicle speed, and there is overlap from one mode to the next. But there is definitely a discernible difference between each, and in the Performance mode damping becomes too stiff for the bumps and lumps of most everyday streets, but perfect for a nice, smooth road-racing circuit.

Whatever the mode, the ZR-1 is pure joy on the kind of lightly traveled roads we encountered in the remote regions of France's Central Massif. The LT5's broad powerband—between 1000 rpm and 5000 rpm, there's always at least 300 lb.-ft. of torque on tap, according to Chevrolet—means you can chug around in any old gear, if you like. But the superb new ZF 6-speed gearbox makes you want to keep snicking the shift lever up and down.

Besides, for all its flexibility, the LT5 doesn't really strut its stuff until the tach hits 4000 rpm or so—about the point where the L98 simply runs out of wind. From there right up to the 7000-rpm rev limiter, the LT5 gathers momentum like some gigantic electric motor. There's none of the cammy rush one experiences with some narrow-band race motors, or turbocars—just a progressive build-up of speed that seems to defy the laws of physics.

### Upper limits

In fact, the ZR-1's upper limit is in the 175- to 180-mph range, not as fast as some, but faster than most. We intend to find out just how fast in a future issue, but the important consideration at very high speeds isn't the absolute number but how the car behaves. And on this score, the ZR-1 is as good as anything on the planet. Its handling is not only precise and agile, but remarkably forgiving as well. The driver can take liberties and the ZR-1 simply accommodates itself to the change. No oversteer, no snap spins, no nasty surprises.

Because of the car's speed potential, it seems certain that someone will manage to wad up his new toy, but if/when that happens we feel certain he'll have only himself to thank. In our opinion, this car's high-speed stability and all-around driveability are beyond reproach.

We do have a couple of minor criticisms. First, there's more high-speed noise than some might find agreeable, some from the engine, particularly at full throttle, more of it from the tires. The LT5 is commendably free of mechanical racket, but does generate a

certain amount of induction noise. And at First-gear speeds, more than a couple of the ZR-1s produced excessive gearbox whine.

As far as the looks of the car are concerned, we do feel that Chevrolet has exercised perhaps a little too much restraint. Besides that tasty little ZR-1 badge on the stern, the only hint that this is something other than a standard Corvette is the wider (by 3 in.) rear-end cap with its slightly rectangular taillamps.

It may be that buyers who step up to a ZR-1 might want a little more in

the way of distinction. We have two suggestions. First, every special-edition Corvette since the heyday of Zora Arkus-Duntov has had a special hood treatment that set it apart from the standard line. That would certainly be appropriate here.

Second, why not help the distinction along with a special set of wheels? Nothing gets the job done quicker.

But it doesn't take a keen eye to see that we think Chevrolet has created something pretty terrific here. A civilized supercar. And better than that, an American supercar.—Tony Swan



## Why radar makes mistakes. How to protect yourself.

It's hard to believe, but traffic radar does not identify which vehicle is responsible for the speed displayed. It shows only a speed number. The radar operator must decide who to blame.

### How radar works

The radar gun is aimed at traffic and it transmits a beam of invisible radar waves. Moving objects reflect these waves back to the radar gun. Using the Doppler principle, the radar calculates speed from the reflected waves. But there's a problem.

### The best guess

Remember, these reflections are invisible. And truck reflections can be ten times stronger than car reflections. How can the operator know for sure which vehicle is responsible for the number?

The truth is, in many cases he can't be sure. The result? You can be ticketed for somebody else's reflection.

The only way to defend yourself against these wrongful tickets is to know when radar is operating near you.



### Self Defense

We specialize in radar warning. Escort and Passport have a unique warning system that tells you radar strength—with both a variable-rate beeper and a visual

meter. You'll know when the radar unit is near enough to have you under surveillance.

*Car and Driver*, *Popular Mechanics* and *Roundel* magazines have each tested radar detectors. And each gave us their highest ratings. Call toll-free and we'll send reprints of the complete tests.

### We're as close as your phone

To order, call toll-free. Orders in by 6:00 pm eastern time go out the same day by UPS and we pay the shipping.

And we guarantee your satisfaction. If you're not entirely satisfied within 30 days, return your purchase. We'll refund your money and shipping costs.

The best defense against wrongful tickets can be in your car tomorrow.

**Toll Free 1-800-543-1608**  
(Call 8am-midnight, 7 days a week)

**ESCORT**  
RADAR WARNING RECEIVER

ESCORT \$245 (OH res. add \$14.70 tax)

**PASSPORT**  
RADAR RECEIVER

PASSPORT \$295 (OH res. add \$17.70 tax)

Cincinnati Microwave  
▶ Department 706869  
One Microwave Plaza  
Cincinnati, Ohio 45249

© 1989 CMI



# GROUND BREAKER.

## DODGE DAKOTA 4x4.

*The first true mid-size pickup ever, this 4x4 comes complete with the muscle of a standard fuel-injected V-6, an available eight-foot bed and our exclusive 7 year or 70,000 mile Protection Plan\*. And handles it all with the attitude of a compact. This year, we've even added standard anti-lock rear brakes. The 1989 Dakota 4x4. Go break some ground of your own. 7/70*

\*See this powertrain limited warranty & its restrictions at dealer.



**THE TOUGH NEW  
SPIRIT OF DODGE**  
THE PERFORMANCE DIVISION OF CHRYSLER MOTORS

BUCKLE UP FOR SAFETY

# How To Install VINYL SHEET FLOORING

BY PAUL BARRETT; PM Illustrations by George Retseck



**T**HEY SAY THAT what goes up must come down. And, if it comes down inside your home, it comes down on the floor. This makes your floor one of the most abused components of the house. Not only is it expected to suffer dirty boots, high-heeled shoes and everyday spills and grime, it's expected to bounce back to its original appearance with a minimum of drudgery.

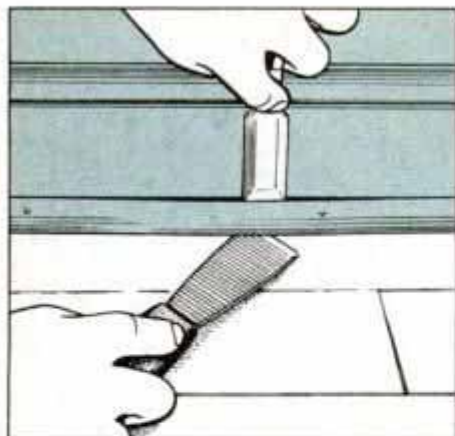
One solution to the problem is a vinyl floor covering. Vinyl flooring is durable, easy to maintain and comes

in a wide variety of styles and colors. And, it's not that difficult to install. In fact, some manufacturers offer an installation kit that costs about \$10 and is designed to take you through the process step by step. It includes paper for making full-size templates, markers and tape. If you buy the kit and flooring from the same manufacturer and you make a mistake, the manufacturer will replace the flooring and kit free of charge. There are some restrictions, however, so be sure to read the fine print.

## About vinyl flooring

The decorative pattern on the flooring may be either printed on, or the result of colored pieces of vinyl inlaid in the backing layer. While both varieties have a durable wear layer on top (generally urethane), the inlaid variety is a better bet for heavy use.

Today, most vinyl flooring products are called "No Wax" floors. The tough top wear layers don't require the protection of wax to maintain their gloss. After a period of time, however, they may need an applica-



**1** Remove shoe molding from baseboard. If there isn't any, you can lay flooring to trim and conceal edge with new molding.

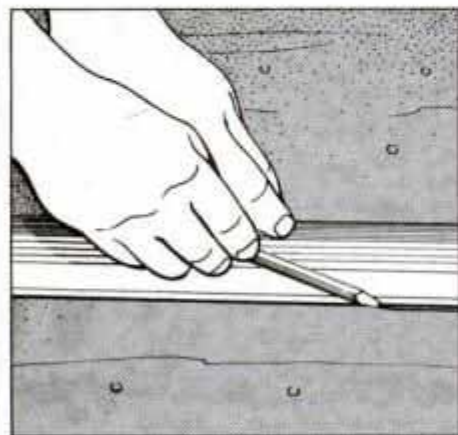
tion of an acrylic floor dressing to restore their original appearance. An exception is Mannington's Never Wax floor. According to the manufacturer, a power buffing is all that's necessary to revive a dull top layer.

The floor backing layer is a composite material that's made of mineral fibers and vinyl, and may vary from product to product. Most manufacturers offer a line of soft vinyl flooring that's appropriate for loose-lay installations. However, for heavy traffic, a permanent installation with a firm-back vinyl flooring is recommended.

Vinyl flooring is available in 6- and 12-ft. widths. The 6-ft. width is a little easier to handle but the 12-ft. width may enable you to cover your floor with few or no seams. It's always a good idea to discuss your project with your dealer to get the flooring product that best suits your installation.

## Surface preparation

Vinyl flooring can be installed over concrete, wood or an existing resilient floor. If your floor is concrete, first



**7** Draw a line on the floor to indicate seam position. Measure from seam line to walls to double check dimensions on drawing.



**2** Where required, trim casing and doorstop with a sharp handsaw so new underlayment and flooring can fit in neatly.

make sure it's clean and free of paint, oil and dust. Use a latex patching compound available at your flooring dealer to level any uneven spots.

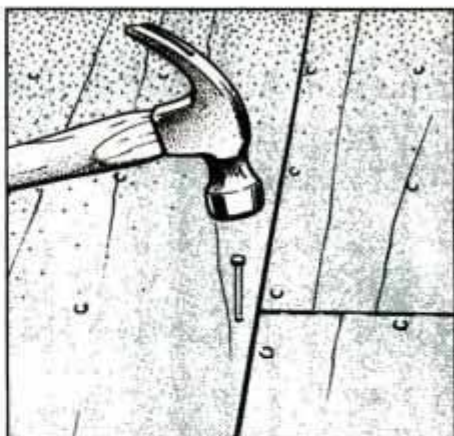
To install vinyl flooring over a wooden subfloor, first make sure that the floor is firmly fastened to the joists. Rock back and forth over questionable areas to locate trouble spots and re nail with 8d ringed flooring nails where necessary. Then, cover the floor with 1/4-in. exterior-grade underlayment plywood staggering the joints at the panel ends. Fasten the plywood with 4d ringed flooring nails. Space the nails 3 in. apart at the panel edges and 4 in. apart elsewhere.

Fill the joints with latex patching compound, sand when dry with 120-grit sandpaper and thoroughly vacuum all dust.

If you intend to install new flooring over old, first check with your dealer to find the types suitable for this purpose. Use flooring nails to secure any loose areas and thoroughly remove all wax and dirt with steel wool and an appropriate cleaning agent available



**8** Use a water-soluble felt-tipped pen to mark cutting lines on flooring. Mark rough cutlines 1/2 in. outside finish cutlines.



**3** Secure plywood underlayment with 4d ringed flooring nails. Space nails 3 in. apart at edges and 4 in. apart elsewhere.

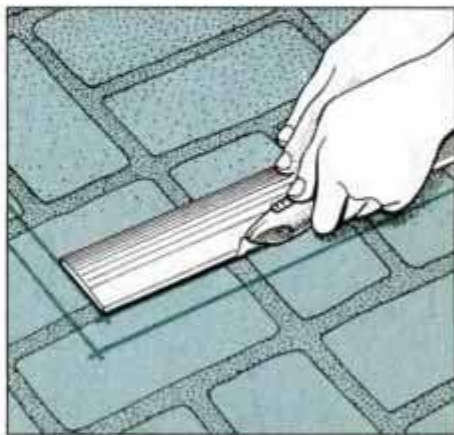
from your dealer. Never sand a resilient floor as it may contain asbestos fibers that can be released into the air.

Finally, the flooring material and the room should be kept at 65° to 70° for two days prior to the installation.

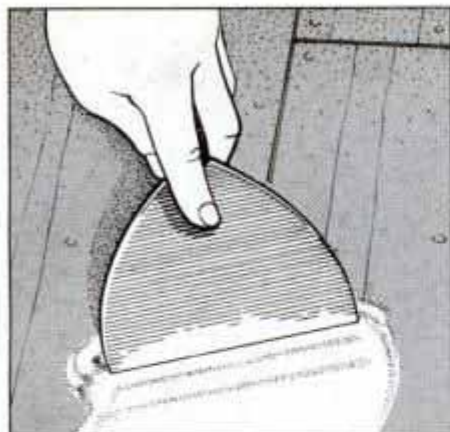
## Getting started

For our project, we installed a vinyl floor in a kitchen with a wood subfloor. To begin, remove all free-standing appliances from the room. If you have a gas range, call the gas company to have them disconnect it. If the gas range is built in, then have the gas company shut off the gas to avoid the danger of a pilot light igniting the fumes from the adhesive.

Next, remove any shoe molding from the baseboard with a flat prybar or chisel (Fig. 1). Pull the nails through from the backside of the molding with locking pliers. This protects the exposed surface of the molding from damage so it can be reused later. If you don't have a shoe molding, then plan to lay the new floor to the edge of the baseboard. After it is



**9** Carefully cut flooring on rough cutlines with a linoleum knife or utility knife fitted with a sharp, linoleum-cutting blade.



**4** Use a wide putty knife when applying latex patching compound to the seams in the plywood underlayment.

in place, you can add the shoe molding to cover the edge of the vinyl. For floors with vinyl base trim, pry away the trim with a putty knife.

Use graph paper to make a scaled drawing of the floor showing doorways, closets, cabinets and walls. Double check all measurements and note them on the drawing.

Because we used 6-ft.-wide flooring, our floor required one seam. If you must have a seam, plan to locate it in a place that minimizes waste.

Mark the finished height of the new floor on the casings and door stops. This should include the thickness of the underlayment plywood plus the thickness of the vinyl flooring. Then, saw to the waste side of these lines with a handsaw to make room for the new floor (Fig. 2).

Install the plywood underlayment with 4d ringed flooring nails as described above (Fig. 3). Be sure to use exterior grade plywood to resist damage from water that may seep through the flooring. Then, fill the seams with latex patching compound,



**5** After the latex patching compound is dry, sand with 120-grit sandpaper. Using a pole sander makes it quick and easy.

sand and vacuum (Figs. 4 & 5).

As you install the plywood, you'll find out just how square the walls are. Make note of these variances on your drawing so the vinyl will be cut accurately. You can measure the deviation from 90° by placing the short leg of a large steel square against one wall and in a corner.

Then, depending on whether the angle is lesser or greater than 90°, measure the width of the gap at one end of the long, 24-in. leg of the square (Fig. 6). This represents the deviation from 90° over 24 in. Transfer this information to your drawing.

If you're planning a seam, mark the floor to indicate the end of the first sheet (Fig. 7). Measure from the seam to the wall at several points and compare with your drawing to check the placement of the cutting lines.

Next, transfer the measurements from your drawing to the flooring material. Use a water-soluble felt-tipped pen and a straightedge to accurately mark the exact cutting lines (Fig. 8). Plan for the finished seam to occur on



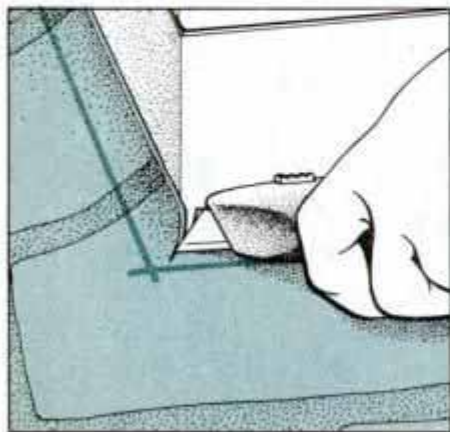
**6** Use a framing square and ruler to determine how far out of square the corners are. Record the information on your drawing.

a straight, continuous line in the pattern but allow a little excess on the waste side of the seam for trimming.

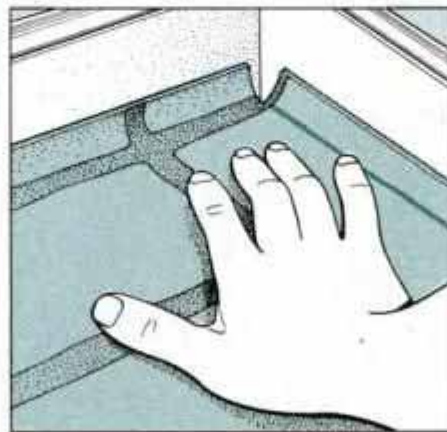
When marking the lines on the second piece, make sure that the pattern will line up along the seam. Allow for about 2 in. of overlap so the pattern can be aligned across the seam. Then, draw additional lines 1½ in. outside your finished cutlines. These are rough cutlines—the final trimming takes place with the material in position. Cut to the rough cutline with a linoleum knife or a utility knife fitted with a linoleum-cutting blade (Fig. 9).

Roll out the flooring and position the seam edge on the seam line. Allow the excess flooring to run up the walls. At the corners, make a diagonal cut from the exact cutline to the corner of the flooring so the material can relax against the wall (Fig. 10). Double check that the seam is properly positioned and have a helper stand on the flooring to keep it from shifting.

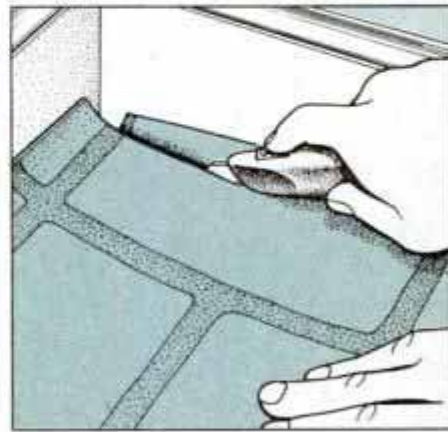
Then, press the flooring in place around the perimeter and trim to the finished cutline (Figs. 11 & 12). Leave



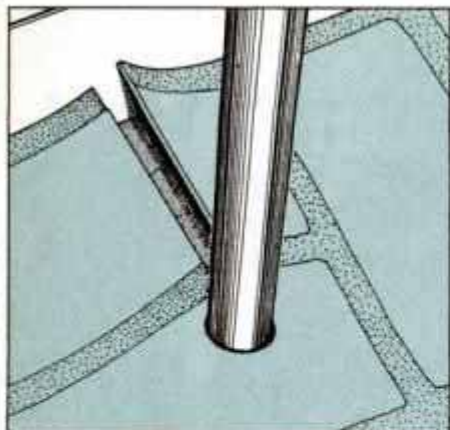
**10** After rolling out flooring and positioning correctly in relation to seam line, make diagonal relief cuts at all corners.



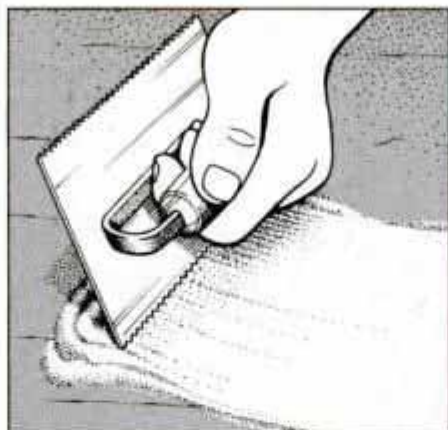
**11** Press vinyl flooring down into corners. Have a helper stand on the flooring to make sure that it doesn't shift.



**12** Cut the flooring to the finish cutlines. Where it will be covered with shoe molding, leave a ¼-in. space for expansion.



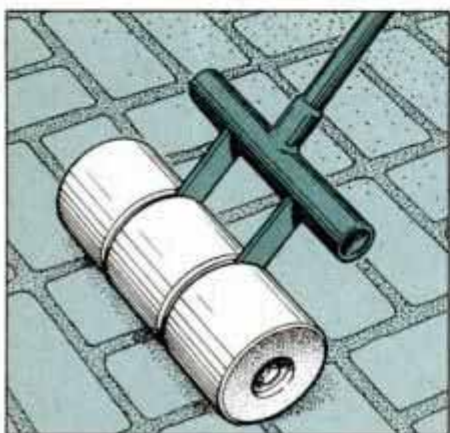
**13** To fit around a pipe, cut an appropriate-size hole at the correct position. Then, cut a straight line from edge to hole.



**14** Spread adhesive with a finely notched trowel and stop 12 in. from seam. Avoid lumps which will show through flooring.



**15** After installing both pieces with overlapping seam, use straightedge to cut seam along line in flooring pattern.



**16** To firmly bed the flooring in the adhesive, use a 100-pound roller which can be rented. Roll across floor in both directions.

a 1/8-in. gap between the flooring and the baseboard or wall to allow for expansion. Carefully fit the material under the door moldings.

Unroll the second sheet allowing it to overlap at the seam and position it for an exact pattern match. Trim to the finish cutlines in the same way as with the first sheet.

### Gluing it down

Your dealer will be able to tell you which adhesive is best for your floor. Some flooring can be stapled around the perimeter with 1/2-in. staples that will be concealed by the baseboard molding. Other types require a band of adhesive around the perimeter. Our flooring was set in adhesive over the entire floor surface.

To begin, reroll the flooring, pattern side in and set it aside. Then, apply the adhesive to the underlayment with a finely notched trowel as per manufacturer's instructions. Spread the adhesive as evenly as possible to avoid bumps that will show through. Stop the application about 12 in. away from the seam line (Fig. 14).

Carefully unroll the first piece of flooring onto the adhesive. Avoid sliding the material as this can cause lumps. Press the flooring down as you go. Then, unroll the second piece, position the seam exactly, and press the flooring in place.

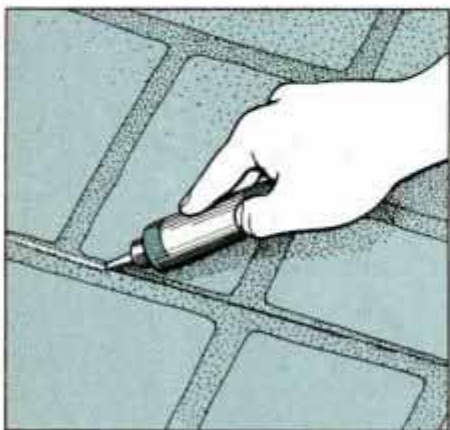
To cut the seam, place a straightedge along a continuous line in the

pattern that's in the overlapped area of flooring. Cut through the two layers at once with a utility knife. Avoid leaning the knife to one side or the other when making the seam cut (Fig. 15). Then, remove the waste and peel back the seam edges of the flooring.

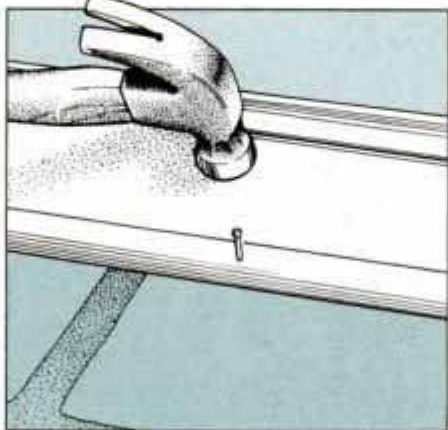
Some manufacturers require a special seam adhesive. Apply the adhesive as evenly as possible with the notched trowel. Press both pieces into place and wipe away excess adhesive with a damp rag.

Next, roll the floor in two directions with a floor roller (Fig. 16). We rented a 100-pound roller from the flooring dealer. Apply seam sealer to the seam leaving a 1/8- to 1/4-in.-wide bead on the surface (Fig. 17).

Finally, reapply the shoe molding or baseboard and set the nails (Fig. 18). Where the new floor adjoins another floor, use metal trim strips to finish the seam (Fig. 19). Allow the adhesive to set for 24 hours. Then, use pieces of plywood to protect the floor when you move any heavy appliances back in. **FM**



**17** Apply seam sealer to seam. Use applicator provided and leave a 1/8- to 1/4-in.-wide bead on the flooring surface.



**18** Replace the shoe molding by securing with 4d finishing nails. Then, set all nails below the surface with a nail set.



**19** Where the new flooring joins another floor at doorways, nail a metal finish strip in place over the flooring edge.

# How To Install A TOWEL BAR

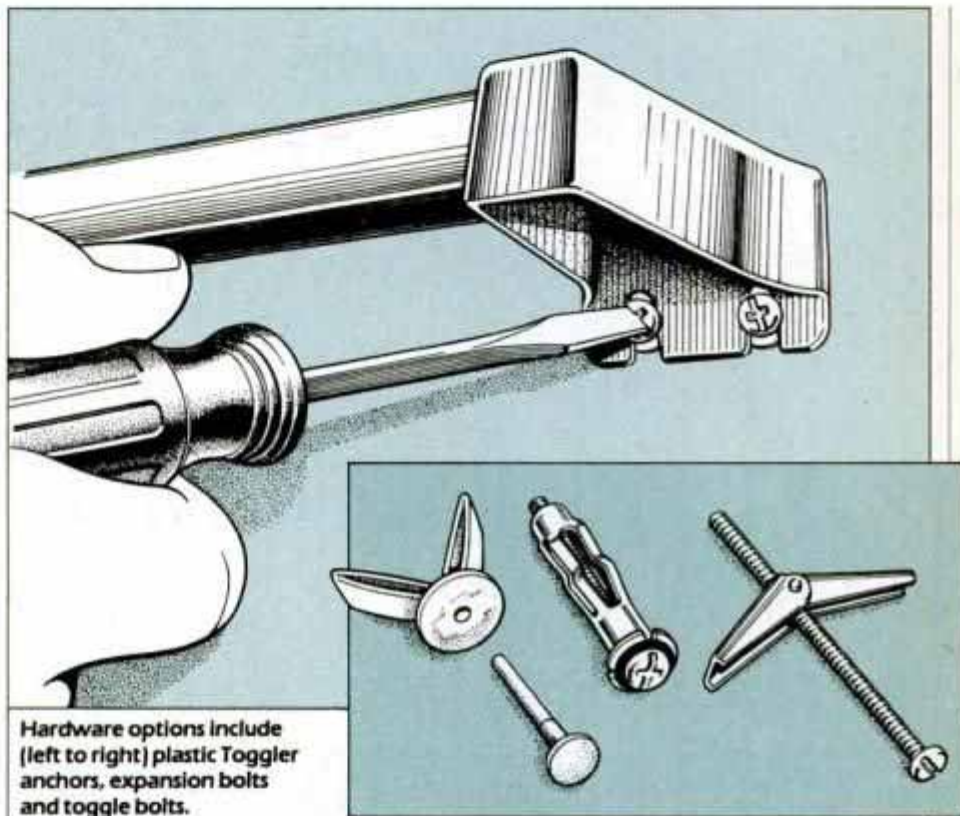
BY ROSARIO CAPOTOSTO; PM Illustrations by George Retseck

**I**T OFTEN seems that where you want a towel bar is exactly where it's the most difficult to install. Rarely can you find wall studs—or other appropriate solid members—in the right position. And if you do attach it directly to your plaster or drywall, one quick tug can bring the whole thing crashing to the floor, leaving behind some holes that you'll have to repair.

Of course, this is a long-standing problem, one that various manufacturers have solved by creating quite an array of fasteners for handling the job. Three of the best are shown at the right: a clever plastic anchoring device called a Toggler, a standard metal expansion bolt often referred to as a Molly bolt, and the tried-and-true toggle bolt with its winged nut and standard machine screw.

Your choice of fixture is usually determined by your taste. Any fixture can be installed anywhere. But common sense does dictate some preferences. For example, if you want a towel bar installed on ceramic tile, it's better to go with the adhesive-backed unit like the one shown in drawings 1 through 4. Drilling through ceramic tile to install a dedicated fastener can be tricky—you risk breaking the tile.

By far the more common problem is attaching towel bars to drywall or



Hardware options include (left to right) plastic Toggler anchors, expansion bolts and toggle bolts.

