TRANSPORTATION ENERGY EFFICIENCY PROGRAM (TEEP) REPORT ABSTRACTS

M.B. Munroe



APRIL 1977
DRAFT REPORT

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16. Abstract

This bibliography summarizes the published research accomplished for the Department of Transportation's Transportation Energy Efficiency Program and its predecessor, the Automotive Energy Efficiency Program. The reports are indexed by corporate author, personal author, report number, and subject.

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PREFACE

This bibliography summarizes the published research accomplished for the Department of Transportation's Transportation Energy Efficiency Project and its predecessor, the Automotive Energy Efficiency Project. The report is separated into three The first section contains abstracts of reports which sections. are or will soon be available from the National Technical Information Service, Springfield, Virginia 22161. The reports which are not yet available are indicated by the suffix "U" after the report number. The second section includes abstracts of working papers and preliminary memoranda; these documants are available only with the approval of the author or program manager. The final section contains abstracts of reports which were requested by the Congress. These reports were accomplished by the Transportation Systems Center in cooperation with other government agencies, and are not solely the work of the Center.

The report abstracts are indexed by corporate author, personal author, report number, and subject.

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All other reports are now available to the public through the National Technical Information Service, Springfield, Virginia, 22161.

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Supplementary Notes

April 1973

etroleum products makes the transportation sector vulnerable to inreased prices of petroleum or insecure sources of petroleum. Since
he dependence of transportation upon imported petroleum is projected
o increase substantially over the next two decades, both short-and
ong-term remedial actions should be initiated now and in the next
ew years because of the long time needed to bring about evolutionary
hanges in the Nation's transportation systems. Possible remedial
ctions include:

- 1. Technological improvements for more efficient use of petroleum by transportation.
- 2. Technological changes to permit greater use of non-petroleum energy resources by transportation.
- 3. Shift of transportation demand to more efficient modes from less efficient modes.
- 4. Reduction of demand for transportation services.

ransportation energy demand projections are given and R&D tasks in ach of the first three categories are assessed.

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This report presents a summarization and assessment of available information pertaining to the potential for implementing mass production of gas turbine engine-powered automobiles. The main topic covered is the schedule requirement for that implementation. Emphasis has been directed toward identifying those critical or limiting factors affecting timely introduction of gas turbine engine concepts on a mass production basis. A description of basic automotive product development phases, engine manufacturing processes, and gas turbine engine current technology status are included to clarify and augment the discussions, and to permit the necessary understanding of the developed implementation schedules.

ANN ARBOR, MICHIGAN 48105

Based on data acquired during the period February 28 to April 30, 1973, a period of 8 to 10 years is a best estimate of the elapsed time until 300,000 gas turbine engines are mass produced annually. This estimate is based on a postulated overall product development schedule of slightly more than 11 years. Prior to major commitment of capital resources necessary for adherence to this schedule, automobile manufacturers must resolve three major issues: 1) improvements in engine fuel economy and exhaust emissions, 2) development of new mass production fabrication processes directed at reducing engine unit cost, and 3) statistical evidence of engine durability in fleet test cars.

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Supplementary Mates		

. Abstract

This report discusses federal legislation and regulations affecting, or having the potential to affect, the design and manufacture of motor vehicles.

The regulations included in this report are those in effect as of April 1, 1974. This report does not reflect changes in automobile emission standards under the Clean Air Act, which would result from enactment of H.R. 14368, the "Energy Supply and Environmental Coordination Act of 1974". Appendix E describes these changes.

Federal Legislation, Motor Vehicle Design, Auto- mobile Design		DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161	
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Potential improvements in tire power transmission efficiency are worth seeking for gaining improved automotive fuel economy. Summaries herein of tire rollin resistance as influenced by tire construction and design, tire materials, and tir operating conditions indicate clearly that current trends towards smaller, lighter automobiles and increasing usage of radial tires, in addition to reduced speed levels are positive contributions in their effort. Difficulties in obtaining accurat and relevant data are discussed, including the capabilities existing and new testimachinery, and the necessity for adopting standardized testing methods for tire

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16. Abstract

This report reviews the available information on methanol as related to its potential use as an automotive fuel. Information gaps critical to assessment and future decisions are delineated and suggestions made for necessary R&D efforts. In this context, methanol is characterized and the results of various studies on methanol and methanol-gasoline blends, throughout the United States and elsewhere, are presented and compared. These studies encompass fuels and their use and effects in engines and vehicles. Cost information, although limited, is given as available. The report also describes and summarizes methanol production processes; their promise and expansion possibilities in relation to potential requirements. Various raw material sources are considered in the light of future production potential needs.

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16. Abstract	Camb	ridge MA 02142		
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bility of reducing the	fuel consum	ption of automo	biles. The	e studv
uses as a reference inf	ormation de	rived from lite	rature, au	tomobile
industry contacts, and	testing con-	ducted as part (of the pro	gram
requirements. The design	n changes, i	which are recomi	mended for	the pur-
pose of maximizing fuel	economy, h	ave been derive	d after lei	ngthv review
against a series of con	straints in	cluding regulate	ory require	ements,
technical feasibility,	and cost ef	fectiveness.		
Several possible t	echnologica	l improvements	are identi	fied.
documented, and evaluat	ed with res	pect to fuel ec	onomy. Resi	ilts are
reported as percentage	improvement	in fuel economy	y by compai	rison with
1973 model year vehicle	s. The eff	ect of vehicle o	emission co	ontrol
systems is considered in	n the evalua	ation procedure		
The most promising	individual	improvements as	re incorno	rated into
three synthesized vehic	le designs.	and the project	ted fuel ed	CONOMY
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17. Key Words Automobiles, Fi	uel Economy	18. Distribution Statement		
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4. Title and Subtitle		Dec	ember 1974	
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7. Author/s)		1	-TSC-OST-7	
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16. Abstract	Cambridg	e MA 0214	12	
industry contacts, and to requirements. The design pose of maximizing fuel of against a series of constechnical feasibility, and Several possible ted documented, and evaluated reported as percentage in 1973 model year vehicles systems is considered in	n changes, which economy, have be traints including nd cost effective chnological improduct to furnity of the effect of	are recomenderived gregulator eness. ovements a ofuel economy vehicle e	mended for lafter ler pry require identify nomy. Responds to the company of the c	the pur- ngthy revie ments, fied, sults are rison with
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1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT-TSC-OST-74-39.11B	PB 238 679	1
4. Title and Subtitle TECHNOLOGICAL IMPROVEME FUEL CONSUMPTION	NTS TO AUTOMOBILE	5. Report Date December 1974
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9. Performing Organization Name and Address Southwest Research Inst		10. Work Unit No. (TRAIS) QS514/R5523
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15. Supplementary Notes	U.S. Department o	of Transportation
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16. Abstract		
This report is a p	reliminary survey of th	e technological feasi-
bility of reducing the	fuel consumption of aut	comobiles. The study
uses as a reference inf	ormation derived from 1	iterature, automobile
industry contracts, and	testing conducted as p	art of the program
requirements. The desi	gn changes, which are r	ecommended for the pur-
pose of maximizing fuel	economy, have been der	ived after lengthy review
against a series of con	straints including regu	latory requirements,
technical feasibility,	and cost effectiveness.	9
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documented and evaluate	echnological improvemen	its are ident; led
documented, and evaluat	ed with respect to fuel	economy. Rt lits re
1077 model ween webigle	improvement in fuel eco	nomy by comparison with
1973 model year vehicle	s. The effect of vehic	le emission control
systems is considered i	n the evaluation proced	ure.
The most promising	individual improvement	s are incorporated into
improvement for these v	abicles is reperted	s are incorporated into
improvement for these v	enicles is reported.	
The status of the	technology reported is	that available in the
time period of July 197	7 to Tanuary 1074	that available in the
Volume II consists	of two parts, Volume II	A and Volume II B.
17. Key Words Automobiles, Fu	el Economy, 18. Distribution States	ment
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4. Title and Subtitle A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION Volume I: Executive Summary		5. Report Date December 1974	
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7. Author's) Donald A. Hurter et al		DOT-TSC-OST-74-40.I	
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A study was conducted to determine potential improvements in automobile fuel consumption based on innovative design and components. Standard and compact-size reference vehicles were selected, and a study of how power is used was conducted. Obvious technological innovations (e.g., powerplants (such as spark-ignited, turbocharged, stratified charge, electronic fuel injected, and diesel), transmissions and drive train systems, tires, accessories and auxiliaries, aerodynamics, and weight) that would save on fuel consumption were identified and evaluated, and then screened against program constraints. Operation of reference vehicles equipped with innovative components or redesigned was computer-simulated to predict fuel usage and performance. Techniques to measure fuel economy performance were also developed, and a statistical evaluation of published driving modes was performed. Compliance of innovative components with constraints (such as emissions and safety) and user requirements was determined. Optimized synthesized standard and compact-size vehicles were simulated and total systems evaluation of each vehicle was performed on the basis of fuel usage, performance, technical compatibility, compliance with constraints, user acceptability, and manufacturer adaptability. Synthesized vehicles were ranked in accordance with study objectives, and conclusions and recommendations on designs were drawn. Program plans for synthesized vehicles were also selected.

