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Popular Mechanics

CHRISTMAS STOCKING STUFFERS



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A WISHLIST

The forecast calls for



Thunderbird.

On the road, an impending storm presents a special challenge—one the driver of a Thunderbird is well-prepared to accept.

Thunderbird's electronically fuel-injected engine provides the power. Steel-belted radial tires and rack and pinion steering provide the grip. And for further stability and road control, Thunderbird's shape helps reduce front and rear lift.

Inside, you'll find the environment of a true driver's car. Thunderbird's airflow management reduces wind noise and helps keep the windows clean. Seating areas provide lateral support for cornering. And to minimize the time your eyes are off the road, the instrument cluster provides vital information at a glance.

Of course, Thunderbird does have its limits; it can't predict the weather. It can, however, make dealing with a storm a little easier. You can buy or lease a Thunderbird at your nearby Ford Dealer. Have a nice day.

Best-built American cars.

"Quality is Job 1." A 1985 survey established that Ford makes the best-built American cars. This is based on an average of problems reported by owners in the prior six months on 1981-1984 models designed and built in the U.S.

Have you driven a Ford... lately?



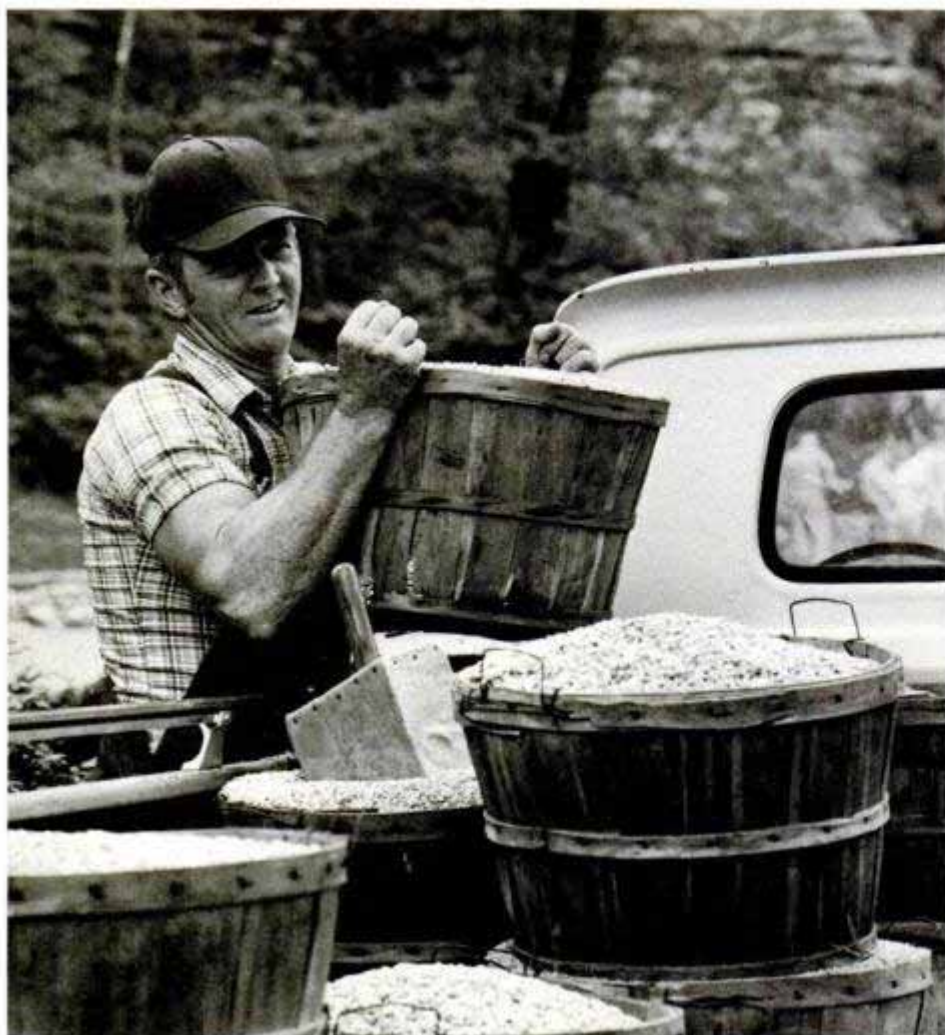
This One



CXSG-KYT-D531

Buckle up — Together we can save lives.

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If you'd like to know more about our whiskey's 100% natural ingredients, drop us a line.

CLARENCE MOREHEAD takes pride in what goes into every batch of Jack Daniel's Tennessee Whiskey.

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ON THE COVER

Boeing's 747 is just one of the big jets that has been involved in air disasters this year, making 1985 the deadliest year in aviation history. In this issue, we examine the causes of the recent wave of jet crashes, and how the latest technologies can make the skies safer. The story begins on page 103.

—PM photo by Brian Wolff

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HARDWARE STORES®

TOOL VALUE OF THE MONTH



Both for
8⁹⁹

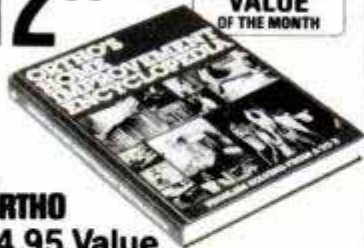
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12⁹⁸

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OF THE MONTH**



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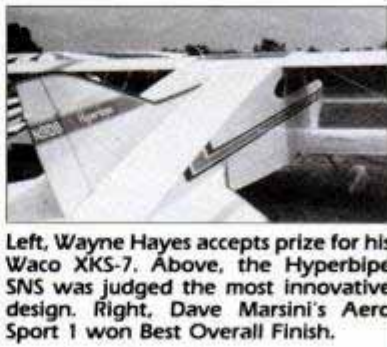
CHARGE IT at participating True Value Hardware Stores. For store nearest you, see "Hardware" in the Yellow Pages.



EDITOR'S NOTES



We had planes on our mind as we developed this issue. Our POPULAR MECHANICS weekend at Sussex Airport in beautiful northern New Jersey started it off. Many of you came out to meet our staff and show off your aircraft—both full-size and scale. And six of you went home with prize money for your efforts. Dennis Sawyer's Hyperbipe SNS, out of Tyngsboro, Massachusetts, was judged the most innovative design and his example was superb. Wayne Hayes of Yardville, New Jersey, didn't have far to fly his 1937 Waco XKS-7, but it was far



Left, Wayne Hayes accepts prize for his Waco XKS-7. Above, the Hyperbipe SNS was judged the most innovative design. Right, Dave Marsini's Aero Sport 1 won Best Overall Finish.

enough to win Best Restoration. Best Overall Finish was judged to be on Dave Marsini's Aero Sport 1 out of Closter, New Jersey. In the Air Model competition, Alan Dieterle of Rockaway, New Jersey; Henry R. McAllister of Elmer, New Jersey; and Bob Fiorenze of Brooklyn, New York, were all winners. Congratulations to you all and thank you to all who came out and made our Sussex weekend such fun. . . . **Planes were on our mind** in a much more somber way, as we heard the news week after week of airliners crashing with tragic losses of life. Jumbo jets all over the world seemed to be going down at a horrendous rate. What was causing these crashes? Is it now unsafe to fly in a commercial aircraft? And can today's modern aerospace technology make flying safer? These were questions in my mind and in the minds of many others. And we all wanted answers. Author Jeff Ethell, long an observer and writer in the aeronautical arena, has some answers for you in this month's cover story (page 103). . . . **Ever have a car stolen?** You arrive at the spot



After the high-speed pursuit, Detective O'Donnell stands by the Corvette everybody wants.

where you know you left your car and it's not there. For a minute, you question yourself. Did I really leave it here? Then the realization sinks in. It's gone. Stolen. It's a weird feeling. It happened to me recently. I flew back from California and walked to the spot where I had parked my '85 Corvette. The Corvette was missing. I knew I shouldn't have parked a Corvette at Newark Airport, but it was too late to cry about it. As it turned out, the Lyndhurst, New Jersey, Police Department had already apprehended the alleged thief, and recovered what was left of the black Corvette. Apparently, the guy who stole the car thought he was one of the stunt drivers in "Smokey And The Bandit" and drove accordingly, actually trying to outrun the police departments of at least two New Jersey communities. "I'm not going to lie to you," Detective Richard O'Donnell told us as he was taking our statement, "that Corvette was fast. We had a hard time catching it until the driver rammed into one of our patrol cars." Fast is one of the reasons everyone wants a Corvette. I just wish everyone who wants one would buy their own.

Last year, NAPA sold two auto parts for every man, woman, child... and dog in America.



think you will), we'll make it right, right away.

All the right places.

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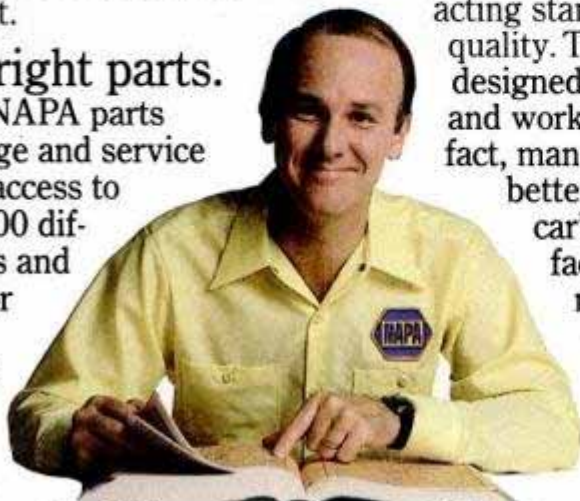


Many NAPA parts are better than original factory equipment.

That's over 600,000,000 NAPA parts. Almost four for every car on the road. And you don't sell that many auto parts without doing a lot of things right.

All the right parts.

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Every NAPA store has access to over 100,000 parts.

the part you need, when you need it. If we don't, we can usually get it for you in twenty-four hours or less. And NAPA parts are made to exacting standards of quality. They're designed to fit right and work right. In fact, many are made better than your car's original factory equipment. If you ever do get a problem part from NAPA, (and we don't

right now, look for the NAPA sign of quality. We've got all the right parts in all the right places.



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Lights: 8 mg. "tar", 0.7 mg. nicotine
av. per cigarette by FTC method.

LETTERS TO THE EDITOR



All decked out

I thought you might like to see the deck I built from plans shown in your June '82 issue (*PM's Custom Deck For A Charming Home*, page 103). The framework is of CCA treated lumber and posts. The deck is made of construction-grade redwood. I closed in the bottom with ready-made redwood lattice and chicken wire backup to keep squirrels and leaves out. Thank you for the inspiration.

DAN MORLAN
OVERLAND PARK, KS

Great work, Dan. For others interested, photocopies of the plans are available for \$1.50 from Popular Mechanics, Box 1014, Radio City Station, New York, NY 10101.



Reader Dan Morlan has no problem finding a shady spot on his deck built from PM plans.

No sticky situation

In reference to your article on wood veneering (*Working With Nature's Laminate*, page 97, July '85). I was making some dining room furniture about four years ago and was required to veneer. I used waxed paper (a method mentioned in your article) for a slip sheet between the veneer and the plywood and, boy, what a disaster.

There were large spots on all pieces where the veneer would not adhere. The residual solvent in the contact cement dissolved some wax from the paper. This waxy residue prevented bonding. I now use small sticks of scrap wood placed across the plywood to keep the veneer from sticking until I have it properly located. I hope none of your readers have the same results with wax paper that I had.

DON WILSON
HENDERSONVILLE, NC

Your trouble is not with wax paper. It's with not allowing the contact cement to dry before using the wax paper, a point we stressed in our story. You can use wood sticks or kraft paper to do the same job, but neither eliminates the need to let the cement dry. If you hurry the process, your bonding will be weak no matter what method you use.

Not so fast

In reference to your article on steam locomotives (*Steam's Back On The Fast Track*, page 90, Sept. '85), labor, not fuel, was the demise of the steam engine. For many years it was neces-

sary to service the steam engine every 100 miles. Just before World War II, General Electric and Union Pacific built and tested a steam electric. There were many problems they were unwilling or unable to solve, so the project was dropped.

A major problem was that they couldn't build a condenser large enough, and would run out of water on a long hill. I just retired after 41 years with Union Pacific. We still have two steamers in service—an oil-burning passenger locomotive and a coal-powered Mallett. These engines are the ultimate toy.

BILL FRAME
NICEVILLE, FL

Smoothing Choppy construction

The classified section of *PM* (page 162, July '85) offers a homebuilt helicopter called "Choppy." As a member of the Experimental Aircraft Assn., I'm trying to provide beneficial insights into this 28-year-old design. Builders and owners of the Choppy have had to substitute currently available materials for those listed in the original design. Some of the changes and modifications I've seen will not result in an airworthy machine. New Choppy builders can contact persons familiar with the design through EAA.

JIM SELF
FENNVILLE, MI

Thank you for bringing this to our attention. Any interested readers may contact EAA Headquarters, Wittman Airfield, Oshkosh, WI 54903-3086.

Privileged pilots

In reference to your article *Sport Planes You Can Build* (page 86, July '85), I'd like to know how someone can build a privately owned aircraft without an airframe and powerplant license. And if you built this aircraft without either of the licenses, how would you get it inspected?

ROBERT MEDAGLIA
FRESH MEADOWS, NY

Under the FAA's Experimental Aircraft Category, which allows individuals to build their own airplane for educational purposes, you are not required by law to have a license. And according to Federal Aviation Regulations Part 21—Certification Procedures for Products and Parts, there are designated inspectors for homebuilt aircraft who carefully ensure everything is in order. Contact the Experimental Aircraft Assn. Headquarters, Wittman Airfield, Oshkosh, WI 54903-3086; telephone (414) 426-4800.

Tire progress

I enjoyed your article *Tires—A Century Of Progress* (page 60, June '85). I was delighted to see information on our 5-minute Vulcanizer included in the story. However, I would like to clarify that it was made by The Shaler Co. We no longer make tire repair kits, but in the early days we sure sold a lot of kits and Shaler Hot Patches. Thanks for including us.

WILLIAM R. COOK
SHALER CO. SALES MANAGER
WAUPUN, WI

Ford welcomes you to the Age of Aerostar.



Ford Aerostar. Shaped by the wind and today's changing needs.



the vehicle to help cushion the ride.

It's "people friendly!"

You sit tall in Aerostar, with a clear view of the road ahead—surrounded by luxury, style and comfort. Rear riders enjoy the open feel of sliding side windows. Plus unusual options like rear stereo controls and head-phone jacks.

Easy to park. Fits your garage.

For all its interior room, Aerostar is the shortest mini-van. You slip into parking spots with ease. Aerostar is sized to go in your garage or through the car wash.

Quality is built in.

Ford took the time to make Aerostar right the first time. Built to Ford's high quality standards, it's already

Ford's totally new Aerostar is strikingly shaped to slice the wind. The unique wedge design gives it aerodynamics unmatched in its class.

Inside the sleek body shell there's uncrowded comfort for seven.* Or the capacity for 140 cu. ft. of cargo.**

Aerostar is fun to drive, easy to maneuver, and park. Its new technology offers features others don't have.

Aerodynamics... the wind works for you.

The wedge-shaped Ford Aerostar slides smoothly through the air. Minimizes wind noise. And actually uses the airflow for improved handling.

Choice of V-6 power or high-tech Four.

Aerostar has an advanced 2.3L Four standard. Its multi-port electronic fuel injection meters a lean mist of fuel precisely to each cylinder.

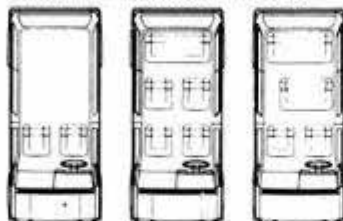
If you want added power and response, choose the optional 2.8L V-6. Bigger and

stronger for extra performance, the V-6 is a modern computerized engine, too.

Tows almost 2½ tons.

Because of its high strength, optional V-6 power and rear-wheel drive, the versatile Aerostar can be equipped to tow up to 4,900 lbs.† That's nearly 2½ times more than most mini-vans!

Whether you're carrying people or cargo or towing a trailer, the added weight on the rear driving wheels means even more traction when the vehicle is loaded.



Take your seats.

The Aerostar Wagon offers you a selection of matched seats: buckets, Captain's Chairs and bench. There's



Ford Aerostar vs. Chrysler Mini-vans

	AEROSTAR	CHRYSLER
Aerodynamic for lower air drag	.37 Cd	.42 Cd
Standard 4-cylinder engines	2.3L	2.2L
V-6 engine power option	2.8L V-6	NONE
Bigger cargo space (cu. ft.)**	140	125
Extra driver legroom	41.4 in.	38.3 in.
Max. opt. trailer towing capacity†	4900 lbs.	2000 lbs.
Longer wheelbase, smooth ride	119 in.	112 in.

room for seven adults.* There's also a path so you can step to the back to reach baggage or children.

Take your seats—out.

Rear seats have quick-release mountings. They slide out to turn Aerostar into a load carrier with over 7 ft. of clear cargo floor.

The easy loader.

The rear liftgate swings up out of your way. You step right up to the flat floor to ease in grocery sacks or slide in heavy objects.

Smooth on the road.

For extra smoothness, Aerostar has a luxury car 119" wheelbase—plus a premium gas-filled shock absorber at each corner of

had over a million miles of accelerated proving ground testing. Now it's ready for you.

Lifetime Service Guarantee.

Participating Ford Dealers stand behind their work, in writing, with a free Lifetime Service Guarantee good for as long as you own your car or light truck. Ask to see this guarantee when you visit your participating Ford Dealer.

Buckle up— together we can save lives.

*With optional rear bench seat.
 **Based on SAE Standard V-16.
 †Reduced by passenger and cargo wt. in towing vehicle.



IMPORTS & MOTORSPORTS



1986 Honda Accord

The best testimonials for Honda's Accord come from the competition. Automakers who try to build cars that will successfully slug it out with this winner refer to it as the "target vehicle." Like organ donors, dissected Accords rest in laboratories of the world's other auto companies, while in the minds of their designers and engineers it just sits on a pedestal—right there to remind them that they still don't have all the pieces put together the right way.

It was Honda engineers themselves who took apart and put back together all the pieces that make up the 1986 Accord. And most of the pieces are all new—these 4-doors and hatchbacks are totally re-engineered. They're the third-generation Accords since the nameplate was first introduced 10



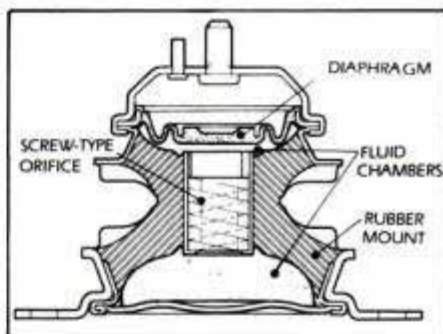
Accord LXi 4-door at \$13,125 is top-of-line model in Honda's re-engineered series.

years ago with a '76 front-wheel-drive hatchback (so nimble that this modest driver won the press-preview gymkhana). The new Accords come in five models: DX and LXi hatchbacks and DX, LX and LXi 4-door sedans (starting at \$8429). All use a larger 1955-cc, ohc, 12-valve Four, but in the LXi models it's fuel injected instead of carbureted (110 hp vs. 98). The main difference between DX and LX models is the amount of standard equipment: DX models don't have a/c, power windows, AM/FM cassette and other features. The Accord's ride quality and roominess is improved as a result of body and chassis changes. Wheelbase is up 5.9 inches and overall length a few inches. Front and rear independent suspensions are now by

double wishbone. Lower hoodlines (almost 2 inches) and other smooth-outs are apparent in a walk-around. The new Accords are on sale now. You can be sure the competition is already dissecting them.



LXi Hatchback is powered by fuel-injected version of 2-liter, ohc, 12-valve Four.



Hydraulic engine mount, using upper and lower chambers, contributes to smooth ride.

Stout-hearted VW

Usually, you have to do something pretty weird to get into the *Guinness Book Of Records*. But this Volkswagen just did what it does best: eat up a lot of terrain, a whole world's worth, in fact. The Vanagon Syncro, VW's 4-wheel-drive bus, made "the fastest trip

around the world through five continents." Never mind that the 27,000 miles through 34 countries took four months.

The standard production vehicle had the same mechanicals and 4wd system that we'll get in a couple of months when the Syncro goes on sale here in van and camper models. What our Syncros won't have are the extra fuel and water tanks, and the heavy-duty heater the drivers used when they crossed Canada in the winter.

radiator, brakes and climate control, and the front and rear bumpers which are now integrated with the body and color-keyed to it. The new wheels, a variation of the Ferrari 5-spoke design, can be seen in the photo below. The door handles are now fully flush with the body. Interior changes are many, including redesigned bucket seats. The V8 now displaces 3.2 liters and compression is up to 9.8 to 1. Those increases along with ignition and cam modifications bring horsepower up to 270. Ferrari is looking at a record production year of 3000 cars. **PM**



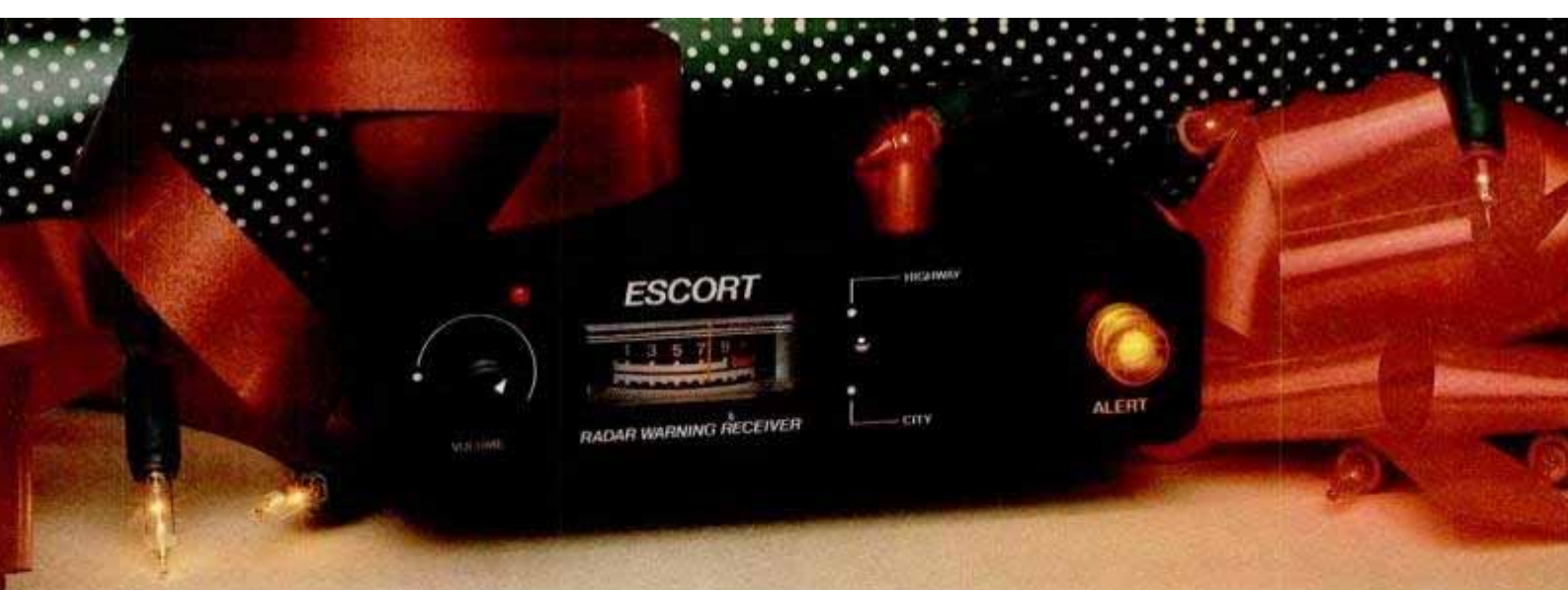
VW Syncro, the 4wd Vanagon that we'll get soon, set a round-the-world record.

Ferrari 328

The best seller in Ferrari's lineup, the 10-year-old 308, is now the 328. The V8-powered 328 GTB and GTS, just introduced at the Frankfurt Auto Show, are an evolution of the famous shape that premiered at the Paris show in 1975. Most noticeable on the Pininfarina-designed bodywork of the 328 models are the new air intakes for



Ferrari 328 GTB, replacement for the 308, uses the familiar V8, but now it's 270 hp.



Overwhelm Your Favorite Driver

Remember those few times when you came up with the perfect gift? You could tell, because the recipient couldn't believe it. He kept asking how you knew.

Hits The Sweet Spot

That's the effect ESCORT has on drivers. If they don't already have one, they've heard of it. And what they've heard is that ESCORT is the classic of radar warning, the one *Road & Track* says "...is highly recommended," the one *Car and Driver* says "...is clearly the leader in the field in value, customer service, and performance..." Over a million drivers have chosen ESCORT since it was introduced in 1978. Probably you know several of them, just in your circle of friends. Ask about us.

We'll Stand On Our Record

Of course they'll say ESCORT works. Any consumer product that has sold over a million units at the rather steep price of \$245 each—and has never been discounted—obviously is in demand. And in the world of high-tech electronics, products that don't work don't stay in demand for seven months, much less seven years.



But ESCORT makes an overwhelming gift for another reason. The way it works. You know how a few possessions in this life get to be favorites because there's just something about them—a certain heft and feel, a certain way of going about their business—that just seems exactly right.



THE RADAR DEFENSE KIT

ESCORT comes complete with a molded carrying case, detachable power cord, visor clip and hook and loop mounting, spare fuse and alert bulb, and a comprehensive owner's handbook.

ESCORT is like that. The case is made of heat-treated aluminum, which protects the sophisticated components within, and also gives a substantial feel. The audible warning is the same frequency used for Morse code (1024 Hz), which cuts through a Ferrari's interior noise, yet won't jangle your nerves. The alert lamp is controlled by a photo-electric eye, which makes it visible on the brightest day, yet dims automatically for nighttime operation. The list goes on, but we'll trust any ESCORT owner to give you the details.

Another Subject, Equally Important

Meanwhile, here's an ESCORT feature aimed at you, the giver. There is only one way to shop and it's the easy way. You buy direct from us. Call toll-free. We're as quick as UPS. There are no hidden charges. We pay all shipping and handling. If you're really in a hurry, Federal Express is only a little extra.

Christmas or anytime, we make the same promise. If you aren't satisfied within 30 days, send ESCORT back. We'll refund all your money and your return shipping cost. We've been making this offer since 1978 and so far it has been refused over a million times. We think that's a pretty overwhelming statistic.

But around here, overwhelming is simply business as usual. Now let us overwhelm your favorite driver.

Try ESCORT At No Risk

Take the first 30 days with ESCORT as a test. If you're not completely satisfied return it for a full refund. You can't lose.

ESCORT is also backed with a one year warranty on both parts and labor.

ESCORT \$245 (OH res. add \$13.48 tax)
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By mail send to address below. Credit cards, money orders, bank checks, certified checks, wire transfers processed immediately. Personal or company checks require 18 days.

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Cincinnati Microwave
Department 100-068-A12
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Cincinnati, Ohio 45296-0100

Tune in "Talktalk," the satellite call-in comedy talk show. Sunday evenings on public radio stations. Check local listings.

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SCIENCE WORLDWIDE



Comet arsenal

We're especially interested in astronomical equipment this month because both Halley's Comet and Christmas are at hand. The celestial event is likely to draw big crowds in the optics department of major stores. But off-brand "store-bought" telescopes generally aren't worth the price. The best equipment for catching the comet on film is a high-quality amateur telescope. If



The \$349 Astroscan 2001 from Edmund Scientific provides an excellent wide-sky view. It's a good beginner telescope.

cially suited to the comet, consider the Edmund Astroscan 2001 telescope. Unlike the Criterion and Celestron, the Astroscan has no clock drive to follow the moving sky. But the \$349 Astroscan is easy to tote around and is easy to handle. Call Edmund Scientific toll free at 1-800-222-0224.

The store-bought telescopes suffer from poor optics. But one model you might find in a large store—the Tasco Model 14F refractor—has superior optics at \$664.85, including clock drive and camera mount. The long-tubed Tasco has a 60-mm aperture, about 3



Bushnell's 7x magnification and 50-mm field of view is excellent for viewing Halley's Comet and the moon.



The Bausch & Lomb Criterion 4000 has best optics and comes with a clock drive and accessories for \$695.

PM PHOTO BY STEVE ESKOW

you're not snapping photos, then a good set of binoculars will do the trick.

The best telescope of the compact Schmidt Cassegrain type is the Bausch & Lomb Criterion 4000. It comes with a clock drive and an array of accessories including camera mount. If your local dealer is already sold out, it would be worth ordering and picking up after Christmas. Another high-quality scope in this class is the Celestron C-90. It has less light-gathering power than the \$695 Criterion, but it costs about half that. For a wide-sky view that is espe-



Tasco's Model 14F refractor scope is the best of the store-bought types. It has less light-gathering power than the other scopes shown here.

inches. That's less than the other scopes. But it is a good piece of equipment for photographing the planets and bright sky events. Write to Tasco, 7600 N.W. 26th St., Miami, FL 33122.

If you aren't planning to shoot photos of Halley's Comet, consider a good set of binoculars. The Bushnell 7x 50-mm set shown above retails for \$60, an excellent price for optics we've used to glimpse the peaks of lunar mountains. There are more expensive binoculars that boast higher magnification, but increased magnification means decreased light-gathering power.

What if . . .

In my quest for a seat on the Space Shuttle, I have begun taking extension courses given to astronauts and mission specialists (a mission specialist does not have to be a pilot). The first course is a familiarization with the Shuttle itself and with NASA launch procedures.

One point that stands out in the opening lesson is the extent to which NASA has prepared for the safety of the Shuttle crew.

You'll recall earlier this year a Space Shuttle mission came close to being aborted on takeoff because of engine

trouble. But the problem was licked and the mission went on.

According to the manual, if the crew is in danger, the Space Shuttle runs on in orbit, burning up its fuel, then makes a glider landing to either Edwards Air Force Base in California or Holloman Air Force Base in New Mexico.

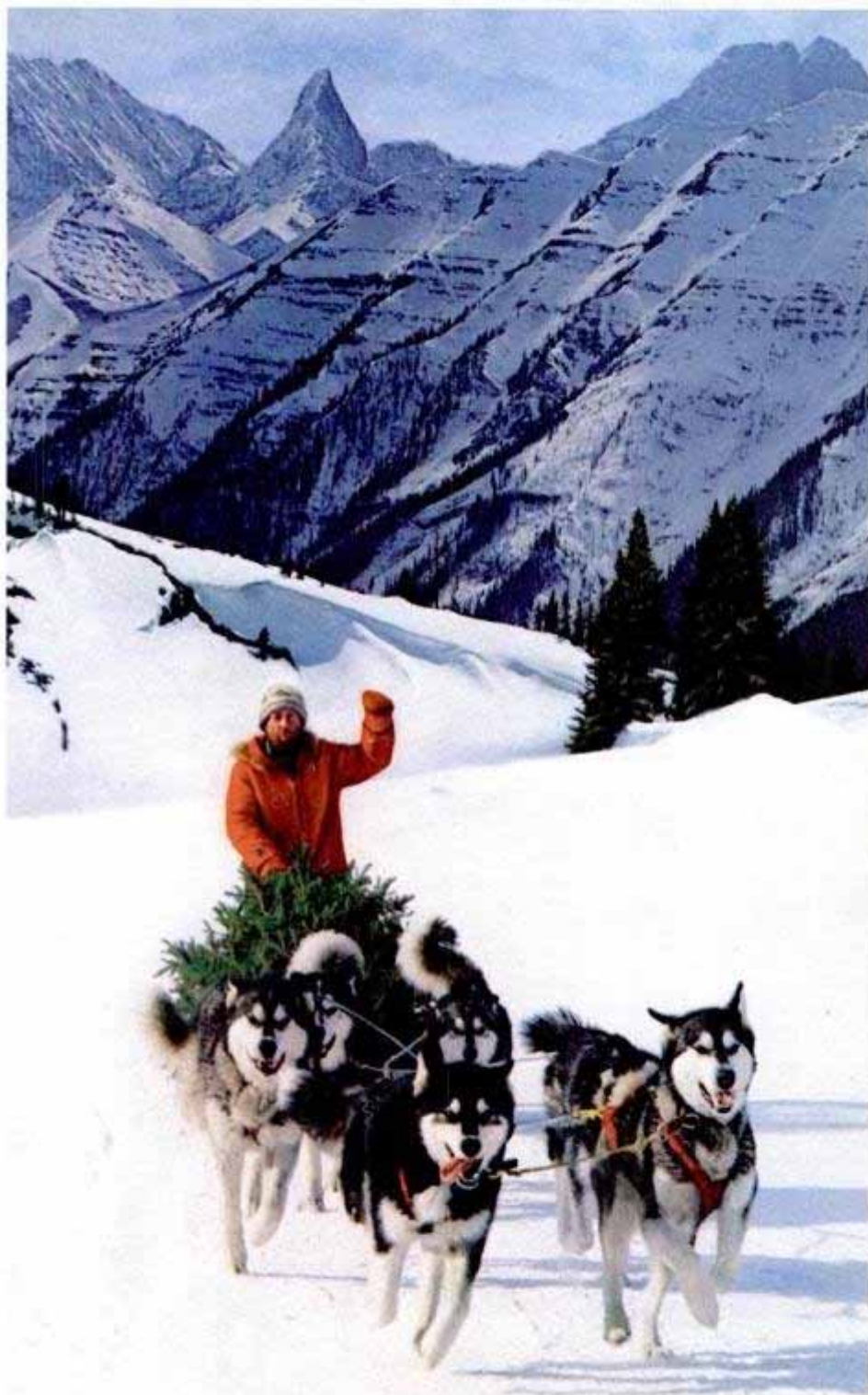
If an abort is required late in the mission, a contingency landing site may be picked. If that is not possible, the Shuttle's crew is supposed to burn out the engines and ditch in the Pacific or Indian oceans. The NASA manual calls crew safety "the prime concern." That's comforting.

Last words

In our story *King Of Comets* this month (page 89), we've recommended a list of good books to help you track down Halley's Comet. I got hooked on stargazing during the passage of Comet Kohoutek in the 1970s. You may well get hooked on Halley. If you want to do some more sky watching, I suggest you pick up the paperbound *A Field Guide To The Stars And Planets* by D.H. Menzel and Jay M. Pasachoff (Peterson, \$9.95). It's the bible of amateur astronomy, with excellent sky charts and the complete rundown on important celestial events.

PM

Citadel Pass. A rugged place for the Christmas spirit to start.



ALBERTA, CANADA

When my dad first brought me up here for Christmas, I didn't know what to make of it. No crowds. No shopping.

Just the snow, and the dogs, and a sense of peace so profound I could feel it months afterward.

When I was older, my dad introduced me to Windsor Canadian. They make it nearby.

I don't think they could make it anywhere else. They'd never match the glacier water, Alberta rye, or the mountain air—the things that make Windsor Canada's smoothest whisky.

It's the smoothness that always brings back memories of this place. When he's older, I want my son to have memories like that.

Give Windsor this holiday. Call toll free to arrange delivery of gift box anywhere in the U.S.: 1-800-621-5150 (Illinois residents call 312-334-0077). Void where prohibited by law.

WINDSOR

CANADA'S SMOOTHEST WHISKY.



Creative home stenciling



Easy-to-use stenciling kit (inset) allows you to add your own personal decorating touch to room interiors.

Plaid Enterprises' stenciling kits offer an affordable way to custom-decorate room interiors. Each kit includes precut Mylar stencils and an instructions booklet. Water-based stenciling paint and brushes are sold separately.

To use, simply tape the stencil to the surface and apply paint to the cutout areas of the design. Then, move the stencil to the next area and repeat. If

there is more than one color in the design, there will be a stencil for each color. Stencil kits are available in 47 styles ranging from country and Victorian to contemporary and art nouveau. The kits cost between \$9 and \$11 and can be found at hardware and paint stores. For details, write to Plaid Enterprises Inc., 1649 International Blvd., Box 7600, Norcross, GA 30091.

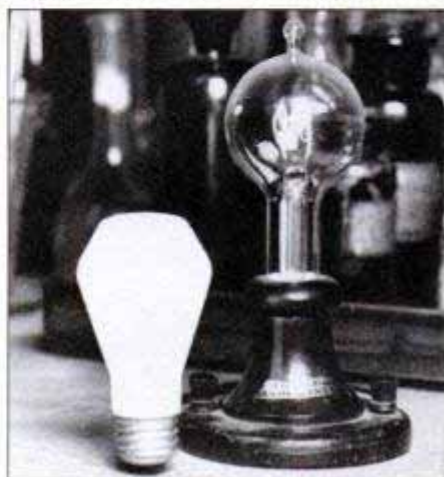
Garage compactor

The Beast trash compactor by Genie packs the equivalent of five 20-gallon trash cans in a single load. A 120-volt, 1/3-hp motor powers a triple-drive screw system that completes the packing cycle in 44 seconds, according to the maker. Unlike kitchen compactors, the Beast is intended for the garage. The unit is 19 x 23 1/2 in. wide x 37 in. high and plugs into a standard wall outlet. It also features a built-in trash caddy so that the compacted trash can be wheeled to the curb for pickup. The Beast is available for about \$450 at home centers. For details, contact Genie Home Products, 3040 West Market St., Akron, OH 44313.



Superbulb

Sears claims that its new DieHard light bulb has an average life of 6000 hours—about six times longer than conventional bulbs. Shown above with Thomas Edison's 1879, 40-hour bulb,



the DieHard is equipped with a specially designed heavy-duty filament and comes with a 5-year home-use warranty. It's available in 2-bulb packs (\$4) in 60-, 75- and 100-watt sizes at Sears stores and through the Sears 1985 Fall/Winter catalog. For details, contact Sears, Roebuck and Co., Sears Tower, Dept. 703-PM, Chicago, IL 60684.

Home fire insurance

First Alert introduces a line of home fire extinguishers that are designed for use in the kitchen, basement and garage. The extinguishers contain a dry, non-toxic chemical that is formulated for use on oil, grease and electrical fires. The chemical won't corrode enamel or metal surfaces, according to the manufacturer. The extinguishers come in compact (\$13) and regular (\$17) sizes with a quick-release, wall-mounted bracket. The disposable, replaceable units come in appliance white and are available at hardware stores and home centers. Write to First Alert, Pittway Corp., 780 McClure Rd., Aurora, IL 60504. **PM**



Life Preserver.

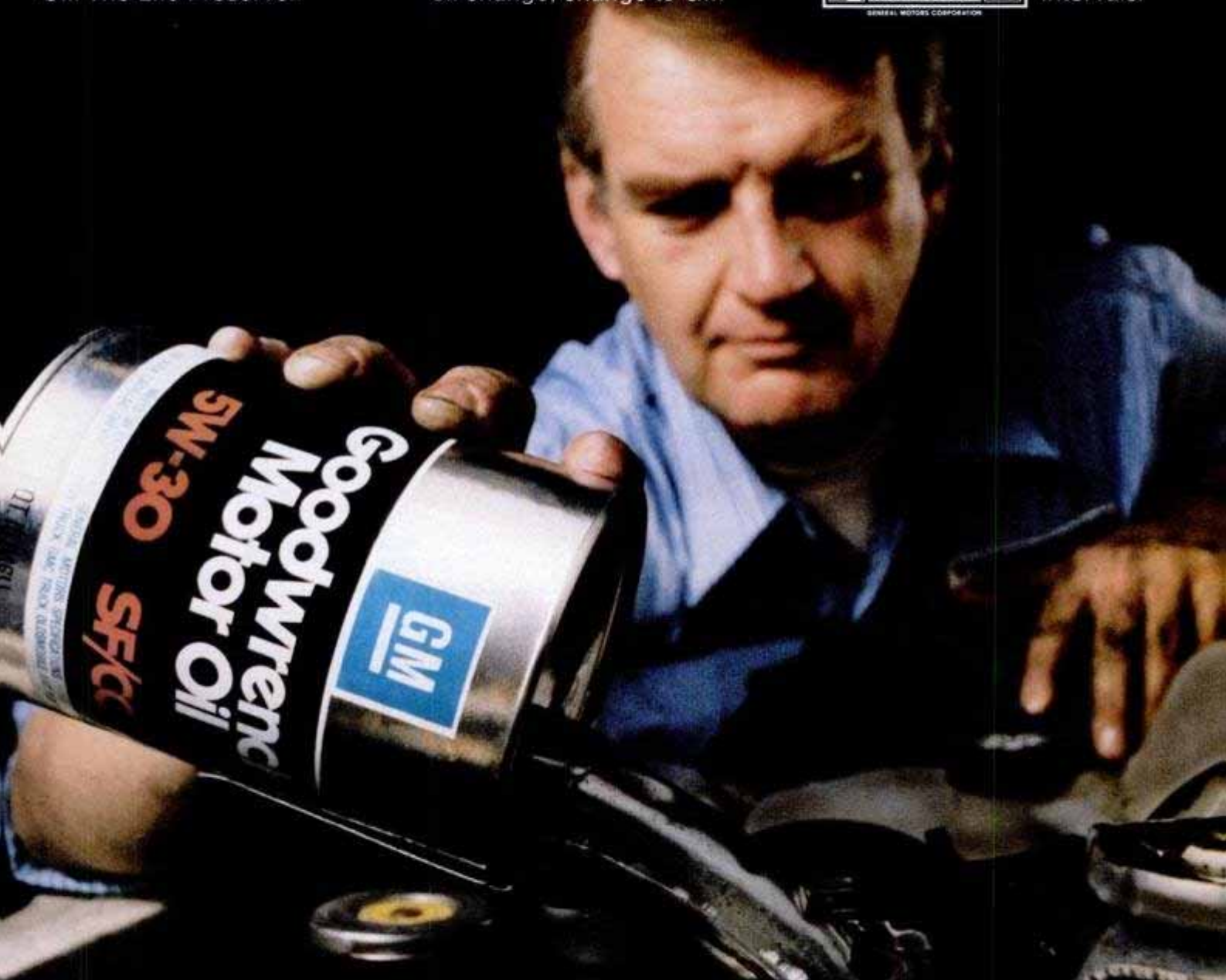
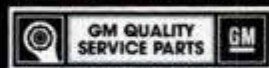
Worn motor oil leaves baked-on deposits that reduce performance and strip years off your engine's useful life. That's why Mr. Goodwrench recommends regular oil changes with GM Goodwrench Motor Oil: The Life Preserver.

GM Goodwrench Motor Oil meets or exceeds all GM specifications for GM cars and light trucks. It reduces engine wear. Fights sludge buildup. And protects against rust.

So next time you need an oil change, change to GM

Goodwrench Motor Oil.

No one knows your GM car better than Mr. Goodwrench. No one. Mr. Goodwrench also recommends GM oil filters. See your owner's manual for oil and filter change intervals.



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PM ELECTRONICS MONITOR



Television news from space

It seems as if home satellite TV rigs are here to stay, becoming more affordable to the average household and easier to install yourself, too. A recent trip to the satellite show in Nashville bears this out. There are more than 1¼ million satellite TV households in the U.S. The potential for more is luring heavyweights such as RCA and Zenith to the business.

Two noteworthy Nashville introductions are under-\$1000 do-it-yourself



Portable 6-foot dish on easel-style patio mount (above) and block-downconverter receiver (left) make up Winegard's \$1000 satellite TV package.



systems from Winegard and Drake. Both include portable 6-foot dishes on easel-type patio mounts plus dish-to-house cables. Winegard's Mini-Ceptor RR646 system features a block-down-conversion receiver, which lets different TVs in the house tune in different

programs coming from a single satellite. The single-conversion receiver in Drake's Black Widow 1 package allows single-program viewing only.

As for scrambling pay TV carried by satellite, only Home Box Office will do so before 1987.

Pixel-packing vidcam

Improved electronic imaging, both for still and moving video, seems closer since Canon unveiled its 380,000-pixel color vidcam. That's double the picture elements of current cameras that use charged couple device (CCD) image pickups (see *Video Thinks Small*, page 81, and *Electronics Monitor*, page 12, Sept. '85). The result is more detailed images, 300 lines of horizontal resolution and low-light sensitivity down to 20 lux. Canon's Ci-10 weighs 10 ounces, accepts any C-mount lens and costs \$1000.



Cigarette-pack-size color vidcam from Canon uses CCD image pickup with 380,000 pixels.

'HQ' brings improved VHS videorecorders

Better pictures from VHS-format VCRs is the goal of the new High Quality (HQ) technology developed by JVC, inventor of the VHS home video format.

JVC's HQ innovation derives from three circuitry changes. The first, called white-clip level expansion, raises the signal level to which bright portions of the pictures are exaggerated during recording. The result is a sharper, crisper picture in playback.

The other aspects of HQ are two types of video noise reduction—VNR, for short. These work on both the color and brightness parts of the video signal to reduce the random noise, or snow, that often plagues VCR pictures—especially those recorded at slower speeds. JVC claims HQ is totally compatible with existing VHS decks. Standard VHS machines will play HQ

tapes with no loss in quality while HQ VCRs will play standard VHS tapes—though with no improvement.

HQ is technically different from Super Beta, a picture-boosting technology for Beta-format VCRs introduced less



First VHS VCR to use HQ (High Quality) picture circuitry is JVC's HR-D565U, around \$850.

than a year ago by Sony and other Beta companies. Super Beta raises the video signal frequency to improve picture detail by about 20 percent.

How dramatic is the HQ picture improvement? Like the picture boost achieved by Super Beta, HQ pictures are noticeably—but not dramatically—better than standard VHS. Some people might not discern the enhanced quality unless they saw a side-by-side comparison. Nonetheless, even this modest step is significant—it's the first substantial improvement in VHS picture quality since the format was introduced 10 years ago.

This picture boosting circuitry already is included in two JVC models now in stores, the \$850 HR-D565U (pictured) and the \$900 HR-D566U. Both have hi-fi stereo. The HR-D566U also includes a decoder for receiving stereo TV broadcasts. Most other major VHS makers are expected to offer HQ models by mid '86. A few, including Zenith and NEC, might do so by the end of '85. **PM**

Train for the Fastest Growing Job Skill in America

Only NRI teaches you to service and repair all computers as you build your own 16-bit IBM-compatible micro

As computers move into offices and homes by the millions, the demand for trained computer service technicians surges forward. The Department of Labor estimates that computer service jobs will actually *double* in the next ten years—a faster growth than any other occupation.

Total System Training

As an NRI student, you'll get total hands-on training as you actually build your own Sanyo MBC-550 series computer from the keyboard up. Only a person who knows *all* the underlying fundamentals can cope with *all* the significant brands of computers. And as an NRI graduate, you'll possess the up-to-the-minute combination of theory and practical experience that will lead you to success on the job.

You learn at your own convenience, in your own home, at your own comfortable pace. Without classroom pressures, without rigid night-school schedules, without wasted time. Your own personal NRI instructor and NRI's complete technical staff will answer your questions, give you guidance and special help whenever you may need it.

The Exciting Sanyo 16-bit IBM-compatible Computer—Yours To Keep

Critics hail the new Sanyo as the "most intriguing" of all the IBM-PC compatible computers. It uses the same 8088 microprocessor as the IBM-PC and the MS/DOS operating system. So, you'll be able to choose thousands of off-the-shelf software programs to run on your completed Sanyo.

As you build the Sanyo from the keyboard up, you'll perform demonstrations and experiments that will give you a total mastery of computer operations and servicing techniques. You'll do programming in BASIC language. You'll prepare interfaces for peripherals such as printers and joysticks. Using utility programs, you'll check out 8088 functioning. NRI's easy step-by-step directions will guide you all the way right into one of today's fastest growing fields as a computer service technician. And the entire



NRI is the only home study school that trains you as you assemble a top-brand micro-computer. After building your own logic probe, you'll assemble the "intelligent" keyboard . . .

Your NRI course includes a Sanyo 16-bit microcomputer with 128K RAM, monitor, double-density/ double-sided disk drive, and "Intelligent" Keyboard; The NRI Discovery Lab[®], Teaching Circuit Design and Operations; a Digital Multimeter; Bundled Spread Sheet and Word Processing Software Worth over \$1000 at Retail—and More.

system, including all the bundled software and extensive data manuals, is yours to keep as part of your training.

100-Page Free Catalog Tells More

Send the postage-paid reply card today for NRI's big 100-page color catalog, which gives you all the facts about NRI training in Microcomputers, Robotics, Data Communications, TV/Video/Audio Servicing, and other growing high-tech career fields. If the card is missing write to NRI at the address below.

. . . then install the computer power supply, checking all the circuits and connections with NRI's Digital Multimeter. From there you'll move on to install the disk drive and monitor.



NRI SCHOOLS

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YOU WIND UP WISHING IT WERE MORE THAN ONE WEEKEND A MONTH.

You might find yourself in a chopper, cruising the treetops at 90 miles per hour.
Or doing something more down to earth, like repairing an electronic circuit.

What you won't find yourself doing is getting bored. Because this isn't ordinary part-time work. It's the Army Reserve.

You'll get valuable skill training. Then one weekend a month, and two weeks each summer, you'll put that training to good use, while receiving good pay and benefits.

But maybe most importantly, you'll come away with a feeling deep down that you were challenged and came through. And that doesn't disappear when Monday rolls around.

See your local Army Reserve recruiter about serving near your home. Or call toll free 1-800-USA-ARMY.

**ARMY RESERVE.
BE ALL YOU CAN BE.**

ALL OUTDOORS



Firestone fits outdoorsmen

This tricked out Chevy S-10 4x4 I tested recently isn't the first example of package marketing in the recreational field. Bayliner's Capri 19-foot bowrider copped that honor. But it may be the most ambitious. Each component in the "Firestone Outdoorsman" was selected by a battery of experts guided by Cincinnati's Hess & Eisenhardt coach works. The package includes cooking, camping and off-road gear, including Coleman stoves, sleeping bags and tent, Marchal lighting and a Warn Winch with brush guard. There is gear for every outdoors consideration and convenience, and it all fits without excess or duplication. Perhaps the nicest fea-



Utility meets performance in Firestone's Outdoorsman, based on the Chevy S-10 4x4.



ture—besides the S-10 itself, which ranked No. 1 in PM's 4x4 minipickup test in the September issue (*Torture* Test, page 84) is the Brahma cap and bed liner. There's also a cutting board on the tailgate, and the sidelights can be particularly helpful when setting up camp at night. But it's not cheap: Add between \$8000 and \$9000 to the S-10's \$13,000 base. Write Firestone, P.O. Box 1474, Hudson, OH 44236.

Lure color selector



Color-C-Lector light-sensing probe is shown bottom right; Fenwick lure kit, background; and other manufacturers' lures, foreground.

Here's a gadget to help you select which color lure to use when bass fishing. The Color-C-Lector was developed on the principle that sight is the dominant sensory perception in game fish. The Color-C-Lector probe measures light in the water, thus determining the lure color fish will see best. Numerous lure makers—notably Pop's, Heddon, Rebel and Cordell with products pictured next to the Color-C-Lector here—have developed color combina-

tions to the Color-C-Lector standard. Fenwick has followed suit with a special color-coded lure carrier (also pictured). For around \$80 (lures extra), the Color-C-Lector helps catch fish. Contact Lake Systems Div., 315 East South St., Mount Vernon, MO 65712.

'Cofilament' fishing line

DuPont Stren has come up with a new twist in fishing line. Its Prime "cofilament" line is made from an extrusion of strong polyester surrounded by a nylon sheath. The low-stretch polyester contributes to Prime's hook-setting ability, and the nylon sheath resists abrasion. Although the line is labeled too stiff by some experts, it's also tough, ultra-sensitive and can stand in nicely for higher pound test line. For more information, you should contact DuPont Stren, Wilmington, DE 19898.

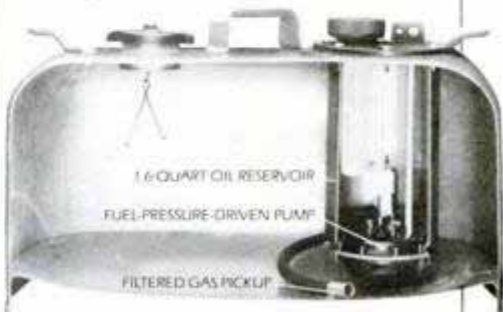


Stren's Prime: Polyester on inside adds strength; outer nylon adds toughness.

Oil blending in a can

It was only a matter of time before the convenience of oil injection descended to outboard motors of less than 50 hp. OMC now offers oil blending in a standard portable tank for 1985 and 1986 Johnson and Evinrude motors from 9.9 to 50 hp that require a gas/oil ratio of 100:1. Like oil injection used for larger horsepower motors, lubricant is placed in a reservoir and is automatically mixed with fuel before combustion. This sensible accessory, which retails for \$114.95, eliminates the mental gyrations of calculating how much oil you need to top off a partially filled tank. Contact OMC, 100 Sea Horse Drive, Waukegan, IL 60085.

PM



The 1.6-quart oil reservoir, right, is integral with 5.8-gal., standard-dimension tank.

APPLIANCE CLINIC



Cool dryer

We have a General Electric clothes dryer, model No. 1DE813DIW, serial No. VC217697, that seems to have lost its power to dry. It barely gets warm, and takes three hours to dry a load. The exhaust hose is in good condition and not obstructed. Can you help?—Ed McGill, Warwick, N.Y.

One of the dryer's coils may be defective. This would account for the low heat output. To check the coils you will need an ohmmeter (you can buy a simple ohmmeter for about \$15).

Unplug the dryer and pull it away from the wall. Remove the four Phillips-head screws that secure the cabinet top to the front, and raise the top. This will give you access to the heating coil terminals. Place one ohmmeter probe on the top

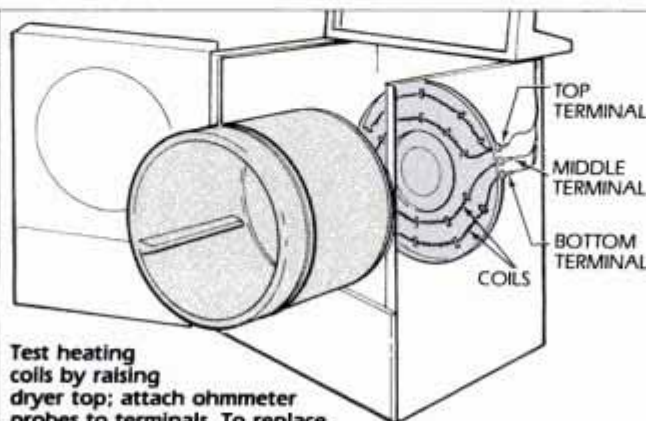
terminal and the other on the middle terminal to check the inner coil. If the ohmmeter shows no movement, this coil is defective. Similarly test the outer

tom access panel on the dryer's back. Next, remove the drive belt from its pulleys. Be careful when swinging back the idler arm, which is under tension.

Unscrew the small access cover at the dryer's rear center. Using a small screwdriver, pry loose the "E" ring from the groove in the drum shaft. Next, remove the front cabinet panel by loosening the two screws on either side of the toe board and removing the two top screws from the inside. Swing the front aside, taking care not to dislodge any of the attached wiring.

To remove the drum, lift it up and out from the front. The heating coils are directly behind the drum. Your local G.E. appliance dealer should have a

coil replacement kit, part No. WE11X60, which costs about \$14. The kit comes with instructions that explain how to hook up the new coil.



Test heating coils by raising dryer top; attach ohmmeter probes to terminals. To replace defective coils, swing dryer front aside and remove drum.

coil by placing one probe on the top terminal and the other on the bottom terminal. To replace a coil you must remove the dryer drum. Open the bot-

Refrigerator smells oily

I have a 1976 General Electric refrigerator, model No. TFF19VTD, serial No. LZ215960. Lately, the refrigerator has developed an odor like warm oil when it runs. Sometimes the odor gets so strong I have to open the back door of the house. I checked under and around the refrigerator but can't find where the odor is coming from.—Howard Goerges, San Francisco, CA

One cause may be dirt or debris lodged in the condenser fan, stopping it from turning. This would block the airflow over the compressor, causing it to overheat. To check the fan and the compressor, unplug the refrigerator and move it away from the wall. Remove the lower access cover and spin the fan blades by hand to make sure the fan motor turns freely. With the back cover off, plug in the refrigerator and check the fan to be sure it's turning. If it isn't, the motor probably needs to be replaced. A new condenser fan motor, available at your local G.E. dealer, costs approximately \$35.

Another possible cause for the odor is an oil leak in the refrigerator's sealed system. Check the defrost water drain pan under the refrigerator for any signs of oil. If you find any, you'll have to call your local appliance repair service.

Rust-stained dishwasher

Our Whirlpool dishwasher, model No. DU4000X1-0, serial No. F32326588, has a large rust spot on the back wall. We called Whirlpool and they said to use a stain remover, but that didn't work. Do you have any suggestions?—Edward Pelc, Marysville, WA

The rust stain is either a mineral deposit, or the result of a flaw in the porcelain tub liner that has allowed the metal beneath it to rust.

If there are no surface imperfections or chips, try a gentle abrasive cleaner like Soft-Scrub or Bon-Ami to remove the stain. However, deep scratches or depressions in the tub lining should be sealed with silicone adhesive sealant. Wet-sand the damaged area with 320-grit sandpaper. Dip the paper in water and carefully sand the area to remove any loose rust, and to roughen the surrounding surface so the sealant will adhere to it. Rinse the area with water and dry it with a lint-free cloth. Then clean it once more with isopropyl rubbing alcohol. Apply the silicone sealant to the damaged area with a putty knife. Allow it to dry for at least 24 hours with the dishwasher door open. The silicone sealant, part No. 482338, costs about \$12.50 and is available at local Whirlpool parts distributors.

Cable catastrophe

I have a double oven made by Magic Chef-Universal, model No. RE61500, serial No. 0333628JX. The oven doors are held shut by cables, but the cables on both doors have broken. I've tried to find replacements but none of the local appliance dealers carry them, and no one knows how to contact the manufacturer. Is there another source for the cables?—Alan Hefty, Beaumont, TX

Your oven was manufactured by Universal Waste King in the late 1960s. Since then, Waste King has merged with the Thermador Co. It's now known as Thermador/Waste King.

The company does not sell parts directly to consumers, so you must get them from a local Thermador/Waste King distributor. For a distributor in your area, check the Yellow Pages, or write to Thermador/Waste King, 5119 District Boulevard, Los Angeles, CA 90040. The door cables come in a kit of four with instructions for installation. The kit is part No. 108283, and costs about \$15.

PM

If you have a problem with any appliance, send your question, along with the model and serial numbers, to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.

Save Gas, Save Engine with "POLY"

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

The Secret is "Poly"

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

Years of Testing and Use Have Proved It True!

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

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

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

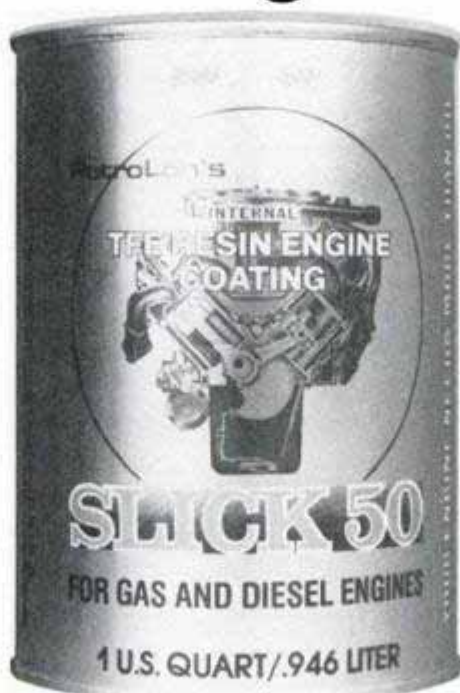
"Dune Buggies & Hot VWs" magazine April 1983 issue records the results of their one year testing of Slick 50. "We can indeed say scientifically that Slick 50 does work, and that it does reduce engine wear! . . . for the price of one treatment when compared to engine rebuild, we feel that you'd be money ahead using Slick 50."

The Federal Aviation Administration has fully accepted Slick 50 Aircraft Piston Engine Treatment (F.A.R. #33.49). An FAA test simulating 1400 hours of engine use showed almost zero engine wear!

The senior engineering researcher at a leading southern California university stated, "Slick 50 does increase horsepower and decreases fuel consumption in tests done at the university."

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

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



There isn't room here to tell you about the dozens of other tests proving that Slick 50 is everything we say. However, if you're still skeptical, send \$2.00 to cover printing and postage costs, and we'll send you detailed test results plus actual letters from users who report how Slick 50 saved their engines and saved them money!