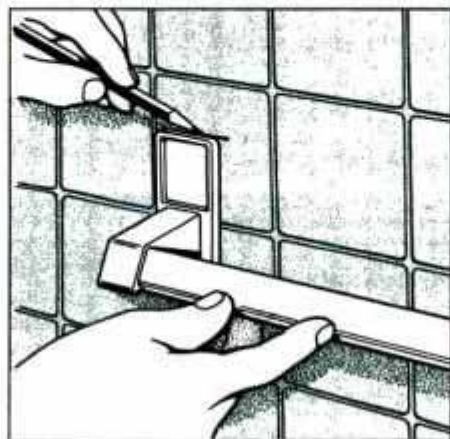
plaster walls. These hollow-wall applications, as they are called, require you to supply a piece of hardware that can be attached firmly to the wall. Then you simply hang your towel bar from this hardware. The principle em-

ployed by all such fasteners is basically the same: They are designed to be inserted through the wall surface and then to expand on the other side for a strong grip.

The metal expansion bolts shown in



**1** To install adhesive-backed holders on ceramic tile, first clean off all the residue from the surface using denatured alcohol.



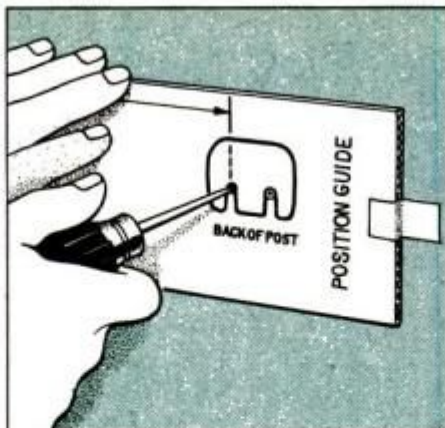
**2** Position the assembled towel bar on tile, level in place, then lightly mark an outline of the end brackets using a soft pencil.



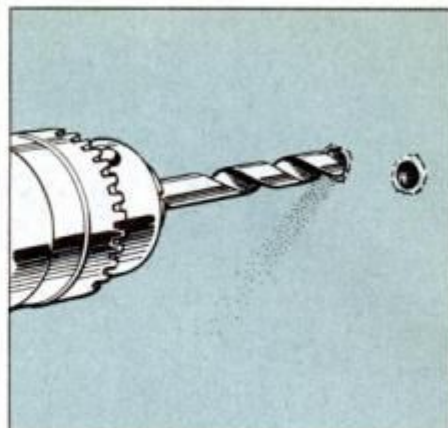
**3** Using your fingertip, apply water to the adhesive pads. Keep applying water and rubbing until the adhesive starts to thicken.



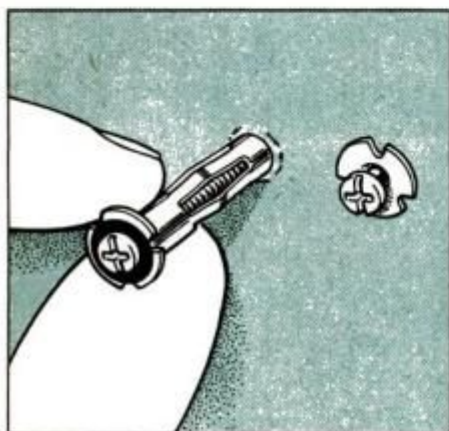
**4** Press the end brackets inside the traced guidelines. Hold steady for 1 minute, then tape in place for 24 hours.



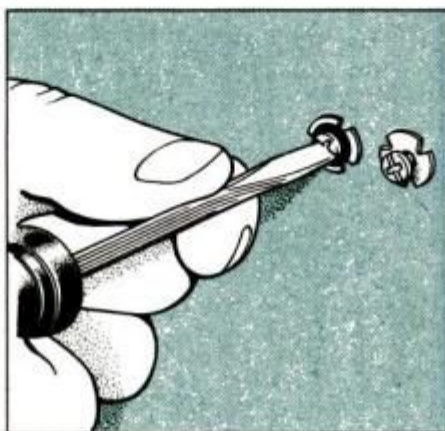
**5** To attach bar to wall with hardware anchors, locate anchor holes using an awl and template supplied with towel bar.



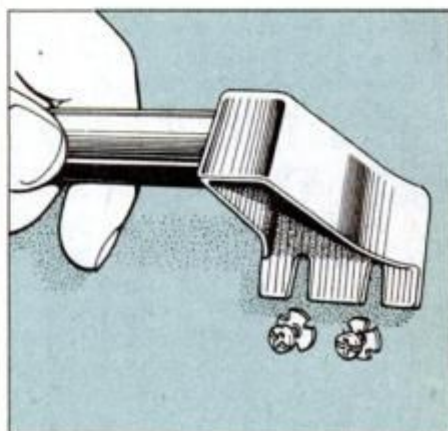
**6** Next, bore holes in drywall or plaster using electric drill and drill bit sized to match the specific anchor you are using.



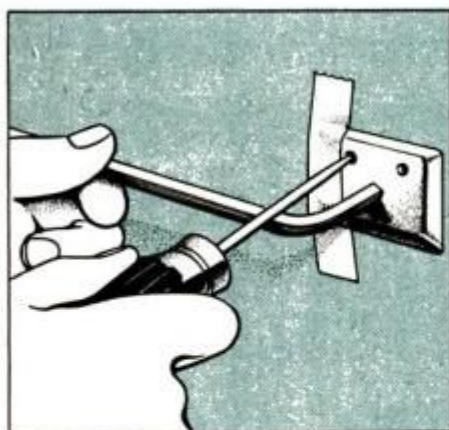
**7** Slide expansion bolts into holes and press sharp ears on surface flange into drywall or plaster. Ears prevent screw from turning.



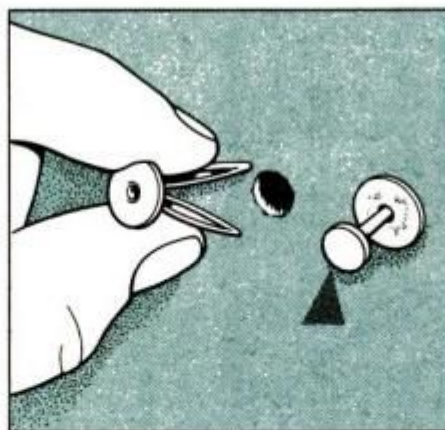
**8** Turn screwheads clockwise until black indicator washer falls off. This signals that anchor is fully expanded and seated properly.



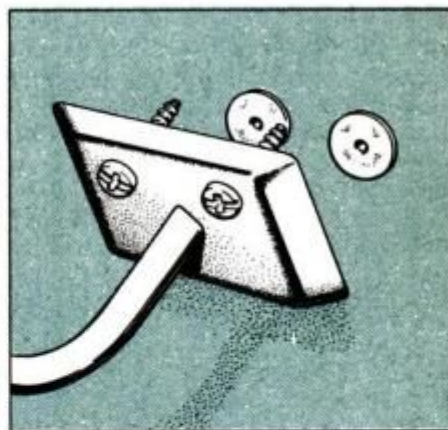
**9** Once anchors are seated, turn out screws to accommodate bracket flange. Slide bracket over screws, then tighten screws securely.



**10** To hang bar on hollow core door, as we did here, hold bar against door, level in place then mark screw locations with awl.



**11** Bore proper-sized clearance holes in door and insert plastic anchor in holes. Separate push pin (arrow) seats anchor properly.



**12** Insert screws through holes in brackets, then thread screw tips into holes in anchors. Tighten screws until bracket is held securely.

drawings 7, 8 and 9 are sized according to the approximate thickness of your wall covering and the amount of weight you plan to support. Once they are inserted into their holes, tightening the screw causes the side walls of the anchor to expand outward and thus seat against the inside surface of the wall covering. Once the anchor is

seated the screw can be removed.

The toggler bolt, on the other hand, is simply pushed into the wall, wings first. By tightening the screw, the wings are drawn against the inside surface of the wall. The one big drawback to this anchor is that the screw cannot be removed. If it is, the wings simply fall down inside the wall.

The Toggler is also sized according to the thickness of the wall. To seat it, simply push it into a hole in the wall as shown in drawing 11. Then push the set pin until the wings expand inside. Remove the pin and screw your towel bar into the plastic inserts, using self-tapping screws of the proper diameter and length.



# Homeowners' Clinic

BY NORMAN BECKER, P.E., Contributing Editor

## Septic Systems

Do you know of any good books on septic and well water systems so that a homeowner can be better informed before calling for the repairman?

JERRY HUBBELL  
BATTLE CREEK, MI

You can usually get information on septic systems from the Department of Health or the Cooperative Extension Service in your state. Two books that I refer to regularly are: *Standards For Waste Treatment Works—Individual Household Systems*, published by the New York State Health Department, and *On-Lot Subsurface Sewage Disposal Systems*, published by The Connecticut Cooperative Extension.

The most important maintenance item for a septic system is a periodic pumping. Most health departments recommend that septic tanks be pumped every two to three years or when the total depth of sludge and scum exceeds one-third of the liquid depth of the tank.

If the tank isn't cleaned periodically, the sludge will build up to the point where the solids will be carried into the leaching field and clog the perforations and open joints of the disposal pipes. If this occurs, you'll have to replace the field which costs several thousand dollars. Pumping the tank generally costs \$100 to \$150.

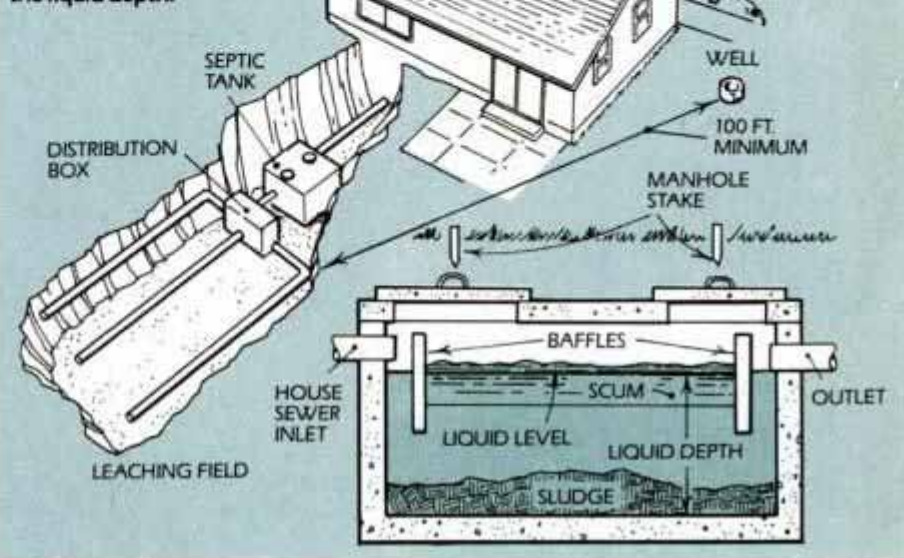
For information on water system pumps, Gould Pumps, Inc., publishes a free booklet titled *Pump Fundamentals*. In addition to covering the different types of pumps, it explains what size and type is best suited for a particular well and how much pressure is necessary. Write to Gould Pumps, Inc., Advertising Dept., Seneca Falls, NY 13148.

## Lost Outlets

I was the general contractor for the new home I recently moved into. I had an electrician do the wiring and then hired professionals to install the drywall. In the process, a few electrical outlets were covered over. Is there a device for locating them?

AVROHMS. ZUCKER  
BROOKLYN, NY

To prevent damage to the leaching field, septic tanks should be pumped when the sludge and scum exceed one-third the liquid depth.



Progressive Electronics in Mesa, Arizona, manufactures a detector that will do the job. The detector, model 508, is used by many electricians and telephone and alarm system installers. The unit is somewhat expensive for 1-time usage—it costs about \$170. You should check with your local installers to see if they have a unit that they would rent to you.

The detector consists of a battery-operated transmitter and receiver. The transmitter is attached to the exposed end of the wire which is at an outlet or the main panel. The wire must be disconnected from any power source. As you trace the wire behind the wall, you'll hear a hum. When it stops, you're at the outlet box. For more information, call Progressive Electronics at (800) 528-8224.

## Aluminum Paint

My white aluminum siding turned black when I washed it with a soft brush and detergent. I'd like to paint the siding and need to know what type of paint to use.

NAT ALEXANDRO  
SOMERSET, NJ

Pittsburgh Paints manufactures a latex paint that's formulated for aluminum and steel siding. It's a ure-

thane-modified acrylic paint that produces a harder, more durable film than ordinary house paint. It's called *Metal Siding Refinish* and it can be applied with a brush, paint pad or spray gun. There are hundreds of colors to choose from and the paint dries to a low-luster eggshell sheen—much like the finish on new siding. It's available at home supply centers and paint distributors.

## Cellar Doors

My home has an outside cellar entrance. Do you know who makes sloping metal doors for covering the steps to the cellar?

FRANK WAMACK  
HONEA PATH, SC

These doors are generally available in larger hardware or building supply centers and cost between \$244 and \$279 depending on size. One manufacturer is the Bilco Co., Box 1203, New Haven, CT 06505. The phone number is (203) 934-6363. **PM**

Do you have a home-maintenance or repair problem? Send it to Homeowners' Clinic, *Popular Mechanics*, 224 West 57th St., New York, NY 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in the column. For more home-repair and maintenance help, get *PM's Home Care Guide*, \$2.45 postpaid. Send your order(s) to *Popular Mechanics*, Box 1014, Radio City Station, New York, NY 10101.

# Appliance Clinic

BY STEVE TOTH, Contributing Editor

## Trigger Happy

I have a Sears Kenmore dishwasher model No. 587.701801, serial No. 05348761180. The soap cup doesn't open for the second wash cycle. Inspection shows no binding and moving the trigger mechanism by hand causes the cup to open properly. However, I noticed that during a wash cycle the bimetal doesn't bend up to release the cup. I tested the electrical leads to the trigger with a neon test light and found no trouble. I then replaced the trigger mechanism but the problem remains. Any ideas?

PHILLIP HERBST  
ROCKWALL, TX

*The bimetal trigger is a low-voltage device that is in series with the dishwasher heating element. It takes about 6 amperes of current for it to bend up and release the cam which opens the dispenser.*

To check the bimetal, turn off the electrical power to the dishwasher and disengage the cam from the bimetal so the bimetal is free to move. Turn on the power, lock the door and advance the timer to the point where the dispenser normally opens. Watch the bimetal. If it slowly bends up, it's working properly.

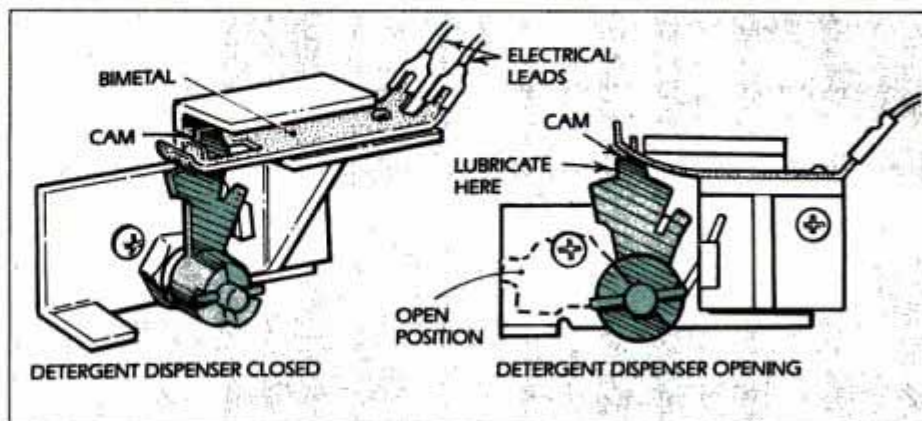
Now, turn off the power again and inspect the part of the cam that latches the bimetal. Check for any roughness that might cause binding. The cam should also be lubricated at this point to keep the bimetal from sticking. If there's no lubrication, apply a dab of all-purpose white grease or a product such as Lubriplate.

## Needs Timer

I've had to replace the clock timer on my 30-year-old G.E. electric wall oven about every five years. Now, my local G.E. parts store has told me that this part is no longer available. Do you know of any business that repairs these clock timers or makes replacement units?

VIRGIL A. BUTLER  
WINTER PARK, FL

*To have your clock timer either rebuilt or exchanged, you can send it to General Electric Co., Appliance Control Products Dept., 1803 Radiant*



If dishwasher bimetal is functioning but detergent cup won't open, the bimetal may be sticking on the cam. Check the cam for roughness and lubricate if necessary.

*Rd., Carroll, IA 51401, Attn.: Repair and Exchange Dept. In the package, include your name, address, phone number and the model number of the timer assembly which can be found on a white tag glued to the timer. Include any other letters or numbers that you see on the tag.*

*If the company has a replacement, they'll send it to you with a bill. If not, they may have the parts to repair your unit. In this case, you'll receive your rebuilt clock timer and bill.*

*Parts for very old clock timers are sometimes unavailable. However, the company may be able to substitute a different unit that fits your appliance. The cost of a factory-reconditioned timer can range from about \$27 to \$60.*

## Mixer Parts

We have an old Hamilton Beach hand mixer model No. 60C with a broken plastic handle. The local appliance parts dealer says that parts are unavailable. Can you help?

EARL L. KNORR  
MADISON, WI

*The Hamilton Beach Co. only stocks parts for its hand mixers for a period of seven years after the model is discontinued.*

*Call Hamilton Beach at (800) 334-2785, explain what you're looking for, and give them all the numbers and letters on the mixer that you can find. The company may be able to tell you whether parts are still available and where to get them.*

## Out Of Sequence

I have a Singer Electric furnace model No. EU26028-12B11, serial No. 0550607B140039. I need Klixon sequencers Nos. 51172-25 and 51172-26. Do you know where I can find them?

DEO ALMAZAR  
WITTENBURG, WI

*In 1982, Singer Climate Control Division was bought by Snyder General Corp. which began selling under the Arcoarie and Comfortmaker brand names. While the original replacement sequencers for your model electric furnace have become obsolete, there is hope.*

*Call the Snyder General Corp. at (618) 282-6262 and ask the Applications Dept. for the name and address of the local Comfortmaker distributor. Then, call the distributor and ask for the name of a dealer who services Comfortmaker equipment.*

*Have a service technician from the dealer check your furnace. If the sequencers are indeed bad, he should contact the distributor who will contact the manufacturer to see if there are new types of controls that can be fitted.*

*If parts are available, the technician will be informed of the installation procedure and should be able to tell you what the job will cost and how long it will take.*

PM

*If you have a problem with any appliance, send your question, along with the model and serial numbers, to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.*

As if to reinforce the growing concern, a United Airlines 747 outbound from Manila lost a piece of its wing March 25. Severe vibrations and the appearance of a 10 x 3-ft. hole in the starboard wing sent the aircraft scurrying back to the airport. The FAA said the piece that fell off was "strictly there for streamlining and not structurally significant."

**Search for cures**

On February 28 of this year, only four days after the United Airlines tragedy, the Airworthiness Assurance Task Force recommended to the FAA an \$800-million program to upgrade older aircraft. The key provision would mandate replacement of various parts and assemblies at specified time intervals, even if inspection detected no flaws.

In other words, the industry would move to a plan of preventive replacement, rather than preventive maintenance. The plan would require repairs in about one of every five jetliners currently in service.

That change in emphasis was also reflected in a recently issued FAA directive ordering airlines to replace, rather than inspect, tens of thousands of rivets on older 727s.

More than 1300 early models of Boeing 727, 737 and 747 aircraft are affected by the first stage of the Task Force proposals. Aircraft areas in question include lap joints and bonded joints that have experienced delamination or corrosion. In addition, widescale modification and/or replacement of aircraft structural materials, fittings and skin will be advised on the basis of service experience. The cost is expected to be about \$600,000 per aircraft.

As of this writing, recommendations have been made only for Boeing aircraft, but others will be issued for aircraft manufactured by McDonnell Douglas, Lockheed, Airbus, British Aerospace Corp. and Fokker.

**Life extension**

For the past 30 years, the U.S. Air Force's Aircraft Structural Integrity Program (ASIP) has been monitoring the effects of aircraft stress with a growing sophistication. Techniques for detection and prediction of problems have improved steadily, and the program has added significant flight time to the life of an aging military fleet. For example, the newest B-52 in the fleet is 28 years old. What's more, as the decades passed, the mission of the B-52 changed drastically, from that of high-altitude strategic bomber to a low-level tactical weapon. A variety of modifications saved

the aircraft from the scrap heap.

The heart of the system is the Individual Aircraft Tracking Program, which monitors the status of an airplane like a patient in a hospital. All Air Force craft are subject to some monitoring techniques, but about 10 percent of the older planes are fitted with specialized sensors and recorders to track such stresses as deflections in the metal between two points, G forces, airspeed and other factors that may contribute to metal fatigue. A counting accelerometer records every instance in which an aircraft exceeds certain gravitational forces. A mechanical strain recorder, bolted to the structure, etches onto a foil tape the evidence of structural deflections between two points. More sophisticated microprocessor measuring devices are under development.

The Air Force also uses a variety of sophisticated techniques to detect cracks and other structural failures. These include:

- Eddy current, which creates an electrical field and observes its flow across the aircraft. If there is a defect at or near the skin surface, it will show up as an obstruction in the flow.

- X-ray detection, useful for spotting major corrosion problems in metallic fabrications, welds, castings and non-metallic products.

- Ultrasound scanners, which operate upon the same principles as modern medical equipment using sound waves instead of X-rays to paint a picture of the innards of a structure.

- Magnetic rubber, used to study structural steel parts within an aircraft. The steel part is magnetized, and then doused with a liquid rubber solution laced with metal filings. The rubber is allowed to harden, then removed and examined microscopically. If a flaw exists, metal filings will have migrated to its location. The technique can detect cracks as small as .00002 of an inch.

- Temperature and vacuum stress tests, useful for certain functions. For example, after every 3000 hours of flight time, the Air Force F-111 is frozen to a temperature of -40° F and then subjected to flight-level stresses. Flawed steel will fail under such conditions, but safely, in the laboratory, rather than in the sky.

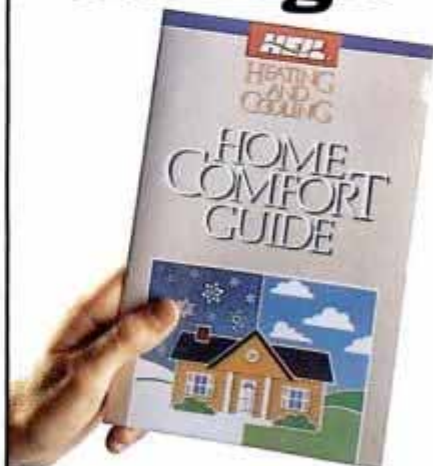
- Fluorescent penetrants, which seep into tiny flaws and reveal them under black light.

- Lasers, which can be integrated with fluorescent penetrant and used to detect flaws in engine blades.

The results of these tests are extrapolated to the entire fleet and used to predict structural failures.

*(Please turn to page 117)*

# Let Heil guide you to energy savings.



Send for your free copy of the Heil Home Comfort Guide and get started on the road to energy savings. This easy-to-read booklet tells you everything you need to know about buying an energy efficient home heating or cooling system.

For example, did you know that the Heil 712 is one of the most efficient central air conditioners on the market today?

Send for your copy of the Heil Home Comfort Guide and learn how you can lower those monthly energy costs.



*Born to Run*  
©1989 HEIL-QUAKER CORPORATION

For a FREE copy of the Heil Home Comfort Guide, call toll-free 1-800-447-4700

or fill in this coupon and mail to:

Heil  
Inquiry Dept.  
460 Tenth Circle North  
Nashville, TN 37203

Yes, I'd like to learn how to save on energy costs. Send me your FREE copy of the Heil Home Comfort Guide.

NAME \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_ ZIP \_\_\_\_\_

PHONE \_\_\_\_\_

PM

## Everywhere, Fishermen Are Raving About These Amazing New Small Outboards!



Amazing all new line of Cruise 'n Carry rugged, ultra-efficient outboards cost up to 23% less and weigh up to 52% less than anything else in their horsepower class!

*Perfect for fishing boats, inflatables, jon boats, runabouts, dinghies or canoes.*

The hot new line of tough-as-nails Cruise 'n Carry outboards are without question the *lightest* motors available today... weighing in at 52% less than anything else in their class. Yet these gutsy little powerhouses easily match the competition for sheer horsepower performance. They're unbelievably easy to use, carry and store.

What's more, the Cruise 'n Carry's are priced up to *hundreds of dollars less*—giving you a surprisingly affordable outboard no matter what your small-to-medium boating needs are! Plus, each model is packed with high-performance features usually found only on much larger and heavier motors:

✓ **Solid-state ignitions** for reliable and easy starts... ✓ **"Positive-action" gear shift** that lets you effortlessly change from neutral to drive with fingertip control... ✓ **Special high-grade** crankshaft ball bearings and connecting rod needle bearings to ensure extra-long engine life... and *more!*

**3 Models to Choose From:** 1. The super-handly Model 6600 (just 12 lbs.) matches the performance of 1.5 horsepower motors twice its weight. 2. The versatile 2.7 HP Model 6700

(only 17 lbs.) is the lightest and hardest-working outboard in the 2.5 to 3 HP range. 3. The rugged 6 HP Model 6800 (just 35 lbs.) is easily the lightest water-cooled outboard available for moving *fast* through the water.

**Free Information.** Fill out the coupon below and mail to Cruise 'n Carry, 5595 E. 7th St. Suite 406 — Dept. 380, Long Beach, CA 90804 and we'll rush you a ton of FREE material about the new Cruise 'n Carry outboards—including where to see them firsthand. Or simply call 1-213-603-9888, and ask for your free material.

**cruise 'n carry**  
THE TRULY LIGHTWEIGHT AND AFFORDABLE OF TRAWLS

Clip and mail today to the above address. # 380

YES, please rush me FREE information about the amazing new line of Cruise 'n Carry lightweight outboards.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone Number ( ) \_\_\_\_\_

## Popular Mechanics plans



**Deck You Can Place Anywhere** A beautiful, free-standing redwood deck that either stands alone or that you can modify to fit your needs. It's durable, won't decay, and provides more than 250 square feet of extra space for entertaining or just relaxing. Plans include detailed drawings and bonus instructions for building a matching bench and planter. (PL-1820—\$6.95)

**For more great plans,  
send for our catalog.**

From tool boxes to outdoor sheds, a doll cradle to bookcase wall, even a two-car garage or PVC furniture. Our catalog has these and hundreds more from Popular Mechanics. Only \$1.95.



**Traditional Gazebo.** This octagonal gazebo will give your yard an elegant look, reminiscent of the Victorian period. It provides the perfect spot for outdoor entertaining, and the lattice roof allows sunlight to filter into the gazebo. Comfortable seats line the inside. Measures more than eight feet across to provide plenty of room for you and your guests. (PL-1860—\$9.95)



**Adirondack Lawn Furniture** This traditional Adirondack furniture is as durable as it is attractive. Crafted of hardwood, each piece is carefully sanded, then assembled with water-resistant glue, sealed with wood preservative and painted—all to make them withstand the rigors of outdoor use. (PL-1751—\$5.95)

Send for your order today! Make check or money payable to  
Popular Mechanics, Box 1014, Dept. 988, Radio City Station, New York, NY 10101.

## HORROR IN THE SKIES

(Continued from page 115)

Thanks to the modification program, the Air Force has extended the original design parameters of much of its fleet. For example, the KC-135 tanker, the military version of the Boeing 707, was first placed in service in 1955, with a scheduled useful life of a relatively short 10,000 hours. A 13-year project to reskin the wings has extended the service life to 36,000.

The best available evidence that an airplane can fly, theoretically, forever is the venerable DC-3. More than 1500 of them, built in the '30s and '40s, are still flying today.

According to Warren Basler, who operates Basler Flight Service, based in Oshkosh, Wisconsin, the DC-3 is virtually indestructible. The company owns and flies 13 of the veteran aircraft, and also repairs and refurbishes DC-3s owned by others, some of which have logged as many as 100,000 hours.

One key difference between the DC-3 and its upstart cousin, the modern jetliner, may be the basic integrity of the construction. Basler tells of one DC-3 he acquired from the French Air Force that, when stripped of paint, revealed an aluminum skin that appeared factory-fresh.