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4. Title and Subtitle A STUDY OF TECHNOLOGICA	I. IMPROVEMENTS	5. Report Date December 1974
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION Volume II: Comprehensive Discussion		6. Performing Organization Code
7 Author's)		8. Performing Organization Report No.
Donald A. Hurter et al		DOT-TSC-OST-74-40.11
9. Performing Organization Name and Address	13	10. Work Unit No. (TRAIS) OS 514/R5523
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4. Title and Subtitle A STUDY OF TECHNOLOGICA	I. IMPROVEMENTS	5. Report Date December 1974
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7. Author's) Donald A. Hurter et al		8. Performing Organization Report No. DOT-TSC-OST-74-40.IIIA
9. Performing Organization Name and Address Arthur D. Little, Inc.*		10. Work Unit No. (TRAIS) OS514/R5523
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A study was conducted to determine potential improvements in automobile fuel consumption based on innovative design and components. Standard and compact-size reference vehicles were selected, and a study of how power is used was conducted. Obvious technological innovations (e.g., powerplants (such as spark-ignited, turbocharged, stratified charge, electronic fuel injected, and diesel), transmissions and drive train systems, tires, accessories and auxiliaries, aerodynamics, and weight) that would save on fuel consumption were identified and evaluated, and then screened against program constraints. Operation of reference vehicles equipped with innovative components or redesigned was computer-simulated to predict fuel usage and performance. Techniques to measure fuel economy performance were also developed, and a statistical evaluation of published driving modes was performed. Compliance of innovative components with constraints (such as emissions and safety) and user requirements was determined. Optimized synthesized standard and compact-size vehicles were simulated and total systems evaluation of each vehicle was performed on the basis of fuel usage, performance, technical compatibility, compliance with constraints, user acceptability, and manufacturer adaptability. Synthesized vehicles were ranked in accordance with study objectives, and conclusions and recommendations on designs were drawn. Program plans for synthesized vehicles were also selected.

Vol. III is divided into two parts, Vol. IIIA and IIIB.

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7 Author(s) Donald A. Hurter et al		DOT-TSC-OST-74-40.IIIB
9. Performing Organization Name and Addre Arthur D. Little, Inc. Acorn Park	ss *	OS514/R5523 11. Contract or Grant No.
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16. Abstract

A study was conducted to determine potential improvements in automobile fuel consumption based on innovative design and components. Standard and compact-size reference vehicles were selected, and a study of how power is used was conducted. Obvious technological innovations (e.g., powerplants (such as spark-ignited, turbocharged, stratified charge, electronic fuel injected, and diesel), transmissions and drive train systems, tires, accessories and auxiliaries, aerodynamics, and weight) that would save on fuel consumption were identified and evaluated, and then screened against program constraints. Operation of reference vehicles equipped with innovative components or redesigned was computer-simulated to predict fuel usage and performance. Techniques to measure fuel economy performance were also developed, and a statistical evaluation of published driving modes was performed. Compliance of innovative components with constraints (such as emissions and safety) and user requirements was determined. Optimized synthesized standard and compact-size vehicles were simulated and total systems evaluation of each vehicle with performed on the basis of fuel usage, performance, technical compatibility, compliance with constraints, user acceptability, and manufacturer adaptability. Synthesized vehicles were ranked in accordance with study objectives, and conclusions and recommendations on designs were drawn. Program plans for synthesized vehicles were also selected.

Vol. III is divided into two parts, Vol. III A and Vol. III B.

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	Cambridge MA 02142	

This report presents a brief summarization of available information pertaining o proposed concepts for improved automotive carburetors.

In particular, information is provided which depicts the development and erformance characteristics of a selected number of advanced, novel, or new caruretors which have been brought to the attention of the Department of Transportation s having the potential to improve automotive fuel economy. To provide a basis f perspective, a discussion of the basic requirements, construction, method of peration, and inherent limitations of conventional carburetors and induction ystems is also included.

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4. Title and Subtitle FIEL CONSUMPTION OF TRA	ACTOR-TRAILER TRUCKS AS	5. Report Date November 1975
AFFECTED BY SPEED LIMIT		6. Performing Organization Code
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7. Author(s) Anthony J. Broderick		DOT-TSC-OST-75-3
9. Performing Organization Name and Addre	5 \$	10. Work Unit No. (TRAIS)
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16. Abstract

The effect of speed limit and payload weight on fuel consumption was determined in tests of tractor-trailer rigs. Two virtually identical vehicles were used, one loaded with a 28,000 lb payload and the other carrying 42,000 lbs; each was driven over two different sets of terrain on the Massachusetts Turnpike at simulated speed limits of 50,55 and 60 mph. Onboard TSC observers recorded data on tank-measured fuel consumption, trip average speed, etc. An analysis of the data led to the following conclusions: (1) Increased fuel consumption results from higher speed limits in the range of 50-60 mph; (2) Terrain is an important factor in determining the effect of speed limit on fuel consumption; (3) A payload increase from 28,000 lbs to 42,000 lbs is carried at no detectable increase in fuel consumption for the "hilly" route, and less than a 7 percent increase in fuel consumption for the route including a crossing of the Berkshire Mountains.

17. Key Words		18. Distribution States	nent	
Tractor-Trailer Trucks, Fuel Consumption Payload Weight	-1	THROUGH	T IS AVAILABLE TO THE THE NATIONAL TECHN FION SERVICE, SPRINGF 22161	ICAL
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EFFECT OF VARIATION OF SPEED LIMITS ON INTER- CITY BUS FUEL CONSUMPTION, COACH AND DRIVER UTILIZATION, AND CORPORATE PROFITABILITY 7. Author's) A.J. Broderick, P. Davis, L. Leist, H. Miller, and E. Klaubert	
EFFECT OF VARIATION OF SPEED LIMITS ON INTER- CITY BUS FUEL CONSUMPTION, COACH AND DRIVER UTILIZATION, AND CORPORATE PROFITABILITY 7. Author's) A.J. Broderick, P. Davis, L. Leist, H. Miller, and E. Klaubert	
UTILIZATION, AND CORPORATE PROFITABILITY 7. Author's) A.J. Broderick, P. Davis, L. Leist, H. Miller, and E. Klaubert	5. Report Date November 1975
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16. Abstract

The effect of speed limit and passenger load on fuel consumption was determined using actual intercity buses with simulated passenger loads over different types of terrain. In addition to road tests, laboratory type measurements were made on four intercity buses. Studies were also made to ascertain the effect of reduced speed limits on maintenance and operations. Principal conclusions were: 1) Increased fuel consumption results from higher speeds in the 50-60 mph range; 2) Terrain is an important factor in determining the effect of speed limit on fuel consumption; 3) No significant fuel savings are expected for intercity buses if speed limits are reduced in the 50-60 mph range over mountainous terrain; and 4) Reducing speed limits should reduce maintenance costs but increase direct operating costs.

17. Key Words		18. Distribution Statem	rent	
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4. Title and Subtitle	PB 251	592	5. Report Date	
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7. Author(s) Hans C. Joksch			8. Performing Organizat DOT-TSC-OST-75-	
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The literature was re relations between automobil On the assumption of four f	e size and the	frequency of o	ccupant death and	i injuny.
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4. Title and Subtitle LEAN MIXTURE ENGINE	S	5. Report Date November 1975
TESTING AND EVALUAT	ION PROGRAM	6. Performing Organization Code
Volume I: Executive Sum	mary	8. Performing Organization Report No.
7. Author's) Mack W. Dowdy, Tom G. Vanderbrug	Frank W. Hoehn and	JPL 5040-12, Vol. I DOT-TSC-OST-75-26.I
9. Performing Organization Name and Addr	*	10. Work Unit No. (TRAIS) OS 614/R6506
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*Under Contract to: U.S. Department of Transportation

Transportation Systems Center, Kendall Square

Cambridge, MA 02142

16. Abstract

This report is aimed at defining analytically and demonstrating experimentally the potential of the "lean-burn concept". Fuel consumption and emissions data are obtained on the engine dynamometer for the baseline engine, and two lean-burn configurations of the same engine and data comparisons are made. Individual cylinder equivalence ratios are measured to evaluate the cylinder-to-cylinder distribution. Pressure-time traces from individual cylinde are used to get information about ignition delay, combustion duration and cycle-to-cycle pressure variations. Fuel consumption and emissions data for one lean burn configuration are obtained over the Federal Driving Cycle using a chassis dynamometer and the results are compared with the stock baseline results. Using experimental results and information from the existing literature, the potential of the "lean-burn concept" is assessed using the Blumberg-Kummer cycle analysis program.

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19. Security Classif. (of this report) UNCLASSIFIED	20. Security Classif. (of this page) UNCLASSIFIED	21. No. of Pages 30	22. Price

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LEAN MIXTURE ENGINES TESTING AND EVALUATION PROGRAM Volume II: Comprehensive Discussion R. Per Mack W. Dowdy, Frank W. Hoehn and Tom G. Vanderbrug Performing Organization Name and Address Jet Propulsion Laboratory* 4800 Oak Grove Drive Pasadena, CA 91103 12. Sponsering Agency Name and Address II. S. Dont of Transpoortation Office of the Secretary F	cipient's Catalog No.
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16. Abstract

This report is aimed at defining analytically and demonstrating experimentally the potential of the "lean-burn concept." Fuel consumption and emissions data are obtained on the engine dynamometer for the baseline engine, and two lean-burn configurations of the same engine and data comparisons are made. Individual cylinder equivalence ratios are measured to evaluate the cyclinder-to-cylinder distribution. Pressure-time traces from individual cylinders are used to get information about ignition delay, combustion duration and cycle-to-cycle pressure variations. Fuel consumption and emissions data for one lean-burn configuration are obtained over the Federal Driving Cycle using a chassis dynamometer and the results are compared with the stock baseline results. Using experimental results and information from the existing literature, the potential of the "lean-burn concept" is assessed using the Blumberg-Kummer cycle analysis program.

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16. Abstract

This study assesses automobile driveline components and configurations, quantifying their performance as possible in the context of such current issues as fuel economy, exhaust emission reduction, safety, driveability, production costs and lead times, and engine life. The current and projected driveline technology is described. The results of simulation studies using the DOT/TSC Vehicle Simulation Program to analyze vehicles incorporating various driveline components and configurations in relation to fuel economy, acceleration, emissions and other factors of interest are also reported.

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This interim report presents the results of the first phase of a two-part program to investigate methods of improving fuel consumption and reducing exhaust emissions for in-service diesel engines used as prime movers in locomotives and several classes of Coast Guard vessels. The engines are large, medium-speed units with individual cylinder displacements in excess of 150 in and power ratings from 2000 to 4000 brake horsepower. The study that is the subject of this report utilizes information that was obtained from the technical literature and from interviews of engine manufacturers, railroads, and engineering staffs of Coast Guard vessels.

