

# Popular Mechanics

JUNE 1994

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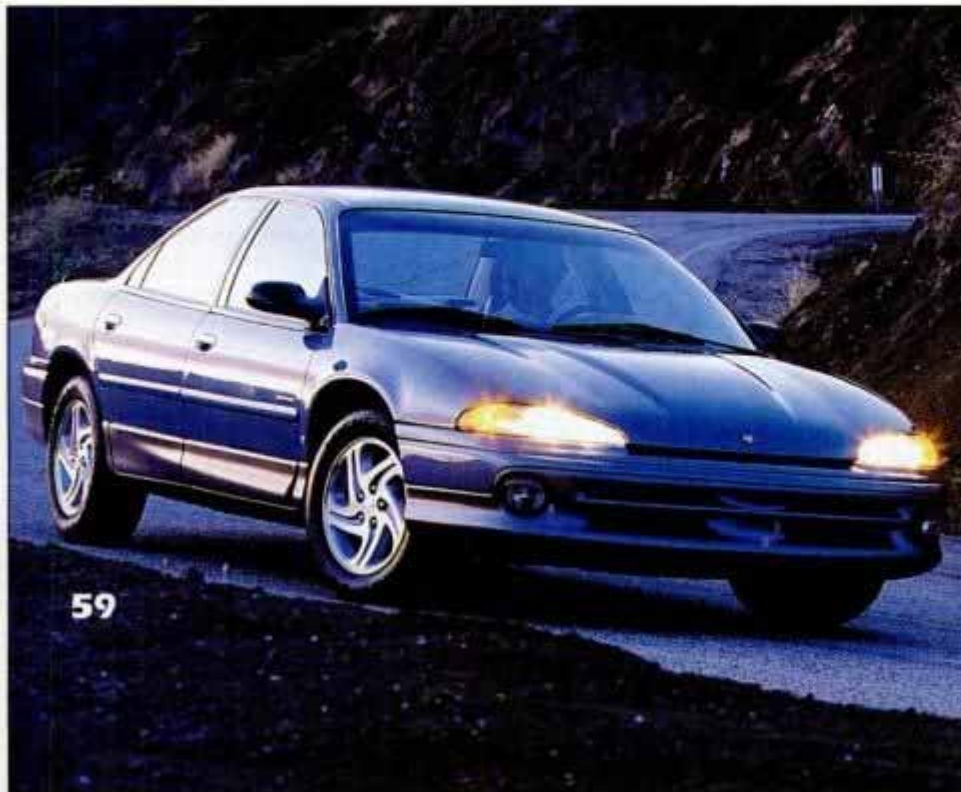
It's innovative thinking like this that's kept us ahead of the competition for more than 150 years. At Stanley we're not happy simply churning out products. We're only happy when our products are better than anyone else's.

**STANLEY**  
helps you do things right.

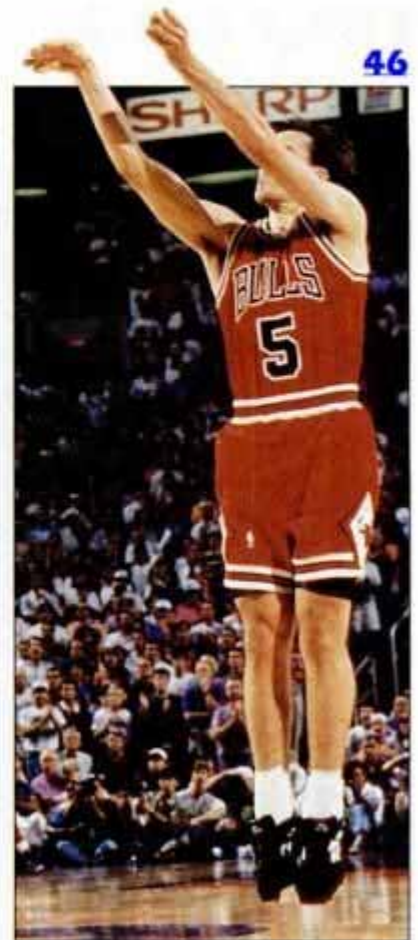
# Popular Mechanics®



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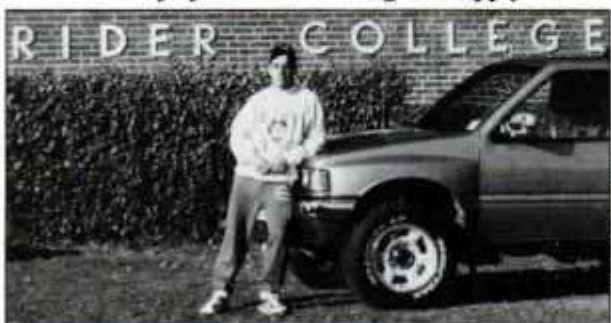
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# EDITOR'S NOTES

● In a recent survey, the No. 1 concern among Americans wasn't the economy or health care or whether the North Koreans have nuclear weapons. It was crime. No wonder gun sales are at an all-time high in this country. No wonder manufacturers can't make home security systems fast enough to supply the demand. We're all looking for ways to protect ourselves. We're all worried every time we go out of the house. Will we be mugged? Will our home be burglarized? Will precious mementos be stolen? Will loved ones be harmed? And there are a certain few among us who worry about break-ins even while we



Typical college student Steve Oldham.

are home. Against this terrifying backdrop, our cover story is particularly timely. Home Improvement Editor Steve Willson and Contributing Editor Stephen Booth collaborated on the guide to home security that goes from the simple to the sophisticated and covers just about all the steps in between. I, myself, favor the simple. In my own home, which has a central climate-control system, I have nailed shut all the bottom-floor windows. It's a somewhat simplistic but highly effective solution to a problem that we're all—unfortunately—forced to deal with in today's society. . . . In our last update on PM's long-term test cars, we announced that we were going to recruit a typical college student to be a guest tester for the Isuzu Amigo in our possession, since the Amigo is a best seller among college-age Americans. We received a ton of mail from college students volunteering their services. But there was one particularly poignant appeal that we received. It read, "Dear Dad: I'm a typical college student. Pick me. [Signed] Your son, Steve." Now what



Norman Becker.

father could resist? So I picked Steven Oldham as our guest tester and his report is in the Long-Term Test Cars report, which begins on page 56, and I think I'm just beginning to understand the psychographics of the typical Isuzu Amigo buyer. . . . With this issue, Contributing Editor Norman Becker marks 10 years as the author of our monthly—and very popular—Homeowners Clinic. Becker was already an accomplished writer, engineer and home inspector when he joined us in 1984. What prompted him to start writing? "During my home inspections, I had many clients say to me that they knew so little about a house, they didn't even know what questions to ask me. This prompted me to write a book on the various systems and components of a house and how they function." Becker is president of Universal Home Inspection in Pomona, New York, and a charter member and past national director of the American Society of Home Inspectors. Happy 10, Norm! . . . Two fascinating stories this month out of our Electronics department. First up is the story of "The Zapper," that remarkable add-on to your VCR that automatically zaps out commercials while you're taping. The second is a look at the UBI System in Canada. The first real stretch of the information superhighway—or infobahn, as it's being called—is in place. The future has begun. Till next time.

  
Joe Oldham

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# SHAPE SHELDON UP WITH



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POPULAR MECHANICS is published monthly by the Hearst Corporation, 850 Eighth Avenue, New York, NY 10019, U.S.A. Frank A. Bennack Jr., President; Randolph A. Hearst, Chairman; Gilbert C. Maurer, Executive Vice President; Victor F. Girani, Senior Vice President, Chief Financial and Legal Officer; Julia W. King, Secretary; Edwin A. Lewis, Vice President and Treasurer. Hearst Magazines Division: D. Claeys Bahrenburg, President; K. Robert Brink, Executive Vice President; Mark F. Miller, Executive Vice President; Daniel E. Zucchi, Senior Vice President; George J. Green, Executive Vice President; Raymond J. Peterson, Executive Vice President; John A. Rihan Jr., Vice President & Resident Controller; Robert B. Dillingham, Vice President for Popular Mechanics.

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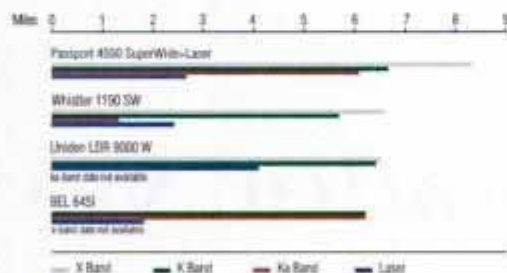
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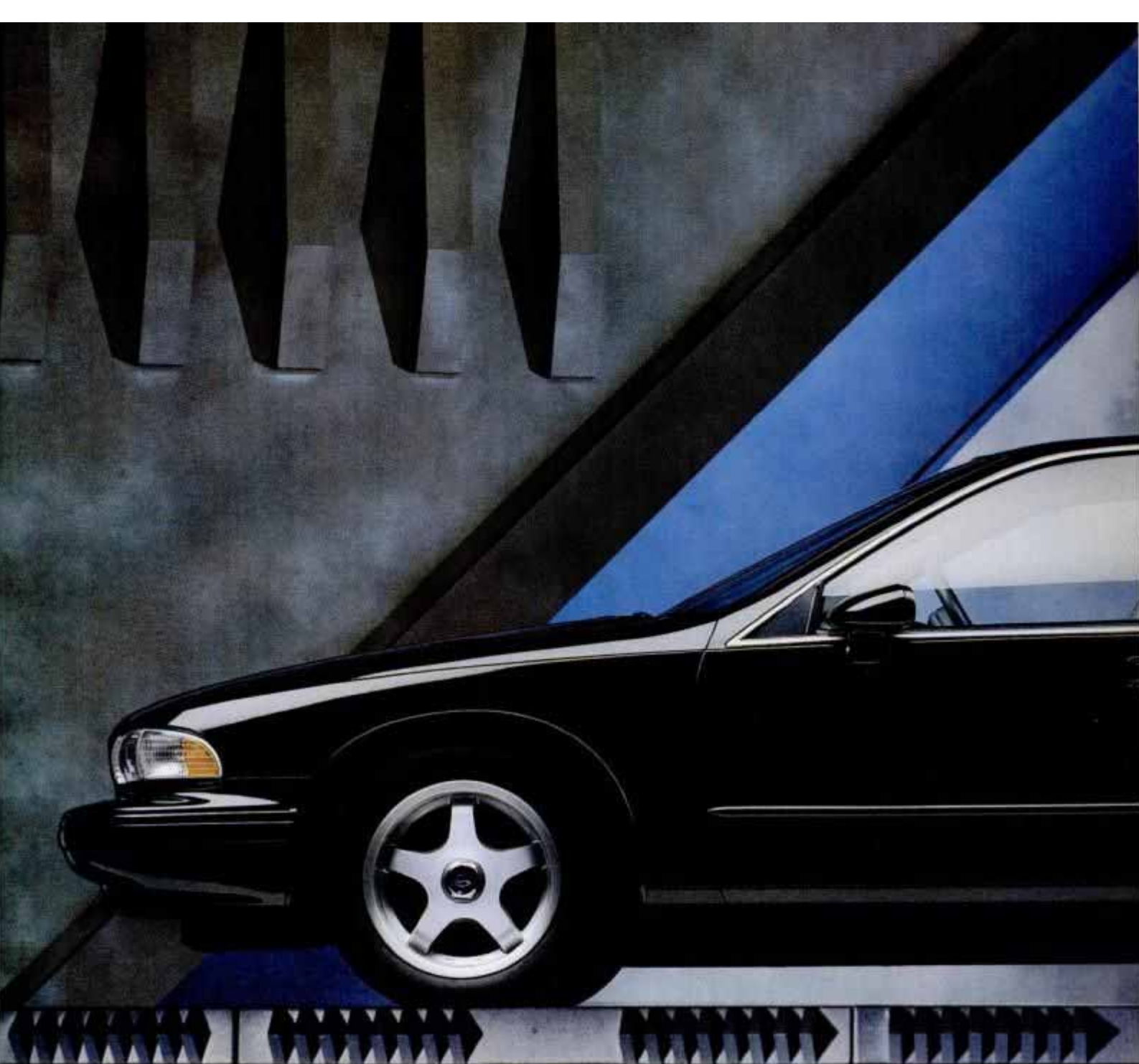
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is ready."

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Whatever it is about the new Impala SS, before you even think about buying one, we feel we owe you a few friendly words of advice: this is not a car for those who prefer to arrive unnoticed.

Are you sure you can live with that?

 Chevy Impala SS

Материал: заводской авторский проект

# To manual shift is human.

# To automatic drive is divine.



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when you consider that just one touch of the pedal controls both direction and speed, well, let's just say that for the money, it's definitely the easiest and quickest way to mow your lawn. Automatic drive is featured on both Murray and "Ultra by Murray" riders and can be found at fine retailers across the U.S.A.



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## Hot Under The Collar



Your "Fire Bombers" story has me really riled up. The United States does not need a new fighter. It does not need a new bomber. What it desperately needs is a new amphibious transport plane that can be instantly converted into a water bomber. We need a transport that can quickly carry commando troops to any place in the world and land them on water, land or snow. If we had had such an aircraft during the Kuwait crisis, one division could have quickly put down the Iraqis in a week. Such aircraft can easily double as water bombers. Certainly the California firestorms in Oakland and Los Angeles, which together destroyed more than 6000 homes, show the United States needs such a standby fleet. Building such a fleet would also give our ailing aircraft industry a much-needed shot in the arm. It almost makes me cry to see that we are presently depending on 50-year-old crocks—such as DC-6s and Canadian-owned Martin Mars planes that were never intended to be water bombers—for our main defense.

VAUGHN M. GREENE  
SAN BRUNO, CA

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

I thoroughly enjoyed "Fire Bombers," coming on the heels of an in-depth piece in the November *Smithsonian Air & Space* magazine on the Martin Mars water bomber. Keep up the good work—including automotive, firearms and military coverage—no matter what a few disaffected readers may say. They do not understand the reader appeal of the great POPULAR MECHANICS formula.

RICHARD M. VOLKMER  
WARRENVILLE, IL

Your article on fire bombers was a bit reckless in its expectations. A high-intensity brushfire generates up to 3000 kw per meter of fireline. This is equivalent to 3.12 million BTUs per hour per foot, and with 70°F water having a heat vaporization at 142° plus 970 BTUs per pound, there are equivalently 2800 pounds of steam per hour per foot of fireline being generated. The Canadian Super Scooper carries about 13,300 pounds of water, good enough for less than 5 ft. of fireline.

GLENN UMONT  
DANVILLE, CA

Thanks to extensive television coverage, we learned a great deal about fire bombers during the intense fires that threatened our community last fall. For several years, our community had supported the acquisition of the Canadair Super Scooper. No longer. While chemical drops are important, the most important firefighting tool is precision water drops that pour thousands of gallons of water on a hot spot, literally putting out the fire. The Super Scooper cannot do this. It cannot fly low enough, and because it is

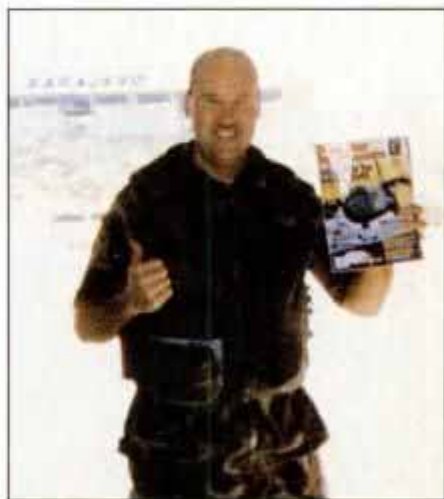
fast-moving, the water load it drops disperses over a large area in more of a spray. Moreover, it cannot make precision drops. Because firefighters are often in the area, pinpoint accuracy is required so that the loads, when dropped, do not land on the firefighters and injure them. Helicopters were by far the most effective fire bombers and they did a magnificent job last fall. JACK ALLEN

PRESIDENT, PALISADES  
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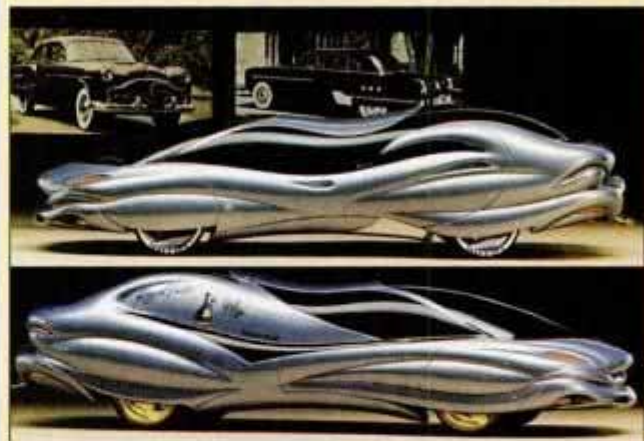
### Bosnia Pipeline

Please excuse this late letter and accept a huge thank you for the excellent article "Mission To Sarajevo," fea-

turing the Provide Promise Humanitarian Airlift. That's me in the photo [above] with your magazine celebrating my 39th birthday on the Sarajevo flightline. The article remains very, very popular with the troops flying the "Bosnia Pipeline." Hundreds of Active, Guard and Reserve  
*(Please turn to page 12)*



### Reader Project Of The Month



Here's a project I thought you would enjoy seeing. These photographs are of a 9-passenger van sedan. It's a new concept in passenger and cargo configuration. The other side of this 1/2-scale model is a Town Panel Courier delivery vehicle. The model took nine months to build. This model effort is being sent as it is constructed using many methods described in projects so often depicted in your publication. POPULAR MECHANICS does an excellent job of keeping readers abreast of the auto industry.

HENRY F. ROM  
EAGAN, MN

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## LETTERS (Continued from page 11)

aircrew members have passed the issue around, reading about their mission. It's a super morale booster to know that somebody is keeping the folks back home tuned in to what the troops are doing "way over there." On behalf of the airlift crews, thanks again and keep up the good work.

CAPT. MARK S. CARROLL  
USAF RESERVE  
910TH AIRLIFT GROUP  
YOUNGSTOWN AIR RESERVE STATION  
VIENNA, OH

### Future Is Now

I found your article "Beyond Jurassic Park" fascinating. It hit on many aspects of the future of computerized imaging in the motion picture industry. It was also a wonderful prelude to the endless possibilities of computerized art.

MICHELLE CONNELL  
DEL MAR, CA

"Beyond Jurassic Park" was incredibly interesting and as thorough as possible, considering all that POPULAR MECHANICS covers. It has been my aspiration to achieve success in a career in computer-generated special effects. When I read your article, I learned of a new realm of opportunities available.

NATALIE N. FRANKS  
LEESBURG, IN

### Viper Hoods

In a recent Detroit Spy Report column, you ran a short piece titled "Hooded Viper." In it you state that the Dodge Viper's hood has been a difficult part to produce and is causing delays in the availability of the car. You also state that Chrysler has changed suppliers for the hood. While it's true that the hood has stretched the composite technology involved and there were some delays early on, it's important to point out that your reporting is roughly nine months behind. To begin with, Rockwell International, as the supplier of the hood, has worked closely with Chrysler in working out the issues we encountered in stretching the technology. Not since July '93 has a Viper been delayed as a result of a hood issue. Also, Chrysler continues to use Rockwell International as the hood supplier and there are no plans to change.

WILLIAM F. REBONE  
PRESIDENT, BODY & CHASSIS SYSTEMS  
ROCKWELL INTERNATIONAL CORP.  
TROY, MI

### Games People Play

"Grown-Up Games" was a nice piece in as far as it went, but one interesting point was missed. At the cost of the systems and software, how can they

really be called "kids" games? Let's get real. At \$45 to \$75 per cartridge, this is parent-supported electronic bribery. These games are not meant for kids. Parents should interact with their kids and not allow kids to interact with machines sans parents.

LE 198  
(FROM PM BULLETIN BOARD)

CD-ROM games are engineered, marketed and sold by adults for adults. The content of the disc should be carefully reviewed before allowing a minor to see it. After all, minors don't have the money for any of these high-priced toys. My real point, however, is that these new systems are all linked to that one ultimate adventure all adults will enjoy within the next few years—virtual reality. Personally, I can't wait to use my \$1600 computer for a better purpose. I just hope it doesn't create any side effects on anyone's well-being.

CARL 152  
(FROM PM BULLETIN BOARD)

### Foot The Bill

When PM publishes a letter from a reader and the letter makes serious allegations about a product, PM, in fairness, should add a footnote to either confirm or deny the allegation, if at all possible. Your article on the 92FS Beretta pistol produced three published letters, two of which made dubious claims that would have benefited by a footnote from PM. The letter from Fred J. Hermon states that "there have been a number of reports of slide cracking with the 92FS." This is a very serious accusation, but is it true and what were the conditions? Where did Hermon get his information? He then goes on to state that the stopping power of the Beretta is less than the .45 and thus "has put our servicemen's lives in dire jeopardy." This is nonsense. Stopping power is not solely the function of the frontal area, but also of the weight of the bullet and the bullet velocity. The 9mm bullet has plenty of stopping power, and most modern armies have adopted this caliber. The other published letter, by J.M. Beck, states that a sidearm is a waste of money, and that no one has used a sidearm in combat. I personally know of two officers who are alive today because they had a sidearm. For the record, I am not connected in any way to the Beretta company and my Army service was back in the Korean War. But I do believe that one of my favorite magazines should not, in the interest of fairness, publish misleading letters without adding a balancing footnote.

I.V. de CHELLIS  
NEW YORK, NY

# IT OUTPERFORMS CONVENTIONAL MOTOR OILS. IT COSTS LESS THAN FULL SYNTHETICS. IT'S NEW VALVOLINE® DURABLEND.™ AND IT'S ABOUT TIME.

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that's a unique combination of technically  
advanced synthetic oil and the highest  
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even 300,000 miles and more.



## DURABLEND gives you better engine protection

at startup, better deposit control, better fuel economy  
and a smoother running engine overall than  
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But (and this is a big but) it costs  
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Sound like the best of both worlds? A better  
oil at a lower price? Well you're right. So try  
new Valvoline DURABLEND. It's a motor oil  
whose time has come.

## PEOPLE WHO KNOW USE VALVOLINE®

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# New From Pocher Of Italy! THE FERRARI F40 1:8 Scale Die-cast Metal Kit

The Ultimate Modeling Experience Made Affordable  
With Four Easy Payments of \$49.99 a Month.



Owning the car that stole the hearts of sports car enthusiasts is now within your reach! As exclusive U.S. importer for Pocher of Italy, we've cut out the middlemen to keep prices down, down, down. We're currently offering the kit that was once a prohibitive \$549.95 for the incredibly low price of only \$199.99!

### The Ferrari F40

At the age of 90, Enzo Ferrari introduced his "best Ferrari ever" to commemorate 40 years of producing high performance automobiles. The year was 1987. The car was the F40. Its aerodynamic design and powerful 478 HP engine made it the most exotic supercar in automotive history. Accelerating to 60 mph in just 3.5 seconds, the F40 claimed a top speed of 201 mph to become the fastest road car ever built!

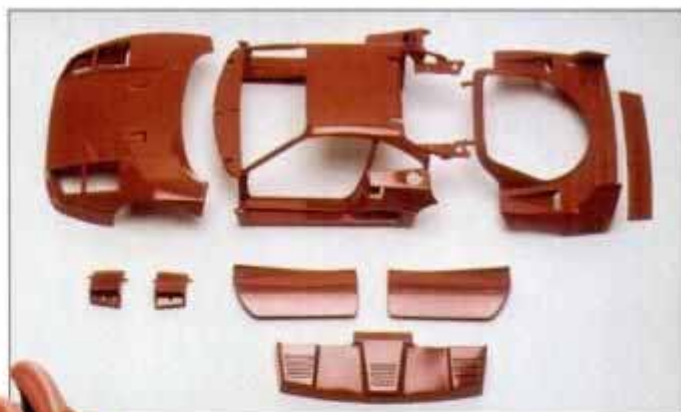
### Pocher's kit... true to the original that inspired it

In producing the F40, Pocher's accomplishment is as monumental as that of Enzo Ferrari. Total commitment to detail and accuracy is evident throughout this extraordinary model. Nearly

every detail of the original F40 has been duplicated (except the speed, of course). It's all here—working steering and suspension, opening doors, hood and trunk, bucket seats complete with seat belts, authentic dashboard with full instrumentation, moving headlights, and the most magnificent 32 valve engine you've ever seen!



Left: The rear independent suspension system complete with operating Koni shock absorbers, brake disc and brake calipers— all faithfully reproduced in 1:8 scale. (The item just to the right of center is the oil reservoir tank.)



Above: The principal coachwork components in die-cast metal, beautifully finished by a special factory applied multi-coat painting process.





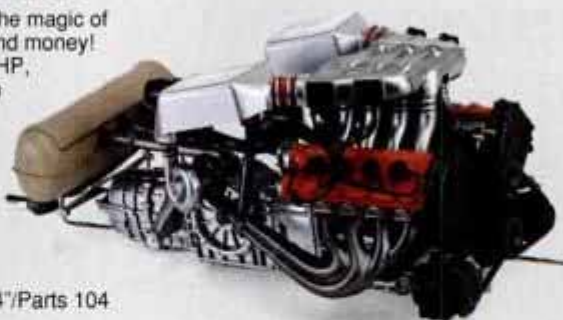


## SAMPLE THE HEARTBEAT!

Build the Ferrari F40 engine and discover the magic of Pocher with a smaller investment of time and money! Complete with all external details, the 478 HP, 3.0 liter V-8 engine is identical to the one in the automobile kit. (In fact, many modelers display it next to their completed model.) Injection molded plastic parts are pre-colored, so no painting is necessary. Clearly illustrated assembly diagrams are practically foolproof. Sample the heartbeat of the finest automotive kit available anywhere!

Kit No. KM55 Height 4"/Length 9"/Width 4"/Parts 104  
List \$39.95 Sale \$29.99

(Deferred payment plan is not available on the F40 engine.)



*Above right: The F40 engine is a modeler's dream with twin turbochargers and heat exchangers, detailed gearbox differential case, engine block with double overhead cam covers, electronic ignition wiring harnesses, tension belts, pulleys and a complete exhaust system. Model is 9" long and 4" high.*

Die-cast metal body panels, doors, hood, trunk, bumpers, spoilers, and headlight covers are pre-painted a flawless Ferrari red. Other precision made components of molded plastic, steel, rubber, fiberglass, polystyrene, and fabric go into making your model an automotive work of art in miniature. A real key actually works the door locks and fits into the ignition!



### Send no money now! Take four months to pay!

We will charge your credit card for \$49.99 (plus a one time \$10.00 shipping & insured delivery charge) when we ship your F40. Then we'll automatically charge your account \$49.99 at the end of each month for the next three months. (PA residents will be charged 6% sales tax on amount billed.) So, start building your Ferrari now, and pay for it in four interest-free installments!

**Please note:** Deferred payment plan is limited to MasterCard and Visa card holders. Credit cards will not be charged until shipment. Special offer is valid through May 31, 1994.

*Above left: the F40 bucket seat assembly precisely reproduced in every detail including its seat belt. The form fitting comfort of the original is easily imagined.*

*Above left: the F40 dashboard is a masterpiece within a masterpiece—a precise reproduction of the original including an ignition key with the Ferrari logo.*

*Below: The front independent suspension system complete with operating Koni shock absorbers, brake disc and brake caliper— all faithfully reproduced in 1:8 scale. Notice the radiator with twin electric cooling fans (shown to the rear of brake disc).*



**Building the model is easy!**  
No glue, paint or tools are required! All 515 precision made parts snap or screw into place. An illustrated instruction manual



helps you finish in about 50 hours. When completed, your Ferrari F40 will be almost 22" long. Curbside weight is a substantial 16 pounds.

Kit No. K55  
Length 21-3/4"/Parts 515  
Mfg. List 549.95 Sale \$199.99  
Four \$49.99 installments



*Left: The completed F40 chassis, as detailed as the real thing.*



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**Yes! Please send me:**  
 No. K55 Ferrari F40 \$199.99 (or four \$49.99 installments)  
 No. KM55 F40 Engine \$29.99 (deferred payment plan not available)  
 Charge my  MasterCard  Visa  
 Charge me in four installments  Charge me the full amount

Account No. \_\_\_\_\_ Exp. \_\_\_\_\_

Name \_\_\_\_\_

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My check or Money Order is enclosed. (Please add 10.00 for shipping and insured delivery or \$4.00 for engine only. PA residents must also add 6% sales tax.)

# TIME MACHINE

90 YEARS AGO: JUNE 1904

## Popular Mechanics

Is the Day of the Armored Battleship Ending?

The Evolution of the Fighting Great Shows That All First-Class Battleships Must Possess a Radical Change in Mode of Construction



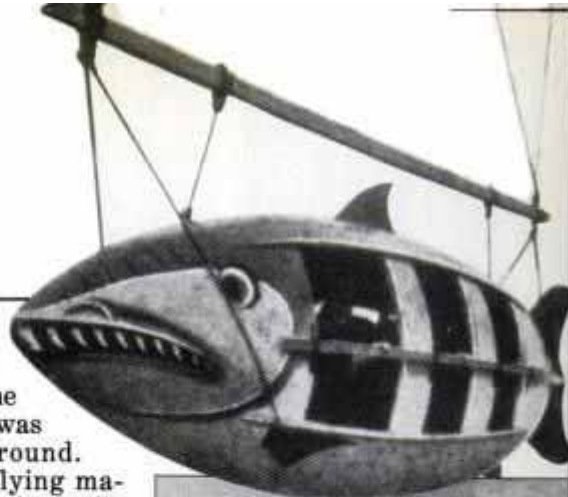
The big, slow armored battleship was becoming a dinosaur. The tide of warfare seemed to turn toward the fast torpedo boat, the floating mine and the little submarine. But the coming generation of dreadnoughts would lay these arguments to rest with three big strokes: big guns, big engines and big armor.

### Tin Can Panned

Was naval strategy due for a sea change? Many observers wondered, in the wake of recent Russo-Japanese engagements, if the big, slow armored battleship was becoming a dinosaur. The tide of warfare seemed to turn toward the fast torpedo boat, the floating mine and the little submarine. But the coming generation of dreadnoughts would lay these arguments to rest with three big strokes: big guns, big engines and big armor.

### Sky Ride

Just as aviation was getting off the ground, so too was the merry-go-round. The umbrella flying machine came from the fertile mind of Sir Hiram Maxim, of mousetrap and machine-gun renown. The ride spun 12 gondolas that held four passengers each. When it reached its top speed of 60 mph, the device opened to a diameter of 200 ft. Apropos to the local climate, the umbrella was a fixture at London's Crystal Palace.



60 YEARS AGO: JUNE 1934



### Bird's Eye

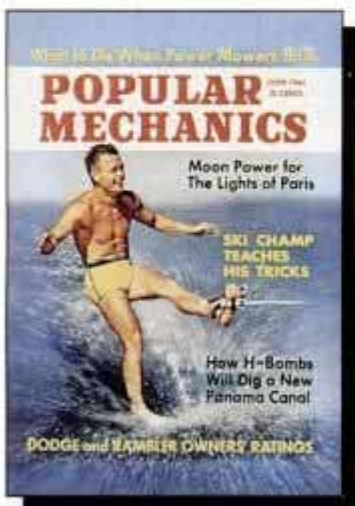
Frequent flyers today are accustomed to magnificent vistas. But during aviation's golden age, rare natural spectacles made flying all the more rewarding. When Amelia Earhart first crossed the Atlantic, she reported a stunning phenomenon spread out across a low-lying fog bank. Flying just under 5000 ft. in altitude, she glanced down to see late-afternoon sunlight refracted into a prismatic rain-circle, her plane silhouetted in the center. Mountain climbers have reported similar experiences.



### Mirror Image

Gleams entered astronomers' eyes when they talked about the record 200-in. telescope that was now taking shape. At its heart: a huge mirror, recently cast in Pyrex (Corning's new borosilicate glass) and coated with aluminum. This optical goliath would make the Moon appear only 25 miles away—close enough, we noted in earnest, to spot large buildings. And before long, a new locale would enter astronomers' lexicon: Palomar. Fourteen years would pass, however, before the observatory opened.

30 YEARS AGO: JUNE 1964



### Hang Five

As waterskiing boomed in the mid-'60s, trick-skiing champion Al Tyll showed readers the mechanics of his popular stunts. The key: mastering a pair of basic maneuvers—the crouch and the upward bounce that cleared the skis of the wake. From these, such gyrations as the helicopter spin and the toe-hold turnaround were pieces of cake. To practice during the off-season, Tyll used a 40-pound block on a rope and pulley to simulate the pull of a boat.

### Dirt Bombs

Nukes for peace—it was an idea that fit nicely into atomic-age thinking. And what better way to turn thermonuclear swords into plowshares than by digging another Panama Canal? Atomic Energy Commission engineers were serious. Their tests in Nevada revealed that nuclear explosives buried below the surface could move millions of cubic yards of earth, opening precisely tailored craters. The AEC cheerfully proposed nuking its way

through the Bristol Mountains in California to prove out its technique. **PM**



# TECH UPDATE

News Of Tomorrow's Technology Today



PAUL DINIARD

## Alaskan Ferry Doubles As Disaster-Relief Center

JUNEAU, AK—For three decades, eight huge roll-on/roll-off ferries have linked the ponytail of islands and ports that make up Alaska's southeastern coastline. Transporting vehicles, passengers, food and goods, these ships—known as the Alaska Marine Highway System—have become the region's economic lifeline.

But nothing sullies Alaska's economy like a major oil spill. So when a ninth vessel joins the fleet in 1997, it will bring a unique mission. In the event of a disaster, the ship will convert into a command and control center.

When emergency strikes, the ferry will pull into the nearest port and discharge its passengers—it can carry 500, plus 100 cars. Emergency personnel will take over the staterooms, and the forward observation deck would transform into the nerve center

of the cleanup operation. The ship will steam right to the spill scene.

Although the ferry won't play a direct role in recovery efforts, it will linger nearby for up to 20 days. Cleanup workers will dock their vessels next to the aft roll-on/roll-off vehicle ramp and decontaminate in a walk-through station on the car deck.

A big part of the contingency package will be a built-in communications hub, able to handle 40 phone calls as

Alaska Marine Highway System ferry will operate as emergency command center in the event of a coastal oil spill.

well as video teleconferencing. The emphasis on beefed-up communications reflects lessons learned from the *Exxon Valdez* incident.

Alaska has drawn up a design for release to potential builders. At 388 ft., the ship will be the biggest ocean-going roll-on/roll-off vessel built in the United States since 1952.

### Highlights This Month

- **Rover Indulgence**—Driving lunar robots for fun.
- **Cold Light**—Stargazing at the South Pole.
- **Food For Thought**—Tomorrow's kitchen today.
- **Sevens Up**—First look at the new Boeing 777.
- **X-Ray Specs**—Tank helmet sees through armor.
- **Aurora Explorer**—NASA probes the northern lights.
- **Seafood Surprise**—Robot mocks lobster.

Editor/Writer: Gregory T. Pope  
Reporters: Philip Chien, Mike Fillon, Scott Gourley,  
Barry Rosenberg

## Drive Your Own Moon Rover

ARLINGTON, VA—Why leave space exploration to government employees? In 1997, if all goes as planned, you'll be able to stop by your local theme park, pay your fare and pilot a remote-control rover around the Moon. The idea—



LunaCorp's rover would wander around the Moon under the control of paying telecustomers.

privately funded, interactive space exploration—has been launched by LunaCorp.

As currently foreseen, a Russian-built Proton rocket would ferry the 880-pound vehicle to the lunar surface at a fee of \$50 million. LunaCorp plans to recoup revenues by selling the means for controlling the rover to theme parks, television networks and science museums.

Some customers would use telepresence technology to guide the rover around the Moon, watching live images from the vehicle's stereo TV cameras. Others would don virtual-reality hardware to experience a moonwalk based on 3-dimensional terrain maps relayed earlier from the rover.

LunaCorp has already tapped Carnegie Mellon University, makers of volcano-scaling Dante (see [Tech Update, page 24, Mar. '94](#)) to build the rover.

## Top-Flight Scramjet



Pratt & Whitney scramjet delivered thrust at Mach 14 (9500 mph) in shock tunnel.

WEST PALM BEACH, FL—Although plans for a Mach-25 National Aero-Space Plane (NASP) may have crashed, interest in scramjets still burns bright. Recently, a scaled-down version of one of these hypersonic engines did what no scramjet has ever done—it demonstrated positive thrust at speeds between Mach 8 and Mach 14. The breakthrough occurred at Calspan's shock tunnel in Buffalo, New York.

Data from the tests will help guide the planned Hypersonic System Technology Program (HySTP), which picks up this fall where NASP left off. Starting in 1997, HySTP will launch four converted ICBMs tipped with hydrogen-fueled scramjets.

## F-22 Could Fly Like A Camry



Five-axis milling machine works over component of first flying F-22 fighter.

WRIGHT-PATTERSON AFB, OH—What a feeling for a defense contractor: fighter jets rolling off a flawless, cost-effective assembly line. But as the Air Force gears up for production of the costly F-22 fighter, the contrast between military and civilian manufacturing has never seemed sharper.

With that in mind, officials spent two days scrutinizing Toyota's factory in Georgetown, Kentucky. The plant produces 1000 Camrys a day and showcases Japanese manufacturing efficiency. Program managers hope to pick up tips for tomorrow's aerospace projects.

## Taurus Charges Into Space



VANDENBERG AFB, CA—After being red-flagged by some capricious California weather, the first Taurus rocket (see [Tech Update, page 17, Jul. '93](#)) finally blasted off on March 13.

Built by Orbital Sciences Corp., Taurus is designed to operate from an austere, sparsely manned launch pad. The 90-ft. rocket is a headless MX missile tipped with a wingless Pegasus air-launched booster. Two satellites rode on the first launch. One 400-pounder, called DARPAsat, is on a classified mission. The other is an 1100-pound TRW-built platform that will test autonomous GPS-based navigation for Air Force satellites.

Taurus lofted TRW spacecraft (above) to investigate satellite self-steering.



43, so young.

Everyone liked him.

She was able to keep the house.

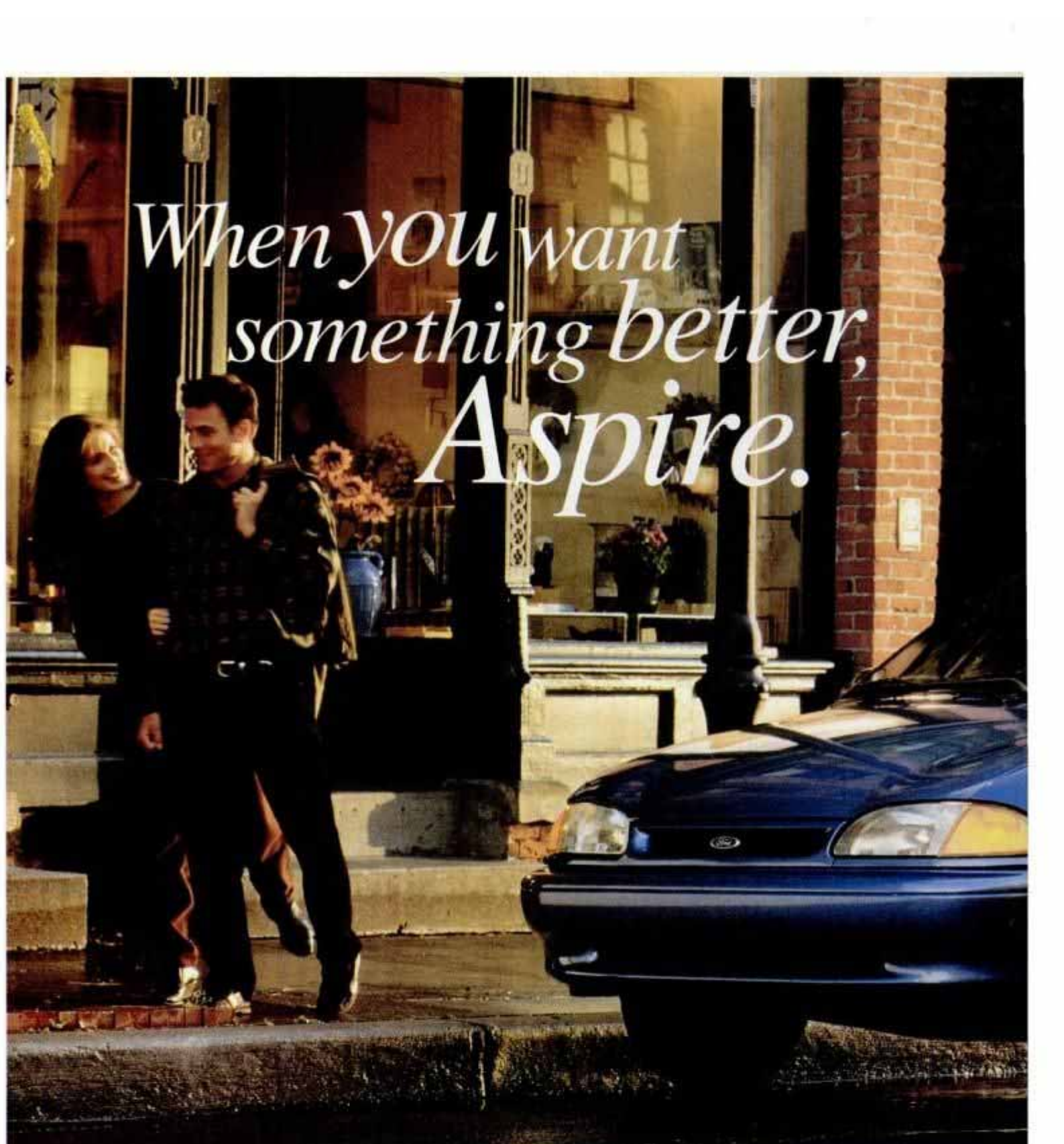
Susan's a junior at Penn.



We help people prepare for an uncertain future. Because when a life ends, other lives must go on.

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ThePrudential 



*When you want  
something better,  
Aspire.*

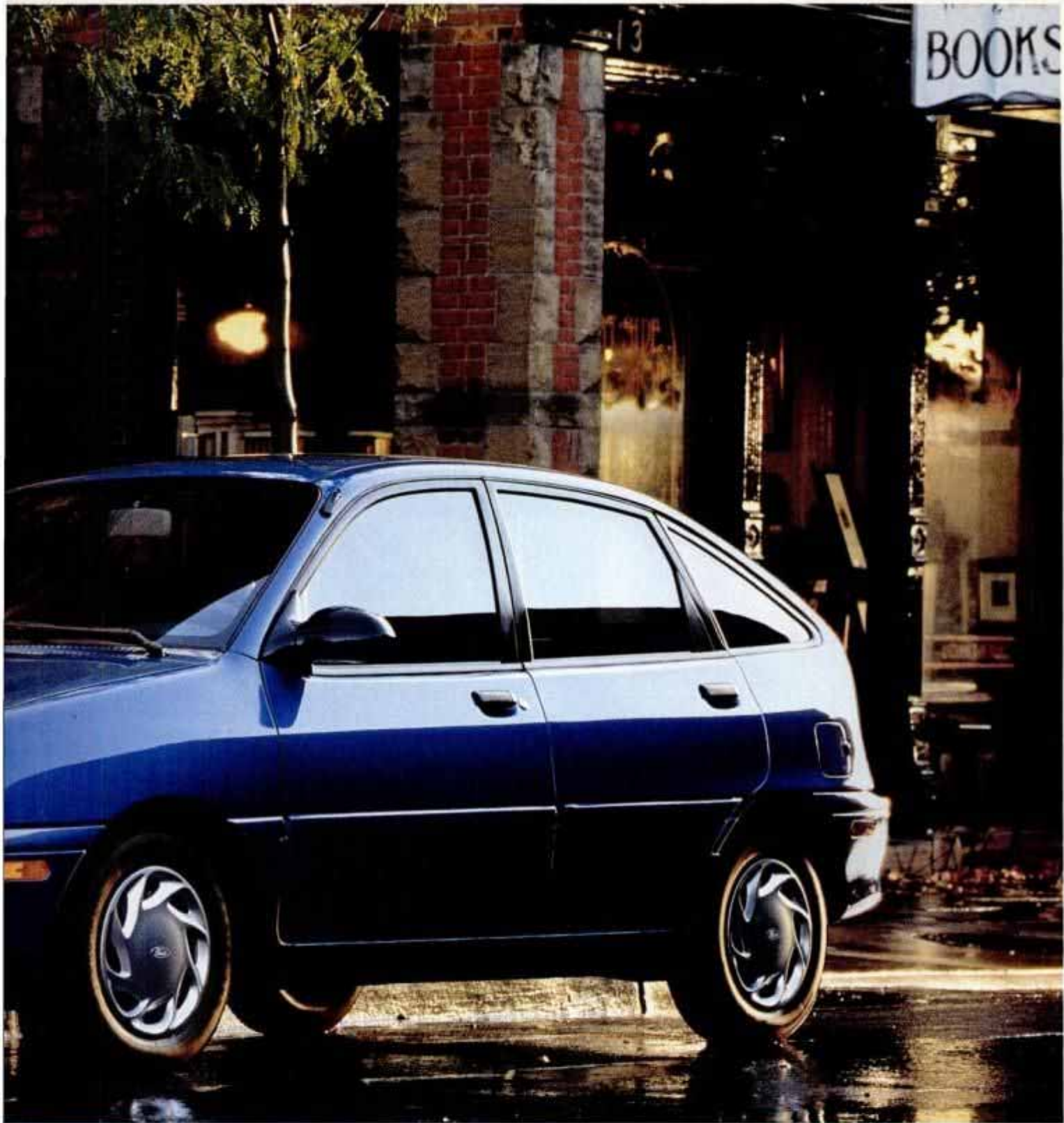
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When we designed the new Ford Aspire, we set out to prove that paying less for a car doesn't mean you have to settle for less. So we gave it more of the things you aspire to in a car. We made Aspire the only car in its class with

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\*\*Ask your dealer for a copy of the limited warranty.

†EPA estimated highway mpg.

††3 years/36,000 miles. See dealer for details.

Always wear your safety belt.



## Stars Come Out At The South Pole

WILLIAMS BAY, WI—The night lasts six months. The air lies calm and bone-dry. The plateau rises to 10,000-ft. altitudes.

Sounds like an astronomer's paradise? It is—if you can stand half a year in an Antarctic winter. After all, the South Pole makes Alaska seem like Hawaii. Nevertheless, the Center for Astronomical Research in Antarctica is assembling several telescopes at the Pole, with the ultimate goal of setting up a world-class observatory.

Now getting a shakedown at Boston University, the Antarctic Submillimeter Telescope and Remote Observatory (AST/RO) is a 5.25-ft. telescope designed to survey the interstellar medium. AST/RO will operate next to the South Pole Infrared Explorer (SPIREX), already installed. The third facility is COBRA, short for Cosmic Background Radiation Anisotropy. This sensor has already delivered high-resolution measurements of microwaves left over from the Big Bang.

Wooden COBRA structure (above) stands next to South Pole observatory (left) that houses SPIREX (inset).

CSA PHOTOS

## Space Plumber's Magic Pump

WALTHAM, MA—In space, where gravity and atmospheric pressure are distant memories, plumbers often need high-tech helpers. One particular plumbing nightmare involves pumping a mixture of gas and liquid through a pipe.

Foster-Miller Inc. has developed a solution in a 2-phase pump. The device separates gas and liquid. Inside, a centrifuge slings the liquid to the outer edge of a rotor bowl, where a pitot pump siphons it out. Meanwhile, a blower routes the gas out through a separate line.

Earthbound applications might include steam-heating machinery and chemical processing.



FOSTER-MILLER INC. PHOTO

Pump handles gas-liquid mixtures in weightlessness by segregating and driving each phase separately.

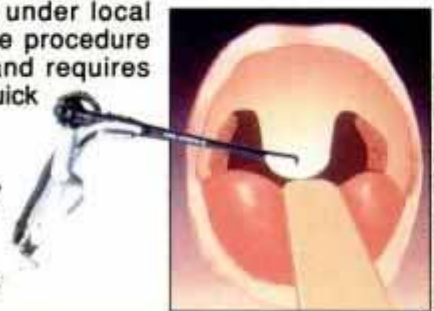
## Lasers Zap The Zs

IRVINE, CA—Uvulopalatoplasty may not be the sweetest-sounding word in the English language, but to those who suffer from snoring it could be music to the ears. This new laser procedure reportedly silences snoring in 85% of patients and curtails it in the rest.

Performed at the Beckman Laser Institute, the surgery targets the soft palate and the uvula, the fleshy tissue that hangs at the back of the throat. A carbon-dioxide laser scars, shrinks and hardens the tissue, making it less likely to obstruct air and vibrate.

Carried out under local anesthesia, the procedure costs \$2500 and requires three to five quick office visits.

Laser-assisted uvulopalatoplasty targets the loose soft palate and uvula.



BECKMAN LASER INSTITUTE, ILLINOIS

## A Clean Sheet Of Paper

ATHENS, GA—A dirty business, papermaking can discharge reams of toxic chlorinated chemicals. But tough new pollution regulations from the Clinton administration will soon have pulp and paper mills scrambling to comply.

