APRIL 1987

MEETING NOTICE CHANGE

Due to the Good Friday holiday the bank will be closed on our regular meeting night. By unanimous vote, the next meeting will be friday APRIL 24th, at *CRAGIN FEDERAL SAVINGS & LOAN* 333 W. Wesley St. Wheaton, Illinois. - Time - 7:30 P.M. *sharp.* Guests are welcome and need not be members to attend the meeting.

THE PRES SAYS

1st of all, as discussed at our last meeting, insurance on our "EV" is still up in the air. In the time remaining till the next meeting, I would like you to investigate with your insurance co. and report findings to us at this next meeting.
2nd, we must discuss our participation at the SantaFe hamfest coming up June 14th. We should plan to have our "EV" there along with handouts and the club "stuff" for sale.
Next, we'll discuss the energy paper on "petro-electro vehicles" your pres. & sec'y are going to present at the National Consumers Day thur. April 23 at 1:00 PM - Circle Campus - room 713. For further info if you would like to attend, call Bill Shafer at 383-8005 weekdays 9:00-3:00 PM.
And, if time permits, we'll discuss some ideas on our video production

FOX VALLEY ELECTRIC
AUTO ASSOCIATION
624 Pershing St. Wheaton, Il 60187

FIRST CLASS

ADDRESS CORRECTION
REQUESTED

Minutes FVEAA Meeting 3/20/87 at Cragin Federal Savings & Loan Office, Wheaton, IL

President W. H. Shafer called the meeting to order at 7:35PM.

There were 18 members present.

The club authorized the president and secretary to present the clubs' paper "Petroleum Electric Vehicle (A logical step towards energy independence) to the forthcoming conference at the University of Illinois, Chicago Circle Center Room 713 750 So Halstead on April 23, 1987 sponsored in part by the Department of Energy.

The motion to adopt the policy re: use of the club car was tabled until each member has an opportunity to check with his auto insurance company regarding coverage of the club car while in possession of the individual club member.

John Newton reported on the performance of the club car. He reports that the top speed is now 42MPH. He recommends that two more batteries be added to improve performance. He further stated based on his experience to date that no car should be built that couldn't travel at 100 Kilometers/hour on a level pavement. Abig Thank you is due to Ken Meyers who fixed the charger on the club car. The relay interlock is now gone but John does not believe that it is a great loss in the club car. John also complimented all club members that worked on the club car conversion. He stated that they had done a good job. That coming from an internationally recognized engineer is no small compliment.

Treasurer V. Vana read the club funds. There is a 948.66 Dollar balance in the NOW checking account and $769.97 in the savings account.

Joe Pollard reported on the audio tapes from the EAA. He stated that the 1985 tape covered batteries and the 1986 tape covered the CO2 or "Greenhouse Effect" with side 2 covering the regenerative circuit and the lithium battery.

Our guest speaker, Mr. S. Ohba, owner of Soleq Corp. discussed the testing of 7 prototype electric vehicles and their experience with immobilized electrolite batteries.

The meeting adjourned at 9:40 PM.

Respectfully submitted,

Kenneth R. Woods

Kenneth R. Woods, Secretary

Longer Life From Motive Power Batteries

Everybody talks energy shortages these days, and how to ease them. Yet, batteries are such a common source of electrical energy there is a tendency to neglect them, says Charles A. Taylor, manager, Motive Power Batteries and Chargers, C&D Batteries. With understanding and proper maintenance, batteries can provide dependable power for 5 to 7½ years on the average.

The maintenance and use procedures developed by C&D engineers and from extensive field experience and feedback are simple.

Charging and Discharging Characteristics

To obtain maximum life, the size of the battery should be such that not more than 80% of its rated capacity, measured in ampere hours is removed on a daily basis. It must then be connected to the charger to have its power restored, usually in an eight-hour period. Discharging a battery to exhaustion overworks the battery, reduces its life and makes recharging difficult. It also takes more time to recharge.

Therefore, a battery might be taken off charge before it is fully recharged. Thus a battery going into a full eight-hour work period undercharged will overcharge to a still lower limit. A vicious cycle sets up that can cause permanent battery damage. In practice — and to assure maximum life and performance, a battery of adequate size should be selected to perform its work cycle within 80% of its rated capacity.