Several methods were investigated for their potential to reduce fuel consumption and emissions, within the constraint of maintaining adequate locomotive and vessel operating flexibility and engine life. These methods included the retrofit of engines with existing state-of-the-art components (e.g., injectors, governor, turbocharger) of improved design, the adjustment of injection timing, and changes in engine operating modes (speed-power points). The effects of engine wear and maintenance on fuel consumption and emissions were investigated, as were the effects of ambient air properties (temperature, pressure, humidity).

The conclusions reached at the end of Phase I of the program resulted in several recommendations for additional investigation or evaluation by actual testing in Phase II.

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16. Abstract

A study of truck fuel economy was undertaken for the U.S. Department of Transportation as a continuation of the Study of Technological Improvements in Automobile Fuel Consumption, report number DOT-TSC-OST-74-40.I-IV. The truck types that accounted for most of the fuel consumed were identified and modeled by computer analysis. Baseline fuel consumption was calculated for the major truck types over specific duty cycles. Design improvements in the truck were then modeled, and the effect on fuel economy was estimated. Those improvements considered cost effective and capable of meeting manufacturing and performance criteria were examined further for their economic impact. Total life cycle costs for the incorporation of improvements were developed for single improvements and combinations of improvements.

The study results indicated that fuel economy gains of up to 40% could be made in Classes I and II, 70-80% in Class VI van-type local delivery trucks, 15-30% in Class VIII depending on the type of truck and use. These four classes account for over 85% of the fuel consumed by the entire truck fleet.

It appears that the technological changes required to mass produce these more fuel efficient vehicles could be accomplished in the 1980's.

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16. Abstract

This report reviews stratified charge concepts and engines, with emphasis on the important issues of exhaust emissions, fuel economy, and performance. Divided and open chamber designs are discussed. Potential improvements in exhaust emissions and fuel economy are considered in detail.

Significant engine programs discussed include those of the Ford, Texaco, and Honda companies. Other variations are described as information is available. Results of programs for the test and evaluation of newly developed and modified conventional engines, particularly engines in test vehicles, are provided.

A special addendum provides additional information current to March 1975, gleaned primarily from "Requests for Suspension of 1977 Emission Standards," filed by several of the automobile manufacturers.

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16. Abstract

This volume contains working papers presented at the Project Coordination Meeting of the Automotive Energy Efficiency Program held at the DOT Transportation Systems Center, November 4-6, 1975. This program is the Federal Government's major effort to assess the capability of the automotive industry to significantly improve the fuel economy of production vehicles and assess the related socioeconomic effects.

The primary objective of the conference was to report on progress to date and future plans of the AEEP as well as to promote the exchange of information between government, industry, and university investigators.

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are included in this vi	olume. Some	are abetrac	te on conice	of visual
material, while others	are formal	technical pa	ipers.	
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17. Key Words Fine 1 Economy Emission (18. Distribution State	ment	
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16. Abstract

On October 8, 1974, President Ford announced the goal of a 40% improvement in fuel economy of automobiles to be achieved in the 1980 new car fleet compared to 14.0 MPH for 1974. The Secretary of Transportation was given the lead in developing the program to evaluate manufacturers' progress to achieve their fuel economy goals, to make periodic analyses of future plans of each manufacturer, and to report findings to the Energy Resource Council. This report discusses the domestic manufacturers' progress to date, reviews the manufacturers' future plans in general, and assesses the likelihood of their meeting the goals.

17. Key Words	1	B. Distribution Stateme	ent	
Data Base Fuel Economy		THROUGH THE	AVAILABLE TO THE NATIONAL TECHNIC SERVICE, SPRINGFII	CAL
19. Security Classif. (of this report) Unclassified	20. Security Classif Unclassif		21- No. of Pages 24	22. Price

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4. Title and Subtitle		
Highway Vehicle Retrofit	Evaluation	5. Report Date November 1976
Phase II Report Testing and Final Evaluation	ion Results	6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No.
M. G. Hinton, L. Forrest	W. B. Lee	DOT-TSC-OST-76-19
9. Performing Organization Name and Addre The Aerospace Corporatio	n*	10. Work Unit No. (TRAIS) OS514/R5523
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U.S. Department of Transportation Office of the Secretary Office of the Asst. Sec. for Sys. Dev. & Tec.		November 1975 - November 1976
Washington, DC 20590	ring	14. Sponsoring Agency Code
5. Supplementary Notes	U.S. Department of T	rangportation
Under contract to:	Transportation System Kendall Square	ns Center
6. Abstract	Cambridge, MA 02142	2

This report presents the results of engine dynamometer and vehicle chassis dynamometer tests conducted with selected automotive retrofit devices in the classes of ultrasonic carburetors, high-velocity intake manifolds, tuned exhaust systems, and high energy ignition systems. The test results obtained by the two test methods are compared and discussed.

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9. Performing Organization Name U.S. Energy Research Bartlesville Energy R	and Development Admin	nistration*	10. Work Unit No. (TRAIS) OS614/R6506 11. Contract or Grant No.
7. Author's) W.F. Marshall and K.R			DOT-TSC-OST-76-22
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4. Title and Subtitle	Haya"	5. Report Date October 1976	
1975 AUTOMOTIVE CHARACTERISTICS DATA BASE		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) Moses Rouse and William Basham		DOT-TSC-OST-76-27	
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15. Supplementary Notes

16. Abstract

A study of automobile characteristics as a supportive tool for auto energy consumption, fuel economy monitoring, and fleet analysis studies is presented. This report emphasizes the utility of efficient data retrieval methods in fuel economy analysis, statistical data reporting, and fleet mix analysis. The methods of vehicle sample selection, computation methods for statistical reports, illustrative output examples, and instructions for operating the data base are presented in order to fully represent the 1975 automobile fleet characteristics. A statistics section in this report contains information that is useful in econometric modeling and the determination of automobile design characteristics.

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FUEL CONSUMPTION, EMISSIONS AND POWER CHARACTERISTICS OF THE 1975 CHEVROLET 350-CID 2V AUTOMOTIVE ENGINE— EXPERIMENTAL DATA		6. Performing Organization Code
		8. Performing Organization Report No.
7. Author's) W. F. Marshall and K. R.	Stamper	DOT-TSC-OST-76-36 BERC/OP-76/19
9. Performing Organization Name and Address U.S. Energy Research and Development Administration*		10. Work Unit No. (TRAIS) OS514/R6517T
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U.S. Department of Transportation of the Secretary		May-June 1975
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15. Supplementary Notes		
*Interagency Agreement with: Transportation Systems Ce Kendall Square		
	Cambridge MA 02142	
16. Abstract		

Experimental data were obtained in dynamometer tests of the 1975 Chevrolet, 350 cubic-inch displacement, 2-bbl engine, to determine the steady-state fuel consumption and emissions of hydrocarbon, carbon monoxide and oxides of nitrogen. These data were obtained in detail adequate to construct performance maps for the entire speed/load operating range of the engine.

The objective of the test work was to obtain data that describe engine performance characteristics in engineering terms; the data are so presented. The comparative or judgmental assessment of engine performance was not an objective and such assessment is avoided.

17. Key Words IC Engines	18. Distribution Statement		
Fuel Economy Fuel Consumption Auto Emissions	THROUGH THE NA	AILABLE TO THE U.S ATIONAL TECHNICA RVICE, SPRINGFIEL	L
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7. Author(s)		8. Performing Organization Report No.	
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Development and Technology Washington DC 20590		14. Sponsoring Agency Code	
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16. Abstract

Vehicles that do not consume fuel are examined to determine if they should be included under the provisions of the Motor Vehicle Information and Cost Savings Act, as amended by Title III of the Energy Policy and Conservation Act. The manner of comparing energy requirements of these vehicles with energy requirements of fuel-consuming vehicles is considered, as is the application of the Act to vehicles that do not consume fuel, their market potential, and the effects of regulations on their production and their introduction into commerce.

17. Key Words	
Life-Cycle	Costs, Lead-Acid
Batteries,	Nickel-Zinc Batteries,
Lithium/Alu	uminum-Iron Sulfide
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18. Distribution Statement

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	LES-PER-GALLON METERS GASOLINE IN AUTOMOBILES	5. Report Date October 1976 6. Performing Organization Code TSC-640 8. Performing Organization Report No.
7. Audior's) M. Stephen Huntley, Jr.	, William Z. Leavitt	DOT-TSC-OST-76-38
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15. Supplementary Notes		
This report is the response to a requirement of the	onse of the U.S. Departm	ment of Transportation

This report is the response of the U.S. Department of Transportation to a requirement of the Energy Policy and Conservation Act (PL-163) for an assessment of fuel flow instruments reading directly in miles per gallon (mpg). The report describes currently available mpg meters, their intallation, utility, and safety and presents an analysis of potential cost savings. It discusses means of encouraging purchase and the use of mpg meters as add-on equipment and considers issues associated with the mandatory installation of mpg meters in new cars. It concludes that it has not yet been demonstrated that the use of available mpg meters will improve fuel economy for typical drivers. It recommends that the Congress not require that each new automobile be equipped with an mpg meter and that no action be taken to promote the use of mpg meters in used cars at this time. Appendix A discusses other driver aids for conserving gasoline. Appendix B contains a summary to the request for information and public comment on fuel flow meters.

17. Key Words	18. Distribution States	ment	
Driver Aids	THROUGH THE N	/AILABLE TO THE U.S. P ATIONAL TECHNICAL ERVICE, SPRINGFIELD,	UBLIC
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OMPUTER-BASED RESOURC UTOMOBILE TECHNOLOGY	E ACCOUNTING MODEL FOR IMPACT ASSESSMENT	6. Performing Organization Code
		8. Performing Organization Report No.
7. Author's) . Barton DeWolf, Chri	stian Davis, Peter C. Heinemann	R-938
9. Performing Organization Name a	10. Work Unit No. (TRAIS) OS-T14/R6517T	
The Charles Stark Drap 18 Albany Street	er Laboratory, Inc.	11. Contract or Grant No. DOT-TSC-1021
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15. Supplementary Notes	U.S. Department of Transportat	ion
*Under contract to:	Transportation Systems Center Kendall Square	
	Cambridge MA 02142	

16. Abstract

A computer-implemented resource accounting model has been developed for assessing resource impacts of future automobile technology options. The resources tracked are materials, energy, capital, and labor. The model has been used in support of the Interagency Task Force on Motor Vehicle Goals Beyond 1980. The report describes the methodology.