University of Georgia biotechnologists believe they can help the mills wipe chlorine bleach out of their operations. For one thing, they've devised a system that yokes bacteria with ultrafiltration to flush chlorinated chemicals out of waste streams. Even more promising is an enzyme-based bleaching treatment that relies on oxygen-based compounds.

This fall, a pilot plant on the Georgia campus will test both processes.



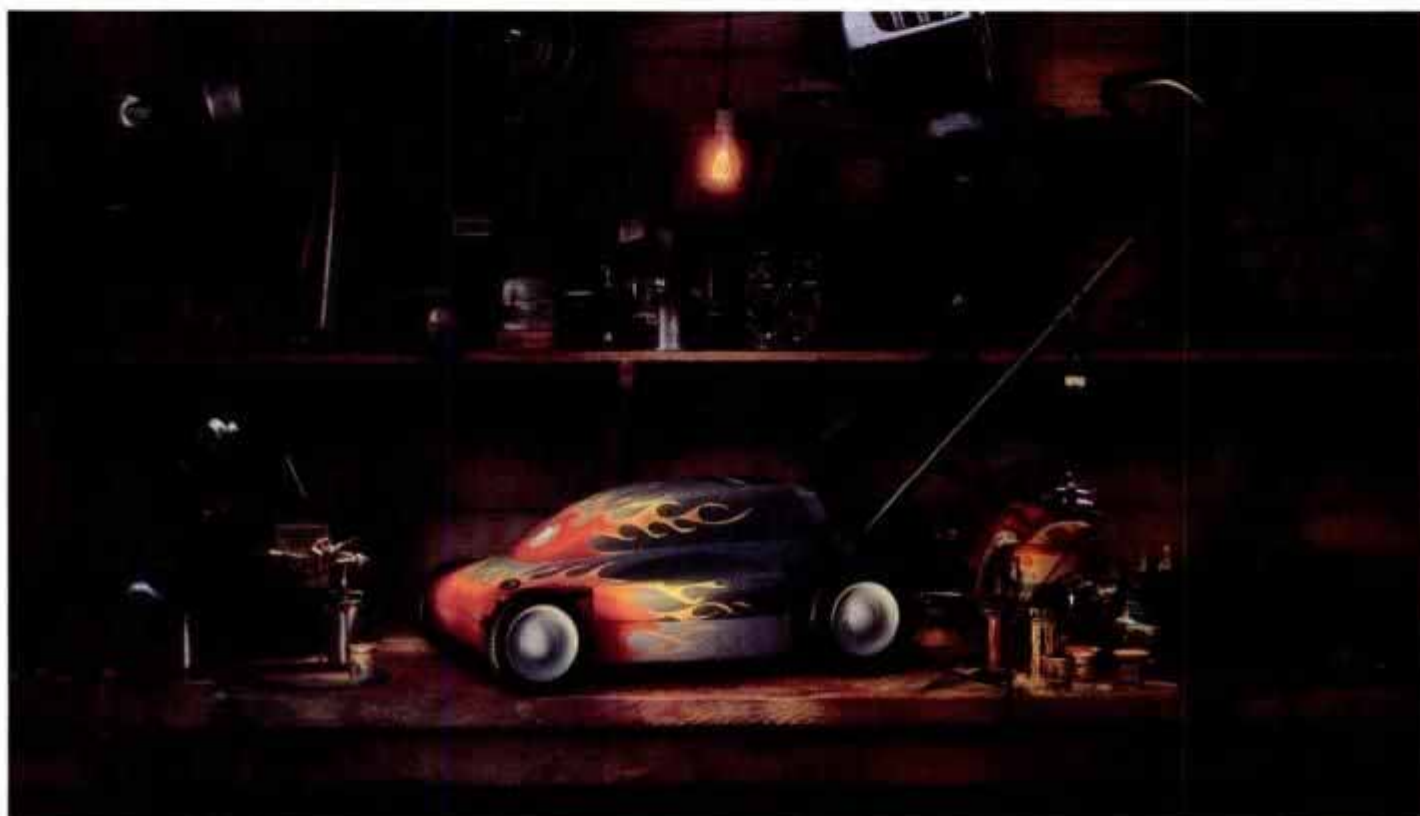
UNIVERSITY OF GEORGIA PHOTO

Biotechnology may help the paper industry relinquish its dependence on chlorine for pulp bleaching.



## Dare we say, fun?

**D**on't let the new cordless, rechargeable Mulchinator™ mower from Ryobi fool you. It is quiet, yes. Virtually silent, in fact. And it does start effortlessly, with the push of a button. Yet beneath the seemingly mild-mannered and gracefully aerodynamic exterior, there lies a beast. With 24 volts of power and the



performance-equivalent of your meanest 4-horsepower gas guzzler for cutting, mulching, even pulverizing and shooting grass clippings back into the soil to fertilize an entire half-acre of lawn on a single charge. All available on a 60-day no-risk guarantee. All with such ease and precision, you may begin to find this normally laborious chore, well, less of one. And because the Ryobi Mulchinator needs no pit stops for gas, oil, pullstarts or clippings and folds for easy recharging and storage in tight garage-like spaces, you will not only find yourself at the finish line in record time...you might even find it fun.



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PRESENT

# THE NATIONAL AUTO QUIZ

1. The driver of this NASCAR Number 43 Plymouth is:



A) Lee Petty. B) Richard Petty. C) Cale Yarborough.  
D) David Pearson.

2. The "free-wheeling" feature offered by a number of carmakers in the 1930s, was:

A) An engine "coast" feature that essentially put the car in neutral when you lifted off the accelerator. B) The early equivalent of an overdrive transmission. C) An idler type starter gear for more positive engine cranking. D) None of the above.

3. Which of the following model names were used by Chevrolet?

A) Master Eagle. B) Standard Mercury. C) Confederate. D) All of the above.

4. Antifreeze in the engine oil can cause:

A) The oil to become thinner. B) The oil to become thicker. C) The oil to congeal. D) Both B and C.

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Send us your auto-related questions. If we use one of them in a future quiz, we'll send you a free car care video. In case of duplicate questions, the one with the earliest postmark will win.

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5. Up until the early 1960s, the 6-cylinder production engine with the highest horsepower per cubic inch was found in the:

A) Chevrolet Corvair. B) Hudson Hornet. C) Plymouth Valiant. D) Buick Special.

6. What nameplate, still in use today, has had the longest running continuous history?

A) Century. B) Continental. C) New Yorker. D) 98.

7. America's first postwar sports car was the:

A) Ford Thunderbird. B) Crosley Hot Shot. C) Chevrolet Corvette. C) Kaiser Darrin.

8. Which is true about hemispherical combustion chambers?

A) They create a turbulent air/fuel charge. B) They always use four valves per cylinder. C) They are non-turbulent. D) They use inline (parallel) valves.

9. The best-selling vehicle in the U.S. in 1993 was the:

A) Ford F-Series pickup. B) Ford Taurus. C) Honda Accord. D) Chevy Cavalier.

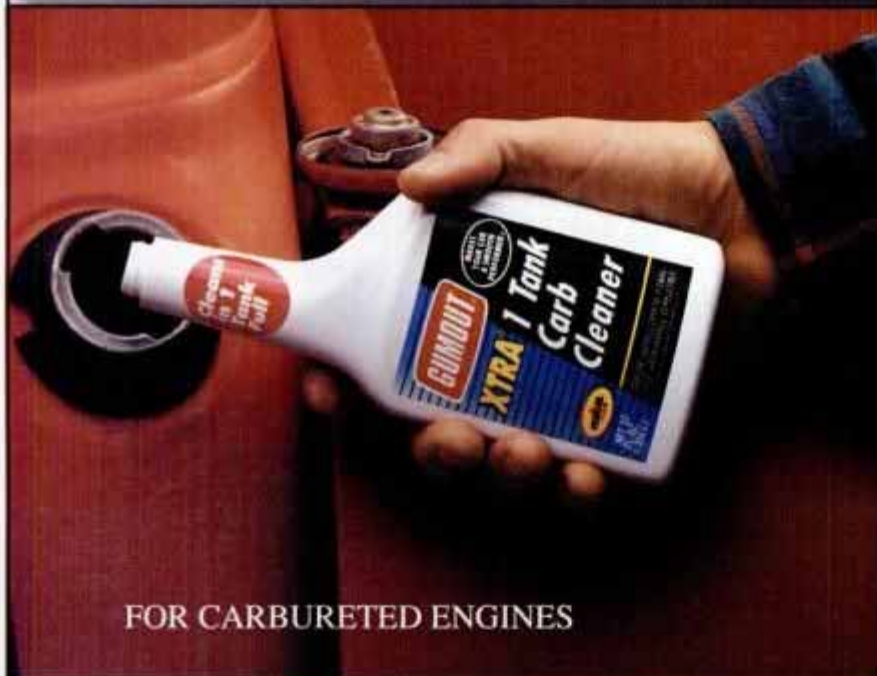
10. Which of the following new cars boasts at least 300 horsepower?

A) Mazda RX-7. B) Camaro LT-1. C) Nissan 300ZX Twin Turbo. D) All of the above.

ANSWERS  
1. B 2. A 3. D 4. D 5. A (150 horsepower, turbocharged) 6. C 7. B 8. C 9. A 10. C.



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FOR CARBURETED ENGINES



FOR FUEL INJECTED ENGINES

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- These days, people are using detergent gasolines to keep fuel systems clean and running. But alone, these gasolines are just not strong enough to truly clean out your fuel system and help eliminate engine performance problems like poor acceleration, hard starts, hesitations and stalls. For that, you need Gumout® Fuel System Cleaners.
- These extraordinary cleaners add a boost of real power to detergent gasolines to clean fuel systems better and faster than gasolines alone. Gumout makes a fuel system cleaner just right for your car or truck -- whether it's fuel injected or carbureted. Pick up the one that's right for yours today. Then pour it into your gas tank during your next fill-up. And in just one tankful, you'll feel a real difference.



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## Back To The Kitchen Of The Future

PASADENA, CA—Is the future making a comeback? Our October 1993 article, "Cooking Up The Future," appears to have whetted kitchen designers' appetites. Whirlpool, for example, recently commissioned projects from product-design students at the Art Center College of Design.

The assignment started with the premise that the 21st-century kitchen will consist of free-standing appliances—furniture rather than fixtures.

The results? A stand-

Dining table's leaves fan out radially, while doorless refrigerator employs wall of air.



ART CENTER COLLEGE OF DESIGN PHOTOS



Stand-alone appliances include methane-fueled jet burner and self-cleaning sink/countertop combo.

alone jet-column burner, designed by Ed Hawkins, provides high-octane firepower for indoor barbecues. A countertop, from Rob Bruce and John Wee, sends a cleansing stream of water bubbling across its surface and into a built-in sink. An expandable dining table, designed by Jeff Salazar and Joe Tan, keeps plates warm via magnetic induction. And Darrek Rosen's doorless refrigerator preserves food with cool air currents and insulating air curtains.

## New Life For The Lead-Acid Battery

AUSTIN, TX—Ecologies for lead-acid technology may be premature. A new unit developed by Electrosource Inc. boasts everything that an electric car needs in a power source—acceleration, fast recharge and long life—without the dead weight of a conventional lead-acid battery.



Inside the Horizon battery—now undergoing evaluation in a number of electric vehicles—lie mesh grids of wire, made of lead extruded over fiberglass. These grids are embedded in paste and stacked horizontally before being soaked in acid electrolyte. Tests indicate the battery matches the performance of emerging but costly technologies such as sodium-sulfur or nickel-hydride.



Horizon battery features grids woven from lead-glass filaments and layered like pancakes.

## Turning Dirt Into Rock

ATLANTA, GA—Weak foundation soil can turn the strongest building into a house of cards. But Georgia Tech researchers have a trick that can shore up the shakiest soil.

Wielding a plasma arc torch (see Tech Update, page 18, Jan. '92), the engineers believe they can melt and vitrify almost any type of earth—even earth beneath existing structures. The electric torch fires a plasma hotter than the Sun's surface.

In recent tests, the torch blazed through a borehole into a cylinder

of dirt. Nearby soil melted and then hardened into a glassy solid, while farther away the earth took on a bricklike consistency.



Plasma arc torch turns soil into glassy material five times stronger than concrete.



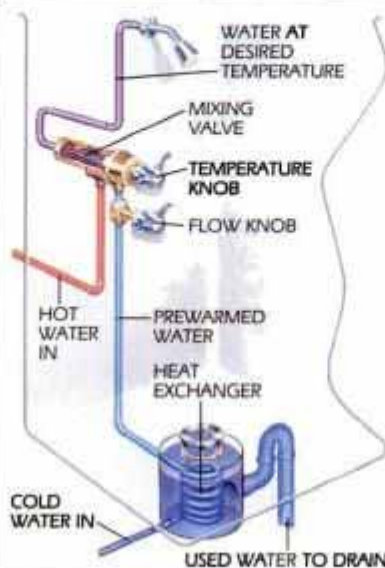
GEORGIA TECH PHOTOS

## Money Down The Drain

AIKEN, SC—Every time you take a shower, you drain away water that you've paid to heat. Why not salvage some of that wasted energy? An inventor at the Savannah River Technology Center has devised a system to do just that.

The hardware consists of a heat exchanger lodged in the drain of a shower and an automatic mixing valve. In the heat exchanger, waste water entering the drain passes its warmth through a coil filled with cold water spiraling upward. This water, prewarmed but untouched by the waste water, flows to the mixing valve. Inside the valve, thermal expansion of a metal such as zinc regulates the flow of hot water.

As the shower progresses, the same heat recycles over and over. Best of all, the water won't suddenly scald you if someone flushes a toilet.



Heat-exchanger system should cost about \$750 to install, paying for itself in four years.

PM ILLUSTRATION BY GEORGE RETSECK

## 25 Years Beyond Sound Barrier

LONDON, ENGLAND—A quarter-century ago last March, the prototype for the Concorde SST took to the air on its maiden flight. Today, the needle-nose sprinter remains the only Mach-busting airliner in the skies, and British Airways and Air France expect another 10 years of service out of their fleets.

Age and a supersonic workload, however, are catching up with the SSTs. Accordingly, the Concorde just went through their most extensive upgrades since service kicked off in 1976. Each of British Airways' seven and Air France's five SSTs underwent a complete rebuild. Pulling out every nut and bolt in the fleet, engineers removed paint, panels, flaps and Olympus turbofan engines.



British Airways aircraft Alpha Fox—No. 6 in the fleet—undergoes gut-renovation at Heathrow Airport after flying the equivalent of 625 times around the world.

Meanwhile, the cabins are now more luxurious than ever, featuring new seats, lighting and galleys, big-

ger luggage bins and a CD-based in-flight audio system. The refurbishment cost \$10 million per airplane.



## New Shields For Hercules

RHEIN-MAIN AB, GERMANY—When the United Nations' C-130s brought food into besieged Sarajevo, snipers occasionally peppered the big planes with small-arms fire (see "Sarajevo Diary," page 26, Jan. '93). The attacks pointed up the vulnerability of the Hercules, which wasn't meant to operate from hostile runways. Acknowledging the threat, the Air

Force is buying 17 drop-in armor packages for C-130s and 13 kits for C-141 Starlifters. Simula Inc., which makes ballistic protection kits for Humvees, is among the manufacturers.

The Simula armor kit consists of 37 strategically placed composite panels

that cover 93 sq. ft. of flight-deck floor. The crew can install the armor, which weighs 750 pounds, in an hour. Another set protects the back, bottom and sides of the crew's seats when the aircraft is on the ground. A set of transparent panels shields the pilot and co-pilot.

Flight-deck armor panels stop 7.62mm armor-piercing shells as well as 12.7mm rounds from 1000-yard range.



## X Marks The Next Citation

WICHITA, KS—Another high-ticket airplane marking a 25-year milestone is Cessna's Citation business jet. Its

newest incarnation is the 10th in the series: the Citation X, billed as the fastest business jet in the skies. The aircraft first flew last December 21.

Peaking out at Mach .90, the X plane will cruise

between Mach .82 and Mach .88. Translated, that's Los Angeles to New York in 4 hours, New York to London in 6½.

What makes these numbers possible is a second-generation supercritical wing. Based on a NASA design, this airfoil pushes the top speed closer to the speed of sound without setting off a drag-inducing shock. To get that fast, two new Allison GMA 3007C turbofans deliver 6000 pounds of thrust apiece.

The X is also the biggest Cessna ever built. The company hopes for certification next year.

Now in flight tests, Cessna's Citation X is the fastest business jet, covering 3800 miles at Mach .82.



# AT AROUND NO COMPACT THIS MUCH POW



	Base V-6 Engine/ Horsepower	Towing	SWB Cargo Bed Volume	Safety	Warranty
DODGE DAKOTA 4x2	Available 5.9L V-6 MPI 175 @ 4800 rpm	4300 lbs	47.1 cu ft	Std. driver's airbag 4-wheel ABS available at extra cost <sup>4</sup>	3/36 Bumper-to-Bumper or 7/70 Powertrain
Dakota Superiorities	More power	More towing <sup>1</sup>	More room in back	More safety features	Dodge provides the only choice of warranties, our Owner's Choice Protection Plan, offering the longest powertrain protection. <sup>5</sup>
TOYOTA COMPACT 4x2	Standard 2.4L I-4 EFI <sup>2</sup> 116 @ 4800 rpm	3500 lbs	41.2 cu ft	No driver's airbag No 4-wheel ABS	3/36 Bumper-to-Bumper & 5/60 Powertrain
FORD RANGER 4x2	Available 5.0L V-6 MPI 140 @ 4800 rpm	1800 lbs	37.4 cu ft	No driver's airbag No 4-wheel ABS	3/36 Bumper-to-Bumper
CHEVY S-10 4x2	Available 4.3L V-6 EFI 165 @ 4000 rpm	4000 lbs	39.4 cu ft	No driver's airbag Avail. 4-wheel ABS	3/36 Bumper-to-Bumper

For still more information, call 1-800-4-A-DODGE. <sup>1</sup>Dakota Sport MSRP comparison vs. compacts with minimum of 175 hp (when available). Tax & destination fee extra. <sup>2</sup>V-6 engine not available on Toyota Regular Cab 4x2. <sup>3</sup>Standard towing with manual transmission & engine shown. <sup>4</sup>\$500 extra. <sup>5</sup>See Dodge's limited warranties, restrictions & details at dealer. Normal maintenance, adjustments & wear items excluded. Warranty provisions vary by manufacturer. **TREAD LIGHTLY!** Always wear your seat belt.

# AND \$11,300, CAN DELIVER POWER AND SAFETY.



For starters, there's a 3.9L V-6 under the hood with more power for the price than any compact pickup.\* Plus something no compact even offers. The safety of a standard driver's airbag. So play it safe, get a mid-size Dodge Dakota Sport and save your cash. It's a little bigger, a lot better.

DAKOTA SPORT



THE NEW DODGE

A DIVISION OF THE CHRYSLER CORPORATION

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## Three 7s Over A Pair Of Jets

SEATTLE, WA—No twin-jet airliner has ever loomed so large. To appreciate its size, consider that its engines alone are as broad as the fuselage of a 757.

Rolled out last April 9, and scheduled to fly this month, the

Designed to carry 305 passengers in this 3-class layout, Boeing 777 could haul 375 in 2-class setup or up to 440 in all-economy configuration.

strength lies in its electronics. The aircraft will fly by wire, its control surfaces steered by electrical signals. Meanwhile, the cockpit bristles with technology unprecedented in civil aviation—color liquid-crystal displays, a fiberoptic gyro and an electronic library system to replace manuals and navigation charts. Appropriately

Boeing 777 has emerged from a 4-year incubation to join battle with its rival, the Airbus A330/A340.

At 209 ft. long, the 777 gives up only 22 ft. to the 747. And only the 747 has a wider body. Ultimately, the 777

could haul as many people as far as an early-model 747.

While the 777's engines are the most powerful ever made, the jet's true

enough, Boeing designed the 777 entirely by computer, instead of building the usual mockup.

## Interceptions On The Fly

ARLINGTON, VA—Every time tank commanders turn around, a new missile on the international market threatens to outsmart the toughest armor. To counter this trend, the Pentagon aims to arm tanks with a Small Low-Cost Interceptor Device, or SLID.

Four contractors are airing proposals. Typical is Raytheon's agile projectile guided by fire-



RAYTHEON ILLUSTRATION

control radar. Rockwell has proposed a laser-guided interceptor, and Hughes and AlliedSignal are offering similar concepts.

Meanwhile, under an Army Tank-Automotive Command effort code-named Guardian, computer simulations have analyzed the effectiveness of other missile defenses—including flying nets, pellet guns and miniature rockets with fuel-air explosive warheads.

Raytheon's SLID Interceptor relies on fire-control radar to steer toward incoming anti-armor missile.

## Tank Gets X-Ray Vision

VALENCIA, CA—Transparent tank armor may be decades away, but the next best thing is available now. The See-Thru-Armor helmet, developed by Vista Controls Corp., gives soldiers in an armored vehicle a 360° view of their surroundings.

Four cameras mounted externally supply the digital pictures. Inside, the video feeds through a coaxial umbilical into a helmet-mounted faceplate, featuring miniature color liquid-crystal displays. As the wearer turns his head, a gyro tracks his field of view and causes the displayed imagery to pan right and left accordingly.

See-Thru-Armor helmet takes video feed from four digital cameras mounted on tank.

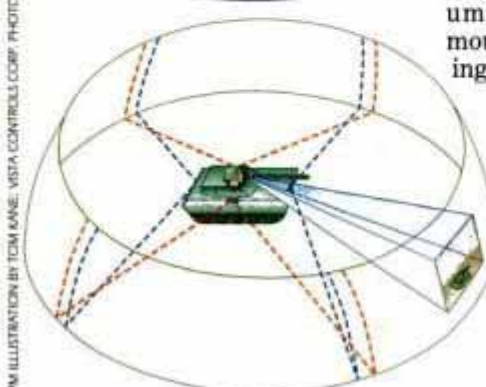
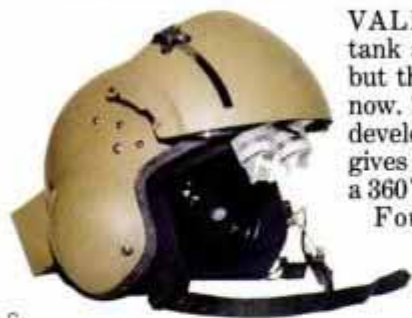


PHOTO ILLUSTRATION BY TOM KANE; VISTA CONTROLS CORP. PHOTO

## Span In A Can

STERLING HEIGHTS, MI—For tanks, getting from point A to point B often means rumbling over obstacles. But when an 84-ft. gap yawns before point B, it's time to roll out the Heavy Assault Bridge.

The mechanical crossing is the first combat bridge strong enough to withstand the weight of an M1. Engineered by General Dynamics and German manufacturer MAN GHH, the bridge rolls with the corps on a converted M1 chassis. The Army eventually wants 106 of these instant-span vehicles.

In action, the two stacked halves of the bridge slide away from each other until they engage end to end. A hydraulic arm then extends and lowers the full length of the span. The maneuver takes less than 5 minutes.



Hydraulic arms extend the twin leaves of the Heavy Assault Bridge from the roof of an M1 chassis.

GENERAL DYNAMICS PHOTO



## NASA's Northern Exposure



PM ILLUSTRATION BY ED VALIGURSKY

Only 46 in. across, FAST will explore the dynamics of the aurora borealis.

POKER FLAT, AK—Astronauts passing over Alaska at the right time describe the experience as “flying through a wall of light.” But the aurora borealis remains as mysterious as it is beautiful. In particular, scientists still don’t understand why the northern lights stick around for so long.

To find out, the Fast Auroral Snapshot Explorer (FAST) will soon zip through the polar upper atmosphere. Scheduled for launch this September atop a Pegasus XL, the little satellite will click off measurements at an unprecedented speed—8 million times per second. Its magnetometers and other sensors will detect plasma waves and particles. And if FAST downloads something especially striking, researchers will quickly send up a sounding rocket to complement its readings.

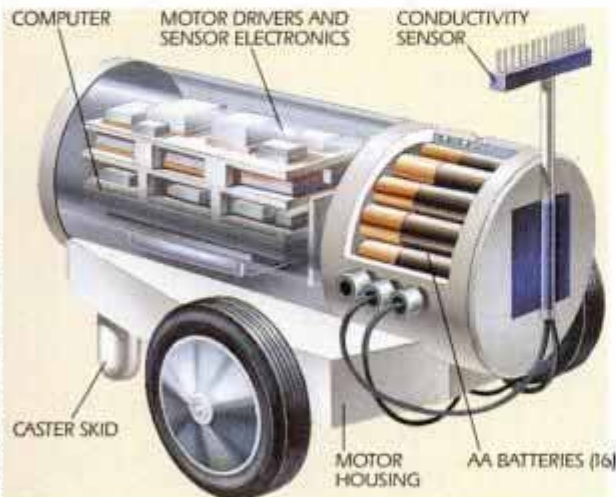
As FAST soaks up the details, another satellite called Polar will deliver the big picture, orbiting high overhead and surveying the stream of solar particles that triggers the aurora.

## Meet Robolobster

CAMBRIDGE, MA—Not only do they taste great and have big claws, but lobsters make fine submarine bloodhounds as well. The feisty crustaceans track down their own food with sensitive antennae, following chemical trails through the water. At the Massachusetts Institute of Technology, roboticists are endeavoring to duplicate a lobster’s skills in a machine.

Dubbed Robolobster, the 9-in. vehicle is a testbed for computer programs that read data from chemical sensors and guide behavior accordingly. In Robolobster’s case, the sensors will pick up rises in salt concentration and steer its wheels toward the source.

In real-world applications, robolobsters could home in on pollution sources or lead lobstermen to the rich offshore feeding grounds where the genuine shellfish might abound.



PM ILLUSTRATION BY ADOLPHE BROTHMAN

Robolobster sniffs the water with conductivity sensor, then follows its nose to source of chemical trail.

## X-Rays For The Extra-Small

ARGONNE, IL—Medical researchers will soon have access to the most intense X-ray beams ever, but they won’t be training them on patients. Instead, viruses, biological proteins, cell organelles and other molecular packages will undergo crystallographic analysis at Argonne National Laboratory’s new Structural Biology Center.

X-rays bright enough to illuminate these tiny structures will emerge from the Advanced Photon Source, a synchrotron accelerator scheduled to open in 1997.



ARGONNE PHOTO

Magnets will wiggle beam of positrons, generating brightest X-rays ever.

## .45 Is Back In Force

STERLING, VA—The 9mm is the standard military handgun? Don’t tell that to the special forces. They may soon be carrying brand-new .45s, under a program called the Offensive Handgun Weapon System.

As its name implies, the Heckler & Koch is intended for offense rather than defense. Although it can fire the traditional M1911 .45 ball cartridge, the pistol is no throwback. The semiautomatic weapon comes with an optional noise/flash suppressor and a laser aiming module that operates in either visible or infrared wavelengths.



HECKLER & KOCH PHOTOS



Special forces’ high-tech .45 can fire M1911 cartridge or high-speed “+P” jacketed hollow-point round.

# “...the hands-down class leader.”

March '94,  
Car Audio and Electronics Magazine®

## Number-one rated performance from the technology leader: BEL-TRONICS



In a recent test of four radar/laser detectors, Car Audio and Electronics declared BEL 635i “...the hands-down class leader.” and “...by far the smallest combination unit on the market...”. Now the new BEL 635i Plus incorporates this same number-one rated performance, with the addition of rear laser detection.

“...awesome performance...”

BEL's reputation as the technology leader didn't go by unnoticed—especially in the detection of important off-axis laser signals. “...the 635i simply blew away the competition with its ability to see off-axis laser beams, by far the most crucial test of any laser detector. It had noticeably better range than the second-place Passport and over 20 times the range of the last-place Cobra.”

### Dual Tracking Laser™

New Dual Tracking Laser™ enhances BEL's number-one rated performance by providing the addition of rear detection of all laser signals. Dual Tracking Laser™ is based on the same laser technology used by the military in Operation Desert Storm. This powerful technology offers the best in off-axis detection—the most common form of police monitoring.

### Number-one Rated Selectivity

BEL ranked number-one in its ability to ignore false alerts. The unit sounded but one single false alarm in a 12-mile city test, “...a remarkable performance for such a sensitive unit.” BEL also ranked number-one in features and mounting hardware.

“...test winner”

“There was no problem singling out the BEL as our test winner...its scores clearly show it to be the hands-down class leader.” To order BEL 635i Plus for just \$289.95 or for the name of a dealer near you, call toll-free today:

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## The New BEL 635i Plus Radar/Laser Detector

Dual Tracking Laser™

Complete Super Wideband Ka Radar Detection With FMT®

Smallest Combination Radar/Laser Detector



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# MERCEDES-BENZ 300E

The Teutonic cruiser is still running strong.

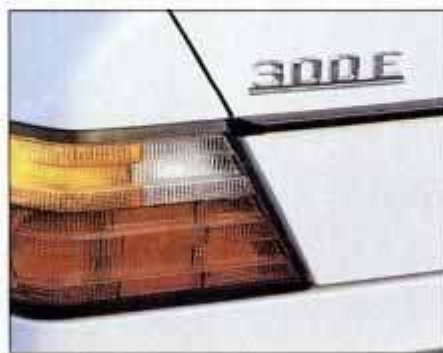
BY MICHAEL L'AMM, Contributing Editor; PM Photos by David Dewhurst



● When Mercedes-Benz first introduced its midsize models back in 1986, the 300-Class sedans represented the bulk of the midsize import luxury market. Since those days, the 300-Class has become the target for Acura, Lexus and Infiniti.

The 300E sedan has been the backbone of this model series, which has grown to include a station wagon, coupe, cabriolet and several versions of the basic sedan. For many years, the heart of the line was powered by an sohc inline 3.0-liter 6-cylinder fuel-injected gasoline engine, hence the designation 300E. The 300E also used to be available with an all-wheel-drive system, called 4Matic. However, for 1994, the 3.0-liter sohc Six and 4Matic versions are gone.

Also gone are the old designations—including the 300E badge. Mercedes-Benz now calls the midsize



models the E-Class. Along with the new names, these cars have also received a minor facelift this year. Otherwise, the descendants of the

300E are essentially unchanged. The 4-door models still ride on the same 110.2-in. wheelbase and are the same 187.2-in. overall length.

The subject of our report is the 1993 300E. This model was available with one of three different engines. Two-wheel-drive sedans were offered with one of two versions of a dohc inline Six. The 300E 2.8 has a 2.8-liter Six, while the 300E has a 3.2-liter. These engines deliver 194 and 217 horsepower respectively. In addition, the 4Matic was available in '93, powered by the original 3.0-liter sohc 177-hp inline Six. All came only with a 4-speed automatic.

In 1986, the 300E carried a base price of \$37,130. Currently, the base price of the E-Class diesel sedan

# MERCEDES-BENZ 300E



Gauges are visible through steering wheel.

Interior is functionally elegant—not plush.

Inline Six is tractable, smooth and strong.

(E300 Diesel) is \$40,000. The E320—the direct descendant of the 300E—has an MSRP of \$42,500. These prices are substantially lower than they were for 1993. The base price for the least-expensive 300-Class cars in '93—the 300E 2.8 and the 300D 2.5 diesel—was \$43,800. The standard '93 300E carried an MSRP of \$49,900.

The 4Matic carried a \$7800 premium; its MSRP was \$57,700. Clearly, discounts were available last year, since our respondents paid anywhere from \$39,500 to \$55,000 for their 300E sedans. Up at the top end of this class—and not part of our survey—is the limited-production \$80,000 E500.

**Brand familiar**  
Previous Mercedes-Benz ownership ranked as the main reason people bought a new 300E. That applied to nearly 38% of the buyers we surveyed. The second reason had to do with Mercedes-Benz's enviable reputation for safety. All 1993 300E's came with dual airbags, 4-wheel antilock

## SUMMARY OF MERCEDES-BENZ 300E OWNERS REPORTS\*

<b>Total miles driven</b>	949,289	<b>Excellent</b>	80.2%	<b>Performance</b>	22.7	<b>Repair it yourself?</b>	
<b>Average miles driven</b>	7977	<b>Good</b>	17.8	<b>Specific dislikes:</b>		<b>No</b>	100.0%
<b>Purchase price:</b>		<b>Average</b>	2.0	<b>No complaints</b>	15.9%	<b>Yes</b>	0.0
<b>Average</b>	\$46,755	<b>Poor</b>	0.0	<b>Price too high</b>	14.5	<b>Dealer repairs satisfactory?</b>	
<b>Range</b>	\$39,500-\$55,000	<b>Braking:</b>		<b>Seating comfort and legroom</b>	7.2	<b>Yes</b>	83.3%
<b>Why did you choose the Mercedes-Benz 300E?</b>		<b>Excellent</b>	81.2%	<b>Glovebox too small</b>	7.2	<b>No</b>	16.7
<b>Owned Mercedes before</b>	37.9%	<b>Good</b>	16.8	<b>Handles poorly in snow</b>	5.8	<b>Dealer service opinion:</b>	
<b>Safety features</b>	16.5	<b>Average</b>	1.0	<b>Not enough storage</b>	5.8	<b>Excellent</b>	58.7%
<b>Mercedes-Benz quality</b>	15.5	<b>Poor</b>	1.0	<b>Suggested changes:</b>		<b>Good</b>	36.5
<b>Styling</b>	13.6	<b>Overall performance:</b>		<b>Increased rear seating and legroom</b>	10.0%	<b>Average</b>	4.8
<b>Good price/value ratio</b>	8.7	<b>Excellent</b>	79.0%	<b>Better air conditioner</b>	9.2	<b>Poor</b>	0.0
<b>Reliability</b>	8.7	<b>Good</b>	20.0	<b>No changes</b>	7.7	<b>Dealer sales policy opinion:</b>	
<b>Avg. mpg, city/hwy:</b>		<b>Average</b>	1.0	<b>More powerful engine</b>	7.7	<b>Excellent</b>	59.1%
<b>2.8-liter Six</b>	16.6/20.6	<b>Poor</b>	0.0	<b>Workmanship opinion:</b>		<b>Good</b>	36.5
<b>3.2-liter Six</b>	19.8/25.0	<b>Control layout:</b>		<b>Excellent</b>	84.3%	<b>Average</b>	4.3
<b>4Matic 4wd</b>	17.5/22.0	<b>Excellent</b>	69.3%	<b>Good</b>	14.8	<b>Poor</b>	0.0
<b>Transmission choices:</b>		<b>Good</b>	27.7	<b>Average</b>	0.9	<b>Number of vehicles owned:</b>	
<b>4-speed automatic</b>	94.7%	<b>Poor</b>	0.0	<b>Comfort opinion, front seats:</b>		<b>This vehicle only</b>	14.0%
<b>4Matic 4wd with automatic</b>	5.3	<b>Instrumentation:</b>		<b>Excellent</b>	73.7%	<b>Two vehicles</b>	45.6
<b>Engine choices:</b>		<b>Excellent</b>	70.0%	<b>Good</b>	21.9	<b>Three vehicles</b>	26.3
<b>3.2-liter Six</b>	86.9%	<b>Good</b>	24.0	<b>Average</b>	4.4	<b>Four or more</b>	14.1
<b>2.8-liter Six</b>	7.8	<b>Average</b>	6.0	<b>Poor</b>	0.0	<b>Principal driver:</b>	
<b>3.0-liter Six</b>	5.3	<b>Poor</b>	0.0	<b>Comfort opinion, rear seats:</b>		<b>Male</b>	56.3%
<b>Options/Accessories:</b>		<b>Driver sightlines:</b>		<b>Excellent</b>	54.1%	<b>Female</b>	42.0
<b>Automatic slip control</b>	37.7%	<b>Excellent</b>	73.0%	<b>Good</b>	41.3	<b>Equal</b>	1.8
<b>Cellular telephone</b>	34.2	<b>Good</b>	22.0	<b>Average</b>	4.6	<b>Age distribution of owners:</b>	
<b>Rear-axle level control</b>	15.3	<b>Poor</b>	0.0	<b>Specific likes:</b>		<b>Under 29</b>	0.9%
<b>Sportline package</b>	11.5	<b>Handling</b>	43.2%	<b>Comfort</b>	38.6	<b>30-49</b>	41.0
<b>Heated front seats</b>	8.7	<b>Comfort</b>	38.6	<b>Safety features</b>	33.0	<b>50-plus</b>	57.9
<b>Engine power:</b>		<b>Ride quality</b>	29.5	<b>Styling</b>	28.4	<b>Based on your experiences, would you buy a Mercedes-Benz 300E if you had it to do over again?</b>	
<b>Excellent</b>	69.3%	<b>Workmanship</b>	25.0	<b>Workmanship</b>	25.0	<b>Yes</b>	59.6%
<b>Good</b>	25.7					<b>Maybe</b>	29.8
<b>Average</b>	4.0					<b>No</b>	10.5
<b>Poor</b>	1.0						

\* Percentages might not equal 100% due to rounding up or insufficient data.

disc brakes and emergency tensioning seatbelt retractors.

The list of standard equipment included electrically raised and lowered front headrests (rear rests could be lowered with a switch on the dash), telescoping steering column (optional in the 2.8), air conditioning, power steering, power windows, power door locks, electric sunroof, cruise control, AM/FM cassette stereo and an anti-theft alarm.

### Fine in the dry

Dry-surface handling was judged excellent by 80.2% of our 300E owners, a ranking far above most cars, even in this price class. In fact, 43.2% judged handling the 300E's best-liked feature. Ride and braking received similar marks, as did workmanship. All three were rated excellent by 80% of our respondents.

About 80% also had experienced no mechanical troubles at all. Problems that did crop up were so minor and scattered that we couldn't tally them; they weren't statistically significant. Fixes for those who needed repairs were carried out smoothly in 83.3% of all cases, but even so, 300E owners weren't terribly pleased with their dealers. Treatment by Mercedes' sales and service personnel was judged excellent by fewer than 60% of our surveyees, a figure 10 points below those registered by Lexus, Acura and Saturn. Such grumbles notwithstanding, the 300E ranked tops again in the J.D. Power 5-year Vehicle Dependability Study.

Specific complaints were hard to come by, the most persistent one having to do with rear-seat comfort. More rear legroom would be nice, said 7.2% of our surveyees, and so would more interior storage compartments. And the 300E's traction and handling on icy, snowy surfaces fell short for 5.8% of our respondents, especially after the marvelous roadability they'd experienced on dry pavement—even with Mercedes-Benz ASR traction control, a \$2590 option in '93.

### Do it again differently

Price irked 14.5% of our owners. Several purchasers observed that they'd shopped carefully and would shop hard again next time.

In all, 10.5% of our Mercedes owners told us they would not purchase a 300E again. Another 29.8% hedged with a maybe. Almost 60% said, "yes," they would buy another 300E. And many of those who were undecided were only uncertain as to which Mercedes-Benz they would buy. In fact, many of these 300E owners expressed their intent to move up to a roomier S-Class next time.

PM



The clean, simple lines of the 300E were actually considered controversial when first introduced. The basic shape has provided myriad inspiration for many carmakers.

### EDITORS REPORT

## Evolution Of The Middle Class

● For an importer that sells fewer than 75,000 cars a year, Mercedes-Benz sure does have a broad menu for prospective owners to select from. This year there are 22 different varieties of the car wearing the 3-pointed star. And of these, there are seven different models in the E-Class.

The E-Class is the designation for Mercedes-Benz's midsize models, and this class represents the backbone of the German carmaker's sales. While fairly stripped E-Class sedans—with manual transmissions and roll-up windows—are popular as taxicabs in Europe, in our market, the E-Class remains the prototype of what a luxury sport sedan should be.

With their billet-like solidity, functionally elegant, if not overly fancy interiors, and superb performance, the midsize Benzes have been the favorite target of product planners from Detroit to Tokyo. And while the efforts of the newcomers from Lexus, Infiniti and Acura, as well as those of refreshed stalwarts from Lincoln and Cadillac, are impressive indeed, there is still something special about a Mercedes.

The most current iteration of the midsize fleet, the E-Class, is no exception. Each of the available engines is more potent than the next—every one of them having bodacious available torque commensurate with ample horsepower. The standard 6-cylinder gasoline engine offers 217 horsepower and 229 ft.-lb. of torque. The smaller V8, in the E420, ups the ante to 275 hp and 295 ft.-lb., and the rocket-sled E500 gets very serious with its 315 hp and 347 ft.-lb. Even the naturally aspirated 6-cylinder diesel offers 155 ft.-lb. of torque, which helps compensate for its 134 hp.

Regardless of engine, and regardless of body style, the E-Class chassis is still up

to the job of keeping the car going where the driver wants. The refined separate spring-and-damper strut front suspension and multilink rear setup have lost nothing with age. In the European tradition, the pieces between the Mercedes' body and wheels have been designed primarily for handling. The result is a sedan that is crisp, predictable and stable, with the front wheels ultimately losing their grip before the rear. This handling comes with a ride somewhat harsher than many domestic luxury car buyers consider acceptable. The ride is certainly firmer than is found in, say, the Lexus LS 400—and ride is no small reason for that car's relative success.

But more than the ride and handling, part of the Mercedes mystique is the legendary quality that comes with the star. And though that quality has been attacked by the Japanese newcomers, these cars are still vault-like. The attention to detail cannot be missed. Opening and closing any door of any of these models instantly signals that the car is a serious piece of equipment.

Despite the soundness of the design, the quality beneath it, and performance and safety to be found in it, these cars are beginning to show their age. In fact, when compared with the new, smaller, less-expensive C-Class sedans, these midsize models show the chinks in their armor.

The E-Class is due for more than a simple exterior freshening. The flush grille, larger headlights and extended lower cladding that adorn the '94 models do not hide the blemishes.

But despite their warts, these cars still set the standard for their class. And for anyone who wants a fast, competent and quietly luxurious sedan, the E-Class is still hard to beat.

—Dan Chaikin

# DENVER INTERNATIONAL

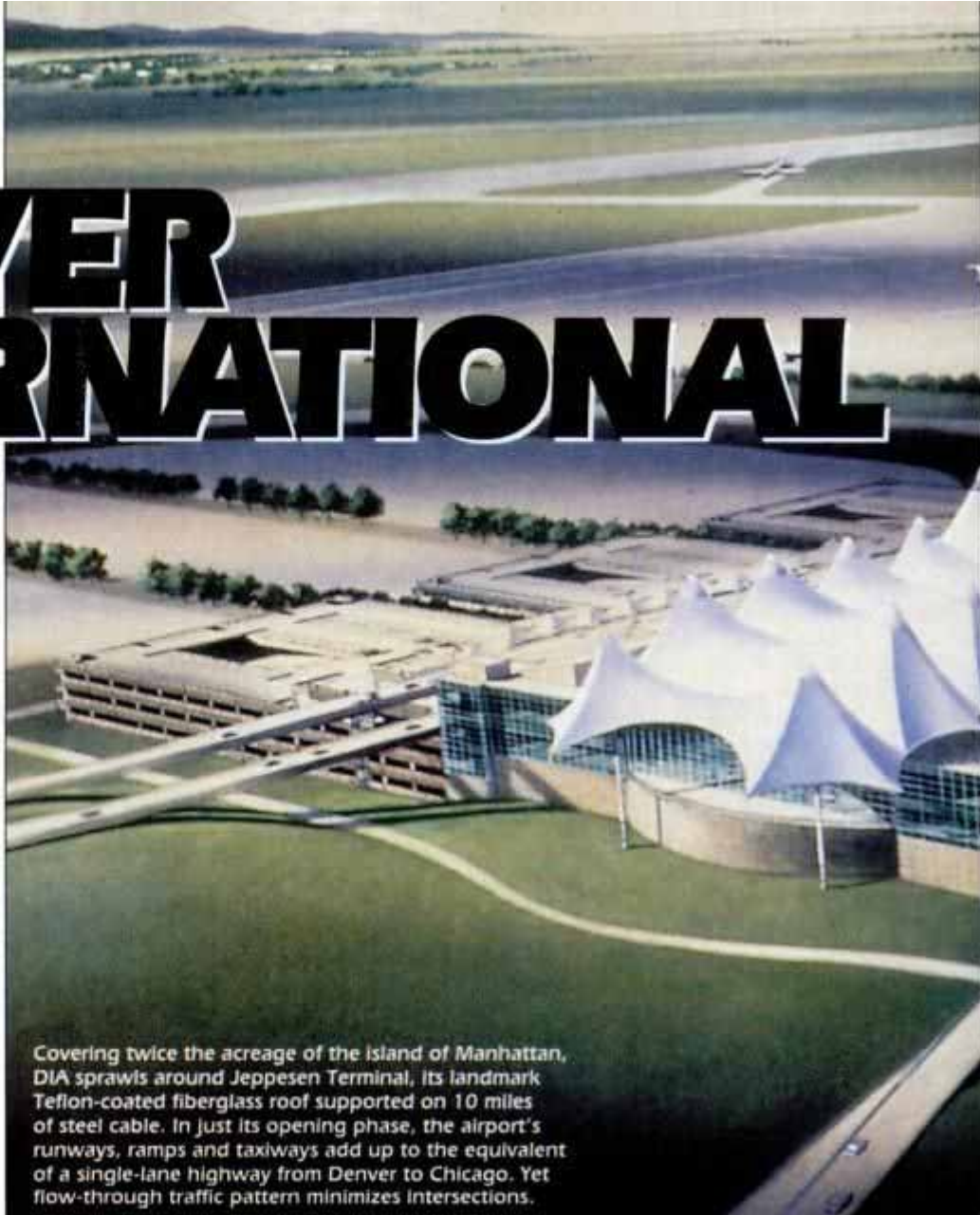
After a rocky start, America's biggest airport goes operational with mile-high expectations of ending bad-weather delays.

BY DAVID HUGHES

• If you've flown in the last six months, you probably know firsthand what havoc winter weather can wreak on air travel. Although eastern airports took winter's brunt this year, no major destination conjures up the phrase "snowed in" quite like Denver. At congested Stapleton Airport, arrivals were often cut in half when reduced visibility forced pilots to fly on instruments. And when a national hub like Denver goes down, a ripple effect fans out to backlog the rest of the country's air traffic.

But now a gigantic new airport—America's first in 20 years and by far its biggest ever—promises to keep Denver's winters at bay.

Like any major engineering project, Denver International Airport (DIA) has had its share of headaches.



Covering twice the acreage of the island of Manhattan, DIA sprawls around Jeppesen Terminal, its landmark Teflon-coated fiberglass roof supported on 10 miles of steel cable. In just its opening phase, the airport's runways, ramps and taxiways add up to the equivalent of a single-lane highway from Denver to Chicago. Yet flow-through traffic pattern minimizes intersections.

Cost and schedule overruns have dogged DIA's construction. The cause of the latest delay—guaranteed to

grab the attention of anyone who has lost a suitcase—has been a rash of gremlins in its \$193 million automated baggage-handling system. And to say the \$3 billion project stirs debate among local residents would be to put it mildly. Nevertheless, say officials, if the May 15 opening date holds up, DIA's troubles will melt away like winter's snow.

What makes DIA so weatherproof? The airport will be able to handle three independent streams of aircraft landing on parallel runways at the same time—even when pilots are relying on instruments and can't see other planes. According to Federal Aviation Administration officials, no other airport in the world can do that. Says Gregory Mueller, tower chief at DIA, the airport can bring in 120 aircraft per hour in almost any type of weather, while handling 80 departures. Even under some blizzard conditions, the airport won't have to shut down entirely.

All this is possible because Denver abounds in a commodity that's scarce



Inside, natural light illuminates 1.4-million-sq.-ft. terminal. Scheduled to open with 84 gates, DIA could expand to 260, serving 120 million passengers annually by the year 2020.

DENVER INTERNATIONAL AIRPORT PHOTO AND ILLUSTRATION



at other major airports—real estate. The three parallel north-south runways lie more than a mile apart. With 53 square miles of land, DIA could engulf Chicago O'Hare, Dallas-Fort Worth and Seattle-Tacoma airports combined.

Each of DIA's initial five runways—seven more will come on line in later years—stretches 2.2 miles long. A 3-mile runway, longer than the space shuttle's landing strip at Edwards Air Force Base, will soon be under construction to handle international flights. Length is critical in Denver's thin mile-high atmosphere, where heavily loaded planes require more runway to lift off than they would at sea level.

To give traffic controllers a panorama of all this acreage, the control tower rises 327 ft., making it the tallest in the world. Inside, terminal-approach radar controllers can track arriving aircraft with a new tool developed by Unisys. Called the Final Monitor Aid Display, or FMAD, the system features a high-resolution TV

screen displaying the three streams of traffic as they approach the north-south runways from 18 miles out. In addition, FMAD's tower computers monitor the stability of the flight paths, alerting controllers to deviations before they become critical.

But arrivals and departures are only a part of low-visibility safety. A state-of-the-art lighting system, embedded in the pavement, will usher planes through the runways and taxiways.

