A Survey of Electric and Hybrid Vehicle Simulation Programs

Volume II: Questionnaire Responses

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National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California
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PREFACE

Two Appendixes, D and E, are combined in this volume of JPL Publication 78-58. These two Appendixes present the questionnaires received as a result of the study survey, along with additional material sent by the respondents. The material is presented in combined form (i.e., the additional material along with the questionnaire) for ease of reference. Appendixes A, B, and C of this report are contained in Volume I.

To eliminate unnecessary material, questionnaire pages that did not contain answers have been removed.

ABSTRACT

This volume presents the data received in a survey conducted within the United States to determine the extent of development and capabilities of automotive performance simulation programs suitable for electric and hybrid vehicle studies. The survey was conducted for the Department of Energy by NASA's Jet Propulsion Laboratory in support of Public Law 94-413, the Electric and Hybrid Vehicle Research, Development and Demonstration Act of 1976. Volume I of this report summarizes and discusses the results contained in Volume II.

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name R.L.Gradishar.

Your company Advanced Kinetics, Inc.

Your company address 1231 Victoria St.

Costa Mesa, Calif. 92627

Your mail stop

Your department

Your title Secretary-Treasurer.

Your phone number

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s)

☐ No

3. Please list program names which are in a usable state.

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

None

SPEED MESSAGE (2)

TO MR. O. FIGUEROA - SUPERVISOR FROM ORDEAN KILTIE - Advisory
FLIGHT PROJECTS CIVIL SYSTEMS PROCUREMENT 2445 Fairfield - A201
MAIL STOP 125-241 - JPL Fort Wayne, Indiana 46807
Tel. 219-745-9139

SUBJECT 4800 OAK GROVE DR - PASADENA - 91103

FOLD DATE 18 NOV 1977

DEAR MR. FIGUEROA :

THIS MESSAGE IS WITH REGARD TO YOUR SURVEY OF AUTOMOTIVE-PERFORMANCE SIMULATION PROGRAM.

I HAVE NO SIMULATION PROGRAM. ON AUGUST 29 I DID ACCOMPANY MR. J. R. HARKNESS, VICE PRESIDENT OF BRIGGS AND STRATTON CO. MILWAUKEE WI TO REVIEW AND DISCUSS THEIR NEWLY DEVELOPED 11. HP AND 16. HP GASOLINE ENGINES SUITABLE FOR HYBRID ELECTRIC VEHICLES WITH YOUR MR. FRANK SURBER, MR. NOEL SANDBERG, TOM BARBER AND OTHERS.

SINCE I PREFER TO NOT COMMITT BRIGGS AND STRATTON I AM MAILING YOUR LETTER AND QUESTIONNAIRE TO MR. J.R. HARKNESS.

I DO THANK YOU.

SINCERELY SIGNED Ordean Kiltie

GrayLine "SNAP-A-WAY" FORM 44-909 2-PARTS 1274
WILSON JONES COMPANY • © 1963 • PRINTED IN U.S.A.

ORDEAN KILTIE
2445 FAIRFIELD - A201
FORT WAYNE, INDIANA 46807 • U.S.A.
TELEPHONE: 219-745-9139
Representing
Briggs and Stratton Corp.
Milwaukee, WI

ADVISORY ENGINEER:
ELECTRONICS TRANSFORMERS; INDUCTORS
AND FERRORESONANT REGULATING TYPES.

3

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name JOHN P. FRAHER

Your company SALSBURY INDUSTRIES

Your company address 1010 E 62 ST

LOS ANGELES CALIF.

Your mail stop

Your department MANAGEMENT

Your title PRESIDENT

Your phone number 213-232-6181

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name EVELYN L. VREDER

Your company NUS CORPORATION

Your company address 4 RESEARCH PLACE
ROCKVILLE, MD 20850

Your mail stop N/A

Your department Federal Government Operations

Your title Proposal Coordinator

Your phone number 301-948-7010

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

   NONE

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name HOWARD J. REID

Your company MELCON SYSTEMS DESIGN CONSULTANTS

Your company address 1200 QUAIL ST.
NEWPORT BEACH,
CA. 92660

Your mail stop _____

Your department _____

Your title CONSULTANT

Your phone number (714) 752 8636

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

NONE.