Annual production requirements for up to thirty materials are accumulated. Projected demand is disaggregated among primary and secondary materials, imports and domestic sources. Capital and labor impacts of auto design changes, disaggregated by two-hundred industries are determined using a modified input/output model.

17. Key Words Resource Accounting Automobile Motor Vehicles Materials Energy		tput Model gy Assess-	THROUGH THI	AVAILABLE TO THE LE NATIONAL TECHNIC N SERVICE, SPRINGFIE	AL	
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FUEL CONSUMPTION, EMISS	SIONS, AND POWER	November 1976
CHARACTERISTICS OF THE	1975 DATSUN 119-CID	6. Performing Organization Code
AUTOMOTIVE ENGINEEXP	ERIMENTAL DATA	
7. Author's)		8. Performing Organization Report No.
W.F. Marshall and K.R.	Stamper	BERC/OP-76/16
9. Performing Organization Name and Addres		
U.S. Energy Research and Dev		10. Work Unit No. (TRAIS)
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Office of the Secretary	3401011	July 1975
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Office of Systems Engineering Washington DC 20590	ng	14. Sponsoring Agency Code
15. Supplementary Notes	U.S. Departm	ent of Transportation
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Experimental data were obtained in dynamometer tests of the 1975 Datsun, 119 cubic-inch displacement, 2-bbl engine to determine steady-state fuel consumption and emissions of hydrocarbon, carbon monoxide, and oxides of nitrogen. These data were obtained in detail adequate to construct performance maps for the entire speed/load operating range of the engine.

The objective of the test work was to obtain data that describe engine performance characteristics in engineering terms; the data are so presented. The comparative or judgmental assessment of engine performance was not an objective and such assessment is avoided.

17. Key Words		18. Distribution States	nent	
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	, AND POWER CHARACTERISTICS	November 1976
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7. Author's) W. F. Marshall and K. R. St	amper	BERC/OP-76/15
9. Performing Organization Name and Address U.S. Energy Research and De	10. Work Unit No. (TRAIS) 0S714/R7508	
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15. Supplementary Notes	U.S. Department of Tran	sportation
*Interagency Agreement with	Center	
16. Abstract	Cambridge MA 02142	

Experimental data were obtained in dynamometer tests of the 1975 Ford, 140 cubic-inch displacement, 2-bbl engine to determine steady-state fuel consumption and emissions of hydrocarbon, carbon monoxide, and oxides of nitrogen. These data were obtained in detail adequate to construct performance maps for the entire speed/load operating range of the engine.

The objective of the test work was to obtain data that describe engine performance characteristics in engineering terms; the data are so presented. The comparison or judgment of engine performance was not an objective and such assessments are avoided.

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4. Title and Subtitle SURVEY OF DRIVER AID DEVICE	ES	5. Report Date November 1976 6. Performing Organization Code
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7. Author's) M. G. Hinton, L. T. H. Davey, R. F	Forrest, D. P. Duclos, R. Sheahan, K. B. Swan	8. Performing Organization Report No. DOT-TSC-OST-76-45
9. Performing Organization Name and Addr. Aerospace Corporation*		10. Work Unit No. (TRAIS) OS-T14 / R7514
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15 Supplementary Notes U.S. Department of		
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16 Abstract		· · · · · · · · · · · · · · · · · · ·

This report presents a brief summarization of available information pertaining to devices offered to aid the driver in improving his driving habits in order to reduce fuel consumption.

Principal emphasis is placed on characterizing the available devices in terms of their features and operating principles. When appropriate, possible side effects (e.g., safety considerations) occasioned by the use of such devices are examined. The available fuel economy test data for drivers who had received training only (no auxiliary or aid devices) are reviewed for comparison purposes.

17. Key Words			18. Distribution States	nent (ii	
Driver aids Manifold vacuum gages Flowmeters Accelerometers	Accelera feedbac Pyromete Cruise c	ers	THROUGH THE	VAILABLE TO THE PUBLICATIONAL TECHNICAL ERVICE, SPRINGFIELD,	LIC
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7. Author(s) Kenneth M. Jacobs	TO THETE RESTRACTOR A	8. Performing Organization Report No. DOT-TSC-OST-76-47
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15. Supplementary Notes	U.S. Department of Tr Transportation System	
*Under contact to:	Kendall Square Cambridge MA 02142	

This report presents fuel consumption and other data on comparable diesel and gasoline trucks. The data was compiled from actual, operational records of the Maine Department of Transportation for trucks of about 24,000 pounds gross vehicle weight and 150 to 180 horsepower. Information on the use of other petroleum based products such as engine oil and lubes is also given, together with initial maintenance costs.

The information is broken down in various ways as the original data source allowed. In particular, information is given on winter and summer operations so that it is possible to consider the effects of different seasonal effects, such as usage, in the comparisons. The period covered is from 1972 through 1976.

In general, the diesel trucks used approximately one-third less fuel than comparable gasoline trucks.

17. Key Words Diesel Truck Gasoline Truck Fuel Usage	DE COMMA COMMA	ribution Statement OCUMENT IS AVAILA HROUGH THE NATION	NAL TECHNICA	L.
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4. Title and Subtitle AGGREGATE AUTO TRAVEL	5. Report Date December 1976	
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7. Audior(s) Robert E. Mellman		DOT-TSC-OST-76-51
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16. Abstract

This report reviews existing forecasting models of auto vehicle miles of travel (VMT), and presents evidence that such models incorrectly omit time cost and spatial form variables. The omission of these variables biases parameter estimates in existing VMT models. More accurate parameter estimates are made, and suggestions are made for improving VMT models.

Accurate VMT models are important because VMT is a primary determinant of auto fuel use, pollution, and traffic fatalities; because the federal government is considering regulations to lower the levels of these externalities; and because future levels of the externalities must be measured in order to calculate the benefits to be derived from such federal regulation.

17. Key Words		18. Distribution Statement		
Auto Travel Forecast VMT Model		THROUGH THE NA	AILABLE TO THE U ATIONAL TECHNIC RVICE, SPRINGFIE	AL
19. Security Classif. (of this report) Unclassified	20. Security Closs Unclass	sif. (of this page) ified	21- No. of Pages 46	22. Price

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FUEL ECONOMY: A STATI	ISTICAL EVALUATION	6. Performing Organization Code
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7. Author's)		8. Performing Organization Report No.
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turer's new car fleet. estimation methods wer uncertainty identified based on limited avail cannot determine avera the increment to be us to manufacturers under (PL 94-163). Alternat the estimates were idewas quantified. Resul	ed in specifying financ the Energy Policy and (ive procedures for reduced	ch automobile manufac- n and fuel economy ically and sources of ion of these methods, at current estimates ing 0.1 miles per gallon, ial penalties and credits Conservation Act cing uncertainties in ntial impact on accuracy

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4. Title and Subtitle FIELD EVALUATION OF MILES-	-PER-GALLON METERS	5. Report Date October 1976
TIBER BYTESTITION OF THE		6. Performing Organization Code
7. Author's) Roger A. Banowetz and Loui	ls J. Bintz	8. Performing Organization Report No. Project No. TSC/640-0235 GF
9. Performing Organization Name and Add Automotive Engineering Dep	partment*	10. Work Unit No. (TRAIS) OS714/R7508
Automobile Club of Souther 2601 South Figueroa Street Los Angeles, California 90	•	11. Contract or Grant No. Contract DOT-TSC-1160
Los Angeles, California A		13. Type of Report and Period Covered
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U.S. Department of Transpo Office of the Secretary		March 1977
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15, Supplementary Notes	U.S. Department of Transpor	tation
*Under Contract to:	Transportation Systems Cent Kendall Square	er
	Cambridge MA 02142	

16. Abstract

One hundred and forty fleet automobiles based in Los Angeles were used to determine the influence of miles-per-gallon meters on fuel economy. Seventy cars were instrumented with the meters and 70 were used without meters for control purposes. Fuel use and mileage records were collected over a 12-week period. The cars were used primarily for commuting in a mixture of highway, urban, and suburban driving. Drivers in both groups were paid every three weeks for the amount of fuel they saved as compared to pre-test fuel-use records. Analysis of variance of the resulting miles-per-gallon averages revealed no significant difference in fuel economy between the two groups.

17. Key Words	18. Distribution Statement	
Miles-Per-Gallon Meters Totalizer Analysis of Variance Driver aids Field Evaluation	DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161	8
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DOT-TSC-OST-76-56 U	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Automobile Engine Con	ntrol Parameters	5. Report Date June 1976
	gine control parameters	6. Performing Organization Code
7. Author's)	A September 1997	8. Performing Organization Report No.
9. Performing Organization Name and Address Aerospace Corporation El Segundo, CA		10. Work Unit No. (TRAIS) OS714/R7508 11. Contract or Grant No.
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15. Supplementary Notes

U.S. Department of Transportation Transportation Systems Center

*under contract to:

Cambridge, MA 02142

16. Abstract

This report presents detailed technical information describing the engine control practices utilized by selected automobile manufacturers to meet current and past emission regulations consistent with acceptable fuel economy and driveability characteristics. Section 1, Introduction, includes a brief description of the scope, method of approach, and overall objectives of the study. Section 2 reviews the design features and operational characteristics of the engine control approaches and tehoniques employed by the domestic and foreign automobile industry and presents a brief discussion of advanced control systems technology. Section 3 discusses the methodology utilized in the selection of the 28 engines reviewed in this report, and describes the features of the two non-exhaust related emission control systems, crankcase ventilation and evaporative emission control, which have been utilized on all automobile engines for a number of years and have remained nearly unchanged for that time period. This is followed by a detailed examination of the control techniques incorporated in the selected engines with particular emphasis on the efeects of control system modifications on vehicle fuel economy and emissions. The principal topics covered for each engine include engine modifications, intake system, carburetion, ignition, emission control devices and techniques, and fuel economy effects.