It's Easy to Treat Your Engine

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

Only One Treatment Necessary

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

Works with Most Oils

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

4 Ways Slick 50 Saves You Money

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

1. Increase mileage
2. Increase horsepower (small economy cars and large RV's really need this)

3. Reduce operating temperatures, thus increasing the lubrication and life of the oil and engine
4. Minimize or eliminate costly overhauls by reducing engine wear

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

Slick 50 Will Not Affect Your Warranty

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

There's No Risk with Our Money Back Guarantee

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

Profit from Selling Slick 50 Yourself

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

Free engine flush sent with each order.
Free shipping with orders of 2 or more.

For purchase or further information call toll-free 1-800-525-8624, ext. 12 (in Colorado call 1-303-762-1385) or send to: Progressive Energy Corp., 3148 S. York St., Dept. PM125, Englewood, CO 80110.

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

One Slick 50 at \$39.95 + \$4.00 shipping and handling.

Give me free shipping and handling for my order of 2 or more at \$39.95 each.

Check C.O.D. Visa/MasterCard

Card # _____

Exp. Date _____

Name _____

Address _____
(Give street address if possible for UPS delivery)

City _____ State _____ Zip _____

Progressive Energy Corporation

3148 South York, #PM125, Englewood, CO 80110
TOLL FREE 1-800-525-8624. In Co 303-762-1385

©1985 Progressive Energy Corp.



Braking brake noise

At 4000 miles the brakes of my 1984 Oldsmobile Firenza started making a loud whistle and squeal when the brake pedal was applied. The noise has gotten progressively worse. Now it occurs when the car is traveling under 10 mph with the brake pedal released. My dealer regards this as normal. Can you enlighten him?—Larry Benke, Jamestown, ND

I'll try. The noise may be coming from either the brake calipers or from the master cylinder. You should check the master cylinder first. It may have a noisy quick-take-up (QTU) valve. If this is the case, replace it with one of a

newer design that is quieter (part No. 18011899).

To determine if the QTU valve in the master cylinder is the noisemaker, hold a mechanic's stethoscope to the rear boss of the cylinder. Start the engine and apply the brake pedal. You'll have no trouble hearing it if the QTU valve is causing the noise.

As for noise coming from the calipers, the outboard shoe/pad assemblies in the calipers are secured by tabs. If the tabs aren't clinching the assemblies tightly to the calipers, the assemblies will vibrate and make the noise you hear when you apply the brake.

The tightest clinch is attained by using a screwdriver to push each shoe/pad assembly into its caliper. With the brake pedal applied, you should clinch the shoe/pad assembly securely to the brake caliper by holding the ball end of a ball-peen hammer against the tab and striking the flat part of the hammer with a mallet.

If the brake noise stays with you, replace the pads with newer design pads, which are supposed to be quieter. The part number for these is 12321417. Finally, you may have to rebuild the calipers if pistons are binding and keeping pads too close to the rotors, which means the minimum required clearance is not maintained.

Peacemaker

My 1984 Ford Tempo uses a quart of oil every 850 to 1000 miles. The dealer argues that this rate of consumption is "normal," but I think he's full of it. My experience with cars tells me that this rate of oil loss is excessive. We've been going around and around for the 7500 miles I've driven the car, and I'm just about ready to throw punches. Tell me, do you think I'm right or is he?—Art Schleger, Forest Hills, NY

Back off and let's discuss this logically. The dealer may be abiding by Ford Motor Co. doctrine which states that use of a quart of oil by an engine every 750 to 1000 miles may be normal. This is true as long as no condition exists that's causing the loss unnecessarily.

With the 2.3-liter Tempo engine, two spots in particular are possible leakers. One is around the three lower bolts that attach the exhaust manifold to the cylinder head. These bolts extend into the oil gallery. If one or more haven't been installed properly, oil will leak. Remove these bolts, apply sealer to the threads and tighten bolts to between 62 and 89 in.-lb. (7 to 10 N-m). Then go back and tighten them again—this time to 20 to 30 ft.-lb. (27 to 41 N-m).

The other spot you should look at lies on the pushrod side of the engine. If there's a smudge of oil where the cylinder head and cylinder block join, remove the head and head gasket. Use a scraper or wire brush to clean the head and block surfaces. Then, apply a 1/8-in.-wide coating of Ford Gasket Maker (part No. E2AZ-19562-A) to both edges of a new head gasket where the push-

rod holes are cut. Reinstall the gasket and cylinder head.

Like other engines, the 2.3-liter can leak oil from other spots. A close inspection of the oil pan, timing case cover, and front and rear seals should be made. Then again, the reason for abnormal oil loss could lie with you. You may be overfilling the crankcase by misread-

ing the dipstick. I've seen more than one Ford owner do this. There are three marks on the stick. The line nearest the tip is the ADD mark. The line above that is the SAFE mark. The correct quantity is indicated when the oil level falls between these two lines.

It's that third mark, in the form of an

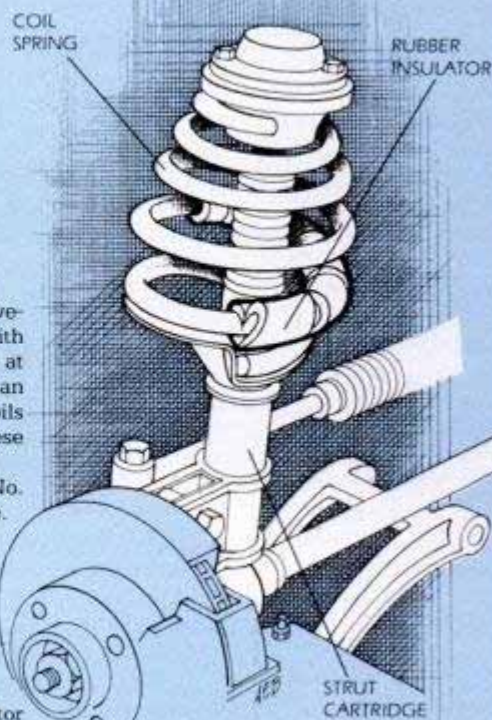
(Please turn to page 24)



Foils for coils

If there's a rattle or clunk on rough pavement from the front suspension of a car with MacPherson struts, you may have a shot at getting rid of the annoyance by placing an insulator between the first and second coils (from the bottom) of the front springs. These may be hitting against each other.

Ford makes a rubber insulator (part No. E43Z-5414-A) especially for this purpose. It can be used on any make car. With front wheels off the ground and hanging so struts are in full rebound position, wrap the insulator around the second coil from the bottom of each spring and seal its ends with rubber cement and bands. The bands (part No. 95874S) and the rubber insulator can be ordered from Ford.





GM

Nobody ever got anywhere by thinking small.

Think big. Think about a sky as big as your dreams.
About a country that challenges your skill and imagination.
Then, think about the perfect vehicle to get you there:
a full-size pickup from GMC Truck.

It still offers full-size towing capacity, when properly equipped.
The standard power of the impressive Vortec V-6 engine.
Or optional V-8s. And a host of options that let you conquer
high society as comfortably as the high country.

If thinking small was never your style, you should think about
visiting your nearest GMC Truck dealer. (You'll find a listing in
the Yellow Pages.) Try a full-size GMC pickup on for size.

You're certain to fit.

GMC
TRUCK

A truck you can live with

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

Материал, защищенный авторским правом

CAR CLINIC

(Continued from page 22)

"O," which is above the SAFE line that causes trouble. Some Ford owners think that this is the FULL mark. It's not. In fact, it has no significance as far as you're concerned. The mark was put there to guide production personnel in filling the engine with oil prior to testing. If the engine is filled with oil to this mark at other times, it's being over-filled. The engine will then discard the excess, giving the impression that too much is being used.

Other possible reasons for abnormal oil loss are bad valve stem seals, incorrectly sized valve guides or stems, and incorrectly installed or defective oil rings. Checking seals, guides and valve stems requires partial engine disassembly. Checking oil rings requires extensive disassembly.

If other attempts to find the cause of oil use have failed, call in a Ford field representative and let him determine if the engine has to be disassembled to check further.

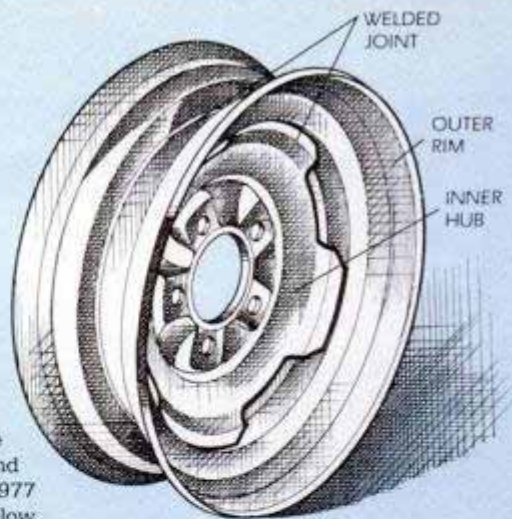
DO YOU HAVE A CAR PROBLEM?

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



Wheel of misfortune

Loss of air from tires isn't always caused by tire damage or a defective valve, reports Bernie Cohen of Woodland Hills, California. Two tires on his 1977 Buick Century went from 32 psi to below 20 psi in 48 hours. A leak test revealed that tires and valves were okay. So why the loss of air? Surprisingly, air was leaking through the welded joint between the inner hub and



outer rim of the wheels. Good things to keep in mind. If you ever run into a similar situation, replace the bad wheels.

Ping meets its Waterloo

Got a dandy for you, Mort. It concerns my 1984 Dodge Diplomat 318-cu.-in. engine, but it could just as well apply to any car on the road. The dealer did cartwheels on this engine trying to rid it of a constant ping. Using all his expensive diagnostic equipment and apply-

ing every Chrysler TSB relating to the subject, he came up zilch. I then decided to try my hand at it.

With the hood open and the engine revving at a high speed, I noticed the engine didn't emit so much as a peep, let alone a ping. I closed the hood and upped the speed again. Sure enough-

\$1000 A Month With Just A Hack Saw!

© by Phillip E. Brancato, Sr. 1985

Yes, you can make \$1000 a month and more with just a hack saw in your spare time.

Will I Get Rich?

No, you will not get rich, but you can make over \$1000 a month in your spare time and have a ball doing it.

I tried all those "Get Rich" gimmicks that are advertised, that never tell you anything until you've sent them your \$25, and then you find out their gimmicks were not for you. Well, I've tried them all and I'm still not rich.

All I ever wanted was something I could do in my spare time with my hands, make a little money and enjoy myself and not have to buy \$3000 worth of tools or merchandise to do it.

Believe It Or Not

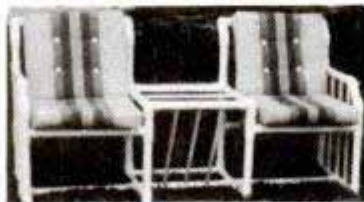
I found the most enjoyable and profitable business working with my hands and the only tools I use are a hack saw and measuring tape. The really nice thing about it is any man, woman or ten-year-old can do it.

What Do I Do?

I make beautiful indoor/outdoor P.V.C. pipe furniture. Such as chairs, lounges, tables, swings, and all kinds of baby furniture out of P.V.C. pipe; even birdhouses and feeders. P.V.C. pipe furniture is the hottest selling furniture on the market today, because it is unique and beautiful and will not rot or rust and it will virtually last a life time.

Profit Unbelievable!

The fantastic part of this business is the profit.



Just go look at some of this furniture in the stores and see some of the unbelievable prices it is selling for.

A chaise lounge that costs \$62.25 in material and three

hours of work is selling for over \$228 in the stores. I can sell my chaise lounge for anything I think my labor is worth. For once, the big manufacturing companies cannot compete with me or you on prices. You will find you will have more orders than you want!

Where can you buy the P.V.C. Pipe?

You can buy the P.V.C. pipe from any local hardware store to start. Plus I will supply you with the names and addresses of cushions and pipe manufacturers who will sell to you wholesale, plus I will supply you with my shop manual and six detailed shop drawings with pictures and measurements of six different designs.

Do you need my shop drawings?

No, you don't need my shop drawings unless you want to save hundreds of hours of trial and error work and thousands of dollars that I had to spend before I finally

found the right design and measurements and tricks to the manufacturing of P.V.C. pipe furniture. I only wish that when I started, I could have bought these shop drawings and I would have gladly paid \$100 for just one of them.

I will pay you!

Yes, I will pay you \$25 for any unique design shop drawing that I can use in my collection and workshop manual.

How do you start?

1) Decide if you like to work with your hands to create things and want to make money.

2) Can you afford \$12.00 for my shop manual and six drawings.

3) Send me your name and address along with your check for \$12.00 to:

Philip E. Brancato Sr.
P. O. Box 237P13
Riverview, Florida 33569
(813) 677-6948

Please allow about two weeks for delivery.



LIGHTEN YOUR WORK LOAD.

Clamp Light™ Task Light. When you can't get a grip on what you have to do, let Black & Decker's Clamp Light™ Rechargeable Task Light help out. It's clip-on and cordless, so it's always ready to lend a hand.

And it comes with Black & Decker's full 2-year warranty.

BLACK & DECKER
IDEAS AT WORK.™

the engine started pinging like crazy. So what was the relationship between the hood and my pinging engine? It took me just two minutes of looking to find out.

On the firewall behind the air cleaner there are junction boxes into which vacuum hoses connect. I found that the hose leading to the exhaust gas recirculation (EGR) valve was too long. Every time the hood was closed, it would pinch the hose and cut off vacuum to the valve. This caused the valve to stay closed. As you know, if the EGR valve doesn't open when it should, engine heat increases and can cause fuel to detonate. Consequently, the engine pings. Shortening the hose by cutting off an inch so the hood can't clamp down on it has solved my problem.

I told the dealer about the fix. He was delighted. By coincidence, he was about to turn a Dodge Diplomat police car back over to the city with a ping he couldn't eliminate—couldn't, that is, until he shortened that EGR vacuum hose.—Ralph Pearkel, Waterloo, IA

You said it in your first sentence, Ralph. This is a "dandy" and bound to help many readers. Thanks a million for sharing it with us.

Fair-weather friend

My 1983 Dodge Charger runs great when the sun's shining, but as soon as the weather turns damp the engine starts chugging and spitting. I've tried the obvious cures—spraying with silicone, adding dry gas—that kind of stuff. The dealer confesses ignorance. Can you help?—Bob Thayer, East Providence, RI

Sure. The weak spot in your car and in other '83s with 1.6-, 1.7- and 2.2-liter engines is the oxygen sensor circuit. It can short out in damp weather. Checking and repair procedures are discussed in technical service bulletin (TSB) 08-16-84. Advise your dealer.

Playing catch-up

Some of you are probably ready to fire off letters concerning what I said in last month's Car Clinic about the type of oil to put into Nissan vehicles. Save your stamps. I said that Nissan recommends using oil designated SF in nonturbocharged gas engines, which is correct. But then I added this statement: "Notice I said SF—not SF/CC or SF/CD."

Between the time I got that information from Nissan and the time the statement was published, Nissan changed its tune. The fact is that you can use any SF-rated oil in a Nissan nonturbo gas engine, including SF/CC and SF/CD. **PM**

SERVICE TIPS

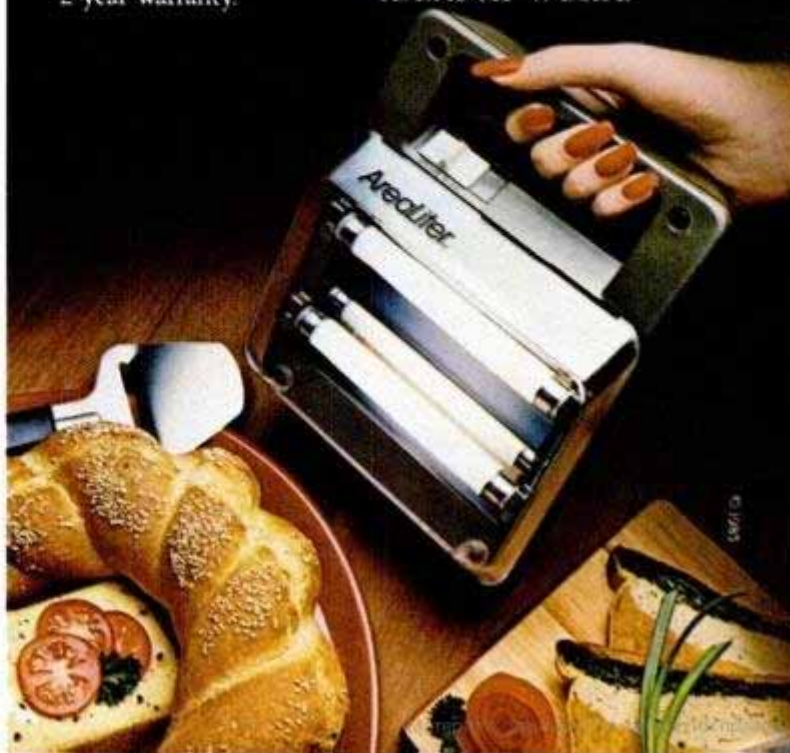
- If you haven't been successful ridding a 1985 Chevy Chevette or Pontiac 1000 1.6-liter engine of a ping, retard ignition timing from 8° BTDC to 4° BTDC.
- That annoying buzzing sound heard when accelerating a 1985 Ford Tempo or Mercury Topaz 2.3-liter engine could be coming from the air inlet resonator vibrating against the inner fender. A foam insulator pad (part No. E53Z-19627-A) installed according to TSB 85-14-15 will get you silence.
- Complaints concerning hard starting of 1984-85 Chrysler 2.2-liter engines when ambient temperature is below 50° F may be resolved by installing a newly designed thermal bowl vent valve (part No. 4241223). Tell your dealer that TSB 18-31-85 gives details.
- To eliminate a vibration in a 1983-'84 Nissan Maxima station wagon when accelerating from 0 to 20 mph, have new rear coil springs (part No. 55020-W3302) and new rear shocks (part No. 56210-W3325) installed. Check TSB TS85-079.
- Speaking about Nissan, I just got word concerning an oddball situation relative to the factory-installed AM/FM MPX Electronic Tuning radio in 1985½-'86 Sentras and Pulsar NXs. If the battery dies on you and is recharged, the radio may play for a little while and then drop dead. To get it going, disconnect the battery positive cable for 10 seconds; then, reattach it tightly.

THE LIGHT YOU PUT OUT WHEN IT'S DARK.

AreaLiter™ Portable Light. The bright way to improve your nightlife is with Black & Decker's AreaLiter™ Fluorescent Portable Light. The rechargeable light that's always ready to light up the great outdoors.

And it comes with Black & Decker's full 2-year warranty.

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SNOW PLOW.

WRANGLER

ENGINEERED FOR SURVIVAL

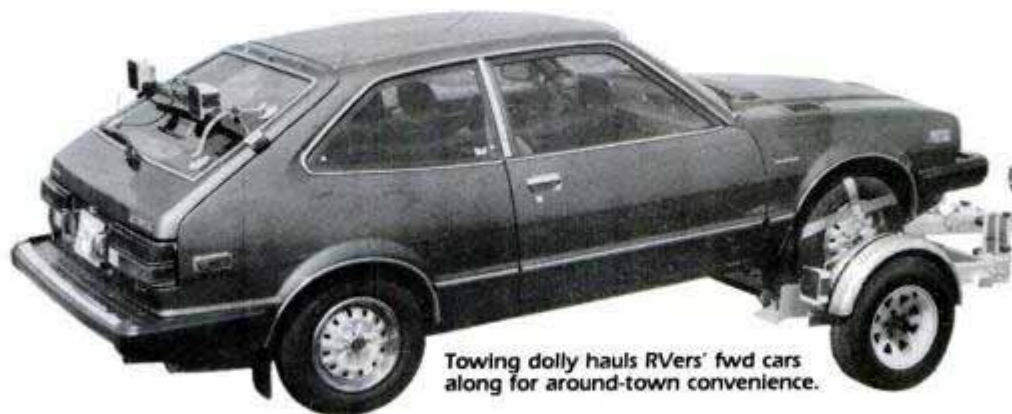
If a driver wants to survive winter elements, he's got to depend on a tire that won't leave him out in the cold. One very good reason to consider the Goodyear Wrangler All-Season

Radial. The all-terrain tire engineered with a unique, aggressive block-tread. To handle snow and ice like an Arctic native. Because in the dead of winter, only the fittest survive.

GOODYEAR

THE PM GARAGE

Roll and go



Towing dolly hauls RVers' fwd cars along for around-town convenience.

Recreational vehicles are homes away from home, but it's a lot more convenient to be able to drive a car while the living accommodations remain set up. Most cars—particularly front-wheel drives—don't take well to extended towing with all four wheels on the ground. Too many drivetrain components are forced to rotate with insuffi-

cient lubrication. The Tow-N-Stow Dolly 2-wheel auto transporter provides a neat solution. The Tow-N-Stow, for cars ranging from subcompact to full size, comes with accessories that include adjustable saddles for various car widths and aluminum loading ramps with safety chains. Options include winches, spare wheels and carrier, and

surge brakes.

Tow-N-Stow is lightweight: Even the larger version for full-size cars weighs only 300 pounds. Cost is \$1186 for model CT-7022 TS from Trailex Inc., Box 553, Canfield, OH 44406.—Lee Green



Turbo saver



Electronic monitor protects turbocharger from damage by hot-engine shutdown.

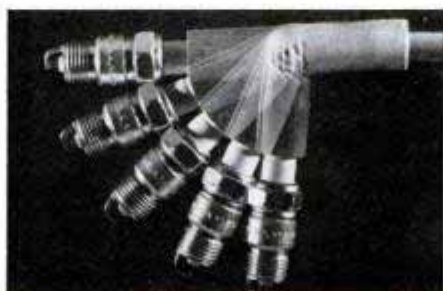
Owners of turbocharged cars have to be especially careful not to shut down engines when they're too hot, as it can result in turbo damage.

The ISSPRO Turbo Temperature Monitor automatically keeps an engine running until turbo temperature drops to a safe level even if the driver has turned off the ignition switch and left the car. A thermocouple installed in the car's exhaust pipe senses temperature and sends an electrical signal to the solid-state control box. When the engine is shut off, the control circuit keeps the engine running as long as the thermocouple senses exhaust temperature is 450° F or hotter. When the temperature falls to a safe level, the

monitor signals the ignition override switch to open and the engine stops. The ISSPRO Turbo Temperature Monitor, kit No. 600680, carries a suggested retail price of \$125. Order it from Instrument Sales and Service Inc., 315 SE Seventh Ave., Portland, OR 97214.—Mort Schultz

Swivel clips

I've yet to see any sparkplug wire set that fits every plug equally well. Earl's Performance Products solves that problem with Swivel-Lock ends on their Spark-Flex plug wires. The silicone-jacket, fiberglass-braid reinforced cables come in either static suppression or copper strand designs. The wires are available in bright yellow, red or blue for 4-, 6- and 8-cylinder engines, in-



Five-position swivel custom fits to cables.

cluding GM HEI systems. They're sold at performance equipment shops or from Earl's Performance Products, 825 East Sepulveda Blvd., Carson, CA 90745 for \$33.50 (V6 set).—W.H.

Tidy packing

Whenever I repack wheel bearings, more grease winds up on my hands than between the rollers. Now, Taylor Made Products makes the job neater with this pressurized can of premium-quality lithium complex grease. Place the bearing between the two halves of the packing adapter, insert the can spout into a grease port and press. When grease flows out between the rollers, the bearing is ready for installation. The Bearing Grease and Packer is \$7.95 at stores or from Taylor Made Products, 3200 West Market St., Akron, OH 44313.—N.S.M.



Pressure-packer is neat and thorough.

HOMEOWNERS' CLINIC



Water heater insulation

For several years, utility companies have recommended installing insulation blankets on our electric water heaters. Some even do it free for customers. I installed one on my own, but I was recently told that the blanket will drastically reduce the life of my heater by trapping condensation and causing it to rust. I was advised to remove the blanket and use the escaping heat to prevent my laundry room pipes from freezing. Whom do I believe?—Edward McLaughlin, Centralia, WA

All tank-type water heaters are insulated by the manufacturer between the storage tank and the outer casing. Even with this insulation, the surface of the outer casing becomes warm to the touch, and as a result it gives up some heat to the room in which it's located. You can reduce this heat loss by covering the casing with an insulated blanket, as was recommended by your utility company.

Condensation is not a problem you have to worry about. For the water

vapor in the air to condense, it must contact a surface that's cooler than the room's temperature. Since the temperature of the water heater casing will be either the same as room temperature or above, moisture in the air will never condense on it, regardless of whether or not the casing is insulated.

If you are concerned about pipes freezing in the laundry room, install a thermostatically controlled space heater, rather than depending on the water heater. This way you can regulate the room temperature to suit your needs and the time of year.

Water-saver toilets

In the area where we live, our water and sewer bill is based on the amount of water we use. I would like to cut back our water use. What type of water-saver toilet works best?—Harry Stevens, Fort Meyers, FL

Almost every toilet manufacturer now produces water-saver models that use 1½ to 3 gallons less water than the conventional 5-gallon per flush cycle. One toilet, called the Seiche One, has a variable flow that allows you to control the amount of water for each flush according to need. Its low-volume flush requires as little as one quart. It's made by Patrick Creek Corp., P.O. Box 135, Hinesburg, VT 05461.

If you replace your present toilet with a water saver, be sure your household water supply has sufficient pressure to operate the toilet properly. Some require a higher pressure than the standard 40 psi.

You should also be aware that if you replace your toilet just for the money you'll save on the water bill, you probably won't pay back the cost of the toilet—unless your water is very expensive. You may still wish to do it, however, since water is becoming an increasingly scarce commodity.

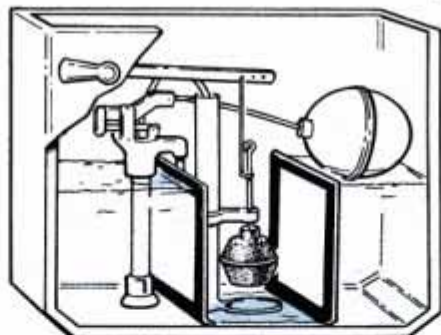
There are a number of devices you can use to reduce the amount of water your existing toilet uses. One product that is being promoted by a local utility company is called The Incredible Superbowl. I've tried it and found it to be quite effective.

The Superbowl consists of two stainless-steel panels encased in rubberized edges. The panels can be inserted inside the toilet tank without tools. The panels partition off the tank and act like

a dam so that the water behind the partitions is not used. Since the water used for the flush comes mostly from the top of the tank—thus making optimum use of gravity—the force of the flow is not reduced.

The Incredible Superbowl is available at hardware stores and plumbing supply outlets. You can also order it direct from the manufacturer for \$9 postpaid. It's made by Resources Conservation Inc., P.O. Box 71, Greenwich, CT 06830.

Sometimes homeowners place a brick in the toilet tank to save water by



To save water, panels partition toilet tank and act as a dam. Tank is shown just flushed with the ball at its lowest point.

displacing some of the tank water. This is definitely not recommended. Particles of brick often flake off and settle around the tank drain, preventing a tight closure of the seal. You can easily lose more water than you save.

A better water-displacement method is to place a small plastic bag in the tank, hanging by a hook from the tank side wall. It will save as much water with each flush as the volume of the bag. Just make sure the bag doesn't interfere with the flushing mechanism.

Slow-heating furnace

I have a problem with my forced warm air furnace. When the furnace ignites it stays on for about two minutes and then goes off before the blower comes on. The blower stays on for two or three minutes and then goes off. The blower and the furnace don't seem to work together. The air from the registers doesn't get very warm, and it takes forever to heat the house. I would appreciate any help you can give me.—Wallace Bieze, Dearborn, MO

There are two basic controls in a forced warm air furnace—a fan control and a high-temperature limit control. The fan control is a temperature-sensitive switch that turns the blower on and off at preset air temperatures. It usually starts the fan when temperature in the plenum reaches 110° to 120°, and shuts the fan off at about 85°.

The high-temperature limit control is also a temperature-sensitive switch that shuts off the burner at a preset temperature, usually about 170°. For proper operation, the fan should start before the burner shuts off.

Based on your description, it sounds as if one or both of the controllers are either out of adjustment or faulty. Check the temperature settings on the controllers. If they are not set for the proper temperatures, reset them. If they are properly set, they will need to be repaired or replaced. **PM**

Do you have a home-maintenance or repair problem? Send it to Homeowners' Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in the column. For more home-repair and maintenance help, get PM's Home Care Guide, \$2.45 postpaid. Send your order(s) to Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101.

Start your own money making business!
Make up to \$26⁰⁰ an hour—
even while learning! *Train FAST*
at home!

**Be
Your
Own
Boss!**



*Get into this booming high-profit business that's
Easy to learn — Easy to do — Easy on You!*

Never before have money-making opportunities been so great for qualified Locksmiths. Now lucrative regular lock and key business has multiplied a thousandfold as millions seek more protection against zooming crime. Yet there's only one Locksmith for every 17,000 people!

Start Collecting CASH PROFITS Right Away

You're in "business" ready to earn \$10 to \$26.00 an hour a few days after you begin Foley-Belsaw's shortcut training. Take advantage of today's unprecedented opportunities in locksmithing for year-round EXTRA INCOME in spare time — or fulltime in a high-profit business of your own. Hundreds we've trained have done it. So can YOU! All tools plus professional Key Machine given you with course. These plus practice materials and equipment plus simple, illustrated lessons, plus expert supervision, plus business building guidance will enable you the KEEP THE MONEY COMING IN! Ideal for retirement — good jobs, too.

SEND FOR EXCITING FACTS—No Obligation

Discover what's in Locksmithing for you — how Foley-Belsaw's Master Locksmith-approved training can give you the skill you can depend on to EARN MORE — ENJOY LIFE MORE.

No Extra Cost!



Included With Your Locksmith Training

BURGLAR ALARM and SECURITY SYSTEMS

training. Covers all phases of Burglar, Hold-Up and Fire Alarm servicing and installation. This valuable and timely instruction includes all special tools and supplies. ONLY Foley-Belsaw offers such extensive training in this rapidly expanding field as a part of your Locksmith training.

ADVANCED Locksmithing!
How to change combinations, install and service Safe, Vault and Bank Safe-Deposit Box locks. You'll find it fascinating and highly profitable work.

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**David Fairbrother—Dave's Locksmith Service
Milwaukee, Wisconsin 53209**



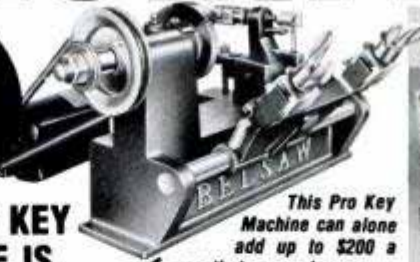
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DETROIT LISTENING POST

Buick's 2-seat Reatta



PHOTO BY GHOSTAR

Buick's 2-seat specialty coupe will have front drive and a turbo V6.

Is it just another Allante? No way. Buick will have its own luxury specialty car that will be quite different from Cadillac's \$40,000 Allante. In appearance the difference is striking, though each will be a 2-seater. Buick's front end is a lot like the 1986 Skyhawk, with hidden headlights and a body-colored bumper. The roof is fixed, not convertible like Allante's. Taillights are simple, and form a thin ribbon that wraps around the fenders for about 8 in.

Underneath the Reatta's exclusive

sheetmetal will be Buick's most powerful V6 engine—turbocharged, if you prefer—that should make Reatta one of the quickest cars on the road. The "I BRAKE FOR CORVETTES" bumper sticker that Buick made for its T-Type Centurys will be no idle boast on this car. How many of these \$20,000-plus coupes will Buick build? Sales in the 10,000 to 15,000 per year range is Buick's goal. Reatta will use a modified Riviera chassis, but with a wheelbase cut by 4 in.

Grand Prix 1987



PHOTOS BY GHOSTAR

The '87 Grand Prix will have a strong BMW flavor with 6000 STE performance possible.

Prototypes of Pontiac's personal coupes have been in the test stage for more than a year now, all sporting this sleek BMW-like shape. The air intake at the front is the only cue to the fact that this car is a Wide Track descendant. All the other sheetmetal is new to the line. The front-wheel-drive system is borrowed from the 6000 sedans. That means a 3-liter V6 as the base engine and a 3.8-liter V6 for the performance option. The headlights will be aero-shaped, not recessed and flat-faced as in the prototype. Also look for 4-place seating,

though Pontiac will almost certainly throw an extra seat belt in the rear and call it a 5-seater. Olds and Buick will have versions of this car with different grilles, taillights and trim.

Bonneville goes fwd

Pontiac plans to pick up the H-body that LeSabre and Delta 88 use for its 1987 flagship sedan. That means front-wheel drive for the first time in this model, with either a 3-liter or 3.8-liter V6 under the hood. The 6-passenger car will undergo only a slight size change



Next year, Pontiac will put a new grille on the Buick LeSabre and Olds Delta 88.

because Bonneville now uses GM's G-body, with a 108-in. wheelbase. H-bodies have 110-in. wheelbases.

Ford's midship flagship

Ford's answer to GM's Corvette, Allante and Reatta specialty cars will be a 2-seater sports car with turbocharged 3-liter V6 engine. There will be a heavy European influence both in exterior styling and chassis development. Primary aim of the \$20,000-plus high-performance model is Corvette's hold on the sports car market in the U.S. Look for this car no sooner than 1988.

Olds' contender

Oldsmobile's special car is still no more than a plan in the minds of Olds managers. Final design has not been decided even though Olds has been working on its specialty coupe for about as long as Cadillac (Allante) and Buick (Reatta). What is decided: A special coupe more sporty and cheaper than Toronado, with space for five passengers. The car, code-named LTS for Luxury Touring Sedan, will use an existing front-drive system, probably the same one as the Ciera, and have unique styling. What Olds wants is a modern version of the record-selling Cutlass Supreme.

Saturn slowdown

GM's highly publicized Saturn small-car project is running into problems with the all-aluminum 4-cylinder engine. GM wants to make the engine using a lost-foam process, in which molten aluminum burns out foam material that forms intricate shapes inside a casting mold. The foam is similar in texture and appearance to that used for insulated coffee cups.

The process is fairly new, but GM has used it successfully on simple castings in the past. Art students will recognize a similarity to the lost wax process used for some sculpture. The Saturn engine poses tough problems. The complicated shapes of the cylinder head call for careful positioning of the foam material. Any shift of the foam during casting will botch up the operation.

"We're trying to work out high-production techniques that do as good a job as we can do in the lab," reports Bob Stempel, one of GM's top managers and the head of Buick-Olds-Cadillac group. "We have to get the foam parts

(Please turn to page 36)

There's a new truck on the road.

It doesn't happen very often. A new Jeep pickup. When your name is legendary, you take the time to be certain that the legend lives on. We're quite certain about Comanche.

2WD/4WD.

Comanche is available as a 2-wheel drive or 4-wheel drive model with a choice of two "shift-on-the-fly" 4WD systems.

Suspension.

Comanche's exclusive Quadra-Link suspension, dual-action shock absorbers, and standard 15-inch all-weather radials are specially tuned for exceptional ride and handling.

Comanche comes with either a 2.5 litre electronic fuel-injected four, an optional 2.8 litre V-6, or an optional 2.1 litre inter-cooled turbo-diesel.

Power.

Comanche comes with either a 2.5 litre electronic fuel-injected four, an optional 2.8 litre V-6, or an optional 2.1 litre inter-cooled turbo-diesel.

Interior.

Comanche's interior is every bit as sporty, stylish, and contemporary as

payload, base engine horsepower, 4WD systems, wheels and tires... the list goes on and on.

It's called Comanche.




It's built by Jeep.

The Bottom Line.

Just how affordable is Comanche? It's the lowest priced Jeep available today. You'll also find something in Comanche you won't find in any other pickup anywhere. The Jeep legend.

It's worth a look.

Only in a Jeep 

Safety belts save lives.

*Comparisons based on competitors' 1985 model information.



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Now Greatly Reduces Serious Risks to Your Health.

DETROIT LISTENING POST

(Continued from page 30)

in the right position, and get the aluminum to flow throughout the casting. But that takes a little more time." Meanwhile Saturn, GM's answer to the low-price import sedans, may be edging past the "before 1990" introduction target that GM had set for the program.

A tall station wagon

That's the way one reporter described Oldsmobile's planned vehicle for the minivan market. Olds officials make no bones about the fact that they want a small, do-everything vehicle like the Chrysler Caravan. (Who doesn't, with sales of that van running a startling 250,000 per year?) They were trying to describe the vehicle without saying "Caravan" when the "tall station wagon" remark was dropped.

Look for Olds to have a passenger van similar to Renault's Espace, a scoop-nosed front-drive van that is not sold in this country. Front-drive is the key here. As in the Caravan, it permits a low, level floor the length of the vehicle for easier loading and passenger convenience. The van is a natural for Olds, which will soon lose its big wagon—the Cutlass Cruiser—to the changeover from rear-wheel drive.

Busting rust

Detroit is taking the final step to guaranteeing your new car against rust. The solution is using body panels treated with galvanized zinc on both sides. Sounds like something that should have been done years ago. But it's more difficult than that.

Galvanized steel, unless it is carefully made, will flake on its surface when formed by a die. So automakers are looking at Japanese-made steel that won't flake and will keep its zinc covering for the life of the car.

"We're encouraging U.S. steel makers to invest in the new equipment to do the same job," a GM executive says. "They can meet the specs, they just want some assurance that we'll use the specialty galvanized over a number of years before they make a big investment." Look for more 5-year rustproof warranties out of Detroit as 2-sided galvanized catches on. As one GM official put it, "If you put aftermarket rustproofing on our new 1986's (Eldorado, Seville, Toronado or Riviera), you're wasting your money."

Totally new Jeep

AMC will upgrade the CJ Jeep line with a "totally new model" in mid-1986. In appearance, the model is much like the current CJ, with the same rugged open-

air look and upright bars in the grille. However, the stance, or track between the wheels, will be greater, giving the 4-wheel-drive utility wagon better stability. A version we spotted recently had 15-in. wheels, a lower and flatter



PHOTO BY JIM DUNNE

New Jeep YJ will be a thoroughly modern workhorse with traditional Jeep styling.

hood, a padded dash with modern recessed instruments and a rear gate hinged at the side, so it doubled as a swing-away spare tire carrier.

The new Jeep is just one of the five new model introductions that AMC plans in the next two or three years. "We have even investigated the Renault Espace for production in this country," an AMC official announced. (Also impressed with the Espace, GM is using the front-drive minivan as a test bed for its future mini.)—Jim Dunne



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The Black & Decker Precision Power Tools. Designing them took a lot of work. But using them doesn't.

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PM PHOTO HINTS

Foam-in-place



Put your printing easel on a block of foam rather than directly on the table under the enlarger. This will prevent the easel from moving when you insert paper to make prints.—*Madison Devlin*

Kitchen chemistry



Disposable filters for the basket-type coffee makers are also excellent for filtering photographic materials. To make a filter holder, just bore holes in a disposable plastic container.

—*Daniel W. Roberts.*

Filter tips



If you store your lens filters in a pouch, they'll be easier to use if you apply stick-on labels to record type, filter factor, number of f-stops to be added, and use—for example—"Color correction 3400K lighting/Daylight film."

—*John Kirwin*

Exciting Breakthrough For Suburban Gardeners!

At last!
Now there's a
tiller/cultivator
exclusively
designed
for small
backyard
gardens.



No longer do you have to choose between a yank-you-along front-tine tiller and a clumsy, hard-to-guide, expensive rear-tine tiller.

Now there's Mantis... the 20-pound wonder that makes every gardening job a breeze! Mantis starts with a flick of the wrist... turns on a dime... and runs all day on a gallon of gas.

Mantis tills a full 8" deep, or delicately cultivates the surface for precision weeding. And, because it's so easy to maneuver, women and older people love Mantis!

"We are well into our 60s and it is such a joy to garden with such ease..." wrote the Hartzogs of Nederland, Texas.

The secret of Mantis' success is its exclusive "tine teeth" which spin at 240 revolutions per minute (twice the speed of most tillers). These *tine teeth* cut through soil, weeds



Women love Mantis



Gardeners in their 60s and 70s love Mantis

and tough sod like a chain saw cuts through wood.

Mantis is so easy to guide that you can cultivate right around plants, along crop rows and up tight to fences... without worrying about running into your growing flowers and vegetables.

And, with its easy-on/easy-off precision attachments, Mantis quickly becomes a Planter/Furrower... a Border Edger... or a superb Trimmer for pruning shrubs and hedges.

Best of all, Mantis costs a fraction of what you'd pay for a big tiller!

**LAST, LAST CHANCE
To Buy Your Mantis
At The LOWEST PRICE
Of The Year!**

... and beat the January price increase, too! ...and receive a \$41 Border Edger... FREE!

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THE PM WORKBENCH



Turning tool trio

These three specialty tools are designed to simplify specific woodturning operations. The DiAccurate tool comes in 10 sizes for cutting tenons accurately. Sizes range from 3/8- (\$23) to 1 1/4-in. dia. (\$24.50). Contact Cryder Creek, 101 Commercial Ave., Whitesville, NY 14897.

Sizing tool accessory fits most 1/4-in. parting chisels and cuts diameters quickly without using calipers. It's available for \$16.60 postpaid from Constantine's, 2050 Eastchester Rd., Bronx, NY 10461. Constantine's also offers a side cutting scraper (\$24.70). Use the high-speed steel tool to shape hard-to-reach spots.—Rosario Capotosto



Woodturning specialty tools (from the top): DiAccurate tool, sizing tool accessory shown with parting chisel and side scraper.



DiAccurate tools come in 10 sizes. Select the desired diameter and feed it slowly into the work. Tool stops cutting automatically.



Diameter sizing tool fits on most parting chisels. It can cut up to a 2-in. dia. and is excellent for doing repetitive turnings.



Cutaway sample shows how side scraper was used to hollow out blank. Tool comes with right- or left-hand cutting edge.

Improved saw blade

Black & Decker has a revolutionary new carbide-tipped saw blade called the Piranha. The blade features a unique curved tooth design that cuts faster, smoother and requires 50 percent less pushing force than conventional saw blades, according to Black & Decker.

Piranha blades are available in 5 1/2-, 6 1/2-, 7 1/4-, 8-, 8 1/4-, 9- and 10-in. sizes. The number of teeth per blade ranges from 16 to 40. The 7 1/4-in., 40-tooth blade shown costs about \$19. For details, contact Black & Decker, 500 Hanover Pike, Hampstead, MD 21074.—J.T.



The blade's curved carbide-tipped teeth cut faster and smoother than conventional saw blades. The blade is available in seven sizes.

Power extender

General Electric's portable power center (PPC) is a safe, convenient way to increase your electrical plug capabilities. The power center plugs into any standard grounding wall receptacle. A lighted on/off switch controls power to the center. The PPC has a 15-amp circuit breaker to prevent overload. It



Power center has a 15-amp circuit breaker that cuts off power in overload situations. Push reset button to restore electric power.

comes in a 4- (\$19) and 6- (\$22) plug model. Contact General Electric, Wiring Device Dept., 225 Service Ave., Warwick, RI 02886.—J.T.

Benchtop jointer



Compact jointer features a cast-aluminum worktable, four nonskid rubber feet and a fence that adjusts from zero to 45°.

If your shop is too small for a full-size jointer, consider the new Wolfcraft 6-in. benchtop jointer. This compact, yet powerful (3/4-hp, 8000-rpm) tool measures only 9 1/4 in. wide x 10 5/8 x 19 3/4 in. The unit has a preset maximum depth of cut of 1/64 in. The widest cut possible is 6 in. The tool-steel cutterhead houses two replaceable carbon-steel blades. Nonskid rubber feet keep the unit from creeping. The benchtop jointer is available for about \$160. For a list of Wolfcraft dealers in your area, contact Wolfcraft, 1107 Lunt Ave., No. 6, Schaumburg, IL 60193.—J.T.

If you've come across a new product with some special features, let us know about it. Write to PM Workbench, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019.

Amazing New Third Brake Light Can Save Your Life

Introducing the biggest safety breakthrough in the history of the National Highway Traffic Safety Administration (NHTSA).

Gov't approved Mandatory for 1986

Stringent government tests prove that the third brake light mounted at eye level reduces rear-end accidents by over 53%. The government is so amazed with these test results they are demanding all 1986 cars be equipped with this new third brake light. (These cars will be introduced in September of 1985.)

The NHTSA estimates predict that this light will prevent 900,000 rear-end collisions a year and 40,000 personal injuries a year. And when accidents do occur, tests show that personal injuries are reduced. Car damage and repairs are also reduced by almost 60%.

Here's why it works

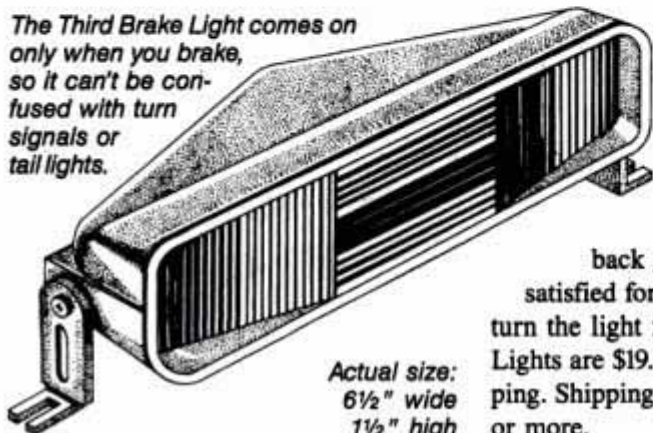
Mounted at eye level, the brake light is bright and easy to see because it shines directly into the eyes of the drivers in the second and third cars behind you. Also, since the light comes on only when you brake, it can't be confused with turn signals or tail lights.

Reduce rear-enders

The third brake light can prevent painful whiplash injuries, remind tail-gaters to back off, and gives the driver behind you better depth perception, day or night.

Many insurance companies are offering discounts for these lights.

The Third Brake Light comes on only when you brake, so it can't be confused with turn signals or tail lights.



Actual size:
6½" wide
1½" high



Amazing results — your chance of a rear-end accident is reduced by over 53%.

Exclusive Design

The versatile design of our light comes complete with everything you need — so it fits every kind of car. The patented bulb assembly snaps out for easy bulb replacement. The contemporary style has a low profile — so it looks good on all vehicles.

This American made light meets all Federal Motor Vehicle Safety Standards (FMVSS) including Federal Standard #108.

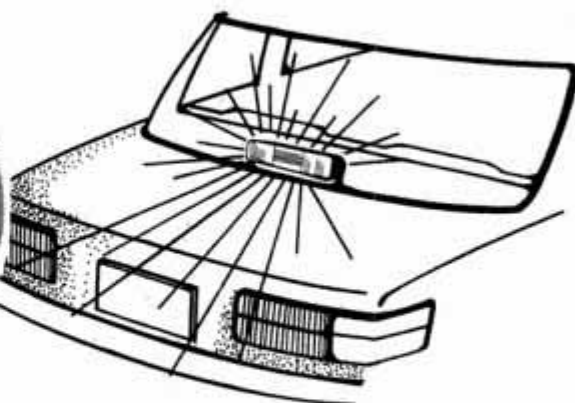
It's easy to install

The eye level brake light mounts inside your rear window — like the new cars, where it is protected from weather, car washes, body damage and theft.

We offer two assembled models — one for American cars and one for foreign cars. Pivoting legs (with leg extensions) make it adjustable to fit all sedans, hatchbacks, station wagons and pick-up trucks. Good instructions and snap-on wire connectors make this a job you can do with a screwdriver and pliers in just 20 minutes.

Money-back Guarantee

Our lights are backed by a one year manufacturer's warranty and our own 60-day money-back guarantee. If you are not satisfied for any reason, you may return the light for a prompt full refund. Lights are \$19.95 each, plus \$3.00 shipping. Shipping is FREE with orders of 2 or more.



Mounted at eye level, the third light is easy to see.

Be first to experience safer driving — it could save your life.

Order today

For ordering or further information, CALL TOLL FREE 1-800-525-8624 (in Colorado 303-762-1385) or send to: Progressive Energy Corp., Dept. PMI25, 3148 South York, Englewood, CO 80110.

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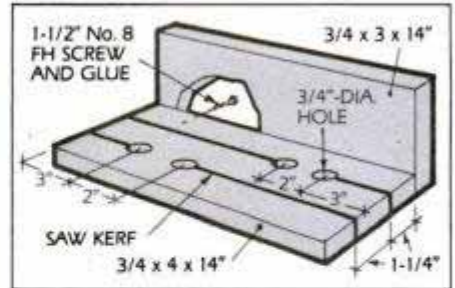
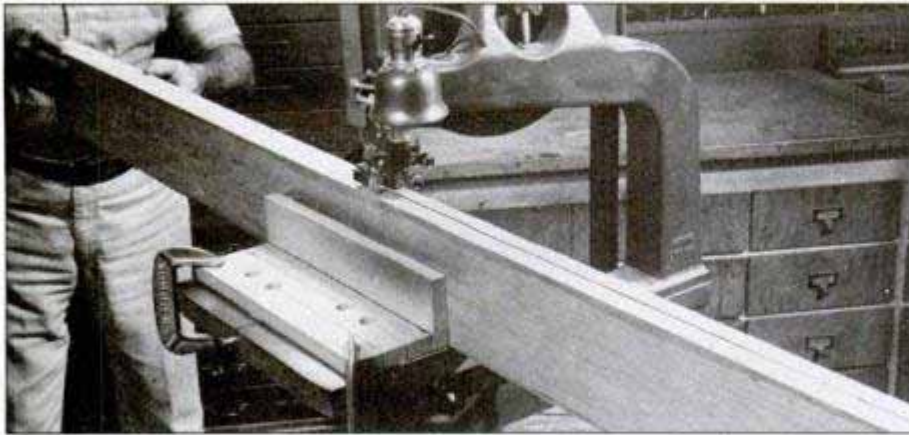
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WORKSHOP MINICOURSE



1 To resaw long boards, clamp a spring board fence to saw table on both sides of stock. (Rear fence is hidden in photo at left.) These will direct board accurately through blade even though hands are far away.

Resawing

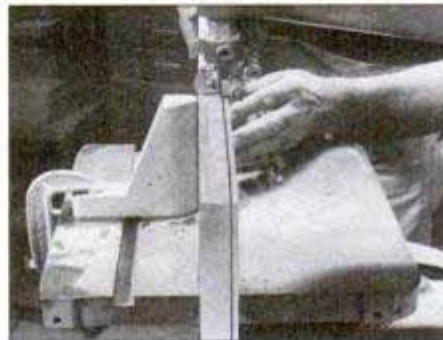
Resawing is the word used for edge-ripping a board to reduce its thickness or to produce two usable boards from one. It can be done on a table saw if the stock is not wider than twice the blade's depth cutting capacity. But if it is, the cut can be made easily on a band saw as long as you use the right blade and a suitable guide.

The best blade is wide ($\frac{1}{2}$ to $\frac{3}{4}$ in.), with coarse teeth (three or four per in.) and has good set. When such a blade is performing well, you can use an ordinary table fence to guide the work. But band saw blades often tend to lead (pull to one side) due to uneven set or because the teeth were filed from one direction only. The latter causes burrs on one side of the blade only. Because of this, several different guides are used to permit "steering" the work.

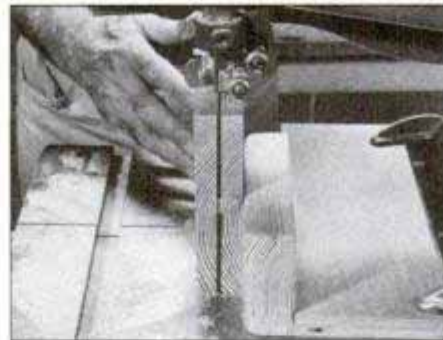
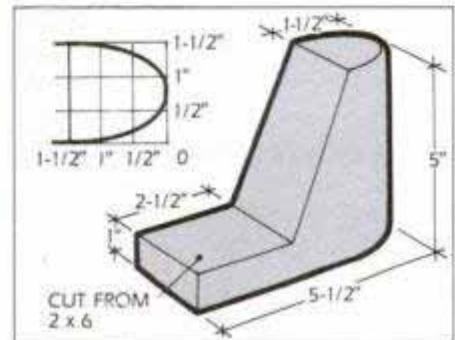
If blade lead is excessive, the pivot fence (No. 2) is best. It allows the most steering because it acts like a fulcrum with both ends of the stock free to swing in either direction. If the blade lead is minimal, but you are resawing very long stock, use a spring board fence (No. 1) on each side of the table. This keeps the board aligned but won't pinch the blade because of the spring action created by the holes and saw kerfs cut in the base board.

For all-purpose work, the utility fence (No. 3) is best. Because it's rigid, it provides a stable surface to push against. And if the blade leads somewhat, the vertical block is short enough to provide some steering. When used in combination with an easy-to-build featherboard (No. 4), it also works for resawing very long boards.

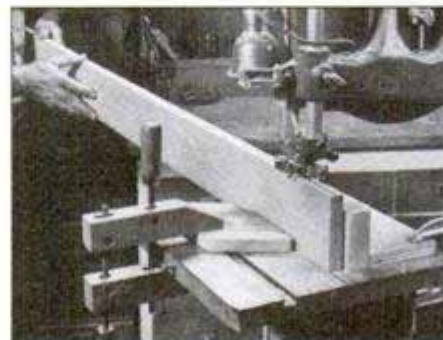
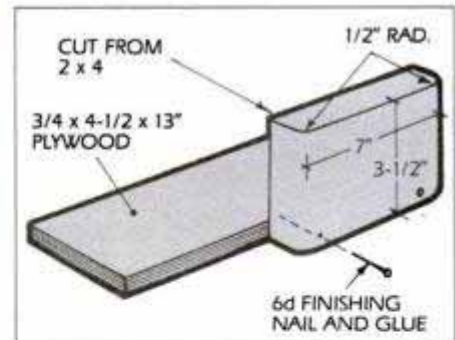
—Rosario Capotosto



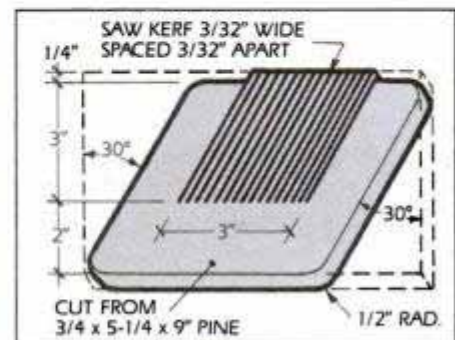
2 If blade tends to lead excessively, use pivot block because it allows maximum steering to compensate for blade. Pivot block is also good for making curved cuts.



3 Utility fence allows for steering and guiding. It works particularly well if stock is first ripped on edges with table saw, then remaining waste is cut on band saw.



4 When cutting long boards using utility fence, clamp featherboard to other side. This keeps stock against fence when hands are too far away to apply lateral pressure.



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by Richard Kruger

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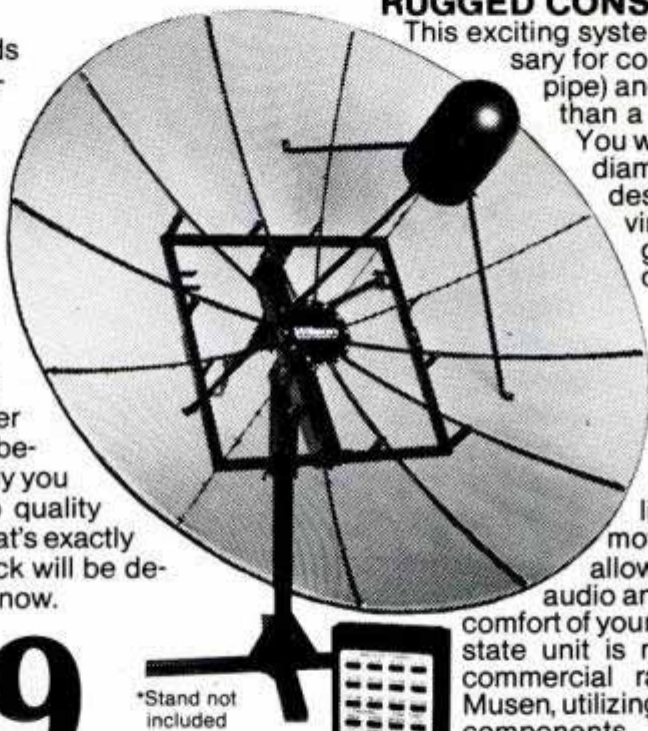
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You will receive a beautiful 9 foot diameter perforated antenna, designed to blend with any environment. This commercial grade, galvanized dish comes complete with a true polar mount for easy tracking of all 16 satellites.

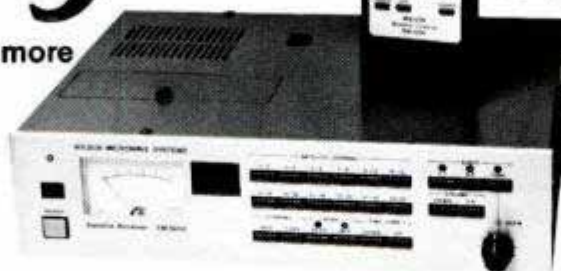
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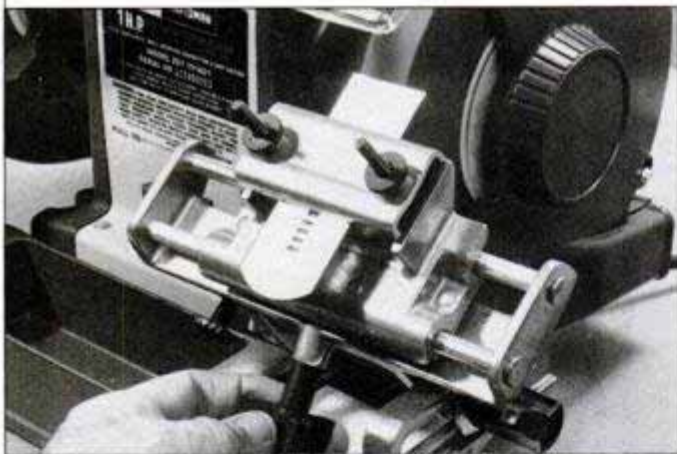
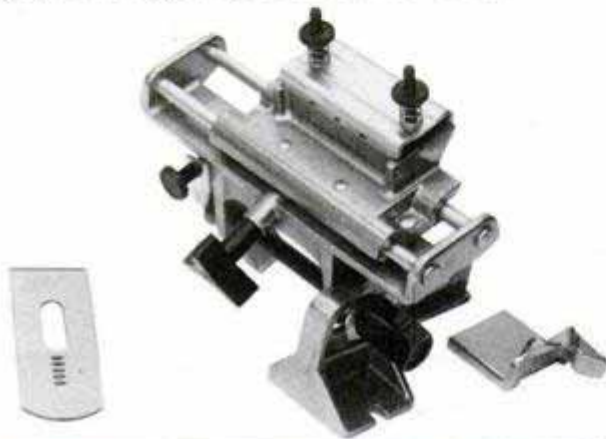
DIVISION OF CHRYSLER CORPORATION

PM LOOKS AT...



Tools For A Sharp Shop

Keeping a keen edge on your cutting tools takes time and patience. These five Sears grinder accessories speed the job and give precision as well.



Flat-blade sharpener has fine-feed knob at left to set blade against wheel at proper angle. Travel knob at center slides rack and pinion platform across face of wheel. Separate guide holds long blades and garden tools. Sears Specialog No. 19596; \$30.

Sharp tools are a must for quick, safe, accurate work. Even so, it's tempting to put up with a dull edge simply because sharpening slows you down, or because you anticipate disappointing results. These five sharpening accessories take much of the time out of sharpening, and assure a precise edge without special skill.

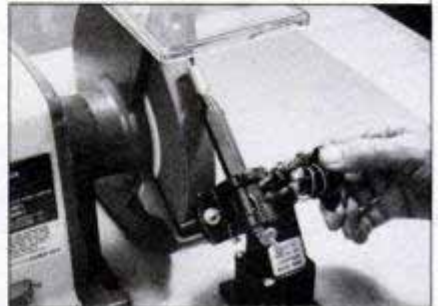
Precision adjustment knobs enable you to position and feed cutting edges against the grinding wheel at the proper angle. The sharpening accessories are bench-mounted, and they can be used with almost any bench-mounted grinding wheel.

They are available from Sears Roebuck's 1985/86 Tool Specialog. Each costs between \$16 and \$30.

