

APRIL 1985

Association

VOL. XVII NO. 4

DOE REPORTS FY1984

SUPPORT GROUPS

EXCERPTS FROM 8th ANNUAL REPORT TO CONGRESS
ELECTRIC AND HYBRID VEHICLES PROGRAM

RESEARCH AND DEVELOPMENT

The first experimental proof-of-concept powertrain was completed by the Ford Motor Company and the General Electric Company on the Advanced Single-Shaft-Electric Propulsion System Technology Development Program (ETX). Additionally, cells, modules and partial subsystems have been completed in that portion of the program aimed at the development of advanced experimental proof-of-concept tubularplate lead-acid, sodium-sulfur, and zinc-bromine battery subsystems to be integrated with the powertrain to form complete propulsion systems for laboratory and in-vehicle evaluation. The Ford subcontractors for battery subsystems development are Lucas-Chloride EV systems (tubular lead-acid), Ford Aerospace and Communications Company (sodium-sulfur) and Exxon Corporation (zinc-bromine).

A 124-cell, 15-KWh zinc-bromine submodule was built and tested by Exxon Research and Engineering Company. The results provided verification of the high voltage single stack design. Using the above results, a 30-KWh laboratory battery has been built in the configuration that is amenable to EV incorporation.

Sandia National Laboratories (SNL) awarded a contract to Ford Aerospace to investigate the reliability and thermal management of sodium-sulfur battery systems for electric vehicle application.

The Eaton A.C. Powertrain Base Technology Program was completed and a complete proof-of-concept powertrain, integrated into a test vehicle, was delivered to DOE for comprehensive test and evaluation.

A multi-year, cost-shared contract was awarded to the Eaton Corporation to conduct an Advanced Dual-Shaft Electric Propulsion System Technology Development Program aimed at advancing the state-of-the-art of dual-shaft a.c. propulsion system technology. In addition to serving as prime contractor, Eaton will develop the powertrain technology. Major subcontractors include Eagle-Picher Industries, responsible for nickel-iron battery subsystem technology, and ASC, Inc., responsible for test bed vehicle development.

A 20-kW, state-of-the-art phosphoric acid electrolyte fuel cell power system was delivered to Los Alamos National Laboratory (LANL) for evaluation of fuel cell and reformer response under simulated vehicle-driving profiles.

The Hybrid Vehicle Technologies Evaluation study was completed by JPL that included recommendations for development of the next generation of hybrid vehicle technologies.

JPL completed the Advanced Vehicle Systems study which describes the most promising vehicle system and battery subsystem candidates for full-performanced EHV's in the 1990.

Jet
Propulsion
Laboratory

*Vehicle
System
Development
*Vehicle And
Battery
System
Testing
*Advanced
Technology
Assessments
*Propulsion
Subsystem
Development

The
Aerospace
Corporation

*Hybrid
Technology
Development
*Advanced
Powertrain/
Battery
Development
*Test And
Evaluation
Support

Lawrence
Livermore
National
Laboratory

*Metal/air
Batteries

Sandia
National
Laboratory

*Flow Battery
Development
*Nonaqueous
Battery
Development

TEST AND EVALUATION

Improved nickel-iron battery modules have achieved greater than 1000 cycles in on-going life test at the Argonne National Laboratory (ANL). A 20% improvement in specific energy over previous designs was demonstrated, and progress was also made in reducing battery cost.

Advanced lead-acid battery cells delivered to ANL have demonstrated a 15% increase in specific energy over previous designs and a total specific energy increase of 57% over lead-acid batteries available when the DOE program began.

The initial evaluation of battery watering wands under the EV Product Improvement Program has resulted in reduction in routine battery maintenance time by as much as 75%.

Dynamometer testing of the Hybrid Test Vehicle (HTV-1) illustrated a potential annual fuel savings of 31% over a similar size 1985 model Internal Combustion Engine (ICE) powered vehicle.

Seven electric vehicles with nickel/iron batteries from GTE Services Operation and Northrop Corporation were successfully used to film the Men's and Women's Marathon Races in Los Angeles for the 1984 Olympics Committee.

