

**1997**

# **FutureCar Challenge**

**SAE** SP-1359  
INTERNATIONAL





# 1997 FutureCar Challenge

SP-1359



**GLOBAL MOBILITY** DATABASE

*All SAE papers, standards, and selected books are abstracted and indexed in the Global Mobility Database*

Published by:  
Society of Automotive Engineers, Inc.  
400 Commonwealth Drive  
Warrendale, PA 15096-0001  
USA  
Phone: (724) 776-4841

Permission to photocopy for internal or personal use of specific clients, is granted by SAE for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of \$7.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. Special requests should be addressed to the SAE Publications Group. 0-7680-0179-X/98\$7.00.

Any part of this publication authored solely by one or more U.S. Government employees in the course of their employment is considered to be in the public domain, and is not subject to this copyright.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

ISBN 0-7680-0179-X

SAE/SP-98/1359

Library of Congress Catalog Card Number: 97-81274

Copyright © 1998 Society of Automotive Engineers, Inc.

Positions and opinions advanced in this paper are those of the author(s) and not necessarily those of SAE. The author is solely responsible for the content of the paper. A process is available by which the discussions will be printed with the paper if it is published in SAE Transactions. For permission to publish this paper in full or in part, contact the SAE Publications Group.

Persons wishing to submit papers to be considered for presentation or publication through SAE should send the manuscript or a 300 word abstract to: Secretary, Engineering Meetings Board, SAE.

Printed in USA

## PREFACE

The papers in this Special Publication, 1997 FutureCar Challenge (SP-1359), were originally written to fulfill competition requirements from the 1997 FutureCar Challenge. These papers document the design, construction, and performance of ten advanced technology vehicles, which represent the second year of the FutureCar Challenge sponsored by the U.S. Department of Energy and the U.S. Council on Automotive Research (Chrysler, Ford, and General Motors). The sponsors invited these universities to use the most advanced vehicle technologies available to them to modify a mid-size vehicle that approaches 80 miles per gallon (mpg) while still offering the same comfort, safety, and affordability that consumers expect from conventional vehicles. The goals of the competition mirror those set by the Partnership for a New Generation of Vehicle program, a cooperative effort between the federal government and the domestic automobile industry.

Beginning with a conventional Lumina, Intrepid, or Taurus, each university team made whatever modifications were necessary within the constraints of the existing vehicle to approach 80 mpg. Most teams made dramatic changes to the powertrain, added energy storage capability, improved aerodynamics, and attempted to reduce vehicle weight. Safety, energy efficiency, improved emissions characteristics, affordability, and the use of advanced technologies are the cornerstones of the FutureCar Challenge. These vehicles represent some of the most innovative advanced technology vehicles ever attempted. The technical reports that were a scored event in this competition are presented in this volume to record design rationale, engineering features, and performance of these unique vehicles. The vehicle's technical specifications and performance summary from the competition are shown in Table A; the results summary is shown in Table B.

These teams competed in a series of dynamic and static events at the GM Technical Center in Warren, Michigan. Emissions testing and fuel economy assessment took place at the U.S. Environmental Protection Agency National Vehicle and Fuel Laboratory in Ann Arbor, Michigan. The teams then embarked on an over-the-road endurance event from Warren to Washington, DC, where they participated in a vehicle display and awards ceremony on Capitol Hill.

The papers in this publication cannot fully convey the dedication and considerable effort demonstrated by the students and faculty to design and build not only an advanced car, but a concept for a new generation of vehicles. On behalf of all the participants and organizers of these competitions, we extend many thanks to those companies that made these competitions possible through financial contributions, in-kind support, and the dedication of their staffs.

Key Sponsors of the 1997 FutureCar Challenge included the U.S. Department of Energy, United States Council for Automotive Research, Chrysler Corporation, Ford, and General Motors. Other sponsors included the U.S. Environmental Protection



# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.