17. Key Words	lication in 19 will be availa	is scheduled fo 977, after which able through the al Information (n it e Nat-
19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price

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1. Report No. 2. Government Accession No. DOT-TSC-OST-77-1	3. Recipient's Catalog No.
DOT-TSC-NHTSA-77-1	
4. Title and Subtitle Study of Automobile Market Dynamics	5. Report Date November 1976
	6. Performing Organization Code
	8. Performing Organization Report No.
⁷ . Author ^(s) Morton, A.S.; Strong, S.; Metcalf, E. Marple, G.; Freedman, A.	1 2
9. Performing Organization Name and Address Arthur D. Little, Inc.	10. Work Unit No. (TRAIS) OS714/HS727 (R7508)
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12. Sponsoring Agency Name and Address U.S. Department of Transportation	Final Report
U.S. Department of Transportation Office of the Secretary Office of the Asst. Sec. for Syst. Dev. and Tech.	July 1975Nov. 1976
Office of Systems Engineering Washington DC 20590	14. Sponsoring Agency Code
U.S. Department of Transportation under contract to: Transportation Systems Center Kendall Square, CAmbridge MA 02	142
16. Abstract	
To determine the effects of alternative energy conse of new cars and upon the distribution by size-class	*

domestic), in-depth interviews were administered to seven hundred recent new-car buyers. Extensive income and demographic data were collected from the respondents along with information on the characteristics and patterns of use of

currently owned vehicles. Four policy options (no change, gasoline taxes, excise taxes proportional to fuel consumption, and regulation of fuel economy) were explained to the respondents. For each policy option, respondents indicated how they thought their automobile purchases for the 1976-1980 time period would be affected in terms of vehicle size, origin, timing of purchase, etc.

17. Key Words automobile, market dynamics shares, size classes, sales economy, gasoline taxes, ex regulation	, fuel	18. Distribution States	ment	
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. Title and Subtitle UTOMOBILE SCRAPPAGE AND RE	CCYCLING INDUSTRY STUDY -	5. Report Date December 1975
VERVIEW REPORT		6. Performing Organization Code
		8. Performing Organization Report No.
. Author's) aiser, R., Wasson, R.P. ar	d Daniels, A.C.W.	7
Performing Organization Name and Addre •H. Aerospace Design Compa		10. Work Unit No. (TRAIS)
ivil Air Terminal edford, MA 01730		11. Contract or Grant No. DOT-TSC-1028
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epartment of Transportation ransportation Systems Cent		Final Report
ambridge, MA 02139	gov. and bear way	14. Sponsoring Agency Code
6. Abstract After an automobile ha	us lost its utility as a mo	ode of transportation, it is
sually deregistered and diche recovery of materials for anclude the number and materials in the U.S.; the formally in the U.S.; the formally in the U.S.; the formal problems associated with andustry where serviceable eachnology of the scrap indigrades of metal scrap. Simulaterials from junked automaterials from junked automaterials from junked automaterials are processed for ferroun in processed deregistered automaterials.	sposed of as scrap. The prome junked automobiles are crials composition of the allow of junk automobiles; the abandoned automobiles; the abandoned automobiles; the parts are salvaged; and the dustry which transforms automobiles, a legal review of a scrap, the problem of automobiles has been stabilitials from the approximately ther than from other forms of	principal factors which influence e reviewed and evaluated. These automobiles that are retired nto the commercial recovery cycle operations of the auto wrecking he structure, operations and tomobile hulks into commercial ies impact on the reclamation of key legislation and policies is rap processors, created by an ever increasing accumulation of ized. In 1974, the fractional y ten million automobiles deregof obsolete scrap. The estimated

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Ferrous metal scrap, Nonferrous metal

scrap, Plastic scrap, Rubber scrap.

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1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT-TSC-OST-77-12		
4. Title and Subtitle		5. Report Date
Automobile Characteristics Historical Data Base		November 1976
		6. Performing Organization Code
		8. Performing Organization Report No.
J.A. Milne, C. (Cantwell, H. Eissler	
9. Performing Organization Name and Address		10. Work Unit No. (TRAIS)
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Washington DC 20590	U.S. Department of	F Transportation
* under contract to	Transportation Sys	stems Center
16. Abstract		4
model years 1955, is to be added to DOT/TSC, for the 1	aracteristics of auto 1960, 1965, 1968 and the data base already 975 model year automo imarily collected fro and correlations be	1970 to 1974. Data y established by obiles.
was not available.		
facturer using pro attributes - ie: type as criteria t which are essentia of a manufacturer are represented by	engine displacement, to select representate ally duplicated by most rick a model of only one	well economy dependent weight and transmission ive vehicles. Models re than one division and Mercury Comet, of the divisions.
Characteristics we representative of	total US sales of al	re than 1000 automobiles 1 Domestic and Imported
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1. Report No. 2. Government All DOT-TSC-OST-77-13 U	ccession No. 3. Recipient's Catalog No.
4. Title and Subtitle	5. Report Date
Transportation Cost Impact of	the U.S. August 1976
Gulf Coast Deepwater Ports.	6. Performing Organization Code
7. Author's)	8. Performing Organization Report No.
A. Gezen, M.J. Kendrick, S.S. K	han
P. Performing Organization Name and Address TERA, Inc.*	10. Work Unit No. (TRAIS)
Arlington, Virginia	11. Contract or Grant No.
Annual Control of the	DOT-TSC-1246
	13. Type of Report and Period Covered
2. Sponsoring Agency Name and Address .S. Department of Transportation ffice of the Secretary	Final report
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*under contract to: Transports	rtment of Transportation ation Systems Center , MA 02142
16. Abstract	
The state of the s	was built to analyse and evaluate
crude oil shipping patterns and to 18 refining districts, and terns and costs from those dismodel is then used to develop	petroleum product shipping pat- stricts to 484 demand zones. The estimates of the impacts of two and Seadock, on petroleum dis-
crude oil shipping patterns and to 18 refining districts, and terns and costs from those dismodel is then used to develop specific deepwater ports, LOOF	petroleum product shipping pat- stricts to 484 demand zones. The estimates of the impacts of two and Seadock, on petroleum dis-

DOT-TSC-OST-77-14 U	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Auto scrappage and recycling industry study: the automobile shredding industry 7. Author's) Kaiser, R.		5. Report Date August 1976
		6. Performing Organization Code
		8. Performing Organization Report No.
9. Performing Organization Name and Address H.H. Aerospace Design Company, Inc. Civilian Air Terminal Bedford, MA 01730 12. Sponsoring Agency Name and Address U.S. Department of Transportation Office of the Secretary Office of the Asst. Sec. for Syst. Dev. and Tech. Office of Systems Engineering Washington DC 20590		10. Work Unit No. (TRAIS) OS714/R7508
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		Final Report
		14. Sponsoring Agency Code
15 Supplementary Notes	U.S. Department of Tra	nsportation
	Transportation Systems Cambridge, MA 02142	Center

16. Abstract

Automobile shredding is the present state of the art method of processing scrap auto husks. In this survey report, the history and present status of the automobile shredding industry in the U.S. are revised.

Technical characteristics of automobile shredding systems are discussed with special emphasis being placed on the different types of hammermills used in practice. Cost data for various commercial systems are presented.

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4. Title and Subtitle Freight transportat:	ion energy:	5. Report Date January 1977
a bibliography		6. Performing Organization Code
7. Author's)	parties of arrow consignation of	8. Performing Organization Report No.
9. Performing Organization Name and Address U.S. Department of Transportation Transportation Systems Center		10. Work Unit No. (TRAIS) OS714
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Office of Systems Engineering		14. Sponsoring Agency Code

16. Abstract

This annotated bibliography was compiled as part of the Rail and Intermodal Energy Efficiency Subproject of the Transportation Energy Efficiency Project. It includes studies of transportation energy in general, freight transportation energy studies, and works concerned with specific modes, grouped by mode. The literature surveyed covered the time from January 1973 to November 1, 1976.

7. Key Words freight	18. Distribution State	ment	a sellulumdud
transportation enertrucking, rail, ai	I THROUGH THE NZ	AILABLE TO THE U.S. PO ATIONAL TECHNICAL RVICE, SPRINGFIELD,	JBLIC
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1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT-TSC-OST-77-16 U		- 121-121 110
4. Title and Subtitle Automotive Manufacturin	g and Automotive	5. Report Date October 22, 1976
Component Historical Co		6. Performing Organization Code
<u> </u>		8. Performing Organization Report No.
7. Author's)G. Fitzgibbons, I J. Milne, P. Kaprielyan,	.H. LindgrenRath & Strong; Paul BrownChilton Co.; ociates	30
9. Performing Organization Name and A George Clayton Associat	ddress	10. Work Unit No. (TRAIS) OS 714 R 7508
25711 Southfield Road Southfield, MI 48075		11. Contract or Grant No. DOT-TSC 1039
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12. Sponsoring Agency Name and Address U.S. Department of Transporta Office of the Secretary	tion	Final report
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*under contract to:

Transportation Systems Center

Cambridge, MA 02142

16. Abstract

This report collects data on the manufacturing characteristics of automotive vehicles and components of the U.S. automobile fleet for model years 1970 through 1975. Tabulated data includes aftermarket selling price and dealer discounts for chassis piece parts for some 36 cars and trucks over this six-year span, finished part weights for the 1975 Chrysler Valiant, Satellite, and Fury automobiles, OEM and aftermarket automotive. manufacturers and vendors, and cost estimates to construct "new" automobile major assembly manufacturing facilities.