BATTERY TECHNOLOGY

The goal of the battery program is to conduct research and development on promising battery technology candidates to advance the technology to a state of readiness capable of being used by original equipment manufacturers to produce electric and hybrid vehicles which can be competitive with internal combustion engine vehicles. To this end the Department of Energy is conducting research and development on aqueous (Pb/acid, and Ni/Fe) batteries as well as advanced battery technology (Na/S, Zn/Br, Li/FeS) during FY 1984. Also, the feasibility of a fuel cell as a power source for electric vehicles is being studied.

As shown in Table 2, significant progress in battery technology has been achieved by this program. Substantial improvements in specific energy and cycle life were achieved in lead-acid batteries while retaining low costs; however, additional reductions in battery weight are needed. To achieve the project goals for lead-acid battery technology, technical issues need to be addressed including methods for increasing the active material utilization and electrolyte and thermal management. Improved nickel/iron batteries have achieved good performance and long cycle life, but further reductions in battery cost and weight are needed to achieve the

con't on pg. 3

Table 2. Performance Objectives and Accomplishments of EV Aqueous Battery Technology

Objectives	Pre-Project Lead-acid Status (1977)	FY 1984 Lead/acid Accomplishments*	FY 1984 Nickel/Iron Accomplishments*	Project Goal
Specific Energy (Wh/kg)**	30	41	48	56
Specific Peak Power (W/kg)***	96	104	103	104
Cycle Life (Cycles)****	250	576	1068	800

* Accomplishments are based on verified results demonstrated at the National Battery Test Laboratory for multi-cell modules.

** At the 3-h discharge rate. Advanced lead-acid cells delivered in late FY 1984 demonstrated 47 WH/kg; life tests are in process.

*** Peak power (30-second average at 50 percent state-of-charge.)

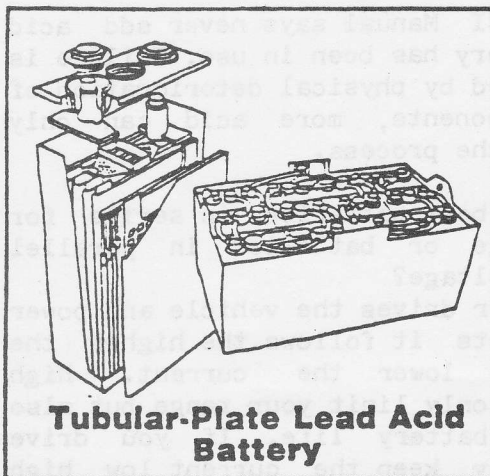
**** Cycling at 80 percent depth of discharge: life to 75 percent retained capacity.

project goals for nickel/iron battery technology. Technical issues need to be addressed including optimization of the thickness of nickel electrodes, electrolyte and gas management systems. The results of ANL National Battery Test Laboratory (NBTL) has been increased by over 55 to 85 percent, respectively, for those improved lead-acid and nickel/iron batteries. In addition, the combination of improved specific energy and cycle life indicates that the expected battery life (in terms of vehicle-miles) in the vehicle has been increased by a factor of three for the improved lead-acid and six for the improved nickel/iron batteries as compared to previously available batteries.

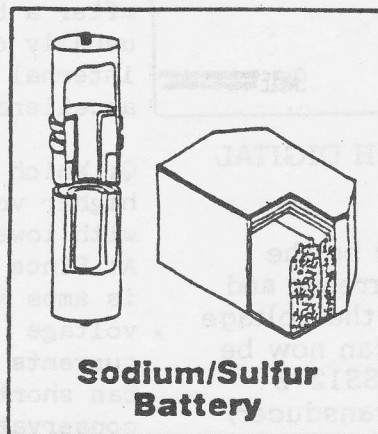
During FY 1984, full-size EV-2300 improved lead-acid battery systems, previously developed by the Globe Battery Division of Johnson Controls, Inc., continued to perform well in field evaluations at the JPL, the Tennessee Valley Authority (TVA) and Detroit Edison. In addition, Globe continued R&D on advanced lead-acid battery concepts. Experimental advanced cells incorporating composite lead/plastic grids demonstrated specific energies of 47 Wh/kg (15 percent greater than prior technology) in tests at ANL's National Battery Test Laboratory (NBTL). Globe also investigated a novel concept using forced flow of electrolyte

through the porous electrodes. Experimental cells of this type achieved very high levels of active material utilization (85% greater than that available in commercial lead-acid EV batteries): this dramatic increase in utilization provides an opportunity for a major increase in the specific energy of lead-acid batteries. Globe also conducted a design and cost study of an advanced gelled-electrolyte lead-acid EV battery which could reduce the amount of battery maintenance needed.