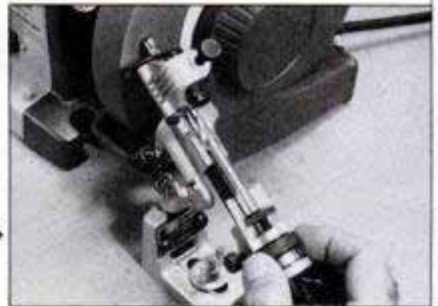
—Rosario Capotosto



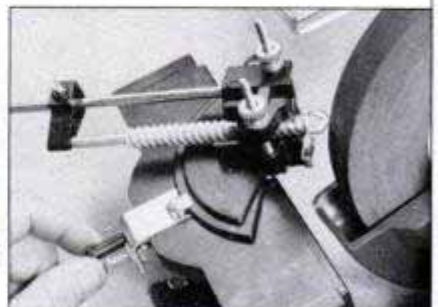
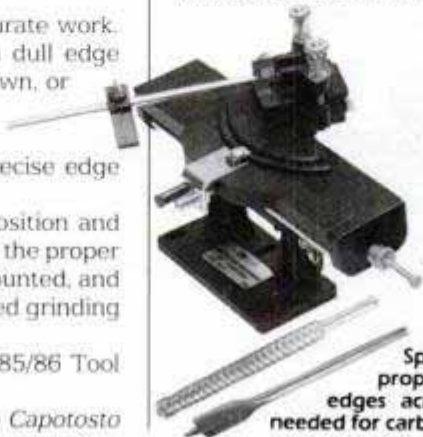
Bit-sharpening guide handles 1/8- to 1/2-in.-dia. bits. Small knob advances bit in .005-in. increments to prevent loss of temper. The cam-action center knob keeps equal pressure on both of the cutting lips. Sears Specialog No. 6672; \$25.



Attachment for sharpening high-speed steel router bits has a fine-feed screw that is turned to advance bit in minute increments against wheel. Large knob slides bit along the edge of the wheel. Sears Specialog No. 6660; \$20.



Side-of-wheel sharpener accepts drill bits from 1/8- to 3/4-in. dia. The adjustable guide arm pivots to match the correct point angle. This tool requires a special side-cutting grinding wheel. Sears Specialog No. 6677; \$16.



Spade and masonry bits are locked at proper angle, then sliding platform moves edges across wheel. Silicone carbide wheel is needed for carbide-tipped bits. Specialog No. 6665; \$25.

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AudioLites turn ordinary lights into sound activated security systems. If anyone even approaches your home, AudioLite sensors pick up the sound and flood your yard with light, room lights come on instantly and intruders are frightened away.

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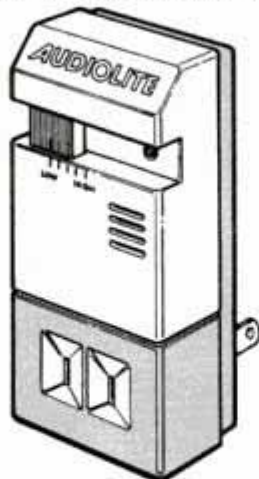
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Three Easy Ways to Protect Your Home in Minutes



The AudioLite Socket is as easy to use as screwing in a light bulb. This is the AudioLite created for outside flood lamps, driveways and walkways. Works with up to 150 watts.



The AudioLite Plug plugs into any standard outlet and is designed to be used on interior room lamps. Any room with a lamp can be sound activated. The plug is portable and can be used anywhere. Works with up to 300 watts.



The AudioLite Switch turns on ceiling lights. It's terrific for dark stairways, hallways, entry ways, basements and garages. It installs quickly and easily in place of your present light switch using just a screwdriver. It takes only a few minutes, even for a novice. Works with up to 200 watts.

ACCESSORIES

A CENTURY OF PROGRESS

100
YEARS

From headlamps and horns to 12-speaker stereos and radar detectors, add-ons have come a long way.

BY MORT SCHULTZ
Illustrations by Pat Ruggero

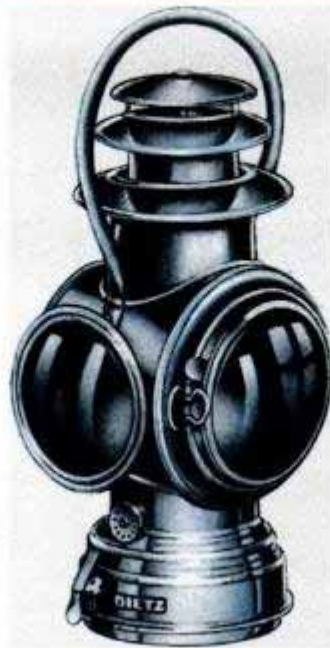
Lemuel Bosco of Akron, Ohio, spent \$5 for an antitheft device that was supposed to lock the Splittorf ignition switch of his car, but it didn't stop a thief. He broke it off and took Bosco's Mercer for a joyride. The cops found the car undamaged, but Bosco was mad and vowed it wouldn't happen again. Thus was born the Bosco Collapsible Driver. When inflated and propped behind a steering wheel, it looked like Charlie Chaplin, right down to moustache and derby. When the mannequin wasn't needed, it was deflated and stored under the seat. Standing a foot away from a car, no thief could tell that the rubber dummy wasn't a real man—or so ads in auto accessory manuals of 1910 would have you believe.

The Bosco Collapsible Driver Co. collapsed in two years, because it didn't take even the dumbest thief long to realize that the guy who was sitting behind the wheel never even twitched, which meant he was either dead, in a coma or not for real.

The Bosco dummy was one of countless inventions that never made it as auto accessories. It wasn't as practical as others that became popular and offered motorists additional comfort, convenience or safety.

Many automotive components we now regard as necessities started life as accessories. They include headlamps, headlamp dimmers, turn signals, backup lights, windshield wipers, horns, jacks, speedometers, temperature gauges, rear-view mirrors, even bumpers and trunks. In most cases, an item's transition from accessory to necessity was interrupted by a period in which it was

(Please turn to page 48)



Ditz Dainty Tail Lamp (above) could be removed from the car and used as a lantern for making repairs or signaling oncoming traffic, as could the similar but bigger Ditz headlamp. Siren-type accessory horn (right) got the other driver's attention.



Modern aftermarket sound system features AM/FM radio, cassette deck, remote control and fold-up security panel to keep unit out of sight when car is parked. Auxiliary amplifiers can drive up to 12 speakers.



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Because the small engine industry has grown so quickly, an acute shortage of qualified Small Engine Professionals exists throughout the country. In fact, it's not unusual for a good small engine man to be three to four weeks behind in the summer and at least a week behind in the winter. When you see how many small engines are in use today, it's easy to understand why qualified men command such high prices — as much as \$49.95 for a simple tune-up that takes less than an hour!

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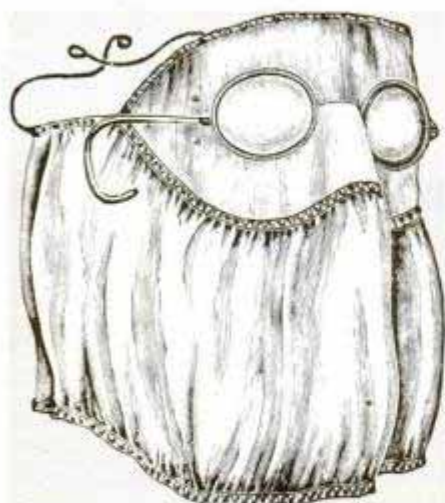
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Early motorists wore hats, goggles and scarves to ward off dust. This fancy lady's mask included crepe vell to protect hair.

offered as an option by the carmaker.

Today, it's hard to believe that even the headlamp took these three steps, but it did. Some owners of the earliest cars took the candle lamps off their horse buggies and put them on their horseless carriages. They served as beacons to warn other drivers of an approaching vehicle, but they weren't bright enough to light the road.

It's alleged that the first true headlamp was a kerosene lantern in the hands of a farmer. In 1887, a driver who had failed to make his destination before night fell found an accommodating farmer who guided him by lantern light to his house. That farmer became the first "headlight."

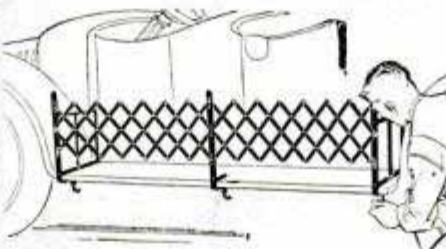
Soon after, someone got the bright idea of offering motorists detachable oil

lamps. Placed in silvered reflectors and outfitted with stands and handles, they could also serve as sources of light to repair flat tires at night. It was only a year or so afterward that carmakers started offering oil lamps as options.

As roads improved and night driving became commonplace, cars were fitted with acetylene tanks to feed gas to headlamps. The acetylene flame wasn't as easy to blow out as candle flames or oil lamp wicks.

Then came electric head and tail lamps, introduced on the 1898 Columbia Electric Car. The main reason makers of gasoline buggies started putting batteries into their vehicles was to power electric headlamps.

Early electric headlamps were blinding because they couldn't be "dipped" when cars approached one another. This drawback gave rise to the accessory dimmer. The forerunner was the so-called depressible headlight, which was introduced by the Guide Lamp Co. in 1915. It allowed a motorist to swivel headlamps vertically by loosening and tightening clamps, but he had to get out of the car to do this.



Universal Luggage Carrier turned a car's running board into a luggage rack for \$2.95. Folded, it was only 6 in. long.

Depressible headlamps became practical in 1917 when Cadillac "automated" them. The lamps were placed on a trunnion. A bar extending to a lever on the steering column let the driver raise or lower reflectors.

In 1925 the depressible headlight became obsolete when the Guide Lamp Co. introduced the 2-filament headlight bulb. Switching between low and high beam was accomplished through a switch on the steering column. In 1927 the dimmer switch was moved to the floor, where it stayed for about 50 years until it was moved again—to the steering column!

Another noteworthy lighting feature that started as an accessory and ended up as a necessity was the flashing turn signal, introduced by the Protex Safety Signal Co. in 1920. But the idea was proposed (sort of) in 1916 when C.H. Thomas of Norristown, Pa., wrote to *POPULAR MECHANICS* describing an invention—a battery and electric bulb attached to a glove so drivers could see hand signals at night.

Flashing turn signals were first of-

fered as an option by Buick in 1938, but only as rear flashing lights. In 1940 the flashing signal was extended to front lights, and the signal switch was given a self-canceling feature.

The bumper is another piece of equipment that was an accessory before motorists considered it a necessity. Two pages were devoted to it in the 1922 automobile supply catalog of The Charles William Stores of New York, which claimed that, "Bumpers are



Nathan Comfy Crib may have been the first infant carrier. Suspended by springs, it could be hung from car top or porch posts.

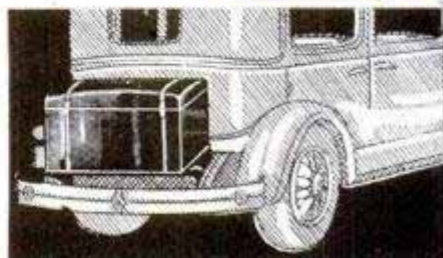
cheap collision insurance." Priced at about \$8 each, bumpers were clamped or bolted onto the front and rear of the car. Two or three years later, carmakers made bumpers standard.

Mail-order windshield wipers in the same catalog consisted of a rubber squeegee that was clamped to the top of the windshield frame. The driver moved this squeegee back and forth by hand, using a crank inside the car. At 89¢, this was the cheap model. If a guy was in the bucks, he could buy an automatic windshield wiper for \$4.75 that "will work of its own accord so you can keep both hands on the wheel to control your skidding, sliding car."

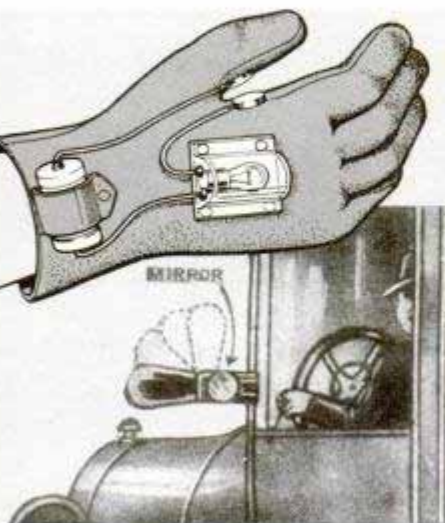
That vacuum-powered unit, connected to the intake manifold by a rubber tube, had a major drawback: It would slow to a crawl as the throttle was opened and, consequently, engine vacuum dropped. Electric wipers didn't do this, but when carmakers finally made windshield wipers standard, they fitted cars with vacuum models because they were cheaper.

The first law requiring motor cars to have an audible warning signal was passed in France in 1899. In the U.S., the factory-installed electric horn or Klaxon didn't become popular until

(Please turn to page 58)



The 1920s Pep Boys catalog featured metal car trunks from \$6.66 to \$12.95. They were strapped above the bumper.



Nathan Safety Traffic Signal combined mirror with a pop-up hand signal—"a necessity for closed cars." *PM* reader's brainstorm (top) made hand signals visible at night.

Marlboro



© Philip Morris Inc. 1985

**SURGEON GENERAL'S WARNING: Cigarette
Smoke Contains Carbon Monoxide.**

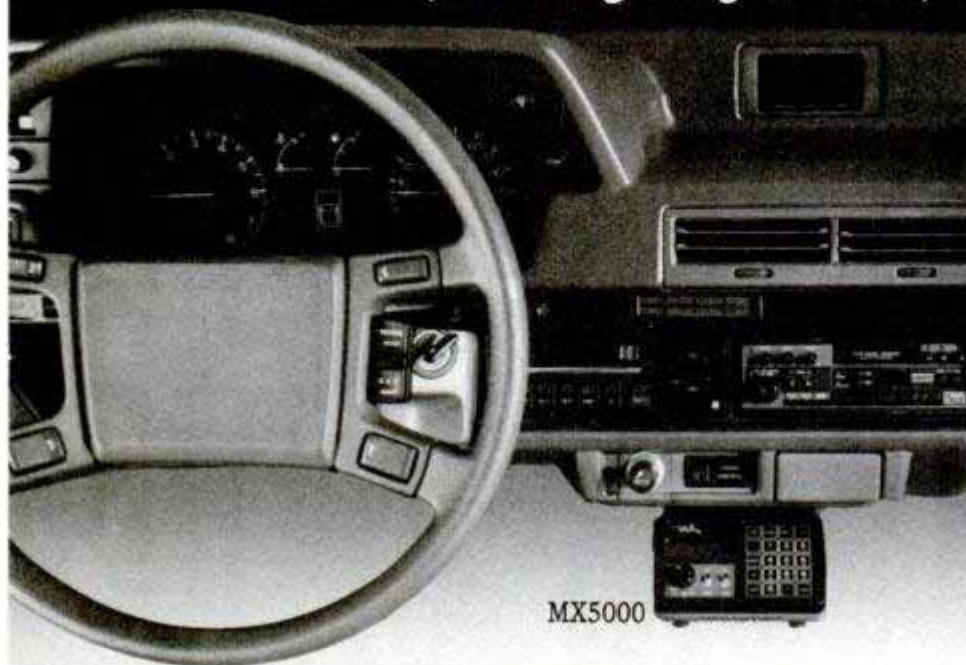
16 mg "tar," 1.0 mg nicotine av. per cigarette, FTC Report Feb. '85

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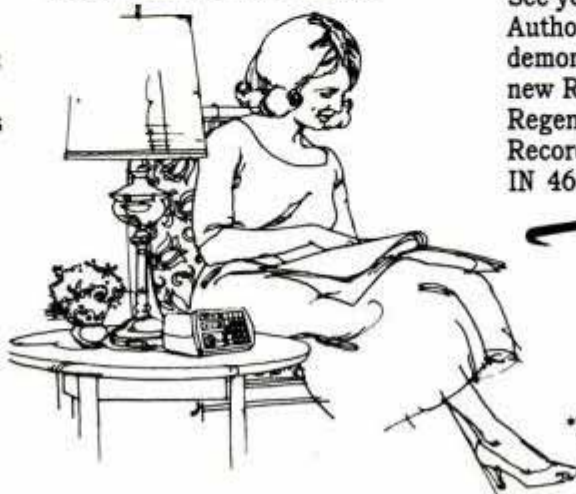
Unique Capabilities

Introducing two all new Regency scanners. First, there's the MX7000, a 20 channel, no-crystal unit that receives continuously from 25 to 550 MHz and 800 MHz to 1.2 GHz. That's right! Continuous coverage that includes VHF and UHF television audio, FM Broadcast, civil and military aircraft bands and 800 MHz communications. Next in line is the new MX4000. It's eight band coverage includes standard VHF and UHF ranges with the important addition of 800 MHz and aircraft bands. Both units feature keyboard entry, a

multifunction liquid crystal display and selectable search frequency increments.

Practical Performance

If you don't need the 800 MHz range coverage, Regency offers two exciting new units. The MX5000 is a 20 channel, no-crystal scanner that receives continuously from 25 to 550 MHz with all the same features as the MX7000. Then there's the 30 channel MX3000. It's digitally synthesized so no crystals are necessary, and the pressure sensitive keyboard makes programming simple. What's



more, it has a full function digital readout, priority, search and scan delay, dual scan speed, and a brightness switch for day or night operation.

At Home Or On The Road

With compact design, easy access front panel and mounting bracket these Regency scanners are ideal for mobile* use. But we also supply each radio with a plug-in transformer and a telescoping antenna so you can stay in touch at home. The MX4000 even has a rechargeable battery pack so it's fully portable.

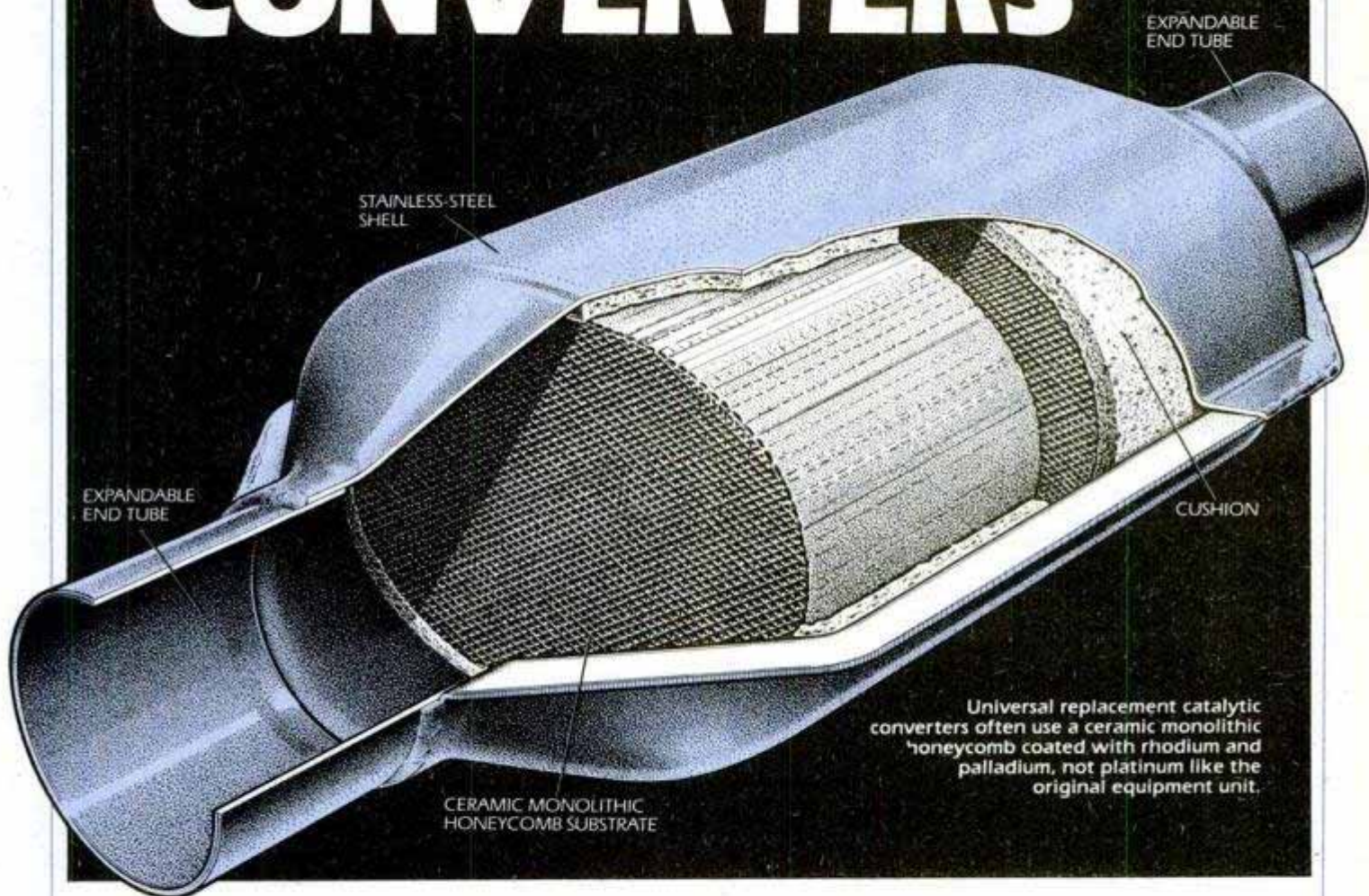
See your Regency Scanner Authorized Dealer for a free demonstration on these and other new Regency Scanners. Or, write Regency Electronics, 7707 Records Street, Indianapolis, IN 46226.

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*Mobile use subject to restriction
in certain localities.

TESTING AND REPAIRING CATALYTIC CONVERTERS



Universal replacement catalytic converters often use a ceramic monolithic honeycomb coated with rhodium and palladium, not platinum like the original equipment unit.

This year, the catalytic converter is celebrating its 10th anniversary as a member of the automobile emissions control combat team. Positioned between the engine and muffler in the exhaust system, a catalytic converter chemically transforms hydrocarbon (HC) and carbon monoxide (CO) into carbon dioxide (CO₂) and water vapor (H₂O). In most cars built since 1980, it also converts oxides of nitrogen (NOx) into oxygen and nitrogen.

After 10 years, one might expect that catalytic converters in older cars are biting the dust at a high rate. But such is not the case. Age alone doesn't seem to

BY MORT SCHULTZ

be a factor that has any bearing on converter longevity.

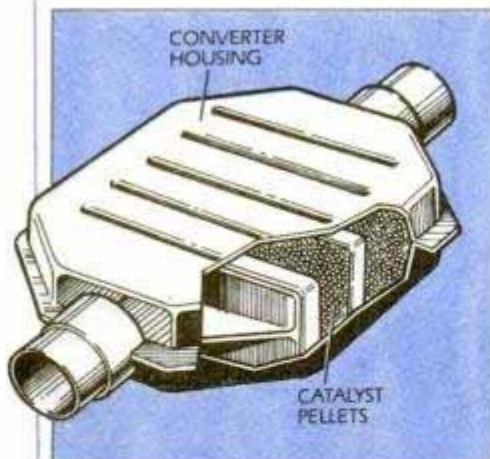
"Catalytic converters in cars with engines that are properly tuned are performing effectively well beyond 100,000 miles," says Dick Wilcox, chief engineer at Arvin Automotive in Columbus, Indiana, a major manufacturer of converters.

A catalytic converter fails when the catalyst loses its effectiveness or when passages in the converter clog to keep exhaust gas trapped in the exhaust

system and engine. Catalytic converter deterioration occurs primarily when leaded rather than unleaded gasoline is used, or if an engine is run for a substantial period of time on a rich fuel mixture. A rich fuel mixture produces high temperature in a converter that causes parts of the unit to melt, plugging passages.

Lead poisoning

As a rule, car owners don't intentionally introduce leaded gasoline into vehicles equipped with catalytic converters, which require unleaded fuel. For one thing, it's against the law. For another,



1 Most GM and AMC cars built prior to 1980 have pellet-type catalytic converters. Filler plug on the bottom is the clue.

most car owners realize a diet of leaded gasoline will ruin an expensive converter before the 50,000-mile warranty period expires. The warranty doesn't cover lead contamination.

This is not to say that leaded gasoline isn't making its way into vehicles with catalytic converters. Stories about dishonest dealers and distributors who pass leaded gas off as unleaded are documented by the Environmental Protection Agency.

The lead in leaded gasoline adheres to and coats the catalyst, which then can't do its conversion job on polluting gases. Each tankful of leaded gasoline causes an increasingly thick coating of lead to build up on the catalyst. The end result of this buildup is that exhaust gases are kept from coming into contact with the catalyst.

How many tankfuls of leaded gas does it take to render a catalytic converter completely useless?

"Each load of leaded gasoline put into a car makes a catalytic converter work that much less effectively," Wilcox states. "Although the effect of one tankful of leaded gasoline on a converter is measurable, it takes more than one tankful to kill a converter. But exactly how many tankfuls it does take, no one can say for sure."

Once leaded gasoline is put into a car having a catalytic converter, the coating on the catalyst generally cannot be reversed. Using only unleaded gas from then on does not completely cleanse the catalyst. Some lead will still remain.

Lead causes monolithic catalytic converters to plug more rapidly than pellet converters (Fig. 1). The slight movement of pellets as they are struck by exhaust gas keeps some lead from adhering to the pellets. The catalyst in a

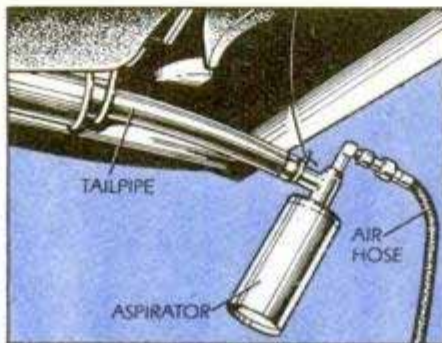
monolithic converter cannot escape. It gets the full load, because the monolithic element is stationary.

Pellet vs. monolithic

Pellet converters are filled with aluminum oxide or ceramic beads. In most pellet converters manufactured in 1980 and afterward, a portion of the pellets are coated with platinum and palladium and the rest are coated with platinum and rhodium. These noble metals perform as catalysts.

Pellet converters have been used primarily on vehicles built by GM and AMC, most before 1980, but some since then. When the catalyst fails, old pellets can be removed and new pellets installed. However, if the housing is damaged the whole converter should be replaced.

To change pellets, an aspirator to



2 When connected to an air hose, aspirator creates a vacuum that holds pellets inside converter as filler plug is removed.

which an air hose is attached is first connected to the tailpipe to create a vacuum that will hold pellets in the converter when the filler plug is removed (Fig. 2). One type of filler plug has to be pried from place (Fig. 3). This

plug will be destroyed, so a new one will have to be installed after pellets are switched. Another type of filler plug can be removed with a wrench and can be reused. (Fig. 4).

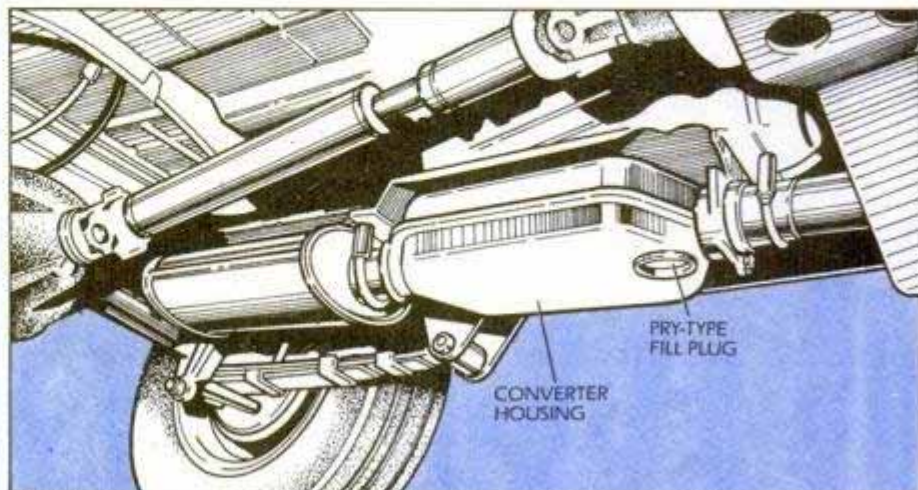
With the filler plug removed, a vibrator and catalyst container assembly is attached to the converter (Fig. 5). The air to the aspirator is turned off, and air to the vibrator is turned on to shake the old pellets out of the converter. They drop into a container.

After all the old pellets are purged, the vibrator is removed from the catalyst and the pellets are dumped from the container. The container is then filled with new pellets and reattached to the vibrator. Now, air to both the vibrator and aspirator is turned on to draw the new pellets into the container.

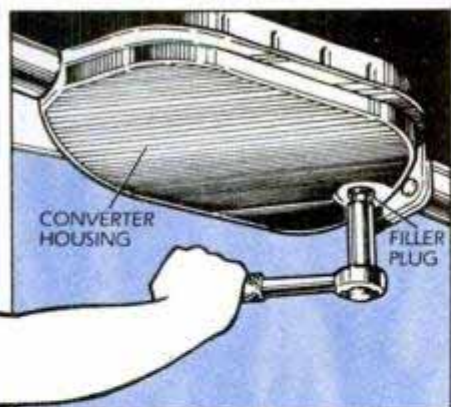
All this fancy equipment (aspirator, vibrator) allows a dealer to change pellets without removing the converter from the exhaust system.

The home mechanic will be tempted to unbolt the converter, shake out the old pellets and pour in new ones. A vacuum cleaner and a stick will help to make sure you've got all the old pellets out. However, you must be careful not to damage the converter or its connecting pipes (which are likely to be rusted) when you remove and reinstall the converter.

You can buy replacement pellets from a GM dealer for about \$40 for a V6 engine (V8s need more pellets, Fours fewer). You'll also need a replacement plug and adapter, and probably new clamps, too. A GM dealer with the equipment can replace the pellets for about \$75. Considering the knuckle-busting potential of exhaust system work, you may want to let the dealer do the job. If he doesn't have the right



3 Filler plug pressed into the converter housing must be pried out, which destroys the plug. Replacement plugs are threaded and require a press-in threaded adapter.



4 Threaded filler plug (whether original or replacement) is removed with a socket wrench. If there's no plug, the converter is a monolithic unit, not a pellet type.

equipment, the dealer will no doubt suggest a new converter, which usually runs over \$300 with labor.

Once you remove the converter, you have the option of installing a \$100 aftermarket universal converter (see below) instead of fooling around with loose pellets.

A disadvantage of pellet converters is that the moving pellets can wear as they rub against each other. When pellets get small enough, they are pulled into small exhaust gas passages and clog the converter.

Monolithic converters, which are also called honeycomb converters, have ceramic cores. In most monolithic converters manufactured since 1980, a portion of the core is coated with platinum and palladium and a portion is coated with platinum and rhodium. Since 1975, Chrysler and Ford have used monolithic units, and since 1980 many cars built by GM and AMC have also used them. When a monolithic catalyst fails, the whole converter must be replaced.

Types of catalysts

Early catalytic converters in 1975-'79 cars treat only the HC and CO elements in exhaust gas. These are known as oxidizing converters. They use a platinum and palladium coating, which in the presence of oxygen effectively breaks up HC and CO.

In 1980, the job of catalytic converters was expanded to include the treatment of NOx. This gave rise to the 3-way catalytic converter, so-called because it neutralizes three pollutants: HC, CO and NOx.

Three-way catalytic converters are divided into two sections. The section nearest the engine uses a palladium/rhodium catalyst to strip oxygen from NOx, thus separating the elements that

make up this pollutant into harmless oxygen and nitrogen. The chemical reaction needs an environment that's as free of oxygen as possible.

The second section of a 3-way converter is an oxidizing unit that uses a palladium/platinum catalyst to render HC and CO harmless. In most cars, additional oxygen is needed to complete this oxidation process. It is provided by the Air Injection Reactor (A.I.R.) system's air pump (Fig. 6). If your car fails a state emissions test for HC and CO, and it has a 3-way catalytic converter, make sure the A.I.R. system is functioning properly before plunging ahead and replacing the converter.

Failing inspection

Inspectors in states that require annual emissions inspections use analyzers that measure the amount of HC and CO in exhaust gas. If the car exhaust shows low amounts of HC and CO, it passes the test.

Suppose, however, the reverse is true. Does this mean you should rush to replace the catalytic converter? No! A malfunction in the engine that's causing fuel richness or a problem with one of the other emission control systems may be the reason for poor test results.

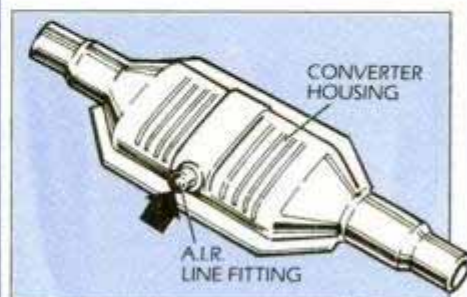
Do an engine tuneup. Concentrate on sparkplugs. Are they clean and properly gapped? Check ignition timing and fuel system adjustments to see that they're set according to the manufacturer's specification.

Then, recheck the exhaust gas. If analysis still shows a high concentra-

tion of HC and CO, make sure the positive crankcase ventilation (PCV), exhaust gas recirculation (EGR) and heated inlet air systems are working properly before blaming the catalytic converter.

When a converter clogs

A catalytic converter with clogged passages is easier to detect than a



6 A 3-way catalytic converter, used on many post-'79 cars, can be identified by its A.I.R. system fitting and hose.

converter which has an ineffective catalyst. A clogged converter creates high exhaust back pressure, which may cause an engine problem. Depending upon the extent of clogging, the engine can backfire through the carburetor, lose power or stall. In the case of solid clogging, the engine may not start.

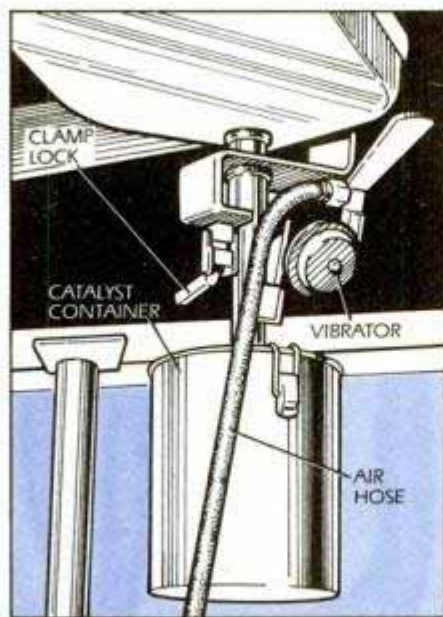
If your engine has a 3-way catalytic converter, it also possesses an oxygen feedback system. To determine if the converter is plugged solid and is preventing engine starting, remove the oxygen sensor that's part of the feedback system. If the engine now starts, blame the catalytic converter.

Do a vacuum gauge test to determine if a plugged or partially clogged converter is causing hard starting or rough-running engine problems. Connect the vacuum gauge to a vacuum source on the intake manifold and check the vacuum gauge reading as the fully warmed-up engine idles.

Although manufacturers are specific concerning vacuum readings for each particular engine, if your reading is between 15 and 21 in./Hg (inches of mercury), vacuum is okay. If it's below 15 in./Hg, there's a vacuum leak in the intake manifold, carburetor gaskets or a vacuum hose that should be corrected before you proceed.

Increase engine speed to between 2000 and 3000 rpm. If the vacuum gauge needle drops and holds steady at a lower reading, there's probably an exhaust system restriction.

If you like, you can confirm that a restriction exists by letting the engine



5 Air-powered vibrator shakes old pellets into container. When aspirator is turned on, new pellets are drawn up into converter.

get cold; then disconnect the exhaust pipe at the exhaust manifold, a tough job. Do the test again. If the vacuum gauge reading is higher than it was during the first test, the existence of a plugged exhaust system is confirmed.

The problem now is to determine if the restriction is confined to the catalytic converter, muffler, tailpipe or some other part of the exhaust system. You can do this by removing the catalytic converter and substituting a straight pipe. Then, do the test again. If the vacuum is at a normal level, a restricted catalytic converter is confirmed. Do not simply leave this pipe in place—it pollutes the air, is illegal in most states, and will be detected at inspections. The reduction in back pressure may cause other driveability problems.

Aftermarket converters

Recently, a step was taken to lessen the blow on the pocketbook when replacing a damaged catalytic converter. Original equipment converters can cost \$250 to \$300. The EPA asked aftermarket parts manufacturers to bring out a replacement converter that wouldn't be as expensive (Fig. 7). The price of the replacement unit is only about \$100. The aftermarket converter is smaller than original equipment units and uses palladium and rhodium, but no platinum.

Apparently, the less expensive replacement unit doesn't do as effective a job of reducing HC and CO as original-equipment converters. The feeling is that the replacement units won't last as long (maybe five years) either, although only time will tell.

Some other facts

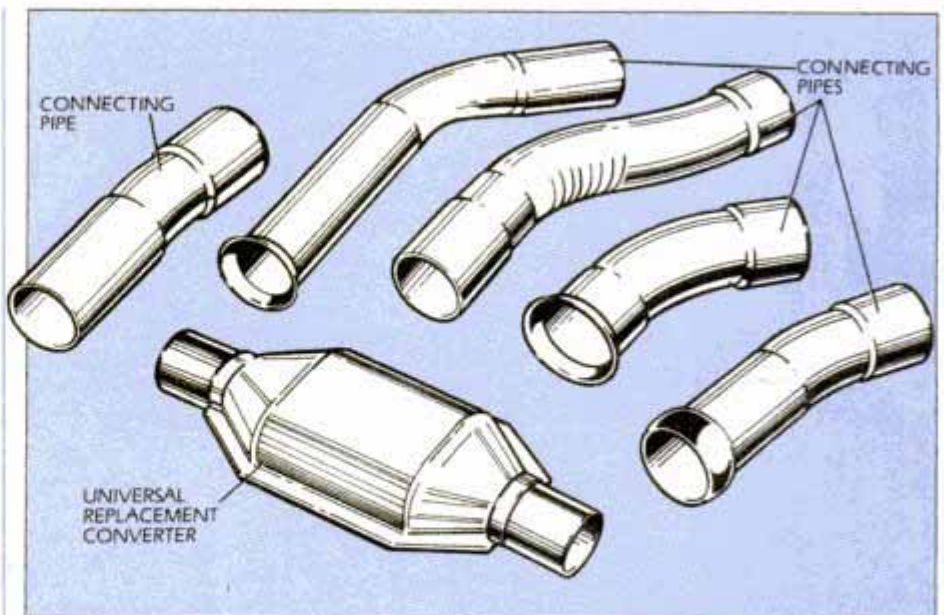
Here are some other facts about catalytic converters that may answer questions still on your mind:

- If you're adept at replacing a muffler, you shouldn't have a problem replacing a catalytic converter (Fig. 8). New units come with explicit instructions. Still, keep the following in mind:

1. Although the engine may be cold, the converter may not be, so don't go laying your hands on it unless you're wearing work gloves. Better yet, don't do the job until the car has been idle for at least two hours.

2. If the old converter is covered by a heat shield that's bolted on, try to remove it. You can reuse the heat shield if it isn't damaged. Don't try to get along without a heat shield.

3. Use a hacksaw to cut off the old converter, but follow the instruction sheet carefully. It will tell you how



7 Aftermarket converter is sold with an assortment of connector pipes for adapting it to various exhaust systems. It costs about \$100 and should last two to three years.

much you can cut off. If you cut off too much, the new converter won't fit.

4. When you have the old converter on the ground, use a hacksaw to open it up so you can examine the substrate. If it's melted, the engine needs work—maybe only a tuneup. Mounting the new converter without doing this work will result in the same trouble—a converter that fails prematurely.

5. When you mount the new converter, make sure the inlet and the outlet are in the right places.

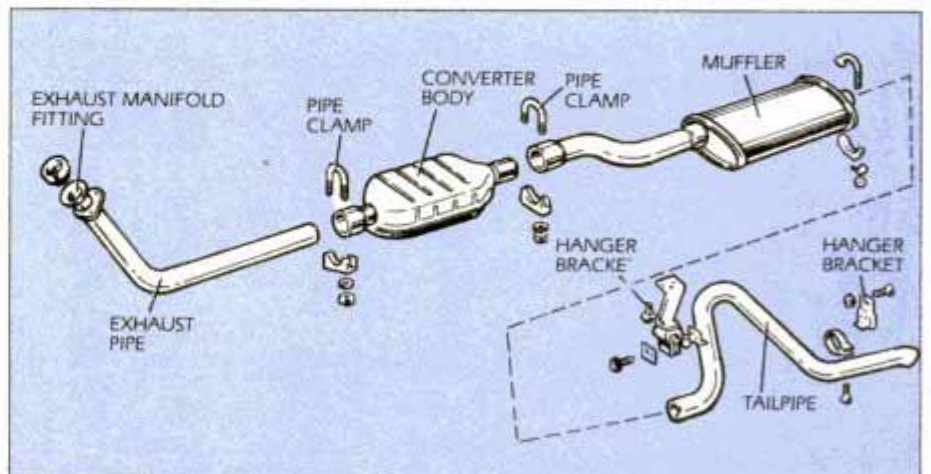
6. Don't overtighten new clamps. You may crush pipes or strip bolts.

Note: If your car has a miniconverter in addition to a regular converter, you should not replace them with the new universal catalytic converter. You have to replace those units with original equipment parts.

- If the original catalytic converter on your car is a pellet type and you don't want to replace the pellets, you can replace the converter with a monolithic aftermarket unit.

- If converter pipes are rusted, it doesn't necessarily mean the whole converter has to be replaced. If you aren't handling the job yourself, find out if it's possible to separate the pipes from the converter without destroying the converter. Be sure to ask how much the job will cost. One mechanic quoted me a price of \$110 for pipes alone, which is hardly worth the money considering the existence of the new aftermarket replacements.

- There doesn't seem to be a scrap market for the noble metals in old converters. In my area anyway, I couldn't give an old converter away. **FM**



8 Catalytic converter, with its stainless-steel body, is no more difficult to replace than a muffler. Connecting pipes and clamps are likely to be rusted in place.

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ACCESSORIES: A CENTURY OF PROGRESS

(Continued from page 48)

about 1915. Before then the horn was an accessory a motorist bought from an auto supply dealer. He could get any sound that pleased him—squawk, toot, whistle, chime or siren.

The era of the electric horn started in 1908 when the Lowell-McConnell Manufacturing Co. of Newark, New Jersey, purchased the rights to an electrically operated signalling device. F.W. Lowell, founder of the firm, called it a Klaxon, from the Greek word *klaxo*, which means to shriek. Soon, road signs warning motorists to "Sound Your Klaxon" were erected at sharp curves.

Trunks and mirrors

As recently as 1932, trunks were literally that—separate cargo chests that motorists bought and strapped to the rear of their cars. Later in the 1930s, cars were designed with a hump in the rear, allowing carmakers to build in luggage compartments.

The first recorded use of the rear-view mirror was the one Ray Harroun had on his Marmon Wasp when he won the first Indianapolis 500 in 1911. The adaptation allowed Harroun to ride alone in his car, while other drivers needed riding mechanics to tell them when cars were on their tails or coming

up alongside. By eliminating the observer, Harroun made his car slimmer, more aerodynamic and lighter.

Capitalizing on Harroun's success, the Marmon Auto Co. started to put rear-view mirrors on all its 1912 models. Other manufacturers followed suit. In 1940 the Guide Lamp Co. offered an accessory rear-view mirror that could be adjusted for day or night driving.

Here are some other accessories that made it to the big time:

- The 1903 Tincher introduced the motoring public to air-boost (power) brakes. It wasn't an option either, but standard equipment. But then, the Tincher sold for \$5000—about 10 times the price of the average car of the day.

- The first adjustable driver's seat was offered in the 1914 Maxwell. The 1921 Hudson had sliding bench seats as standard equipment. Buick, in 1946, gave motorists the first optional 2-way power seat, and the 1953 Lincoln had the first optional 4-way power seat.

- In 1921, an innovator by the name of Wills Sainte Claire mounted a bulb on the rear of his car and wired it to a switch on the car's transmission, so it glowed when the car was shifted into reverse. Thus, the backup light was invented and sold as an accessory until federal law made it mandatory in the 1960s.

- The 1923 Springfield sedan is credited with being the first car to offer a radio as an option. Radios didn't become popular until the early '30s, when they finally lost their reputation as a driver distraction.

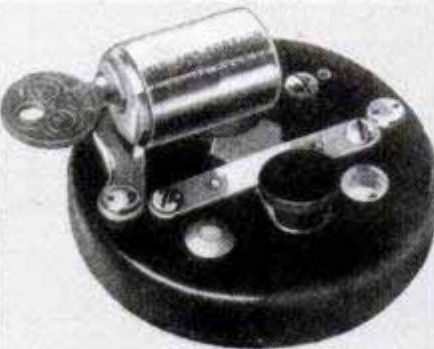
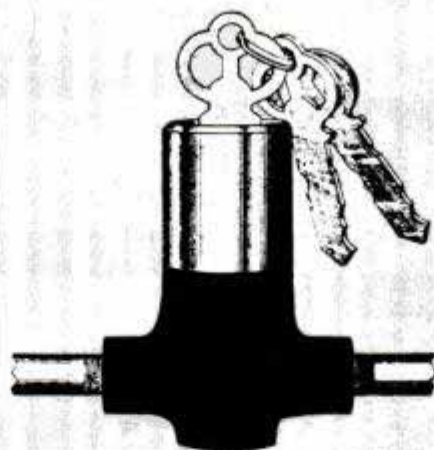
- The 1928 Studebaker gave us the first windshield defroster; the 1937 Studebaker, the windshield washer.

- The 1939 Packard ushered in air conditioning.

What's ahead

All the accessories up to now may pale by comparison to those coming in the future. With the explosion in electronic technology, the world of automotive accessories promises to be more exciting than ever. Stereo systems and radar detectors are the hot accessories today.

The Etak computer can map out trips and display a car's location on a cathode ray tube along with the best way to get from one place to another—just like in commercial jets. Speaking of jets, did you hear about the idea of putting black boxes into cars similar to aircraft flight recorders, so courts can determine who's at fault in accidents? It's possible now, but likely to be as popular as The Bosco Collapsible Driver. **PM**



Early antitheft systems paralleled those of today; accessory key locks were sold to shut off the fuel line [above] and ignition system. Some were easily defeated.

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Downsized Eldorado (foreground) and Seville feature traditionally conservative Cadillac styling. The Seville is a 4-door version of the Eldorado, minus last year's "hunchback" trunk.

1986 CADILLAC ELDORADO/SEVILLE

Digitized, robotized, computerized... and more than anything else, downsized. That's the new Eldorado and Seville from Cadillac for 1986.

Although the Seville and Eldorado are identical under the skin, each has its own personality and aura. The Seville is definitely the more stately of the two cars while the Eldo has a saucy air about it that makes you want to stuff it hard into a freeway off-ramp and blow off the guy in the BMW 318i. Whether you'll be successful at the maneuver is another story.

The Seville is 16.6 in. shorter than the 1985 model, and the Eldorado has lost 16.3 in. Other "shortenings" on the body are not as pronounced, and there is a slight width increase in both cars. Weight on the Seville is down 375 pounds to 3428; the Eldorado lost 359 pounds, weighing in at 3365 pounds.

All this girth control translates to cars that are a lot happier being pressed down a curvy road than were their predecessors. In fact, Cadillac has done a lot of work to the suspensions on these cars to give them the feel of their marketplace competition.

Steering control is precise and surprisingly quick for a Cadillac. With a MacPherson strut front suspension and an

Caddy takes aim at younger buyers in the personal luxury car field.

BY STEVEN PARKER

isolated rear subframe featuring an all-new transverse fiberglass leaf spring and air-inflated struts, Cadillac has managed to incorporate the fine handling characteristics of smaller, less luxurious cars into their machines. Based on the new GM-30 platform (shared with the Buick Riviera and Oldsmobile Toronado), the '86 Seville and Eldorado exhibit handling from their base suspensions that is superior to the optional 1985 Touring Suspen-



On the road, the Eldo and Seville (shown) exhibit tauter handling and better performance than their predecessors.

sions. The automatic electronic load leveling standard on both cars was put to the test on a particularly hilly up-and-down portion of our test loop.

We loaded down an early-production Seville with five large-sized adults and took off for the hills.

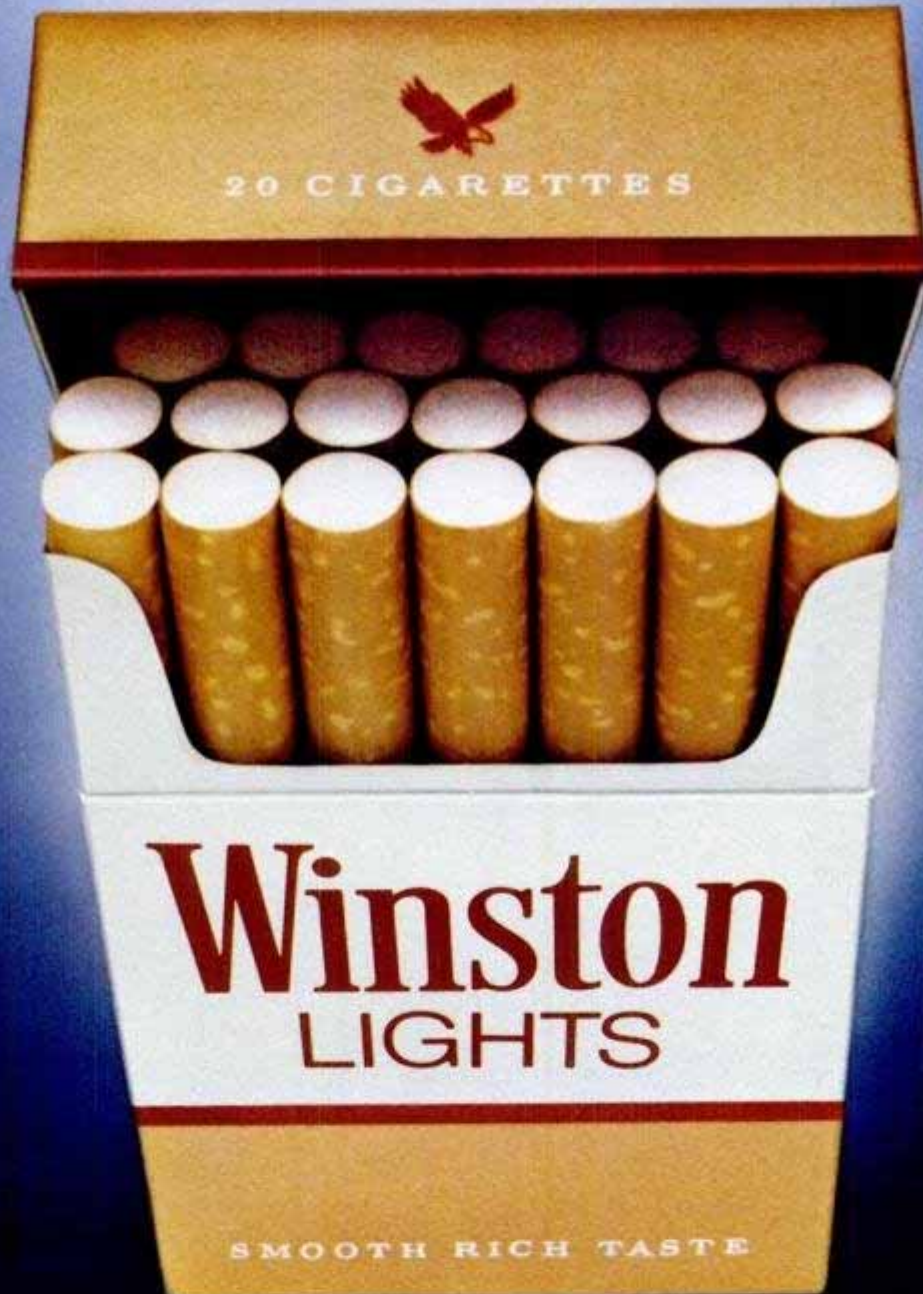
Despite the heavy load, the car never bottomed out and remained stable at all the speeds we tried, including a couple of vigorous cornering maneuvers that had the back seat passengers screaming for mercy long before the car did.

A super road car needs a stout engine to match fine handling characteristics. And while the Seville/Eldorado will never win any burnout contests at the local dragstrip, they will stay up nicely with any traffic you're likely to run into on the street. Zero to 60 mph runs averaged 12.5 seconds.

Providing the urge under the hood is an improved version of the all-aluminum HT 4100 V8, which has been around in various Cadillacs for a couple of years. The 4.1-liter V8 has received a compression ratio increase to 9.1:1 for 1986 and is mounted transversely to mate with the front-wheel-drive system. A new 120-amp generator has been added, and one self-adjusting belt runs all the engine accessories. Mileage

(Please turn to page 66)

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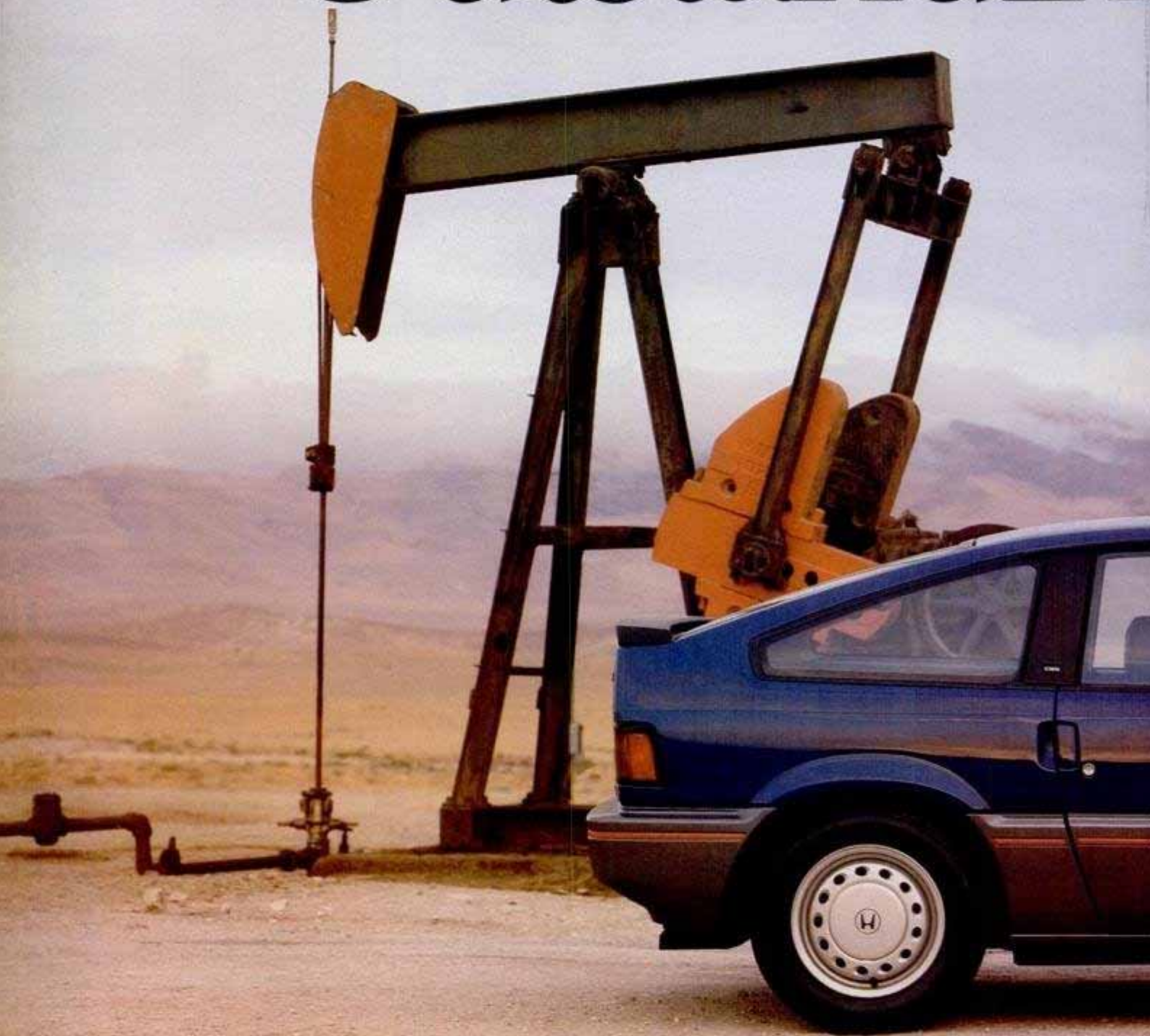
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Since the title "Gasoline Fuel Economy Champion" was first awarded, Honda has dominated the competition, winning a remarkable eight of 13 times. (Based on 49-state EPA

mileage estimates.) In 1986, the Honda mileage champion is the Civic CRX HF.

Shaped to cut through the wind, its aerodynamic features include flush-surface door handles, a close-bonded windshield and flush-mounted headlights, producing a low 0.33 coefficient of drag.

An upshift light tells the driver the precise

g in its field.



moment to shift for optimum economy. The conservation instincts of the car are further enhanced by low rolling-resistance steel-belted radial tires and lightweight aluminum alloy wheels.

The result of all the advanced engineering is a car that consumes a miserly one gallon of gas every 52 miles. Fuel economy is even

better on the highway. (52 EPA estimated city, 57 estimated highway. California estimates lower.) And that makes the Honda Civic CRX HF outstanding in its field. Again.

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CADILLAC ELDORADO/SEVILLE (Continued from page 62)



Main styling difference between the two cars, aside from the number of doors, is at



the rear. Seville (left) has horizontal taillights; Eldorado has vertical units.

claims from Cadillac for the Eldorado and Seville are up slightly for 1986, to 17 mpg in the city and 26 on the road.

Inside, the car is Cadillac through and through. Fit and finish are up to their usual high standards, though there is room for improvement. Silly gimmicks such as the combination coin/drink holder only serve to cheapen an otherwise deluxe interior package.

The digital instrument panel gives information in a legible manner, though not enough of it at any one time. If Cadillac wants to emulate European style, why not include rpm, engine temperature and oil pressure as standard on-dash readouts?

The real star of the comfortable interior is the all-new climate control/driver information system. Utilizing upgraded capabilities from previous computerized electronic control module systems, the driver information system can provide up-to-the-second information on over 70 engine/drivetrain/body operating situations. An alphanumeric display reports information to the operator in plain English, and offers a new feature for 1986 called Snapshot. This enables a service technician to get a complete report on all of the monitored systems at any one time, making it invaluable for tracking down the causes of annoying intermittent problems. Service technicians can access this feature, and even record the Snapshot information for later playback and analysis.

We'd like to see more standardization of controls on the Cadillacs. Thumbwheels, pushbuttons, toggles—it's a

potentially confusing array. A fine cruise control system, easily operated, is a standout, as is the accurate and improved air conditioning. The comfortable seats offered infinite electronic adjustment, and the power lumbar support happily returns for 1986.

After driving the new Seville/Eldorado, we think Cadillac stands a good chance of accomplishing its goal of introducing a younger audience to its cars. What the designers have come up with are cars traditional enough to be attractive to the generally conservative Cadillac buyer, and perhaps just sporty and performance-oriented enough to appeal to today's new image-oriented consumer. **PM**

THE PM REPORT CARD

CADILLAC SEVILLE/ELDORADO	GRADE	COMMENTS
Acceleration	B	4.1-liter V8 provides smooth responsive power with no surprises
Handling	B+	New suspension components outdo last year's optional Touring package
Braking	B+	Little fade with no-drag 4-wheel disc system
Steering	A	Good response and road feel for a luxury car
Transmission	B+	New viscous clutch aids in smoothing out acceleration
Ride	A+	Cadillac still has the market cornered on some items
Fuel economy	B	Better than the past, headed in the right direction
Seating	A	Comfort and convenience at a button's touch; rear seats hold three adults
Vision	B+	Distortion in rear window; front and sides fine
Gauges/controls	B+	Need more standardization and pertinent information
Ventilation	A+	Never a complaint from this AC system
Noise (at 55 mph)	A+	What noise? Cadillac sets the standard
Cargo capacity	A+	One of the biggest trunks in the business
Engine serviceability	A	Complex, but computer diagnosis pinpoints problems for service tech
Fit and finish	B+	Only because we expect better from Cadillac; any other car would rate an easy "A"



Plush interiors feature understated instrument pods with lots of digital readouts.



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SAFETY GLAZING

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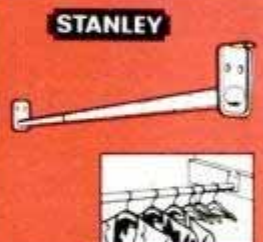


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REEL LIGHT

\$1399

Retractable 20' cord. Metal grounded guard, switch, side outlet. (44610)



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48"-72" expandable. Easy to install, bright zinc finish. Screws included. (SP7052)



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2-bag apron W/12 pockets. Ideal for do-it-yourselfer (VP1527)

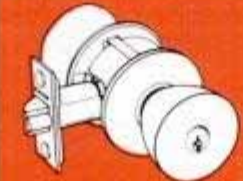


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1262	12"	7"	22 1/4"	4 lbs.	8.50
1263	12-13"	7"	25 1/4"	5 lbs.	10.00
1264	13-15"	9"	28 1/4"	7 lbs.	17.50



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High speed hub and spindle set. 2000 lb. capacity,
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15 lbs..... Order #1241 Hub.... #1246 Spindle



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		Capacity	Leaves		
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1251	2000 lb.	2	3	3	\$24.00/pr
1252	3000 lb.	2	3	3	\$27.00/pr



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High speed trailer wheels & tires, fit all 4 hole boat and
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Item #	Size	Ply	Cap.	Tire Only	
				Sale	Item #
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(Shipping cost not included)



750 Lb. Engine Stand

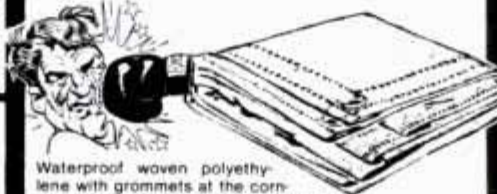
Heavy duty engine stand w/adjustable
arms. 3" x 2" tubular steel
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Holds any engine. Rotates 360°

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This sturdy material will not rot rust or mildew! Super Sale!