With these old birds, he says, problems are more likely to be found in the powerplant. "Those old radials have been rebuilt so many times, they've just about had it, and nobody's building new ones," he says. Basler's solution is to add two Pratt & Whitney PT6 turboprops. The modern powerplant reduces the vibration load on the structure, and cuts the cost of both fuel and maintenance.

Basler completed the first renovation in 1988 and he says, "it hasn't stopped flying since we wheeled it out the door." In fact, Basler believes that these modified DC-3s could still be in service on their 100th birthday.

Preventive replacement makes better economic sense than the alternative action of scrapping the fleet. The Task Force plan is a positive indication that the industry is attempting to act on its own, before it becomes necessary for outside regulators to force changes in the system. What remains to be seen is how quickly and thoroughly airlines will respond to tragedies that have pointed out flaws in our aging aircraft, and how astute they will be at making the tough calls that balance safety and economy.

As the FAA's Farrar points out, "We would have no safety problem if we put all the planes on the ground tomorrow. But that would bring the world to a halt."

PM

### MAKE MONEY

#### Swiss International GOLD AND PRECIOUS METALS MERCHANTS\*

Will buy your scrap...



- Gold
- Unwanted Estate or damaged jewelry
- Dental Gold
- Platinum
- Silver
- Palladium, etc.

\*registered trade name

Highest Prices Paid

**WE WILL SEND YOU PAYMENT IN U.S. FUNDS.  
ALL TRANSACTIONS STRICTLY CONFIDENTIAL**

Purchaser becomes owner of goods received. All metals to be melted down and considered scrap. Record of transaction to be enclosed. **Print in block letters & include in your parcel, your name and full mailing address.**

(In U.S.A.)  
S.I.G. & P.M.M. Ltd. PM  
421 Center Street  
Lewiston, New York  
14092 U.S.A.

(In Canada)  
S.I.G. & P.M.M. Ltd.  
301 Sheppard Ave. W.  
Willowdale, Ontario  
M2N 1N4 Canada

Celebrate July 4th & All Events

## CARBIDE CANNON

BIG BOOM!

29.95

Mammoth Cannons Shoot With Terrific Boom! Have bang-up time at special events. Uses powdered carbide ammo. Hundreds of shots for few cents. All metal construction with large, rugged cast iron wheels. Machined brass mechanism for easy loading & firing. Authentic turn-of-century military design. Handsome decor when not in use. Made in USA to last a lifetime. Available in 2 sizes: 9" Cannon, \$29.95 postpaid; 17" Cannon (shown) with rapid firing & automatic loading, \$59.95 postpaid. The larger the cannon the louder the boom! Carbide Ammo, about 100 shots. \$2.95; 3 packs for \$7.50. Send check, money order or phone (813) 747-2356. Visa, MasterCard, Amex accepted. Give card number & expiration. Money back guarantee. Johnson Smith Co., B-320, P.O. Box 25500, Bradenton, FL 34206-5500.

# Exercise More with Less

■ **MORE EFFECTIVE** By duplicating the motion of cross country skiing, the world's best exercise, NordicTrack provides the ideal aerobic workout.

■ **MORE COMPLETE** Unlike bikes and other sitdown exercisers, NordicTrack exercises all the body's major muscles for a total body workout.

■ **MORE CALORIES BURNED** In tests at a major university, NordicTrack burned more calories than an exercise bike and a rowing machine.\*

■ **MORE CONVENIENT** With NordicTrack, you can exercise in the comfort of your home. NordicTrack easily folds, requiring storage space of only 17" x 23".

\*Scientific test results included in NordicTrack brochure.

■ **LESS TIME** Because NordicTrack is so efficient, you burn more calories and get a better aerobic workout in less time.

■ **NO DIETING** No other exercise machine burns more calories than NordicTrack... So you can lose weight faster without dieting.

■ **NO IMPACT** Running and some aerobic workouts can cause painful and potentially harmful jarring. A NordicTrack workout is completely jarless.

■ **NO SKIING EXPERIENCE REQUIRED** Even if you've never skied, in a few minutes you'll be "tracking" your way to better health.



**NordicTrack**  
THE BEST WAY TO FITNESS

A CML COMPANY © 1988 NordicTrack

Bill Koch  
Olympic  
Silver Medalist

FREE BROCHURE AND VIDEO

Call Toll Free Or Write:  
**1-800-328-5888**

In Minnesota 1-800-423-5145 In Canada 1-800-433-9582  
141 Jonathan Blvd. N., Chaska, MN 55318

Please send free brochure  
 Also free video tape  VHS  BETA  
Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
Phone ( ) \_\_\_\_\_ 27599

# WIN THE BATTLE AGAINST SEPTIC SYSTEM BACK-UP.



When your septic system backs up, it's a big mess, a big expense and big trouble. But it's bound to happen sooner or later, right? Not necessarily. Not when you use an ounce of prevention, or to be specific, a pound of RID-X®. It's simple. Just flush RID-X down your toilet once a month and stop worrying. RID-X works to prevent septic system back-up.

RID-X adds hundreds of millions of bacteria to digest up to 25 times its weight in solid waste, to help keep your septic system running trouble-free. In fact, lab tests show that no other leading septic system additive is better than RID-X. And RID-X is superior to yeast because yeast contains no bacteria.

RID-X is safe for plumbing, contains no harsh or caustic chemicals and won't harm your pipes or septic system.

RID-X is available wherever household products are sold.

## RID-X®

THE SAFE WAY TO A WORRY-FREE SEPTIC SYSTEM.



Send for this informative booklet, which can help you avoid septic system failure. Send to RID-X Booklet, P.O. Box 5940-G, Westbury, New York 11592.

RID-X® is a product of the d-CON Company, Inc. 225 Summit Avenue, Montvale, NJ 07645.

## Enlarge Project Designs

Craft Projector is Simple! Fast! Accurate!  
Projects on to: Drawing, Graph & Tracing Paper, Wood, Other Surfaces.



Adjustable lens enlarges by fractions up to 27 1/2 times for the size you wish! Copy unlimited ideas for craft designs. Enlarge patterns, designs, portraits, still lifes, landscapes, photos, slides, designs on coins and jewelry. Projects in exact colors. Does not damage original. Simple instructions. Uses household current and 60 watt bulb. Send \$19.95 plus \$2.95 shipping. 30 day money back guarantee.

Norton, Dept. GT-268, Box 2012, New Rochelle, N.Y. 10802

### BORN TO TRAVEL

Whether you check a folding boat with your luggage to Bermuda or cartop one of our rigid kit models to the closest river or lake, a Folbot is still the best way to travel on water. Stable as a rock, quiet and efficient to paddle. Folbots have been an outstanding value for over 55 years.

NEW MODELS FOR 1989  
KITS from \$350  
FOLDING from \$1025

Also rotomolded polyethylene & fiberglass Folbots, sailings and many other accessories

## FOLBOT™

FREE COLOR CATALOG

Call 1-800-533-5099 or write Folbot, Inc. PO Box 70877, Dept. PM Charleston, SC 29415

FACTORY DIRECT PRICES — SATISFACTION GUARANTEED

## WORLD'S SMALLEST WEATHER STATION



THE AMAZING WEATHER COMPUTER THAT YOU CAN HOLD IN THE PALM OF YOUR HAND.

DIGITAR's new TWR-3 Micro Weather Station includes a computer, precision wind vane and speed sensor with mounting hardware, and 40 feet of cable. For only \$159.95. With the optional, automatic-emptying RG-3 Rain Collector (\$49.95) you can even monitor rainfall!

- \* WIND SPEED
- \* WIND DIRECTION
- \* WIND CHILL
- \* WIND GUST RECORD
- \* TEMPERATURE
- \* HI/LOW TEMP RECORD
- \* RAINFALL (Optional)
- \* TIME OF DAY
- \* AUTO SCAN
- \* METRIC/STANDARD
- \* NIKAD READY
- \* ONE YEAR WARRANTY

ADD \$5.00 for shipping, plus sales tax for California deliveries.

### DIGITAR

3485 Diablo Avenue  
Hayward, CA 94545

MADE IN U.S.A.      M/C & VISA

ORDERS ONLY: 1-800-678-3669  
(7 a.m. - 5:30 p.m. Pacific Time)

INFORMATION: 415-732-7814      FAX: 415-732-9188

## END DIRTY, ROTTEN DOOR MATS FOREVER!

WITH OUR #650 CAST IRON GRATE

- WIPES FEET CLEAN
- DURABLE • DECORATIVE • ODOR FREE
- STAYS WHERE YOU PUT IT

Finished surface CLASS 30 GREY CAST IRON weighing just under 75 lbs. Measures 21 1/4" x 43 1/4" x 5/16" and reinforced throughout

## \$21995

INTRODUCTORY OFFER

WE'LL REPLACE IT IF IT EVER WEARS OUT!

To Order Your Last Door Mat CALL: (717) 296-7784

OR MAIL COUPON

YES! Please enter my order for #650 doorgrates at \$219.95 each

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

(Day Phone) \_\_\_\_\_ (Night Phone) \_\_\_\_\_

Check one:  
 Check    Visa    Mastercard

Signature \_\_\_\_\_

Exp. Date \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Another quality product from:  
**Architectural Iron Company**  
 Box 126 Schocopee Rd. • Milford, PA 18337

## 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

DEALER/DISTRIBUTOR!! DESIGN PATENT PENDING!

## INFRARED SENSOR CONTROL

INDOOR/OUTDOOR. Connects 110 volts. Light, T.V., Alarm, Appliances, etc.

Size: 4 1/4" x 3" w. Mounts anywhere. 180° Detection. For homes & commercial Mobile homes 12V Model available.

VANPORT INC., 795 Peace Portal, Blaine, WA. 98230 (Add \$4 for shipping)

\$27 each

## EARN \$75/hr

New patented machine paints elegant wallpaper patterns directly on walls. Protected territories.

UN-WALLPAPER CO.  
 Box 757 Dept. PM-69  
 Silver Spring, MD 20901

As seen on  
The Weather Channel



*low cost  
Now I have all the water I need!*

There's nothing like having your *own unlimited supply* of water! I'd like to show you how you can get it yourself -- by drilling on your property with the amazing Hydra-Drill. You can probably finish the well in just one weekend, and install the pump and tank the next one.

### Save Money!

Let me send you absolutely FREE a complete information package full of pictures, descriptions, and prices of the equipment. There's even a fully-illustrated booklet called "**How To Drill Your Own Water Well**", and a recording of a half-dozen folks just like yourself from all over the country who have drilled their own wells and saved a lot of money!

### Expert Help Available

You'll also find out about our Toll-Free Consulting Service. It's a DeepRock exclusive! If you have a question *while you are actually drilling the well*, you call a special number to talk with a drilling consultant for on-the-spot tips.

Then, when you've finished the well, we can help you select exactly the pump and tank you need, and show you how to install it. In fact, if you have a video tape player, a complete instruction tape will answer most all your questions. And the tape comes **free** with your pump. Anything else you need -- call the toll-free number!

# Homeowners! Gardeners! Say Goodbye to Expensive Water Bills

## --with Your Own Easy-to-Install Water Well System\*

### Remember the Drought?

Need water for your lawn and garden when the city says NO WATERING? Tired of paying *twice* for your city water -- once for the water itself, and then again for the sewer charge?

Be Water Independent with your own water well system you install *yourself!*



### Yours FREE:

- \* "How To..." booklet
- \* 33 rpm record
- \* Complete info & prices



FOR FREE INFORMATION PACKAGE

Call Toll-Free  
**1-800-333-7762**

(Ask for Operator 7155)  
Or Clip Coupon and Mail Today!

**DeepRock** FACTORY DIRECT  
7155 Anderson Road  
Opelika, AL 36803-0001

- YES! I may want to drill on my property. Rush the FREE INFORMATION PACKAGE including the booklet, record and prices.
- Also, send information and prices on your well pumps and tanks. No obligation!

Print Name \_\_\_\_\_

Address \_\_\_\_\_

City/State/Zip \_\_\_\_\_

Phone \_\_\_\_\_

© 1989 DeepRock



PONTIAC 6000 STE AWD

## Long-Term Test

### PONTIAC 6000 STE AWD

All-wheel drive comes of age.

### FORD FESTIVA LX

Think of it as turbocharged.

### DODGE CARAVAN SE

Inconspicuously indefatigable.

**T**HIS month we're saying goodbye to a couple more vehicles, with our faithful Dodge Caravan and Ford Festiva going back to Detroit. New in the fleet is a new Pontiac that's been a real comfort through the nasty weather, and there are a few other newcomers just over the horizon.

#### Pontiac 6000 STE AWD

Pontiac's 6000 STE has always been one of our favorite midsize domestics, so when the excitement folks announced a 4-wheel-drive version, we jumped at the chance to evaluate the new technology in a familiar setting.

The engineering task force started with an upside-down S10 Blazer front differential, and used it as the basis for a rear suspension that incorporates springs, control arms, half axles and shocks into one subassembly. Look for this basic unit to find its way into other GM passenger cars.

Delivering power through all four wheels transforms the STE into an incredibly capable foul-weather ma-

chine, able to barge through snow and slush under perfect control, which is augmented by an excellent antilock braking system.

It's an excellent vehicle for skiers—or for those who are terrified of being stuck in the grocery store parking lot after putting 150 pounds of groceries in the trunk.

There's even an electrical switch on the console to lock the planetary center differential, but you'll only need it *in extremis*. On pavement, there's no real tipoff of the 4wd, except for a groaning noise, audible during sharp cornering.

One down side to the design is the rear differential's intrusion into the trunk—pack carefully, and use soft luggage. The problem is compounded by enormous decklid hinges that don't allow a box or hard suitcase to be put into the front corners of the trunk. Two large adults complained about cramped legroom in the rear seat, although that's not the fault of the 4wd, just a problem inherent in most downsized domestics.

The STE's freeway ride has just a

lingering reminder of big-car float, but otherwise no real bad habits. And since this car began life as a Euro-challenger, the addition of 4wd makes it even more fun on a winding road.

We've been plagued by several minor problems. The door locks have frozen up several times, once effectively locking us out of the car until the sun came up and warmed up the door. The left rear door needs to be slammed to get full closure, and the windshield washer fluid warning light seems to be permanently on. There's also a leak in the power steering system that doesn't leave any hydraulic fluid on the drive, but does empty the reservoir in a thousand miles or so.

We'll get all these irritations attended to at the first service.

Fuel mileage has been disappointing—21 at best on long trips, dropping to 16 in the city. The weight and rolling resistance of the 4wd pieces apparently take their toll, but we plan to conduct a complete check of the entire engine and fuel-injection system to be sure.

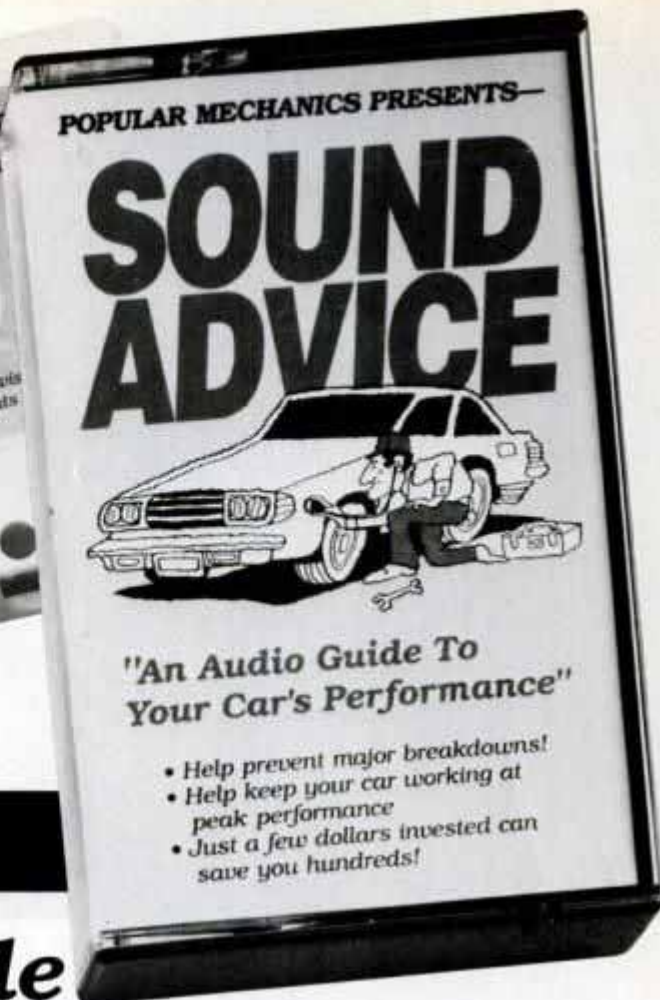
—Mike Allen

(Please turn to page 123)



FORD FESTIVA





## SOUND ADVICE

# "An Audio Guide To Your Car's Performance"

Have you ever tried to explain a "THUD" or "PING" to your mechanic? Difficult, isn't it?

Now, YOU can help your mechanic identify what the problem is after you have listened to SOUND ADVICE—an audio cassette tape containing 20 of the most common noises that your car can make. It will enable you to pinpoint that mysterious thud or ping and, in turn, assist you or your mechanic in remedying it. (Perhaps, you can even have your mechanic listen to it, especially if your car ISN'T making strange noises when you get it to the garage. That way you can tell him which sound it was.)

This unique auto diagnostic tape has been compiled by Mort Schultz, PM's expert contributing automotive editor. It allows you to hear the noise with the car running under operating conditions. Play it in your

car's cassette deck and compare the sounds on the tape with the sounds your car is making.

### LISTEN TO WHAT YOUR CAR IS SAYING!

#### Order your tape today

**SOUND ADVICE CASSETTE, #V-1010 — 6/89**  
only \$7.95. Send check or money order to:  
**POPULAR MECHANICS**, Box 1014,  
Radio City Station, New York, NY 10101

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

#88-S

State Farm Agent

Q:

*Mike Weston*  
on the  
Family Insurance Checkup.

A:

1. What is a Family Insurance Checkup?

2. What policies does it cover?

3. What's so special about a Family Insurance Checkup from State Farm?



1. "When you live in a small town like I do, you get to know your neighbors. And that's what a Family Insurance Checkup is really all about. It gives your agent an opportunity to know you better, learn what changes have taken place since you last saw each other, and advise you on how your coverage can be updated to suit your present needs."

2. "Auto, home, life, health — what you'll come away with is an overview of *all* your insurance policies at no cost to you."

3. "It's our 'good neighbor' philosophy. Whether you live in a small town like mine or a big city, you'll always be assured of receiving the highest standard of service. Professional, dependable, knowledgeable, friendly — that's a State Farm agent. And the State Farm difference."

Have your State Farm agent answer your questions about the State Farm Family Insurance Checkup.



Like a good neighbor,  
State Farm is there.

## LONG-TERM TEST

(Continued from page 120)

### Ford Festiva LX

We consigned our 1988 Festiva LX to memory—and fond memory at that—in late February, almost exactly one year since the day we picked it up in a Dearborn, Michigan, snowstorm and slogged back to New York City.

The mileage is relatively low for a 1-year test at 6974, but the Festiva's trauma-per-mile index is as high as any other vehicle that has Manhattan as part of its daily regimen.

And aside from the trek back from Michigan, that was our Festiva's lot in life—the contact sport that passes for



DODGE  
CARAVAN

Big enough for 4x8 plywood or seven full-sized adults, Caravan was utterly reliable.

driving in New York City. We're pleased to say this Korean-built econobox performed its somewhat hazardous duty without incident, surviving the onslaughts of potholes, taxis and parking lot attendants with equal aplomb. Nothing broke and nothing came adrift, a tribute to the car's build quality.

Our one ongoing complaint about the Festiva—unusually balky response at part throttle—continued to be a problem throughout the test. Ford instituted a fix for this malady—a little more static timing and a little less EGR—but it made no difference in the car's behavior, and we simply learned to live with it.

This condition has since been cured by the substitution of throttle-body injection for the old 2-bbl. carburetor on 1987-'88 Festivas, making this little Mazda-designed, Korean-built mini a real pleasure to drive.

Also, cheap to drive. Our Festiva averaged 35.4 mpg over the course of the test, and didn't use a drop of oil between the two changes we made.

The bottom line: This is a delightful little car that thrives on urban abuse and parking leftovers. It's quiet, peppy enough to keep pace, comfortable, roomy and inexpensive to operate. Our loaded test car was pricey at \$8300, but Ford is now offering more packaging alternatives that provide a better price without resorting to a total strippo.

—Tony Swan

(Please turn to page 125)



## This is the only way a Hunter ceiling fan could ever be loud.

WHILE IT'S HIGHLY UNLIKELY WE'D EVER BUILD A FAN AS LOUD AS THE ONE ABOVE, IT'S EVEN MORE UNLIKELY WE'D EVER BUILD A NOISY ONE.

THAT'S BECAUSE UNLIKE CHEAP FANS WHICH CAN WOBBLE AND HUM, EVERY HUNTER IS BUILT WITH A POWERFUL, SMOOTH-RUNNING MOTOR AND PRECISION-BALANCED WOOD BLADES.

SO THEY'LL RUN SILENTLY FOR YEARS.

IN FACT, IN A RECENT INDEPENDENT LABORATORY TEST, OUR FANS RAN 90% QUIETER AT LOW SPEED THAN OUR FIVE LARGEST COMPETITORS.

FOR A FREE BROCHURE, WRITE DEPT. PM, 2500 FRISCO AVE., MEMPHIS, TENNESSEE 38114. OR CALL (901) 745-9222.

HUNTER

© 1989 HUNTER FAN COMPANY

THE QUIET FAN.

## Where is Rislone needed most?



From new car or truck to one that's older, from classic to exotic... whatever your answer, you're right. With Rislone® Engine Treatment in the oil of any car or truck engine, you can count on performance like this:

In new vehicles, Rislone prevents engine deposits; prolongs smooth, powerful engine operation. In older vehicles, it removes power-robbing varnish, gum and sludge; quiets noisy valves and lifters; and assures a quieter, smoother running engine.

So, whether new or old, 4-, 6- or 8-cylinder, reach for a quart of Rislone. From first oil change to last.

**FREE** Lube Tips booklet. Write today.

The Shaler Company • Dept P069, PO Box 471 • Waupun, WI 53983 • © 1989 The Shaler Company



# Our Test Drive Could Be Worth \$1,500

These days, shopping around for a boat, power and trailer package can be confusing with all the options on the market. What isn't confusing is that this very same market is the daily business of the Sunbird™ Boat Company. Every day, we're package shopping. We shop and compare, then design and build what we feel is the very best in quality-constructed, value-priced packages.

Like the Corsica™ 175 shown. You get all-weather marine carpeting, AM/FM cassette stereo, a convertible top, ice chest, built-in ski tow, teak swim platform, boarding ladder, power trim gauge, a rugged galvanized trailer, a 128-HP OMC Cobra® stern drive and more, for just \$8,999.\* We've Corsica™



Powered By  
**OMC Cobra** STERN DRIVES

185 and 195 packages too.

And whether you test drive them on water, or look them over on land, you'll see how our Sunbird™ Corsica™ packages give you more for your dollar than other brands.

End the confusion. For the name of your nearest Sunbird™ dealer, write: Sunbird,™ An OMC Boat Group Company, Dept. A, 2348 Shop Road, Columbia, SC 29201, or CALL TOLL FREE 1-800-562-0330

**Boat, Trailer And 128-HP  
OMC Cobra® Stern Drive**

**\$8,999\***

\*Manufacturer's suggested retail price in effect at time of publication. Price varies through participating dealers. Dealer prep charges, freight, customs, registration and taxes may be additional. Prices subject to change without notice. Ask your dealer for details. ©1987 Sunbird™ Boat Co., Inc.



## LONG-TERM TEST

(Continued from page 123)

### Dodge Caravan SE

Okay, the interior is as innocuous as elevator music, and the exterior, especially the white one we had, really does do a decent impression of a Maytag. We've heard the word appliance in connection with this vehicle more than once. But if you're buying a minivan, it's probably not to impress pretty girls—you want to haul around people and stuff. And the Caravan does *that* kind of work with a will.

After 20,207 miles of hauling around said people and stuff, we're pleased to report that this particular Dodge Caravan was as trouble-free as we could possibly have asked. Our biggest complaint was that the package bin in the console was occasionally difficult to open.

We used our Caravan to shuttle the PM Racing Mustang crew and tools back and forth to the races, moved several teenagers in and out of college dorms, and even jammed it full of two rooms of furniture, three people, one Doberman and a Persian cat for a 1-day, 1000-mile hero drive.

Even with the suspension squashed almost flat, the Caravan never faltered.

As we frequently observe, New York City is not the kindest environment for cars, so it's not too surprising that the Caravan's exterior acquired several minor scrapes and dings.

Also, the interior did begin to get a little abraded back by the rear door, where we jammed vast amounts of "just one more thing" in.

We averaged just over 20 mpg overall, including much short-trip, 4-feet-at-a-time N.Y.C. commuting and plenty of heavy hauling.

—Mike Allen

### Newcomers

Although they're too late to be introduced in this issue, our depleted long-term fleet is getting a number of new replacements, which should add up to the most varied group we've ever assessed.

There will be five in all—a Ford Thunderbird Super Coupe, Nissan 240SX (a hatchback SE), a 4wd Mazda MPV minivan, a (here comes some variety) Ford Club Wagon with the new 460-cu.-in. V8, and last, but quite literally not least, a 27-ft. Winnebago Chieftan motorhome.

The T-Bird has been in service exactly one day at this writing, with the others at various points in their respective delivery pipelines.

It promises to be an interesting summer.

PM

# Popular Mechanics PLANS

## WOODWORKING AND GIFTS



**Master Craftsman Toolbox:** This TOOLBOX will organize, protect your tools and add a touch of class to any workshop. (Dimensions 20 1/4" x 9 1/4" x 12 3/8") Built with cherry or walnut wood, styled with brass corners caps and lock.

This solid wood toolbox will last for generations and become a family heirloom. Plans include step-by-step instructions and materials list. (PL-1826 \$4.95)



**Colonial Garage Barn:** Holds two full size cars each in separate bays. The structure measures 24 x 26 ft. with an additional 350 square ft. on the second floor. A 3 ft. overhang on the side provides excellent storage for wood and garden equipment. Plans include an 8-page instruction manual and 4 blueprint-size layout sheets: • Overall perspective • Basic wall building steps • Construction details for framing loft, floor, roof and end gables. • Exterior finishing details and suggestions for alternate versions of the barn. **Materials List Included** PL-1277 \$30.00 Each additional Plan \$20.00 when purchased with the first Plan.

Send your name and address with check or money order payable to POPULAR MECHANICS. Mail to: Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101



**Craftsman Work Center:** Build the MASTER CRAFTSMAN WORK CENTER. A portable tool center, two cabinets and deluxe assembly bench allow you to keep all your tools close at hand. A grid top makes clamping easier; covers with a sheet of plywood for other tasks. Swivel casters with brakes; drawers that open on either side and your choice of finish gives you a personalized work center. Plans

and materials list. (PL-1760 \$5.95)



**Classic Workbench** Here's the classic European workbench every woodworker dreams

of owning. Using these plans, you can build this workbench for less than half the cost of a factory-made version. Dovetail joints give the drawer super resistance to racking. Detailed plans, instructions and materials list. (PL-1748 \$5.95)



**Hobby Lathe:** Every woodworking shop needs a LATHE. A working capacity of 10 inches; will swing a six inch diameter disc. This scaled-down lathe is perfect for making toys, crafts and homemade gifts. Plans include an 8-page manual, layout and materials list. (PL-1723 \$5.95)



**Lincoln Mantel Clock:** Build a reproduction of the LINCOLN MANTEL CLOCK. This beautiful clock is an attractive addition to your home; great for a gift. Built from mahogany, superbly designed. 8 day pendulum clock movement. Plans materials and source list included. (PL-1824 \$5.95)

Introducing

The New

# Weed Wizard.

the ultimate solution to rotary trimmer line problems

- No more trouble with trimmer line — **never buy line again!**
- Easy to install on **your** gas trimmer.
- Cuts through tough weeds, briars and grass.
- Keeps **your** rotary trimmer in business.



