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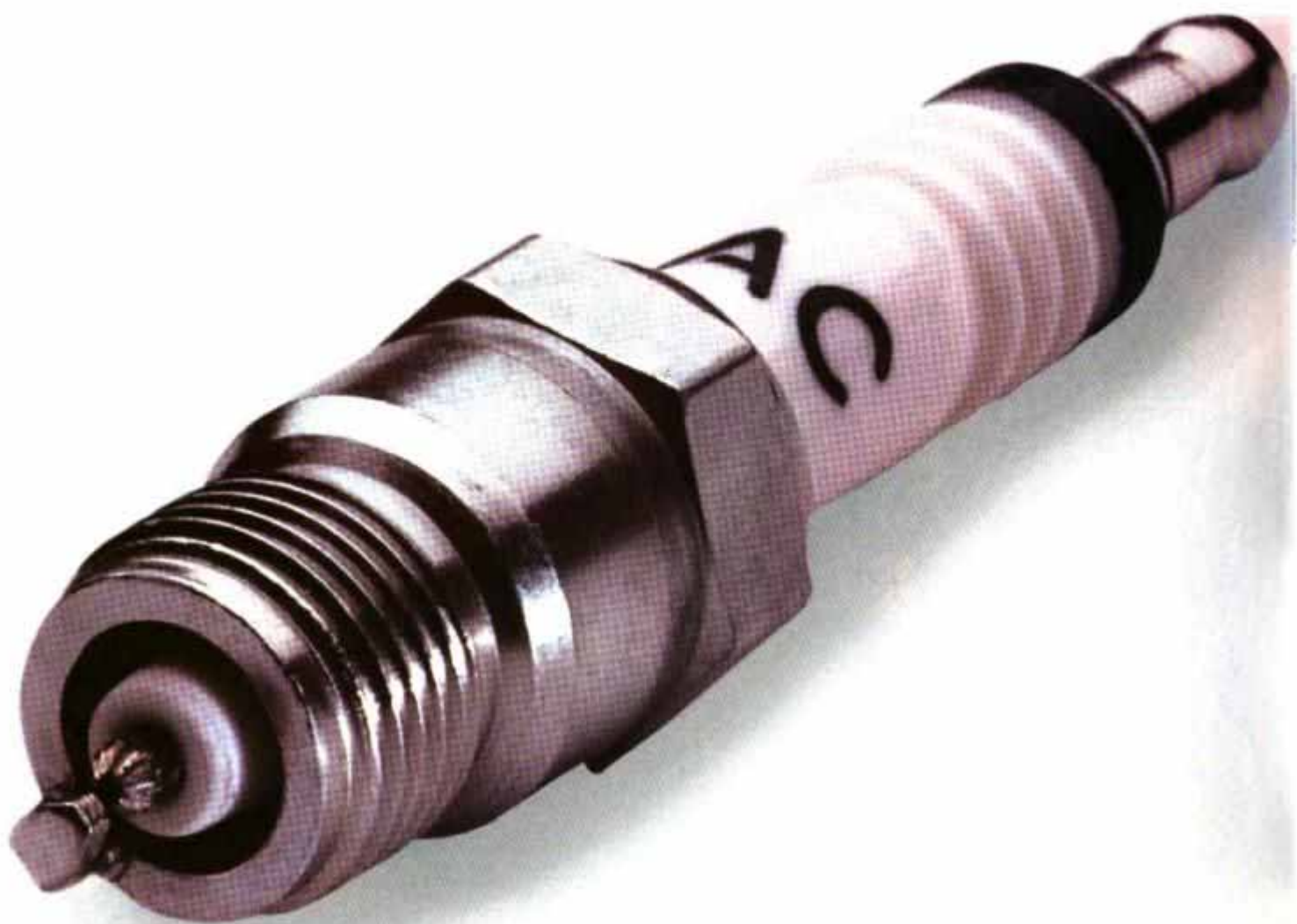
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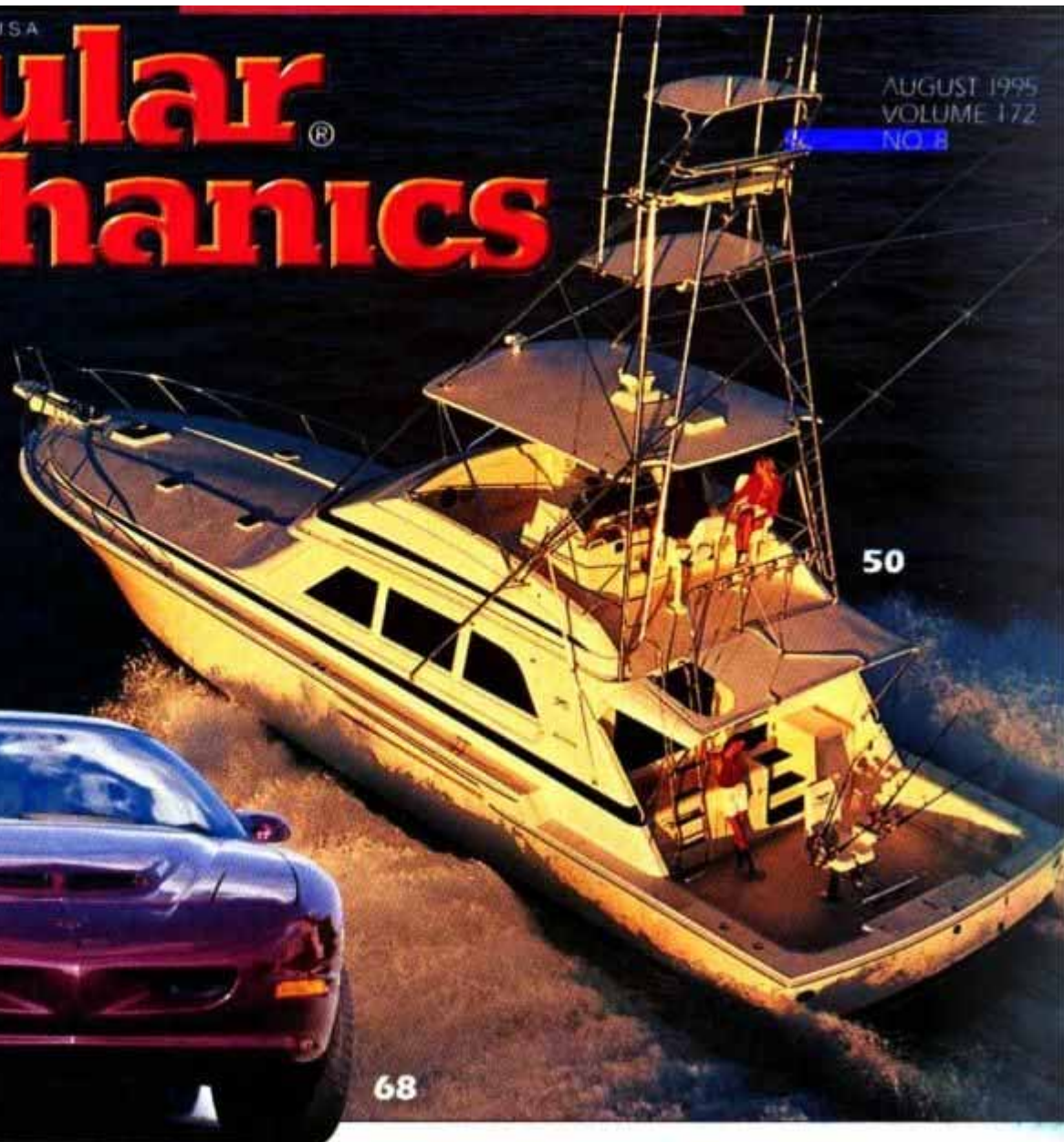
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# Popular Mechanics®

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NO. 8



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## EDITOR'S NOTES

● Imagine your boss saying to you, go spend a week on a \$1.8-million 60-ft. sportfisherman going for the big ones off Bimini. Then come back and tell our readers what it's like to live the dream. That's exactly what I said several months ago to Joe Skorupa, our Boating/Outdoors Editor, who, like a good soldier, promptly went out and followed my instructions to the letter. "Actually, because of deadlines, I had to cut the trip short," Joe says. "I spent only five days down there." Things are tough all over. Meanwhile, what *do* you get when you plunk down two mil for a boat? In addition to a huge mass of fiberglass, steel, cast iron, teak, chrome, leather, wool, cotton and plastic, you get more. You get a fantastic fishing machine and you get a fantasy. The fantasy part



Joe Skorupa at "work" on a 60-ft. Bertram sportfisherman.

begins on page 50. . . . When we heard last year that the Smithsonian Institution in Washington, D.C., had decided to restore only a section of *Enola Gay's* fuselage rather than the whole aircraft, as part of its exhibit commemorating the 50th anniversary of the end of World War II, it was the last straw for me. Here is an aircraft that flew a mission that literally changed the world. The controversy over the use of nuclear weapons aside, this is the plane that flew the mission. *The one.* Over the past 90 years, we've preserved planes that have done far less to alter aviation's—and humankind's—destiny. Yet, for years, this aircraft was left to rot instead of taking a place of honor among the most significant planes in history. The final blow was the Smithsonian insult. The *Enola Gay* deserves better. You'll know why after reading Contributor Bill Garvey's cover story beginning on page 45. . . . **There's always the guy who needs more.** More speed. More power. If you're the Tim Allen type, always looking for more power—especially in your cars—stock isn't enough. What? Get along with a measly 250 or 300 factory horsepower? No way. Not when you can make a phone call and order up 400-hp Mustangs and Camaros and 500-hp Vipers. For you, only a tuner car will do. Your selection process begins on page 68. . . . **And when you're tired** of blasting all over town, laying rubber at every light and popping the hood in the parking lot of every hamburger drive-in joint around (I'm really dating myself here), you're ready to relax in a spa that's guaranteed to soothe those jangled nerves and calm the beast in you. You'll want to first consult our spa buyers guide (page 76) to make sure you make a wise purchase decision and to ensure that your hard-earned money doesn't whirl down the drain. Ouch! Till next time.

  
Joe Oldham

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See important additional information on adjacent page.

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Brief Summary of  
Prescribing Information as of April 1993

## CARDIZEM<sup>®</sup> CD

(diltiazem HCl)

### Capsules

#### CONTRAINDICATIONS

CARDIZEM is contraindicated in (1) patients with sick sinus syndrome except in the presence of a functioning ventricular pacemaker, (2) patients with second- or third-degree AV block except in the presence of a functioning ventricular pacemaker, (3) patients with hypotension (less than 90 mm Hg systolic), (4) patients who have demonstrated hypersensitivity to the drug, and (5) patients with acute myocardial infarction and pulmonary congestion documented by x-ray on admission.

#### WARNINGS

- Cardiac Conduction:** CARDIZEM prolongs AV node refractory periods without significantly prolonging sinus node recovery time, except in patients with sick sinus syndrome. This effect may rarely result in abnormally slow heart rates (particularly in patients with sick sinus syndrome) or second- or third-degree AV block (13 of 3290 patients or 0.40%). Concomitant use of diltiazem with beta-blockers or digitalis may result in additive effects on cardiac conduction. A patient with Prinzmetal's angina developed periods of asystole (2 to 5 seconds) after a single dose of 60 mg of diltiazem.
- Congestive Heart Failure:** Although diltiazem has a negative inotropic effect in isolated animal tissue preparations, hemodynamic studies in humans with normal ventricular function have not shown a reduction in cardiac index nor consistent negative effects on contractility (dp/dt). An acute study of oral diltiazem in patients with impaired ventricular function (ejection fraction 24%  $\pm$  6%) showed improvement in indices of ventricular function without significant decrease in contractile function (dp/dt). Worsening of congestive heart failure has been reported in patients with preexisting impairment of ventricular function. Experience with the use of CARDIZEM (diltiazem hydrochloride) in combination with beta-blockers in patients with impaired ventricular function is limited. Caution should be exercised when using this combination.
- Hypotension:** Decreases in blood pressure associated with CARDIZEM therapy may occasionally result in symptomatic hypotension.
- Acute Hepatic Injury:** Mild elevations of transaminases with and without concomitant elevation in alkaline phosphatase and bilirubin have been observed in clinical studies. Such elevations were usually transient and frequently resolved even with continued diltiazem treatment. In rare instances, significant elevations in enzymes such as alkaline phosphatase, LDH, SGOT, SGPT, and other phenomena consistent with acute hepatic injury have been noted. These reactions tended to occur early after therapy initiation (1 to 8 weeks) and have been reversible upon discontinuation of drug therapy. The relationship to CARDIZEM is uncertain in some cases, but probable in some. (See PRECAUTIONS.)

#### PRECAUTIONS

##### General

CARDIZEM (diltiazem hydrochloride) is extensively metabolized by the liver and excreted by the kidneys and in bile. As with any drug given over prolonged periods, laboratory parameters of renal and hepatic function should be monitored at regular intervals. The drug should be used with caution in patients with impaired renal or hepatic function. In subacute and chronic dog and rat studies designed to produce toxicity, high doses of diltiazem were associated with hepatic damage. In special subacute hepatic studies, oral doses of 125 mg/kg and higher in rats were associated with histological changes in the liver which were reversible when the drug was discontinued. In dogs, doses of 20 mg/kg were also associated with hepatic changes, however, these changes were reversible with continued dosing. Dermatological events (see ADVERSE REACTIONS section) may be transient and may disappear despite continued use of CARDIZEM. However, skin eruptions progressing to erythema multiforme and/or exfoliative dermatitis have also been infrequently reported. Should a dermatologic reaction persist, the drug should be discontinued.

##### Drug Interactions

Due to the potential for additive effects, caution and careful titration are warranted in patients receiving CARDIZEM concomitantly with other agents known to affect cardiac contractility and/or conduction. (See WARNINGS.) Pharmacologic studies indicate that there may be additive effects in prolonging AV conduction when using beta-blockers or digitalis concomitantly with CARDIZEM. (See WARNINGS.) As with all drugs, care should be exercised when treating patients with multiple medications. CARDIZEM undergoes biotransformation by cytochrome P-450 mixed function oxidase. Coadministration of CARDIZEM with other agents which follow the same route of biotransformation may result in the competitive inhibition of metabolism. Especially in patients with renal and/or hepatic impairment, dosages of similarly metabolized drugs, particularly those of low therapeutic ratio, may require adjustment when starting or stopping concomitantly administered diltiazem to maintain optimum therapeutic blood levels.

**Beta-blockers:** Controlled and uncontrolled domestic studies suggest that concomitant use of CARDIZEM and beta-blockers is usually well tolerated, but available data are not sufficient to predict the effects of concomitant treatment in patients with left ventricular dysfunction or cardiac conduction abnormalities. Administration of CARDIZEM (diltiazem hydrochloride) concomitantly with propranolol in five normal volunteers resulted in increased propranolol levels in all subjects and bioavailability of propranolol was increased approximately 50%. In vitro, propranolol appears to be displaced from its binding sites by diltiazem. If combination therapy is initiated or withdrawn in conjunction with propranolol, an adjustment in the propranolol dose may be warranted. (See WARNINGS.)

**Cimetidine:** A study in six healthy volunteers has shown a significant increase in peak diltiazem plasma levels (58%) and area-under-the-curve (53%) after a 1-week course of cimetidine at 1200 mg per day and a single dose of diltiazem 60 mg. Ranitidine produced smaller, nonsignificant increases. The effect may be mediated by cimetidine's known inhibition of hepatic cytochrome P-450, the enzyme system responsible for the first-pass metabolism of diltiazem. Patients currently receiving diltiazem therapy should be carefully monitored for a change in pharmacological effect when initiating and discontinuing therapy with cimetidine. An adjustment in the diltiazem dose may be warranted.

**Digitalis:** Administration of CARDIZEM with digoxin in 24 healthy male subjects increased plasma digoxin concentrations approximately 20%. Another investigator found no increase in digoxin levels in 12 patients with coronary artery disease. Since there have been conflicting results regarding the effect of digoxin levels, it is recommended that digoxin levels be monitored when initiating, adjusting, and discontinuing CARDIZEM therapy to avoid possible over- or under-digitalization. (See WARNINGS.)

**Anesthetics:** The depression of cardiac contractility, conductivity, and automaticity as well as the vascular dilation associated with anesthetics may be potentiated by calcium channel blockers. When used concomitantly, anesthetics and calcium blockers should be titrated carefully.

**Cyclosporine:** A pharmacokinetic interaction between diltiazem and cyclosporine has been observed during studies involving renal and cardiac transplant patients. In renal and cardiac transplant recipients, a reduction of cyclosporine dose ranging from 15% to 48% was necessary to maintain cyclosporine trough concentrations similar to those seen prior to the addition of diltiazem. If these agents are to be administered concurrently, cyclosporine concentrations should be monitored, especially when diltiazem therapy is initiated, adjusted, or discontinued. The effect of cyclosporine on diltiazem plasma concentrations has not been evaluated.

**Carbamazepine:** Concomitant administration of diltiazem with carbamazepine has been reported to result in elevated serum levels of carbamazepine (40% to 72% increase), resulting in toxicity in some cases. Patients receiving these drugs concurrently should be monitored for a potential drug interaction.

#### Carcinogenesis, Mutagenesis, Impairment of Fertility

A 24-month study in rats at oral dosage levels of up to 100 mg/kg/day and a 21-month study in mice at oral dosage levels of up to 30 mg/kg/day showed no evidence of carcinogenicity. There was also no mutagenic response in vitro or in vivo in mammalian cell assays or in vitro in bacteria. No evidence of impaired fertility was observed in a study performed in male and female rats at oral dosages of up to 100 mg/kg/day.

#### Pregnancy

Category C. Reproduction studies have been conducted in mice, rats, and rabbits. Administration of doses ranging from five to ten times greater (on a mg/kg basis) than the daily recommended therapeutic dose has resulted in embryo and fetal lethality. These doses, in some studies, have been reported to cause skeletal abnormalities. In the perinatal/postnatal studies, there was an increased incidence of stillbirths at doses of 20 times the human dose or greater. There are no well-controlled studies in pregnant women, therefore, use CARDIZEM in pregnant women only if the potential benefit justifies the potential risk to the fetus.

#### Nursing Mothers

Diltiazem is excreted in human milk. One report suggests that concentrations in breast milk may approximate serum levels. If use of CARDIZEM is deemed essential, an alternative method of infant feeding should be instituted.

#### Pediatric Use

Safety and effectiveness in children have not been established.

#### ADVERSE REACTIONS

Serious adverse reactions have been rare in studies carried out to date, but it should be recognized that patients with impaired ventricular function and cardiac conduction abnormalities have usually been excluded from these studies.

The following table presents the most common adverse reactions reported in placebo-controlled angina and hypertension trials in patients receiving CARDIZEM CD up to 360 mg with rates in placebo patients shown for comparison.

CARDIZEM CD Capsule Placebo-Controlled Angina and Hypertension Trials Combined		
Adverse Reactions	Cardizem CD (n=607)	Placebo (n=301)
Headache	5.4%	5.0%
Dizziness	3.0%	3.0%
Bradycardia	3.3%	1.3%
AV Block First Degree	3.3%	0.0%
Edema	2.6%	1.3%
ECG Abnormality	1.6%	2.3%
Asthma	1.8%	1.7%

In clinical trials of CARDIZEM CD capsules, CARDIZEM tablets, and CARDIZEM SR capsules involving over 3200 patients, the most common events (i.e. greater than 1%) were edema (4.6%), headache (4.6%), dizziness (3.5%), asthma (2.6%), first-degree AV block (2.4%), bradycardia (1.7%), flushing (1.4%), nausea (1.4%), and rash (1.2%).

In addition, the following events were reported infrequently (less than 1%) in angina or hypertension trials.

**Cardiovascular:** Angina, arrhythmia, AV block (second- or third-degree), bundle branch block, congestive heart failure, ECG abnormalities, hypotension, palpitations, syncope, tachycardia, ventricular extrasystoles.

**Nervous System:** Abnormal dreams, amnesia, depression, gait abnormality, hallucinations, insomnia, nervousness, paresthesia, personality change, somnolence, tinnitus, tremor.

**Gastrointestinal:** Anorexia, constipation, diarrhea, dry mouth, dyspepsia, dyspepsia, mild elevations of SGOT, SGPT, LDH, and alkaline phosphatase (see hepatic warnings), thirst, vomiting, weight increase.

**Dermatological:** Petechiae, photosensitivity, pruritus, urticaria.

**Other:** Amblyopia, CPK increase, dyspnea, epistaxis, eye irritation, hyperglycemia, hyperuricemia, impotence, muscle cramps, nasal congestion, nocturia, osteoarthralgia, polyuria, sexual difficulties.

The following postmarketing events have been reported infrequently in patients receiving CARDIZEM: alopecia, erythema multiforme, exfoliative dermatitis, extrapyramidal symptoms, gingival hyperplasia, hemolytic anemia, increased bleeding time, leukopenia, purpura, retinopathy, and thrombocytopenia. In addition, events such as myocardial infarction have been observed which are not readily distinguishable from the natural history of the disease in these patients. A number of well-documented cases of generalized rash, characterized as leukocytoclastic vasculitis, have been reported. However, a definitive cause and effect relationship between these events and CARDIZEM therapy is yet to be established.

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## All That Glitters



One of the nine areas listed for potential treasure hunters was Lees Ferry, Arizona. Lees Ferry, which lies within Glen Canyon National Recreation Area, is managed as a National Historic District. Under such protection, treasure hunting is prohibited by law. In addition, possessing or using a mineral or metal detector, magnetometer, side-scan sonar or other metal-detecting device, or subbottom profiler within any National Park Service area is illegal. Although the article did caution readers to obtain permission from landowners prior to searching, we are concerned that it may encourage people to violate regulations and destroy precious park resources.

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cles about the subjects that are of the most interest to the average American. And out of the more than 15 magazines I subscribe to, yours is by far the best. Thank you for such an excellent magazine!

DAN CZERWONKA  
BROOKLYN PARK, MN

## Keep On Brewin'

I enjoyed your article on home brewing. I like beer drinkers to experience the challenge of brewing great beer. And we at Miller are pleased that the Editor-In-Chief is "sticking to Miller Genuine Draft."

JOHN N. MACDONOUGH  
CHAIRMAN AND CEO  
MILLER BREWING CO.  
MILWAUKEE, WI

It was nice to see an article on home brewing in your mag. Your findings are just the kind a home brewer like myself expected to see. The three "quick" home-brew kits are nothing of the sort. Brewing time depends much more on the ingredients—particularly the type of yeast—than on the outfit you're using.

ROBERT WINSOR  
KEOTA, IA

Your article was interesting, but it only scratched the surface. Experienced home brewers would categorize most of the equipment you tested as "gadgets." With a little bit of guidance, a beginner could probably make the most, the best and the least-expensive brew with the tall plastic bucket system. By the way: An indispensable source of information about this hobby is your local home-brewing club.

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COMPANIONS  
FARGO, ND  
(VIA INTERNET)

## The Armed Citizen

I'm a convicted armed robber who is now serving a 20-year prison sentence. When publications like yours advertise more and more handguns, you are helping to arm a growing population of criminals.

ALEX FRIEDMANN  
CLIFTON, TN

*Or maybe we're helping to arm law-abiding citizens to defend themselves against the likes of you.*

—Ed.

I prefer that your magazine runs neither gun nor cigarette advertisements.

WILLIAM A. CAWLEY  
PALMYRA, VA

## Give An Inch

I found your comparison test of small V6 sedans very interesting. Best of all, you included cubic-inch engine-displacement values in addition to liters. This made it easy for me to compare cubic-inch/horsepower/weight ratios, as my little mind can't deal with liters. I was beginning to think it was against the law to use cubic inches. Is this part of the New World Order? At any rate, I'll keep my cubic inches here in America—give the liters back to the Europeans. By including cubic inches, you provided a service many car magazines no longer do.

JOHN N. SIMIEN  
BEAUMONT, TX

Advertisement



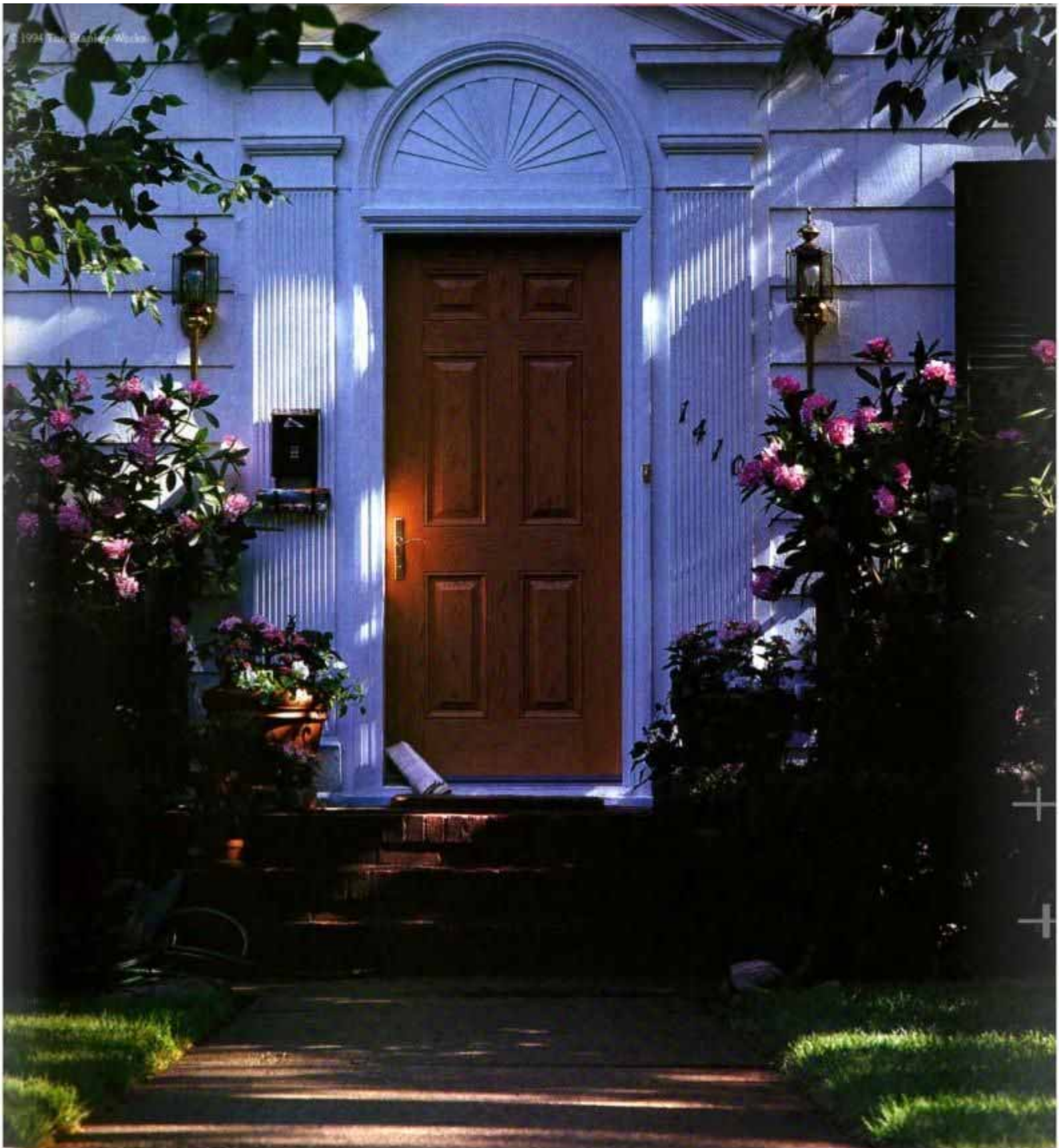
**STANLEY**

## Reader Project Of The Month

I recently installed a new furnace, and used some of the metal left over from the old one to build this model Mercedes 540K Roadster from scratch, using only a single photo for guidance. The body parts are steel, covered in aluminum veneer to hide soldered joints. The wheels are wood, with pins used for the 52 wire spokes in each. The suspension: coil springs in the front and leaf springs in the rear. The convertible roof was built to fold down, but I later added a rear window.

JEROME S. GARDESKI  
GRAND RAPIDS, MI

*If your project is chosen as Reader Project of the Month, you will receive a Stanley Home Improvement Kit, complete with hand and decorating tools, and an electric stapler/nailer, valued at more than \$200. For your project to be considered, please send a clear color photo and brief description to: Reader Project of the Month, Popular Mechanics, 224 W. 57th Street, New York, NY 10019.*



## 300 lbs of pressure and 224 mph winds couldn't break this door down. Better not lose your keys.

We don't test our doors at Stanley. We punish them. We punish them with wind. With water. With very large metal objects. And when we're done, we punish them some more.

If we sound like violent folks, please forgive us. We're not. In fact,

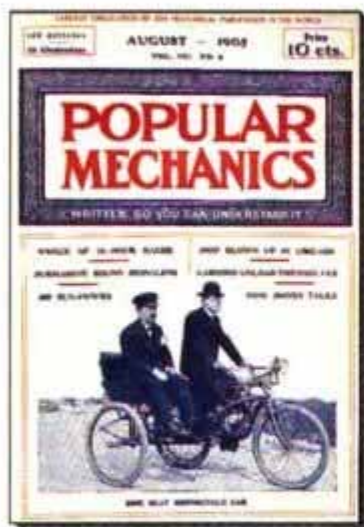
we love flowers, birds and other living things. But to make a better door, you have to be tough.

That's why everything we make at Stanley is specifically designed to be around for a while. Like until the next millennium. Whether it's a mirror

door that doesn't come off its track or a fiberglass hammer that doesn't break on mis-hits, the same will always be true. After all, we've been around for more than 150 years. So, we definitely know a thing or two about longevity. **STANLEY** helps you do things right.

# TIME MACHINE

## 90 YEARS AGO: AUGUST 1905



### Side Action

In between motorbike and automobile scooted the sidecar motorcycle, whose popularity was revving up in the century's early years. Jaunty and inexpensive, the 3-wheeling transport typically traveled up to 30 mph and carried roughly 60 miles' worth of gasoline. One of its most appealing features was a telescoping rear axle, which the driver could shorten to zip in and out of city traffic, then lengthen to help tame those rough country roads.

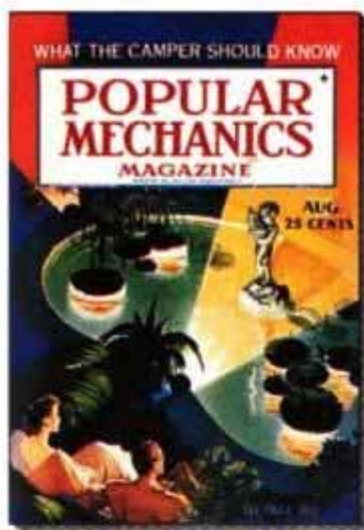
### Super Dock

Well on its way to America's newest possession—the Philippines—was the world's biggest floating dry-dock. The *Dewey* could accommodate battleships

as heavy as 20,000 tons. In action, the 525-ft. vessel would first lower its pontoon base 30 ft. into the water. The ship to be repaired moved in between the dry-dock's walls. Then, pumps flushed water out of the pontoon's ballast tanks, raising the ship. The mobile naval yard took three months to make the trip from Baltimore, around Cape Horn, to the South Seas.



## 60 YEARS AGO: AUGUST 1935



### Night Lights

In the 1930s, summertime entertainment meant garden parties, and lighting companies like General Electric made them possible with new weatherproof wiring accessories. We presented a spectrum of bright ideas for outdoor illumination, ranging from flood-lamps tucked into carved tufa rock to faux lily pads, formed from aluminum and lit from below. Strung between trees, traditional Japanese lanterns created a carnival atmosphere.

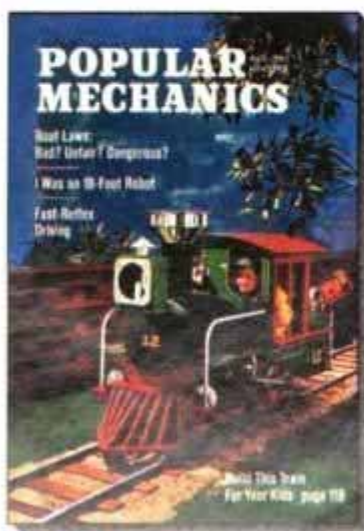
### Flight Heights

Wiley Post's high-altitude experiments had convinced airlines that substratospheric travel was safe and practical. Now they were trying to figure out how to convince their passengers. No one wanted to suck oxygen out of a tube. The answer lay in supercharging cabin air—just as airplane engines had to be supercharged

to breathe the thin atmosphere above 25,000 ft. Meanwhile, engineers considered replacing gasoline engines (which ran feebly above cloudtops) with diesel or steam powerplants.



## 30 YEARS AGO: AUGUST 1965



### Yard Switcher

A Chicago adman took model railroading to the next level by building a pint-size locomotive that chugged along on a couple of car batteries. To get the project on track, the home craftsman began with trips to the lumberyard, hardware store and electrical supply house. The little locomotive ran on 2 x 4 tracks and stopped on a dime—thanks to a powerful handbrake. Push-pull pistons provided the power, although solenoids, not steam, did the grunt work.

### North Star

Alaska's new Marine Highway System was siphoning tourists out of the lower 48 and whisking them into the Last Frontier. Three ferries plied the 500-mile inland waterway from Prince Rupert, British Columbia, to Skagway—the gateway to the Klondike. Chugging along at 20 knots, the vessels completed the trip in 30 hours. Each ferry carried 500 passengers and up to 105

vehicles. While accommodations were plush, a popular option was to use one's pickup camper as a stateroom while seaborne. **FM**





**[ LIKE MANY GREAT VEHICLES CHERISHED BY THEIR OWNERS,  
OURS IS DESTINED TO COLLECT DUST. ]**

Unlike most classic vehicles, the Sonoma Highrider wasn't meant to sit around in some millionaire's warehouse. It is, after all, a GMC Truck. So while it looks great in any parking space, Highrider is at its best in gear, whether it's cruising down the open highway or kicking up dust on the meanest dirt road. Just climb behind the wheel, and Highrider's appeal becomes immediately apparent. Its available 191 HP Enhanced 4.3 liter V6 is the most powerful engine in its class. And there are other niceties as well. Things like massive stabilizer bars. Huge 31-inch tires. Special heavy duty axles. And a suspension anchored by 46 mm Bilstein® shocks, built to absorb punishment. Even the frame was specifically designed for Highrider. It's a truck for truck fanatics, brought to you by the experts at GMC Truck. And although it has all the right qualities to inspire immense devotion in its owners, Highrider has one other distinct advantage: you won't be afraid to take it out of the garage. For more information, call 1-800-GMC-TRUCK.



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# TECH UPDATE

News Of Tomorrow's Technology Today



## Introducing Comanche: Looks, Brains And Guns

STRATFORD, CT—It's not a mock-up. It's real. The Army's dream machine of the 21st century rolled out of an assembly hangar last May. And we got up close and personal with the Boeing/Sikorsky RAH-66 Comanche armed reconnaissance helicopter.

If you could somehow morph a computer into a Corvette, load it with weaponry and make it fly like a hummingbird, you'd wind up with something like the Comanche. On the outside, the chopper is both gorgeous and forbidding. True, it feels odd to rap on a helicopter and hear a soft clunk rather than a metallic ding. But the composite skin and bones lend both stealth and strength.

A demo flight in Sikorsky's Comanche simulator offers a preview of what this chopper is all about. First of all, it's easy to pilot. The cockpit's sidearm sticks do away with traditional collective and cyclic. The fly-by-wire control system brims with unique

autopilot features, such as a hover-position hold that compensates for wind gusts. This helicopter stays in the same spot until you instruct it to move. That should suit Comanche recon missions, which will involve a lot of hiding behind bluffs, popping out for a quick look-around, then hiding again to sort through the images.

The helicopter's reconnaissance capabilities are equally automated. The forward-looking infrared scanner builds digital images, which an on-board processor examines for targets. Cued to find vehicles, the computer seeks out hard-edged shapes with

**Stealthy and smart, the first RAH-66 Comanche saw daylight May 25 and is now in Florida awaiting flight trials.**

telltale infrared signatures. If the processor spots something suspicious, it clips the target out of the image and puts it on a multifunction display to alert the crew. Meanwhile, the computer dots a digital map with target coordinates, which a data radio then relays to commanders.

Sikorsky is still perfecting the software package that will handle all of this work. But the helicopter is on schedule for its first flight this November, in West Palm Beach, Florida.

### Highlights This Month

- **Horn Of Plenty**—Army's mammoth loudspeaker.
- **Space Stations**—NASA's new Mission Control Center.
- **Walking On Air**—Return of the rocket backpack.
- **Yard Work**—Philadelphia proposes high-tech shipbuilding.
- **Shell Game**—Targets flee from smart artillery rounds.
- **Digital Phobia**—Virtual reality helps fight fear itself.
- **Call Of Freedom**—Easiest satellite telephone yet.

Editor/Writer: Gregory T. Pope  
Reporters: Philip Chien, Mike Fillon, Scott Gourley, Francis Hamit, Barry Rosenberg, Herb Shuldiner, Bridget Mintz Testa

## Mother Of All Speakers



Army's Mobile Acoustic Source stretches 56 ft. long, with a mouth 8 ft. wide.

WHITE SANDS MISSILE RANGE, NM—Remember the gigantic horn that sounded off to start the movie

"The Vikings"? The Army now has one that would blow a Norse horn away. It's called the Mobile Acoustic

Source, or MOAS—invariably renamed the "Mother Of All Speakers."

The Army's Battlefield Environment Directorate uses MOAS to study how sounds of helicopters and tanks propagate under various atmospheric conditions. The research aids development of smart munitions that spot vehicles by their acoustics.

MOAS, which is wheeled across the country on a tractor-trailer, can deliver blasts as loud as 145 dBA. Sounds between 10 and 500 Hz can be uncorked. For safety, the crew works 500 ft. away.

Inside MOAS, a 150-horsepower engine drives an air compressor. A voice coil modulates the resultant 8-psi airflow to produce sound.

## Bone Breakthrough

CUPERTINO, CA—Screws, pins and plates in broken limbs may become yesterday's hardware if a bone substitute called Norian SRS proves solid. Doctors are now testing the substance with approval from the Food and Drug Administration.



Artificial bone paste cures quickly to support fracture.

A mixture of calcium and sodium phosphates, Norian SRS crystallizes in much the same way that coral reefs grow—by sheer chemistry, without the guidance of biological proteins. Injected into the voids of bone-break sites, the material hardens in 10 minutes, curing to the strength of natural bone in just 12 hours. Not only do patients need far less support, but living bone also grows into the implant, eventually replacing it.

## Four-Chuter For Sky Diving

ORLANDO, FL—Four jumpers on a single parachute: It sounds like one of those crazy stunts the Russians are always pulling off, but in fact it's a new vehicle for sky diving built by Strong Enterprises.

Called the Quad Pod, the hardware consists of a welded aluminum frame in which two jumpers face forward and two face aft. Once in the air, a 10-ft. drogue chute deploys first before the 1200-sq.-ft. canopy opens. Wielding a joystick, one passenger



Quad Pod vehicle can bring four sky divers to Earth from 14,000 ft.

controls the canopy via servo-powered spools that wind 6 ft. of line on either edge.

Strong has tried out the system twice from a CASA C-212. The Quad Pod has an emergency parachute should the main canopy misfire (which hasn't happened yet).

## Ski House At The South Pole

CAMBRIDGE, ENGLAND—

When summer reaches the South Pole this December, the British Antarctic Survey team will double in size, as seasonal field scientists arrive. But they won't have to live in the disposable tentlike struc-

tures they once inhabited. The intrepid researchers, who found the ozone hole in 1985, have a new house—a unique dwelling that rests on two giant skis.

Cater-

pillar bulldozers can haul the 60-ton structure to new sites. This mobility is crucial because the house sits atop a floating ice shelf. Over several years, shifting ice and winter blizzards can bury and crush a building.

The 64-ft. skis are also fitted with airbags that can inflate to crack ice that accumulates beneath the house.

Nicknamed "Snow Hotel," mobile accommodation resists ice movement.





We  
thought of  
everything.

1  
Chapter One

WITHOUT ANTI-LOCK BRAKES      WITH ANTI-LOCK BRAKES



Anti-lock brakes help you brake and steer your way out of danger. And now we made them standard equipment on most models.

We moved the wheels farther apart, front and rear. Which gives the new Caravan even more stability.



Ultra-high strength steel door beams and front and rear crumple zones are part of the new Caravan's energy management system, which helps protect occupants from the force of an impact.



The new Caravan offers a personal alarm system that you can turn on or off by remote control.

There's room for 28 2x4s under the back seats. Plus we made the liftgate easier to lift and to close.



It's so easy to deploy the wheels on our rear benches, you can do it with one hand tied behind your back.



The wheels on our Easy Out Roller Seats™ pop down like landing gear.

# Introducing The New Dodge Caravan.





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# The New Dodge Caravan



Just as original as the original.™

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New workstation-oriented Mission Control Center (left) is replacing mainframe-based original center (above).

## New Mission Control

HOUSTON, TX—When a Russian robot crept across the California desert last April, it wasn't on a spy mission. Commanded remotely by NASA engineers, the machine was on a mission to show off the flexibility of Johnson Space Center's new Mission Control Center.

The 60,000-sq.-ft. center will supplant the familiar Gemini-era facility by the end of this year. The original center was a technological wonder when it opened in 1964, but

it could handle only one project at a time. When a program changed, workers had to rip out and reconfigure miles of copper wire linking consoles to mainframe computers.

In the new control center, 200 multifunction Unix workstations replace the single-purpose consoles. A 160,000-ft. fiberoptics network—the world's biggest of its type—shuttles data among them. The facility can support several missions simultaneously from its three main control rooms.

Meanwhile, the old control center—which choreographed Moon landings, *Skylab*, Apollo-Soyuz and dozens of shuttle flights—will become a museum.



## Faceprint Security

ALEXANDRIA, VA—Like a fingerprint, the pattern of blood vessels beneath a person's face is unique. Technology Recognition Systems is

First, an infrared camera captures a portrait of a face. The image highlights areas, such as blood vessels, that display a higher temperature than the surrounding flesh.

A computer compares the infrared portrait to one stored in a database. The program begins by matching general facial features and then moves on to the finer data points.

While facial thermography is aimed at controlling access to government facilities, the technique may spawn commercial uses.



Using infrared portraits, thermography can discern identical twins.

developing an identification technique that exploits this individuality. Called facial thermography, the technology should prove quicker and less obtrusive than other biometric systems.

## Rocket Man Rides Again

HOUSTON, TX—One of the most endearing technologies of the 1960s has made a comeback. The rocket belt—designed originally by Bell Aerosystems—has blasted off again. And the man strapping it on is none other than William Sutor, who holds all records for rocket-belt flight.

The new device comes from American Flying Belt, aided by prolific inventor Doug Malewicki. It runs on the same chemistry as the Bell machine. Hydrogen peroxide rushes across a silver catalyst bed, breaking into steam and oxygen and producing a jet stream of superheated air. In the new belt, titanium and aluminum replace stainless-steel components, and fuel tanks are bigger. Untethered flights last 28 seconds, 7 seconds longer than Bell's belt.

Beyond demos by Sutor, American Flying Belt plans to sell the belt in kit form.

Original rocketeer Bill Sutor checks out his new flying belt.