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1773	12'x 16'	8 lbs.	\$9.95
1774	12'x 20'	11 lbs.	\$12.95
1775	16'x 20'	12 lbs.	\$19.95
1776	20'x 30'	23 lbs.	\$39.95
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1778	30'x 50'	49 lbs.	\$89.95

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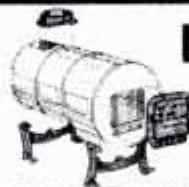
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1773	12'x 16'	6 lbs.	\$9.95
1774	12'x 20'	11 lbs.	\$12.95
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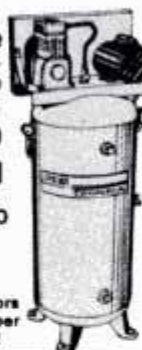
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Two approaches to warmth this winter (far right): She's wearing Woolrich's olefin-filled polyester/cotton shell. He's got on Bob Allen's "new tech" Gore-Tex shell camo coat filled with DuPont Thermolite. Right: The Gerry line relies on Bion II for breathable waterproofing in its camping and sports parka.



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It's lighter, warmer, drier and more breathable.

BY CLIFF GROMER; Photos by Jim Brown

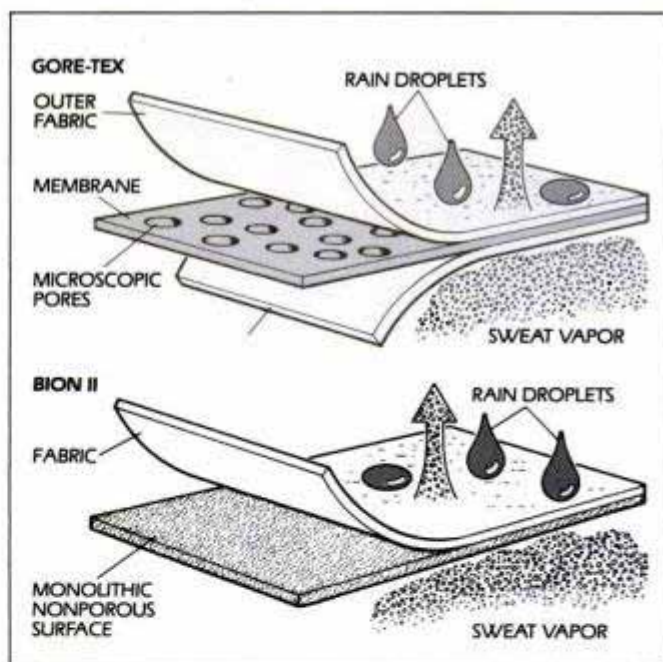
There was a time when outdoor activity meant roughing it. If you weren't freezing, soaked to the skin or swimming in perspiration, you really weren't enjoying the environment. Today, that's all changed. New high-tech fiber, fabrics and trailwear have taken some of the rough out of roughing it. And they've made enjoying the great outdoors, well, enjoyable.

While familiar materials such as cotton, wool and common synthetics have been given a new wrinkle for better performance, the quest for the ideal trailwear has sparked research into nonclothing areas, challenging the test-tube crowd to come up with totally new materials. But high-tech trailwear goes beyond sheer chemistry. It involves new concepts in weave construction, fabric blending and garment layering to create comfortable, protective systems.

You can't be comfortable unless you're dry. So developing trailwear that keeps out rain while allowing perspiration to escape is a primary goal with many apparel makers. Sweat condenses to form a cold, clammy cocoon and trailwear manufacturers have attacked this problem on two fronts.

The first approach to making trailwear that keeps you warm and dry is based on the principle that rain droplets are considerably larger than perspiration vapor. Developing a barrier that keeps out the rain but lets sweat vapor pass through is a trick that's keeping the high end of the high-tech trailwear market on a boil.

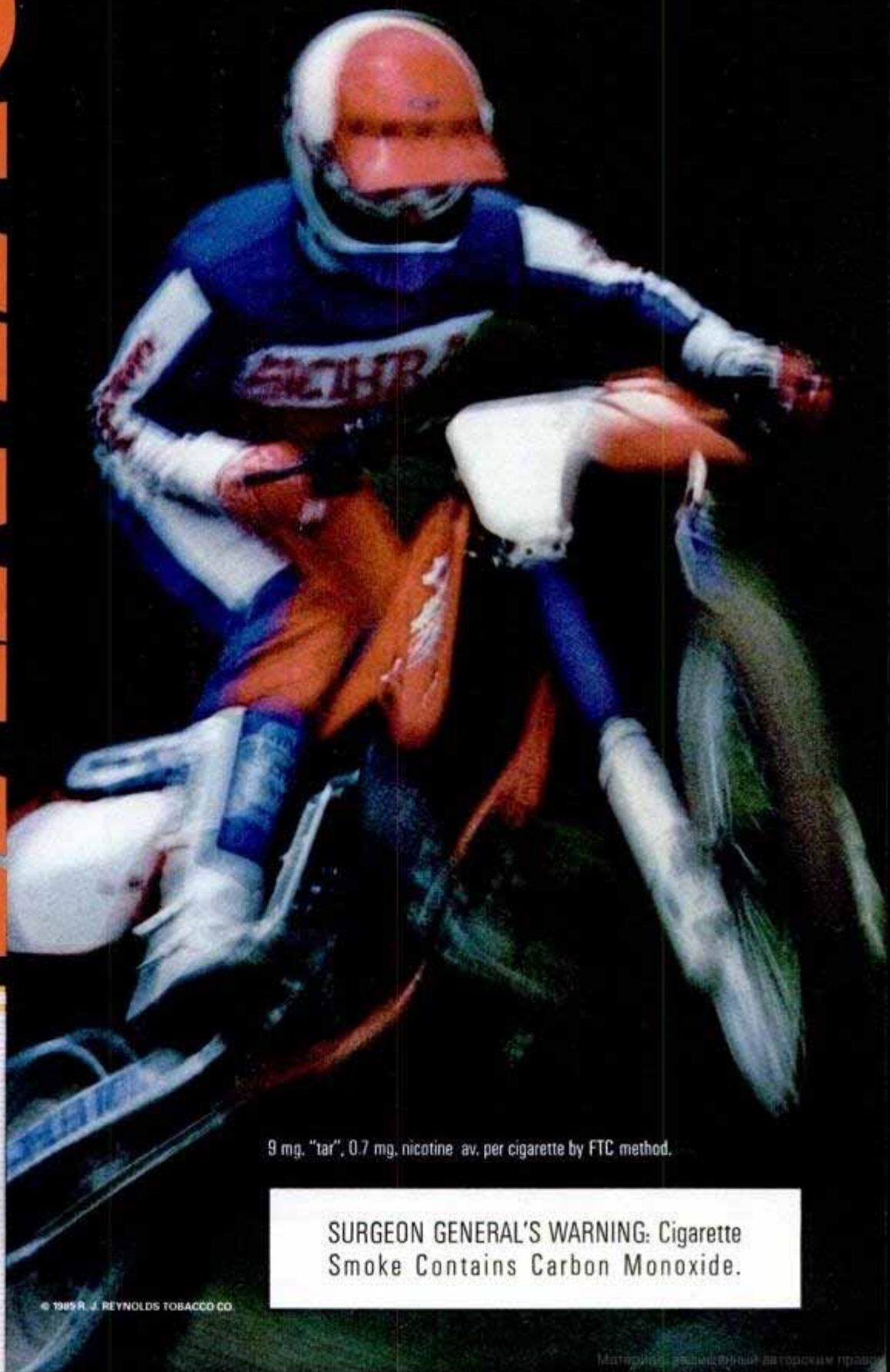
The established leader in this area is W.L. Gore & [\(Please turn to page 72\)](#)



Breathable membranes keep you warm and dry by preventing rain droplets from penetrating and allowing body vapor to escape. Gore-Tex uses a porous Teflon membrane that's laminated to a shell fabric. Bion II uses a nonporous "monolithic" coating that allows body vapor molecules to pass through molecular gaps in the film. Left: microscopic views of Gore-Tex and Bion II.

VANTAGE

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THE THRILL OF REAL CIGARETTE TASTE IN A LOW TAR.



9 mg. "tar", 0.7 mg. nicotine av. per cigarette by FTC method.

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Матеріал є авторським твором



A New Balance trail suit protects him with 100 percent Gore-Tex on the outside and 100 percent polypropylene on the inside. She's wearing Patagonia's Seal Coat Raingear that uses special vents for breathability.



His and hers underwear from Duofold features an outer layer of 90 percent polypropylene/10 percent nylon over an inner layer of 100 percent polypropylene. It wicks away body moisture for dryness.

Associates Inc. with its popular fabric waterproofing treatment called Gore-Tex. The process uses a thin Teflon membrane (polytetrafluorethylene, for you chemists) the consistency of Saran Wrap that is laminated to an outer shell fabric. The membrane contains 9 million pores per square inch, each 20,000 times smaller than a drop of water but 700 times larger than a water vapor molecule. In 2-layer Gore-Tex fabric, the membrane is laminated to one side of the outer shell. The 3-layer variety has the membrane sandwiched between a shell fabric and a tricot knit fabric. The Gore-Tex membrane is actually bonded to the fabric by adhesive dots. The bonding is permanent and will not peel off or degrade.

Gore-Tex is now used in everything from trailwear to footwear to gloves and even the outer layer of the space suits worn by U.S. astronauts. Gore-Tex will be permanently waterproofed only if the garment's seams are specially sealed. A 3-layer sealing tape made of thermoplastic adhesive, Gore-Tex membrane and, in some cases, a nylon knit face must be applied with a special sealing machine.

The Gore-Tex membrane does not add strength to the garment. Strength depends on the fabric to which the membrane is bonded. It windproofs due to the small size and misalignment of the membrane pores, and it adds to cost—making Gore-Tex products some



Patagonia's Synchronia jacket uses a fine denier polyester fabric for light weight and warmth. Pants from United Actionwear combine 60 percent merino wool with 40 percent polypropylene; Thor-Lo Paddis socks use Orlon/nylon/cotton.

of the more expensive on the market.

But Gore-Tex isn't the only membrane game in town. Bion II was developed from research with polyurethane materials for use in making artificial hearts compatible with the human body. The primary research was redirected when Thoratec Laboratories was asked to develop a wound dressing to cover incisions, cuts and burns.

Unlike Gore-Tex, which uses physical holes in its membrane for water vapor molecules to pass through, the Bion II polyurethane film has no holes. Rather, it's a monolithic structure designed so that the water vapor molecules actually squeeze through molecular gaps in the film. It's the same diffusion process that causes a helium-filled balloon to gradually lose its helium. And because the film presents a solid barrier to water droplets, it's waterproof.

Bion II also differs from Gore-Tex in the way it is applied to the fabric. Instead of adhesive dots, the Bion II polyurethane film is coated directly on the fabric as the polymer solution bites into the fabric before curing, creating a very strong bond.

Laminates and coatings aren't the only way to achieve a water-resistant, breathable fabric. Burlington Industries has developed a new polyester fabric it calls Versatech. Made of closely woven superfine polyester yarn, the spaces in the fabric are hundreds of times smaller than the size of the water drops, but large enough (larger than the pores in the Gore-Tex membrane) for body vapor to pass through. Versatech may not be as waterproof as Gore-Tex or Bion II, but it certainly is a lot less expensive.

While competition waxes hot and heavy in waterproof/breathable trailwear, Patagonia is taking a different tack. Banking on their nonporous Seal-

(Please turn to page 78)



**Popular
Mechanics**

Gift
Guide



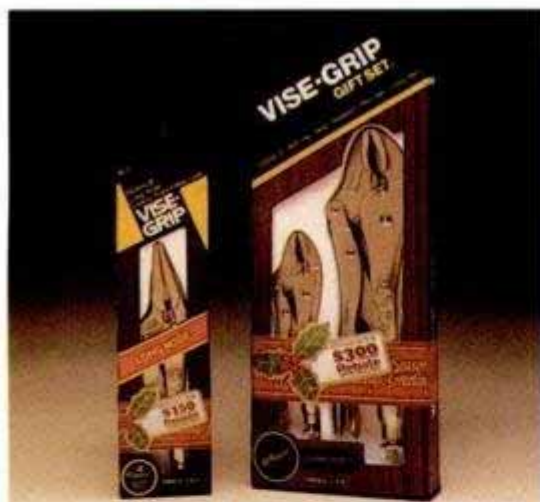
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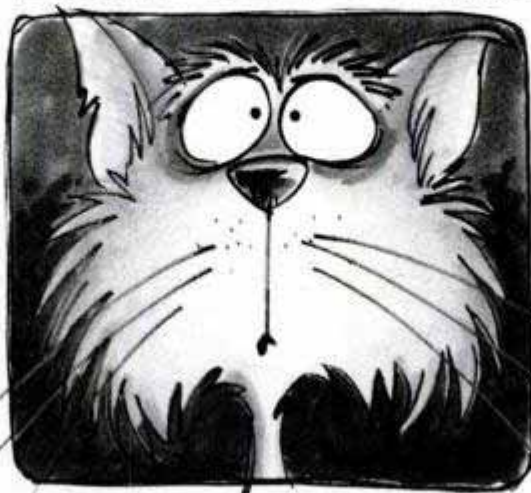
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The Dremel Moto-Tool. With all the jobs it can do, you'll think it has more lives than a cat.

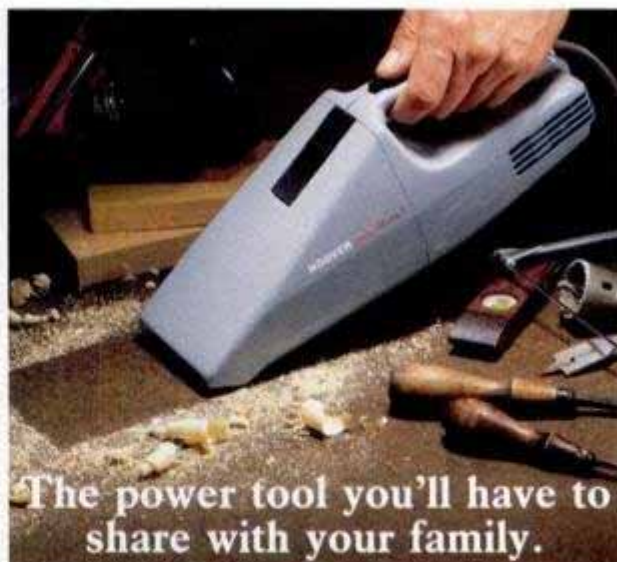
sits over the mantel or hangs above the door. It's also a high speed grinder for cleaning up those rusty car dents your son swears he never put there.



DREMEL
Gets the job done bit by bit.



Nostalgia buffs will love this turn-of-the-century roll-top desk. It's made from fine cherry wood and finished in a rich antique walnut and cherry stain. A tambour front conceals compartments and drawers for papers and other stationery items. \$5.95. *Popular Mechanics*, Box 1014, Radio City Station, New York, NY 10101.



The power tool you'll have to share with your family.

The Hoover® Help-Mate II™ hand vac is more powerful than battery-operated vacs. Great for keeping your workshop neat. It's so versatile, you're apt to find people using it for cleaning upholstery, drapes, stairs, even the car. But go ahead and share.

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Here's a classic reproduction of an 18th-century doll cradle that your little girl will adore. It's hand-crafted of mellow pine and finished with satin stain and varnish. Measures 10¾" x 22½". \$4.95. *Popular Mechanics*, Box 1014, Radio City Station, New York, NY 10101.



Cobra Trapshooter Pro II Remote Radar Detector (RD-5100)

This superheterodyne remote is virtually "invisible" to thieves. Consists of miniature 3½" long *control head*, which mounts under dash, and *detector module* (not shown) for under hood, behind grille; control head cover for camouflage. Eliminates false alerts with "Lockout" and "No False". Includes exclusive "Signal Sensor". Suggested retail \$229.95.

For location of nearest dealer call 1-800-COBRA 22.



Get your kids in on the thrill of trail riding with the Honda XR80R. With its four-stroke engine and Pro-Link™ suspension, the XR80R is the toughest little trail bike around. The toughest, that is, except for its big brother—the XR100R. For a truly memorable holiday, pick up a Honda trail bike—and get in on the adventure.



Off-road fun begins with the Honda FourTrax™ 70. It's small in size and big on features. Including a smooth four-stroke engine. And an automatic clutch. The only thing that provides as much off-road fun is the FourTrax™ 125. So get on a FourTrax™ and make this holiday the start of something big.



The Ready-Lite rechargeable light from First Alert is always fully-charged and ready to use because it plugs directly into electrical outlets. Only Ready-Lite has a swivel head to shine its powerful Krypton bulb where you need it. And Ready-Lite lasts longer on a single charge than the other leading brand.

HIGH-TECH TRAILWEAR

(Continued from page 72)

Coat coating (similar to Hypalon—the stuff used for whitewater rafts), the company claims to have the most waterproof and durable rain gear on the market at prices substantially lower than the breathables.

The SealCoat is applied in five separate layers to either 70-denier nylon taffeta or 210-denier oxford, depending on light or heavyweight application. The coated side of the fabric is then bonded to an ultralight nylon tricot and the outside of the fabric is treated with a Teflon-base repellent. Perspiration and condensation dissipates, instead of remaining in beads, and travels along the tricot fibers. It then spreads out over a large area for better drying.

The second approach to successful waterproofing is to use a material that draws moisture away from your skin and transports it to the outer layers of clothing. The trailwear industry refers to this as "wickability" and the hot high-tech wick fabric is polypropylene.

Polypropylene works by transmitting moisture through capillary action. This property alone, combined with light weight and low bulk, makes the fiber a natural for underwear. But polypropylene is also getting a lot of play in T-

shirts, pants and jackets. Combined with acrylic and with wool, polypropylene can save about half the weight of an equivalent wool garment, with better insulation and lower moisture absorption. Other uses include shells for polyester-filled quilted jackets and liner material for jackets and pants.

You get maximum wickability when you dress with polypropylene outerwear over polypropylene underwear. Other pluses include rapid air drying (the material isn't waterproof, but you can wring it out and it will dry quickly) and an abrasion resistance like nylon.

But there are two sides to the polypropylene coin. The fabric doesn't like temperatures in excess of 120° C. Hot clothes dryers and irons will cause the synthetic to melt down to an icky mess. In addition, while the fiber is inert in almost every instance, polypropylene is attacked by the two most common dry-cleaning fluids. Another problem is pilling. Polypropylene doesn't pill any more than other spun yarn such as wool and cotton, it's just that because polypropylene has such a high tensile strength, the pill balls don't fall off.

DuPont's Thermax material is a new arrival that attempts to duplicate the wickability of polypropylene while alleviating some of polypropylene's disadvantages. DuPont claims Thermax will

wick more effectively when the system floods, that is, when it is completely clogged with perspiration. It also claims Thermax is softer and more stable at high, clothes-dryer temperatures. Thermax uses a new hollow polyester fiber called T-727. The hollow nature of the fiber reduces the effective fiber density while increasing surface area. Low fiber density enhances Thermax's insulation properties, while high surface area maximizes wickability.

Tri-blends also are appearing in trail garments these days. They've been around for a while, and still perform in the budget sector of high-tech trailwear. A combination of polyester, nylon and cotton, tri-blends offer excellent wind and cold protection, especially when worn over polypropylene.

One footwear company, Thorneburg Hosiery, uses an Orlon/cotton/stretch nylon in its Padds line of hiking/backpacking hose for use with all hiking and western boots. It incorporates a special heel pad that reduces slippage. The inner Orlon layer wicks moisture away from skin, the cotton absorbs moisture, and the outside layer of nylon provides good durability and fit.

One drawback of tri-blends is that loose fibers tend to roll up and pill. Another is the synthetic's low moisture

(Please turn to page 86)

THIS YEAR, MAKE SURE THE GIFTS YOU GIVE DON'T BECOME COLLECTOR'S ITEMS.



How long have your Christmas presents been turning into ghosts of Christmas past?

If it's too many years to remember, now's the time to start giving gifts from Sentry Hardware.

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Where hardware isn't a sideline.

Check the Yellow Pages under Hardware for the Sentry store nearest you. Sentry Hardware Corporation, Cleveland, Ohio 44113. Merchandise shown in this advertisement is available from participating dealers only. Offer expires December 24, 1985. All Sentry dealers own their own stores. They select their merchandise and set their own prices. There may be variations in products, available quantities and prices in individual stores.

Arrow

Electric Staple Gun
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\$16.99 After \$3.00 Mfr. Rebate
(Offer Expires 12-31-85)

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Kwikset

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(660X3CP) \$7.99

VERMONT AMERICAN

Deluxe Router Table
(148123466) \$21.88

shop-vac

Mighty Mini Vac
(100-00-8) \$44.88

PM TECHNOLOGY UPDATE 12/85



NASA gets a brand new pad

Tradition will be broken this winter when NASA launches a Space Shuttle from Vandenberg Air Force Base in California. The Shuttle Launch Center (above) was built in the '60s for the manned orbital laboratory program, which was canceled in 1969. In recent months, construction crews have worked furiously to modify the new complex (right), which is scheduled to launch three Shuttles in 1986. Other Shuttle launches will

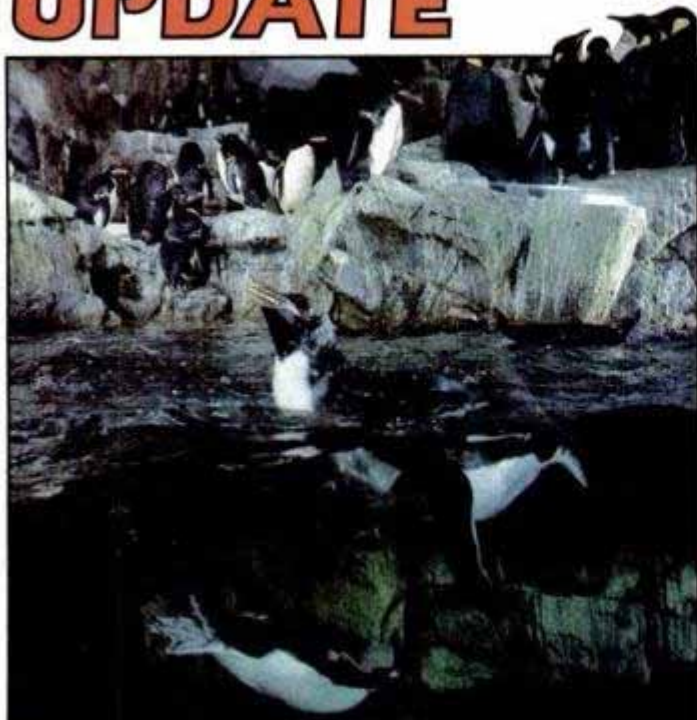
take place at Cape Kennedy. The SLC has a payload preparation building where the Shuttle is loaded and a Shuttle assembly building where external tanks are added. Vandenberg launchings will permit polar orbits, which fly over more of Earth's surface.

Editor: Dennis Eskow
Assistant Editor: Ted Francis
Contributors: Sheldon M. Gallager, Coleman Taylor Mobley, Lee Green, Michael Fillari, Douglas Smoot, Chris Mitchell, Fran Golden, Alton Blakeslee, Richard K. Schrader



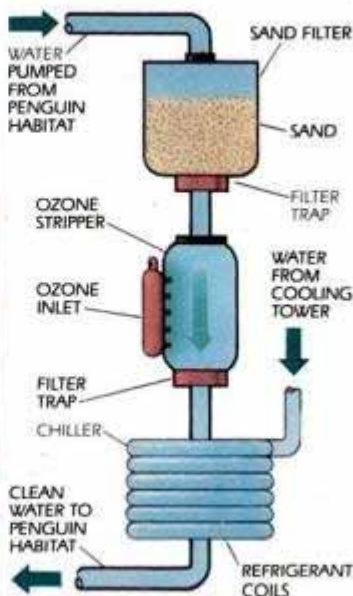
Space Shuttle will move from building to building on a flat car when the updated NASA Shuttle Launch Center is completed.

TECHNOLOGY UPDATE



ENGINEERING

Penguins test water cleaner



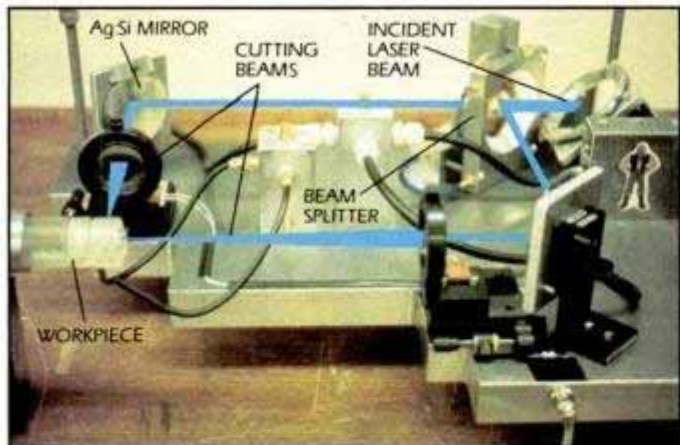
Sea World's new Penguin Encounter in Aurora, Ohio, uses a computerized filtration system to produce 45,000 gallons of pure water each day. The system filters out over 600 pounds of waste per day. Water from the Penguin Encounter is pumped through a sand filter, then to an ozone tower that strips out bacteria. The water is chilled before being returned to the arctic habitat. The system could be a prototype for water purification systems for humans.

LASERS

Laser lathe

M.I.T. researchers have developed a laser lathe prototype (below) for cutting plastics and ceramics. The 1200-watt CO₂ laser is split into two perpendicular cutting

beams. The beams bounce off argon-silicon mirrors to cut the workpiece laterally and head on, producing a ring. The system is unique since laser lathing to date has usually resulted in material melting. Also, the beams never dull and there are no machine tool deflections or vibrations.



Laser used in atom pictures

Bell Lab scientists have fashioned a laser that can pulse at 8 femtoseconds (8 million billionths of a second). Bell plans to use the laser (above)

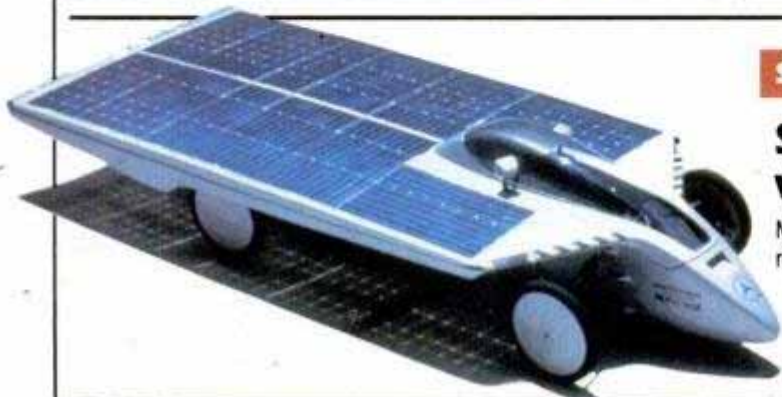
to take slow-motion "movies" of instantaneous events such as chemical reactions. The laser pulses will be used as electronic flashes to picture atoms and molecules in motion. The laser is expected to aid in designing smaller, faster microelectronic devices.

SOLAR POWER

Solar car wins rally

Mercedes' "Solar Silver Arrow" won Europe's first rally for sun-powered vehicles. Arrow ran in the purely solar category: Only solar

power could propel it or recharge its silver-zinc battery. Arrow averaged a record 37 mph. The 400-pound car uses two 1.2-hp electric motors with a 3-gear system. The fiberglass body, topped by 432 solar panels, resembles a moth, but it flew like a butterfly. Its steel tubing frame reduced aerodynamic drag.



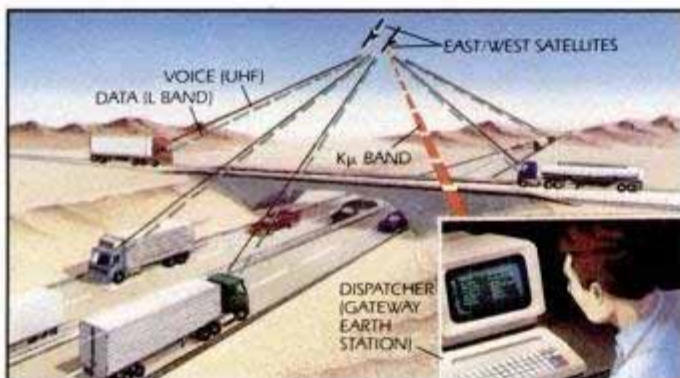
SATELLITES

Sweden's first satellite set

The Swedish Space Corp. will place its first satellite, Viking, in low polar orbit by the end of 1985. Viking will perform several experiments such as measuring earth's electric and magnetic fields. In addition, Viking will be used as part of Mailstar, a communications system in which the satellite will serve as a mailbox in which sender messages will be stored until the satellite passes the addressee. At that point, the message is retransmitted.



PM ILLUSTRATION BY ED VALDORISAT



Breaker! I see where you are

Fleet owners will be able to track their rigs with this proposed mobile satellite system. The system would employ a pair of geosynchronous satellites to provide 2-way

radio communication and monitoring and control of truck functions such as refrigeration. Voice would be carried to the satellites via UHF and data via L Band. The satellites would communicate with the ground by converting the signals to the K μ Band.

Something to squawk about

Johns Hopkins scientists are tracking migratory birds with a 5.7-ounce transmitter affixed to the birds' backs with a teflon ribbon harness. The transmitter sends signals to two Tiros satellites. They are picked up by the Argos tracking system in France and relayed to Maryland, where scientists determine the birds' location. Data will aid endangered species protection.



SUBMERSIBLES

Sub takes role in sea search

Last July, Bell Labs' SCARAB (Submersible Craft for Repair and Burial), was rushed from its usual cable repair duties

near France to an airliner crash site off the coast of Ireland. SCARAB searched the 747's wreckage in 7000 feet of water, located the black boxes and retrieved them. SCARAB is equipped with two video cameras, two mechanical arms and a 10,000 foot tether.



COMMUNICATIONS

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TECHNOLOGY UPDATE



AVIATION

NASA eyes new scope

NASA's Ames Research Center is shopping for a configuration for its Stratospheric Observatory For Infrared Astronomy (SOFIA). A favored design is a 747sp with

a 3.5-meter aperture infrared telescope (above). The 747sp would replace the KAO Lockheed C-141. Ames favors the 747sp because of its ability to climb and maintain altitudes

from 41,000 to 45,000 feet while carrying the 80,000-pound telescope. SOFIA will explore infrared sources discovered by NASA's infrared astronomical satellite.



Tilt rotor comes of age

The tilt rotor aircraft, developed more than 30 years ago, is finally in demand by the four armed services. They will procure 913 CV-22As (drawing above) for use during the 1990s. Bell developed the XV-15 (photo), which has

logged more than 300 flight hours since 1977. Requirements for the CV-22A include a 288-mph cruising speed and ability to maintain a 15,000-foot altitude on one engine while carrying 24 passengers. XV-15 engines are mounted on each wing. Tilt rotors combine the advantages of helicopters with those of fixed-wing aircraft.

You can't play this HARP

Hughes Helicopter has successfully developed a hingeless main rotor system as part of HARP (Hughes Advanced

Rotor Program). The new rotor system, tested on a 500E (below), incorporates advanced composite blades and flexbeams, which eliminate hinges. HARP lightens main rotor systems while reducing costs.

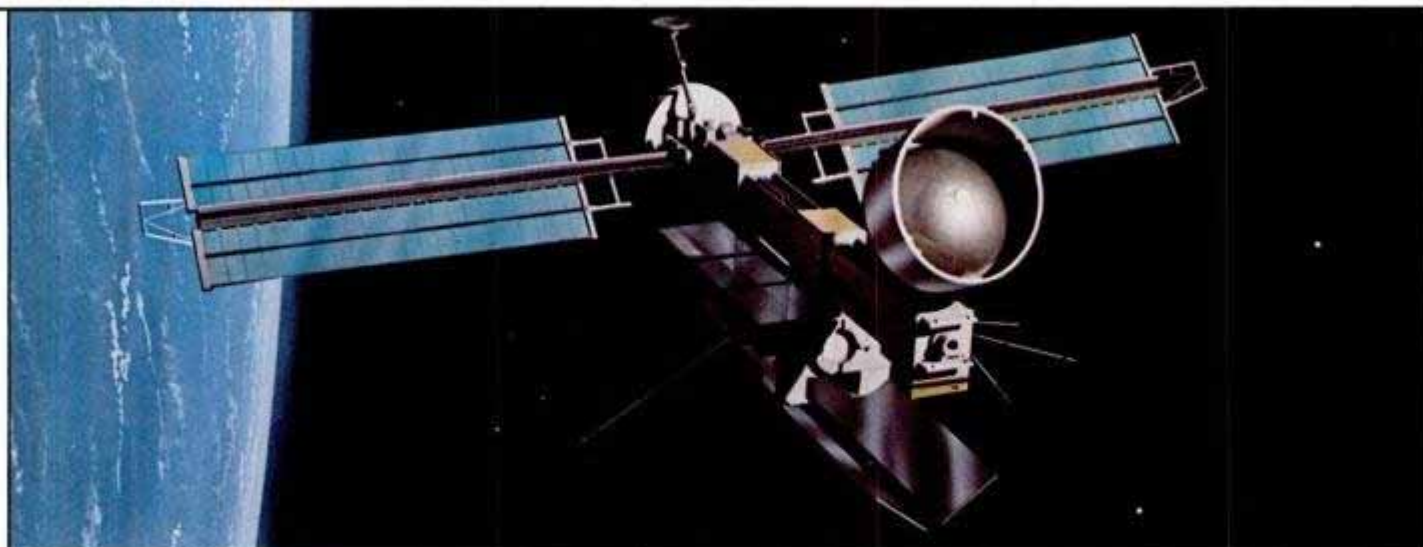


A chopper for back-seaters

To reduce pilot workload for the Army's new generation of rotor craft, Sikorsky is developing a single-pilot evaluation

research helicopter. An S-76 (below) with single-seat cockpit grafted to its nose will be used to test cockpit concepts such as the fly-by-wire side-arm control stick. This is Sikorsky's initial step in the Army's LHX competition.





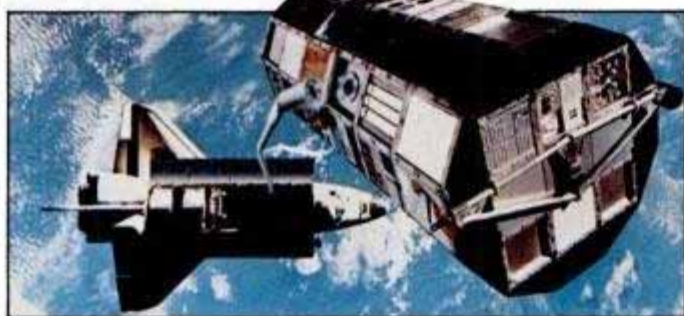
PM ILLUSTRATION BY BRIAN SULLIVAN

AEROSPACE**British alter platform plan**

British Aerospace Dynamics has altered the design of its proposed space platform to permit launch from the European Space Agency's Ariane 5 as well as the Shuttle. The

alterations are designed to calm potential user fears that there will be insufficient launch capacity. Changes include the addition of six entry ports for experiments and a

radio telescope attached to one of the ports and synthetic aperture radar attached to lower ports. Redesign is due to the Shuttle's heavily booked launch schedule.



PM ILLUSTRATION BY BRIAN SULLIVAN

NASA eyes docking link

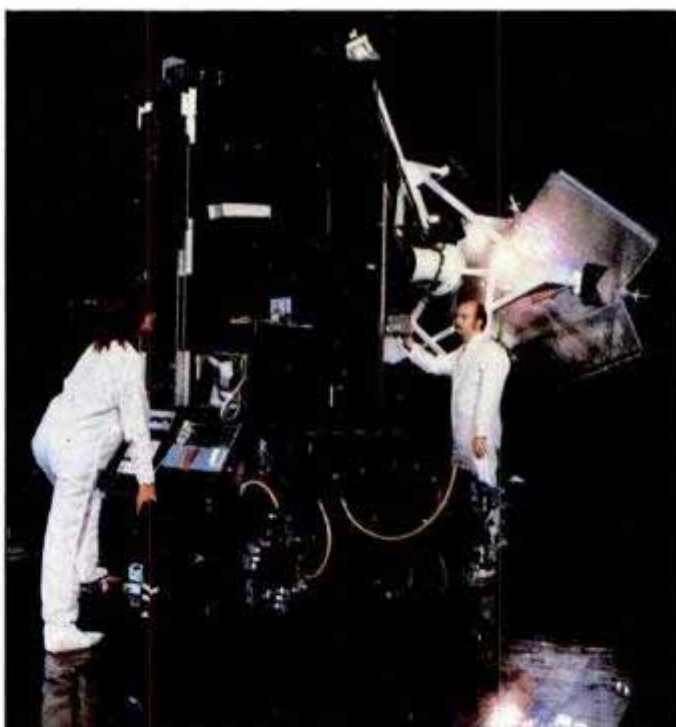
NASA has expressed interest in an automatic docking system for spaceships and load carriers. The system uses a

photodetector to receive and translate electronic impulses from light-emitting diodes. The system was developed to measure movements and reflexes of handicapped persons. NASA is impressed by its light weight.


MILITARY**State-of-art fighter design**

Lockheed has completed a preliminary design for the Air Force's Advanced Tactical

Fighter program (ATF). The craft will incorporate efficient supersonic cruising, advanced low observable technology, and lightweight composites and metals. The ATF is expected to engage enemy craft over their territory.

**NASA's OMV is a pushover**

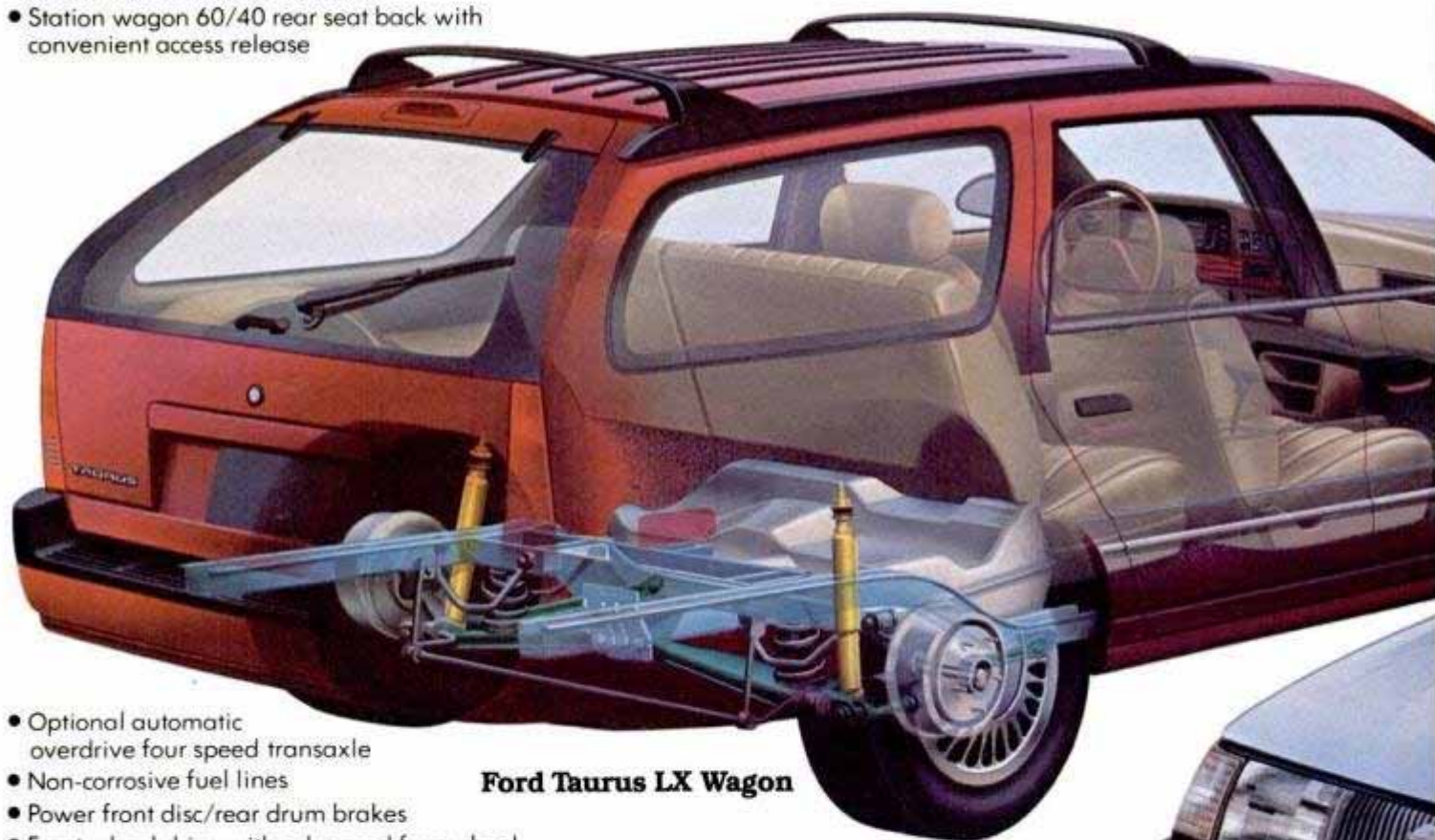
NASA is training its pilots to operate its Orbital Maneuvering Vehicle (OMV) through simulation at its Teleoperator/Robotics Laboratory in Alabama. The OMV, which will be NASA's tugboat in space.

will be used to ferry payloads to and from the Shuttle. At the lab, the OMV rides a flat floor on a thin film of air giving the 3000-pound simulator the feeling of weightlessness. Trainees can manipulate the simulator as easily as pushing a pencil. Use of the OMV will eliminate some satellite propulsion systems. 

A Preview of Ford Taurus New Standards of Automotive

The new Ford Taurus and Mercury Sable contain over 300 engineering details designed to answer the American Driver's call for higher quality. They set new standards for six passenger roominess and comfort. And new standards in their engines, their transmis

- Unique rear suspension in station wagons for maximum cargo capacity
- Optional integral station wagon picnic tray
- Station wagon load floor tie downs
- Two way liftgate on station wagon
- Aerodynamically designed corrosion resistant station wagon luggage rack
- Easy access lockable under floor storage compartment on station wagon
- Station wagon 60/40 rear seat back with convenient access release
- Aerodynamic flush glass all around for less wind noise
- Long windshield blades and large spray pattern
- Convenient single key for door and ignition
- Optional Insta-Clear® windshield for quick clearing of ice or frost
- Loss-proof tethered gas cap



Ford Taurus LX Wagon

- Optional automatic overdrive four speed transaxle
- Non-corrosive fuel lines
- Power front disc/rear drum brakes
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- Stainless Steel muffler and exhaust system — standard with 3.0L V-6 engine
- "Lubed for life" suspension and steering components
- Permanent set front alignment (caster & camber)
- Power rack-and-pinion linear steering
- Conveniently located swing-down fuse box with extra fuses
- Low brake fluid-warning light
- 5 MPH polycarbonate corrosion free, scuff resistant bumpers
- Aerodynamic halogen headlamps
- All season tread steel-belted radial ply tires
- Illuminated safety designed front door trim panel and rear door reflectors
- Clearcoat over metallic paint option
- Front and rear door courtesy lights
- One-piece shingled doors seal for easier closing

Buckle up—Together we can save lives.

and Mercury Sable: Quality from the inside out.

sions, their suspensions. Part-by-part, feature-by-feature, Ford Taurus and Mercury Sable have been designed from the inside out to be the best cars we've ever made. They'll be available at Ford and Lincoln Mercury dealer showrooms in late December.

- 2.5L HSC 4-cylinder fuel injected engine
- 3.0L EFI multiple port injected V-6 engine
- Most advanced electronic engine controls (EEC IV) with "memory"
- Hydraulic engine dampers contributing to a comfortable and quiet ride
- Yellow highlighted underhood, "self-check" features
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Mercury Sable LS Sedan



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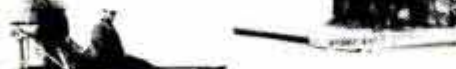
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HIGH-TECH TRAILWEAR

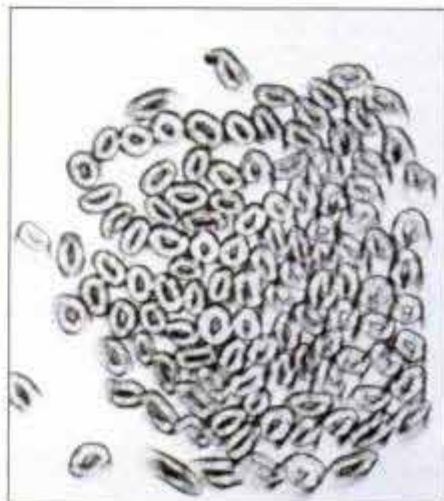
(Continued from page 78)

absorbency, limiting its ability to draw off perspiration.

To overcome the disadvantages, but retain the benefits of a cotton/polyester fabric, Patagonia created DualSpun fabric for trailwear. DualSpun wraps pure cotton fibers around a core of polyester fibers. This way only the cotton is exposed, giving it cotton-like properties with the strength of polyester.

In addition Patagonia has come out with a 100 percent polyester material called Synchronilla. It's dry and soft, and, unlike some outer-layer garments, refuses to pill.

Another area of trailwear that's highly competitive is improving a garment's insulating properties while cutting down weight and bulk.



End view of ThermoMax fibers show hollow-core construction to enable a garment to trap heat and wick away moisture.

High-tech insulation fills have moved from the sleeping bag arena into trailwear shells. But high-tech here means thin insulation, and the leading players are Du Pont's Dacron polyester ThermoLite and 3M's Thinsulate. The objective of these two insulating systems is to provide warmth and dryness in "slim-look" clothing.

When it comes to sheer strength and abrasion resistance, the King Kong of tough fabrics is Cordura nylon. The material was developed as a result of DuPont's efforts to find a stronger tire cord. The material became popular for use in luggage and backpacks. Its use has now descended to hiking and hunting boots and rugged trailwear, including briar-proof and snake chaps.

As for the future of trailwear, the high-tech trend is expected to remain in high gear. Already, Gore-Tex has a new stretch fabric, but it is limited at the current time to the sportswear. But overall, as trailwear gets warmer, lighter and dryer, "roughing it" has never been so smooth. **PM**

POPULAR MECHANICS • DECEMBER 1985



Though the Merkur XR4Ti is a member of Ford's Jellybean School of Design, most folks don't catch the family resemblance.

MERKUR XR4Ti Genuinely German Ford

CHEVROLET ASTRO Maxi-sized Minivan

CHEVROLET CORVETTE Coveted by everyone

CHRYSLER LEBARON GTS Few faults, few virtues

BUICK SOMERSET REGAL GM's brightening future

This month we bid a fond farewell to a pair of test cars (the Chrysler LeBaron GTS and Buick Somerset Regal), a not-so-fond farewell to the Corvette, and welcome two newcomers to our long-term fleet (the Astro and Merkur). The Corvette is our second test this year to end with a bang. You may recall that our west coast Subaru wagon served as a crash barrier for another driver without brakes (see *Long-Term Car Tests*, page 152, July '85). Our Corvette was stolen and T-boned a police car during a high-speed chase. But first, the good news:

Merkur XR4Ti

Anytime someone gives us a car that rides like a Mercedes, handles like a BMW, and goes like a Mustang, they've

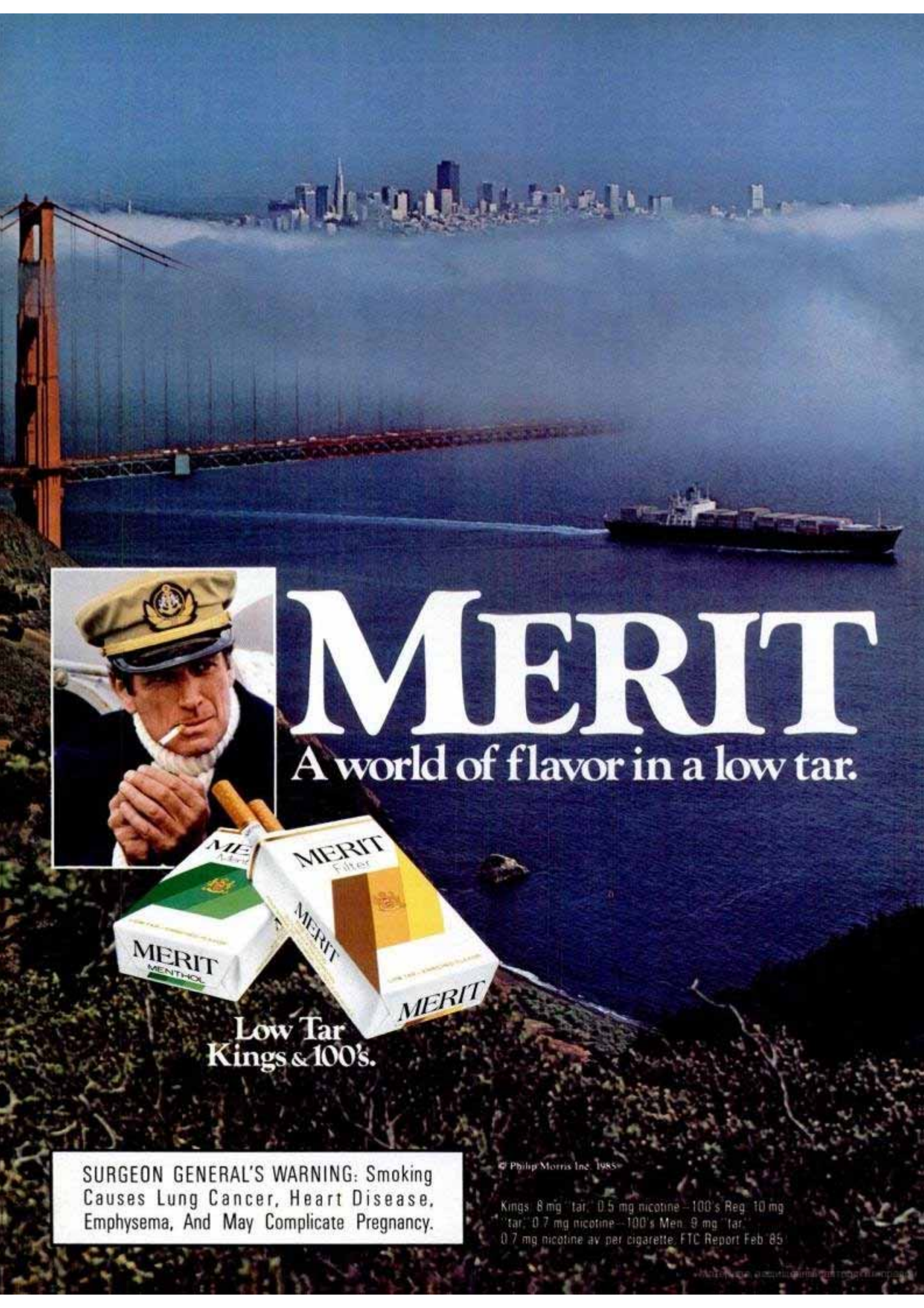
pretty much made our day. We fell in love with the first Merkur we ever tested (see '85 *Imports: The Sports Sedan*, page 92, Mar. '85). As we've explained before, the Merkur XR4Ti is a German Ford Sierra, modified for sale in America by Lincoln-Mercury dealers. Most significant change is the use of the 175-hp, 2.3-liter Turbo T-Bird engine in place of the German 2.8-liter V6.

This is a real driver's car in the European tradition. It's a comfortable car to drive fast in, but there's no pampering of the driver. The 8-way adjustable bucket seats and sunroof are manual, not power-assisted. The ride is also European firm but not harsh. Typical Euro touches include the 60/40 split rear seatbacks to accommodate three

(Please turn to page 150)



With rear drive and V6 power the Astro makes the best hauler among the minivans.



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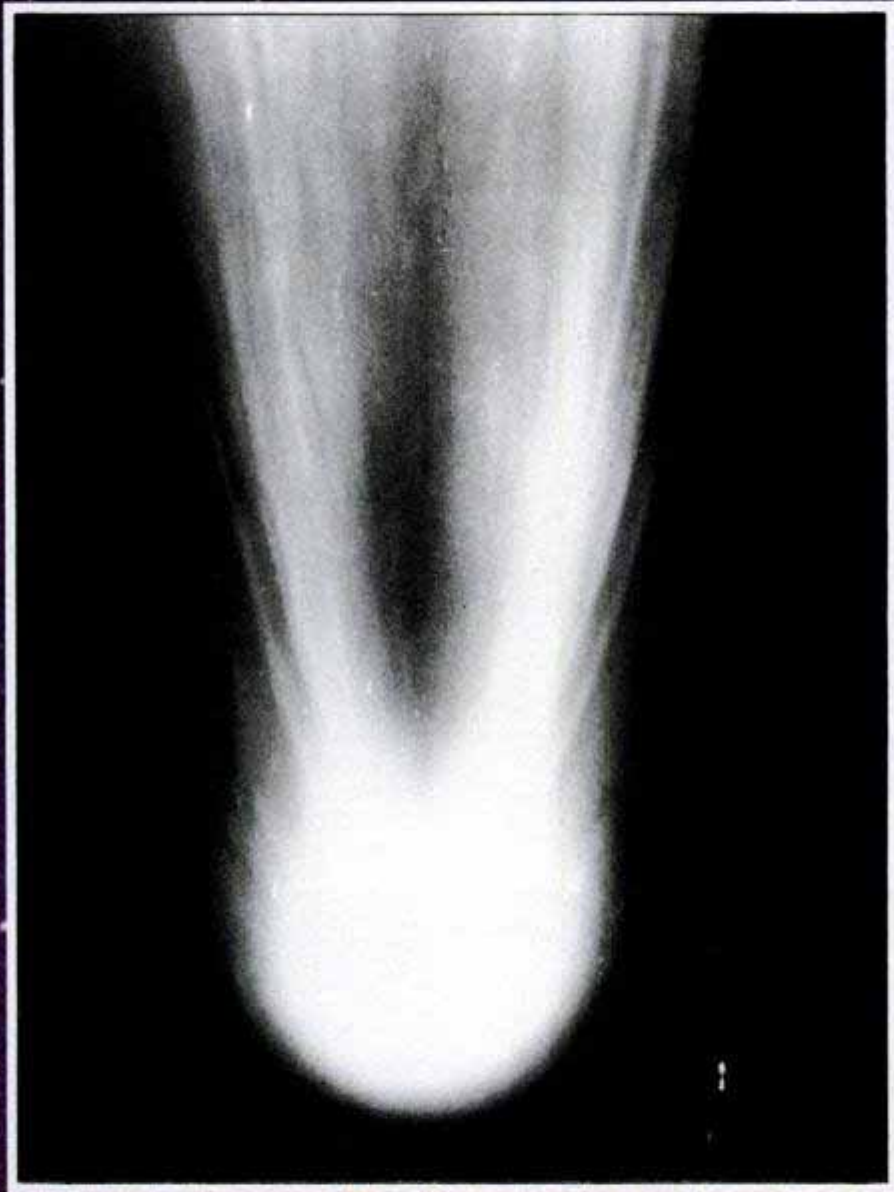
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Kings: 8 mg "tar," 0.5 mg nicotine -- 100's Reg: 10 mg "tar," 0.7 mg nicotine -- 100's Men: 9 mg "tar," 0.7 mg nicotine av. per cigarette. FTC Report Feb '85

THE KING OF COMETS



Comet Halley is streaking toward the sun with a 25-million-mile tail and a light show anyone can see:

BY TERENCE DICKINSON

The royal visitor, with a head crowned in brilliant light and a 25-million-mile train following behind, comes to earth once every 75 years. There are a few brighter objects in the sky, even a few brighter comets. But no comet has captured the imagination of man as dramatically as Comet Halley. It's the King of Comets. Twenty-eight times in recorded history, all the way back to 240 B.C. when Chinese astronomers discovered the phantom visitor, Halley's Comet has stirred the very souls of men of science and

View of Halley's Comet (above) was taken by the Hale Observatories in 1910.

THE KING OF COMETS



religion. As it comes into view this year, five separate space missions will cross its path. Hundreds of ground-based observatories will photograph it and hundreds of thousands of amateurs will flock to get this once in a lifetime celestial view. You'll be one of the lucky ones if you follow our instructions and practice patience.

The comet has never had an apathetic audience. And now, with great fanfare, Halley's Comet is sailing into earth's ken again. But this time, we have a pretty good idea of what a comet is. Halley is thought to be nothing more than a 5-cubic-mile flying mountain of cosmic ice that, when heated by solar radiation, spews a multimillion-mile vaporous tail sprinkled with highly reflective dust.

Our numbers may be off a little. Earlier this year, when a U.S. satellite went through the tail of the comet Giacobini-Zinner, instrument readings indicated the comet was thousands of miles wider across the tail than had been thought. But the basic facts seem to be in place.

About Halley in particular, there is much already known. It passes the earth like clockwork every 76 years. It won't come closer to us on this trip than 39 million miles. That's three

times farther away than its last trip in 1910. That means we will have a less inspiring show than our ancestors. With the increased presence of city lights, the comet will be even more difficult, perhaps impossible, for many to view. The best place to look for Halley's Comet will be in the darkest rural areas. The ideal place to see it will be somewhere in the Southern Hemisphere, although it will be faintly visible throughout the continental United States. The farther south you go, the better the view.

This winter, the comet will be visible from December through part of January. Toward the end of January, it will be blocked by sunset. The best viewing period will be from mid-March to late April (see viewing chart below). But the absolute best viewing window for North American observers comes in the early morning sky from Mar. 18 to 23. At that time, the comet will be a few degrees above the horizon, 60 to 90 minutes before dawn. It will sport a lengthy tail that sweeps up and to the right. The tail should be at least 5° long (that's the width of three fingers held at arm's length). Some cometologists are even predicting a 15° tail.

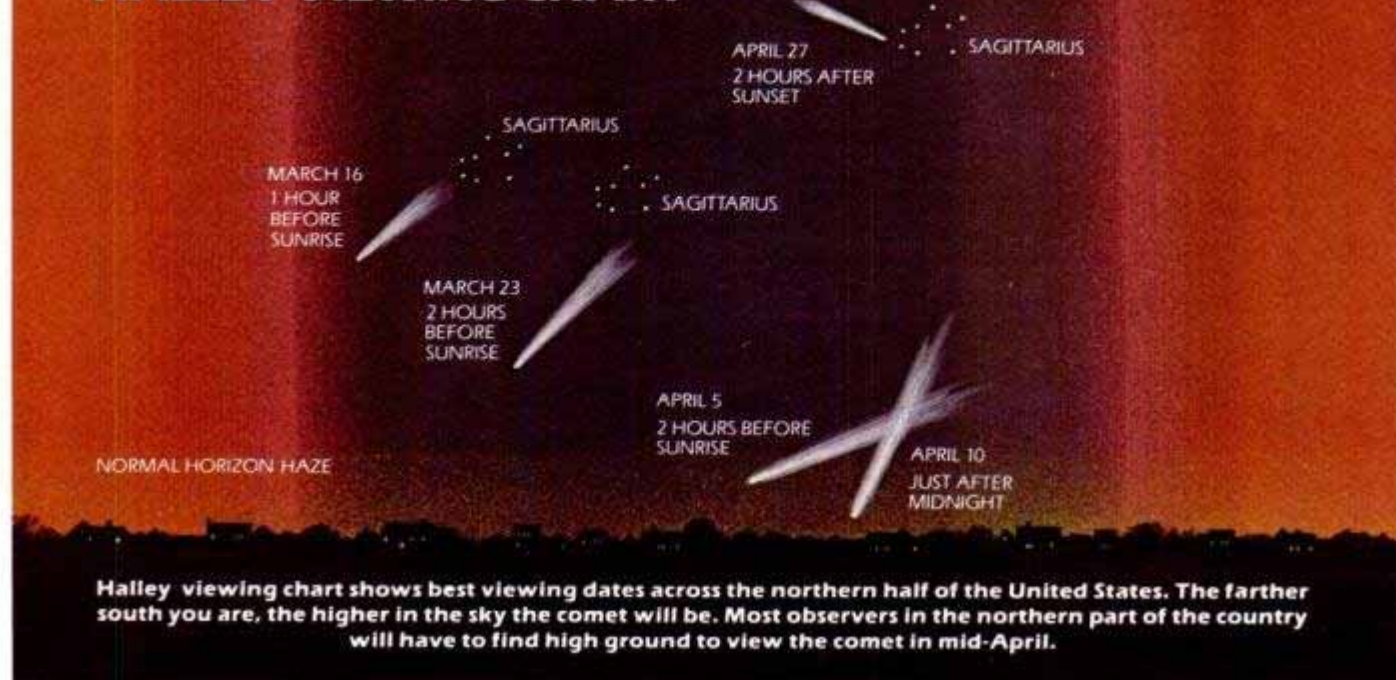
Halley will be at its brightest in

Sequence provided by Edmund Scientific was taken from April to June of 1910. Halley is first seen after going around sun. Then, it disappears beyond the orbit of Mars.