Four touch-screen pads in the tower will control the 18,000 lights. For example, the pilot of a jet that has just landed will be shown only the lights needed to steer to the right gate. And when visibility drops below a quarter of a mile, departing aircraft will find a red light-bar, along with flashing yellow wigwag lights, blocking the path onto the runway. Only when the tower controller turns off this stop sign will a row of centerline lights wink on, leading the aircraft onto the runway. As the plane wheels forward, it rolls over pressure switches in the runway to extinguish these lights, advising

the pilot of the next waiting aircraft that he is not cleared to taxi onto the runway.

The task of shepherding passengers and luggage around the airport has commanded equal attention from DIA's designers. After stepping off an inbound flight, a passenger will hop on a 28-mph computer-operated subway to ride from the arrival concourse to the main terminal. Meanwhile, baggage handlers will put bar-coded luggage on a conveyor belt that in turn loads bags directly into motorized gondolas. Traveling at 18 mph, each gondola can reach any point in the airport in 12 minutes and can detour automatically around a stalled vehicle. Though an easy target for criticism when glitches appeared last March, the ambitious system promises unparalleled efficiency once operational.

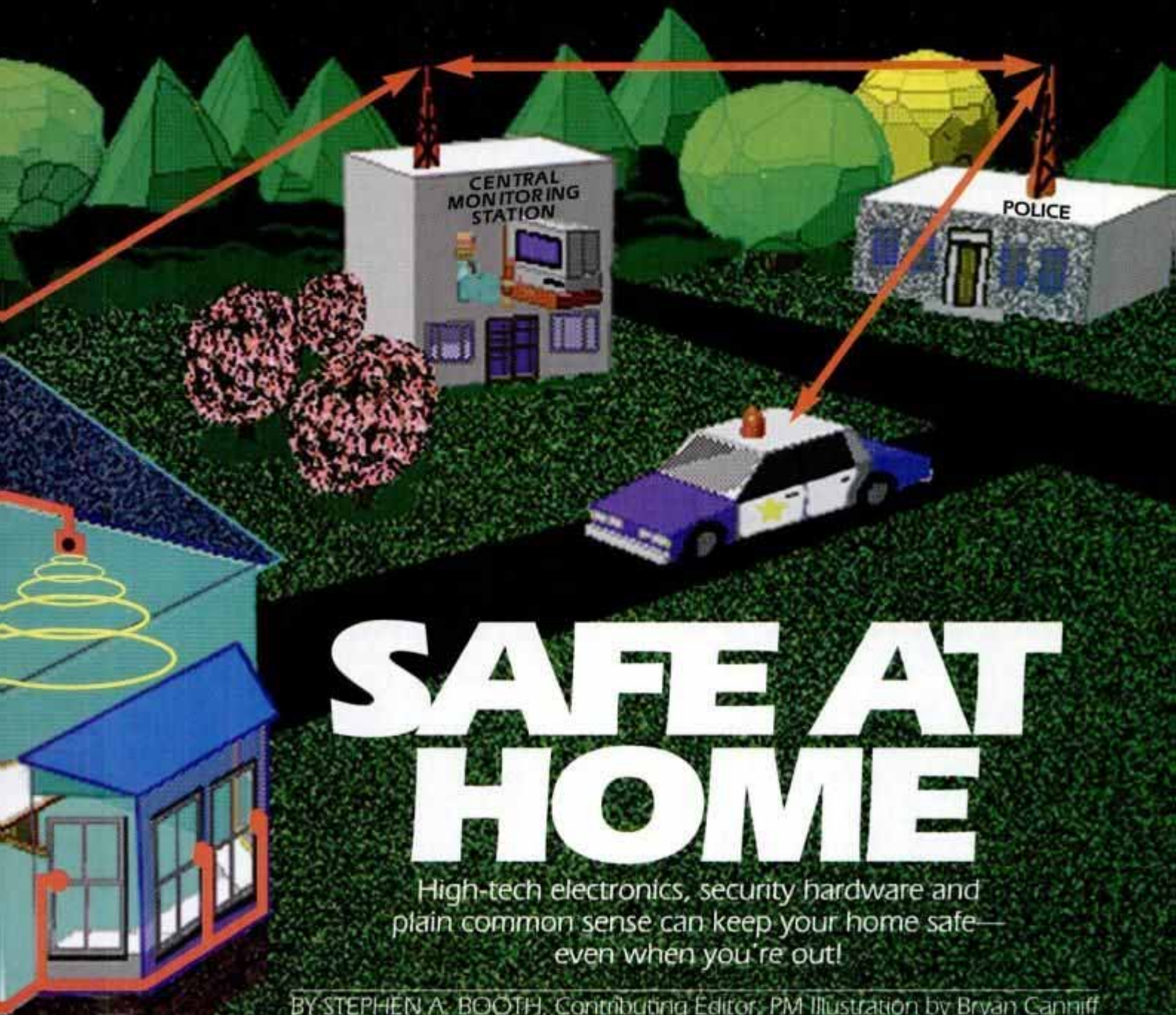
True, DIA still has kinks to iron out. But officials are counting on one thing: Six months from now, when another winter closes in on Denver, delayed flights and terminal turmoil will have faded into oblivion. **FM**

## COVER STORY



High-end digital communicating security systems, like the one shown here, collect a wide range of data from sensors located around the house. The control center constantly analyzes the data and, when necessary, communicates any problem to a central monitoring service via the phone wires. Once the monitoring service checks for system error and confirms the security breach, it contacts the appropriate emergency service.





# SAFE AT HOME

High-tech electronics, security hardware and plain common sense can keep your home safe—even when you're out!

BY STEPHEN A. BOOTH, Contributing Editor, PM Illustration by Bryan Canniff

• At first you don't notice the empty space where the TV and VCR used to be. What catches your eye is the overturned end table, then the littered floor and the scattered fragments of a crystal lamp your mother adored.

In yet another unwelcome surprise, you survey the ruptured pipe and curling floor tiles, and note the high-water mark. And as your mind's eye races beyond the sodden wallboard, you wonder about the condition of studs and joists, and just how soon it will be before the insulation starts to smell. Doubts arise and linger about the meat in the freezer, as well as damage to the appliance itself. Was it only the heater that crapped out or did all the power go—and for how long?

Both of these misfortunes, and many other catastrophes as well, show the varied aspects of home security. On the one hand is

the obvious concern about crime that we all share. On the other hand is the less sensational, but still very real, concern about damage done by fire or water.

Of course with crime so prominent in the headlines and national psyche, there's a tendency to regard home security only from the perspective of break-in detection and response. Fire, flood and other hazards become peripheral concerns as attention focuses on criminal incursion for purposes of theft, vandalism or worse.

The statistics from government crime-reporting agencies create a composite picture that isn't pretty. Residences account for two out of three burglaries in the United States. Several million occur yearly, with roughly one in six of the nation's 50 million private homes taking a hit. Losses average \$1280 per household.

Forcible entry occurs in 70% of these cases.

## Crimebuster's Checklist

● Although insurance companies award their top discounts for monitored digital-communicator security systems, many also cut their premiums for other alarm and hardware items designed to protect the home against crime or hazards.

Anecdotal evidence suggests that burglars target unoccupied homes, look for conditions that let them approach and enter unobserved, and won't spend more than 60 seconds breaking in. Locked doors and windows are a must. But your first line of deterrence is making the home look occupied when it's not, and denying intruders cover and concealment. The drawing at right points out some very simple but very useful home security tips.

### Bar the door, Katy...

If a housebreaker doesn't mind making a racket by busting windows or doors, probably the only thing that will bar entry is steel gates. Most prefer to work quietly. Unless you like that Bastille look, back up your key-in-knob type with a cylinder deadbolt (see "How To Install A Deadbolt Lock," page 84, Apr. '94).

Patio doors are another tempting point of entry. Most of us think we can secure these doors by slipping a wood rod in the track—right? But given enough clearance, anyone can lift the door up and out of the track without disturbing the rod.

Besides adjusting track clearance, install an additional lock that will prevent the door from leaving the track. Or, you can drill a hole through the frames of the moving and the stationary glass panel, and slide an eyebolt through the holes so that both door panels will be joined together. The eyebolt is easy to remove whenever you want to open the door.

There's also a lot of hardware around for securing double-hung windows. But one of the simplest and most effective items remains the bolt-through-the-frames method that we just described for the patio doors. Drill for a stout eyebolt where the inner and outer sashes overlap, going partway into the outer sash. If you drill the hole at a slightly downward angle, the bolt will never vibrate out.

### Let there be light

Burglars prefer to work in the dark—both outside and in. You could leave the same lights on day and night while you're away—it's better than nothing. But if you're away for an extended period and your house is being cased, this might be a tip-off. Putting lights on timers, or installing models that switch on when needed, is a smarter choice. It's probably cheaper in the long run too.

Regarding any outdoor floodlight, security gurus say to mount them where hoods

can't bust or remove the lamps—but where it's easy for you to replace them. (Go figure...) We figure you should put them high on the house. Either you or the hoods will need a ladder. Maybe they won't feel like bringing one.

### Hot leads, no leads

You won't get digital-communicator technology, and you might have to forgo central monitoring, but you can still install some pretty sophisticated security on your own. Both Radio Shack and X-10 USA offer a selection of do-it-yourself systems—including some that are supervised and, therefore, UL-compliant.

You'll have to choose between wireless and hardwired. In wireless systems, the sensors and control center communicate by radio waves. They're easier to install than hardwired types, but the sensors (as many as 16) run on batteries (usually 9-volt), which will need replacing. The hardwired security systems offer more options, and tend to cost less to buy and run, but you've got to channel wires and make connections.

Two final tips: Always use a telephone answering machine to keep 'em guessing, and make contact with your local police and fire personnel. They're often willing to visit a home and give advice on the placement of sensors and alarms. —S.A.B.

Most of the action takes place from 6 pm to midnight and when the weather is pleasant and warm. Doors—front and back—account for the most popular means of access at 63%. Windows place a distant second, just one in four. When an attached garage is handy, its portals are used 8% of the time.

Police and other experts caution that there's no perfect or fail-safe security system, only levels of deterrence. The more, the better. In home security, the same rules apply as for street crime—the less vulnerable a target appears, the less likely it is to be attacked. Most criminals prefer the path of least resistance.

Some of the most effective deterrents are the easiest to implement. These common-sense measures are outlined above. They work because they place doubts in a would-be burglar's mind, or somehow tip the odds against an easy job.

"Lights! Lights! Lights! Outside and in!" advises Sgt. Ed Sheehy, security specialist with the City of New Rochelle police in Westchester County, New York. "None of these guys wants to be seen outside or take a chance on meeting anybody inside," he explains.

"After lights, your best deterrent is a big, hungry, growling dog," Sheehy adds. "Even a 'Beware of Dog' sign on

the premises is better than nothing. The guy may think it's phony, but now you've got him guessing. Does he feel lucky today?"

A real dog isn't likely to remain behind when you leave home for vacation. But a home security system stays on the job as long as there's electricity, or batteries, to feed it.

There's no lack of home security products and alarm systems on the U.S. market. Choices abound, even if you only consider the recognizable brand names, such as AT&T, Heath-Zenith, Honeywell, Intermatic, Leviton, Radio Shack, Sears and X-10 USA. Lesser-known but numbering in the thousands are security installation companies, including Ademco, ADT, Digital Security Controls, Interactive Technologies, Optex Morse and Radionics.

The products come as simple and one-size-fits-all as a rotary timer for lights and appliances. Or, they can be as comprehensive as a home-automation program in your personal computer. Sensors—the eyes, ears and nose of a system—detect motion, sound, smoke, moisture, toxic gases and even temperature changes that might indicate fire or the possibility of a damaging freeze. Hazard indicators include eardrum-piercing alarms and disorienting strobe lights. External sirens and flashing lights can sig-

nal an alert outside the home. Some top-shelf systems even phone or radio for help.

### Overview

At the risk of oversimplification, there really are just two kinds of security systems. All other things being equal—such as the sophistication of internal sensors, the activation of local alarms and how they communicate within the house—what separates them is whether and how they communicate distress to the outside world.

Today's most high-tech systems, called digital communicators, use the phone to alert a central monitoring station about a breach in security. This agency then notifies the appropriate emergency service.

Initial communication between the home system and the agency is automatic and voiceless. These digital communicators send a burst of coded information to the central station, which then uses the open line to make vocal contact with the home or otherwise assess the situation. This includes monitoring the sensors within the home—live and on-line. Meanwhile, the central agency is in voice contact with the local authorities who'll dispatch assistance.

The critical elements here are the system's ability to communicate beyond the home, automatically, and the



PHOTO ILLUSTRATION BY GEORGE RETZCO

monitoring agency's person-to-person contact with the emergency services.

### Options

Systems that only activate internal or external alarms depend on being heard—and heeded—and then on someone alerting the police or fire department. The screaming sirens and flashing strobes within the house might shoo an intruder. Externally audible and visible signals might cause a neighbor to raise an eyebrow and the telephone. But there's no guarantee that the cavalry will come.

Some home security devices do have the ability to make calls automatically to designated numbers that are stored in memory. Unlike digital communicators, these simply play a voice message that you've previously recorded.

Although you might hire a 24-hour central monitoring agency to be on the receiving end, usually these voice-message devices are marketed as an alternative to that added expense.

Instead, you program the auto-dialer to make direct calls to police, fire, a neighbor or perhaps another phone where you can be reached. The other party can listen in on the open line after hearing your message, but there's no digital reporting of system status or remote electronic monitoring of the situation. These systems

usually cost \$100 to \$200, depending on packaged sensors and accessories. The most widely available of these is the Voice Dialer Console in the extensive PowerHouse line from home-automation giant X-10 USA. The same item comes in several brands, including Radio Shack's Plug'n Power line.

A system that phones out probably is better than a siren that falls on deaf ears, but one that isn't centrally monitored might create a sense of false security—and false alarms. Although your recorded S.O.S. might reach police and fire, there's no guarantee that your neighbor or doctor is home to answer or relay an alarm. And if you're not home when the system sounds off, there's no way to confirm or cancel the call. It's one reason why police prefer monitored systems.

### False alarms

"We're constantly plagued with false alarms, whatever the cause," New Rochelle's Sgt. Sheehy says. "Even if we can't confirm we have to send two units to respond—you don't want a guy out there alone. If you get 800 of these a month, it's a big headache. We could be spending those man-hours on the street deterring crime in the first place."

Police estimate that the 7 million security systems in the United States generate some 14 million alarms a

year. Depending on the area, these can account for 10% to 30% of the calls police receive. The cost to taxpayers averages \$100 per response, yet studies show that 95% of the alarms are false. The burden is such that some municipalities now levy fines for false alarms. Others have taken the extreme measure of suspending response to repeat offenders.

Security experts cite several reasons why a system might cry "Wolf!" The primary cause is user-error (42%). Then, in descending order, there's aging or failing gear, storms and faulty installation.

Lately, security-equipment makers have attempted to remedy these ills, mostly through improvements in sensor and communications technology, user controls and installation know-how. Much of this is already incorporated in the digital-communicator gear, which, at this writing, is available only through professional installers or specialty mail-order firms (see our Buyers Guide on page 42). So for now, this gives pro-installed systems a technological edge over those that the do-it-yourselfer can buy in retail stores. But the situation is likely to change, as economies of scale lower the cost of the latest in computer processing and component miniaturization. Today these systems command relatively high prices. Often they're

## Home Security Buyers Guide

● Digital-communicator security is seldom available to the do-it-yourselfer. One exception is the range of products and services offered by HAL (Home Automation Laboratories), a mail-order specialty firm (telephone (800) HOME-LAB or (404) 319-6000). A basic digital communicator

package costs about \$700, including one year of free central monitoring by HAL (usually \$180/year). Less high-tech but one of our faves is HAL's Shadowmaker (\$125), an art-quality device that projects moving shadows randomly around a room. Here are other DIY security gear. —S.A.B.



### Time On Your Side

Forget that "Home Alone" scenario where the hoods yuck at the telltale timer pattern. Intermatic's switchers vary the on/off times



randomly each day. A basic plug-in model that you can use with any standard lamp, SB711C (left, \$10), permits two on/off cycles daily. In-wall timers that replace any standard wall switch are available too. The EJ341C (far left, \$29) performs 24 on/off cycles daily and

randomly. It lets you put overhead lights or outdoor floods on a timed schedule, as well as lamps or small appliances on wall-switched outlets. The use of two or three of these timers is often all that's needed to create a credible impression that the home is occupied and not worth pursuing.



### Wide-Angle Viewing

Heath-Zenith's Reflex SL-5312 (\$35) is a motion-sensing outdoor light. Its 190° viewing angle and 70-ft. range blanket an 8100-sq.-ft. area. Pulse-count technology reduces false triggering by precipitation or wind-blown objects. It has variable time-delay shutoff, auto daylight shutoff and manual-switching override. And, it's a breeze to install. It simply replaces your existing floodlight.

financed, whether a retrofit or part of new construction.

Systems built around digital communicators are sold under various brands by security-specialty retailers. AT&T, for example, distributes its line through some 350 specialty dealers. Honeywell sells its systems through its own sales force and outside agents. Sears licenses its name to company-approved and UL-certified components sold by independent installers, and backs the consumer on service and warranty issues. Based on the installations AT&T has financed, the company's package for a typical home runs \$2500 to \$3000, according to Randy Tidmore, general manager of the security division. Honeywell cites \$4000 as the average ticket for its TotalHome household automation package, which includes security.

Despite digital-communicator capability, central monitoring is an optional service with any of these systems. Usually it's performed by an independent contractor, often through arrangement with the hardware dealer. Honeywell is an exception: The company operates its own monitoring centers, and says the typical monthly tab is \$29.

This might seem a bit stiff until you realize that your insurance company will basically subsidize the cost. Most give premium discounts where centrally monitored security is installed

—as much as 15% to 20%. Also, lesser breaks might be available for other security alarms and items—including deadbolt locks.

### Sample system

Although state-of-the-art security systems vary in details from brand to brand, the options available from AT&T supply a representative example.

The company offers the wireless System 8000 and the hardwired System 8300 installation. In this context, wired and wireless (radio wave) describe how the sensors communicate with the control panel. In either case it's a supervised system, meaning the brain center constantly checks the status and condition of the many reporting sensors, particularly for electrical power and wiring faults. Supervised operation, also called Grade-A Service, complies with Underwriters Labs standards and often is required for insurance discounts.

According to AT&T's Tidmore, both systems offer similar sensing for break-in, fire and other hazards. But one or the other might be better for a specific installation. Hardwired is preferable where metal studs or lath might obstruct radio signals. Wireless might be more suitable for homes with historical or architectural considerations, since it disturbs little of the home's integrity.

Like most other security systems,

AT&T's entries require password access, and employ simple but confidential ID verification codes for silent or ambush alarms should the homeowner be forced to talk to the central monitoring station when under duress. Remote control is a given—for panic-button situations or routine instructions. The systems also offer flexible operation. Although fire, flood, temperature and other hazard sensors may be monitored constantly, it's possible to set the intrusion-detection section for total or partial security.

For example, in the AWAY mode, perimeter sensors (for doors and windows) and motion detectors (for large, internal spaces) would both be armed. In the HOME mode, the latter would go off-duty, giving people free rein to walk around without tripping alarms, while the perimeter sensors for windows and external doors remain on guard. Selectable zone coverage is even possible. You might disarm the backyard door while you're picnicking outside but leave the street-side entrances armed.

### Dual verification

As sophisticated as a control and communications console may be, it's got to rely on input from the sensors.

AT&T's Tidmore and others say that sensor reliability keeps improving. The latest types are less prone to causing false alarms because they em-



## Phantom Dialer

X-10's PowerHouse home automation products use your AC wiring to send on/off signals to lights and appliances. They'll work in concert with the X-10 Voice Dialer Security system, which flashes lights, activates sirens and sends a recorded message in your voice to up to four phone numbers if a break-in, fire or other sensor is tripped. Shown here is a typical X-10 package that sells for about \$200. Clockwise: 1) Plug-in outlet control module. 2) Keychain remote control. 3) Indoor remote control runs four outlet-modules, arms and disarms system. 4) Voice Dialer console accepts wireless signals from sensors, sounds built-in siren, phones recorded alarms. 5) Remote siren. 6) Wireless door/window perimeter sensor. 7) In-wall AC control module. 8) Infrared motion detector. 9) Wireless repeater relays commands to main console. 10) Light-socket control module.

## Computer-Aided Security

Put your home PC to work running a home automation/security program. X-10 and Radio Shack offer computer software that operates through an accessory called an interface. The packages, for Apple and Macintosh, Commodore or IBM-compatibles running Windows, cost about \$69. The system uses household wiring as the data highway for on/off commands. The interface controls up to 256 modules and programs up to 128 timer events. After you program the interface, detach your computer and the system takes over.



## Security Blanket

Radio Shack's Safe House Model 49-485 (\$200) is more than a versatile, hard-wired, 8-zone burglar and fire-alarm control center. It's a security consultant because its superb manual takes you step by step through the planning and layout of a system. More important, it'll show you how to connect for UL-compliant Grade A "supervised service"—the kind that qualifies for insurance discounts because the system constantly checks the status of the remote sensors. You can equip the 49-485 with all types of sensors, detectors and alarms, and even add an auto-dialer to telephone for outside assistance.



ploy dual-verification technologies.

For example, perimeter sensors for glass breakage come in two flavors. One is an acoustic transducer that "hears" the break. The other measures flexing in the material. Either can be fooled and emit a false alarm, but newer sensors incorporate both. Each condition must be satisfied before the flares go up.

Motion detectors boast similar upgrading. They're used to police large, open areas where contact-type or other sensors aren't feasible. What they really detect is heat. Typically, an arc of infrared light reacts to motion-induced temperature changes—including the kind that might be caused by a frisky dog or even a moth landing on the lens.

Although detector lenses have been made more discrete, and installation manuals instruct pros and DIY'ers alike to aim the lens to create a low "pet alley" near the floor, police still gripe about cat burglars that turn out to be kittens.

To make them less error-prone, new motion-detector systems combine infrared and microwave technology. "The microwave portion operates much like radar," explains Tidmore. "It sends out a 10-gigahertz radio signal and looks for a return wave of the same frequency. Any variance, it knows something's moving."

He notes that whereas infrared

works best in a focused line-of-sight manner, microwaves can blanket an area. By combining and comparing both inputs, the processor in a security system makes an intelligent analysis. Mouse? Or man?

## Do-it-yourself options

Supervised service, wireless or wired operation and user-selective arming are not limited to digital-communicator systems. Do-it-yourselfers will find any of these features in the extensive lines from X-10 and Radio Shack. Eventually, dual-verification sensors will become commodity items, too.

What makes digital-communicator systems unique, then, is communication. But its method of communication also represents its Achilles' heel. What happens if the phone stops working?

"If the phone line is cut or otherwise interrupted, our systems will automatically activate their local alarms," volunteers Tidmore. "Beyond that, there are some backup options."

One of these is automatic pass-off to a second, wired phone line. It's a staple service among banks, jewelers and other high-profile industries, and it's a feature of the step-up AT&T System 8300 that's optimized for businesses.

Another backup in the System 8300 is automatic switching to wireless cellular-phone service, which can't be compromised because it runs on radio

waves that can't be knifed.

"There's also a service called 'Derived Channel' that's available from the local telephone companies," says Tidmore. "Basically, it automatically generates an alarm at the local operating system if there's any interruption in your phone service. It scans tens of thousands of lines every few seconds."

Tidmore says that the availability of Derived Channel varies according to the equipment installed at individual regional networks. Where it's in place, contingency plans can be arranged on a per-customer basis. For example, you could authorize the central switching office to notify the police if there's a break in your phone service. **FM**

## SOURCE LIST

- **AT&T:** Room 2C16, 5 Wood Hollow Rd., Parsippany, NJ 07054; (800) 222-5111
- **Heath-Zenith:** P.O. Box 1288, Benton Harbor, MI 49023; (616) 925-6000
- **Honeywell:** Home & Building Controls, 1985 Douglas Dr. N., Golden Valley, MN 55422; (800) 345-6770
- **Intermatic:** Intermatic Plaza, Spring Grove, IL 60081; (815) 675-2321
- **Leviton:** 59-25 Little Neck Pkwy., Little Neck, NY 11362; (718) 229-4040
- **Radio Shack:** 1700 One Tandy Center, Fort Worth, TX 76102. For phone number, check local directory for nearest store.
- **Sears:** 3333 Beverly Rd., Hoffman Estates, IL 60179; (800) 366-1151
- **X-10 USA:** 91 Ruckman Rd., Closter, NJ 07624; (800) 526-0027

## WHAT'S NEW IN

## NASCAR®

The Winston Cup stockers add several high-tech twists for the '94 season.

BY JACK FLOWERS; PM Photos by Don Hunter



• The whole idea that nothing is supposed to change in NASCAR is changing (see "Low Tech, High Speed," page 34, Mar. '93). Sure, the basic concept of Winston Cup stock-car racing still is the same—production factory components to keep the cost of racing relatively reasonable and help ensure a level playing field. But the cars are getting safer and there's still room for creativity within the rules to hone a winning edge.

The basic stock-car package still is the same—a factory engine fed by a

Holley carburetor, and a body that any aspiring race-car driver can buy through any dealer tied into the factory-performance-parts catalog. But the sport is evolving nonetheless—in the direction of helping those big old 3500-pound Winston Cup stock cars stay on the ground and steer left.

While mechanical changes to gain a mechanical edge (translate: cheating) are vigorously policed, modifications to make the sport safer and the drivers more comfortable get a warmer reception from NASCAR's tech inspectors. So when a new steering wheel showed up at the first race of the year, the Daytona 500 in Daytona

Beach, Florida, it caused little more than a minor stir. The wheel has a thicker rim made of extra-thick foam rubber padding. Aside from providing a bit more impact protection in a crash, the more heavily padded wheel is softer to the touch and easier on the driver's wrists and finger muscles in long races.

More dramatic are new "boom-rangs," or air deflectors mounted to the car's roof. First used this past February at Daytona, the deflectors help keep cars from going airborne during a spinout or crash. The roof flaps were mandated by NASCAR for the higher speeds generated at sev-

*Jack Flowers is the Winston Cup editor of the weekly Speedway Scene.*



Extra padded steering wheel and aero roofcam are recent intros to NASCAR racing.

changing rear spring rates during qualifying for faster lap times by using "donuts." Instead of changing the actual spring to alter the rate, pit crews now use hard rubber wedges,

tona—without the rear getting loose. So if this is the hot setup for qualifying, why not use it during the race itself? Good question. Answer: tire wear. The extra force on the rear increases tire wear dramatically. This isn't a factor during the 2-lap qualifying trials, but it would create the need for more pit-stops if used during the 500-mile race.

And in actual racing, it's more complicated. Factors such as driver style and preference and weather and track conditions all affect car setup. A driver like Dale Earnhardt,



Sterling Marlin checks new lift-spolling air deflectors.

or donuts, that are inserted into the coils of a soft spring to increase stiffness. Removing the wedges softens the rate. Inserting and removing the donuts can be done in less than 2 seconds right on pit road.

Softer rear springs allow aerodynamic forces to push the tail end down for more rear tire bite. This permits higher speeds—such as 200 to 220 mph blasts down the back stretch of Day-

for example, prefers a stiffer rear spring. A more conservative driver will tend to be easier on tires and can get by with a softer spring. The same concept applies to the front suspension where using donuts to alter spring rates will work to tune and balance the car's over- and understeer characteristics.

One last change this season doesn't affect the cars or drivers one bit. But it sure affects you when you're watching the race. A miniature television camera with a built-in transmitter has been mounted on the roof of Mark Martin's Valvoline/Ford Thunderbird. This "roofcam" is faired into the sheetmetal of the roof so its presence does not bother the aerodynamics of the car. When hooked into the broadcast systems of CBS, ABC, ESPN and TNN, the camera puts race fans right in the thick of the action. The camera shoots down over the hood for a driver's perspective of the track and the fender-banging competition.

So when Mark Martin pulls up into Sterling Marlin's draft next Sunday, you're along for the ride. You better buckle up.

PM



eral of the superspeedways on the 31-race circuit.

The deflectors came out of an idea by NASCAR, and Winston Cup director Gary Nelson. The deflectors themselves consist of two 20 x 8-in. flap units mounted on a boomerang-shaped holding device, which is mounted on the top of the roof near the rear window. The system is virtually flush with the roofline and hard to detect unless you're looking for it. The flaps are activated by the aerodynamic lift of wind passing over the car's roof, popping up the flaps and decreasing the lift.

Another relatively new strategy is



Rubber donuts are used to vary spring rates.

## SPORTS SCIENCE

Basketball's 3-point shot is a long-range bomb that demoralizes the opposition. In a PM exclusive, the shooting coach of the Orlando Magic shows you how to hit

# NOTHING BUT NET



BY BUZZ "THE SHOT DOCTOR" BRAMAN  
PM Illustration by Jeff Mangiat

• For a basketball player, there's no better feeling than seeing a shot swish through the basket. Whether it's at the beginning of the game, at the buzzer or from out in 3-point land, making baskets is the essence of the game.

In order to be a complete offensive player, a consistent jump shot is a must. Hot-and-cold jump-shot shooting is a product of mechanical flaws in the stroke. In many respects, a 3-point shot is the same as a free throw from the foul line since, mechanically, the shots are the same. The difference lies in the speed at which the shot is taken. A free throw is shot when you want to shoot. A 3-pointer is shot as the speed of the game dictates.

Shooting has become a lost art. In the past 20 years, the game has shifted toward athleticism. The National Basketball Association (NBA) and athletic shoe com-

panies are marketing the dunk. Instead of practicing shooting, young players spend their time practicing the "slam." However, the growing importance of the 3-point shot—put up from 22 ft. and beyond in the NBA—is now making good shooters a premium.

The NBA game has evolved into a game of double-teaming the superstar—someone like Shaquille O'Neal of the Orlando Magic or Charles Barkley of the Phoenix Suns. When the ball is passed out of the double-team in the low post underneath the basket, the result is an open jump shot or an open 3-pointer. If more players could shoot the "3," there would be no more double-teaming. Zone defenses in college would be a thing of the past.

So why is it so hard to shoot the 3-point shot?

The two biggest excuses for poor shooting are lack of confidence and lack of concentration. These are the

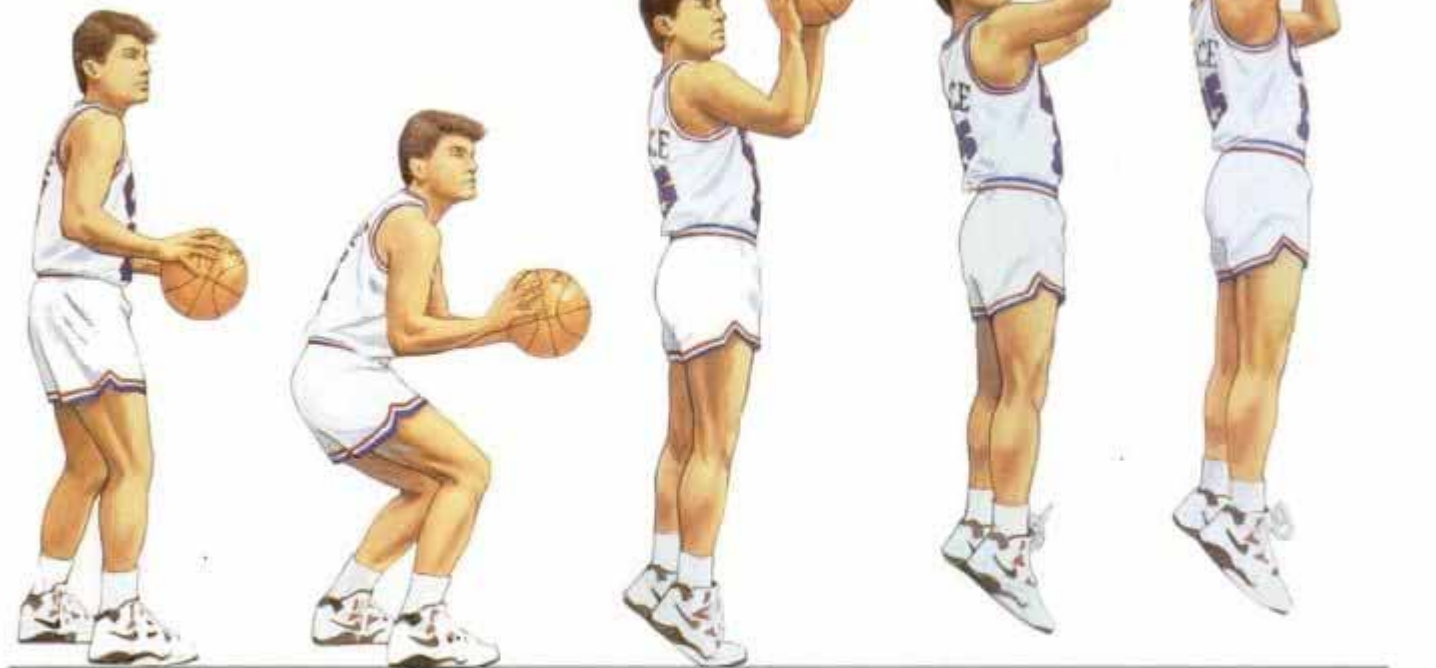




Mark Price of the Cleveland Cavaliers is perhaps the NBA's best 3-point shooter. Price won this year's 3-point shooting contest, held just prior to the NBA's All-Star Game, for the second consecutive year.

# NOTHING BUT NET

**Shoot and freeze:** The L-shaped shooting arm rises so the line from the forearm through the index and middle fingers lines up toward the basket. Freeze the follow-through until the ball reaches the basket.



**1.** The index and middle fingers of shooting hand point toward basket.



**2.** As the body elevates, the ball begins to roll off the fingers.



**3.** The left hand, fingers pointed upward, falls away from the ball.



**4.** Aim your index finger over the front of the rim and release the shot.



**5.** Follow through with the wrist bent over and fingers pointing down.

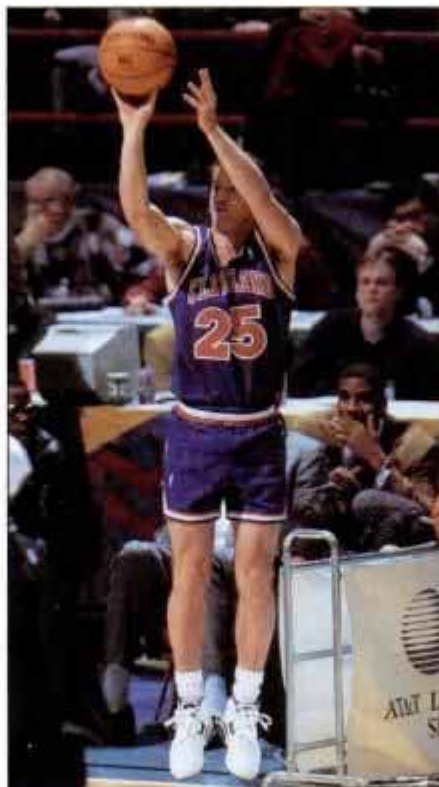
standard answers given by coaches, players and parents. What they don't realize is that lack of confidence and concentration are the effect, not the cause. When the ball doesn't go in, confidence and concentration slide.

But the real reason that the ball isn't going in consistently is poor mechanics. When the mechanics get straightened out and the ball starts going in the basket, guess what happens to a player's confidence and concentration?

All young players are taught several lessons concerning shooting that are important. You should "square up," meaning your shoulders and feet face the basket. You should also bend your knees for power and concentrate on the target.

These things are important but let's face it, these are things most players do naturally.

The two biggest reasons for poor shooting are not being able to make the ball go straight consistently and not being able to judge distance correctly. What does this mean? It's really very simple.



Price exercises fingertip control.

There are only four ways to miss a shot: left, right, short or long. If you could shoot a 3-pointer using a computer, all you would need to do is draw a straight line from the point of release, your fingertips, to the middle of the rim, which would be adjusted for the correct amount of thrust and arc for the ball to go the correct distance.

To be a consistent shooter, you must understand how to shoot straight and how to accurately judge the distance to the basket. Otherwise, you're shooting by instinct and this leads to streaky shooting.

## Straight shooting

For simplicity's sake, let's assume everyone is righthanded. To start, hold out your arm fully extended and with your fingers spread. Look down your forearm as though you were looking down the barrel of a rifle. If you draw a straight line down your forearm to your fingertips, you will notice that only two of your fingers are within that straight line: your index and middle fingers.

Now hold a ball in your right hand

as if you are going to shoot the ball. The shape that is formed from your wrist to your elbow and from your elbow to your shoulder should look like an L. When you make the L, it should be brought in front of you so that the straight line created by your forearm and extending up to your index and middle fingers is lined up toward the middle of the front rim of the basket.

The shooting motion is an exercise in simplicity. From the L position, we bend our knees, thereby lowering the L. Then we simply push up. When the ball rolls off the fingers, guess which two fingers touch the ball last?

That's right. It's the index and middle fingers. The very last finger that touches the ball is the index finger. The miracle of straightness is this: Wherever your index finger points when you release the ball and follow through is where the ball goes. When you push up under the L, your elbow locks straight and your wrist breaks. If your index finger is pointed over the middle of the front rim, the ball will never miss right or left. Since the rim is a circle, you can always see the middle of the rim no matter what angle you shoot from.

Meanwhile, the correct amount of arc on the shot will be determined by three factors: 1. the natural upward push motion of the L; 2. your instincts; and 3. freezing the follow-through at the point of release—when your arm locks straight and your wrist flips over—at a spot about 6 to 8 in. above the rim.

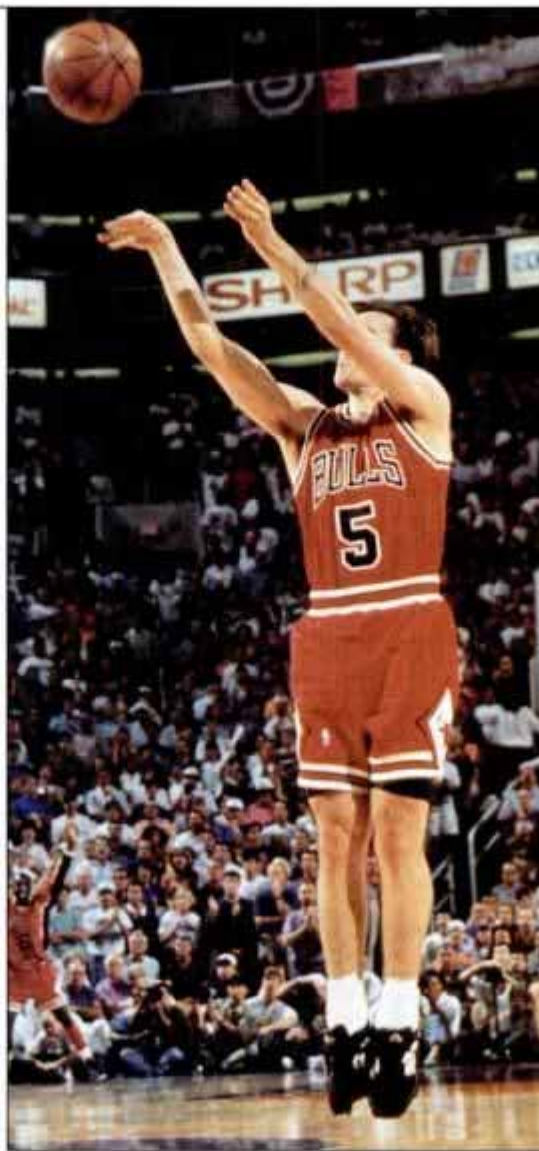
### On the other hand

So what is your other hand—the left hand in this instance—doing? Its job is very simple. A ball should be shot with only one hand. The left hand is just for support.

For a righthanded shooter, the left hand should be placed on the side of the ball at about the 9 o'clock position. As the L moves upward, the left hand loses contact with the ball when the ball is level with your forehead. All five fingers of the left hand are straight up and down. The arm is bent and the palm faces to the right.

The left hand is not allowed to shoot, push, flick, twist or face the basket. If it does, you are shooting with two hands.

What's so bad about shooting with two hands? If the palm of your left hand starts rotating toward the basket, then you are pushing the ball to the right and off the index and middle fingers. Remember, the ball goes



Championship shot: John Paxson of the Chicago Bulls launches a "3" to beat the Phoenix Suns 99-98 in last year's NBA Finals. Note the follow-through.

where the index finger is pointing. Missing right or left is the result of the left hand pushing the ball. This is a very common mistake for players of all ages.

### Judging distance

Most players rely solely on their instincts and "feel" when it comes to judging distance. These are important considerations but not the only ones. The follow-through is a critical element as well. As it happens, "follow-through" is a phrase every basketball player has heard but which few can define.

The follow-through forms as the L of your arm rises, the arm locks straight and, as the ball is released, the wrist finishes bent over with the fingertips pointing downward. After shooting the ball, you should freeze in this position like a statue and don't move until the ball reaches the basket. This is the correct follow-through. When you have the same release and structure on every shot, you can then

use your instincts and "feel" to a greater degree. Simply put, the method is: shoot and freeze.

To better understand the importance of the follow-through, try this experiment. Stand at the foul line and with the L formed, push up. As you shoot, jerk your arm back as fast as you can. You'll find that you have no control of the ball.

Next, shoot and freeze. You now have maximum control over the direction of the ball.

"Pulling the string" is the phrase used to describe that jerking motion of pulling your arm back before you've finished the follow-through. Imagine that there is a string connecting your index finger to the ball.

### Perfect practices

The high-school and college 3-point shot is 19 ft. 9 in. I once did a shooting demonstration at Villanova University for the Philadelphia 76ers' coaching staff and about 20 rookies. I shot 250 college 3-pointers and made 246. I made the first 92 in a row. I could hear the players' amazement as I shot.

What they didn't realize was that my mechanics were perfect: a perfect L shape of the arm, a perfect shoot-and-freeze motion and a perfect lefthand release. Every ball I shot went straight.

Of course, they also wanted to shoot 3-pointers like that. But something else they didn't realize was that I shot 300 3-pointers a day for six months, training for that exhibition. Don't think that you can practice shooting a 3-pointer, or any shot for that matter, by shooting only a few shots per day.

Good depth perception and good form comes from practicing correctly over and over. Practice does not make perfect. Perfect practice makes perfect.

To master the 3-point shot or any other shot, you need to practice it so many times it becomes second nature. It must not only become ingrained in your mind but, more importantly, it must become ingrained in your muscles. Muscle memory is the key to being a good shooter. Even if your team is down by two points and there are only 1.5 seconds left in the game, when you pull up for the "3"—assuming your technique is correct and you've prepared with long hours of practice—the only sound you'll hear before the crowd begins to roar will be the sound of your 3-point shot swishing through the net. **FM**

To learn more about basketball shooting, you can purchase Braman's Sure Shot videotape by calling (800) 451-8100.

# THE ZAPPER

A new device automatically eliminates commercials from recorded TV programs on playback.

BY STEPHEN A. BOOTH, Contributing Editor

● Imagine catching up with the evening news hour in just 48 minutes, shaving 20 minutes off a 9-inning ballgame without missing a pitch or watching a late-night movie 33% faster than you can today. Nobody's come up with the video equivalent of speed-reading. But you'd get through a TV show a lot faster without the commercials that punctuate most programs.

You'll be able to do so very soon, thanks to a technology that eliminates commercials from videotape recordings. This technology will be available first as an accessory for your VCR. Eventually it'll be built right into the VCR. Unlike earlier attempts at editing commercials from VCR recordings, this one is virtually foolproof.

The technology is called Commercial-Free and it makes its debut in Commercial Brake, a new under-\$200 device from Arista Technologies. It's the brainchild of Jerry Iggulden, president of Invention Management Associates,

an Encino, California, affiliate of Arthur D. Little Enterprises.

The Commercial-Free process used in Commercial Brake gives new meaning to the term time-shifting. The commercials are recorded on tape along with the program. But during playback, the system detects the onset of commercials and automatically fast-scans past the interruption. During this 5- to 10-second intermission, a blue screen masks the garbled picture on your television.

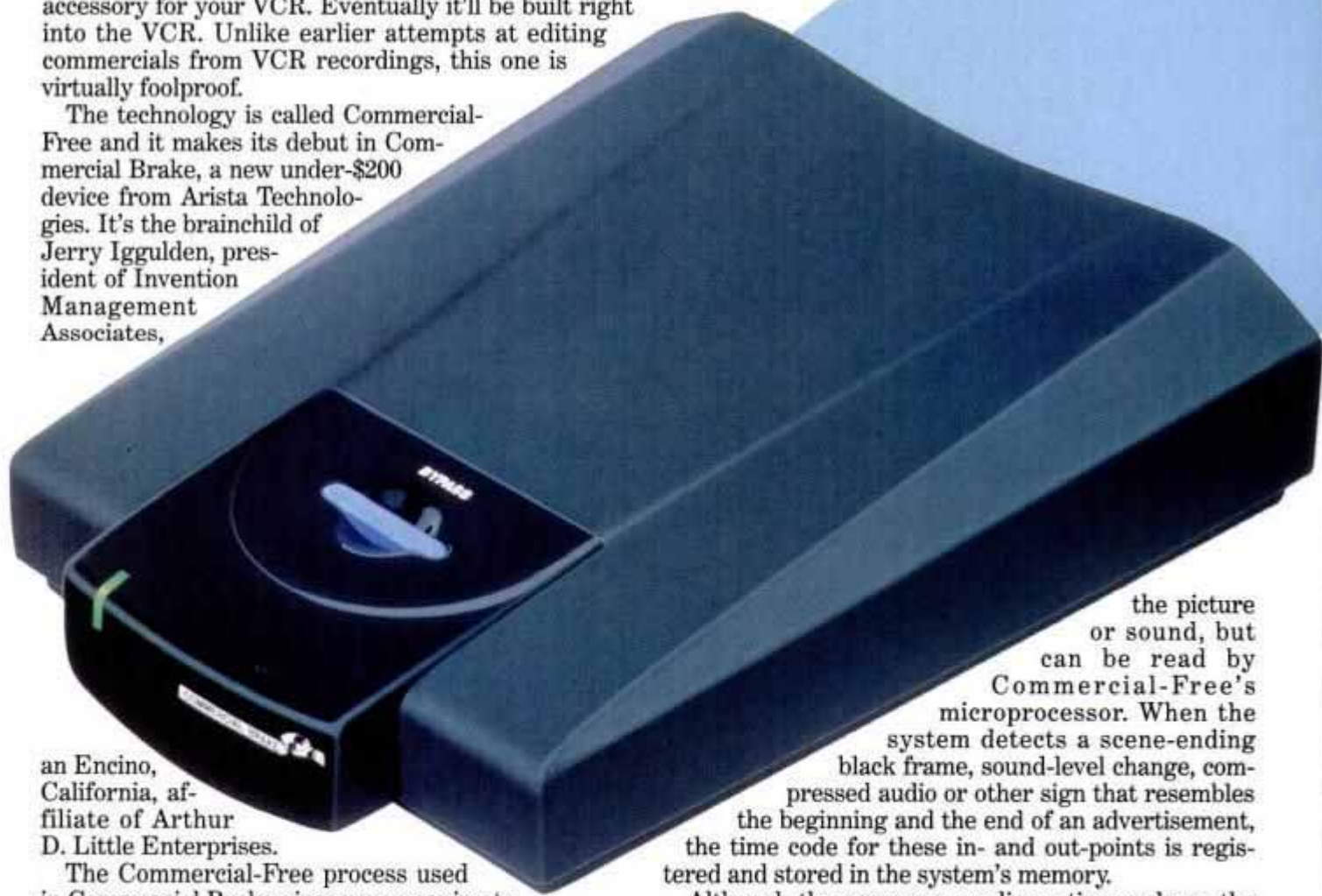
The reason Commercial-Free works reliably is that it records the commercials and then deletes them later.

The system starts by applying a digital time code to the videotape while it is being recorded. This code is stored on a section of the tape where it doesn't interfere with

the picture or sound, but can be read by Commercial-Free's microprocessor. When the system detects a scene-ending black frame, sound-level change, compressed audio or other sign that resembles the beginning and the end of an advertisement, the time code for these in- and out-points is registered and stored in the system's memory.

Although the accessory applies a time code on the videotape, the playback map registered to that recording resides in the Commercial Brake unit. Given the storage capacity of the microprocessor, even a very large home video library can be accommodated.