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name ERWIN A. ULBRICH

Your company CREATIVE AUTOMOTIVE RESEARCH DIVISION

Your company address TWENTY FIRST CENTURY ELECTRIC VEHICLES INC.
8136 BYRON RD.
WHITTIER CA 90606

Your mail stop BLDG. G

Your department NONE

Your title CHIEF ENGINEER

Your phone number 213-593-1246 HOME 213-696-4886

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☐ Some government funding
- ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☒ Yes Name of Program(s) BATTERY TEST PROGRAM
- ☐ No

3. Please list program names which are in a usable state.

(1) BATTERY TEST PROGRAM (ANALOG)

(2) DUAL MODE AUTOMOBILE SIMULATION (DIGITAL)

4. Is your program(s) available for public use?

☐ Yes ALTHOUGH THE MATHEMATICAL MODELS USED HAVE BEEN WIDELY PUBLICIZED AND APPROX. 250 COPIES GIVEN AWAY ON FICHE.

☒ No

5. Is the program(s) described in any publicly available technical publications?

☐ Yes

☒ No BUT I HAVE THE LIST OF THOSE WHO GOT THE MODELS ON FICHE (ALL IEEE MEMBERS)

6. Can your simulation program in some manner simulate or predict performance of:

☐ Heat-engine vehicles

☒ Electric vehicles (1)

☐ Hybrid vehicles

☒ All of the above (2)

☐ None of the above

(Please define your meaning of "Hybrid".) TWO TORQUE SOURCES IN SERIES OR PARALLEL — MODULAR CONSTRUCTION

7. Please describe your program(s) in terms of:

The programming language used (1) ANALOG (2) CSSL III

The computer(s) it runs on (2) CDC 6500

The approximate number of source code cards (2) 1,000

The approximate number of routines (2) 20

Core storage requirements (2) NOT LARGE (80 K TO 100K)

8. Your simulation program(s) is:

☐ Well documented FOR ENGINEER-USERS

☒ Partially documented FOR OPERATORS

☐ Not too well documented *per conversation with Mr. Ulbrich on 3/22/78.*

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☐ Yes

☒ No COULD BE EASILY ADDED

10. Is your simulation program(s) designed for:

(2) (LINE PRINTER PLOTTING)

☒ Batch mode operation

☐ Interactive mode

(1) DATA ONTO LOAD SHEETS

☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

☐ EPA urban

☐ EPA highway

☐ Some or all SAE J227 schedules

☒ Other (2) ANY PREPROGRAMMED TRIP

(1) ANY PREPROGRAMMED TRIP

12. Can JPL use this data in a survey report for the Department of Energy?

☒ Yes

☐ No

☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

☒ Yes

☐ No

☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

☐ Yes Who? _____

☒ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

TOO MANY TO LIST

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name David Yancey

Your company Clark County Transportation Study

Your company address P.O. Box 396
Las Vegas, Nevada 89101

Your mail stop our office

Your department Regional Street and Highway Commission

Your title Principle Planner

Your phone number (702) 386-4011, X-484

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

The Clark County Transportation Study is responsible for studying, and implementing/developing a transportation system for Clark County to provide for an efficient and well balanced transportation system to adequately provide for the mobility needs of the Community as it evolves within the desired development patterns.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name FRANK VERBEKE

Your company ALTURDYNE

Your company address 8050 ARMOUR
SAN DIEGO, CALIF 92111

Your mail stop

Your department

Your title PRESIDENT

Your phone number 714 565 2131

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state.

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

We're just getting started with our own model of a battery-gas turbine vehicle.

D. Vanderlaan

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name B. H. ROWLETT

Your company AiRESEARCH MFG Co

Your company address 2525 W. 190th ST
TORRANCE CALIF 90509

Your mail stop

Your department 93-8

Your title PROGRAM MGR

Your phone number (213) 323-9500 x 3638

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☒ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) DoE Contract "Near Term Electric Vehicle"

☐ No

3. Please list program names which are in a usable state.

MINGT2
EVNMTR
LA4NEW

4. Is your program(s) available for public use?

☐ Yes

☒ No

5. Is the program(s) described in any publicly available technical publications?

☒ Yes

☐ No

6. Can your simulation program in some manner simulate or predict performance of:

☐ Heat-engine vehicles

☒ Electric vehicles

☐ Hybrid vehicles

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) Electric plus heat engine powered