TO ORDER CALL TODAY  
**1-800-262-5122**  
(Call for dealership inquiry)



ONLY  
**\$21.95**

WEED WIZARD

( ) VISA ( ) M/C # \_\_\_\_\_ Exp. Date \_\_\_\_\_  
( ) Check enclosed for \$21.95 plus \$3.00 postage and handling.

Your Trimmer Make \_\_\_\_\_ Model # \_\_\_\_\_

Name \_\_\_\_\_ Phone ( ) \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Send to: **WEED WIZARD, INC.**, P.O. Box 275, Dahlonega, Georgia 30533 PM689

## CABLE T.V. CONVERTERS WHY PAY A HIGH MONTHLY FEE?

All Jerrold, Oak, Hamlin, Zenith, Scientific Atlanta, Magnavox and all specialized cable equipment available for shipment within 24 hours. For fast service MC/VISA or C.O.D. telephone orders accepted 800-648-3030 60 Day Warranty (Quantity Discounts) 8 A.M. to 5 P.M. Monday through Friday Central Time. Self Addressed Stamped Envelope (60c postage for FREE Catalog).

**Midwest Electronics Inc.**  
5143 W. Diversey • Chicago, IL 60639  
No Illinois Orders Accepted

## NEW FACTORY-BUILT

Buy your **MAGNATAC** FACTORY-ASSEMBLED or in KIT form!

Use it to landscape your home or build a road; Excavate a basement, pool; Garden; Haul logs, clear trees and brush...and Do It All Yourself! ...work for others for Extra CASH!

- CATALOG of uses... \$1.00
- TECHNICAL MANUAL - shows complete construction details... \$7.00

**STRUCK-KIT**  
Box 307 • Dept: PMes  
CEDARBURG, WI 53012

## BEST BUY!

**EASY-TO-ASSEMBLE-KITS**  
In Stock for Immed. Shipping or Pick-up.

ONLY **\$425** F.O.B. Broomall, PA  
for 3'6" diam.  
(hts. 7'6" to 8'1")

Comparable savings on diams. from 4' to 7'.  
Kits available to fit any floor-to-floor hts.

Now! Showroom & Warehouse locations in:

**Pomona, CA**  
(714) 598-5766  
**Sarasota, FL**  
(813) 923-1479  
**Houston, TX**  
(713) 789-0648  
**Chicago, IL**  
(312) 952-9010



© The Iron Shop 1977, '82

People who've looked everywhere tell us there isn't another spiral stair around that touches our combination of price and quality of materials and workmanship. We believe it!  
CALL OR WRITE FOR FREE BROCHURE:

To: The Iron Shop, Dept. PM69, Box 128, 400 Reed Road  
Broomall, Pa 19008 Our Tel: (215) 544-7100

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

We accept MasterCard, VISA and AMEX.

**THE IRON SHOP**  
MANUFACTURERS

## 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, 6301 Equitable Rd  
Dept. 51679, 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 \_\_\_\_\_

## GO KARTS, ENGINES-KITS-PARTS

72 PAGE CATALOG  
\$3.00 REFUNDABLE  
Largest Selection.



(216) 357-5569  
**KW KART WORLD** Dept. M  
1488 Mentor Ave., Painesville, Ohio 44077

DISCOUNT PRICES

## PVC PIPE FURNITURE

Profitable Home Business  
Plans, Kits & Supplies  
**FREE BROCHURE**



J & L Casual Furniture Co.  
P.O. Box 208 - Dept. P  
Tewksbury, MA 01876 Tel. (508) 851-4514

## Build Your Own HELICOPTER

**SIMPLE, LOW-COST ASSEMBLY** • Carries one person-plus  
• Tip-Jet Powered • No license needed  
PLANS — fully illus. \$14.95\*

Info: \$3 or free with orders!  
P.O. Box 50  
Riderwood, MD 21139  
Credit card order line: 1-301-583-8266



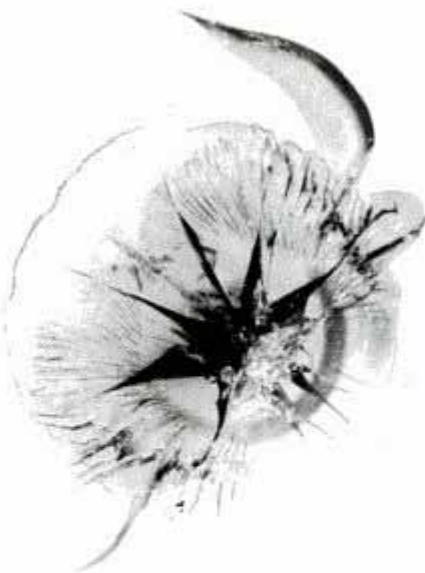
THE Helicopter Experimenter's HANDBOOK \$10.95\*  
★ SPECIAL! ★  
Both Books: Only \$19.95!  
P.O. Box 54, U.S. Funds only.

## START YOUR OWN SHOP



Complete Neon Course, clearly written, with photos and diagrams. Everything you need to know... where to get wholesale materials; how to earn while you learn, etc. Ppd. \$44.00 (US). VISA okay. Write for details. (Canadian \$55.00).

Peter Horsley Publications  
115 Riverbirch Cres, SE, Calgary, Canada T2C 0B8



## THIS IS A CLEAR OPPORTUNITY.

With a Novus windshield repair franchise, your opportunities are unlimited.

Because as a Novus franchisee, you can easily repair broken and cracked windshields to like-new condition.

The fact is, windshield repair is a profitable new growth industry. With expansion opportunities. Unlimited earnings potential. And the investment is modest.

For more information on the world leader in windshield repair, call 1-800-328-1117. In MN call collect (612) 944-8000. Or write: Novus, 10425 Hampshire S., Department PM-69, Mpls., MN 55438.

# NOVUS

©1987 Novus Inc.



## WHY RENT CABLE WHEN YOU CAN BUY A TV SATELLITE SYSTEM FOR AS LITTLE AS \$99<sup>00</sup>

And Receive Cable Stations FREE!

(The Same Way the Cable Co.'s Get Their Signal)

Start to View Some of The OVER 200 STATIONS OUT THERE FOR YOU

**DID YOU KNOW THAT SATELLITE TV**

- IS MUCH CLEARER THAN CABLE
- BRINGS IN PURE STEREO RECEPTION— BETTER THAN ANY SYSTEM YOU CAN BUY



- VIEW OVER 200 CHANNELS . . . FREE. 50x MORE THAN PAY CABLE SYSTEMS
- HIGHER QUALITY PICTURE AND SOUND THAN CABLE
- VIEW WHAT YOU WANT FROM DISNEY to XXX

- Movies • Cinemax • HBO • Sports Network
- Disney • Arts And Entertainment • Movie Channel • TV From Around The World
- Shopping Networks • Financial News Network
- News Network • Super Stations • Erotic Entertainment • Playboy Channel • X Rated Fantasy • Unrestricted Network (You Can Lock These Out When You Want)

The best book of its kind to show you how you can get the right system at the right price.

ONLY \$795

### EVERYTHING YOU WANT TO KNOW ABOUT SATELLITE TV

- Colorful, exciting and up-to-date. Shows how easy it is to get in on the revolution in television viewing.
- Uses friendly, simply written language—with over 200 photos and illustrations.
- Saves you money selecting your system and planning your own home earth station.
- Guides you through all the channels and programming so you'll be an expert "bird-watcher" in no time.
- Even shows you how to UNSCRAMBLE the Scrambled Signals Legally!

### THERE'S SOMETHING EXCITING UP THERE . . . FOR ANYONE

Why pay \$39 or more, each month for just 21 channels when you can have 100 or more channels . . . for just pennies a month.

**TRY IT FIRST!**

**YOU CAN EVEN RENT A SATELLITE SYSTEM AND GET CREDIT FOR YOUR PAYMENTS WHEN YOU PURCHASE IT.**

And now local ordinances do not apply. The government ruled that local ordinances cannot restrict a dish—We'll even tell you where to lease a system for less than cable—with an option to buy it.

© 1985 NCC CORP.

### 30 DAY MONEY BACK GUARANTEE

SATELLITE TV, Dept. 7055 (615) 254-7230  
300 McCann St. Nashville, TN 37210

Please rush me the Basic Guide to Satellite TV for only \$7.95. Add \$1.50 for postage and handling.

Enclosed is my check or money order for \$\_\_\_\_\_, OR charge to my  VISA  MasterCard.

ACCT. NO. \_\_\_\_\_ EXP. DATE \_\_\_\_\_

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_ ZIP \_\_\_\_\_

## Underground Downspout Kits

Easy to install. Debris filter prevents plugging; And adapts to fit any round, square, or oblong downspout on your home.

Water overflows bubbler pot onto the grass. Bottom holes reduce standing water and ice.



**Beaver Industries**  
890 Hensley St. Dept 6  
St Paul, MN 55114  
612-644-9933

**KIT PRICE \$29.95 ea. FREIGHT FREE**  
KIT CONTAINS  
1 BUBBLER POT AND LID  
1 ELBOW 1 ADAPTER FILTER  
2 4 FOOT PVC DOWNSPOUT PIPES  
1 30 INCH PVC DOWNSPOUT

# CATALOG MART

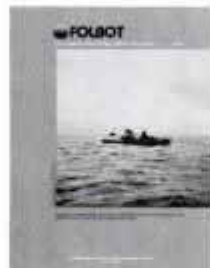
## ANNOUNCING, ULTRA LIGHTWEIGHT OUTBOARDS!



"Amazing new outboards weigh 52% less than every other outboard in similar HP size. The hot new Cruise 'n Carry outboards are without question the *lightest* motors available today! Plus they are priced up to *hundreds of dollars less*—letting you afford an outboard no matter what your small-to-medium boating needs are! FREE complete information."

1

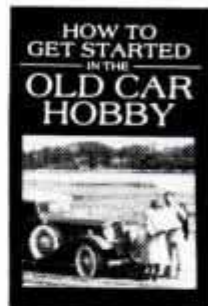
## CANOE COMPARE?



FOLBOT introduces the canoe alternative. Easy to build boats that allow for a dry and stable ride. There are nine models to choose from—with space from one to four people plus gear. 20-page catalog shows models and specifications. FREE.

2

## MAKE YOUR OLD-CAR DREAMS COME TRUE



Looking for a pre-1980 collector car? This booklet shows how to research and choose your dream car, where to look, what to consider before you buy, and why old cars are so much fun. Includes facts on prices, appraisals, restoration, clubs, and shows. From Hemmings Motor News. 32 pages, \$3.00.

3

## NORTHERN "WHERE THE PROS AND HANDYMEN SHOP"



Save 20-50% on a wide variety of name-brand power and hand tools, air compressors and air tools, 3-23 HP gas engines, log splitters, chain saws, pressure washers, trailer parts, pickup accessories, winches, generators, welders and more! Colorful 136-page discount catalog from NORTHERN—"Where the Pros and Handymen Shop" FREE

4

## GOING UP?



The Iron Shop's do-it-yourself spiral stair kits are constructed of solid steel with vinyl handrails, include all fasteners, and are prefit for easy installation. 20-page brochure illustrates standard kit features, optional accessories, and various stair layouts. \$1.00.

5

## SUPER LOW FRICTION LUBRICANTS



Fluoramics introduces a patented family of Tufoil-based lubricants for computers, engines, automatic machinery, hinges, locks, guns and more. Brochure explains what Tufoil is and features product line. FREE

6

## WHAT'S NEW



Progressive Energy Corporation offers a FREE catalog featuring new and innovative items to save you money, extend the life of your car and protect your home and family. Space age lubricants, miracle gloves that resist 600°F, sound activated home security devices, and many other exclusive products. Order your FREE catalog today!

7

## Things You Never Knew Existed...

... and other items you can't POSSIBLY live without Called "most unusual catalog in the world."

Hundreds of items you never dreamed you'd see. *Esquire*, *Life*, *New Yorker* have said "World of fantastic wonders." "Fabulous treasure trove." "Humor in jugular vein." 96 pages of over 1800 funmakers, jokes, hobbies, novelties, gadgets, sports, science, self-improvers, bargains, surprises and more. Johnson Smith Company. \$1.00

8

## AMERICAN HONDA MOTOR CO., INC.



Brochure on full line of Honda Power Equipment, including lawn mowers, riding mowers and lawn tractors, a utility tractor, generators, pumps, tillers, outboards, power carriers and snowthrowers. FREE.

9

Popular Mechanics 6/89  
Box 1718, Sandusky, Ohio 44870

Please see that I receive the items checked below

- 1 FREE    2 FREE    3 \$3.00  
 4 FREE    5 \$1.00    6 FREE  
 7 FREE    8 \$1.00    9 FREE

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.

This Coupon Expires August 31, 1989

Total money for priced items \$ \_\_\_\_\_

Service Charge \$ \_\_\_\_\_ 1.00

Total money enclosed \$ \_\_\_\_\_

Total items requested \_\_\_\_\_





The Sebring  
'62 Austin-Healey reproduction



The Marlene  
'36 Mercedes 500K reproduction

# Why Build Your Own Classic Roadster?

**B**ecause it's a fun and rewarding project. Thousands of people, like you, have built and are now driving their own Classic Roadster. Our kits are engineered for easy assembly and years of driving pleasure. And, our quality is guaranteed. If you prefer, we will custom build a roadster for you.

*"Whether you're looking for a factory built, turn-key roadster or want to build your own from a first-class kit, Classic Roadsters is the way to go."*  
The Editors, Kit Car World Magazine

Now available with V-8 power!

Also available: Jaguar, MG and 4 passenger Mercedes reproductions.

Call Today for Free Brochure or Videotape Information!

**1-800-373-9000** Ext. 2862

For International Export Call (701) 293-8866

YES, Please send me the following information: **2862**

**Easy-To-Assemble Kit**  **Custom Built**

A)  FREE Color Brochure, parts & options info, and Corporate Report

B)  (\$5.00) 16 pg. Product Catalogue, plus 24 pg. company, component & pricing info

C)  (\$15.00) VHS Videotape (corporate & model profile) plus "B" literature pkg.

D)  (\$2.00) Business Opportunities report

Name \_\_\_\_\_

Phone (day) (\_\_\_\_\_) \_\_\_\_\_

Phone (eve) (\_\_\_\_\_) \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Card # \_\_\_\_\_ Exp. \_\_\_\_\_



**Classic Roadsters Ltd.**

1617 Main Ave.  
Fargo, ND 58103



Coupon must be complete to process.

## Stop ugly nail fungus.

Pro Clearz is a quick, safe and simple way to eliminate nail fungus for good. Pro Clearz ends the aches, odors and discomfort of fungus on toes and fingernails. Simply brush it on twice daily and fungus disappears. Comes complete with its own brush. 1 oz.

WAS \$9.99  
Now Only **\$5.99**  
MONEY-BACK GUARANTEE



## HealthFest

Dept. PRO-85, 74-20th Street, Brooklyn, NY 11232

YES! Please send \_\_\_\_\_ Bottle(s) of Pro-Clearz, #549.

One for \$5.99 plus \$1.25 postage and handling (Total \$7.24).

**SAVE!** Two for \$9.99 plus \$1.85 postage and handling (Total \$11.84).

Name \_\_\_\_\_

Address \_\_\_\_\_

City, State, Zip \_\_\_\_\_

Allow up to 6 weeks for delivery.

**MAKE UP TO \$26<sup>00</sup> 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 shortcut 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  
6301 EQUITABLE RD., DEPT. 11638  
KANSAS CITY, MO. 64126

PLEASE RUSH FREE BOOK "Keys To Your Future"

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY-STATE-ZIP \_\_\_\_\_



TELLS HOW TO MAKE MONEY IN LOCKSMITHING ALMOST FROM THE START!



Tells how you quickly train to be your own boss in a profitable Sparetime or Full-time business of your own.

SEND FOR YOUR COPY TODAY!

30 DAY NO RISK TRIAL

ALL SPECIAL TOOLS AND EQUIPMENT INCLUDED





# PLUGGING POWER STEERING LEAKS

BY PAUL STENQUIST

**S**MOKE billows out from under the hood of your car. The air fills with an obnoxious sulfur odor. Suddenly, the steering goes heavy. You feel as though you're at the tiller of a 10-ton truck.

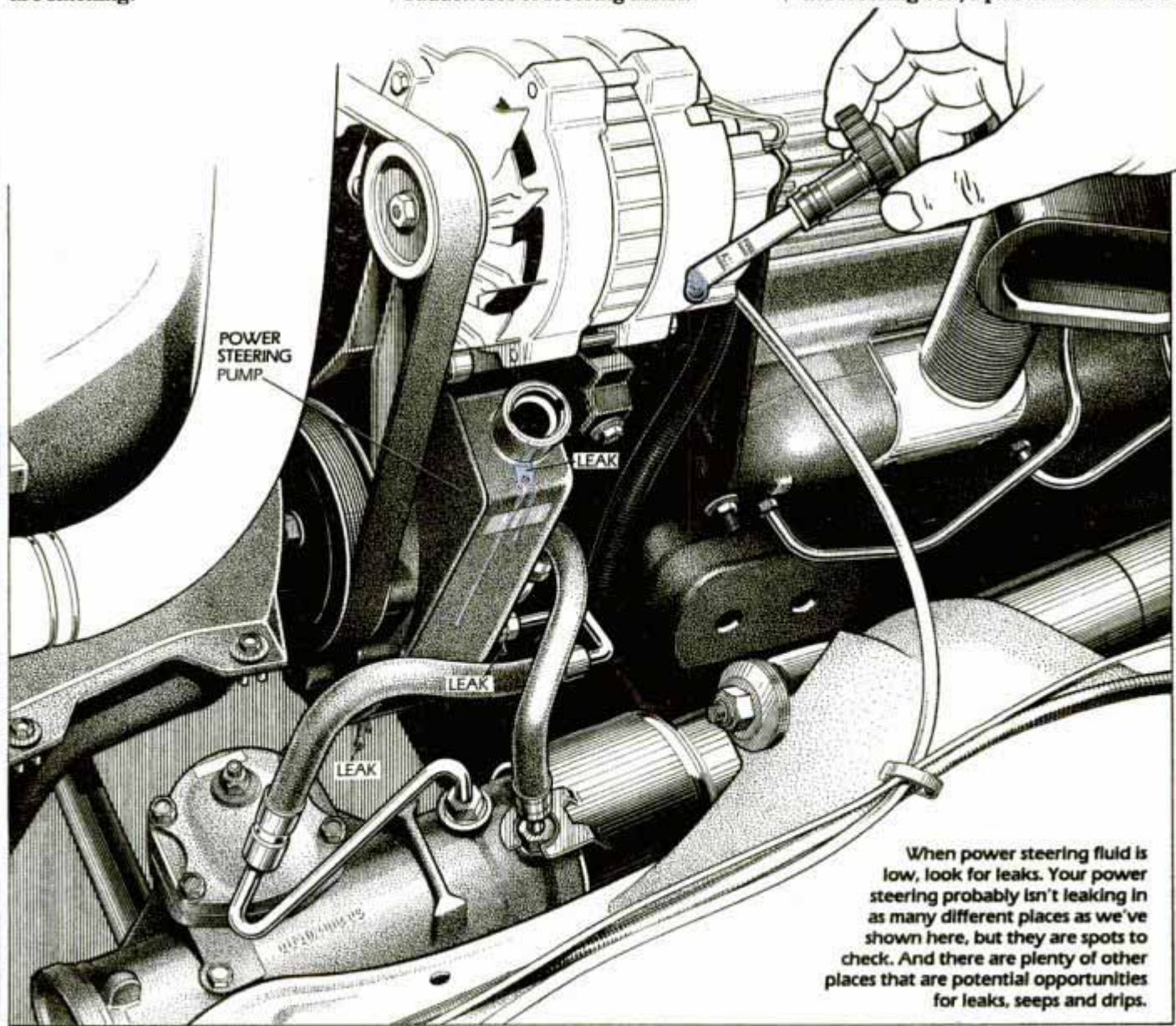
You stop your car, leap out and throw the hood up. Everything is covered with oil—the exhaust manifolds are smoking.

The cause of this mess? Quite possibly a big leak on the high-pressure side of your power steering system.

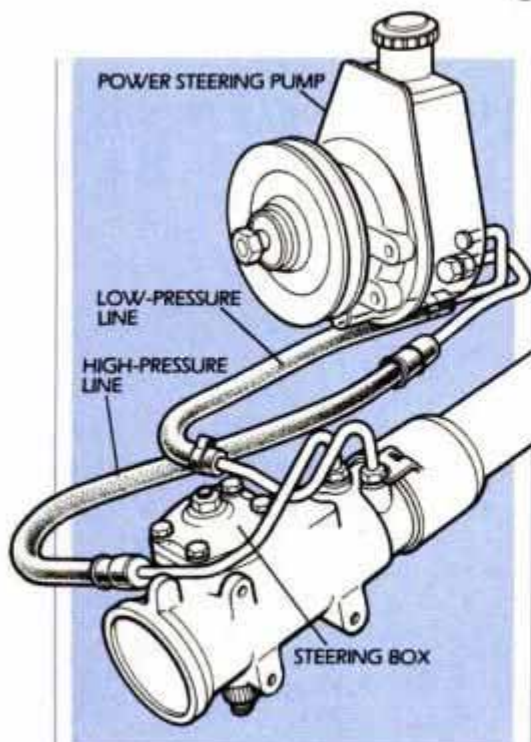
But power steering leaks may not always be quite so obvious. A leaking seal or low-pressure hose, for example, may only leave puddles of hydraulic fluid in your driveway. In either case, the fluid loss can cause a sudden loss of steering assist.

## Power steering basics

Although some power steering systems have grown more complex in efforts to improve "feel," basic operation is simple. When the engine is running, hydraulic fluid is pressurized by a belt-driven pump mounted on the engine and delivered to the steering box by a high-pressure hose. Within the steering box, a piston is connected



When power steering fluid is low, look for leaks. Your power steering probably isn't leaking in as many different places as we've shown here, but they are spots to check. And there are plenty of other places that are potential opportunities for leaks, seeps and drips.



1 Typical system consists of steering box, pump and high- and low-pressure hoses.

to the steering linkage. When the steering wheel is turned, a valve routes high-pressure oil to the piston. This helps the driver move the steering gear and turn the wheels. Low-pressure oil is directed back to the steering pump reservoir through a return hose (Fig. 1).

On most cars, the pump reservoir is mounted directly on the pump. On some cars, primarily imports, the reservoir is remote-mounted and connected to the pump by means of a second return hose.

### Locating a leak

Some power steering leaks will be obvious and easy to spot. Others may be quite elusive. To track down a leak, fill the reservoir with fluid. (Make sure you don't overfill it. If the reservoir is already overfilled, you may have located the source of your leak!)

Clean any areas that are covered with fluid. Then, with the engine idling, have a helper turn the steering wheel left to right and back several times.

Trace the system: pump to high-pressure hose to steering box, steering box to low-pressure hose to pump. On cars so equipped, carefully check the remote reservoir and its hose connections. In addition to all hoses and connections, check the front shaft seal area on the pump (behind the pulley), the junction between the pump and its attached reservoir (where applica-

ble), and all seal areas on the steering box.

### Hoses and remote reservoirs

Both low- and high-pressure hoses are subject to failure, but it's easy to distinguish between the two. A leaking high-pressure hose will squirt fluid all over. A leaking low-pressure hose will only drip fluid.

The most common cause of a power steering fluid leak is a burst high-pressure hose. The hose separates from the metal collar and fitting. It may seem as though you can reattach the failed hose to its failed fitting, but believe us—you can't. It'll blow out again. Replacement is the only fix.

Before replacing the hose, disconnect the negative terminal of the battery and turn the front wheels to the straight-ahead position. Use a tubing wrench to unbolt the hose-end fittings from the power steering pump and the steering box. Catch spilled fluid as you disconnect the fittings.

Some power steering hoses are sealed by means of an O-ring in the pump or steering box fitting. If you

find an O-ring, replace it with a new one. Use only the specified replacement O-ring, which is usually provided with the new hose. If you need only the O-ring, you should be able to purchase the right piece at the dealer's parts counter.

Reinstall the new hose in exactly the same position as the old one. If you use an aftermarket hose, it may be slightly longer than the old one. That's okay, but make sure the hose won't be subjected to chafing or other abuses. Don't twist the hose and be sure it isn't in contact with other components.

Tighten the hose-end fittings with a tubing wrench. Don't overtighten the fittings: You could damage the tube nut wall or—where applicable—the O-ring seal, either of which will cause a leak. Use only firm wrist pressure. If you have a torque wrench and "crow-foot" open-end or tubing wrench attachment, torque the lines to the manufacturer's spec.

Like the high-pressure hoses, some low-pressure hoses are made with permanently attached fittings. But most hoses are attached to steel tubing with crimped or worm-drive

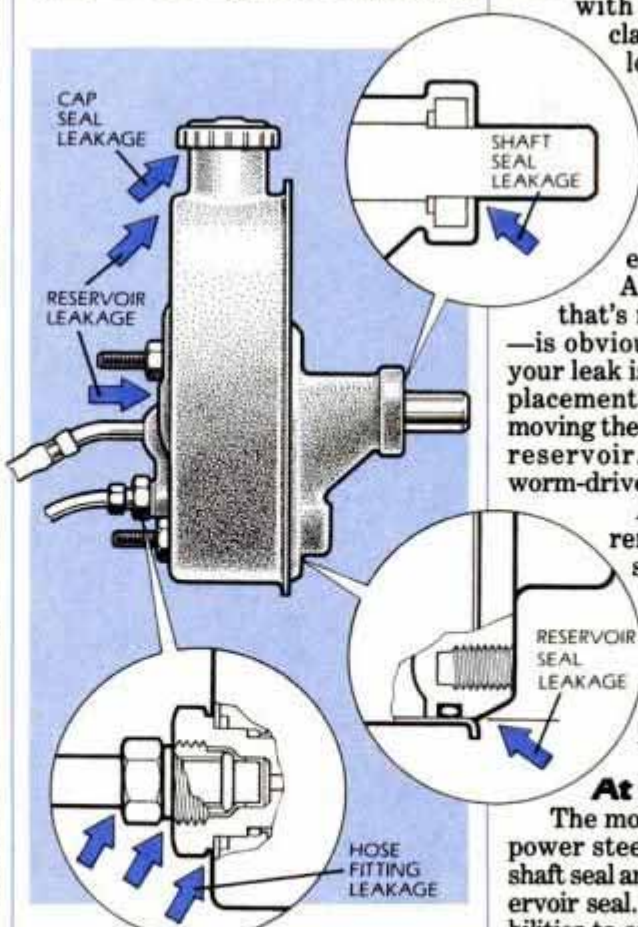
clamps. When you replace a low-pressure hose that is not equipped with permanent fittings, use worm-drive clamps to secure it in place. Don't attempt to reuse the crimped clamps from the original equipment.

A remote reservoir—one that's not attached to the pump—is obviously a prime candidate if your leak is a slow, steady drip. Replacement is simply a matter of removing the hoses and installing a new reservoir. Attach the hoses with worm-drive clamps.

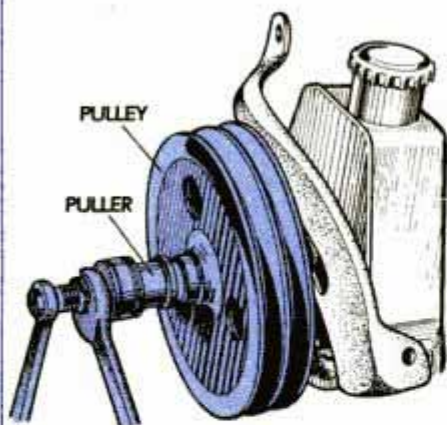
After replacing hoses or a remote reservoir, bleed the system as described at the end of this article on page 136. The bleeding procedure should follow any power steering system repair where fluid is released.

### At the pump

The most common leak points on power steering pumps are the front shaft seal and the fluid reservoir or reservoir seal. But there are other possibilities to consider (Fig. 2). One is the cap gasket. Make sure it is in place before you start taking things apart, or



2 Pump leaks can occur at cap, hose connections, reservoir seal, and body or shaft seal.



3 To remove pulley, hold pilot bolt while turning the shaft nut counterclockwise.

you could turn a simple 2-minute repair into a messy 2-hour job. Other possibilities include loose rear cover bolts, if applicable, and a damaged or cracked pump body.