In this way, Commercial-Free creates an individual playback map for each recording. When you view the





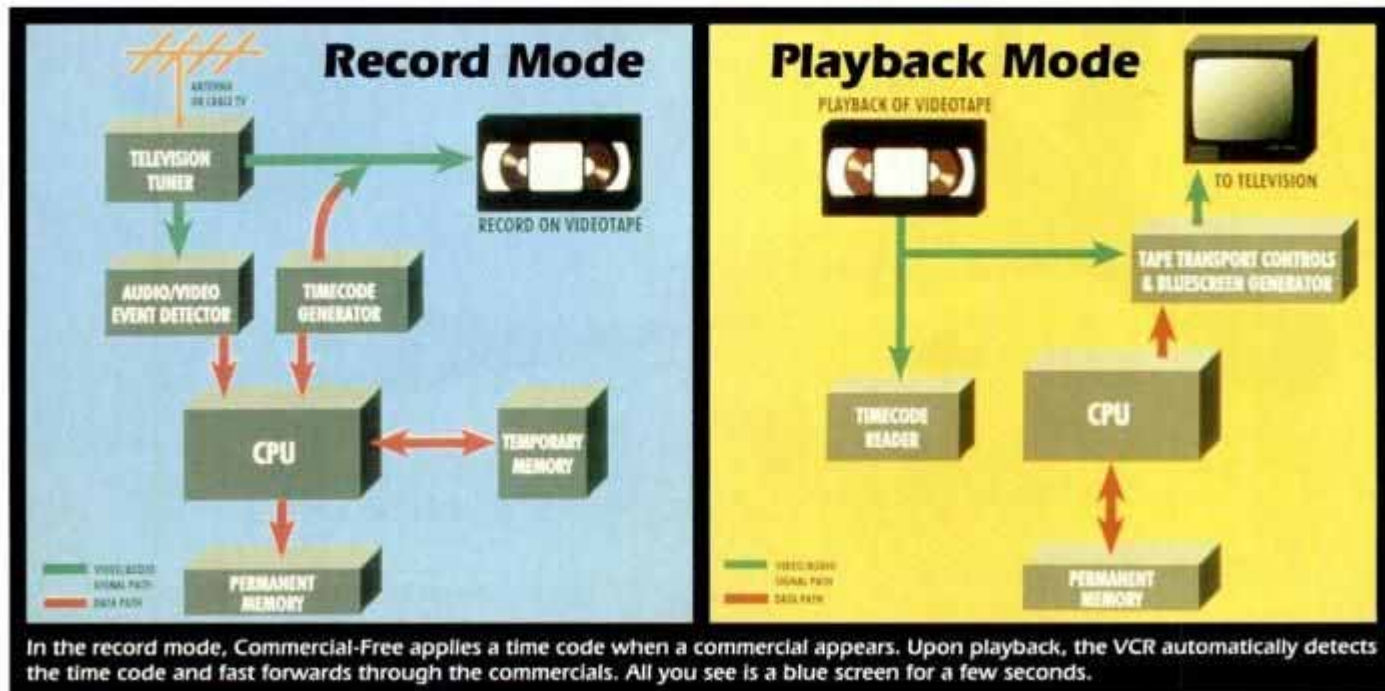
tape later, the map tells Commercial-Free where the commercial break begins and ends, and the system instructs your VCR to speed through this section of tape. Commercial-Free employs some proprietary formulas to distinguish between commercial breaks and mere scene transitions. For example, Iggulden notes that commercials seldom travel alone. Usually they're clustered in a "pod." Accordingly, the formulas in Commercial-Free would

look for a grouped pattern of telltale signals.

So what's the likelihood that broadcasters will do something soon to make Commercial-Free's technology obsolete tomorrow?

Iggulden believes such a move by broadcasters is unlikely. "People already can scan past the ads with their remote controls. All our technology does is automate the process," he says.

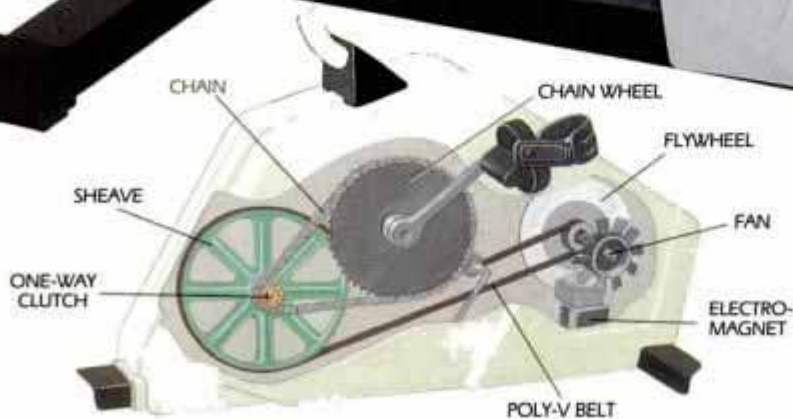
So if you're the type that sees red during a commercial, then you may be happier just seeing blue. **PM**



# HEARTBEAT OF AMERICA

Want to burn calories and strengthen the cardiopulmonary system? Who doesn't? We tested five aerobic machines that do just that.

BY JOE SKORUPA,  
Boating/Outdoors Editor  
PM Photos by Bill Ashe



**PRECOR M8.2E/L**  
Instead of transferring power, as it does on road bikes, the chain on the Precor recumbent stationary bike transfers resistance, which is supplied by an AC-powered electromagnet.

● All right. I'm finally convinced. I resisted for a while, but my body keeps telling me, "Use it or lose it." It's time to get a home aerobic machine and jump on it three or four times a week. I may not like the prospect of all the grunt work, but I only hurt myself if I procrastinate. After all, it's my heart we're talking about.

But after checking health clubs and fitness magazines, I've discovered there are a bewildering number of options: bikes, skiers, climbers, treadmills and many others. What are the differences? Is one machine better for me than the others? Where do I start?

Millions of people are asking similar questions as home aerobic machines enjoy a current boom. To provide the answers, POPULAR MECHANICS brought together five different units for two weeks of testing. Although each one was a different type of machine, the common denominator was a design that emphasized lower-body workouts and, of course, strengthening the cardiopulmonary system. This type of exercise gets the name aerobic because it requires the body to increase its intake of oxygen. (Exercise that doesn't require increased intake of oxygen, such as an all upper-body muscle-building workout, is called anaerobic.)

After fitness expert Michelle Quentzel (an aerobics director for a top New York health club) helped us analyze each machine from a biomechanical perspective, there was only one thing left to do: work up a sweat. We developed a series of 30-minute workouts that put both body and machine to the test. Here's what we found.

### Bodyguard Quantum Step By Step

Unknown as recently as the

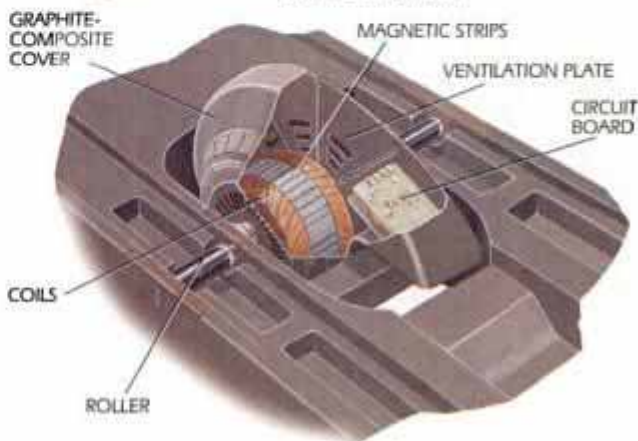
late 1980s, stair-steppers have moved to the forefront of home aerobic machines. The primary attractions are ease of use (most people can climb steps), a popular focus on the gluteus maximus muscles (everybody wants a tight butt) and the ability to offer a workout that doesn't overly stress the knees.

In a field sprinkled with flimsy products, the Quantum Step By Step by Bodyguard proves to be a rugged home exercise unit that's stable at all workout speeds. It's equipped with large footpads for good balance, plus traction pads for nonslip footing. An electronic control screen monitors useful exercise information. It also has a wide range of adjustable set-



### NORDICSPORT SKI 450

The unique MC<sup>2</sup> unit replaces the traditional flywheel with a magnet-and-coil generator that produces all the electrical energy the NordicSport Ski 450 requires.



## QUANTUM STEP BY STEP

tings, encourages good posture and provides a smooth, comfortable motion. The only nit to pick is with the sculpted armrests, which form a semi-cage around the user and partially inhibit free-swinging arms.

Overall, stair-climbers require some balance and coordination skills. They also require a good back. This combination means they are probably not recommended for the very old and the very young. Of this new type of machine, the Step By Step is a solid, well-designed unit that delivers the rugged and ergonomic kind of quality typically found in health clubs.

### Lifecycle 6500HR

Like all good upright stationary bikes, the Lifecycle 6500HR, by Life Fitness, not only delivers a good workout for the quadriceps (thigh muscles), but does so in a way that requires little skill, is gentle on the knees and is less challenging than a stair-stepper.

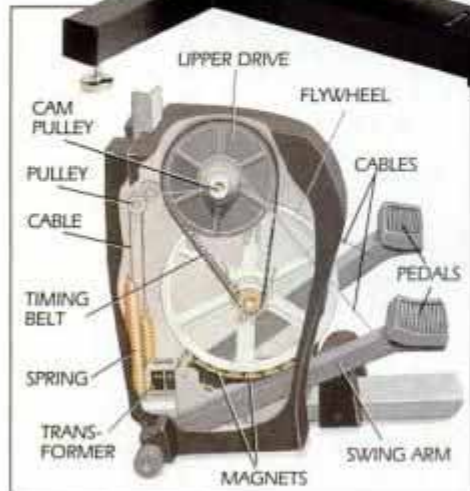
In addition to these benefits, the 6500HR comes with an impressive bundle of electronic features that run on a 9-volt battery and power generated by the unit itself. The user-friendly controls offer a wide variety of adjustable settings, and the digital display flashes all the information you need, including heart rate.

While the 6500HR has a number of outstanding features—smooth motion, minimal noise, smart ergonomic design and a sturdy frame—the Life-pulse heart-rate monitor places the unit in a class by itself. To activate the heart-rate monitor, just grab two clearly marked sensors built into the handlebars, which effortlessly pick up the pulse in your hands.

Except for those with lower back problems, the 6500HR is ideal for all levels of fitness and athletic skill. A sound overall design combined with the best electronics package in the test place the 6500HR in the top rank of home aerobic units.

### NordicSport Ski 450

Although Nordic Track introduced its first machine in 1975, it wasn't until the late '80s that cross-country ski machines exploded and virtually led



A complex system of cams, pulleys and springs produces the step motion for the Quantum Step By Step. Resistance is supplied by AC-powered electromagnets.

## SPECIFICATIONS AND TEST ANALYSIS

MANUFACTURER/MODEL/ ADDRESS	PRICE/ DISTRIBUTION	WEIGHT/HEIGHT/ WIDTH/LENGTH	RESISTANCE TYPE
<b>Bodyguard Quantum Step By Step</b> 2645 Watt St., Quebec City, Quebec, Canada G1P 312	\$1750/ Retail outlets only	125 lb./54" 22 1/2"/37"	Electromagnetic, requires plugging in
<b>Life Fitness Lifecycle 6500HR</b> 10601 N. Belmont Ave., Franklin Park, IL 60131	\$1500/Mail order <sup>1</sup> and retail outlets	77.5 lb./55" 22 1/2"/41"	Electromagnetic, 9-volt battery but no plug in
<b>Nordic Track NordicSport Ski 450</b> 104 Peavey Rd., Chaska, MN 55318	\$600/Nordic Track stores and mail order <sup>2</sup>	52 lb./65 1/2" 14 1/2"/35"	Pulley and brake for arms, electromagnet for legs
<b>Precor M8.2E/L</b> 20001 N. Creek Pkwy., Bothell, WA 98011	\$1800/ Retail outlets only	78 lb./43" 27"/63"	Electromagnetic, requires plugging in
<b>Trotter 525</b> 10 Trotter Dr., Medway, MA 02053	\$4200/ Retail outlets only	240 lb./48" 30"/69"	2-hp electric motor that requires plugging in

1. Call (800) 877-3867 ext. A644. 2. Call (800) 445-2231 ext. 02MF4.

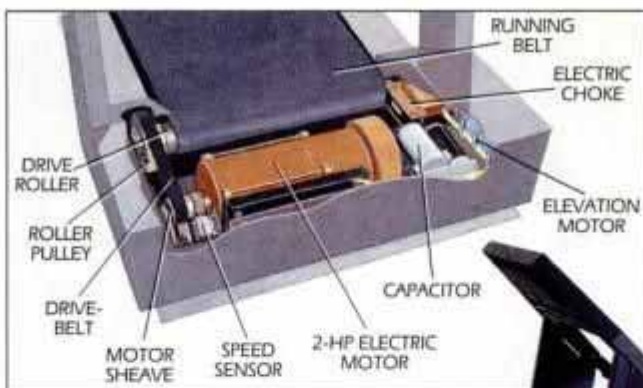
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the way into the current home fitness boom. Nordic Track's latest cross-country skiers are found in the new NordicSport line, and it is made with a cutting-edge graphite-composite base and a technologically advanced resistance system called the MC<sup>2</sup>.

Our test model was the NordicSport Ski 450—an affordable unit that features adjustable resistance levels for the arms and the legs, plus a screen that displays a wealth of exercise information, including heart rate, which is activated by plugging an ear clip into the main control board.

By far, the unit's most impressive feature is the MC<sup>2</sup>, which replaces a simple belt-and-flywheel system. In addition to controlling and adjusting resistance levels for the legs, the unit generates all the power needed to run the electronic control panel and display screen. Unlike the

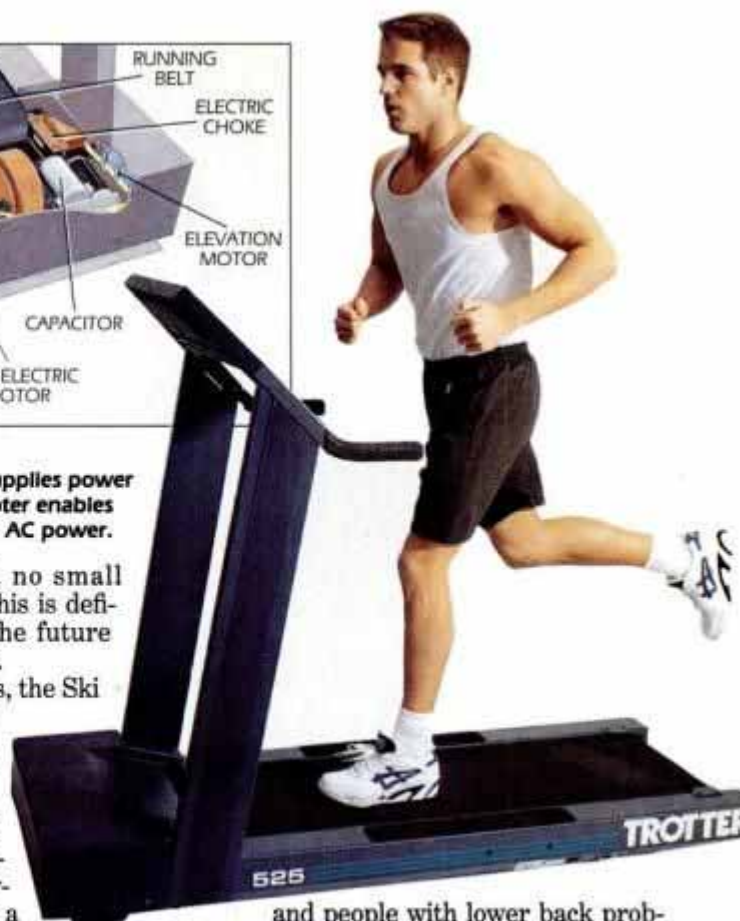


### TROTTER 525

A 2-hp electric motor supplies power and resistance. An adapter enables the DC motor to run on AC power.

Lifecycle 6500HR, no small battery is needed. This is definitely the wave of the future for aerobic machines.

Of all the test units, the Ski 450 requires the most athletic skill and longest learning curve. Balance, coordination and patience are definitely required. However, the payoff is a workout that reaches muscles in both the upper body (deltoids and pectorals) and lower body (quads and gluts). This is unique among the test group. While not necessarily recommended for the very young, very old



and people with lower back problems, the Ski 450 is ideal for serious aerobic exercisers and clearly it is the overall body-workout champ.

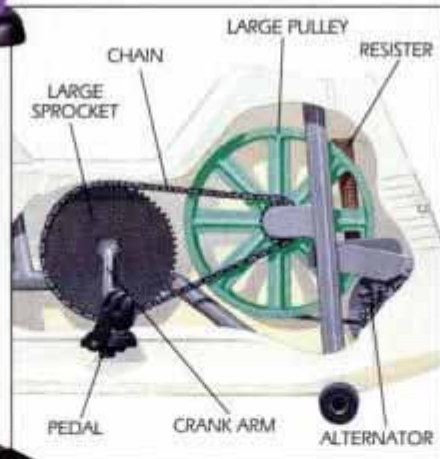
### Precor M8.2E/L

The most recent entry into the home aerobic machine market is the recumbent bike, a stationary bike that works out the quad muscles with a twist—the rider sits in a reclining position instead of upright. Recumbents are hot right now, because they're excellent for the elderly and those who want to avoid stressing their backs and butts.

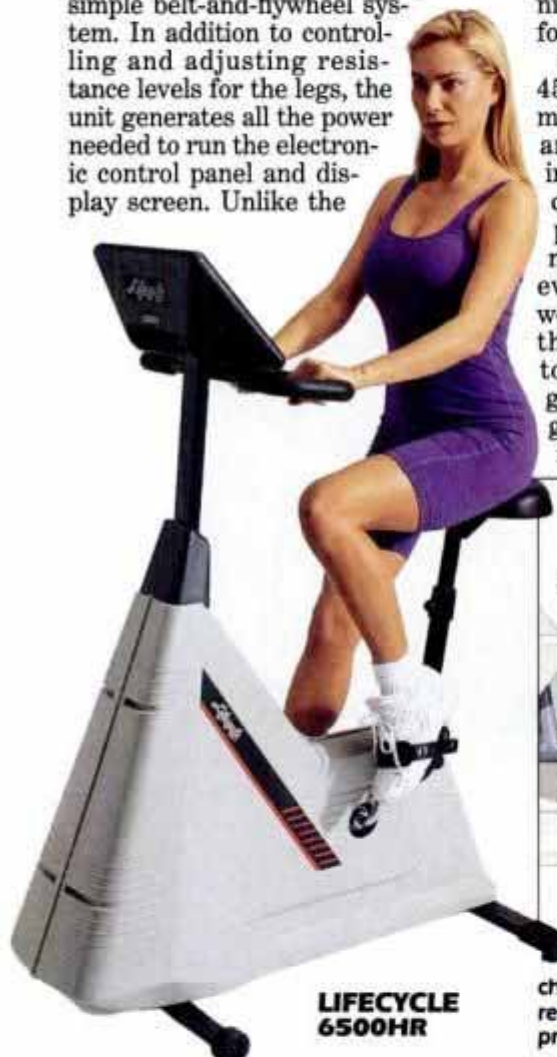
Our test model, the Precor M8.2E/L, is a comfortable, fully adjustable, plug-in unit that comes with a user-friendly display screen that helpfully retains four settings in memory. Importantly, it also has a heart-rate monitor, which the user activates by wearing a chest strap that transmits an infrared signal to a receiver mounted on the control stand.

While the M8.2E/L's basic design is smooth, well-balanced and solid, the

*(Please turn to page 117)*



As on the recumbent bike, the chain on the Lifecycle 6500HR transfers resistance instead of power. A generator produces all the electricity the unit needs.

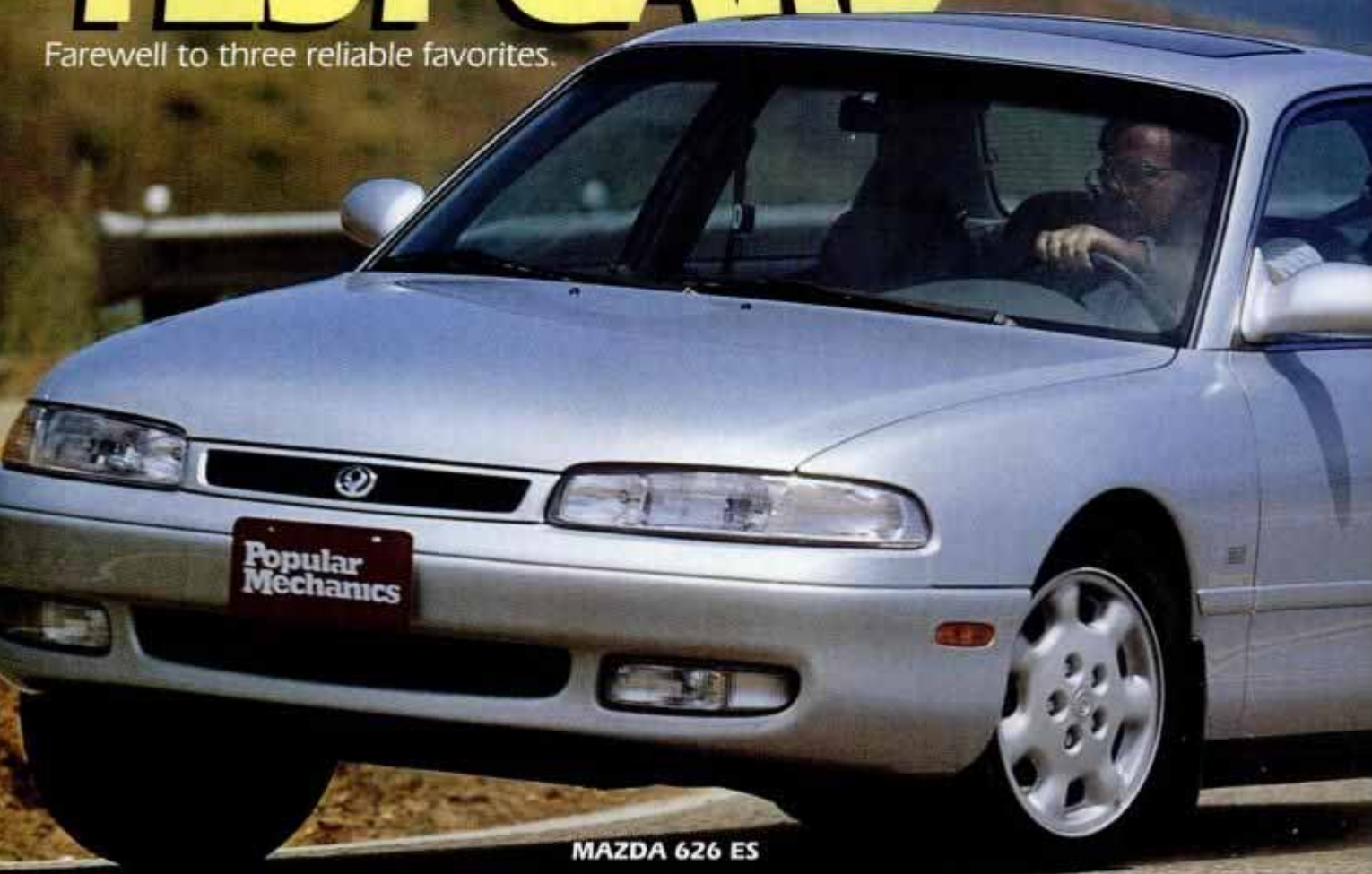


**LIFECYCLE 6500HR**

ELECTRONIC FEATURES	MUSCLES: MAJOR/SECONDARY	OVERALL ERGONOMICS	CONSTRUCTION/DURABILITY	BEST FEATURES	DRAWBACKS	RECOMMENDED USERS
Controls, screen, programs, memory of last parameters	Mostly quads, gluts/some hams, abs	Outstanding footpads, natural climbing motion	Strong base/should maintain structural integrity	Built-in bookshelf, works gluts, doesn't stress knees	Cage-like armrests slightly restrict free-swinging arms	Not ideal for children, elderly, those with lower back problems
Controls, screen, programs, heart-rate monitor	Mostly quads/some gluts, hams, abs	Comfortable setup, encourages good posture	Stout where it counts/long-term value	Superb heart-rate monitor, generates own power	Upright seat requires some balance and back strength	Good for all ages and levels of fitness
Controls, screen, programs, heart-rate monitor	Mostly quads, delts/some pecs, gluts, abs	Comfortable, smooth and adjustable	Base made of graphite composite/should last	Upper- and lower body workouts, heart-rate monitor	Requires patience, skill, long learning curve, coordination	Serious adult users without lower back problems
Controls, screen, programs, memory, heart-rate monitor	Mostly quads/some gluts, hams	Comfortable, adjustable, stress-free seat	Screen, panel need reinforcing/rugged where it counts	Four-setting memory, remote heart-rate monitor	Doesn't require use of trunk and ab muscles	Good for all ages, fitness levels and therapy
Controls, screen, programs, memory	Mostly quads, hams, hip flexors/some abs	Length/width of track ideal for all speeds	Made with health-club toughness/built to last	Huge screen, big track, rock-solid, smooth	Sticker shock, not for those with lower back problems	Good for all ages, fitness levels and therapy

# LONG-TERM TEST CARS

Farewell to three reliable favorites.



MAZDA 626 ES

## Mazda 626 ES

● Few long-term testers have given us as much unmitigated pleasure as the Mazda 626. Over the past year, it has made its rounds without a hiccup, squeak or rattle. It is one of those rare cars always ready to respond to its driver's whims.

Whether it's a coast-to-coast cruise, a blast down your favorite stretch of back road or just a run to the local supermarket, the 626 has a personality matched to each job. Its well-shaped bucket seats provide excellent long-haul comfort as well as sports-car support when the curves start coming at you quickly. Its handling is exceptional among midsize sedans—quick, precise and

agile. And its 2.5-liter V6—the same engine that powers the Ford Probe GT and Mazda's MX-6 coupe—is one of the sweethearts of internal combustion. Although there are more potent engines available in this class, few deliver with the kind of mid-range zeal of this Mazda motor.

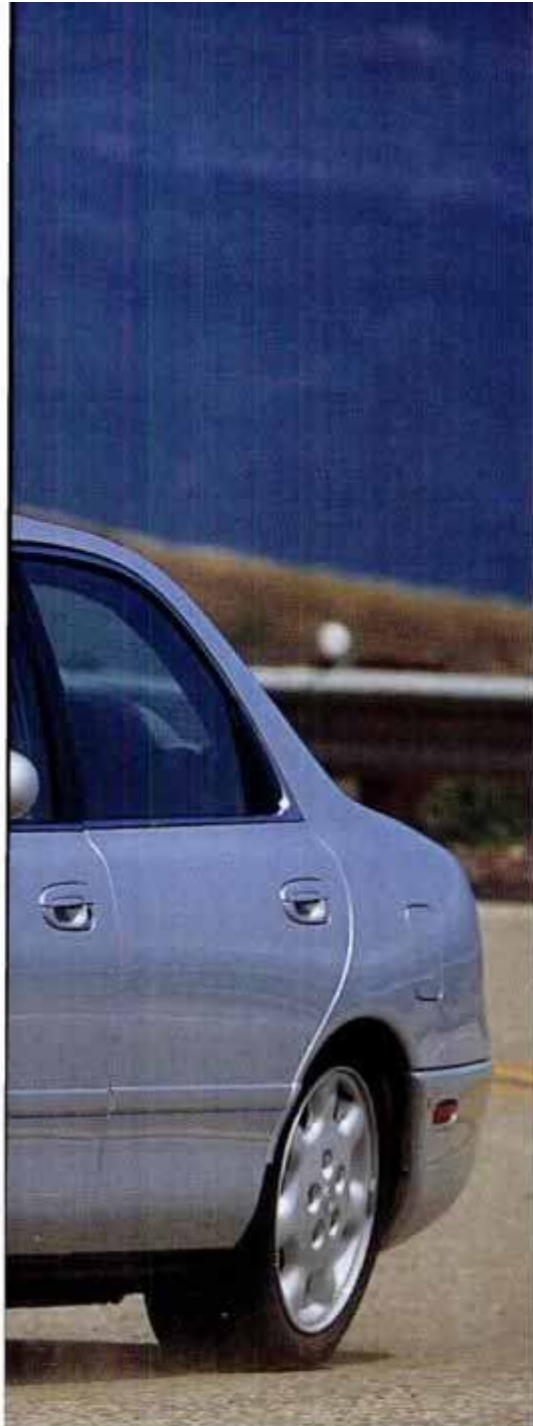
The 626 also delivers better-

than-average fuel economy. Over the course of our test, we averaged 24.3 mpg. There weren't many entries on the negative side of the 626's long-term logbook. Highway wind noise drew a few comments, as did the cruise control, which is not as easy to adjust up and down as are some others.

We also noted an occasional



TOYOTA CELICA GT



startup noise from the valvetrain after the car had been sitting for a few days. This would disappear after a few minutes.

But on the whole, performance was



ISUZU AMIGO XS

TM PHOTO BY CLIFF GARDNER

superb. Although there are a lot of cars that call themselves sport sedans, this is one of the few that lives up to the title. —Tony Swan

**TEST SUMMARY**

Report number: 4  
 Total miles driven: 16,648  
 Miles driven since last report: 6391  
 Average fuel economy: 25.4 mpg  
 Worst observed fuel economy: 21.9 mpg  
 Best observed fuel economy: 28.5 mpg  
 Maintenance/repair costs: None

**Toyota Celica GT**

You want to know what we like best thus far in our test Celica GT? This is a car with no pretensions whatsoever of being anything but what it is—a balls-to-the-wall, drive-me-hard-every-minute sport coupe.

Forget about utility. You can't even get into the back seat, much less sit there. The leather-covered front buckets are tight and uncomfortable if you're a 250-pound widebody. And the suspension is taut—no, make that stiff. But the Celica GT is about driving, not sitting. If you want a car that's great to sit in, go look at the Cadillac Fleetwood Brougham. If you want a car that you can drive the wheels off, rush to your Toyota dealer

and check out the Celica GT.

On dry pavement, we couldn't help constantly pushing this car to its limits. Its 135 hp feels like 190 and the slick-shifting automatic can bang off manual shifts if you want. Surprisingly, the Celica GT did yeoman's service in the snow and ice, too, constantly amazing us with its surefootedness and excellent stability.

Even with all the hard driving and winter conditions, we haven't been able to get less than 22 mpg out of this car, which we consider outstanding based on the conditions it's endured. However, we're going to turn it over to a less leadfooted member of the staff for the next report to see if the Celica can do better.

Sorry for not having anything further to report at this time, but is it our fault that absolutely nothing has broken or failed in the first 7200 miles?

—Joe Oldham

**TEST SUMMARY**

Report number: 2  
 Total miles driven: 7287  
 Miles driven since last report: 7277  
 Average fuel economy: 23.6 mpg  
 Worst observed fuel economy: 22.8 mpg  
 Best observed fuel economy: 24.4 mpg  
 Maintenance/repair costs: None



HONDA ACCORD EX

TM PHOTO BY CLIFF GARDNER

## LONG-TERM TEST CARS

### Isuzu Amigo XS

*Editor's Note—In our last report, we admitted to not fully understanding the appeal of the Isuzu Amigo to young adults. We said that we would enlist the aid of a typical college student to help us gain that understanding. This is his report.*

I'm a freshman at Rider College in Lawrenceville, New Jersey. It's bad enough being a freshman, but if you're a freshman without really cool wheels, you're dead on campus. So when the opportunity came along to help POPULAR MECHANICS test an Isuzu Amigo XS, I naturally jumped at the chance.

The Amigo is definitely considered cool among college students in general, and especially here at Rider. Amigos aren't exactly a dime a dozen on campus, but you see enough of them so that you're conscious of them being around. A great thing about the Amigo is that it's considered cool among guys and girls, not just guys. Take a car like the Chevy Corvette. Guys think it's great. But most girls think it's too low, too tight and uncomfortable—and it doesn't have a back seat. I know all this because my dad owned a Corvette. On the other hand, guys think the Amigo is tough, and girls think it's cute.

In the past few months, I've put about 4000 miles on the POPULAR MECHANICS test vehicle, mostly in and around campus, with a couple of trips home and one big road trip to the University of Delaware. The Amigo is great for two people. You can fit two more in the back, but it's tight back there and a real chore just climbing in. It would be much better if the vehicle had a rear door or hatch.

Before the bad winter hit, I wanted to get the top off one day to do some open-air cruising. It took my friend and me over an hour and it was a real pain. There's room for improvement here.

Once the bad weather did hit, the



SUBARU IMPREZA L

PHOTO BY SCOTT DWIGGART

Isuzu was incredible. I just locked the front hubs with a simple twist and shifted into 4-wheel drive. I always felt very safe in this truck and avoided all the slipping and sliding everyone else was going through at the time. After one big storm, the snow that had been cleared from campus roadways had been piled into a huge mountain—about 15 or 20 ft. high. The guys from Lincoln dorm dared me and, don't tell my dad, I took them up on the dare. Yes, the Amigo climbed the snow mountain.

All of this technical stuff is secondary, however. To truly appreciate the charisma of the Isuzu Amigo, you have to cruise around campus in it. Take in the admiring glances of both guys and girls. Park, stand back and watch the crowd form around the Amigo. College kids just like this thing. It's amazing. Now that the weather has broken, I'm going to practice the top-down routine until I get it under an hour. Hey girls, wanna go for a ride? —Steven Oldham

#### TEST SUMMARY

Report number: 2  
Total miles driven: 4455  
Number of miles since last report: 4270  
Average fuel economy: 20.4 mpg  
Worst observed fuel economy: 17.6 mpg  
Best observed fuel economy: 25.3 mpg  
Maintenance/repair costs: None

### Honda Accord EX

Want to test the mettle of a car really quick? Spend the worst New York winter in recent history with it. Start

it up morning after morning in sub-zero temperatures. Drive it through deep snow and over glare ice. Get stuck with it at the bottom of your driveway. Commute with it for weeks straight, on slushy, salt-covered highways. Believe us, you'll find out a lot about a car—good and bad.

And that's what we've just done with our 1994 Honda Accord EX Coupe. So we know a lot more about this car than we did when we brought you our last report. For one thing, we know this is a car that gets more friendly with each passing day. The harder the drive, the worse the conditions, the more we felt we could count on the Accord to get us through. Even on the worst roads and through the worst conditions, the Accord constantly gave us a feeling of great stability and safety. The Honda had become our friend.

Don't take this quality lightly. There are cars we drive that never feel friendly—even after thousands of miles. Some cars feel like they're constantly fighting you, making your drive harder, not easier, keeping you from feeling truly comfortable and secure in the vehicle.

The Accord Coupe is one of the more comfortable and utilitarian 2-door cars on the market. Four really big guys fit comfortably, but, frankly, getting in and out of the back seat is a chore. Egress is very cramped and you have to contort yourself to keep from being hanged on the safety belt.

*(Please turn to page 105)*



DODGE INTREPID ES

PHOTO BY BOB AITKEN

# DODGE INTREPID



Chrysler's mainstream LH sedan wins a vote of confidence.

BY MICHAEL LAMM, Contributing Editor; PM Photos by David Dewhurst

• At \$16,030, the Dodge Intrepid is the least-expensive member of Chrysler's new LH family. Next comes the Eagle Vision at \$17,487, then the Chrysler Concorde at \$18,441, the Chrysler New Yorker at \$24,294 and the top-of-the-line Chrysler LHS at \$29,046.

Excellent cars, according to virtually all of the many automotive writers and broadcast journalists who tested them. And the kudos were enthusiastically echoed by our Intrepid owners.

First, they found the Dodge Intrepid amazingly well-equipped. Oft-mentioned—and apparently much appreciated—standard features ranged from the car's dual airbags to its V6 engine, its 4-speed automatic



transaxle, its 3-abreast 50/50 front bench seat with folding armrests, tilt steering wheel, rack-and-pinion power steering, rear air-conditioning and heating ducts, speed-sensitive intermittent windshield wipers, headlight delay switch with warning chimes, AM/FM

ETR sound system and full instrumentation.

To this, the up-market ES model adds 4-wheel disc brakes, touring suspension, polycast steel wheels, bucket seats with a center console, an electronic message center and a half-dozen additional comforts, all of which add \$1259 to the price of the base Intrepid.

With either model, buyers can order optional anti-lock brakes, low-speed traction control, two different

# DODGE INTREPID



Owners liked dark-on-white markings.



Overall roominess rated high marks.



Most owners opted for a basic 3.3-liter V6.

air-conditioning systems, built-in child safety seats and a remote key-less-entry system.

The Intrepid comes in only one body style—an aerodynamic 4-door sedan. Besides winning a number of awards, it's a design that almost everyone seems to like. The cab-forward look drew terrific scores from

nearly all of our respondents. Some three-quarters listed styling as their main reason for choosing this car over its main rivals—the Ford Taurus, Honda Accord, Toyota Camry and Nissan Maxima.

Another plus was roominess, which the Intrepid has in abundance. Chrysler simply produced a bigger

basic package than the competition, which shows up the most in exceptional rear-seat roominess. The front bench seat makes this a true 6-passenger sedan. Both front and rear seating comfort received ratings of excellent from nearly 80% of the owners we surveyed.

The Intrepid's standard engine is a

## SUMMARY OF DODGE INTREPID OWNERS REPORTS\*

<b>Total miles driven</b>	2,244,187	<b>Noise</b>	11.8	Excellent	74.5%	<b>Engine noises</b>	7.6
<b>Average miles driven</b>	5829	<b>Rear sightlines</b>	7.3	Good	22.9	<b>Transmission</b>	6.5
<b>Purchase price:</b>		<b>Inadequate windshield defroster</b>	5.1	Average	2.3	<b>Repair it yourself?</b>	
Average	\$19,019	<b>Vulnerable trunk release</b>	5.1	Poor	0.3	No	97.8%
Range	\$14,866-\$25,400	<b>Suggested changes:</b>		<b>Driver sightlines:</b>		Yes	2.2
<b>Why did you choose the Intrepid?</b>		Adjust headlamps properly	14.0%	Excellent	62.1%	<b>Dealer repairs satisfactory?</b>	
Styling	74.3%	No changes	9.2	Good	29.2	Yes	67.9%
Roominess	26.5	Reduce noises and rattles	8.5	Average	6.9	No	32.1
Handling	16.7	Improve defroster	7.4	Poor	1.8	<b>Dealer service opinion:</b>	
Price/value	11.9	Improve seat comfort	5.5	<b>Overall convenience:</b>		Excellent	54.4%
Reputation	10.8	Relocate trunk release	5.2	Excellent	69.4%	Good	36.8
Ride quality	7.9	<b>Engine power:</b>		Good	28.0	Average	5.7
<b>Model choices:</b>		Excellent	61.8%	Average	2.6	Poor	3.0
Standard Intrepid	54.6%	Good	36.9	Poor	0.0	<b>Dealer sales policy:</b>	
Intrepid ES	45.4	Average	1.3	<b>Workmanship opinion:</b>		Excellent	56.8%
<b>Options/Accessories:</b>		Poor	0.0	Excellent	75.5%	Good	36.9
Air conditioning	99.7%	<b>Handling:</b>		Good	22.8	Average	5.0
Antilock brakes	41.0	Excellent	85.0%	Average	1.3	Poor	1.3
Optional suspension	39.3	Good	14.5	Poor	0.3	<b>Number of vehicles owned:</b>	
Leather interior	6.4	Average	0.5	<b>Comfort opinion, front seats:</b>		This vehicle only	22.2%
Integrated child seat	2.1	Poor	0.0	Excellent	79.7%	Two vehicles	42.9
<b>Avg. mpg, city/hwy:</b>		<b>Braking:</b>		Good	16.5	Three vehicles	25.3
3.3-liter V6	21.3/26.9	Excellent	72.0%	Average	2.8	Four or more	9.7
3.5-liter V6	19.8/25.4	Good	27.0	Poor	1.0	<b>Principal driver:</b>	
<b>Engine choices:</b>		Average	0.8	<b>Comfort opinion, rear seats:</b>		Male	50.3%
3.3-liter V6	88.3%	Poor	0.3	Excellent	80.2%	Female	43.6
3.5-liter V6	11.7	<b>Overall performance:</b>		Good	18.5	Equal	6.1
<b>Specific likes:</b>		Excellent	73.3%	Average	0.5	<b>Age distribution of owners:</b>	
Styling	64.5%	Good	26.4	Poor	0.8	Under 29	5.0%
Handling	55.6	Average	0.3	<b>Any mechanical trouble?</b>		30-49 years	44.7
Roominess	38.5	Poor	0.0	No	76.4%	50-plus	50.2
Comfort	29.3	<b>Control layout:</b>		Yes	23.6	<b>Based on your experiences, would you buy a Dodge Intrepid if you had it to do over again?</b>	
Ride quality	27.4	Excellent	71.5%	Cruise control	20.7%	Yes	79.0%
Engine power	17.6	Good	26.0	Electrical system	12.0	Maybe	16.2
<b>Specific dislikes:</b>		Average	2.6	Fuel gauge	10.9	No	4.9
No complaints	21.7%	Poor	0.0	Air conditioning	7.6		
Headlight adjustment	12.5	<b>Instrumentation:</b>					

\* Percentages might not equal 100% due to rounding up or insufficient data.

3.3-liter pushrod V6, introduced in 1990. It delivers 153 hp, and while this doesn't seem like much for a 3200-pound car, most of our respondents judged its performance as excellent. Also, output of the 3.3-liter V6 has been increased by 8 hp—to 161 hp—in 1994 models.

There's also an optional engine—a totally modern 3.5-liter 24-valve sohc V6. This powerplant produces 214 hp at 5800 rpm, with a redline of 6300. The 3.5-liter's 221 ft.-lb. of torque stretches from 2100 to 5600 rpm, so it gives a very broad powerband, important for use with automatic transmissions.

The larger V6 adds only \$625 to the Intrepid's overall price, and while the 3.5-liter makes a dramatic difference in launch and passing acceleration, it hardly cuts fuel consumption at all. We were surprised that only 11.7% of our owners chose the optional 3.5-liter version.

Handling was a feature Intrepid owners greatly admired—85% judged it excellent, an exceptionally high rating, particularly for a car in this size class.

The Intrepid's handling begins with a very rigid, solid body structure. Front MacPherson struts and multi-link Chapman struts at the rear form the basic suspension system. The Intrepid's spring and shock rates come in three levels of tune: base, touring and performance.

At the head of a very short list of mechanical problems came a stubborn cruise control, which 20.7% had to take back to the dealer for repair. Nonmechanical complaints included several different types of door problems. The most common had to do with broken front-door limit straps.

Another frequent complaint—in fact, the *most* frequent complaint—touched on the Intrepid's headlamps, which some respondents found inadequate, even on high beam. Chrysler reports that a few units simply weren't adjusted properly at the factory, but a spokesman also added that they've recently re-engineered the reflectors and lenses.

However, like most of the other Intrepid complaints, the headlight issue seems to be a minor flaw in an otherwise outstanding car. Almost 22% of our respondents had no complaints under the Specific Dislikes heading, and more than 9% were unable to suggest any changes.

There's no doubt that Chrysler scored an important coup with its LH sedans. The company needed a home run to stay in the ballgame. And according to the owners we surveyed, the Intrepid—the bread-and-butter LH—represents just that. **PM**



Intrepid's celebrated cab-forward design pleased most owners, who cited styling as their prime purchase motivation. Spacious interior and crisp handling also won praise.

## EDITORS REPORT

### Prescription: LH

● Somewhere, someplace there's an LH owner who's not happy. Maybe.

Everybody likes these cars. The value is high for both stripped models and fully optioned models, although we'd probably skip checking off the box for the leather seating. It's too slippery to keep the editorial backside stationary on the seat when whipping around corners as fast as an Intrepid encourages one to go.

While the pushrod 3.3-liter V6 is fine, we strongly recommend the 4-cam 3.5-liter V6. There's little penalty in fuel mileage, and plenty of rewarding midrange torque to compensate. The traction control is one feature we really haven't had much need for in the wilds of suburban New Jersey, but the few times we activated it, it worked fine. It manages to keep the front tires glued to the ground and reduces steering-wheel kickback at low speeds over loose gravel and puddles.

One of the few differences between the Dodge/Plymouth/Chrysler-flavored LH models are the headlights. The Intrepid headlamp is different from the others, and Chrysler is in the midst of re-engineering the headlamps on the Vision and Concorde. Most of the changes have to do with evening out the spread of light.

Some of the owners in our survey complained about headlights, but we really hadn't noticed any problem.

Similarly, we haven't noticed any problem with squeaks or rattles—every LH we've driven has been as tight as a bank vault and as quiet as a teenager trying to sneak back

into the house at three in the morning.

Yes, the performance suspension is firmer than the standard. Consequently, it allows more road noise to intrude into the interior. One change since our survey is to make the performance suspension truly optional, rather than bundling it with other options. This way a buyer who really wants a loaded car won't be forced to take the stiffer, noisier suspension.

Nor have we had any problem with the trunk release. Of course, we generally use the electronic trunk-release button on the key fob rather than reaching for the one on the floor.

As for the defroster, every LH in our experience has had the optional air conditioning with automatic temperature control. It's CFC-free, and it kept us cool in one of the nastiest, hottest and most humid New York City summers we can remember.

We use the cruise control a lot—it's just about the only way to keep from inadvertently achieving warp-drive speeds on the open roads when prudence would prefer maintaining a more politically correct velocity. And the cruise control is as good as any we've seen, from the easy-to-find buttons on the steering wheel to its smooth acceleration when resuming speed after slowing for a tollbooth.

All in all, it's easy to see why our owners like these vehicles so much, and hard to understand when they've found even minor faults. Some people are never happy—but driving one of these cars is a good prescription for curing the blues. —Mike Allen

TELECOMMUNICATIONS

# RIDING THE TOLL-FREE INFOBAHN

A Canadian model for the data superhighway has no tolls. The cost is borne by the service provider and not the consumer.

BY GEORGE MANNES; PM Illustration by Peter Bollinger







INFORMATION SERVICES



HOME AUTOMATION



TRANSACTIONS



INVESTMENT SERVICES



BANKING



HOME SHOPPING



TICKET PURCHASING



GAMES

Quebec's UBI system will offer subscribers a wide array of interactive services. In addition to the services shown here, subscribers would be able to use electronic mail, access databases and even play the lottery.

Starting in the spring of next year, if all goes according to plan, several thousand residents of the province of Quebec will be able to do a lot more than just passively watch TV. They'll use their television to play the lottery. They'll make dinner reservations. They'll pay their bills. They'll send their neighbors electronic mail. And they'll print out coupons they can use in their local grocery store. And since the price tag for all these extras is just a few dollars, these Quebecers will be riding the information highway on what's essentially a toll-free road.

The proposed system, dubbed "UBI," is only one of many ventures announced around the continent to test what many companies and customers hope will be the cable system of the future: one that offers not just entertainment, but a grab bag of interactive services.

What's distinctive about UBI (which stands for Universality, Bidirectionality and Interactivity) is its ambition. UBI hopes to put its hardware into 80% of the homes (approximately 34,000) in the Chicoutimi/Jonquiere region of Quebec by the end of the year. In some ways this project is more evolutionary than revolutionary since one of the companies behind UBI, the Canadian communications company Le Groupe Videotron, already offers a form of interactive television in Montreal and other areas of Canada. The company's Videoway system lets home viewers access games and

information services, and even pick the camera angle they want to watch during a hockey game. For Groupe Videotron, UBI represents a long-planned step toward greater interactivity in cable.

The first UBI system will be piggybacked onto an upgrade of Groupe Videotron's cable network in Chicoutimi. The current cable system in that area is a noninteractive system with 450 megahertz (MHz) of bandwidth, giving it a capacity of about 40 channels. The system is being rebuilt as an interactive 750-MHz system able to carry close to 100 TV channels. The system will allow 2-way, packetized digital transmission of data, software, sound and graphics, with users able to send 200 kilobits per second of information back toward the cable network's control center, or "head end." The upgraded system will have a fiberoptic cable running from the head end to individual "cells," a group of about 2000 homes each. At the cell level, the network switches to traditional coaxial cables for transmitting signals the rest of the way to peoples' homes.

At the heart of the planned UBI system in Chicoutimi will be multimedia servers that will receive transactional information from the home and deliver interactive services. These central computers, however, won't be the video servers that other companies are testing this year because the UBI equipment won't be

## RIDING THE TOLL-FREE INFOBAHN

delivering digitally compressed movies on demand in immediate response to requests from individual households.

Instead, says Michel Dufresne, president of Groupe Videotron's Videoway Communications subsidiary, the UBI system will have about 15 to 20 channels devoted to "near video-on-demand." The same recent, popular movie might run on several channels simultaneously; starting times would be staggered every 15 or 30 minutes, so viewers would never have to wait too long once they decide to watch that movie. "Our technology, I think, is simpler than implementing video-on-demand," Dufresne says.

The hardware that will be in each home hasn't been finalized, but Dufresne has a rough outline. The main terminal will be an upgraded version of the box that current Videoway subscribers use in Montreal. Inside the set-top box will be a PowerPC microprocessor based upon the chip developed by Apple, IBM and Motorola—though the UBI chip won't be as powerful as the one designed for desktop computer use. The UBI box includes about 2 megabytes of RAM for downloading information and software from the network. "The network will provide the software the same way a hard disk does for a personal computer," Dufresne says. "If you want to play a game, the game is downloaded into the terminal from the network."

Connected to the terminal will be a "transactional" module that home users will use to pay for services they order over the terminal. People ordering goods or services from their TV will be able to pay by swiping their credit card or bank card through the machine. An alternative form of payment will be a smart card encoded with a particular amount of credit—like a fare card purchased for a public transportation system—from which a dollar amount can be deducted for each transaction.

Also part of the transactional module will be a numeric keypad, Dufresne says, for communicating such information as dollar amounts during home-banking operations and personal identification numbers for credit-card authorization.

A third piece of home equipment will be a small printer. This will be used to produce a transaction receipt if you've ordered any items, such as flowers, or discount coupons for

restaurants and other businesses.

While the transaction module and the printer will be hard-wired to the terminal for the Chicoutimi rollout, the eventual plan is to have a different communications link. This could be done via infrared signals or by signals traveling over a house's electrical wires using the home automation standard developed by the Electronic Industries Association.