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on UNIVAC 1100

The approximate number of source code cards 2,000 each

The approximate number of routines 10 each

Core storage requirements 20 blocks each

8. Your simulation program(s) is:

☐ Well documented

☐ Partially documented

☒ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☐ Yes

☐ No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other arbitrary cycles $V = f(t)$

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [x] Yes Who? Tom Barber, Ron Yoshida
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

(10)

NOTE: ALL REFERENCES TO ELECTRIC AND ELECTRIC HYBRID VEHICLES.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name ROY KAYLOR

Your company KAYLOR ENERGY PRODUCTS

Your company address 1918 MENALTO AVE
MENLO PARK, CALIF
94025

Your mail stop

Your department

Your title PRESIDENT

Your phone number (415) 325-6900

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☑ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☑ Yes Name of Program(s) Electric Vehicle Performance

☐ No

3. Please list program names which are in a usable state.

ELECTRIC VEHICLE PERFORMANCE

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) SODIUM, LITHIUM, ALCOHOL, OR GASOLINE POWERED GENERATOR

7. Please describe your program(s) in terms of:

The programming language used BASIC

The computer(s) it runs on SMALL

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements 8K

8. Your simulation program(s) is:

- [ ] Well documented
- [ ] Partially documented
- [x] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [x] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [x] Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes *per conversation with Mr. Kaylor on 2/7/78*
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [ ] Yes
- [ ] No
- [x] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name JOHN BRENNAND

Your company G R C

Your company address P.O. Box 3587
S.B. CA 93105

Your mail stop

Your department

Your title MEMBER OF TECH. STAFF

Your phone number 805 964 7724

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- [x] All government funding
- [ ] Some government funding
- [ ] No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- [x] Yes — Name of Program(s) Studies funded by Electric & Hybrid Vehicle R&D Act PL 94-413
- [ ] No

3. Please list program names which are in a usable state.

ELVEC

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles
- [x] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) Heat engine / battery electric

7. Please describe your program(s) in terms of:

The programming language used Fortran

The computer(s) it runs on IBM, Unvac, CDC

The approximate number of source code cards 5000

The approximate number of routines 50

Core storage requirements ~220000 BYTES

8. Your simulation program(s) is:

- [ ] Well documented
- [x] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [x] Both of the above

11. If your simulat r(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [ ] Some or all SAE J227 schedules (incl. SAE Metro. & Residential)
- [x] Other Constant speed + European FAICRA

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [x] Yes Who? Phil Chapman
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name WALTER-H.-KORFF

Your company KORFF CORP.

Your company address 449-N.-LAMER ST.
BURBANK CALIF. 91506

Your mail stop

Your department

Your title PRES. & GEN. MGR.

Your phone number (213) 848-2239

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state,

   NONE

(13)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name G. GOODMAN

Your company GLOBE-UNION INC

Your company address 5757 N. GREEN BAY AVE.
MILWAUKEE, WIS. 53201

Your mail stop

Your department CORPORATE APPLIED RESEARCH GROUP

Your title MANAGER

Your phone number 414-228-2364

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state.

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Exxon

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name H. Reese Ivey

Your company Wood-Ivey Systems Corp.

Your company address P.O. Box 4609

Winter Park, FL. 32793

Your mail stop _____

Your department _____

Your title Vice President

Your phone number (305) 678-6116

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state,

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

The major automotive companies

_____

_____

_____

(15)

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

THIS CORPORATION IS BEING LIQUIDATED AT THIS TIME

Electric Dynamics Corporation
Attn: James C. Boylan
President
607 North Main Street
Plainwell, MI 49080

Dear Sir:

The Jet Propulsion Laboratory (JPL) has been requested by the Department of Energy to conduct a survey of automotive-performance simulation capability within the United States and, in particular, electric and hybrid vehicle performance simulation capability within the industry and government sectors. The results will be published and made available to the public.

Attached is a questionnaire designed to give JPL a brief indication of your automotive performance simulation capability. The questions are yes/no or multiple-choice types which will convey information to JPL with a minimum expenditure of your time. The questionnaire should require approximately 10 minutes to complete.

Please help us by indicating your answers to the questions and returning the questionnaire in the self-addressed, stamped envelope provided. Your prompt response will be greatly appreciated.

It is emphasized that this is a request for information only and does not constitute a commitment, implied or otherwise, that JPL will take any procurement action. JPL or the Government cannot be responsible for any cost incurred in furnishing this information.