(More Tech Update on page 20)

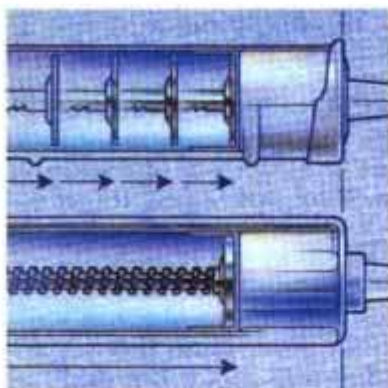


# Better beads thro

**N**o matter what kind of project you're doing, now it'll come out better with one of our new PowRCaulk™ cordless caulking guns. They let you apply

just about any kind of caulk, sealant or adhesive more smoothly and evenly.

The secret to drawing a nice, even bead is smooth, even pressure. That's where manual caulking guns hit a snag. They operate with the



*One squeeze is all it takes to get smooth, even pressure. (And fewer bumps, lumps and jiggles.)*

constantly varying pressure of a ratchet device. So every time you squeeze the handle you get an initial, but temporary, burst of caulk. On the other hand, the PowRCaulk cordless caulking gun uses a screw-driven plunger, steadily advanced by a strong, battery-powered motor—a motor strong enough to apply even the thickest

*There is one advantage to a manual caulker. You'll get more exercise.*



construction adhesive. simple, but effective. You get even pressure, an even bead and even better results.

In fact, when you pull the trigger, you'll be eliminating most of the problems you've ever had with caulking. There are fewer lumps

and bumps, jiggles and jags, and less hand and forearm fatigue. (You can even apply up to 10 tubes of material

just one set of batteries. The PowRCaulk stops neatly as it works, too. W





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engages. This  
stantly releases  
e pressure and  
ectively draws



*With the PowRCaulk's unique drive system, there are no gooey strings or drips.*

e remaining caulk back up  
e tube. The result is the

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messy little strings,  
blobs and drips.

So why let a  
bead of caulk come  
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a job well-done?

Get a PowRCaulk cordless  
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*PowRCaulk caulking guns start as low as \$44.99.*

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# Navy Yard To Crank Out Cruise Liners



Meyer would scale up its Papenburg yard, birthplace of 24-knot *Oriana* (above), for Philly facility.

PHILADELPHIA, PA—The City of Brotherly Love has its heart set on a proposal by one of the world's top-3 shipbuilders. It's a bid to turn the soon-to-close Naval Shipyard into a state-of-the-art commercial facility.

The company: Germany's Meyer Werft, which builds everything from tankers to the brand-new *Oriana* cruise liner. The plan: a \$370-million facelift for the navy yard, including a gigantic covered construction dock big enough to house eight football fields.

The building, outfitted with 210-ft.-high doors, could accommodate the world's biggest passenger ships. Inside, a crane with a lift capacity of 600 tons would shuttle between an assembly area and a dry-dock. Ships would be built in a modular fashion, on a scale not seen before in the United States.

The company's proposal has gained as much support from local labor leaders as it has engendered resistance from rival U.S. shipyards.

## A Touch Of Sound

ANN ARBOR, MI—Sensitive hands have long aided doctors as they probe the body for disease. But palpation does little to spot deeply buried ailments such as kidney disorders. To remedy the problem, engineers at the University of Michigan are giving physicians an electronic sense of touch.



Elasticity imaging is tested on gel that simulates abdominal tissue.

The technology is known as elasticity imaging. Doctors press on the outside of the body, while ultrasound tracks the motion of internal anatomy. Scarred kidney areas don't move as freely as healthy regions—ultrasound can pick this up.

## Open-Air Chair

DENVER, CO—The wilderness may soon beckon to a whole new category of off-roaders aboard Phoenix all-terrain wheelchairs. The new vehicle is the only chair with 4-wheel suspension, adjustable ground clearance and hydraulic disc brakes.



Phoenix all-terrain wheelchair conquers trails with 4-wheel suspension and hydraulic brakes.

Built by Wildernet, the 42-pound Phoenix has mountain-bike handlebars to provide control during downhill runs. You steer the chair with the rear wheels while heading up-

hill or going over rough terrain.

Wildernet is working to develop an off-road wheelchair racing category, in which athletes compete head-to-head with both able-bodied and physically challenged rivals.

## Recording Record



Magnetoresistive head puts 3 gigabytes on a square inch.

SAN JOSE, CA—After cruising the information superhighway, you're going to need a big parking lot to store all your data. Magnetic media—including the good old hard disk—continue to meet the growing demand.

IBM engineers recently achieved a record 3 billion

bits per square inch. At that density, a 720-mega-byte hard drive could hold 3.2 gigabytes of data.

The keys to the breakthrough: a low-noise cobalt alloy and a new magnetoresistive recording head that can register smaller data bits.

## Battle Truck 2000

WARREN, MI—Unlike its tanks, the Army's trucks don't emerge from grand R&D projects. Instead, they evolve from commercial technologies and components, evaluated through testbeds called Tech Demos.

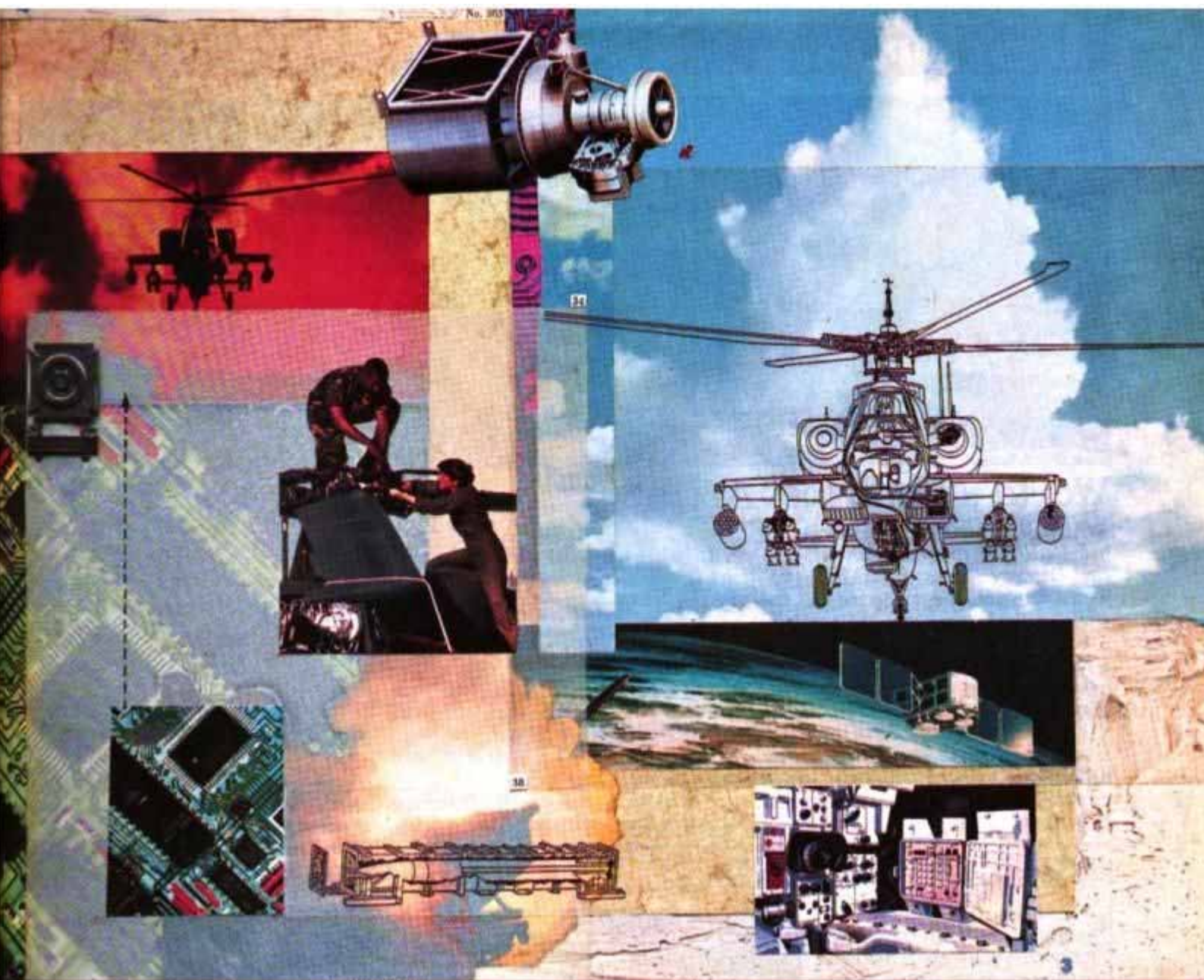
Tech Demo III, under construction by Barnes & Reincke, will begin showing its stuff this winter. The truck is based on a Pallet-

ized Load System (see [Tech Update, page 24, June '93](#)).

A cab-over-engine configuration will swell interior volume by 35% while shortening the entire vehicle by 14%. Inside, a capacitor will assist engine starting, eliminating the need for a second battery. Other goodies: a 9-speed automatic transmission and a traction-control system.

Tech Demo III will evaluate state-of-the-art commercial components for military trucks.





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Because when the future arrives in civilian technology, you'll prove to employers you've already been there. Call 1-800-USA-ARMY.

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people



## World's Smartest Artillery Shell

AZUSA, CA—It's official. The Army has approved production of the Sense And Destroy Armor (SADARM) projectile, a munition designed to halt enemy armored brigades in their tracks.

SADARM blasts from the muzzle of a standard 155mm howitzer. Once over the target area, two submunitions expel themselves from the shell.

Each submunition first pops out a small parachute and gets a fix on its altitude using a millimeter-wave rangefinder. Once the weapon has stabilized, it begins scanning the

ground with millimeter-wave and infrared sensors. Its primary targets are self-propelled howitzers, although SADARM will also draw a bead on tanks, rocket launchers, personnel carriers and air-defense platforms.

A second parachute unfolds to give the submunition time to analyze data. When it has selected a target, it orients itself accordingly and fires an explosively formed penetrator, with devastating results.

SADARMs will also fly from the Multiple Launch Rocket System.



M109 howitzer launches SADARM shell. After separating from its carrier, weapon pinpoints tank and launches penetrator.

## Virtual High Anxiety

ATLANTA, GA—Do dizzying heights turn your knees into rubber? If so, a head-mounted display could show you how to rise above your fear. At Georgia Tech, psychiatrists and computer scientists have created the first virtual-reality treatment for phobias.



GEORGIA TECH PHOTOS



Patient quells phobia by experiencing an open-glass hotel atrium elevator via virtual reality.

level of distress they experience on bridges and balconies. But because they never left the doctor's office, they avoided the

Clinicians have already tested the concept. Instead of marching patients up to high places and talking them through their anxiety, therapists had them don displays and view simulated scenes.

Patients reported the same

embarrassment of freaking out in public. Ultimately, after several sessions of virtual-reality therapy, most could handle real-life heights.

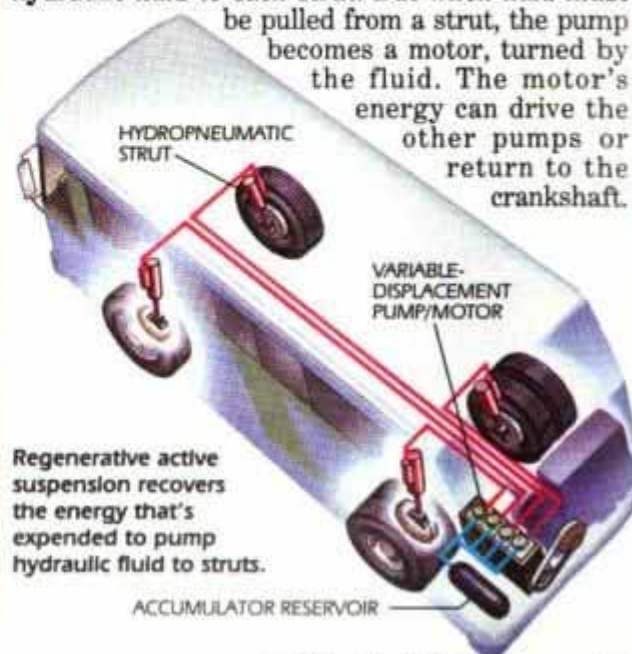
The researchers believe the technique could solve a variety of behavioral disorders.

## Bus Stops Rolling

SAN ANTONIO, TX—Those long cross-country bus trips might get smoother with a new suspension system developed at the Southwest Research Institute. Not only does the hardware take the pitch and roll out of bus travel, it doesn't sap horsepower the way a normal active suspension can.

At the very heart of the system is a quartet of variable-displacement pumps, each driven by a common shaft and connected to a hydropneumatic strut at each wheel. To control vehicle motion, a computer adjusts pump displacement to meter hydraulic fluid to each strut. But when fluid must

be pulled from a strut, the pump becomes a motor, turned by the fluid. The motor's energy can drive the other pumps or return to the crankshaft.



Regenerative active suspension recovers the energy that's expended to pump hydraulic fluid to struts.

ACCUMULATOR RESERVOIR

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with new VG-2 Guard™

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## Sat Phones Get Lighter

NEPEAN, ONTARIO—"No Service." This message winks on when your cellular phone is out of range. It's a problem that future communications-satellite constellations aim to solve by blanketing the world in coverage. But an existing Hughes-built satellite already covers North America—and will soon be operational.

Launched last April on an Atlas II, MSAT carries two antennas that are far bigger and more high-powered than those on the current Inmarsat spacecraft. Inmarsat phones are suitcase-size and costly to operate. By contrast, calls on a 10-pound MSAT phone—built by Mitsubishi and Westinghouse—should run only 75 cents per minute. And you don't have to lift and point it—just be outdoors.

MSAT users will have a single phone number with a special area



MSAT covers North America to supply remote telephone service cheaper than Inmarsat.

code. The phone will use the terrestrial cellular network whenever it's available, switching automatically to the satellite when it's out of range.

## Lasers To Save Your Teeth



At a wavelength of 9.3 microns, pulsed laser anneals tooth enamel without zapping pulp.

ROCHESTER, NY—Ditching the drill, dentists are already experimenting with lasers to remove decay. But scientists at the University of Rochester and Eastman Dental Center have

gone one step further—wielding the laser to prevent cavities.

Ultrashort laser pulses can melt and then fuse a tooth's enamel coating. The enamel absorbs nearly all of the energy. Its surface temperature rises by 1000° F, then cools between pulses. Shielded by the enamel, the sensitive pulp

heats up by only a degree or two.

So far, researchers have tested this technique only on extracted teeth in the lab. But the fused enamel has proven 70% to 85% more resistant to acids.

## Head Airbags On The Side

MUNICH, GERMANY—Looking like a big Bavarian weisswurst, an airbag will burst from a BMW door panel to cushion the head of the driver or front-seat passenger. The automaker plans to introduce the head bag a year from now. (Meanwhile, catching up with Volvo,



BMW's tubular airbag deploys from door upholstery to cushion head.

BMW is also debuting side-impact airbags this year.)

The tubular structure inflates in a 12-mph collision—and in half the time (15 milliseconds) of a BMW front airbag. As the bag emerges, it shortens and balloons to cushion the head. BMW claims that the airbag remains effective even if a side window pops out.

## Camera Combines Near And Far Sight

URBANA, IL—An electronic camera with an endless depth of field is under development at the University of Illinois. The device can snap an image in which distant mountains are as sharp as the flowers at the photographer's feet.

In a standard electronic camera, the image plane of the sensing device stands perpendicular to the lens's line of sight. But in the Omni-Focus camera, the



Camera pans across the scene, focusing objects both near and far when light strikes tilted image plane at a variety of resolving distances.

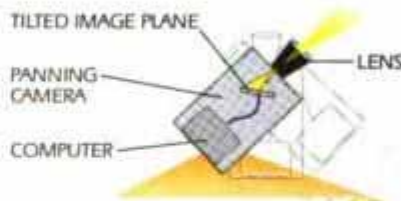


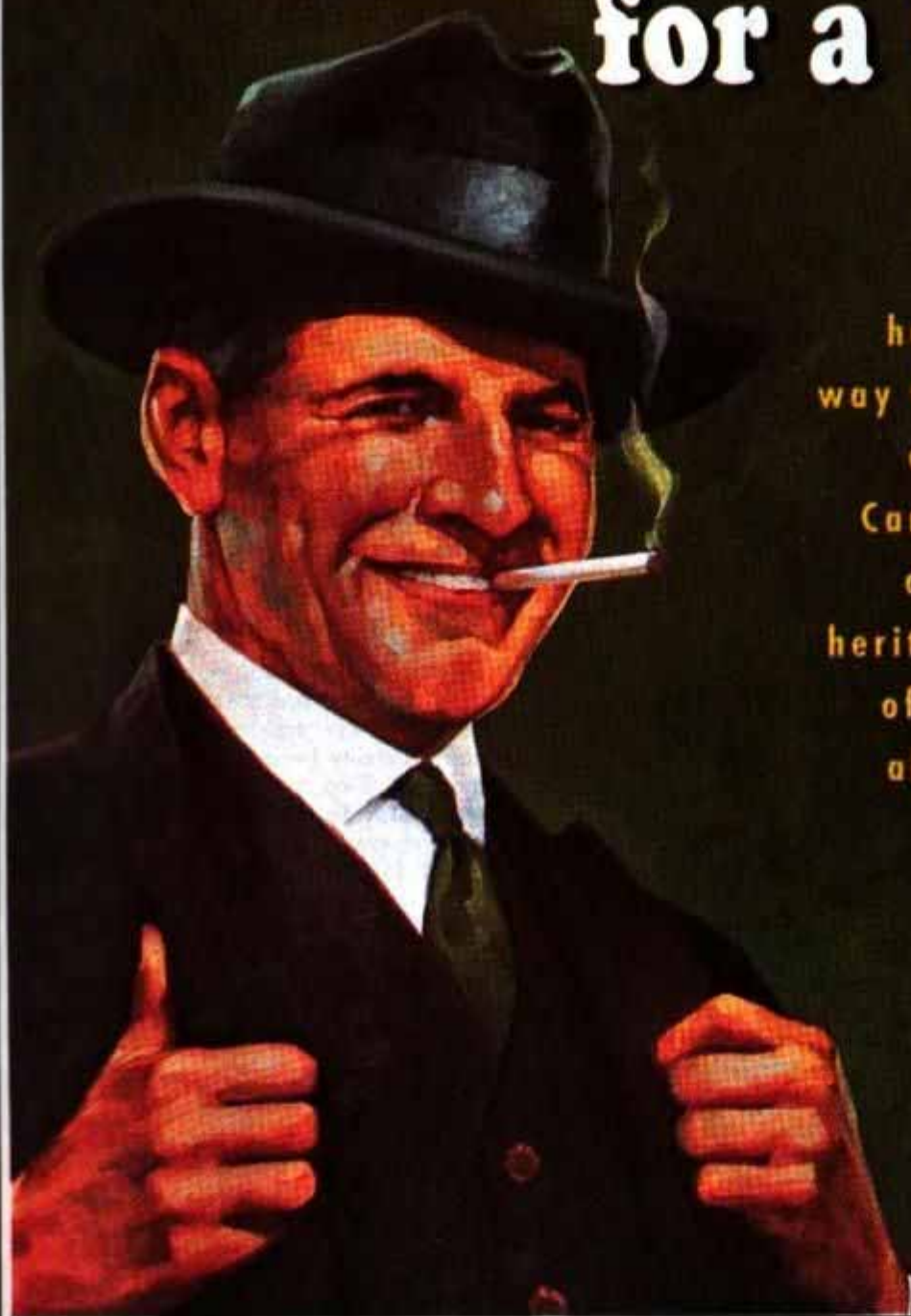
IMAGE ARRAY

FINAL IMAGE

image plane is at an angle. Thus, some elements of the plane lie closer to the photographed scene—and resolve objects at different distances—than other elements. What's more, the camera pans on a small motor, capturing an array of images, so that the entire scene is shot over a range of resolving distances.

The camera's computer analyzes the image array and selects the sharpest image of each object, combining them into one photo.

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# New Technology Improves Sleep Quality

*Chances are, you need better sleep. Thanks to advances in sleep surface technology, now you can get it!*

America has become a nation of the chronically sleep-deprived. The Better Sleep Council reports that over the past 20 years, we Americans have added around 158 hours, or nearly an entire month each year, to our job schedules. That's not to mention the time we spend working hard to care for our families and homes. Sleep deprivation is caused by both lack of time spent sleeping and poor quality sleep. Sound familiar? Then you owe it to yourself to read on!

## SLEEP DEPRIVATION CAN BE DANGEROUS

According to the AAA Foundation for Traffic Safety, sleep-deprived drivers are vulnerable to "micro-naps" lasting four or five seconds—plenty of time at highway speeds for a fatal crash to occur. Disrupted sleep and sleep disorders cost American businesses billions of dollars annually in lost productivity, industrial accidents and higher medical bills. Lack of sleep also was implicated in the Exxon Valdez oil spill, the space shuttle Challenger disaster and the nuclear accident at Three Mile Island.

Loss of sleep during the night is responsible for increased vulnerability to illness, a tendency to nod off at work the next day, and even loss of creativity and clarity of thinking, say British researchers. Power tools can become dangerous weapons in the hands of someone who is not well rested. And almost everyone is familiar with the physical aches and pains that occur because of poor quality sleep.

## DO YOU NEED MORE SLEEP, OR JUST BETTER SLEEP?

On the average, most adults require seven and a half to eight hours of sleep per night, and a full cycle including deep sleep is required for us to feel adequately rested in the morning. Any number of factors can interfere with

deep, nourishing sleep—including cigarette smoking, worry, a noisy environment and physical discomfort.

*Only air-cushioned support has been proven to positively affect all three factors that determine the quality of sleep: spinal alignment, pressure points and physiology.*

We try remedies from pain medication and sleeping pills, to chiropractic care and self-relaxation techniques in order to get better sleep and rid ourselves of morning aches and pains. But new sleep surface technology offers a simpler solution for many people who toss and turn.

## THE FIRST REAL BREAKTHROUGH IN SLEEP SURFACE TECHNOLOGY IN OVER 100 YEARS

Even if you just bought a new bed, you may be sleeping on an antiquated surface! Developed a century ago, innerspring mattresses create pressure points that interfere with total relaxation. Waterbeds made a big splash in the '60s, but even those labeled "firm" produce a hammock effect, causing the spine to curve unnaturally. Fortunately, a new technology has come through test after test with flying colors: Select Comfort Air Sleep Systems™.

The Select Comfort adjustable firmness mattress uses air, which, unlike metal coils or water, distributes body weight more evenly and provides better support.

While it looks like a traditional mattress on the outside and even fits standard sheet sizes, the Select Comfort mattress is completely unique on the inside. Air is captured inside innovative "I-beam" chambers that contour to the body, support the spine, eliminate pressure points and evenly distribute weight for better sleep.

What's more, each side of the Select Comfort adjustable firmness mattress is independently adjustable—with a remote hand control that digitally tells you the

firmness level that's perfect for you. And, you can let air in or out to change the mattress firmness, depending upon how your body feels each night. This is essential for couples, because two people of different shapes and sizes cannot sleep on the same surface and both be as comfortable as they should be to achieve the best possible sleep.

## MADE-IN-MINNESOTA QUALITY

Select Comfort adjustable firmness mattresses are manufactured in Minneapolis, Minnesota, and tested for comfort and durability by independent laboratories. Well on its way to becoming a worldwide leader in state-of-the-art sleep systems, Select Comfort currently is the fastest growing company in America's bedding industry, and has earned 22 U.S. patents.

## LIGHTWEIGHT AND EASY TO SET UP YOURSELF

The Select Comfort adjustable firmness mattress is so lightweight, it can be delivered via UPS in one carton. Following the simple instructions, one person can set up the system at home, usually in 30 minutes or less. An attached electronic air pump fills the mattress with the right amount of air, and then hides out of sight under the bed. Dual controls allow each sleeping partner to adjust the sleep surface to their desired firmness.

## TRY SELECT COMFORT RISK FREE FOR 90 NIGHTS

Thousands of people from coast to coast already own a Select Comfort adjustable firmness mattress. You can try one, too, protected by a "90 Night No Risk" guarantee and a 20-year product warranty. Call our sleep consultants and ask them about your particular sleep needs. They can answer all your questions and help you better understand how you can benefit from a Select Comfort adjustable firmness mattress.

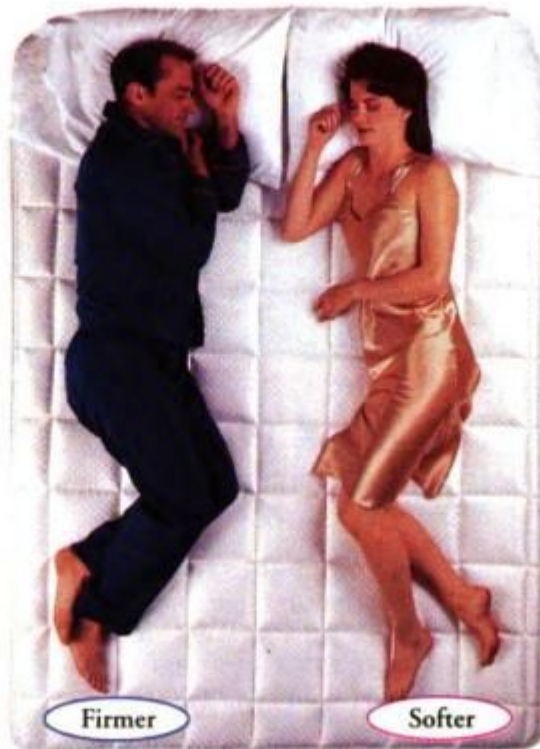
For a free brochure and introductory video, call 1-800-831-1211, Dept. 4332.



# Sleep Better, Feel Better!

## Frustrated With The Quality Of Your Sleep?

Do you toss and turn at night? Can't seem to find a comfortable position? Does your back ache when you awake? These are signs that your metal coil mattress or waterbed isn't supporting you properly and isn't right for your body. Select Comfort can help you sleep better with a revolutionary mattress that's so comfortable and supportive, it's recommended by doctors.



*With Select Comfort, you each get exactly the firmness you need.*



*Select Comfort's patented air cushion design has no springs or coils that can create pressure points and uneven support.*



*Metal coil mattresses support only the firm parts of your body, creating pressure points, and uneven spinal support.*

## You Control The Firmness

With Select Comfort, you can change the firmness depending on how your body feels each night. Go from extra-firm to extra-soft, simply at the touch of a button. In



*Customize the firmness of each side of the mattress.*

fact, the firmness adjusts independently on each side of the bed so you and your partner can get custom support without compromising comfort or quality of sleep.

## Call For More Information

You owe it to yourself to learn more about this revolutionary way to a better night's sleep.

For a **FREE** Video and Brochure, Call  
**1-800-831-1211**

**Yes! Please rush me a FREE Video and Brochure.**

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**SELECT COMFORT™**

Mail to: **Select Comfort Corporation**  
6105 Trenton Lane North, Minneapolis, MN 55442  
Dept. 4332

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## Sleep Better On Air

A Select Comfort adjustable firmness mattress doesn't rely on springs or water. Instead, it supports your body perfectly on a cushion of air. Air is better because it gently contours to your body's shape and keeps your spine in its natural alignment. And that lowers the tension in the surrounding muscles. So you can sleep comfortably in any position and wake feeling great—without back pain.



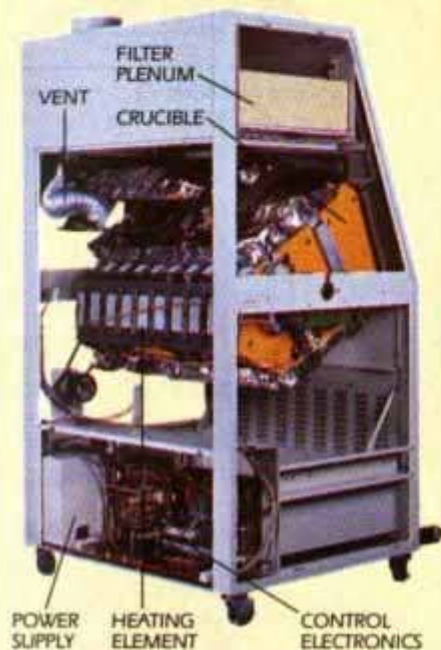
*Select Comfort contours to your body.*



*The Only  
Mattress with  
Push Button  
Firmness Control.*

## Throwing Out Medical Waste

MINNEAPOLIS, MN—To dispose of infectious medical waste—such as blood-tainted syringes and surgical gowns—workers must box it up carefully and haul it to a special incinerator. To snarl matters, the Environmental Protection Agency is slapping new regulations on emissions from these incinerators.



DSI System 2000's crucible renders infectious medical waste safe to handle.

In response, Medivators Inc. has developed an on-site disposal unit that allows dangerous waste to be recycled or tossed out safely. The DSI System 2000 destroys infectious agents by baking waste in a high-temperature crucible. The output after a 105-minute cycle: a harmless, easy-to-handle brick.



SOFIA will carry aft-mounted infrared telescope on short-fuselage, long-range 747SP.

## NASA's New Jumbo-Jet Telescope

MOFFETT FIELD, CA—Among NASA's many eyes, one of the keenest is the Kuiper Astronomical Observatory. It's actually a C-141 aircraft fitted with a 3-ft. infrared telescope. Soaring between 41,000 and 47,000 ft., Kuiper flies above most infrared-blocking water vapor in the atmosphere.

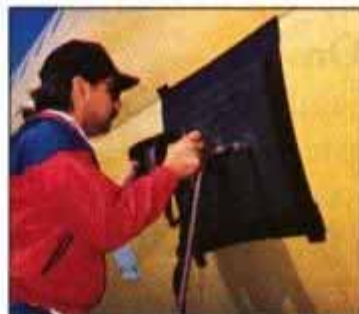
While Kuiper has enjoyed a glorious career, discovering Uranus's rings and photographing Halley's comet, the

plane is nearly 20 years old. So next year, NASA will prepare its replacement: the Stratospheric Observatory For Infrared Astronomy, or SOFIA.

Built into a used Boeing 747SP, the observatory will carry a telescope with a 7.8-ft. mirror, offering seven times the collecting area of the current telescope. Germany is bankrolling much of the project, in exchange for viewing time.

## Magnetic Bodywork

LONG BEACH, CA—Just like cars, airplanes suffer dings and dents. To keep planes in service and out of the body shop, McDonnell Douglas is offering a new electromagnetic dent-removal system that can straighten aluminum skin without having to cut up the fuselage. The



Electromagnetic dent removal can be accomplished in the field.

FAA-certified technology was developed under license from Seattle-based Electroimpact.

The hardware consists of a coil that first sets up an electromagnetic field across the inner and outer surfaces of the damaged area. Then a capacitor discharges, and the resultant flux disrupts the outer field. Pressure from the inner field pushes the skin out with a pop.

## Patrol Craft Packs A Punch

CORONADO, CA—Fast and mean, the Navy's new Cyclone-class patrol boats are already active. Last year, they debuted in operations off Haiti. The class will fill out with its 13th vessel—the USS Shamal—in early 1996.

For a 170-ft. ship, the Cyclone boasts impressive agility. It can accelerate from zero to 35 knots in just 100 seconds, then reverse to full astern at 15 knots in 60 seconds. Port and starboard rudders, coupled with an on-board gyroscope system, keep the vessel livable in high seas. The ship dips only 3 ft. into the water.

Armaments? Two Mk.38 25mm cannons, a Stinger missile station and four pintles that can hold either machine guns or grenade launchers. The Navy is already replacing one Mk.38 with a new Mk.96 platform that combines the same gun with a grenade

launcher, all on a stabilized turret. At the boat's rear, Navy SEALs can deploy on rubber raiding craft or by diving off a swimmer's platform. **TU**



Cyclone patrol craft features stabilized weapons turret among its deck mounts.



## PM HOTLINES

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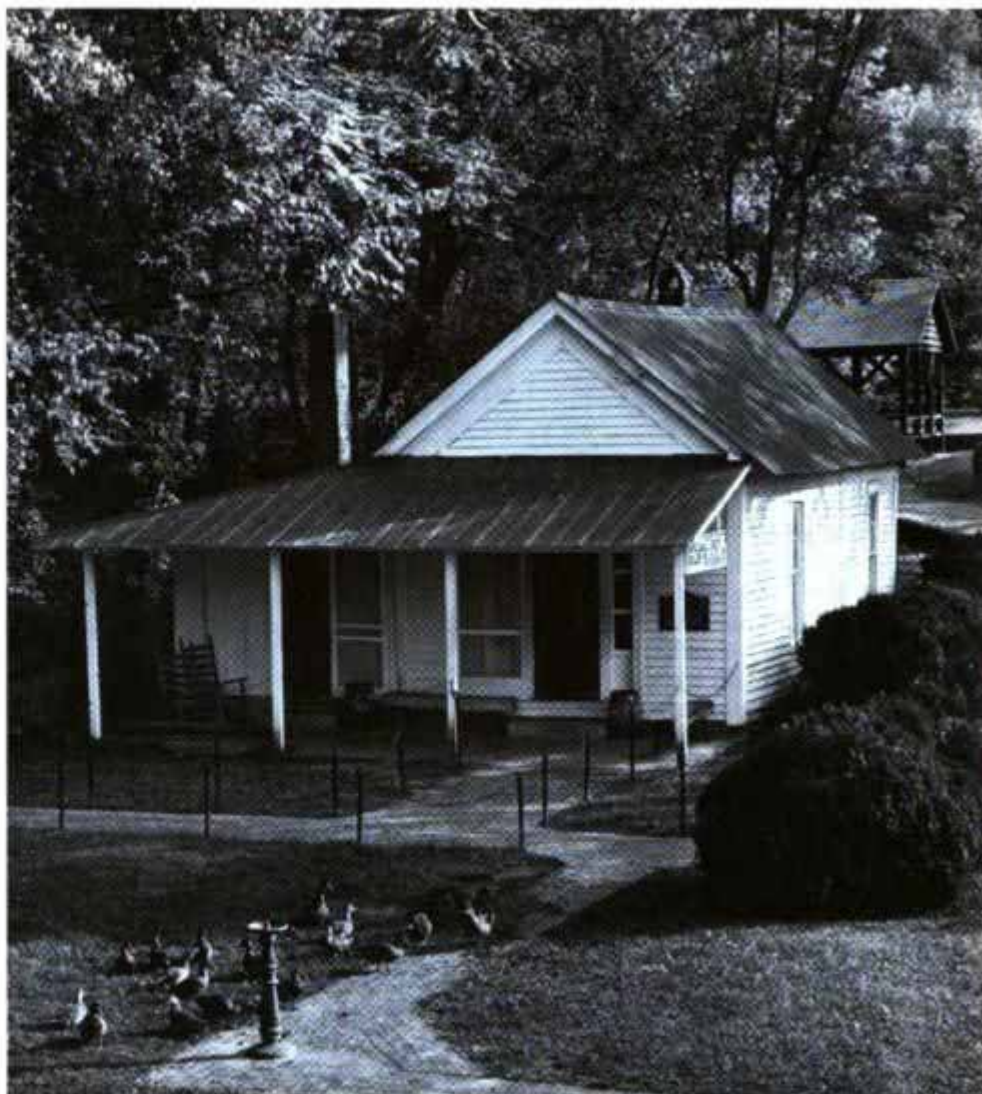
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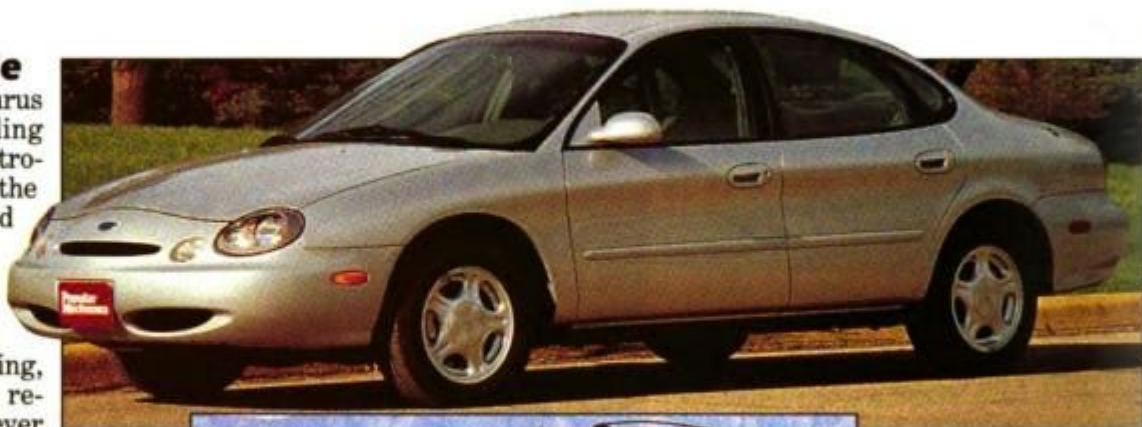
# AUTOMOBILES

## New Cars

### Taurus And Sable

● The original Ford Taurus was a considerable styling departure when it was introduced in 1986—perhaps the biggest gamble Ford had taken since the Edsel back in the late '50s. However, unlike Edsel, it was a winning bet, and the Taurus (and its sibling, the Mercury Sable) has remained a styling leader ever since. In addition, both cars have been sales leaders, gaining ground after a minor facelift in 1992.

This fall's Taurus/Sable models are less radical a departure from the past. Despite the fact that not so much as a nut or bolt is carried over from the previous models,



the cars share looks and engineering with the still-new Contour/Mystique.

Exterior sheetmetal drapes dramatically over the mechanical underpinnings, and the oval theme of the bodywork gives a drag coefficient of only 0.30 for excellent freeway mileage. Computer-aided design and manufacturing techniques permitted Ford engineers to make the body substantially stiffer without adding weight. This, in turn, permits better isolation from road noise and harshness.

There's also a new engine under the hood: a 200-hp 200 ft.-lb. 24-valve 3.0-liter V6 Duratec, related closely to the 2.5-liter Duratec that's used in the Contour. Coupled with this engine is the all-new AX4N high-capacity 4-speed electronically controlled transaxle. An updated and improved version of

the pushrod-operated 3.0-liter V6 is rated at 145 hp/170 ft.-lb.

The new Taurus is more than 5 in. longer than last year's, and the Sable, nearly 8 in. With overall width nearly 2 in. greater, interior volume is up by 17%.  
—Mike Allen

### Chevrolet Tahoe 4-Door

With this 4-door Tahoe, Chevy expects 75,000 sport/utility buyers this



Tahoe 4-door fits "just right" between Blazer and Suburban.

year to remember the childhood fable *Goldilocks And The Three Bears*. They'll find the 4-door Blazer *too small*, the Suburban *too big* and the new 4-door Tahoe *just right*. The 199.1-

in.-long Baby 'Burban fits dead center between the 181.2-in. 4-door Blazer and the 220-in. Suburban.

The 4-door Tahoe's 117.5-in. wheelbase also splits that dimension of the other two trucks. And having the same 76.4-in. width as the Suburban, the Tahoe can seat six, whereas the 67.8-in.-wide Blazer is limited to four. Cargo room is also significantly greater than that of the Blazer—and the Ford Explorer and Jeep Grand Cherokee, for that matter.

All 4-door Tahoes are powered by a 200-hp 5.7-liter V8 that makes this big truck feel small out on the road. Merging into traffic or passing on a 2-lane is no problem. And the V8's 310 ft.-lb. of torque give the 4-door Tahoe a maximum towing capacity of 6500 pounds.

To complement the Tahoe's cushy highway ride and smooth-shifting 4-speed automatic transmission is a lux-

urious interior (leather is optional) with a driver's airbag, multiple cup holders, well-placed grab handles, rear-seat heat ducts and a 60/40 fold-down rear seat. Four-wheel ABS is standard.

Chevrolet (and GMC with its 4-door Yukon) has found a niche in the red-hot sport/ute market that the first competitor (probably Ford) won't be entering for another 18 months. With no

direct competition, and base prices at \$26,995 (2wd) and \$29,195 (4wd), Chevy has written its own fairy tale. This truck is just right.

—Scott Oldham

## Pontiac Firebird And Sunfire

Pontiac home fires are burning brighter for '96, as engineers heap more coal into the sporty Firebird and its junior sibling, the Sunfire. Heading the all-fire cast is the 305-hp Ram Air WS6 option for the Firebird and Trans Am. A new intake uses a twin-scooped hood with "Ram Air" emblazoned on each nostril (shades of Pontiac's '60s muscle years). The hood is sealed to a large



A Ram Air option for the '96 Firebird/Trans Am brings dual hood scoops and 305 hp.

## Porsche 911 Turbo

The 993-chassis versions of the 911 Turbo are here, following the normally aspirated Carrera 2 and 4 by a

Subjectively, the Turbo achieves ludicrous speed in only a heartbeat or two. And it does so with perfect manners—even if the steering wheel is not straight.

Despite being faster than a speeding bullet and more powerful than a locomotive, the 911 Turbo is perfectly happy to chug along in stop-and-go traffic without overheating, stalling or turning your left leg to mush.

Porsche has held the older model's \$99,000 price, making it the most attainable of the cars at its performance and sophistication level. —M.A.

## V8 Explorer

Ford already owns the middle and upscale portions of the compact sport/ute market, with Explorer garnering 26% of total sales. That's a more-than-significant amount of a field with 20 players. But what's been



A 2.4-liter dohc balance-shaft Four replaces the 2.3-liter Quad 4 in Pontiac Sunfires.

Corvette-style air cleaner. Dual pup catalytic converters reduce exhaust backpressure. Handling is tweaked to match the added power with the WS6's stiffer springs, larger sway bars and revalved shocks. There's also a stiffer transmission mount and stiffer Panhard rod bushings. The hot 'Birds keep their cool on new, sticky P275/40ZR17 Goodyear Eagle GS-C tires wrapped around 17 x 9-in. 5-spoke alloy wheels.

The standard LT1 V8 has been upped 10 hp to 285, also by dual pup catalytic converters.

Meanwhile, the base 3800 Series II V6 has been stoked up with 40 more horses and 25 more ft.-lb. of torque, so output is now 200 hp/225 ft.-lb. A special 3800 performance package includes disc brakes at all four corners, limited-slip rear, performance ratio axle with the automatic transmission and quicker ratio steering.

Sunfire (and its sister, the Chevy Cavalier) gets a new 2.4-liter dohc balance-shaft Four that's standard in the GT coupe and optional in other models. Replacing the 2.3-liter Quad 4, the larger engine—with its longer stroke and reduced bore—pumps out an additional 5 ft.-lb. of torque that peaks at 4400 rpm instead of the Quad 4's 4800 rpm. Horsepower is the same for both—150 at 6000 rpm. Also new is an optional 4-speed automatic with all engines. —Cliff Gromer

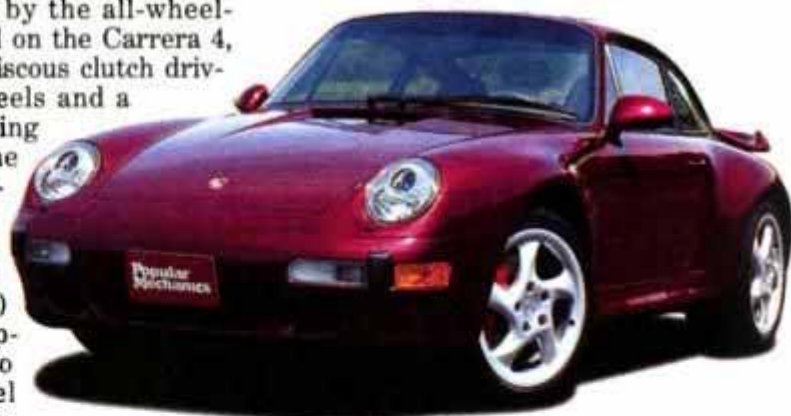
full model year. Propelled by a twin-turbo 3.6-liter flat-Six, it generates 400 prodigious horsepower and 400 urgent ft.-lb. of torque. This is applied to the pavement by the all-wheel-drive system used on the Carrera 4, a silicone-based viscous clutch driving the front wheels and a conventional locking differential on the rear. Supplementing this advanced setup is Porsche's ABD (Automatic Brake Differential) system, which applies the brakes to either rear wheel when it's slipping, at up to 43 miles per hour.