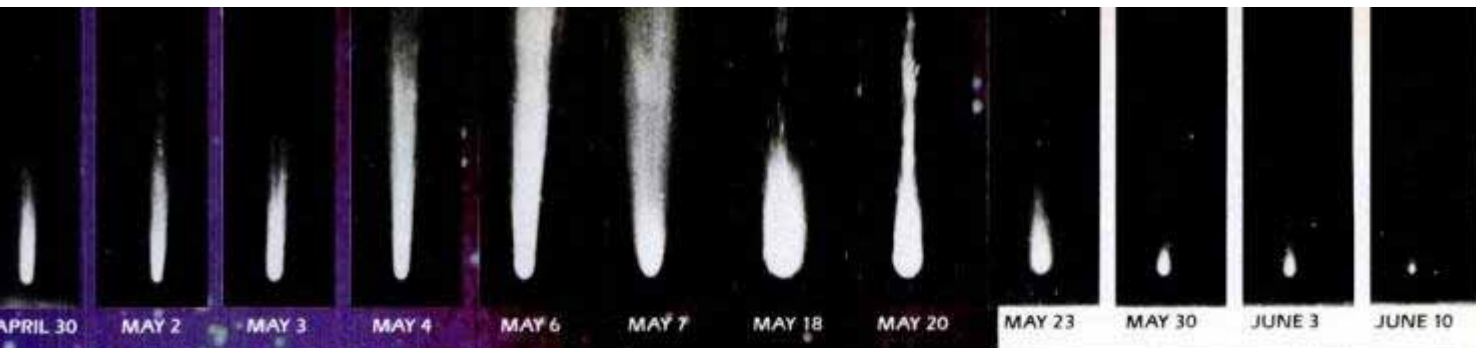
APRIL 26 APRIL 27

PHOTO BY NATIONAL OPTICAL ASTRONOMY OBSERVATORY

HALLEY VIEWING CHART

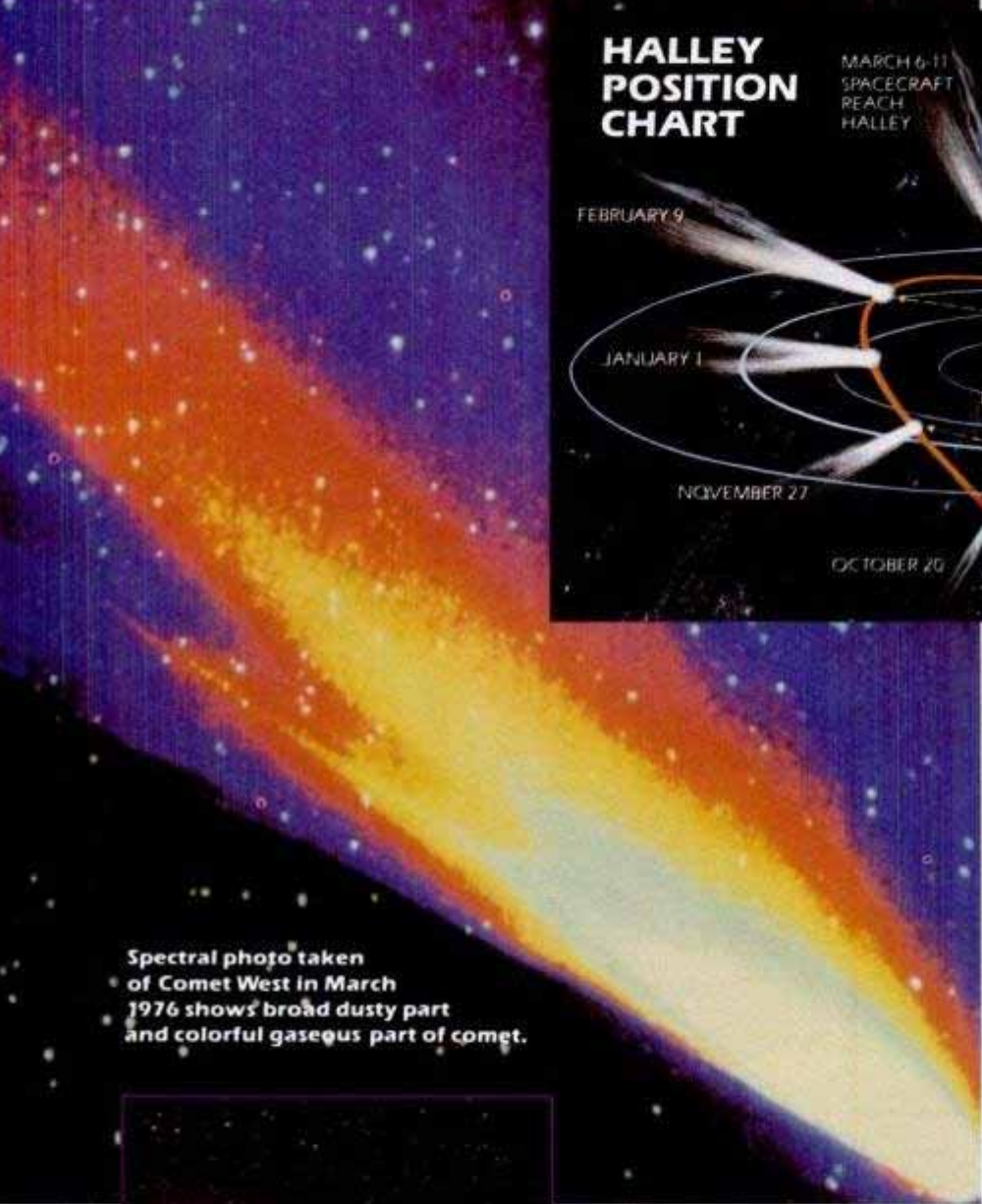


PM ILLUSTRATION BY DEAN ELLIS



APRIL 30 MAY 2 MAY 3 MAY 4 MAY 6 MAY 7 MAY 18 MAY 20 MAY 23 MAY 30 JUNE 3 JUNE 10

HALLEY POSITION CHART



Spectral photo taken of Comet West in March 1976 shows broad dusty part and colorful gaseous part of comet.

late March and early April, but for viewers in the northern two-thirds of the United States and across Canada it may be obscured by early morning haze in the southern horizon. It would be better if you get to high ground and have a clear view of that southern horizon in those places. Follow our viewing chart for the dates and location of the comet in the sky.

Halley's Comet will be visible to the naked eye at least part of the time. If you get to a good location, you won't need any instruments to see its spectacular form. Even in a less than perfect viewing area, you will be able to see the comet with some help.

Do you need a telescope? As the comet nears earth, telescope manufac-

(Please turn to page 128)

How To Catch A Comet On Film

The photo of Comet West at the left was taken by an amateur astronomer at the same time the spectral photo above was done professionally in 1976. You can't achieve the same thing a professional astronomer can, but you can get excellent photos of a comet with simple equipment. You need a camera capable of time exposures, fast film, a cable release and a tripod. Use ISO 1000 speed daylight slide or print film. A standard 50-mm focal length lens will capture the entire comet. Since a photo will capture

more of the tail than your eye can see, frame the picture with the comet head near the edge of the long dimension in the viewfinder. You will want to expose the film for less than 90 seconds. Before shooting a comet, take an ordinary daytime photo. That will alert the film developer on how to expose the night shots. Set your lens at its fastest aperture. Focus at infinity. Wipe condensation off your lens. Depress and lock your cable release. Take a series of 10, 20, 30-sec. and higher time exposures.—Robert Little



PHOTO BY DENNIS DI CICCO



YUGO GV



HONDA CIVIC



MITSUBISHI
MIRAGE



DODGE COLT



SUBARU
HATCHBACK



TOYOTA
TERCEL

CHEAP WHEELS



CHEVROLET SPRINT

How much car do you get for \$3990?
Does \$5538 get you a lot more?

Entrepreneur Malcolm Bricklin has harvested a bushel of publicity by promising to retail a car he calls the Yugo for only \$3990, P.O.E. This is a substantial \$1200 less than any other new car you can buy in America, stripped Japanese econoboxes included. It's also the boldest marketing move since Henry Ford offered a Model T Runabout for \$260 in 1925.

What Bricklin wants to capture is the market for basic transportation. This is something very different from the new car market. Bricklin's Yugo has to compete not only with other automobiles, but also with motorcycles, motor scooters, bicycles, running shoes, buses, subways, commuter trains, and most especially, used cars (see *The Used Car Alternative* on page 95).

The key to the transportation market is not price *per se*, but monthly payments. The critical point seems to be \$150 a month, which is what you'd pay on a \$5500 new car loan at an average 13.5 percent for 48 months. Payments on the \$3990 Yugo will be more like \$120 per month. So the big question for Malcolm Bricklin is: Will Americans buy a Yugo instead of a Honda or Toyota, in order to save \$30 a month?

Including the Yugo, there are nine new cars on the American market with a base sticker price of \$5500 or less. To answer our \$30-a-month ques-



NISSAN SENTRA



CHEVROLET CHEVETTE

CHEAP WHEELS

tion, we ran examples of all nine cars through our standard track tests and over-the-road evaluations.

Honda Civic

Honda must be the most heads-up car company in the world. Every model Honda builds is the standard of excellence in its market segment, and even when it comes to building a cheap stripper, Honda does it better than anybody else. For \$5500, there isn't a car that comes close to the Civic's clever blend of good looks, quality, performance and economy.

Start with the styling. The chopped-off Kamm-back gives the Civic the silhouette of a station wagon, but with a perky distinctive flair. One of our testers enthused, "This car will look modern for another five years—Honda is one full styling cycle ahead of everyone else."

Inside, the Civic is equally slick. The ergonomics are excellent, and all the controls are convenient, well-labelled and easy to use. Not only is there enough headroom and legroom for two American adults in the front bucket seats, but two adults fit comfortably in the rear seats as well.

Typically Honda, everything inside and out is functionally attractive. It's obvious that this is not an expensive car, but it doesn't look cheap. Indeed, the Civic you buy for \$5500 differs in only minor ways from the more expensively trimmed Civic S version that can cost \$3000 more. As one of our group wrote, "Nothing chintzy here. Doesn't give you that 'stripped' ambiance, despite all the vinyl and molded plastic."

Where the Civic really shines is in the driving. Most Civics have a 1.5-liter

engine and 5-speed transmission. The stripped version has a 1.3-liter engine and 4-speed. It honestly doesn't matter all that much. The last Civic S we tested (see *Pocket Rockets*, page 76, Aug. '85) ran 17.98 sec. at 74.38 mph in the quarter-mile; this one ran 18.91 at 70.31 mph. On the other hand, this stripped Civic returned a healthy 6 mpg more. That's a great trade-off.

In our slalom test, the stripped Civic actually performed better than the Civic S, though it was marginally slower on the skidpad because of its narrower tires. Braking was excellent, and our



Honda's classy Civic finished second in our track tests and first in our hearts. It's inexpensive, not cheap.

testers called the handling wonderful, safe, consistent and fun.

Chevrolet Sprint

In Japan, this car is called the Cultus, and it's the largest model Suzuki makes. In America, it's the smallest, lightest car you can buy. Also the most

Produced by the PM Auto Dept.
Text by Rich Taylor
Photos by Humphrey Sutton

fun. As one of our group wrote: "The Sprint is the only car in this group that consistently puts a smile on your face. The Honda is a better car, but the Sprint is fun, fun, fun. It's a berserkoid 4-wheel motorcycle."

The Sprint has an unusual 1-liter, 3-cylinder engine, with the free-revving feel of a good Japanese motorcycle. The 5-speed shifter is slick, and the handling excellent. It's really not especially fast, nor are the cornering limits particularly high, but it *feels* zippy and perky. As one tester wrote, "This car makes you want to drive fast."

Our male testers called the styling "bland and inoffensive," the females thought the Sprint was "cute and cuddly." Both are accurate. The Sprint is also terrifically economical, the first car we've ever tested to return more than 40 mpg on our standard test loop. Considering the fact that most of our drivers were blitzing around, foot to the floor, that's impressive.

The Sprint may fall down in only one area. As one of our group wrote, "Compared even to these other strippers, the Sprint seems very lightly built and not very durable." Only time will tell how these cars hold up in America.

Nissan Sentra

Compared to the Civic, the notchback Sentra seems very conventional, even old-fashioned. Compared to the Sprint, the Sentra seems very substantial, even robust. This doesn't make it fun to drive, but it does make it a good buy for economical, long-term transportation.

All of our testers ranked the Sentra in the middle of the pack; it won third place in our overall rankings thanks to its winning day at the track. Slightly larger than the competition, the Sentra

TEST RESULTS

CAR	GAS MILEAGE (EPA city/ PM test)	ANNUAL FUEL COST ¹	1/4-MILE (sec. @ mph)	SLALOM ² (mph)	SKIDPAD ³ (cw/ccw)	BRAKING (ft.) (60-0 mph)	TRUNK CAP. INDEX ⁴	INTERIOR SPACE INDEX ⁵	TEST TRACK RATING ⁶	ROAD TEST RANKING ⁷	OVERALL RATING ⁸
Chevrolet Chevette	28/39.6	\$379	18.99 @ 70.81	57.80	.69/.70	169	11	87.51	9	7	7
Chevrolet Sprint	55/41.1	\$364	18.75 @ 70.06	60.83	.70/.73	139	6	96.26	4	2	2
Dodge Colt	36/30.3	\$495	18.57 @ 71.68	57.25	.69/.73	145	10	110.51	3	6	5
Honda Civic	37/34.1	\$440	18.91 @ 70.31	59.24	.73/.78	116	7	108.84	2	1	1
Mitsubishi Mirage	36/29.1	\$515	18.41 @ 72.55	55.84	.72/.75	152	10	110.51	6	5	6
Nissan Sentra	31/25.8	\$581	18.21 @ 73.43	59.84	.72/.79	145	16	111.22	1	4	3
Subaru Hatchback	31/24.0	\$625	18.86 @ 70.31	54.44	.67/.72	131	11	101.61	8	8	8
Toyota Yerfel	35/30.5	\$492	18.64 @ 71.42	57.39	.68/.71	150	12	106.10	5	3	4
Yugo GV	26/27.3	\$549	20.20 @ 65.64	57.05	.70/.78	115	9	102.46	7	9	9

- Based on 12,000 miles per year at PM test mileage × \$1.25-a-gal. fuel cost.
- Best speed achieved while weaving through seven cones placed 100 feet apart; the higher the speed, the better the transient handling.
- G-forces generated during steady-state cornering around a 200-foot-diameter circle; cw=clockwise, ccw=counterclockwise.
- The number of standard-size grocery bags that will stand upright (1-inch crush space permitted) in the trunk.
- Front-seat width × headroom × legroom + rear-seat width × headroom × legroom ÷ 1,000.

proved to be fast, roomy and good handling. Our group even liked the "BMW-like" exterior styling, but not the fish-skin seat upholstery.

We couldn't find anything wrong with the Sentra—it's pleasant, sturdy, economical, comfortable—and boring. The Honda and Sprint are basic transportation, but they're something more, besides. The Sentra is a utensil, with no personality, good or bad. As one of our group put it, "This is the Clark Kent of automobiles. Too bad it didn't bring along a Superman suit."

Toyota Tercel

The Tercel and Sentra went together in our tester's minds. Like the Sentra, the Tercel is a real car. It's also easy to maintain, reliable, no problem to drive, nicely appointed, pleasantly styled, economical, a great buy, and so bland one tester wrote, "No comments to make, good or bad. So sorry."

The Tercel's strong points are Toyota's excellent attention to detail and flawless quality control. Its weaknesses are a direct function of price: tacky carpets and upholstery, thin door panels and an almost total absence of gauges. On the other hand, the bucket seats were good for a car in this class.

As our track tester wrote, "The driving position is great, handling is fine. It's also the quietest in this group."

Dodge Colt Mitsubishi Mirage

We tested both a Dodge Colt (also sold by Plymouth dealers) and a Mitsubishi Mirage. But since the two cars are literally identical and our testers ranked them fifth and sixth, we've combined their comments. The only reason we can see to choose one over the other is

your dealer's reputation and willingness to haggle over price.

Realistically, we could have combined the Colt and Mirage not only with each other, but with the Sentra and Tercel as well. All four are generic Japanese economy cars with no shining

The Used Car Alternative

According to Hertz, Americans purchase 17 million used cars each year. That figure is twice the number of cars bought new.

In 1984, the average used car price was \$5406, for a car just over four years old with 45,000 miles on the clock and, presumably, up to another 100,000 miles of driving yet to go.

This information inspired us to take a look through the New York area classifieds to see what kind of cars were available secondhand for the same \$5500 as one of the new stripped economy cars in our comparison test.

Since we were looking for dependable, reliable, easy-to-live-with transportation, we skipped over the 1970 Buick GS 455 musclecar, the 80 percent complete '40 Ford Coupe and the Triumph TR-7 with a supercharged Chevy V8 under the hood.

Still, we came up with some better buys than the Hertz average. None of the \$5500 cars we saw had more than 25,000 miles, and all claimed to be in showroom condition.

Among the most appealing choices we found in the classified section were: half a dozen 1982 Buick Centurys, Regals and LeSabres, a variety of 1983



and '84 Chevy Cavaliers and Plymouth Turismos, an '83 Caprice Classic, an '82 Ford LTD, a selection of '83 and '84 Ford Escorts and Tempos, three Lincoln Continental Town Cars and two 1982 Camaro Berlinettas.

Obviously, a used full-size Lincoln is not going to deliver the fuel economy of a new Chevy Sprint. On the other hand, when the Sprint is just a memory, that V8 Lincoln will still be chug-a-lugging along, power accessories, high-zoot stereo and fancy interior more or less intact.

The Chevy Sprint is clearly a car that is more fun to drive, but not even the most die-hard econobox fan will try to claim it's as comfortable or durable as a big American V8.—R.T.

virtues and no glaring faults. They all perform about the same, look about the same and feel about the same to drive.

The Colt/Mirage was called a real car, not a toy, and praised for its big-car feel, quality, dependability and val-

(Please turn to page 130)

SPECIFICATIONS AND DIMENSIONS

VEHICLE TYPE	BASE PRICE	PRICE AS TESTED	ENGINE	TRANSMISSION	WHEEL-BASE (in.)	LENGTH (in.)	WEIGHT (lb.)
4-passenger 3-door	\$5470	\$5760	65-hp OHV 1.6-liter inline-4	4-speed manual	94.3	161.9	2100
4-passenger 3-door	\$5151	\$5394	48-hp SOHC 1.0-liter inline-3	5-speed manual	88.4	141.1	1550
4-passenger 3-door	\$5372	\$5572	68-hp SOHC 1.5-liter inline-4	4-speed manual	93.7	157.3	1900
4-passenger 3-door	\$5399	\$5578	60-hp SOHC 1.3-liter inline-4	4-speed manual	93.7	150.0	1800
4-passenger 3-door	\$5459	\$5949	68-hp SOHC 1.5-liter inline-4	4-speed manual	93.7	157.3	1900
4-passenger 2-door	\$5499	\$5625	69-hp SOHC 1.6-liter inline-4	5-speed manual	94.5	165.3	1900
4-passenger 3-door	\$4989	\$5268	69-hp OHV 1.6-liter flat-4	4-speed manual	93.3	156.9	2050
4-passenger 3-door	\$5448	\$5748	62-hp SOHC 1.5-liter inline-4	5-speed manual	95.7	158.7	2000
4-passenger 3-door	\$3990	\$4340	55-hp OHV 1.1-liter inline-4	4-speed manual	85.0	137.4	1650

6. Points are awarded from best (1) to worst (9) in each category. The car with the fewest total points ranks first, next lowest second, and so on.

7. Subjective ranking on the road by a team of testers; cars are graded by "feel," independent of test track results.

8. Average of Test Track and Road Test ratings. Ties are decided in favor of Road Test score.

Bold numbers indicate best performance.



UP THE CREEK

It's a great place to be with the latest in high-tech and special-interest canoes.

BY TIM COLE, Boating/Outdoors Editor
Photos by Jim Brown

If you'll pardon the understatement, canoes have changed.

Wood is out, aluminum is passé and high-tech synthetics have arrived. Even NASA would envy the strength-to-weight ratios today's canoe-building artisans are able to achieve, and right now there's never been more variety, with a canoe for every discipline and environment.

Let's look at the current technology. It didn't take long for miracle fibers like Kevlar and carbon fiber to migrate over to the world of competition canoeing. But today, most competition canoe manufacturers are refining their building technique with special vacuum-bagging operations following hand layup. Plastic sheets are laid over synthetic laminates and sucked down with vacuum pressure, which creates a tight, uniformly resinated bond.

In only slightly less sophisticated canoes, fiberglass has attained new high-tech status. Special layers of E-glass and high-strength S-glass, where fibers are laid unidirectionally in the area of maximum load, are joining forces to create tough, complex structures at reduced expense. We*No*Nah has a variation on contemporary glass technology that uses a composite cross-weave of unidirectional glass and polyester fibers. They claim scratch and tear resistance that surpasses regular glass for the same cost.

Hexcel honeycomb and PVC foam-core materials are also finding their way into composite layups as sandwich reinforcements.

In lower priced, entry-level canoes, cross-linked polyethylene has joined the now traditional thermo-formed Royalex, an ABS sandwich, as materials of choice.

Perhaps the biggest news in canoeing's expanding technology isn't so much *what's* being used, but *where* it's being used.

The quest for performance—that light, feathery touch on the lakes and dance-floor stability through the rapids—has pushed new materials and construction techniques into designs for every canoeing purpose.

In this age of specialization, environment plays a big role in deciding which canoe is right for you. On rivers, the water moves erratically and the waves stand still, but on lakes the reverse is true, with the water standing still and wind-formed waves moving in long and regular patterns.

Accordingly, river and whitewater boats must be highly maneuverable. As a result, U-shaped bottom profiles near the area of center depth, with higher bows and fuller ends, are most appropriate. Low windage and tracking are more important to lake or pond canoeists. A shallow vee bottom, fine entry and low profile keep the canoe moving in a straight line.

Although the broad family of modern canoes has many sets and subsets, PM has broken them down to five principal types: tandem racer, tandem cruiser, entry-level tandem, solo racer and solo cruiser. Their handling characteristics are strikingly different.



Today, canoes come in a variety of shapes and sizes for every paddling environment. Above left, a tandem cruiser moves swiftly through the rapids while a solo whitewater competition boat, above, frolics in the rough stuff. At right, a selection of tandem racers takes a breather. From left: Sawyer, Memphremagog, Wabash Valley, We*No*Nah, White. Note the radical shapes and extensive use of Kevlar.

Ready to race doubles

There is really no credible way to compare the racing genus of the current species with normal recreational canoes. While the Wabash Valley Defeater was perhaps the most exotic asymmetrical shape we reviewed, the short-class White was certainly the most conventional (and maybe the most appropriate all-Kevlar canoe for rough



Материал: эластичный дуглас или пихтом



Solo, or "personal," canoes—made of lightly resinated synthetics—are a hot item in today's canoe market. Note the variations in shape, seats, bulkheading and thwarts. From left: Wabash, Memphremagog, Curtis, Mad River and Sawyer.



From traditional wooden long-shaft blade at left, paddles progress in grip, shaft profile and blade angle to synthetic-material paddle, right.



Blue Hole Sunburst, an ABS solo whitewater model with kneeling thwart, gets aft flotation airbag topped off.

water work). In all, we liked the Memphremagog Triathlon II seating arrangement, with nonstress-bearing slides positioned on the centerline. We also took a shine to the Sawyer Legend's unique bulkheading system. Athwartships support is carried through the entire hull cross-section with this arrangement instead of being localized at the gunwale/thwart junction. It makes an incredibly stiff canoe, and a canoe that doesn't flex or vibrate means paddle power can be imparted directly to forward motion.

Tandem battle cruisers for the wilderness

Take a ride on any of these broad, powerful machines for extended voyaging and it will turn you into a paddler for life. They feather through the rapids, glide into the chutes, skirt past outcroppings and thread calmly through angry haystacks. I fell madly in love with

Sawyer's 222. She behaved exquisitely from the moment I felt the rapids take over until we paddled out into flatwater. Although my rough-water experience with the Catamount and the We*No*Nah Sundowner wasn't all that extensive, they still offered the same kind of beefy security and easy handling on flatwater.

Entry-level tandem

A lot of specialty canoe makers like Mad River, Blue Hole and Sawyer are beginning to build boats for the entry-level market hitherto dominated by Old Town and Coleman—but with a difference. They are convinced that the first-time paddler will pay a little more for added performance, graduating into more challenging canoes as they gain more experience. The Mad River Peter Pond is a splendid example of this philosophy, with contoured bench seating and a light, manageable shape.

Coleman's new 16-foot Gold Medalist is intended to inject a little performance in its canoe line. Reports from the U.S. Whitewater Team about this latest Coleman are favorable, with allusions to the boat's "indestructible" thermoform polyethylene construction. The team reports that the Gold Medalist was still paddleworthy after a "Roof Rack Ejection" test at 65 mph.

We sent the Old Town Discovery down through the rapids and it behaved up to expectation. It's a heavy canoe at 78 pounds, so it didn't respond with the finesse of its lighter cousins, but it felt solid and safe.

Solo sprinters

Solo racers generally take on the same specialty characteristics of their tandem siblings—light, sturdy, with a low-profile asymmetrical shape. But that's where the common features end-

(Please turn to page 132)

CANOES FOR ALL REASONS

NAME	LOA	BEAM @ GUNW'L/ BEAM @ 4" WL (in.)	CENTER DEPTH (in.)	WEIGHT (lb.)	CONSTRUCTION MATERIAL	CONSTRUCTION METHOD	PRICE	MAKER
Tandem Racers								
Defeater	18'6"	31/32	12	25	K/Hc	HLU/VB	\$1195	Wabash Valley
Triathlon II	18'6"	28/32	11.5	40	FG	HLU/VB	825	Memphremagog
Legend	18'6"	32/32	11.75	36	FG/K/PVCc	HLU/VB	999	Sawyer
Jensen	18'6"	30/32	11.5	32	K	HLU/VB	1225	We*No*Nah
Lightnin'	16'6"	32.5/30	15	50	K	HLU	1245	White
Tandem Cruisers								
222	18'6"	35.5/32	14	65	K	HLU	1399	Sawyer
Catamount II	18'6"	35.5/32	14.5	55	FG	HLU/VB	825	Memphremagog
Sundowner	18'	34/33	13.5	68	FG/K	HLU	679	We*No*Nah
Entry-Level Tandem								
Nature Bound	16'	36/33	12	65	FG	HLU	419	Outdoor Endeavors
Peter Pond	17'	35/33	12	66	FG	HLU	599	Mad River
Discovery	17'4"	36/34	14	78	PLE/PVCc	RTOM	560	Old Town
Gold Medalist	16'2"	36/34	14	79	PLE	TF	450	Coleman
Solo Racer								
Rademaker FW	16'7"	20.5/28.5	16	17	K/Hc	HLU/VB	980	Wabash Valley
Triathlon I FW	16'10"	23/29	11.5	25	K	HLU/VB	995	Memphremagog
Shock Wave FW	16'8"	22/28.75	12	26	FG/K/PVCc	HLU/VB	795	Sawyer
Tempest FW	17'3"	18/29.75	12	24	FG/K	HLU/VB	999	Mad River
Dragonfly WW	14'6"	24.5/26	14	42	K	HLU	1179	Curtis
Solo Cruiser								
Merlin	15'6"	29/28	16	37	K	HLU	1045	Wabash Valley
Starlight	13'4"	23.875/25.375	11.875	31	K	HLU	1025	Sawyer
Pearl	13'4"	27.5/22.25	10.5	24	K	HLU	999	Mad River
Sunburst	14'6"	32/29	14	58	RLX	TF	775	Blue Hole
Vagabond	14'8"	25.5/25.5	11.5	36	FG	HLU	699	Curtis

FG = Fiberglass; K = Kevlar; PLE = Polyethylene; Hc = Hexcel foam core; PVCc = PVC foam core; RLX = Royalex; HLU = Hand Lay Up; VB = Vacuum Bagged; TF = Thermoform; RTOM = Rotomolded; FW = Flat Water; WW = White Water



Many racers, like Wabash Valley Defeater, have exotic pinched gunwale shape aft.



Mad River Pearl adopts age-old concept for a comfortable kneeling arrangement.

Technical Highlights

TANDEM RACER PINCHED GUNWALE MEANS EASIER PADDLE STROKING BOTTOM FOAM-CORE REINFORCED



TANDEM CRUISER SYMMETRICAL HULL FOR EASIER TURNING STRUCTURAL FOAM RIBS ADD STIFFNESS LARGER CONTOUR SEAT KEEPS PADDLER ON CENTERLINE

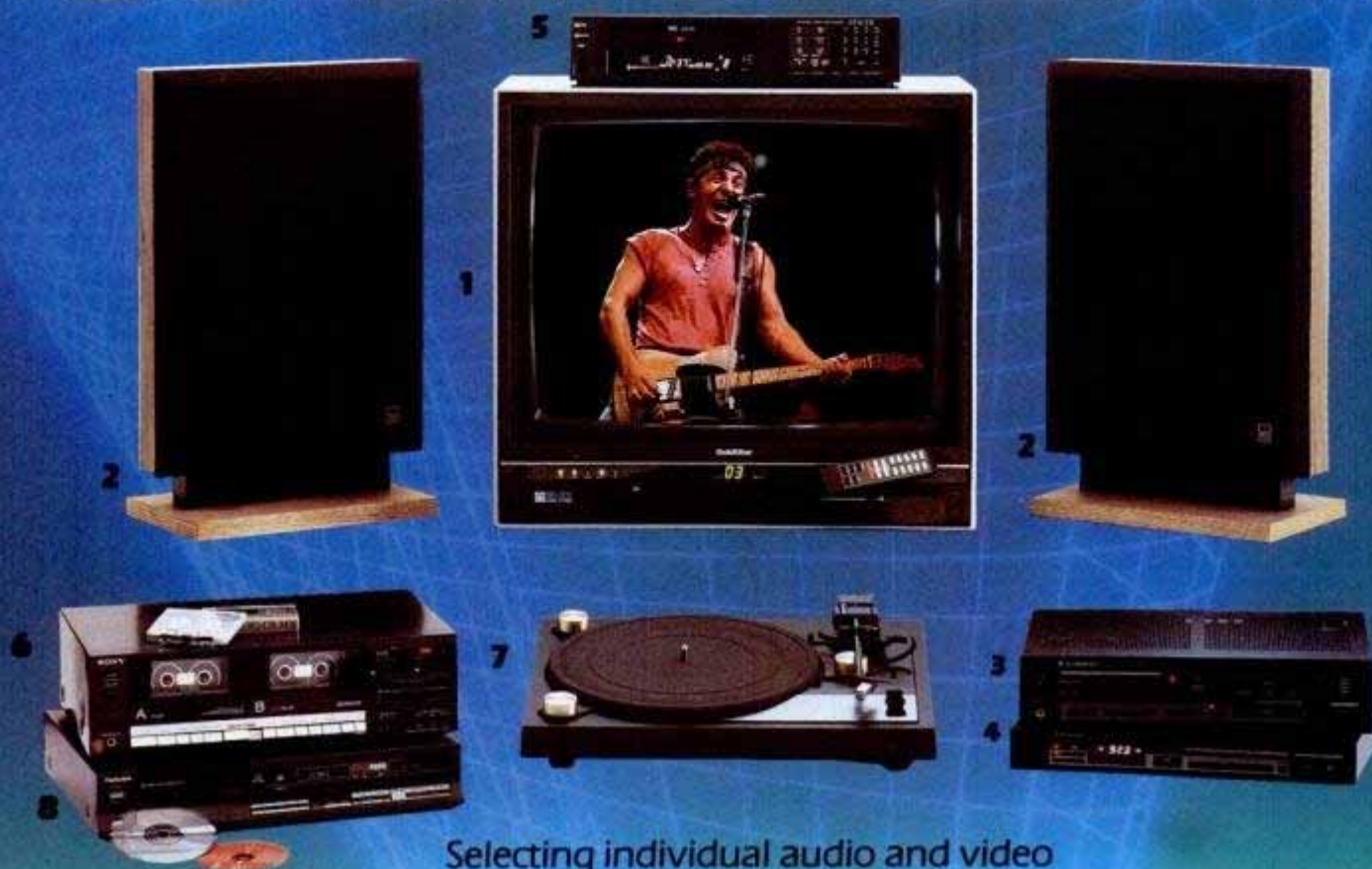
ENTRY-LEVEL TANDEM WIDE, STABLE HULL OPTIONAL FOOTBRACE SIMPLE BENCH SEATING AIRTIGHT COMPARTMENT

SOLO RACER PINCHED GUNWALE MEANS EASIER PADDLE STROKING FINER ENTRY, BETTER TRACKING ASYMMETRICAL HULL SMALL RACING SEAT FOAM-CORE REINFORCEMENT LESS COCKPIT VOLUME MEANS LESS WINDAGE

SOLO CRUISER SYMMETRICAL HULL SHAPE, GREATER CARRYING CAPACITY LARGER SEAT OPEN END FOR EASIER BAILING

Every variation in design has some price or performance implication. Complex shapes and high-tech materials are pricey, but committed canoeists appreciate added performance.

COMPONENTS



Selecting individual audio and video components lets you assemble a home theater with exactly the features you want, but requires some planning.

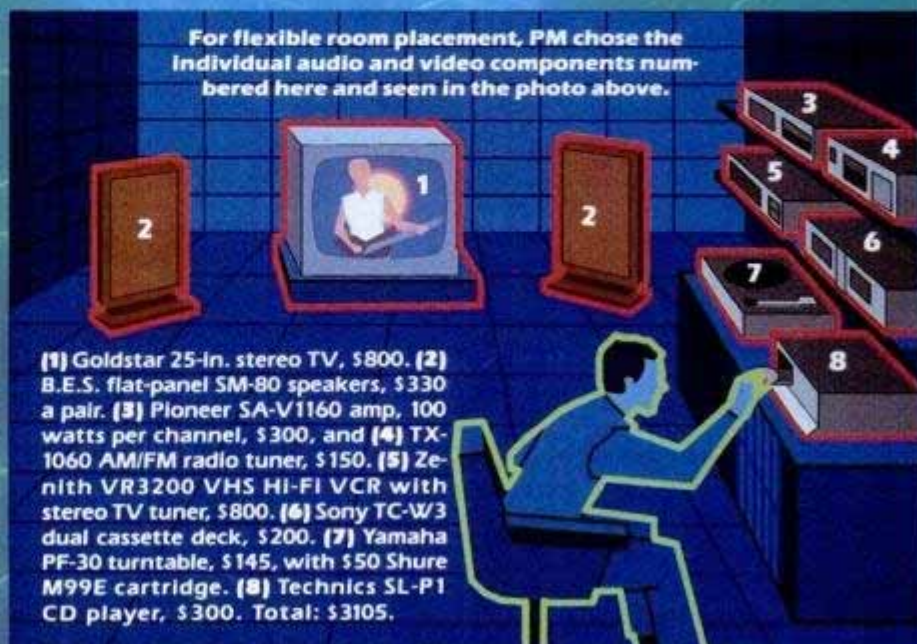
BY TERRY SHEA

Buying a hi-fi system used to be much like buying a car. Presented with a dizzying array of options, you'd go through the laborious process of selecting those that best met your needs. In the end, you had a car that did exactly what you wanted it to do, no more and no less. So it was with hi-fi systems. You'd choose the pieces from among a confusing cornucopia of components, and assemble the system that worked best for you.

That approach to cars is less widespread ever since Japanese auto companies popularized the packaged approach to options-buying. Rather than have you select items individually from an exhaustive list, they've grouped the most popular features into a handful of options packages. Want 4-wheel disc brakes? Fine, but you've got to take the limited slip differential and the leather seats. That's the package.

The Japanese have introduced a similar approach to buying audio systems. It used to be that you assembled a

For flexible room placement, PM chose the individual audio and video components numbered here and seen in the photo above.



[1] Goldstar 25-in. stereo TV, \$800. **[2]** B.E.S. flat-panel SM-80 speakers, \$330 a pair. **[3]** Pioneer SA-V1160 amp, 100 watts per channel, \$300, and **[4]** TX-1060 AM/FM radio tuner, \$150. **[5]** Zenith VR3200 VHS HI-FI VCR with stereo TV tuner, \$800. **[6]** Sony TC-W3 dual cassette deck, \$200. **[7]** Yamaha PF-30 turntable, \$145, with \$50 Shure M99E cartridge. **[8]** Technics SL-P1 CD player, \$300. Total: \$3105.

VS. SYSTEMS



You can have an instant media room by choosing an audio/video package from a single manufacturer, but you may get more—or less—than you need.

system by purchasing each component separately based on whether it satisfied your wants and needs. Today, the most popular way to buy hi-fi is in the form of a one-brand system, sometimes called a rack system, in which all the components have been matched and assembled by a single manufacturer.

The attraction of the one-brand approach is its simplicity. Just as many people consider it a nuisance to wade through page after page of car options, many can't be bothered with shopping for half a dozen different audio components. They're quite content to rely on a single manufacturer to select everything that's necessary, and now, this soup-to-nuts service includes video components along with the hi-fi.

The trouble is, such faith in a manufacturer is sometimes undeserved. Just like the car buyer who wants 4-wheel disc brakes and has to take leather seats too—like them or not—many rack system buyers go home with components and features for

Sanyo's Connaisseur AV4000 system, in top photo, integrates audio and video components in a single \$3000 package.



As represented here, furniture rack houses (1) 26-in. stereo TV and (2) from top, record turntable with phono cartridge, 100-watts-per-channel amp, AM/FM radio tuner, dual cassette deck, Compact Disc player, Super-Beta HI-FI VCR.



Floorstanding speakers (3) have 12-in. bass woofers. Infrared remote (4) controls all audio/video functions. Story on following page tells how Sanyo's super package stacks up against PM's roll-your-own component system.

Photo top left: Harry Hartman Studios
TV screen insets: Star File
Illustrations: Steve Lombardi, Graphic Media Inc.
Background photo: Michel Tcherevkoff



Fisher's AVS-1086 system has 25-in. TV, but VCR is optional.



Sansul's AV system has separate remotes for TV, VCR and audio gear.

which they don't have any use. Had they assembled their systems component by component, with the help of a knowledgeable friend or dealer, chances are they'd have spent their money more efficiently. Indeed, it's quite possible they'd have spent substantially less. But before examining that issue more closely, let's take a look

at what makes one-brand systems so appealing.

Foremost on the one-brand's roster of attributes is that it's easy to buy. Not since the days of radio-phonograph consoles has there been a more painless way to buy hi-fi. You walk into the store and arrayed before you are maybe six systems, priced perhaps at \$400, \$500,

\$700, \$850, \$1000 and \$1200. Take your pick and off you go.

Compare that with the daunting task of choosing a minimum of four separate components—possibly more than twice that many—from the hundreds of models from different brands that crowd store shelves. And you don't even have to worry about where you'll put all those components when you get the system home, because the one-brand comes with its own rack. What's more, you can buy a one-brand system at your favorite department store. Many people shop more comfortably here than in an electronics specialty store, which they find intimidating.

Reinforcing the buyer's decision to go with a one-brand is that these systems offer most or all of the right stuff. High-powered amplifiers, digital tuners, dubbing cassette decks, 3-way tower speakers, linear-tracking turntables, multiband equalizers, and even Compact Disc players—all the buzzwords are there to reassure the neophyte that his system is indeed state-of-the-art. It might be and it might not.

One thing that makes buying a one-brand so easy is that manufacturers don't detail performance specifications the way they do with individual components. Package systems compete against one another on the basis of convenience features and styling. So long as the overall package sounds okay, frills and looks will determine the buying decision.

Components, though, are judged individually according to their stated performance. Priced the same, an amplifier with 0.5% distortion will outsell another with 1% distortion. The 200-watt amp that comes in a one-brand might be a top performer. Or, in the unlikely case that it's pushed to its limits, it might distort sound terribly. Trouble is, you won't know in advance unless you can get your hands on complete specifications—and know how to interpret them. If you do, you'd probably be buying components in the first place.

Performance specifications aside, *(Please turn to page 134)*

How The Components Stack Up

You get a lot for your money with most of today's one-brand systems, but we just couldn't resist the challenge of picking a representative one-brand and assembling a comparable system from separate components.

The idea was to offer performance at least as good as the one-brand's, match its features, and maybe surpass it in a couple of areas. All this while remaining reasonably close to the one-brand's price.

For our reference system, we chose Sanyo's Connoisseur AV4000 because it offers many of the latest features, comes with a unified remote control, and has a very competitive suggested retail price of \$3000.

For both Sanyo system and our own, items in italic print denote features not included in the other system. Here's what Sanyo provides for the same price that some audiophile companies charge for a pair of loudspeakers:

- 26-in. TV monitor/receiver with 140-channel stereo tuner; inputs and outputs for routing the sound through the audio system.
- Beta Hi-Fi VCR with *Super-Beta technology*—said to boost picture quality; 14-day/8-event programmability.
- Compact Disc player.
- Fully automatic, belt-drive turntable with *magnetic cartridge*.
- 100-watt-per-channel integrated amplifier with *built-in 5-band equalizer* and extra audio inputs for TV and VCR sound.
- AM/FM stereo quartz PLL synthesized tuner with station presets.
- Dual-transport dubbing cassette deck with Dolby B noise reduction.
- Floorstanding loudspeakers with three cones each, including 12-in. bass woofer and passive radiator.
- *Cabinet* for audio and video gear.

Challenging the AV4000 is a system

comprised of the following separately available components. The prices are suggested retail.

- Goldstar CMT-2525 25-in. TV monitor/receiver with 139-channel stereo tuner; audio/video inputs and outputs (\$800).
- Zenith VR3200 VHS Hi-Fi VCR with *built-in stereo TV tuner* (\$800).
- Technics SL-P1 Compact Disc player (\$300).
- Yamaha PF-30 fully automatic, belt-drive turntable with a *3-point double float suspension* to better resist vibration and shock (\$145).
- Shure M99E magnetic cartridge (\$50).
- Pioneer SA-V1160 100-watt-per-channel integrated amplifier, with *two inputs that not only select audio portion of a video program, but switch the video signals as well for dubbing* (\$330).
- Pioneer TX-1060 AM/FM stereo quartz-PLL synthesized tuner with station presets (\$150).
- Sony TC-W3 dual-transport dubbing cassette deck with Dolby B and *Dolby C noise reduction* (\$200).
- B.E.S. SM-80 flat-panel loudspeakers with *omni-directional sound dispersion* to make speaker placement less critical (\$330 per pair).

Adding up the prices of our separate components yields a total system cost of \$3105, just \$105 more than Sanyo's A/V package. What do you get? A system that offers everything the Sanyo does and a little more. What you don't get is cabinetry, and a single remote control handset that operates the entire system.

If you do want audio/video furniture, it's widely available and will set you back about \$250. Regarding remote controls, the Goldstar TV and Zenith VCR come with their own. As for audio remotes, remember, you'll still have to leave your recliner to jockey discs or tapes!—T.S.



FEAR OF FLYING

Structural problems, wind shear, heavy air traffic and pilot error are being blamed for a wave of jumbo jet crashes. What are the causes? The answers may now be at hand.

JEFF ETHELL

"This latest disaster has brought us to the point where we are going to have to face facts and answer the question of which is more important, the dollar or human lives?" The speaker is David L. Behncke, president of the Air Line Pilots Association (ALPA). His comment speaks for many airline pilots flying commercial routes in 1985, the worst year in history for airline crashes.

Ironically, Behncke was speaking in 1947 after a tragic United Airlines DC-6 crash at Bryce Canyon, Utah. In 1985, commercial airline crashes claimed over 1300 lives. Hundreds of those lives could have been saved had airlines adopted Behncke's recommendations of 38 years ago. It has taken the deadly record of 1985 to bring federal safety officials and airlines to the point where they are willing to take a new and hard look at long-standing proposals to make airline flying safer.

PHOTO BY LARRY LEE, WEST LIGHT

FEAR OF FLYING

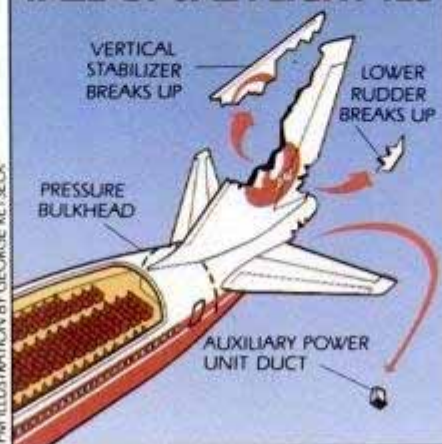
Even before the year's spate of air crashes, manufacturers had begun speaking publicly in 1985 of adding equipment to airports and aircraft that could head off the worst disasters. Newark Airport installed a new wind-shear detection system last summer. Its 360° radar sweep can detect sudden surges in the wind at varying altitudes. It makes a complete sweep in less than a minute so that a sudden wind shear, where winds gust up above 100 mph at a specific altitude for an instant, can be detected in time to prevent a crash.

Engineers say the wind-detection device, and others like it that are scheduled for installation around the nation next year, will become even more effective when aircraft manufacturers install detection devices in the aircraft themselves. Boeing earlier this year began installing cockpit warning systems. Ultimately, all aircraft flying the major U.S. routes will have Doppler radar detection for wind shear, industry analysts predict. But it will be voluntary. The federal government has been slow to force the aircraft industry to do anything.

Experiments, at first not promising, have begun to show that antimisting

fuel might cut the number of air crash deaths dramatically. Further tests are being run by NASA, and the antimisting fuel, which would not explode on impact, may be in aircraft within five years. Even without antimisting fuel, military pilots pointed out to **POPULAR MECHANICS** that their aircraft are

TALE OF JAL FLIGHT 123



Boeing 747 crash in Japan is attributed to failure of rear pressure bulkhead, which allowed high-pressure air to explode into tail, destroying it and the hydraulics.

equipped with explosion-resistant tanks. "They could be installed in commercial aircraft," one pilot told us, "but they are damned expensive." Following the debacle of 1985, several airlines were talking about installing the military-type fuel cells.

Going down the list of causes of crashes in 1985, we found that wind shear and structural problems plagued



After being hit by a small plane, a Pacific Southwest Airlines Boeing 727 crashed in flames near the San Diego Airport. More than 100 people died.

the airlines. But we also found there were many experts who said the causes given for crashes are a smoke screen for a much more broad-based problem. The aircraft bodies don't take advantage of the latest technologies in safety in the body of the plane itself.

"Manufacturers, airlines and government regulators have chosen to ignore a much safer airplane design available for more than 60 years," aircraft safety expert Edmond K. Cantilli wrote in an article on the ultimate safe airplane. "The Burnelli lifting body design provides a safer passenger cabin than a conventional airplane because the airfoil-shaped fuselage provides as much as 60 percent of the total lift."

Vincent Burnelli built eight "lifting body" prototypes before the end of World War II. Boeing started designing an aircraft based on the Burnelli design in the 1970s, according to Cantilli, but



WIDE WORLD PHOTOS



PM ILLUSTRATION BY JOE MILIOTO

DESIGNING A SAFER AIRCRAFT

On-board wind-shear radar will help airline pilots avoid crashes. But when a plane does go down, much more can be done to increase the chances passengers have of surviving. Emergency Locator Transmitter (ELT) helps rescue crews pinpoint crash site quickly.

the airlines balked at the expense. They opted for the currently popular twin-engine, twin-aisle Boeing 767.

The U.S. government agencies responsible for overseeing civil aviation, the Federal Aviation Administration (FAA) and the National Transportation Safety Board (NTSB), maintain that regardless of 1985's terrible loss of life, twice in the last decade there have been periods of more than two years each when there were no catastrophic airline crashes. Thirty years ago, there was an average of one crash per month. Since there are far more flights now, the safety record has improved markedly—from 1975 to 1984 there was a 71 percent improvement in accidents, a clear downward trend.

Still, passengers who have been demanding drastic improvements in aviation safety consider this whitewash. It's one thing when a single propeller-driven DC-6 went down with 60 people, but quite another when a jumbo jet with over 500 aboard hits the ground. In 1945 there were 20 airline crashes, a horrible record, but there were only 240 fatalities. The Japan Air Lines crash of Aug. 12, 1985, was the worst in aviation history, killing 520 people.

Wayne Williams of the National Transportation Safety Association, a nonprofit, independent division of the Aviation Safety Institute, has been labeled by FAA officials as a "self-ap-

POPULAR MECHANICS • DECEMBER 1985

pointed safety messiah" who makes "self-fulfilling prophecies." But this has not stopped him from crying all the louder for improved safety. Citing a 1981 NTSB report on turbine aircraft accidents between 1970 and 1981, he reveals some shocking findings: "Of the 88 accidents, 77, or fully 88 percent, were survivable. Of almost 5000 persons involved in those 77 survivable accidents, almost 2000 (40 percent) were injured or killed. In 60 percent of those survivable accidents, there were failures of cabin furnishings (seats, belts, panels, partitions, overhead compartments). Those failures killed, injured and trapped occupants. In almost 50 percent of the events involving those furnishings failures, fire erupted. Those who were trapped, rendered unconscious, or had injuries affecting mobility, died. So did many who were conscious and mobile—they were killed by toxic gases, or could not find exits in smoke."

Williams then quotes the NTSB report itself, saying "that the substantial body of knowledge and practical experience . . . can be applied successfully to large transport aircraft, in many cases *without substantial penalties in cost or weight and without major modifications to existing structures.*" (Note: emphasis added.) Passengers (and crew) are not adequately protected from death and injury in even *minor* accidents!

Williams then asks several disturbing rhetorical questions. "Is a 40 percent probability of being killed, or injured, in survivable accidents reasonable? Is it acceptable that thousands of deaths and injuries have been caused by fuel and cabin fires since the 1940s despite strong protests and congressional hearings dating back to that period? Why, under U.S. law, are automobile seats required to withstand more than twice the g loads (20 vs. 9gs) of airline seats?"

Williams, who has devoted his life to teaching crash survivability in the Air Force, with Eastern Airlines and now with the NTSA, has watched the cycle with sadness. "For some 40 years, a sad sequence has been repeated. The crash occurs. People are killed. The media covers the event. Public concern results in congressional hearings. Those responsible for remedial action promise it. Nothing—or very, very little—is done. Then another crash, and it all begins again."

The first day of the year opened tragically when an Eastern Airlines Boeing 727 crashed in the mountains of Bolivia, near La Paz, killing 29. The flight data and voice records were never recovered due to the deep snow at the remote crash site, and simply locating the aircraft was a challenge. Due to an exemption from Federal Aviation Regu-

(Please turn to page 145)

BRUTE BIKES

Charging through California's Gold Country on the fastest big-bore cruisers being built, our crew tests the limits of the machines, the roads and the riders.

BY NORMAN MAYERSOHN; Photos By Rich Cox



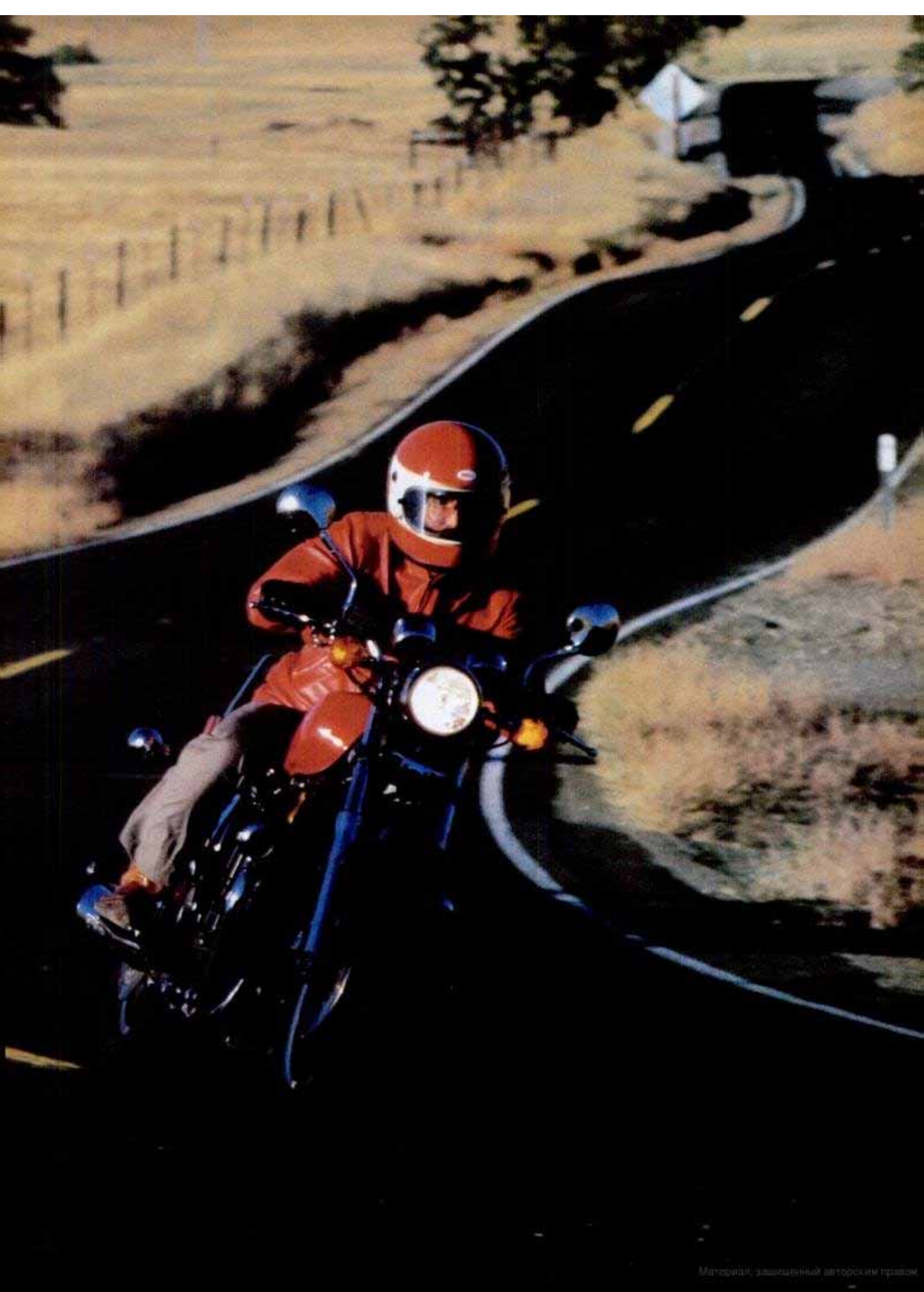
Welcome to the world of specialization. In an era that coddles surgeons who'll only operate on left clavicles, and chefs who prepare nothing but *soufflés*, we introduce you to motorcycling's specialized segment of American-style power cruisers.

Of course, these are a lot more

than single-purpose machines, but this muscle-bound quartet does have a clear mission—they're the magnum-force 2-wheel acceleration specialists. If cross-continent touring is your wish, look up a full-boat Gold Wing. You want only to grind down footpegs on the canyon roads? Sign up for one of a myriad of

road-race replicas offered in dealer's showrooms. But if you must have the maximum horsepower available in a boulevard bomber, you've come to the right place.

Fortunately, the similar performance goals of the four machines tested don't require four identical engineering approaches. The solu-



tions to power, packaging and appearance variables differ widely, from Harley-Davidson's traditional pushrod V-twin all the way up to Yamaha's radical 145-hp V4. Each factory has interpreted the desires of riders in a different way, so to best sort them out we headed for the foothills of the Sierra Nevada range, in California's Mother Lode country. With an ideal mix of smooth, winding roads and temptingly long straightaways, they are the perfect cruiser bike proving grounds.

The Brute Bike class, personified in this test by Yamaha's V-Max, Kawasaki's Eliminator, Honda's V65 Magna and the Harley Low Glide, is the pumped-on-steroids offshoot of the factory-custom machines that sell so strongly in America. At first, that group was devised to attract buyers who liked the low and lean "chopped" look, but wanted the reliability of modern Japanese cycles. The craze took hold, to the point that nowadays the look has been transplanted onto what we used to call Superbikes. Distinguishing features of the cruiser (and Brute Bike) breed usually include a low-slung, stepped seat; a nostalgic teardrop gas tank profile; fat rear tire and front forks styled to give the extended raked-out look. Definitely a member of this group, but unavailable from the importer for our test, is Suzuki's Madura, a 1200-cc V4 with all the right hardware.

Should you choose to make light of the All-American nature of this bike style, consider this: Three of our four test units were built in the U.S.A. Kawasaki assembles the Eliminator in Nebraska, Honda puts large



Kawasaki Eliminator is second fastest Brute Bike, behind the V-Max.

displacement machines together in Ohio, the two geographically straddling H-D's Milwaukee home office.

Harley-Davidson Low Glide

Sole surviving American motorcycle manufacturer and archetype for cruiser bikes of every kind, the Harley-Davidson name has become a synonym for tradition. Its products have been centered around V-twin engines since 1909. And with the company back in the hands of private owners (including the Davidson family), it continues to modernize at a respectable pace.

The Low Glide carries on the classic H-D lines, but a closer look reveals a number of contemporary touches—such as cast alloy

wheels, a Gates belt secondary drive, 5-speed transmission and rubber-mounted 1340-cc Evolution engine.

The Evolution powerplant carries on the long-revered 45° V-twin design with pushrod-actuated valve gear. With two valves per cylinder and hydraulic tappets, it's a slow-revving but super torquey engine. Advances over the older designs include aluminum cylinder barrels with cast-in iron liners, an electronic ignition and a diaphragm clutch.

The modern touches don't stop there. Chain drive to the rear wheel is gone, but hasn't been replaced by a shaft drive, either. Instead, a Kevlar-fiber-toothed belt does the work, silently and cleanly. In our time with the Low Glide it didn't require any adjustment, will never need lubrication and can be expected to last at least 20,000 miles.

No matter where we rode, the Low Glide attracted admirers of the classic H-D stance. The plentiful low-speed grunt of the big twin is ever-present, so the Harley feels quick, with roll-on power to spare. The distinctive sound is music to a bike-lover's ear, and the new engine proved absolutely drip-free, though it did have a penchant for ping-ing on 89-octane fuel.

One feature we tried was an optional performance suspension package. This unexpected perk includes dual discs for the front binders, 2-inch-longer inner front fork tubes, increased rear shock travel and extra cornering clearance. Seated comfortably in the saddle with the pullback handlebar and forward footpegs putting the rider in a proper cruiser position, the Low Glide still has a few rough edges that need attention. Our unit shifted with a disturbing clunkiness, and despite the dual front discs,

(Please turn to page 139)



V65's 116 hp carries the Honda to 11.29/119-mph quarter-mile times.