Modern ferroresonant chargers will recharge a battery automatically. However, it is possible for some charger designs to get out of adjustment. Any of the following conditions are signs of trouble.

1. **Unusual rise in battery temperature.** During charging temperature will not normally rise more than 25°F during an eight-hour charging period.

2. **Continuous running of the charger.** This is usually due to failure of the timer on the charger, or if it has a TVR relay which fails to operate.

3. **Continuous charging at a high rate.** Charging rate will drop as the battery approaches a charged condition. On non-ferroresonant designs, if it does not drop, check for failure of the controls and charger adjustments.

How Do You Determine When Your Battery Is Fully Charged?

1. Voltage will level off.
2. Ammeter readings on the charger will level off at its lowest value.

Equalizing or Weekend Charge

This is a low rate charge and is given only to insure that all cells reach full charge with little or no difference between cells. This is usually done by increasing the daily charging time by another three hours.

Regular Maintenance Procedure

When properly watered and charged, batteries should remain clean and dry.

If electrolyte spills out over the battery or overflows from inside a cell, neutralize it with a solution of baking soda and water (one pound of soda to one gallon of water).

Rinse battery down with clear water.

Make sure vent caps are in place prior to cleaning.

"Those who cannot remember the past are condemned to repeat it" (George Santayana)

HAMFESTS 1987

May 2 Sat. 8:00 a.m. $3.00
Circle B Rec Center Hwy. 60
& County I Cedarburg, Wisc.

May 17 Sun. 8:00 a.m. $3.00
Kankakee County Fairgrounds
Rt. 45 south Kankakee, Ill.

June 14 Sun. 6:00 a.m. $4.00
Santa Fe Park 91st & Wolf
Rd. Willow Springs, Illinois

Aug. 9 Sun. 6:00 a.m. $4.00
Santa Fe Park 91st & Wolf
Rd. Willow Springs, Illinois

Aug. 23 Sun. Commodore Fest
Kane County Fairgrounds, Ill

Sept 13 Sun. 6:00 a.m. $3.00
Santa Fe Park 91st & Wolf
Rd. Willow Springs, Illinois

Sept 19 & 20 Two days $4.00
Expo Gardens W. Northmoor rd
off 6300 block Peoria, Ill.

Oct. 25 Sun. 8:00 a.m. $3.00
Waukesha Expo Ctr. Hwys. J &
FT off I-94 Waukesha Wisc.

Oct. 31 & Nov. 1st Two days
Norris Sports Ctr. Rt. 64 &
Dunham Rd. St. Charles, Ill.

WANTED

ELECTRONIC CONTROLLER
48 to 72 Volt
400 Amp
New or Used - Working
Reasonable

Call: Paul Harris
9421 N. Kildare
Skokie, Il 60076

674-6632

FOR SALE

10 6 volt batteries
Trojan 105 Amp $15 each

Call: Don Kubick
249 Arlington Hts. Rd.
Elk Grove Village
Illinois 60007

437-0453

A credit card is a magical bit of plastic that enables a person to buy things he doesn't need, with money he doesn't have, to impress people he doesn't know.

What's a Tyroda? Tyroda is a device which regulates tire pressure. Since studies have shown that improperly inflated tires rob your car of gas mileage, the Swiss decided to do something about it, so they invented a device which simply screws onto a tire's valve stem. A visible piston shows correct pressure with a glance.

Popular Science

Erstwhile electric cars

Your article on the gasoline/electric sports car that doesn't exist yet [Aug.] has just gone into my thick 26-year-old file of electric-car developments that never hit the market. It includes the Charles Townabout of 1960 and Harry Grepke's "hybrid turbine/electric car" [PS, Sept. '75]. Grepke is quoted as saying that the turbine generator on his car would no longer be needed in 1980. By that time, he said, we would have totally electric cars powered by super-batteries. You would think that if this new hybrid you write about is so promising, the big auto manufacturers would be racing to be first with it on the marketplace. Is it possible that the Big Seven oil companies don't want electric cars on the road because they would sell less gasoline?

Norman B. Reed, Norristown, Pa.