Porsche claims a 0-to-60-mph time of 4.4 seconds, and we find that to be conservative by at least a half second.

missing is a V8-powered version of the hugely successful Explorer.

Available this fall, some models of the 2wd Explorer will be available with the 5.0-liter V8 used in other Ford trucks. No timetable has been announced as of yet for the 4wd versions, so don't call us.

The 4.0-liter V6 will continue to be available in all models of the Explorer. —M.A.



Tamed, yet still bad to the bone, the '96 Porsche 911 Turbo boasts 400 hp and 400 ft.-lb. of torque.



Coming this fall: 2wd Ford Explorers with 5.0-liter V8s.



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

17 mg. "tar", 1.3 mg. nicotine av. per cigarette by FTC method.

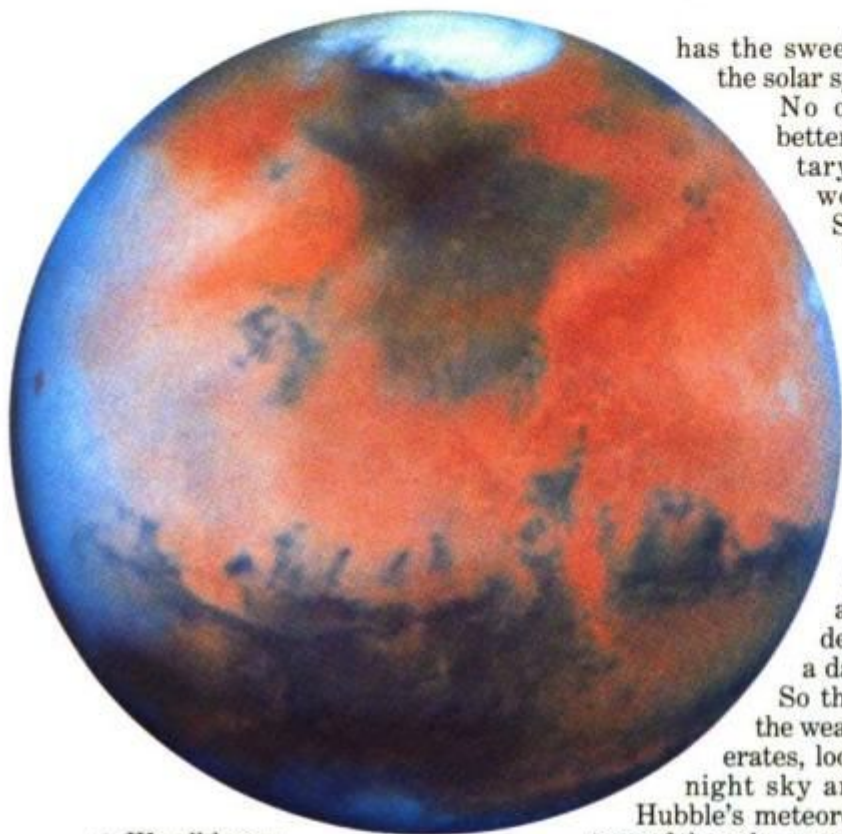
**AGFIELD**



**You  
Can't  
Rush  
Smooth  
Flavor.**

# How's The Weather Up There?

BY GREGORY T. POPE, Science/Technology Editor



has the sweetest weather in the solar system.

No one knows this better than the planetary scientists who work the Hubble Space Telescope. When it's not gazing halfway across the universe, the telescope keeps a weather eye on Earth's nearest neighbors. Lately, Hubble has revealed conditions that make a Nebraska thunderstorm look like a day at the beach.

So the next time the weather cooperates, look at the night sky and take Hubble's meteorological tour of the solar system.

You can skip Mercury, however, which Hubble isn't even permitted to watch (it skirts too close to the Sun). Besides, the little planet either bakes at 750° F or chills at -350° F. With its scant atmosphere, Mercury simply doesn't have any weather to speak of.

Venus is another story. Our cloud-wrapped neighbor, currently bleached out of Earth's sky by the rising Sun, has a distinct climate, though it's hardly agreeable—unless you like battery-acid rain and 900° F surface temperatures.

Surprisingly, though, Venus's weather is improving. Last winter, Hubble photographed Venus in ultraviolet wavelengths, which revealed concentrations of sulfur dioxide. This smoggy gas has cleared since NASA last checked the planet's weather—when the *Pioneer Venus* probe took its suicide plunge (see [Tech Update, page 18](#), Feb. '93). The explanation: Venus's sulfur-spewing volcanoes, recently charted by the *Magellan* spacecraft, have been quiet.

Next stop: Mars, which now glowers

in the evening above the western horizon. Last winter, the Red Planet swept so close to Earth that Hubble captured images with resolution approaching that of a weather satellite. This picture (left), shot last February, is considered the finest photo of Mars ever snapped from Earth's vicinity.

Like Venus, Mars has seen its weather change since the last time Earthlings sent a spacecraft there. When the *Viking* lander touched down in 1976, the Martian sky was a peach pastel, tinted by dust particles swept into the atmosphere. But if a spacecraft landed today, its cameras would see a gorgeous deep blue sky, flecked with fleecy clouds.

That's because Mars is now colder, clearer and drier than it was in the 1970s. The planetwide dust storms that kick up about every two years—when Mars swings closest to the Sun—have mellowed considerably. The Martian winds apparently aren't whipping enough debris into the atmosphere for the particles to stay airborne once Mars retreats from the Sun.

Dusty days are mild days on Mars—sunlight warms up the particles, which, in turn, heat the thin atmosphere. When Martian air is clear, however, temperatures fall so low that water vapor



Venus: smog is clearing.



Jupiter: rapid storm movements.



Neptune: new clouds each week.



condenses into ice clouds.

Another clue to a colder Martian climate: Hubble's spectrographic instruments have measured elevated levels of ozone creeping down toward the Martian equator. Frosty temperatures encourage ozone because water is locked up into ice crystals instead of floating freely as an ozone-depleting gas.

Now it's on to Jupiter, which currently rules our southern sky from the constellation Scorpio. For months, Hubble has been scoping out the king of planets for the probe

*Galileo* (see [Tech Update](#), page 20, July '95). Scheduled to arrive sometime in December, *Galileo* will have plenty of alien weather to watch, since Jupiter never lacks for colorful atmospheric phenomena.

The disturbances stirred by the great comet crash of 1994 (see "Year Of The Comet," page 40, Dec. '94) have largely subsided, and Jovian winds have smeared away the "black eye" left by the impact. But Jupiter watchers have become intrigued by a trio of storms racing toward the Great Red Spot. These oval structures gain their white color from cloud tops of

frozen ammonia. During the past year, they've moved so dramatically that they're sure to be prime targets for *Galileo's* closeup camera.



The new dark spot in Neptune's northern hemisphere may not last long.

Meanwhile, on Saturn (which rises a few hours before dawn), Hubble has been tracking a major storm—a rarity on the calm ringed planet. Approximately 8000 miles across, the storm has been raging unabated ever since its discovery last September.

Hubble has also taken the first shots of Uranus and Neptune since the *Voyager 2* flybys of 1986 and 1989. Ground-based telescopes can't resolve details on these distant planets, which, this summer, lie in Capricorn and Sagittarius, respectively.

On Uranus, Hubble identified two bright clouds and a haze over the

planet's southern pole—features first spotted by *Voyager 2*. But Uranus has little in the way of weather, since it's far from the Sun and cranks out scant internal heat.

Neptune, by contrast, changes quickly. Case in point: the Great Dark Spot, discovered by *Voyager 2*. It's gone. Instead, brilliant clouds swirl across the planet's blue face. In addition, a new dark spot has surfaced on Neptune's northern hemisphere. But unlike Jupiter's Great Red Spot—a giant hurricane—Neptune's spots are believed to be gaping holes in the high-altitude methane clouds that mask the planet. Neptune burns a strong internal heat source that can scramble its atmosphere within weeks.

Remote Pluto would be the final stop on this tour, but its atmosphere is too thin and cold to boast weather. Although Hubble has taken pictures of Pluto that reveal a variegated surface, scientists will have to wait for the Pluto Express probes (see "Destination: Pluto," page 64, July '95) to gain further insight. **FM**

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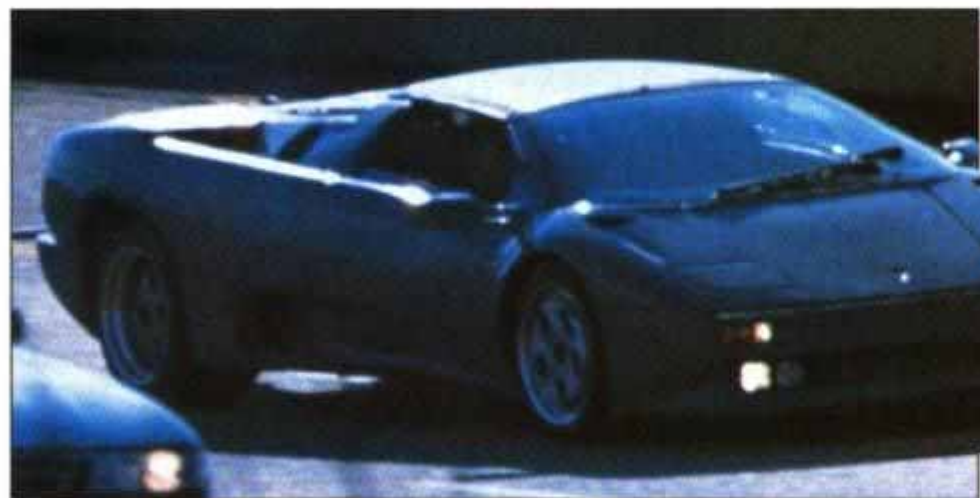


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# Europe Spy Report

BY MIKE ALLEN, Associate Automotive Editor



## Lamborghini Jota

● Lamborghini, the Italian supercar-maker, has found it necessary to improve the performance of the already prodigiously fast Diablo. With more than 600 horsepower, the new lightweight Jota is being groomed to compete with the likes of the Bugatti

cently revamped 900, including narrowed headlights and wraparound taillights. Here's hoping that the United States gets the 275-hp twin-turbo version when the new vehicle is rolled out in 1997. Other powerplants include a normally aspirated 245-hp version of the pressurized V6.



The next Saab 9000 shows more rounded lines, narrow headlights.

EB110 and the McLaren F1 in European racing, probably including the 24 hours of Le Mans. In addition to its enhanced horsepower, the Jota has a special lightweight chassis.

## Saab 9000

Receiving its first major facelift since being introduced in 1984, the Saab 9000 sports styling cues from the re-

## Range Rover Mini-Ute

Designed to compete with upcoming sport/utility vehicles from BMW and Mercedes-Benz, the mini-ute (code-named CB 40) is scheduled

to hit the market in mid-1997. A mix of off-roader (Land Rover's long suit) and people-carrier, this heavily disguised version was captured testing in England. With less lavish interior appointments than the other upscale

Range Rover models, the CB 40 will occupy the bottom of the British auto manufacturer's lineup. Look for the small truck to share the sophisticated, full-time 4-wheel-drive drivetrain of its larger brethren.



Range Rover will bring out a smaller, more frugal sport/ute.

## Audi's Smallest

Based on what is essentially the next-generation Volkswagen Golf, the A3 is a trifle longer in the wheelbase, as well as more luxurious. It will be the smallest Audi since the demise of the Audi 50 almost 18 years ago. Available with a 5-speed manual or 5-speed automatic transmission, the A3 will be available in Europe in 1996. Dates for the U.S. introduction have not yet been set. There will be dual airbags right from the start, and Audi is talking both 3- and 5-door



Based on VW Golf, A3 is the smallest Audi in a generation.

versions. Later plans—with help from Porsche's engineering department—call for two sporty variants: a 2+2 fastback and a 2-seater coupe. Look for those models a year or so after the introduction of the hatchbacks.



Ragtop Volante breaks Aston Martin's conservative tradition.

## Aston Martin Volante

This soft-top convertible was seen testing in the south of France. With all first-year production slated for the United States, this variant of the DB7 coupe will debut at the Detroit Auto Show in early January. It's powered by a 335-hp 3.2-liter version of the Jaguar straight-Six engine. Expect a price well into six figures. **PM**

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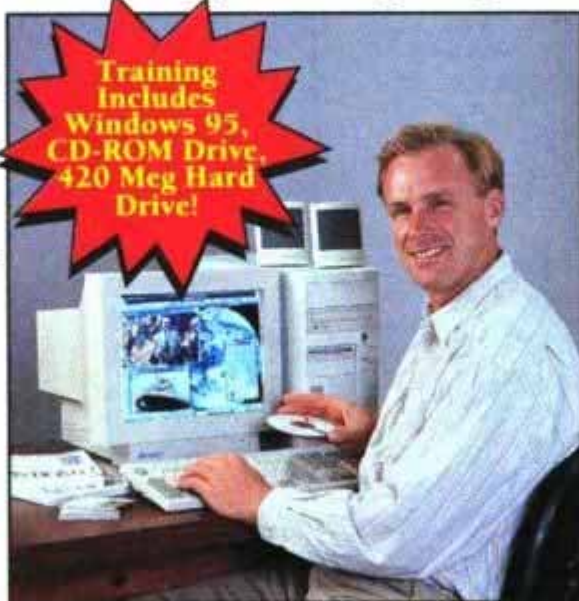
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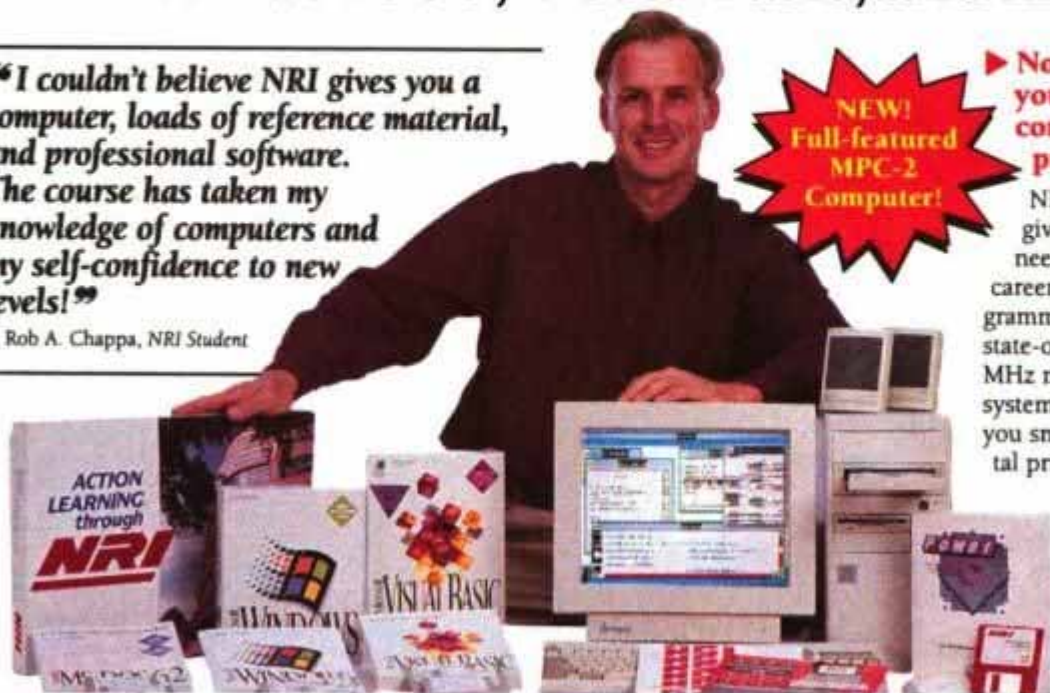
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# Video's Holy Grail

BY FRANK VIZARD, Electronics Editor

● A visit to Sony's IMAX movie theater in New York City to see the 3D film "Wings Of Courage" is a reminder that despite the ridicule often associated with the medium, the 3D experience can be the most exhilarating and emotionally involving screen spectacle you'll ever see.

It helps, of course, that this IMAX 3D screen is the world's largest at 80 ft. high and 100 ft. wide—roughly the equivalent of an 8-story building. The film used is also the world's largest, with a frame 10 times bigger than 35mm film and triple that of conventional 70mm movie film.

What pulls you into the picture, though, are the lightweight 3D glasses you get upon entering the theater. While they're a lot more high-tech looking than the paper glasses of days gone by, the operating principle is well established. The liquid-crystal lenses in the headset receive a near-identical pair of infrared signals, one for each eye, causing the lenses to alternately open and close. This movement creates the illusion of one 3-dimensional image. Built-in speakers complement the theater's sound system by offering directional audio cues.

The overall effect—awesome. In "Wings Of Courage," the planes seem to be within arm's reach, and you get a sinking sensation as they fly



Special headgear makes the 3D experience come alive at Sony's IMAX theater in New York City.

over Andean precipices. You feel totally immersed in the action.

So, is this the ultimate video experience? For the moment it may be, but video's Holy Grail is to bring 3D to your television set—without special glasses. You may actually have participated in this quest if you watched a Pepsi commercial during the Super Bowl a few years ago. If you remember, it allowed you to watch a 3D video with glasses—or a 2D image minus the glasses—without any jarring difference in the picture. This so-called Pulfrich Effect, most effective with objects in motion on the 3D side, is still being used in a line of travel tapes made by Virtual Videos of Orlando, Florida.

Attaining this goal may not be as far-fetched as it appears. A number of companies—call them our "Electronic Knights of the Round Table"—are working on this project.

Among the most exciting is an effort by a group of Sharp Laboratories engineers in Oxford, England. There, two superimposed liquid-crystal displays (LCDs) are used. A special optical arrangement causes the viewer to see one panel with the left eye and the other with the right, thereby creating a 3D effect that can be seen at wide viewing angles. Two prototypes—one with a 14-in. screen and

the other measuring 8.6 in.—have been developed. Sanyo also has a 4-, 6- and 10-in. 3D LCD based on similar image-splitting technology. One limiting factor: Larger LCD screens have proved difficult to manufacture.

One system that does work with a large screen has been devised by Xenotech Inc. of Perth, Australia. The Xenotech approach uses a miniature camera that automatically locates the position of the viewer's eyes and makes continuous adjustments, to two projectors, based on their location. A slanted mirror directs the projector's beam directly to the appropriate eye. When the viewer's head moves, the mirror follows suit in order to keep the beam aimed at his or her eyes. Unfortunately, the system can accommodate only one viewer at a time.

Meanwhile, New York's Dimensional Media Associates (DMA) seeks to present 3D images that seemingly hover in midair. Designed for use as an in-store display, DMA's 3D Suspended Image System collects light rays from a video source and then reassembles and projects the aggregate rays into a 3D aerial image. The projected image can vary in size from just a few inches to 20 ft. across, and it has a 120° viewing angle.

All this is proof that the quest for the Holy Grail carries on. **FM**



DMA's system hangs images in midair.

# Born-Again Outboards

BY JOE SKORUPA, Boating/Outdoors Editor



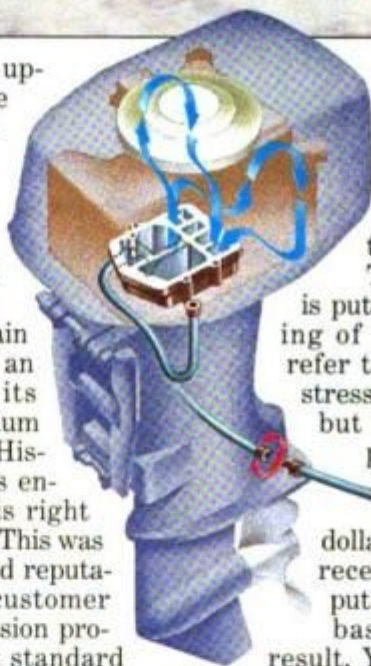
● What a difference a year makes. While other engine builders proclaimed the dawn of a new age last year, Yamaha played it close to the vest. Yes, the company came out with two new 4-strokes—a 9.9 horse and a 50 horse—and it made several individual model modifications, too. But while other manufacturers were crowing about raising the technological ante to new heights, Yamaha basically stuck with the cards it had been dealt.

Not this year. At a recent long-lead press intro in Stuart, Florida, Yamaha made it clear that it wants to play with the high rollers in 1996. Engineers in Hamamatsu, Japan, apparently worked overtime to upgrade and fine-tune virtually every outboard in Yamaha's line—from 5 hp to 250 hp.

The upcoming '96 lineup includes

15 new engines, two upgraded multiengine series and a penchant to equip every single unit (even relatively recent models) with state-of-the-art components and technologies.

Yamaha's born-again engineering effort is an attempt to solidify its position as the premium brand of outboards. Historically, Yamaha has enjoyed top-shelf status right from its start in 1984. This was based on a well-earned reputation for reliability, customer satisfaction, anticorrosion protection, outstanding standard



A front-mounted flushing device circulates fresh water through the engine without running it.

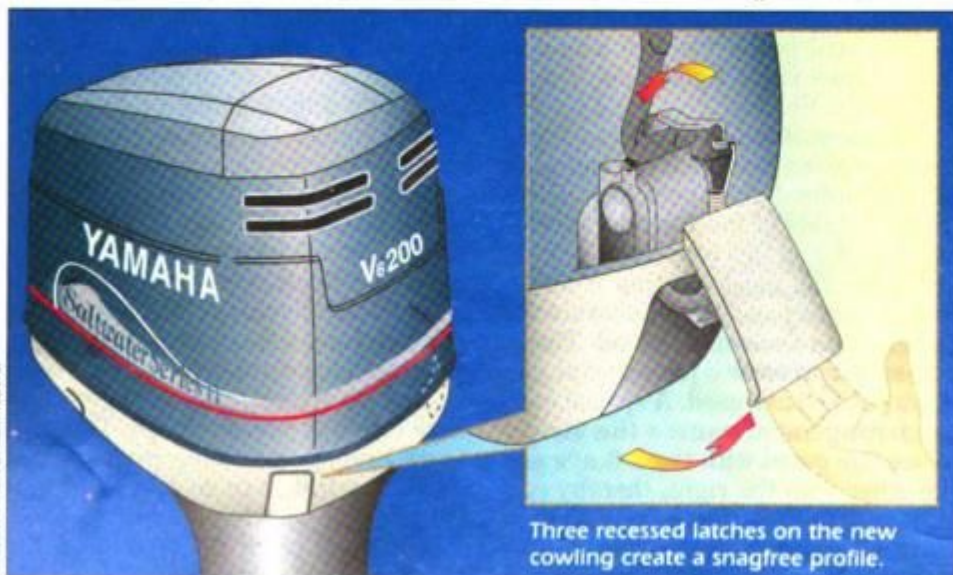
features (where others charged extra) and cutting-edge technology.

Today, however, Yamaha is putting a twist on the meaning of premium by making it refer to cost. This news wasn't stressed at the long-lead intro, but boaters are discovering premium prices in dealer showrooms. The drastic reduction in value of the dollar compared to the yen in recent months has no doubt put a squeeze on the Japan-based manufacturer. As a result, Yamaha is attempting to make up for some lost revenue by raising prices. To temper the sting, Yamaha is upgrading its entire line.

Clearly, the biggest news at the long-lead preview was the introduction of the Saltwater Series II of outboards. These engines—the second generation of a successful series that was introduced two years ago—are based on 2.6-liter V6 90° blocks and 3.0-liter V6 76° blocks. They range from 150 hp to 250 hp.

Thanks to a long list of new features, Saltwater Series II engines are quieter, stronger in midrange torque, easier to maintain, simpler to rig, more resistant to corrosion and more fuel efficient.

To make all this happen, Saltwater Series II outboards have an improved



Three recessed latches on the new cowling create a snagfree profile.

air silencer that damps noise from intake air and a redesigned cowl that tightly confines engine sound beneath the hood. This new cowl, by the way, appears on a number of models throughout the line. Seven pounds lighter than previous cowls, it features a smooth, highly stylized appearance. It also has a new latch system in which all the sealing assemblies are hidden inside the engine compartment and only the handles are visible. The handles, somewhat reminiscent of those on a car door, are easy to operate and are recessed into the cowl to make for a snagfree surface—a characteristic fishermen will welcome.

Anticorrosion features are another set of key improvements on Saltwater II engines. Most are difficult to see, such as new aluminum-alloy components and stainless-steel shift, drive- and propeller shafts. Others are easier to spot: a stainless-steel steering arm and steering tube, an aluminum anode in the transom bracket and stainless-steel bonding straps.

Yamaha officials were anxious to note that Saltwater II engines are equipped with a computerized ignition system called SMART. The word is an acronym for . . . well, let's just say that all of the visual aids in the world will not make SMART mean more than a system of electronic-ignition spark

control that produces instant cold starts, highly efficient engine operation at all speeds and self-diagnostics.

Other key features in the series include a high-output alternator, horizontal reed-valve induction, a multiport oil-injection system and a front-mounted freshwater flushing unit—a useful device actually introduced last year.

What follows is a brief overview of what else is new:

- Saltwater Series status has been extended to V4 115-hp and 130-hp engines. This means a 25-in. shaft length, improved corrosion protection, counterrotation and stainless-

steel steering arm and steering tube.

- The portable 5-horse unit has the capability to use a remote fuel tank to extend its cruising range.

- The basic 9.9-hp and 15-hp models feature redesigned lower units, Euro-style cowlings and a steering tube on remote-mounted engines. In addition, there's a new High-Thrust 9.9-hp Four-Stroke that's built specifically to serve as an auxiliary kicker motor. It has a large-diameter dual-thrust prop, a low gear ratio and manual start.

- Three-cylinder engines move all the way down to the 25-hp level. This represents a major shift in boating. Yamaha's new small triple will be a

drive- and propeller shafts.

- The Pro 75 has been bumped up to 69.6 cu. in. to deliver the increased power demanded by what Yamaha calls the pike-boat market.

- All 90° V6s have new precision intake systems and exhaust tuning. They also feature an improved flywheel and crankshaft.

- Yamaha introduced a ProV II Series of engines (150 hp to 200 hp) aimed at the bass-boat market. Since bass boaters like their outboards to perform at wide-open throttle, this upgraded series has microcomputer ignition and a new cowling with ram-air induction vents. The new cowling features radically aggressive styling and graphics for macho fishermen.

- And finally, Yamaha added what it calls E.Z. Rigging throughout its line. This is basically a benefit to boatbuilders and dealers, but individual boaters will notice a cosmetically improved appearance in all wiring and control components.

So, do all of these upgrades make Yamaha the premier outboard builder? The answer is yes—for now. (Remember, the other builders haven't announced their '96s yet.) Clearly, this massive effort has helped Yamaha catch up in all segments where it had fallen behind in recent years. In fact, it's no exaggeration to say that the current Yamaha line-

up has no real weaknesses. Except . . .

Except for these three things—no EFI engines, no slim 60° V blocks and no plans to go with either large 4-stroke or direct-injection outboards. Unlike OMC and Mercury, Yamaha doesn't believe that '96 is the year to commit to these advancements. And the truth is that even without them, Yamaha's line is still state-of-the-art circa 1996. But is it really wise to neglect the future? The others don't think so, but only time will tell.

While it appears that Yamaha is still hedging its bets, there's little doubt that the company is anteing up more than it has in recent years. **PM**

popular motor on lakes with power restrictions. Its high-torque thrust offers hole-shot power for small aluminum and jon boats.

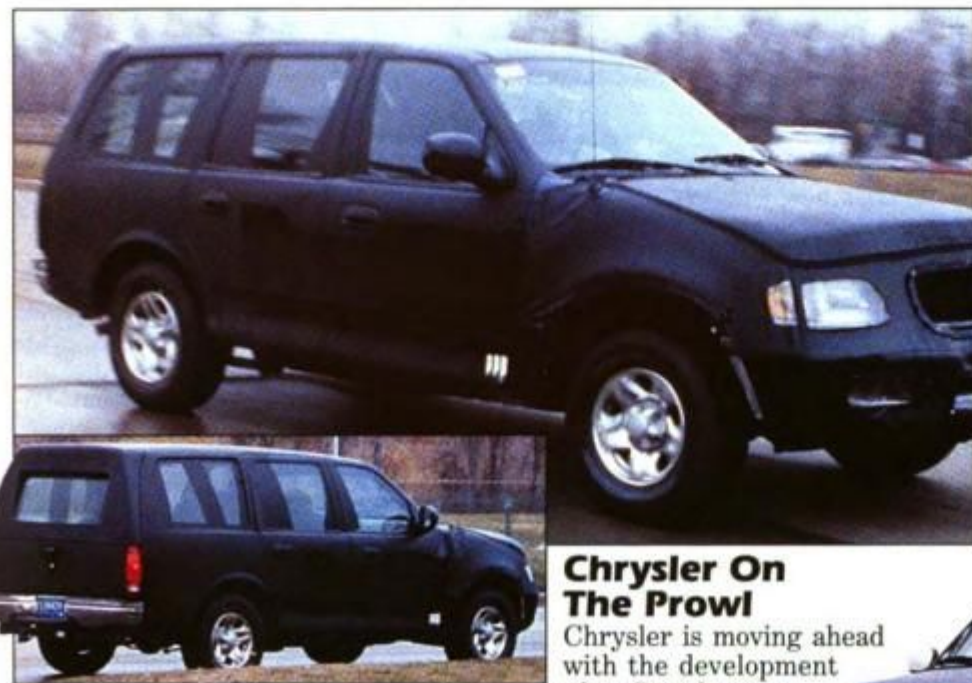
- The 40-horse motor features a new multifunction tiller handle and steering-friction adjustment.

- An upgraded version of the 50-hp 4-stroke is billed as the ultimate Pontoon Series outboard. Called the T-50 Four-Stroke High Thrust, the engine has antisplash plates, large-diameter prop and a low gear ratio.

- The C-60 triple replaces the old C-55 twin cylinder. The new 60-horse engine comes with a microcomputer-controlled ignition and stainless-steel

# Detroit Spy Report

TEXT AND PHOTOS BY JIM DUNNE, Detroit Editor



a 214-hp 3.5-liter V6 and a 4-speed automatic. Chrysler hopes to put the Prowler on the street by mid-1996.

## '96 Ford F-150

A closeup photo of a Ford F-150 prototype illustrates the new shape of Ford's—and the country's—best-selling vehicle. Despite the heavy masking, the rounded contour of the cab is obvious. Note that the Club Cab—like the one spotted here—has a hidden third door for easy access to the rear of the cabin. Ford plans to build the F-150 with a cab that's smaller than the one it will offer on the heavy-duty F-250 and F-350. The drop in size is designed to appeal to buyers

## Chrysler On The Prowl

Chrysler is moving ahead with the development of its Prowler concept car.

This photo shows a rough prototype of the 2-seat city roadster being tested at one of Chrysler's proving grounds in Michigan. Pay no attention to the Jeep-like cabin —that's simply a handy



The '96 Ford F-150 pickup—new 3-door body and all.

## Bigger Than Bronco

● The Chevy/GMC Suburban twins will soon be getting competition—and not just from their smaller Tahoe/Yukon siblings. The long-rumored and equally long-denied 4-door Ford Bronco is nearly set for introduction next year. This prototype caught dur-

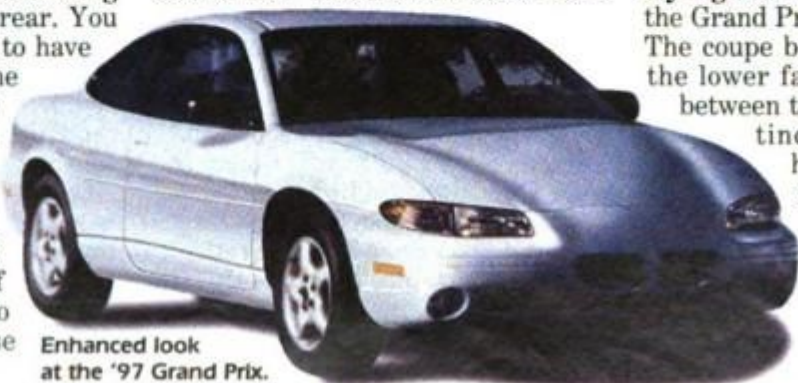


Beneath that Jeep body is the new Chrysler Prowler roadster.

ing testing earlier this spring is under heavy disguise, with canvas covering its body details, front and rear. You can expect the new Bronco to have the same front styling as the '96 F-150 Ford pickup truck. This means oversized headlights and an oval grille that sports a floating Ford logo. As for power, the ohc 4.6-liter modular V8 now installed in a variety of Ford passenger cars also figures to be the workhorse in the updated Bronco.

and very temporary shelter for engineers while they're testing. What you *should* pay attention to, however, are the Prowler's elongated snout and oversized tires. Naturally, some of the concept Prowler's details will change by production time, but you can bet that power

to the rear wheels will come from



Enhanced look at the '97 Grand Prix.

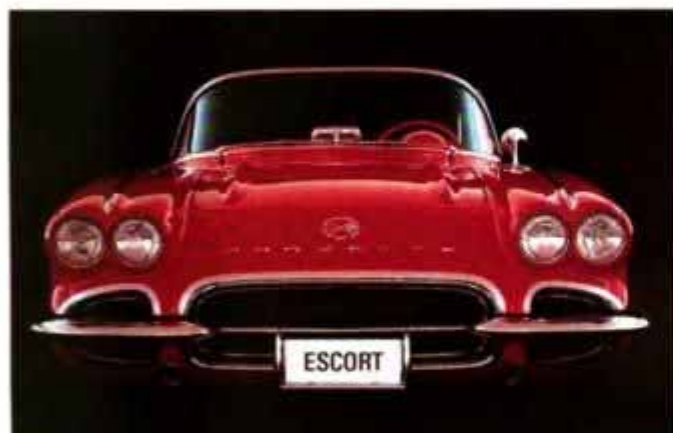
who want a full-size pickup—but don't want the bulk of a one-size-fits-all cabin. Compare the cabin of this pickup with the prototype Bronco's and you'll see that they appear to be identical in both size and overall styling.

## Grand Prix, 1997

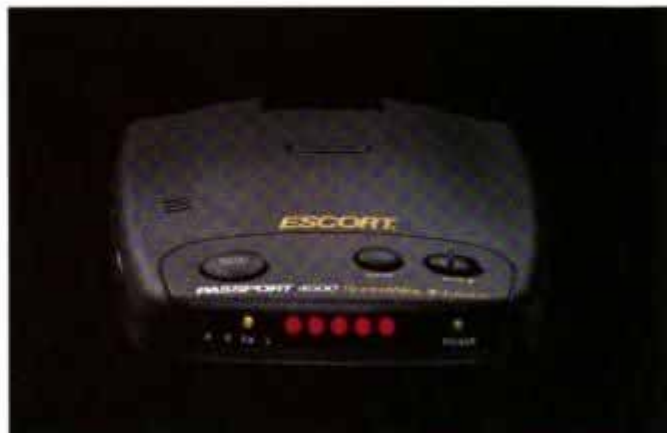
By using a computer to enhance a photo of the 1997 2-door Pontiac Grand Prix, it's easy to see the car's distinct grille and front-end styling. Pontiac plans to emphasize that styling as a way to further distinguish the Grand Prix coupe from the sedan. The coupe boasts dual air intakes in the lower fascia (the blank surface between the headlights) and a distinct shape to the greenhouse. Look for Pontiac to offer a high-performance version of this 2-door model, complete with supercharged V6 engine, flared fenders and extra cladding on the lower doors. **PM**



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# THE SHAME OF ENOLA GAY

Fifty years ago, this airplane carried out the most significant military mission in history. So why did it suffer decades of neglect? And why is it still cloaked in disrespect at the Smithsonian?

BY WILLIAM GARVEY

● Undoubtedly, the foreman had never conducted a tour like this one. He'd been assigned to escort the officer through the cavernous Martin factory, where an army of workers hefting rivet guns and drills were transforming sheets of aluminum into immense bombers. A visit by brass wasn't unusual. It happened all the time at the huge Omaha, Nebraska, plant. What made this tour so different was that the Air Corps colonel—all of 30 years old—had come to select an airplane that *he* would fly. His own handpicked

Superfortress. This guy was up to something special.

The Boeing B-29 Superfortress was one of the technological wonders of World War II—certainly the most complex mass-produced airplane of its day. It was conceived as a very long-range heavy bomber capable of crossing the vast reaches of the Pacific Ocean. Almost 100 ft. long, the Superfortress housed two pressurized compartments and flew on four 18-cylinder Wright Cyclone engines, generating a total of 8800 horsepower. With a bomb load of 20,000 pounds and enough fuel to



The long limbo of *Enola Gay*, shown here as it appeared in 1949, began at Davis-Monthan Air Force Base, near Tucson, Arizona.





As dawn broke, Tibbets and *Enola Gay* circled over Iwo Jima before setting a course for the Japanese islands.

uranium bomb known as "Little Boy."

To the hundreds of thousands of sailors, Marines, airmen and GIs then assembling to invade the main islands, the atomic-bomb missions against Hiroshima and Nagasaki were their deliverance. A full-scale seaborne assault on Japan was a daunting prospect. U.S. forces suffered 26,000 casualties in taking the small island of Iwo Jima—and another 48,000 in the invasion of Okinawa. A street-by-street, paddy-by-paddy fight across the Japanese homeland would be a blood bath. And after years of burying their boys on no-name Pacific islands, Americans were sick of the fighting and its awful toll. They wanted the conflict finished. And the end came swiftly, cataclysmically.

"Little Boy" had a yield approximating 15,000 to 20,000 tons of TNT. It went off 1850 ft. above the center of Hiroshima. Some 80,000 people were killed and another 51,000 seriously wounded or missing. Of

the city's 76,000 buildings, all but 6000 were destroyed.

The terrible mission completed, Tibbets turned to his copilot and said, "I think this is the end of the war."

He was right. Stunned by the annihilation of Hiroshima—and of Nagasaki three days later—the Japanese surrendered unconditionally on August 14, ending the carnage they'd begun years earlier in a vicious campaign of subjugation in eastern Asia. The B-29 had indeed fulfilled its mission.

*Enola Gay* retired from active duty the following summer, and was placed in storage at Davis-Monthan Air Force Base, near Tucson, Arizona. Three years later, the aircraft was returned to flying condition. Col. Tibbets piloted it to Park Ridge (now Chicago O'Hare International) airfield in Illinois, where it was deeded over to the Smithsonian Institution. In 1953, Smithsonian personnel flew the airplane to Andrews Air Force Base, outside Washington, D.C.



## Lost legend

It was at this juncture that the story of *Enola Gay* took a peculiar turn. Citing a lack of space to shelter such a huge machine, the Smithsonian Institution parked the bomber in a remote corner of the airfield—and then more or less abandoned it. Public interest in the aircraft, one official explained, was minimal.

Years passed. Unattended and unprotected, the B-29 began to suffer from corrosion. The once-smooth skin became pitted and dull. Souvenir-hunting youngsters pilfered irreplaceable components. Birds and vermin made homes in the cowlings and insulation. Water poured through windows broken by chance or by vandals. *Enola Gay* became a derelict.

In 1960, technicians disassembled the aircraft and moved it—in sections—to the museum's restoration facility in Silver Hill, Maryland. And there it remained, its parts scattered and untouched, for another 24 years. Meanwhile, *Bock's Car*, the B-29 that dropped the atomic bomb on Nagasaki, was flown in 1961 to the Air Force Museum in Dayton, Ohio, where it has remained on permanent display ever since.

Not until 1984 did the Smithsonian's National Air and Space Museum management direct craftsmen to begin a meticulous restoration of *Enola Gay*. Some \$1 million and a decade later, the bomber's restored forward fuselage and one engine were finally ready for display—just in time to commemorate the 50th anniversary of the end of World War II.

A whirl of controversy preceded the unveiling. Many observers wondered how the nation's foremost institution for the preservation of aerospace artifacts could have been so negligent toward so historic an airplane for so long. Why was so expensive a restoration necessary when the aircraft

The Smithsonian spent well over a decade—and \$1 million—restoring *Enola Gay* in a painstaking, bolt-by-bolt effort. At right, a craftsman works on a wing engine support. Below, the finished fuselage, wrapped in plastic, awaits transport to the Air and Space Museum.



had been delivered to its caretakers in good flying condition? And why, they asked, had it taken 46 years to put only a portion of the airplane on display?

## Public humiliation

Veterans say the answers lurked in the exhibit that Smithsonian curators proposed to accompany *Enola Gay's* return to public view. The plans called for much more than a simple display of the fuselage (the downtown museum building has neither the floor strength nor space to house the airplane in its entirety).

As originally conceived, the exhibit described the war as one "of vengeance" for most Americans, yet for the Japanese it was a fight "to defend their unique culture against Western imperialism." The display was heavily laden with photos of Hiroshima's dead and wounded, a section intended to be the "emotional center" of the exhibit. The "personal tragedy" that





At the Smithsonian's Silver Hill facility, amid undisplayed artifacts, *Enola Gay* receives a rare visit from an Air Force staff sergeant.

resulted from the bombing was to be emphasized.

When the vets—the Air Force Association foremost among them—got wind of the script, they were furious. The exhibit, they said, had turned history upside down, casting Japan as a victim rather than the aggressor, and implying that American servicemen were little more than war criminals. Moreover, *Enola Gay* was presented as a symbol of nuclear terror rather than as a machine that brought a rapid end to an agonizing war. The veterans said the display failed to reflect the sentiments and realities that existed in 1945, but instead promoted the antinuclear leanings of the museum's curators 50 years later.

Among the incensed was none other than Paul Tibbets, who had retired from the Air Force in 1966 as a brigadier general. He described the proposed display as “a package of insults,” adding: “*Enola Gay* has been miscast, and a group of valiant Americans have had their role in history treated shamefully.”

Across the country, veterans, politicians and citizens echoed that sentiment. And the museum felt the heat.

After months of meetings and attempted revisions, the secretary of the Smithsonian stepped in this past January and scrapped the controversial display. In May, the director of the Air and Space Museum resigned over the matter, and many veterans cheered.

When it finally opened to the public this summer, the exhibit featured only the polished fuselage of *Enola*

*Gay*, as well as plaques and videos to help visitors understand the aircraft, its crew and their mission.

So much for the machine. As former B-29 crewman W. Burr Bennett says of *Enola Gay*: “There’s no need to glorify it, but there’s no need to denigrate it, either.” And now, interpretation of the aircraft’s legacy is left to each individual—as it should be.