To remove the pump, disconnect the hoses at the pump. Hold a can under the fittings as you disconnect them to catch fluid. Once the hoses have been disconnected, keep the free ends in a raised position to prevent oil spills. Then cap or tape the ends of the hoses to keep dirt out. Cap or tape the pump fittings as well.

With hoses disconnected, remove the pump belt. To do this you'll have to either loosen the pump-mounting bolts and rotate the pump toward the engine, or, on cars so equipped, loosen the pump jack-screw adjustment. Once the belt is off, remove the pump retaining bolts and lift the pump out of the engine compartment.

To remove a power steering pump pulley, you'll need a special hub puller designed specifically for power steering pumps (Fig. 3). A universal model that works on almost all cars is available from your better auto parts stores. The same tool is used to press the pulley back onto the shaft once repairs have been completed.

Before removing the pulley, drain as much fluid as possible from the pump through the reservoir neck. Then install the removal tool on the pulley hub. Make sure the tool's pilot bolt bottoms in the pump shaft by turning the nut all the way to the top of the pilot bolt. With most tools, you remove the pulley by holding the pilot bolt and turning the nut counterclockwise. The same tool is used to press the pulley back onto the shaft once repairs have been completed. To install the pulley, hold the pilot bolt and turn the nut clockwise.

The reservoir is usually attached to the pump by means of mounting studs and a rubber O-ring. In most cases, you'll have to remove the mounting brackets from the pump to get at the reservoir. Before attempting to remove the reservoir, clean the exterior of the pump and reservoir with solvent. Then clamp the pump in a bench vise with soft jaws. On most pumps you'll have to remove the outlet fitting. On Ford pumps you'll have to remove the flow control valve as well.

Use new O-ring seals in all locations when reinstalling a new reservoir. Use a pick to remove O-rings from valves or fittings (Fig. 4).

To reinstall the reservoir, locate a new O-ring seal on the housing. Apply petroleum jelly to the O-ring and the inside edge of the reservoir. Place the reservoir over the pump and align any fitting holes with the respective holes in the pump. Push it into place.

To replace a leaking shaft seal on most pumps other than GM units, you'll have to completely disassemble and reassemble the pump. Unless you're very skilled at this type of work, we'd recommend buying the rebuilt unit. An aftermarket pump will probably cost quite a bit less than a new pump from the dealer.

You can, however, usually replace the pump shaft seal on a GM power steering pump without disassembling the pump itself.

First, you should protect the pump driveshaft with steel shim stock wrapped around the shaft and inserted between the shaft and the seal. Then use a chisel to cut the seal. Remove the shim stock. Then remove the old seal with pliers.

Coat the new seal with power steering fluid, and carefully drive the new seal into the pump housing using a seal driver or a deep well socket that

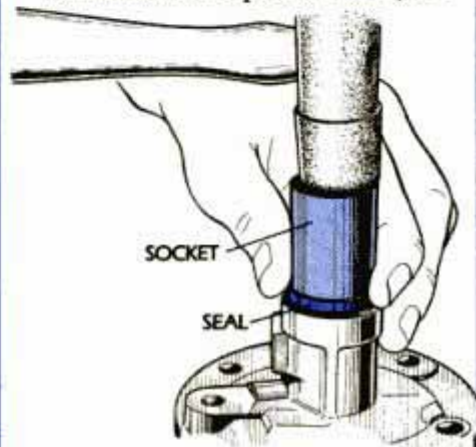
will slip over the driveshaft but whose outer circumference rests on the metal seal carrier (Fig. 5).

## At the box

The most common leak point on a recirculating-ball power steering box is the pitman shaft seal. If the seal is bad, fluid will drip or squirt from the shaft area. The underside of the car may be completely covered with power steering fluid.

Before you can extract the pitman shaft seal, you have to remove the pitman arm. Once again, a special tool is required. It's a simple hub-puller that fits snugly around the shaft end of the pitman arm. You can rent or buy one at most auto parts stores.

To remove the pitman arm, un-



5 Install new seals with a mallet and a socket just slightly smaller than the seal.

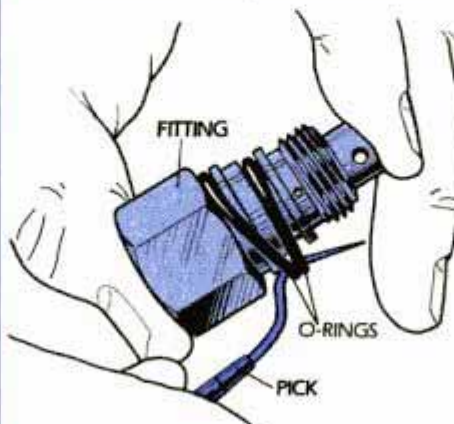
screw its retaining nut. It may be locked in place with a cotter pin or lock washer. Then slip the pitman arm puller over the shaft end of the arm and use a socket wrench or box wrench to tighten the hub-puller's jack screw against the end of the pitman shaft (Fig. 6).

Once the pitman arm has been removed, clean the exposed end of the pitman shaft and the steering box housing with solvent.

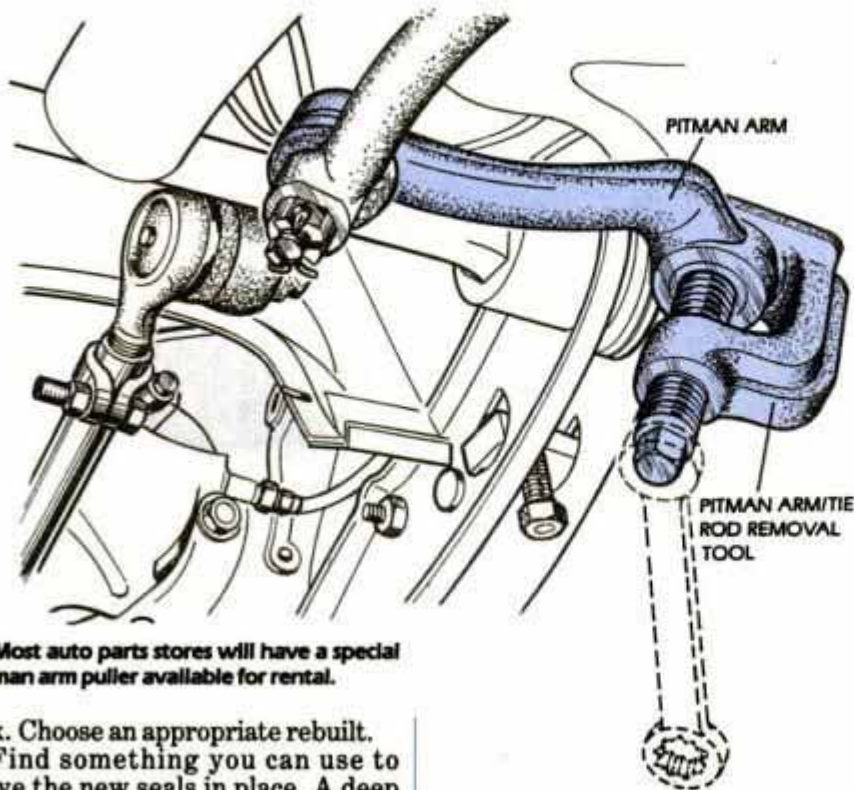
Within the shaft housing you'll find a snap ring holding the seal in place. Remove this ring with your snap ring pliers.

Place newspaper and a drain pan on the floor under the pitman shaft area. Top off the power steering fluid if it's low, then start the engine and turn the wheels fully to the left. This should force the seals and washer out. (Most are fitted with two seals.)

Once the seals have been removed, inspect the housing and shaft. If the shaft is worn, rough or pitted, you'll probably have to replace the steering



4 Remove old O-rings from a flow control valve or fitting with a sharp pick.



6 Most auto parts stores will have a special pitman arm puller available for rental.

box. Choose an appropriate rebuilt.

Find something you can use to drive the new seals in place. A deep well socket that contacts the outer edge of the seal will work on many applications. If you can't find anything that will do the job, you may have to purchase a seal installer. In any case, make sure you drive the seal in straight and true. As with any seal of this type, you'll ruin it if you cock it going in.

Reinstall the pitman arm, lock washer and nut. Torque the pitman nut to spec.

### At the rack

Some rack-and-pinion steering box leaks are merely the result of a leaking hydraulic cylinder line. These lines, sealed with O-rings, join the cylinder at one end of the rack to the valve at the other end (Fig. 7). If the leak is coming from one of these lines, you should be able to spot it while your helper turns the steering wheel back and forth. That is, you should be able to spot it if you can see the rack. On some cars, it's buried behind the engine.

If access is okay, try tightening the line slightly. Don't muscle it down. You could strip the threads and ruin your steering box. Manufacturers provide torque specs for these fittings. Your best bet is to tighten the fittings with that previously mentioned torque wrench and "crow-foot" open-end or tubing wrench.

If tightening the fittings doesn't

stop the leak, replacement is necessary. Replacing the seals and, if necessary, the lines is a simple job, executed with a tubing wrench. Use the torque wrench if possible.

Some rack-and-pinion leaks are due to failure of other, internal seals. Most rack-and-pinion steering box leaks are, unfortunately, a symptom of a failed rack. In most cases, steering effort gets hard before the leakage begins. This hard steering effort is most noticeable when the car is cold.

The fix? Replace the rack with an aftermarket rebuilt unit. These aftermarket rebuilds are a relatively good buy, as compared to a new factory unit. Rebuilding the old rack yourself is a possibility, but it's an extremely

difficult job and not recommended. You're liable to expend much effort and agony, spend a lot on parts and special tools, and end up with a rack that leaks or—worse yet—doesn't steer very well.

On many cars, however, removing and replacing the rack is relatively easy. By checking the procedure in your service manual, you should be able to determine if it's a job that you feel comfortable with. But you must have a factory service manual and a good set of jackstands or ramps. Observe all normal precautions for jacking and supporting a car. Plan on having the toe-in reset at an alignment shop when you're finished.

### Bleeding the system

Following any steering repair where hoses have been disconnected or parts removed, air will have to be bled from the system.

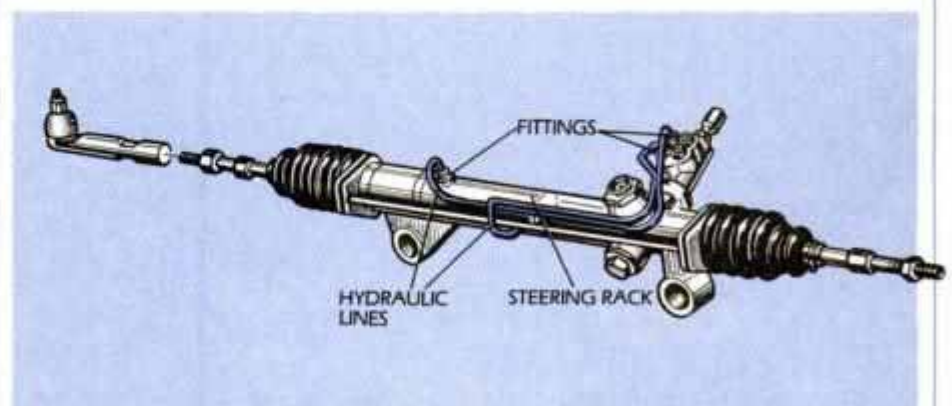
First, turn the wheels all the way to the left and add the manufacturer's recommended power steering fluid (see your owner's manual). Fill only to the COLD level as indicated on your steering reservoir dipstick.

Start the engine. With the engine at a fast idle speed, recheck the fluid level. If it's not up to the COLD level, add more fluid.

Turn the wheels from side to side several times without going all the way to full lock. Keep adding fluid gradually if necessary to maintain the level. Repeat this procedure until the fluid in the reservoir is normal in appearance. (Fluid with air in it will be lighter in color than normal fluid.)

Return the wheels to the center position, and run the engine for 2 or 3 minutes. Then road test the car. Steering function should be normal and free of noise.

Recheck the fluid level and top off to the HOT level if necessary. **PM**



7 Common leakage points include O-ring seals at either end of hydraulic cylinder lines.

# You Saw It On TV's "THIS OLD HOUSE"

## LIFTS • PEELS • STRIPS AWAY UP TO 30 COATS OF PAINT AT A TIME!

- NOW AVAILABLE IN COMMERCIAL PRE-MIX, simply apply—let set—and lift away paint in one single action.
- Ends sanding—scraping—spraying—chipping—steel wool virtually FOREVER!
- Amazing European discovery turns layers of paint into a single sheet, so it LIFTS AWAY INTACT!
- There are NO TOXIC FUMES and NO FLAMMABLE SOLVENTS!



### "PEEL-AWAY" WORKS WONDERS ON WINDOWS, WALLS, BRICKS AND FURNITURE

You've seen it on TV's "THIS OLD HOUSE." You've read about it in newspapers and magazines. Now here it is, the amazing wonder formula that starts to penetrate old paint (shellac and varnish, too) IN JUST MINUTES! Transforms it into a soft, plastic-like film. Then simply let set . . . lift, roll, strip up to 30 coats of paint away in a single lift-away action! Years of built-up paint, lift away quick and easy.

"PEEL-AWAY" will also remove painted or unpainted wallpaper.

**SIMPLY COAT IT ON—LET SET—  
SEE IT TURN PAINT TO "PAPER"—  
AND PEEL IT AWAY IN A SINGLE  
LIFT-OFF ACTION!**

And now it's even easier than ever to apply, because easy to use, "PEEL-AWAY" comes in a NEW READY-MIX formula. Ready to use, just coat onto practically any painted surface, (except on factory baked finishes such as cars, washing machines, etc.) press down special "PEEL-AWAY" magic Liftex Strip away cloth . . . let formula set and adhere to surface and lift away old paint. It is as simple and easy as that!

© 1988 Dumond Chemicals, Inc.

**SO ECONOMICAL TOO! REMOVES  
YEARS OF BUILT-UP PAINT . . . UP  
TO 30 LAYERS AT A TIME!**

"PEEL-AWAY" is every home-owners dream come true. Ideal for indoors on walls, windows, furniture, etc.—Plus 101 outdoor uses too. And it's so economical too. Homeowner's size alone gives enough coverage to strip away as much as 50 to 80 feet of average wall and door trim, window frames, furniture molding, stair railing, patio furniture, edging, roof gutters . . . its uses are almost endless!

**SAVES WORK! SAVES TIME!  
SAVES MONEY! MAKES TAKING  
OFF PAINT ALMOST AS EASY AS  
PUTTING IT ON!**

So for the new low-cost, super-fast way to lift away old paint . . . lift away old varnish and shellac . . . order your "PEEL-AWAY" today on a full money-back guarantee. REMEMBER: You must be able to simply coat . . . peel . . . lift and strip away up to 30 layers of old paint in a single lift-away action . . . without sanding, scraping, chipping or steel wool . . . or purchase price refunded in full. Order Today!



### PROVEN WORLD WIDE:

**WASHINGTON MONUMENT, Baltimore, MD** LIFTED AWAY 28 coats of paint in a single application!

**GREENWICH PALACE, London, England** LIFTED AWAY 32 coats of paint from ornate plaster ceilings!

**CAPITOL BUILDING, Indianapolis, IN** LIFTED AWAY 23 coats of paint in a single application!

**BRITISH MUSEUM, London, England** LIFTED AWAY 100 years of paint from the museum's iron railings, in a single application!

PLUS . . .

**Texas A&M University, The American Hotel in Amsterdam, Holland, Royal Hospital, Chelsea, England,** and other landmarks across the nation, and worldwide!

*The Pros no longer chip, scrape, spray, or sand . . . why should you?*

#### MAIL NO RISK COUPON TODAY

DUMOND CHEMICALS, Dept PSA-12 1501 Broadway, NY, NY 10036

Please RUSH the quantity of "PEEL-AWAY" (now available in commercial pre-mixed formula) checked below. If I am not completely satisfied with the way it "lifts-away" up to 30 coats of paint with just one single application, I may return for a full refund (less postage and handling, of course).

#### CHECK OFFER DESIRED

- Regular Size (½ Gallon) only \$12.95 plus \$3 postage and handling.
- Homeowner Size (1 Gallon) only \$19.95 plus \$5 postage and handling. **YOU SAVE \$7.00!**
- Handyman's Super 5 Gallon Size only \$74.50 plus \$15 postage and handling. **YOU SAVE \$70.00!**

Amount Enclosed \$\_\_\_\_ (NY residents add sales tax) No C.O.D.'s please.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_



Set your own posts  
...pour your own  
concrete slab.

**\$2**  
**REBATE**  
**PER BAG**

To set posts  
just pour  
into hole  
with water.



For concrete  
steps or slab  
just mix with water.

**JUST  
ADD  
WATER**

Just add water, mix and pour multi-use QUIKRETE® Fast-Setting Concrete. Sets hard in minutes. For steps, sidewalks, setting posts, etc. \$2 rebate on 50-lb. bag May 15 - July 15, 1989. 5-bag limit per family.



**\$2**  
**REBATE**  
**PER BAG**

Make your own repairs to cracked or broken concrete steps, floors, walks. Just add water and apply. \$2 rebate on 40-lb. bag May 15 - July 15, 1989. 5-bag limit per family. See rebate coupon for details.



Order this new  
165-page  
hardback that  
tells you all you  
need to know  
to build and  
repair with  
concrete.

Complete dozens  
of projects from  
making simple  
sidewalk  
repairs to  
building a foundation or

wall. Detailed illustrations — photographs, drawings and diagrams — lead you step by step. All necessary tools and materials are listed. Available at your home center, hardware or building supply. Or send \$7.95 to QUIKRETE®, RD 1, Box 276, New Ringold, PA 17960.



The QUIKRETE® Companies, Atlanta, GA 30345

The Mantis Tiller.  
Just 20 pounds  
and it's  
all muscle.

Tills 8" deep, 9" wide, even in tough, rocky soils. Weeds and cultivates an average-size garden in 20 minutes. With optional attachments, aerates and de-thatches your lawn, digs planting holes and furrows, even trims hedges. Try it risk-free in your own garden for a full month! Order early and the Border Edger attachment is yours free!



Send coupon today or  
Call toll-free 1-800-366-6268

**Mantis** Mantis Manufacturing Co.  
1458 County Line Rd., Dept. 8202  
Huntingdon Valley, PA 19006

Yes, please send me free details about the amazing Mantis tiller!

Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_  
State \_\_\_\_\_ Zip \_\_\_\_\_

© 1989 MMC

MAIL THIS COUPON FOR FREE FACTS!  
**TRAIN AT HOME  
FOR A BETTER CAREER**  
22 ways ICS can help you improve your life!

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.

**ICS** International Correspondence Schools, Dept. PBS69  
Scranton, Pennsylvania 18515

**ASSOCIATE IN SPECIALIZED BUSINESS DEGREE PROGRAMS**

- Business Management
- Accounting
- Business Management with option in Finance
- Business Management with option in Marketing

**ASSOCIATE IN SPECIALIZED TECHNOLOGY DEGREE PROGRAMS**

- Civil Engineering Tech.
- Mechanical Engineering Technology
- Electrical Engineering Technology
- Electronics Technology

**CAREER DIPLOMA PROGRAMS**

- High School
- Auto Mechanics
- Surveying & Mapping
- Drafting
- Air Conditioning & Refrigeration
- Wildlife Forestry Conservation
- Police Sciences
- Electrician
- Small Business Management
- Electronics
- Microcomputer Repair
- Computer Programming
- TV/VCR Repair
- Journalism/Short Story Writing

Name \_\_\_\_\_ Age \_\_\_\_\_  
Address \_\_\_\_\_ Apt. # \_\_\_\_\_  
City/State \_\_\_\_\_ Zip \_\_\_\_\_  
Phone (\_\_\_\_) \_\_\_\_\_



Subscribe today **ONLY \$14.95** \$21 in Canada

Send to:  
**Hemmings  
Motor News**  
Box 100, Dept. 9618, Bennington, Vermont 05201



Why Are We Giving Away Our Nationally Advertised

# GFX-100 INDOOR TV "DISH" ANTENNAS

for  
only **\$10**

**GUARANTEED TO  
FIRST 10,000 WHO  
RESPOND BEFORE  
AUGUST 31, 1989**

Throw away your old TV rod antenna! The GFX-100 looks like an outdoor satellite "dish," but works *indoors* like ordinary "rabbit ears." *No wiring or installation!* Legal in all 50 states. *You pay NO cable fees because you're NOT getting cable!!! You pay NO satellite fees because you're NOT using satellite technology or service!!!* Works entirely via proven "RF" technology—actually pulls signals *right out of the air*. Instantly locks into every local VHF and UHF channel from 2 to 83 to bring you their **movies, sports and special events just like an ordinary pair of "rabbit ears."** **No cable box or special attachments needed!** Enhances color and clarity, helps pull in weak signals. Compatible with all TVs from 3-inch portables to giant 7-footers. Sits on any TV top in less than 4 linear inches of space! Guaranteed not to utilize, replicate, transmit or interfere with any satellite signal. Complies with all applicable federal regulations. Not technical razzle-dazzle but the sheer aesthetic superiority of its elegant parabolic design make the GFX-100 a *marketing breakthrough!* At this price, put one on every TV in your home! One-year money-back guarantee. *(Sorry, limit 3 per address. No dealers or wholesalers, please!)* We reserve the right to extend above time and quantity guarantees.



**MAIL BY AUGUST 31  
FOR THIS AMAZING OFFER**

Yes, rush me a TV "Dish" Antenna for the low price of only \$10.

(R54220)

**SAVE!**  2 FOR ONLY \$17 (SAVE \$3)  
 3 FOR ONLY \$25 (SAVE \$5)

Add \$3 Shipping for Each Antenna. NY residents add sales tax. Make check payable to RBM Ltd.

**TOTAL \$ \_\_\_\_\_ enclosed.** Or charge to my

VISA  MASTERCARD/Expire Date: Mo\_\_Yr\_\_  
(Enter all 13 or 16 card numbers below)

Card # \_\_\_\_\_

Mr/Mrs \_\_\_\_\_  
Ms/Miss \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**MAIL TO:** RBM Ltd., TV "DISH" ANTENNA, Dept. 114-127  
Box 1280, Westbury, NY 11595

**ALLOW UP TO 6-8 WEEKS FOR SHIPMENT**

## Uniquely Beautiful Inside and Out!



- Energy Efficiency with the Beauty of High Ceilings
- 30% More Floor Space over Rectangular Structures
- Over 30 Years Experience
- Pre-Insulated Kit



### Geodesic Domes, Inc.

Please Send Me:

- 125 pg. color brochure with 80 home plans. Enclosed is \$8.  
 For now just send me your FREE flyer.

Dept. PM  
10290 Davison Road  
Davison, MI 48423  
(313) 653-2188

Name

Address

City

State

Zip

## \*\*\*\*\* PRESENTING \*\*\*\*\* CABLE TV EQUIPMENT

\*\*\*\*\* 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 HOURS

FOR FREE CATALOG ONLY 1-800-345-8927  
FOR ALL INFORMATION 1-818-716-5914

PACIFIC CABLE CO., INC.

7325 1/2 Reseda Blvd., Dept. 1721  
Reseda, CA 91335

## TELEPHONE LISTENING DEVICE



Record telephone conversations in your office or home. Connects between any cassette or tape recorder and your telephone line. Starts automatically when phone is answered. Records both sides of conversation. Stops recorder when phone is hung up.

**\$19.95 EACH** (By Mail)

### Super Powerful FM TRANSMITTER

Many times more powerful than other transmitters. Transmits up to 1/2 mile to any FM radio. Easy to Assemble Kit - up to 9W battery (not incl). For catalog of Transmitters, Voice Scramblers and other specialty items, enclose \$2.00 to USI Corp.

Call 800-725-1000 or send \$19.95 + \$1.00 shipping per item to: USI Corp., PO Box 25067, Tallahassee, FL 32302, C.O.D.'s OK.

## Pay For Your Hobby!

With White's New **EAGLE** Metal Detector, Programmable Computer Driven to locate only valuable items! Fun and profitable! Models from \$99.95!



For a Free Catalog  
Call Toll-Free:  
1-800-547-6911

WHITE'S ELECTRONICS  
Dept. PA-7 Sweet Home, OR 97386

## CUT TALL WEEDS AND BRUSH IN IMPOSSIBLE PLACES

NO MONEY DOWN  
PAYMENT PLAN



- Cuts brush and saplings — up to 1 1/2"
  - Commercial Sickle bar mower — used by Rental yards and Highway departments
  - Costs over \$100 less — than homeowner models
- Send for Literature and factory pricing

**KINCO**

WRITE TODAY.  
Dept. 5894 170 N. Pascal,  
St. Paul, MN 55104 1-800-234-0515

## Wood-Mizer®

World's Largest  
Manufacturer  
Of Portable  
Sawmills



### OWN YOUR OWN SAWMILL

Four Models To Choose From  
BUY DIRECT

**1(800)553-0219**

In Indiana call: (317) 271-1542  
44-page catalog or use  
your MasterCard or VISA  
to order our 50-minute  
demonstration video—\$10.00  
Wood-Mizer Products, Inc. • Dept. D47  
8180 W. 10th St. Indianapolis, IN 46214-2430

FREE

## MINI-MARVEL ELECTRIC MOTOR KIT

- Fun for all • Educational • Easy to assemble
- Fully illustrated instructions. Runs on 6V dry cell (not included). Please send a check or money order for \$12.00 + \$3.00 P.H. to:



MARVEL MOTOR, DEPT. A  
P.O. BOX 9847, TEXARKANA, TX 75505

## BASEMENT TOILET

FLUSHES UP To Sewer or SINK

No Digging Up Floors  
Install It Yourself - Anywhere

Write McPherson, Inc., Dept. 16  
Box 15133 Tampa, Florida 33684



## MAKE \$25 TO \$100 PER HOUR



Badge-A-Minit lets you make pin back buttons for fun or profit. Button parts cost only pennies each to make... set for much more. Send for a FREE catalog or to get started send \$26.95 plus \$1.75 shipping (IL res. add \$1.68 tax) to Badge-A-Minit, Dept. PM680, Box 800, LaSalle, IL 61301. Phone 1-815-224-2090.

Money Back Guarantee.

**NEW • AT LAST!** 100 FREE DARTS  
LUNG BOWLING  
PARA-COMBAT MAGNUM™ "Guerrilla"™ AIR-DART®  
Used in Vietnam  
SILENT, POWERFUL  
ACCURATE

**ZAP-SHOOTERS® \$8.97**

Great! Starts slow, gets up to 100 mph! Hunting, target, pleasure, survival, kids, sports, party!  
Great! Starts slow, gets up to 100 mph! Hunting, target, pleasure, survival, kids, sports, party!  
Great! Starts slow, gets up to 100 mph! Hunting, target, pleasure, survival, kids, sports, party!

ADD \$2.25 U.P. 500 PCS 500 PCS 500 PCS  
Zap darts #4 1000 \$7.200 #15 500 \$4.40 #18 500 \$4.40 #20 500 \$4.40 #22 500 \$4.40 #24 500 \$4.40 #26 500 \$4.40 #28 500 \$4.40 #30 500 \$4.40 #32 500 \$4.40 #34 500 \$4.40 #36 500 \$4.40 #38 500 \$4.40 #40 500 \$4.40 #42 500 \$4.40 #44 500 \$4.40 #46 500 \$4.40 #48 500 \$4.40 #50 500 \$4.40 #52 500 \$4.40 #54 500 \$4.40 #56 500 \$4.40 #58 500 \$4.40 #60 500 \$4.40 #62 500 \$4.40 #64 500 \$4.40 #66 500 \$4.40 #68 500 \$4.40 #70 500 \$4.40 #72 500 \$4.40 #74 500 \$4.40 #76 500 \$4.40 #78 500 \$4.40 #80 500 \$4.40 #82 500 \$4.40 #84 500 \$4.40 #86 500 \$4.40 #88 500 \$4.40 #90 500 \$4.40 #92 500 \$4.40 #94 500 \$4.40 #96 500 \$4.40 #100 500 \$4.40

Send for FREE catalog to: ZAP-DART, INC. P.O. Box 25051-M Salt Lake City, Utah 84125

# MESSY SHELVES?

Magazines all over the place! What you need are Popular Mechanics FILE BOXES to help you keep those bookshelves neat and orderly. Each box stands alone with all twelve issues intact. With every order you receive FREE self-adhesive labels covering the years 1975 through 1988. Peel off the year required and place on appropriate box.