How does the gasoline/electric sports car get 100 mpg when in your own article you say the car loses one-third of all the energy put into it. An efficient car like the Citroën 2CV with a small engine only gets about 50 mpg.
Alexander Gladich, Willowbrook, Ill.

Dan McCosh replies: "The one-third loss referred to in the story was for most current traction motor-generator combinations. Unique Mobility claims about 95-percent efficiency—about the same as current transmissions. Gains mainly come from running the main power-generating motor at a low, constant horsepower; the remainder from regenerative braking: Energy is recovered by using the wheel motors as generators to slow the car."

Can the two-stroke make it this time?

A revolutionary air-pressurized injector, developed in Australia, is pumping new life into the two-cycle engine. Now even Detroit is considering these light, simple engines for future passenger cars.

By DAVID SCOTT
Drawings by Linda Richards

PERTH, AUSTRALIA

When I first opened the hood of the experimental subcompact car, I had to lean well forward to find the tiny three-cylinder engine lurking at the bottom of a near-empty compartment. Dwarfed even by the Chevette-sized Holden Camira in which it was being tested, the tiny two-stroke engine nonetheless gave brisk performance when I took the car for a spin on Australian roads. The Holden accelerated quickly and easily pulled steep grades. And I found the engine far smoother than the small fours that usually power cars like the Camira.

Neither the size nor the performance should have been a surprise. Firing once every piston stroke, two-cycles normally outperform four-stroke engines, which fire only every other revolution. A three-cylinder two-stroke fires with the same rhythm as a standard four-stroke six-cylinder, making the engine exceptionally smooth.

Still, as someone who remembers the noise and the smoky trail left by the popcorn-popper two-stroke Saabs of the 1960s, I couldn't help but be impressed. There was no irregular stuttering under light load, and not a hint of blue exhaust smoke anywhere.

The secret is a new low-cost air-and-fuel injection system developed by Australia's Orbital Engine Co. Orbital's recent work on the oft-scorned two-stroke already has sparked interest at both General Motors and Ford. The promise of clean-running two-cycle engines has also attracted attention from outboard-engine companies. And not only is a two-stroke revival in the offing, Orbital's air-powered fuel injection may spur another renaissance: the stratified-charge engine.

"Our in-cylinder injection eliminates all the snags of previous two-strokes while retaining their clear advantages of mechanical simplicity and compactness," says Ken Johnsen, commercial manager of Orbital.

Although auto makers are reserving judgment and are especially skeptical about any two-stroke's ability to pass U.S. emissions standards, the light weight, compact size, and familiar manufacturing techniques embodied in the Orbital engine already have encouraged both GM and Ford to commission prototype cars using it.

"We've been working on our own two-stroke for several years," says Ian MacPherson, director, power-train engineering office at Ford. "So when we saw what Orbital had done, naturally we were interested."

Against the wind

Changing the current prejudice against two-strokes prevalent among auto engineers today could be tough indeed. Virtually all cars on the road use four-stroke engines. Fuel and air are drawn into the cylinder on the first downstroke and compressed on the upstroke. Power is produced only on the third, downward thrust of the piston, propelled by the exploding mixture. The final upward motion pushes exhaust gas out of the combustion chamber, and the cycle begins again.