But that still doesn’t put things right. *Enola Gay* entered history as an airplane, and so it should be displayed. At the moment, the bomber is dissected. During this temporary exhibition, the public gets to view just two-thirds of the fuselage and, apparently, one engine (at press time, the precise makeup of the exhibit was still being withheld). That’s not good enough.

Plans call for the airplane to be displayed permanently—and in its entirety—at the museum’s yet-to-be-constructed annex at Dulles International Airport near Washington, D.C. The facility is sure to be a stellar one, and an accommodating home for big beasts like an SR-71, a space shuttle and *Enola Gay*. Unfortunately, that project’s fruition lies in the next century.

Time is merciless. The ranks of men and women for whom *Enola Gay* is most significant—the people who fought and won World War II—thin with every passing day. The vets want to see the completed airplane again, see the machine that helped bring an end to the war and gave them all another 50 years of life.

They deserve that last look.

PM

# BIG GAME

What can you get for \$1.8 million in a high-tech sport-fishing boat? We cross the Gulf Stream to the legendary waters of Bimini to find out.



BY JOE SKORUPA, Boating/Outdoors Editor  
PM Photo by Forest Johnson

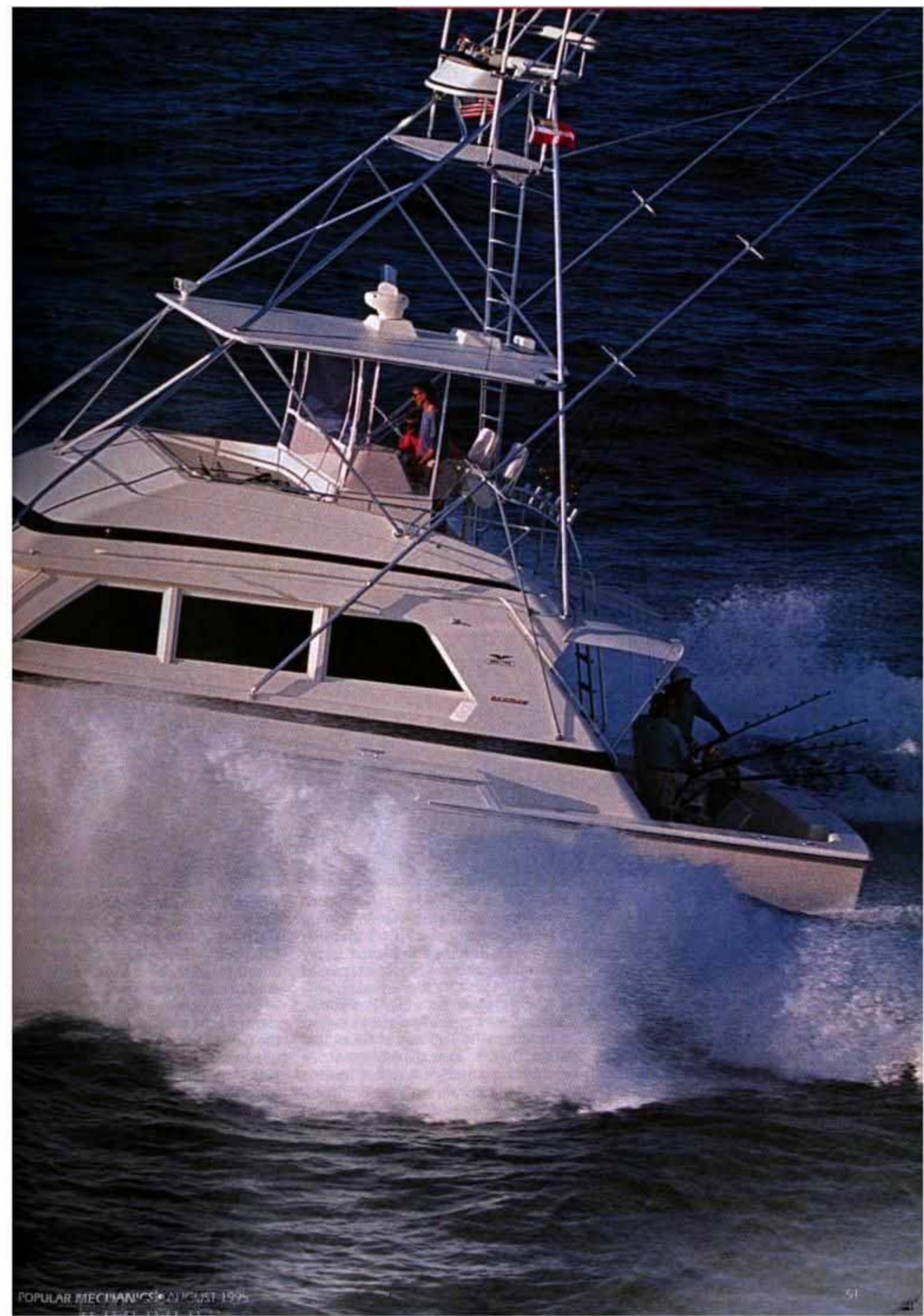
• "Everybody ready? I'm taking this Bertram to Bimini." I've always wanted to say those words. Especially while standing on the flying bridge of a big 60-ft. convertible. The wheel is in my hands. The salt wind is in my hair. The city of Miami is receding at my back. And legendary Bimini beckons across the Gulf Stream.

For those unfamiliar with the world of big-game fishing, this scenario is akin to driving a Bentley Turbo R along the Grande Corniche in the French Riviera. It's like smoking a Coheba Splendido cigar while strolling through the remains of Old Havana. It's like sipping a 25-year-old single-malt Scotch while playing golf—or should I say after playing golf, to avoid drinking while driving a golf cart—at St. Andrews.

You can create your own pantheon of finer things, but there's no doubt that Bertram belongs. For the past 35 years, Bertram has been king of production-line sport-fishing boats. Starting with Dick Bertram's celebrated performance hulls of the early 1960s, Bertram Yacht (3663 N.W. 21 St., Miami, FL 33142) has been updating and expanding its model line over the past three decades with state-of-the-art construction methods, materials, attention to detail and the ultimate in luxury refinements.

As for Bimini, let's just say that Ernest Hemingway didn't come here to deepen his tan. Sure, the facilities are colorful in an out-island kind of way, and no trip would be complete without a visit to the famed Big Game



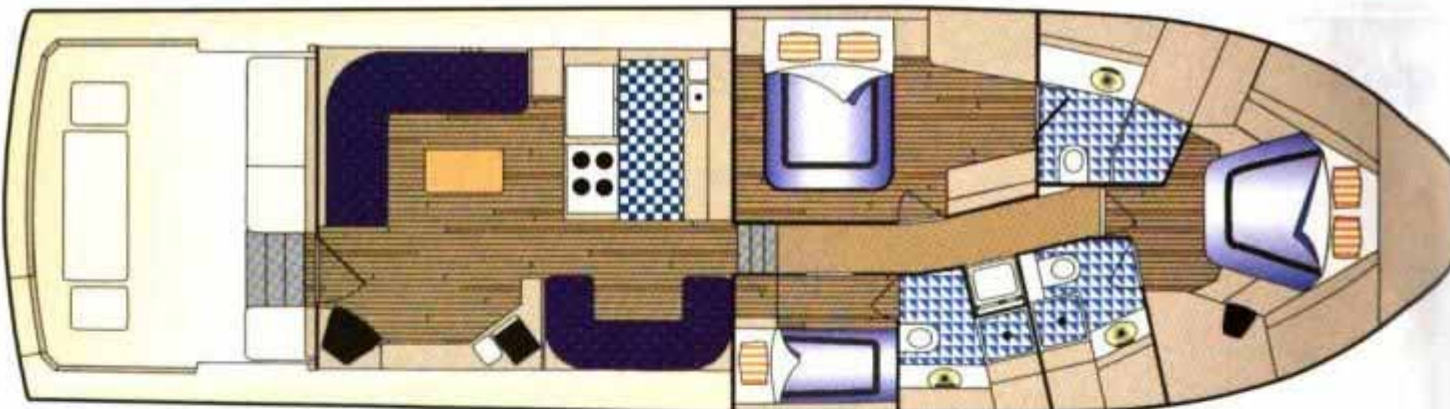


## BIG GAME

Club and the Compleat Angler. But the island's enduring fame rests on its pivotal location at the edge of the Great Bahamas Bank. Here, it serves as the jumping-off point for the best big-game fishing on the East Coast.

All these things make it a special trip for me, but there's another reason I'm excited, and it's a whopper: The boat I'm driving carries a \$1.8-million price tag. Yes, indeed. A million here, a million there. Pretty soon you're talking real money. And make no mistake about it—a Bertram 60 Convertible is a boat worth real money.

While the big 60 is one of the best fishing boats money can buy, it's quite



a bit more than a state-of-the-art, wave-busting battle wagon. It's also a true luxury yacht that's equipped with all the niceties of an upscale home in the suburbs—three baths, two staterooms, a bunk room for the crew, full galley, dining area, a salon and much more.

But before I can take advantage of the big 60's posh amenities, I'd better find the shallow channel that leads into Bimini. Located less than 50 miles offshore from Miami, Bimini is part of the 700-mile-long Bahamas archipelago. Total running time from the Miami Beach Marina to Alice Town, the sport-fishing center of North Bimini, is just 90 minutes.

After pulling into the marina, the first duty for all American boats is to clear customs and obtain fishing permits. The process takes about an

hour. While waiting, I get my initial taste of what it's like to go fishing Bertram style—a chilled glass of Bahamian beverage is placed in my hand and a platter of burritos is passed around the air-conditioned salon.

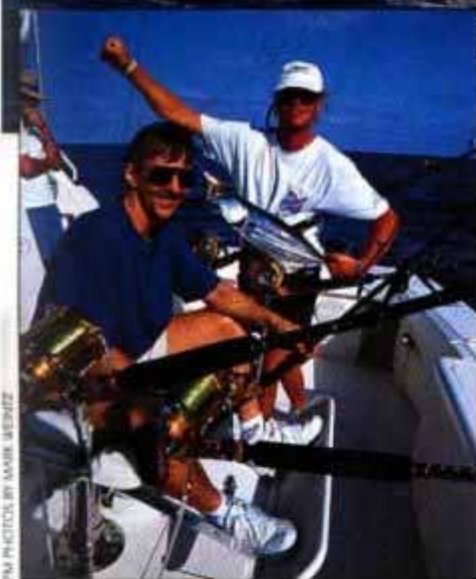
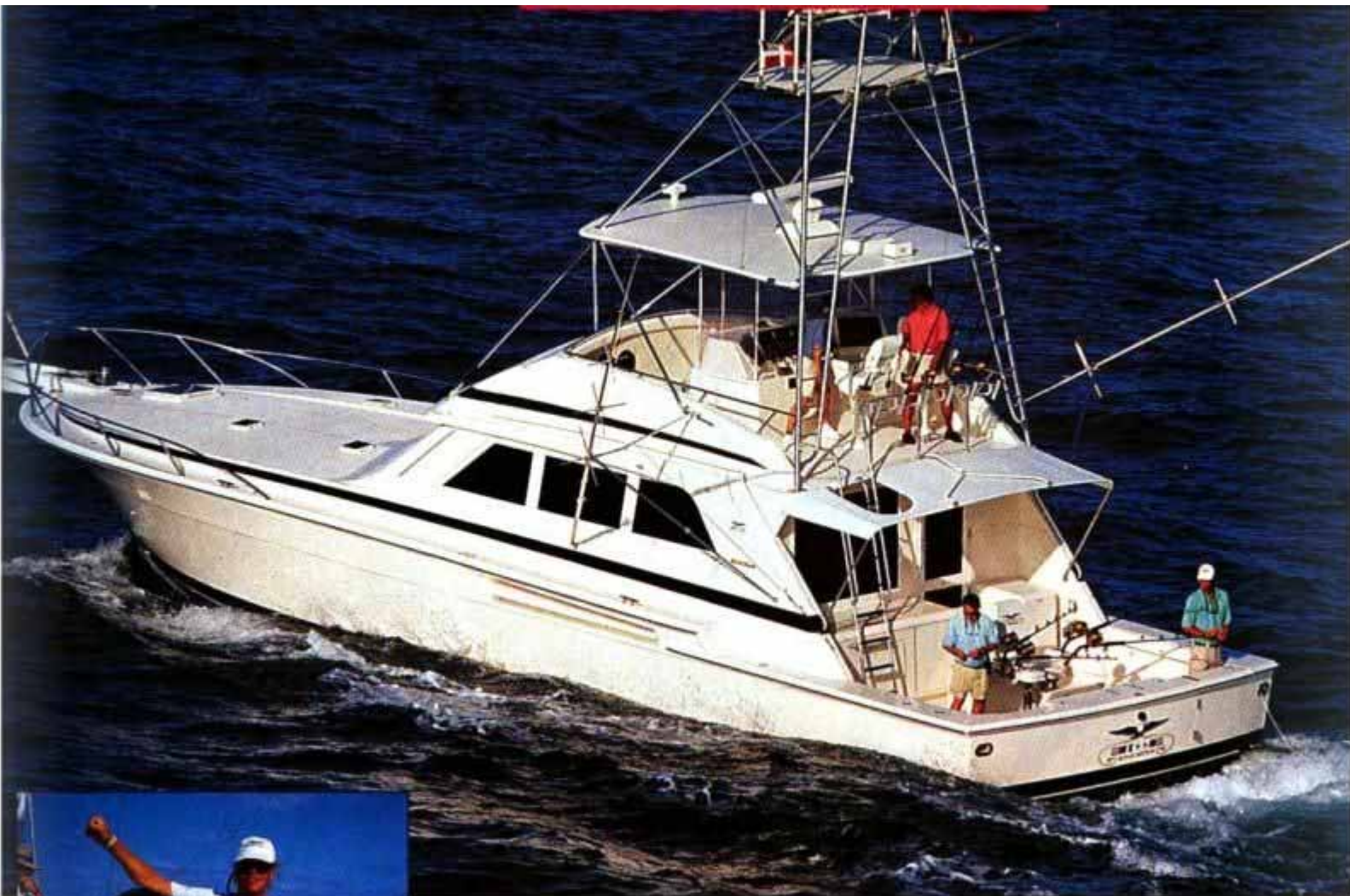
So this is how the other half fishes. It's not how I typically wet a line—but then, I usually fish out of boats less than 25 ft. in length. My creature comforts generally consist of leaning against a gunwale while eating plastic-wrapped sandwiches and drinking from pop-top cans.

Still, I'm not so set in my ways that I can't adjust to fishing Bertram style, and one of the big adjustments is getting used to a large crew. On the professional side, it consists of Capt. Jerry Hulick, First Mate Chuck Prentice and Second Mate Debbie Hulick. Rounding out the list is Mark Weintz,

whom I brought along for backup fishing and photo duty, and the two staffers—Jerry Soderholm and Tim Chalfant—Bertram sent along for support. A crew this size would swamp most of the boats I fish on.

Once customs *and* the dishes are cleared, we head out to the edge of the Great Bahamas Bank, located between South Bimini and Cat Cay. Here, we put six lines in the water (plus two teasers) and spend the afternoon trolling natural bait over a steep underwater wall.

The Bertram 60 is well suited for this type of fishing. As might be expected, the 60 has a huge aft cockpit that features an open layout to maximize fish-fighting capability. A top-of-the-line Murray Bros. fighting chair is located center stage, and everything else radiates outward from it.



Left page, top to bottom: Capt. Hulick at the wheel on the flybridge; the salon, left, and master stateroom, right; and the layout of the Bertram 60. This page, clockwise from top: the Bertram 60 trolling; insignia for the chartering arm of Bertram; entryway to Hemingway's legendary watering hole; and a typical catch during a humbling three days in Bimini.

The first thing you notice is that there's thigh-high padding all the way around the cockpit. Lifting a lid, you find a large insulated box built into the transom. This is equipped with an Eskimo icemaking machine to cool beverages and provide a ready supply to ice down the catch. Also in the transom is a rock-solid tuna door and gate. Belowdeck is a fish box that drains through a macerator pump. Along the back wall of the cockpit is an exceptionally deep bait well and a huge freezer.

Operation of the boat is handled from the raised helm of the flying bridge. This area is reached by climbing an external, aluminum ladder. From here, the captain can scan the water for fish and look into the cockpit to direct or adjust to the action. Twenty feet above the flying bridge is

another set of helm controls, located in the crow's-nest of the aluminum tuna tower—an expensive, custom-built unit installed by Pipewelders. From the topmost perch of this tower, the skipper has a view that stretches for miles. While functional, this position is rarely used because it delivers a rugged, lurching ride in rough water.

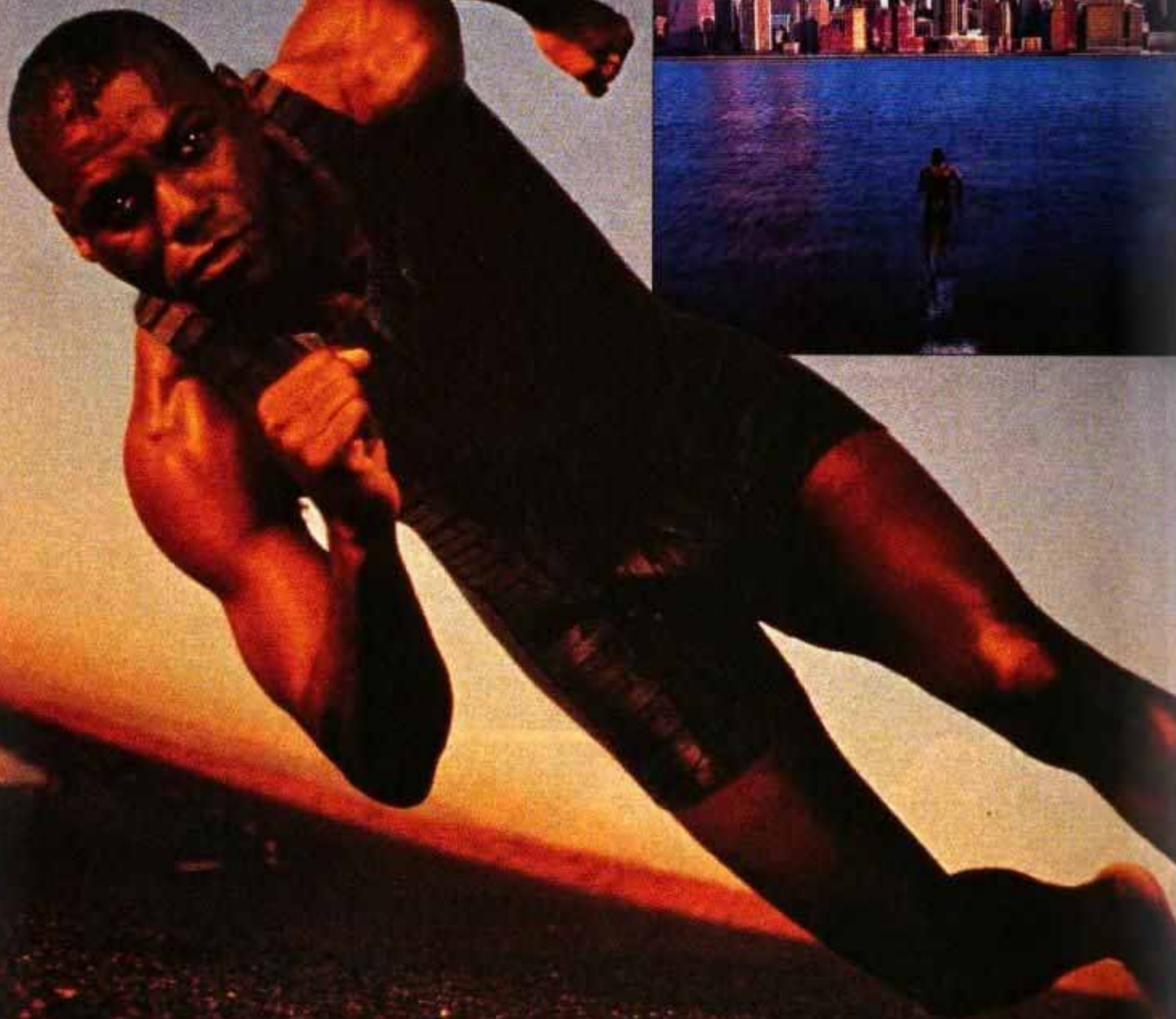
At the main control console on the flying bridge, two Murray Bros. helm chairs provide easy access to an array of high-tech equipment. Spread across the console are: radar, GPS, chart plotter, VHF radio, autopilot, color video sounder, compass, Hynautics power steering and KVH Quadro trip-status and trip-log monitors.

Not to be overlooked is another set of helm instruments—the DDEC (Detroit Diesel Electric Control) display. This unit is a cutting-edge upgrade

available for engines like the twin, 1400-hp V16 Detroit Diesels aboard the Bertram 60. DDEC is a trailblazing electronic engine-management system that uses an electric control module to monitor engine operation, control the amount of fuel sent to the cylinders, do self-testing and tuning, synchronize the engines and perform repair diagnostics. It's powered by a dedicated 12-volt battery and operates without mechanical cables (although it has a manual override for emergencies). In addition to being highly efficient and clean burning, DDEC offers a host of programmable options—preset speeds for trolling, idling, cruising and so forth—that can be activated with the push of a button.

Aside from engine operations, the captain of the Bertram 60 also has

*(Please turn to page 108)*



# GIANT STEPS

Carl Lewis defies all laws of gravity in 30 seconds.

BY CLIFF GROMER, Contributing Editor

● Carl Lewis's fast feet got him into the record books, but nothing he has ever done on the track compares with the fancy footwork he displays in his current television commercial for Pirelli tires. This is one 30-second spot that'll resist even the lure of snackies from the fridge.

The scene opens with Lewis charging around a corner—and seemingly right into your living room. The special effect makes it look as if he's taking the corner heeled *way* over,

like a motorcycle. He then jumps off a wharf into New York Bay and heads toward Manhattan. But Lewis isn't swimming. He's *running on the water*.

Once he's in the Big Apple, Lewis doesn't stop to sightsee or catch his breath. Okay, he does get a chance to view the skyscape high atop the Chrysler Building. What's next? A giant leap that would leave lesser men in a mangled heap on the sidewalk below, then a visit to the Statue of Liberty. But Lewis doesn't take the end-

less winding stairs inside the statue like some common tourist. He just runs straight up on the *outside* of the statue. Much quicker. Lastly, Lewis is perched on one of Miss Liberty's spires with nothing left to do because his 30 seconds have run out.

Naturally, the 6-time Olympic gold medalist couldn't have done any of these antics without Pirelli treads on his feet—or the special effects.

How did they do it? All the background footage—the New York sky



digitized so that they could be manipulated by computer—in this case, a Silicon Graphics Onyx model. In essence, Lewis was lifted and “pasted” onto the appropriate background.

One key tool for manipulating the images is a software package called *Flame*. In the opening scene, one problem was to mate the angled shot of Lewis to the straight road, and to make his feet appear at a correct angle to the ground. *Flame* “warped” Lewis’s ankles to realize this effect.

*Flame* also has a tracking feature that allows the computer to isolate a specific area of a shot over a given number of frames. This area is designated on the first frame in a box, and the computer looks for the nearest match of pixel groupings in each of the frames specified—so a specific area of the image can easily be modified for the number of frames desired.

Two other considerations were essential: the size/perspective of Lewis in the frame and the lighting. Composited shots are fabricated by electronically pasting a subject into a scene or shooting him or her against a blue screen, eliminating the need to cut the character out of an existing background. While this is a fairly simple technique, the lighting on the subject tends to be flat and unrealistic when dropped

into the real background, so studio lighting that matches the real-world scene is critical.

To make Lewis seem like he was running on water, the studio started with a helicopter shot sweeping low over the bay, the New York skyline in the background. The big splashes Lewis makes are created with a wedge-shaped form that skips and splashes over the water while being towed. Lewis himself was filmed in the studio—running on a wet surface—by an overhead camera mounted on a telescopic boom.

The final composited scene adds the splash images and Lewis to the New York Bay shot. To get everything in synch, tracking software eliminated the movement of Lewis in the frame. Once the sprinter was stabilized and the visual effect of a moving camera deleted, the computer essentially had an image of Lewis running in place. It then analyzed the motion in the helicopter shot and applied that information to the images of Lewis and the big splashes so that all the elements had the correct perspective transitions.

The same basic technique was utilized in the Chrysler Building and Statue of Liberty sequences. The former combined the background shot provided by the helicopter circling the building’s gargoyles with a shot of Lewis standing on a rotating turntable in the studio. The computer then synchronized the two moves.

The Statue of Liberty scene? The helicopter shot sections of the statue. Lewis was in the studio, and the images were rotated 90°. Lighting was the key to achieving a realistic effect. Standing on the Statue of Liberty with the water reflecting behind him, Lewis would naturally be backlit—accomplished in the studio by using large white flats.

The payoff shot, where we see Pirelli treads on the sole of Lewis’s foot, was done by cutting out a section of a real

tire and slapping it onto Lewis’s foot, using adhesive. Hey, not *everything* has to be high-tech. A single-frame image of the shot was blown up and the edges of the tire tread were retouched electronically to form a more realistic blend to Lewis’s foot. The *Flame* tracking feature then automatically retouched every frame in the sequence.

It all adds up to some entertaining viewing in a commercial that Reebok wishes it could have made.

## How did they do that?

## AMERICAN CLASSICS



### COLT .45 M1911A1

With patents by John Browning dating to 1897, the Colt Model 1911 and Model 1911A1 served as the official military sidearm throughout most of this century. The standard Colt M1911A1, shown above, has a Parkerized finish and checkered plastic grips. The gun and medals are part of a collection on display at the Springfield Armory National Historic Site in Massachusetts.



# COLT .45 AUTOMATIC

Millions of servicemen have staked their lives on the M1911A1 Government Model sidearm. It was the ultimate combat weapon of last resort—and the most copied pistol ever made.

BY TODD WOODARD; PM Photos by Brian Kosoff

• If any sidearm can be called America's pistol, it's the Colt .45 Automatic. Also known as the Colt .45 Service Pistol, this handgun was the standard-issue sidearm for the U.S. armed forces for 74 years, from 1911 to 1985. In its two official versions—the 1911 and the 1911A1—it remains the most widely built, heavily used and thoroughly imitated autoloading pistol of all time.

The venerable Colt .45 pistol, which served as the soldier's weapon of last resort through most of this century, was actually born in the fertile mind of John Moses Browning at the end of the last century. The story begins on July 24, 1896, when Browning struck a business deal with Hartford, Connecticut-based Colt's Patent Fire Arms Co. Together they built the Model 1900, a .38-cal. predecessor to the 1911, and submitted the new sidearm in 1898 for testing to the U.S. government's Ordnance Department at



the Springfield Armory in Springfield, Mass.

Ordnance, however, wasn't too impressed with the Model 1900. The department reported, "It is not reliable and recommended against replacing standard .38 revolver with any autoloading pistol."

Some of the Ordnance Department's distrust can be attributed to the newness of Browning's autoloading design. Soldiers of that time were familiar with shooting single-action revolvers, which worked by having the shooter manually pull back the handgun's hammer for every round fired.

In contrast, Browning's new pistol came equipped with a blowback mechanism that automatically reloads it. To load the first round, the shooter pulls back the slide on the automatic (technically making this a semiautomatic, since only one round is fired per trigger pull). This pushes a cartridge into the chamber. The shooter then pulls the trigger, detonat-

# COLT .45 AUTOMATIC



## GOVERNMENT MODEL MKIV SERIES 80 STAINLESS STEEL

Colt's Manufacturing, of Hartford, Connecticut, still makes the .45 Auto in a number of nonmilitary versions. The one shown above comes with a stainless-steel finish. Minor modifications on this model include a combat-style hammer with an elongated hole.



## GOVERNMENT MODEL MKIV SERIES 80 BLUED

Based on the former M1911A1 Service Pistol, this newly manufactured Colt .45 Auto comes with a blued finish. Although historically referred to as an automatic, the pistol is technically a semiautomatic, since only one round is fired per trigger pull.

ing the cartridge. The resultant explosion creates both forward and rearward forces. As with any firearm, the forward force propels the bullet down the barrel.

The breakthrough feature on Browning's handgun was that simultaneous with the bullet driving forward, recoil energy forces the slide backward. Then, sequentially, it ejects the spent casing, compresses a recoil spring and cocks the hammer. At a certain point, the recoil spring stops the slide and pushes it forward again. Next, a spring-loaded magazine in the pistol's grip propels a cartridge upward into the slide's path. The slide then thrusts the cartridge into the chamber and the gun is reloaded, cocked and ready to fire. The entire operation consumes only a fraction of a second.

Additionally, the M1900 delivered extra firepower by carrying two more rounds than the .38 revolver (seven in the magazine and one in the chamber for a total of eight). It also cycled faster, and could be re-

loaded with a full magazine in less than a second. Loading a revolver cylinder took 5 to 6 seconds.

In sum, Browning made the auto pistol's operation less complex than the revolver while improving every performance factor that mattered.

What the Model 1900 didn't have was stopping power—as our soldiers discovered during the Philippine Insurrection of 1899-1902, when insurgents attacked U.S. occupation forces with machetes. The .38 round often wounded charging guerrillas without stopping them.

Accordingly, in 1907, the Ordnance Department invited 19 companies to submit big-bore .45-cal. revolvers and pistols to be considered as the next U.S. Service sidearm. Colt, of course, was one of the com-

panies, as were domestic suppliers Savage and Smith & Wesson. Ironically, three German handguns were also submitted, including the .45 Luger Automatic Pistol.

Though Browning's autoloader continued to interest the government, Ordnance testers still thought the samples malfunctioned too often. This compelled Browning to redesign his semiauto in 1909. The updated version, patent No. 984,519, came to be known as the "New Model" and the "Model of 1909." It was the father of the M1911.

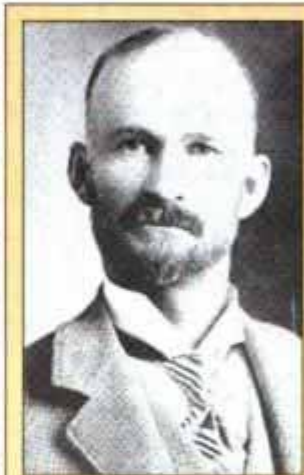
Approximately two years later, a tweaked Model 1909 beat out a Savage autoloader for the Service Pistol contract. Final trials began on March 15, 1911. On March 23, the testers submitted their report, which recommended that the Colt .45 "be adopted for use by foot and mounted troops in military service."

Less than a week later, Secretary of War Jacob M. Dickinson designated the Automatic Pistol, Caliber .45, Model of 1911, as the country's new Service sidearm. The M1911 and its successor, the M1911A1, held that designation until January 1985.

In its nearly eight decades of official military duty, the pistols covered themselves in glory both on and off the battlefield. Though the record is littered with tales about the .45's abilities in combat, no anecdote better illustrates the gun's strengths than the story of Medal of Honor winner Cpl. (later Sgt.) Alvin C. York. Trying to capture a machine-gun position in the Argonne Forest in 1918, York was pinned down by German troops. He had nearly emptied his rifle when six Germans charged, bayonets fixed. Contrary to the movie version, where in York (Gary Cooper) shoots his adversaries with a rifle, York actually used his .45 to dispatch the enemy soldiers.

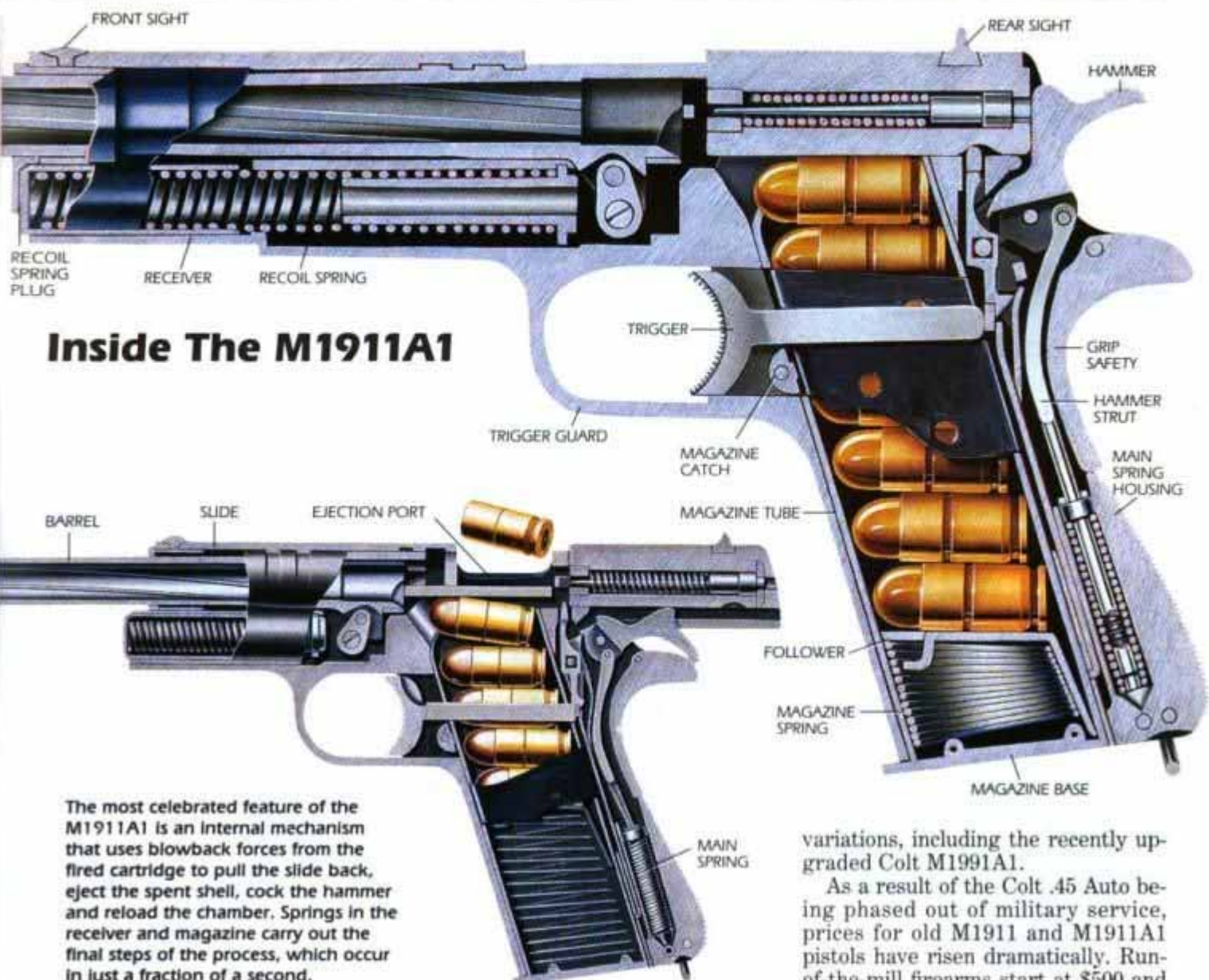
As related by Sam K. Cowan in the book *Sergeant York*: "So calmly was York master of himself and so complete his vision of the situation that he selected as his first mark among the oncoming Germans the one farthest away. He knew he would not miss the form of a man at that distance. He wanted the rear men to fall first so the others would keep coming at him and not stop in panic when they saw their companions falling, and fire a volley at him. He felt that in such a volley his only danger lay.

"They kept coming, and fell as he



John M. Browning, father of the innovative M1911.





## Inside The M1911A1

The most celebrated feature of the M1911A1 is an internal mechanism that uses blowback forces from the fired cartridge to pull the slide back, eject the spent shell, cock the hammer and reload the chamber. Springs in the receiver and magazine carry out the final steps of the process, which occur in just a fraction of a second.

variations, including the recently upgraded Colt M1991A1.

As a result of the Colt .45 Auto being phased out of military service, prices for old M1911 and M1911A1 pistols have risen dramatically. Run-of-the-mill firearms start at \$500 and go to \$2500. However, Springfield Armory M1911s from World War I and Navy-marked M1911s are frequently sold for \$4500.

A true find for a collector would be a North American Arms Company-marked M1911. The Canadian manufacturer made only about 100 .45 Autos, and each one is worth from \$10,000 to \$15,000. Another valuable gun is the sidearm made by Singer Sewing Machine Co.

Some 500 of these pistols were manufactured, and they've sold for as much as \$15,000. (For additional information about specific guns, contact the Colt Collectors Assn., 25000 Highland Way, Los Gatos, CA 95030.)

Overall, the number of Colt .45 Autoloaders that have been manufactured is now 5.5 million and counting. The pistol is officially retired from military duty, but after 74 years of service, it proudly takes its place as an American classic—the finest military sidearm ever made. **FM**



shot. The foremost man, and the last to topple, did not get 10 yards from where he started. Their bodies formed a line down the hillside."

After the war, the .45 Auto moved into another phase of development when a civilian, Marcellus Rambo, suggested several changes be made to the M1911's design. The government agreed that these and other problems should be addressed. The alterations were significant enough to warrant a new name, and on May 20, 1926, the M1911A1 was christened.

It, too, had a baptism under fire—this time in World War II. Colt and several other firms, including Ithaca, Remington Rand, Singer and Union Switch & Signal Co., manufactured 1.8 million .45 pistols. This production level necessitated that the gun be made as cheaply as possible, so in 1940, plastic grips, called Coltrock, began appearing. Another tougher plastic—Coltwood—showed up in grips two years later.

The final government contracts for the M1911A1 pistol were canceled on

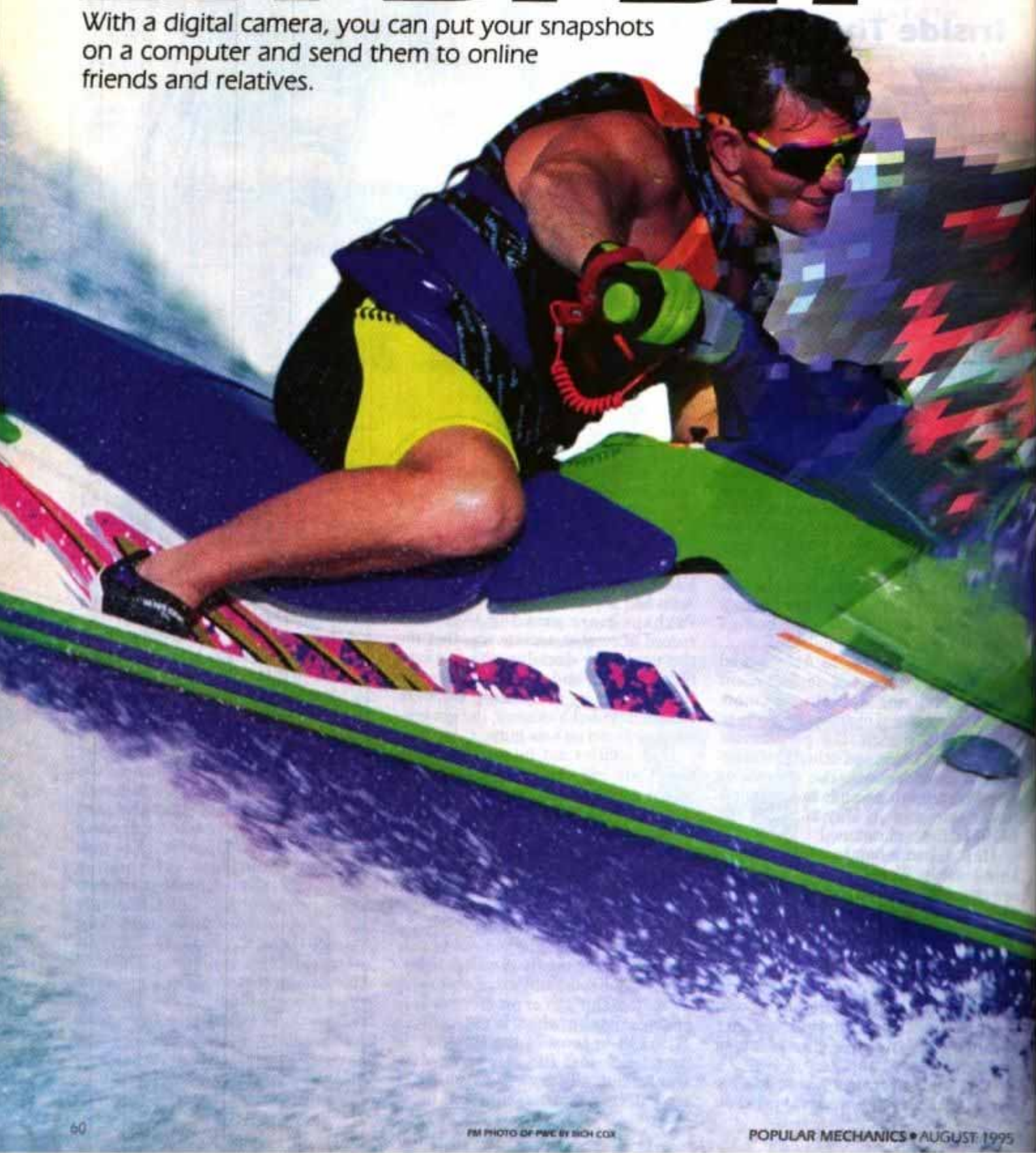
VJ Day in 1945, but by then, the .45 Auto had secured its place in history. Perhaps more amazing than this record of combat service was that for the next four decades, the government rebuilt and repaired existing .45s for military use. During this time (which included Vietnam), the government ordered no new guns.

Had politics not intervened, the Colt .45 Automatic might still be the country's Service Pistol. But because the United States' NATO allies preferred the 9mm Parabellum round for its arms, the government began investigating whether the .45 Auto should be put out to pasture. In the minds of many .45 loyalists—and some objective observers as well—the government made a grave mistake when it retired the M1911A1 in favor of the Beretta M9 9mm autoloader 10 years ago. Fortunately, nonmilitary .45 autoloaders are still being manufactured in many

PHOTOGRAPHY

# PICTURES BIT-BY-BIT

With a digital camera, you can put your snapshots on a computer and send them to online friends and relatives.





BY GEORGE SCHAUB; PM Photo by Michel Tcherevkoff

● You're at a family reunion in Ohio, and you take out your electronic still camera and snap a few pictures. Before the day is finished, everyone sits around the picnic table and looks at the pictures on the camera's built-in liquid-crystal display (LCD) screen. That evening on the plane, you remove the credit-card-size photo-storage disk and examine the shots full-size on your laptop. A few of the pictures are too dark, or taken from too far away, so you do a quick exposure adjustment and some cropping using the built-in enhancing software. You then select the pictures you like and check off a set for prints, which you make the next morning on your home printer.

While you're at it, you order Photo CDs of the best images for all the relatives by modeming picture files to the local print shop. You also include pictures on the CD from the reunion five years ago—digitized and stored on a separate memory card—so that everyone can see how they've changed. You type in a personal letter and throw in a chart of the family tree, adding the names of the new children that have joined the fold. You then place a set of pictures in Cousin Bill's electronic mailbox so that he can view them the next evening on his home computer in Hawaii.

The calendar on your computer beeps to remind you that a family member's birthday is approaching. Time to order a customized card for Uncle Pete. You select a photo from the reunion file and modem it to the local digital lab, along with your signature so they can personalize the greeting. Before you hit the send button, however, you realize that your brother Ernie must have wandered off again because he's not in the shot. No sweat—you clone his image from another picture and paste him right into the group shot.