The cost to consumers of this in-home interac-

clude lottery operator Loto-Quebec and the National Bank of Canada, which says it will offer basic banking and bill-paying services. Canada Post Corp., the equivalent of the U.S. Postal Service, plans to offer commercial and personal electronic mail, large file transfers, deferred bill payments and other mail storage services. The utility company Hydro-Quebec expects that customers will be able to view information about their accounts, along with materials

from company brochures. The company would be able to inform customers of planned service interruptions. Eventually, Hydro-Quebec says, its bills could be sent and paid electronically. Farther down the electronic highway, customers could use the UBI system to automatically regulate their heat, light and water heater usage for different times of the day.

In addition to these planned partners, more than 90 service providers have agreed to offer goods or services over UBI, including companies such as Coca-Cola, Avon and Sears Canada.

The UBI system could be a costly undertaking, with a terminal, transaction module and printer costing about \$450 total by Dufresne's estimate. Just manufacturing equipment for 34,000 homes in Chicoutimi will cost more than \$15 million. Marketing, along with system hardware and software, will add to UBI's expenses, and the UBI partners are already planning to expand beyond Chicoutimi. Starting in 1996, they say, they will roll out the system over a period of six years to the metropolitan regions of Quebec City and Montreal. The venture isn't expected to be profitable for four to five years, Dufresne says.

Though it is a business, UBI is also an experiment. While the group is confident that its technology is sound, says Dufresne, questions remain about the system's appeal to consumers.

"Is there really a business there?" is one of the questions that has to be answered, says Dufresne. "All those partners want to know: Is it right that people will buy those things from the home on their TV sets? Is it right that they will use video-on-demand as part of it? ... I think we know the answer but we want to check it out before we deploy. Because our plan is to deploy into more than 1 million and a half homes within the next five to six years, you don't want to be wrong." **PM**



Hardware for the home would include a set-top terminal, a transaction module that recognizes credit cards and issue receipts or coupons and a remote control.

tive gear will be minimal, Dufresne says. Users won't have to buy the equipment. Rather, they will rent it at a minimal cost—\$2 or \$2.50 a month, he says, or whatever price it takes to persuade 80% of the households in the market to sign up for service. They'll have to pay for items they buy or for services such as pay-per-view movies. Most of the cost, though, will be borne by the service providers who will be paying UBI for using the network.

At press time, five companies were planning to join Groupe Videotron and Videoway as partners in the UBI consortium, though they hadn't finalized the necessary agreements yet.

One of the expected participants is The Hearst Corp., publisher of POPULAR MECHANICS. Hearst plans to offer a business directory that would be an electronic competitor to the Yellow Pages. Subscribers could use their TV screens to search for businesses in different categories—say, florists, plumbers, restaurants or car dealers. Once a promising listing comes up, the user could call up additional information about that business. They could print out a promotional coupon for a discount, or they could make a reservation at a restaurant.

Hearst is also planning to include a service called HomeNet on the UBI system that would translate the company's current editorial products into interactive multimedia that is relevant to the home: design, construction, decorating, entertainment, maintenance and repairs.

Other expected partners in UBI in-

# John's losing his hair. His mission: get it back.

ASAP!  
But how?  
Weaving? No.  
Transplant?  
Not for him.  
A hairpiece?  
Never, never.  
What John really  
wants is his  
*own* hair back.  
And now he's learned,  
for male pattern  
baldness, only  
*Rogaine*<sup>®</sup> has been  
proven to regrow hair.

*Rogaine*<sup>®</sup> Topical Solution (minoxidil topical solution 2%) works in part by prolonging the growth of hair, which grows in cycles. With more hairs growing longer and thicker at the same time, you may see improved scalp coverage.

### Will *Rogaine* work for you?

Dermatologists conducted 12-month clinical tests. After 4 months, 26% of patients using *Rogaine* reported moderate to dense hair regrowth, compared with 11% of those using a placebo (a similar solution without minoxidil — the active ingredient in *Rogaine*). After 1 year of use, 48% of the men who continued using *Rogaine* in the study rated their regrowth as moderate to dense. Thirty-six percent reported minimal regrowth. The rest (16%) had no regrowth.

*Side effects* were minimal: 7% of those who used *Rogaine* had itching of the scalp.

*Rogaine* should only be applied to a normal, healthy scalp (not sunburned or irritated).

### Make a 4 month commitment to see results.

Studies indicate that *at least 4 months of twice-daily treatment with Rogaine are usually necessary before there is evidence of regrowth*. So why not make it part of your normal routine when you wake up and go to bed, like brushing your teeth.

As you'd expect, if you are older, have been balding for a longer period, or have a larger area of baldness, you may do less well.

*Rogaine* is a treatment, not a cure. So further progress is only possible by using it continuously. Some anecdotal reports indicate that if you stop using it, you will probably shed the newly regrown hair within a few months.

**Get your free Information Kit today. You may even be eligible for a free, private hair-loss consultation with a doctor.\***

Why wait? Find out whether *Rogaine* is for you. Call 1-800-548-3535 for a free Information Kit about the product and how to use it. **And because *Rogaine* requires a prescription**, we'll include a list of nearby *dermatologists or other doctors experienced in treating hair loss who may be able to offer you a free, private hair-loss consultation.\**

Call

**1 800 548-3535**

for your free Information Kit on *Rogaine*.

We'll also tell you how to find out if you're eligible for a free, private hair-loss consultation with a doctor.\*

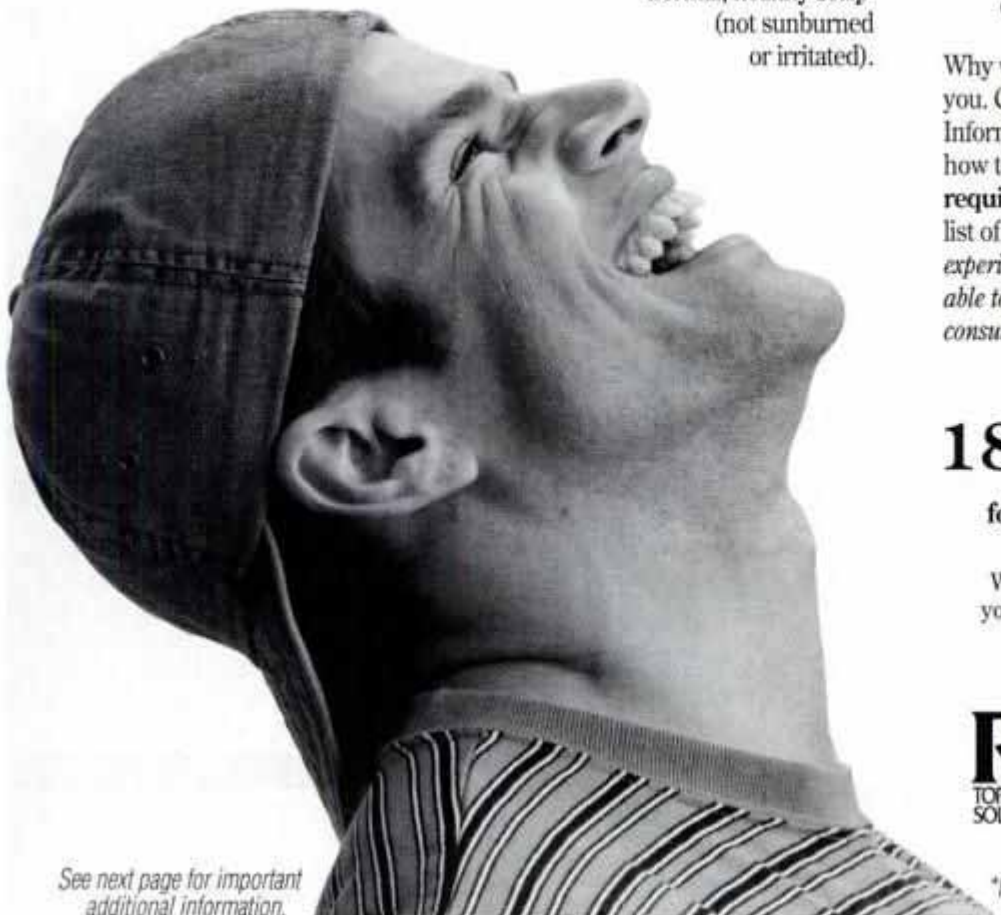
**Rogaine**<sup>®</sup>  
TOPICAL SOLUTION minoxidil 2%

See next page for important additional information.

\*Not available in all areas.

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**Rogaine**<sup>®</sup>  
TOPICAL SOLUTION minoxidil 2%

## The only product ever proven to regrow hair.

### What is ROGAINE?

ROGAINE Topical Solution is a prescription medicine for use on the scalp that is used to treat a type of hair loss in men and women known as androgenetic alopecia: hair loss of the scalp vertex (top or crown of the head) in men and diffuse hair loss or thinning of the front and top of the scalp in women. ROGAINE is a topical form of minoxidil, for use on the scalp.

### How effective is ROGAINE?

**In men:** Clinical studies with ROGAINE of over 2,300 men with male pattern baldness involving the top (vertex) of the head were conducted by physicians in 27 US medical centers. Based on patient evaluations of regrowth at the end of 4 months, 26% of the patients using ROGAINE had moderate to dense hair regrowth compared with 11% who used a placebo treatment (no active ingredient). No regrowth was reported by 41% of those using ROGAINE and 58% of those using a placebo. By the end of 1 year, 48% of those who continued to use ROGAINE rated their hair growth as moderate or better.

**In women:** Clinical studies with ROGAINE were conducted by physicians in 11 US and 10 European medical centers involving over 600 women with hair loss. Based on patient evaluations of regrowth after 32 weeks (8 months), 23% of the women using ROGAINE had at least moderate regrowth compared with 9% of those using a placebo. No regrowth was reported by 43% of the group using ROGAINE and 60% of the group using placebo.

### How soon can I expect results from using ROGAINE?

Studies show that the response time to ROGAINE may differ greatly from one person to another. Some people using ROGAINE may see results faster than others; others may respond with a slower rate of hair regrowth. You should not expect visible regrowth in less than 4 months.

### How long do I need to use ROGAINE?

ROGAINE is a hair-loss treatment, not a cure. If you have new hair growth, you will need to continue using ROGAINE to keep or increase hair regrowth. If you do not begin to show new hair growth with ROGAINE after a reasonable period of time (at least 4 months), your doctor may advise you to discontinue using ROGAINE.

### What happens if I stop using ROGAINE? Will I keep the new hair?

Probably not. People have reported that new hair growth was shed after they stopped using ROGAINE.

### How much ROGAINE should I use?

You should apply a 1-ml dose of ROGAINE twice a day to your clean dry scalp, once in the morning and once at night before bedtime. Wash your hands after use if your fingers are used to apply ROGAINE. ROGAINE must remain on the scalp for at least 4 hours to ensure penetration into the scalp. Do not wash your hair for at least 4 hours after applying it. If you wash your hair before applying ROGAINE, be sure your scalp and hair are dry when you apply it. Please refer to the Instructions for Use in the package.

### What if I miss a dose or forget to use ROGAINE?

Do not try to make up for missed applications of ROGAINE. You should restart your twice-daily doses and return to your usual schedule.

### What are the most common side effects reported in clinical studies with ROGAINE?

Itching and other skin irritations of the treated scalp area were the most common side effects directly linked to ROGAINE in clinical studies. About 7 of every 100 people who used ROGAINE (7%) had these complaints.

Other side effects, including light-headedness, dizziness, and headaches, were reported both by people using ROGAINE and by those using the placebo solution with no minoxidil. You should ask your doctor to discuss side effects of ROGAINE with you.

People who are extra sensitive or allergic to minoxidil, propylene glycol, or ethanol should not use ROGAINE.

ROGAINE Topical Solution contains alcohol, which could cause burning or irritation of the eyes or sensitive skin areas. If ROGAINE accidentally gets into these areas, rinse the area with large amounts of cool tap water. Contact your doctor if the irritation does not go away.

### What are some of the side effects people have reported?

ROGAINE was used by 3,857 patients (347 females) in placebo-controlled clinical trials. Except for dermatologic events (involving the skin), no individual reaction or reactions grouped by body systems appeared to be more common in the minoxidil-treated patients than in placebo-treated patients.

**Dermatologic:** Irritant or allergic contact dermatitis—7.36%; **Respiratory:** bronchitis, upper respiratory infection, sinusitis—7.16%; **Gastrointestinal:** diarrhea, nausea, vomiting—4.33%; **Neurologic:** headache, dizziness, lightheadedness—3.42%; **Musculoskeletal:** fractures, back pain, tendinitis, aches and pains—2.59%; **Cardiovascular:** edema, chest pain, blood pressure increases/decreases, palpitations, pulse rate increases/decreases—1.53%; **Allergic:** nonspecific allergic reactions, hives, allergic rhinitis, facial swelling, and sensitivity—1.27%; **Metabolic-Nutritional:** edema, weight gain—1.24%; **Special Senses:** conjunctivitis, ear infections, vertigo—1.17%; **Genital Tract:** prostatitis, epididymitis, vaginitis, vulvitis, vaginal discharge/itching—0.91%; **Urinary Tract:** urinary tract infections, renal calculi, urethritis—0.93%; **Endocrine:** menstrual changes, breast symptoms—0.47%; **Psychiatric:** anxiety, depression, fatigue—0.36%; **Hematologic:** lymphadenopathy, thrombocytopenia, anemia—0.31%.

ROGAINE use has been monitored for up to 5 years, and there has been no change in incidence or severity of reported adverse reactions. Additional adverse events have been reported since marketing ROGAINE and include eczema, hypertrichosis (excessive hair growth), local erythema (redness), pruritus (itching), dry skin/scalp flaking, sexual dysfunction, visual disturbances, including decreased visual acuity (clarity), increase in hair loss, and alopecia (hair loss).

### What are the possible side effects that could affect the heart and circulation when using ROGAINE?

Serious side effects have not been linked to ROGAINE in clinical studies. However, it is possible that they could occur if more than the recommended dose of ROGAINE were applied, because the active ingredient in ROGAINE is the same as that in minoxidil tablets. These effects appear to be dose related; that is, more effects are seen with higher doses.

Because very small amounts of minoxidil reach the blood when the recommended dose of ROGAINE is applied to the scalp, you should know about certain effects that may occur when the tablet form of minoxidil is used to treat high blood pressure. Minoxidil tablets lower blood pressure by relaxing the arteries, an effect called vasodilation. Vasodilation leads to fluid retention and faster heart rate. The following effects have occurred in some patients taking minoxidil tablets for high blood pressure:

**Increased heart rate:** some patients have reported that their resting heart rate increased by more than 20 beats per minute.

**Salt and water retention:** weight gain of more than 5 pounds in a short period of time or swelling of the face, hands, ankles, or stomach area.

**Problems breathing:** especially when lying down, a result of a buildup of body fluids or fluid around the heart.

**Worsening or new attack of angina pectoris:** brief, sudden chest pain.

When you apply ROGAINE to normal skin, very little minoxidil is absorbed. You probably will not have the possible effects caused by minoxidil tablets when you use ROGAINE. If, however, you experience any of the possible side effects listed above, stop using ROGAINE and consult your doctor. Any such effects would be most likely if ROGAINE was used on damaged or inflamed skin or in greater than recommended amounts.

In animal studies, minoxidil, in much larger amounts than would be absorbed from topical use (on skin) in people, has caused important heart-structure damage. This kind of damage has not been seen in humans given minoxidil tablets for high blood pressure at effective doses.

### What factors may increase the risk of serious side effects with ROGAINE?

People with a known or suspected heart condition or a tendency for heart failure would be at particular risk if increased heart rate or fluid retention were to occur. People with these kinds of heart problems should discuss the possible risks of treatment with their doctor if they choose to use ROGAINE.

ROGAINE should be used only on the balding scalp. Using ROGAINE on other parts of the body may increase minoxidil absorption, which may increase the chances of having side effects. You should not use ROGAINE if your scalp is irritated or sunburned, and you should not use it if you are using other skin treatments on your scalp.

### Can people with high blood pressure use ROGAINE?

Most people with high blood pressure, including those taking high blood pressure medicine, can use ROGAINE but should be monitored closely by their doctor. Patients taking a blood pressure medicine called guanethidine should not use ROGAINE.

### Should any precautions be followed?

People who use ROGAINE should see their doctor 1 month after starting ROGAINE and at least every 6 months thereafter. Stop using ROGAINE if any of the following occur: salt and water retention, problems breathing, faster heart rate, or chest pain.

Do not use ROGAINE if you are using other drugs applied to the scalp such as corticosteroids, retinoids, petrolatum, or agents that might increase absorption through the skin. ROGAINE is for use on the scalp only. Each 1 mL of solution contains 20 mg minoxidil, and accidental ingestion could cause unwanted effects.

### Are there special precautions for women?

Pregnant women and nursing mothers should not use ROGAINE. Also, its effects on women during labor and delivery are not known. Efficacy in postmenopausal women has not been studied. Studies show the use of ROGAINE will not affect menstrual cycle length, amount of flow, or duration of the menstrual period. Discontinue using ROGAINE and consult your doctor as soon as possible if your menstrual period does not occur at the expected time.

### Can ROGAINE be used by children?

No, the safety and effectiveness of ROGAINE has not been tested in people under age 18.

**Caution:** Federal law prohibits dispensing without a prescription. You must see a doctor to receive a prescription.

**Upjohn** | DERMATOLOGY  
DIVISION

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USJ 1786.00 February 1994 CB-4-S

## PM HOTLINES

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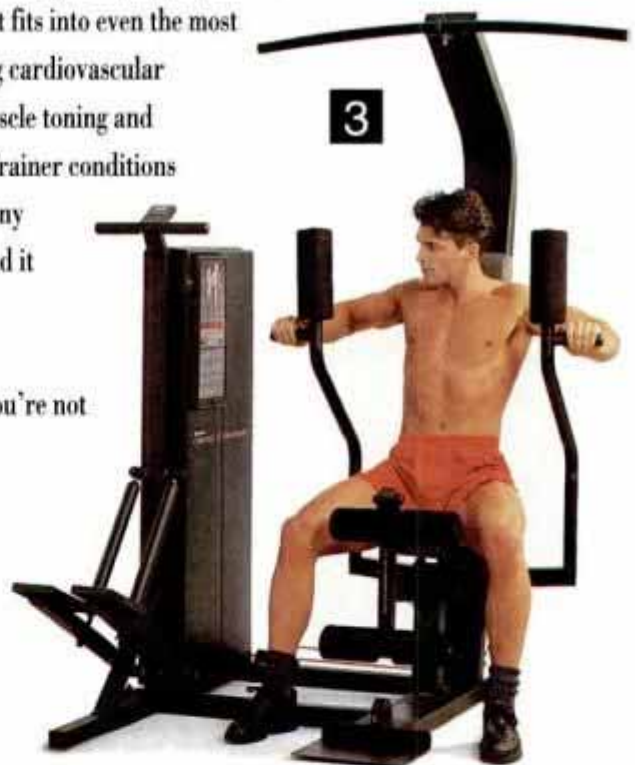
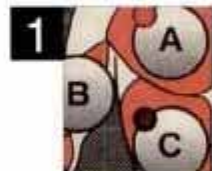
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# HOME&SHOP JOURNAL

## HOME IMPROVEMENT

# Super Siding

*New siding materials mean more options than ever to choose from.*

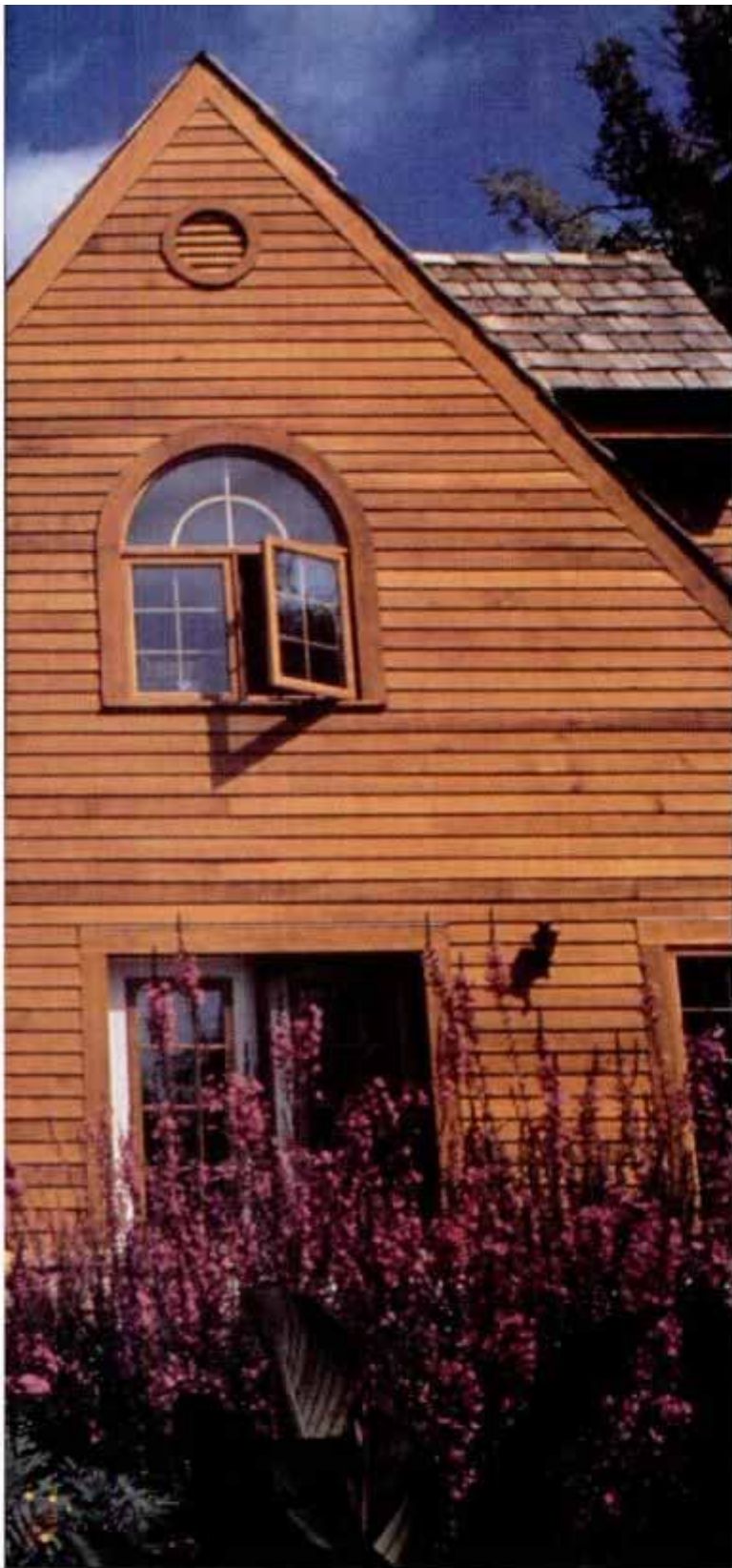
BY ROY BERENDSOHN, Assistant Home Improvement Editor

● Siding is a big part of any house, usually occupying more square footage than anything else including roofing, windows and doors. In many ways, it's the face your house presents to your neighborhood and the community beyond. And when the condition of your siding is combined with the appearance of your landscaping, you have a good visual definition of a great real-estate buzzword: curb appeal. The way your house looks from the street not only defines your pride in ownership but also it creates the first impression for potential buyers when it comes time to sell.

For most homeowners, good-looking siding is just a matter of periodic cleaning or painting. But for others, the chore of painting or the expense of having others

do it makes them consider installing new siding, especially any of the maintenance-free versions. Some are just tired of their existing siding and want to change the whole appearance of their house. And still others are shopping for a new house and have the luxury of choosing any siding they want.

If you are in the market for new siding for any of these reasons, it's worth taking a look at this general introduction to siding. All the major material choices are covered and our quick-reference chart will give you an idea of comparative installed costs. As always, make sure to check product warranties as well as upfront costs. And if you plan to hire contractors to install your siding, make sure to visit their projects where the



siding has been in place for at least a year. A bad job doesn't show up immediately. It takes a little while.

### EIFS stucco

Once upon a time there was only portland cement stucco, but in the past 20 years, a synthetic stucco has come into wide use. Its formula replaces the portland cement with acrylic resins. It's known as Exterior Insulated Finish Systems (EIFS, pronounced eefs). The acrylic resins help to form a weatherproof surface. The material is troweled over insulated sheathing with mesh fastened to it.

EIFS combine durability with good thermal insulation. Their color is blended right into the finish coat, so you don't have to paint them.



CEDAR SHINGLES & SHINGLE BUREAU/PHOTOS



Cedar bevel siding (far left) and shingles (above) are durable and attractive. Shingles can be individually installed (above) or panelized (left). Any cedar siding is durable, but it requires paint, stain or sealer.

### Traditional stucco

Traditional stucco consists of three coats of a mix containing portland cement and sand (also called portland cement plaster). This is applied over wire mesh on sheathing, or the stucco is troweled over concrete block.

Properly installed stucco is incredibly durable, but details, such as coat thickness, have a major effect on its durability (the same is true of EIFS). While a small number of hairline cracks are considered inevitable, even on properly installed stucco, major cracking, flaking and delamination are not typical.

With either type of stucco, ask your contractor for references on jobs that were completed more than a year ago, to determine if the jobs have stood up well.

### Brick

Brick is the most durable and the most expensive siding. It is considered to be maintenance-free, but sometimes it needs to have efflorescence (minerals that leach from the mortar and brick) cleaned from its surface.

Thin brick siding is made from full-width brick (not plastic or other materials) that is sliced into thin pieces. This system is useful for brick siding in remodeling jobs where installing regular brick presents structural problems. Thin brick is attached with adhesive or grout.

You have the right to demand good workmanship with any siding, but even more so with brick since it is unforgiving of sloppy installation. Ask your contractor for references where the brick was installed several years ago to determine how the installation has stood up.

### Metal siding

Metal siding is made from steel or aluminum sheet formed to look like wood siding. It receives a factory-applied coating, and the surface may be smooth or textured.

Aluminum siding is durable and if you don't like exterior painting, it will eliminate the need to paint for many years—20 years or longer depending on climate. Its color will fade as it ages, but modern siding has a more durable finish than that installed years ago.

It can be dented, however, by careless placement



CALIFORNIA REDWOOD ASSOCIATION PHOTO

Redwood can be sealed, stained or painted. With maintenance, it is a durable and beautiful siding. The best type of redwood is clear all-heart grade. Less-expensive knotty grades are also available.



WOLVERINE TECHNOLOGIES PHOTOS

Vinyl siding is sold textured or smooth. This siding comes in 40-ft.-long pieces, eliminating lapping pieces. Window and corner trim can offset the main siding color or blend with it.

of ladders or bouncing hail stones. And, aluminum siding can buckle during heat waves if it's not properly installed.

Steel siding looks like aluminum siding, but it is more dent- and warp-resistant. It tends to be installed in the Midwest where violent hailstorms are common. A drawback is that it will rust if it is scratched to bare steel. These spots must be painted.

### Plastic siding

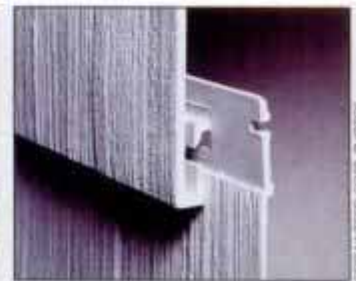
Plastic siding is molded with color throughout its thickness. This means that scratches are not obvious, and this siding is dent-resistant.

Plastic sidings come in two types: vinyl and polypropylene. Vinyl is the more widely used siding, and it can be smooth or textured to look like rough-sawn wood bevel siding. Polypropylene is only available molded to resemble cedar shingles, brick or stone.

Plastic siding has a reputation for good durability and color retention, and the modern versions of it have only improved characteristics. However, any plastic siding can buckle in hot weather if improperly installed.

### Plywood siding

Plywood siding is the least complicated siding to install. It comes in 4 x 8-ft., 4 x 9-ft. and 4 x 10-ft. sheets and in several grades. The better grades have fewer patches, which replace knots, in the face veneer. The siding is grooved to look like vertically installed wood siding, and it is often used on houses with contemporary or modern architecture. Contractors often refer to all plywood siding as T-1-



CEB/TWEEDE CORP. PHOTOS

If you like the way wood looks but don't want to paint, polypropylene plastic siding can be molded to look like cedar shingles. The molds for this siding were made from wood shingles. The siding is a panelized type with interlocking tabs.

11 (a specific type of plywood siding by Georgia-Pacific Corp.), but there are several different models.

Plywood siding is applied vertically, and the horizontal seams where the panels meet are often covered with a piece of 1 x 4 wood trim. A piece of aluminum flashing is bent to step behind the upper piece and over the lower piece where the panels meet. The panels can also be installed so the top piece overlaps the piece below it, in which case the flashing is omitted.

Plywood siding, and its trim, is most durable if you protect it with a heavy-bodied stain or a paint.

To stay flat and remain attractive, plywood siding needs to be fastened in an orderly way using corrosion-resistant nails.

### Solid wood

Wood siding is often the choice of traditionalists, and when properly cared for it is extremely durable.

There are several types of wood used to make siding: redwood, cedar, southern yellow pine and white pine. And while western timber harvests

have been curtailed in recent years, driving up the cost of white pine and redwood, these sidings are still available, as is cedar, which mostly comes from Canada. Wood siding has rich colors, textures and shadow lines. Cedar and redwood also have notable natural decay resistance.

These woods are available as horizontally applied bevel siding and in other patterns, such as with a cove-shaped edge. You can also apply square-edged lumber vertically with narrow wood battens to seal the joints between each piece. This is known as board-and-batten siding. Of all the wood sidings, only cedar is commonly sold as individual or panelized shingles.

Aside from the style of siding, you also have several grades to choose from. The better grades have fewer knots and are more expensive. Also, the best grades of cedar and redwood can be ordered with edge or vertical grain. This orients the wood's growth rings perpendicularly to the siding face, improving paint-holding ability.

Maintenance intervals for wood siding may range from three years be-



## SIDING CHOICES

The chart below represents premium grades in each category. Cost estimate includes building paper or similar covering below siding. Price does not include other building components, such as trim (prices as of March '94).

	COMMENTS	INSTALLED COST (per sq. ft.)
<b>EIFS stucco:</b>	Durable and more resistant to hairline cracking than traditional stucco. Has good insulating qualities and color retention.	\$4-5
<b>3-coat stucco:</b>	A durable siding material, but may develop hairline cracks. Installation cost largely dependent on local labor market.	\$3-5
<b>Brick:</b>	The most durable siding material. Sometimes develops efflorescence, which after several years needs to be cleaned.	\$5-8
<b>Thin brick:</b>	Durable, but not widely used. Often employed in remodeling where full-width brick poses structural difficulties.	\$5-8
<b>Cedar shingles:</b>	Durable, providing shingles are stained, sealed or painted at 3- to 7-year intervals.	\$2.50
<b>Panelized cedar shingles:</b>	Same durability as cedar shingles, but more rapidly installed, making them a good choice for quick remodeling.	\$3
<b>6-in. cedar bevel siding:</b>	Durable, providing that the siding is sealed, stained or painted at 3- to 7-year intervals.	\$2.50
<b>Redwood lap siding:</b>	Equal durability to cedar, providing it is sealed, stained or painted at 3- to 7-year intervals.	\$2.50
<b>White pine siding:</b>	Slightly less durable than cedar or redwood, but still provides good performance with paint or heavy-bodied stain applied at 3- to 7-year intervals.	\$1.90-2
<b>Southern yellow pine lap siding:</b>	Good durability with paint or stain applied at 3- to 7-year intervals. Only rough-sawn variety holds paint well.	\$2.50
<b>Plywood panel:</b>	Durability equal to pine siding when painted or stained at 3- to 7-year intervals. Easily and quickly installed.	\$2
<b>Hardboard:</b>	To a greater extent than solid wood siding, durability is dependent on proper installation and control of moisture vapor inside the house. If it's not factory-coated, then it must be painted.	\$1.50-1.75
<b>Oriented strand board:</b>	Same comments as hardboard siding, but it can be stained.	\$1.50-1.75
<b>Aluminum:</b>	Durable, but can be dented. Requires no maintenance beyond cleaning once or twice a year.	\$3-4
<b>Steel:</b>	Durable and more dent-resistant than aluminum. Scratches or dents that penetrate to bare steel should be painted. Needs periodic cleaning, like aluminum siding.	\$3-4
<b>Vinyl:</b>	Durable and dent-resistant compared with aluminum. The most widely available siding. Should be cleaned once or twice a year.	\$3-4
<b>Polypropylene:</b>	Durable and dent-resistant, like vinyl siding. Molded texture of cedar shingles or stone may require more careful cleaning than smooth-faced sidings.	\$3-4

tween touchup of stain or preservatives to five to seven years between paint jobs or complete restaining.

### Oriented strand board (OSB) and hardboard

OSB siding is made from wood strands that are oriented in layers under heat and pressure. The top layer is resin impregnated or protected with a sheet of resin-impregnated paper. Also, some OSB sidings have factory-applied topcoat or primer.

Hardboard siding has wood fibers oriented at random. The wood fibers are molded with a resin under heat and pressure. The top of each piece

is protected by resins and a factory-applied primer or topcoat.

Both OSB and hardboard sidings perform best when water vapor inside the house is controlled through venting and vapor barriers. They re-

### SOURCE LIST

#### Plywood and Hardboard:

- American Plywood Assn., P.O. Box 1170, Tacoma, WA 98411

- American Hardboard Assn., 1210 W. Northwest Hwy., Palatine, IL 60067

#### Aluminum Siding:

- American Architectural Manufacturers Assn., 1540 E. Dundee Rd., Suite 310, Palatine, IL 60067

#### Masonry:

- Portland Cement Assn., 5420 Old Orchard Rd., Skokie, IL 60077

- Brick Institute of America, 11490 Commerce Park Dr., Reston, VA 22091



Hardboard siding comes in individual pieces or panels. It may be primed or have a factory-applied topcoat.



Modern acrylic stucco systems look like traditional portland cement versions, but better resist hairline cracking.



After 40 years, aluminum siding is still popular. Often it's installed with new aluminum gutters, soffits and trim.



This "masonry" siding is really polypropylene, molded to look like sandstone. It can also look like brick or limestone.

sist weather best when painted.

Like wood siding, these materials are unforgiving of sloppy installation. You should ask to see the manufacturer's installation requirements before your contractor applies the siding. **PM**

#### Vinyl Siding:

- Vinyl Siding Institute, 355 Lexington Ave., New York, NY 10017

#### Wood Siding:

- California Redwood Assn., 405 Enfrente Dr., Suite 200, Novato, CA 94949

- Cedar Shake & Shingle Bureau, 515 116th Ave. N.E., Suite 275, Bellevue, WA 98004

- Southern Forest Products Assn., P.O. Box 641799, Kenner, LA 70064

- Western Wood Products Assn., Yeon Bldg., 522 S.W. Fifth Ave., Portland, OR 97204

- Western Red Cedar Lumber Assn., 1200-555 Burrard St., Vancouver, British Columbia V7X1S7



SHOP PROJECT

# Porch Planter

*What the well-dressed porch is wearing this summer.*

BY NEAL BARRETT



With its galvanized liner, this planter is ready for shrubs and small trees. Without the liner, it handles potted plants.



● Using trees, flowers and shrubs to decorate your home is a great way to add color and warmth. The containers that most plants come in, however, leave much to be desired. The best solution to the problem is to make your own wooden planter boxes. Our version is designed for use indoors or on a covered porch. With its galvanized liner, it can handle direct planting. Or, leave out the liner and use the unit to hold a potted plant.

We used select-grade pine for our planter—it's readily available and takes a nice painted finish. If you want an unpainted look, cedar, cypress or redwood would be suitable.

### Preparing the pieces

First, cut 12 pieces of  $\frac{3}{4}$ -in. stock to  $2\frac{1}{4}$  in. wide and 24 in. long. Then, using a waterproof glue, laminate sets of

three pieces face to face to produce four  $2\frac{1}{4}$ -in.-sq.  $\times$  24-in.-long blanks (Photo 1). Crosscut the blanks to 20 in. and set aside the cutoffs to use for the finials. Use a jointer or hand plane to true and square two adjacent sides on each post blank, then use the table saw to rip the posts to the 2-in. finished dimension. Sand the newly cut edges to remove the saw marks.

Lay out the locations of the mortises in the posts and cut these with a plunge router and edge guide. It's best to use a spiral upcutting bit, as this type draws the chips out of the cut and plunges easily without burning. Square the mortise ends with a chisel (Photo 2). Next, switch to a  $\frac{1}{4}$ -in. bit and rout the grooves that hold

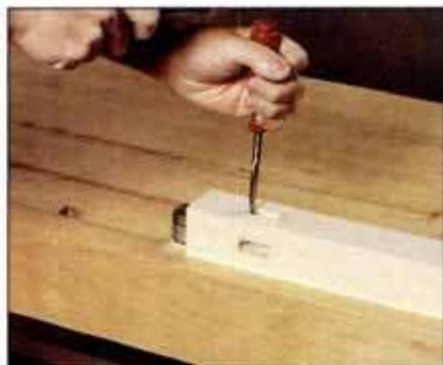
**Lead photos:** John Griebisch

**Step-by-step photos:** Neal Barrett

**Technical art:** Eugene Thompson



**1** Begin each leg by gluing three  $\frac{3}{4} \times 2\frac{1}{4}$ -in. boards together. Use waterproof glue, and trim each blank to  $2 \times 2 \times 20$  in.



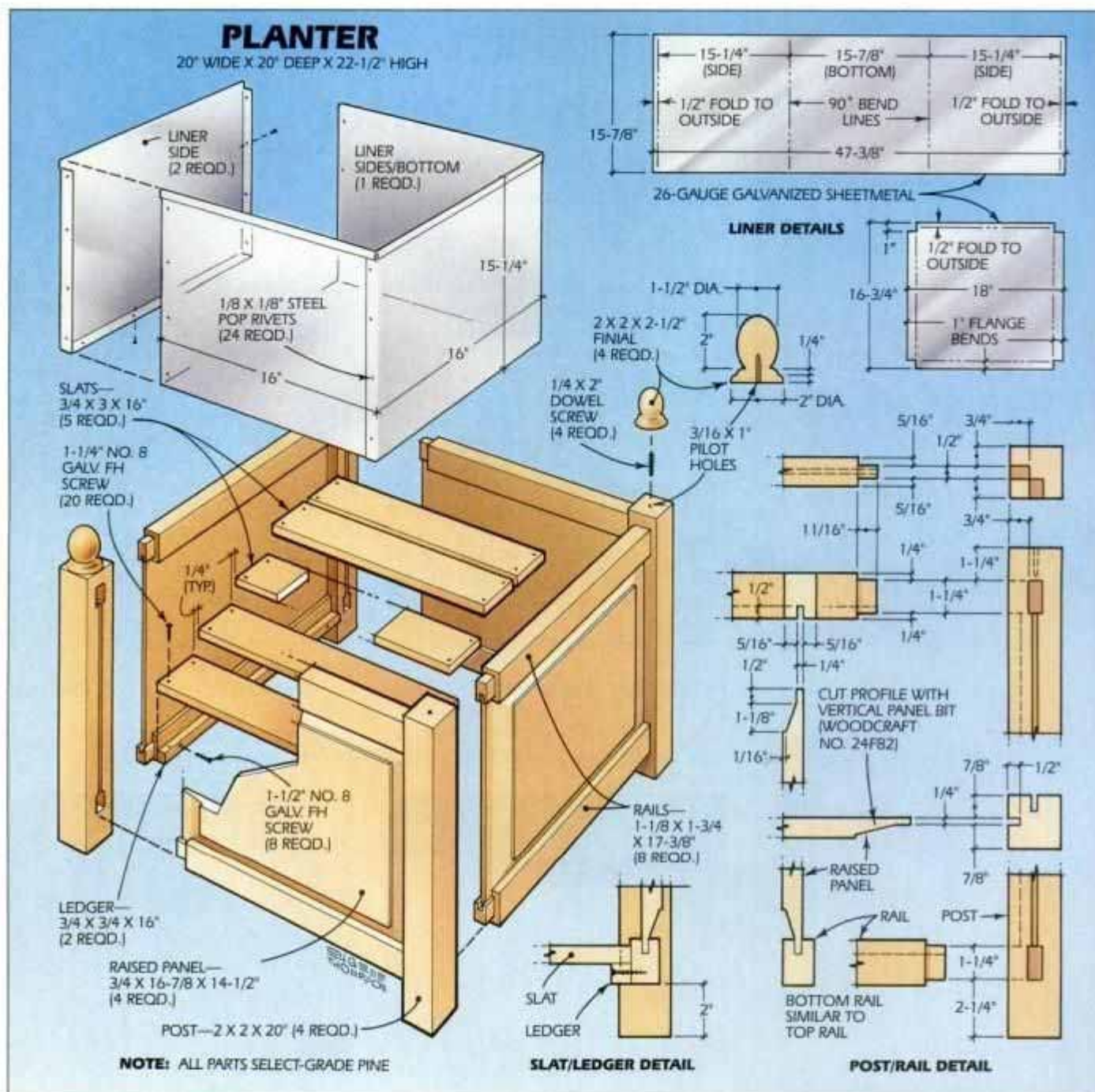
**2** After cutting the leg mortises with a plunge router and guide fence, trim the ends square with a sharp chisel.



**3** Cut the rail tenons with a dado blade. A stopblock clamped to a miter gauge extension ensures accurate repetitive cuts.



**4** Reset the dado blade and make the  $\frac{1}{4}$ -in.-wide  $\times$   $\frac{1}{2}$ -in.-deep grooves in each rail. Use a push block to move work safely.



the edges of the raised panels.

Rip and crosscut 5/4 stock to size for the rails, and lay out the tenons on the ends. Use a dado blade in the table saw to cut the tenons (Photo 3). Then, readjust the blade height to cut the tenon shoulders. It's best to cut the tenons slightly oversize and pare them to finished dimension. Then, reset the dado blade and cut the panel grooves in the rail edges (Photo 4).

Glue together 3/4-in. stock for the raised panels, trim them to final dimensions when the glue is dry and then sand, scrape or plane them smooth. Use a plate joiner to aid in aligning the panel boards (Photo 5).

Cut the raised panel profile on the

router table using a vertical panel-raising bit (Photo 6). We used a Safety-Raiser panel-raising bit, No. 24F82 available from Woodcraft, 210 Wood County Industrial Park, P.O. Box 1686, Parkersburg, WV 26102. Use a tall router-table fence to support the workpiece. Make the cuts in several stages, moving the fence back slightly after each cut. Cut the end grain edges on all panels first. Thoroughly sand the panels with a small sanding block and 120-, 180- and 220-grit sandpaper.

Bore pilot holes in the post tops for securing the finials. Use a doweling jig to position the holes and to keep them square to the post end.

## Assembly

Apply glue to the mortises and tenons for one side of the planter. Insert the rails into their mortises in one post, and slide the panel into position (Photo 7). Be sure to avoid getting any glue in the panel groove. Put the second post in place and clamp. Compare diagonals to make sure that the assembly is square, and adjust if necessary (Photo 8). Assemble the opposite side in the same manner. Join the two sides and the remaining rails and panels on a flat surface to avoid a twist in the planter frame.

Cut the ledger strips and slats to size. Bore and countersink pilot holes in the strips and slats. Install the



**5** Make the side panels by gluing the narrower stock together. Use a plate joiner to ensure good alignment.



**6** After trimming the panel to exact size, cut the raised panel profile on a router table with a vertical panel-raising bit.



**7** Begin assembly by gluing two rails to one post. Then, slide panel into grooves, add opposite post and clamp joints tight.



**8** Check that the assembly is square by measuring opposite diagonals. If necessary, loosen the clamps and adjust.



**9** Install the ledgers to two opposite lower rails with screws and glue. Counter-sink pilot holes for flat head screws.



**10** Use a template as a guide to shape finials. Leave a stub at top end and sand while in lathe. Then, sand stub smooth.



**11** Use a felt marker and straightedge to lay out cut and bend lines on sheetmetal. Make cuts with heavy-duty shears.



**12** To bend sheetmetal neatly, clamp hardwood strips at bend line. Then, use strips to bend metal to a 90° turn.



**13** To assemble liner, first bore 1/8-in. holes, then install pop rivets. Use silicone caulk to make seams watertight.

strips to opposite bottom rails using screws and glue (Photo 9). Then install the slats with screws only.

Mount one of the finial blanks in the lathe, and use a gouge to turn it to a 2-in.-dia. cylinder. Make a template of the finial profile and transfer the critical transition points of the finial design onto the cylinder. Shape the finial leaving only a small attachment at the top end to hold the work in the lathe (Photo 10). Sand the piece while in the lathe, then remove, cut off the top stub and sand it smooth.

Bore pilot holes in the finials and use locking pliers to thread a steel dowel screw in each. Then install the finials on the corner posts and sand

the planter. Apply a coat of exterior primer and two or three coats of exterior latex enamel.

### Making the liner

Begin by drawing the pieces on 26-gauge sheetmetal. Use a felt-tipped pen to mark the metal and make the cuts with a pair of heavy-duty shears (Photo 11).

Mark the bend lines as shown on the drawing. Then, clamp two 3/4-in.-thick hardwood strips on either side of a sheet at a bend line at the top edge of the liner. Use the wooden strips as a lever to bend the metal 90° (Photo 12). Then, use sheetmetal pliers to tightly fold over this top edge

and complete the remaining top edges in the same way.

Next, make the two 90° bends in the long strip of metal that forms the bottom and two sides. Finally, make the bends in the two remaining sides to form the tabs that join these sides to the rest of the liner.

Join the pieces together with 1/8 x 1/8-in. steel pop rivets. Use locking pliers or clamps to hold the pieces together while you drill 1/8-in. pilot holes. Then install the pop rivets to assemble the liner (Photo 13).

For a truly waterproof liner, apply silicone caulk to all interior seams and rivets. Let the caulk cure for 24 hours before filling the liner with soil. **PM**

## TOOL TEST

# Sears Plunge Router

TEXT AND PHOTOS BY  
ROSARIO CAPOTOSTO,  
Contributing Editor

● If you're looking for a router that is able to handle serious heavy-duty work—everything from panel raising to deep mortising—the new Sears Model 27506 3½-horsepower plunge router is worth considering. It's not only filled with many useful features, but compares in performance with industrial models of a similar size.

To handle its power gracefully, the tool has a soft-start feature that gradually brings the motor up to speed, which is variable from 10,000 to 25,000 rpm. A speed selection chart is printed on the housing to help you match rpm to bit diameter and the type of material being cut. The router also has electronic circuitry that maintains speed under varying loads.

The plunging range is 2½ in., and the plunge action is smooth and free of side play. To control depth of cut, the tool has a micro-adjustable depth rod. When plunging, the depth rod works along with a 6-position, turret-type depth stop that has three adjustable positions. There is also a depth-of-cut scale with an adjustable zero indicator so you can make a fast and accurate change to a previous setting.

Bit changing is quick and easy, thanks to a convenient spindle lock, and the router handles ½-in.-shank bits or ¼-in. bits with a collet adapter that comes with the tool. As a safety feature, the router can't be started and a red warning light at the center of the housing glows when the spindle is locked.

The handles are large and comfortable, a combination that makes for easy handling and positive control. The left handle contains the plunge-lock mechanism. A light squeeze on the locking cam locks plunging action, and a thumb press on the release button unlocks it. The right handle contains the ON/OFF switch and the power-lock button.



The Sears Model 27506 plunge router combines 15-amp power with professional features such as soft-start and electronic variable speed. It handles ½-in. and ¼-in.-shank bits.

I made numerous edge and inside cuts in both soft- and hardwoods and found the balance, handling and access to controls and adjustments excellent. The router runs quietly, but has plenty of punch. In addition to the ¼-in. collet adapter, the router comes with a collet wrench, edge guide, contour guide and template guide bushing. The guide accessories are often optional extras on other plunge router makes.

The 3½-horsepower 15-amp Model 27506 plunge router (about \$250) is available at your local Sears store, or through the *Sears Power And Tool Catalog*. To get a catalog, call (800) 377-7414. Also available is the less-expensive Model 27505, a 2-horsepower router (about \$190). This version has the same housing design as the 27506, including the ergonomic handles and controls, but lacks the soft-start and variable-speed features.

PM



Standard accessories include a ¼-in. adapter, template guide bushing, contour guide, edge guide and collet wrench.



Engage spindle lock by pressing button on housing top. Red light at center indicates locked spindle, and tool will not start.