- 1 File Box, \$2.95
- 2 File Boxes, \$2.75 ea.
- 3 File Boxes or more, \$2.50 ea.

Send order to Popular Mechanics, Dept. FL, Box 1014  
Radio City Station, New York, NY 10101.

For more on interesting projects send for PM's  
Plans and Ideas catalog, \$2.00

## MUSCLE MIX

- can help you...
- add inches to your chest and arms
- increase strength
- build muscle mass
- ... in just days!



Send for FREE info!  
DASH\* P.O. Box 2688 • Dept. PM69  
Tulac, AL 35403 1-800-367-9599

Subscribe to...

## MILITARY VEHICLES

### ADS • ARTICLES • NEWS

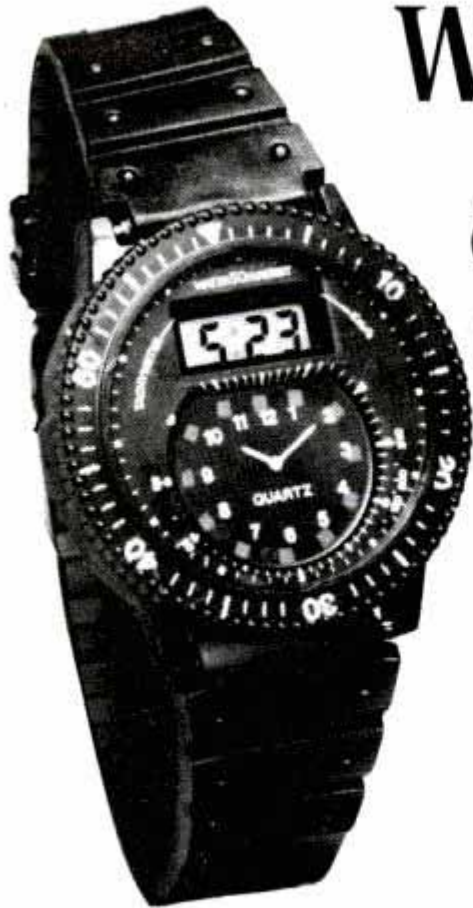
**MILITARY JEEPS, TRUCKS, TANKS & MORE!**  
Over 5,000 paid subscribers larger circulation than any other magazine for military vehicle enthusiasts... and still growing rapidly! Many more advertisements than any other magazine... Exclusive comprehensive listing of upcoming rallies... and much more!

### SUBSCRIBE NOW!

- One Year (6 Issues) \$12
- Two Years (12 Issues) \$20
- Foreign - Canada \$15, other \$20
- US Dollars payable by US Bank
- Sample Issue \$3 USA, \$5 outside



P.O. Box 1748-48, Union, NJ 07083



# Why are we giving away this rugged "Navigator"-style LCD watch...

FOR ONLY

# \$2

THIS IS NOT A MISPRINT.

**OFFER ENDS ON THURSDAY OF NEXT WEEK!**

That's right. Until midnight Thursday of next week, you may order this sturdy "Navigator"-style watch for only \$2.

The "Navigator"-style-rugged and masculine-looking-is one of the most popular of all watch styles for the adventurous, active man. Extremely practical in design, this watch has a fully adjustable black matte strap and a liquid crystal digital display (LCD) that tells time with long-running accuracy. It also features a handsome printed 12-hour watch face as an extra touch of elegance.

Shock and water-resistant, the "Navigator"-style watch is built to take hard knocks. It's the ideal watch to wear when swimming, jogging, playing squash, tennis, polo, mountain climbing-in any and every situation when you wouldn't trust the most expensive watch you already own.

**How can we make such an incredible offer?**

This offer is possible only because we're making it as part of a test marketing survey. We are trying to learn which newspapers are the best for us to advertise in. The number of replies from each paper will guide us in planning a projected million-dollar advertising budget.

**A GREAT GIFT IDEA!**

To thank you for ordering from this ad, you may have up to four (4) more watches at the same \$2 giveaway price as gifts for your closest friends and relatives. (P.S. They'll never guess how little you paid.)

**Unconditional Money-Back Guarantee**

This watch will not be sold by this firm in any store. There is a limit of five (5) watches per address at this \$2 price. You must be 100% satisfied, or return the watch(es) anytime within one month from receipt for a full refund-no questions asked.

To get your watch(es), mail the original printed coupon on this page (no xeroxes or hand-made copies will be accepted) before the deadline of midnight Thursday of next week to The Rothchild Depository, 101 West Street, Hillsdale, NJ 07642. Enclose \$2 for each watch ordered-limit, 5 watches per address-plus only \$1 postage and handling for each watch ordered. Thank you.

**FREE JEWELRY**

This is NOT a "must", but if you enter your birth date on the coupon, we'll celebrate your next birthday by sending you a FREE GIFT of JEWELRY from our Fifth Avenue Vault. There will, of course, be no obligation on your part.

**\$2 "NAVIGATOR"-style WATCH<sup>RC2RE1</sup> GIVEAWAY**

**THE ROTHCHILD DEPOSITORY**  
101 West Street  
Hillsdale, NJ 07642

Please rush me \_\_\_\_\_ "Navigator"-style watch(es) at only \$2 each plus only \$1 postage and handling for each watch ordered. (Limit 5 watches per address.) I must be 100% satisfied, or I may return watch(es) within one month of receipt for a full refund.

**ENCLOSE FULL PAYMENT IN CASH, CHECK OR MONEY ORDER**

Print Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Zip \_\_\_\_\_

Optional: My birth date is (Mo/Day/Yr) \_\_\_\_\_

Send me a FREE GIFT to celebrate my next birthday.

**YOUR ORDER MUST BE POSTMARKED NOT LATER THAN MIDNIGHT THURSDAY OF NEXT WEEK.**

NOTE: Be sure to use this original coupon. No xeroxes or hand-made copies can be accepted.

©1989 IRPI

# CLASSIFIED ADVERTISEMENTS

Sophie Gronowicz, Classified Sales Manager Dorothy Nolan, Classified Service Manager

Rate: \$7.95 per word payable in advance each insertion. Minimum insertion ten words.

Bold face capitalized words—\$1.00 per word additional (First word set in Bold Face at no extra charge, Zip Code Free.) Centered Headlines in All Bold-Face Letters—\$50.00.

The next available issue to place an advertisement in America's No. 1 Classified Section is **AUGUST**. The closing is **JUNE 5th**. Send remittance payable and order to Popular Mechanics, Classified Department, 224 West 57th Street, New York, New York 10019.

Please indicate Heading under which ad is to appear. As a consumer service and in cooperation with our mail-order advertisers who use post office box addresses for their convenience in handling your order, Popular Mechanics maintains a register of such mail-order advertisers containing their complete names and street addresses.

Advertisers using P.O. Box number must furnish complete name and street address for our records.

To avoid delay in the publication of your ad, please send samples and descriptive materials with your request if your ad does not state clearly what is being offered.

**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 Book! Join our successful authors. All subjects invited. Publicity, advertising, beautiful books. Send for fact-filled booklet and free manuscript report. Carlton Press, Dept. PMF, 11 West 32 Street, New York, 10001

**"SHARPENERS REPORT"** Monthly Newsletter. Valuable Tips—Sources—Buy/Sell Used Equipment. Free Brochure. Skog Company, Dept. PM6, P.O. 22559, Minneapolis, MN 55422

**BUY** discount books! Free details! Deceno, Ltd., Box 20315, Reno, NV 89515

**BOOKLET**, "Working Your Way Through College," describes money-making campus jobs. Excellent gift. \$9.50. Lee Dickinson, P.O. Box 385, Hampton, Virginia 23669.

**GOLD PANNING FOR FUN AND PROFIT.** You too can find gold! Learn how and where. Free Details: Adventure Outings, P.O. Box 1294-PM3, Golden, CO 80402

**VITAL INFORMATION** for anyone starting a business. Time saving, easy to understand. (5) Subjects \$14.95. Also selling by mailorder \$6.95 Send to: Dunco Graphics, P.O. Box 6160, Richmond, VA 23222-0160

**SAVE** 201+ ways home construction/remodeling costs. \$6.95. Buildco, Suite 361, 800 Fifth Avenue, Seattle, WA 98104-3191

**RESUMES** Write your own resume in professional manner. Critical do's and don'ts. Concise, detailed procedure, plus fifteen excellent examples. \$9.95. Resumes, Box 3048, Kearney, NE 68848

**EASY** Step-By-Step Plans For Making Money At Home. Free Information! Palmer Publications, 301-F Beverly Drive, Hughesville, Maryland 20637

**GET RICH AT HOME!** Seven PROFITABLE businesses. FREE Information. DVZ, 559 South Madison, Waupun, Wisconsin 53963

**TOP Secret:** Gemstone Files Abduction of America Lincoln to JFK massive coverup. 30 pages \$19.95 + \$2.00 U.P.S. J.P. Research, P.O. Box 3487, Bozeman, MT 59772

**SUCCESS**, happiness, wealth can be yours. Free catalog. Self improvement books. Harris, P.O. Box 2251, Lakeside, CA 92040-A

**NEW** car a **LEMON!** How I got my money back **WITHOUT** lawyers! \$7.95 to: L. Faso, POB 234, Park Ridge, NJ 07656

**5 WORKING MAN'S** ways to weather the coming recession. Send 5 dollars to: 2M Concepts, RL #1 Box 1441, Heyburn, Ida. 83336.

**PAYOFF HOME MORTGAGE TEN YEARS SOONER.** \$70,000+ Interest savings. Free information. Consultants, 450 E. Chapman, #105pm6, Orange, CA 92666.

**SECRETS** of Get-Rich-Quick ads **REVEALED!** Timely exposed **RIPS THE LID** off of these hucksters' methods. You must read **THE EMBO FILE**, Rush \$7.95 to Dennis Embo, 3939 Glenwood, Ste. 352, Raleigh, NC 27612.

**PLAY POKER AND WIN!** Expert teaches bluffing, betting and odds. Learn mistakes most players make. **SATISFACTION GUARANTEED!** \$3.00- Classic Marketing, 72571-P6 St. Landry, Covington, LA 70433

**CAREER** building, small business, job search books. **FREE BROCHURE.** Archives, P.O. Box 4107, Torrance, CA 90505

**MARKET YOUR CRAFT ITEMS! OUR METHODS HELP YOU MAKE EXCELLENT EARNINGS. HOT SOURCES LISTED! PERFECT MANUAL FOR YOU OR GIFT. ONLY \$8.00 PLUS \$2.00 SHIPPING. IVERSON, BOX 2068, ALPINE, CA. 92001**

**FLY FREE** on United... How?... \$2... Box 88, Seattle, WA 98111-0088

## MAGAZINES

**SUBSCRIBE TO DERBY TECH**, Newsletter for Soap Box Derby Enthusiasts. Six Bi-monthly Issues for \$15. Derby Tech, 976 W. Foothill, Suite 508, Claremont, CA 91711

## CATALOGS

**STAINLESS** Steel Hardware, Catalog \$2.00. Classic Chassis, P.O. Box 53PM, Glenview, IL 60025.

**BUY KNIVES, CUTLERY ITEMS** at Wholesale. Save up to 60%. Huge Selection. Satisfaction Guaranteed. Fast Service. **FREE** Catalog. Smoky Mountain Knife Works, P.O. Box 4947SO, Sevierville, TN 37864

**BOOMERANGS . . . INCREDIBLE** Returns. High-Tech Designs. World's Best. **FREE** Catalog. **BOOMERANGMAN**, 1806-1 N 3rd, Monroe, LA 71201-4222

**MAKE GIFT GIVING EASY!** Exclusive "Mail-Minder" Service. Products guaranteed. Catalog and Details. \$1.00. **GIFT EXPRESS**, 3715 Terstena, Suite 403, Santa Clara, CA 95051

**PORTER'S FREE PHOTO/VIDEO CATALOG.** Best in the Industry. 4,000 brand names, unique and unusual items, discount prices and Fast service. Free copy write: Porter's Camera Store, Box 628, Dept. PM, Cedar Falls, IA 50613 or phone: 1-800-553-2001.

**POPULAR MECHANICS HOME HOW-TO** This book is for YOU if you are considering tackling any of those do-it-yourself projects: hanging wallpaper, mounting new lighting, fixing floorboards or even major remodeling. Over 3,000 illustrations and photographs. 512 pages and only \$29.95. Order #B-1935. You won't be sorry. Popular Mechanics, Box 1014, Radio City Sta., New York, NY 10101

## AUTOMOBILES

**IS IT** true you can buy jeeps for under \$200 through the U.S. Government? Get the facts today! Call 1-312-742-1142 Ext. 7133

**GOVERNMENT SEIZED** Vehicles from \$100. Fords. Mercedes. Corvettes. Chevys. Surplus. Buyers Guide (1) 805-687-6000 Ext. S-20024

**SLICK 50 FOR LESS.** Call 1-800-537-7932 (In CA (408)-28-SLICK). B&J Specialties, Box 7783, San Jose, CA 95150.

**GOVERNMENT SEIZED VEHICLES** from \$100. Corvettes, Mercedes, Imports now available. For Buyer's Guide call 1-800-333-4100 ext. V-230.

**HOW TO "Read Tires"** . . . Prevent Major Costs Before They Happen. Book \$4.50. Thoren Enterprises, Box 1501, Auburn, Mass. 01501-1432

**VAPOR** Carburetor Triples MPG, Free Information, H&A, R2 PV, Bowling Green, MO 63334

**INCREDIBLE BARGAINS! BUY** Government Seized/Surplus . . . BMW's, Mercedes, Porsche's, Domestic, Trucks, Boats, Vans, Misc. From \$100. **AMAZING** Recorded message **REVEALS** Details. (602) 721-2997 Ext. 2406

**BUY** Government seized & surplus vehicles from \$100. Fords, Chevys, 4x4's, etc. For info call (602) 842-1051 ext. 007

**GOVERNMENT SEIZED** Vehicles starting at \$100. BMW's, Mercedes, Mustangs, vans, trucks, etc. Comprehensive buyer's guide. 1-800-628-2828. Ext. 503-V9.

**WANTED:** European Sports Cars Any Year, Any Condition - Call (404) 971-5014

**SLICK 50 GUARANTEED LOWEST PRICE! WE WILL BEAT ANY CURRENTLY ADVERTISED MAGAZINE PRICE BY \$2.00. DEALERS WANTED.** Progressive Energy Corporation, 255 South Bent B-2, San Marcos, CA 92069. 1-800-525-8624 (In CA 1-800-233-9559).

**RUST HOLES.** Repair them yourself. Production Bodyman shows how. Easy guide. Send \$4.50 to: Control Rust, P.O. Box 49, Pasadena, TX 77501-0049.

**DRUG RAID SEIZURES!** Buy dirt cheap Cars, Trucks, Vans, Boats, Aircrafts. Write Seizures: Box 4309-AT, West Covina, CA 91791.

**SAVING MONEY** on **NEW CARS:** audio cassette. \$7.00: M. Manz, 2512 8th Ave. N., Grand Forks, ND 58201

**HOW** to prevent and decarbonized your engine, details \$1.00. ZAEKO, 8903 S. Sepulveda, Los Angeles, CA 90045

**SELLING OR TRADING??** Learn how to find your vehicles "TRUE VALUE". Fast! Easy! Proven Method! \$3.00. Lynde Publications, P.O. Box 1056, LaPorte, Texas 77572-1056.

**BEAT TRAFFIC TICKETS** fight tickets with confidence proven methods, \$3 booklet. Traffic Clinic, 173 N. First, Fresno, Ca 93702

**SEIZED** In Government Narcotics Raids!! Automobiles. . . Vans. . . Boats. . . Furniture. . . Thousands other items. Buy Dirt Cheap - Resell for Big Profits! Free information: 216-453-3000, Ext. A8333

**SAVE 50% OR MORE ON GAS & CAR EXPENSES FOR ONLY \$5.00.** Practical, simple-to-understand book covers 500 timely tips to save gas, reduce auto repairs and reveal unethical, dishonest service practices that all car owners should know. Send \$5.00 plus \$1.00 postage and California Residence Sales Tax to: Covina Valley Gifts, 17632 Covina, California 91722

## AUTO SUPPLIES & EQUIPMENT

**CORVAIR PARTS** Giant 400 page **CORVAIR** catalog rushed \$4.00. Clark's **CORVAIR** Parts, Inc., Box 32, Shelburne, MA 01370. (413)-625-9776

**PARTS:** Army Jeep and truck parts. Spare Parts & Equipment Co., P.O. Box 751, Lexington, Kentucky 40587-0751

(Continued on next page)

Материал, защищенный авторским правом

## AUTO SUPPLIES & EQUIPMENT

(Continued from preceding page)

**SUPERGRIP BATTERY CLAMPS.** 1989 Invention award! Quick release. Anti-theft. FREE brochure. \$11.95/pair. Foursquare Enterprises, Box 1213, Makati 1299, Philippines.

**SAVE \$\$\$\$\$\$** Build your own air compressor for under \$50. Send \$4 for plans to-MMC, Box 8000-372, Sumas, WA 98295-8000.

**TUNE-UP TECHNICIANS! DO-IT-YOURSELFERS!**  
**SPARK PLUG INSTALLATION TOOL** assists difficult installations and helps prevent cross threading. A must for every tool box. Designed by a former Certified Technician. Order direct! 30 Day money back guarantee. Mail \$3.99 to: **SPARKPLUG INDUSTRIES, P.O. BOX 9469, FORESTVILLE, CONNECTICUT 06010.** Connecticut residents include 7.5% sales tax.

**CURE IN SECONDS** Air-Vents That Droop Or Swing. Guaranteed \$3.00. Vent Keep, Box 174, Richfield, WI 53075

**OLD CHEVY PARTS.** Good source catalog. \$4.00 Chevrolets. RR1, 363-C, Wailuku, HI 96793

**EXTRA MILES** from your motor and transmission. Remove even microscopy metal from oil with powerful patent pending magnets attached to oil pans, working 24 hours everyday. In USA send \$4.00 per magnet to: Magnets, 7170 Plainview Road, Hillsboro, OH 45133

**ALTERNATOR/Generator Rebuilding Book.** Price: Hedlund Engineering, Box 26044, Las Vegas, NV 89126

**BODY REPAIR VIDEOS \$19.95.** Free Brochure 1-800-562-8855.

## BIKECAR

**BUILD A BIKECAR!** See Popular Science Magazine Classifieds for Details!

## MOTORCYCLES, MOTORSCOOTERS & SUPPLIES

**GO KARTS,** Minibikes, ATV's Kits, Parts, Engines. Lowest Prices. Largest Selection. 80 Page Catalog \$3.00. Refundable. Kart World, Dept. C., 1488 Mentor Ave., Painesville, Ohio 44077

## AVIATION, HANG GLIDING

**AIRCRAFT MECHANIC IN 1 YEAR!** Unique practical with actual aircraft. Classes starting January, March, June, September. **DAKOTA AERO TECH,** 1801 23rd Ave. N. RM 111, Fargo, ND 58102. 701-237-5305

**HOBBY HELICOPTER.** Ultralight single seater. Simplified construction - Motorcycle engine. Brochure \$5.00. **POLYNOVA,** Dept. PM, Saint-Remi, Quebec, Canada J0L 2L0.

## PROPELLERS

**MOST EFFICIENT, SMOOTHEST RUNNING, TOUGHEST PROPELLER AVAILABLE.** Space age composite, variable pitch, 48" to 70" diameters, currently to 100hp. Warp Drive, P.O. Box 701, Dept. PM, Clear Lake, IA 50428

**AIRBOATS,** Ultralights, Propellers, Informations \$1.00. Askey Propeller, 8515A Old Denton Rd., Keller, Texas 76248. (817) 431-3160.

## HOVERCRAFT

**VW HOVERCRAFT** information \$5, plans \$25. Neoteric, 1649 Tippercanoe, Terre-Haute, Indiana 47807.

**HOVERCRAFT** Plans All Sizes. Catalog \$1.00. Universal Hovercraft, Box 281, Cordova, Illinois 61242

**AERO-CAR** Amazing Hovercraft built easily with ordinary tools. Lawnmower engine power. Carries one man plus. Hovers, flies forward, backward. Sideways over land/snow/water. Complete construction plans and brochure. \$11.95. Aero-Projects, Box 5118PM, Clinton, New Jersey 08909.

**BARTLETT** Flying Saucer Ultra-Light Hovercraft Featured In Documentary Film, "Force Beyond." Powered By Ordinary Lawn Mower Engine. Complete Plans \$10.00 Send To: Herb Bartlett, P.O. Box 156M, Silverdale, WA 98383

**HOVERCRAFT** plans, 3 to 160hp. Information, \$4 (refundable). Sevtec, Box 846, Monroe, WA 96272

**HOVERCRAFT PLANS & PUBLICATIONS** Catalog, \$1.00. Lansing Aero-Marine, Box 27655, Lansing, Michigan 48909

**FLYING SAUCER** (radio controlled) that Performs spectacularly. Guaranteed to be World's Fastest Accelerating Aircraft. Economical to build. Plans \$10.00. Blanchette Aeronautical, 1725 172nd Pl NE, Bellevue, WA 98008

## CB'S, RADIO & HAM EQUIPMENT

**POLICE-FIRE SCANNERS. CB'S. HAM. 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. CBCL, Box 31500M, Phoenix, AZ 85046

**SECRET CB** manuals, modifications, accessories. Catalog \$2. Selman Enterprises, POB 8189, Corpus Christi, TX 78468-8189. (512)853-2935.

## ELECTRONICS

**BUGGED? WIRETAPPED?** Find out fast! Countermeasures equipment catalog \$1. Capri Electronics, Box 589P, Bayfield, CO 81122

**HARD-TO-FIND ELECTRONICS** for private investigators and security professionals! Send 4 stamps for catalog Now! Hunterex, Box 793, Clemmons, NC 27012

**TUBES** Transistors. Sylvania distributor discounts. Arlen Supply, 7409 West Chester Pike, Upper Darby, Penna. 19082. 1-800-458-1301

**ELECTRONIC Kits!** Voice Disguisers! FM Bugs! Transmitters! Phone Snoops! Bug Detectors! More! Catalog \$1.00: XANDI Electronics, Box 25647, Dept. 28T, Tempe, AZ 85285-5647.

**SECURITY SYSTEMS** how to instructions and diagrams for alarm systems, including home, vehicle, wireless, closed circuit television, much more! Equipment lists, order from us and save! Send \$5.00 for catalog to: M.O.S.S., P.O. Box 11133, Tucson, Arizona 85734-1133

**PROTECT YOUR HOME AND BUSINESS** From Electronic Eavesdropping And Wire-Tapping! Complete Countermeasures Catalog. \$3.00 (Refundable). **DIVERSIFIED WHOLESALE PRODUCTS,** Box 1275PM, Redondo Beach, CA 90278

## COMPUTERS & SOFTWARE

**FREE** Programs!! All home Computers! Send stamps. EZRAEZA, Box 5222MJU, San Diego, 92105.

**100,000** Almost-Free Software Programs. Details, Tips, Tricks, \$6. Order "Insiders Report On Shareware". Promo Press, 21205 Windsong, Walnut, CA. 91789.

**SHAREWARE** - catalog - SASE: Desert Diskware, P.O. Box 9399, Scottsdale, AZ 85252

**50 QUESTIONS** To Ask When Buying A Computer, \$2.00. Real Info, P.O. Box 593, Rehoboth, MA 02769.

**PROFITS.** Computer center 4'x3.5', costs \$15, 2-hour easily built, retail \$100. Plan \$2.99. Guaranteed. Som-m6, 7900 Cambridge 72E, Houston, TX 77054

**FREE IBM Software!** Best Selection. Free Catalog. Infosys Tech, Box 741340, Los Angeles, CA 90004

**FREE CATALOG.** IBM Shareware (Software). Save On Software, Box 2837, Dept. PM 69, Wilkes Barre, PA 18703-2837

## SATELLITE - TV

**SATELLITE TV** Systems - parts and components - all major brands. Absolutely the lowest prices possible. Videocipher repair. Sat-Tronics, P.O. Box 18195, 131 E. Norwich, Columbus, OH 43218. Visa-MC 1-800-232-2445 - orders 24 hrs. 1-614-353-3474 - information

**VIDEOCYIPHER SATELLITE DECODER SCHEMATICS.** (Complete Set) Audio And Video Parts List - Much More! \$9.95. The Stage Door Video, P.O. Box 576, Burnsville, NC 28714

**FREE CATALOG** 36 pages. Major Brands. Nobody under-sells **WEST** since 1977. Immediate shipping. Call for prices. 1741 Cedardale Road, Mr. Vernon, WA 98273. (800) 222-9064

**FREE DETAILS, INSTALL IT YOURSELF!** Easy to follow instructions. Complete systems and upgrades. Enjoy HBO, Cinemax, Showtime, The Movie Channel and more! Orbitek Satellite Communications, Box 264-M1, Bohemia, New York 11716-0264. Phone (516) 589-1291.

## TV, VIDEOS & VIDEO EQUIPMENT

**NOTICE: USE OF CERTAIN ITEMS IN THIS CLASSIFICATION REQUIRES STATION AUTHORIZATION.**

**CABLE TV CONVERTERS: JERROLD, ZENITH, TOCOM, OAK. MANY MORE. HAMLIN COMBO W/REMOTE \$155. CALL TODAY 415-584-3924.**

**CABLE TV Converters, Filters** for beeping any channel. 1-313-979-8356.

**CABLE TV DESCRAMBLERS,** converters, filters, and more. **FREE** 14 page catalog. TW Cable, 12062 S.W. 117 Court, Suite 126, Miami, FL 33186 800-442-9333

**CLASSIC** films on video. Brando, Sinatra, Wayne. Two hour preview tape \$5.95. Eagle Lion Video, 5252 Balboa, San Diego, Calif. 92117. (619) 277-1211

**CABLE TV CONVERTERS.** Jerrold, Oak, Scientific, Atlanta, Zenith and Many Others. "New" MTS Stereo Add-On ... Mute and Volume. Ideal for 400 & 450 Owners! Visa, M/C + Amex. 1-800-826-7623. B&B Inc., 4030 Beau-D-Rue Drive, Eagan, MN 55122

## CAMPERS & TRAILERS—KITS, PLANS

**BUILD YOUR OWN** - Travel Trailer - Fifth Wheeler - Motorhome - Camper - Pickup Cover - Plans - Patterns - Kits - Catalog \$1. Glen-L, 9152 Rosecrans, Box 1804/RV, Bellflower, CA 90706.

**172 TRAILER PLANS** Motorcycle, Utility, Car, Construction-Strong, Streamlined, easily built, Component Kits. Catalog \$4.00 (Refundable). Tag-Along, Box 15107, Salem, OR 97309

## BOATS, OUTBOARDS, TRAILERS, & KITS

**BOAT KITS - PLANS - PATTERNS** - Plywood -Wood Epoxy - Fiberglass - Steel - Aluminum - **WORLD'S LARGEST COMPLETE LINE** - 8'/70" Sailboats - Powerboats - Cruisers - Sportboats - Houseboats - Hydroplanes - Tunnelhulls - Runabout - Duckboats - Canoes - Kayaks - Dorries - Dinghies - Multihulls - **SEND FOR CATALOG** \$3.00 (Airmail \$5.00) includes Supplies Catalog (Epoxy Fiberglass-Flotation Foam)-**BOOK** "Amateur Boatbuilding", \$6.00 - **CLARKCRAFT,** 16-P Aqualane, Tonawanda, NY 14150

**BOAT PLANS - PATTERNS - KITS** - For Home Builders Hundreds of Proven designs - 7'/55" - Hydroplanes - Canoes - Kayaks - Rowboats - Duckboats - Dorries - Bassboats - Sailboats - Houseboats - Sportfishers - Quick/simple Stitchenglue. Tremendous savings! 160-page **DESIGN BOOK** \$4.00 airmail (\$3.00 slow). Includes Free "Boatbuilding Supplies" catalog. Book: "Boatbuilding With Plywood" \$19.95 ppd. **GLEN-L,** 9152 Rosecrans, Box 1804/PM9F, Bellflower, CA 90706.