Sound like a lot of future hype? Not if you believe what leading photographic and electronics companies are saying. They tell us that most of the pieces of this puzzle are already here, or will be in place by next year.

The way in which we all take pictures, view them, move them from place to place and order prints will change radically

in the next few years. While so-called traditional photography will be with us for some time to come, the options for working in the electronic realm are closer to reality than ever before.

The movement toward electronic photography—talked about for years but too often stalled in the prototype stage—is gaining some momentum because of a shift in our communications culture. The surge in home and small-office computers and the proliferation of CD-ROMs have made the computer—and not the TV (as many predicted)—the main access machine. This means that the digital mode, not the analog mode, is the way in which pictures will be taken, processed and printed.

The plummeting cost of computer memory and electronic image-capture devices tells us that the popularity of this equipment will continue to expand. Just as photography for the masses became a reality when the image-capture medium switched from glass plates to flexible film (in the 1880s), the proliferation of computers and the dropping price threshold of digital cameras figure to mean much the same for the change-over to digital imaging.

The breakthroughs in the ability to

compress previously huge image files into smaller and smaller disk-storage space mean that rolls of film will be replaced with credit-card-size “memory cards,” and that we’ll be able to manipulate and transmit complex images in seconds, not hours.

The only gap that presently remains to be closed is the quality of the images produced by electronic snap-

\$300 home color printer, will be met shortly. And the company knows that the success of any mass-market EI camera will be determined by how it stacks up against the quality of a moderately priced 35mm camera. High tech is terrific, but it still has to be able to deliver the goods.

Readers of POPULAR MECHANICS know that the trek to today’s digital cameras has been a steady climb on an occasionally rocky road. The first of the breed were still-picture-on-tape cameras, which recorded with CCDs (charged coupler devices), and video-still floppy disks were the storage medium—they were like video cameras capturing frames one at a time. These interesting hybrids currently occupy display cases in the “Museum of (Highly) Transitory Technology.”

Direct digital cameras—the ones that store captured pictures in a solely digital format—came onto the scene in the early '90s, and while they also used the CCD as a capture device, they stored picture information digitally on internal disks or on the so-called memory cards.

The latest digital still cameras use either removable storage mediums (the credit-card-size PCMCIA for-

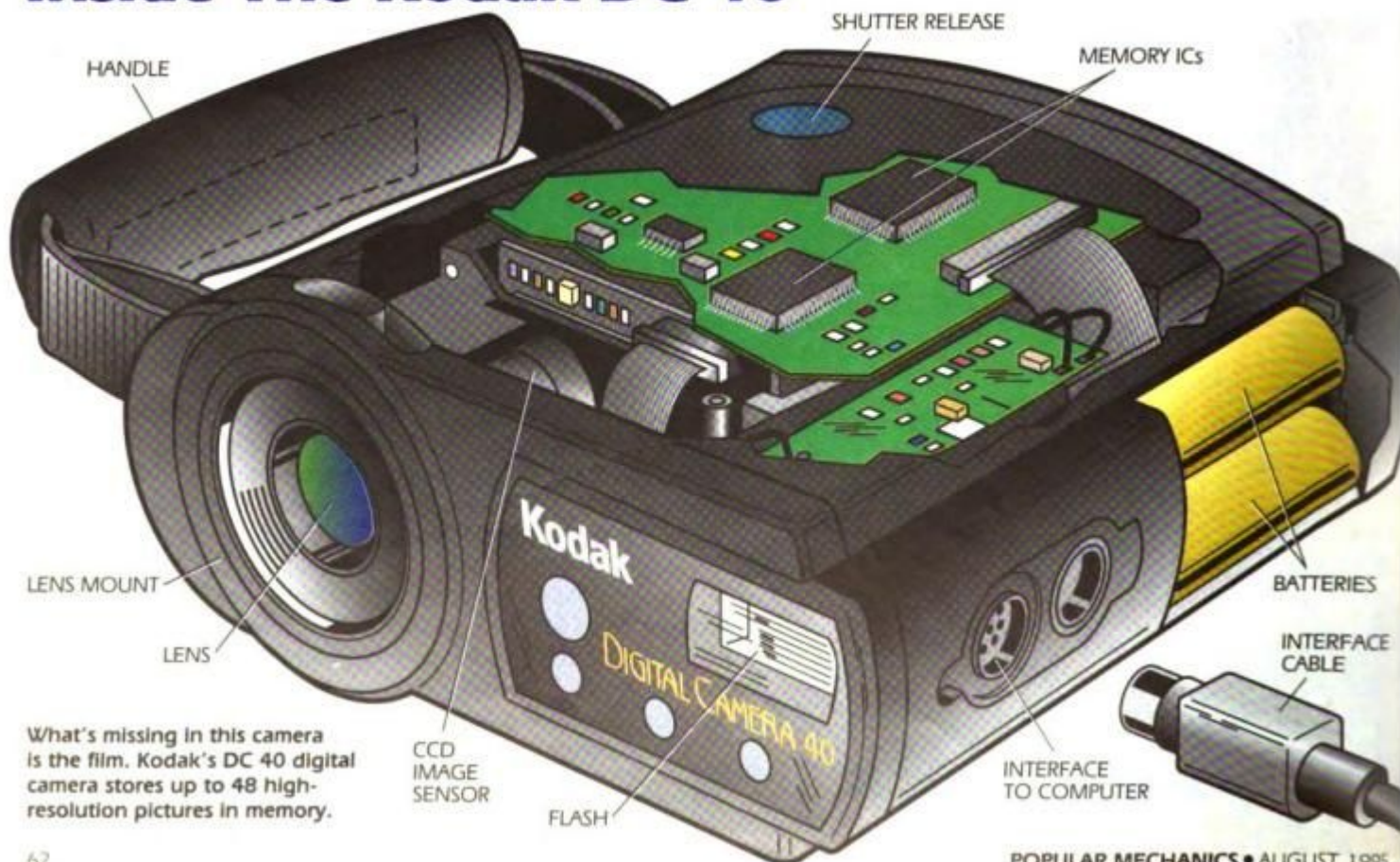


**CASIO QV-10**

shot cameras versus those from conventional ones. But this is directly linked to the cost of producing the high-density image-capturing chips used in electronic imaging (EI) cameras. If recent trends are any indication, that gap is being closed.

According to Kodak CEO George Fisher, the goal of producing a \$300 electronic still camera, linked with a

## Inside The Kodak DC 40



What's missing in this camera is the film. Kodak's DC 40 digital camera stores up to 48 high-resolution pictures in memory.

mat) and/or hold the picture information on a built-in "flashcard" that must be downloaded to a computer. Professional-level cameras now available from Nikon and Canon (in conjunction with Fuji and Kodak) are priced at \$8000 and up. Digital snapshot cameras, offered by companies such as Apple, Casio, Kodak and Chinon, come in at approximately \$800.

The professional cameras look, feel and operate like high-end single-lens-reflex 35mm cameras. Not surpris-



**MINOLTA DIGITAL MAXXUM**

ingly, the amateur and small-business-oriented cameras look, feel and operate like lens/shutter (point-and-shoot) 35mm compact cameras.

What do you get for your \$8000-plus digital pro camera? The Canon EOS DCS 5, for example, handles 36-bit color with a resolution of 1.5 megapixels, has a built-in microphone to record sound bites to caption images, can shoot at a speed of 10 images in 4 seconds, can record more than 100 images per disk (on a removable card-type hard disk) and has the capability to hardwire the camera directly to a computer via a standard SCSI cable. Plus, it has all the photographic features of the high-end Canon EOS-1N camera—and it accepts all the Canon lenses and accessories.

Kodak and Canon promise to deliver a 6-megapixel version of the camera later this year. The current model yields a photographic-quality image up to 5 x 7 in. in size at 150-line resolution. The next version should blow any doubts about the quality gap (film versus digital) right out of the water—at least when it comes to enlargements up to and slightly larger than 8 x 10 in. If you're excited about this new product, better start saving

up your pennies. Though no prices have been released, our guess is that it will come in somewhere around the \$15,000-plus range.

Those of us who are not ready to ante up the big bucks for the pixel-packing version can get involved with snapshot digital models from a wide variety of sources. These are full-color image capturers that are ready to download stills to computers or into snapshot-size-output digital color printers. Once they're in the computer, the images can be manipulated and edited as desired, then printed out, sent over phone lines or pasted into documents by using various software programs.

Right now, there are two main breeds emerging in the amateur/small-business (SOHO) market—the digital capture/video signal system (typified by the new Casio QV-10, \$700 retail) and the direct digital camera (such as the new Kodak DC 40 and the Chinon ESC-3000, both at a retail price of under \$1000).



**CHINON ESC-3000**

The Casio camera allows you to view recorded pictures in a number of ways. Once the picture is taken, you can have instant replay on the 1.8-in. (diagonal) LCD finder on the back of the camera—fans of Viewcams and similar camcorders are familiar with this setup. Or you can patch directly to your television via a video-in cord, which then permits you to make videotape recordings of the stills on your VCR. You can also patch the TV to the Casio VG-100 video printer for wallet-size prints. To get pictures into your computer and then edit them, you'll need a "Personal Computer Connection Kit," which converts the NTSC signal to digital form.

You can record up to 96 pictures with the Casio in its field-recording mode (no higher-resolution mode is available) on the unit's 16MB flash memory recorder, and you may either store or delete images whenever you like.



**KODAK DCS 460**

The just-released Kodak DC 40 is a direct descendant of the Kodak/Apple QuickTake 100 camera—both allow for direct patching and downloading to a computer. The latest model delivers higher resolution (756 x 504 pixels versus 640 x 480 in the high-resolution mode of the QuickTake) but retains the same 24-bit color. Improved image-compression technology enables you to take and store more pictures in high-res (48 for the DC 40 versus eight in the QuickTake—this is even more than the 32-image maximum in the QuickTake's low-res mode).

These numbers aren't reported simply for numbers' sake. The implications of what has happened in the year since the QuickTake's introduction are profound, and they point to one of the main



## Digital Developer

● Digital technology makes image manipulation a cinch, but "doctored photo" loses its sinister meaning with *Picture Window* (\$99, for Windows PC from Digital Light & Color, 800-577-7090 or 617-497-9027). This program turns your home PC into a virtual darkroom for enhancing or improving photographs.

You can use *Picture Window* to stick your head on the torso of Hercules or to erase an ex-spouse from holiday photos. But the program's primary purpose is fixing up what's already in the frame.

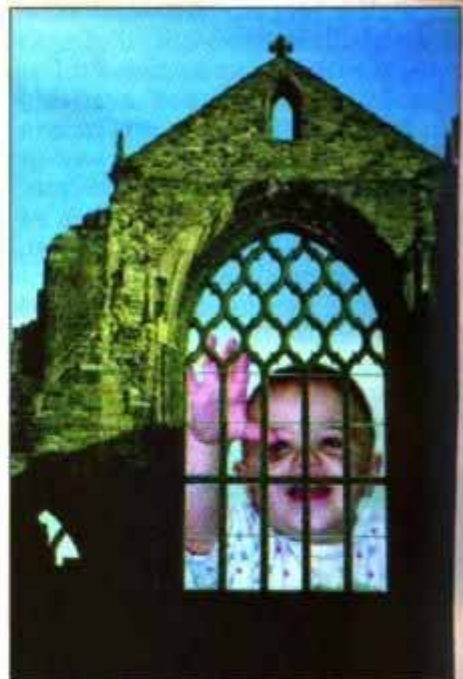
Digital processing sharpens up a soft, somewhat out-of-focus image, or corrects colors that either aren't exactly right or are entirely wrong (like those flash-induced red eyes).



Similarly, the program can restore a level horizon to photos shot off-kilter.

This digital sleight of hand goes on and on—from subtle fixes to trick effects. It all starts with an existing still (print, slide, negative, magnetic or solid-state image) and ends with a digitized print or diskette.

At the front end, you have to get the original photos into your computer. This may be done in one of two ways. You can have originals transferred to a Kodak Photo CD (figure \$1 per shot), then use your PC's CD-ROM drive as a source. Or, you might record the photos on your PC's hard storage drive using some form of color-scanning device.



*Picture Window* is a computer program that lets you "doctor" images—like changing the sky at Stonehenge or framing a baby inside a church window.

Once the photos are in the PC, you make your changes on-screen with the *Picture Window* software, comparing before and after images. When finished, you record the alterations on a floppy diskette. Digital Light & Color provides a service that develops prints (\$9 to \$15, depending on size) from the floppy. They'll also transfer your originals to Photo CD if you can't get it done locally.

The images you've recorded on diskette are also an electronic album, and can be displayed on a computer any time—slide-show style. And you can make copies of disks for friends or relatives—the other computer doesn't need *Picture Window* to run the show. —Stephen A. Booth

drivers in digital imaging's gain on conventional photography.

The two key phrases to always keep in mind are "on-board memory" and "improved compression." Picture files in raw form are very large. The comparison is often made between a frame of 35mm color film and a digital image file: The 35mm frame is said to hold approximately 18 million pixels of image information, the pixel being the definable building block of the digital picture.

Digital pictures, especially large-format color pictures, are worth far more than a thousand words—in this realm, they may be worth 100,000 words, digitally speaking. Such disk hogging has been the major stumbling block to bringing picture storage and processing to less than monster-capacity computers. But a number of things have happened to remove this hurdle:

1. Processing speed has increased strikingly. This means that information—including pictures—can be brought in, manipulated and processed through, and transmitted from and to computers at ever-spiraling rates. A new digital picture-processing system called FITS format (for Functional Interpolation Transformation System) creates a virtual image that increases speeds dramatically—and opens up new areas of creativity that don't take a day to process.

2. Higher-capacity CCD chips are now available for less money. Accompanying this price drop is a parallel trend toward greater memory capability in recording (cameras) and storage (computers and flashcards) devices. This means that more of us can get higher-resolution (sharper) and more information-rich pictures from the camera, and that we can store

more pictures in the computer without the need for massive storage units. The imposing 18-million-pixel 35mm color-print frame begins to look less challenging every day as the price barriers for digital cameras and powerful computers continue to fall.

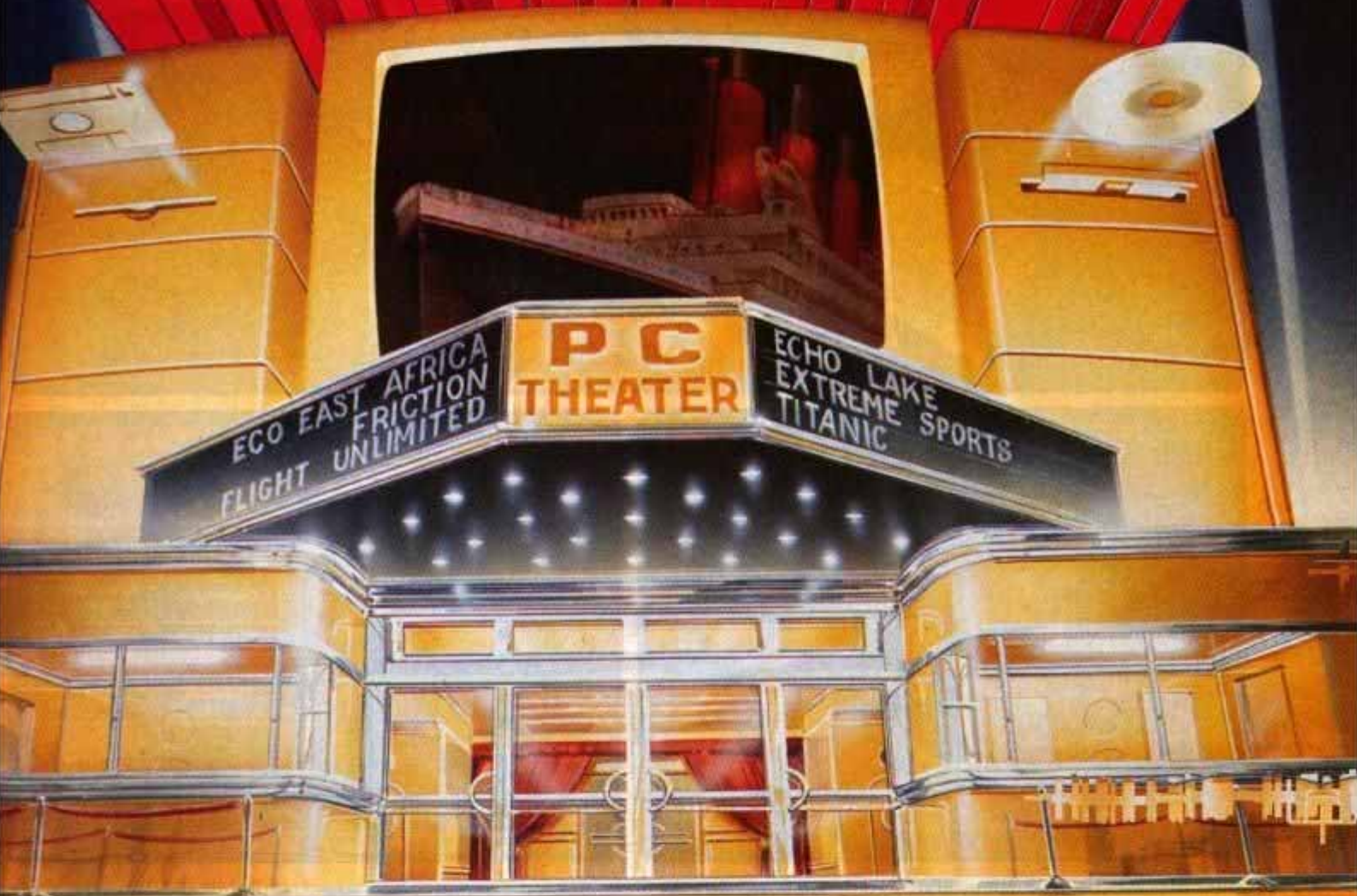
3. New image-compression schemes are being discovered at a rapid pace. Image compression is a way of shrinking the very large image files to a more manageable size, and then, when needed, expanding them back to their original, full-resolution size. This has been done with algorithms—that is, making assumptions about pixel arrangements and neighboring pixel identification, and then creating a digital formula that can be used—as required—to reconstruct the "whole" picture.

There are a few things in the works that will bring an even faster spin to

(Please turn to page 107)

ELECTRONICS

# NOW SHOWING MULTIMEDIA EXTRAVAGANZA!



There are plenty of software titles available, but only a few use computer technology to its fullest extent.

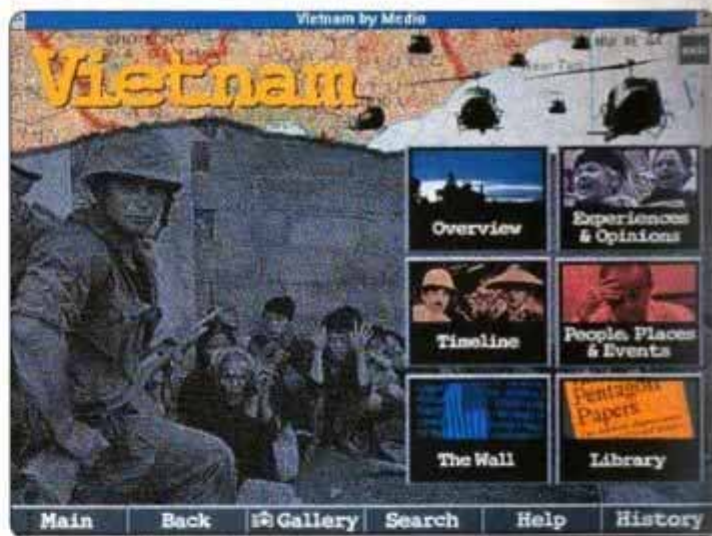
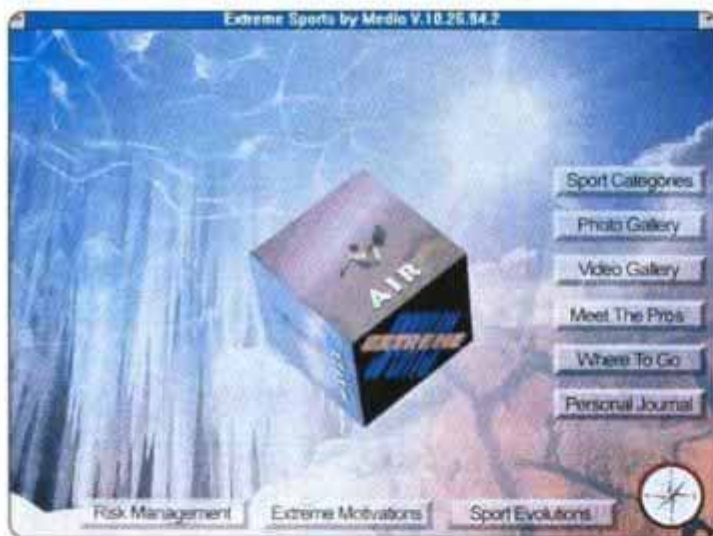
BY FRANK VIZARD, Electronics Editor, and STEPHEN A. BOOTH, Contributing Editor

• Our memory is being eaten alive by setup programs, icons and various other bits of invasive data that, while individually nonthreatening, taken together are choking our computers. Most disturbing, though, is that many of the multimedia CD-ROMs we look at are a waste. Some represent a simple transfer of information onto a disc (yawn). Some developers are totally clueless (yikes!). And some just don't know how to tell a good story (snore).

But hey, there are a lot of bad movies around and

we haven't sworn off film. The same is true of multimedia CDs. At the risk of being mistaken for Siskel and Ebert (no chance), here are our picks of multimedia CDs worth owning. Our criteria are simple. The title must keep us awake and entertained, and we have to learn something from it. It also has got to use technology to the max.

• **Roots:** If you want to trace your family history or leave an ongoing record for future generations, check out *Echo Lake* (Delrina, \$60, PC/Mac) and *Family*



**Tree Maker** (Banner Blue, \$60, PC).

The programs differ in that *Family Tree Maker* comes with a Family-Finder CD to help you retrieve data about ancestors. It indexes public records on 100 million deceased Americans, and it tells you how to obtain copies. Optional CDs index specialized records—some from overseas.

*Echo Lake* has no genealogical research tools. It takes a storybook approach: Family members “visit” the old vacation cabin and record a few anecdotes. You trace time and generations by tree rings. When you’re done, you can download bits of folk history onto a floppy and send it to friends and relatives.

● **Flying:** The new top gun of flight

sophisticated algorithms and aerial photography combine to make realism the name of the game in both *Terra Nova: Strike Force Centauri* (Inset, top) and *Flight Unlimited* (top). You can document your daredevil activities with *Extreme Sports* (above, left). *Vietnam* brings this controversial war home in all its emotional impact.

simulators is *Flight Unlimited* (Looking Glass Technologies, \$80, PC). This simulator has two things going for it. First, the very advanced computational fluid dynamics make the plane react according to spec. Second, the terrain texture-mapping is based on aerial photography, so the landscape you fly over looks amazingly real. Try it with virtual-reality headgear and you may never land.

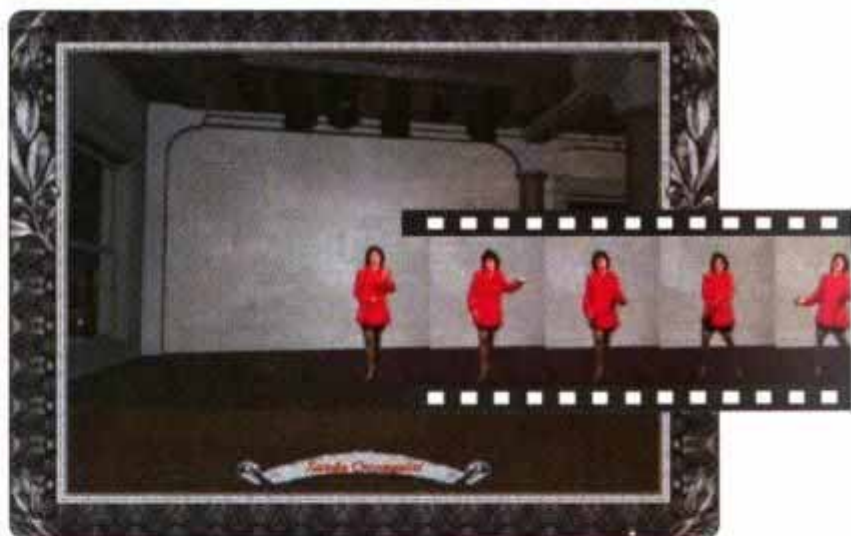
The same company also lets you drop out of a plane and fight aliens in the upcoming *Terra Nova: Strike Force Centauri*. Some fancy algorithms create a realistic environment—you can walk to a mountain, for example, and the ground will give underneath your feet. The firefights are cool, too.

● **Sports:** *Extreme Sports* (Medio Multimedia, \$60, PC) profiles thrill-seeking activities like sky surfing and ice climbing. Even better, you can record your own adventures.

● **War:** *Vietnam* (Medio Multimedia, \$60, PC) is among the best of a new crop of history titles. You’ll get a better understanding of this conflict, but the aching heart won’t go away.

● **Ecology:** The visually stunning *Eco*





*East Africa* (IVI, \$70, PC) makes you the warden of an African game park. Your assignment: Restore balance to the fragile ecosystem by fighting weather, poachers and bureaucrats. Your actions may remedy things—or harm them further. The job is its own reward, but it's not for the faint-hearted. Poachers play for keeps.

● **Photography:** You could learn photography by trial and error, spending a fortune and a lifetime waiting for your prints to come. Or, you could shoot to thrill in a virtual workshop with *Understanding Exposure: How To Take Great Photographs* (DiAMAR, \$60, PC/Mac), by esteemed paparazzi Bryan Peterson. The CD gives you instant feedback on-screen

Manage the environment in *Eco East Africa*, a disc with stunning visuals (top). *Echo Lake* (above, left) lets you create your folk histories and then send them to other members of the family. **Visual Radio** is an online service that brings cutting-edge comedians, musicians, poets and other artists directly into your home.

as you change shutter speed, aperture and film type.

● **Online:** Not everyone needs the in-depth business research that only Fortune-100 companies can afford. But anyone who does can get it for cheap with *Profound*, an online service for Windows PCs (800-270-9896).

Reports on virtually any topic, sourced from blue-chip research firms, emerge on-screen just as they

appear in print. *Profound* scans databases to retrieve the info you need. You can even program it to assemble dossiers of specific information—and then update them regularly.

At \$20 a month (plus \$7 an hour for connect time), it doesn't sound cheap. But your connect time can be measured in seconds because you'll prepare the research requests offline and hit the modem only to download the data.

With *Visual Radio* (800-555-RADIO), an online arts-and-entertainment service, you can get cutting-edge musicians, poets, artists and even comedians on your PC for \$9.95 a month.

● **Sneak preview:** Keep a watch out for the *Titanic*. Due next year, this disc lets you explore the ship. **PM**



# WHEN STOCK WON'T DO

Specialty tuners can make your hot car sizzle.

BY SCOTT OLDHAM, West Coast Editor

● If you get squeamish when your brother-in-law punches the accelerator in his minivan, these cars aren't for you. They're for people who are really serious about going really fast. They're known as tuner cars.

A tuner car is a superhigh-performance version of a factory production of an already high-performance car. These cars are created by "tuner" companies that sell the vehicles as their own. Tuners make fast cars go faster. It's sort of like tweaking your home computer into performing like a Cray supercomputer.

The eight fully legal street cars here are unabashedly hairy-chested, macho vehicles, built in very small num-

bers for people who figure too much performance is a good starting point.

## SLP Firehawk Firebird

In terms of sheer volume, SLP of Troy, Michigan (810-288-3066), leads the hit parade of tuner cars (1000 copies of their '95 Firehawk will be stalking Pontiac showrooms across the country). Available as option code R6V on Formula models, the Firehawk comes with a special hood and graphics. The base package, which costs \$6495, ups Firebird's stock 275 horses to 300—thanks to the hood and an oversize Corvette-style air cleaner. For an extra \$1199, you can get 15 more ponies with a free-flow exhaust.

Only coupe models can be had with a sport-suspension option (\$1599) that includes variable-rate springs, Bilstein shocks, stiffer bushings and 275/40ZR17 tires on 17-in. wheels.

The 315-hp 'Hawk will blast from 0 to 60 mph in 4.9 seconds, eat the quarter-mile in 13.5 seconds and ultimately find 160 mph. SLP guarantees all of its components for three years/36,000 miles.

## HKS Toyota Supra Turbo

With \$8000 in engine upgrades, 18-in. wheels and tires, and more gauges than the space shuttle, this 452-hp Toyota Supra twin-turbo sprints from 0 to 60 mph in 4.7 seconds.



SLP FIREHAWK FIREBIRD



HKS USA Inc. of Torrance, California (310-328-8100), which makes performance parts for Japanese cars ranging from Honda's Civic to Mazda's RX-7, says 620 street-legal horsepower is available from the Supra's inline 6-cylinder engine—if aftermarket turbos are used. This black car's stock turbos crank out 17.4 psi of boost, and work with an HKS Super Drager Exhaust system—with its Lincoln Tunnel-size 5-in.-dia. tailpipe—and makes use of the stock catalysts. The turbo boost, adjustable from the cockpit, can be cranked up to 20 psi for close to 500 hp. Power delivery is melted-Velveeta smooth, but you can feel when each turbo spools



### CALLAWAY CAMARO C8

up. The first comes on hard at about 3000 rpm, then, at five grand, the second turbo fires up and rockets the car forward like God kicked it in the rear bumper. And boy, does it run out of revs quick. During acceleration runs, keeping the engine off the rev-limiter requires fast and furious shifting of the stock 6-speed transmission.

Another feature that we like is the Turbotimer, which extends the life of the turbos by keeping the car running for a preset amount of time (2 to 10 minutes) after the ignition key has been turned off and removed.

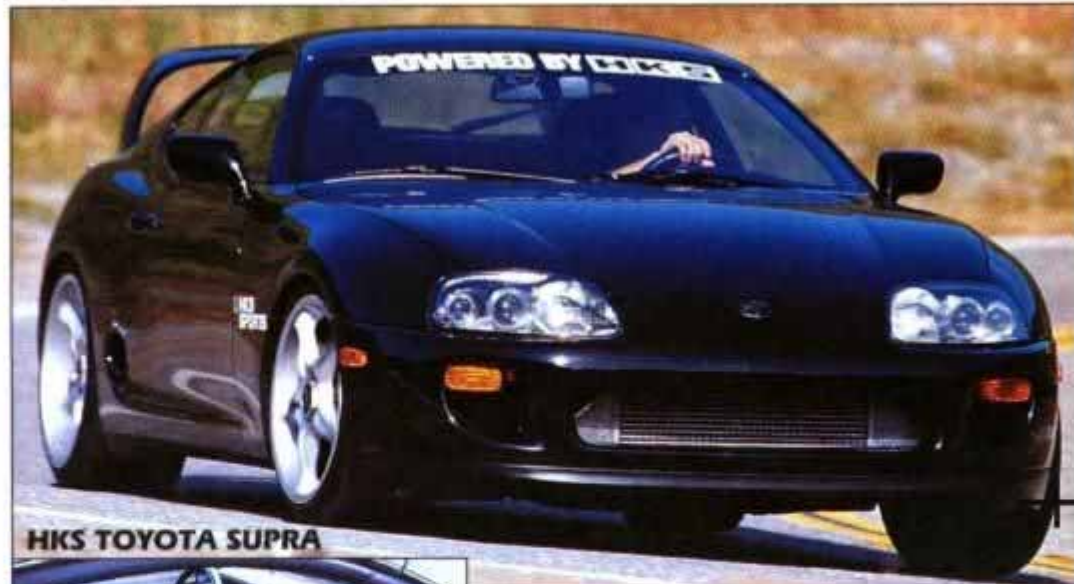
### Callaway Supernatural Camaro C8

Reeves Callaway's last name became recognizable in 1987 when his company began twin-turbocharging Cor-



vettes and selling them for six figures. Now Callaway Engineering of Old Lyme, Connecticut (203-434-9002), is tweaking Chevy's more economical Z28 Camaro.

Unlike Callaway's past efforts, the 404-hp Camaro C8 makes its power with classic hot-rodding knowhow instead of high-tech turbochargers. Callaway bored and stroked the Camaro's 350 V8 to 383 cu. in. and

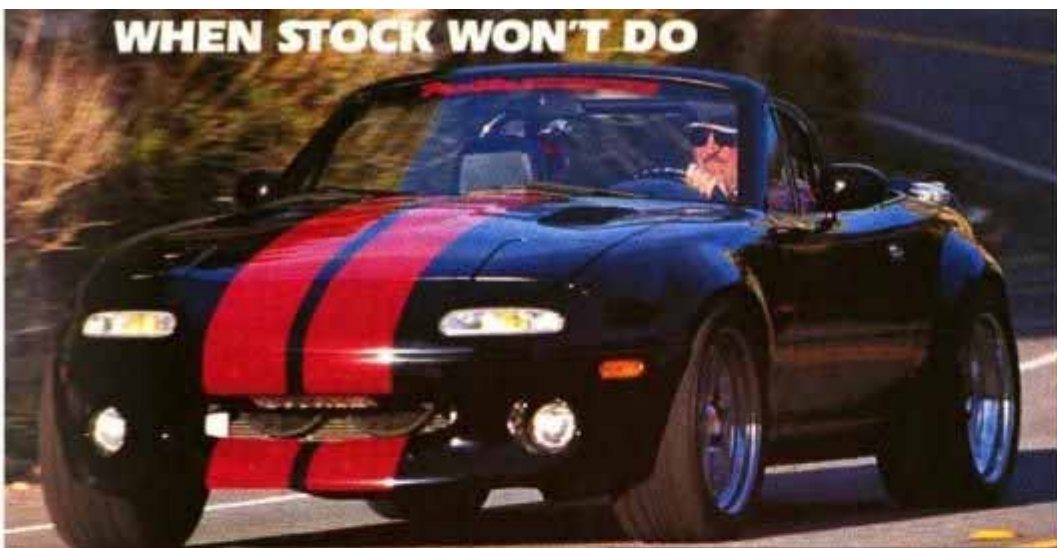


HKS TOYOTA SUPRA



equipped it with bigger valves, a larger intake system, ported heads, a revised camshaft and a free-flowing exhaust. The result is a small-block engine that feels like a built 502-cu.-in. big-block. The power comes on just off idle, and keeps you pinned to the seat through the first four gears like only V8 power can. The short-throw Hurst shifter with a billet-aluminum knob makes power shifting the Z's stock

## WHEN STOCK WON'T DO



MEGA-MONSTER MIATA

6-speed a great way to work off stress.

Callaway also adds Brembo brakes, adjustable shocks and 17-in. wheels and tires. These upgrades not only give the car a low, no-wine-spritzer-drinkers-need-apply stance, but they make the Callaway easier to drive hard up and down a mountain road than a stock Z28. Gone is all the body roll and the Camaro's tendency to unweight its rear end during trail braking. Turn-in is *now*, and the brakes are strong enough to bail you out.

A Whopper with everything costs \$54,383. Or skip the toppings—the Ferrari-esque bodywork (\$10,300) and the interior wood trim (\$2620)—and you still have a car that sounds like a Trans Am racer and accelerates from 0 to 60 mph in 4.7 seconds.

### Mega-Monster Miata

Mazda's 128-hp Miata emulates the sprightly British sports cars of the 1960s. The guys at Monster Motorsports, in Escondido, California (619-738-7592), think sprightly better describes gymnast Mary Lou Retton than a performance car, so they created the V8-powered Monster Miata.

Monster Miatas are powered by 5.0-liter Ford V8 engines, ranging from the standard 225-hp conversion (\$18,995) to the supercharged 400-hp Mega-Monster with its bulging body kit (\$49,500, including a new base Miata). Or you can really do it right—like Bill Hall of La Costa, California, the owner of our photo car—and have a 480-hp supercharged engine specially built. That's 480 hp in a car that weighs 2550 pounds and has a shorter wheelbase than a Geo Metro. Is this the world's nastiest go-kart, or what?

All Mega-Monsters use a heavy-duty Ford World-Class T5 5-speed transmission, Mazda RX-7 R1 brakes, larger-than-stock wheels and tires, and a Ford Thunderbird independent limited-slip differential (optional on the Monster). And every car receives some chassis

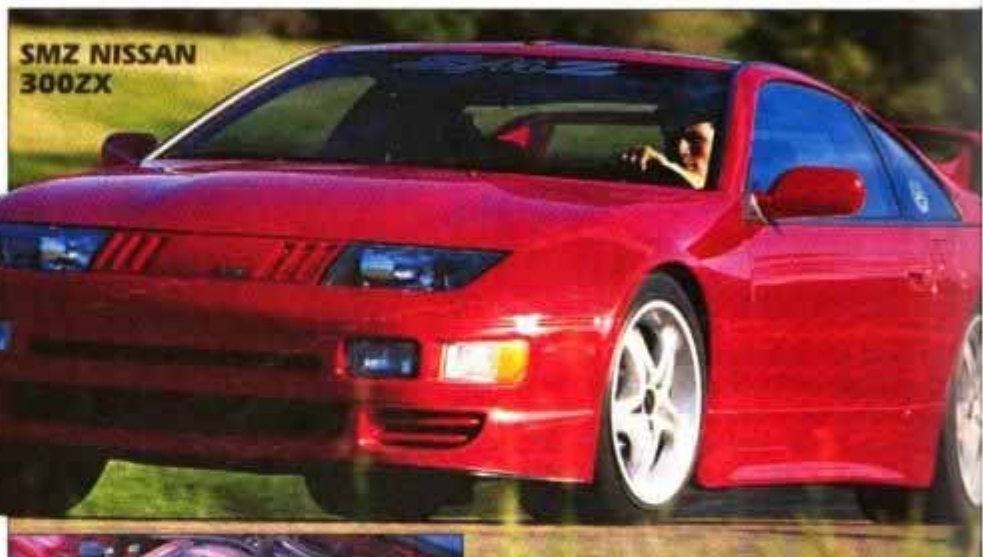


reinforcements, so the little roadster doesn't twist itself into a pretzel the first time you stand on the throttle.

Rest assured. Nobody will ever call a Miata that runs 0 to 60 in just over 4 seconds sprightly.

### SMZ Nissan 300ZX

With rumors flying that the present Nissan 300ZX is close to gasping its last breath, IMSA champion Steve Millen's company, Stillen of Costa Mesa, California (714-545-2742), is



SMZ NISSAN 300ZX



building 300 examples of this SMZ-enhanced 300ZX twin-turbo to celebrate the model's 25th birthday.

For \$55,000, the SMZ gives you 365 hp, compliments of 2 more pounds of turbo boost, a low-restriction induction setup and a 3½-in. exhaust system. Turning and stopping are improved with larger and adjustable sway bars, lower, variable-rate coil springs, giant 17-in. front and 18-in. rear wheels and tires, as well as bigger brakes from Nissan's Skyline GT-R (a red-hot performance car sold only in Japan). The whale tail and subtle body kit make sure the neighbors know you didn't buy just any ol' Z-car.

### Saleen Mustang S351

Call Steve Saleen a tuner and he's liable to go for your jugular. According to Saleen, his cars are not hot-rodded Ford Mustangs—they're Saleens, manufactured at the company's Irvine, California, facility (714-597-4900), sold through select Ford dealers and covered by a Ford-backed warranty.

Drive one and who cares. This car runs rings around a stock Mustang. Saleen replaces the stock drivetrain with one of three 351-cu.-in. (5.7-liter) Ford V8s. Our \$43,990 ragtop had the standard, normally aspirated version, claiming 370 hp. And it ran strong, tearing up its rear Bridgestones with ease. But 370 hp seems a bit optimistic—it feels more like 300. For those looking to do their Kenny Bernstein impression, a supercharged 408-hp version is available, and the \$59,000 Saleen SR model boasts carbon-fiber

body panels and a claimed 480 hp.

Saleen also adds his own shocks, springs, brakes, 18-in. wheels and tires, gauges, shifter and a winged and scooped body kit.

### Hennessey Viper

Tuners spend months in the dyno room trying to squeeze 400 hp out of their cars. Hennessey Motorsports, in



**SALEEN MUSTANG S351**



Houston, Texas (713-849-5081), starts with 400 hp. You see, Hennessey tunes 488-cu.-in. V10 Dodge Vipers. Oh, yeah—Hennessey finishes with either 500 or 550 hp.

Hennessey's catalog is filled with go-fast stuff for 10 cars, from Acura's NSX to Chevy's Z28 Camaro. But Vipers are his bread and butter.

For \$14,500 and your Viper, you've got 500 hp after Hennessey installs ported and polished cylinder heads, stainless-steel roller rocker arms and a fuel-management computer upgrade. The \$22,000 Venom 550 package adds a camshaft and fuel-pump upgrade, a fuel-pressure regulator, fuel lines and a new valvetrain.

Except for the aftermarket hardtop, Gary Whitner's red Venom 500 Viper looks stock, but it runs from 0 to 60 mph in 4 seconds. Whitner's car is even equipped with the optional stainless-steel headers that bump power up to 520 hp, but contribute to accelerated hearing loss.

### **Guldstrand Corvette GS90**

Dick Guldstrand spent most of the 1960s racing Corvettes at such venues as Sebring and Le Mans. Now his company, Guldstrand Automobiles, in Culver City, California (310-391-7108), is planning to build 100 GS90s in the next few years.

Based on a ZR-1 Corvette, the \$134,000 GS90 uses the 405-hp 32-valve 5.7-liter V8 that Corvette racer Doug Rippie has tuned to 475 hp. The suspension is as different from stock as the carbon-fiber bodywork. Heim joints and needle bearings remove the

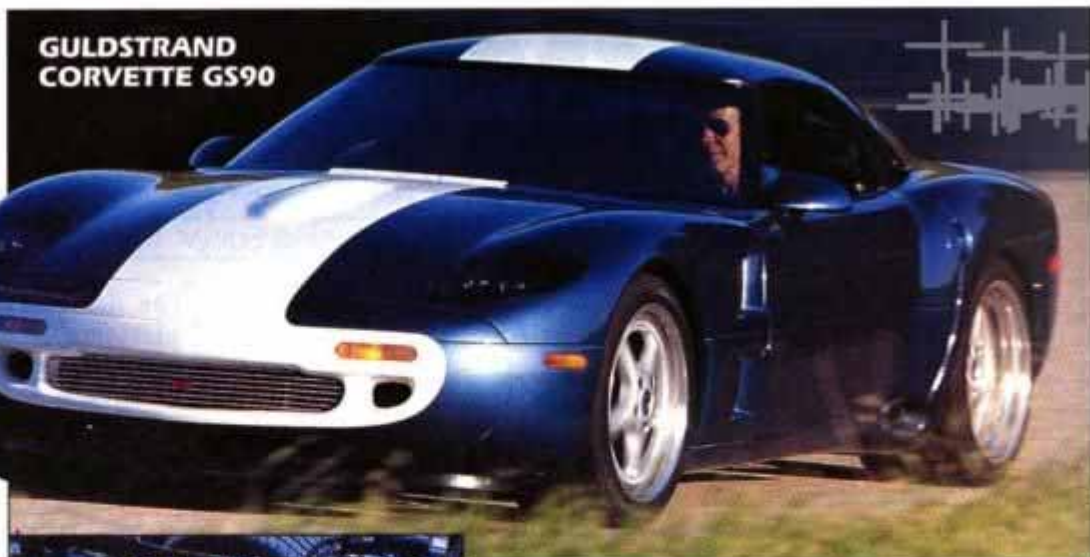


**HENNESSEY VIPER**



slop of the rubber bushings, and coil-over shocks replace the leaf springs. Guldstrand also adds 18-in. wheels and way-low-profile 30-series tires. The cockpit-adjustable Bilstein shocks make sure the ride isn't diminished.