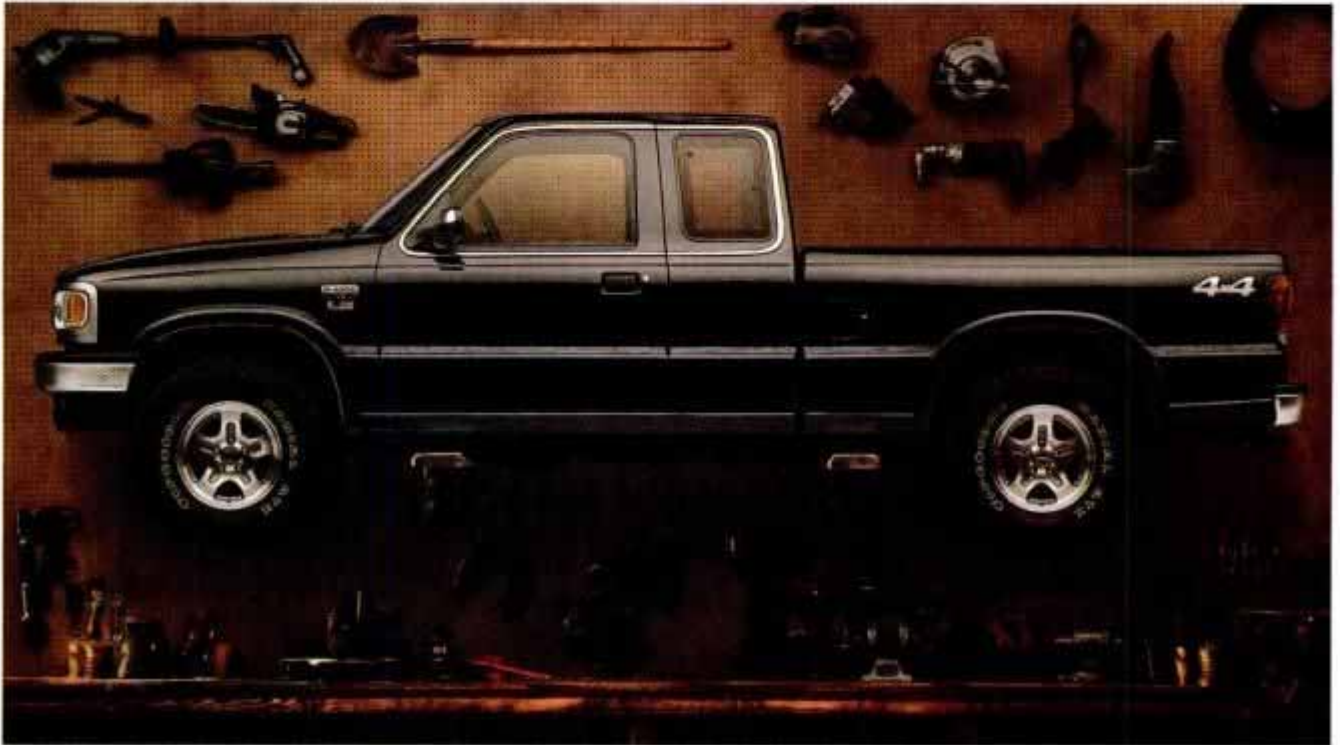
Comfortable handles contain router controls. Left handle incorporates plunge-lock lever and release button (under thumb).



Variable-speed dial is located near right handle. The right hand also works the ON/OFF trigger and power-lock button.

**The New Mazda Truck** When it comes to weekends, Mazda owners are quite industrious. Whether they're putting up drywall, landscaping

gravel. Especially with a bigger available payload than ever. Plus, a 36-month/50,000-mile, bumper-to-bumper warranty,\*\* so you can put



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the yard or just running to the hardware store

all your energy into fixing that leaky faucet.

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import truck in its class, thanks to a rugged 4-liter

V6.\* So you can haul, even when you're hauling



INFORMATION COMPARISON	MAZDA	TOYOTA	NISSAN
Largest available engine	4.0L V6	3.0L V6	3.0L V6
Horsepower/torque	160/220	150/180	153/180
Maximum towing capacity	5,900 lb.	3,500 lb.	5,000 lb.
Front track (inches) (4x2/4x4)	56.7/58.3	53.3/56.3	54.9/56.1 55.7/56.9 (V6)
Rear track (inches) (4x2/4x4)	57.3/57.3	53.9/56.1	54.5/54.5 56.3/56.3 (V6)
Basic warranty (years/miles)	3/50,000	3/36,000	3/36,000

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NEW PRODUCTS

# Fresh Paint

*New painting products help make the job easier.*

BY ROY BERENDSOHN, Assistant Home Improvement Editor



### Pick A Color

Glidden says its Master Palette matching system can produce 6100 mathematically color-matched shades. How? Each color is designated a number, based on a 3-dimensional (cylindrically shaped) model of color. Furthermore, Glidden says the colors remain the same regardless of gloss and whether acrylic or alkyd resins are used. Depending on the paint, Master Palette colors cost between \$11 and \$18 a gallon.

Also, the company has introduced an exterior version of its Spread 2000. The paint is free of volatile organic compounds, and it can be used on masonry or wood. A gallon costs from \$18 to \$23. The paints are sold at hardware and paint stores. Write Glidden, 925 Euclid Ave., Cleveland, OH 44115.



### Stone In A Pail

This unusual product produces a stone-like surface in 30 minutes. Just trowel it right out of the bucket onto stucco, cement board or concrete, and it's dry in a half-hour. Called Exterior Stone Finish, it consists of an acrylic polymer and stone granules. It comes in 5-gallon pails (\$110 per pail), and each pail covers 140 to 150 sq. ft. It's sold in five colors—silver stone, sandstone, granite, rose quartz and forest green—at masonry supply and gypsum supply stores. For your nearest distributor, contact USG, P.O. Box 806278—PM, Chicago, IL 60680.



### Solid Stuff

Plasti-Kote has increased the solids content and reduced the solvents in its line of Ultra High Solids enamels and Rust Not paints. Increasing a paint's solids content improves its ability to hide what's beneath it and makes it more weather-resistant. Reducing the solvents, which evaporate as the paint cures, reduces the pollutants released into the atmosphere. The paints are available in a range of colors and cost about \$6 a can at paint stores and hardware stores. Write Plasti-Kote, 1000 Lake Rd., P.O. Box 708, Medina, OH 44258.



### Leftovers, No Problem

It's good to have a little paint around the house for touchup work and other small jobs, and here's a product to keep the leftover paint from forming a skin while it sits in the can. The Gallon Saver is a disc (made from recycled plastics) with a grip that you slide into the can and position above the leftover paint. A pack of three costs about \$4, a 6-pack about \$6, at hardware stores and home centers or from its distributor, Sugrue Products, 5644 N. Artesian, Chicago, IL 60659, or call (800) 594-5152.



### Shoot 'Em Down

This foam spray was designed to keep you from getting stung twice—once by a wasp and the second time from falling off the ladder after you get stung. The spray shoots 20 ft., and the foam coats the nest, preventing the insects from escaping, its manufacturer says. It can also be sprayed on individual insects, and it's supposed to work on wasps, yellow jackets and hornets. A 6-ounce can costs about \$4 at hardware stores and paint stores. For more information, contact Enforcer Products Inc., P.O. Box 1068, Cartersville, GA 30120.



### Clean It Again And Again

Ever Clean is a cleanable (flat and satin) interior latex paint. Sherwin-Williams says it resists grease, juice, crayon marks and other paint-staining substances because it's not nearly as porous as average flat and satin wall paints. A layer of Ever Clean allows stain-creating materials to be completely cleaned from its surface with a soft cloth and household cleaner, the company says. A gallon of Ever Clean costs about \$27 at Sherwin-Williams paint stores. For more information, write The Sherwin-Williams Co., 101 Prospect Ave. N.W., Cleveland, OH 44115.



### Jazz It Up

Steel doors are sturdy and well-insulated, but they're boring. ZAR steps in to brighten things up with its graining tool (about \$4). To finish the door with this process costs about \$20 (including the cost of a pint of ZAR wood stain at \$5 and a quart of exterior polyurethane at \$11). You apply stain to the door and then move the graining tool across it. The tool, stain and polyurethane are sold at paint stores and home centers. Write UGL, P.O. Box 70, Scranton, PA 18501.

### Pour It On

Straight from the bottle, this water-based sealer (at right) is an easy-to-see milky-white liquid, but it dries clear. It's formulated to adhere to new, and still-damp, pressure-treated lumber. A gallon costs about \$18.

Also, water-based ColorFast stains (below) can be mixed into 100 colors, in solid and semitransparent types. They contain ultraviolet inhibitor and a mildewcide. A gallon of the stain costs about \$20. Both products are sold at hardware stores and home centers. Write Thompson & Formby Inc., 825 Crossover Ln., Suite 240, Memphis, TN 38117.



**Prep Step**

Norton says its new line of Select abrasive sheets, discs and belts can be used for sanding bare wood or removing paint and rust. The sheets and discs have aluminum oxide abrasives (belts have zirconia alumina) and use extra-



heavy paper with a heavy coating of adhesive, says Norton. The abrasive is coated with zinc stearate. According to Norton, the panel on the left (below) was stripped clean with one Select belt, while the one on the right could only be partially stripped by a standard belt before it clogged. A package of three 5-in.-dia. hook-and-loop discs costs about \$5 at hardware stores and home centers; a pack of two belts costs about \$8. Write Norton Co. Consumer Products Division, P.O. Box 15008, Worcester, MA 01615.



**Why Bend?**

As a means of applying deck cleaner or sealer, Wolman improved the standard garden sprayer by increasing the length and flexibility of the hose and adding a detachable wand tip. Wolman calls the device the Back-Saver. It costs about \$30 at paint stores and home centers. Write Wolman, 1850 Koppers Building, 436 Seventh Ave., Pittsburgh, PA 15219, or call (800) 556-7737.

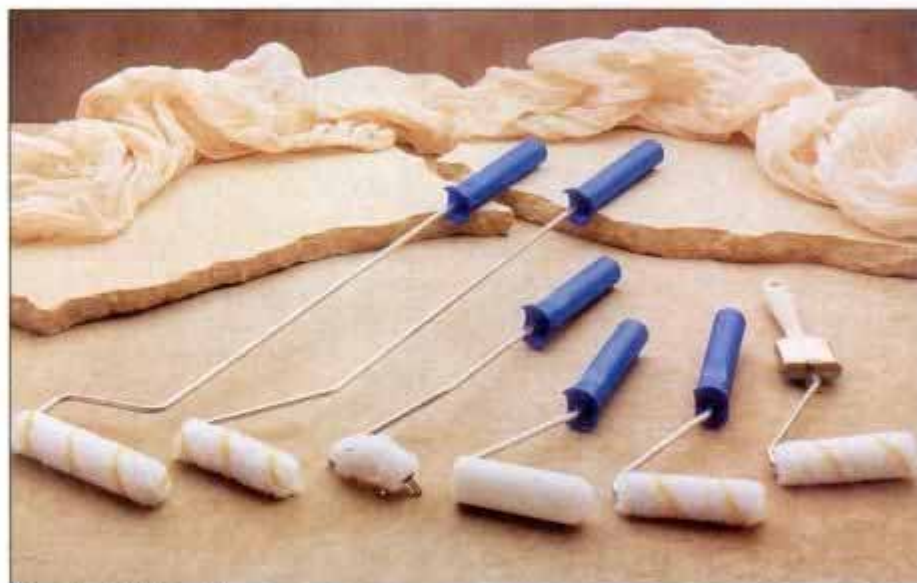


**Clean And Green**

Exterior Wall Renewer is a wall cleaner with a twist—it won't harm grass or shrubbery as it's washed off the house because it's formulated to act as a fertilizer, its manufacturer says. All you do is attach a garden hose to the container, spray it on the wall, brush it in and hose it off. The 64-ounce container of concentrate is enough to clean 1700 sq. ft. of wall, according to its manufacturer. It costs about \$12 at hardware stores and home centers. For more information, write Convenience Products, 866 Horan Dr., Fenton, MO 63026.

**Stick With It**

If you need to patch before you paint, then consider this device. It looks like a big stick of deodorant, but we found that it really works for performing its intended job of light-duty patching. To use it, take off its combination cap/knife. Turn the bottom rim, and a stick of patching compound feeds out from the top. Apply some patching compound, then smooth it using the cap/knife. The best part is that since the knife is plastic, it doesn't leave scuff marks on the surface like a metal knife would. It costs about \$3 at hardware stores and home centers. For more information, contact DAP Inc., P.O. Box 277, Dayton, OH 45401, or call (800) 543-3840.



**Best Of Both**

These rollers combine the best features of brushes and rollers. The rollers with domed ends can paint into corners like a brush, while another model (far right) even has a handle like a paintbrush for a familiar feel and action. With these tools, you can apply paint evenly on overhanging edges that occur on siding and trim. Padco says they can be used to apply stain, varnish or paint on a variety of interior and exterior surfaces. They cost about \$4 at hardware stores and home centers. Write Padco, 2220 Elm St., Minneapolis, MN 55414.

PM



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Protects against the elements so well, it's **guaranteed for 20 years**. Premium quality acrylic latex paint covers your house in just one coat. Mildew, blister, fade and chalk resistant. Mercury and lead free. **Sold exclusively at Wal-Mart.**



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*Steve*

Steve  
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*Always.*



*Steve*

Steve  
Department Manager  
Hardware

## Homeowners Clinic

BY NORMAN BECKER, P.E.,  
Contributing Editor

### Dripping Relief Valve

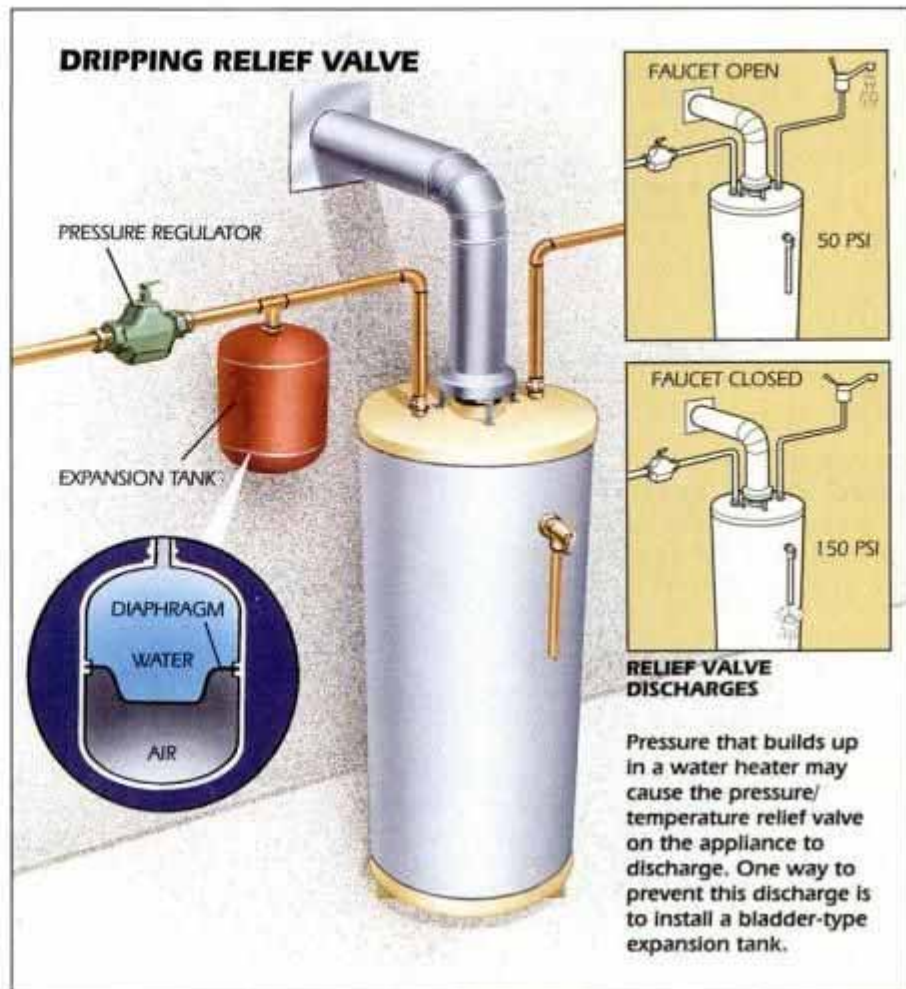
Every house in my area has a pressure regulating valve (set for 60 psi) at the city water connection. When my water heater cycles on, the water pressure in the tank builds steadily and causes the water heater relief valve to vent until a tap is opened, at which time pressure drops and the leaking stops. Is there a practical way to prevent the pressure buildup as described?

D. CHRISTOPHER  
SANTA CLARITA, CA

*In order to prevent possible water contamination, many municipalities have code requirements for back-flow preventer devices, including non-bypass pressure regulators on the inlet water service pipe. These devices create a closed system when a faucet is not drawing hot water. When water is heated, it expands. In a closed system where there is no room for this expansion, the pressure will increase. Consequently, the thermal expansion of water in the water heater will often result in dripping relief valves. Not only does this waste water, it also represents wasted energy.*

*In order to control this pressure increase, a provision must be made for the expansion. This can be done by installing a precharged bladder-type tank (expansion tank) similar to the ones used on hot water heating systems. The expansion tank should be installed on the cold water inlet, between the pressure regulator and the water heater (see diagram).*

*When the water expands, it flows into the bladder tank, thereby maintaining the pressure. When water is drawn from a fixture, the water*



*from the tank flows back into the system. Two manufacturers of these tanks are Amtrol and Flexcon Industries. The tanks are called Therm-X-Trol and Vent-Rite WH Series. They are generally available at plumbing supply stores.*

*For information, write Amtrol Inc., 1400 Division Rd., West Warwick, RI 02893; Flexcon Industries, 300 Pond St., Randolph, MA 02368.*

### Time-Delay Switch

Please advise me as to where I can purchase a time-delay wall switch. I once had one controlling my carport light, and it became inoperative. I haven't been able to find a replacement anywhere. The switch had a 45-

to 60-second delay. It allowed me to turn off the switch, go outside and lock the door, get in my car, and start to drive off before the light went out.

B.R. STEED  
SPRINGFIELD, GA

*Leviton Manufacturing Co. in Little Neck, New York, manufactures the Decora Time-Delay Switch, catalog No. 6690. You can buy the switch at electrical supply stores, home centers and hardware stores. It costs about \$20. There are three buttons on the switch: one to turn the light on, another to turn it off and a third for it to delay turning off.*

*When the delayed-off switch is pressed, the light will remain on for 5 minutes and then shut off automatically. The switch is for incandescent lights only.*

### Water Spots On Ceiling

I was wondering if you have a solution to my problem. A leaky roof left water spots on my bedroom ceiling. I have had the roof fixed and I have tried to paint over the spots, but they just show through.

CAROL CERNOCH  
ANTIGO, WI

## BUZZWORD ● ● ● Marine Boot Glazing

● You would think you walked into a boating supply house to hear your local window retailer talk about marine boot glazing. But the term is well suited to the high and dry. It refers to a flexible vinyl boot that is stretched around an insulated glass lite (often referred to in the window trade as an

IGU, for insulated glass unit). Acting like a gasket, it prevents moisture and air penetration. The boot is installed at the factory or can be reinstalled with a new IGU in case the existing one has been broken by a flying object, or by other means.

—Roy Berendsohn

There are a number of products on the market that will solve your problem. They are available at hardware stores, paint stores and home centers, and are referred to as water stain blockers or sealers (also called stain-blocking primers and stain-blocking sealers).

The stain-blocking sealer/primer is applied to the ceiling with a brush or a roller, or it is sprayed on (it's available in aerosol cans). After the sealer/primer is dry, paint the ceiling.

### Service Tip: Lead Paint Test

In recent years, the public has become aware of the fact that dangerous levels of lead can be found in suburban homes as well as apartments in cities. It is estimated that 74% of all private homes built before 1980 contain lead paint. Not only are paint flakes a potential health hazard, but so is paint dust, which can develop during renovation or as a result of the rubbing action of window sashes.

If you would like to know whether or not you have lead-based paint in

### Worth Getting

● With summer, roofers begin work in earnest. If you are thinking of having your house's shingles replaced, now is the time to get cracking. CertainTeed, a building products and roofing manufacturer, has prepared a low-cost (\$1) guide of commonly asked questions about roofing. The pamphlet gives an overview on how to choose a contractor, building ordinances regarding roofing, fire ratings, shingle types, roof ventilation and underlayments.

The booklet is mercifully free of manufacturer's hype. And given what most people know about shingles (practically nothing), anyone considering a roofing job would do well to pick it up and read through it once or twice.

Another useful and related pamphlet (also \$1) is the one that's titled *Choosing A Reputable Roofer*. Al-

though this pamphlet repeats some of the information in the previously mentioned guide, it treats the subject in greater detail, explaining the difference between an estimate (a single price) and a proposal (prices for good, better and best roofing that includes product literature and samples). Also included is a list of seven questions to ask a roofer and information on contracts.

Write to CertainTeed Corp., Roofing Materials Group, P.O. Box 860, Valley Forge, PA 19482. —R.B.



your house, you can test for the presence of lead by using *Lead Check Swabs*. Each swab is a self-contained cartridge containing a chemical that is highly specific for lead. According to the manufacturer, it will

not produce a false positive result.

In addition to checking for lead in paint, the swabs can be used to test for lead in ceramic glazes, dinnerware, food cans, solder, toys and dust. A 4-pack of *Lead Check Swabs*



costs about \$10 at home centers and hardware stores. For more information, call the Lead Check Consumer Information Hotline at (800) 262-5323.

**Free Info**

If you're buying a home, you would do well to have it inspected, of course. But how do you choose a home inspector, and what can you expect from the process? The American Society of Home Inspectors' brochure, *The Home Inspection & You*, answers the common questions about inspections and hopes to persuade you to hire an ASHI-certified inspector. The pamphlet makes sense to us, and it should—our Homeowners Clinic columnist, Norman Becker, is a founding member of ASHI. For a free copy of the brochure, send a business-size self-addressed stamped envelope to: ASHI, 85 W. Algonquin Rd., Arlington Heights, IL 60005. **PM**

**DO YOU HAVE A HOME-MAINTENANCE OR REPAIR PROBLEM?**

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

**Moving Day**

● Whether you are moving across town or across the country, there are several things you need to keep in mind when moving a refrigerator.

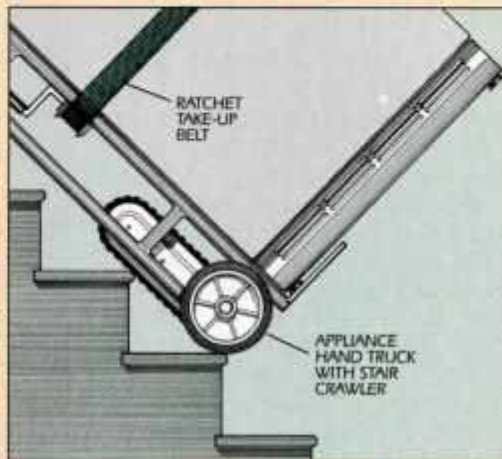
1. Unplug the refrigerator, and tape the power cord to its back.
2. Remove all the food.
3. Take out all removable parts such as ice trays, bins, racks and shelves.
4. Defrost the freezer compartment.
5. Remove the drain pan, clean it and reinstall it.
6. Tape the doors closed.
7. Transport the refrigerator standing upright. The refrigerator can be plugged in and used immediately if moved upright. If the appliance has been moved while lying on its side, wait 24 hours before plugging it in. The oil in the refrigerator's compressor drains into the sealed refrigerant system when the appliance is on its side. The oil must be allowed to drain back into the compressor.

8. Rent or borrow an appliance hand truck that has a stair crawler and a ratchet take-up belt. Fasten the refrigerator to the hand truck using the belt.

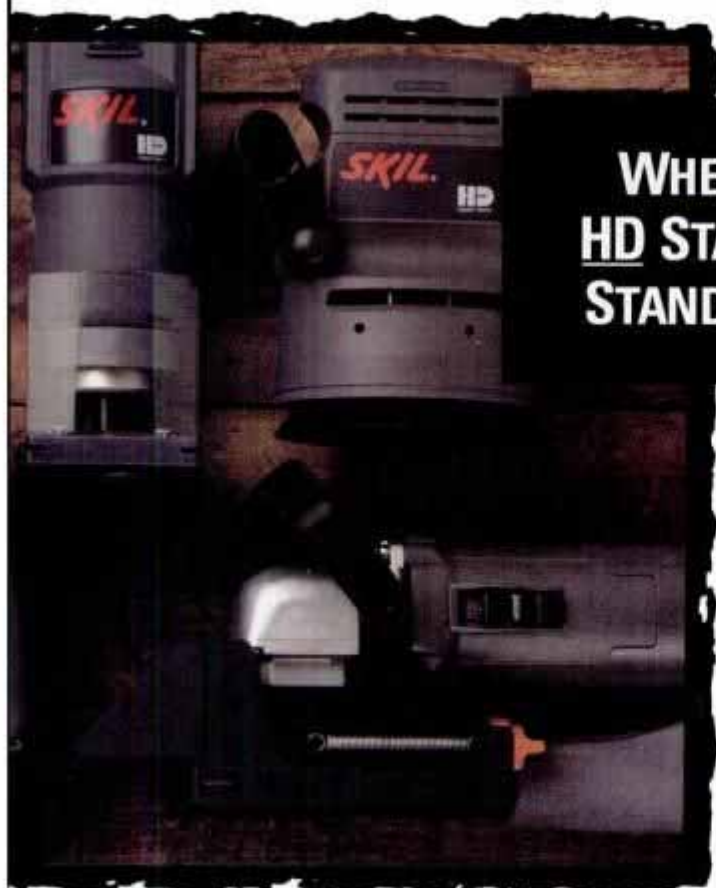
—Steve Toth



**APPLIANCE CARE TIP**



PH ILLUSTRATION BY GEORGE BETZLEY



**WHEN YOU KNOW WHAT  
 HD STANDS FOR, YOU WON'T  
 STAND FOR ANYTHING LESS.**

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**HOME  
IMPROVEMENT**

**Installing A  
Furnace  
Filter**

BY NEAL BARRETT  
PM Illustrations by  
George Retseck

● It's no secret that the quality of the air we breathe has been on a steady decline. Byproducts of manufacturing and power generation, as well as automobile emissions, all contribute to an atmospheric soup that shapes the environment as well as our health.

Until recently, our homes seemed to be havens from this toxic assault. Within the past decade, however, it's become apparent that even here we are vulnerable to pollution.

The sources of indoor air pollution are many. Products used in construction, such as flakeboard, plywood, certain types of insulation and carpet backer, can emit gases into the home. Tobacco and cooking smoke, skin flakes, viruses, bacteria, animal dander, mold and mildew all contribute to a less-than-perfect environment inside the home.

One way to tackle indoor air pollution is to circulate the indoor air through a filter. With a forced-air heating or air-conditioning system, the ductwork, gratings and blower are already in place. Unfortunately, the filters generally installed in these systems are not very efficient in eliminating most of the pollutants. One solution to the problem is to install a supplementary air filter.

**Choosing a filter**

The two most common types of air cleaners are the media type and the electronic type. The media type has an accordion-shaped, dense paper filter that catches particles in the airstream. These filters have no moving parts and require no electricity to operate, although the filter medium must be replaced about once a year, which costs about \$30 to \$40. Electronic cleaners use an electric charge to trap particles on a screen. Although the filters are permanent, they have to be cleaned every two to three months.

Electronic air cleaners remove smaller particles than media filters



and are a good choice if you suffer from allergies. On the other hand, they cost three to four times as much as a media-type filter and, although you may be able to find an electronic unit that you can install yourself, most

manufacturers won't honor the warranty unless the unit is installed by an authorized technician.

By contrast, media-type cleaners cost about \$200 and you can install one yourself in about a day. For our



**1** Use a screwdriver to release the retaining clips that hold the furnace access door in place. Then, remove the door.



**2** Remove the existing filter from the furnace and check its condition. If it's a reusable type, clean it and set it aside.



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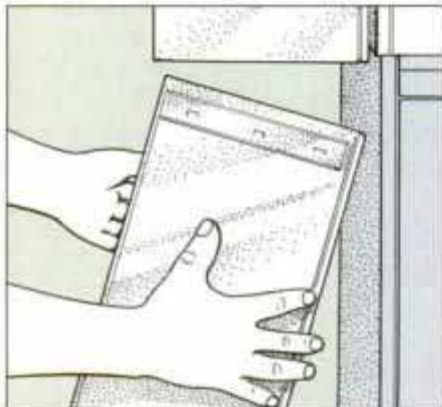
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**3** Pry off the metal clips that hold the return duct on the furnace. On some installations, you'll find screws.

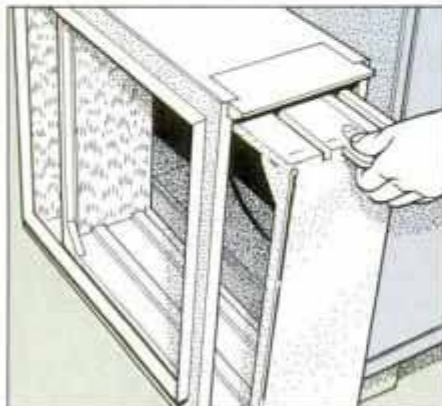
installation, we chose a media-type—the Space-Guard High Efficiency Air Cleaner, Model 2200, manufactured by Research Products Corp., P.O. Box 1467, Madison, WI 53701.



**4** Detach a section of ductwork by first releasing the snap joint with a screwdriver. Then pull the joint apart.

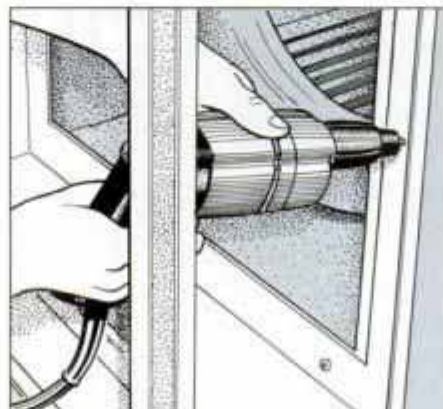
### Filter location

The air-cleaner unit must be mounted between the furnace and the cold-air return duct so that it filters the air returning to the furnace. Depending on your furnace configuration, the cold-air return may be either on the top,



**5** Position the air cleaner next to the furnace so the outlet side faces the furnace. Then, slide out the filter frame.

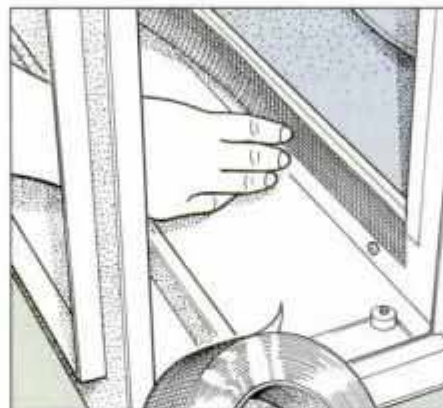
bottom or side of the furnace. Study your layout carefully and determine whether you have space for the air cleaner. On our system, the cold-air return duct ran down the furnace side and entered near the bottom. The bottom section of the return consisted of a 4-ft. length of 8 × 24-in. duct. Because our return duct also contained a humidifier located about 5½ ft. from the floor, we decided to reroute the lower duct section to make room for the new air cleaner. When designing your installation, plan to disturb the



**6** Use sheetmetal screws to fasten the housing to the furnace. Power driving with a hexhead driver speeds up work.

existing ductwork as little as possible so as not to inhibit airflow.

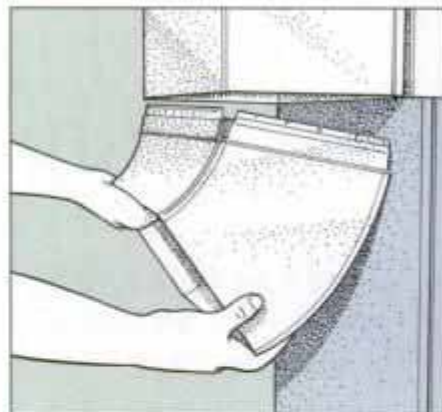
Note that your air cleaner has an inlet side and an outflow side, and it must be installed in the correct orientation. If necessary, the unit can be turned upside down to achieve correct relation to airflow.



**7** After securing the housing, seal all joints with duct tape. Any air leaks will reduce the efficiency of the air cleaner.

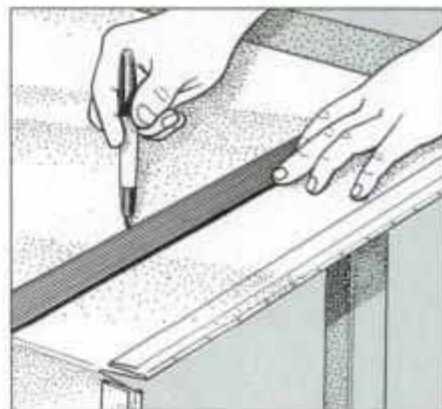
### Getting ready

To mount the air cleaner on a furnace designed like ours, begin by removing the cold-air duct from the furnace. Use a screwdriver or a pair of pliers to turn the locking clips that hold the blower compartment access door in



**8** Begin rerouting the cold-air return duct to the air-cleaner housing by adding a 45° bend to the existing ductwork.

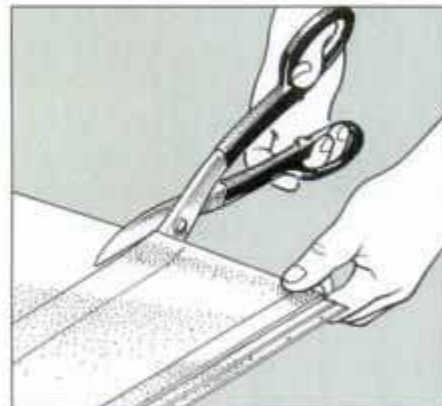
place (Fig. 1). Then, open and remove the door and remove the furnace filter from the blower compartment. If it's a reusable filter, clean it thoroughly and set it aside to be reinstalled later (Fig. 2). If it's the disposable type and it's dirty, discard it and



**9** Cut a duct by measuring exposed duct length from lower edge of snap joint. Then mark with felt pen and straightedge.

then replace it later with a new one.

Use a flat-blade screwdriver to remove the screws or pry off the sheet-metal clips that secure the cold-air return duct to the furnace side (Fig. 3).



**10** Extend cut 1 in. to allow for joining tabs, and cut duct L section with metal shears. Beware of sharp edges.

—◆◆◆◆◆—

# Add Our Name To The List Of Organizations Dedicated To Keeping Kids Out Of Hot Water.

—◆◆◆◆◆—

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burned. Burned by scalding bath and tap water. Burned by the change in shower temperature. And burned by the time not



taken to practice simple safety measures in the bathroom. That's why Peerless Faucet Company is a proud sponsor of the National SAFE KIDS Campaign. A program designed to educate parents and caregivers about how to best prevent injuries such as scald

burns. Most of these hot water-related injuries are preventable through a mix of common sense and safety-conscious products. Such as pressure balance anti-scalding valves. They help prevent scalds by keeping water temperature at a consistently safe level even



when water pressure changes. Because while accidents will always happen, it's great to know organizations like National SAFE KIDS and Peerless Faucet Company are striving to make the world safer for our children. And that's an idea we can all warm up to.



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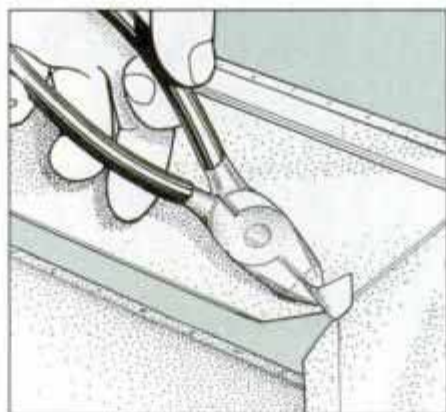
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**11** After both L sections are cut to length, slide them together to complete short straight length of duct.

Loosen the joint between the last two sections of return duct by prying the snap joints apart. Then, separate the duct sections (Fig. 4).

Position the air cleaner alongside the furnace to provide the most straightforward connection between



**12** Use shears to make small triangular cuts at each corner of the duct. Then, remove these pieces with pliers.

the duct and the furnace. Open the air-cleaner access door and remove the filter frame (Fig. 5). Use sheet-metal screws to fasten the air-cleaner housing to the furnace and seal the



**13** Join short duct to a 45° bend by first sliding the cut ends into the snap joint of the bend. Secure with screws.

joints with duct tape (Figs. 6 and 7). It's important to seal all joints since the efficiency of the air cleaner depends on the amount of air pulled through the filter medium.

To continue the end of the existing return duct alongside the air cleaner, a 45° bend, a short straight length and an additional 45° bend need to be added. Begin by installing a stock 45° bend to the end of the ductwork. Simply fit the snap-joint ends together and push until the pieces lock in place (Fig. 8).



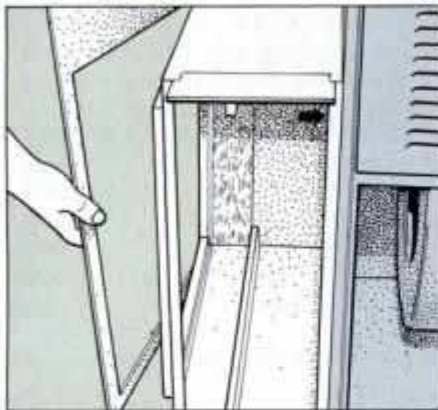
**14** Use furnace cement or plumbers putty to fill gaps at joint corners. Then, seal entire joint with duct tape.

To make the short straight length, cut a section from longer stock. Note that metal duct is sold in L-shaped sections that must be assembled, and it's easiest to cut the pieces to length before assembly. Determine the exposed length of straight duct required between the two bends, measure from

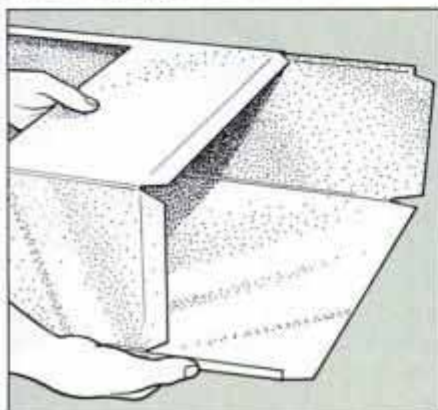


**15** Install straight and bent sections on return duct. Measure the straight length needed to reach air-cleaner housing.

the back edge of the snap joint on one L section and make a mark. Use a yardstick to scribe a straight line across the duct (Fig. 9). Then make a second line 1 in. farther down the duct and cut along this line with metal shears (Fig. 10). The extra 1 in. of



**16** Cut opening in duct when duct is disassembled. Hold L section against air-cleaner housing and check for fit.

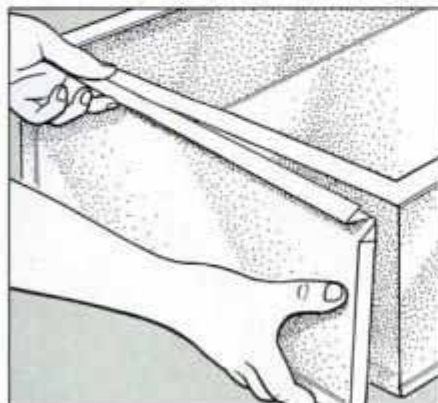


**17** Then, assemble L-shaped duct halves by sliding them together. Note triangular corner cutouts in end tabs.

metal will form a tab to interlock with the adjoining piece of duct.

After cutting both L sections of the duct, slide the halves together (Fig. 11). Then, use shears to make small triangular cuts at each corner of the cut end of the duct, up to the first layout line. Use pliers to remove these corner pieces (Fig. 12). The cutaway corners facilitate joining this section with the next.

Join the cut end of the straight section to the second 45° bend and secure



**18** Slide the endcap in place and secure it with sheetmetal screws. Then, seal joints with duct tape to prevent air loss.

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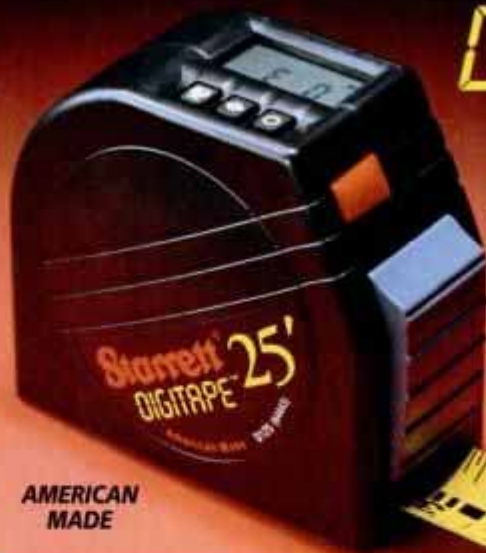
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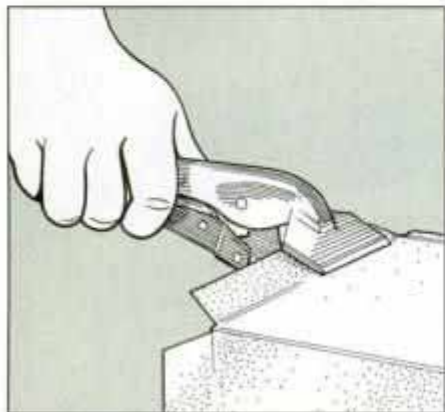
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the joint with sheetmetal screws (Fig. 13). Use furnace cement or plumbers putty to fill any gaps in the corners, and seal the entire joint with duct tape (Fig. 14).

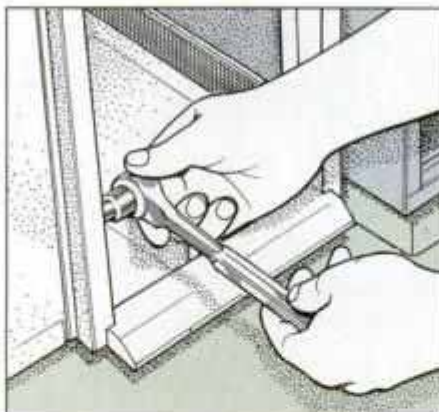
Install the straight section and 45° subassembly to the initial 45° bend already in place (Fig. 15). Then measure the length of the duct necessary to reach the air-cleaner housing at the bottom of the furnace. Remember to



**19** If the duct must slide over an adjacent section, use sheetmetal pliers to bend out tabs. Screw joint together after assembly.

allow an additional 1 in. for joining tabs. We managed to use our original section of duct by cutting it shorter and enlarging the opening to match the air cleaner. If you reuse a length of duct, disassemble it before attempting to cut it to length.

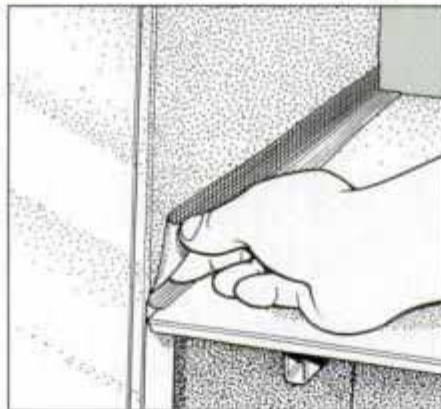
Cut the opening in the duct to fit tightly over the flange on the intake side of the air cleaner. Check the fit of the opening before assembling the duct (Fig. 16). While the section is in place, drill pilot holes for securing the



**20** A ratchet wrench is best for driving sheetmetal screws that connect air-cleaner housing with return duct.

duct with screws after the duct is entirely assembled.

Join the two L sections (Fig. 17) and make triangular cuts at the corners, as before. Install a duct endcap at the bottom end of the duct and secure with sheetmetal screws (Fig. 18).

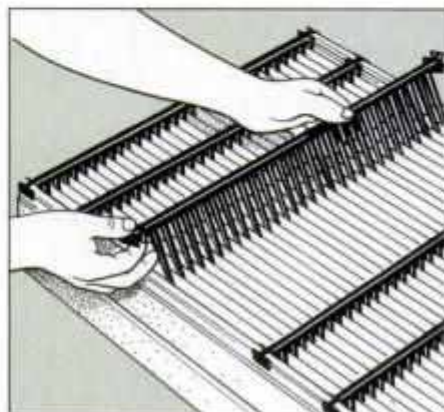


**21** After all ductwork is in place and secure, check for any unsealed or open joints and cover with duct tape.

If this last section must slide over an adjacent section, use sheetmetal pliers to gently bend the joining tabs outward to ease assembly (Fig. 19).

Slide the duct in place and join to the previous section and to the air-cleaner housing with sheetmetal screws. A ratchet wrench is handy for tightening screws in confined locations (Fig. 20). Remember to make sure all the joints are sealed with duct tape (Fig. 21).

Install the filter media in the filter



**22** Install filter in the frame as instructed by manufacturer. Position pleat spacers as required to maintain filter shape.

frame as directed by the manufacturer. Locate the pleat spacers as required (Fig. 22). Then slide the filter frame into the housing and close the air-cleaner door.

Install a clean furnace filter in the blower compartment and replace the door. Then, turn on the furnace blower, let it operate continuously for about 15 minutes and check that the installation is functioning properly. **PM**

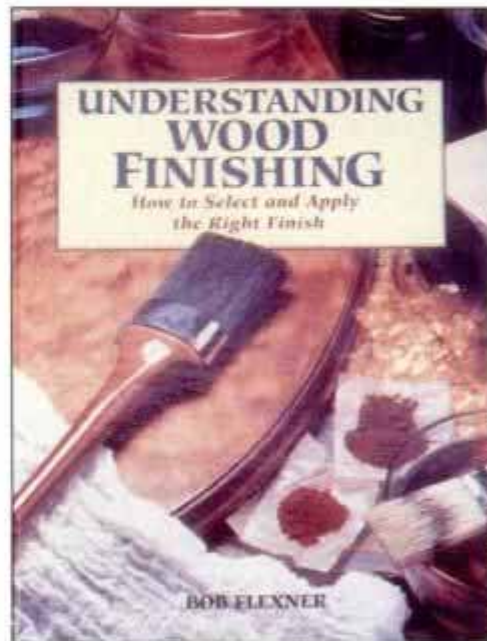
## BOOK REVIEW

# Understanding Wood Finishing

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*Understanding Wood Finishing* is published by Rodale Press Books, 33 E. Minor St., Emmaus, PA 18098, and costs \$26.95. —Thomas Klenck



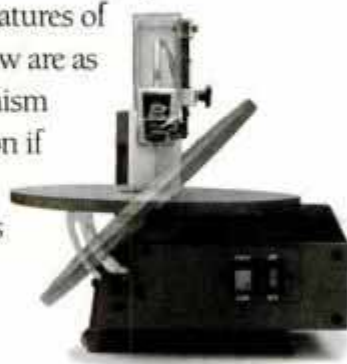
# What it takes to cut it as a Consumers Digest Best Buy.

You don't get named a *Consumers Digest* Best Buy without working at it. You have to be an *outstanding* value. That's the Dremel 1671 Scroll Saw.

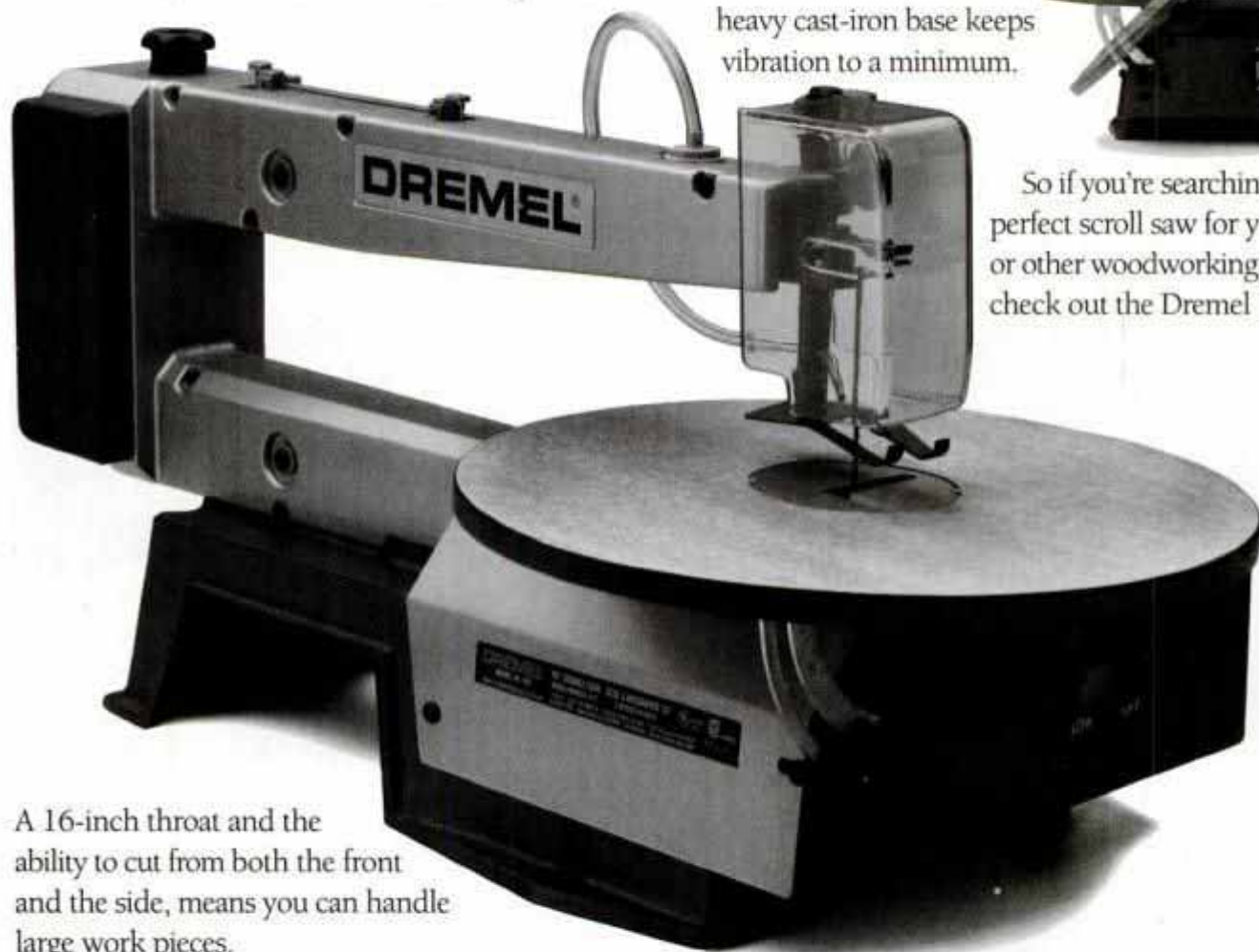
The Dremel 1671 has a lot of features that make it a pleasure to use. It has two cutting speeds and a powerful motor that lets you buzz through wood up to two inches thick, as well as sheet metals and plastics.