17. Key Words automotive aftermarket, automobile manufacturing, automotive components	Thi lic will ion	istribution Statement is document is s ation in 1977, I be available al Technical In ringfield, VA 22	after which through the formation S	it Nat-
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1. Report No. DOT-TSC-OST-77-18 U	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Spark Ignition Performance		5. Report Date November 1976	
7. Author's) Thomas Trella 9. Performing Organization Name and Address U.S. Department of Transportation		6. Performing Organization Code	
		8. Performing Organization Report No.	
		10. Work Unit No. (TRAIS) OS714/R7508	
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		14. Sponsoring Agency Code	

16. Abstract

This report contains documantation of two computer simulation analyses which are used for evaluation of spark ignition preformance. Emphasis is placed on the application of existing engine simulation models and correlation with real engine data. Topics of general interest in simulations which are pertinent to the two models are discussed. The first model deals with engine performance based on closed cylinder thermodynamics, and the second model deals with the simulation of induction system dynamics. Examples demonstrating the effect of engine operating parameters on engine performance, such as spark timing, exhaust gas recirculation, and fuel-air equivalence ratio, are illustrated for a constant combustion duration angle to show the applicability of the simulations for studies of this type. Finally, transformation relationships are developed which relate changes in engine preformance (BSFC, BSNOX) for the three engine operating conditions. Vehicle performance studies to account for engine performance tradeoffs and trends, as a result of application of the transformation relationships, will be documented in a separate report.

17. Key Words		18. Distribution Statement This document is scheduled for publication in 1977, after which it will be available through the National Technical Information Service Springfield, VA 22151.		nich it the Nat-
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	2. Government Accession No.	3. Recipient's Catalog No.
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4. Title and Subtitle		5. Report Date
Manufacturing Technology	Assessment	
Volume I Automatic Trans	smission, Dual Catalytic	6. Performing Organization Code
Converter, Fuel Injection	n and Lightweight Diesel	
7. Author(s)		8. Performing Organization Report No.
Gene Q. Cowie		
9. Performing Organization Name and Addre		10. Work Unit No. (TRAIS)
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15. Supplementary Notes		
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16. Abstract Development costs	for the subject automotive co	omponents are functions of t
levelopment time allotted, t	he resources committed to the	e development, and the natur
and extent of the changes.	Capital expenditures are a fu	unction of the nature and ex
ent of the changes and the	extent to which existing equi	ipment and facilities can be
onverted. The time require	d to make major changes will	largely depend upon the numb
or such changes undertaken s	ince all will draw upon the a	resources of the machine too
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	consumption	00 00 00 00 0 0 0 0 0 0 0 0 0 0 0 0 0

17. Key Words

Cost Analysis

Automatic transmission, Catalytic Converter, Fuel injection, Diesel engine 18. Distribution Statement

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Volume IV - Lightweight Materials Study--Potential weight savings and effects

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upplementary Notes * Under Contrac	Transportation Sy Kendall Square	stems Center
Abstract The transfer line indu	Cambridge, MA 02	
h components. The ultimate lity of the transfer line and higher production rates at This volume provides an assemble and the transfer line Volume I. Other volumes in this report Volume I - Automatic Tran Converters and and impacts on	cost to the consumer wild related industries to reasonable manufacturing sament of these factors e industry. The information is smissions, Fuel Injection industrial production of the consumer will be consumer of the consumer will be consumer will be consumer of the cons	develop and build machinery ng costs. in light of the historical ation generated provided input on, Dual Catalytic inesAn analysis of cost capacities.
	consumption	tors affecting vehicle fuel
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1. Report No.	. Government Accession No.	3. Recipient's Catalog No.
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4. Title and Subtitle	- 14	5. Report Date
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7. Author's)		B. Performing Organization Report No.
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Development & Technology	Washington, D.C. 20590	
15. Supplementary Notes *Under Contra	ct to: U. S. Department o	f Transportation
	Transportation Sys	
	Kendall Square	*
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16. Abstroct A search of the lite	rature and inquiries of au	tomobile manufacturers and
supplier firms indicated that	there is little if anything	ng to be gained in fuel
efficiency from closer contro	of manufacturing toleran	ces. Many components are not
sensitive to tolerances in a	way which would affect fue	l efficiency. The new com-
puterized control systems that to make related components le	t respond to ambient condi-	tions and engine output tend
to make related components le		
reduced, the objective was improved emissions control rather than fuel efficien In view of these findings, the investigation focused upon six areas of vehic		upon six areas of webials
dynamics. The effects of var	riations in each of those a	reas, the cumulative effects
and the contributions of each	was identified. The invest	stigation procedures con-
sisted of an analysis of a 19	75 Chevrolet utilizing ana	lytic procedures commonly
employed in the automotive in	dustry.	Ly cic procedures commonly
Other volumes in this repo		
Volume I - Automatic Tr	ansmissions, Fuel Injection	n, Dual Catalytic
	nd Lightweight Diesel Engi	
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Volume II - Transfer Lin	e StudyState of the art	and near term projections
Volume IV - Lightweight	Materials StudyPotential	weight savings and effects
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17. Key Words	18. Distribution State	ment
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		8. Performing Organization Report No.
7. Author's) T.A. Barber, Ted K. Per	ıg	a = ===
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16. Abstract

Lithium/metal sulfide batteries are potentially attractive for use in automobiles because the electrode materials have a low equivalent weight and form cells of high specific energy. These batteries employ a molten salt electrolyte (LiCl-KCl eutectic; mp, 352° C) and operate at 400-450°C. Because of the high ionic conductivity of this electrolyte, the batteries are capable of very high discharge rates and thus can provide the high power needed for automobiles. The use of negative electrodes of solid lithium-aluminum alloy, which exhibits a lower lithium activity than molten lithium, has minimized reaction with ceramic separators and insulators in contact with the electrodes. With such electrodes, separators of boron nitride fabric have performed without failure for more than 3000 hr. The use of solid iron sulfide, rather than molten sulfur, has improved the capacity and life of the cells. The search for low-cost component materials continues in order to meet the cost goals for mass-amrket applications. The maintenance of high operating battery temperatures requires the development of an inexpensive, compact and high efficiency insulating jacket. Materials have been identified and designs have been proposed to satisfy these requirements, but prototype units have not yet been tested.

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opacity, flow pulsations, back flow, and swirl due to elbows; line voltage fluctuations; electromagnetic radiation from ignition; vehicle attitude with respect to the vertical; and vibration, (2) the test set-up and procedure used for evaluating and calibrating these meters in the laboratory under conditions simulating the automotive environment, (3) possible sources and magnitudes of errors in the calibration, and (4) results of illustrative tests on seven flowmeters.

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This report in four volumes presents analyses and assessments of both heat engine/ battery, and heat engine/flywheel powered hybrid vehicles to determine if they could contribute to near-term (1980-1990) reductions in transportation energy consumption under several sets of operational conditions: urban driving; highway driving; and stop-start, low speed delivery service conditions. In addition, the impact of such hybrid vehicle usage on vehicle-related exhaust emissions was determined, and the ability to accommodate a different energy resource base in the longer term was evaluated: i.e., by permitting a portion of the recharge energy for the on-board energy storage device (battery or flywheel) to be provided by wall-plug electric power from the utility industry instead of from the on-board heat engine. Alternative paths for power transmission from the heat engine to the vehicle drive wheels were considered along with the potential of regenerative braking to reduce vehicle energy consumption.

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16. Abstract

This report in four volumes presents analyses and assessments of both heat engine/battery, and heat engine/flywheel powered hybrid vehicles to determine if they could contribute to near-term (1980-1990) reductions in transportation energy consumption under several sets of operational conditions: urban driving; highway driving; and stop-start, low-speed delivery service conditions. In addition, the impact of such hybrid vehicle usage on vehicle-related exhaust emissions was determined, and the ability to accommodate a different energy resource base in the longer term was evaluated; i.e., by permitting a portion of the recharge energy for the on-board energy storage device (battery or flywheel) to be provided by wall-plug electric power from the utility industry instead of from the on-board heat engine. Alternative paths for power transmission from the heat engine to the vehicle drive wheels were considered along with the potential of regenerative braking to reduce vehicle energy consumption.

17. Key Words hybrid automotive vehicles, tion energy consumption, auto vehicle exhaust emissions, b flywheels, motors, generator engines, transmissions, rege braking	motive atteries, s, heat	18. Distribution Statement This document is lication in 1977 will be availabl ional Technical Springfield, VA	, after whic e through th Information 22151.	h it e Nat- Service,	
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6. Abstract

A study has been carried out to evaluate the potental for weight reduction f automobiles. It is concluded that automobiles of lighter weight than those current (1976 models) is the domestic market may be built in each of three size classes, 4, 5, and 6 passenger, and that this can be done within the limits of presently prevailing designs and materials. Detailed weight breakdowns are presented for a 4-passenger vehicle of 1987 lbs. curb weight, for a 5-passenger vehicle having a curb weight of 2551 lbs. and a 6-passenger vehicle of 3271 lbs. curb weight.

Since weight reduction is without significance unless product characteristics are well defined, detailed package dimensions are presented for each of the three size classes, and an improved roominess factor is proposed for the evaluation of ffective roominess in cars. Other vehicle characteristics are discussed in detail and defined.

Detailed weight comparisons are presented between present and past designs of vehicles in each of the three size classes mentioned above.

The design process is outlined and illustrated by the making of design decisions for a new design of a 5-passenger vehicle. Finally, the potential for weight reduction by material substitution is examined.

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*under contract to:	Transportation Systems Center Cambridge, MA 02142	
16. Abstract		

Vehicle miles of travel (VMT) by passenger automobiles is an important determinant of gasoline consumption, ambient air quality, highway safety, and personal and corporate financial conditions in the U.S. Changing patterns and trends in VMT therefore have profound implications for energy conservation, environmental quality, and economic stability. Forecasts of likely future levels of VMT have become a central input to transportation policy analysis.

This report was an effort to assess the state of the art of VMT forecasting and map out strategies for extending it. The work included an inventory of data sources and a review of existing VMT models. Recommendations for both long- and short-range future research are included, along with estimates of effort and costs required for carrying out each possible research strategy.