**YAMAHA
V-MAX**



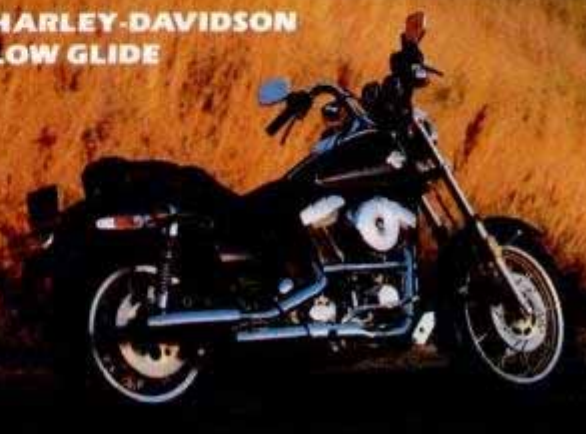
**HONDA
V65 MAGNA**



**KAWASAKI
ELIMINATOR**



**HARLEY-DAVIDSON
LOW GLIDE**



**YAMAHA
V-MAX**

LIST PRICE: \$5299
ENGINE: 1198-cc, dohc
16-valve 70° V4
HORSEPOWER: 145
TRANSMISSION: 5-speed
FINAL DRIVE: Shaft
WHEELBASE: 63.7 in.
WEIGHT: 624 lb.
FUEL CAPACITY: 4.2 gal.
¼ MILE: 10.86 sec. @
125.69 mph
GAS MILEAGE: 29.1

**KAWASAKI
ELIMINATOR**

LIST PRICE: \$4499
ENGINE: 908-cc, dohc
16-valve inline Four
HORSEPOWER: 105
TRANSMISSION: 6-speed
FINAL DRIVE: Shaft
WHEELBASE: 63.0 in.
WEIGHT: 573 lb.
FUEL CAPACITY: 2.8 gal.
¼ MILE: 11.22 sec. @
119.52 mph
GAS MILEAGE: 32.5

**HONDA
V65 MAGNA**

LIST PRICE: \$4048
ENGINE: 1098-cc, dohc
16-valve 90° V4
HORSEPOWER: 116
TRANSMISSION: 6-speed
FINAL DRIVE: Shaft
WHEELBASE: 62.8 in.
WEIGHT: 590 lb.
FUEL CAPACITY: 4.5 gal.
¼ MILE: 11.29 sec. @
119.20 mph
GAS MILEAGE: 32.3

**HARLEY-DAVIDSON
LOW GLIDE**

LIST PRICE: \$8149
ENGINE: 1340-cc, pushrod
4-valve 45° V-twin
HORSEPOWER: 68
TRANSMISSION: 5-speed
FINAL DRIVE: Belt
WHEELBASE: 64.7 in.
WEIGHT: 617 lb.
FUEL CAPACITY: 4.2 gal.
¼ MILE: 13.40 sec. @
96.25 mph
GAS MILEAGE: 43

WISH LIST

Now that you've taken care of everyone else, why not treat yourself to something special and expensive?

The great thing about the really great gifts for 1985 is you don't actually have to own them to get pleasure from them. We went window shopping for the greatest gifts this year and had a terrific time just dreaming about flying the world's most expensive private plane or driving the No. 1 car for sheer luxury. Every gift item on our list is available to anyone. All you need is money. And a little imagination.



Gulfstream III is the jet for you if you're the kind of person who likes to take weekend jaunts across the country. Gulfstream Aerospace of Savannah, Georgia, lists the basic plane for just \$12 million.



Formula 1 Baker Hovercraft from Hammacher Schlemmer (toll free 1-800-543-3366) is just \$6995 plus shipping. The hovercraft is powered by a 500-cc Yamaha engine.

Aston Martin Lagonda comes with a high-tech dash containing three CRT screens and a 4-cam aluminum V8 engine, all for \$150,000. It's from Aston Martin Lagonda, Greenwich, Connecticut.

Folding bike from Sharper Image (toll free 1-800-344-4444) has three speeds and is 28 pounds. It costs \$299 plus shipping.

© THE SHARPER IMAGE





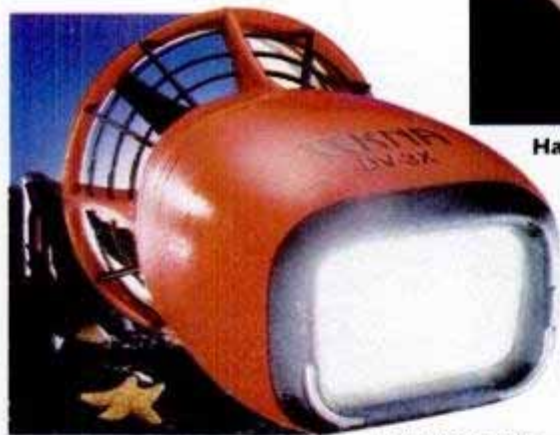
Long-EZ Model canard-wing plane can be built and flown for \$680, plus shipping. It's from The Sharper Image, and comes with radio controls and a Fox .45 model propeller engine.



Recliner is just right to relax in after a day of shopping. Extend the footrest for high or low vibration. Built-in panel has AM/FM and cassette player with stereo wraparound speakers. It costs \$1595 from The Sharper Image.

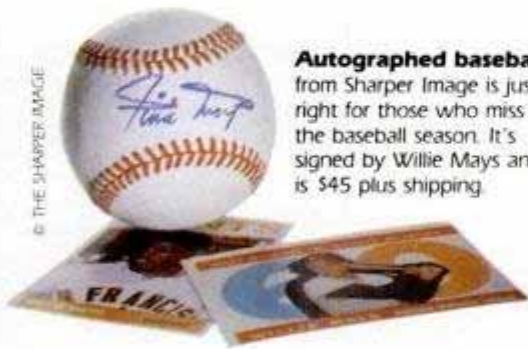


Hatteras 77 motor yacht lets you cruise the world for a paltry \$1.7 million. From Hatteras Yachts of High Point, North Carolina, it features a complete salon, gallery, enclosed pilot house, two guest staterooms, a master suite and a cruising range of 555 miles.



© THE SHARPER IMAGE

Tekna DV-3X undersea shuttle weighs 48 pounds and travels up to 2.8 mph with a maximum range of 3 miles. An argon gas headlamp lights the way for the \$995 unit. It's from The Sharper Image.



Autographed baseball from Sharper Image is just right for those who miss the baseball season. It's signed by Willie Mays and is \$45 plus shipping.

© THE SHARPER IMAGE

Infinity's Reference Standard III loudspeaker system weighs in at 1200 pounds and costs \$32,000 a pair. Combined, the 7½-foot stereo towers boast 108 drivers, including 12 bass woofers. Feeding the behemoth is Goldmund's \$15,000 Reference Turntable, fitted with a \$3500 Kiseki Lapus phonocartidge. You'll find them at New York's Lyric HiFi. **PM**



PM PHOTO BY STEVE FAY

Private SECRETARY

If you are tired of doing paperwork on the kitchen or dining room table and don't have the space or place for a full-size desk, this compact secretary could solve your problems. When the drop lid is down, this piece features a spacious writing surface, a convenient pencil drawer and seven open compartments for storing stationary and correspondence. But when you're done working, you can easily close the lid and in one step hide everything—especially the bills—from view. Then, the piece exhibits the clean lines that can complement nearly any decor and a shallow profile that can fit in nearly any room. But perhaps the most remarkable feature of this desk is the wood used to build it—curly maple. This species has a truly remarkable grain pattern that appears to change with the type of light in the room and the angle from which it's viewed. Because of this, the piece maintains a freshness and dynamism that will make it stand out tastefully from its surroundings.

Since the grain pattern is a major design element in the piece, it is important that the lumber chosen for the various desk parts be selected carefully. Intensity of curl as well as type of curl—wavy or interlocking grain—should be considered when matching boards to be edge-joined for the desk parts. The most interesting pieces should be reserved for those areas which will be seen the most: the drop lid panel and frame, drawer fronts, and case top and sides.

Once you've selected and matched the stock, cut the boards for the panels slightly oversized to allow for final trimming later. Then, edge-join the stock using glue and $\frac{1}{8}$ -in.-dia. dowels spaced 6 to 8 in. apart to aid in alignment. Use bar clamps above and below each assembly to achieve even clamping pressure and eliminate buckling of the joint. After the glue has set for 30 to 40 minutes, use an old chisel or scraper to remove excess glue squeeze-out before it hardens completely. While the glue dries on the panels, cut the remaining desk parts to their finished sizes and set aside. Leave the desk legs as $1\frac{3}{4}$ -in. squares for now; the taper will be

Made of solid curly maple, this stylish secretary desk can complement any room in the house.

BY NEAL BARRET



This compact secretary desk is made of solid curly maple and features a large utility drawer, a drop-down lid, a smaller pencil drawer and seven cubbyholes.

cut after the mortises are made.

Remove the panels from the clamps and use a cabinet scraper to smooth the surface of each. Use the table saw to rip and crosscut each panel to finished dimension. Lay out the angled cuts on the desk sides and use the band saw to cut to shape, being careful to cut on the waste side of the line. Use the belt sander to remove the saw marks from the cut edge.

Set the table saw blade at a 45° angle and use the miter gauge to make the mitered cuts at the top edge of each case side and at both ends of the case top. Set the saw at 18° and rip the bevel at the front edge of the case top and bottom.

The miter joints that connect the sides and top are reinforced with a blind spline. Use a router and a $\frac{1}{4}$ -in. slotting cutter (Bosch No. 85-520) with a 1-in.-dia. ball-bearing pilot to cut the spline groove. To accurately guide the router along the mitered edge of the panels, construct a 45° angled ramp as shown in photo No. 1.

To build this ramp, screw together two $1\frac{1}{2}$ -in.-thick boards which have been ripped at a 45° angle. With the panel in the workbench vise, clamp the angled ramp just above the mitered edge. Guide the router along this ramp to cut the spline groove. Note that the spline groove is stopped short of the

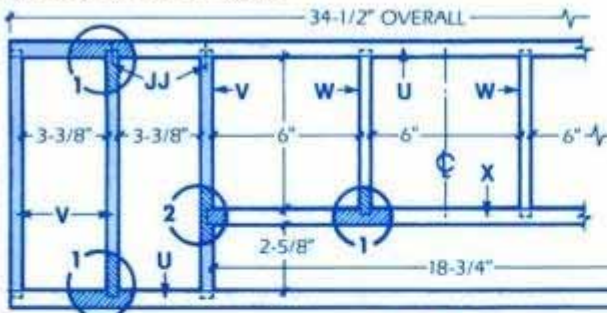
front edge of each panel. Be careful when starting and stopping the router in the groove to avoid damaging the workpiece. Since this operation requires using the router in a somewhat precarious position, practice the cut on a scrap board before attempting the final cut on the desk parts.

Next, clamp the case sides to the bench and use a $\frac{1}{4}$ -in.-dia. straight cutter and edge guide to rout the stopped dado in each side for both end tenons on the case bottom. Readjust the router to cut a $\frac{1}{4}$ -in.-deep rabbet on top and bottom on both ends of the case bottom panel. This forms the tenons that join the bottom to the sides. Use a dovetail saw to cut the shoulders at the front edge of both tenons so they will fit into

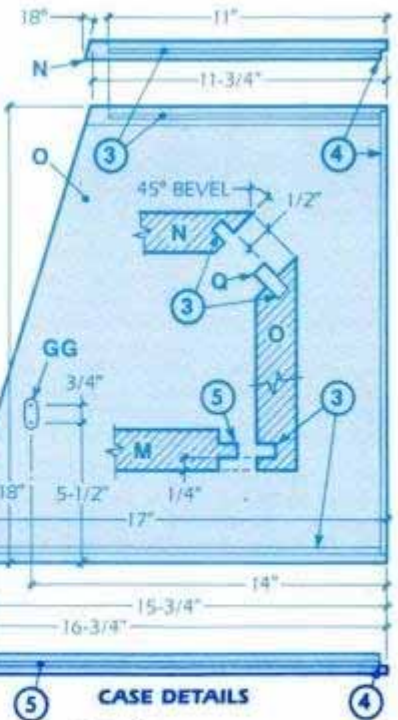
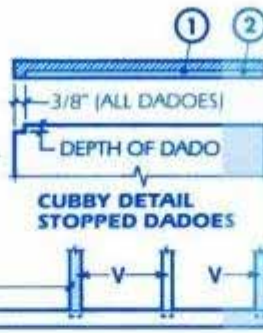
Black and white photos: Neal Barrett Technical art: Eugene Thompson
Color photo: Harry Hartman Photo stylist: Gabe Herrick



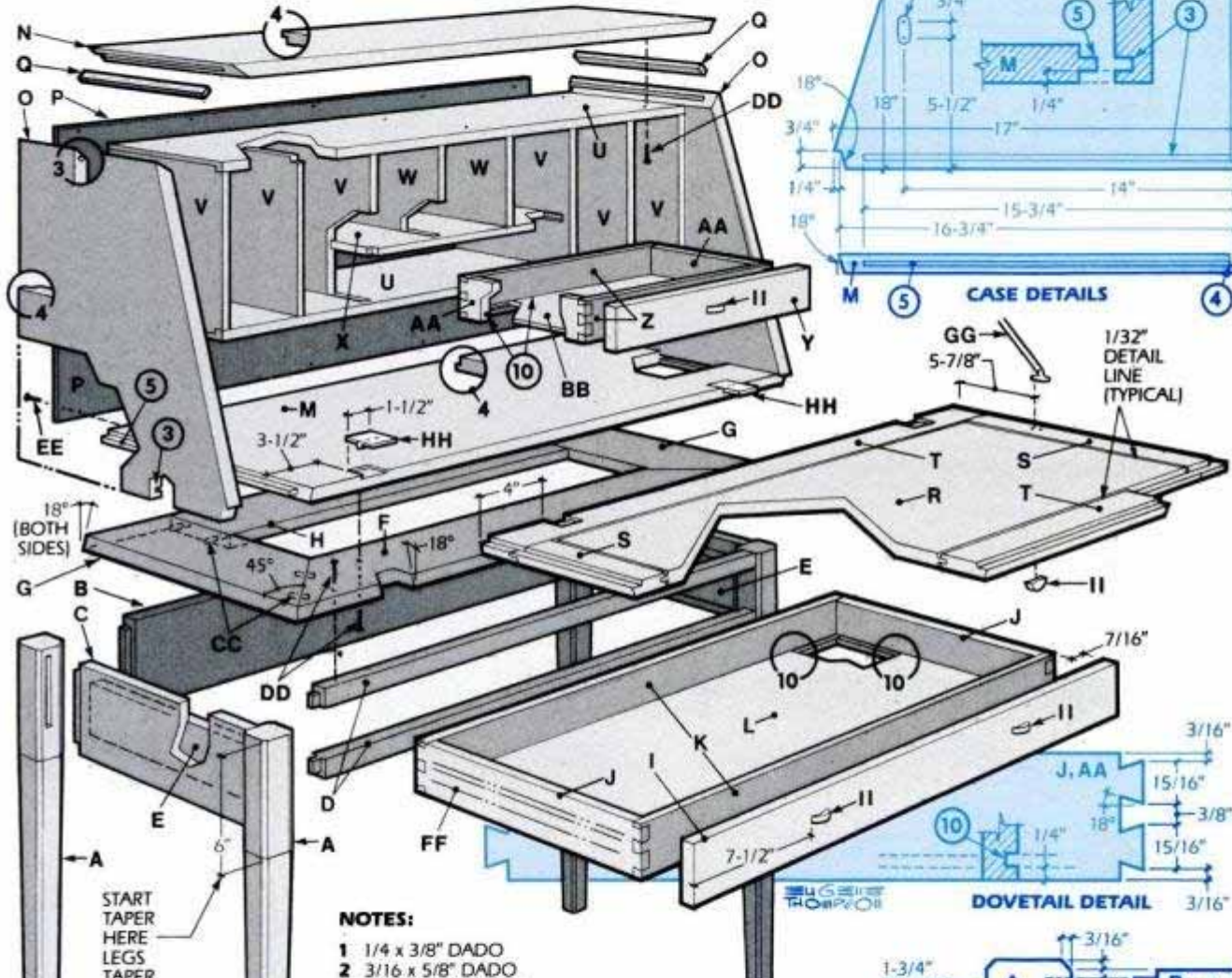
SECRETARY DESK



CUBBY ASSEMBLY



CASE DETAILS



START TAPER HERE
HERE LEGS
TAPER
TO 1"
SQUARE

3/16" x 45°
CHAMFER
(4 SIDES)

NOTES:

- 1 1/4 x 3/8" DADO
- 2 3/16 x 5/8" DADO
- 3 1/4 x 3/8" GROOVE
- 4 1/4 x 1/2" RABBET
- 5 1/4 x 3/8" TENON
- 6 1/4 x 1/2" GROOVE
- 7 1/4 x 17/32" TENON
- 8 1/4 x 1/2" TENON
- 9 1/4 x 5/8" RABBET
- 10 1/4 x 1/4" GROOVE



HINGE RECESS



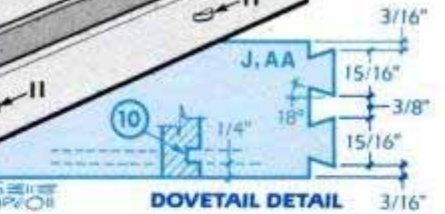
RAIL-S DETAIL



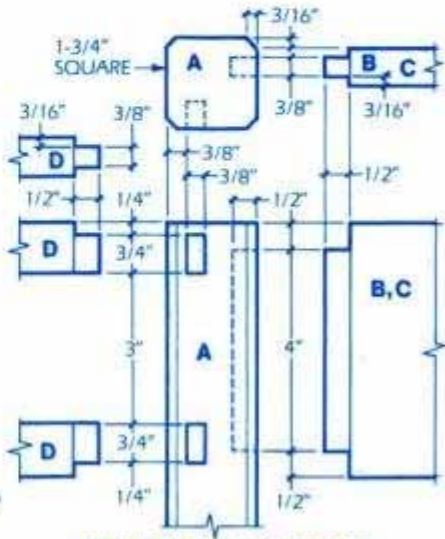
DROP-LID SIDE SECTION



DROP-LID FRONT SECTION



DOVETAIL DETAIL



LEG AND APRON DETAILS

TOOLING

1 Mason's bag—This roomy carry-all bag is designed to hold masonry tools, but its versatility has been discovered by many others including carpenters, plumbers and gardeners. The bag is made of heavy-duty No. 8 cotton duck formed to a 12-gauge steel frame. A tough leather bottom extends 3 in. up the bag's sides. The 6 x 15-in.-deep x 24-in. bag features leather carrying handles and straps with buckle closures. It's available at hardware stores and home centers for about \$49. For additional information, you should contact Bolen Leather, 903 S. Main St., Springfield, TN 37172.

2 Box of drawers—If you've been looking for a convenient way to organize hand tools and small parts, check out Plano's new 5-drawer toolbox (Model TDS865; about \$80). The 9½-in.-deep x 13¾-in.-high x 19-in. box is made of durable impact-resistant plastic. The four upper drawers are 1½ in. deep. The bottom drawer is 3½ in. deep and comes with three removable dividers. A front panel folds down and slides back to allow easy access to all five drawers. Look for the box at hardware stores and home centers. For details contact Plano Co., Box 189, Plano, IL 60545.

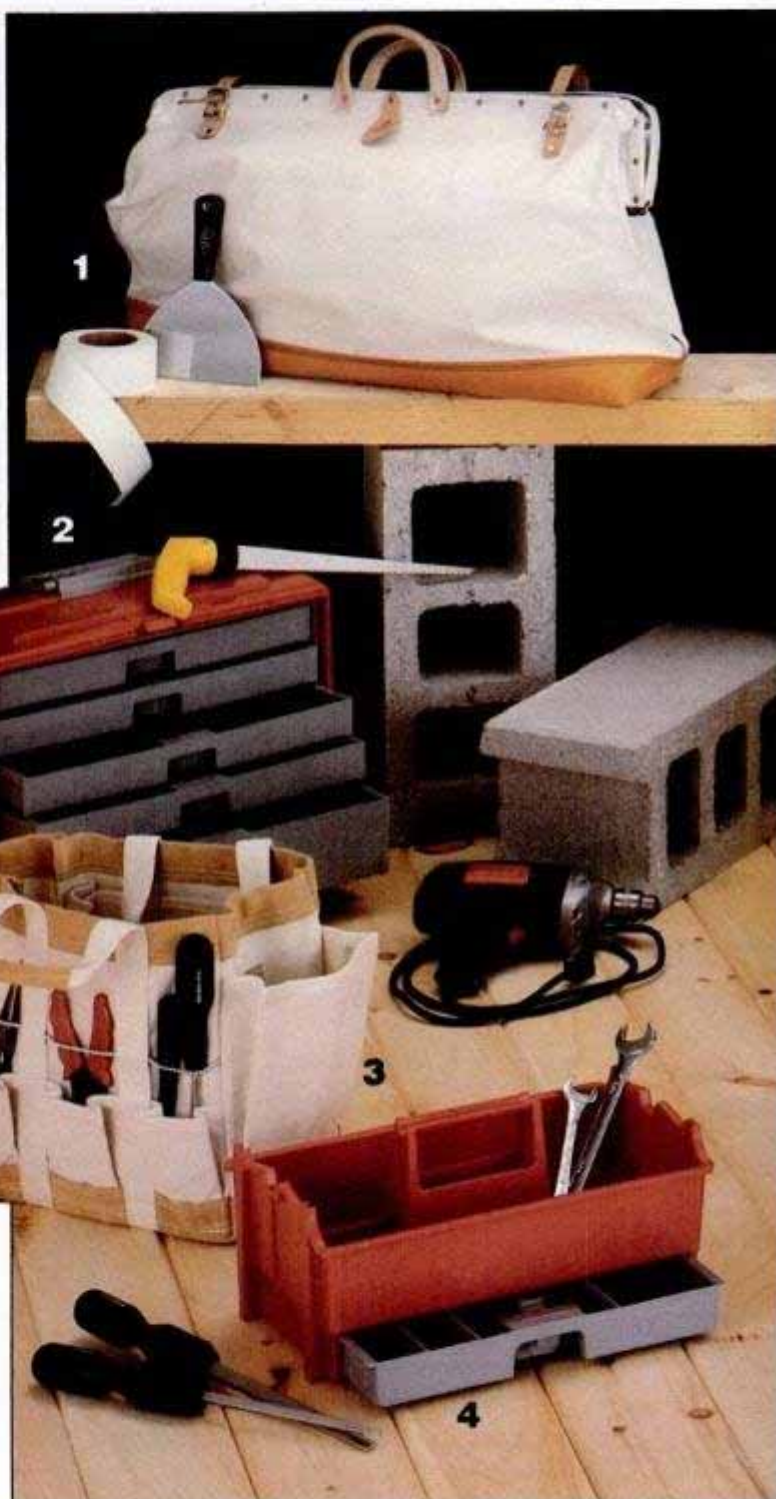
3 Versatile canvas carrier—Use this rugged, collapsible canvas bag to tote hand tools, books, handicraft supplies, garden tools and camping gear. The bag measures 11 in. wide x 11 in. deep x 15 in. and features a long-lasting suede bottom and 11 pockets—three on each side, one on each end and three roomy interior pockets. Above each side pocket is an elastic shock cord that steadies tall and unstable cargo. Called the Kangaroo bag, it's \$44.90 postpaid from Brookstone, Vose Farm Rd., Peterborough, NH 03458.

4 Tray tote—The Plano Tote-More tool tray features a handy 1½-in.-deep, 9-compartment small-parts drawer. A built-in latch holds drawer closed. Use roomy upper tray for holding home repair tools, cleaning supplies or hobby and handicraft provisions. The low-profile, polypropylene plastic tote measures 6¾ in. high x 9¼ x 14¾ in. and is designed so you can stack one Tote-More securely on top of another. The single-handled tote is at hardware stores and home centers for about \$9. Write to Plano Co., Box 189, Plano, IL 60545.

5 Leather apron—The convenience of carrying tools while having both hands free is provided by this bib-style leather apron. Made of heavy-duty yet comfortable suede, the apron has 11 large, easy-access pockets and two hammer-holding loops. The crisscross canvas shoulder straps pass through metal grommets and tie in the back. The straps can be adjusted for a comfortable fit and the wrap-around design protects your waist and hip area. The apron (model No. 430) is available at hardware stores and home centers for about \$38. For further details, contact McGuire-Nicholas Co., 2331 Tubeway Ave., Commerce, CA 90040.

6 Aluminum toolbox—Here's proof that a toolbox can be both functional and attractive. This all-purpose box is made from .050-in.-thick polished aluminum. The compact, yet spacious, box measures 10½ x 11¾ in. deep x 18 in. and weighs about 11 pounds. Located under its divided top are four fold-out tool trays that have 15 compartments. The 7¾-in.-deep bottom compartment holds larger tools. Features include steel corner protectors and chrome-plated brass latches. The aluminum toolbox is \$122.20 postpaid from Garrett Wade, 161 Avenue of the Americas, New York, NY 10013.

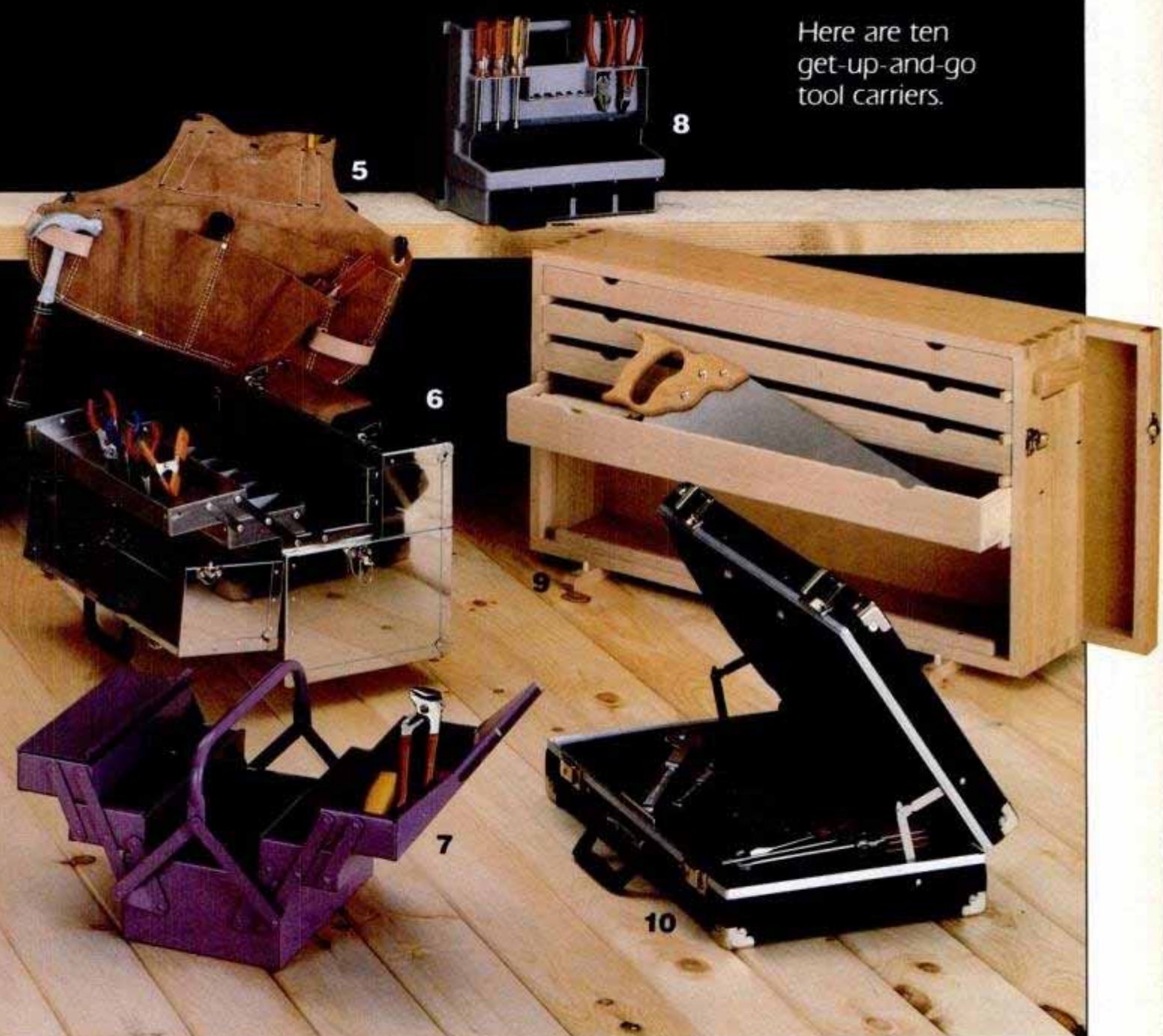
7 Compact storage—Measuring only 8 x 8 x 12 in., this versatile all-metal toolbox features four 1¾-in.-deep foldout tool trays and a 4-in.-deep central storage well. The center-mounted handle permits carrying the box even when it's opened fully. When the box is closed, the two lids interlock and the handle folds flat for storage. The toolbox accepts a padlock to deter unauthorized entry. All toolbox surfaces are painted to resist dirt and rust. The storage box (model No. B34518) costs \$22.90 postpaid from Edmund Scientific Co., 101 East Gloucester Pike, Barrington, NJ 08007.



8 Open-tray tote—Keeping your hand tools organized is easy with the Tool Mate II tote tray. Made of impact-resistant polystyrene, the lightweight tote has 22 tool-holding slots, five storage wells and a large, catch-all tray. It also has eight 1½-in.-deep x 2½ x 5-in. storage drawers for holding hardware, fasteners and other small parts. The tote measures 11 in. wide x 12 in. high x 14 in. The Tool Mate II is available at hardware stores and home centers for about \$15.50. For details and further information, you should contact Akro-Mils, 1293 S. Main St., Akron, OH 44301.

ALONG

Here are ten
get-up-and-go
tool carriers.



9 Craftsman's tool chest—The all-wood construction of this handsome tool chest has made it a favorite with carpenters and home woodworkers. The solid red oak cabinet is constructed with precisely fitted dovetail joints. The four hand-tool drawers are made of poplar. Store power tools in the large, open section located under the drawers. The removable lid's interior surface is used to hold handsaws. The tool chest measures 9 x 18 x 32 in. and comes finished in clear lacquer. It's available for \$219.95 postpaid from West Rindge Builders, Sunrindge Rd., Rindge, NH 03461.

10 Briefcase tool kit—This 60-piece tool kit comes with virtually everything you'll need to tackle home fix-up jobs. All the tools fit neatly in a 5 x 13½ x 19-in. vinyl-covered briefcase. The case has two removable tool boards with elastic straps that make tool organization easy. Some of the tools included are standard and metric socket sets, screwdrivers, 25-ft. tape measure, open-end wrenches, hammer, hacksaw and an assortment of pliers. The briefcase tool kit is available from Hammacher Schlemmer, 147 E. 57 St., New York, NY 10022, for \$299.50 postpaid. **PM**



Handsome and elegant, this Queen Anne stool is built with precarved legs and has a storage compartment.

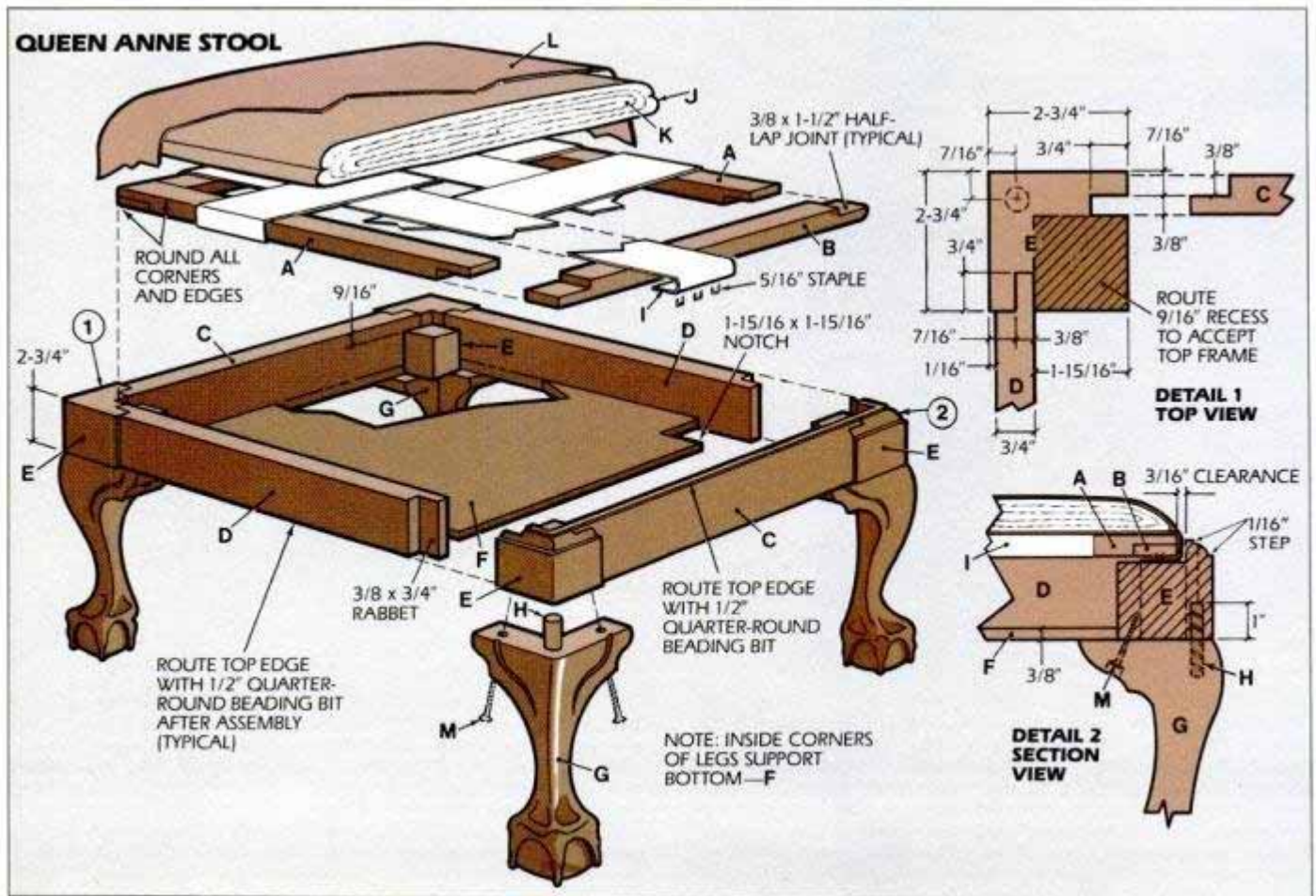
TEXT AND PHOTOS BY
EDWARD J. MCINTYRE

This eye-catching little footstool, comfortable for stretching out your legs yet strong enough to sit on, has room inside to conceal your knitting, your Smith & Wesson—or both.

The stool's side rails and corner blocks are solid maple. You may want to use a highly figured grain in the rails for added interest. Corner blocks are cut to size from a 12-in. length of 3x3-in. turning square that you can purchase milled on two sides. The precarved legs used here were available only in alder but they can be stained to match the maple. See the materials list for the turning square and legs.

Briefly, the construction procedures

Footstool Fit For A Queen



are as follows: Rails and corner blocks are assembled in a rectangle using groove and rabbet joints. The top inside portions of the corner blocks are then routed down $\frac{1}{16}$ in. to serve as rests for the upholstered seat frame. Next, a quarter-round beaded edge is applied to the rails and corner blocks using a router table. Legs are secured to the corner blocks with dowels and screws; the stool bottom mounts on the extended portions of the leg tops.

Cutting the parts

Begin by cutting or surface-planing stock to width for the corner blocks. Then, using a table saw with a dado blade, cut two $\frac{3}{8}$ -in. grooves the length of the stock, $\frac{7}{16}$ in. back from the adjacent sides. Make successively deeper cuts, alternating the two sides of the stock, until both grooves are exactly $\frac{3}{4}$ in. deep. After the grooves are completed, you should crosscut the corner blocks to size.

Cut the four rails to width and length and cut the rabbets at each end. The rabbets should fit the grooves snugly, with no gaps, since these joints will be exposed and visible.

Apply a light coat of glue to all mating-joint surfaces, and assemble the rails and corner blocks on a flat surface. Clamp with a web clamp or bar clamps. As you increase clamp pressure, make sure the tops and bottoms of all the

pieces remain flush. Check the assembly with a framing square before the glue sets, and reposition the clamps if necessary to bring it square.

After the glue is dry, use a router with a straight bit to remove the top $\frac{1}{16}$ in. from the corner blocks on a line with the inside of the rails. Clean out the corners with a sharp chisel.

Use a router table and a $\frac{1}{2}$ -in. quarter-round beading bit to cut the bead on the top edge of the rails and corner blocks. You will need to attach an extension to your router table fence that is long enough for the protruding corner blocks to run against for the full length of the cut.

Working with a piece of scrap wood,

MATERIALS LIST QUEEN ANNE FOOTSTOOL

Key	No.	Size and description (use)
A	2	$\frac{3}{4}$ x $1\frac{1}{2}$ x 19" maple (front/back seat frame)
B	2	$\frac{3}{4}$ x $1\frac{1}{2}$ x $17\frac{1}{4}$ " maple (side seat frame)
C	2	$\frac{3}{4}$ x $2\frac{3}{4}$ x $15\frac{3}{4}$ " maple (side rail)
D	2	$\frac{3}{4}$ x $2\frac{3}{4}$ x 17" maple (front/back rail)
E*	4	$2\frac{3}{4}$ x $2\frac{3}{4}$ x $2\frac{3}{4}$ " maple (corner block)
F	1	$\frac{3}{8}$ x $18\frac{1}{4}$ x $19\frac{3}{4}$ " plywood (bottom)
G*	4	9" precarved ball claw leg
H	4	$\frac{1}{2}$ "-dia. x 2" spiral hardwood dowel
I*	10 ft.	$3\frac{1}{2}$ " upholstery webbing
J	1	19 x 25" muslin bag
K	**	Cotton batting
L	**	Cloth cover
M	8	$1\frac{1}{2}$ " No. 8 fh wood screw

Misc.: $\frac{3}{16}$ " heavy-duty staples, wood glue, 120- and 220-grit sandpaper, penetrating oil stain, tung oil.
*Available from Constantine's, 2050 Eastchester Rd., Bronx, NY 10461.
**As required.

adjust the fence and router height to cut a bead with a $\frac{1}{16}$ -in. step along both the top and side of the piece; this will leave the rail sides with a smooth, rounded edge. Now, lower the router slightly for your initial pass along the perimeter of the stool. Then, for the final pass, return the router to its original set position.

Smooth the rail sides with a cabinet scraper. Then carefully sand the rounded portion of the rails using 220-grit sandpaper.

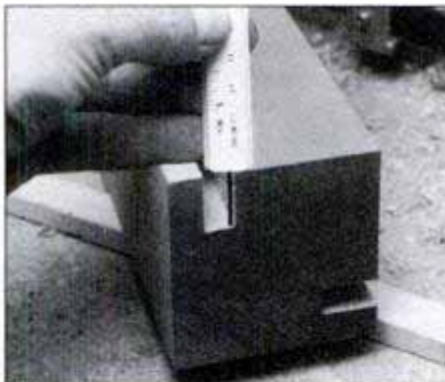
Mounting the legs

Sand the tops of the legs flat to remove any surface irregularities. Then hold each leg in place, square and align with the corner blocks, and scribe the leg positions on the corner blocks. Also mark the portion of the leg wings that extend under the rails. Since the rails are set back $\frac{1}{16}$ in. from the corner blocks, slightly round over the upper edges of the leg wings in this area to form a neat joint. Number each corner block and leg.

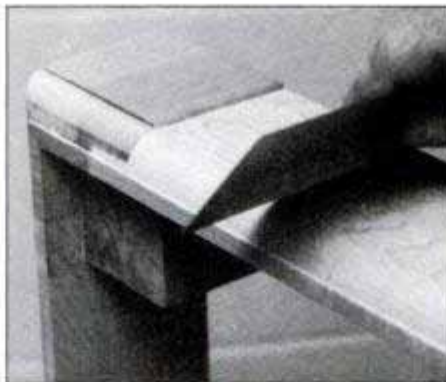
Using a drill press or drill guide, bore dowel holes in each leg with a $\frac{1}{2}$ -in.-dia. brad-point bit. Bore two $\frac{3}{16}$ -in.-dia. screw holes and counterbore for the screwheads.

Place a dowel center in the dowel hole and align the leg with the pencil line. Tap the leg with a mallet to mark the hole location in the corner block,

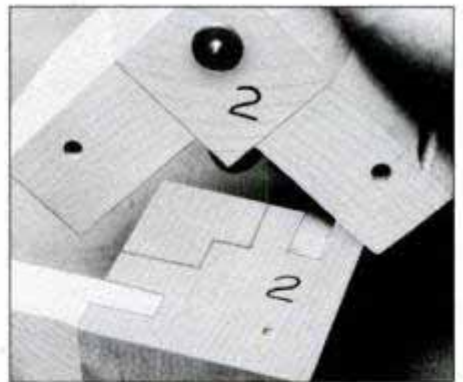
(Please turn to page 144)



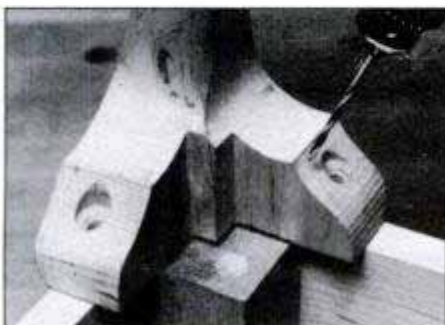
Cut grooves in corner blocks before cross-cutting the blocks to size. Then cut rabbets in side rails. Rabbets should fit grooves accurately, since joints will be exposed.



Before mounting legs, smooth rail sides with a cabinet scraper. Sand quarter-round bead with 220-grit sandpaper to blend the round and flat surfaces of the rails.



Mark leg placement on corner blocks, and number legs and blocks. Use a dowel center in the leg to locate dowel hole on frame bottom. Align leg and strike with mallet.



Before gluing, dry-mount leg with dowel. Extend screw pilot holes into corner block, to a depth of $\frac{1}{8}$ in. with a $\frac{3}{16}$ -in. bit, then to full screw depth with a $\frac{1}{4}$ -in. bit.



Muslin bag seams should be $1\frac{1}{4}$ in. wider than seat frame to allow for padding. Turn bag inside out before stuffing it with 3 or 4 double thicknesses of cotton batting.



Stuffed bag should be about $\frac{1}{2}$ in. larger than the seat frame. Fold the open end of the bag underneath and slap it to compress the batting and work it into the corners.



Our versions of these age-old delights are guaranteed to bring a Christmas smile. Clockwise from stocking, the **ring toss** develops future basketballers. **Jacob's ladder** flip-flops from the top, and the **flying machine** takes off with a swish of the palms. Our **beetle** can also be made by elves. The **top** is a finger-spinner, the **yo-yo** a sleeper. **Paddle boat** is powered by a rubber band, the **4x4 truck** by a push. The **smoke grinder** has no known use, but turn the crank and amaze your friends with the moving pistons. Make the **dancing bear** climb the strings.

Stocking Stuffers

Ten toys for tots you can make yourself.

BY ROSARIO CAPOTOSTO AND CLARK CASWELL

Each of these simple toys, made with scraps of lumber, can be built in about an hour. We used red oak for its hardness and interesting grain pattern. We even went all out and cut our own dowels from oak using a rounding-over bit in a router, as shown on page 124. However, you can use

any kind of wood for the toys, and buy ready-made dowels to simplify the job. For a nontoxic yet tough finish, we used wood bowl seal, available from Constantine's, 2050 Eastchester Road, Bronx, NY 10461. This finish accentuates the wood grain and provides a low-luster sheen.

TOP

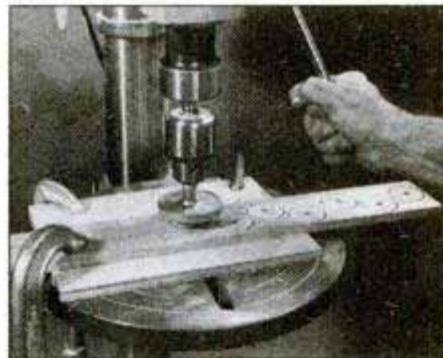
Cut the disk for the top from $\frac{3}{4}$ -in.-thick stock using a hole saw on a drill press, as shown. A $1\frac{3}{4}$ -in.-dia. hole saw, allowing for the saw kerf, forms a disk of about $1\frac{1}{2}$ in. dia. Cut a length of $\frac{1}{4}$ -in.-dia. dowel about 2 in. longer than required, and chuck it into the drill press. Hold a file to the end at 45° to form



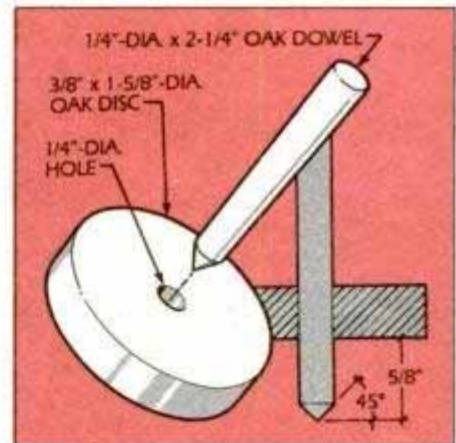
the point. Since the top must be well balanced, slide the disk onto the dowel and glue in place. Then, spin the assembly at about 1500 rpm. Hold a file to the edge of the disk and shave off wood until it spins true. Cut off the excess dowel, and blunt the end of the point slightly for a smooth spin.



Cut thin stock for the top, and for other toys, using a thickness planer. Or, you can resaw stock to thickness on a table saw.



Make the top disk and wheels with a $1\frac{3}{4}$ -in. hole saw. Run the cuts about two-thirds through. Complete from the other side.

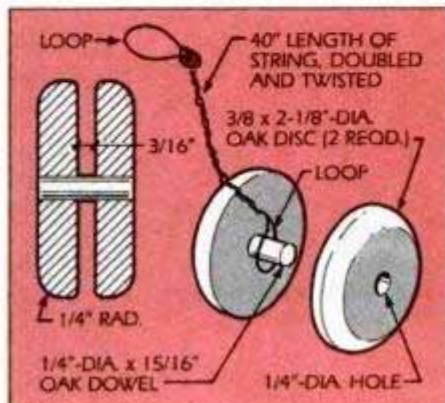


YO-YO

Cut the yo-yo disks with a $2\frac{1}{4}$ -in.-dia. hole saw. Shape and balance them as shown below, then reverse the halves and slightly round the inside corners. Lightly glue the disks to the hub. Use a piece of single-strand string about 7 ft. long. Attach one end to a stationary object and the other end to a



small screw eye chucked into a portable electric drill. Pull the string taut while twisting it tightly with the drill. Place the yo-yo at the center of the taut string, then slowly bring the two strands together. The yo-yo will spin and the strands will twist together, looped around the hub.



Temporarily join disks with $\frac{1}{4}$ -in. bolt, washers and nuts. Turn in drill press to shape and balance disks with a file.



To string yo-yo without a knot, twist a taut single strand with drill; place yo-yo at string's center and allow string to ravel.

Stocking Stuffers

SMOKE GRINDER

If you hope to grind smoke efficiently, you'll have to cut the parts for this toy accurately. Cut the base perfectly square, then tilt the table saw blade 11° and elevate it to make a $\frac{7}{16}$ -in.-deep cut. Set the rip fence $1\frac{1}{8}$ -in. from the blade, measuring at table level. Make four passes, rotating the block after each pass. This will form the angled walls of the dovetail grooves. Reset the blade upright and lower it slightly to maintain the $\frac{7}{16}$ -in. depth of the grooves. Make repeated passes, rotating the block and shifting the fence, to clear out the waste.

Cut the dovetail pistons so they will fit the grooves with very slight clearance; too loose a fit will cause erratic

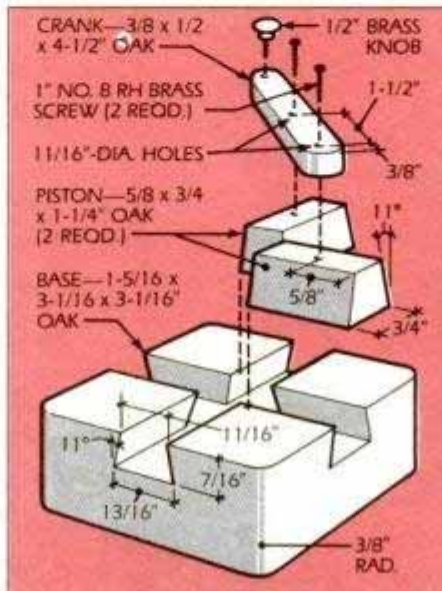


Cut grooves with saw blade set $\frac{7}{16}$ in. high and tilted 11° . Remove waste by making repeated cuts; clean out with chisel.



operation. Bore clearance holes for the screws in the crank. Then, mark the screw hole locations on the top center of both pistons. Crank and piston screw holes should align when the inside ends of the pistons are $\frac{1}{16}$ in. back from the intersection of the grooves. If the alignment is correct, bore the pilot holes in the pistons.

Apply the finish coat to all the parts before assembling them. When the finish is dry, rub candle wax in the grooves and on the contact surfaces of the pistons. Now you should screw the crank to the pistons so the parts can turn freely but without vertical play. Next, bore a pilot hole for the brass turning knob, and secure it to the crank.



After applying the finish, wax the grooves for smooth movement. Then, assemble the crank and pistons using brass screws.

JACOB'S LADDER

Solving the mystery of how Jacob's ladder flip-flops may seem impossible. If you assemble the toy as described, it will work; however, even after building it you may not know why.

Cut the seven leaves to size and round the corners to a $\frac{1}{8}$ -in. rad. Smooth the flat surfaces, and break all the edges slightly with a sandpaper block. Apply finish to the leaves, and allow it to dry thoroughly before you begin assembling the leaves by attaching the tapes.

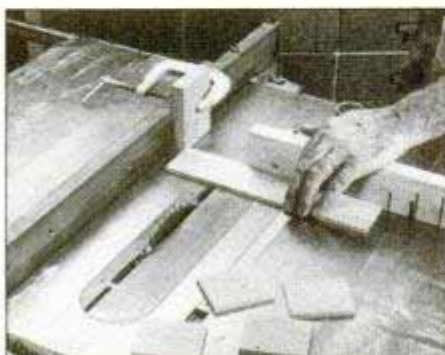
Begin assembly by gluing the center tapes, as shown in the photo, to six of the leaves. Attach just $\frac{1}{2}$ in. of the tape using white glue. Allow the glue to set up for a few minutes, so the tapes will not slide out of place. Then place a piece of wax paper over the glued ends and weigh



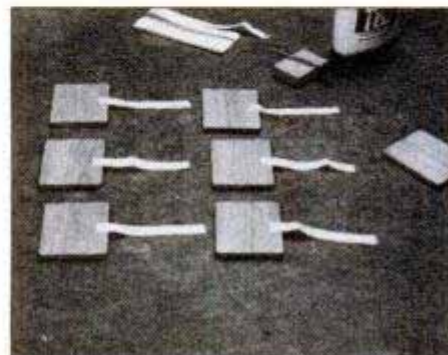
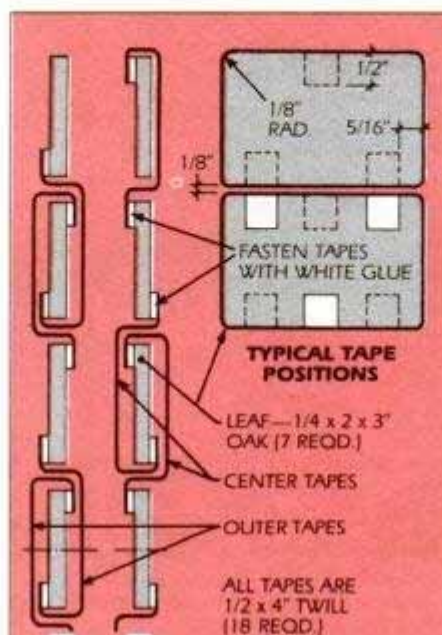
them down with a heavy book.

When the glue has dried, attach the opposite ends of these center tapes to adjoining leaves. Follow the layout for the center tapes as shown in the drawing. While gluing them, lay the leaves on a flat surface and place $\frac{1}{8}$ -in.-thick scraps of wood between them as spacers. Keep the tapes taut. When the glue has begun to set, remove the spacers, then weigh these ends down with wax paper and a book.

After the center tapes have been completely installed, you should attach the outer tapes using the same procedure as described above. This time follow the layout that is indicated in the drawing for the outer tapes. Use the scrap spacers while gluing both sides.



Cut leaves using table saw miter gauge. Clamp a guide block to the fence to prevent binding between fence and blade.



First glue center tapes to six leaves; assemble the leaves with these tapes, as in drawing. Then, glue outer tapes in place.

Stocking Stuffers

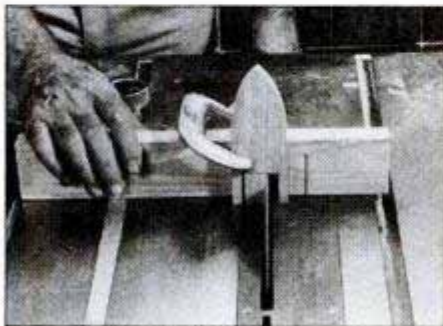
PADDLE BOAT

Cut and assemble the parts for the paddle boat following the grid in the drawing. The hull and rounded decks may be cut on a scroll saw or by hand with a coping saw. The notch for the paddle wheel can also be cut by hand, but repeated kerf cuts made on the table saw will produce a cleaner notch. Make the notch large enough so the paddle will have clearance on all three sides to spin freely. Slots cut in the hull for the rubber band

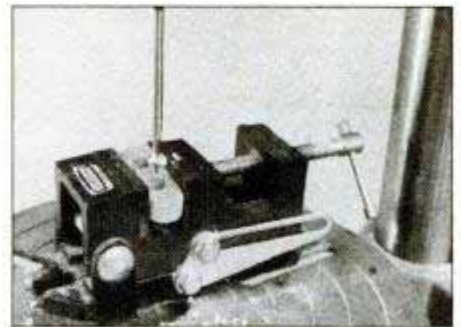
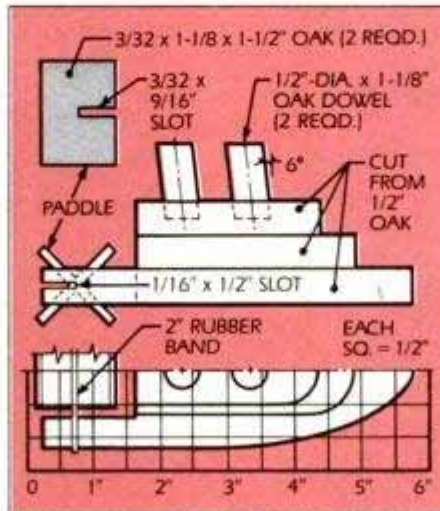


keep the paddle low in the water and allow the rubber band to grip the paddle tightly along its axis. Assemble the paddle wheel with an edge-lap joint. Use the table saw and miter gauge to cut slots into each piece equal in width to the thickness of the stock, and extending to the center of the paddle blades.

Use waterproof glue to assemble the parts. A quick-setting epoxy adhesive will do the job nicely. Mount the paddle with a 2-in. rubber band.



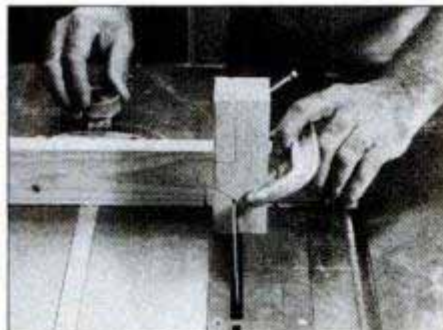
Clamp the boat hull to a miter gauge fence extension, and form the paddle wheel cut-out with a series of repeated kerf cuts.



Clamp the upper deck in a vise at a 6° angle. Bore smokestack holes 1/4 in. deep using a brad-point bit in a drill press.

4x4 TRUCK

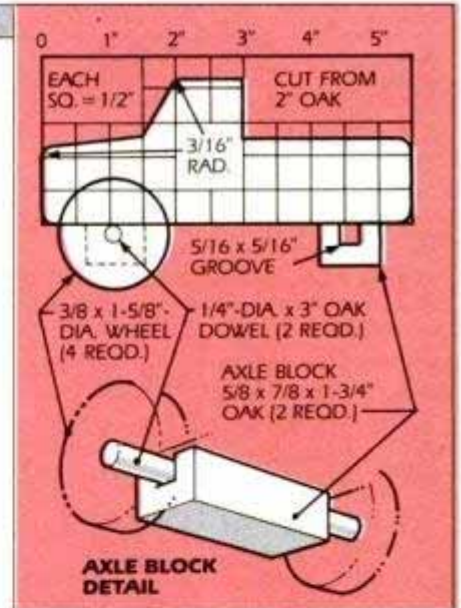
Glue two pieces of 5/4 stock together for the truck body. Shave off the excess on a table saw or jointer to obtain the required 2 in. thickness.



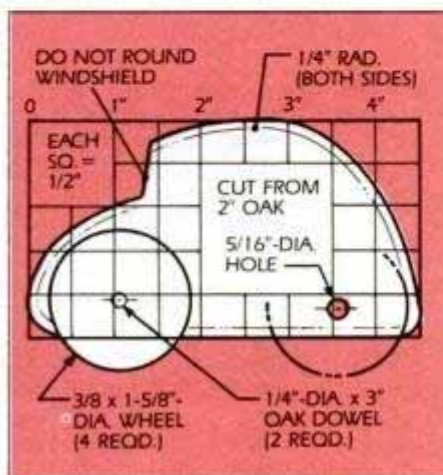
Tilt the saw blade 6° to cut the hood of the truck. Cut the windshield at a 30° angle. All other cuts are square.

Cut out the truck body on the table saw, with the work clamped to a miter gauge fence extension. Tilt the blade 6° to make the hood, and 30° to cut the windshield. Now you should make the 3/16-in.-rad. on the corners and ease all the edges, as shown in the drawing at the right, by sanding with a felt-padded sanding block.

Cut the axle blocks, and glue and clamp them to the body. Then, slide the axles in place through the grooves and glue on the wheels.

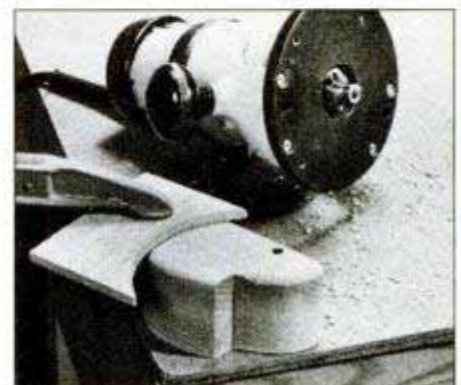


BEEBLE



Cut the contoured outline for the beetle on a band saw after making a 10° angle cut for the windshield on the table saw. Now, shape the edges of the car, except for the windshield, with a 1/4-in.-rad. rounding-over bit.

Bore holes for axles; then insert the axles and attach the wheels with glue. Note that the rear axle hole is approximately 1/8-in. lower than the front axle to give the car a forward rake.

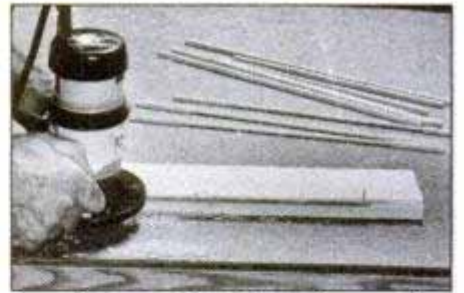
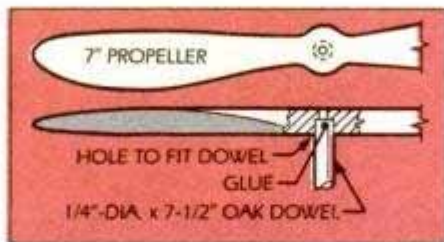


Round all the body edges except the windshield with a 1/4-in.-rad. rounding-over bit. Use a stop to avoid cutting the windshield.

Stocking Stuffers

FLYING MACHINE

You can make the launching dowel for this flying machine yourself, or use a ready-made dowel. Airplane model propellers, in various lengths, are available at most hobby shops. The flying machine can be any size, but the dowel should always be $\frac{1}{2}$ -in. longer than the prop. If the propeller hole is smaller than the diameter of the dowel, rebore the prop halfway through. Secure the dowel with a dab of glue.



To make dowels for this toy (or car axes), tack a $\frac{1}{4}$ -in. strip into a $\frac{1}{4}$ -in. rabbet; round edges with a $\frac{3}{16}$ -in. rounding-over bit.

RING TOSS

Cut the base for the ring toss using a circle cutter in a drill press, or you can turn it on a lathe. Round the top edge with a $\frac{3}{16}$ -in.-rad. rounding-over bit in a router. Bore a $\frac{1}{2}$ -in.-deep hole in the base for the center dowel.