The GS90 is available in any color



**GULDSTRAND CORVETTE GS90**



you and your 134 grand want, but this car's dark metallic blue and white stripe take you back to 1963 and Chevrolet's very special Grand Sport Corvette racers that served as inspiration for the GS90. Guldstrand claims performance figures that put the GS90 in some pretty elite company: 0 to 60 mph in just over 4 seconds and a top speed of 200 mph.

**PM**



# OLDSMOBILE ACHIEVA

Snappy performance and sassy style.

BY MICHAEL LAMM, Contributing Editor; PM Photos by Jean Constantine

● Not too long ago, there was an ad for the Achieva in which the car was called “a compact car with an attitude.” That about hits it on the head—if you go by the respondents to our Owners Report survey.

“I wanted a medium-size, 6-cylinder, American 4-door that didn’t look boxy or stodgy,” explained a Texas electronics technician. Added a New York secretary: “For the money, the Achieva was the nicest, sportiest car I could find. Good workmanship, not cheaply made, very sturdy.”

Several owners who filled out our questionnaire said they were pleasantly surprised by the Achieva’s long list of standard equipment. The humblest Olds Achieva—the base S Series I coupe model—includes 14 items that most automakers charge extra for. Among them: antilock brakes, automatic power door locks, tilt steering wheel, power steering and a center console—all that and more for \$13,500.

The Achieva is built on General Motors’ front-drive N-platform, which it shares with the Pontiac Grand Am and Buick Skylark. Like the other two cars, the Achieva S is available in coupe and sedan form. The Achieva now comes in two trim levels, Series I and Series II, which has a higher level of trim and standard equipment. You also get a choice of engines and transaxles.

In 1994 (the model year for our survey), the base engine in the Achieva S was GM’s Quad-OHC sohc Four. This single-cam version of the Quad 4 delivered 115 hp. There was also a 155-hp Quad 4 with twin cams and another Quad 4 rated at 170 horses. The High Output 170-hp Quad 4 came only with a 5-speed manual transmission, and a mere 4.3% of our respondents ordered their cars that way—which explains why it has been discontinued. For ’95, the engine lineup is simplified, with just a 2.3-liter Four rated at 150 hp and a 3.1-liter V6 with 155 hp. That’s it.



Interior is comfortable, but too noisy.



Most of our owners chose the V6.



John Rock, Oldsmobile's general manager, told his dealers he wouldn't tolerate unhappy customers. So if someone buys an Achieva—or any Oldsmobile—and decides within 30 days or 1500 miles that he or she doesn't like the car, it can be returned for the customer's money back, or it can be traded in for some other Oldsmobile model. In our survey, only one owner had taken advantage of this offer. She traded her new Achieva for a new Cutlass Supreme.

Oldsmobile, like other GM divisions, has set up several programs whose goal is to keep customers loyal. The Oldsmobile Edge offers free transportation any time you

In '94, most survey respondents opted for the 3.1-liter 155-hp V6, which delivers more torque than any of the 4-cylinder engines: 185 ft.-lb.

**Customer as king**  
Oldsmobile, looking to Saturn as a role model, is trying to match Saturn quality and customer satisfaction.

leave your car to be serviced. You also get a loaner or reimbursement for a rental if your vehicle needs to stay overnight. Olds speeds to your rescue

## SUMMARY OF OLDSMOBILE ACHIEVA OWNERS REPORTS\*

<b>Total miles driven</b>	1,319,560	<b>Transmission choices:</b>	Good	45.1	<b>Power door locks</b>	25.0%	
<b>Average miles driven</b>	5615	4-speed automatic	93.4%	Average	1.7	Brakes	10.7
<b>Purchase price:</b>		5-speed manual	6.6	Poor	0.4	Electrical system	10.7
Average	\$14,916	<b>Specific likes:</b>		<b>Control layout:</b>		Windshield wipers	8.9
Range	\$12,000-\$19,200	Styling	53.5%	Excellent	55.8%	Air conditioner	7.1
<b>Why did you choose the Achieva?</b>		Handling	40.1	Good	39.2	Shifting	7.1
Styling	60.8%	Comfort	29.2	Average	5.0	Transmission	7.1
Price/value	41.0	Economy	20.8	Poor	0.0	<b>Repair it yourself?</b>	
Standard equipment	12.2	Power	19.3	<b>Instrumentation:</b>		No	98.2%
Previous ownership	11.3	Ride quality	18.8	Excellent	50.4%	Yes	1.8
Size	9.9	<b>Specific dislikes:</b>		Good	43.3	<b>Dealer repairs satisfactory?</b>	
Handling	9.0	No complaints	15.6%	Average	4.6	Yes	82.0%
<b>Model choices:</b>		Excessive noise	15.1	Poor	1.7	No	18.0
Base Achieva S	74.9%	Needs more power	8.4	<b>Driver sightlines:</b>		<b>Dealer service opinion:</b>	
Achieva SC coupe	12.8	Needs more space inside	7.8	Excellent	36.0%	Excellent	42.9%
Achieva SL sedan	12.3	Blind spots	6.7	Good	48.5	Good	46.3
<b>Body style choices:</b>		Dashboard layout	6.7	Average	13.8	Average	9.1
4-door sedan	55.1%	<b>Suggested changes:</b>		Poor	1.7	Poor	1.7
2-door coupe	44.9	Make car quieter	16.1%	<b>Overall convenience:</b>		<b>Dealer sales policy opinion:</b>	
<b>Options/Accessories:</b>		More comfortable seats	8.7	Excellent	46.1%	Excellent	44.6%
Air conditioning	100.0%	No changes	8.1	Good	48.3	Good	44.6
Power door locks	97.5	Improve dashboard layout	6.7	Average	5.6	Average	7.3
Cruise control	77.0	Increase engine power	6.7	Poor	0.0	Poor	3.4
Power windows	71.2	Change styling	6.7	<b>Workmanship opinion:</b>		<b>Number of vehicles owned:</b>	
Premium sound system	55.4	Eliminate blind spots	6.7	Excellent	53.4%	This vehicle only	36.6%
Alloy wheels	48.6	<b>Engine power:</b>		Good	43.6	Two vehicles	38.7
Split folding rear seat	18.6	Excellent	48.1%	Average	2.6	Three vehicles	14.0
Alarm system	14.3	Good	43.6	Poor	0.4	Four or more	10.7
Power driver's seat	9.4	Average	7.4	<b>Comfort opinion, front seats:</b>		<b>Principal driver:</b>	
Leather seat trim	5.1	Poor	0.8	Excellent	49.8%	Female	62.8%
<b>Avg. mpg, city/hwy:</b>		Handling:		Good	44.9	Male	36.7
115-hp Quad-OHC 4	23.5/29.5	Excellent	61.2%	Average	5.3	Equal	0.4
155-hp Quad 4	23.7/29.1	Good	34.3	Poor	0.0	<b>Age distribution of owners:</b>	
170-hp Quad 4	23.6/29.0	Average	3.7	<b>Comfort opinion, rear seats:</b>		Under 29	19.1%
155-hp V6	22.6/28.8	Poor	0.8	Excellent	32.6%	30-49	46.4
5-speed manual	24.4/32.6	<b>Braking:</b>		Good	55.1	50-plus	34.6
4-speed automatic	23.1/29.0	Excellent	60.3%	Average	11.5	<b>Based on your experiences, would you buy an Oldsmobile Achieva if you had it to do over again?</b>	
<b>Engine choices:</b>		Good	36.4	Poor	0.9	Yes	56.8%
155-hp V6	40.1%	Average	3.3	<b>Mechanical trouble?</b>		Maybe	35.5
115-hp Quad-OHC 4	36.9	Poor	0.0	No	76.5%	No	7.7
155-hp Quad 4	18.7	<b>Overall performance:</b>		Yes	23.5	<b>What type of trouble?</b>	
170-hp Quad 4	4.3	Excellent	52.7%				



The Achieva's somewhat sassy appearance, when coupled with the vehicle's inherent value, proved to be a prime purchase motivator for many of our survey respondents.

## EDITORS REPORT

### The Attitude Is Needed

● These days, Oldsmobile likes to go around calling itself GM's "Saturnized" import-fighting division. Indeed, if you take a look at the new Aurora and, to a lesser extent, the Oldsmobile Eighty Eight, you begin believing it.

But then take a look at Achieva. This is arguably the best looking of the GM N-platform cars (which include the Buick Skylark and Pontiac Grand Am), but what is Olds doing with it?

Nothing.

You wouldn't know it if you believe those Achieva TV commercials. It's okay for the ad agency to say your car has an attitude. And the film clips of the Achieva skidding around in the dust out on a dry California lake bed make for some dramatic footage. But what happens when you fire one up at your local Olds dealer and take it for a test drive? Unfortunately, not much.

It was worse a few years ago. Then, if anything, there was too much happening—too much under the hood for the chassis to cope with. Violent torque steer threatened to rip the steering wheel out of your hands if you dumped in too much throttle off the line. And the car was downright treacherous on a wet roadway.

Well, things have calmed down a bit. Perhaps too much. The wild turbocharged engines are gone. But what's in their place? The Four is okay. It'll get you around, and, after all, that's what people buy cars for, right? But if you see one of those TV commercials that Oldsmo-

bile's advertising agency, Leo Burnett, prepared, you want attitude. Unfortunately, even the V6 doesn't deliver on the promise.

The commercials set up an expectation that's way too high for any current Achieva to meet. You approach the car anticipating something you don't get. Yes, you do get a solid ride and a nice interior—even luxurious, in the upscale trim levels. But the car feels heavy and underpowered, its V6 engine notwithstanding. You don't get that nimble, throw-it-around, "import" feel.

This is not to say that the Oldsmobile Achieva isn't a good performer. As we said, the car is stable and smooth, and it rides comfortably. It's just not fun to drive. In fact, the fun quotient is about zero. And personally, we think cars should be fun to drive. Apparently, so do the survey respondents who wouldn't bother to buy another Achieva. A car's fun-to-drive quotient is mostly a matter of power-to-weight ratio. Imports usually do a much better job of it than American cars of the same class. So while the Achieva is a good, sturdy car, it's really no fun to drive, nor does it have the attitude alluded to in commercials.

And this is all too bad, because the Achieva has the looks to be a really terrific small car. If it had the powertrain to deliver on the aforementioned attitude promise, Oldsmobile would have something here. As it is, the Achieva turns out to be quite the underachiever.

—Joe Oldham

if you get locked out or stranded on some lonely road. And the company will help you plan vacation routes, even reimburse you if your Achieva conks out away from home.

Is the Oldsmobile Edge working? Apparently so, because most Achieva owners gave their dealers high marks for the way they handled both sales and service. Many Olds dealers now use Saturn's "no-dicker sticker" policy, and our buyers liked that. Said one Michigan entrepreneur: "My salesman gave me his best price, with no dickering, and so far I haven't heard of a better deal."

As for service, just over three-fourths of our surveyees required none at all. Of the rest, the most common complaint had to do with the Achieva's automatic power door locks. Under certain driving conditions, doors now lock, unlock and relock themselves. They lock when you shift out of PARK, for example, and then unlock when you shut off the ignition. You can defeat the "unlock" by removing a fuse. You can also lock and unlock all doors with a key or remote entry fob. Some owners didn't understand these intricacies, and, then again, sometimes the locks just flat out didn't work. But these problems—as well as others—were repaired quickly, with an 82% success rate.

Better yet, repaired cars were often returned to their owners with thoughtful surprises. Reported a New York secretary: "My car came back with a full tank of gas—the first time that's ever happened to me."

Slightly less wonderful was a frequent complaint about noisiness. Seems the Quad 4 still isn't the quietest of engines, despite GM's continuing changes. Another complaint had to do with the Achieva's thick windshield pillars causing blind spots. And many owners wanted dual airbags instead of the single bag featured in 1994-95 models.

In the judgment of most, the Achieva scored well on the basics. The car provided adequate power, an acceptable ride, good maneuverability and handling, roominess, comfort and overall economy. Yet it knocked no one's socks off. If anything, owners tended to take these things for granted. The Achieva met expectations, it delivered on its promises—but didn't go beyond them.

In all, a less-than-impressive 56.8% of our surveyees said they'd buy an Achieva the next time around. Another 35.5% answered maybe. Many of the maybes explained that they hoped to move up to a larger, more luxurious Oldsmobile with their next purchase. The rest wanted to see what else would come along.

PM



# Natural Prostate Relief

It's a natural fact. If you are a male over 40 and don't already suffer from a prostate gland disorder, the odds are 2 to 1 that you will before you are 59. By the age of 65, most American men have enlarged prostates.

As the years pass, mild discomforts can become disabling. Today, prostate surgery is the second most commonly performed surgery in men over age 65! Surgical complications can include total loss of bladder control and sexual dysfunction.

Prescription drugs may halt the swelling, but rarely ends the suffering. Like many prescription drugs, they have side-effects, like weak erections and low sex drive.

Many doctors feel that prostate disorders can be treated or prevented by giving the prostate the nutrition it lacks.

Recent scientific research has shown how to remedy the underlying problems associated with prostate disorders--safely and effectively. These results have been published in the *British Journal of Clinical Pharmacology*, the *American Journal of Gerontology* and papers from the *National Cancer Institute*. They reveal that several vitamins, minerals and natural herbs can dramatically shrink the prostate and improve urinary performance in older men.



The most modern application of these healthy ingredients is found in **Prostsafé** from Whitewing Labs. **Prostsafé** is the nutritional "tool kit" for men with prostate problems, and those who wish to prevent them. It is a mixture of zinc, serenoa serrulata, ginseng, certain amino acids, bee pollen and vitamins A, B-6 and E. Working as a team, these ingredients have been scientifically proven to shrink a swollen prostate.

Our customers have said  
Prostsafé helps to:

**Halt the endless trips to the bathroom during the night!**

**Stop that burning sensation during or after urination!**

**Prevent uncontrollable wetting!**

**Improve bladder control!**

**Empty bladder completely!**

**Sustain erections and enhance virility!**

**Please a concerned wife!**



Dr. Michael Rosenbaum, M.D. says "Prostsafé supplies essential vitamins, minerals and herbs needed to nourish and maintain a healthy prostate."

For as little as a dollar a day, that seems like inexpensive insurance against deadly prostate disorders. If for some reason you are not satisfied, just return the unused portion within 30 days for a full refund.

The reasons why men over 40 use **Prostsafé** are clear. If you are looking for relief, order **Prostsafé** today.

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17939 Chatsworth St., Suite 408, Granada Hills, CA 91344

PS1 1 month supply of Prostsafé only \$34.95 plus \$4.50 S&H  
 PS2 2 month supply only \$59.95 (Save \$9.95) plus \$4.50 S&H

PS6 6 month supply only \$119.95 (Save \$89.75) plus \$4.50 S&H

Check enclosed \$ \_\_\_\_\_ CA res. add 8.25% & AZ res. add 5.50%

Visa/Mastercard # \_\_\_\_\_ Exp. date \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

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

or call **1-800-950-3030** Dept. 187

"Now I get a good night's sleep without getting up every two hours to urinate."

-- Mr. C. Hussy  
Cleburne, TX

"Prostsafé has stopped the burning after urination."

-- Mr. C.E. Black  
Barboursville, WV

"I empty my bladder and have a good stream of urine with no strain."

-- Mr. S.J. Hymel  
Houma, LA

"I previously encountered discomforts such as bladder urgency. These problems are now completely absent."

-- Mr. B. Doser  
Holland, MI

"This is a little personal but, how can I say, I am more virile."

-- Mr. G. Howard  
Cleveland, OH

"...and in the sex department, my wife thanks you."

-- Mr. G. Sawin  
Lynwood, WA

**CONSUMER GUIDE**

# Whirlpools And Spas

*Some say it doesn't get any better than this. Here's what they're talking about.*

BY MERLE HENKENIUS

● If you haven't noticed, lots of folks are buying home spas these days.

According to industry analysts, there are now some 3.3 million residential spas in place, with sales for 1993 alone topping 385,000 units. Though many are purchased to either soothe aching muscles or for entertainment purposes, a greater motivator is stress reduction.

Home spas aren't for everyone, of course. To begin with, they're a bit pricey—ranging from \$800 to \$8000. Then too, some of us lack the room, indoors or out. And finally, while sitting in a spa is generally considered to be a healthy activity, it can also elevate blood pressure and heart rate, while decreasing blood sugar. As such, they aren't recommended for the very old, or for people with diabetes, hypertension or heart disease.

Still, spas seem to have an almost universal appeal. There's something about them, that's, well, irresistible. All that water. All that fun. And all those choices.

## Terminology

The word spa has become a catchall marketing term, encompassing everything from pulsating shower heads to saunas. In the parlance of the manufacturer's showroom, however, spas are pump-operated, jetted tubs.

Of these, there are two general types. The simplest are nothing more than enhanced bathtubs, sometimes called whirlpools. They have pumps and air/water jets, but usually no heaters. (Inline heaters are sold as options for \$350 to \$400.)

Typically, whirlpools have six jets. But even though they're positioned for optimum effect, the jets aren't as controllable as the ones found in larger tubs. Jetted bathtubs are connected to water and drainage lines in the conventional manner. These tubs

are generally smaller, accommodating one or two bathers, and are installed indoors. More importantly, jetted bathtubs—just like standard bathtubs—are drained after each use.

In contrast, larger spas (also known as hot tubs) hold water all the time, which means that they must be continually heated, circulated, filtered and sanitized. This adds significantly to the cost of both ownership and operation.

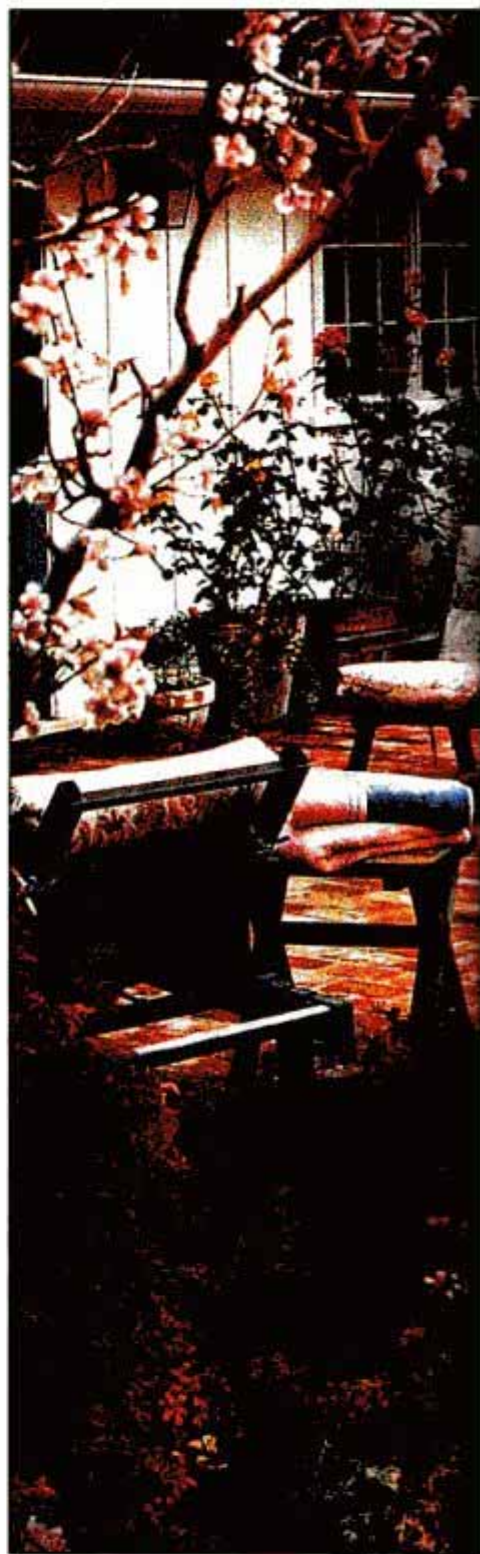
What you get in return, however, is more room, more water, more varied and controllable massage jets and a constant water temperature of about 102° F. Most are designed to be used indoors *and* out. In fact, some of the lightweight portables can be moved in and out of the house with the seasons.

## Material differences

Jetted bathtubs are constructed of cast iron, porcelain-enamel steel, gel-coated fiberglass or fiberglass-backed acrylic. Larger spas (hot tubs) are almost always made of plastics—either fiberglass, fiberglass-backed acrylics or, more recently, extruded, continuous-depth thermal plastics. The exceptions are soft-sided tubs, which are built with marine-grade vinyl.

In the jetted-bathtub category, cast iron is the most substantial and durable material. But with anything larger than a standard 30 × 60-in. tub, weight becomes an issue. The tub alone can approach 400 pounds. For this reason, some plumbing manufacturers have developed steel tubs that are coated with a layer of polyurethane (or other plastic) before being enameled in porcelain. Heat loss is reduced, the finish is more durable and the tub feels warmer—and it weighs a mere one-third to one-half of a cast-iron model.

The first departure from metal was gelcoated fiberglass. While few com-



panies make these versions today, fiberglass tubs tend to be less expensive and easier to repair.

The lion's share of the industry has moved toward a marriage of fiberglass and acrylic plastics. Here, a thick, acrylic layer is bonded with a molded fiberglass base. These lami-



The classic whirlpool hot tub is a focus for family and friends—and a great place to unwind. Models like this Hot Springs spa by Watkins are portable and most can be used both indoors and out.

nated tubs are extremely strong, and acrylic plastics allow for a wide variety of contours, colors, surface patterns and textures. However, acrylics can be susceptible to chemical burns, surface bubbles that can appear with age and delamination.

As acrylics technology improves,

these problems are becoming less common. Perhaps the most significant harbinger of product quality is the tub warranty. While some manufacturers offer 20- to 30-year warranties against leaks, a leak is highly unlikely in heavy tubs. Here's a more telling point: A surface warranty of less than

five years, or no mention of the surface in the warranty, should immediately send up a red flag.

Latest on the scene are tubs that are made of extruded polypropylene or other thermal plastics. These materials can't delaminate and are more resistant to chemical burns. Surface

warranties of from five to seven years are quite common.

And finally, insulation is crucial. A well-insulated 6- to 8-person tub might average \$11 to \$16 per month in energy costs, based on midrange electricity rates, outdoor installation and several months of cold weather. By contrast, poorly insulated tubs can average \$30 per month. Closed-cell foam insulation is best, but the critical factor is the amount of insulation used. Every cavity not occupied by equipment should be filled with insulation.

Some companies do such a good job of insulating that they'll guarantee—in writing—maximum energy use, based on local rates and climate. Be sure to ask, though, as insulation is not often visible in the showroom.

## Jet technology

With the exception of mini-spas (more on them later), the trend these days is toward more of everything—more room, larger pumps and more jet control and variety. Bigger spas have between nine and 21 jets, with some built right into the contoured seats.

A typical spa has one primary high-volume jet, several fixed jets, several adjustable jets and at least one back-massage jet. Some have a narrow flow while others spin, spiraling the flow for a softer effect. Some are positioned for foot massage, while others target the neck and shoulders.

Due to limits in pump capacity, not all jets work effectively at the same time. Built-in mechanical or electric flow-control valves allow you to dial in your preferred combination.

Most enticing are jets designed for back massage. Some companies provide a jet cluster for back muscles. Others have jets that travel along your spine. The Moto-Massage jet in some Hot Springs spas is a good example: The jet shimmies up and down a vertical groove, and can be adjusted for a vigorous or a soothing stream.



Inset jetted baths, such as this model by Pearl, offer the greatest design flexibility. However, bath remodeling adds to cost.

Indoor/outdoor hot tubs often feature wooden panels and come ready to use. This Baja spa has an acrylic tub.

## Jetted bathtubs

Why choose a jetted bathtub when you could have a large whirlpool spa with all of the bells and whistles?

The answer has to do with price, space and lifestyle.

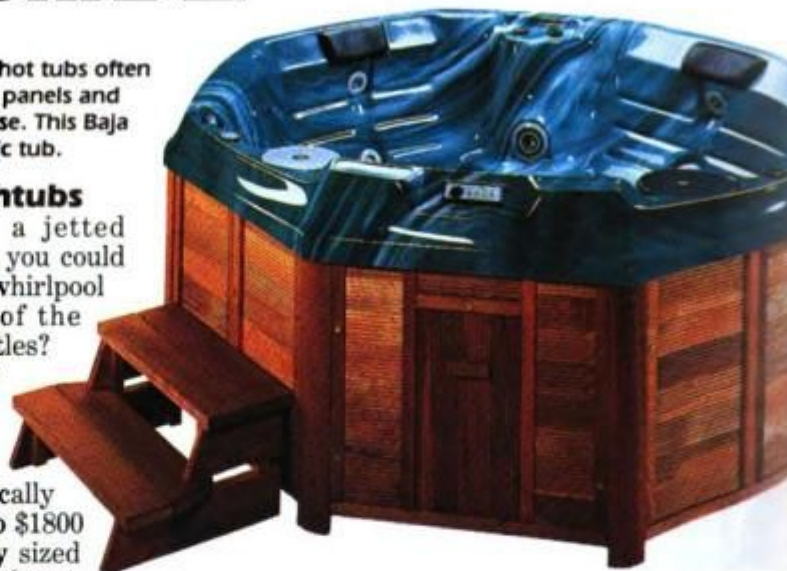
Spas that typically sell for \$800 to \$1800 fit in modestly sized bathrooms, and can be enjoyed without needing daily water-sanitation maintenance. Because these tubs are built-in, however, retrofit installations may increase the cost significantly.

There are two types of jetted bathtubs—drop-in models that hang in a site-built deck and free-standing tubs that rest directly on the floor. Drop-in models offer the best variety of shapes and sizes, while free-standing tubs are ideal for small-bath installations. Some of the free-standing units sold by plumbing-fixture manufacturers are available with optional surround panels, which allow for a shower above the tub. Standard 60-in.-long tubs come in widths that range from 28 to 32 in.

With both installations, you'll need to build an access to the pump. The access panel can be cut into one of the end walls or into the facing surface of the deck. Some free-standing models come with removable apron panels. The pump will need to be fed by a dedicated 15- or 20-amp circuit, starting with a ground-fault circuit interrupter (GFCI) breaker.

## Larger tubs

The philosophy of the hot-tub buyer is different from that of the jetted bath-



tub buyer. For many owners, hot tubs are the scenes of stress-relieving parties—even when only family members are invited. As such, they're often installed in bedrooms and rec rooms, or on decks and patios near a backyard swimming pool. Because almost all are free-standing, the purchase price is often the final price—minus electrical hookup and maintenance costs.

As for indoor feasibility, many are designed to fit through conventional entry doors. From there, it's all a matter of careful measurement. If your tub is destined for a bedroom or basement rec room, measure the tub against the stairway head clearance and hallway turning radius. Some larger spas that won't fit indoors are specially insulated for outdoor use.

When installed outdoors, a spa requires a flat, level surface—a concrete patio, wooden deck or stepping-stone pad will do. The critical thing to consider, however, is the combined weight of the tub, equipment, water and spa users. Decks and in-house floor joists may need beefing up. While a plastic, jetted bathtub will require only 40 to 50 psi of support (usually within the designed strength of the floor), larger tubs typically demand 70 to 75 psi of load-bearing



This Kohler whirlpool unit features an optional removable apron. Without the apron, a custom valance is required.



Free-standing whirlpool baths, such as this one by American Standard, offer spa features with minimal bathroom remodeling.

capacity. You may need to install extra frost footings and support posts under a deck, or double the floor joists beneath an indoor spa.

While some spas come with 120-volt, GFCI household plugs, the larger units should be wired directly to either a 120- or 240-volt circuit. All outdoor wiring must be enclosed in weather-tight conduit and boxes.

Spas that hold water full-time are subject to the same child-safety concerns as swimming pools. For this reason, every spa should have a solid cover. On outdoor installations, a locking cover is a good idea—and may actually be required by code. Insulated covers also greatly reduce energy consumption, especially during the winter months. In indoor installations, they don't add to the humidity.

### The mini-spa

If the thought of spending \$4000 to \$6000 or more on a full-size spa gives you muscle spasms, don't panic. Because there are so many of us in this category, manufacturers offer scaled-down models called mini-spas. These abbreviated versions accommodate two to four users, sell in the \$1900 to \$3000 range and require less space and floor support. They also plug into standard 120-volt receptacles and come with GFCI protection.

### Pumps and filters

While today's trend is toward bigger, more powerful pumps—up to 5 horsepower—to support more and more jets, most manufacturers use pumps rated at 1 to 1.5 hp, and limit the number of jets to a dozen or less. Because pump motors run often, if not continuously, warranties are important. Although traditional warranties have terms of one to two years, some companies are now extending the coverage to as many as five years.

The pump not only propels water and air through the jets, it also draws

Mini-spas fit tight budgets as well as tight spaces (right). These soft-sided vinyl units by Softub are also entirely portable. One good example is the Softub Legend (inset). This 4-person tub is 71 in. across and weighs 65 pounds. The pump and cover add only 46 pounds. The tub holds 220 gallons of water.



SOFTUB INC. PHOTOS

soiled water through a skimmer and, eventually, through a polyester-fiber filter. The filter traps body oils and particle contaminants before the water is routed back through the pump and electric inline heater. Polyester filters do a good job, but they require periodic cleaning in an oil-stripping solution.



### Sanitation

While filters help trap body oils and dirt, they can't rid the water of harmful viruses and bacteria. Only chemical or mechanical oxidation can do that. As for chemical treatment, the primary concern is pH balance. Water that's too acidic can corrode the pump and heater, while water that's too alkaline will leave mineral deposits on equipment. Both extremes reduce the effectiveness of chemicals. Beyond pH, enough chlorine or bromine must be added to kill germs. Both pH and chlorine levels can be gauged with a simple test strip, or through an inexpensive electronic probe. You'll need to add chemicals daily, either through the skimmer or via a floating applicator. Your dealer

will set up a testing and treatment regimen, but you should expect to invest about 3 minutes per day and about \$100 per year in chemicals.

For people who have trouble completing daily chores, there's help in the form of mechanical sanitizing equipment. The most popular is an ozonator, which feeds ozone

gas into the water. Ozone kills most waterborne organisms on contact. Another approach is an ionizer, which kills through an ion-exchange process. Both devices reduce the need for chemicals by up to 90%, though an ozonator is preferred by most manufacturers. Each will add \$350 to \$400 to the cost of the spa.

And finally, for \$700 to \$800, you can equip your new spa with an automatic monitor and chemical-feed system. But most spa owners are willing to handle sanitation problems with conveniently packaged chemicals that are quick, cheap and effective. **FM**

### FOR MORE INFORMATION

For a list of spa, whirlpool-bath and hot-tub manufacturers, write to the National Spa & Pool Institute, 2111 Eisenhower Ave., Alexandria, VA 22314.

### PHOTO SOURCES

- American Standard, 1 Centennial Plaza, Piscataway, NJ 08854.
- Baja Products Ltd., 4065 N. Romero Rd., Tucson, AZ 85705.
- Kohler Co., Kohler, WI 53044.
- Marquis Corp., P.O. Box 549, York, PA 17405.
- Pearl Baths Inc., 9224 73rd Ave. N., Minneapolis, MN 55428.
- Softub Inc., 21100 Superior St., Chatsworth, CA 91311.
- Watkins Mfg. Corp., 1280 Park Centre Dr., Vista, CA 92083.

Self-contained spas use electric motors to power pumps that move air and heated water through jets mounted in the tub. With access panels removed, this large Marquis unit displays the pumping system required to maintain pressure at the jets. Filters remove oil and dirt from treated water.



MARQUIS CORP. PHOTO (BOTTOM)

**PRODUCT TEST**

**3M  
 Wallpaper  
 & Paste  
 Remover**

TEXT AND PHOTOS BY  
 ROSARIO CAPOTOSTO,  
 Contributing Editor

● If you've ever removed wallpaper using hot water, an electric steamer or a harsh chemical-stripping method, you know only too well how messy, time-consuming and difficult the task is. Well, the next time you have to tackle the job, you may want to consider using the recently introduced 3M Wallpaper & Paste Remover. We tried it—and we liked it.

The product is a water-based gel that's formulated to rapidly penetrate all types of wallpaper—including vinyl, strippable, grass cloth and foil. The gel's consistency allows it to cling to a vertical wall surface, thus eliminating any runoff (Photo 1). The remover is nontoxic, nonflammable and doesn't emit harmful vapors, so no special ventilation or gloves are required.

The 3M Wallpaper & Paste Remover is available in 1-gal. (about \$16) and ½-gal. (about \$10) containers, and in a 22-ounce trigger spray bottle (about \$7). A gallon of the remover will strip about 200 sq. ft.

To round out the system, 3M also offers several accessories separately. These include a porous roll-on applicator, a brush-on applicator for use on wall edges and near window and door trim, and a plastic knife—similar to a putty knife—for removing softened wallpaper and paste. Also available are a handled woven pad, for lifting off residual paper and paste, and a contoured-grip cleanup sponge (not shown). These accessories range in price from about \$1 to \$4.

We tested the remover on firmly adhered vinyl-coated wallpaper that had been applied to painted drywall. Using the roller, a thick layer of remover was applied and allowed to set for about 15 minutes (Photo 2).

The softened wallpaper was then stripped from the wall with 3M's specially designed knife (top photo). Stubborn areas required spot rewetting, using the brush-on applicator saturated with remover (Photo 3). The



3M Wallpaper & Paste Remover softens wallpaper for easy stripping. 3M accessories include a plastic knife that has a built-in tray for catching paste residue.



1 The thick gel formula is especially designed to cling to walls. A 1-gal. container of remover can handle about 200 sq. ft.



2 Use the porous roller to apply a thick layer of remover. Then, allow the gel to set for approximately 15 to 20 minutes.



3 The 3M brush-on applicator can also be used for wall edges, baseboards, corners and trim, and for small spot applications.



4 Remove residual paste with the woven-pad accessory that's wetted with gel. Once it's washed, the pad can be reused.

woven-pad tool cleaned off the paste residue after the paper had been removed (Photo 4). A sponge dipped in clean water was used to rinse the wall.

For more information about 3M's

Wallpaper & Paste Remover, or any of the accessories mentioned in this article, write to Consumer Relations, 3M DIY, 3M Center, 515-3N-02, St. Paul, MN 55144.

**HOME  
 IMPROVEMENT**

**Room Air-  
 Conditioner  
 Maintenance**

BY STEVE TOTH,  
 Contributing Editor  
 PM Illustrations by  
 George Retseck

● Summer's here and your room air conditioner is laboring hard. You can help the appliance work more efficiently through the months ahead by following a simple maintenance program, and you might even save a little money on your utility bill.

Effectively keeping up some appliances—high-efficiency gas or oil furnaces, for example—requires a technician. Fortunately, a basic room air conditioner can be maintained by a homeowner who has only a few hand tools and a shop vacuum.

To begin, unplug the air conditioner and remove the front grille and filter (Figs. 1 and 2). The filter traps pollen, dust and dirt, and if it's clogged, you won't get maximum cooling performance. Wash it with a mixture of warm water and soap. If the filter has deteriorated, replace it. Your local appliance store, hardware store or home center may be able to supply you with the exact size and type of replacement part you need. If not, several manufacturers make filters that can adapt to many brands of air conditioners. These are cut to fit with a pair of scissors. One source for such filters is the General Electric Consumer hotline: (800) 626-2000. A cut-to-fit GE filter costs \$8.05 with shipping (state tax is extra).

Remove the air conditioner from the window and clear away any accumulated debris from the windowsill. Take the appliance out of its cabinet. (Some will slide out of the cabinet, but on most, the cabinet is held in place with screws.) Remove the screws and put them aside (Fig. 3). Then, use a shop vacuum and crevice tool to get rid of leaves and debris from within the air conditioner (Fig. 4).

To clean the inside (Fig. 5), bring the appliance outdoors and use a paintbrush and some soapy water. Put plastic bags over the fan motor, electrical control box and compressor.



Secure the plastic with duct tape. Hose the inside clean (Fig. 6), and make sure the base, coils and pan for condensate are clean as well.

When you've finished, remove the plastic bags and dry off the air conditioner with a fresh cloth. Allow the remaining moisture to evaporate, or you can accelerate the drying process by blowing out moisture with a can of compressed air. Single-use cans of compressed air are available through tool catalogs and some hardware stores. You can also try using a rechargeable air tank, which is sold at hardware stores, home centers and auto parts stores.

When the appliance is dry, reassemble and reinstall it in the window, following the general guidelines mentioned below. It's a good idea to allow the air conditioner to remain idle for one full day—just to be sure that the machine is thoroughly dry before you begin running it.

**Reinstallation**

Now that the maintenance of your air conditioner is complete, it's time to start thinking about ways of getting maximum performance and durability out of the appliance.

Many people mistakenly believe that air conditioners need to be pitched down, slightly out of level, to help them drain condensate. Actually, the exact opposite is true. An air conditioner should be installed so it's level. These appliances are designed so that condensate collects below the fan and runs into the slinger ring, which is made of sheetmetal and is part of the fan assembly. The bottom of the ring acts like a gutter to collect condensate. The fan then picks the water out of the ring and slings it against the condenser coils.

Recycling the condensate in this manner increases the coils' cooling capacity. Check the air conditioner for level—front to back and side to

side—when you install the unit.

If the appliance's side panels are cracked, now is the time to replace them. In some cases, you can get a single side panel from an appliance store (each side costs about \$15 to \$30), or you may have to buy both sides—and the guides that they run in. Some people opt not to replace the side panels when they wear out. Instead, they remove the panels and screw clear plastic sheet (Plexiglas, for example) over the runners. This also lets in a little extra daylight.

Take steps to seal the area where the window closes on top of the air conditioner. In many instances, the foam strip that came with the appliance will have worn out. The gap left by an improper seal is energy inefficient, not to mention an entryway for bugs. Appliance stores sell kits called Air Conditioner Window Foam. These are nothing more than bags with foam strips that have peel-and-stick backing. If you can't find one of these kits, you may substitute adhesive-backed weatherstripping. Weatherstripping can also be used as a vibration damper when a storm window or screen rests on the top of the appliance.

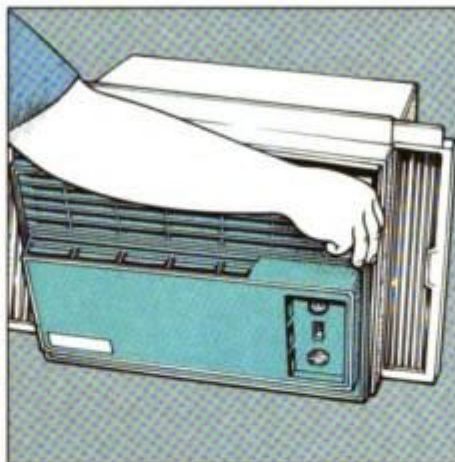
If your air conditioner is installed in a vinyl replacement window, think about using a wood reinforcement strip below the appliance to distribute its weight. An air conditioner is heavy enough to distort some vinyl replacement windows. Also, consider screwing L-brackets into the window channel rather than letting the unit rest against the window sash. Again, the brackets bear the weight of the air conditioner—not the replacement sash.

If you have a problem with birds building nests under the air conditioner, install a thin, exterior-grade strip of plywood or a piece of painted solid wood to block their entry.

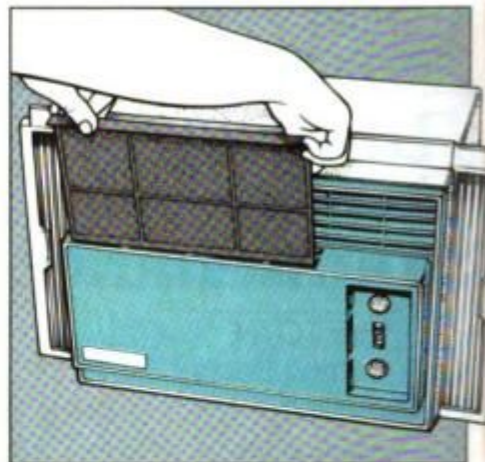
## Operation tips

Finally, there are things you can do to help reduce the heat load on your air conditioner. One sounds obvious, but it's often overlooked: Draw blinds or drapes on the sunny side of the house to block out the Sun's rays. In hot, sunny climates, awnings can also substantially reduce heat gain. Further, keep the garage door shut and close all the windows in the house.

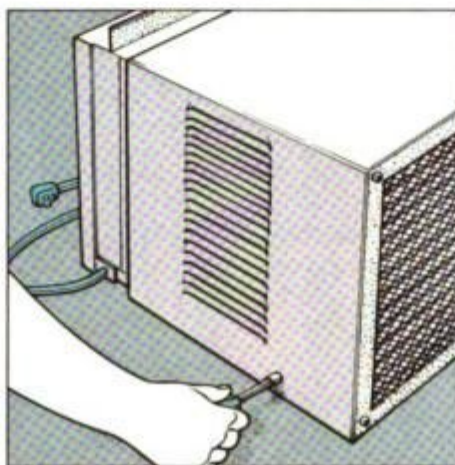
Along similar lines, the same kinds of weatherstripping that prevent heat loss in the winter also prevent heat gain in the summer. Properly weatherstripped doors and windows, combined with attic insulation, are your best defense against wasted energy.



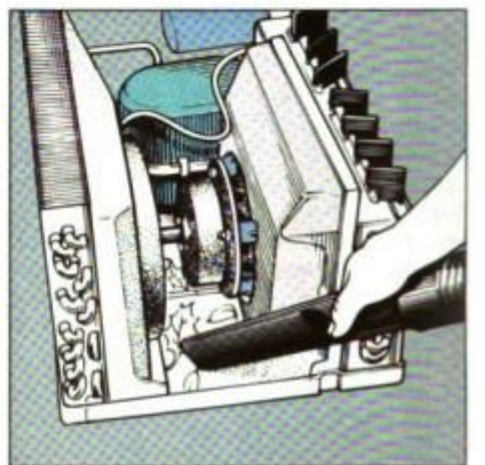
**1** The first two steps in air-conditioner maintenance are unplugging the appliance and then removing its front grille.



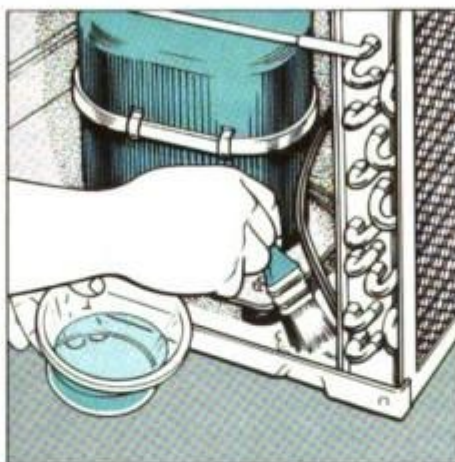
**2** Remove filter and wash it thoroughly. If filter particles come loose, or if the part is cracked or has many holes, replace it.