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Of course, not all the features of the Dremel 1671 Scroll Saw are as obvious. A special mechanism quickly stops cutting action if the blade breaks. And the heavy cast-iron base keeps vibration to a minimum.

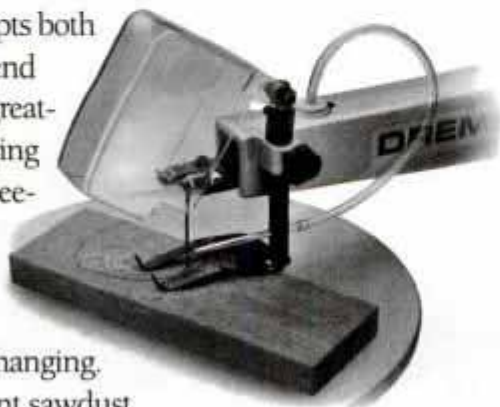


So if you're searching for the perfect scroll saw for your craft or other woodworking projects, check out the Dremel 1671.



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# CAR CARE

## CAR CLINIC

BY MIKE ALLEN,  
Associate Automotive Editor

### Ridge Runner

I'm rebuilding the engine in my old pickup. I don't have any way to lift the engine out of the car, so basically I'm rebuilding it one piece at a time. I haven't decided if the crank needs to come out and be reground yet. That's because I haven't figured out how to get the pistons out. The rings hang up on the ridge they've worn into the cylinder bore. Even if I do remove the crank, I don't think the pistons will go out the bottom.

JOHN HAGOPIAN  
DES PLAINES, IL

*Sigh. I've found that halfway measures in engine rebuilding are generally less than successful—at least if you intend to put the vehicle back into real service, rather than just use it as an occasional toy.*

You need to use a gadget called (surprise) a ridge reamer. It has carbide knives that will shave the ridge down without damaging the cylinder bore. Then you can pop out the pistons. The bad news is that if the pistons won't come out, then the block is so worn that you need to bore it oversize and get new pistons to match.

Even if the rings will squeeze past the ridge, you should still use a ridge reamer. New rings will be larger than worn rings, right? The new rings will bump into the ridge, and there's a good chance you'll damage the ring lands.

You can rent a ridge reamer at an auto parts store or tool rental center. You can also rent the engine hoist you need to pluck the engine out of the truck to get it down to the machine shop for proper reconditioning.

### Cool Runnings

Settle a bet between some of my co-workers who have been arguing for months. Let's say you're driving a car, the outside temperature is  $-20^{\circ}\text{F}$  and you're going 60 mph.

1. Is it colder than  $-20^{\circ}\text{F}$  for your engine?

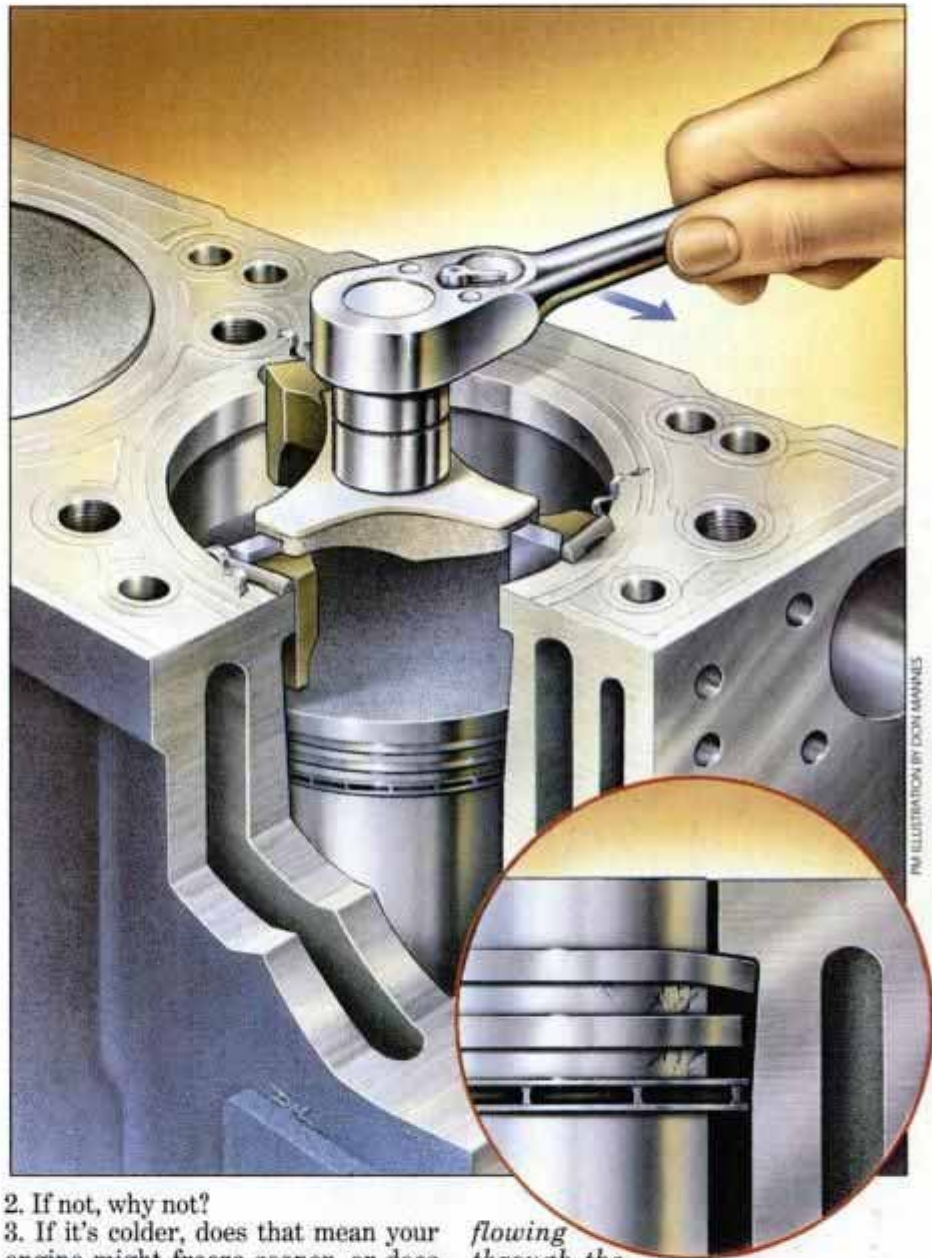


ILLUSTRATION BY DON MANNES

2. If not, why not?

3. If it's colder, does that mean your engine might freeze sooner, or does the freezing point stay the same?

PIERRE SAINDON  
BAIE-COMEAU, QUEBEC, CANADA

Had a lot of time on your hands last winter, eh, Pierre?

1. & 2. It's the same temperature for your engine, but because the cold air is rushing through your radiator faster, the coolant gets cooled off faster. That's why it helps to block off the radiator opening with some cardboard during really cold weather. Reducing the amount of frigid air

flowing through the radiator will help your car warm up faster and stay at the proper operating temperature.

The problem is you are confusing temperature with heat.

3. Even though the amount of cold air going through the radiator is enough to overcool the cooling system (in spite of the thermostat in the wet side of the radiator), the freezing point is the same. You can go 100 miles per hour at  $-20^{\circ}\text{F}$  and the radiator won't freeze.

Don't be confused by the wind-

## CAR CARE

chill factor they use on TV. That takes into account the evaporative cooling on human skin. Car radiators don't sweat like humans do, and the formula doesn't apply.

### Our Cap's Off To This Guy

I own a 1993 Z28 Camaro and I'm concerned about the 18-psi radiator pressure cap. I'm worried about future problems with intake manifold and head gaskets blowing under the increased pressure. Should I replace it with a 15-psi cap?

DAVID SILVA  
GARDEN GROVE, CA

*No. And no again, just in case you weren't listening.*

*Both your head gaskets and manifold gaskets handle substantially higher pressures than the 18 psi in the cooling system. The oil pressure peaks a lot higher than that, and the head gasket has to handle the combustion chamber pressure.*

*The pressure is higher to keep the coolant inside the engine at the higher temperatures that modern emission-controlled, mileage-con-*

### A Riveting Story

I manage to have some friends who know absolutely nothing about cars. And if you worked at this job, you'd find them as refreshing a change as I do. All work and no play makes Mike a dull boy.

But even though they know nothing about cars, they own cars, and the cars need repairs, and I wind up giving the advice. Fine. This woman I know was told by her repair shop that it would cost what seemed like a lot of money to replace a ball joint on her car because it was riveted to the control arm, and they'd have to replace the control arm as well. The service manager even led her into the shop and showed her the car up on the lift, rivets and all.

It's time for a new mechanic, dear. The customary procedure is to drill out the rivets. Start with a small ( $\frac{1}{8}$ -in.) bit all the way through. Then follow with a  $\frac{1}{2}$ -in. bit until the rivet head pops off and simply bolt a new \$15 ball joint on with appropriately sized bolts.

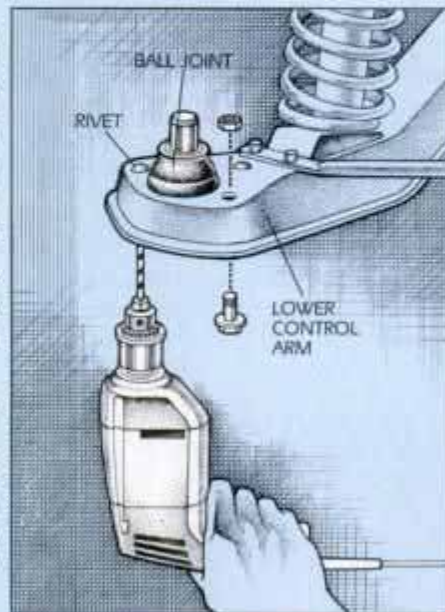


PHOTO ILLUSTRATION BY ADOLPHE E. BERTHIAUX



# Great Balls of

## CAR CARE

strained engines run at. Don't change the radiator cap or use a cooler thermostat.

### And The Fog Rolls In

On rainy days the windows of my Maxima always fog up, starting at the rear and creeping around to the front.

There's no antifreeze smell, and the trunk vents in the rear quarter panels aren't plugged up. What's wrong?

JOSEPH KREUSER  
VILSECK, GERMANY

Maybe nothing. Make sure that the a/c evaporator's tray drain isn't plugged—you'll find water all over the carpet if it is. Be sure you're running the system in a mode that runs fresh air through the car. In spite of the fact that the outside air is at 100% humidity during a rainstorm, it still helps to keep the air moving.

And you'll need to run the air conditioning. Say what? Yup, the a/c will dry out the air, which you can then heat up with the heater to keep from shivering. Run the fan on an intermediate setting, the a/c on the non-economy setting (fresh as opposed to recirculated air) and turn

up the heat to a comfortable level.

Most cars automatically turn on the a/c in the DEFROST position.

### High Test

What kind of mileage and performance should I expect if I use premium gasoline in my car? It's surprisingly hard to research this question.

DANA CLARK  
BARRE, MA

*It doesn't work that way, Dana. There's a minimum level of octane your engine requires to function properly. If you see any improvement in mileage or performance by raising the octane, then the lower performance was being caused by detonation, potentially damaging your engine.*

*In fact, higher-octane gas has a slightly lower energy content than regular, although the difference is too small to be a consideration. **FM***

### DO YOU HAVE A CAR PROBLEM?

Just ask Mike about it. Mail your question to Car Clinic, Popular Mechanics, 224 W. 57th St., New York, NY 10019. While letters, faxes or phone calls cannot be answered individually, problems of general interest will be discussed in the column.

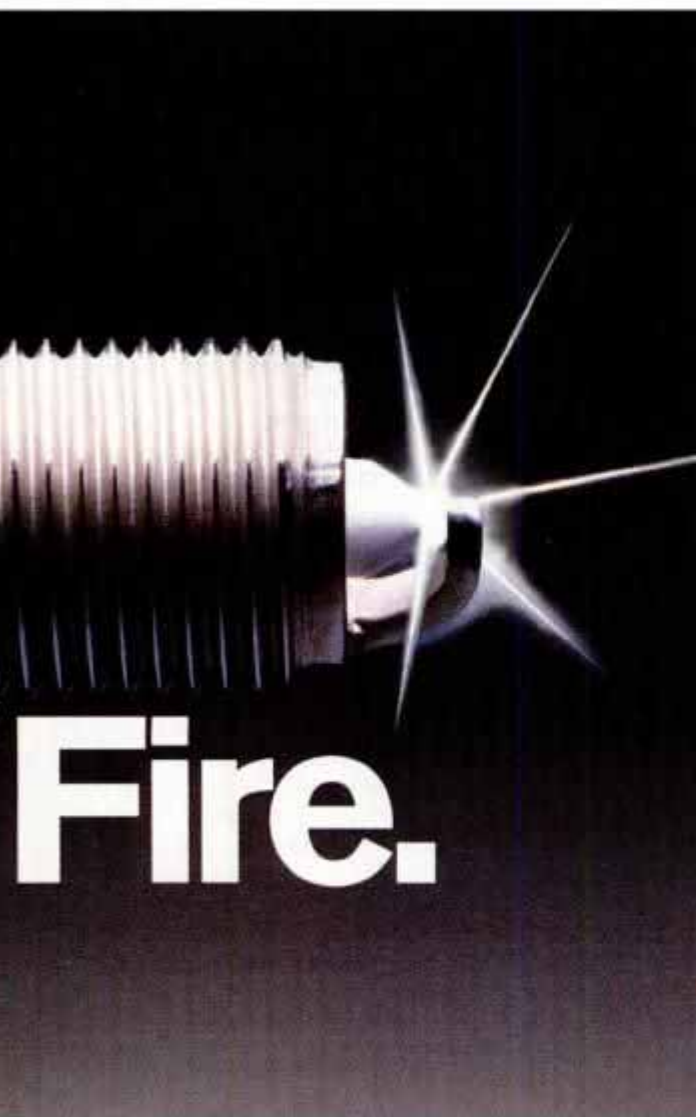
### SERVICE TIPS

● If your late-model Chrysler Corp. car is experiencing intermittent speed-control disengagement, there's a TSB that authorizes replacement of either the speed-control servo or the automatic transmission's computer.

● Ford claims the thud that comes from your gas tank 1 to 2 seconds after your '86-89 Aerostar or '89-93 Ranger comes to a complete halt is normal. The sound is most prominent when the tank is three-quarters full.

● Does your 1993 Toyota Camry start hard after being run for a while and then shut down for 10 minutes? Does it surge and stumble going down long hills? There's a revised engine control module that may help.

● Some 1991 and '92 Nissan Pathfinders may have differentials that whine at some speeds between 25 and 45 mph. Nissan says the cure is a new differential gasket with teeth cut at a reduced contact angle.



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## MAINTENANCE BASICS

# REPLACING A SEALED BEAM

BY DON CHAIKIN,  
Automotive Editor

● As well as your car or truck may be running, if you can't see where you're going you're not going to enjoy driving it. Your night visibility is totally dependent on your vehicle's headlights. If one headlight is burned out, your night visibility is cut in half.

Fortunately, replacing a burned-out sealed-beam headlight is a simple and inexpensive task.

The first step in replacing a headlight is ascertaining exactly what type of light you need.

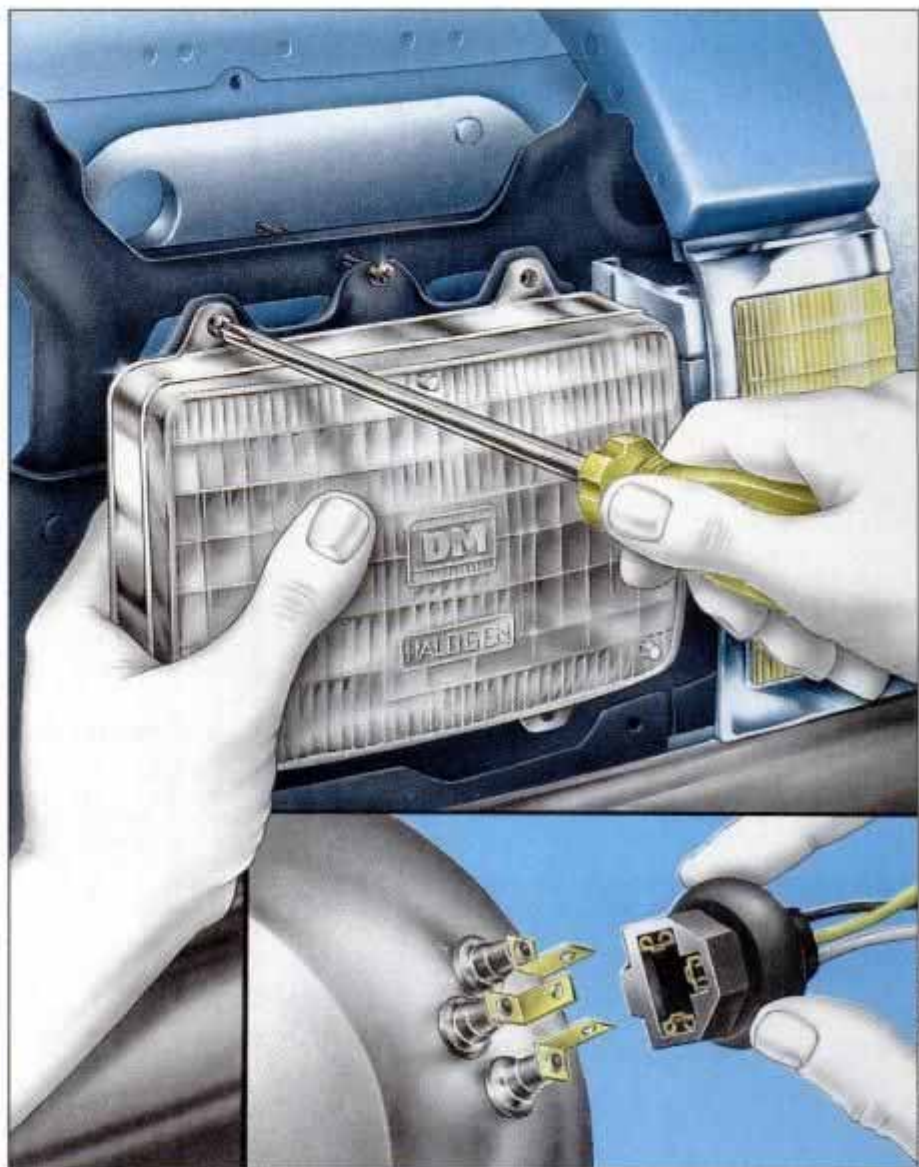
● Most cars and trucks on the road use sealed-beam headlights, which have the bulb, reflector and lens as one unit. If there are screws holding a trim piece around the headlight and another metal ring holding the headlight itself, the headlight is a sealed beam. If the light is burned out, the entire unit must be replaced.

● Some newer models have composite headlamps, which have separate, easily replaceable bulbs. If there is no obvious way to remove the headlight unit from the car, and if there is a large collar on the backside of the headlight where the wires attach to it, the headlight is a composite unit. If this light is burned out, only the bulb need be replaced.

● If your vehicle has sealed-beam headlights, they may be arranged as either a 2-light system or a 4-light system. In a 2-light system, each sealed beam incorporates both the low and the high beams. A 4-light system has separate lights for low beam and high beam. The actual sealed-beam units of a 4-light system are smaller in size than those of a 2-light system. Sealed beams come in round and rectangular varieties.

Armed with a replacement headlight, replacing a sealed beam is rather simple.

● First, remove any trim ring, chrome or plastic bezel that may surround the headlights. This may require a Phillips-head screwdriver or a special Torx or Pozidriv tool. Check your owner's manual.



● The sealed beam itself is held in place by a metal retaining ring. Round units are held by three screws; rectangular ones, by four. Do not confuse these retaining screws with the headlight's aiming screws.

● There are two aiming screws per headlight, one on either the top or bottom, and one on one side or the other. These screws are spring-loaded and should not be disturbed when you replace the sealed beam.

● Before attempting to remove the headlight's retaining screws, you should spray them thoroughly with a penetrating solvent.

● Hold the headlight in its socket as you remove the last of the retaining screws. After the retaining ring is removed, lower the headlight carefully from its receptacle.

● The wiring connector on the back of the sealed beam pushes onto prongs on the light's back. Pull it off.

● A headlight for a 2-headlight sys-

tem has three prongs on its back for the connector. A headlight for a 4-headlight system has only two prongs.

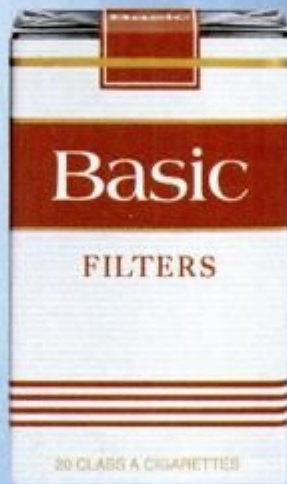
● Before plugging the wire connector onto the back of the new headlight, clean any corrosion from the connector socket using an aerosol electric contact cleaner. Check that none of the wires are damaged or frayed.

● Push the wiring connector onto the prongs on the new headlight. Place the headlight in its receptacle.

● Small bumps along the outer edge of the back of the headlight align with small dimples in the headlight socket to ensure that you install the headlight right-side up. The writing on the lens should also be upright.

● Hold the sealed beam in place while you reinstall the retaining ring. If the retaining ring is damaged, you can buy an inexpensive replacement where you bought the sealed beam.

● Reinstall the trim ring or bezel over the headlight and you're done. **PM**



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#### FUEL ECONOMY TEST

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API certification ensures that the highest standard for fuel efficient oils is met.



#### RUST AND CORROSION TEST

This test evaluates an oil's ability to handle fuel and water build-up, which will contaminate engine oil.  
Certified oils help neutralize the harmful effects of fuel and water to prevent premature engine rusting and corrosion, maintaining performance.



#### ENGINE WEAR TEST

This test measures an oil's capability to reduce friction and protect moving parts within the engine from fusing together.  
Certified oils use additives to form protective layers on the engine surfaces and they can help extend the life of an engine.



#### PHOSPHORUS CONTENT

Phosphorus is used in oil to prevent wear and control oil oxidation. But too much phosphorus can reduce the effectiveness of a car's emissions control system.  
Certified oils have limits on the amount of phosphorus to control engine wear and help maintain emissions system durability.



#### DEPOSIT TEST

This test gauges the level of detergents and dispersants in the oil. Detergents clean grime from engine surfaces, while dispersants keep it suspended.  
By minimizing the development of engine sludge, certified oil protects engine parts against increased wear plus loss of power and performance.



#### HIGH TEMPERATURE OIL THICKENING TEST

This test measures an oil's resistance to thicken and helps to ensure oil will flow after exposure to high temperatures - up to 300° F.  
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## SATURDAY MECHANIC

# REPAIRING BODY RUST

BY JOHN DECKER

● When you bought your new truck, it was your pride and joy. You washed it once a week and waxed it every three months.

But that was eight long years ago. Not only has the newness worn off, you've noticed some rust. Not much, just a few rusty bull's-eyes where door dings used to be. The worst rust is around the left rear wheel well. There are even a few holes there. Time for a new truck?

Maybe. But you probably can get a few more years out of your favorite

hauler if you fix rust damage while the problems are few and far between. Leave rust to its own devices, though, and it will start playing its own corrosive version of connect-the-dots. Before you know it, your once proud truck will quite literally be a mere shell of its former self.

Thankfully, there are many ways to deal with rust that go far beyond the traditional methods of sanding, sandblasting and grinding. There are chemicals that can remove rust or convert it to a hard, paintable surface.

There are also new products that make filling small holes easy, and larger holes can be patched with pre-formed steel body panels that closely match the contours of the rusted area.

### Rust recess

You'll be happy to know that on new vehicles, rust is not nearly the problem it used to be. That's because rust-prone body parts are now made of aluminum. It's possible to make proper repairs of rusted body surfaces with little more than hand tools. No welding necessary.

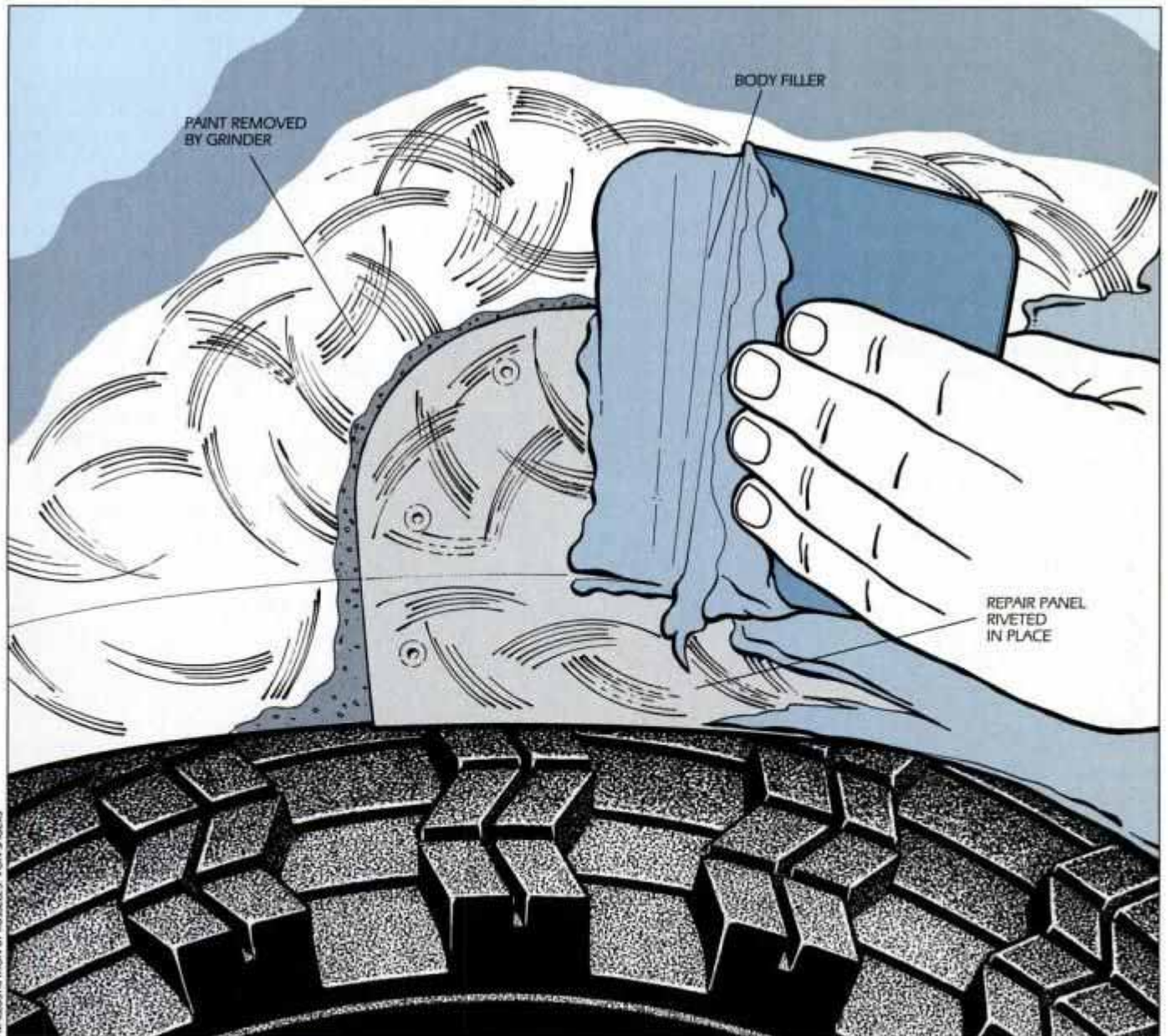


PHOTO ILLUSTRATION BY RUSSELL J. VON SAUBERS

from electroplated galvanized steel. Scratch one of these panels and the zinc plating surrounding the scratch immediately rushes over the wound, thus healing it from the ravages of corrosion. The process works so well that car- and truckmakers now routinely offer rust-through protection warranties of seven years or more.

It also means that rust-proofing a new car is a waste of time and money in most cases. In some instances, it can even void the new-car warranty because drilling holes to spray body cavities with rustproofing agents can actually accelerate corrosion.

Getting an improper collision repair can also void the rust-through warranty.

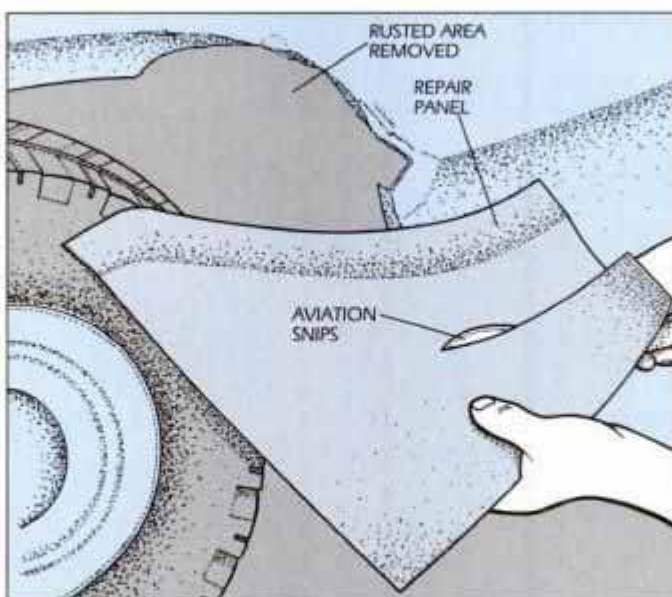
That's because during a collision and the subsequent repair, seam sealers crack, sheetmetal is torn, body parts are welded, panels are sanded bare and primers and finishes are applied. If any of these items is overlooked or the work is done improperly, rampant rust is the result.

If your car has a rust-through warranty and you have an accident, be sure to get your car repaired by factory-authorized personnel or by body technicians who are certified by the Inter-Industry Conference on Auto Collision Repair. These I-CAR technicians get extensive training in restoring corrosion protection as part of the collision repair.

That's great, but what about your truck? Fortunately, there are a whole host of new, rust-removing, rust-stopping and rust-repairing products out there. Use them correctly and you'll not only find rust repair fairly easy, you'll be able to keep rust from coming back.

## Rust rules

The first rule of rust repair is to know your limits. That means if your vehicle has large rust-through areas, patching them up and repainting them is a bad idea. Cosmetic patching doesn't do a thing for structural integrity, especially in critical areas such as door and window pillars as well as rocker panels. Maintaining structural integrity is especially criti-



Begin by removing the rusted area with aviation snips. Be ruthless. Trim a section of the repair panel to cover the rusted-out area.

cal on cars with a unitized chassis where the body actually forms the chassis of the vehicle.

If a rusted area is large, or you have any doubts about whether the corrosion is structural, consult an expert at an auto body shop.

## Surface rust

Repairing surface rust is the easiest to tackle, thanks to several new products. Begin by removing as much of the rust as possible. Rusty nicks and scratches should be sanded clean. You can also sandblast rust away.

Conventional sandblasters are large, messy tools that get sand everywhere. But a new spot sandblaster made by the Eastwood Co. is

small and inexpensive. It's also a lot less messy than conventional blasters because a rubber apron around the blast nozzle presses close to the car body and causes the sand to return to a cloth bag instead of blowing all over the place. Several rubber aprons come with the blaster. You simply pick the one that most closely conforms to the body contour. To use the Eastwood blaster, connect it to your air compressor, select an apron that fits the body area, press the blaster against the body and push the button. When you pull the blaster away, you'll find a quarter-size area that has been blasted clean down to bare metal. Be careful not to blast any longer than necessary, since excessive blasting can cause the metal to swell.

Sanding or even sandblasting won't remove all traces of rust. If you paint over it, the rust will return. Prevent this by brushing the areas with a rust converter such as Extend from Loctite. Converters alter rust into a stable iron magnetite oxide that doesn't flake and will accept paint.

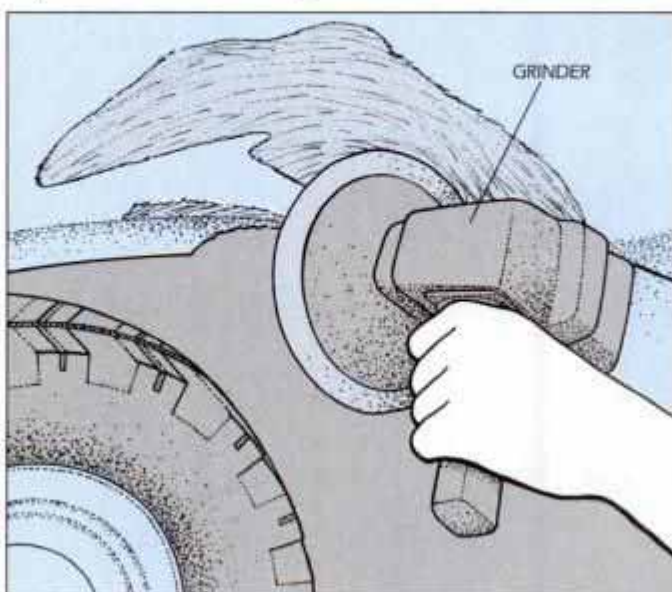
Before painting, fill pits and scratches with putty or filler, sand and prime.

## Small rust holes

The traditional way of fixing small rust holes was to use fiberglass cloth and polyester resin to patch the hole before filling the area with body filler.

The job is considerably easier and the results are better thanks to a product from Marson called Stuff-It, available at auto parts stores and body shop supply houses. Stuff-It consists of a 2-part body filler that contains long strands of fiberglass. As its name implies, you stuff the hole with it. The long strands give the filler enough strength to make the repair permanent.

To use Stuff-It, grind the metal clean using a 16- or 24-grit sanding disc, then treat the inside of the panel and any remaining rust with rust converter. Next, dimple the metal around the hole and then fill the hole with Stuff-It, leaving the area slightly lower than the body. Once it's dry, fill the area



After removing the rusted areas, use a grinder with 24-grit sandpaper to remove any paint within 3 to 4 in. of the damage.



with conventional body filler, sand it level, prime and paint.

### Larger rust holes

Knowing where rust is likely to develop is no great mystery. Chances are, if your vehicle is rusting over the left rear wheel well, there are thousands of others out there that are rusting in the exact same location. The makers of rust-repair panels such as Keystone, Sherman and Tabco make it their business to know where cars and trucks are likely to rust. They then stamp panels to fit over these rusted areas. They also make complete parts such as front fenders, doors, hoods, trunklids and tailgates.

Many auto parts stores can order rust-repair panels. Or, you can contact the makers directly (see Source List below).

#### SOURCE LIST

- Eastwood Co., 580 Lancaster Ave., P.O. Box 296, Malvern, PA 19355
- Keystone Automotive Industries, 700 E. Bonita, Pomona, CA 91767
- Loctite Corp., 705 N. Mountain Rd., Newington, CT 06111
- Marson Corp., 130 Crescent Ave., Chelsea, MA 02150
- Sherman Associates, 27940 Groesbeck Hwy., Roseville, MI 48066
- Tabco, 30500 Solon Industrial Pkwy., Cleveland, OH 44139

Larger holes and places where there are multiple holes are best repaired using a rust-repair panel.

Body shops weld rust-repair panels into place. But unless you have a MIG or TIG welder handy, that's not practical.

The alternative is to rivet and epoxy the new panel into place.

You'll need to make some hard decisions once you really get down on your hands and knees and take a close look at the rusted panel. Rust perforations often extend into the inner body panels, and to add insult to injury, the damage visible from the inside of a fender is often much more extensive than it appears from the outside. If the damage is extensive enough, the repairs necessary are beyond the abilities of most Saturday mechanics and beyond the scope of this article to boot.

Remember that the structure of your vehicle is part of a carefully calculated crush zone intended to save your butt in an accident. Don't compromise this with extensive cosmetic repairs that aren't structurally sound.

Choose a replacement panel that most closely fits the area that needs repair, then cut and grind away the corroded metal.



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Of course, once you've cut away the damaged outer metal, you're likely to find corrosion on the inner metal. Brush away any loose or flaking rust, then treat the area with rust converter.

Many times, interior rust areas can't be reached easily. If that's the case, scrape or wire brush the area then treat it with Corroless rust stabilizer from Eastwood. Corroless acts like a rust converter by changing much of the corrosion into iron oxide. But it goes one step further by forming a hard primer-like surface to accept paint.

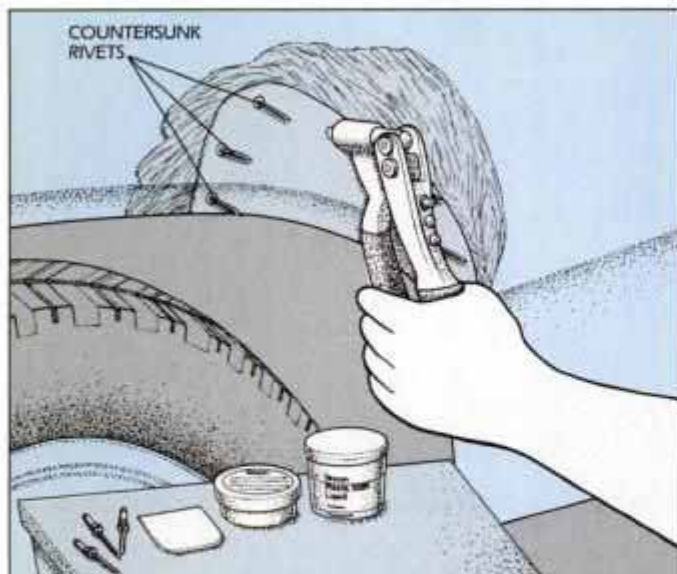
After treating the area, apply chas-

sis black or rubber undercoat to seal it against moisture.

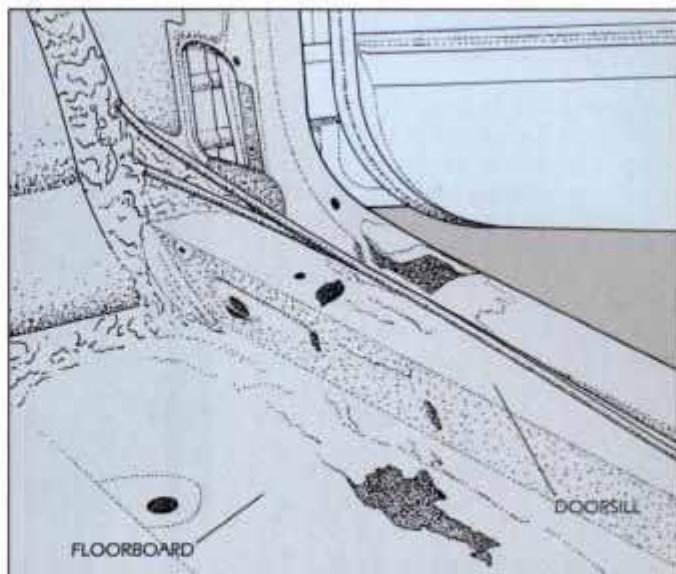
With the rust hole clean and trimmed, use aviation snips to cut the repair panel to fit over the hole.

Next, grind the area surrounding the rust hole with a 16- or 24-grit disc to rough up the surface and remove all paint. Do the same thing to the back of the repair panel.

The panel is permanently affixed to the body with 2-part liquid steel and countersunk pop-style rivets. Devcon 2-part liquid steel is available from industrial supply houses (don't confuse it with the 1-part liquid steel in hard-



Rivet the new panel in place with an epoxy adhesive to provide moisture resistance. Grind away excess adhesive.



Serious structural rust calls for a professional welder's attention or a trip to the scrapyards. This car can be saved.

ware stores). Marson makes  $\frac{3}{16}$ -in. steel countersunk rivets, which are available in many auto parts stores and auto body supply outlets.

To fasten the panel, hold it to the body, then drill several  $\frac{3}{16}$ -in. rivet holes around the perimeter. Next, countersink the holes in the panel so the rivet

head will rest lower than the panel.

Mix the liquid steel according to the instructions, then spread it onto the back of the repair panel. Press the panel in place so the rivet holes align, then slip all the rivets into the holes before drawing them tight with a rivet gun.

At room temperature, it takes about 24 hours for the epoxy to dry. After it has hardened, grind the area with a 36-grit disc, then spread body filler over the rivets and the seam.

After filing and sanding the filler level, prime the area, fill pinholes with putty, sand and paint. **PM**

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A professional installation can be arranged, or the average home handyman can install a Sola-Tube in about three hours. Every roof type can be handled with ease. You'll especially appreciate the absence of mess or disruption in the household.

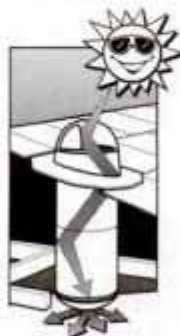
Made in the USA, Sola-Tube is completely maintenance free, sealed and waterproof, and protected by a 10 year warranty. Average price including installation is around \$300.

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### THE EXCITING NEW ALTERNATIVE TO TRADITIONAL SKYLIGHTS

Every home has its dark spots. Now you can brighten them quickly, easily and economically with natural sunlight, through a unique new product, Sola-Tube. A clear acrylic dome - 10 unobtrusive inches in diameter - sits on the roof. Inside the dome, a reflector catches sunlight from all angles and beams the light down mirrored transfer tubing, to a diffuser in the ceiling.

The diffuser looks like a regular light fixture, and it spreads the light evenly, illuminating up to 100 square feet. Sola-Tube fits between the roof rafters and ceiling joists, so no structural modifications are needed for installation.



**SOLA-TUBE**  
NORTH AMERICA LIMITED  
*High Performance Natural Lighting*

Performance has been excellent, and we especially like the new 2.2-liter 16-valve 4-cylinder engine.

Lest you think all is perfect with this car, it is not. The most glaring negative is the climate-control system. It is just not up to the task of a Northeast winter. Its worst problem is that, even on mildly humid days, the system cannot keep the car's glass clear. The minute you enter the car, your body heat causes the glass to cloud up, and, even with the a/c compressor on full blast, the system has a hard time keeping up.

The only other problem has been a balky electric door-lock system that wants to keep clicking minutes after you've asked it to lock all the doors. We'll have this taken care of when we bring in the Accord for its first scheduled maintenance.

—Deborah Frank

**TEST SUMMARY**

Report number: 2  
 Total miles driven: 5649  
 Miles driven since last report: 5444  
 Average fuel economy: 25.1 mpg  
 Worst observed fuel economy: 24.7 mpg  
 Best observed fuel economy: 27.6 mpg  
 Maintenance/repair costs: None

**Subaru Impreza L**

The Impreza made the trek from our Santa Monica, California, offices eastward after it had already accumulated some mileage, as well as a reputation for being a perfectly adequate little shoebox. We found the impressions of our West Coast staff accurate. The interior was a little cramped, the engine was a trifle underpowered and noisy compared with some others in the class and there were some annoying rattles and squeaks somewhere about 6 ft. behind our ears, but otherwise the little wagon was great for ferrying groceries as well as being reliable for getting us to the airport on time.

It did not make a big impression.

And then the snows came.

New York and environs saw its worst winter in decades, with 17 snowstorms outstripping the ability of road crews to stay ahead of the rapidly mounting white stuff. Did we mention that the Impreza, like 80% of Subaru's sales in the United States, is all-wheel-drive?

Next winter, keep track of all the annoying people passing you by in the unplowed left lane of the freeway when you're struggling to stay on the road in the plowed and salted right lane. These people are probably driving Subarus. The straight-line stability of awd on snow-covered roadways has to be experienced to be believed. We found ourselves driving around on nasty days just for fun, when most people found conditions so bad they

were unwilling to leave the house—even for food.

The Impreza's ability to extricate itself from snowbanks is similarly amazing. We left it in the long-term parking lot at the Newark, New Jersey, airport, returning five days later to find it literally door-handle deep in drifted and plowed snow. We had to dig enough to get the door open, and then started the engine and backed out of the parking place without having to slip the clutch.

But spring has come, the snows are no more and we're giving our little awd shoebox back to Subaru.

—Mike Allen

**TEST SUMMARY**

Report number: 4  
 Total miles driven: 14,356  
 Miles driven since last report: 2800  
 Average fuel economy: 18.9 mpg  
 Worst observed fuel economy: 16.3 mpg  
 Best observed fuel economy: 27.9  
 Repair/maintenance costs: None

**Dodge Intrepid ES**

The Intrepid has been returned to Dodge. We're genuinely sorry to see it go, even though it's been supplanted by newer vehicles in our test fleet. We've cycled through more than a dozen other vehicles, both long-termers and press-fleet cars that were guests in our garage for a week or so

since our last report. Through it all, the Intrepid has always been a welcome place to return to.

We've experienced no maintenance needs of any sort. Twelve thousand miles doesn't sound like a lot, but commuting into New York City five days a week involves a lot of traffic jams. Fuel economy consequently suffers—but seat time is seat time, and we've had plenty of that. We've been grateful for the Intrepid's excellent stereo and automatic climate-control system. On the weekends, we've also appreciated the trip computer and the cruise control. Any kind of driving makes us appreciate the power-adjustable seats. My normal driving position is unusual, with the seat back leaned way back and the seat cushion raked back to match and pulled close to the pedals. Few other cars can achieve this admittedly bizarre driver attitude, but the Intrepid's seats do it so easily.

We'd buy one of these for our mother in a minute—and we mean that as a compliment.

—M.A.

**TEST SUMMARY**

Report number: 4  
 Total miles driven: 12,536  
 Miles driven since last report: 3500  
 Average fuel economy: 18.9 mpg  
 Worst observed fuel economy: 13.6 mpg  
 Best observed fuel economy: 22.3 mpg  
 Repair/maintenance costs: None

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# Detroit Spy Report

BY JIM DUNNE, Detroit Editor

## Pontiac's Sunfire

● Pontiac intends to build some excitement into the small, front-wheel-drive segment this fall. That's when GM's excitement division will introduce a totally new line of compact sedans and coupes to replace the old Sunbird J-Car. Wearing the new name, Sunfire, the new cars look totally different from the



ones they replace. These photos clearly show that the styling changes are car-wide—the new sheetmetal has much softer lines than before, falling into step with its competitors. The car will have a totally new look inside as well, and will feature dual airbags. The odd black-and-white paint scheme and the boxy bulges are merely disguises—this is not what you will see in showrooms. The front end (inset) is closer to the truth.

## Replacement Wrangler

Without taking much of a breather after the creation of the Ram pickup, Chrysler truck operations is already embroiled in another big project—a new Jeep Wrangler. The smallest vehicle from Jeep—and the one that's closest in appearance to its forebear, the military Jeep—will be more civilized after its 1996 model-year change. The Wrangler's cab will have integrated doors and a roof that reaches from the cowl rearward to behind the front seats. The bumpers will be plastic-covered modern ones that follow the body contours. Besides the modern, civilized look, changes are also being made to the suspension. The new Wrangler will finally discard the traditional long leaf springs in favor of coils at all four corners. So the traditionalists won't worry too much, the Wrangler will retain its front and rear solid axles. It's interesting to note that

the Jeep's designers used the Geo Tracker as their benchmark vehicle. Tracker's updated styling was the starting point for Wrangler. Oh yeah, you can also look for round headlights to return in the 1996 model.



## An American Cat?

Despite speculation about future Jaguar models since the British marque is now owned by Ford, future Jaguars will continue to be built in England and will not be made part of Ford's U.S. assembly lines. At least that's the word from insiders at both Jaguar and Ford. Explains a Jaguar official, "We've made a conscious effort to identify with Jaguars of the past. It's all about image and British heritage."

## Suburban Guerrillas

Despite the closed-mouth attitude of Ford officials, there is no hiding the fact that the folks from Dearborn are readying this full-size sport/utility

vehicle. And even though Ford's requirements may differ from those of GM, the as-yet-unnamed vehicle will compete directly against GM's Suburbans when it is introduced as a 1996 model. The new Ford is based on the F-Series Ford pickup. That means the cab design—both inside and out—is taken from the best-selling pickup. This prototype model has a fabric mask over its 1996 front end, which has the styling of the Ford pickups. But a more careful glance at the fender lines shows a steep slope to the hood profile. The lowered hood height is partly a result of a new front suspension. Ford will drop its venerable Twin I-beam front suspension in favor



There's no denying the obvious. The Ford full-size sport/utility (right) is sized, shaped and aimed to compete head to head with General Motors' so-far-unchallenged Suburban (left).