Very truly yours,

O. Figueroa, Supervisor
Flight Project &
Civil Systems
Procurements

PD:cm

enclosure

29

Telephone 354-4321 *Twx 910-588-3269* *Twx 910-588-3294*

(16)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name WARREN HARNAY / PRESIDENT

Your company ELECTRIC VEHICLE ASSOCIATES INC

Your company address 9100 BANK ST.
Cleveland OH 10 44125

Your mail stop _____

Your department _____

Your title PRESIDENT

Your phone number 216-524-8418

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☐ Some government funding
- ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☒ Yes Name of Program(s) J227 B, C, D Range Simulator
- ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) GASOLINE or Diesel Heat engine + Electric in series or parallel Configuration

7. Please describe your program(s) in terms of:

The programming language used BASIC

The computer(s) it runs on DEC PDP 11

The approximate number of source code cards PROPRIETARY

The approximate number of routines 11 / 11

Core storage requirements _____

8. Your simulation program(s) is:

- [ ] Well documented
- [x] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No AT PRESENT

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [x] Some or all SAE J227 schedules
- [ ] Other _____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [ ] Yes
- [ ] No
- [x] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

TRIAD SERVICES DEARBORN MICH

G.E.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Arthur E. Raynard

Your company AiResearch Manufacturing Company

Your company address 2525 West 190th Street

Torrance, California 90509

Your mail stop T-41 Building 36

Your department 93-8

Your title Senior Project Engineer

Your phone number (213) 323-9500 x-2881

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) Preparing for upcoming Hybrid Vehicle Program

   ☐ No

3. Please list program names which are in a usable state.

   1. Hybrid Vehicle Performance Program

   2. Hybrid Vehicle Life Cycle Cost Program

4. Is your program(s) available for public use?

- [ ] Yes
- [X] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [X] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [X] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) Vehicle uses two fuel sources, one of which is wall plug electricity and storable in the vehicle.

7. Please describe your program(s) in terms of:

The programming language used Fortran V

The computer(s) it runs on UNIVAC - 1100

The approximate number of source code cards Performance - 1500; Cost - 500

The approximate number of routines 15

Core storage requirements Performance - 20K words

8. Your simulation program(s) is:

- [X] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [X] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [X] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [X] EPA urban
- [X] EPA highway
- [X] Some or all SAE J227 schedules
- [ ] Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?_____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

University of Wisconsin, TRW, Aerospace Corp., Ford Motor Co., LLL, Exxon

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Bogdan W. Bernert

Your company B. I. E. - BERNERT INTERNATIONAL ENGINEERS

Your company address 7615 Greenback Lane

Citrus Heights, CA 95610

Your mail stop _____

Your department _____

Your title President

Your phone number (916) 726-0450

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

We do not know any U.S. companies to be engaged in automotive performance simulation program.

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name ROBERT S. MCKEE

Your company MCKEE ENGINEERING CORP.

Your company address 411 W COLFAX ST.
PALATINE, ILL. 60067

Your mail stop _____

Your department _____

Your title PRESIDENT

Your phone number 312-358-6773

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

   _____

   _____

   _____

   _____

RECEIVED
NOV 28 1977
SECTION 622

McKEE ENGINEERING CORPORATION

Mr. O. Figueroa
Flight Project and Civil Systmes Procurements
Jet Propulsion Laboratory
4800 Oak Grove Dr.
Pasadena, Ca 91103

November 22, 1977

Dear Sir:

With regard to the recent request from your office concerning Vehicle Simulation Programs: we are currently seeking support for the development of Vehicle Simulation and Parameter Identification software.
We have significant in-house experience and capability in this field and we would appreciate information concerning the procedure for qualifying our company so that we can receive RFP'S and submit proposals in this general area.

Very truly yours,

Robert S. McKee
President
RSM/rr

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(20)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name M.A. POCOBELLO

Your company TRIAD SERVICES, INC

Your company address 10611 HAGGERTY ST

DEARBORN, MICH. 48126

Your mail stop

Your department

Your title PRESIDENT

Your phone number 313-584-0751

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) ELECTRIC VEHICLE DESIGN

   ☐ No

3. Please list program names which are in a usable state.

EV RANGE	FECON
EV PERF	ACCELM
EVSCR	ACCELA
EVSEP	RACE

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [x] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used BASIC, FORTRAN IV

The computer(s) it runs on CYBERNETICS

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

- [ ] Well documented
- [ ] Partially documented
- [x] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other ARBITRARY.