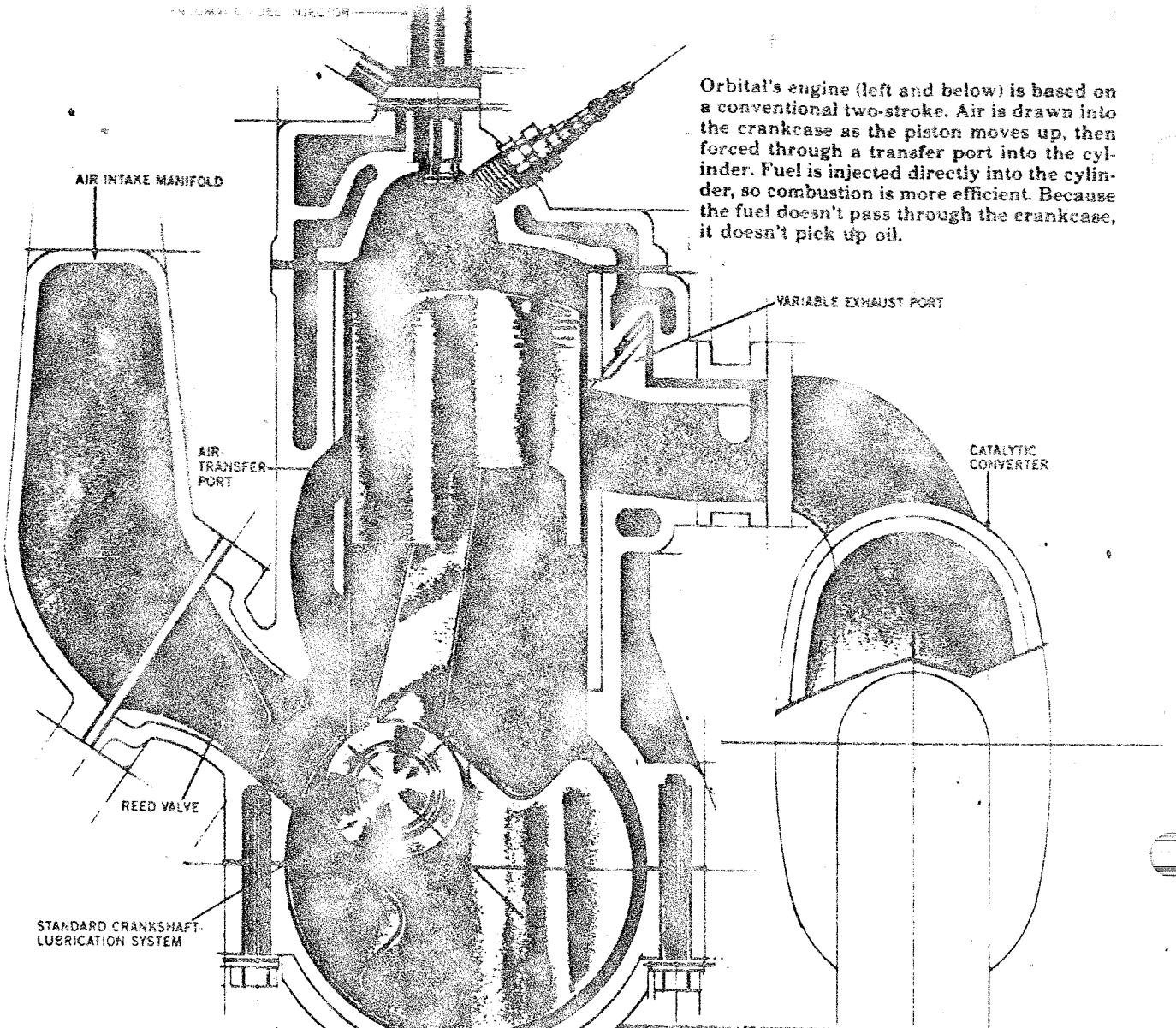
The principle is something like keeping people separated by sections of a revolving door. Fresh gas and exhaust don't mix, hence exhaust doesn't disturb the combustion mixture and fresh gas doesn't pollute the exhaust. Regardless, the "wasted" pumping exhaust stroke that produces no power beckons engineers to combine the intake-exhaust cycle.

A typical two-stoke draws a charge of air and fuel into the crankcase below the piston, at the same moment another fuel-air charge is being compressed above the piston. After the engine fires, the piston moves down, uncovering transfer ports that let the air and fuel pass from the crankcase into the combustion chamber. In addition to refilling the cylinder with a fresh mixture, this also helps push the exhaust gas out of the cylinder.

Because the pistons are firing every stroke, a given displacement engine should produce twice the power of a normal four-stroke. Another benefit is simplicity: Two-strokes frequently dispense with the complicated valve train of a four-stroke, instead using holes cut in the cylinder wall to admit fuel and air and allowing exhaust to exit.

But two-stroke can be a quick and dirty way to generate horsepower. Controlling combustion accurately over various engine speeds and loads is nearly impossible. So two-strokes tend to misfire frequently, making that familiar corn-popping sound and dumping raw hydrocarbons into the atmosphere. Also, lubricating oil inevitably mixes with the fuel as the mixture is drawn through the crankcase, and burning oil becomes a source of further hydrocarbon emissions, not to mention the cause of the telltale blue smoke. At present, no two-stroke engine—automotive or motorcycle—can pass emissions standards for street use in the U.S.