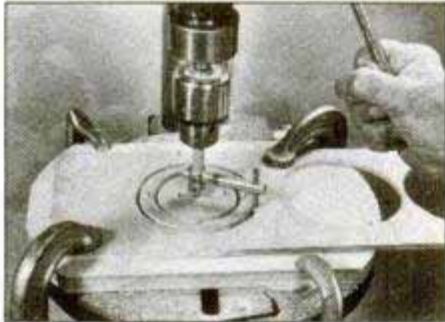
You can make this dowel the same way as shown in the photo, above right,



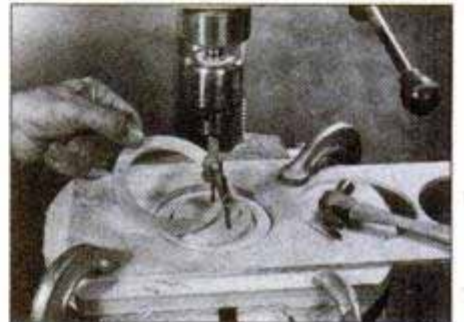
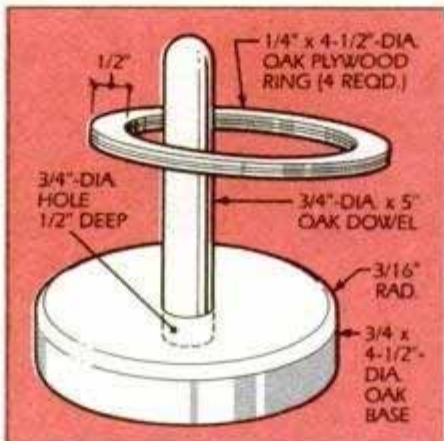
by using a $\frac{3}{4}$ -in. strip tacked into a $\frac{3}{4}$ -in. rabbet, then rounding the edges with a $\frac{3}{8}$ -in.-rad. rounding-over bit.

Round the top end of the dowel with sandpaper and a sanding block, then glue it into the base hole.

Cut the rings using a circle cutter in a drill press, as shown in the photos.



Cut the $4\frac{1}{2}$ -in.-dia. rings using a circle cutter in a drill press, with both ring and inner circle tack-nailed to a backup board.



Extend both cuts far enough into the back-up board to avoid beveled edges. Fill the tack-nail holes in the ring with wood filler.

DANCING BEAR

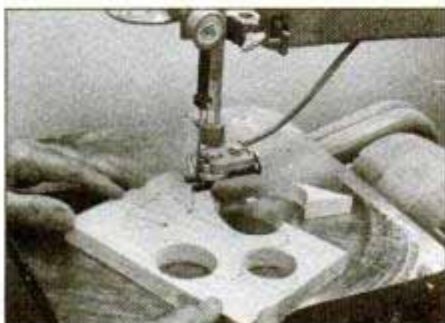
Draw the bear's outline on the wood using the grid below as a guide. Be sure to get the angle of the arms and the string holes through the hands properly positioned so the bear will operate smoothly.

Use a $1\frac{3}{4}$ - and a $2\frac{1}{4}$ -in.-dia. hole saw to preform the large radii in the outline. Bore $\frac{3}{16}$ -in.-dia. holes to form the inside curves for the neck. Then, cut the figure with a jigsaw or scroll saw. A half-round file will make easy work of smoothing out the saw ripples. Apply

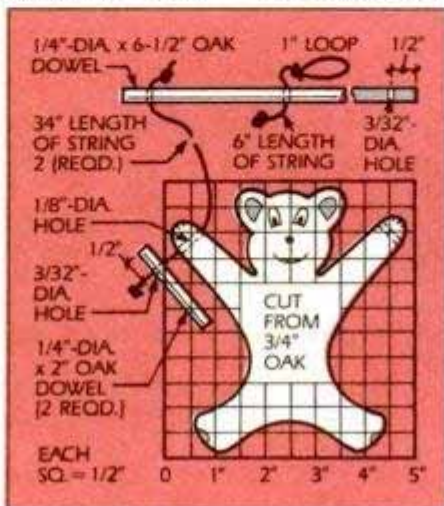


the finish to the wood, then draw in the face and other markings lightly with a pencil. Darken the lines with an indelible marking pen.

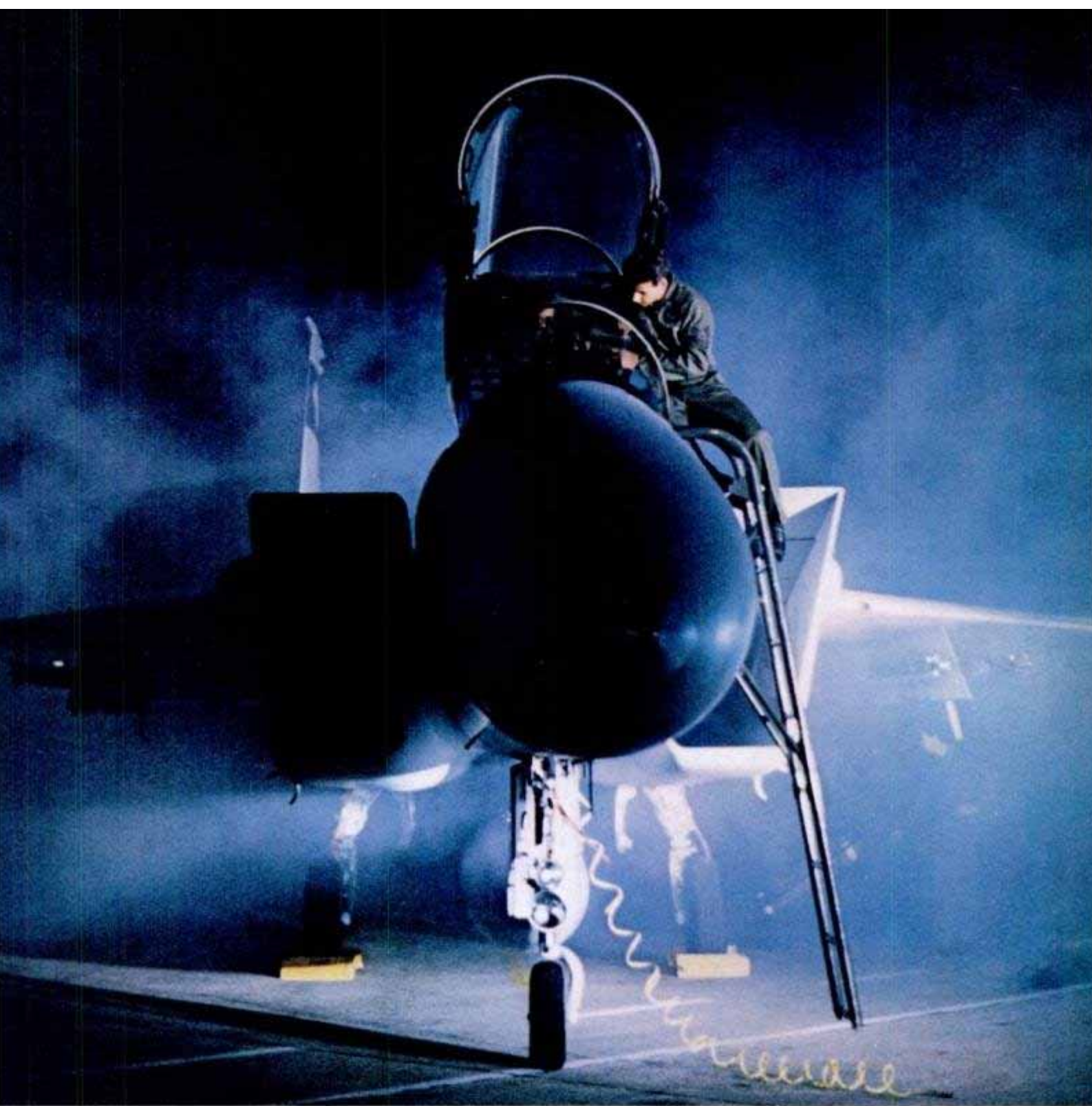
Thread each of the long lengths of string through a short dowel, then through one arm and one end of the long dowel. Knot each end of the strings. Knot a 6-in. length of string onto the center of the long dowel, and tie a 1-in. finger loop at the other end. To make the bear climb and dance, have someone hold it up with the finger loop, then pull the two short dowels down and outward. **FM**



Bore holes for the round parts of the bear's body, and between its arms and neck. Cut the outline with a jigsaw or scroll saw.



Bore string holes in the hands at right angles to the edges. The proper angle is necessary to make the bear climb.



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PRIVATE SECRETARY

(Continued from page 114)

edges with 120-grit sandpaper, followed by 220-grit sandpaper to remove the saw marks.

Using dado blades in a table saw, cut the tenons on the drop lid frame rails. Then, cut the groove on the inside edges of frame rails and stiles using a shaper, as shown, or dado blades in the table saw.

Next, using a $\frac{3}{4}$ -in.-dia. straight bit and edge guide, rout a $\frac{1}{4}$ -in.-deep \times $\frac{1}{2}$ -in.-wide rabbet around the top and bottom edges of the drop lid panel. This forms a tenon to hold the panel in the frame and creates a $\frac{1}{2}$ -in.-wide detail line for design interest.

Assemble the drop lid, using glue on the joints between rails and stiles only. The panel should not be glued in place so it can move with seasonal changes in humidity. Clamp the drop lid and check for square.

When the glue has dried, rout the rabbets on the inside edge of both rails and the upper stile. Then, set the table saw blade to an 18° angle and cut a bevel around the entire outside edge of the lid as specified.

To construct the cubbyhole insert for the desk case, begin by laying out the position of the stopped dadoes for the partitions in the top, bottom and middle divider. Use a $\frac{3}{8}$ -in.-dia. straight bit and router to make the cuts, followed by a sharp chisel to square the end of each

dado after routing. Again using a router, cut the stopped dadoes in the two vertical partitions to accept the middle horizontal divider. Again square the dado ends with a sharp chisel.

Next, cut the notches in the front edge of the cubby partitions to fit in the stopped dadoes. When satisfied with the joints, pre-sand all cubbyhole parts with 120-grit, followed by 220-grit, sandpaper.

To assemble the cubbyhole insert, apply glue to all dadoes and to the ends of all partitions. Slide each piece into position and use $\frac{3}{4}$ -in. brads to tack each in place. When the unit is assembled, check for square and set aside for the glue to cure.

Construct the drawer according to the dimensions in the plans. We used through-dovetailed corners, with an applied drawer face. (For step-by-step details on this technique, see *PM's Guide To Building Drawers*, page 106, May '85.) The pencil drawer uses no drawer slides, and must fit snugly in its opening in order to operate smoothly. Take extra care when measuring and cutting parts to ensure a proper fit.

For the base drawer, we used 14-in. slides that require a $\frac{1}{2}$ -in. side clearance on each side of the drawer. Cut filler strips for drawer slide attachment and fasten with screws to the inside face of the base side aprons.

Remove the case back and clamp the case to the worktable. Then, lay out the position of the mortises for the drop lid

hinges. Next, position the drop lid in front of the case and transfer the hinge mortise locations to the lid. Note that the lid mortises require an additional recess for the hinge barrel. When these cuts are complete, attach the hinges and check for proper operation of the lid. Apply the flap stays as shown in the drawing and again check for smooth operation. Now you should remove the lid and hardware for finishing.

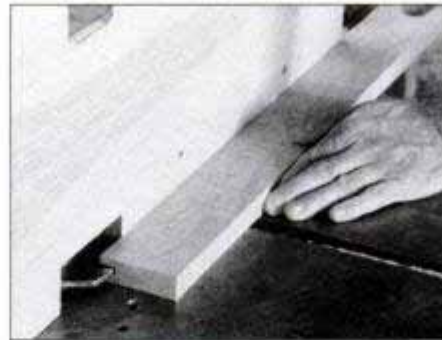
Slide the cubbyhole assembly into the case and temporarily clamp in position. Then, bore pilot holes and attach the assembly to the case top using screws. Next, attach the frame to the top of the base with screws, making sure that it overhangs the legs equally on the front and sides and is flush with the legs on the back.

Before finishing, sand the drop lid and case outside surfaces with 120- and 220-grit sandpaper. Finish-sand any other parts that were marred in assembly, then apply finish. We used three coats of Behlen's Brushing Lacquer, thinning each 50 percent with lacquer thinner. Allow each coat to dry at least four hours before applying the next coat. After the final coat has cured for 48 hours, rub the surface with 4/0 steel wool to achieve a satin finish.

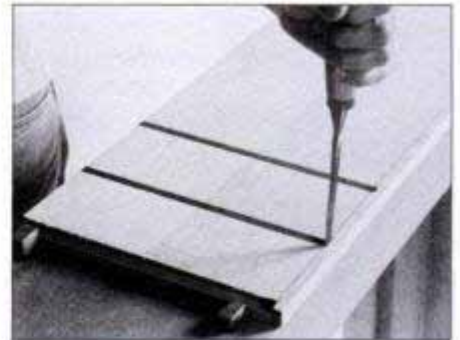
Complete assembly of the desk by reapplying the case back, drop lid and flap stays. Attach the case to the base frame with screws driven up from below. Apply pulls to the drawer faces and drop lid. **PM**



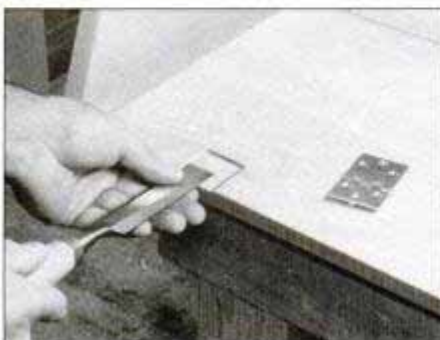
7 Glue, dowel and clamp base frame members together. Then, when dry, cut 18° bevel on front and side edges using table saw.



8 Cut panel grooves in drop lid rails and stiles using shaper and $\frac{1}{4}$ -in. grooving cutter (above) or dado blades in table saw.



9 Cut stopped dadoes in cubby assembly top and divider using router and straight bit. Square ends of dado using sharp chisel.



10 Using sharp chisel, cut mortise for drop lid hinge in case bottom first. Then, transfer hinge location to surface of lid.



11 After desk base is assembled, screw filler strip to both side aprons to support drawer slides. Countersink screwheads.



12 Position base frame over base so reveal is equal on sides and front. Then attach by driving screws through frame into aprons.

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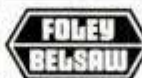
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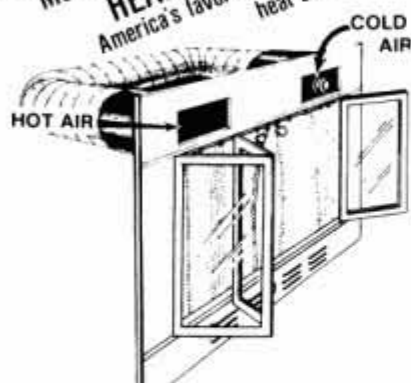
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THE KING OF COMETS

(Continued from page 91)

turers are stepping up their ad campaigns, suggesting that their instruments will project the comet watcher into the best viewing seat. A telescope may be useful in some instances, and if you ever considered buying a telescope for general star gazing, this would be a good excuse. A typical \$150 store-bought telescope will certainly let you catch glimpses of the moons of Jupiter and the rings of Saturn. But it won't give you any better view of Halley than a good pair of binoculars.

Why scopes won't work

The reason is light-collecting ability. Comets are relatively faint objects compared to planets and brighter stars. To see a comet better, you have to increase your light-gathering ability. Those store-bought telescopes are big on magnification of an object. But as you magnify an object, you spread the light across a wider collecting area and the object gets dimmer even while it is getting larger. Store-bought scopes magnify an object with a 60-mm lens, making it 75 times brighter than seen with the naked eye. A good set of binoculars (see *Science Worldwide*, page 10) has a 50-mm main lens system that ups light collection 70 percent.

"Locating the comet will be easier using binoculars than a small telescope because of the significantly wider field of view in binoculars," says Warren Morrison, one of four North American coordinators for the International Halley Watch. Still, Morrison and other experienced amateur astronomers readily concede that larger amateur telescopes—with 80-mm apertures or wider—will give a Halley watcher some advantage. Also, those who own SLR cameras will enjoy the advantage of a good telescope (see *How To Catch A Comet On Film*, page 91).

The best images of Halley will probably be taken from space and from large professional earth-bound telescopes. In mid-March (see position chart on page 91), five spacecraft will cross Halley's path. The most ambitious project involves two Soviet probes that will come within 6000 miles of the nucleus, which means they likely will go through the gas and dust of the outer coma. The Soviet probes are carrying an American dust-measuring device.

Japan's Planet-A probes also will arrive as a pair and will cut across Halley's tail. The European Space Agency is sending Giotto through the tail around the same time to capture photos and measure temperatures and chemical contents inside the tail.

NASA has put a special Halley watch satellite with a telescope into earth orbit

to observe from just above our atmosphere. And on earth, the International Halley Watch, working through NASA's Jet Propulsion Laboratory, will collect data for a report on the comet.

Recent work with other comets has confirmed much of the theoretical work on these visitors from the outer limits of our galaxy. In 1976, Comet West was the object of a massive international study. The spectral photograph on page 91 taken by the National Optical Astronomy observatories shows the banded distribution of gas and dust in Comet West's tail. Halley should be similar.

In the years ahead, when this massive investigation of Halley's Comet is digested, we will know more about ourselves as well as comets. These are the most primitive objects in the solar system, unchanged since the origin of the sun and planets, due to their lengthy stay in the cosmic icebox. It is already known that these pristine chunks of primordial ice contain abundant water and other simple compounds. Biologists suspect these were primary ingredients for life on earth.

What Halley has wrought

Halley's Comet already has an important place in the history of science. It was Isaac Newton's friend and benefactor, Edmond Halley, who first suggested that several comets recorded in history were actually the same object making long, elliptical orbits around the sun. Halley predicted the comet's 18th century appearance. He died before the apparition. But the comet was named after him by an international astronomical community that saw it as firm evidence favoring Newton's theories on how planets revolve around the sun.

The next major comet breakthrough came in 1950, when American astronomer Fred Whipple and Dutch astronomer Jan Oort worked out the basic composition of a comet.

Who knows what the massive Halley Watch will yield in the coming years.

If the comet bug bites you, we recommend some excellent books to help you catch and understand Halley.

- *Mr. Halley's Comet*, Sky and Telescope Publishing, Cambridge, MA, \$2
- *Halley's Comet: Mysterious Visitor From Outer Space*, Edmund Scientific, Barrington, NJ, \$8.95
- *The Comet Is Coming!* Viking Press, New York, \$6.95
- *The New York Times Guide To The Return Of Halley's Comet*, \$7.95
- *Comets: Swords Of Heaven*, by David Ritchie, Plume, NY, \$8.95
- *Halley's Comet*, Blackwell Publishing, New York, \$12.95
- *International Halley Watch Amateur Observers Manual For Scientific Comet Studies*, Sky Publishing, Cambridge, MA, \$9.95.



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CHEAP WHEELS

(Continued from page 95)

ue for money—what we've come to expect from the Japanese.

All of our testers commented on the especially convenient seat adjustment controls, as well as the especially dumb radio location on the floor. They thought the shifter was balky and the steering heavy, but not obtrusively so. Summed up one tester, "A nice, solid commuter car, but neither stylish nor fun to drive."

Chevrolet Chevette

General Motors has sold over 2 million Chevettas in the past decade, and despite the fact that it's really a pretty unsophisticated car, those buyers have more than gotten their money's worth. GM's previous small cars were the Corvair and Vega, both technically innovative, but practical disasters.

The Chevette was understandably made as conventional as possible—sort of a half-scale '66 Chevy Impala—and turned out to be the very definition of basic transportation. This is the only car in the group that you can imagine running 100,000 miles or more without problems cropping up, and it is also likely to be the cheapest car to maintain over that period.

It uses inexpensive shock absorbers,

not pricey MacPherson struts. The rear-drive configuration makes it easy to change the clutch, for example, or do major engine work. Parts are readily available at any Chevrolet dealer or local parts store. There simply can't be cheaper transportation.

On the other hand, the Chevette is very old-fashioned—it was when it came out 11 years ago—with uninspiring styling and an uncomfortable interior. It doesn't have performance in the usual sense. You can turn a corner, accelerate up to the speed limit or brake to a stop (after a fashion—our test car's rock-hard brakes required a very heavy foot), but the car does not perform the way a Honda does.

The concept of driving fun and a Chevette are simply not compatible. This is cheap transportation, designed for people who regard driving as a necessary chore rather than an enjoyable pastime. As one of our testers put it, "This is the orthopedic shoe of automobiles: It gets the job done, but it's not very pleasant to look at or to use."

Subaru Hatchback

Honda, Toyota, Nissan and Mitsubishi create a \$5500 car by leaving off the expensive doodads from their \$8000 cars. But the basic mechanism is the same. That makes them relative bar-

gains. Subaru's Hatchback, on the other hand, is a completely different car from its more expensive models.

The Hatchback's engine is the old 1.6-liter pushrod flat-Four that's been replaced by an overhead-cam design in the rest of the Subaru line. And the body is the ugly old-style Subaru shell superseded on other models.

The Subaru is as stripped as a car can be, including rubber floor mats. The interior is cramped, and the pervasive gray plastic/rubber has all the cheerful ambiance of a life raft. It's not a place where you'd want to hang out for very long. "No fun at all," wrote one tester, "even takes the fun out of functional."

Mechanically, the Subaru is a match for its styling and interior. Comments included: "gearbox is dreadful," "engine shows no discernible pulse or respiration, it's DOA" and "handling? I can't get going fast enough to tell." Summed up one disgruntled tester: "All the refinement of a 30-year-old British car with none of the charm."

Yugo

Malcolm Bricklin's Yugo is based on modified 1.1-liter, front-wheel-drive Fiat 127 components, and is assembled by Zavodi Crvena Zastava of Kragujevac, Yugoslavia. In Eastern Europe it's called the Yugo 55, and has been in

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production for four years. In the Zastava line, it's sized between a Fiat 650 and Fiat 128 built under license.

To put it as kindly as possible, our testers don't think that Zastava is quite ready to compete in the American market. Some of the things they had to say were: "This car makes a Fiat Strada seem like a BMW." And, "This car positively reeks of cheapness and corner-cutting. It will scream 'cheapskate' at its owner every day."

Malcolm Bricklin began his automotive career by importing Subaru 360s into the U.S. This micro-minicar was so ill-suited to our market that Bricklin was reduced to selling them to go-cart tracks as bumper cars. One fears the same fate for the Yugo.

Bricklin makes some clever comparisons to the Model T Ford and VW Beetle, both cheap, basic cars with a reputation for durability. However, Fiats have a terrible reliability record, and Fiats built in Eastern Europe (like the Russian Lada) have been even worse. As one tester summed it up: "If the Yugo is indicative of Communist Bloc quality, I hope their bombs are as good as their cars."

The Yugo is a tiny car: 5½-footers found their heads rubbing the roof in the back seat. The driving position features a laid-back, bus-like steering wheel and pedals cramped close to the seat. Move the seat back and you can't reach the top of the steering wheel! The shifter is balky, the engine roars at almost any speed, and the whole car is generally cramped and uncomfortable.

"If I had to commute to work every day in this thing," said one tester, "I'd wind up hating my job."

Conclusion

Malcolm Bricklin has chosen to enter what is probably the toughest market segment in the world with a car that is not very competitive except on price. There seems to be no way any car company can compete with the Japanese when it comes to building basic transportation. If Ford, General Motors and Chrysler haven't been able to do it, Zavodi Crvena Zastava isn't about to.

Honda's Civic is so good it's simply unbeatable, no matter what criteria you use to judge it. If your Honda dealer is out of cars, then the Sentra, Tercel or Colt/Mirage makes a satisfactory substitute. If you just want to have cheap fun, buy a Chevy Sprint. And if you just need something to drone to work in for the next 10 years, a Chevette will get you there as cheaply as possible. If you must have a Subaru, spend the money and buy the excellent DL sedan. As for the Yugo, skip desserts, and you'll save the difference between the monthly payment on a Yugo and a Honda. You don't need those calories anyway. **FM**

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UP THE CREEK

(Continued from page 98)

ed in the canoes that we reviewed.

Again, Wabash Valley has produced perhaps the most radical flatwater configuration. Its asymmetrical hull is characterized by a small (practically hip-width), low-windage cockpit and extremely sharp tumblehome in the area of maximum beam. The brand-new Mad River Tempest adopts a similar cross-sectional shape in a slightly more symmetrical hull form. Sawyer and Memphremagog produce solo racers with clean, fullish lines. The Sawyer Shock Wave also has a pronounced tumblehome and uses the same bulk-heading system that appears in the Sawyer Legend.

We included the Curtis Dragonfly with several of the flatwater race boats because its design was originally intended to be used for whitewater competition. The Dragonfly makes a superb personal cruising canoe, however, and represents one of the most efficient dual-purpose canoes we paddled. You can satisfy your competitive urges with a run through the rapids, then split for an outing with your camping gear. Its spritely rough-water handling and load carrying ability seems to do it all.

'Personal' canoeing

Don't let the apparent simplicity of our batch of solo cruising canoes fool you. The Wabash Valley Merlin, Sawyer Starlight and Mad River Pearl are all



Solo cruisers tote an amazing amount of gear yet retain lively handling. Left to right: Mad River, Sawyer, Curtis, Wabash Valley

manufactured using vacuum-bagged Kevlar composite and each costs approximately \$1000.

Of the four solo cruising canoes we paddled, however, the brand-new Mad River Pearl was the lightest, easiest paddling (though tippiest) and most innovative. Mad River's owner/designer Jim Henry has incorporated several interesting features in this little gem. The foam saddle is molded from the real thing, creating a very secure seating arrangement. The Pearl also comes with translucent gauges molded in the hull, which makes it easier to position loads.

Still, price is an important element, and we found that for the money the Curtis Vagabond is one of the toughest, least expensive canoes we reviewed.

Overall, paddling these various types of canoes invited the following rumination. What do you get when you take a thousand-year-old design and introduce it to high-tech synthetics? Nothing less than a melding of two distinct eras in human history—the Space Age, of course, and that ancient period when North American Indians ranged the land. As you paddle out of the rough stuff and enter flatwater, astronaut and native American finally shake hands.

Welcome, canoeing, to the future. **PM**

CANOE SOURCES

Blue Hole Canoe Co., Sunbright, TN 37872
Coleman, 250 N. St. Francis, Wichita, KS 67201
Curtis Canoes, P.O. Box 188, Hemlock, NY 14466
Mad River Canoe Co., P.O. Box 610, Waitsfield, VT 05673
Memphremagog Canoes, P.O. Box 466, Newport, VT 05855
Old Town Canoe Co., 58 Middle St., Old Town, ME 04468
Outdoor Endeavors, 840 Water St., Fitchburg, MA 01420
Sawyer Canoes, 234 S. State St., Oscoda, MI 48750
Wabash Valley Canoes, 616 LaFayette Ave., Crawfordsville, IN 47933
We*No*Nah Canoes, Box 247, Winona, MN 55987
White, 58 Middle St., Old Town, ME 04408
Special thanks to Wilderness Outfitters, Amherst, NH, for technical support in preparation of this article.



For paddling on a budget, try a low cost entry-level tandem. From left: Coleman, Mad River, Old Town, Nature Bound.



The big trippers use high technology in conventional hull forms. Left to right: We*No*Nah, Sawyer, Memphremagog.

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COMPONENTS VS. SYSTEMS

(Continued from page 102)

comparing the cost of a one-brand system to a *similarly equipped* mixed-brand system leaves no doubt that for the average buyer, one-brand packages are a bargain.

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Marantz AV-70: separate remotes for TV, VCR, audio receiver.

table, cassette deck with Dolby C noise reduction, 3-way speaker system with 12-in. bass woofers, a Compact Disc player and a cabinet.

A mixed-brand system consisting of the least expensive, similarly featured components we could find would easily cost more than \$1800 at suggested retail prices (you can expect discounts of 20 percent or more). For example, we could buy a Kenwood KA-880SD 100 watt-per-channel integrated amplifier (\$335) and AM/FM stereo quartz-controlled digital tuner with presets (\$235); Technics SL-BD2 semi-automatic belt-drive turntable (\$100);

Onkyo TA-2017 Dolby C-equipped cassette deck (\$165); Sanyo CP660 Compact Disc player (\$300); and Acoustic Research 58BX speakers (\$720 a pair), which have three cones including a 12-in. bass woofer, just like the Pioneer's. The total price for the components is \$655 more than Pioneer's similar rack system, and you haven't bought furniture!

Such numbers games with most any one-brand system will yield similar results, and the obvious conclusion is that you get a lot for your money with these modern interpretations of yesterday's console stereo.

The problem is, we've added up the prices of components without considering whether you need every one of those items in the particular rack system. Furthermore, can you be certain that each component in a one-brand offers the technical performance and

specific features that are best for you?

It's the inflexibility inherent in the one-brand approach that is its single greatest liability. For example, the Pioneer system cited includes a CD player, an item many people might find they can do without. Or, maybe you are just starting to get involved with music, haven't built up an extensive LP collection, and so might prefer a system that includes a CD player but not a turntable. If you rarely listen to radio, why pay for a tuner, especially one with multiple station presets? Conversely, per-

haps you're a heavy radio listener, but live in an area where clear reception is a problem. You might want to invest in an exceptionally good tuner, but make do with less power than the high-wattage amplifier that comes in a one-brand system.

Equalizers, meanwhile, are nearly univer-

sally in one-brand systems, yet they are probably the most frivolous of components. Pioneer offers a second \$1200 system that replaces the CD player with an equalizer. This gesture toward freedom of choice only drives home the inflexible nature of one-brand systems: The manufacturer, rather than the customer, has decided to exchange a CD player for an equalizer.

Another example: Dubbing decks that handle two cassettes at a time are nearly as common as equalizers in packaged systems, and they cost more to



Technics AV-500: integrated remote control of audio, video.

manufacture than single-transport decks. If you've no need to make copies of cassettes, why not spend less money on the deck? Or, use the same amount of money to buy a conventional deck with more features, such as an additional playback head so you can monitor recordings as they're being made, or a better noise reduction system, such as Dolby C or dbx.

Finally, consider the loudspeakers, and whether you really need an equipment cabinet. Every one-brand comes with a rack, but if you intend to put your

components elsewhere, why pay for furniture? The speakers that come with one-brand systems usually are large, floor-standing towers with multiple cones. A smaller, 2-cone bookshelf speaker can belt out just as much sound, and give greater freedom of placement.

Having outlined the case against one-brand systems, the case for separate components comes down to this: You're free to assemble a system with specific features that suit your needs—nothing more, nothing less.

Indeed, that was the very argument used some 30 years ago by the proponents of separate components, which were just then being introduced as alternatives to the monstrous console phonographs of the time. The only difference then was that consumers were also wooed with the argument that it's best to buy components from specialty manufacturers. That is, a turntable from a company that specializes in turntables, and so on.

Today, with the exception of loud-speaker companies, specialty manufacturers are hard to find. Most manufacturers make and sell a full line of components. Still, some manage to offer more for your money with certain models in certain product categories.

For example, one company might offer a particularly feature-packed cassette deck at a reasonable price, or another brand might offer a low-priced amplifier that's a stand-out performer when compared against competing models. Also, you can generally expect loudspeakers from a speaker specialty company to have better technical specifications than most of what comes in an electronics specialty company's one-brand system. Finally, never forget that in a competitive market such as electronics, a variety of factors can cause the price of one component to dip far below the price of similar components from other companies. These include sluggish sales, new models arriving with old models still in inventory, and special deals for large-volume retailers.

Remote operation

You might wonder if there's anything the mixed-brand approach can't offer, besides the undeniable shopping convenience the one-brand route represents. Well, yes there is—remote operation of different-brand components through a single control.

There are individual components that can be operated by one remote, but they've got to be all the same manufacturer. Aiwa, Sony, RCA, Kyocera, Bang & Olufsen, Revox and others offer such an option. But at present, the only way to remotely operate components of different brands through a single handset is by using General Electric's recently

(Please turn to page 138)

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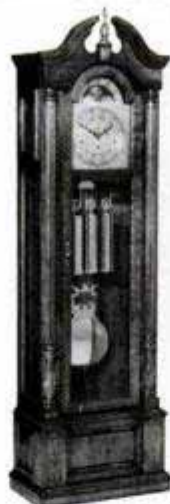
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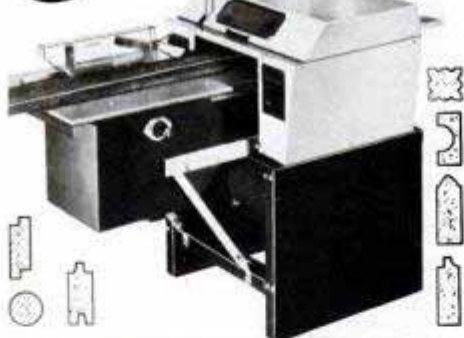
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COMPONENTS VS. SYSTEMS

(Continued from page 135)

introduced Command Central, which reads and stores the infrared code contained in the handset of any remotely operable component. The catch is, only components that already offer remote control can be operated by the GE unit. There are plenty of remote-control audio receivers, CD players, TVs and VCRs, but the number of remote cassette decks and turntables is small.

On the other hand, one-brand systems in which every audio and video component can be remotely operated through a single handset are coming fast and furious from the major makers of audio and video components. Lead by RCA's Dimensia series introduced late last year, such miracle systems also are available from Pioneer, Sanyo, Technics and others. So if the ability to operate your entire media room from the comfort of your favorite recliner is important, pick a one-brand A/V system.

By the way, not all one-brand A/V systems feature a universal remote control. Of the nearly 50 systems on the market, most simply mate one of the company's audio rack systems with its TV and VCR, and each element might have its own remote control.

More to consider

Arguments for and against the one-brand A/V approach remain the same as with audio-only systems, but there are a few more considerations.

If you already own a TV set equipped with the audio outputs needed to mate it to an audio system, and you're happy with its size and performance, then you don't really need the TV in the one-brand audio/video system. Even if your TV lacks audio outputs, but it is otherwise adequate, you might do better to invest in a new audio receiver that has a built-in stereo TV tuner in addition to the usual AM/FM radio bands.

Consider too that most one-brand A/V packages come with a 25-inch TV, but you might be just as content with a 19-inch set. Also, the VCRs that come with one-brands don't always have top-end features such as hi-fi stereo recording, built-in stereo TV tuner, or multiple heads. If you're picky about picture quality when using VCR special effects such as freeze-frame, you might want a 4-head machine, a rarity among one-brand VCRs.

So which approach—one-brand or separate components—is right for you? The decision is yours, but if you've bought a car recently, think about this: Are you happy with the leather seats that came with the options package you chose, or would you have rather spent the money on a set of alloy wheels and low-profile tires? **PM**

BRUTE BIKES

(Continued from page 108)

stopped unconfidently. Loafing along on the highway, engine vibration is present, but not disturbing.

What is hard to reckon, though, is the Low Glide's price tag. At \$8149, it's almost \$3000 more expensive than the next closest Brute Bike.

It makes no sense for the simplest machine to also be the priciest, but emotionally it manages to make an irresistible draw for a whole strata of the riding population.

Honda V65 Magna

Of all the entries in the Brute Bike class, the big bore Magna is closest to Harley-Davidson's original cruiser concept. With a deeply stepped saddle for low slung riding and long, backswept handlebar, this Honda is a boulevard blaster that packs the punch of a WBA heavyweight.

Centered around the smooth-as-glass 90° V4 we know and love from the sporty Interceptor series, this 1098-cc version packs a 116-hp wallop. That power level is no surprise, but the silky running characteristics attributable to the perfect primary balance of the 90° cylinder positioning is a shocker—you can run it right up to the 10,000-rpm redline with no indication from noise level or vibration that the engine is at the end of its operating range.

The front fork is air-adjustable to suit riding conditions and rider size, and rear shocks offer adjustable rebound and compression damping. Honda's TRAC antidive system is fitted at the front end to control fork compression under braking.

Low-maintenance operation is one of the Magna's long suits, thanks to a self-adjusting, hydraulically actuated clutch, automatic cam chain tensioners and shaft drive. To help keep the V65 in the hands of its owner, Honda supplies a fiber-optic locking cable system.

Clean and convenient as it is, that shaft drive feature is one that's hard to come to terms with. On the road, the bike feels darty and twitchy, making smooth cruising at high speeds a full-attention proposition. Yes, the Magna will go around corners fast, but you'll be holding your breath in every turn.

Few other faults can be found—the footpegs are positioned far forward and widely staggered, so most of our group found themselves dangling feet in mid-air when pulling away from a stop. Once the bike got up to speed the story was different. Click the gearbox into the overdrive SIXTH gear and lay back for relaxed cruising. Drop it back to FIFTH and it'll even keep up with the much faster V-Max in a 50-mph roll-on race.

(Please turn to page 142)

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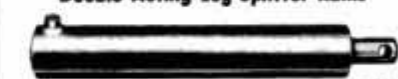
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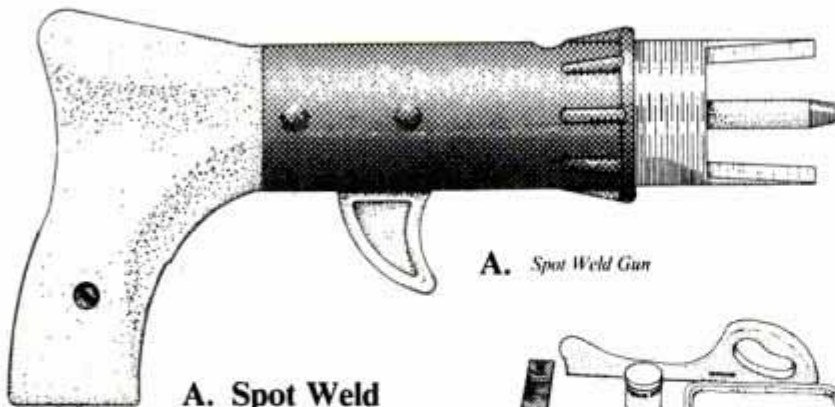


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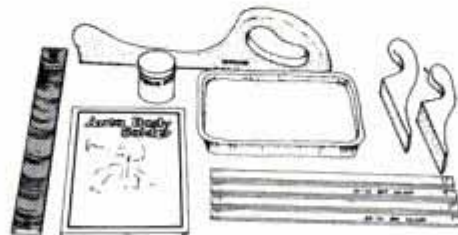
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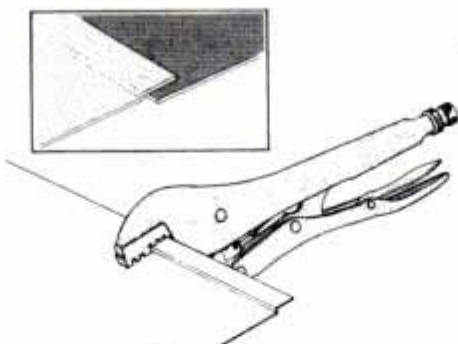
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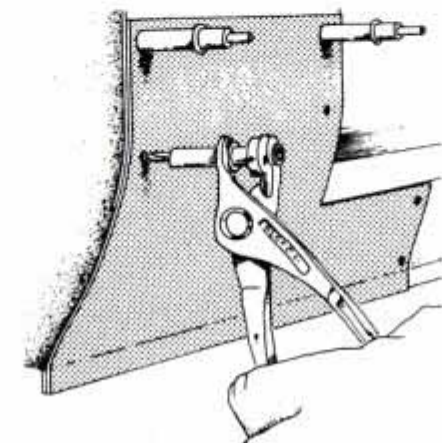
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C. Battery Tray Coating



D. Panel Flanger



E. Panel Holding System

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H. Fabricate Panels With A Sheet Metal Bender

Will form 90° angles in 20 gauge up to 18" wide. Bends heavier gauge metal in smaller widths. Great for reproducing body panels, covers, etc. All-aluminum. Bolts or screws to workbench.

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3219 Spotweld Cutter — \$12.95

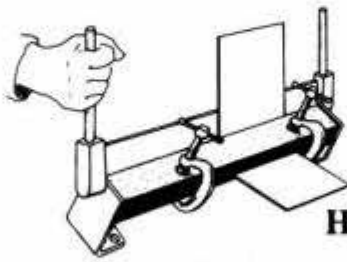
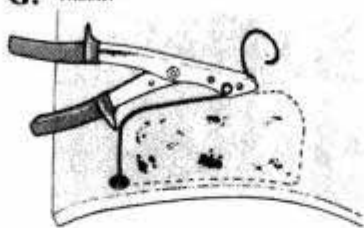
3220 Replacement Cutter — \$4.50

K. Sandblast Away Rust

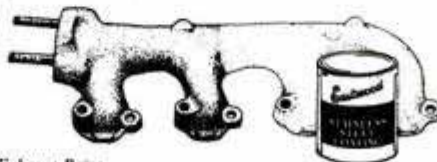
Our sandblaster is field proven (thousands in use) and priced right. This sandblaster gives you the ability to remove rust, scale, paint and corrosion in minutes. Also doubles as air gun/degreaser for cleaning parts.

The Eastwood sandblaster package includes all-metal power (same as used on our larger units), ten foot hose, 14" pickup tube, spare nozzle and complete instructions. Just attach to 1 HP compressor, insert pickup

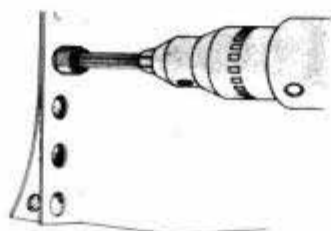
G. Nibbler



H. Sheet Metal Bender



I. 1200° Exhaust Paint



J. Spotweld Cutter

tube into sand or other abrasive and you're ready.

8532 Sandblast Gun — \$30.95

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BRUTE BIKES

(Continued from page 139)

Kawasaki Eliminator

Kawasaki catches on to American ways quicker than most companies. Since the days of their trend-setting LTD factory customs, they've managed to come to market with bikes that slide right into the spot where our riders live. Witness the Eliminator: a Brute Bike to be sure, with 105 hp on tap, but in no way a traditional cruiser. Instead, it's a barely disguised drag-race replica, low to the ground and devoid of long-distance creature comforts.

Of course, Kawasaki had the basis for a real tire melter already up its sleeve—the 908-cc Ninja engine. It's a 16-valve, dohc inline Four, transversely mounted and liquid cooled. Kawasaki's Fours have become the small-block Chevy of drag-bike engines, because of their straightforward design and wide availability, and this generation will carry on that heritage.

For what appears to be a single-purpose straightaway machine, the Eliminator has one glaring paradox—shaft drive. The shaft robs a notable percentage of engine power (H-D claims 7 to 10 percent) in the two right-angle gearsets it requires.

Part of that styling scheme calls for a sleek gas tank, but at a 2.8-gallon capacity, Kawasaki has gone overboard. On our back-country runs, we ran it dry in less than 75 miles on several high-speed sections and had to resort to siphoning in order to continue.

As the second fastest cycle in our test (the quarter-mile in 11.22 seconds at 119 mph), no one could say that the Eliminator didn't live up to the promise of its looks. Though we found the ride well controlled and handling excellent, we would like a little more ground clearance. And the pads which keep knees from frying on the engine proved to be uncomfortable and annoying, a poorly engineered item.

Yamaha V-Max

The Yamaha V-Max is a cinch to sum up. Here is the most powerful street motorcycle ever built, the quickest machine money can buy. Claimed horsepower is 145, but on board you'll swear it has thrice that.

Now here's a real mixed bag of features. First, there's the powerhouse of an engine, an 1198-cc dohc 70° V4, adapted from the Venture touring machine and put on a muscle-building program. Key to the phenomenal output is the V-Boost induction system, an rpm-sensitive setup that allows each cylinder to be fed by two carburetors when revs exceed 6000. Low-speed tractability is preserved, and high speed power is like a V8. Because the

cylinders are set 70° apart and the firing pulses come at an irregular cadence, the engine emits a delightful *chuffa-chuffa* under power.

Advanced features abound—all three disc brake rotors are automotive-type vented units, and the unique rear wheel is a solid-disc design carrying an enormous 150/90V15 tire.

Styling-wise, Yamaha's brute is dominated by the black-finish V4 powerplant. Almost nothing blocks that statement of raw muscle, not even the protruding polished air scoop snouts up alongside the gas tank. Here's an area where the stylists won out over the function-minded engineers: Both the scoops and tank are fakes. The carbs draw air through a filter mounted under the decoy tank, and the real gas reservoir is mounted under the seat. That much we can live with, but every rider in the group cried out for a legible tachometer mounted on the dash to replace the watch-sized rev counter which nestles below the steering head.

Even as the only bike in our test assembled in Japan, the V-Max comes in at \$5299. But try to buy that kind of performance in a car and you'll find it a bargain—0-to-125-mph acceleration in 10.8 seconds with a 145-mph top end.

Buyers step forward

Purchase decisions, especially for an item as passion-influenced as a motorcycle, depend far more on what the buyer wants than needs. For the hardcore horsepower junkie, there is no choice—only Yamaha's V-Max will fill the bill. As a boulevard blaster, the V-Max has no equal.

But that doesn't mean any one bike can be all things to all riders. Harley buyers are believers in traditional American durability. These days there's a lot more substance to that legend, particularly with the Evolution engine. The price is astronomical (at \$8149, practically double the Honda V65) but resale is accordingly strong, and the bike will likely last through dozens of owners and rebuilds.

Neither the Honda V65 Magna nor the Kawasaki Eliminator suffer any lack of power, as both post low 11-second quarter-mile times. For around-town cruising and short trips, the powerhouse Honda is a smart buy, though the seating position we find inappropriate for all the power at hand. The Kawasaki is definitely limited to urban duty, by virtue of the minuscule gas tank and restricted range. Very likely it would make the best stoplight racer.

To our way of thinking, Brute Bikes are now in the first stage of development, with the Yamaha showing what future competitors will have to shoot for. The mark is high, but so are the abilities of the other manufacturers. **PM**

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QUEEN ANNE FOOTSTOOL

(Continued from page 119)

then bore the dowel hole. Dry-assemble the legs with the dowels, aligning the legs with the pencil lines. Extend the $\frac{3}{16}$ -in.-dia. screw holes about $\frac{1}{8}$ in. into the frame. Then, with a $\frac{9}{64}$ -in.-dia. bit, extend the holes to full screw depth.

Wax the screw threads for easier turning, then glue the legs and dowels, tap them in place, and drive in the screws. Be sure that you remove any excess glue with a sharp chisel after it begins to harden.

Cut the bottom panel to size from $\frac{3}{8}$ -in. plywood. Turn over the stool while holding the panel up against the corner blocks and mark the outline of the blocks with a pencil. Cut out the four corners of the panel, then glue it to the inside corners of the legs. Tack-nail the panel in place with $\frac{3}{4}$ -in. brads.

Cut the seat frame pieces to size, then cut the end-lap joints on all ends. Glue and lightly clamp the four pieces together and square the assembly with a framing square. Then tighten the clamps. Round all the corners and outside edges of the frame with a sanding block and 220-grit sandpaper.

Upholstering the seat

To give even seat support, two strips of webbing run in both directions across the seat frame. Space the webbing evenly between the seat frames, and alternately weave the strips over and under where they intersect.

To install the webbing, work with the full roll rather than cut pieces. Attach the webbing end to the underside of the seat frame with three staples. Then, unroll the webbing around the frame to the opposite side.

With the frame on a solid work surface and butted against a stop, pull the webbing as tight as possible without bowing the frame. Secure the webbing with three staples and trim it off flush with the inside edge of the frame.

Attach the other three strips the same way. Then, apply white glue to the cut ends of the webbing to keep them from unraveling.

Sew together a muslin bag on three sides so that the stitching on either side of its narrow dimension measures 19 in. apart. The length of the bag should be 6 to 8 in. longer than the front and back seat frame pieces. The excess can be folded underneath. Turn the bag inside out before stuffing it. Cut the cotton batting slightly larger than the seat frame. Insert the batting into the bag and fold under the end. When stuffed, the bag should be about $\frac{1}{2}$ in. larger than the seat frame on all sides, as shown in the photo.

Use staples to attach the needlepoint or other material to the padded seat frame. Begin with one or two staples in the middle of each frame piece, pulling the material very tight while kneeling on the frame to compress the padding. Continue stapling toward the corners, pulling the material tight as you go. Fold the corners under carefully so that they are as flat as possible, allowing the seat to fit down fully into the stool base.

Finishing the stool

Before staining, finish-sand the footstool with 220-grit sandpaper. Use a sanding block on flat surfaces; contour the paper with your hand and fingers to smooth the curved surfaces and the leg carvings.

For an antique appearance, we finished our stool with a penetrating oil stain. This type of stain also brings out the end grain of the corner pieces and accentuates the carvings on the legs.

We then applied two heavy coats of tung oil, allowed it to dry, then rubbed it into the wood with 000 steel wool. For the final step, we applied three thin coats of tung oil, handrubbing to a satin finish.

PM

FEAR OF FLYING

(Continued from page 105)

lations (FARs), the aircraft was not carrying an Emergency Locator Transmitter (ELT), a device that emits a constant radio signal on battery power for searchers to home in on. It can be picked up by satellites, so location is almost immediate. However, the FARs exempt turbine-powered aircraft from carrying them. If there were survivors of this accident, they were not located quickly enough to be rescued.

On Jan. 21, a Galaxy Airlines Lockheed Electra crashed on takeoff at Reno, Nevada, killing 70 people. This was the same aircraft that the Rev. Jesse Jackson had cited as unsafe when he used it during the last presidential campaign. According to the NTSB, once airborne, the aircraft suffered extreme vibration and the pilot reduced too much power. Poor maintenance has been suggested as a possible cause, though all four engines were running at impact.

This points to a serious problem in the airline system. The older and more difficult to maintain aircraft are usually flown by the less affluent operators. They get less maintenance and corners are often cut. The FAA has found many companies, particularly the smaller commuter airlines, in violation of maintenance FARs when trying to survive economically. According to some, including ALPA, The Airline Deregulation Act of 1978 has aggravated the problem since the number of scheduled carriers has tripled to 150 and commuter airlines have doubled to nearly 300.

Fare wars

Air fare wars have reduced ticket prices. Some observers claim this has compromised safety since the costs have to be cut somewhere in order to make up for lower revenues from ticket sales. Charles Miller, a former safety inspector for the Civil Aeronautics Board, has been quite blunt in asserting that the market driver is economics, not safety.

Though two Boeing 747s—the JAL aircraft on Aug. 12 and an Air India jet in the water off Ireland on June 23—have gone down this year, company officials and Boeing have made it clear there seems to be no link between the two losses, particularly since a bomb was supposed to have destroyed the latter aircraft. Others strongly disagree.

The cause of the JAL crash has been narrowed down to the failure of the rear fuselage pressure bulkhead. Once ruptured, it allowed high pressure air to enter the vertical stabilizer and tear it apart, destroying not only a major control surface but all of the hydraulic controls. A 747 cannot fly without at least one of the hydraulic systems oper-

ating, though the pilot made a valiant attempt in flying the aircraft for 30 minutes before it crashed.

Inspection of the aircraft's records revealed that the bulkhead had undergone a faulty repair in 1978 after the 747 was damaged in a landing so hard it injured 30 people on board. Boeing sent a team to Japan to put a splice plate on the bulkhead, which, according to the company, "was incorrectly installed . . . such that one of the three rows of rivets did not pass through the splice plate." Subsequent inspections did not reveal the improper job, though investigators are not sure this would actually have caused the bulkhead to fail. However, the FAA did say, "An improper repair can significantly affect strength, fatigue life and damage tolerance of the bulkhead."

Though the FAA does not believe there is a link, some independent analysts believe the Air India crash, which resulted in 329 deaths, could have been caused by failure of the same bulkhead and not by a bomb. When a bomb goes off, it is not unusual for several different terrorist organizations to claim credit. There were no claims for this one. Though much of the aircraft remains at the bottom of the Atlantic, investigators have found no evidence of bomb damage, either on the voice or data recorders or on bodies and airframe components. If the pressure bulkhead blew at 31,000 feet, it would have been so violent, with escaping air traveling at supersonic speed, it could have taken the tail off.

If a bomb did down the Air India flight, clearly tighter security, though maddening for the traveler, is needed. If lack of maintenance inspections are the basic cause, then the FAA force will have to be increased or managed better. Last September, the FAA, though denying pressure due to this year's accidents, decided to add 500 more aviation inspectors to its force of 674 assigned to the airlines and 936 assigned to general aviation.

Wind shear

On Aug. 2, a Delta Air Line Lockheed L-1011 crashed in Dallas, killing 134 people. There is little doubt that wind shear due to an intense thunderstorm brought down the aircraft. This problem has been recognized for years as the cause of numerous crashes, notably 27 from 1964 to 1982, that killed a total of 491 people. This weather phenomenon has been described as a sharp change in wind speed and direction over a short distance. It is most dangerous near the ground when a "microburst" lasting up to 15 minutes can reverse from a strong headwind to a downdraft, then a tailwind, robbing an

(Please turn to page 146)

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FEAR OF FLYING
(Continued from page 145)

aircraft's wings of their needed lift. Tragically, though the Dallas-Fort Worth Airport has a very expensive Low Level Wind-Shear Alert System, the microburst that brought the L-1011 down was not detected. Ironically, according to NTSB inspector G.H. Patrick Bursley quoted in *Aviation Week & Space Technology*, the 5-sector LLWAS was activated by a storm 10 to 11 minutes after the airliner crashed. "Sensors only detect what is practically on top of them. There could have been a violent event some distance away."

The bottom line, however, is giving the pilot an onboard system to detect wind shear and avoid it on his own. The NTSB has stated that it "recognizes that despite the variety of information available to pilots on the presence of wind shear, none offers a precise measurement of the hazards that pilots can expect to encounter. As a result, pilots in command must make the most prudent decision possible . . . on the advisability of conducting a flight into a wind-shear environment." All well and good, except that few are aware of it until it hits the aircraft, and then it can last up to 15 minutes over a distance of around 2 miles. A bright note: American Airlines has chosen to delay flights when faced with heavy thunderstorm weather in spite of losing money.

Backward-facing seats
Despite the tremendous impact with the ground made by both the JAL and the Delta aircraft, there is firm conviction that many more people could have survived the crashes had they been sitting in reinforced backward-facing seats with shoulder harnesses.

Williams of the NTSA waxes furious over these two crashes, particularly upon hearing about the survivors of the JAL crash who told of many more who lived through it but died on the mountain before being rescued. "Within the last 40 years, there have been many advances in aviation technology (jet engines, metallurgy, flight instruments, communications). Passenger safety? We are sitting in seats, held in place by lap belts and surrounded by cabin furnishings that meet 38-year-old standards." Are those adequate? Not according to that 1981 NTSB report: "Seats and other cabin furnishings continue to fail in aircraft accidents regardless of the severity of impact. . . . Aircraft occupants are being injured and killed because of the failure of seat/restraint systems and other cabin furnishings." This innocuous phrase, "cabin furnishings," pops up often, the most deadly being storage bins where lug-

(Please turn to page 148)

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STATEMENT OF OWNERSHIP

FEAR OF FLYING

(Continued from page 146)

gage is stored. Very few experts disagree over doing away with carry-on baggage. Anything loose in a crash becomes a deadly missile hurled at the speed the aircraft is traveling.

William says, "Your body can tolerate some 27gs crash deceleration force without irreversible injury, if you are wearing just a lap belt. If you face backward with a shoulder harness, you can take up to 40gs. But, your seat, belt attachment and the structures around you are required to resist only 9gs. In a 1982 accident, 69 of 70 passengers died of head, neck and chest injuries secondary to impact, when their seats and belts failed. It was a 12g impact."

On Aug. 22, a British Airtours Boeing 737, on takeoff from Manchester, England, had its left engine explode, killing 54 people. Though the pilot got the aircraft stopped on the runway, the disintegrating engine, throwing turbine blades like bullets and operating in reverse for braking, ruptured fuel tanks and lines, creating a roaring fire in the rear passenger section of the fuselage. Firemen reached the scene in a remarkable 30 seconds but smoke enveloped the inside, hampering evacuation of the overcrowded cabin. Those who died are believed to have been killed by smoke and toxic fumes from the burning polyurethane seat covers, acrylic carpet and foam seat cushions. Then oxygen tanks for the emergency masks blew up.

Postcrash fires

Between 1965 and 1979, 480 passengers (about 1 in 5) died in postcrash fires, according to the NTSB. Though the screams have been loud, only just this year are fire-blocking seat covers being installed in airliners. Overall cabin material flammability standards however, are lagging behind. There have been proposed regulations for two Halon fire extinguishers in each cabin and low-level lights to help passengers find exits in smoke and darkness. The NTSB has been recommending floor-level exit lights since 1973 but they have never been required, in spite of the FAA's belief that they could save 20 percent of postcrash fatalities.

Though the FAA has been working on an antimisting kerosene additive to prevent fuel from igniting when leaking, tests conducted at Edwards Air Force Base by crashing a Boeing 707 have not led to further research. Years ago, work was done on a gelled fuel that was atomized by an ultrasonic carburetor. Though it could not be ignited even by a blowtorch, there was no pressure for its development.

On Sept. 6, a Midwest Express Douglas DC-9 crashed in Milwaukee, killing

31 people. Just after takeoff the right engine failed, spewing turbine blades and parts into the fuselage and down onto the runway. Then the right engine lost 30 percent power. There was speculation that the turbine disc shrapnel severed the controls, throwing the aircraft toward the ground out of control.

Both the British Airtours 737 and the Midwest Express DC-9 were equipped with the Pratt & Whitney Aircraft JT8D engine, though the former had the newer Dash 15 version and the latter the Dash 7. In both cases, investigators suspect combustion chamber failure and disintegration as the reason for the engine failures. These were not the first signs of trouble. In October 1984, the FAA issued a directive to all JT8D operators around the world to check turbine parts. By May 1985, the NTSB cited several turbine disc failures over the previous four years on aircraft equipped with the engine, calling for all JT8Ds to once again be inspected.

Inspection woes

Inspections, or the lack of them, have plagued the FAA. Since the FAA's dual role is to regulate the aviation industry as well as promote it, some believe the two goals are in conflict and that the FAA leans toward keeping the industry financially well off.

This has shown up in the FAA failing to deal with major safety violations by some commuter airlines, despite stepped up inspections. According to *U.S. News & World Report*, critics contend that the whole inspection program is understaffed and unaggressive. Provincetown-Boston Airlines broke a number of regulations, including keeping "fraudulent or intentionally false" records. But the violations did not come to light until a fired PBA pilot blew the whistle. The FAA grounded the airline. But 15 days after getting back in the air, one of its aircraft crashed.

And survival among the commuter airlines has even more of a desperate air than with the larger carriers. Pilots who want to be hired by the big companies look upon flying for the commuters as a door, often a necessary evil. Breaking FARs is at times considered necessary if a pilot wants to keep his job. Companies have made it clear that passengers will be flown regardless, to keep cash flow up. If a pilot has to make bad-weather approaches below prescribed minimums or fly when he is too tired, so be it. By September 1985, there were six commuter crashes.

Through this litany of disaster, a number of other aviation safety questions have not been addressed, but which are ripe for producing tragedy. For instance, water survival is inadequate by most standards. Many airlines

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PM LONG-TERM CAR TESTS

(Continued from page 87)

people plus long cargo like skis, the elastic luggage net in the trunk, and the intermittent speed on the rear wiper.

We picked up our Merkur in Detroit with 2600 miles already on the clock, presumably road test abuse from other publications. By the time it was delivered to our New York offices, it had 3700 miles on it, the power steering pump was growling because the fluid level was low, and it needed a quart of oil. We topped up the fluid levels and started having more fun with this car than any other in recent memory.

Our test car develops 14 to 15 psi of turbo boost, allowing the overhead cam Four to rocket away from other traffic



Classy notchback sedan lines plus hatchback practicality give LeBaron GTS wide appeal.

like it was standing still. Fortunately, the front disc/rear drum brakes and fully independent suspension are up to controlling all this acceleration.

But it's no single-purpose hot rod either. In everyday use, the Merkur is a very useful hatchback. The seats flip and flop about seven ways from Sunday, and we've hauled everything from a lawnmower to an extension ladder in the thing. This is doubly amazing when you park it next to a Honda Accord and realize that the two cars are about the same size. But the Merkur is almost spherical in shape, so you've got a lot more volume inside.

The biplane spoiler keeps the rear end firmly planted on the road at high speeds and makes this car easy to spot in parking lots, but it takes some getting used to—when you first spot it in the mirror, you'd swear it was part of another car or truck following too close.

At \$16,361, the Merkur's not cheap, but compared to the 18- to 20-grand Audis, BMWs, Saabs and Volvos it sells against, the Merkur is almost a steal.

Unfortunately, after only 8000 miles we are beginning to see ominous signs that this car may not enjoy the high reliability we usually associate with German products. The power steering system is definitely losing fluid, the engine eats a quart of oil every 1000 miles, there's a steering shimmy at 45 to 55 mph, the brakes pulsate in light

use (probably a disc warped in brutal road testing) and the windshield is leaking on the driver's side. We've got a service appointment and we'll let you know how it all turns out.

Meanwhile, fuel economy has been averaging 20 mpg, which is dead on the EPA city figure and pretty good considering the way we've been flogging the turbo. Our high and low figures have been 27.1 and 17.9 mpg.—W.H.

Chevrolet Astro

There's so much to like about Chevrolet's newest van, the midsize Astro, that it's a shame there are a couple of details that tend to spoil things while you're driving it.