**EVINRUDES - NEW 1987** Bargains - Top Brands ... all sizes ... \$2.00 handling ... Scott McCulloch parts ... Electra Marine, 610 Merrick Road, Lynbrook, New York 11563

**"EASYBUILD"** Boats-Inboards-Outboards-Duckboats-Numerous models-Catalog \$2.00-Hankinson Associates, Box 2551X, La Habra, CA 90631

**AVOID** State/Federal citations! All pleasure boats require proper Coast Guard approved equipment. Free information. GarciCo, Box 14505, Detroit, MI 48214

**USED** outboard-inboard parts. 1(218)885-2212. Marine Salvage Systems, HCI, Box 775, Pengilly, MN 55775.

## OUTDOOR EQUIPMENT

**SWINGSET ACCESSORIES PLANS AND COMPLETE KITS,** Olympic Recreation, 1-800-255-0153

## ATHLETIC EQUIPMENT AND BODY BUILDING COURSES

**BIGGER,** More Powerful Muscles - faster!! Free Booklet! Universal, Box 6694A, Detroit, Michigan 48240

**KUNG-FU** Free Lessons. Send \$1.00 for Postage. McLisa, Box 1755, Dept. PM89F, Honolulu, Hawaii 96806

**SAVE** on Bodybuilding Supplements! Free Catalog! Vitamins, Box 2073-I, Reading, PA 19608

## FISHING, TACKLE, LURES

**FANTASTIC!** 12 Famous dry flies. 3"x4" case w/chart. Send \$9.95. Jules G. enr., Dept. P. C.P. 236, St-Michel Que. Can. GOR 350

## ENGINES, MOTORS

**ENGINE OVERHALL KITS: WHOLESALE CATALOG** \$2.00 Engine Service Group, Dept. PM, Box 13053, Lansing, MI 48901.

**BUY WHOLESALE!** 184 PAGE ILLUSTRATED CATALOG OF REPAIR PARTS FOR POWER AND NON-POWER OUTDOOR EQUIPMENT. Parts for Small Engines, Lawn and Garden Equipment, Chainsaws, Karts, Minibikes, More. Includes Service Manuals, Specialty Tools, Accessories. Send \$4.00. Sav-On-Parts, P.O. Box 45231, Dept. P, Somerville, MA 02145

(Continued on next page)

## ENGINES, MOTORS

(Continued from preceding page)

**WANTED - DETROIT DIESEL 149 AND 8.2L INJECTOR CORES.** Call Pops Hunter. (800) 321-4234.

## TOOLS FOR SALE

**BOLTS, SCREWS, TOOLS, WHOLESALER, DIRECT.** Guaranteed. Catalog \$1.00 (Refundable). Camelot, Dept. 44, Box 65, Bristol, Wisconsin 53104

**DISCOUNT TOOL CATALOG** \$1.00 refundable with purchase. Krown Industries, Box 296, Piscataway, N.J. 08854

**STANLEY TOOL KITS** at Tremendous Savings. Free Catalog. Call Tool Systems, Inc. 1-800-432-1313.

**SAVE up to 80% on U.S. made tools!** Free details. A. Davis, Dept. GR0, 50 Mooring Road, San Rafael, CA 94901

## UPHOLSTERY SEWING MACHINES

**UPHOLSTERY Sewing Machines** with Walking Feet. Complete ready to use-only \$570.00. Thompson Model PW201-AVAILABLE FROM YOUR LOCAL DEALER, or order direct (Master Charge-Visa). Datho Mfg. Inc., P.O. Box 12110, Lubbock, Texas 79452-Phone: (806) 744-6774

## MACHINERY, TOOLS & SUPPLIES

**SMALL FOUNDRY Furnaces, Supplies.** Free literature. Pyramid Products, 3736 South 7th Avenue, Phoenix, Arizona 85041

**LATHES, Mills, Tools.** New catalog \$1.00. Blue Ridge, Box 536V, Hurricane, WV 25526. 304-562-3538.

**STEEL, Aluminum, Brass-Sheet, Bar, Shop Supplies.** Plans. Write: CEI, RR1, Box 163, Cameron, IL 61423.

**4" METAL Cutting Lathe** \$109.80. Taig, 15048 Proctor, Industry, CA 91746

**BANDSAW BLADES, Any Size.** Free literature. King Saw, 6541 Tidewater Drive, Norfolk, Virginia 23509

**TOOLS** rusting? Unique method, treatment/prevention. \$5.00 Satisfaction Guaranteed. Box 60874, Savannah, GA 31419

**HOBBYISTS** improve your **LATHE** with the ultimate tool-post system! KRF, Box 783C, St. Joseph, MI 49085. 616-429-7050

**PYROMETER KIT 2200°F.** Components for small foundry/heat treating temperature measurement. \$65 Details. DC Products, Box 4105, Hopkins, MN 55343

**LATHES-INDUSTRIAL/HOBBY FROM \$325.00, METALS, SUPPLIES, LARGE CATALOG \$2.00.** CAMPBELL TOOLS 34TH YEAR. 2100-D SELMA RD., SPRINGFIELD, OHIO 45505. 1-513-322-8582.

**NEW TOOL!** Removes rusty, corroded screws fast. Tool \$1.00. Details Free. Shockey's, 5841 Longford, Dayton, Ohio 45424-2940

## ENERGY SAVING

**FREE ENERGY!** Fuel-less Motors and Generators! Amazing Principles and Details. H&A, R2EP, Bowling Green, MO 63334

**SAVE ON ELECTRIC BILLS** Latest moneysaving facts and ideas! Unusual methods! Details SASE. American Information Network, Box 99594, Troy, MI 48099

## SOLAR & ALTERNATE ENERGY

**SOLAR ELECTRIC SYSTEMS!** Panels, Equipment, Books. Free Catalog! SUN POWER - TEXAS, POB 2788, Freeport, Texas 77541. (409) 233-8350

**SOLAR, HYDRO-ELECTRIC, WIND POWER** equipment CATALOG. \$3.00. U.S. \$6.00 foreign. WESCO, Box 936, Redway, CA 95560.

**STEAM** Power Systems, Catalog \$10.00 (credited). Liberty Enterprises, Jolley, Iowa 50551

**REFRIGERATE WITHOUT ELECTRIC!** Gas refrigerators work Anywhere. Details FREE: Lehman's, 411F, Kidron, Ohio, 44636-0041.

**PORTA-SUN.** Portable solar water heater. Ideal for swimming pools. Do it yourself for under \$125.00. For plans mail \$5.00 to: Porta-Sun, P.O. Box 291, Menomonee Falls, Wisconsin. 53051

**FREE HYDROGEN FUEL GENERATOR** uses Water and Solar Cells. Plans and Kit \$15.00. Prairie Power, Box 8291, Edmonton, Alberta, T6H 2W6, Canada.

## HOME CRAFTSMAN

**MAKE WOODEN TOYS, whirligigs, doll houses, clocks, music boxes, weather instruments, crafts, furniture** with our plans, parts, kits, books, supplies - Catalog \$1.00 - (614) 484-4363 - Cherry Tree Toys, Belmont, Ohio 43718-0369.

**WOODCRAFT PATTERNS, Windmills, Wishing Wells, Bird Houses, Feeders, Flying Duck, Pheasant, Outdoor Planters,** Catalog \$1.00. Crafters, 11840 US. 27 North, DeWitt, Michigan 48820

**FAVORITE WOOD TOYS, Patterns, Parts, Wheels,** Catalog \$1.00. Toys and Joys, Box 628M, Lynden, Wash. 98264

**PVC PIPE FURNITURE** Plans, Kits And Supplies. Free Brochure. Casual, Box 208, Tewksbury, MA 01876

**FULL-SIZE PROFESSIONAL PLANS** Catalog \$2.00. Over 200 professionally designed plans for building furniture. Furniture Designs, Inc., CP-89 1827 Elmdale Ave., Glenview, IL 60025.

**BREAKDOWN PLYWOOD PICNIC TABLES.** Sturdy design, economical, easily made. \$5.00 for complete instructions. Q.E.C., 3941 Willow, Hobart, IN 46342

**BUILD YOUR OWN WATERBED AND SAVE.** Mattresses, Heaters, Massage Systems, Hardware, Packages, More!! Send \$2.00 for catalog with Free plan set. Woodins' Waterbed Connection, 45 Industrial Pk Rd, Albany, NY 12206

**FIREWOOD RACK PLANS.** Wooden, One Chord, Photo, \$3.00. P.O. Box 141, Lydia, LA 70569

**DUTCH WINDMILL!** Over five feet tall including blades. Accent any yard/garden! Patterns Plus woodcraft catalog \$7.00. Accents (DP-09), Box 7387, Gonic, NH 03867

**FURNITURE PLANS WITH INSTRUCTIONS.** Traditional, contemporary, country. Free Details. Roseman, Route 6, Box 75, Statesville, NC 28677

**FLOWER PLANTER (47"x20")** Simple to build. Detailed plans \$6, or SASE for information. Hildinger, Box D21 Cora Lane, Chester, N.J. 07930.

**NEW! BUILD AMAZING LIQUID PISTON ENGINE** from pipe fittings. Easy plans. Free information. ABCO, Box 306-M6, Seminary, MS 39479

## WOOD, WOODWORKING

**CARVE REALISTIC BIRDS.** Complete course for amateur to pro by professional carver/instructor. Fascinating hobby or career. Instruction guides and detailed patterns (three free) \$19.95. Birds In Wood, 308 Glenview Circle, Waco, TX 76712.

**NEW CONCEPTION!-MONEY MAKER** Bird House/Feeder Combination Cover Bridge Pattern, Complete Instruction Send \$5.00 To: Bird House/Feeder, RT. 1, Box 149, Trenton, FL 32693

**SANDBLADE SANDING TOOL. NEW, DURABLE, EASY TO USE.** Silicone carbide abrasive on both sides of FLEXIBLE blade. Coarse or fine. \$7.95. Sandblade Co., 506 Peach Grove Lane, Santa Barbara, CA 93105. (805) 682-7919.

## PLANS, BLUEPRINTS, PROJECTS

**335 CONTEMPORARY HOME PLANS** Features Solar-Oriented Trend houses, Earth Sheltered homes and Atrium and Courtyard designs, as well as imaginative plans for one 1 1/2, two-story and multi-level contemporaries. Send \$9.95 PPD. to: HOME PLANNERS, INC., Dept. PMC96, 23761 Research Drive, Farmington Hills, Mich. 48024

**BEAUTIFUL,** efficient, well designed, working building, 12'x20' lean-to, 14'x20' 2-story barn, 14'x36' solar greenhouse in one. Easy to follow, detailed plans, \$30 postpaid guaranteed. Practical Designs, RR 2, Box 48, Cambridge, IL 61238.

**WOOD STOVE HOT WATER JACKETED PLANS** \$20.00. Information \$2.00 and LSASE. Thoht Inc., 28285PM Mateer Rd., Gold Beach, OR 97444.

**POPULAR MECHANICS "PLANS AND IDEAS" CATALOG** - Hundreds of ideas on workshop projects, plans for shop tools, storage houses, boats, furniture, toys - just about everything! Send \$2.00 to: POPULAR MECHANICS, P.O. BOX 1014, RADIO CITY STA., NEW YORK, N.Y. 10101.

## DOMES

**BUILD YOUR OWN SUPERINSULATED DOME HOME!** Illustrated catalog, plans, prices - send \$5.00 - ENERGY STRUCTURES, 893 Wilson, St.Paul, MN 55106. (612) 772-3559

## FOR THE HOME

**WINDOW CRANKS TOO LONG?** Lower your blinds without interference. Replace cranks with close fitting "T" Handles. Free information. Lorac, Dept. 22 R.D. 2, Box 1390, Waterbury, Vt. 05676

**GORGEOUS** photowall and door murals. Many selections. Easy installation. Free brochure. Brandon's, 2717 Edison, Klamath Falls, Oregon 97603.

**IS YOUR MICROWAVE LEAKING DANGEROUS RADIATION?** Find out now. Amazing Microwave Meter check for leaks. \$12.95. HealthTech Co., 3021-9 NE 72nd Ave., Vancouver, Wash 98662.

## HOME BUILDING & REMODELING

**SPIRAL Stairs** - Handcrafted. Goddard's, Box 502, Logan, KS 67646. (913) 689-4341

**HOMEOWNERS CONCRETE BOOKLET** \$12.00 - 262 East Danbury Court, Grand Junction, CO 81503

## PLASTICS

**CASTOLITE** Liquid Plastics. Crystal clear, colors. For casting, embedding, coating, fibreglassing, repairing and reproducing with our Mold Making Supplies. Catalog \$2.00. CASTOLITE, Dept. 89G/PM Box 391, Woodstock, IL 60098.

## AIR CONDITIONING & HEATING

**SHEETMETAL** pattern development, 20 pages. Square, round, elbows, funnels, "Ts", "Y's", offsets. For tradesmen, craftsmen. \$24.95, \$3.00 postage. Patterns, P.O. Box 8452 CRB, Tucson, Arizona 85738

**AIR CONDITIONING-DESIGN REPAIR,** Manual \$5.00, EGP, P.O. Box 2347P, Brenham, Texas, 77833.

## DO IT YOURSELF

**HANDYMAN (WOMEN) - WE NEED YOU - NOW!** HANDY with screwdriver/pliers? We pay you \$125-\$350/Week (or more!) \$5.00 (refundable) rushes details. HandyMan, Box 62, Westmont, IL 60559

**BUILD YOUR OWN SHED!** Complete plans, materials list, instructions - 12' x 8'. Send \$19.95 ppd. FASECO, P.O. Box 210376, Anchorage, Alaska 99521-0376.

**VIDEO'S** instructional texts, computer software on electrical wiring, carpentry, plumbing, welding, etc., FREE CATALOGS. AAVIM, 120-PM Engineering Center, Athens, GA 30602. 1-800-228-4689.

**WATERBEDS** - Plans & accessories. Catalog \$1. A.W.C., 10441 1/2 A NE 4th Plain, Vancouver, WA 98662

**ELECTROPLATING.** Complete Textbook. Electroplate Metallics/Nonmetallics. \$11.95. Details Free. Tropix, Palm Bay, FL 32906-0095

**INSTALL YOUR OWN IN GROUND SWIMMING POOL** for as low as \$1,695.00. Cheswick Pools, Rt. #28, Cheswick, PA 15024. 412-274-6400

4,321 Catalogs Listed. Sources for Anything! \$5.95. Directory, Box 92452N, Atlanta, Georgia 30314

**IN-GROUND SWIMMING POOL KITS,** 50 year warranty from \$1995.00 financing 501-758-6946

**NEW** ... repair your own TV, easy ... write. Research, Box 536PM, Colville, WA 99114

**BUILD YOUR OWN SWINGSET.** Highest Quality Accessories and Complete Kits Available. Free Brochure: Back Yard Creations, P.O. Box 426, Hubbardston, MA 01452.

**ARROWHEAD** Making!!! Fun Hobby or Money Maker. Information \$1.00. Commons Crafts, P.O. Box 5012-M, Central Point, Oregon 97502.

**REFILL** PC copier - laser printer cartridges. For yourself or profitable business. Instructional Video and Supplies. Free Information. (312) 598-0580. Morack, 8847 W. 87th, Hickory Hills, IL 60457

**INGROUND POOL CONSTRUCTION BOOK, A-Z,** common materials, tools, ability. \$29.50 delivered. Design Pools, 4850B Clifton-Glendale Rd., Spartanburg, S.C. 29302

(Continued on next page)

Материал, защищенный авторским правом

## DO IT YOURSELF

(Continued from preceding page)

**GARAGE DOOR OPENERS** - Radio Controlled - Buy Factory Direct - Thousands In Use - Free Brochure - Easy Homeowner Installation - Shipments By UPS Or PP. Helmpate Equipment Company, 1650 East Empire Avenue, Benton Harbor, MI 49022

**FREE SHOWER DOORS** from soap scum. Amazing method. SASE \$2.00 - FMB, POB 2174, Easley, S.C. 29640.

**SAVING** money on Home Air Conditioning repairs. Details \$5.00. Harold Pike, 702 119 Ave. E, Tampa, FL 33612

**CALL THE ROOTERMAN?** Maybe not: This easibilt electric-powered drain rodder costs less than a service call. Plans \$7.95. PAKTCO, Box 452, Wichita, KS 67201

**POOL HEATER** - wood, coal, solar, 170". Build for \$90. Diagrams \$10. Harwood, POB 895, Clearfield, PA 26830

**16,791 Catalogs Directory Guide.** Below Wholesale Sources For Anything! \$5.95: IRC, Box 14107AA, Jackson, MS 39236.

**REPAIR** your Kenmore/Whirlpool washer/dryer. Problems/answers booklet, illustrated - \$4.95. R. McMahon, 80 Newmilford Ave., Dumont, NJ 07628

**LASERS!** The source for All types, kits, plans, parts. \$1 information. APEX, Box 11181-PML6, Costa Mesa, CA 92627.

**"INSTALL YOUR OWN TELEPHONES** and extensions, very easy, instruction manual \$11.95. Dispatch, Dept. PM, PO Box 536, Cypress, CA 90630"

**FLEAS, TICKS, FIRE ANTS, CHIGGERS...**Lawn or House? **PEST CONTROL** of Professionals **NOW** can be **YOURS**. Complete programs described. \$10.00. [Products available]. **END-PEST**, #529-M, Zebulon, GA 30295

**TELEPHONE EXTENSIONS** - Learn how you can easily install your own extension phones in your home. Descriptive literature and diagrams explain cabling, connections, mounting, etc. Great for person that likes to do a quality job. Send \$7.00 to: NCS, Department A-1, Call Box 11856, Fernandez Juncos Station, San Juan, Puerto Rico 00910.

**POOL Owners** - Fill Vacuum hose, cover with hand, walk to skimmer, jam into place. (Probably repeat.) Easy changes eliminate this frustrating hassle forever. Start your vacuum in seconds-with dry hands. Illustrated instructions \$19.95 MGI Corporation, POB 281 (A), Rocky Hill, Ct. 06067

**MAKE YOUR BICYCLE INTO SOLAR ELECTRIC** Send \$5.00 For Plans. 4646 West Saint Joe., Lansing, Mich. 48917

**BUILD a WATER DISTILLER** Easy, inexpensive, much of what you need you may already own. Complete plans \$5.00. Sawatzky, Box 152-PM, Landmark, MB, Can. R0A 0X0

**RECOLOR** countertops, appliances. Don't replace. Complete instructions \$14.95. H & H Refinishing, 3212 39th St., Lubbock, TX 79413.

**BUILD** your own in-ground swimming pool. Save thousands! Write: Wesco Pools, Box 1024, Southaven, MS 38671

**PICNIC TABLE:** Stowaway Picnic Table is a clever one-piece design that folds like a scissor for convenient storage. Easy to build. (PC-1716-\$5.95) Send order to: Popular Mechanics, P.O. Box 1014, Radio City Station, New York, NY 10101

## COMPRESSED EARTH BLOCK MACHINE

**AT LAST!** Economical machine produces tough compressed earth building block. **IMPACT 1000**. Southwest Alternatives, Ltd., Box 1363, Corrales, NM 87048. (505) 898-6609.

## ARTS, CRAFTS, SUPPLIES

**STAINED GLASS SUPPLIES: EXCITING SUPER CATALOG-PM \$3.00.** CORAN-SHOLES INDUSTRIES, 509 E. SECOND, BOSTON, MA 02127.

**"GETTING** Started in Stained Glass." \$1.00. Whittemore, Box 2065T, Hanover, Mass. 02339

**COMPLETE CLOCK KITS FROM \$5.90!** Music movements \$1.95! Components, plans, epoxy, prints - over 800 clock-making items! Wholesale catalog \$3.00 (credited). Steebar, P.O. Box 463P, Andover, NJ 07821-0463

**NEON ART** home study course. \$35 ppd. Complete, clearly written with diagrams and photos, buy wholesale materials. Earn while you learn! **FREE DETAILS.** Neon, 522 Myrtle, Dept PME2, Arlington, TX 76018

**EARN MONEY PRINTING YOUR ARTWORK!** I've helped artists make thousands. Informative booklet, only \$11.90. Send for today! Cat's Paw, P.O. Box 217J, Swansea, MA 02777 or SASE for brochure.

## CARTOONING, COMMERCIAL ARTS, SIGN PAINTING

**CARTOON** for Fun and Money!!! Free Booklet!!! Cartoons, Box 40614A, Detroit, Michigan 48240

**LEARN** Sign Painting, Pin Stripping. Free Catalog. Kaufmann Company, Centertown, Missouri 65023

## MODELS, MODELS SUPPLIES

**"FASCINATING LIVE STEAM MODELS!"** Complete "WILESCO & MAMOD" line. **KITS OR ASSEMBLED.** Over 100-Trains, Tractors, Marine, Cars, Trucks, Stationary Engines and Accessories. Stunning large 34-page colored catalog \$5.95 Refundable. Sales, Parts, Service. **LARGE DISCOUNTS.** Diamond Enterprises, Dept. PMA, Box 537, Alexandria Bay, NY 13606 **PHONE:** (613) 475-1771

**RADIO** control Airplanes, Boats, Helicopters, Supplies. Discount Catalog \$5.00. **ROCKETS** \$3.00. Modelers Supply, Box 310 P, Eclectic, AL 36024

**FREE** Offers, Wooden Ship Kits, Hobby Tools, Dremel, X-Acto. \$1.00 Catalog. Spectra Hobby & Science, M16 29632 Lori, Livonia, MI 48154

**SOLAR** powered models. Choose from helicopter, airplane, windmill, watermill or carousel. Specify order of preference. Send \$15.25 to: PFP, P.O. Box 81024, Cleveland, OH 44181.

**HANGAR-7 R/C** C/L Catalog \$2. Stangel Enterprises, Box 336 (PM2), Waukesha, WI 53187-0336.

## MAGIC TRICKS, JOKES, VENTRILOQUISM

**FREE!** World's Leading Novelty Catalog. 1600 Jokes, Tricks, Science, Sports, Hobbies. Johnson-Smith, F-01, Bradenton, FL 34206-5500

**FREE CATALOG:** Ventriloquism, Magic, Clowning, Puppetry, Ballooning! Supplies, Instruction. Entertain Successfully. Profitably! Maher, Box 420-PM, Littleton, Colorado 80160.

**ASSORTED** Catalogs. 2000 Tricks. \$4.00. Refundable. Winkler's Warehouse, 24 Doyle Road, Dept. PM6-89, Oakdale, Connecticut 06370

**FREE** Catalog, Magic You Can Do. Ace Magic, 7917 Nordica, Niles, IL 60648

## HOBBIES & COLLECTIONS

**NAZI** & Historical Military Collectibles. **FREE** catalog. HMA, Box 1806PS, Lafayette, CA 94549.

**MILITARY** Medals Catalogue \$1.00. Subscription Yearly \$8.00. Vernon, Box 1560PM, Wildomar, CA 92395-1560.

## FLAGS

**FLAGS! FLAGS! FLAGS & FLAGPOLES!** Free Catalog! **LIBERTY FLAG**, P.O. Box 424PM, Reedsburg, WI 53959. 1-800-274-7001.

**FREE FLAG CATALOG!** U.S., historical, international, in/outdoor, custom flags, banners, flagpoles, accessories. Browse 'n' Buy, Box 504-PM2, Bohemia, N.Y. 11716-0504.

## DECALS, EMBLEMS, PATCHES

**CUSTOM EMBROIDERED EMBLEMS, PINS, DECALS.** Free Catalog/Quotes. Rush Sketch. Stadri, 61P Jane, N.Y.C. 10014. (212) 929-2293

## ANTIQUES, RELICS, INDIAN GOODS & CURIOS

**FREE** List to Serious Collectors. 30,000 Indian Artifacts, Pots, Spears, Axes, Slate, Beadwork. Caddo Trading, Box 669, Murfreesboro, AR 71958

## MILITARY INSIGNIA, ETC.

**U.S. MILITARY INSIGNIA** Large Catalog. \$2.00. Saunders, Box 3133PM, Naples, FL 33939-3133

## STAMP COLLECTING

**50 YEARS** Old fifteen different United States, over fifty years old-25¢ with approvals. Jaxon, Box C11-P, New Rochelle, New York 10804

**FREE!** Big Catalog - New edition listing thousands of bargains on Worldwide stamps, packets, albums, and accessories. Free when requesting stamps on approval. Buy what you like. Return balance. Jamestown Stamp Company, Dept E69PM, Jamestown, NY 14701.

**50 DIFFERENT** Old U.S. between 1861 and 1939 - \$1.00. Ed Roush, 423 Shepard, Mansfield, Ohio 44907.

**OLD** U.S. stamps on approval. Sherman, Box 15355E, Philadelphia, PA 19111

**FREE!** Surprise Collection with approvals. Gould, Box 75012B, Petaluma, CA 94975

**ONE!** Two! Three! Cent Stamp Approvals, Regardless Catalog. Kloster, 4164 52nd St., San Diego, CA 92105

**BARGAIN** 100 World-wide Stamps 25¢. Quality Approvals. R. Parker, Box 143, West Brookfield, MA 01585

**WORLD** Wide Stamps mounted in books on approval 2¢ and up. **TRUST STAMP COMPANY**, P.O. Box 100-P, Jamaica, N.Y. 11435

**"INVERTED ERROR"** + 100 Different United States, 50¢ with approvals. Luray, P.O. Box 7088, Silver Spring, MD 20907

**SUPER OFFER 100 DIFFERENT U.S. EARLY ISSUES!** \$2.00. FMCN, 513 Fairview, Ridgefield, N.J. 07657

**FREE** U.S. Mint pictorial set complete. Mint approvals included. Hildebrand, Box 4867, Santa Clara, California 95054

**4 FOREIGN** Sets 25¢. Request Approvals. R.G. Sales, Box 1065-M, Jamaica, N.Y. 11431

**12 OLD** Canadian stamps. Only \$1.00! Approvals. Quebephil, Box 68, St-Jerome, Canada J7Z 5T7.

**MINT** Mexican Stamps, Free To Try Our Approvals. Bonus Every Purchase. Frontier, Box 2332, El Paso, Texas 79952

**100 DIFFERENT** U.S., 25¢ approvals. Bradley, Box 425P, Midlothian, VA 23113

**SPECTACULAR!** 300 Breathtaking Stamps from 25 Countries. Only \$1.00 with latest bargains and sensational approvals. StampsPlus+, D-MF9, Box 982F, Toronto, Canada M4Y 2N9

**1,000 MIXED U.S. \$3.00** Approval's, Albums, Accessories, Supplies. Shirley Patterson, Dept. 101, Box 29307, Dallas, Texas 75229

## COINS, TOKENS, CURRENCY

**U.S. Silver Dollars** Over 50 Years Old. \$14.95. Estate Coins, Box 310102, New Braunfels, Texas 78131

## BINOCULARS, TELESCOPES, MICROSCOPES, MAGNIFIERS

**TELESCOPES!** Catalog #M89, \$1.00. Scope: Source, P.O. Box 2001, Ardmore, OK 73402

## PLAYS, SONGS, MANUSCRIPTS

**POEMS,** Songs Wanted. Free Recording/Publishing. Broadway Music Productions, Box 7438PM, Sarasota, FL 33578

**FREE SONGWRITING SUCCESS BOOK!** Top Records, Box 23505PM, Nashville, TN 37202

## MUSIC INSTRUCTIONS & INSTRUMENTS

**INTERNATIONAL VIOLIN COMPANY,** tonewood, tools, varnishes, parts, accessories, strings, cases, instruments, bows. Violin, guitar kits. Catalog \$1.00. Dept. IS, 4026 W. Belvedere Ave., Baltimore, MD 21215.