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [ ] Yes
- [ ] No
- [x] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name AUGUST G. HEBEL JR

Your company BONAC CORPORATION

Your company address 1257 — 18 Mile St.
DETROIT, MICHIGAN 48216

Your mail stop SAME

Your department PRACTICAL RESEARCH

Your title CHAIRMAN — CHIEF EXECUTIVE OFFICER

Your phone number (313) 496-1740

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s). (PERSONAL FUNDING)

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding —

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) HYBRID POWER

   ☐ No

3. Please list program names which are in a usable state.

   NONE — MORE RESEARCH IS REQUIRED

4. Is your program(s) available for public use?

☐ Yes

☒ No

5. Is the program(s) described in any publicly available technical publications?

☐ Yes

☒ No

6. Can your simulation program in some manner simulate or predict performance of:

☐ Heat-engine vehicles

☐ Electric vehicles

☒ Hybrid vehicles FOR THE FUTURE

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) ON BOARD GENERATOR DRIVING AN ELECTRIC VARIABLE POWER CONCEPT.

7. Please describe your program(s) in terms of:

The programming language used _____

The computer(s) it runs on _____

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements MINIMAL

8. Your simulation program(s) is:

☐ Well documented

☐ Partially documented

☒ Not ~~too well~~ documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☐ Yes

☐ No NEEDS MORE DEVELOPMENT

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [?] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [x] Other OUR IDEAS ARE NOT IN USE TODAY UNDER ANY SCHEDULES

12. Can JPL use this data in a survey report for the Department of Energy?

- [ ] Yes
- [ ] No
- [x] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

WILLIAMS RESEARCH - WALLED LAKE, MICHIGAN
AMERICAN MOTORS - SOUTHFIELD, MICHIGAN

(22)

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name ROBERT SCHWARZ

Your company SOUTH COAST TECHNOLOGY

Your company address P.O. BOX 3265
SANTA BARBARA, CA. 93105

Your mail stop —

Your department —

Your title DIRECTOR OF ENGINEERING

Your phone number (805) 964-4749

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☒ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s) _____

☒ No (BUT EXPECT TO BE SHORTLY)

3. Please list program names which are in a usable state.

VROOM

EV227

4. Is your program(s) available for public use?

☒ Yes (USABLE ON GENERAL ELECTRIC TYMSHARE SYSTEM ONLY, AT THE MOMENT. WILL BE CONVERTING FOR USE ON CDC 6400 IN NEAR FUTURE)

☐ No

5. Is the program(s) described in any publicly available technical publications?

☐ Yes

☒ No

6. Can your simulation program in some manner simulate or predict performance of:

☒ Heat-engine vehicles (VROOM)

☒ Electric vehicles (EV227)

☐ Hybrid vehicles

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on G.E. TYMSHARE SYSTEM

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

☐ Well documented

☒ Partially documented (VROOM)

☒ Not too well documented (EV227)

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☒ Yes

☐ No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [x] Other VROOM WILL ACCEPT ANY DRIVING CYCLE INPUT; EV227 USES SAE J227a (D) CYCLE.

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

(29)

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name GEORGE H. GELB

Your company TRW SYSTEMS AND ENERGY

Your company address ONE SPACE PARK
REDONDO BEACH, CA.
90278

Your mail stop R1/1086

Your department ADVANCED TECHNOLOGY LABORATORY

Your title MGR. ENERGY APPLICATIONS

Your phone number (213) - 535-2500

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☒ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s) _____

☒ No

3. Please list program names which are in a usable state.

NONE

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) HEAT ENGINE/STORED ENERGY SOURCE OF EITHER PARALLEL OR SERIES TYPES

7. Please describe your program(s) in terms of:

The programming language used ON LINE SYSTEM

The computer(s) it runs on IBM 360-75

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

- [ ] Well documented
- [x] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [x] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [x] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [x] Other PROGRAM ACCEPTS STATISTICAL DISTRIBUTIONS OF VEHICLE VELOCITY-ACCELERATION EVENTS

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name R W HUNN, (*) RESEARCH SUPERVISOR

Your company U.S. D.O.E.