Masking at the rear of this Taurus wagon hides shapes of C-pillar and rear side window.

of a traditional A-arm system. That lowers the front-axle clearance an inch or two for a lower hoodline. In this prototype, a V8 engine is set well aft of the axle line.

### 1996 Dakota

Chrysler will introduce a newly styled Dakota pickup late in 1995 as a '96 model. And that introduction will mark the end of a total overhaul of all of the company's vehicle lines. Dakota, the largest of the so-called compact pickups, is a strong seller for Dodge. But its appearance is slightly dated—especially when compared to the newer trucks in its class. Chrysler designers promise that the next Dakota will leapfrog its competitors and feature more-powerful drivetrains coupled with dramatic styling. And you know that styling will be a strong point. As you might guess, the new Dakota will look a lot like the Ram.

### Potentially Potent Windstar

Though you won't be able to order one right now, sometime in the future you may be able to specify a V8 engine to power your Ford Windstar minivan. Ford engineers purposely designed the Windstar's engine compartment to accept a V8. That's an easy task, since the Windstar powertrain was adapted from the 1995 Continental's. Though a V8 may never show up in a future Windstar, Ford will be ready to slide one in if the competition moves that way.

### Cocoons

If researchers have their way, your car may well someday become something of a cocoon outside as well as in. One airbag research company is testing the advantage of putting airbags on the outside of cars. The idea is to cushion the force of an accident impact before metal even meets metal. Bags would fit in bumpers and on roof rails, for rollover protection. These external airbags would complement radar systems—already under development—which would signal a collision and trigger the bag inflation. The extra cushioning effect of the external bags would add to the crush space al-

ready built into a car body. Cost? The answer to that question is often another question: What is the saving of a single life worth?

### Taurus Station Wagon

You might find it difficult to see through the heavy disguise, but this prototype of the 1996 Taurus wagon gives a hint of what's coming from Ford. Points of special interest include the rounded shape of the C-pillar and the extreme angle of the third side window (which is mostly covered) at the cargo area. Ford insiders keep assuring us that those boxed-in door handles on Taurus prototypes are definitely not for production cars. In the final design, the surface between the doors and handles is smooth and continuous. **PM**

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# Line Of Fire

BY ALEX ZIDOCK JR.



• Buck Rogers fired one a half-century ago. So did Flash Gordon. Capt. Kirk used one in the 1960s, and Capt. Picard uses one now. What do these Hollywood heroes have in common? A laser-ray gun, plus one more thing: They live in the future. For better or worse, laser guns are still technologically beyond our reach.

Laser sights, on the other hand, are available right now, and their growing fraternity ranges from law enforcement and military users to hunters and competition shooters.

Basically, a laser sight is a low-power laser device mounted to a firearm. When activated, the device sends an intensely focused beam of light from the firearm to the target. Aligned properly, the laser beam matches the firearm's target-acquisition line.

The primary reason for the current boom in laser sights is because small, affordable visible-laser diodes (VLDs) have finally become available in the consumer market. Also, nothing boosts target-acquisition quickness and aiming accuracy more than touching the intended target with a long finger of light. While laser-sight systems are actually a simple application of laser technology, they represent a big improvement over traditional iron or tritium sights.

Everybody remembers what laser stands for, right? Laser is an acronym for Light Amplification by Stimulated

Emission of Radiation. In traditional lasers, light is produced when atoms are excited by an energy source such as light or heat. A common light bulb produces light the same way, but with a laser the light is concentrated on a single wavelength instead of spread across a wide range.

The current generation of laser sights is being touted as having more power than earlier lasers, and some manufacturers are calling them "daylight lasers." The reason for the apparent increase in strength is that the new units emit a light of a shorter wavelength than earlier-generation laser sights.

The so-called "daylight" sights emit 630nm to 635nm laser beams (wavelengths of light are measured in nanometers). These narrow wavelengths are located closer to the red/yellow portion of the visible-light spectrum than the first-generation 670nm lasers. Although the intensity is not stronger than previous sights, they appear more orange in color and 10 times brighter.

When analyzing **The Site-Lite LS-2** requires drilling and tapping for installation.

laser sights, there are several things to consider. Of the models examined for this story (including both 670nm and 635nm varieties), all seemed more than bright enough to use at close range, day or night, plus outdoors at medium range from dusk to dawn. However, for a laser sight to be effective at distances of 100 to 300 yards, or for use outdoors in the shade or shadows on a bright sunny day, a laser sight with a 630nm to 635nm diode is much preferred.

Another important consideration is the method in which the sight is mounted to the firearm. Most manufacturers offer a variety of mounts that fit all makes and mod-



PHOTO BY ALEX ZIDOCK JR.



The trigger-guard mount system for the Laseraim LA-5 includes a NiCd battery.

els of firearms. For this story, laser sights were requested to fit either the Beretta 92FS or the Model 1911 A1 clone.

If you own a Glock pistol, Aro-tek (206 Frontage Rd. N., Pacific, WA 98047) will modify the firearm so that only the laser diode appears externally on the trigger guard. The wires run from the diode through the hollow trigger guard to a pressure switch mounted to the back of the grip. Concealed wires then travel to a battery

in the base of the grip. Cost is \$399, plus \$15 for shipping and handling.

The Site-Lite, made by Concept Development Corp. (P.O. Box 14706, Scottsdale, AZ 85267), also requires firearm modification—drilling and tapping two holes in the base of the receiver to accept No. 6-48 screws. Cost at a local smith was about \$25. This mounting system produces a secure, permanent fixture. The manufacturer reasons that since gun owners drill and tap firearms to mount sights

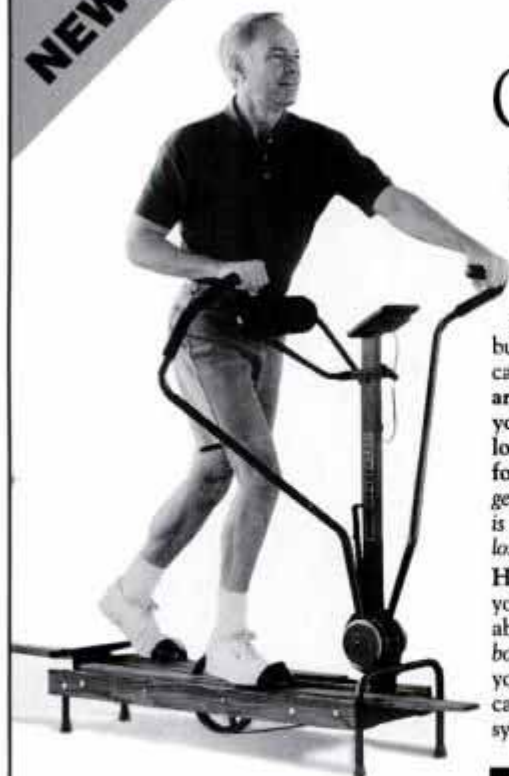
and scopes, why not a laser sight? The Site-Lite LS-2 (670nm) comes with a detachable 6-in. low-pressure switch that can be positioned anywhere on the firearm with Velcro tape. It also includes a belt holster with magazine pouch, custom mount, switch and an extra ring mount. It retails for about \$219. The LS-5 model with the Hi Visibility 635nm diode retails for about \$369.

Laseraim, made by Emerging Technologies (P.O. Box 3548, Little Rock, AR 72203), is the only sighting device tested that comes with a rechargeable NiCd battery. When the NiCd gets low, you attach the recharge cord to any 9-volt battery. In about 10 hours the Laseraim is ready for another round of 2000 to 4000 bursts. Users get a half-dozen recharges from one battery.

Using either a trigger-guard or barrel-mount system, the Laseraim Hotdot performs extremely well at long distances. The LA-5 (above left) with the 670nm diode lists for less than \$200. Hotdot models with the 630nm diode cost less than \$250.

While 670nm diodes are currently available, the future of laser sights is in 630nm to 635nm diodes. And while space-age laser guns are not yet on the horizon, laser-sight technology has definitely arrived. **PM**

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# Eyecatching Video

BY FRANK VIZARD, Electronics Editor

● Just when you might think the ubiquitous videocassette recorder would offer little in the way of innovation, along comes an improvement of note.

Don't get the idea there are as few differences among VCRs as there are among competing brands of toasters. The point is well illustrated by a new line of hi-fi VCRs from Toshiba.

Called the Cinema Series, all three VCRs in this line employ a flying preamp design that is borrowed from the professional broadcast arena, which produces a sharper, clearer picture. The high-end model, meanwhile, includes six video heads so the picture quality differences between the Standard Play (SP) mode and the Extended Play (EP) mode are almost indistinguishable.

So why is the flying preamp design so significant?

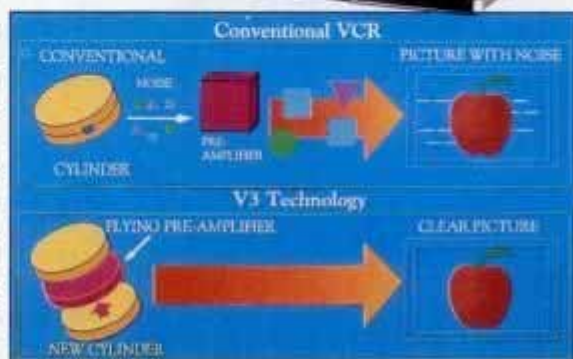
"Until now, only professional decks featured flying preamps, which amplify the video signal while it is still inside the VCR's rotating head cylinder," explains Claude Frank, Toshiba's national product marketing manager. "Because the flying preamp is located directly in the video head cylinder, virtually no noise enters the signal during playback. The result is a much clearer and more natural-looking picture."



Picture quality also gets a boost from the inclusion of six video heads. In traditional 4-head VCRs, two video heads are used for SP playback and recording while the other two are used in the EP mode. In Toshiba's Model M760, two additional heads are added for EP recording and playback. These very narrow video heads not only enhance EP picture quality but also improve the quality of special effects such as slow-motion.

These improvements are all part of what Toshiba calls its V3 chassis design. However, these are not the only improvements under the hood. All three VCRs include VCR Plus C3 circuitry that allows the VCR to link easily with a cable box for simplified recording between different channels.

Another handy feature is called Auto Speed Select. When engaged, the VCR automatically downshifts to



A flying preamp reduces noise, thereby producing a sharper, more natural-looking picture.

a slower recording speed in order to fit an entire program on the tape.

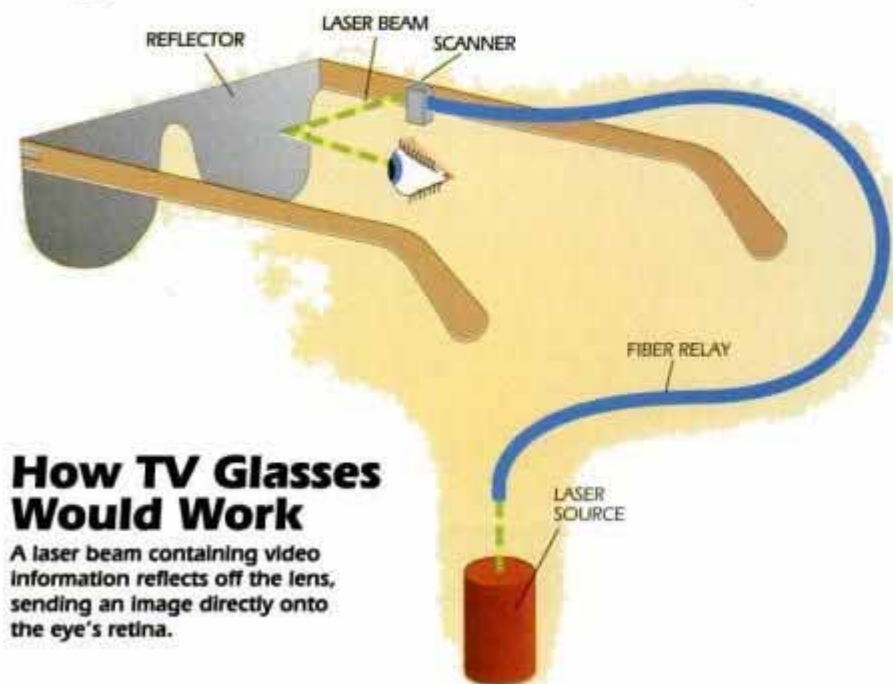
Now you'll know how things turned out in the end. List prices range between \$450 and \$700.

## Retinal Scan

TV glasses are not a new idea. Usually the concept employs some method of projecting the image directly onto the eyeglasses for viewing.

Motorola Inc., however, recently applied for a European patent for what it calls a direct retinal scan display, thereby putting a whole new twist on the idea of TV glasses. Simply put, this device projects the video image directly onto your eyeball.

The idea is to send a modulated laser beam containing video information along a fiberoptic cable connected to a small scanner on the frame of the glasses. The scanner sweeps the light beam rapidly along a raster of horizontal lines, working much like a conventional television. The scanning itself could be done with micro-machined mirrors, electro-optic or acoustic-optic devices, which are all extremely small and require very little power. The video beam is then bounced off the eyeglass lens and directed through the pupil to produce an image on the retina of the eye. Assuming the scanning is done quickly enough, the eye perceives a continuously moving image.



## How TV Glasses Would Work

A laser beam containing video information reflects off the lens, sending an image directly onto the eye's retina.





This tiny video camera mounts atop a computer monitor for face-to-face conferencing.

Needless to say, a device like this would have some regulatory hurdles to jump—just from a safety standpoint alone—before it came on the market. Still, this idea offers a glimpse—no pun intended—of where the future of TV might be headed.

### TV Camera

The future, meanwhile, is just about here as far as video interactivity is concerned. With inexpensive video conferencing over coaxial cable or standard copper wiring becoming available from companies like Intel and AT&T, the next add-on device for your TV or computer monitor just may be a video camera.

Early adapters of new technology can already pick up such a camera from SuperCircuits Inc. of Austin, Texas. The company's new PC-11 microvideo camera mounts atop a computer monitor and produces a color picture with 350 lines of horizontal resolution. Light sensitivity is 2 lux, and the microvideo camera features a built-in high-sensitivity microphone and a preamp section for easy connection to your multimedia computer or video input board. There's also a standard video output for connection to a TV or VCR. List price is \$350.

### Environmental Software

Let's say you want to see what a room would look like if you painted the walls a different color, put in a fireplace and rearranged all the furniture. You can get a good idea of how things would look with a computer software program called *Virtus VR*.

Despite the name, *Virtus VR* isn't quite a virtual-reality program, although the environments you can construct are 3-dimensional. *Virtus VR* has a library of objects and environments so all you have to do is drag and drop from one window to the next. We put *Virtus VR* into our own working environment, and you can see the result in the article on home security in this issue (see illustration on page 38). POPULAR MECHANICS' graphics director, Bryan Canniff, thought *Virtus VR* was "cool" but notes that working

in *Virtus VR* can be very memory intensive for the computer.

### Sound Notes

If you like to make voice memos to yourself but are tired of fumbling with a tape recorder, then the good news is that personal recorders are going digital. The advantage is random access to your voice memos and ease of use.

While there have been a few digital recorders already on the market, they tend to offer very limited recording times. The best we've seen thus far is called Flashback and is manufactured by Norris Communications Corp. of Poway, California. This recorder, listing for \$199, is very light at 3 ounces and is thin enough to fit easily into a shirt pocket.

Despite its small size, Flashback is feature-packed and all of them are easily accessed with either of two control buttons. Features of note include the ability to insert addenda into an already recorded memo and the ability to listen to recordings at a very fast or very slow

speed without loss of intelligibility. Sound quality in any mode is very good.

Recordings are actually made onto tiny sound clips that you insert into Flashback. Each sound clip has a 30-minute capacity, and additional sound clips are available for less than \$70. The slot the sound clips are inserted into is also PCMCIA compatible. This means your memos can be downloaded onto a personal computer, personal digital assistant or other PCMCIA device outfitted with this performance-enhancing feature. **PM**



Flashback offers pocket-size digital recording.

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# The Trouble With Antimatter

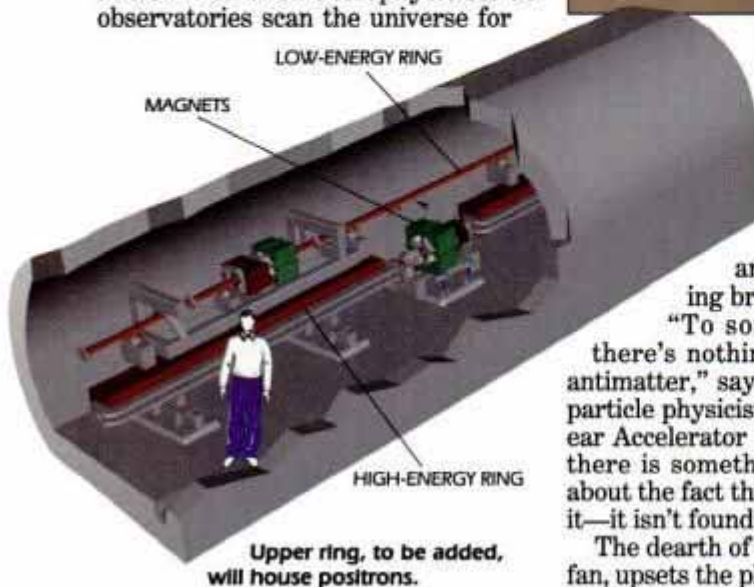
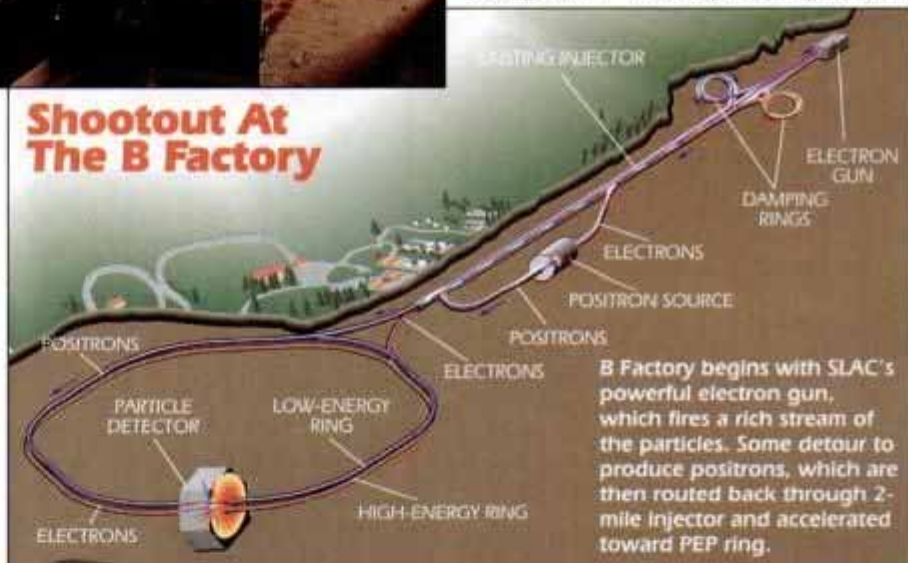
BY GREGORY T. POPE, Contributing Editor



● Ever wake up in a cold sweat worrying why you're not made of antimatter? Neither have most of us. But the predominance of matter over antimatter is one of those momentous questions that darkens the rings under physicists' eyes.

While antimatter abounds in the engine rooms of fictional spacecraft, in real life it's disturbingly rare. Our world of matter contains atoms made of negatively charged electrons orbiting positively charged nuclei. In antimatter, positively charged electrons—called positrons—circle negative nuclei. But when astrophysicists at observatories scan the universe for

## Shootout At The B Factory



naturally occurring antimatter, they're left hungry. Only their colleagues who smash atomic particles together at accelerators can create streams of antimatter before eating breakfast.

"To someone like myself, there's nothing mysterious about antimatter," says Jonathan Dorfan, a particle physicist at the Stanford Linear Accelerator Center (SLAC). "But there is something very mysterious about the fact that we have to produce it—it isn't found in any stable form."

The dearth of antimatter, says Dorfan, upsets the pleasantly symmetrical

view of the world that physics relies on. True, theoreticians have found various loopholes in nature's laws that would explain the imbalance of matter and antimatter. But none of them ring with the elegance that physicists crave, and none are well supported by experiment.

All that should change, however, after the year 1999, when the B Factory opens for business. Now under construction at SLAC, in Stanford, California, the B Factory is a new experimental facility that aims to solve, once and for all, the problem of antimatter.

Unlike the equally ambitious Superconducting Supercollider, which Congress scuttled because of its expense, the B Factory seems a cinch to reach completion. With a price tag of \$177

million, the machine is a bargain for big science. Rather than building from scratch, physicists will upgrade an existing collider at SLAC, which is a Department of Energy lab run by Stanford University.

That collider, called the Positron-Electron Project, or PEP, currently whips high-energy electrons and positrons around a storage ring before diverting them into head-on collisions. To become the B Factory, PEP will get a second ring, engineered so that electrons and positrons collide with unequal energies.

Physicists crash familiar particles together to produce short-lived unfamiliar particles, which then reveal something about the makeup of familiar matter. And that's exactly what

the B Factory will do. SLAC is tooling the factory to crank out hordes of fleeting particles known as B mesons.

To understand why B mesons hold the key to the antimatter question, you have to walk through the mind-boggling world of theoretical physics.

Back in the mid-1950s, scientists felt they could explain the interactions between physical forces and particles with an overarching theoretical model. A clean symmetry pervaded this set of rules. One hallmark of the rulebook was that the laws of physics should be exactly the same in a mirror-image world. That's a world in which, for example, a given atomic particle would spin right-to-left instead of left-to-right.

All was well until two American physicists discovered that a certain type of atomic decay, governed by a law of physics, violates this mirror-image symmetry. For ruining a perfectly attractive theory, these researchers landed Nobel Prizes. Luckily, however, the violation they found proved to occur in full force 100% of the time, leading physicists to believe that their theory had a simple flaw. Sure enough, it turned out that to get physical laws to work in a mirror-image world, you must do more than just flip left and right. You must also replace matter with antimatter. The notion briefly restored symmetry to particle physics.

But in 1962, two more scientists found another species of atomic decay that spoiled this symmetry—again, winning Nobel Prizes. Unfortunately, this new discovery could not be explained away as easily, because the violation occurs only rarely. Nevertheless, this technicality means, in essence, that a world of antimatter must behave differently from a world of matter.

Known in physics lingo as "CP violation," the discrepancy could explain why matter rules the cosmos. Current theories about the creation of the universe center on a primordial explosion known as the Big Bang. Just as high-energy accelerator experiments produce matter and antimatter in equal amounts, so, physicists reckon, should have the Big Bang. Yet normally when matter and antimatter touch, they disappear into a flash of energy.

"After the Big Bang," says Dorfan, who is the B Factory project leader, "matter and antimatter should have annihilated each other. Thank goodness matter seemed to win this war, or else we wouldn't be here. It seems that CP violation tipped the balance slightly in favor of matter."

Russian physics legend Andrei Sakharov is the one who reasoned that CP violation must lie behind the

victory of matter. Still, nobody really knows what causes CP violation.

That's where the B mesons come in. As it happens, B mesons and their antimatter counterparts, anti-B mesons, are more prone to CP violation than any other particle.

Even so, only one out of 100,000 B mesons exhibits this rare phenomenon, which shows up as the particles decay. But because its electrons and positrons will bring unequal momentum to their collisions, the B Factory will produce B mesons in motion. This motion will scatter the particles farther apart than usual. Physicists will

be able to key in on the ones they want and study their decays with unprecedented precision.

The B Factory will allow experimenters to compare CP violation in B mesons and anti-B mesons. The result: a broad set of measurements, with enough range to test competing theories about CP violation. With this in hand, theoreticians should be able to roll an accounting of the phenomenon into the laws of particle physics. That will be one more step toward a true understanding of the universe. And to a handful of physicists, it may finally mean a good night's sleep. **PM**



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## COMPUTERS

# A Notebook Of Note

BY STEPHEN A. BOOTH, Contributing Editor

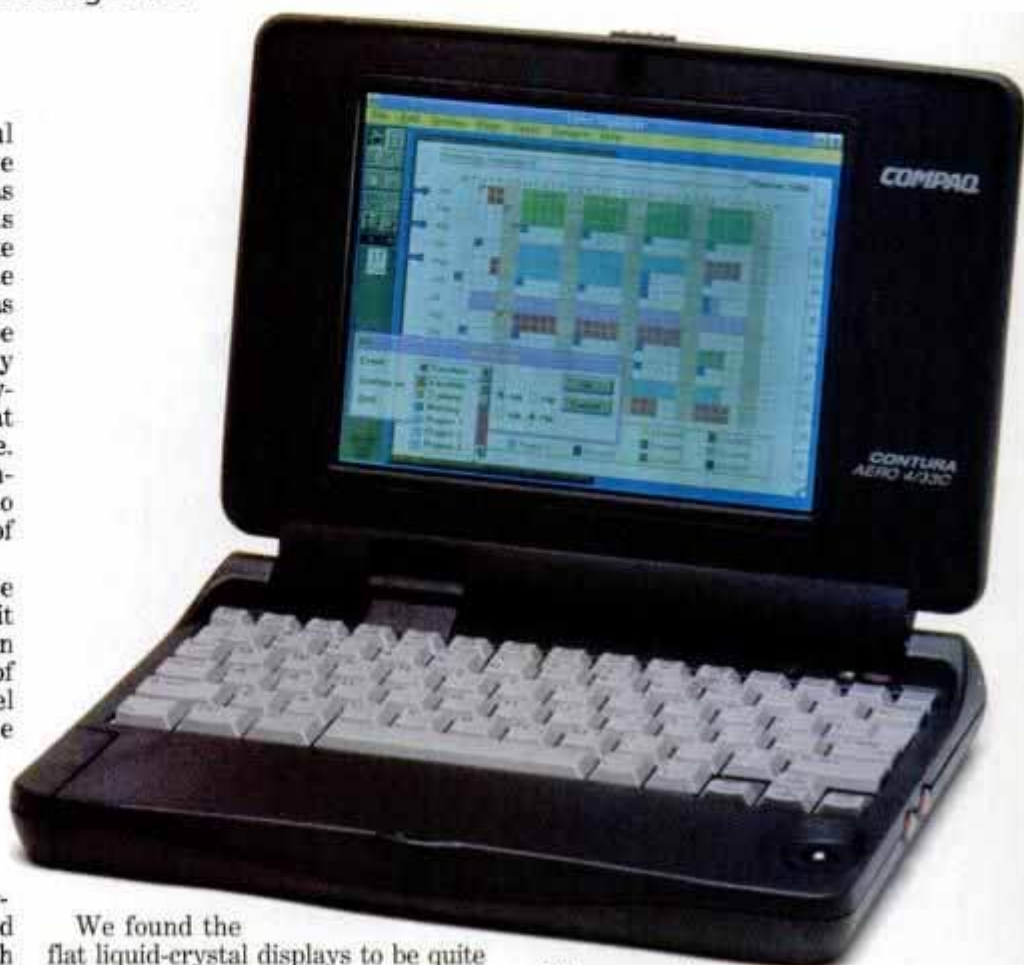
● There's a great deal of wishful thinking when it comes to portable computers. We want them to run as fast as desktops and pack just as much memory storage, so we can take a suitcase of files and programs on the road. We want the flat screen to be as big and bright as the cathode-ray tube monitor back home, and preferably with vivid color. We want a big keyboard with the reassuring feel that lets you know your points hit home. Of course, we want all this performance and convenience in a package no bigger and heavier than a handful of magazines.

There's a great deal of compromise and unfulfilled expectations when it comes to portable computers. Even when a machine satisfies most or all of the above requirements, we marvel that it costs so much more than the desktop powerhouse. Then comes the crushing realization that this lightweight genie loses its power to grant your wishes after just 2 hours on a battery.

Compaq Computer set out to correct the drawbacks of portables, and has succeeded remarkably well with its new Contura Aero line of subnotebook-size portables.

Subnotebook describes the Aero's size and weight: just 10.25 in. wide × 7.5 in. deep, and 1.5 in. thick with its flat screen folded down in the closed position. It tips the scales at 3.5 pounds, including its rechargeable battery.

Within those tiny confines, the Aero packs an Intel 486SX processor, making it the intellectual equal of most desktop PCs. It's a special low-voltage version of the chip, whose 3.3-volt consumption is easy on batteries. As for processing speed, the Aero 4/25 with monochrome display runs at 25 MHz (megahertz) while the 4/33C with color screen runs at 33 MHz—no slouches here. The display screens are generous by subnotebook standards: 8 in. diagonally for monochrome and just a quarter-inch less for color.



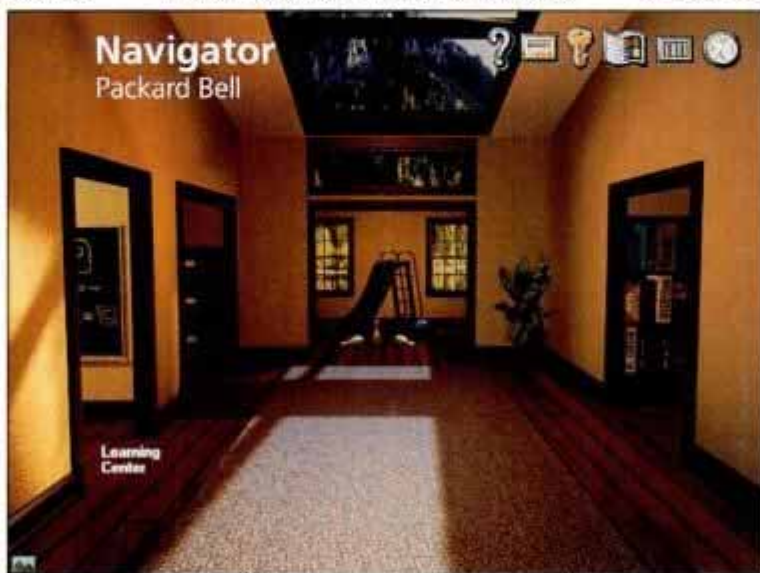
We found the flat liquid-crystal displays to be quite bright. The VGA color version was surprisingly sharp even though it's not an active-matrix design. So-called active-matrix LCDs are usually the sharpest, but are sponges for power. Compaq instead uses an STN (super twisted nematic) grid but has enhanced its performance handsomely.

These machines easily match desktops when it comes to system memory and storage. Standard issue is 4MB (megabytes) of system random access memory (RAM). For power users, the system RAM is expandable to 12MB. The bulk storage is remarkable for portables. The base

Aero has an 84MB hard disk drive, with 170MB and 250MB upgrades available. Compaq notes that 75% of the desktop PCs in homes have less than 84MB of storage.

In the interest of portability, sometimes the width of a keyboard is reduced so much that it seems your hands have too many fingers. Compaq's Aero is very user-friendly at the keys. Compared with the company's larger Contura series portables, the Contura Aero keyboard is just 5% smaller and retains 85% of the stroke.

*(Please turn to page 117)*



Packard Bell's Navigator is a visual shell designed to make access easier.

control panel itself seems to be a bit slight. Aside from this minor quibble, the M8.2E/L is a good example of the easiest-to-use exercise machine on the market.

### Trotter 525

Clearly, the BMW of the test is the Trotter 525 treadmill, a home unit that lives up to health-club standards in terms of ruggedness, advanced features and overall quality. The catch is that the price tag is \$4200. That's right, four big ones. Is it worth it?

Of all the units in the test, except for the stair-stepper to a lesser extent, the treadmill is a machine that you don't want to cut corners on. Treadmills are the only machines that absorb full body pounding, an activity that delivers extraordinary stress on resistance systems and overall structure. Compared with the other units, the 525 appears to be built to withstand a war—a feature that doesn't come cheaply.

Like all treadmills, the 525 provides a good workout for the quads, hamstrings and hip flexors.

The Trotter's screen is the largest and easiest to read in the test. Working through the prompts and built-in programs was a little more clumsy than necessary, but after practice it delivers a wealth of options and information. Best of all, the 525 has a long, wide running track that features superior traction. Overall operation is smooth, comfortable, restriction-free and rock-solid.

Serious aerobics enthusiasts who want a long-lasting machine that delivers an excellent workout for all levels of fitness (children, elderly, elite runners, physically challenged) would be well served by the Trotter 525, despite its considerable investment.

So, which unit is the best? For serious, aerobics athletes, the answers are the NordicSport Ski 450 and the Trotter 525, with the Quantum Step By Step and Lifecycle 6500HR not far behind. For the elderly, physically challenged and those undergoing physical therapy, the Precor M8.2E/L recumbent bike is the clear winner, with the Lifecycle upright bike and Trotter 525 close seconds. For those seeking overall workouts, the affordable NordicSport cross-country skier is the only unit that works both the upper and lower body. In the end, since all of the units are quality machines, two factors count most. The first is a user personal profile. Before you choose, determine your physical strengths, limitations and goals. The second factor is personal preference. Select a machine that you enjoy using. Beyond this, turn up the Walkman and get set to sweat. **FM**

Real expandability comes through the Aero's PCMCIA Type II slot. This lets you expand the sub's functions with a variety of credit-card-size modules—for example, a fax/phone modem for communicating with other computers.

Another neat option is an external 3.5-in. diskette drive (\$160) that connects to the Aero through the PCMCIA slot, and even draws its power from the Aero. Compaq says that eventually there'll be a CD-ROM drive that hooks up the same way.

Speaking of hookups, the Aero sub-notebooks do become desktop PCs when you snap them into a \$99 accessory called the Convenience Base. This option replicates all the Aero's outputs and ports so you can connect a larger monitor and keyboard, a mouse, and stationary devices such as printers. The base has its own AC power supply and a cradle for recharging an extra battery.

Power and battery technology are the Aero's strong suits. Many portable computers run on rechargeable batteries that are specially shaped or sized just for a specific model. But Compaq has teamed up with Duracell to promote a standard battery you can buy off the shelf at retail stores, such as Kmart.

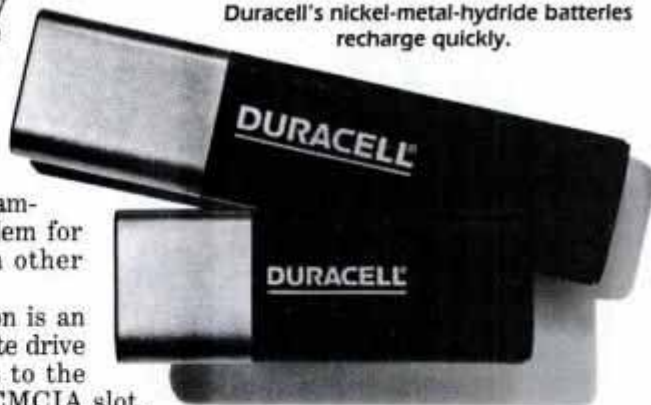
This Duracell battery is a nickel-metal-hydride (NiMH) type that can be recharged quickly, at any level of discharge. This Duracell battery will power the monochrome Compaq Aero for up to 6 hours and recharge in as little as 90 minutes. It'll operate the color Aeros for about 4 hours. Older nickel-cadmium (NiCd) batteries would run only about one-half to two-thirds as long.

Even the most mobile computer user doesn't need to run on canned juice all the time. But AC-to-DC converters have been heavy, bulky affairs in the past.

Compaq has remedied this situation with a tiny converter that weighs just 6 ounces and uses a 2-prong plug instead of the usual 3-prong variety. This is a thoughtful touch, because 3-prong outlets aren't found everywhere, especially overseas. To recharge overseas, all you need is the appropriate adapter, usually available from the hotel desk.

Compaq has done an admirable job with the electrical requirements of portable computers. What it's done about sticker shock is equally remarkable. The base Aero with monochrome screen and 84MB drive costs

Duracell's nickel-metal-hydride batteries recharge quickly.



\$1399. Aero's base color, with 170MB storage, lists for \$2199.

### Shell Game

As personal computers become more powerful and capable of performing more tasks, actually managing all that muscle proves intimidating to many a user. It's a good bet that PCs wouldn't be on so many desks if people had to use lengthy commands to run them. GUIs—or graphical user interfaces—let you point to a picture or icon and click on it to access a computer function. Microsoft *Windows* for IBM-compatible PCs is such a "shell."

Lately, managing the manager, or customizing the GUI, has become a desirable feature. This is especially true for home PCs that might be shared by several family members—each with his or her own set of files, applications and even games. Packard Bell now loads such a system, called *Navigator*, on all its PCs.

Using Hollywood-style animation and color graphics, *Navigator* lets you create different environments for working with the computer.

Turn the computer on and you see the image of a computer on a desk. *Navigator* then lets you choose to run the computer through a traditional menu or through one of the different, graphical environments. Select the latter and you'll find yourself in the hallway of an attractive house. From here, pick one of four different "rooms" where you'd like to work.

Children, for example, might decide to start their busy day in Kid-space. Adults might prefer to work in a more office-like environment, called Workspace. Anybody can go to the Learning Center, for help in running the computer, or right to Software, a denlike setting that houses the library of programs stored in the computer.

There are many nice features to *Navigator*. One is an instant Delete command that lets you remove unwanted material from storage in a snap. *Navigator* will be available as a separate software option for other PC brands later this year. **FM**

# New Cars

## SLP Firehawk

● Ed Hamburger of SLP Engineering Inc. (Toms River, New Jersey) will never be the McDonald's of tuner cars, because he doesn't serve billions and billions of his SLP (Street Legal Performance) specialty—the Pontiac Firehawk. Hamburger considers it a good year when he cranks out 500 of his very capable conversions to the already credible Pontiac Firebird Formula.

Available through any Pontiac dealer as factory option R6V, the Firehawk looks and goes like no other Firebird that boasts a factory warranty.

The base Hawk conversion, for \$5995, boosts power output to 300 horsepower, thanks to a twin-scoop hood and a free-breathing modified Corvette air-filter unit.

Firehawk backs up its muscle with P275/40ZR17 Firestone Firehawk (naturally) SZ tires mounted on custom wheels. An optional suspension package (\$1495) stiffens spring rates and front and rear control arm bush-



ings, adds a larger front antisway bar and a new rear track bar, and lowers the car by 0.75 in.

With 60 mph arriving in 5 seconds flat and the quarter-mile disappearing in just over 13 seconds, this is one hawk that can catch prey costing \$10,000 more. —Cliff Gromer



## Nissan Maxima And 240SX

After stumbling around the marketplace for too long, Nissan introduced

the Altima last year and found both focus and success. Fortunately for everyone who appreciates good cars, the Altima's success was a harbinger of what Nissan had next in its pipeline—the 1995 Maxima and 240SX.

The long-awaited Maxima front-drive sedan bears a strong resemblance to the previous model, while wearing the current Nissan family face. The bigger news lies beneath the handsome new sheetmetal. For one thing, there is appreciably more room inside the new Maxima than the old, thanks to its wider track and longer wheelbase. The new car is not longer overall than the old, however. The structure is 10% stiffer overall than before, and there's an all-new, multi-link independent



Nissan follows the success of its Altima with the '95 240SX (above left), powered by a 2.4-liter Four, and the new Maxima (above right).



dent rear suspension between the rear wheels.

There's also a potent, newly refined aluminum V6 sitting between the front wheels. The dohc 3.0-liter winds out 190 horsepower, while riding the steady surge of a broad 205 ft.-lb. torque curve.

The result is a 5-passenger sedan with a potent, responsive engine, driving a nimble, predictable chassis that carries its occupants in modern luxury and comfort. It's really kind of hard to argue with that kind of formula.

It's also difficult to argue with the new 240SX. The sporty coupe jumps seriously back into the take-no-prisoners fray that is the current sport-coupe market. By dint of a new structure that boasts a 50% increase in torsional rigidity and



The coiled snake on the flanks of a Mustang coupe or convertible designates the car as a Cobra.

Both of these new Nissans are to be taken as seriously as the Altima. —Don Chaikin

### Mustang Cobra

Few names in autodom are as hallowed and have been as abused as Cobra. Since Carroll Shelby created the beast back in 1962, successive generations of cars bearing the name have tried to recapture the magic, often with dismal results.

Now, more than 30 years after the first Cobras touched the pavement, Ford's Special Vehicle Team (SVT) has closely approximated the intent of the original with the 1994 Mustang Cobra. Building on the '94 Mustang GT, the members of the SVT have given

front discs and 11.65-in. vented rear discs. The discs are hidden by 8 x 17-in. wheels carrying P225/45ZR17 Goodyear GS-C tires.

Reaching back into Ford's and the Cobra's early days, the SVT bolted easy-breathing cast-iron GT-40 cylinder heads onto the venerable 5.0-liter V8. The engine also benefits from roller rockers, new valve springs and a tuned intake manifold.

A day of thrashing Cobras at the Bondurant School's racetrack outside of Phoenix proved that the new Cobra is a chip off the original. The car delivers nimble, very controllable and precise handling without exhibiting any latent evil will during the process. Most anyone can drive this car quickly.

Since the latest Cobra is meant to emulate the original, you will find that it may slay some very high-dollar sporty coupes along your favorite stretch of twisty 2-lane road, but it won't slay many Z28 Camaros in the all-out run to the next stoplight. The Cobra—both in coupe and convertible shape—will be sold only at selected Ford SVT dealerships for a few thousand dollars more than your basic-issue Mustang GT. —D.C.



### Callaway Supernatural Camaro C-8

It's called the Callaway Supernatural Camaro C-8, and it offers unique en-  
*(Please turn to page 120)*

a 100% increase in bending stiffness, Nissan's engineers were able to recalibrate the car's strut-front and multi-link-rear suspension for both crisper handling and increased ride comfort.

Power for the rear-wheel-drive coupe still comes from a dohc inline Four, which produces 155 horsepower.

As they did with the Maxima, Nissan's engineers stretched the 240's wheelbase and track. However, the overall length of the new car is actually less than the old.

the new Cobra a tauter, re-tuned suspension with recalibrated springs, shocks and antisway bars. The Cobra also benefits from fairly massive brakes—13-in. dual piston



Callaway Camaro goes even faster than it looks like it can.



Eagle Talon (above) and Mitsubishi Eclipse (below) share the same 4-cylinder drivetrain and other essentials.



gine and body panel goodies that you can mix 'n' match to suit your taste and budget. The fun starts with Callaway's 404-horsepower version of GM's LT1 5.7-liter V8. You can have the engine installed in your Camaro coupe or convertible, 6-speed or automatic, by the factory or by one of five authorized dealers for a mere \$13,000. Twist your own wrenches and save a bundle by ordering up a motor in a crate for \$8800, plus \$350 for a high-flow air-intake option.

If you want your Camaro to look as good as it cooks, a Paul Deutschman-designed body package can be had for \$8500 installed, or \$4500 in kit form.

If you're interested, you can get these pieces from Callaway Cars, 3 High St., Old Lyme, CT 06371; (203) 434-9002. —C.G.

### Eagle Talon And Mitsubishi Eclipse

One of the interesting and irrevocable facts about today's auto industry—with its maze-like affiliations and joint ventures—is that competitors introduce closely related new models simultaneously. That's the case with the latest sporty coupes from Diamond Star. This joint venture in Normal, Illinois, builds cars for both Chrysler Corp. and Mitsubishi.

The good news for you is that you can select between the brand-new 1995 Eagle Talon or Mitsubishi Eclipse versions of this swift, sexy-looking car.

The Talon has a 3-model lineup: ESi, TSi and TSi awd. Mitsubishi presents the Eclipse in four flavors—RS, GS, GS-T and GSX. Regardless of

name, the low-line versions are powered by a dohc 2.0-liter Four. The up-market models add an intercooled turbo and 70 hp to the equation.

Translation: You can buy anything from a mild, economical and fun front-drive hatchback coupe to a very serious awd rocket. Let your own tastes and bank account make the decision.

In all cases, you get dual airbags and have the availability of antilock brakes. And it's all wrapped in a come-and-catch-me body carrying a snug, stylish and comfortable—realistically, only for two—interior.

Expect to part with \$14,000 to \$23,000 depending on your personal preferences. —Jim Dunne & D.C.

### Grand Sport 90

Back in 1963, Chevrolet built five factory Corvette

Culver City, CA 90230; (310) 391-7108). His latest offering—the Grand Sport 90—is a repowered and re-bodied Corvette based on the LT-5 platform and powertrain.

Wearing a blue-and-white paint scheme that harkens back to the '63 Nassau Speed Weeks Grand Sports, the GS 90 jumps with an LT-5 engine that's been tweaked to 480 horsepower and 460 ft.-lb. of torque. (A 420-hp natural-gas version is also available.) A 6-speed manual is the only transmission offered.

Weighing in at a trim 3100 pounds, the GS 90 challenges any exotic car on the planet with 0-to-60 mph times in the 4-second bracket, quarter-mile capability of 12 seconds and a mile-melting top speed of 200 mph. All this is coupled with surprisingly



Guldstrand's Grand Sport Corvette goes 200 mph.

race cars dubbed "Grand Sport" that challenged—and defeated—the Shelby Cobras at the International Nassau Speed Weeks. One notable driver of the Grand Sport era, Dick Guldstrand, has since formed his own car company—Guldstrand Engineering Inc. (11924 W. Jefferson Blvd.,

good everyday driveability, ABS, traction control and dual airbags. The luxury amenities of air conditioning, leather interior, Bose CD stereo and power seats are standard equipment. The price tag for this combination is \$134,500. —C.G.



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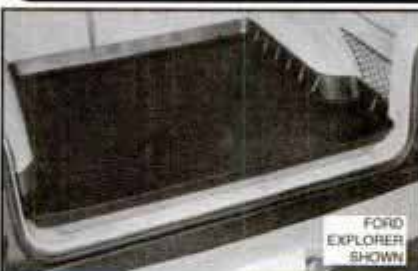
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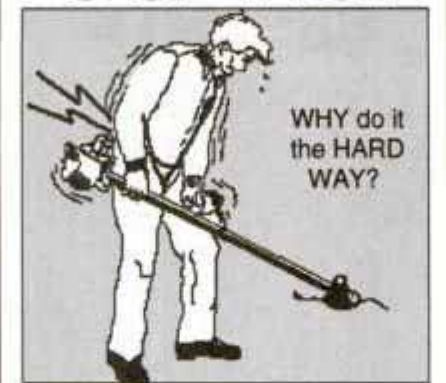
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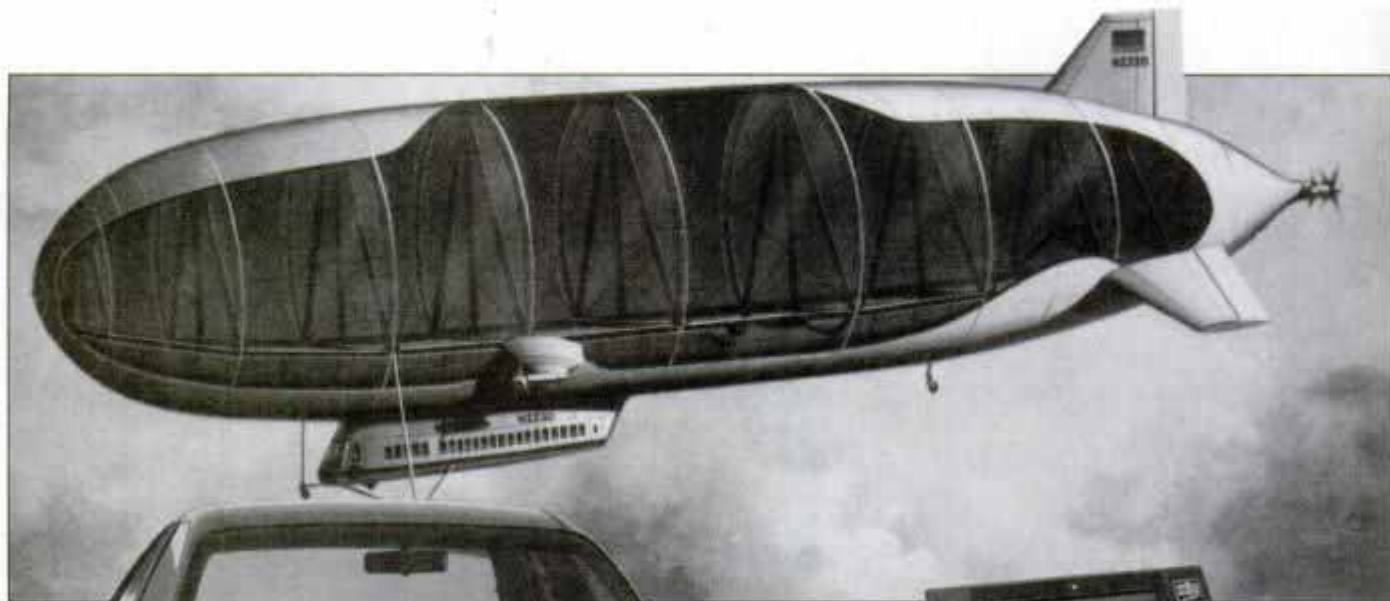
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