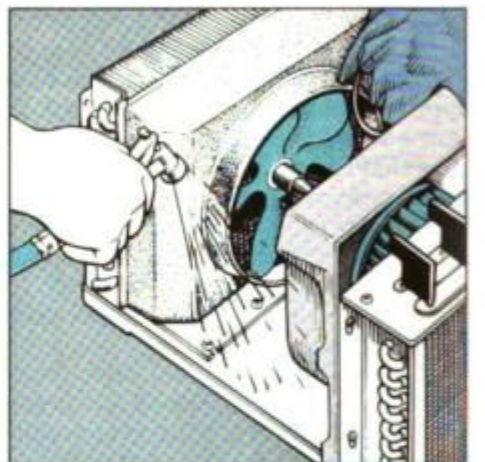
**3** Next, remove the side panels from the air-conditioning unit, then take out the screws that are holding the cabinet.



**4** Use a shop vacuum and crevice tool to clean any dust and debris that may have accumulated inside the air conditioner.



**5** Cover all electrical components with plastic bags. Then, clean the inside of the unit with soapy water and a paintbrush.



**6** Hose down the appliance and let it dry. Reassemble and reinstall it, but wait a day to make sure it's dry before turning it on.

And don't overlook ventilation. Attic, ridge and soffit vents should be cleared of bird and insect nests so that attic heat can escape.

Winterizing your air conditioner at the end of the season is simple. If you leave it in the window, wrap it with plastic sealed with duct tape, or buy an air-conditioner cover. With stay-

in-place machines, also remember to close the vents. If you take the appliance out of the window, be careful not to bend or damage the cooling fins on the back of it. And don't store an air conditioner on a garage floor, where it could come into contact with corrosive de-icing salts that can drip off of a car's tires.

PM



# Homeowners Clinic

BY NORMAN BECKER, P.E.  
Contributing Editor

## Solar Hot Water

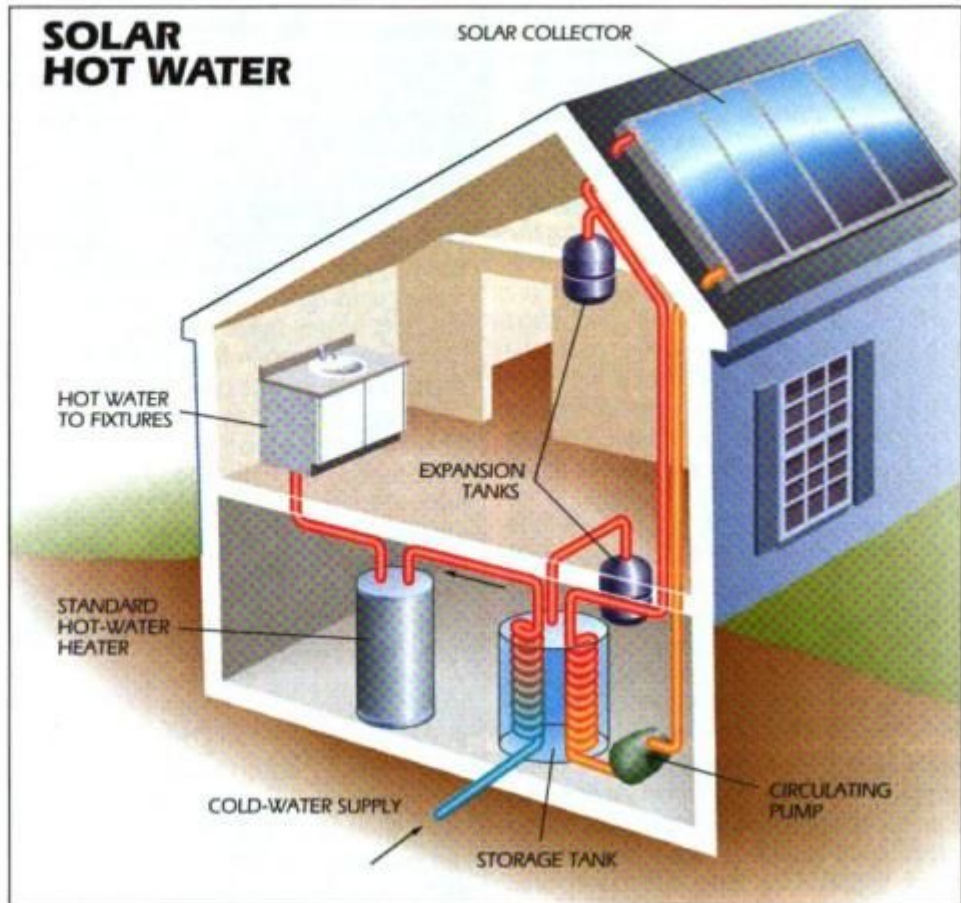
I live in a warm climate. The temperature never drops below 40° F. I'd like to install two hot-water-heating solar panels on my roof and connect them to my electric hot-water tank so that hot water from the roof enters the tank through the cold-water inlet. Could you please discuss this in your column?

RALPH R. CHUTE  
CAYUCOS, CA

Over the years, a number of designs have evolved for heating water with solar panels. A general diagram for locations that have below-freezing winter temperatures (most of the country) is shown at right. This system has an antifreeze solution circulating through the solar panel. Note that the storage tank is a heat exchanger—it transfers heat from the antifreeze solution to the domestic water. By using two sets of coils, the system prevents the potable water supply from being contaminated if antifreeze should leak out.

In areas where the temperature never drops below freezing, you can run potable water from the collector directly into the water heater. Also, some designs do away with a water heater. The collector's capacity is large enough so that it serves directly as the water heater.

Collectors are usually installed facing south and tilted at an angle.



A solar collector in a climate with subfreezing winter temperatures heats an antifreeze solution that warms domestic water. Expansion tanks cushion any thermal stresses.

Since the angle of the sun changes with the seasons, the collector's angle becomes a compromise. A rule of thumb is that the collector panels should have a tilt equal to latitude plus 5°, measured from horizontal.

If the collector panels are placed on the roof, make sure to mount them on brackets that will provide adequate strength. Solar panels are subjected to uplifting forces when wind strikes their undersides, and should be built so that they can

withstand gusts of up to 100 mph.

For more information, contact The Real Goods Trading Corp., 966 Mazzone St., Ukiah, CA 95482; (800) 762-7325. The company sells solar-heating products and provides design and installation information.

## Birds Versus Cherry Trees

I have two cherry trees in my front yard that I have to net each season so that the birds won't eat the fruit. Is

WHAT YOU NEED TO KNOW ABOUT AIR CONDITIONING

Consumer Guide to Efficient Central Climate Control Systems

ARI

## Air Conditioning Help

● If you've been sweating it out lately and think that it's time to go with a centralized air-conditioning system, your first step should be to read this free booklet. In 31 pages, it explains the basics of central air conditioners and heat pumps and also offers tips on improving the performance of these appliances if you already have them.

Furthermore, it provides a series of checklists should you decide to replace an existing central air-conditioning system or install a new one. To receive the booklet, send a self-addressed stamped envelope to the Air-Conditioning and Refrigeration Institute, 4301 N. Fairfax Dr., Suite 4254, Arlington, VA 22203.

—Roy Berendsohn

## Sheetmetal Duct Help

● Installing sheetmetal components for central air-conditioning and heating systems is a tough job for a homeowner. Here's a brochure that can make the job easier. It's from a company with a sheetmetal parts program for do-it-yourselfers who shop at home centers and hardware stores. The pamphlet isn't a guide on how to work with sheetmetal. It is, however, an aid to help you identify the sheetmetal parts you need and where these parts are placed—in the basement or attic. You can get the pamphlet at the store, or just send a self-addressed stamped envelope to Jackes-Evans, Dept. PM, 4427 Geraldine Ave., St. Louis, MO 63115.



there a way to protect the trees without nets, perhaps by using a high-tech device? I've wondered how big-time growers protect their trees.

GARY ALBRECHT  
SANTA ROSA, CA

*There's no high-tech solution to the problem. I spoke to the local horticultural agent for the Cooperative Extension Service, who said that many commercial growers pick the fruit before it's ripe. Birds don't find the unripe fruit very appealing, so they leave it alone. The cherries ripen either during shipment or at the stores themselves.*

*The best approach is to cover the trees with netting. This discourages birds—and it won't harm the tree or the fruit. Some people use plastic owls and sound devices to scare off birds. This isn't as effective as nets, however, and some communities have passed noise ordinances that prohibit such devices. We even checked with the National Arbor Day Foundation to see if any chemical repellents could be sprayed on the trees. The NADF says there are none.*

## Low Municipal Water Pressure

Our home is higher than the houses in the surrounding area. The municipal water system we're connected to doesn't seem to deliver adequate pressure to match our elevation. Is there a device that can boost our water pressure?

JOHN DUNCAN  
PITTSBURGH, PA

*You need three things: a booster pump, a pressure tank and a pressure switch. There are various-size pumps, but since water pressure for residences is usually between 30 and 50 psi, I recommend purchasing a pump that boosts the pressure 25 psi above street pressure.*

*The pump should be connected to*

## Vacuum Maintenance

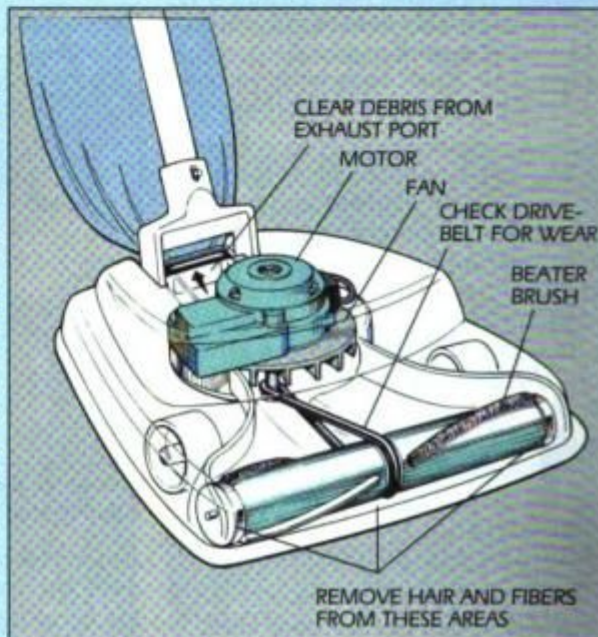
● If you want your upright vacuum cleaner to clean properly, you need to give it a little attention. And one of the most important things is to not overfill the bag. These machines move a surprising amount of air for a small appliance—at least 60 to 70 cu. ft. per minute. The bag filters out dirt from the airstream before the air reenters the room. A few words of caution: An overfilled bag greatly reduces cleaning efficiency and can cause dirt to be beaten into the carpet. And when you replace the bag, check that the exhaust port is clear. Also, don't pick up needles from the Christmas tree or other large debris with these machines—use a shop vac instead. Large debris can damage the fan and the bearings that the brush rides on.

It's important that you remember to change the drivebelt every four months. The belt stretches with use, and a stretched belt will slip on the brush, wasting energy and reducing its cleaning ability. Finally, the brush on these machines runs in the 5000-rpm range, so it won't take long for hair and fibers to work under the endcaps, straining the brush bearings and burning up the belt. After every use, turn the vacuum over and remove hair and fibers from the roller ends and where the belt meets the roller. As with any appliance, remember to unplug it before doing maintenance.

—Sterling Frey



## APPLIANCE CARE TIP



*the inlet water pipe and discharge into the pressure tank. The tank's outlet should be connected to the house-water distribution pipe. The pressure tank can be quite small and will function only to maintain the pressure. The pump is activated whenever water is drawn.*

*Depending on your requirements, you could get a larger tank with more storage capacity. The water is stored under pressure until it's needed. As water is drawn from the*

*system, the pressure in the tank decreases. Upon reaching a preset minimum pressure, the switch automatically activates the pump. Also, the pump itself should be mounted on brackets so it doesn't transmit vibrations to the house's plumbing.*

*ITT Bell & Gossett manufactures the type of centrifugal pump you need. Write the company at 8200 N. Austin Ave., Morton Grove, IL 60053, or call (800) 542-6655. Ask for a distributor in your area. They should be able to provide you with the name of a plumbing-supply house that can sell you the parts, or sell them to the plumber you contracted to do the job.*

*Keep in mind that you may need plumbing and electrical permits and inspections to do this job. Contact your local building department before beginning work.*

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

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

## BUZZWORD

### ● ● ● Beam Sensor

● A beam sensor is a device that discerns infrared light. It's a door-stopping safety feature that's employed on many garage door openers made since 1993. It works like this: There is an infrared beam that spans the door opening. Let's suppose that you use the remote control to close the door, and suddenly, a person, pet or object enters the path of the closing door, breaking

the beam. The sensor won't receive the signal, and the circuitry in the opener's powerhead stops and reverses the garage door, protecting people, pets and objects while the door is closing. In the case of a missing, broken or malfunctioning beam sensor, the door can still be operated by pressing and holding a wall button that's mounted within view of the door.

—R.B.

**WOODWORKING**

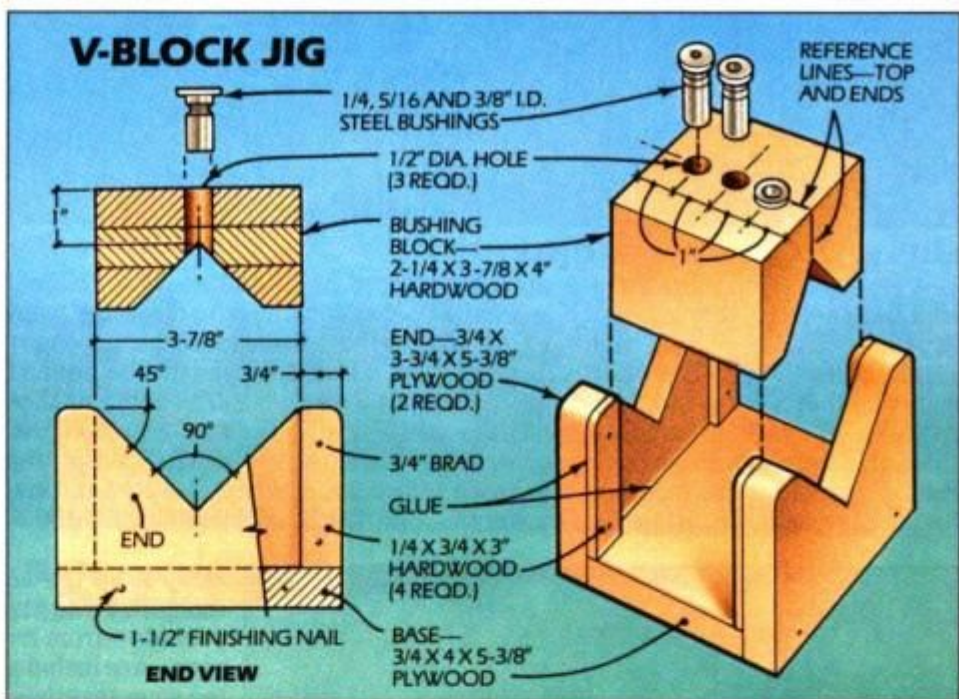
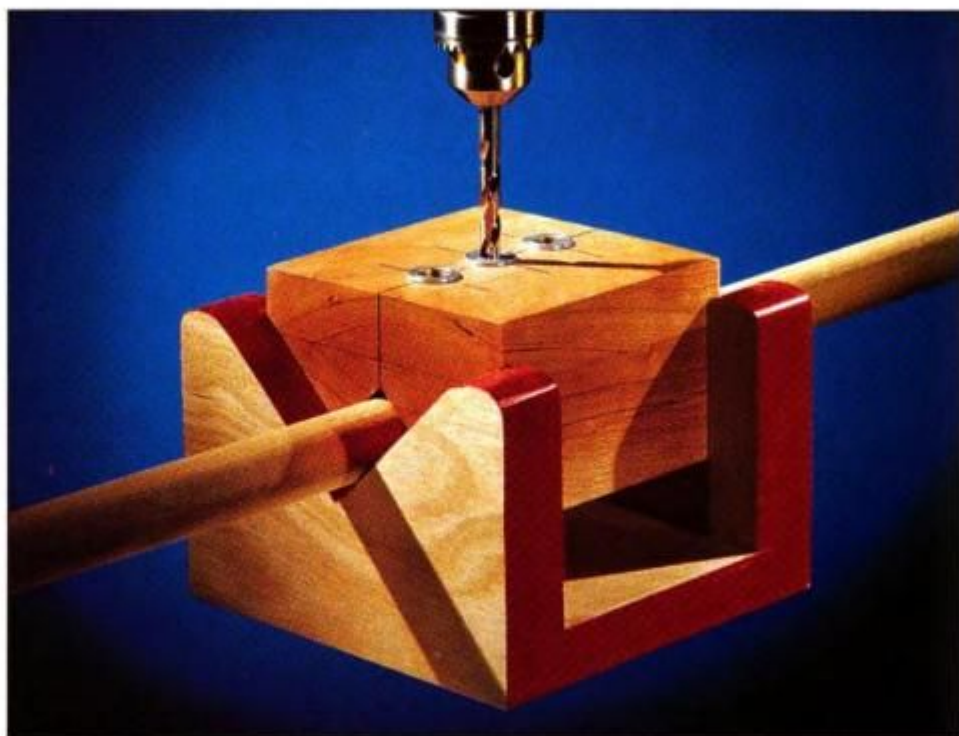
# V-Block Drill Jig

*Here's a better way to bore centered holes through round stock.*

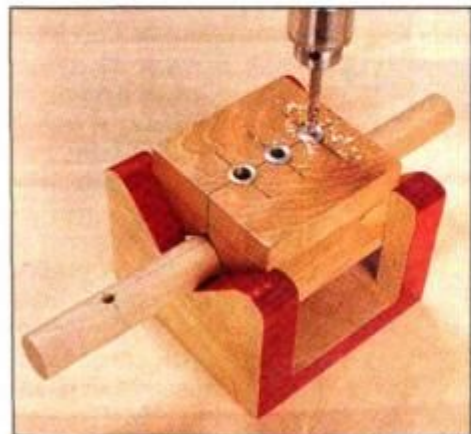
TEXT AND PHOTOS BY ROSARIO CAPOTOSTO, Contributing Editor

● With this handy jig, you can easily bore centered and perpendicular holes in round stock that ranges from  $\frac{3}{8}$  to 2 in. in diameter. The hardwood V-block holds three hardened-steel bushings that guide the drill bit for boring  $\frac{1}{4}$ -,  $\frac{5}{16}$ - or  $\frac{3}{8}$ -in.-dia. holes. The three bushings are available as a set (No. 626-062) from Woodworker's Supply Inc., 1108 North Glenn Rd., Casper, WY 82601. A plywood cradle holds and stabilizes the workpiece.

To construct the jig, first glue together three pieces of  $\frac{3}{4}$ -in. hardwood



1 Set table-saw blade at 45° and align fence and blade height to produce a centered V-notch. Use pushstick for safety.



2 Align the work with an offset mark that matches the distance from the bushing to the block end. Then, bore your hole.

to make up the  $\frac{2}{4}$ -in.-thick V-block. After cutting the block to exact size, lay out the centerlines for the holes so they're spaced 1 in. apart and 1 in. from each end. Use a drill press or drill guide to bore the three  $\frac{1}{2}$ -in.-dia. holes for the bushings. Mark the lines for the V cut, then tilt your table saw blade to 45° and make two passes to form the V in the block (Photo 1).

Lay out the V-shaped cutouts on the cradle endpieces, and cut exactly to the line with a sabre saw or band saw. It's easier and safer to make both cutouts on the ends of a long board first, then cut each piece to exact length. (You can also do the job on a table saw with the blade set at 45°

and the miter gauge set at 90°.) Nail the four  $\frac{1}{4}$ -in.-thick guide strips to the cradle pieces, as shown. Use finishing nails and glue to join the cradle ends to the base. Mark a vertical centerline on the ends of the V-block, then apply sanding sealer to all surfaces.

To straighten work in the jig, make an offset index mark on the work that corresponds to the distance from the desired bushing center to an end of the V-block. Then, align the centerline of the hole position on the workpiece with the centerline of the V-block, and align the offset index mark with the appropriate end of the V-block. Insert the bit in the bushing and bore the hole (Photo 2).

**FM**

**NEW PRODUCTS**

# The Better Home

*The latest building materials to expand and improve your home.*

BY ROY BERENDSOHN, Associate Home Improvement Editor



## Going To Great Lengths

Lee/Rowan's solution to the perennial problem of home storage is as follows: Buy this shelving, then just cut it and hang it. You don't have to design or paint it, or purchase specialized hardware. All you need is a hacksaw to cut the shelving, a screwdriver to drive in the fasteners and a level to check it. The product comes in four varieties: hook, hooks and shelf (shown), basket shelf and shoe rack—all of which are made of epoxy-coated steel wire. Called Great Lengths, the 4-ft. shelf shown here costs about \$20 at home centers. The clips that the shelf hangs from are included. For more information, write Lee/Rowan Customer Service, 900 S. Highway Dr., Fenton, MO 63026, or call (800) 325-6150.

## Leveraged Pry Out

Intruders are fond of using leverage to get through a door, so here's a little leverage of your own—a security bar made of aircraft-grade aluminum. Lengthen or shorten it by turning it—it's threaded. Put the bar in place and tighten it against the doorknob with just the flip of a lever. The device's manufacturer says its padded, rotating-ball foot grips the floor so firmly that the bar can resist 1000 pounds of force. It costs about \$40 at hardware stores and home centers. Write MasterLock Co., 2600 N. 32nd St., P.O. Box 10367, Milwaukee, WI 53210.



## Fold On The Dotted Line

The Rain Master folding vinyl gutter system is designed with homeowner installation in mind. To begin with, the gutter, drip edge and leaf screen are all one piece that folds flat. After laying out where it's supposed to be installed, simply slide the gutter out of its box, install the fasteners,

carry it up the ladder and attach it to the fascia. Fold up the gutter and snap the leaf screen in place. All other components—from mounting hardware to downspouts and corners—are included in the system. Individual lengths of gutter snap together with flexible-gasket fittings (a variety of other components are available in the system, such as end-caps, left and right bends and transition elbows). The Rain



Master is available in brown or white and costs about \$1.80 per linear foot, including downspouts. It's sold at hardware stores and home centers. Write Bemis Mfg. Co., Rain Master Division, 300 Mill St., Sheboygan Falls, WI 53085, or call (800) 558-7651.

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There are millions of TVs and VCRs currently in use in this country, and yet, according to recent government figures, fewer than 40,000 TV and VCR Repair Technicians in the U.S. That means there's a wealth of

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**Traffic Report**

Now you can stay out of traffic when you get the mail. The mail carrier opens it from the front, but you remove the mail through a back door. The box is molded out of polyethylene—with an ultraviolet inhibitor for colorfastness—and it resists cracking. To install, place it over a 4 x 4-ft. post (not included) that's set in the ground and mount it with lagscrews. Three models are available: no newspaper space below the box, a single space and a double space (\$45, \$50 and \$60). They're sold at hardware stores and home centers. Write Step 2 Corp., 10010 Aurora-Hudson Rd., P.O. Box 2412, Streetsboro, OH 44241.

**The Check, Please**

Concerned about lead in your water? The manufacturer of this device says it can detect lead in tap water at or above 15 parts per billion. A simplified version of the test: Draw water and inject the sample into a filter. Check the filter for lead with the materials provided. If it indicates lead, test it again. Each kit contains enough material for two tests. If you get a second positive reading, the company recommends you have the water tested by a laboratory. The kit costs \$20 to \$30 at drug stores and hardware stores. For more information, write Lead Check, P.O. Box 1210, Framingham, MA 01701, or call (800) 262-5323.



**Stay In Control**

Photo controllers screw into light sockets to provide low-cost security lighting. They activate the bulbs at dusk and shut them off at dawn. However, if you've used a standard incandescent photo control with a floodlamp, you may have noticed that when the bulb burns out, it takes the control with it. For about \$13, the Intermatic NE200C neatly solves the problem with a photo control that won't be damaged when the bulb fails. It can be used with just about any bulb—incandescent, halogen, flood and screw-in fluorescent. As a mark of its versatility, it can also be installed indoors or out. The device is sold at home centers and hardware stores. Write Intermatic, Intermatic Plaza, Spring Grove, IL 60081.



**Take It Away**

Here's a device that lets you take your recycling bin to the curb with a modicum of effort. Called the Binster Roller Cart, it is a galvanized-tube steel handle mounted on wheels with a pair of hooks welded to it. The hooks are positioned to grab the edge of a recycling bin. Tip the device forward so that the hooks make contact, then tip it back and wheel the bin away. We tried one and found that it works just fine. The Binster Roller Cart costs about \$20 plus shipping from National Roller Cart Co., 366 Brookview Dr., Rochester, NY 14617.



**Up And Away**

If you're interested in the ultimate suspended ceiling, these commercial-quality Cadre panels might be for you. They're expensive, however, costing from \$50 to \$60 for a 2 x 2-ft. panel. A domed panel twice that size costs about \$750. Installation costs are roughly \$500 for an 8 x 8-ft. ceiling. Here are some additional facts: These panels are made of fiberglass-reinforced plaster and come in a range of colors, with some available in a wood-grain finish such as oak, mahogany or walnut. You can also order them with a grid system in which the grid is covered. The panels are suspended from commercial-quality hardware and should not be hung from an ordinary residential grid. To find a distributor, USG suggests that you call (800) 950-3839, or write USG, P.O. Box 4470, Chicago, IL 60680.



### Pair Up

Now you can pair the look of tile roofing with the light weight of metal panels. Each of these steel structures is 3 ft. wide and is coated with a zinc/aluminum alloy. And they come in a variety of lengths, enabling them to span from the eave to the ridge without seams. The panels, which are available in a range of red, blue, green and gray colors, are installed with weather-gasket screws that are driven into the roof deck. The Tile Panel roofing system costs about \$150 to \$200 per square (100 sq. ft.), plus installation. For the name of a distributor, contact Met-Tile Inc., P.O. Box 4268, Ontario, CA 91761.

### Old Reliable

If your submersible sump pump rusts through or burns out, you may be left with a basement flooded with water. Pumps from Wayne, however, include features that should improve their durability. The top and base of the



pump's housing are made of plastic, and the housing and fasteners are stainless steel. To keep the high-torque motor cool under load, the housing is oil-filled. Further protection is afforded by the motor's overload cutoff switch. The pumps come in two sizes: 1/3 hp (about \$100) for standard applications and 1/2 hp (\$120) for more taxing work. These sump pumps are sold at home centers and hardware stores. For more information, write Wayne, The Campbell Group, 100 Production Dr., Harrison, OH 45030, or call (800) 237-0987.

# The Drill Bit Serious Do-It-Yourselfers Built Themselves.

The revolutionary JET POINT™ tip on our TURBOMAX® drill bit bears our trademark. But - we have to admit - it's based on someone else's ideas.

Yours.

Before we used advanced technology to create TURBOMAX® bits, we did some old-fashioned research. We talked to

contractors, mechanics, and do-it-yourselfers who know the difference a well-made bit can make.

We wanted to know what they like about the bits they've used. What they didn't like. What they wanted. And weren't getting.

What they wanted is what we've created. A drill bit that *stays sharp longer*. A bit that won't slip in the chuck. A bit that will make even the most challenging jobs go smoothly.

Independent tests have shown conclusively that TURBOMAX®

bits drill twice as many holes as the leading bit. *And drill faster*. Because only TURBOMAX® bits have the JET POINT™ tip - a computer-designed, radically superior tip ground with the superabrasive, CBN, for the sharpest cutting edge ever.

So use TURBOMAX® bits on your next project. Then you can truly claim you built it all yourself - down to the last bit.

**TURBOMAX**  
STAYS SHARP LONGER





### Think Again

Most of us don't think of fiberglass insulation as a sophisticated product, but it can be. ComfortTherm is enveloped in two kinds of polyethylene to reduce the irritating airborne fibers associated with installing insulation. It's also a vapor barrier. To reduce vapor transmission, the front poly is a rip-resistant high-density type and the back poly face has an ultrathin coating of aluminum. A bag of R-13 insulation costs about \$28 (a bag has 12 batts, each measuring 15 in. wide x 93 in. long) at building supply houses and lumberyards. Write Schuller International, ComfortTherm Product Information, P.O. Box 5108, Denver, CO 80218.

### Racing Around

External wiring is nothing new, but this product lets you hide power and data wiring in a single attractive raceway. Furthermore, it allows modifications later without the added expense of fishing wire through walls. Called Access 5000, it provides separated channels for 110-volt and low-voltage cables. Outlets and device brackets clip into it, and the face attaches to the back panel once the job is done. Ac-



cess 5000 is mitered or connected with fittings at the corners. Covered with cherry veneer, it costs about \$8 a linear foot. White vinyl is approximately \$4.50 for the same length. The device is sold at electrical supply houses. Contact Wiremold Co., P.O. Box 5000, Bristol, CT 06011; (800) 621-0049.

**MAINTAINING OUR NEW GARAGE DOOR OPENER IS  
SO EASY, YOU'LL QUICKLY GET THE HANG OF IT.**



### Introducing the Stanley Workhorse™ Screw Drive Garage Door Opener.

It requires no maintenance for a minimum of ten years.\* Yet it's so durable and dependable that you can count on it for smooth, quiet operation even in the toughest weather conditions. On top of that, the Workhorse has six built-in safety features for greater peace of mind. Quite a relaxing thought, isn't it?

For more information, call anytime. 1-800-Y-STANLEY

\*Additional lubrication may be required based on an average of 2.5 open and close cycles per day.



**STANLEY**  
helps you do things right.®



## The Right Tough

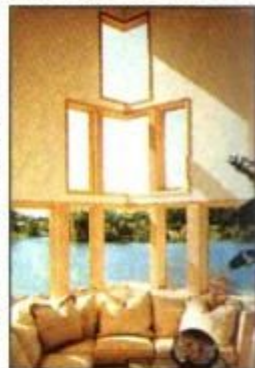
Weiser Lock takes advantage of aerospace technology to literally blast a coating onto its Brilliance door hardware. The company says this method yields a finish so tough that it's virtually weather- and corrosion-proof. The process is called low-temperature arc vapor deposition (similar techniques put tough metallic coatings on spacecraft and industrial-grade drill bits). Once the procedure is completed, the metal is left with a dense and inseparable film. What does this cost? About \$45 for a keyed lever; keyed knobs, \$20; deadbolts, about \$25; and handle sets, from \$80 to \$110. All are sold at hardware stores, home centers and locksmiths. Contact Weiser Lock, 6700 Weiser Lock Dr., Tucson, AZ 85746; (800) 677-5625.

## Corner Office

Pella's CornerView window does the seemingly impossible—it joins two insulated glass panes at a sealed miter joint. The manufacturer says the view through the window is free of distortion.



The  $\frac{5}{8}$ -in.-thick insulated window has wood sash corners connected with mortise-and-tenon joints, glue and metal fasteners. The windows come in three sizes, and all are made of either aluminum-clad or primed wood. An aluminum-clad window in which each of the panes is approximately 36 x 36 in. costs about \$2300 at Pella dealers. For more information, write Pella Corp., Pella, IA 50219, or call (800) 847-3552.



## Dial Your Way In

Wouldn't it be nice if you could just dial a combination to let yourself into your house the next time you're locked out? Well, that's the idea behind this electronic lock and deadbolt set. It works with a combination that reads out digitally, but you can also open it with a key. The device is powered by a 3-year lithium battery and uses a Motorola microcomputer. When you leave the house, simply press its exit button and it'll lock when you close the door. The InnerKey Digital Deadbolt will run you about

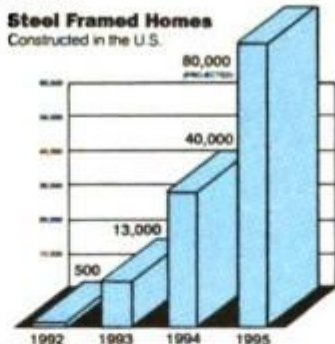


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\$100 at home centers. For more information, write Intellock Technologies, 5627 Gibraltar Dr., P.O. Box 9018, Pleasanton, CA 94566, or call (800) 562-5875.



### Slowed To A Trickle

How can you guard against a sudden rush of scalding water in a shower or bath? With these devices from Memry Corp., which are installed by threading them in place. There are three versions: a shower head, a tub spout and a fitting that threads on sink faucets like an aerator (not shown). They slow hot water to a trickle by incorporating metal alloys and other materials that



react to water at 120° F. They're designed to reset automatically and resume normal waterflow once the water has cooled. The shower head costs approximately \$14, while the tub spout comes with or without a diverter and runs about \$25 to \$30. They're all sold through hardware stores, home centers and plumbing suppliers. Contact Memry Corp., 57 Commerce Dr., Brookfield, CT 06804; (800) 582-5454.

### Drop In Anytime

At last—here's an attic fan a homeowner can install without cutting ceiling joists. When joists are 16 in. on center, just drop it between them. For 24-in. on-center framing, turn the fan 90° to the joists—and then drop it in. In both cases, the only framing to install is blocking at the ends of the fan. The device, called the HV1000, is covered by two insulated lids that raise

and lower automatically when the fan turns on and off. The lids are lifted with a 6-watt motor. Each fan has a separate 36-w motor, yet its manufacturer claims that the device is only slightly louder than a running refrigerator. The HV1000, which comes with a grille plus an ON/OFF switch, costs about \$375 (shipping is extra). For more information, contact Tamarack Technologies Inc., P.O. Box 490, West Wareham, MA 02576. **FM**



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## Fight plaque and gum disease with the world's only ULTRASONIC toothbrush!

UltraSonex® is the world's only ultrasonic toothbrush. Accepted by the American Dental Association as an effective cleansing device, the UltraSonex removes plaque, fights gum disease and is recommended by dentists. *UltraSonex is not an electric toothbrush. It has no moving parts, does not vibrate and is absolutely silent.* It works by



Results of a 30 day clinical trial.



Clinical testing proves that using UltraSonex can reduce bacterial plaque by 97% daily and bleeding gums by 60% and gingivitis by 28% - in just 4 weeks - and UltraSonex can reverse the progression of gingivitis, which can lead to periodontal disease.

Results of a 30 day clinical trial conducted at a leading university teaching hospital. Subjects were instructed to brush twice daily for 2 minutes.

transmitting 1.6 million cycles per second of ultrasonic waves directly to the teeth and gums. No other product approved for home use offers ultrasound technology. And clinical testing proves that using UltraSonex can also reverse the progression of gingivitis and gum disease. It is extremely gentle, yet you'll quickly notice dramatic results. Just brush normally using your favorite toothpaste. Shuts off automatically and recharges in its own base. Try UltraSonex. You and your dentist will both be amazed at the results. **\$99.95** (\$10.95) #3100. UltraSonex and 6 Replacement Heads (Yr.'s Supply) **\$129.95** (\$12.95) #3325. Now available, the Twin UltraSonex - two UltraSonex toothbrushes that recharge in one space saving base. **\$169.95** (\$13.95) #3400. Twin UltraSonex and 6 Replacement heads (6 Month Supply) **\$189.95** (\$14.95) #3425.



## Breathe air that's 99.97% pure!



The HEPA-CLEAR™ Air Purifier with Ionizer from Slant/Fin® is a true HEPA (High Efficiency Particulate Air) filtration system. *It operates at an astonishing 99.97% efficiency.* Literally scrubbing the air clean in a 10'x14' room of billions of pollutants and allergens every 15 minutes - pollen, dust, dangerous bacteria, mold spores, animal dander, even tobacco smoke. *And the HEPA-CLEAR is 166 times more effective than purifiers that operate at 95% efficiency.* Other filter systems blow purified air out of the bottom or sides of the machine,

re-contaminating it with dirt and dust from rugs and floors. Slant/Fin's patented air passageway design discharges only pure, clean, filtered air from the top of the unit back into the room. The HEPA-CLEAR can help relieve respiratory ailments and it's the only true HEPA system that is compact (12" diameter x 14" high) and lightweight enough to be placed virtually anywhere - on the floor, a table, even a file cabinet. The Filter Replacement Indicator System lets you know when it's time to service the filter. Healthful negative ions enrich the air, making it fresh, invigorating and odor-free. The HEPA-CLEAR is less than half the price of larger, more cumbersome models. *In fact, in its price range, this is the only complete HEPA filtration system.* We're so sure you'll be completely satisfied with the HEPA-CLEAR, we offer a 100% money-back guarantee. Mfr.'s 2-year limited warranty. **\$129.95** (\$12.95) #4280. Replacement Hepa Filter **\$49.95** (\$5.95) #4290.

Air drawn into the back of the unit is purified as it passes through the pre-filter and then the HEPA filter. Clean air enriched with negative ions is pushed up and away from the front of the unit.



## To the thief, this is rather alarming!



The parking lot is dark. You can't find the car. You're all alone - with the baby. But in an instant, you're able to light up the inside of your car and safely find your way with the help of the *Safe Entry Alarm System*. Not only does it provide excellent personal and property protection, but complete peace of mind, as well. Mounted prominently on the dash board, it has a flashing LED that alerts criminals to the fact that your auto is alarmed. If challenged

by motion or vibration, it emits a deafening 110dB. alarm. You can even arm and disarm via remote control from up to 25 yards away. It's completely portable and can be used in any car by simply plugging it into the cigarette lighter. A 9-volt battery back-up with low-power indicator ensures it will work even if unplugged. What's more, Safe Entry Alarm System is manufactured by the makers of *The Club*, so you know it's a high quality and dependable piece of security equipment. It's your family's best defense against car thieves and muggers. FCC approved. **\$69.95** (\$8.95) #4025.

## This is one powerful vacuum!



You'll be amazed with the performance of the *Oreck Power Broom*. It picks up anything and everything in its path. Dust, crumbs, broken glass, - you name it. *In fact, it's got more power than any other electric broom you can buy.* The Power Broom features a two-speed motor for customized cleaning control, a large capacity dust cup with a washable, re-usable filter and an extra-long 25-foot cord. With a self-adjusting floor tool that quickly and easily glides from floors to carpets, it goes places most regular vacuums can't, like under beds, up and down stairs and up against walls. It makes quick pick-ups a breeze. Hangs flat and out-of-the-way in a minimal amount of space. The Power Broom is so well built, it's backed by a Mfr.'s 2-yr. ltd warranty. **\$69.95** (\$9.95) #3900.



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# CAR CARE

## CAR CLINIC

BY MIKE ALLEN,  
Associate Automotive Editor

### You Can Hear A Pin Drop

How in the H-E-double-hockey-sticks do you replace the brushes on these newfangled alternators that have the regulator buried inside? I took mine apart to put in new brushes and found that I had to replace the regulator, too, because the brushes come along with it. So I filed down some brushes I had left over from my tractor and soldered 'em right on. But I can't figure out how to get the darn thing put back together because I can't get any tool inside to hold the brushes back while I reassemble the case.

FRED HOWLAND  
DES PLAINES, IL

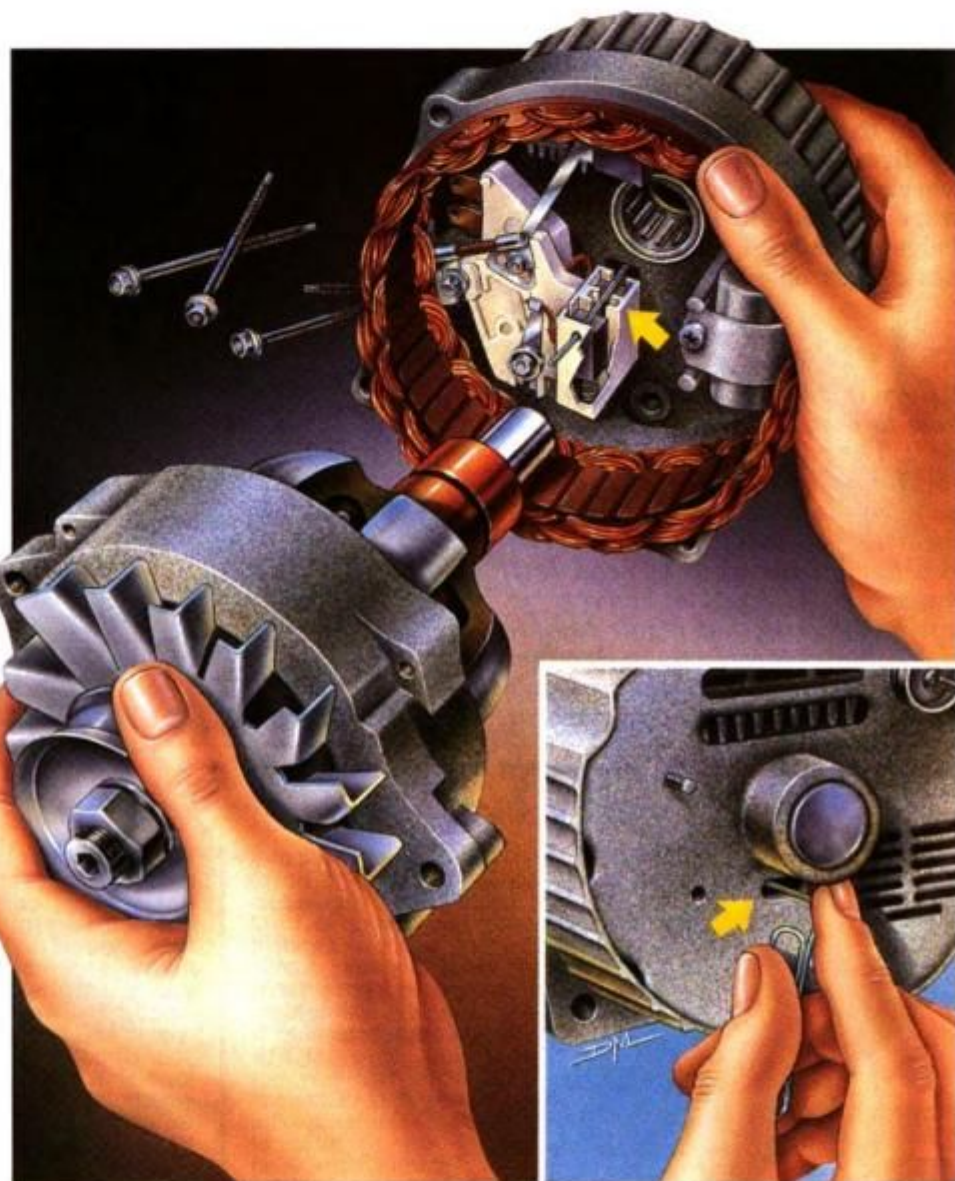
First of all, I don't have much confidence that your filed-down brushes will work. Even though the graphite they're made of is soft and slippery, they have to fit the brush holders properly in order to maintain their tension against the copper slip rings. Second, you really shouldn't solder those connections. Periods of very high load will soften and eventually melt the solder. These connections need to be spot-welded, just like they are at the factory.

When you buy a new regulator—live a little, they're only about 20 bucks—you get brand-new brushes. And you get a little piece of wire that slips into a hole in the back of the alternator and through the brush holder to keep them retracted. After the case halves are put back together, just pull the wire out.

By the way: You did mark the two halves so that they go back together the same way they came apart, right? There are four bolts holding the two halves together—and three ways to reassemble the halves out of index.

### Filtered Or Regular?

Some carmakers claim to manufacture a superior oil filter with an anti-drainback valve. How can a regular



do-it-yourselfer like me know which aftermarket filters have one? None of the brands I regularly use mentions such a valve.