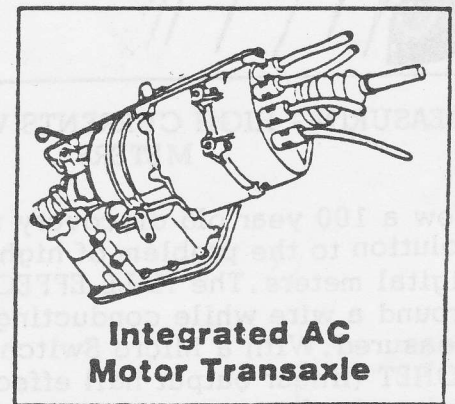
Eagle-Picher Industries (EPI) continued R&D on improved nickel/iron batteries. Research was focused on the development of nickel electrodes up to twice as thick as prior technology and having the desired porosity and strength. Cell designs based upon thick electrode technology are projected to significantly reduce battery costs while simultaneously improving battery specific energy. Changes in cell case material and cell construction were developed to eliminate problems of electrolyte leakage that were encountered in previous field evaluations. A full-size battery system of this type is now performing with no electrolyte leakage problem in vehicle tests at TVA. A full-size, 140-cell, EPI nickel/iron battery system has exceeded 897 deep discharge cycles to date at ANL in simulated van driving equivalent to 47,000 miles of operation.



Tubular-Plate Lead Acid Battery



Sodium/Sulfur Battery



Integrated AC Motor Transaxle

Argonne
National
Laboratory

*Aqueous
Nonflow
Battery
Development
*Battery
Verification
Testing

Lawrence
Berkley
Laboratory

*Technology
Base
Los Alamos
National
Laboratory
*Fuel Cell

Nevada
Operation
Office

*Contract
With Public
Sector Site
Operators
*Test And
Evaluation
Data Center

← →
**SUPPORT
GROUPS**

Idaho
National
Engineering
Laboratory

*Vehicle
System and
Component
Dynamometer
Testing

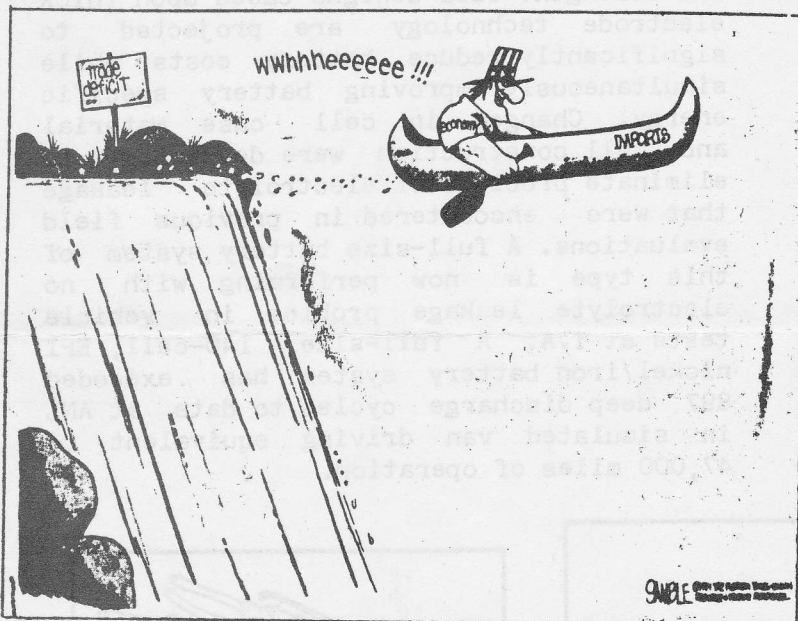
*Test and
Evaluation
Subcontract
Management
*Instrumenta-
tion Support

SPECIAL THANKS TO OUR MAN IN
WASHINGTON DAVE GOLDSTEIN
FOR HAND DELIVERY OF DOE INFO..

!! NEWS FLASH !!

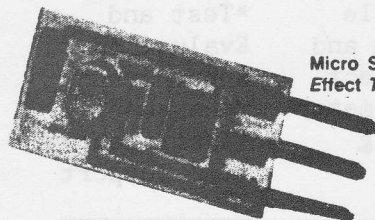
Mr. Saied Motaei has been nominated by EAA for the 1985 Soichiro Honda Medal of Honor, awarded annually by the American Society of Engineers for a significant improvement in personal transportation. His several improvements in his ELECTRIC CAR performance may well earn him this prestigious award. Of course you all remember his outstanding 215 miles of city and freeway driving at our last Rally, on a single charge.