Your company address BARTLESVILLE ENERGY RESEARCH CNTR
P.O. BOX 1398
BARTLESVILLE, OK 74003

Your mail stop

Your department ALTERNATE CONTACT - W.F. MARSHALL

Your title (*) PROJECT LEADER - TECHNOLOGY ASSESSMENT

Your phone number 918-336-2400

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   [X] All government funding

   [ ] Some government funding

   [ ] No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   [X] Yes Name of Program(s) AUTO TECH ASSESS

   [ ] No

3. Please list program names which are in a usable state.

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN / HPL

The computer(s) it runs on HP 2100 ; HP 9825

The approximate number of source code cards 500

The approximate number of routines 3

Core storage requirements 16 K

8. Your simulation program(s) is:

- [ ] Well documented
- [ ] Partially documented
- [x] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [x] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?_____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

GEN MOTORS

FORD

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name VAUGHN R. ANDERSON

Your company BILLINGS ENERGY CORP.

Your company address 2000 E. BILLINGS AVE.
P.O. BOX 555
PROVO, UTAH 84601

Your mail stop _____

Your department HYDROGEN ENGINE/VEHICLE DIVISION

Your title DIRECTOR OF HYDROGEN ENGINE/VEHICLE RESEARCH

Your phone number (801) 375-0000

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

   _____

   _____

   _____

   _____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

NONE TO MY KNOWLEDGE

_____

_____

_____

(26)

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

Electric Vehicles of Ohio
Attn: Robert D. Childs
9135 Frenwood Drive
Olmsted Falls, OH 44138

Dear Sir:

The Jet Propulsion Laboratory (JPL) has been requested by the Department of Energy to conduct a survey of automotive-performance simulation capability within the United States and, in particular, electric and hybrid vehicle performance simulation capability within the industry and government sectors. The results will be published and made available to the public.

Attached is a questionnaire designed to give JPL a brief indication of your automotive performance simulation capability. The questions are yes/no or multiple-choice types which will convey information to JPL with a minimum expenditure of your time. The questionnaire should require approximately 10 minutes to complete.

Please help us by indicating your answers to the questions and returning the questionnaire in the self-addressed, stamped envelope provided. Your prompt response will be greatly appreciated.

It is emphasized that this is a request for information only and does not constitute a commitment, implied or otherwise, that JPL will take any procurement action. JPL or the Government cannot be responsible for any cost incurred in furnishing this information.

Very truly yours,

O. Figueroa, Supervisor
Flight Project &
Civil Systems
Procurements

PD:cm

enclosure

57

Telephone 354-4321 *Twx 910-588-3269* *Twx 910-588-3294*

(27)

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name Elmo M. Long

Your company St. Elmo Hybrids

Your company address 1048 Van de Venter Street
W. Palm Beach, Florida 33405

Your mail stop _____

Your department _____

Your title Director

Your phone number (305) 832-6986

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s) _____

☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

None.

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Edward A Cam pbell

Your company Electric Vehicle Council

Your company address 90 Park Avenue

New York, N Y 10016

Your mail stop _____

Your department _____

Your title Executive Secretary

Your phone number 212/573-8785

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

   _____

   _____

   _____

   _____

60

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

More

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name _____

Your company BENJAMIN BARRON
TECHNICAL DIRECTOR
BOGUE ELECTRIC MANUFACTURING COMPANY

Your company address 100 PENNSYLVANIA AVENUE
PATERSON, NEW JERSEY 07509

Your mail stop _____

Your department _____

Your title _____

Your phone number 201- 525-2200

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

DO NOT KNOW OF ANY - BUT WE ARE VERY INTERESTED IN BECOMING INVOLVED IN THIS WORK -

FB

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name R L RICCI

Your company EXXON ENTERPRISES INC.

Your company address PO BOX 192
FLORHAM PARK
NEW JERSEY 07932

Your mail stop

Your department ELECTRIC POWER CONVERSION SYSTEMS

Your title PROJECT MANAGER

Your phone number 201 414 5214

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☑ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☑ Yes Name of Program(s)

☐ No

3. Please list program names which are in a usable state,

EVSIM.FORT

ACCSIM.FORT

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes SAE PAPER 2/18
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on IBM 370

The approximate number of source code cards 1700

The approximate number of routines 15

Core storage requirements 80 000 BYTES

8. Your simulation program(s) is:

- [ ] Well documented
- [x] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other SCOTT, SAE J1082

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes *per conversation with Mr. Ricci on 2/9/78.*
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [ ] Yes
- [ ] No
- [x] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name ___ C. A. Belsterling, Mgr., E.E.