On the plus side of the ledger, the Astro gives you a terrific feeling of airiness and room when you're inside. It feels larger than the other minivans. You sit higher in it and you feel like you're driving a more substantial vehicle than the outside dimensions would make it seem.

The drivetrain is a big plus also. If you've driven any other other mini vans and felt they were underpowered, check out the V6 power under the Astro's hood—a husky 4.3-liter V6 pumping out 145 hp. For our test Astro, we ordered the 4-speed automatic transmission and trailer-towing package which includes a 3.42 axle ratio.

This combo gives the Astro brisk performance. Acceleration from 0 to 60 mph averages around 12 seconds, which is right in the ballpark with some of the sporty coupes around. According to Chevrolet, this also gives the Astro a towing capacity of up to 5500 pounds. We towed our PM Water Sportster boat and trailer with the Astro, and with that 3000-pound combination hitched up, the Astro's power was just barely adequate in terms of acceleration.

Once on a roll, of course, there is no problem. But getting up to speed coming out of a toll booth seemed to take months, and hills gave us fits. Gas mileage so far averages out to 13.7 mpg in a mix of commuting and vacation duty. Fillups can be stretched to 300-mile intervals, thanks to the capacity of the van's optional 27-gallon tank.

The interior layout is flexible, allowing you to design an interior for your particular needs. You can order seating for two, five or eight. We ordered an 8-passenger configuration because the seats go in or out as needed just by flipping a couple of latches. With the back seat out, the Astro will amaze you with how much stuff it can swallow.

The Astro's handling is on a par with anything in its class except Chrysler's front-wheel-drive Voyager/Caravan minivan. In our opinion that vehicle, which is more carlike, still has the edge in overall handling. The Astro is definitely more trucklike, but still easy to handle and park because of its modest outside dimensions—77 in. wide and 176.8 in. overall.

If it sounds like we're enthused about the Chevy Astro, we are. It's a shame it's one of the most uncomfortable vehicles we've ever driven. For one thing, the seats aren't very comfortable, even though we ordered the deluxe interior. Second, the seat positions you almost directly over the left front wheel. The wheelwell hump intrudes under your left foot so there's no place to put your foot except up on the hump. After a half hour of driving in this position, the hump starts to form in your left hamstring muscle.—J.O.

Corvette

When we last reported on our long-term test Corvette, we told you we were going to try some different shocks in it, and get hold of a Corvette with a manual transmission and Z51 suspension package.

With about 12,000 miles on the clock, we did remove the Delco-Bilstein heavy-duty shock absorbers and substituted a set of stock shocks. With this change, we discovered the best Corvette of all. The ride with the stock shock is smooth but firm.

Probably on a road racing course, you'd find that the gas shocks offer a modicum of control not available with the stock shock absorbers. However, we must report that in normal, but hard, driving, we found no loss of control with the stock shocks in place. In fact, on rough roads, control was better because



Formal roofline of Somerset Regal gives great rear seat headroom, large glass area.

the suspension could move and work so the wheels followed the road contours and moved over bumps rather than bounding into the air.

During the time we had our automatic transmission test car, we also borrowed a Z51-equipped manual transmission Corvette from Chevrolet to compare performance, ride and handling. This, of course, uses the 4+3 transmission setup, a T10 4-speed with overdrive available in the top three gears. Ours had the overdrive switch located down on the console, but by now Chevrolet has changed over production to a shift-knob-mounted control. Gear changes require little effort, but the feel could be more positive. Also, our car had an odd free-wheeling effect on coastdown when the overdrive was engaged, and though it was no real problem, Chevrolet had no explanation for the cause except to say that it wasn't normal.

We think that Z51 cars should not be allowed inside New York's city limits. As tolerable as this car was on the smooth Interstates, once in the Big Apple the combination of potholes and unyielding springs brought on rattles and sore backs for drivers. Very simply, if you live where the roads are bad, you've got no right to order a Z51 suspension option.

As the odometer passed 13,000 miles on our long-term test car, Chevrolet unfortunately remembered that they had loaned us the car and wanted it back. The Corvette had served us for almost 10 months in every type of weather, on every type of road, and in every type of driving condition. It had been subjected to abusive treatment on the road, on dragstrips and on road-racing courses. It had served as a commuter car, a long-distance road car, and an around-town car. In all, it had delivered over 18 miles per gallon and had suffered little more than a dead battery.

This was a good car. So good that the editor decided to buy it. A few days after this decision was made, the car was stolen (see *Editor's Notes*, page 3A). It was recovered and now sits forlornly at a Chevy dealer's bodyshop on Long Island awaiting its final fate. It deserved better. After all, it is the current king of the road.—J.O.

Chrysler LeBaron GTS

The GTS just went back to Chrysler with 10,557 miles on its odometer and we still haven't mentioned its all-around good looks. In July (see *PM Long-Term Car Test*, page 148), we were too busy adjusting to the car mechanically, and learning how to hold onto its 146 hot-rocket horsepower, to get in a good word for the achievement of making a practical hatchback look like a classy notchback sedan.

The handsome devil did let us down once: A crimp on a starter motor connection let go and left the car stone dead. And with the starter totally buried under everything else, we couldn't find the problem to do a fix ourselves. So, a towing we did go. The only other glitch that frustrated us was the passenger-side, front-door panel: Its clips kept popping loose from the door frame, and fixing a bug like that requires the patience of a saint.

For the 4500 miles we drove the car since our last report, mileage continued to range between 18 and 28 mpg and we didn't have to add any oil — pretty good since we persistently treated the GTS like the "hot-rodded K-car" we called it in our last report. The trick for Chrysler now is to evolve this pretty good hot-rod into a full-fledged sports sedan while keeping the price (\$14,110 for ours) from getting any higher than it already is.—B.H.

Buick Somerset Regal

Though the Buick Somerset Regal is based on very familiar front-drive technology, around here it's considered to be a sign of GM's long overdue awakening to the real advantages of smaller cars. The Somerset is well laid out and efficiently packaged, but more importantly, it behaves on the road like it was actually designed to be this size. So many of GM's previous fwd efforts felt spongy and ponderous by comparison. The longer we live with the N-car, the more hope we have that Detroit is catching on to the ride and handling qualities that attract foreign-car buyers in the first place.

Truthfully, we aren't that optimistic about the design team that executed the interior. Even after months of day-to-day commuting in the Regal, the stereo and climate controls continue to baffle drivers, to the point that they're a real distraction. We experienced no major mechanical failures in the Somerset, but there were a couple of annoyances: a passenger-side front seat belt that stuck in its retractor reel, and a rough-running/stalling condition that only surfaced during extended idles in rush-hour traffic. Also, acceleration is markedly slower when the air conditioner is blowing hard, something we wouldn't expect with the 3-liter V6 under the hood.

With a 4-door version coming along on the '86 line (to be known as the Skylark), this model has to be one of GM's most sensible all-around family cars. There will be a T Type available as well, which indicates Buick's commitment to refining this platform as time permits. In most respects, the starting point is a winner, and though conservatively styled, a good omen for GM's future health.—N.S.M.

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OPEN PLENUM RPM RANGE 2000 - 6000

Your Low Price 7548
S.B. Chevy **\$69.95**

STAINLESS STEEL FLEX-A-LITE FANS

UNIVERSAL FIT
8000 RPM RATING

#1070 17" DIAMETER
#1080 18" DIAMETER

YOUR LOW PRICE \$10.95

GENUINE HAYDEN RAPID COOL TRANSMISSION OIL COOLERS

1518 CARS (MEDIUM DUTY)	YOUR LOW PRICE \$19.95
1522 CARS, TRUCKS & TOWING (MEDIUM DUTY)	YOUR LOW PRICE \$29.95
1528 MOTORHOMES, TRUCKS & ALL HEAVY TOWING	YOUR LOW PRICE \$34.95

ON SALE

BRAND NEW OUTRIGHT - NO EXCHANGE REQUIRED LIFETIME WARRANTY

GENUINE BENDIX SEMI-METALLIC FRICTION KING II DISC BRAKE PADS

Your Low Price **\$24.95**

FOR MOST DOMESTIC & FOREIGN CARS & LIGHT TRUCKS (UP TO 1/2 TON)

STATE MAKE / MODEL / YEAR & FRONT/REAR AXLE

PRICE IS FOR 2 WHEELS

ON SALE

BRAND NEW OUTRIGHT - NO EXCHANGE REQUIRED LIFETIME WARRANTY

GENUINE BENDIX PREMIUM QUALITY DISC BRAKE PADS

Your Low Price **\$10.95**

AVAILABLE FOR MOST DOMESTIC & FOREIGN CARS & LIGHT TRUCKS

STATE MAKE / MODEL / YR & FRONT OR REAR AXLE

PRICE IS FOR 2 WHEELS

ACCEL or MALLORY DUAL-POINT DISTRIBUTORS (YOUR CHOICE)

Mechanical Advance

Chevy V8	\$48.95
Ford 289-302	\$54.95
Ford 351 W*	\$54.95
Ford 351C-400	\$54.95
Ford 429-460	\$54.95
MOPAR	
318-340-360	\$54.95
MOPAR 383-440*	\$54.95

VACUUM ADVANCE

Chevy V8	\$69.95
Ford 289-302	\$99.95
Ford 351 W*	\$99.95
Ford 351C-400	\$79.95
Ford 429-460	\$79.95
MOPAR	
318-340-360*	\$79.95
MOPAR 383-440*	\$79.95

* MALLORY ONLY

MALLORY UNILITE

Mechanical Advance

Chevy V8	\$9.95
Ford 289-302	\$9.95
Ford 351 W*	\$9.95
Ford 351C-400	\$9.95
Ford 429-460	\$9.95
Mopar 318-340-360	\$9.95
Mopar 383-440	\$9.95

ON SALE

ACCEL BREAKERLESS ELECTRONIC IGNITION DISTRIBUTORS

Mechanical Advance

Chevy V8	\$9.95
Ford 289-302	\$9.95
Ford 351C-400	\$9.95
Ford 429-460	\$9.95
Mopar 318-360-360	\$9.95

Vacuum Advance

Chevy V8	\$9.95
Ford 289-302	\$9.95
Ford 351C-400	\$9.95
Ford 429-460	\$9.95
Mopar 318-360-360	\$9.95

AUTOMETER AUTOGAGE PERFORMANCE STREET TACH'S

Your Low Price **\$27.95**

#2300 Satin Black **\$29.95**

#2001 Chrome Full 3/4" Diameter 0-6,000 RPM Red Line Pointer Universal Mounting

AUTO-GAGE'S

Oil Pressure #2321	\$11.95
Water Temp. #2321	\$14.95
Vacuum #2371	\$11.95
Amps #2386	\$9.95

YOUR LOW PRICE \$39.95

ON SALE

ACCEL BREAKERLESS ELECTRONIC IGNITION DISTRIBUTORS

Mechanical Advance

Chevy V8	\$9.95
Ford 289-302	\$9.95
Ford 351C-400	\$9.95
Ford 429-460	\$9.95
Mopar 318-360-360	\$9.95

Vacuum Advance

Chevy V8	\$9.95
Ford 289-302	\$9.95
Ford 351C-400	\$9.95
Ford 429-460	\$9.95
Mopar 318-360-360	\$9.95

ON SALE

CARTER PERFORMANCE FUEL PUMPS

Mechanical Street & Off Road \$24.95
RACE \$29.95
Electric Street & Off Road \$36.95
RACE \$39.95

CARTER AFB CARBS

9635 825 CFM Chevy	\$189.95
9636 825 CFM Mopar	\$189.95
9637 825 CFM Ford	\$189.95

CARTER THERMO-QUAD CARBURETORS

9810 800 CFM Chevy	\$209.95
9811 800 CFM Mopar	\$209.95

HOLLEY PERFORMANCE CARBURETORS

Brand New No Seconds No Rebuilds

4 BARREL UNIVERSAL VACUUM SECONDARY

800 CFM 1850	\$96.95
750 CFM 3310	\$107.95

2 BARREL UNIVERSAL VACUUM SECONDARY

396 CFM 8007	\$149.95
600 CFM 9834	\$133.95

EDELBROCK PERFORMER MANIFOLD

As Low As \$84.95

2131 AMC V8 70	134.95
2101 58 Chevy	139.95
2164 188 Chevy	139.95
2176 SB Mopar	134.95
2181 440 Mopar	129.95
2121 58 Ford	129.95
2181 3576 Ford	129.95
2171 351M 400	139.95
2160 480 Ford	133.95
2185 390-426 Ford	184.95
2171 350-403 Olds	149.95
2176 Pontiac V8	134.95

TRANSPARENT DISTRIBUTOR CAPS

AVAILABLE FOR Ford/GM/Mopar V8

YOUR CHOICE OF CLEAR/RED/BLUE/YELLOW

YOUR LOW PRICE \$8.95

NOT AVAILABLE FOR ELECTRONIC IGNITION

SUPER COILS

Accel Supercoil	\$28.95
Accel Supercoil-HEI	\$28.95
Accel Yellow Supercoil	\$14.95
Mallory Voltmaster	\$29.95
Chrome Coil & Bracket	\$14.95
Mallory Pro-Master	\$6.95
O.E.M. Universal Replacement 12V	\$ 6.95

FRAM OIL & AIR FILTER SPECIAL

Your Low Price **\$8.95**

Most Domestic Cars 1960-1980

PERFORMANCE V BELT & RADIATOR HOSE SPECIAL

Kit includes 2 "V" BELTS & UPPER & LOWER RADIATOR HOSE

Your Low Price **\$14.95**

Most Domestic Cars 1960-1980

O.E.M. REPLACEMENT IGNITION PARTS

ELECTRONIC IGNITION KITS

Available For Most Domestic 6 CYL & V8 Engines. KIT INCLUDES ROTOR & CAP.

G.M. V8 78-84	FORD \$8.95
G.M. V8 74-85	MOPAR \$3.95
MOPAR 6 CYL 78-83	FORD \$3.95
FORD V8 73-84	MOPAR \$3.95
FORD V8 83-84	MOPAR \$3.95
FORD V8 74-84	MOPAR \$3.95

ON SALE SAVE OVER 50%

HOLLEY WATER INJECTION KITS

- SUPPRESSES DAMAGING ENGINE KNOCK
- OPERATES ONLY WHEN ENGINE IS WARMED-UP
- USES WATER ONLY AS NEEDED
- MAXIMUM RELIABILITY AT LOWER COST

THE HOLLEY SYSTEM COMES COMPLETE WITH STEP-BY-STEP INSTRUCTIONS AND ALL MOUNTING HARDWARE

LOW COMPRESSION #19-1	REGULAR PRICE \$58.95
HIGH COMPRESSION #19-2	REGULAR PRICE \$58.95
RV'S/MOTORHOMES #19-3	REGULAR PRICE \$58.95

YOUR SPECIAL LOW PRICE \$19.95

SAVE OVER 50%

NEW TRW FUEL PUMPS

Your Low Price from **\$12.95**

S.B. CHEVY

Available for all Makes & Models. Phone for Your Low Price.

EDELBROCK PERFORMER PLUS CAMSHAFT KITS

Kit includes CAMSHAFTS-LIFTERS-LUBE

AMC 384-401	2132	\$144.95
Buick V6 79 up 231	5487	\$124.95
S.B. Chevy up to 250 2102	\$136.95	
S.B. Chevy 400	2103	\$136.95
S.B. Chevy	2162	\$139.95
S.B. Mopar 318-360	2177	\$146.95
S.B. Mopar 413-400 2182	\$152.95	
S.B. Ford 289-302	2122	\$145.95
351W Ford	2182	\$152.95
351M 400 Ford	2172	\$147.95
390-426 Ford	2106	\$145.95
429-460 Ford	2167	\$146.95
Pontiac 400-455	2157	\$149.95

ISKENDARIAN SUPER CAMS

Economy/Hi-Torque/IV Kit includes Camshafts-Lifters-Springs

\$139.95

BOOKS

H.P. BOOKS HOW TO REBUILD BOOKS

Ford 351C 351M 400-429-460	\$9.95
S.B. Ford 289-302 351W	\$3.95
S.B. Ford F.E. 390-428	\$9.95
Ford 1-3-1-6 & 2-0-4M.C.	\$9.95
S.B. Chevy	\$9.95
S.B. Chevy	\$9.95
S.B. Mopar	\$9.95

TUNE-UP SPECIAL

- 2 "V" Fan Belts
- Upper/Lower Radiator Hoses
- Fram Oil Filter & Air Filter
- R. Autolite Spark Plugs

Your Low Price **\$29.95**

Most Domestic Cars 1960-1980

KONI ADJUSTABLE PERFORMANCE SHOCKS

Available For Most Domestic 6 CYL & V8 Engines. KIT INCLUDES POINTS-ROTOR-CONDENSER & DISTRIBUTOR CAP.

AMC 6 CYL	68-74
G.M. 6 CYL	63-73
V8	57-74
MOPAR 6 CYL	62-72
V8	73-84
FORD 6 CYL	56-65
V8	60-73

YOUR LOW PRICE \$5.95

TOP QUALITY TUNE-UP KITS FOR POINT TYPE IGNITION

Available For Most Domestic 6 CYL & V8 Engines. KIT INCLUDES POINTS-ROTOR-CONDENSER & DISTRIBUTOR CAP.

AMC 6 CYL	68-74
G.M. 6 CYL	63-73
V8	57-74
MOPAR 6 CYL	62-72
V8	73-84
FORD 6 CYL	56-65
V8	60-73

YOUR LOW PRICE \$5.95

DON'T REBUILD YOUR ENGINE WITHOUT CHECKING OUR PRICES.

California residents: Items in this ad are: Not legal for sale or use on pollution controlled motor vehicles in California; Legal in California only for racing vehicles which may not be used on highways

WE CARRY A COMPLETE LINE OF MECHANICAL ENGINE PARTS FOR ALL APPLICATIONS. STOCK REPLACEMENT, HI-PERFORMANCE & RACING.

MONROE SHOCK SPECIALS

MONROE VIP

1-3/16 BORE HEAVY DUTY CONSTRUCTION EXCEEDS MANUFACTURERS SPECIFICATIONS AVAILABLE FOR ALL U.S. MODEL CARS



MONROE-MATIC

MONROE'S BEST SELLING REPLACEMENT SHOCK. 55% INCREASE IN RIDE CONTROL. OVER REGULAR OEM SHOCKS. AVAILABLE FOR ALL U.S. CARS & LIGHT TRUCKS



MONROE GAS-MATIC

THE ULTIMATE IN RIDING COMFORT & CONTROL. LOW PRESSURE GAS CHARGED. AVAILABLE FOR ALL U.S. CARS & LIGHT TRUCKS



MAGNUM 60

HEAVY DUTY ALL TERRAIN SHOCKS FOR PERFORMANCE & HEAVY DUTY APPLICATION FOR LIGHT TRUCKS & 4x4's



LOAD LEVELERS

INCREASES LOAD CAPACITY FOR U.S. CARS OR TRUCKS. HEAVY DUTY SHOCK & SPRING COMBINATION FOR FRONT & REAR APPLICATIONS



AIR SHOCKS

INFLATES TO 150 LBS WITH VEHICLE LOADED. FOR HAULING THOSE HEAVY LOADS FOR ALL U.S. CARS & TRUCKS



ELECTRIC RIDE CONTROL (DASHBOARD MOUNT) ADD \$84.95

WE HAVE A COMPLETE SELECTION OF MONROE SHOCKS. ADJUSTERS & REPLACEMENT STRUTS, SPRINGS, COIL-OVER CARTRIDGES. PHONE FOR YOUR LOW PRICE.

CHROME MOLLY PUSH RODS

Available for most popular Domestic Engines

MANLEY O.E.M. REPLACEMENT VALVES

LEGAL N.H.R.A. REPLACEMENT

1.72 Intake 1078 1.75 Intake 1478 2.02 Intake 1850 4.50 Exhaust 1077 2.85 Exhaust 1849 5.95

810 BLOCK CHEVY 2.06 Intake 1652 3.05 2.19 Intake 1654 6.35 1.72 Exhaust 1651 4.45

S.B. MOPAR 1.82 Intake 1778 3.05 1.60 Exhaust 1721 3.55

S.B. MOPAR (WEDGE) 2.08 Intake 1316 3.35 1.90 Exhaust 1365 3.85 1.74 Exhaust 1717 4.55

S.B. FORD 289 (Non Rail) 1.78 Intake 1628 3.35 1.45 Exhaust 1567 3.85

S.B. FORD 302 (Rail) 1.78 Intake 1732 3.95 1.46 Exhaust 1771 4.50

351C 4 BIL HEAD FORD 2.02 Intake 1762 4.05 1.72 Exhaust 1763 4.55

351C 2 BIL HEAD FORD 2.04 Intake 1764 4.35 1.85 Exhaust 1765 4.85

351W FORD 88-74 1.94 Intake 1760 2.65 1.96 Exhaust 1761 4.05

351W FORD 75-77 1.78 Intake 1830 3.00 1.45 Exhaust 1831 3.95

352 390-428 FORD 2.02 Intake 1415 2.45 1.58 Exhaust 1335 3.85

428-460 FORD 2.07 Intake 1720 4.05 1.85 Exhaust 1731 4.10

Valves available for most domestic cars - Phone for Price

OPTIONS AVAILABLE: Molly Rings ADD \$15.00 - H.V. Oil Pump ADD \$6.00 - Drive Roller Chain Set ADD \$3.00 - NOTE: Bearings Available Std. 010, 020, 030, 040, 050, 060, 070, 080, 090, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000

ON SALE

SB CHEVY DELUX ENGINE REBUILD KIT

YOUR LOW PRICE \$99.95 S.B. CHEVY ONLY

Kit includes: PISTON RINGS, CL77 ROD BEARINGS, CL77 MAIN BEARINGS, ENGINE GASKET SET, OIL PUMP, TIMING CHAIN SET

NOTE: BATH TUB INTAKE GASKET NOT INCLUDED WHERE APPLICABLE

OPTIONS AVAILABLE: Molly Rings ADD \$15.00 - H.V. Oil Pump ADD \$6.00 - Drive Roller Chain Set ADD \$3.00 - NOTE: Bearings Available Std. 010, 020, 030, 040, 050, 060, 070, 080, 090, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000

HI PERFORMANCE LONG SLOT ROCKER ARMS

S.B. Chevy 39.95 set 16 B.B. Chevy 54.95 set 16 Kit Includes Arms, Balls, Nuts

ROCKER ARMS

FORD S.B. Ford 289-302-351W \$69.95 Set Of 16 State Year, Rail or Non Rail 351C Boss-429 \$96.00 Set Of 16 Adjustable Kit w/ Arm, Ball, Nut 390-427-428 \$82.00 Set Of 16 Adjustable Rockers

PONTIAC VE 1.5 Ratio \$59.95 Set Of 16 VE 1.6 Ratio \$59.95 Set Of 16 Kit Includes Arms, Balls, Nuts

MOPAR S.B. Mopar Adjustable \$122.00 Set Of 16 B.B. Mopar Adjustable \$112.00 Set Of 16 We have Rocker Arms for all Domestic Engines for your low price

NEW STOCK REPLACEMENT CAMSHAFT-LIFTERS SPRINGS KIT

Available for most V8 & 6 Cyl Domestic Engines Ford - Chevrolet - Mopar Your Low Price \$119.95

CHEVROLET PISTON RINGS 250 (2 Bolt Main) 780.00 850.00 350 (4 Bolt Main) 860.00 950.00 390-400-427 304.00 380.00 454 (2 Bolt Main) 1008.00 1108.00

FORD 289-302-351W 780.00 848.00 351C 351M 400 428 400-300 580.00 540.00 400 840.00 880.00

MOPAR 360 636.00 676.00 440 908.00 1088.00

LONG BLOCK CONTAINS ALL OF THE ABOVE PLUS CYLINDER HEADS, ALUMINUM WATER PUMP, COMPRESSOR, VALVE LIFTERS, TAPPETS TO MATCH CAMSHAFT, MAIN BEARINGS & LIFTERS. Your choice of oil pan to match your Camshaft. We have in stock all major engine parts for all Domestic Engines. For your low price, call today.

TRW FORGED FLAT TOP PISTON & RING SPECIAL

Available Std. 030-040-060 CALL CHEVROLET 289-327-350 440 209.00 350 (4 Bolt Main) 1080.00 1180.00 390-400-427 304.00 380.00 454 (2 Bolt Main) 1288.00 1388.00

FORD 289-302-351W 1088.00 1188.00 351M 351C 1188.00 1270.00 400 1270.00 1288.00

MOPAR 360 1178.00 1230.00 440 1350.00 1450.00 For Custom bearing ADD \$60.00 For Chevy Molly Rings ADD \$15.00

HI-PERFORMANCE DOUBLE ROLLER CHAIN SETS

S.B. Chevy 29.95 Others Your Low Price S.B. Chevy 29.95 S.B. Mopar 29.95 S.B. Ford 39.95 351C-400 Ford 39.95 429-460 49.95 390-428 29.95 Oldsmobile 49.95 Pontiac 49.95

SUPER STOCK CON RODS

MANUFACTURED \$8.95 Each ADD \$7.50 For Bushed Factory Rods (S.B. Mopar, S.B. Ford)

PERFORMANCE LIFTERS Solid Hydraulic S.B. Chevy \$36.95 OTHERS \$39.95 Set of 16 Most Cars Available for most popular Domestic Engines.

TRW WATER PUMPS

CHEVROLET Small Block from \$29.95 Big Block from \$54.95 FORD 289-302-351W from \$39.95 351C-400-351M from \$42.00 429-460 from \$48.95 390-428 from \$49.95 CHRYSLER Small Block from \$29.95 Big Block from \$29.95 We have Water Pumps for all domestic models. Phone for your low price.

SUPER STOCK ENGINE KIT

COMPLETE UNASSEMBLED HOME REBUILD SPECIAL



STREET/STRIP/COMPETITION SHORT BLOCK

• BLOCK: Sealed block with forged pistons. Custom ground rods, cam bearings, pusher factory coils, Cam Bearings in steel

• PISTONS: Available in all popular stock compression ratios. Your choice of oil pan

• PISTON RINGS: Iron compression with premium chrome oil ring

• CONNECTING RODS: Completely manufactured for maximum durability

• CRANKSHAFT: Custom ground on Rod and main bearings for perfect fit on holes throughout

• BEARINGS: Top quality forged type III-30

• TIMING CHAIN SET: Steel gears and camshaft

• CAMSHAFT: Your choice stock, flat top, load sense or hydraulic

• OIL PUMP: Heavy duty push rod

• GASKETS: Complete Gasket set

• VALVES: Custom bearing ADD \$15.00 For custom bearing ADD \$60.00 For Chevy Molly Rings ADD \$15.00 For custom bearing ADD \$60.00

PERFORMANCE CRANKSHAFT KITS

Custom ground on Rod & Main Journals, Con Rod & Main Bearings supplied for perfect fit. Available for most 6cy & V8 \$158.00

ON SALE TRUCKS/TRACTORS ADD-A-LEAF

FOR FRONT OR REAR SPRINGS FITS MOST DOMESTIC TRUCKS ETC. YOUR LOW \$44.95 PAIR PRICE

FLAT TOP PISTON SPECIALS WITH RINGS

Available Std. 030-040-060 Chevrolet 305-350 99.00 400 119.00 Ford 302-351W 99.00 351C 351M 400 114.00 Mopar 318-340-360 99.00 For Molly Rings ADD \$15.00

HIGH VOLUME OIL PUMPS

20% More volume than stock pump S.B. Chevy \$19.95 ALL OTHERS \$24.95 Chevrolet, Mopar, Ford, Pontiac

SUPER STOCK MASTER KIT

Kit includes: PISTONS & PINS, PISTON RINGS, CONNECTING RODS, ROD & MAIN BEARINGS, CRANKSHAFT, CAMSHAFT-LIFTERS-SPRINGS, TIMING CHAIN SET, OIL PUMP, CAR BEARINGS, GASKET SET



Kit includes: PISTONS & PINS, PISTON RINGS, CONNECTING RODS, CON ROD & MAIN BEARINGS, CRANKSHAFT

AMC 198-232-256 457.00 504.00 287-290-304-327 506.00 548.00 343-360-401 509.00

BUICK 231 V6 463.00 504.00 300-340-350 509.00 400-401-425-430-455 584.00

CADILLAC 390-429-472-500 563.00 664.00

CHEVROLET 194-230-250-262 494.00 504.00 289-283-327 494.00 504.00 305-307-350 494.00 529.00 390-400-427 504.00 588.00 454

FORD 144-170-200-250 494.00 498.00 280-289-302-351W 494.00 498.00 351C 351M 400 478.00 510.00 428 484.00 629.00 428-454 593.00 549.00

MOPAR 438.00 504.00 172-186-225 498.00 528.00 275-318-340-360 588.00 538.00 440 509.00 578.00

OLDSMOBILE 330-350 509.00 538.00 394-400-425-455 549.00 558.00

PONTIAC 230-250 498.00 504.00 326-350-388-400-455 589.00 578.00

Pistons available in all popular sizes and stock compression ratios. State piston offset required For Molly Rings ADD \$15.00 For custom bearing ADD \$60.00

SUPER STOCK CRANKSHAFT KIT

Kit includes: PISTONS & PINS, PISTON RINGS, CONNECTING RODS, CON ROD & MAIN BEARINGS, CRANKSHAFT



Kit includes: PISTONS & PINS, PISTON RINGS, CONNECTING RODS, CON ROD & MAIN BEARINGS, CRANKSHAFT

AMC 198-232-256 429.00 344.00 287-290-304-327 348.00 396.00 343-360-401 360.00 396.00

BUICK 231 V6 303.00 344.00 300-340-350 348.00 414.00 400-401-425-430-455 423.00 484.00

CADILLAC 390-429-472-500 423.00 484.00

CHEVROLET 194-230-250-262 264.00 344.00 289-283-327 298.00 344.00 305-307-350 298.00 344.00 390-400-427 344.00 389.00 454 304.00 429.00

FORD 144-170-200-250 290.00 338.00 280-289-302-351W 290.00 338.00 351C 351M 400 319.00 369.00 428 329.00 354.00 428 334.00 489.00 440 349.00 389.00

MOPAR 438.00 504.00 172-186-225 498.00 528.00 275-318-340-360 588.00 538.00 440 509.00 578.00

OLDSMOBILE 330-350 509.00 538.00 394-400-425-455 549.00 558.00

PONTIAC 230-250 498.00 504.00 326-350-388-400-455 589.00 578.00

Pistons available in all popular sizes and stock compression ratios. State piston offset required For Molly Rings ADD \$15.00 For custom bearing ADD \$60.00

SUPER STOCK PISTON KIT

Kit includes: PISTONS & PINS, PISTON RINGS, ROD & MAIN BEARINGS, PERFORMANCE GRIND, CAMSHAFT



Kit includes: PISTONS & PINS, PISTON RINGS, ROD & MAIN BEARINGS, PERFORMANCE GRIND, CAMSHAFT

AMC 198-232-256 118.00 204.00 287-290-304-327 209.00 258.00 343-360-401 209.00 258.00

BUICK 231 V6 183.00 204.00 300-340-350 209.00 274.00 400-401-425-430-455 215.00 274.00 390-429-472-500 283.00 344.00

CHEVROLET 194-230-250-262 154.00 204.00 289-283-327 154.00 204.00 305-307-350 154.00 204.00 390-400-427 154.00 219.00 454 154.00 289.00

FORD 144-170-200-250 154.00 204.00 280-289-302-351W 154.00 204.00 351C 351M 400 189.00 219.00 428 184.00 229.00 440 209.00 249.00

MOPAR 170-186-225 194.00 204.00 275-318-340-360 194.00 229.00 318-340-360 194.00 229.00 440 234.00 279.00

OLDSMOBILE 330-350 200.00 229.00 394-400-425-455 249.00 259.00

PONTIAC 230-250 194.00 204.00 326-350-388-400-455 208.00 279.00

Pistons available in all popular sizes and stock compression ratios. State piston offset required. Camshaft section or stock camshaft will be substituted. For Molly Rings ADD \$15.00 For custom bearing ADD \$60.00

PAW T-SHIRTS & HATS

The Fabulous PAW Blown Motor Logo in 3 Colors on both Front & Back of a Quality Hanes Beefy T-Shirt. Available SM, M, L & XL. State Your Size ONLY \$6.50 PAW Hat with Logo - fits all sizes ONLY \$4.50



GET OUR GIANT NEW 1985 CATALOG FREE with an order from this advertisement or send \$4.00

P.A.W. MONEY BACK GUARANTEE

BUY WITH CONFIDENCE FROM P.A.W.: IF FOR ANY REASON YOU ARE NOT SATISFIED WITH OUR PRODUCTS, JUST RETURN THEM WITHIN 90 DAYS FROM DATE OF RECEIPT AND WE WILL REFUND YOUR MONEY. NOTE: NO REFUND ON SHIPPING CHARGES. PRODUCTS MUST BE IN NEW AND UNUSED CONDITION IN ORIGINAL PACKAGE. INSTALLED ITEMS CANNOT BE REFUNDED. CALL 818-998-3641 FOR RETURN AUTHORIZATION.

WE SHIP COD. NO DEPOSIT REQUIRED ON MOST ITEMS IN STOCK

WE ACCEPT MASTERCARD & VISA

TECH LINE & PHONE ORDERS

CALL 818-998-6000 8:30 AM to 5:30 PM Pacific Time Monday thru Friday

CUSTOMER SERVICE: For Return Information and Inquiries Regarding Previous Orders Call 818-998-3641.

MAIL ORDER

PERFORMANCE AUTOMOTIVE WHOLESALER, INC. 21122 Lassen Street, Chatsworth, CA 91311

HOW TO ORDER State Make, Model, Year & Engine Size. Send at least 50% deposit by Cashiers Check or Money Order, no personal checks accepted or use your Mastercard or VISA. All Overseas & Canadian orders must be paid in full. No C.O.D. on truck freight shipments. C.O.D. on UPS only. All Engines & Master Kits must be paid in full. Customer responsible for all shipping charges.

Print Name _____ Phone # () _____ Address _____ City _____ State _____ Zip _____

Make _____ Model _____ Year _____ Engine Size _____ NOTE: P.A.W. is not responsible for typographical errors in pricing or applications, including all contents of this advertising

IF YOU DON'T SEE IT, PHONE FOR YOUR LOW PRICE.

California residents: Items in this ad are: Not legal for sale or use on pollution controlled motor vehicles in California; Legal in California only for racing vehicles which may not be used on highways

New "Energy Pill" Gives Fast Lift Without Worry

All Natural Pepper Upper Sweeping The Country!

BEVERLY HILLS, CA—A dynamic and innovative company in Beverly Hills has just developed and perfected what many people are describing as the "most sensational energy pill ever available!" It's called Energene/500 and it's dynamite!

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Exotic Ingredients Insure Quick Results

What is this fantastic tablet? How is all this possible? It's really quite extraordinary! The primary ingredient of Energene/500 is Guarana, a potent plant extract, that has been used by the Sateré-Mawé Indians of the Amazon Jungle for centuries! They say Guarana provides quick and almost endless energy! In fact, to the Mawés, Guarana is revered as a gift from the gods! And...although never verified, Guarana is thought by many to actually energize and markedly improve their sex lives.

But there's more! Energene/500 also contains one hundred percent pure Chinese Gotu-Kola, known for its super energizing powers, plus an exact amount of vitamins and minerals, in perfect balance, to deliver what countless people are describing as "the best feeling they've ever had!"

It's no wonder Energene/500 is already being used by people from all walks of life who now swear by it. In fact, Energene/500 is the new "Hot Pill" for the executive class. The very people who need instant energy without stress. And who can dis-

agree! Don't we all need an occasional lift, an occasional good feeling for those times when life becomes a bit too much? So why not choose something natural, something legal, even something healthy!

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Energene/500 is now available direct from Bio-Force Industries and it comes with an incredible guarantee. One that would be impossible to make if there were even a single doubt about its remarkable effectiveness.

Take Energene/500 anytime you are in need of extra energy. If after 15 minutes you don't feel your energy soaring, if you don't feel completely alert, awake and revitalized, in fact if you don't feel better than you've felt in a long, long time, then simply return the container and Bio-Force Industries will refund your entire purchase price. No questions asked!

Best of all...ordering Energene/500 is simple, fast, and reliable! Simply call Bio-Force Industries, Toll Free: Dial (1-800-453-9005), and order with your credit card. If you don't have a credit card Bio-Force Industries will also accept C.O.D. orders right over the phone! All orders are shipped immediately by UPS which means no delay and no orders lost in the mail!

\$14.95—60 tablets, or \$25.95—120 tablets. Operators are standing by and will be glad to take your order. You can order 24 hrs. a day, 7 days a week! Please don't wait to call. You really do deserve to feel good! To order by mail send check or money order to: BFI, 270 N. Canon Drive, Suite 1255, Beverly Hills, CA 90210. © 1985 BFI.

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FEAR OF FLYING

(Continued from page 148)

are given exemptions to fly as far out to sea as 180 miles without rafts. On overland flights, instead of vests, passengers are expected to use their seat cushions for flotation. But these 2-pound pieces of foam get waterlogged and weigh up to 25 pounds, becoming near useless.

Airline industry observers cite other areas—not enough emergency exits and slides, and no pre-flight briefings on how to use them. They claim that the slides themselves often fail, that they are too old, evaporate near fire and often cause injuries in themselves.

Pilot error

Then there is the often intangible area of pilot error, to which 65 percent of all accidents are attributed. As one NTSB investigator candidly said, "When we can't find a cause for an accident, we often assume it is pilot error and let it go at that." Working conditions are often conducive to fatigue. Though actual pilot flying hours are held to 100 per month, working hours are often much longer.

Though the FAA's air traffic control system has survived the 1981 controller's strike, the 14,000 controllers (including 2100 trainees) now on duty are suffering major morale problems, similar to those that led to the strike. An FAA task force has found that increased air traffic has exceeded the control system's capacity. As one employee told the task force, "It's killing us. It gets so bad it's unsafe." To their credit, controllers rarely make errors and there have been no major accidents attributed to controller error in five years.

However, many more close calls have taken place in the last two years than in previous years, and many are not being reported. Over the next two years, the FAA has been authorized to add another 1000 controllers to its ranks. In addition, the entire air traffic control system is scheduled to undergo a \$14 billion revamping under the National Airspace Plan through the end of the century, one of the largest aviation programs ever undertaken. New computers and datalink systems should take the load off pilots and controllers.

There are many new technologies that can probably prevent some air disasters from occurring, and others that would allow more passengers to survive if a crash does occur. However, not until safety is considered good economics will the industry aggressively institute the many reforms being called for. If the hue and cry from the worst year in aviation history remains loud, then our remarkably safe skies could become even safer.

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EN4

"How To Get Rich Sooner Than You Think."

A Whole New Class of Millionaires Can Be Created In The Next Three Years!

My name is Joanna Jordan, and I have created a "New" and fantastic money making program just for you.

Let me tell you why I am so charitable.

No, I am not crazy and I don't like giving away my confidential money making secrets. But as you read further you will understand why I have to. "I HAVE NO CHOICE."

There are, at this very moment, fifty million Americans who are geared up to spend an estimated 2 Billion Dollars in the next twelve months on services like my program offers, and someone else, besides myself, has to take advantage of this opportunity or it will be lost forever.

If you are looking for a way to clear up all those overdue bills laying on your desk, or kitchen table, then this may be the solution to your problems.

I will show you how to start my new program entitled "How To Get Rich Sooner Than You Think" on a "beginner budget" and perhaps pocket up to \$25,000 dollars the following month you receive it.

Wait! Don't get the wrong idea. Let me assure you, right now, that you are NOT working for a parent, franchise or distributorship company. You are Not working for me or my company. You are in business for yourself and all the money you make with this marvelous business is yours to keep. You don't have to share any of it with anyone.

But, before we go on I would like you to take a few minutes and CALL my private telephone number for a personal recorded message I made just for you

(703) 450-6052

Now that I've got your attention, it would be my pleasure to continue.

Maybe you won't make \$25,000 dollars the first time out, you may do better. I have no way of knowing. All I know is that it is URGENT that you move on this opportunity now. Not next week or next month but Now. It would be a shame for all that money (over 2 Billion Dollars) to just pass you by without you getting your fair share of it.



That brings me to this very important point.

If I could handle all the business that will be generated in the next twelve months, I wouldn't be telling you one solitary thing about this potentially "strike-it-rich opportunity." I wouldn't be writing you this urgent message. Nor would I be revealing my inside secrets. I would be just working the system I have invented and be making all the money I could spend. But that's not the case. I can't handle all the business. Neither can ten other people, or 100 or 1,000 for that matter. It's just too big!

Okay. Okay. I understand that *not everyone* wants to become a millionaire in the next twelve months. Maybe you don't want the headaches of handling all that money at this time. Maybe you're looking for something "short-term" and not long term. That's okay. Give me a few more seconds of your time, I think I've got the answer for you.

Let's assume for a minute that you want to make \$300,000 dollars, not one million. And let's further assume that you want to work part-time only. That's fine. You can do it. You can operate the program part-time, weekends only or evenings if you like, and make up to \$300,000 dollars in seven months. Then, you could stash away the money in the bank and live off the interest for the rest of your life. For example: 12% interest on \$300,000 is \$36,000 a year; without touching the principal.

Listen Closely! What I am offering you here is an opportunity for you and your family to perhaps retire early in life. Stop worrying about the everyday chores and live off the interest on the money that will be made by you in the next seven months. **Once and for all be free** from having to get up on those cold and chilly mornings, start the car that may or may not start; get stuck in the traffic or snow that may or may not be blocking your path to work.

Instead, with my system you are free to choose the days you want to work. You could decide, on those snowy days in January, to sit at home and watch TV all day if you like, play in the snow like we used to do when we were kids, or catch a plane for Hawaii or Florida. **Never having to worry** about how you are going to pay the mortgage or car payments while you are on vacation. **Never having to worry** about someone taking over your job while you are missing a few days from work.

You and I both know *that* is no way to live. We have been through those headaches over and over again. Let's don't make the same mistakes twice. Take my advice, and don't pass up this "once-in-a-lifetime" opportunity to perhaps get rich sooner than you think. Order my program now, Today.

Let me level with you. We all come into this world naked and broke and we are *all* going out the same way. What we do with our lives in between those two points in time *is what counts.* Darn, I would hate for my friends to say after my death: "She never enjoyed herself while she was on this earth. All she did was go back and forth to work 350 days a year, took two weeks off for vacation, if she was lucky, and spent the rest of the year working for someone she couldn't stand."

Listen, that's not going to happen to you and me. We are going to have some fun for a change. We are going to do some of the things we have always wanted to do and we are going to do them Now.

Let me let you in on a little secret. I know what it's like to be skeptical. I also know what it's like to purchase inspirational books, money making programs and income opportunities from other companies and individuals. You name it and I've bought it. I have probably bought and tried every money making program on the market today and then some. I even went to the trouble of buying two of them from two overseas companies in Australia and Japan.

Nothing seemed to work for me. Most of them I enjoyed reading, but when it came right down to putting the program into operation I was lost. There just wasn't enough good information for me to follow. *Oh,* I know they intended to do a good job in the beginning, but their writing skills and instructions left me flat. Every time I started to do some investigating about a particular system or put a plan into operation I came up empty handed.

My money making program is complete, well written, precise, detailed and perfectly understandable. There are no if's or but's to it. Order my program now and see if I am right or wrong. If I am wrong you have wasted a postage stamp. But if I am right, you may be able to walk into the showroom of the Mercedes dealership and hand the salesman \$42,000 dollars in cash (*in one-hundred dollar bills*) and drive away in the automobile of your choice. *A two-door 380 SL convertible would be nice.*

Purchase The Home of Your Dreams!

Once you start receiving your monthly checks from your new business do you realize that you may be able to purchase that new home in that special neighborhood you always wanted to live in. *You know the one I mean.* That special place or street you always wanted to live on. You could *waltz* right in and tell the real estate agent you would like to buy the home up on the hill. You then hand him or her a check for the down payment, and start the paperwork to move in right away. With your new business and the proposed yearly income you could be making you should have no problem qualifying for the mortgage.

Once you read the "two volumes" of my new program that I have prepared for you. You will see that this hypothetical situation can become a reality for you—not just a dream.

Listen Closely! I know I don't know you personally, but for the sake of all that money that might be lost, over Two Billion Dollars, I am going to reveal to you powerful inside secrets that most people don't even know exist. **I will give you** names and addresses of companies that have been kept hidden from the American public for over fifty years. These companies are the "key to your future" that will help you achieve success like you never thought possible.

Here's What You Are Going To Receive: You are going to receive "TWO VOLUMES," a complete set of my ideas and systems written exactly as I use them on a daily basis. The same ones I used, last year, to make over one million dollars.

Both volumes are handsomely designed and printed by one of the most sought after printing companies in the country. There are 238 pages altogether, about 210 pages of text and about 28 pages of exhibits, pictures and illustrations. There are insider secrets, start up beginner budgets, detailed through instructions, **hard-to-find business contacts,** and my own special powerful money-making ideas. *These publications are both brand new and the creative pro-*

gram you will find in them is being offered for a limited time and a limited time only.

I shared my secrets with some of my closest friends before I decided to select the readers of this publication, as some of the few qualified people in this country, to participate with me in this unique opportunity.

Here's how they did:
\$12,000 in fifteen days

When you showed us your materials my wife and I sat up to 3:00 AM reading every word of your money making program. Two days later we put your methods into operation. Wow! Were we surprised when we made \$12,000 in fifteen days. Our goals are set higher.

Thank you from both of us.

Mr. and Mrs. G. A., Santa Monica, California
\$1,000 A Week

Since I read your program on how to get rich, my life has taken a turn for the better. I was earning about \$200 a week in a job that I really didn't like, working for a boss I couldn't get along with.

After applying your money making program for the last four weeks, my income has already reached \$1,000 a week. I am hoping to make \$5,000 a week by next spring. I can't thank you enough for showing me how to put this kind of money into my own bank account, instead of my boss's.

Mr. S. McC., Newtown, CT

\$9,000 dollars Richer

Every week I would work all week long, pick up my paycheck, and 24 hours later after paying by bills I would be flat broke. Your program "How To Get Rich Sooner Than You Think" came in the mail three weeks ago yesterday.

Today after applying your methods for only two and a half weeks I am \$9,000 dollars richer. I have money in my savings account for a change and I am buying myself a new car. You're the greatest.

Mr. R.I.G., Los Angeles, California

I Made \$93,455.00 in one month

I don't know whether or not I am the most successful person to use your techniques, and I may not be, but, with no exaggeration, I made \$93,455.00 in one month.

I just wanted to write and tell you that your information is incredible. I am happier than I ever thought I would be.

Joanna, thank you.

Mr. J. A., Danbury, Connecticut

Dear Reader:

I want to tell you of my experience with Joanna Jordan — and her new money making program "How To Get Rich Sooner Than You Think!"

My name is Kathy Rice and I am a close friend of Joanna's. Until recently, I thought I was happy in my job and family life.

But what I learned from Joanna helped me see that I was going about it all wrong. In fact, I was on the same treadmill everyone else seems to be on these days. "Make a few dollars this week, and spend more than I made next week."

Joanna Jordan has an individual and "different" approach on how to make big money that lasts for more than a couple of weeks. Her methods are logical and effective. And her way of explaining her new unique program makes it easy to understand and quick to apply.

Her program entitled "How To Get Rich Sooner Than You Think!" can show you how to earn money fast, and her confidence in its money making ability shows in her guarantee. She will give you a "Three Month" FREE TRIAL. (That will give you plenty of time to try her techniques and find out that Miss Jordan has been completely sincere in what she has been telling you.) Use the information and put the money making program into action, for that period, and if you are not satisfied, for any reason, just mail the materials back and she will refund every cent of your money to you.

Sincerely yours,
Kathy Rice, New York, New York

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"Please don't hesitate, this is your One-Time chance to get in on something really fascinating. Do it now. Order today."

Let me prove to you that I know what it's like

I know what it's like to spend every cent of your paycheck two days after you get paid. I know what it's like to write a questionable check at the grocery store on Wednesday, for \$25 dollars, and hope to cover it by Friday. I know what it's like to have more bills to pay at the end of the month than you brought home in all four paydays. I know what it's like to stand in line in a department store with your Visa card in hand, hoping you won't be embarrassed by some clerk behind the counter when she calls in your number to the controller.

I know all these things because I have experienced all these things. Isn't it about time you made a change in your everyday life? Isn't it about time you said "enough is enough" and started a new way of life? **Don't Let Someone Else Control Your Life.** Do something about it Today.

You could start, right now, and be on your way to your fortune by the end of next week. If you order today, not next week, or next month. But Now! Send **\$12.95** for both volumes of "How To Get Rich Sooner Than You Think!" Today!

Before I go any further. Let me clear up any possible misunderstanding you may have.

I didn't write this money making program and then expect to make my fortune. I made my fortune before I wrote the first word in "How To Get Rich Sooner Than You Think!" In fact, while we're on the subject, the year before I wrote "How To Get Rich Sooner Than You Think!" I made \$1,031,000 dollars. The year before that I made \$780,000 and two years before I made \$554,000. It's all Documented!

The amount of money I made using my system is documented and can be backed up with bank records and financial statements from my Certified Public Accountants.

I don't wish to brag, but I must make you understand that you too can perhaps do as well as I did for the past three years. You may even do better.

Here is An Example Of What My Plans Can Do!

My Bank Deposits For The Past 12 months:	
January	\$ 63,010.60
February	\$123,138.29
March	\$171,129.43
April	\$107,404.62
May	\$ 88,097.60
June	\$ 64,613.08
July	\$ 65,116.00
August	\$ 89,883.63
September	\$ 94,222.50
October	\$ 45,560.33
November	\$ 44,567.21
December	\$ 74,357.78

These are the facts. You can believe them or not. It's your choice. But I'll tell you this, I didn't have a lot of money when I first started, and that's why I designed this program with you in mind. I wanted anyone who was interested in improving themselves, to be able to start producing Big money immediately.

Two Volumes!

Don't Delay! Don't miss out on this opportunity!

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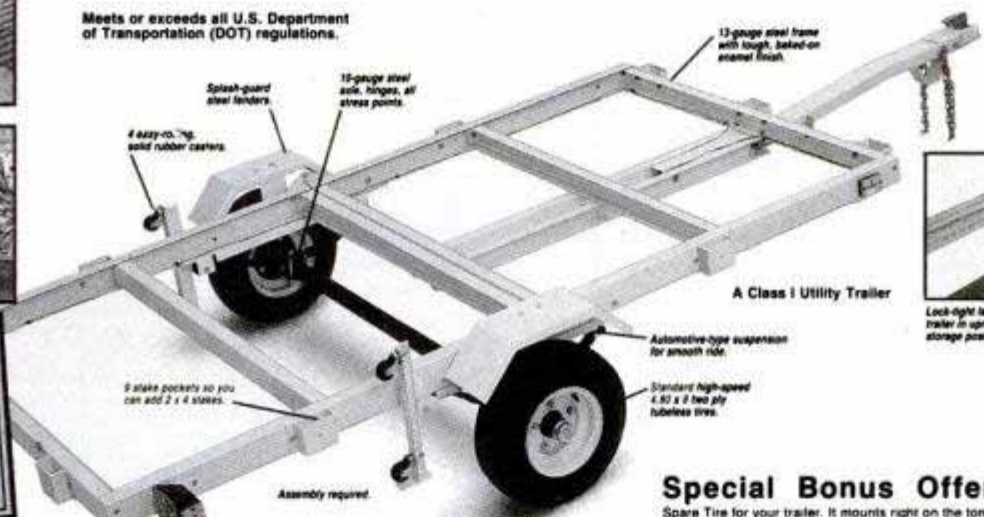
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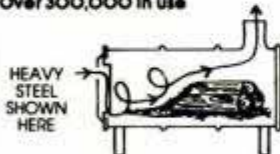
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A Cordless Circular Saw

Here's a circular saw that's truly portable—the Milwaukee cordless 6 1/4-in. saw (model No. 6305). The saw is powered by a compact, rechargeable 12-volt battery.

After testing the saw's cutting capabilities, I was pleasantly surprised by the tool's power and endurance. Each of the following cutting chores can be expected from a single, one-hour charge: 75 crosscuts of 2x4 pine, 80 linear ft. ripped of 1x6 pine, 70 linear ft. of 1/2-in. plywood and 50 linear ft. of 5/8-in. particleboard.

The saw has a no-load speed of 3450 rpm and a depth-of-cut capacity of 2 3/16 in. at 90° and 1 7/16 in. at 45°. It's equipped with a specially designed thin-line, carbide-tipped blade that reduces friction and motor strain.

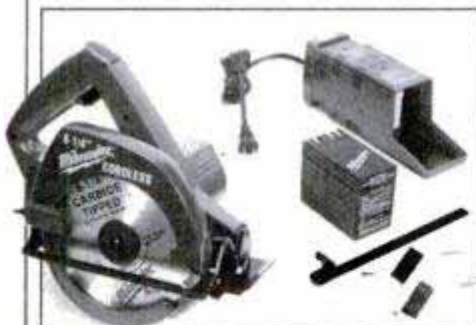
The cordless 6 1/4-in. saw sells for about \$195 and comes with a battery,



Cordless, battery-operated 6 1/4-in. circular saw has the power to cut through 2x6 stock easily.

battery charger, rip fence and wrenches for changing the blade. For details, contact Milwaukee Tool Corp., 13135 W. Lisbon Rd., Brookfield, WI 53005.

—Rosario Capotosto



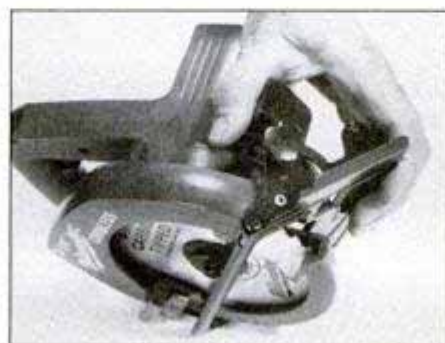
The cordless saw comes with a carbide-tipped blade, battery charger, 12-volt battery, rip fence, blade and spanner wrenches.



Battery slides easily into the saw's plastic housing; total weight: about 8 pounds. Battery has an average life of about 2 years.



A spring-loaded safety latch prevents the saw from starting accidentally. First, lift the latch, then squeeze the trigger switch.



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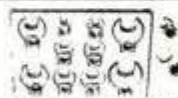
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PM's Computer Home Workstation—This three-piece desk keeps everything neat and gives you plenty of room to work. This is for a state-of-the-art home computer system. An efficient work station you cannot buy, it can blend with your home decor and, it is more advanced than any office workstation you've seen. Plans and material list. (PL-1828—\$6.95)



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SAFE, STURDY CAST-IRON CONSTRUCTION

All Consolidated Dutchwest stoves are built entirely from durable, virgin cast iron. They are cast and assembled by hand and sealed airtight. Each meets or exceeds all national and local safety codes. **And now, every Consolidated Dutchwest stove can accept, at the owner's option, a catalytic combustor, so that it will meet anticipated safety and pollution control requirements of the 1990's today.**

EXCEPTIONAL PERFORMANCE

Consolidated Dutchwest stoves employ an intricate baffling system to encourage secondary combustion, maximize and direct heat transferral, and permit catalytic woodburning. **In a word, they are exceptionally efficient stoves.** Many models can heat most to all of a typical home, and hold a fire 12 hours or more on a single loading.

EASY TO USE

Consolidated Dutchwest stoves do not let you down where most others do — convenience. Most models burn both wood and coal. An ashbin and slide-out tray make ash removal **clean and easy.** A shaker grate, front and side doors, cook top, probe thermometer, glass windows, and firescreen are among the other standard features.



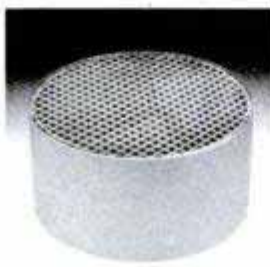
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TIME MACHINE

75 YEARS AGO: December 1910



A sport with a practical future.

Skis for wheels

A French firm came up with the novel idea of converting an automobile into an auto-sleigh for use in countries where frequent snows would make such a conveyance practical. Runners were attached to the spindles of the axle-trees in the same manner as wheels. The auto-sleigh was propelled by a revolving drum beneath the front seat and connected to the engine shaft by a chain gear. The auto-sleigh was a primitive precursor of the popular skimobile and the larger ski plane.

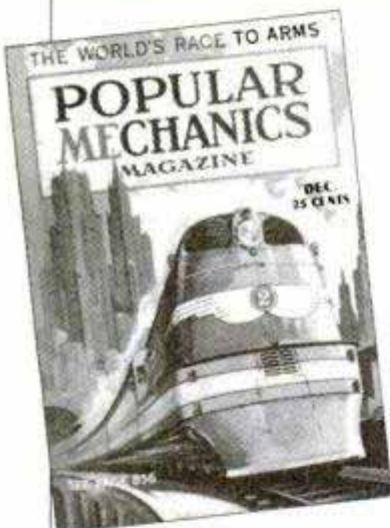


Running on gas

The British outfitted one of their unarmored vessels with a combustion engine. The 715-ton *Rattler* (above) attained a speed of 10 knots with a 5-cylinder gas engine with a space savings of 1400 sq. ft. The admiralty made plans to use the new space for in-

creasing magazine sizes and stowing planes and subs. A journalist wrote: "We shall be told that gas engines will render all steam-propelled ships obsolete. . . remember that the 'Dreadnought' did the same thing. We still have 46 pre-Dreadnought armored ships."

50 YEARS AGO: December 1935



Review of locomotive "voices."

Steam songs

Locomotive engineers had been using a system of whistle communication for more than a 100 years. As the railroad advanced, so did whistle decibel levels. The streamliners were equipped with musical voices—air horns of distinctive tones that told the world the 400 or the *Zephyr* was on its way. While whistle potency advanced, civilization was a little slow catching up. A train crew was arrested for sounding a whistle within Waukesha, Wisconsin, city limits, contrary to city ordinances.

Canary genius

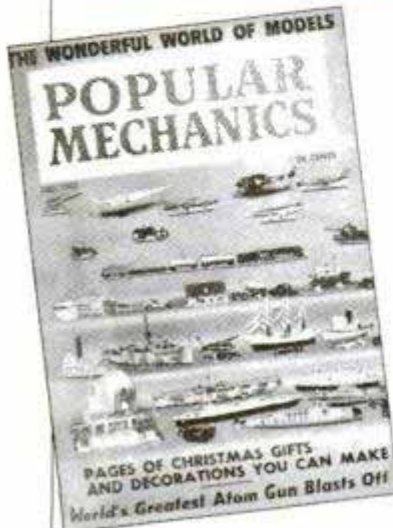
A canary showed psychologist Dr. Gustav Eckstein that it had horse sense. Billie Burke, a bird with a broken wing, disliked her isolation on the floor at feeding time while other canaries were eating on a tabletop. So Eckstein built a spiral staircase of sticks fastened to the table leg. In three days, Billie used the stairs. Later, a similar stair was built to a tree and in 30 seconds Billie had scaled it. Eckstein said Billie recognized the characteristics of her experience and used it to a new end.



Taxidermy fun

Workshop taxidermists could pose animals in humorous attitudes, like this banjo-strumming frog.

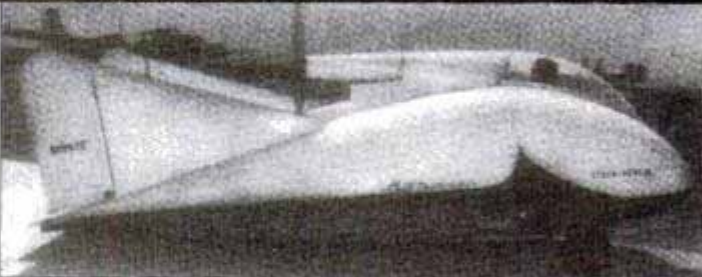
25 YEARS AGO: December 1960



Space age boosts models.

A model society

Model kits may not be a scientific gauge of social change, but a week after the USAF announced its Starfighter jet, stores sold out of the kit. Model manufacturers were hard-pressed to keep pace with sales in a year in which the U.S. announced its moon-landing ambitions. Models showed importance in education, research, therapy, media and manufacturing. Revell researchers did such a thorough job on the Starfighter that Air Force clearance was needed before it could be produced.



Beep-beep zoom

If you've ever idled in heavy, creeping traffic, you'll appreciate the Roadair flying car. It had a 15-foot body and maneuvered on a tricycle gear with the single rear wheel driven by a small gasoline engine. As an airplane, the wings un-

folded to a 25-foot wingspread. A 75-hp airplane engine powered the pusher-propeller. Roadair was one of many efforts to build a car/plane. None fulfilled both purposes, which may account for the popularity of light planes like the Piper Cub. **PM**

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*Including occupants, equipment and cargo.
**Max. GVWR not to exceed 8,500 lbs. for vehicle and trailer combined.
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†Calendar year 1984. Ward's Automotive Report

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