By John Newell

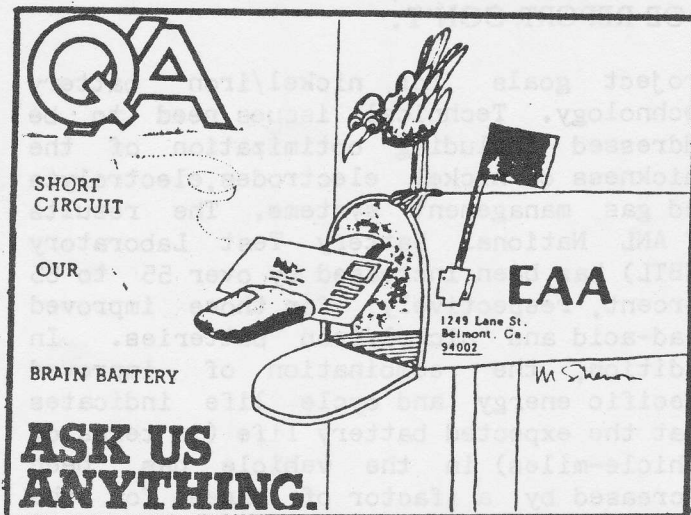


MEASURING HIGH CURRENTS WITH DIGITAL METERS

Now a 100 year old discovery may be the solution to the problem of high currents and digital meters. The HALL EFFECT, the voltage around a wire while conducting, can now be measured. With a Micro Switch 91SS12-2 LOHET (linear output hall effect transducer) and a simple op-amp your motor current can be measured with no direct connection. see July "84" Radio-Electronics Magazine. This may solve the problem of parallel ground currents, witch A/D converters cannot toller-ate.



THE HALL-EFFECT SENSOR from
Micro Switch, the LOHET (Linear Output Hall
Effect Transducer).



Q: Does the Lestronic charger have a auto level, like 5 Amps for 3 to 6 hours.?

A: No, however I have found that if you restart after automatic shutoff the charger will run for approx. an hour at around 5 Amps. you can keep restarting until you have the desired level time.

Q: What happened to Citicar.?

A: Citicar was sold to General Engines Co. Inc. a few years ago, they are still building the renamed Comuta-car in Sebring FA. they also build electric Mopeds, bikes, trikes, and Pedalpower electric system that fits any bike or trike.

Q: Is it OK to add acid to weak cell if it does not come up after normal leveling charge.?

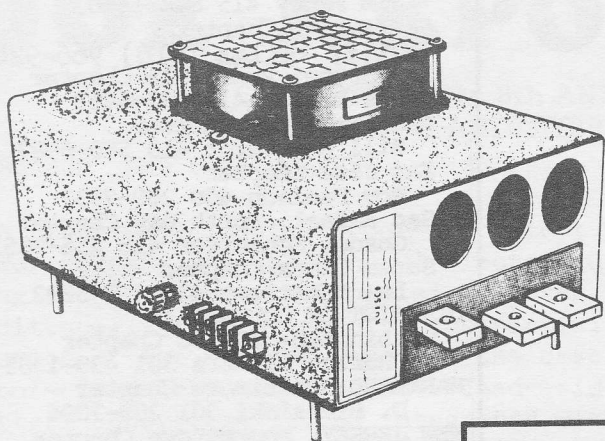
A: No, the BCI Manual says never add acid after a battery has been in use. Failure is usually caused by physical deterioration of internal components, more acid can only accelerate the process.

Q: Which is best batteries in series for higher voltage or batteries in parallel with lower voltage?

A: Since power drives the vehicle and power is amps X volts it follows the higher the voltage the lower the current. High currents not only limit your range but also can shorten battery life. If you drive conservatively, keep the current low high voltage is better. If you have a lead foot like me (My 007, 120V goes to 400 amps a lot), I think I like parallel.

With lower voltage regeneration is simplified, easy to control, and holds up at lower speeds. With low voltage you can use a simple speed controller. With my Aztec hybrid running 48 volts I have better control of charging current when running on the IC engine. When I accelerate, climp a hill, and anytime the amps go high It's good to know the batteries are in parallel.