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This paper examines s	some of the dynam	nic properties of the automobile fleet.
The focus is not on new o	ar demand, but i	rather on the overall behavior of the
system. Relationships der	rived from previo	ous studies have been incorporated and
integrated in a single mod	lel This lends	empirical credence to the model, as well
		for a group of parametric relationships
		ojective of the work was to test the
		approach and the DYNAMO software package
for dynamic automotive fle	eet model.	
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7. Author's) R.J. Tabaczynski and J.B.	Heywood	8. Performing Organization Report No.
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Cambridge, MA 02142

16. Abstract

The work involved in developing a methodology for assessing lean burn engine concepts is discussed. An executive summary is given in Volume I and the detailed results of the first year's work are given is Volumes II through VI. Substantial progress has been made on the development and use of the combustion model. Through use of the combustion model, it is shown that cyclic variations in cylinder pressure are due to variations in the turbulent flow field on non-uniformities in the microscale that effect the ignition process. The laminar flame speed facility has been developed after an extensive review of existing data. Also, turbulent flame propagation experiments have been performed which give information on the turbulent entrainment speed and characteristic reaction times. This data is being used to improve the turbulent combustion model.

In addition to the experimental work, a cycle simulation program has been developed which can predict nitric oxide emissions and performance simultaneously. This cycle simulation can be used with the advanced combustion model to predict the effect cyclic variations have on engine performance and is an integral part of formulating a methodology for assessing lean burn concepts.

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16. Abstract

A model describing turbulent combustion in a spark-ignition engine is presented. The model is based on an entrainment theory and features as parameters the entrainment theory and features as parameters the entrainment speed and characteristic reaction time. The model is used in a parametric study on the effects of mixture and flow non-uniformities. It was found that fluctuations which affect only the distribution of heat release in a given cycle yield families of pressure time diagrams with common expansion curves. Whereas fluctuations in the total heat release per cycle yielded familities of pressure-time diagrams with different expansion curves.

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4. Title and Subtitle The Development of Performer for Lean Mixture Engines. lence in a Steady Flow formetry 7. Author's) N. Nanopolous, D.P. Hoult	Vol. III: Study of Turbu- r an Engine Cylinder Geo-	5. Report Date June 1976 6. Performing Organization Code 8. Performing Organization Report No.
9. Performing Organization Name and Addr Massachusetts Institute of 77 Massachusetts Avenue Cambridge, MA 02139		10. Work Unit No. (TRAIS) 0S714 R7508 11. Contract or Grant No. TSC-1034 13. Type of Report and Period Covered
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16. Abstract

A steady flow simulation is used to study the turbulent flow field produced during the intake process of a CFR engine. Measurements of turbulence parameters are made with a Hot-Wire Anemometer and a set of response equations is developed for the hot-wire, that accounts for the high level of turbulence intensity observed in the flow. Flow mappings are presented and estimates of the swirl rate are made for different valve configurations. Profiles of the mean velocity, fluctuating velocity, and turbulence intensity of the jet are also presented for different orientations of the hot-wire. A signal correlator is used to obtain the auto-correlation function of the fluctuating velocity component and hence the integral scale of the flow. The turbulent flow field was studied at various points in the flow for various valve lifts and for shrouded and unshrouded valve configurations. A qualitative discussion of the steady flow model is presented and some general conclusions on the nature of the turbulent flow are drawn. The most significant observation is the presence of a large turbulence intensity throughout the flow field, including the interior of the jet. This is contrary to the classical behavior of turbulent jets where turbulence intensities are of the order of ten per cent.

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16. Abstract

Turbulent flow and turbulent combustion in spark ignition engines is reviewed. a basic characteristic of the turbulent flow field is its large relative turbulent flow field is its large relative turbulent intensity ($u'/\bar{u}<.2$). This fact makes analysis of engine turbulence difficult at best. Correlation for the integral and micro length scales are presented. These correlations are based on isotropic homogeneous turbulence theory and seem to correlate with engine data quite well. From these correlations it is deduced that the chamber height is the controlling physical dimension governing the integral scale of trubulence for chambers with low squish areas. Turbulent combustion for ignition to termination is reviewed. The important variables governing ignition and fully developed flame propagation are discussed. Also turbulent combustion models for spark ignition engines are discussed.

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16. Abstract

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A discussion of measurement techniques has been included from which the advantages and disadvantages of each become evident. The report concludes by identifying the existing government sponsored research programs in the field of vehicle aerodynamics.

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7. Author's) Joseph C. Sturm		8. Performing Organization Report No. PM-T-36
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Supplementary Notes

Included in this paper are descriptions of the current roadway classification schemes utilized within the U.S. Four major types of classification are discussed: (1) regional; (2) functional (3) funding related; (4) administrative. A key factor in the classification of roadways is the administration of Federal funds; other factors include the overall planning of the highway system and assignment of jurisdiction. Some states employ efficient classification methods and techniques, whereas others use outmoded shcemes. Massachusetts has been chosen as the main source of material for this paper due to proximity. Included in the appendices are supportive documents dealing with roadway policies as practiced by Massachusetts. These include: (1) functional readway classification; (2) roadway classification inventory; (3) current administrative roadway policy. The work itself consists of the selection and evaluation of potential data and data source areas relating to roadway classification, funding, and administration. What is desired is a consolidation of these mechanisms insofar as they relate to current federal/state/local funding practice.

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Abstract

omotive fuel induction systems may be either carbureted or fuel inted. Traditionally, carburetors have been used on mass produced rican automobiles, while fuel injection has been used in special h performance engines. For future use, the two systems must be essed on the basis of attainable emission levels, fuel economy lev-, cost competitiveness, performance, and maintenance characteriss. At this time, there is no emission test data or production cost a on U.S. cars equipped with fuel injection. New model carburetors t more, but require less maintenance than earlier models. Fuel nomy improvement may be obtained through cut off fuel flow to the ine during deceleration with fuel injection. Closed loop fuel ection systems are being developed to meet the 1978 emission stands of 0.41 HC, 3.4 CO and 0.4 NOx (gm/mi), with three-way cataic reactors. In 1975, several European manufacturers met eral emission standards without catalytic converters.

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16. Abstract

This report is an initial attempt to examine impacts in the petroleum industry resulting from changes in the nature of automotive fuels. A survey has been made of available literature dealing with the effects of current and potential trends in automotive fuels in particular, and with the refining industry in general.

The studies reported in this document encompass four areas of motor gasoline modification: lead content reduction, octane rating improvement, volatility lowering, and sulfur content reduction. Fuel modifications in these directions have been examined individually, considering three refining criteria: additional capital investment, additional raw material requirements, and increase in manufacturing cost.

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This paper seeks to establish a framework for assessing the simulation capability and modelling accuracy of the driving schecules currently used by the EPA and by automobile manufacturers. The data are taken from both private and federal transportation research sectors. Specific data include statistical time series on roadways, and data gathered from research on automotive travel behavior and roadway use.

The analytical thrust of this framework is the generation of a family of curves similar in nature to those from the driving schedules. The lata base includes current and past vehicle miles traveled, as well as data on average traveled speed. Additional data characterizing arban/rural travel behavior have been interfaced with data on roadway ase.

Specifically, the driving schedule output is: percentage of distance travelled by the test vehicle at various speed levels and within various speed ranges. Output of the proposed model is: percentage of total national urban/rural VMT generated at various speed levels and within various speed ranges. These two measures are similar in nature, and lend themselves to direct comparison on a curve-by-curve basis.

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REVIEW OF DIESEL ENGINE TECHNOLOGY FOR	February 1975
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7. Author's Thomas J. Trella	PM-T-45
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This survey finds that currently produced diesel automobiles show a fuel economy advantage of 10 to 80% over gasoline powered automobiles in the same weight class. The advantage varies depending upon how normalized. The most favorable figures are on a miles per gallon basis. The advantage quickly deteriorates when normalization accounting for horsepower to weight ratio, BTU per gallon, and highwa driving cycles are applied. Diesel powered automobiles currently mee emission levels of 0.41 HC, 3.4 CO and 2.0 NOx grams per mile. Lower NOx values are attainable only at expense of fuel economy. Supercharging promises significantly increasing the low horsepower to weight ratio. Improved fuel injection systems for direct injection diesel engines are also under development. The undesirable attribute of the diesel engine—smoke, odor and idle noise—can be controlled with current technology.

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The material composition for 14 different production automobiles manufactured between 1963 and 1975, as well as for several calculated composites, is presented in this report. Compact, intermédiate, standard and luxury cars are included in the sample. An automobile is mainly made up of ferrous material (77.4% by weight), combined with 5.3% nonferrous metals and 4.4% each rubber, fluids and lubricants. There is also about 2.4% glass, 1.9% soft trim, 1.9% plastics, 1.7% sound deadener, 0.7% paint, and on the latest models, 0.1% ceramics. Cars made in the past few years contain significantly more plastic materials than cars made in the early 1960's. In general, however, it appears than the materials mix for U.S. automobiles has remained roughly constant over the past 20 years.

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15. Supplementary Notes

16. Abstract

Lean mixture engines are spark-ignition internal combustion engines designed to burn fuel/gas mixtures containing appreciable amounts of excess air or other non-combustible gas. They offer fuel economy and reduced emissions over the traditional automotive engines. Lean mixture technology is compatible with the basic design of existing engines, and with oxidation catalysts. It will not, however reduce emissions enough to meet the hydrocarbon standard alone. Further improvements in lean mixture engines can be expected to include redesign of combustion chambers to promote efficient burning, and changes in induction systems, ignition systems and engine control The potential of these changes is further reduction in NO_{X} emissions and modest increases in fuel economy.

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Abstract

rocessing and display programs have been developed to accept engine ynamometer test data and to provide engine maps for visual display, for se in engineering calculations, and for input to vehicle simulation prorams. The programs process about 4000 items of raw test data acquired rom a single steady state engine test and yield engine maps of fourteen ey engine parameters.