**VIOLIN, GUITAR,** etc., making materials, accessories, books. Catalog, \$1.00. International Luthiers Supply, Box 580397, Tulsa, OK 74158

**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, 313-755-6050-800-325-1832

**PIANOS, PLAYERS, PUMP ORGANS.** Rebuild and Repair. Catalog of "How-To" Books, \$2.00 (refundable). Vestal Press, Vestal 11, New York 13850

**PORCH PICKIN'!** Video courses: banjo, guitar, beginners, advanced. Most effective instruction ever produced. Course descriptions on request. **COMMUNIVERSITY of MUSICAL ARTS**, Box 11215, Knoxville, TN 37939.

**INSTRUMENT** Kits! Build Appalachian and hammered dulcimers, banjos, mandolins: even harps, harpsichords. Free Catalog. PM Hughes, 4419 West Colfax, Denver, CO 80204

## SELF IMPROVEMENT

**SELF-Improvement Books!** Free Catalog! FMCN, 513 Fairview Terrace, Ridgefield, N.J. 07657

**BE ASSERTIVE!** Informative booklet shows how. Send \$4.50: Atek, Suite 105-M, 2452 State Road 7, Margate, FL 33063

## EDUCATION & INSTRUCTIONS

**"JET/GAS TURBINE CAREERS!"** Homestudy - theory, maintenance, overhaul - Diploma awarded. American Jet School, Department PM99, Darby, Montana 59829. (406)349-2100.

**TERMPAPER** assistance. 16,278 papers available! 306-page catalog—rush \$2.00. Research, 11322 Idaho, #206MK, Los Angeles, 90025. (213)477-8226.

**TRAIN FOR A BRIGHTER FUTURE** with condensed home study courses! Learn new skills fast! Learn electrical, electronics, building trades, small engine repair, accounting, marketing, nursing assistant and much more. Over 50 courses at low cost. Diploma awarded. Free Details. CIEE-21, Box 20345, Jackson, MS 39209

**CLOCK REPAIR.** Cash producing skill, enjoyable, free catalog. School of Clock Repair, RM M, 6313-Come About Way, Awendaw, SC 29429

**BANK TELLER-** Study at Home - Bank Teller Careers, P.O. Box 571704, Houston, TX 77257-1704

**DETECTIVE** Home Study Course. Free lapel pin, certificate, great future. Professional Investigator School, Dept. CP, P.O. Box 41256, Los Angeles, CA 90041

**HANDLE YOUR OWN LEGAL AFFAIRS.** Be a Paralegal. Accredited Attorney Instruction. Home Study. **FREE CATALOG.** Southern Career Institute, Drawer 69PM-2158, Boca Raton, FL 33427. (407) 368-2522

**PARALEGAL GRADED CURRICULUM.** Approved in-depth training by correspondence. **BLACKSTONE SCHOOL OF LAW:** 100 years of legal training. Write for free catalog. P.O. Box 790906, Dept. PM, Dallas, Texas 75379

**FREE 1988 CAREER GUIDE.** Earn more money with Success Proven Correspondence Diploma Courses. Granton Institute, 263A Adelaide Street, West Toronto, Canada. M5H 1Y3

**FUNERAL SERVICE -** homestudy - 4 month **CERTIFIED MORTUARY TECHNICIAN** program **FUNERAL SERVICE INSTITUTE,** Box 1184, Deerfield Beach, FL 33443. 800-323-5532.

**UNIVERSITY DEGREES** By Mail. Accredited Bachelors, Masters, PhD's. Free Facts Revealed. Careers-PM6, Box 470886, Tulsa, OK 74147

**EXTENSION** And Post-Graduate Awards in Philosophy, Art, Science, Botanic, Medicine, Homeopathy, Radionics, and others. 30 subjects Curricular free (airmail \$1.00 refundable). Registrar, Sussex College of Technology, Highfield, Danehill, Sussex, England.

**LOCKSMITHING,** Universal School of Master, Correspondence and Shop Training, Box 214652PM, Sacramento, CA 95821

**LEARN** Homeopathic Medicine or Naturopathy from Internationally Accredited School, to Professional Diploma standard. Other courses Dietetics, Radionics. Established 1961. Prospectus Free (airmail 2 Dollars) **BRANTRIDGE FOREST SCHOOL.** Highfield, Danehill, Sussex, England RH177EX. Telex 95246.FAX 0825-790097. Tel 0825-790214.

**BE A RECORDING ENGINEER;** Train at home for Exciting Careers. **FREE** Information. **AUDIO INSTITUTE,** 2174 Union St. Suite 22L, San Francisco, CA 94123

**\$\$\$'s** waiting for those who have or will pay off a FHA Loan. Instruction kit \$5.00. Info-Plus, P.O. Box 86-1732, Plano, Texas 75086

**NEON ART** home study course. **FREE DETAILS.** Neon, 522 Myrtle, Dept PMC2, Arlington, TX 76018

**GLASS** etching. Illustrated instructions, patterns. \$3.00 LSASE. Infomart, Rt. 2 Box 278, Maryville, TN 37801.

**RADIESTHESIA,** Radionics and Dowsing, Books, Courses and Equipment. Electronic Homeopathy Equipment. Illustrated 78 Page catalogue Free (air mail 3 dollars) Established over 40 years. Bruce Copen Laboratories, Highfield, Danehill, Sussex, England RH17 7EX. Tel-0825-790214. Fax 0825-790097 Telex 95246.

**EARN** College degree after age 25. Triple your income! Free Details! Twilite Industries, Box 2677, Branchville, NJ 07826

**RADIO** Careers. Free details. Don Seel, Box 5848, Calgary, Alberta, Canada. T3K 1A7.

**PIANO TUNING PAYS -** Piano tuning - Electronic organ servicing. Learned easily at home. Free booklet. Niles Bryant School, P.O. Box 20153, Sacramento, CA 95820

**MONEY** for College, free details. PSI-A, POB 4062, Johnson City, Tennessee 37602

**NONRESIDENT UNIVERSITY DEGREES.** Bachelor's, Master's, Doctorates. Accredited, inexpensive, fast. Credit for life experience. Free sixteen page booklet. Dr. John Bear, Box 7070-173, Berkeley, CA 94707

**BECOME A PARALEGAL.** Work With Attorneys. Home Study. Free Catalog. 800-223-4542 Dept. LG127

**DETECTIVE** training home-study program. Free information. Global, Box 191 PM, Hanover, Mass. 02339

**SECURITY-LOCK UP A NEW CAREER!** Two Year Hands-On Training Program. Prepare For A Locksmith Job! Write: Pine Technical Institute, Dept. L, Pine City, Minn. 55063. Tel: 612-629-6764

## 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. Our 90th year. Call 1-800-228-5600 or write American School, Dept. #345, 850 E. 58th St., Chicago, IL 60637

**LEARN CLOCK REPAIR -** Earn big money, work at home, be your own boss. For details send \$2.00 (applied to tuition) to: **NATIONAL CLOCKMAKERS INSTITUTE,** P.O. Box 449, Lewistown, PA 17044. Course approved by the Pennsylvania Department of Education.

## EMPLOYMENT INFORMATION

**JOBS,** Any State, Any Occupation, including Government, State, Public. Also Cruiseships, Tugs, Ships, Riverboats, Oilrigs. Women-Men. Work month-Home month. U.S.A. plus Overseas. Information \$5.00. Nationwide Employment, B207, Central, Indiana 47110.

**JOBS,** Cruiseships, Tugs, Ships, Riverboats, Oilrigs: Women—Men. Work month-Home month. USA + overseas. Information \$3.00. Marine Employment, B207, Central, IN 47110.

**AUSTRALIAN OPPORTUNITIES!** Information On Country, Emigration, Employment. \$5.00. Mascor-A, Box 7367, Silver Spring, MD 20907.

**NEVADA GOLD MINING** High Pay, Excellent Benefits details \$2.00. Labo, Box 201, Goldfield, NV 89013

**EASY** Work! Excellent Pay! Assemble Products At Home. Call 504-641-8003 Ext. 5038.

**WORK IN AUSTRALIA!** Latest information on employment and emigration. \$3.00. Falcon, Box 408-M6, Long Beach, CA 90801

**SEAMANS PAPERS-** Get yours with no experience. Complete instructions and application. Send \$7.95 to: R.T., P.O. Box 5404, Galveston, Texas 77554.

**POSTAL JOBS!** \$20,000 yearly! Nationwide! Exam secrets revealed! Secrets, Box 3321, Ft. Smith, AR 72913

**FEDERAL EMPLOYMENT \$15,080-\$79,000!** Now Hiring—\$5.00 for Current Nationwide Book Listing All Occupations. Federal Employment, P.O. Box 6714, Washington, D.C. 20020

## HELP WANTED

**GOVERNMENT JOBS** \$16,040 - \$59,230/yr. Now Hiring. Call (1) 805-687-6000 Ext. R- 20024 for current federal list.

**OVERSEAS** . . . \$25,000 - \$75,000+. Free Report! Employment, Box 19760-AS, Indianapolis, IN 46219.

**AUSTRALIA WANTS YOU!** Big Pay! Transportation! New Employment Handbook—\$3.00. International, Box 19107-AS, Washington, DC 20036.

**ASSEMBLERS** needed at home. Jewelry, novelties. Earn \$256.00 weekly, no selling, experience. SASE. Crafts, Box 660-M, Pinellas Park, FL 34664

**OVERSEAS EMPLOYMENT!** Many High Income Opportunities And Countries. Free Report. Overseas, Dept. T4, Box 7367, Silver Spring, MD 20907.

**EXCELLENT** Pay for Home Assembly Work! Many Opportunities available. Call 24 hour recorded message. (216) 348-3144. Dept. Q1.

**BE ON T.V.** Many needed for commercials. Casting info. (1) 805-687-6000 Ext. TV-20024

**OVERSEAS.** To \$1,000 Daily. Free List. **ZINCPO,** Box 13110, Las Vegas, NV 89112

**EARN** Up To \$339.84 Per Week Assembling Our Products At Home. Amazing Recorded Message Reveals Details. **GUARANTEED.** Call Today. 516-336-6132, Department 410.

**EARN MONEY** Reading books! \$30,000/yr income potential. Details. (1) 805-687-6000 Ext. Y-20024

**AUSTRALIA-Opportunities!!** Latest Information **FREE** Application Forms!! \$6.00. Wise-Eye Publishing, 715-1755-M Robson, Van., B.C. V6G-3B7

## FOR INVENTORS

**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 (516) 499-4343

**PATENT** search and patentability opinion. Free brochure. Registered Patent Agent. Scott Ramsey, 5253 Even Star, Columbia, MD 21044.

## DEAL DIRECT WITH A REGISTERED PATENT ATTORNEY

**AND GRADUATE ENGINEER** with 31 years of 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** and **RECORD OF INVENTION.** Introduction to Industry, Marketing Plans, Overseas Production, Prototypes and Research Readily Available. Also specializing in Copyrights and Trademarks. —**LESS THAN ONE HOUR FROM US PATENT OFFICE—** **CALL TOLL FREE 1-800-442-2728** or write: Michael I. Kroll Registered Patent Attorney, US Patent registration #26,755; 171 Stillwell Lane, Syosset, NY 11791

**FREE** help for inventors! No charge for protection forms or consultation. Affiliated Inventors Foundation, 2132-M Bijou, Colorado Springs, CO 80909, or Toll Free 1-800-525-5885.

**PATENT IT ECONOMICALLY!** Free details. Licensed since 1958. Raner Associates, 2008 Fondulac, Richmond, VA 23229.

**INVENTORS!** Can you patent and profit from your idea? Call or write for your free information package. Over a decade of service. **AMERICAN INVENTORS CORPORATION,** 82 Broad Street, Dept. PM, Westfield, Massachusetts 01086. 1-800-338-5656. In Massachusetts or Canada call (413) 568-3753.

**IDEAS,** inventions, technology wanted! Industry presentation/national exposition. 1-800-288-IDEA. ISC-PM, 903 Liberty, Pittsburgh, PA 15222.

**NONPROFIT** Inventor Organization offers **FREE** packet. Contact Minnesota Inventors Congress and Resource Center, P.O. Box 71-C, Redwood Falls, MN 56283. 507-637-2344. 32nd Annual Congress June 9-11, 1989.

**REGISTERED PATENT ATTORNEY** Donald A. Kettlestrings, 414 Hungerford Drive, Rockville, Maryland 20850

**PATENT** searches for \$150 **ACCUSEARCH** 1-800-999-5498.

**WRITE** your own patent application. Save thousands. Call **INVENFO** for free information packet. 1-904-398-0791

**MARKET** inventions yourself. Eliminate middleman-guaranteed! Alternative Marketing Newsletter, RS, 8795P Twin Falls, ID 83301

**DRAW** "Selling" Homemade Plans!!! . . . Mine Earned Thou\$and\$! . . . Write: Freelancer, Box 22601, Minneapolis, MN 55422

**INVENTORS:** Free information on offering your invention for sale. Kessler Sales Corporation, C-5-FI, Fremont, Ohio 43420.

**PATENT,** literature, market research on your idea. Research, Box 12654, Pittsburgh, PA 15241

**FREE** consultation call or write David Rosenblum, Patent Attorney, P.O. Box 277, Garnerville, N.Y. 10923-0277, 1-800-446-1852

**PATENT SEARCH/LEGAL OPINION \$150.00** Patent Attorney. Free Information. 1-800-876-8670

(Continued on next page)

Материал, защищенный авторским правом











# Popular Mechanics

224 West 57th Street, New York, N.Y. 10019  
Classified Advertising Dept. (212) 649-3167

Order  
Form  
J89

**DEADLINE FOR ADS:** Copy and payment must be in by the 5th day of the 2nd preceding month for the issue in which the ad is to appear. See Head of Classified Section.

**HOW TO COUNT WORDS:** Name and address must be included in counting the number of words in your ad. Each initial or number used counts as 1 word: J.J. Smith, 224 West 57th Street, New York, New York 10019: 9 WORDS. Zip codes are not counted. Phone #: 2 WORDS. Symbols used as keys are charged for. City or state count as 1 word each: New Brunswick, New Jersey: 2 WORDS. Abbreviations such as C.O.D., F.O.B., R.P.M., U.S.A., P.O., 5x7, 16mm are counted as 1 word. (P.O. Box 392 counted as 3 words) Webster's International Unabridged Dictionary will be used as our authority for spelling, compound words, hyphenations, abbreviations, etc. Please make checks payable to **POPULAR MECHANICS**.

Only \$79.50 for 10 word minimum

\$7.95 each additional word

**BOLD FACE CAPS add  
\$1 per word**

(First Word: No Charge For Bold Face)

Remittance of \$ \_\_\_\_\_ is enclosed to cover \_\_\_\_\_ insertion(s) in the \_\_\_\_\_ issue(s). \_\_\_\_\_ Classification

No Charge for CAPS	2	3	4	5	6	7
8	9	10-\$79.50	11-\$87.45	12-\$95.40	13-\$103.35	14-\$111.30
15-\$119.25	16-\$127.20	17-\$135.15	18-\$143.10	19-\$151.05	20-\$159.00	21-\$166.95
22-\$174.90	23-\$182.85	24-\$190.80	25-\$198.75	26-\$206.70	27-\$214.65	28-\$222.60
29-\$230.55	30-\$238.50	31-\$246.45	32-\$254.40	33-\$262.35	34-\$270.30	35-\$278.25
36-\$286.20	37-\$294.15	38-\$302.10	39-\$310.05	40-\$318.00	41-\$325.95	42-\$333.90
43-\$341.85	44-\$349.80	45-\$357.75	46-\$365.70	47-\$373.65	48-\$381.60	49-\$389.55
50-\$397.50	51-\$405.45	52-\$413.40	53-\$421.35	54-\$429.30	55-\$437.25	56-\$445.20

YOUR NAME \_\_\_\_\_ (PLEASE PRINT) PHONE: \_\_\_\_\_

FIRM (NAME IN AD) \_\_\_\_\_

YOUR ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

DATE: \_\_\_\_\_ YOUR SIGNATURE \_\_\_\_\_

(PLEASE PRINT OR TYPE COPY • FOR ADDITIONAL WORDS ATTACH SEPARATE SHEET)

## GREENHOUSES

**GREENHOUSES** - Redwood/Fiberglass Kits. Hobby/Commercial Sizes. Brochure \$2. Gothic Arch Greenhouses, P.O. Box 1564-PM6, Mobile, AL 36633. (205)432-7529

## GARDENING & LAWN CARE

**ELIMINATE FAIRY RING!** Free Information. Capstan Publishing, #62, 1323-44 Ave. N.E., Calgary, Canada T2E 6L5

**EYE CATCHING-COLORFUL** Rain Gauge-Read From 50' Away. \$9.98. Nina Enterprises, 902386 Nina, Omaha, NE 68124

**"NEW AUGY"** Sprinkler trimmer and Garden auger, makes lawn work easy. Just send \$16.95 to: Forever Line Prod., Box 380163, San Antonio, Texas 78280. (Visa or MC accepted)

## RECIPES, COOKING, ETC.

**SWEET & SASSY** recipe... BBQ sauce for chicken/ribs/game... \$3.00 SASE. P.O. Box 2234, Des Moines, Ia. 50310

**BETTER THAN SEX** Cake. Yummy. SASE \$2.00. FMB, POB 2174, Easley, SC 29640

**LOWER** Cholesterol Booklet! 20 recipes. \$6.00. 5183 Midway, Pass Christian, MS 39571

**FOUR** easy to make quick breads from Mom's Kitchen. Send \$3 (sase): Cumru Associates, DM, Box 6751, Wyomissing, PA 19610.

**MONTANA** oatmeal raisin, carob brownies, peanut butter carob bars: mail order fruitsweetened, natural 4 bars \$5.00, 8 bars \$10.00, 16 bars \$20.00 + \$3.00 UPS. P.O. Box 170, Clyde Park, MT 59018

**GOURMET** Ground Turkey, 15 Recipes \$3.00. DeMoch Enterprises, P.O. Box 417PM1, Brooklyn, N.Y. 11238

**HOT SPICY BBQ SAUCE** plus recipes for complete BBQ meal \$4 SASE. GST-3C, Box 508, Marion, Ohio 43302-0508

**POP CORN.** Exciting Recipes \$3.00. Hall, Box 3074, Burbank, Calif. 91504

**KAHLUA** delicious makes one gallon SASE \$2.00. Jems, 1512 Wall St., Box 1124, Auburn, NY 13021

**INDULGE YOURSELF!** Rich & chewy Chocolate Chip Cookies every time! Recipe \$2.00. Mrs. Stewart, Box 2757p, Vancouver, WA 98668.

**INTERNATIONAL** party recipes. Twenty. \$4.00. Janet, P.O. Box 341, Grosse Ile, MI 48138

**BBQ'S** Delicious! Mouth Watering Recipes \$3.00 SASE. Baldwin, 817 West Hartford Place, Broken Arrow, Oklahoma 74012

**TWENTY RECIPES VIA ITALY!** \$3.95, SASE. Gallo, Box 360743, Strongsville, Ohio 44136.

**CAPONE'S ITALIAN RECIPE'S,** Tomato Sauce, Lasagna, Manicotti. \$3.00 SASE. Box 29231, San Diego, CA 92129

**PEA SALAD** recipe. Delicious! \$2.00. Frye, Box 1206, Stephens City, VA 22655

**SOURDOUGH SECRETS. START AUTHENTIC SOURDOUGH FROM SCRATCH. PLUS THREE RECIPES. \$3.00.** ALICE GOSSE, P.O. BOX 3052, BLAINE WA. 98230.

**CELESTE'S** 4th generation Italian Recipes. Easy and delicious. \$4.00. Celeste, Box 528, Amherst, N.Y. 14226

**VERY OLD CHILI RECIPE** No Heat-Burn Guaranteed \$4.00 to: Kim Valentine, 520 A-Z Harbour Dr., Andalusia, PA 19020

**CHARCOAL** grilled marinated pork. South Seas recipe. \$3.00. Stettin Prints, Box 2013, Wausau, WI 54402-2013

**UKRAINIAN** Recipes. Popular & delicious. \$4.00. Kalyna, Box 240, Station J. Talon, Montreal, Quebec H1S 2Z2

**CAPONE'S ITALIAN COOKIES,** Lemon, Honey. \$2.00 SASE. Box 29231, San Diego, CA 92129

**DELICIOUS** Tropical Desserts, From piña colada to papa-ya flan. Send \$4.98 to: Cocina Olé Lo Lai, P.O. Box 380584, San Antonio, TX 78280

## WINEMAKING, BEERMaking, ETC.

**FREE CATALOG** Winemaking, Beermaking supplies. Continental, Box 1227A6, Daytona Beach, Florida 32015

**BEGINNERS WINE RECIPE.** Easy. Tasty. any season. \$2.00. Recipe. Box 88, Mandan, ND 58554-0088

**BEERMAKERS ONLY! FREE** Catalog/Newsletter. William's, Box 2195-M9, San Leandro, CA 94577

**WINEMAKERS - BEERMAKERS: FREE ILLUSTRATED CATALOG OF SUPPLIES. SEMPLEX, BOX 11476R, MINNEAPOLIS, MINNESOTA 55411**

**BEER, WINE** make your own. Free catalog, quality supplies, excellent fast service. Beer & Wine Hobby, 22B Cranes Court, Woburn, Mass. 01801. 1-800-523-5423

**WINEMAKERS - BEERMAKERS - Free** illustrated Catalog - Fast Service - Large Selection - Visa/Mastercard - (816) 254-0242 - Kraus, Box 7850-L, Independence, Missouri 64053.

**WINE/BEER MAKING** Catalog:B&J Enterprises, 1845 South 19th, Springfield, Illinois 62703

**FREE BEERMaking BOOK - Catalog.** Finest Equipment, Ingredients, Fast Service! 919-929-4277. SPI, Box 784-P, Chapel Hill, NC 27514

**WINEMAKERS, BEERMAKERS!** Discount Catalog. 560 quality items. Crossfire, Box 530Q, Somersville, CT 06072

**FREE CATALOG! GREAT PRICES! FAST SERVICE!** Sebastian Brewers Supply. 1-800-780-SUDS.

## BURGLAR ALARMS & HOME PROTECTION

**INEXPENSIVE** Burglar Alarms and Personal Safety Devices. Send for free info. Kar-Lyn Enterprises, 4317 E. Michigan Street, Orlando, Florida 32812

**SCARECROW PROTECTS** Your Home. Low-Cost Security Products. FREE Information. Overview Ltd., 567 Windsor Road, Wood-Ridge, New Jersey 07075

**PREVENT HOME BURGLARY!** Four Burglar Alarm Decals \$1.00. Medved's, 5233 Six Mile, Racine, WI 53402

POPULAR MECHANICS • JUNE 1989 151

Материал, защищенный авторским правом

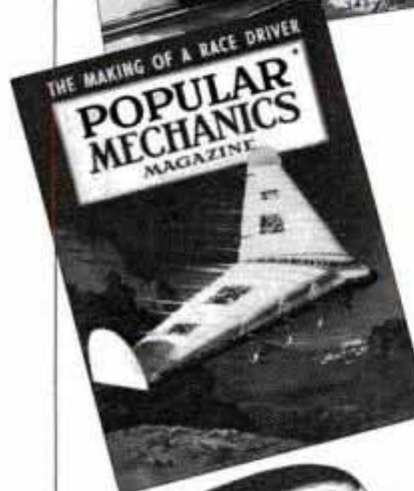
# NOTICE TO PM READERS

## We need your help.

The Henry Ford Museum & Greenfield Village and POPULAR MECHANICS need your help. To commemorate the 90th anniversary of the magazine, Henry Ford Museum and POPULAR MECHANICS are planning to collaborate on an exhibit on the history of the popular culture of American ingenuity and mechanical knowledge, as reflected in POPULAR MECHANICS. Because of its important role in popularizing innovation and spreading mechanical know-how throughout the 20th century, the history of our magazine exemplifies the deep and lasting American tradition of ingenuity and problem-solving.

We need the help of all you readers to identify and locate examples of the inventions, the projects, the models, the cover art and the plans for the countless features that have filled the pages of POPULAR MECHANICS for the past 90 years. We are interested in both those things that predicted a future that never came to pass and those things that were so successful in becoming a part of daily life that we no longer even think about them. Please help us locate this material so we can create a timely and exciting historical exhibit.

Please send any information you think would be helpful to POPULAR MECHANICS Exhibit, 224 West 57 Street, New York, NY 10019.



AVAILABLE FROM

READER SERVICE

PM PLANS AND IDEAS



### POPULAR MECHANICS "PLANS AND IDEAS" CATALOG—

Hundreds of ideas on workshop projects, plans for shop tools, storage houses, boats, furniture, toys—just about everything! Send \$2.00

### "SOUND ADVICE"

An Audio Guide To Your Car's Performance! The only cassette tape of its kind. It identifies 20 of the most common noises that a car can make and aids you in fixing it yourself or helps you explain the problem to your mechanic. Order #V-1010. Only \$7.95

### Popular Mechanics HOME HOW-TO

A 512 page book with over 3,000 illustrations and photographs covering small fix-it jobs through major renovations. No homeowner should be without one. Order #B-1935. Only \$29.95

Mail your check or money order to: **Popular Mechanics, Box 1014, Radio City Station, New York, NY 10101.**

POPULAR MECHANICS (ISSN 0092-4558) is published monthly by The Hearst Corporation, 224 West 57th Street, New York, NY 10019, U.S.A. Subscription prices: United States and possessions, \$13.97 for one year; \$23.97 for two years. Canada and all other countries, add \$16.00 for each year. Second-class postage paid at New York, NY, and additional mailing offices. Authorized second-class mailing-in-Canada privileges by Canada Post, Windsor, Ont. Send returns to Canadian Direct Mailing Sys. Ltd., 900 Mercer St., Windsor, Ontario N9A 7C2. Registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 20, 1950, © 1989 by The Hearst Corporation. All rights reserved. Printed in U.S.A. POSTMASTER: Send address changes to Popular Mechanics, P.O. Box 10064, Des Moines, IA 50300.

# SOME RULES AREN'T MADE TO BE BROKEN.

Ever since the first one came off the production line, experienced professionals and serious do-it-yourselfers have associated the Stanley POWERLOCK® tape rule with one thing.

Quality.

That's because for over 25 years the people who work with tools for a living have taken it to the limit.

And it always comes back for more.

You see, no other tape rule is built like a Stanley Tape.

Its Mylar® coated blade, for example,

provides the ultimate in protection, resisting wear, abrasion and most chemical solvents longer than any other tape blade.

It also features a durable, three rivet, tru-zero end hook for precision measuring. Clear, three color, easy-to-read blade graphics. And a blade that stays rigid at least 7 ft.

And some models offer patented, speed control cams which are specially designed to prevent whiplash and return the tape at an even speed, reducing the chance of damage even more.

And Stanley tape rules are laser tested for precision to make sure they're the most accurate tapes you can buy.

What's more, Stanley tapes are available in a variety of styles and lengths, from 3 ft. up to 100 ft.

But no matter which size tape you buy, when you buy a Stanley you're buying the #1 tape rule. The rule by which all others are measured.



**STANLEY**  
helps you do things right!

 **BADGE OF THE PROFESSIONAL**® The design of the POWERLOCK® Tape Rule case is a registered trademark of The Stanley Works.

Материал, защищенный авторским правом

# Take this simple IQ test:

For the same price, would you buy an ordinary camera which only gives you this?



Or would you buy the Pentax IQZoom 60 which gives you



this



this,



this,



and this.



## You're a genius!

See how easy it is to raise your IQ? The Pentax IQZoom 60, with its motorized zoom lens, gives you multiple choices. From wide angle to telephoto and everything in between. Even macro for close-up details. And of course the IQZoom 60 is smart

enough to be fully automatic, smart enough to give you great pictures, and even smarter since it costs no more than ordinary cameras.

Raise the Pentax IQZoom 60 and get the pictures you want.

**PENTAX IQZoom 60**



For best results use Kodacolor Gold. © 1989 Pentax Corp.