The major breakthrough claimed for



Orbital's engine (left and below) is based on a conventional two-stroke. Air is drawn into the crankcase as the piston moves up, then forced through a transfer port into the cylinder. Fuel is injected directly into the cylinder, so combustion is more efficient. Because the fuel doesn't pass through the crankcase, it doesn't pick up oil.

the Orbital engine is a fuel injector that uses compressed air instead of the usual fuel pressure to squirt gasoline into the engine cylinders (see caption). One of the major advantages of the injector is that the blast of high-velocity air blowing through the fuel atomizes it into exceptionally fine particles—about 1/20 the size of the droplets in the spray of a conventional fuel injector. The homogeneous fuel-air mixture that results makes for more complete combustion, hence greater output.

When applied to a two-stroke engine, the direct-injection system solves some of the major drawbacks of conventional designs.

The Orbital system precisely controls the fuel-air mixture. In effect, the Orbital two-stroke engine is a modified stratified-charge engine [PS, July '75]. The highly atomized fuel actually sets up several zones of fuel mixtures in the combustion chamber that ignite progressively as the flame front

Continued

Can the two-stroke make it this time?

A revolutionary air-pressurized injector, developed in Australia, is pumping new life into the two-cycle engine. Now even Detroit is considering these light, simple engines for future passenger cars.

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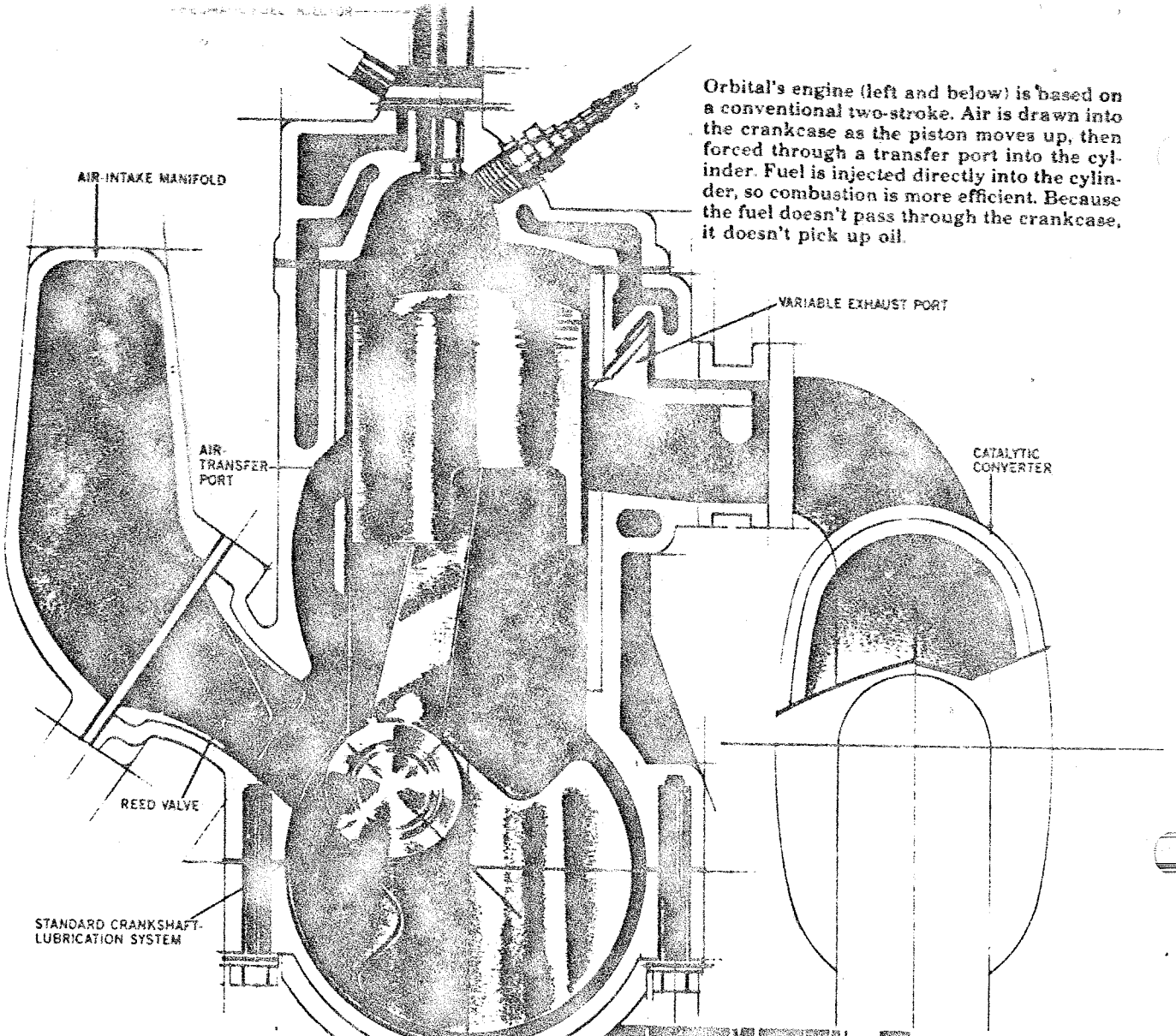