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16. Abstract

This study estimates the near-term impacts of fuel economy goals and emission standards upon aggregate automotive gasoline consumption and new car sales. Concentrating on the 1975-1985 time period, the analysis evaluates the effects of (1) a 19.6 and a 21 mile-per-gallon fuel economy goal in 1980, and (2) a 28 mile-per-gallon goal in 1985. The analysis is carried out for the several sets of emission standards which are currently under consideration. It is assumed that fuel economy goals and emission standards will be met solely through extensions of existing technology. The analyses are based upon an approach which combines automotive technology assessment with econometric projections.

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16. Abstract

15. Supplementary Notes

The tests discussed in this memorandum compared the contribution to fuel economy of Mobil 1 and Kendall (10W-40) lubricating oils during steady-state operation of a spark ignition engine. The data indicated that within normal engine variability there is essentially no difference in fuel economy between the two oils for a fully warmed up engine. A slight fuel economy benefit is indicated at idle. This test did not compare low temperature operation. Further testing is recommended.

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6. Abstract

This study investigated the effect of engine tuning malfunctions and maladjectments on the fuel consumption characteristics of a four cylinder, spark ignition engine. The assortment of tuning malfunctions looked at in this study was by no means exhaustive, but those chosen did cover, or at least, simulated a significant potion of the malfunctions that would be found in the field. This study was able to show that major tuning malfunctions result in significant excessive fuel usage; minor tuning malfunction engine lata was generally inconclusive, although definite trends vere discernable.

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15. Supplementary Notes

16. Abstract

Title III of the Energy Policy and Conservation Act establishes a Federal program to regulate the fuel economy of passenger automobiles. The Act sets average fuel economy standards for each manufacturer's fleet of new cars sold in the United States beginning with the 1978 model year. While specific standards are enumerated for the 1978, 1979, 1980, and 1985 model years, the Secretary of Transportation has responsibility for issuing standards for the 1981-1984 model years. These intermediate standards must require maximum feasible average fuel economy levels and must result in steady fuel economy improvements toward the 1985 goal.

To assist in establishing such standards, this report evaluates potential fuel economy improvements during the 1980-1985 time period. After assessing alternative technological and design approaches, a general production implementation scedule was specified for the domestic automobile industry. Based on this schedule, hypothetical rates of introduction and market penetration for specific new designs and technology were established and possible values of fleet average fuel economy for all domestic producers were calculated.

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Plymouth Valiant equipped with an experimental multi-mode automatic transmission		6. Performing Organization Code
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. Abstract

This report is part of the "Study and test to confirm automobile drivetrain components to improve fuel economy." A Plymouth Valiant powered by a 318 cubic inch V-8 engine was equipped with an experimental automatie transmission and tested for fuel economy and emissions in accordance with the 1975 EPA test procedures. The test results indicate that the fuel economy of this vehicle can be improved by as much as 14% (composite cycle) without oushing emissions beyond the realm of control. This fuel economy gain was concurrent with a decrease in NOx emissions of 11%.

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6. Abstract

This report, prepared in compliance with Section 10 of the Energy Supply and Environmental Coordination Act of 1974, P.L. 93-319 (the Act), addresses the potential for fuel economy improvement for new motor vehicles. The Act directed the Administrator of the Environmental Protection Agency (EPA) and the Secretary of the Department of Transportation (DOT) to conduct jointly a study and report on the practicability of a fuel economy improvement standard of 20% for new motor vehicles in the 1980 time frame.

As required by Section 10 of the Act, the information on fuel economy improvement potential presented in this report includes an assessment of the technological problems of meeting any such standard, including lead times involved, the test procedures required to determine compliance, the economic costs and penefits, the enforcement means, the effect on energy and other resources, and the relationship of safety and emission standards.

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16. Abstract

This Policy Assessment Panel Report is Report Number One (1) of seven (7) panel reports prepared by special panels of a task force established under joint chairmanship of the US Dept. of Transportation and the US Environmental Protection Agency to conduct a study of the practicability of a 20% fuel economy improvement for new motor vehicles in the 1980 time frame. Materials developed by the various study panels were used in preparing the Report to the Congress entitled "Potential for Motor Vehicle Fuel Economy Improvement" dated 24 October 1974 (second printing 18 November 1974).

This panel report selects eight specific fuel economy improvement strategies which fall into the broad categories of new car fuel economy labeling, government established and enforced fuel economy standards and vehicle taxation to dissuade purchases of new automobiles with poor fuel econlmy. The strategies are evaluated on the basis of their impact on consumers, producers and government administration. The report concludes that none of the strategies is clearly preferable over all the others. Each has its strength and weakness.

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15. Supplementary Notes

16. Abstract

This Safety Implications Panel Report is Number Two (2) of a group of seven(7) prepared by special panels of the Task Force established under the joint chairmanship of DOT and EPA to conduct a study of the practicability of a fuel economy improvement standard of 20% for new motor vehicles produced in the 1980 time frame.

This panel report contains four individual analyses related to the safety impact of increased small car usage and automobile weight reductions to improve fuel economy

- 1. Fuel economy as a function of weight, performance, and driving schedule.
- 2. Traffic control for safety and fuel economy.
- 3. Weight versus safety.
- 4. Effects of speed limits on fuel economy and safety.

17. Key Words Fuel Economy vs. Safety Safety Impact of Increased Usage	Small Car	Document is ava the National Te Springfield, Vi	ilable to the chnical Inform	public through ation Service,
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15. Supplementary Notes

16. Abstract

This Air Quality and Emissions Panel Report is No. 3 of a group of seven (7) prepared by special panels of the Task Force established under the joint chairmanship of DOT and EPA to conduct a study of the practicability of a fuel economy improvement standard of 20% for new motor vehicles produced in the 1980 time frame.

The report describes the factors which affect air quality, i.e., number and kind of stationary emission sources, the motor vehicle fleet mix and number of vehicle miles traveled by each class of vehicle, etc., and then by using a simple methodology described in the text, draws some conclusions on the effect various fuel economy strategies will have on air quality.

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The authors conclude that the domestic automobile manufacturers could increase their sales weighted automobile fuel economy by more than 30% by 1980. The manufacturers of foreign imports which are more fuel efficient than domestic automobiles could meet a 20% improvement but could not meet a 30% improvement goal by 1980.

18. Distribution Statement

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16. Abstract

This Economics Panel Report is Number Five (5) of a group of seven (7) prepared by special panels of the Task Force established under the joint chairmanship of DOT and EPA to conduct a study of the practicability of a fuel economy improvement standard of 20% for new motor vehicles produced in the 1980 time frame.

This report analyses the economic effects automobile fuel economy improvement will have on the automobile industry, the American consumer, and the US economy in general. Some specific conclusions are that

- 1. Consumers will generally experience savings on fuel and maintenance expenditures which more than offest the increases in car prices due to the fuel economy improvements.
- 2. Automobile sales are expected to increase in the 1970's and 1980's although the rate of increase is expected to be slower than in the past, with a shift back towards standard-size cars.
- 3. Petroleum savings could range from 0.9 to 1.5 million bb1/day by 1980, from 1.6 to 3.0 by 1985 and from 1.9 to 4.0 by 1990.

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6. Abstract

This Fuel Economy and Test Procedures Panel Report is No. 6 of a group of seven 7) prepared by special panels of the Task Force established under the joint hairmanship of DOT and EPA to conduct a study of the practicability of a fuel conomy improvement standard of 20% for new motor vehicles produced in the 1980 time trame.

This report presents the test procedures recommended for insuring compliance with fuel economy regulations. Discussions included are: (a) driving variables pertinent to the establishment of a meaningful, reproducible test methodology; (b) test and reasurement methods which are applicable to fuel economy certification tests; (c) current test procedures in use by industry and the federal government, and (d) recommendations for a standardized Federal Test Procedure.

The recommendation is that federally conducted fuel economy tests for labeling and/or certification be performed on a chassis dynamometer using two driving schedules - city and highway.

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16. Abstract

This Truck and Bus Panel Report is Number Seven (7) of a group of seven (7) prepared by special panels of the Task Force established under the joint chairmanship of DOT and EPA to conduct a study of the practibility of a fuel economy improvement standard of 20% for new motor vehicles produced in the 1980 time frame.

Special consideration is given in this report to the potential improvement of truck and bus fuel economy implementable by the 1980 production year. Vehicles considered in the section are those with gross vehicle weight ratings of 10,000 pounds or more. This group of vehicles presently consumes an estimated 18% of all highway fuel, but the technologies and production facilities involved in efforts to improve the fuel consumption of this category of vehicles are quite different from those of the automobile.

Analyses of available data indicate fuel economy improvements for some individual trucks can be as great as 41% by the 1980 production year. Assessment of such technology applied without cost or production capacity restraint would yield an aggregate reduction of 25% in the fuel consumed by the new trucks and buses manufactured in 1980.

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16. Abstract

In view of the Nation's long range need to conserve energy nad the fact that the motor vehicle fleet is the largest single user of our decreasing petroleum supplies, the Energy Resources Council established a Federal Task Force to study motor vehicle fuel economy goals beyond 1980. These goals were to be compatible with environmental, safety, and economic objectives.

Relative to a baseline of 1975 automobile characteristics (new car size mix, fuel economy, safety, and emissions, etc) projected without change into the future and accounting for the expected growth in vehicle miles traveled, the Task Force concluded that, with substantial industry effort, investment, and risk, coupled with a reasonable approach to government regulation, the United States can acheive the following reasonable goals:

- 1. 40-50% reduction in projected automobile fuel consumption by 1995
- 2. 80-100% improvement in new-car fleet fuel economy with the current automobile of 4, 5, and 6 passenger cars.
- 3. Substantial reductions in auto deaths and injuries
- 4. Continuing improvement in ambient air quality
- 5. Savings in the cost of automotive transportation
- 6. Substantial savings in material resources

The value of the potential auto fuel savings exceeds the cost of the capital investment necessary to obtain these savings.

17. Key Words automobiles, fuel	economy,	emissions	18. Distribution Statement Draft available	for public co	omment.
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