FRANK WOO  
EL PASO, TX

Look for the rubber antidrainback valve inside the baseplate surrounding the filter's threads. Some vehicles require a valve-type filter because the filter is mounted so that the oil will drain back into the crankcase after the engine is shut off. The valve keeps the filter filled with oil, reducing the length of time—after the engine starts—that the bearings go without lubrication.

Other vehicles don't have this requirement because the filter is mounted either close enough to the

oil pump or in such an attitude as to provide an instant supply of oil to the engine.

You'll see that virtually all filter manufacturers make filters with and without valves—depending on which vehicle they're trying to fit.

### Packed House

I have a 1986 Buick Century. I decided it was time to repack the front-wheel bearings, but I find that they're sealed for life. How long can I expect them to last?

WILSON PAEZ  
SOUTH HACKENSACK, NJ

Sealed bearings on fwd cars are not repackable. They are, indeed, sealed at the factory. Expect them to last as long as any other part of the car—

200,000 miles or longer. Unless, of course, you run over a big pothole or smack a curb hard enough to bend a rim, in which case the life of the bearing is measured in hundreds, not thousands, of miles.

## Running Backward

In the past, one of the hidden dangers of buying a used car was the likelihood that the odometer had been rolled back. I suspect this was done by directly manipulating the little wheels in the odo that the numbers were printed on. Is it possible to fudge the mileage on a new car that has an electronic odometer?

D.L. CENTER  
BOWIE, MD

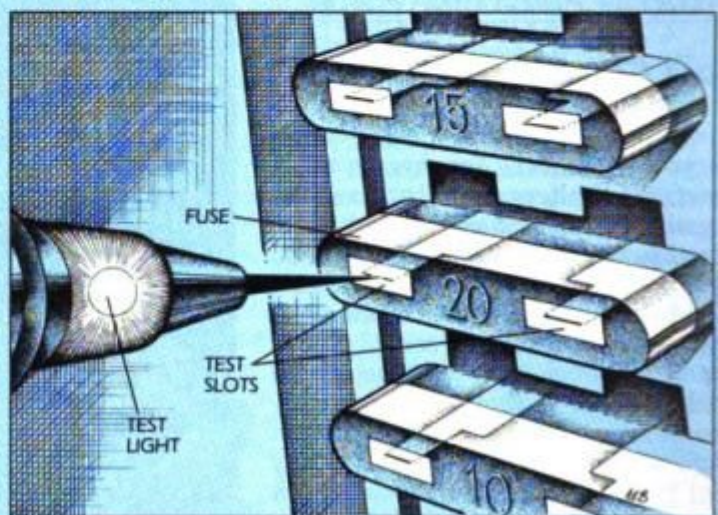
It sure is, and anybody who knows how to read a service manual can do it. The mileage on electronic odos is kept on an electronic chip. Depending on the manufacturer, it's difficult—or totally impossible—to reprogram the chip to read less mileage. It is possible, however, to add mileage so that repair technicians can set it correctly in case of a failure. Most car dealerships won't sell you a zero-mileage replacement

## Probing Question

● I was troubleshooting a weird electrical problem on a friend's car last weekend. (In case you haven't figured it out by now, lately, I seem to spend more time working on other people's cars than my own. Hey, I'm easy.)

He was blowing fuses at random, obviously as the result of a short. He'd been pulling out fuses and holding them up to the light to visually check them. The fuse box was buried in a bad place, so access to the fuses practically required a headstand in the driver's footwell.

Being smarter and lazier, I got out my trusty light and tested the fuses in place. There are two places on the fuse's body where a probe can contact the metal. Touching the fuse in one of these places sets off the light. If the circuit is hot and the fuse is good, both sides of the fuse will set off the light. Blown fuses will have one dead side and one good side.



## FROM FRONT...



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MAT SHOWN

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**PRICED TO BE THE WORLD'S BEST MAT VALUE:** Typical car mats can cost a small fortune at a car dealer, but **WeatherTech** mats are anything but typical!

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### WE GUARANTEE YOUR SATISFACTION.

If you are not happy with your order, return your unused mats or cargo liner within 30 days for a complete refund, less shipping.

\*We pay shipping within the 48 contiguous states on orders of a front & back set, two or more sets, or a combination of mats and cargo liner. Extra shipping charge may apply outside the 48 states. If paying by check send checks payable to MacNeil Automotive Products Ltd. IL residents add 6 3/4% sales tax.

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# CAR CARE

chip. Unscrupulous people will locate them, or scour the junkyards to find a low-mileage wreck to pilfer. Regardless of how it's done, misrepresenting mileage is illegal. In many states it's a felony.

## Real Cool

A friend of mine took his car in for maintenance and asked the shop owner to flush and refill his cooling system. At first he was upset when they didn't do so—until they explained that they'd tested his coolant and found that no change was necessary. Is it possible to do this, and is it a good idea?

GREG MAY  
STRONGSVILLE, OH

What they probably performed wasn't the kind of antifreeze test we normally think of—a simple hydrometer test to determine the relative concentration of glycol and water in the antifreeze system (although it's still necessary to do this test). What they tested was pH—the acid-base balance—as well as the ability of the additives to continue to prevent the coolant from becoming acidic. If the coolant's anticorrosion package still has sufficient buffering, it isn't necessary to change the coolant.

There are several caveats here. Even if it's good today, the coolant may not be good tomorrow. After the

first two years, check it several times annually. And don't forget to give the system a good going-over for rotten hoses or leaks. Also, visually inspect the coolant for color and little chunks of stuff that aren't supposed to be in there.

Aside from trying to save the customer money whenever possible (a good business practice, in general), the shop owner may have an ulterior motive—namely, he has to pay for used coolant to be hauled away, or buy expensive equipment to recycle

it on-site. Backyard mechanics have no legal responsibility—yet.

At least one major car manufacturer recommends 4-year change intervals. For those vehicles—the ones the manufacturer has tested for extended coolant-drain intervals—I'll grudgingly concur. But be careful. **PM**

## DO YOU HAVE A CAR PROBLEM?

Just ask Mike about it. Mail your question to Car Clinic, Popular Mechanics, 224 W. 57th St., New York, NY 10019. While letters, faxes or phone calls cannot be answered individually, problems of general interest will be discussed in the column.

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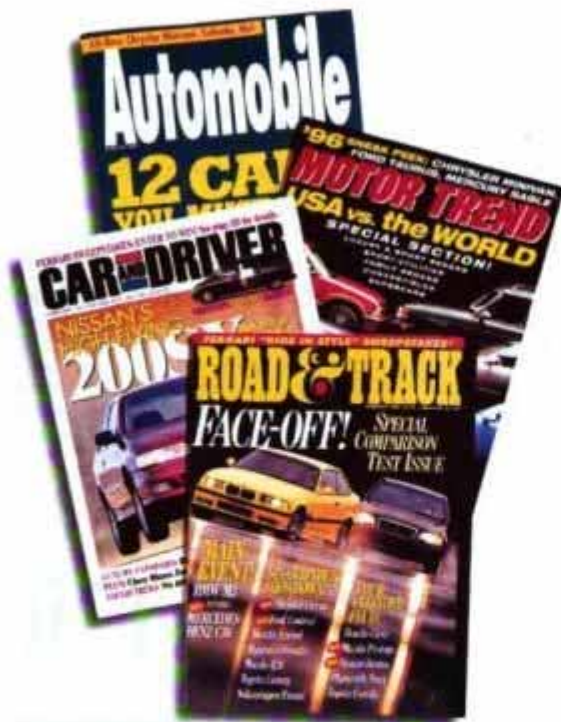
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## SERVICE TIPS

- Excessive brake-pedal travel or fade on 1989-91 Ford 3/4- and 1-ton E- and F-trucks built before May 1, 1991, can be reduced by installing phenolic (plastic) pistons that have new seals and dust boots in the calipers. The part numbers are FOTZ-2194-A (piston) and EOTZ-2120-A (brake seal kit).
- Tired of listening to your 1989-90 Cadillac Fleetwood's headrests rattle your brain? After opening up the seatback to get to the headrest mechanism, glue two pieces of Velcro material (pile side only) inside the shaft-retainer slide area to take up the slack and eliminate the rattle.
- Off-road dust is a common cause of power loss on 1992-93 Chevy C/K trucks with the 6.5-liter diesel. As a result, Chevy came up with an air filter featuring a washable poly-wrap outer foam (PN 25099849) that can help. In addition, use silicone caulking to seal the hole formed by the right-side inner and outer fenders next to the soft bumper filler panel.



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## SATURDAY MECHANIC

# SERVICING DRUM BRAKES

BY PAUL WEISSLER

● You're halfway down the hill when you realize how much speed you've picked up. So you hit the brakes. Hard. Too hard, apparently, because the front tires repeatedly lock and aren't able to kill off much velocity. At the first turnoff, you check your front brakes—hot as a cup of McDonald's coffee. But your rear brakes are cool. Obviously, the front disc-brake job you had done over the weekend wasn't enough. It's time to look at those rear drum brakes.

### Diagnosis

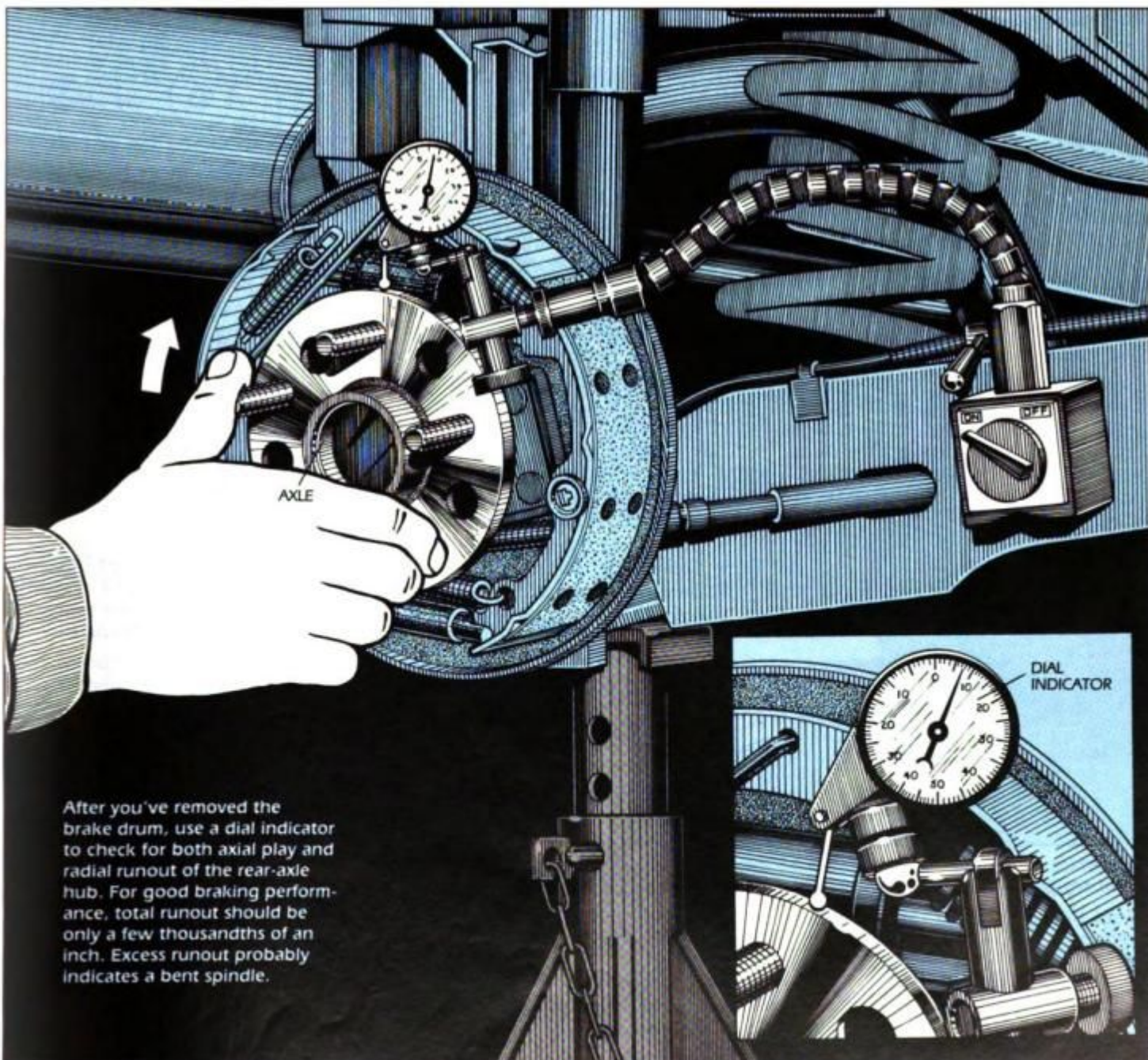
Block the front wheels. With the vehicle's rear off the ground and on safety stands—and with the parking brake off—turn each wheel. If you hear a uniform light scraping noise, that's okay. Otherwise:

● If the wheel is binding all the way around the rotation, the brakes aren't releasing properly. If that's the case, remove the drum and check for either one of two possibilities: 1. The brake shoes are not retracting fully because

the return springs are weak, perhaps combined with the shoes hanging up on the backing plate; or 2. The automatic adjuster for the shoes is overdoing it.

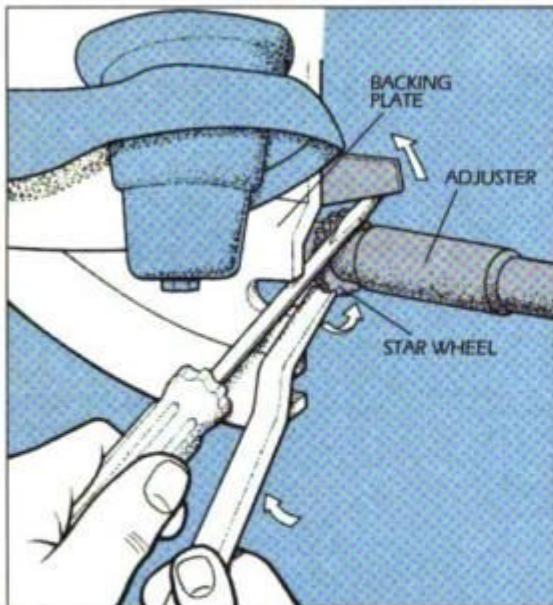
● If you get an intermittent scraping or binding, maybe the drums are out-of-round, the shoes aren't retracting properly, a backing plate is warped or an axle problem exists.

● If there's no hint of a scrape—despite the fact that your rear brakes have been noisy or haven't been con-



After you've removed the brake drum, use a dial indicator to check for both axial play and radial runout of the rear-axle hub. For good braking performance, total runout should be only a few thousandths of an inch. Excess runout probably indicates a bent spindle.

PH ILLUSTRATION BY RUSSELL J. VON SAUER

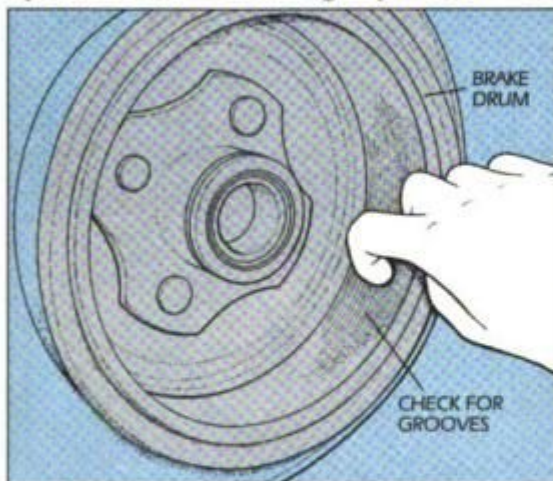


Adjusters need to be free-moving. Check this while lifting the adjuster arm with a screwdriver.

tributing to the car's braking—they may need to be adjusted. If there's an access opening in the backing plate or drum, turn the adjuster until the shoes make light contact with the drum. Then rotate the wheel to see if the lining drag is relatively even all around. If you can't turn the adjuster, take off the drum to free it.

## Look as you listen

To gain a better look at the brake drum, remove the tires and wheels. Now, as you turn the brake drum, eyeball its relationship to the backing plate at various points. If the drum seems to move in and out or rock up and down—even slightly—the



The surface of the brake drum should be totally free of any grooves, cracks and shiny spots.

wheel bearing is bad, or the wheel spindle or axle shaft is bent. If the drum appears to turn evenly but its relationship with the backing plate is uneven, perhaps the plate is bent—also not an unusual problem. (If you're not sure, compare one rear

drum brake with the other to see if the appearance is different while turning it.) Either way, you'll have to pull the drums to confirm the cause.

Inspect the drum where the wheel mounts against it. If a wheel is deformed, the drum may be deformed as well. Also, compare the tire sizes side to side and front to rear. Odd-size tires can trigger a vehicle's antilock brakes at the wrong time, affecting the rear-braking performance and, in some systems, setting off an ABS trouble code.

## Drums off

Pulling off stuck brake drums may require a penetrating solvent. You might even have to apply—gently—heat from a propane torch to the stud holes and the drum/hub joint. If a drum is still stuck, you may need to use a screw-type drum puller.

Once the drum is off, check its shoe-contact surface for any grooves in which you can catch a fingernail. Discs work well enough with deep scores (although they may get noisy), but drums don't. And even if a drum is super-smooth, get it measured at a machine shop to see if it's out-of-round, worn past specs or misshapen in some way. Normally (but not always), a faulty drum will create an uneven lining wear pattern or cause short lining life.

Find a drum that needs cutting?

Take *both* drums to the machine shop, and have an equal amount removed from each. There may not be enough metal remaining, which means new drums. After a drum is machined, clean it out with a detergent and water solution, then wipe it with a lintfree rag and a brake solvent. Wipe until the rag comes clean, and let the drum dry.

Next, inspect the linings. Even if they're thick enough to be left in ( $\frac{1}{8}$  in. or more), they may have a glazed surface and need replacing. Don't try to sand off the glaze. The linings have undergone a chemical change from overheating, possibly combined with the effects of aging as well as climate.

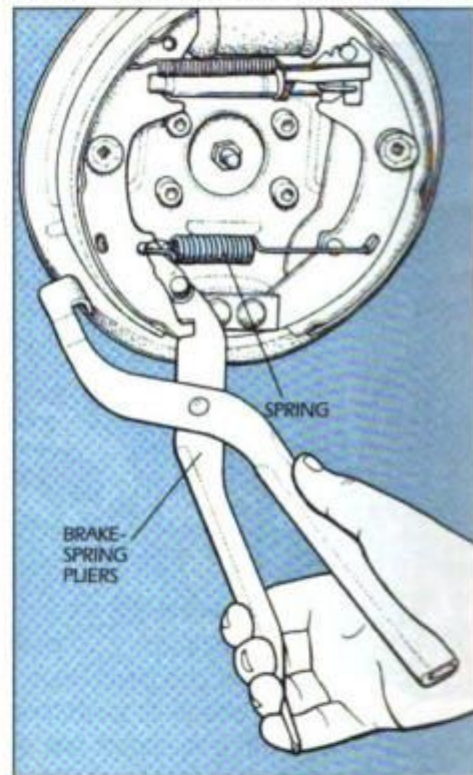
The linings may also be glazed because the brake shoes were dragging. Perhaps the automatic adjustment mechanism is bad—or someone

keeps forgetting to release the parking brake before starting to drive.

## Running out—literally

Did you encounter that intermittent scrape when you turned the drum in a pre-disassembly check? But despite the noise, did the drum and shoe hardware seem to be good? This is the time to check for a bent spindle or axle shaft, and/or a bad bearing. Use a dial indicator. (If you don't own an indicator, you can rent one from an auto parts store or rental center.)

To check the radial runout, mount the dial indicator on the suspension, body or chassis so that the plunger is against the edge of the spindle or shaft hub. Then turn the axle shaft or spindle. Caution: Turn the axle

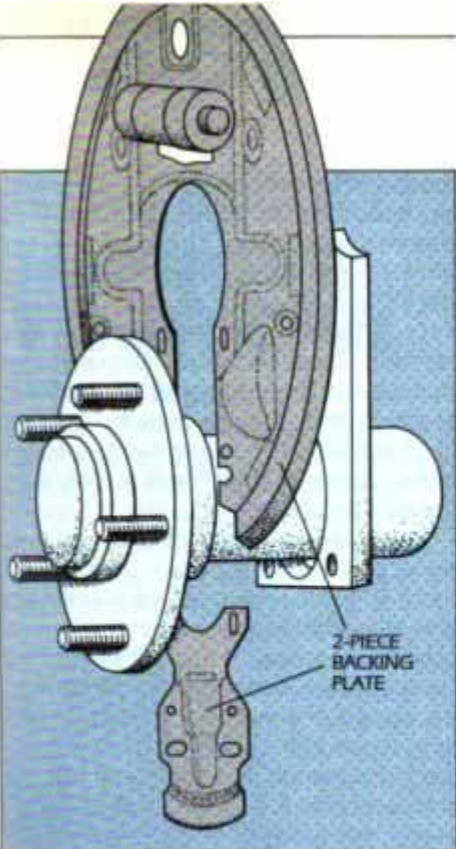


Brake-spring pliers make the process of reinstalling springs both safe and easy.

slowly, so you won't be fooled by a burr or nick on the hub—particularly one on the edge—as you're checking radial runout. To get an accurate reading, you may need to clean up some corrosion on the hub with sandpaper or a wire brush.

To check for lateral runout on axle shafts with a hub, relocate the dial indicator so the plunger is touching the outer face of a hub. Then turn the shaft again.

Runout, in any case, should be within manufacturer's specs—typically just a few thousandths of an inch. If your brakes have objectionable shudder, you'll probably find that the runout is .010 in. or greater.

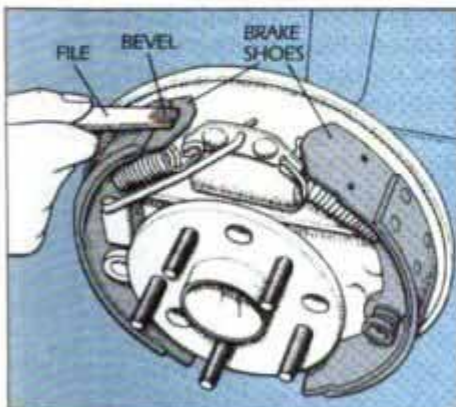


Aftermarket 2-piece backing plates can help you avoid the very difficult job of removing the axle.

### Putting it all together

Ready to install new shoes, springs and other hardware that come in the typical drum-brake repair kit? Don't use a screwdriver or your neighbor's 15-year-old set of brake-spring pliers—a spring could fly off and smack you right in the mouth. Instead, get a pair of spring pliers designed for late-model cars—it has jaws that engage the spring hooks and the shape to actually expand the spring enough to remove it. Ditto for late-model brake hold-downs, which come in more than one size and call for a new tool with the two popular-size tips. Clean off the shoe side of the backing plate and make sure that the wheel cylinder isn't leaking.

How should you install semimetallic shoes if you live in an area with cold, wet winters? If they freeze to the



Chamfering the leading edges of the lining material can improve your car's braking performance in certain weather conditions.

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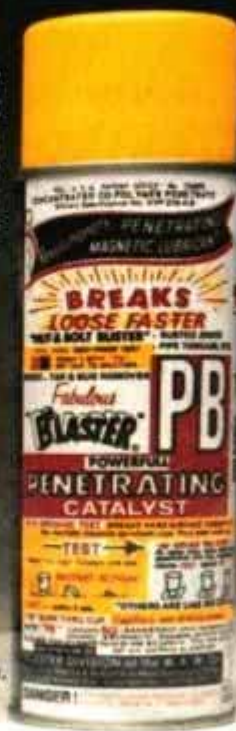
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## CAR CARE

drums after an overnight cold snap, the first brake application may be uneven. Chamfer the ends of the shoes (up to the first rivets) and they'll break loose more easily and retract when you take off. If the problem occurs even at temperatures just above freezing, you might want to check with the car dealer—he may have a substitute lining (with a lower metal content) that's less affected by the cold weather.

If pre-disassembly checks indicate a warped backing plate, don't try to bend it back into position—install a new one. On many rear-drive General Motors cars built from the late 1970s through the early 1990s, there may be another problem: wear in the cutout for the clip-held wheel cylinder. The result is a loose cylinder. If you can force it to rotate even slightly—say, by moderate prying on each end of the cylinder with a large screwdriver—that's reason enough to install a new backing plate.

The "by-the-book" method of replacing a brake backing plate on a rear-drive car is to remove the axle shaft. This is a tough job, so if you need a new plate, it's a lot easier to install an aftermarket 2-piece plate (available for many GM cars). Just loosen and cut the old one with a hacksaw and you can bolt on the new one without breaking a sweat.

If the platforms on which the shoes slide are burred or rusty, they're probably a contributor (along with weak springs) to the shoes failing to retract quickly—not to mention overheating or premature wear. Smooth off the platforms using fine sandpaper, wipe clean and apply a coat of silicone dielectric grease. Also, you should sand smooth the edges of the new brake shoes where they ride on the platforms.

If you saw a lot of road film on the inside of the backing plate, or evidence of water/snow entry in winter, seal up the back of the plate. If any inspection/adjustment covers are missing, buy and install replacements. And if you can see any light coming through the wheel cylinder cutout in the backing plate, seal it.

Finally, bolt on the wheels and tighten them to specification with a torque wrench, using a crisscross pattern. This is not only important for front-disc rotors, but it will also keep rear drums from warping.

The bottom line? If you touch all the bases this time around, you'll get 100% braking action the next time you hit that pedal.

PM

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#### Wire Wheel

Custom wire wheels are real eye-catchers, giving your car a bold, distinctive look. The ZZ-30 steel wheel from ZZ Wheelz adds a new twist by offering interchangeable spinners. Both items come in chrome or 24-karat gold plate, so you can mix and match them depending on your mood.

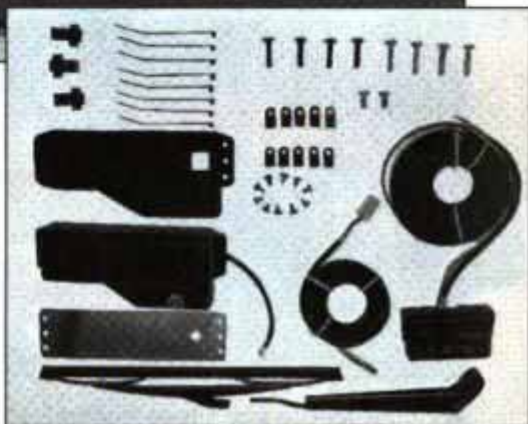
Available in 14- and 15-in. sizes for all rear-wheel-drive passenger cars, they're sold at some of the large chains and also at tire-and-wheel dealers. While the price varies according

to size, the cost of a 15 x 8-in. wheel is \$99.95 for chrome and \$114.95 for gold plate. Contact ZZ Wheelz, 1215 Commerce Dr., Richardson, TX 75081; (800) 673-3633.



#### Rear Wiper

Station wagons, sport/utilities and minivans can usually be ordered from the factory with a rear-window wiper. But if you have one of these vehicles that didn't come so equipped, or own a pickup truck with a cap camper, you can retrofit this self-contained Power Wiper in about an hour. The kit includes a motor, a gasket for waterproofing, an adjustable-length wiper arm and blade, switches, wiring, mounting hardware and instructions. An intermittent wiper function is optional, and the unit is covered by a 1-year warranty. The Power Wiper costs \$149 from Conceptual Engineering, 302 Cooper Ln., Hamilton, MT 59840; (406) 363-3377.



#### Speedy Shine

If you like driving a car with a gleaming finish, but don't like the elbow grease needed to get it looking that way, here's a simple but clever polish/wax applicator that cuts waxing time in half. Consisting of a joystick handle and a 12-sq.-in. press-on foam pad, the Speed Waxer covers six times the area of a conventional cloth or sponge, in which just your fingertips apply pressure to the car's surface. Holding the handle in a vertical position also reduces the fatigue and muscle ache so prevalent with horizontal waxing. The Speed Waxer costs \$6.95, plus \$2.95 shipping, from Malm Chem. Corp., P.O. Box 300, Dept. PM, Pound Ridge, NY 10576; (914) 764-5775.



#### Brake Fluid Tester

Brake fluid may be the most neglected—yet most critical—of all vehicle fluids. Over time, brake fluid absorbs water from the air, which lowers its boiling point and corrodes ABS components. Hard braking can generate enough heat to boil the fluid. The result: anything from a spongy pedal to a complete loss of brakes. To help you monitor fluid condition, here's a brake-fluid tester from Tech Plus. This device checks your fluid's boiling point and tells you if it needs to be replaced. The company will also test your fluid free of charge. The unit costs \$399 from Tech Plus Products Inc., 240 Portage Rd., P.O. Box 670, Lewiston, NY 14092; (905) 822-3330.

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Until now, portable generators have been either heavy and powerful or small and weak. The Lightning Emergency Power Unit changes all that. Weighing just 16 pounds in a package that measures less than 1 cu. ft., the unit provides 800 watts at 115 volts AC and 80 amps at 12 volts DC. The generator is powered by a 2-hp 2-cycle engine, and comes with removable 8-ft. 8-ga. jumper cables. It costs \$474, and is available through Active Technologies Inc., 1117 LaVelle Rd., Alamogordo, NM 88310; (505) 434-6149.



# RIDIN' HIGH, RIDIN' LOW

Inconsistency stalks the Western Auto/PM team.

BY AL PEARCE



● Going fast is one thing. Going fast consistently without breaking—week in and week out for 500 miles or more at a time—is a somewhat more difficult task. Just take a look at what has been happening in this year's NASCAR Winston Cup series—and specifically to Darrell Waltrip and the No. 17 Western Auto/POPULAR MECHANICS Monte Carlo.

Right after the team celebrated an impressive fourth-place finish at the small, tough Martinsville Speedway in Martinsville, Virginia—and that includes leading for 146 laps of the weather-shortened race—it went and finished fourth again a week later at a superspeedway that's diametrically different from Martinsville's bullring: Talladega, Alabama. The Winston Select 500 was held at NASCAR's longest and fastest oval, and Waltrip and his Chevrolet Monte Carlo recorded another solid finish. However, a week later, at Sears Point road course in Sonoma, California, Team PM had to settle for 35th. A week after that, they ended a race in Charlotte, North Carolina, up against the wall.

## Winston Select 500

After qualifying a mediocre 21st, Waltrip called on his 23 years of experience to draft his way through the field on his way toward the front. A dented fender midway through slowed him down briefly, but he moved up steadily once his crew taped over part of the car's front grille.

Waltrip led twice for five laps before finishing behind winner Mark Martin, runner-up Jeff Gordon and third-place finisher Morgan Shepherd. Not surprisingly, Waltrip was delighted with the effort. "That's the best we've finished here in a long time," he said afterward. "But nobody cuts me any slack because I haven't raced out front

with some of these boys. I've got to earn my respect back."

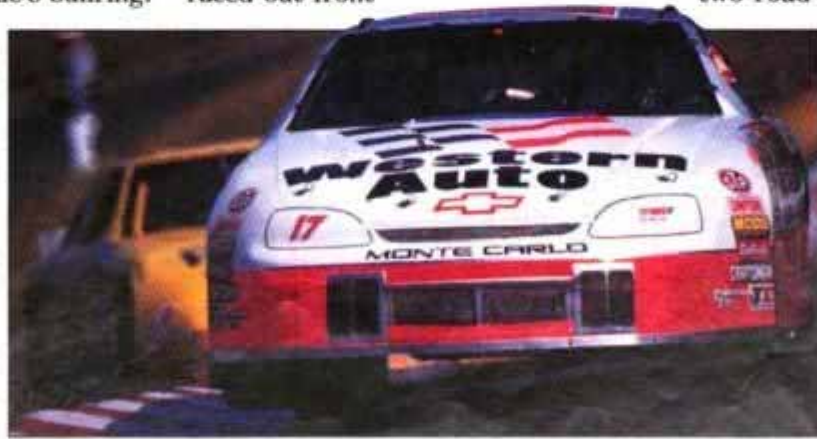
Still, there's no denying that the POPULAR MECHANICS entry is getting better. "This race team never questions how good I am or how old I am," said Waltrip, a youthful 48. "They're doing the work, putting a car out there that old D.W. likes and can drive. We'll be a factor in the points before the season is over."

## Save Mart 300k

The tour went from the high banking of Talladega directly to the twisting, undulating road course of Sears Point and a 74-lap, 187-mile race. The 2.52-mile Sears Point Raceway is one of only two road circuits on the schedule, and most teams dread making such a long haul for such a short race.

Waltrip started 17th and was running a respectable lead-lap 12th when his Chevy's gear-box failed on lap 21. The Western Auto/PM crew showed its skill and speed by replacing the transmission in 20 minutes, but the damage had been done: Waltrip lost 10 laps of the short

(Please turn to page 107)



Waltrip was on the lead lap at Sears Point when his car's gearbox failed.

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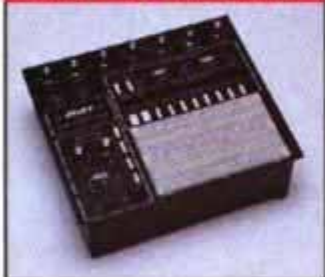
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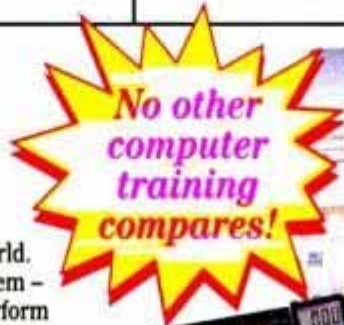
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race and ended up 35th, one of his worst showings of the year.

Dale Earnhardt passed Martin on the penultimate lap to get his first road-course victory. Pole-sitter Ricky Rudd led for the first four laps, Martin took over for the next 22 and Ken Schrader led 27-28 during an exchange of pitstops. Martin was ahead from lap 29 on until Earnhardt passed for the victory at lap 72.

## The Winston Select

The Winston Cup racing series took Mother's Day weekend off before heading to Charlotte for the Winston Select. This special nonpoints all-star event was created in 1985 to showcase NASCAR's top drivers in a high-profile, high-pressure, big-money exhibition race on national television.

And Darrell Waltrip has always been up to this challenge. After winning the inaugural race in 1985, he finished fourth, ninth, ninth, seventh, 13th, third, 11th, sixth and fourth in the next nine. Waltrip is one of only six drivers to qualify for all 11 races, and he had been a lead-lap finisher in nine of the previous 10.

That impressive string ended abruptly this year. Waltrip crashed—or was crashed into, some observers would argue—trying to outrun Earnhardt and Gordon into Turn 4 during the opening seconds of the \$200,000-to-win, 10-lap shootout final event. The No. 17 Monte Carlo was heavily damaged and Waltrip bruised several of his ribs when Earnhardt slid into him after both drivers had passed Gor-



PM race-team manager Clyde Booth, helping Waltrip find his way to a fourth-place finish at Talladega.

don entering Turn 3.

Waltrip finished the first 30-lap segment 11th and was second in the subsequent 30-lapper. That put him beside pole-sitter Gordon and ahead of third-starting Earnhardt for the 10-lap dash.

The race began after an aborted start, and Waltrip quickly passed Gordon on the outside. Earnhardt pulled ahead of Gordon on the inside near Turn 3. Earnhardt and Waltrip reached Turn 3 side by side, then crashed in Turn 4 when Earnhardt

slipped up the high-banked track.

"I knew they [Waltrip and Earnhardt] weren't going to make it through Turn 4," Gordon said later. "I eased up, then turned left and went on by when they crashed. They tried to take me out and ended up taking themselves out."

With Waltrip and Earnhardt sidelined, Gordon had no trouble winning the final 10-lap sprint.

Waltrip came in an unlucky 13th. Typically, he was battered but unbowed. "Jeff had a fast car, so I knew I had to get in front of him," he said. "I thought I'd pulled it off until I saw Dale down there, digging under me. And I said, 'Oh, Lord, we're in trouble if he comes up here much farther.' I guess he broke loose all of a sudden and the rest is history. I sucked it up and said, 'I hope this doesn't hurt too bad.' That's about all I could do.

"But I have a good backup for the Coca-Cola 600, and I'm ready to go racing again. Praise the Lord—I ain't ready for the junkyard yet!" **FM**

(Continued from page 64)

the conventional-to-digital photographic cycle. Many of these have to do with what computer techies call "hard copy," and what photographers have always called prints. For those who like to process and print their images at home (such as a fan of the fast-fading darkroom), there are a host of inexpensive software programs—*PhotoFinish* (catalog price, \$34.90) for Windows, *Photo Enhancer* (\$129) for Mac or Windows, or the classic *PhotoShop 3.0* (about \$599 in stores) for pros and avid users on the Mac or Windows—that can turn any snapshot into a master "printer."

Making images shine on the computer screen is one thing, but getting a decent print is another. You can go out and spend \$5000-plus on an industrial-strength laser color printer, or hold off a bit longer until Kodak and Hewlett-Packard deliver their recently announced \$300 color inkjet printer. The companies claim that the yet-unnamed unit will provide good-quality prints—at least for the home-snapshot market—from digital files.

For people who like to manipulate their pictures on the computer but don't want to bother printing (or want better quality than the home printer can deliver), plans are currently in the works to install online photofinishing from high-capacity, high-quality "output" shops. Co-developed with Microsoft, the software will allow you to enhance digitized picture files on your home computer and then send the files to a kiosk in a retail outlet via an online link, from which you get quality prints or even a Photo CD. These stand-alone picture producers will soon make their appearance in copy shops and computer/photo stores.

Other developments are readying the environment for digital imaging. Scanners, once the expensive toy of pre-press shops, are available for under \$1000. These devices deliver digital image files of anything—prints, slides, negatives and even small objects. One expected use is acquiring images from family albums. With simplified retouching software soon to be available, you'll be able to colorize shots of your grandparents, and even enhance shots that are fading due to age.

Does this mean you should run out and trade in your cameras for the latest digital-image recording device? For most of us, the "old-style" cameras, film and picture processing will meet our needs for many years to come. But don't be surprised if you start seeing family pictures showing up in your electronic mailbox. It just means that someone you know has already made the leap into the digital-picture age. **FM**



Waltrip working in his mobile office, trying to make up ground after pitting at Sears Point.

controls for an electric windlass to handle the anchor and for two electric reels located overhead in the hardtop. This trick feature permits the captain to effortlessly control the spacing of the two teaser lines that run from the 35-ft. Rupp outriggers to the outside of the trolling pattern.

All this heavy artillery notwithstanding, we head back to port in the late afternoon with empty fish boxes. As a matter of fact, no billfish or worthy sport fish graces our personal space during the three days spent scouring the waters of Bimini. Fish have a frustrating way of hum-

bling the best efforts of fishermen—even those aboard one of the most elite boats on the ocean.

But Bertram 60s aren't called convertibles for nothing: This boat is capable of performing double duty—both fishing and cruising. So, on the way back to dock, it's time for another round of Bertram burritos and Bahamian beverages. Taking full advantage of the power delivered by twin 16-kw Northern Lights generators, we crank up the air conditioner and blast the Bang & Olufsen entertainment center (VCR, cassette player, CD player, AM/FM radio) that's

wired to a Mitsubishi TV, Polk speakers and a Bose subwoofer. It isn't long before we're asking, what fish?

Back at the marina, we plug into shore power and prepare dinner—at least Debbie Hulick does. Debbie, the trip's MVC (Most Valuable Crewperson), has the skills of a master chef and the equipment to exercise them: a 21-cu.-ft. refrigerator/freezer, a 4-burner stove, a convection microwave oven and a high-capacity desalinator (fresh water in Bimini is pumped at the marina for 45 cents a gallon). After-dinner duties—never a fisherman's favorite—are handled by a dishwasher and a trash compactor.

Several crew members stay the night at the Bimini Big Game Club, but I elect to sleep on-board. Although exclusive, I doubt the Big Game Club can beat the accommodations available on the Bertram. Everything is made with craftsmanlike care—teak and holly inlaid floors, Corian countertops, maple cabinets, cedar closets, top-of-the-line carpeting, indirect lighting. By cheating during the room-selection process, I get assigned to the master stateroom, which has a king-size bed, TV, radio/cassette player and private bath. Needless to say, sleep arrives quickly and easily.

We get an early start the next morning, but, as noted, the fish don't cooperate. I had hoped to hook a magnificent billfish (marlin, sailfish) or a battling gamefish (dolphin, wahoo), but all I can manage are blackfin tuna, skipjack tuna, a queen triggerfish (which looks like an aquarium fish but is actually a feisty, good-eating fish) and copious barracuda—none of which requires the use of the fighting chair or any of the other big-game equipment on-board. As Capt. Hulick says at journey's end, quoting from the professional fishing guide's handbook: "You should have been here yesterday, and after you leave, you should have been here tomorrow."

But my three days on the Bertram 60 were not without merit. I learned a number of useful facts about how the other half fishes. For example, to put fishing Bertram style into perspective, consider that the two Michigan Wheel 33 x 35-in. nibrals props cost as much as a new Saturn Coupe. The tuna tower, as much as an S500 Mercedes-Benz. The engines? Together, as much as an oceanfront house.

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by Bob S. Garrard

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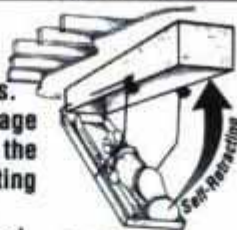
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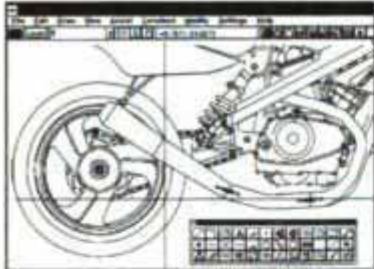


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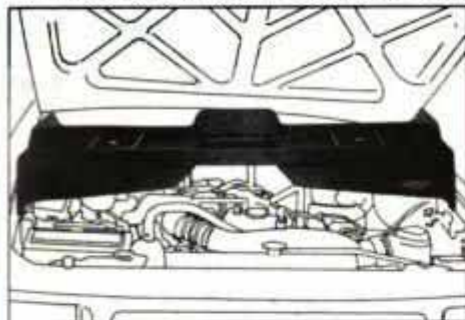
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# Coming Up In Popular Mechanics



## Breaking The Sound Barrier—On Land

Achieving Mach 1 in a land-based vehicle will be the goal at the upcoming speed-record runs at Bonneville Salt Flats in Utah. Our tech tour of this new breed of jet cars shows you what it takes to reach 750 miles per hour.

## Shift Into Jetdrive

Goodbye props, hello jets. Jetdrives for boats, now as efficient as props, are turning up in conventional 20-footers. Get up to speed with our analysis of how jetdrives compare to prop-driven outboards.

## Be Taller

Here's a great-looking, country-style, versatile wood step stool that's simple to build. And we'll show you how, step-by-step.

## Remote Operators

A New York surgeon saves the life of a patient in Kuwait—without leaving her office. A new system using television and remote-control "hands" opens a new chapter in medical history. Here's how remote surgery operates.

## More Joy From Your Stick

Better sharpen your reflexes, because Saturn from Sega and Sony's new PlayStation take videogames to the next level. The action is faster, the graphics more real and the experience more intense. Tune in here for a preview.

## Baja Blasting

The military version did fine in the Gulf War, but how tough are civilian Hummers? Find out on our 1000-mile torture test over the original route of the Baja 1000 off-road race.





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