SAFETY ELECTRIC VEHICLE CONTROLLER Model HV-500



SPECIFICATIONS:

- 100-500 AMP
- 24-120 VOLT
- 4000 HZ EFFICIENCY
- FULLY PROTECTED
- REGULATED COOLING FLOW
- SIZE — 4" D x 8" W x 12" L
(101.6mm x 203.2mm x 304.8mm)
- WEIGHT — 14.5 lb.
- FULL LINE OF ACCESSORIES
AVAILABLE

**IN STOCK
NOW**

SAFETY FEATURES:

- NON-GROUNDED SYSTEM
- ACCELERATOR INTERLOCK
- SOFT-START ACCELERATION
- HIGH-VOLTAGE DISCHARGED
WHEN OFF
- OSHA YELLOW ENCLOSURE
- HIGH VOLTAGE WARNING LABEL
- AXIAL FAN GUARD

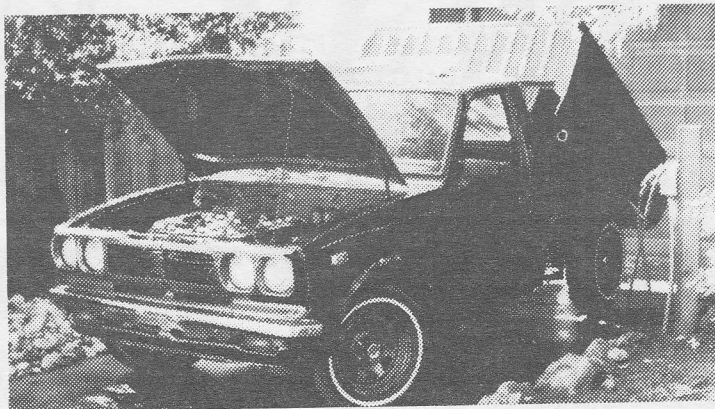
\$550

CALL OR
WRITE FOR
DETAILS

P.O. Box 3761
Santa Rosa, CA 95402

Telephone:
(707) 542-4151

RUSSCO 
ELECTRO-MECHANICAL ENGINEERING



ELECTRIC EXPRESS FOR SALE • 1974 • TOYOTA PICKUP

- ENGINEERED/CONSTRUCTED BY RIC BARLINE - SES/PMC
 - 3200 MILES SINCE 1/83 GROUND-UP CONVERSION USING **ALL NEW PARTS**
 - PRESTO 21HP MOTOR w/CUSTOM ADAPTOR TO STOCK 4-SPEED & RUNNING GEAR
 - 108 VOLT (18 NEW ALCO 2200 6 VOLT DEEP CYCLE BATTERIES)
 - SES 500 AMP TRANSISTOR CONTROLLER
 - ONBOARD, DIRECT AC-DC CONVERTER CHARGER
 - MASTER IN-CAB CIRCUIT BREAKER AND COMPLETE GAUGES
 - HEAVY DUTY SUSPENSION WITH COIL-SPRING OVERLOADS
 - TILT-UP CARGO BED FOR BATTERY ACCESS
 - NEW PAINT 1/83 (STOCK TOYOTA DARK SILVER) WITH MATCHING STEEL 'SPOKER' RIMS
 - NEW STRATTON STEEL RADIALS 3/83
 - INCLUDES: 30 FT., 30 AMP (30 AMP HEAD) & 50 FT., 30 AMP (15 AMP HEAD) EXT. CORDS; SES MANUAL & COMPLETE HISTORY
- THIS LITTLE TRUCK IS DRIVEN DAILY AND OPERATES FLAWLESSLY. ITS RANGE IS 50+ MILES IN THE CITY AND WILL CRUISE COMFORTABLY AT FREEWAY SPEEDS. TRUCK REFERENCES CALL MIKE BROWN (ELECTRO AUTOMOTIVE) (408) 438-3606. OVER \$8,500 INVESTED, ALL REASONABLE OFFERS CONSIDERED

\$4,000 • FRED FORTUNE • (408) 723-1202

FOR SALE

1969 Toyota PMC Controller, Baldor Motor, On Board Charger, 16 Trojan Batteries. Built by EE J. Anderson, at a cost of \$5000. Will sell for \$1000 FIRM. J. Benson (415) 992-5453.