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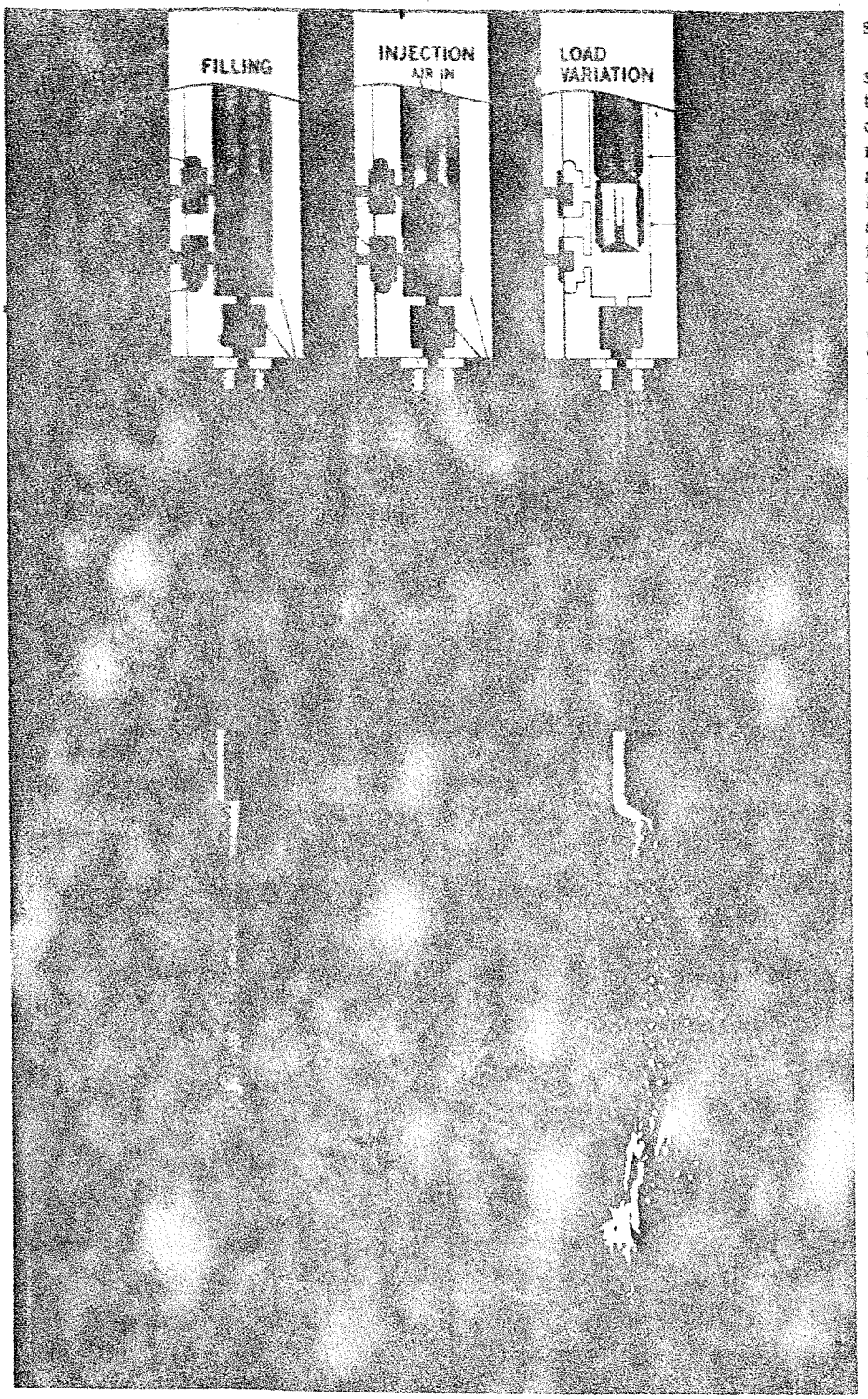


advances. Keeping the fuel out of the crankcase also helps control lubrication pollution.

Orbital's Johnsen also notes that the low-pressure injection system and conventional engine design make for ease of manufacturing, hence low cost.

Orbital has already built one running car and delivered several engines for GM to examine, in addition to pursuing a program with Ford. Outboard Marine Corp. also has licensed Orbital technology. The outboard manufacturer anticipates that auto-style emissions laws eventually will reach the marine market.

Even if Orbital's new two-stroke doesn't find its way into your Chevrolet or Ford, the revolutionary air-powered fuel injector might. MacPherson says that Ford has been studying the Orbital injection system separately from the two-stroke engine. Like most U.S. auto makers, Ford is still looking for potential fuel-saving technology, even in these days of cheap gas. And company engineers think Orbital's injector might work well in a stratified-charge four-stroke engine.

Stratified-charge engines are designed to burn air-fuel mixtures far too lean to ignite with a spark. They do this by first igniting a small jet of richer mixture, then using this jet as a torch to ignite the leaner mixture filling the rest of the cylinder. Ideally, such an engine could be both more efficient and cleaner running than current production engines.

Ford has had a long-running program to develop the stratified-charge combustion process. In the mid-1970s the company did extensive work on the programmed-combustion (PROCO) engine, which started out as a two-stroke, then evolved into a four-stroke design. PROCO was put on the back burner when gas became plentiful, but work continues on the project.

The Orbital injection system is one approach to stratified-charge combustion for either two- or four-stroke engines, says MacPherson. Ford recently signed a contract with Orbital to build a four-stroke engine, based on that from the current Ford Escort, to demonstrate the technology.

Walbro, a major manufacturer of fuel-system equipment, also sees the injection system as promising for both two- and four-stroke engines. In fact, the company has gone so far as to license the Orbital technology for sale here in the U.S.

Two-cycle skepticism

Despite their advantages, two-strokes still raise eyebrows in Detroit. "Emissions are a serious problem," Ford's MacPherson says. "The scavenging action [using incoming air to push out exhaust gas] of a two-stroke cools off the exhaust gas." That makes it difficult to light off the catalytic converter needed to oxidize leftover hydrocarbons.

Orbital says it has the answer to the hydrocarbon emissions—a specially designed catalyst. And although oxides of nitrogen (NO_x)—caused when the high temperatures from lean burning fuse atmospheric nitrogen and oxygen—are a problem with most stratified-charge engines, the company is testing a variety of combustion chambers in search of a solution.

The compact size of a two-stroke would be of greater benefit to a minicar than to the big sedans Detroit still depends on. So expect to see the new lightweights on the market overseas before they make inroads in the U.S. But given the new generation of small economy cars coming into the market in the U.S., the powerful, compact Orbital engine might prove to be the right idea in the right place at the right time.