WANTED

QUICK CHANGE ADAPTOR FOR CM77 GENERATOR. CALL Clarence (408) 248-2588 day or night.

FOR SALE

'61 RENUALT, RUNNING, W/J&H G29, 72V, Willey 8 Controller, 12 GOOD Batteries, \$1200/offer. Mike (408) 371-5225

PLEASE!! PLEASE!! SEND ARTICALS,
QUES? WITH or WITHOUT ANS.
THANKS CLARENCE

ADS must be received with payment by the 10th of the month, for the following month's issue. AD rate is min. 1 to 5 lines \$5.00. 1/4 Pg. \$15, Full Pg. \$50.00, Full Pg. 2 sides \$80.00, Wanted Trade, For Sale, etc. Mail to EAA 1249 Lane St. Belmont, CA 94002

WHATS HAP'N

Peninsula

PENINSULA CHAPTER; Meeting for April 6, 1985. 10:00 A.M. at San Bruno Library Auditorium. An interesting talk by Mr. Gene Fowler about "Selecting the Right Motor". Refreshments will be served. See you there.

PG&E

P G & E is sponsoring an ENERGY SHOW at SERRAMONTE SHOPPING CENTER, Daly City, April 11 thru 14, 1985. The EAA will be showing Al Hardage's "AQUILA" car. L.L.L. is showing an ELECTRIC car. Ms. Charity Cheekee is showing her Class "B" Bonneville Salt Flats record setter. Along with all the P.G.& E. material, this will be a very interesting Energy Show. Please plan to attend.

Ted & Mae BENSEN

WANTED

Marathon C-360 Van with captive trailer, condition of body not too important. I want a sound rolling chasis in good structural and mechanical condition for a hybrid project. Do not care about electric motor, transmission, or controller since I will be replacing them.

Charles W. Scheck, 1682 Winchester Rd.
Annapolis, MD 21401 (301) 757-0606

EAA CHAPTERS

Call the contact person for meeting times and places.

ARIZONA: Phoenix Chapter

Greg Whitney 602 849-1872

ARKANSAS: Little Rock Chapter

B.S. Boykin 501 562-0252

CALIFORNIA:

Bakersfield Chapter

James Peters 805 393-1749

Concord: Contra Costa Chapter

Max Rosenstein 415 229-3469

Los Angeles: Burbank Chapter

Il. Weiss 213 849-7632

Oakland: East Bay Chapter

Jim Fahey 415 848-1468

Sacramento Chapter

Cliff Veiles (916) 966-9281.

San Bruno: Peninsula Chapter

Mae Benson 415 992-5453

San Francisco Chapter

Bill Marquardt 415 586-6987

San Jose Chapter

Roy Paulson 408 269-7937

San Rafael: North Bay Chapter

Gordon Schaeffer 415 456-9653

Santa Clara Chapter

Lee Hemstreet 415 493-5892

DISTRICT OF COLUMBIA:

Washington: EVA/DC Chapter

Charles Dammers 301 439-1365

MARYLAND: Baltimore Chapter

D. Michalski 301 289-7896

NEW JERSEY: Moorestown Chapter

Sid Kreitsberg 609 829-2445

OKLAHOMA: Tulsa Chapter

W. E. Watson 918 743-9317

OREGON:

Albany: Linn Benton Chapter

Keith Sherry 503 745-5607

Medford: Rogue River Chapter

George Holbrook 503 772-6856

Salem: Willamette Chapter

Lee Brundidge 503 390-3871

TEXAS: Houston Chapter

Robert Nixon 713 668-4214

WASHINGTON: Seattle Chapter

Steven Lough 206 325-2600

WISCONSIN: Milwaukee Chapter

David Parez 414 481-9655

EDITORS: - Walter Laski - John Newell - Bill Palmer - Paul Brasch - COMPILED AND
PUBLISHED By Clarence Ellers. SEND IN YOUR PERSONAL AND CLUB NEWS AND COMING
EVENTS. ARTICLES _ COMMENTS etc. all correspondence to address below.

Electric
Auto



NEWS

Association

APRIL 1985

1249 Lane St.
Belmont, Ca.
94002

NON-PROFIT
ORGANIZATION
U.S. POSTAGE

PAID

SAN JOSE, CALIF.
PERMIT NO. 3021

TIME DATED MATERIAL - DO NOT HOLD