NO MORE GAS

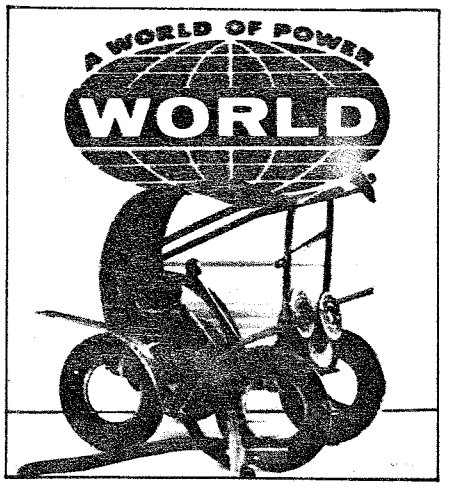
by Charles E. Miller

There was a raucous blast from the little red electric's horn as it zipped by the service station where there was the early morning lineup of commuter cars, but no one waved back. Everyone in the neighborhood knew about the electric car that got its fuel from the wall socket and they were tired of the owner laughing at them for not having the foresight to buy an electric car.

The worst time was when they washed their cars on Saturday morning. Then the little electric would glide up and the owner would ask them if they knew that 92% of their trips were well within the range of an electric car and that 2 million barrels of oil a day could be saved if they used an electric car for only 25% of their driving needs.

The best argument was that the gasoline car owners could have defended themselves with is that the two types of vehicles should not be compared: each has a use and a purpose and the popular idea of replacing the gasoline car with an electric is a myth. Ambitious plans that are published about future electric cars too often promise a vehicle that will have the speed and acceleration of a gasoline engine and a "yet to be developed" battery that will provide a comparable driving range.

Present lead-acid batteries can supply the power for a medium-size electric car to travel at speeds of 50 mph with a range of around 40 miles. To charge batteries of this size could take up to 16 hours for maximum battery life and the guarantee of a full charge. After a full day of driving, let's say that an electric car has been on the charger for three hours and an emergency comes up that requires a 10 mile trip. Better call a cab or borrow the neighbor's car because there is not enough energy in the battery for a trip that long.



So besides having a limited range, the electric car can only work an eight-hour day unless it has been run only a few miles during the work day. Car buyers have always had to make a choice between wanting a sports car and needing a station wagon, so they will have to know that an electric car is suitable only for short runs in a level urban area.

The Department of Energy might be correct that an electric car would satisfy 92% of normal driving needs, but it would only be true in Manhattan. It would not work in a hilly city like San Francisco or a sprawling city like Houston. The old refrain "Get a horse" would take on real meaning when shouted at some poor guy with dead batteries in the middle of a freeway at rush time.

It is claimed that the electric car has a much higher efficiency than a gasoline engine and a lower cost per mile, but those figures all depend on what factors are used. The five cents-per-mile cost for electric vehicles would be true if electricity is obtainable at two cents per kilowatt hour. A gasoline engine getting 18 miles per gallon will cost almost six cents per mile, so the electric car is actually more expensive to run as most consumers pay at least five cents per kilowatt hour for electricity. Starting with the fuel oil at an electric generating station and then figuring out how much of that potential energy in the fuel oil would come out of the wheels of an electric car, an efficiency rating of only 11% is achieved, less than the 15% efficiency of gasoline engines.

While it is hoped that mass production would help lower the price of an electric car, their present selling price of around $12,000 is certainly higher than most compact gasoline cars. There have been many advances made in the efficiency and cycle life of lead-acid batteries, but present production batteries will give a service life of from 18 months to three years in an electric car. This means that the owner would have to invest around $1500 for new batteries, when the gasoline car of the same age would be ready for a brake job and minor adjustments.

Figuring the vehicle cost, recharging expense and time, and limited range, where are the advantages? To those who claim that it uses less petroleum and that the initial cost is not important, it is hoped that they live in an area where all electricity is produced by hydro power or coal. One answer might be to forget about trying to compete with the speed and power of the gasoline engine and design the electric as a simple shopping car.

Long forgotten, the electric cars built 65 years ago gave a range of 100 miles at 20 mph and this is supposed to be the modern age. It just might be that the old timers knew some things about electric cars that we need to know.

If the little red electric car in your neighborhood honks his horn, wave and be nice because he is a true believer.

* * *

Vehicle Radar Systems of Mt. Clemens, Michigan, has announced a radar system to protect cars and trucks against accidents. The device is a miniature microwave radar antenna which will detect vehicles in heavy fog. The systems will sell for $558 for cars and $966 for trucks on the retail level.

* * *