Your company. Franklin Institute Research Labs.

Your company address Ben Franklin Parkway
Philadelphia, PA 19103

Your mail stop _____

Your department _____

Your title _____

Your phone number (215) 448 1235

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☑ Some government funding
- ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☑ Yes — Name of Program(s) Tunnel Entrance Safety.
- ☐ No

3. Please list program names which are in a usable state.

Hybrid system — no program names

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [x] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) Electric – Internal Combustion – Flywheel.

7. Please describe your program(s) in terms of:

The programming language used Fortran and Assembly Language

The computer(s) it runs on EAI Pacer 100 digital – General purpose analog.

The approximate number of source code cards —— none.

The approximate number of routines Seven.

Core storage requirements 60K.

8. Your simulation program(s) is:

- [ ] Well documented
- [ ] Partially documented
- [x] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?_____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

None

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name ANTONIO F. ARTILES

Your company MECHANICAL TECHNOLOGY INC.

Your company address 968 ALBANY SHAKER RD.
LATHAM N.Y. 12110

Your mail stop

Your department ENGINEERING DEPT., R&D. DIVISION

Your title ANALYTICAL ENGINEER

Your phone number 518-785-2435

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☑ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s)

☑ No

3. Please list program names which are in a usable state.

1. HYBRID

2. AUTOMOBILE PERFORMANCE SIMULATION PROGRAM

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [x] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) VEHICLE POWERED BY A COMBINATION OF A HEAT ENGINE AND AN ELECTRIC MOTOR.

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on CDC 6600

The approximate number of source code cards 2 BOXES (~2000)

The approximate number of routines 53

Core storage requirements $124\,000_8$ WORDS

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [x] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [x] Other ANY THAT IS INPUT.

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [x] Yes Who? RONALD C. HEFT
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

(33)

BORISOFF ENGINEERING CO.
ELECTRIC TRANSPORTATION EQUIPMENT
7706 BURNET AVENUE
VAN NUYS, CALIF. 91405
213-988-5630

November 23, 1977

JET PROPULSION LABORATORY
California Institute of Technology
4800 Oak Grove Drive
Pasadena, California 91103

Gentlemen:

In response to your November 17, 1977 inquiry regarding automotive performance simulation, we are sorry to state that we do not presently have a computer simulation capability such as your letter inquired about. Our primary field of expertise and competence is in the engineering and design of electrically propelled vehicles.

As a matter of interest and reference, we believe that our credentials and experience are known to Department of Energy staff and industry people and we would welcome the opportunity to be of help to your organization as your interest indicate.

I would appreciate an opportunity to explore this with you further. May we hear from you?

Very truly yours,

BORISOFF ENGINEERING CO.

Bob Borisoff

B. Borisoff, P. E.

BB:kh

73

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name Karl R. Stewart

Your company Sierra Solar Systems, Inc.

Your company address P. O. Box 310
Nevada City, California 95959

Your mail stop

Your department

Your title Exec. Vice President

Your phone number 916/272-3444

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s)

☐ No

3. Please list program names which are in a usable state.

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Aero Power
2398 4th Street
Berkeley, CA 94710

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Roger H. Ducoffre

Your company Metal Specialists, Inc.

Your company address 16440 Common Road

Roseville, MI 48066

Your mail stop _____

Your department _____

Your title Director of Sales

Your phone number 773-0800

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

One of the companies we do work for that has this type of testing equipment is Dana Corp-Parish Division. Our facilities are geared primarily to the metal stamping and assembly area. We are involved in both prototype & production manufacturing of body and chasses components.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name BERT ENSERINK

Your company Dynamic Science, INC.

Your company address 1850 W. Pinnacle Peak Rd.
Phoenix, AZ 85047

Your mail stop _____

Your department _____

Your title Director, Technical Operations

Your phone number 602-942-3300

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

   _____

   _____

   _____

   _____

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name VESTER FORREST

Your company THE AEROSPACE CORPORATION

Your company address 2350 EAST EL SEGUNDO BLVD
EL SEGUNDO, CA. 90245

Your mail stop CONTINENTAL BLDG, RM. 602

Your department MOBILE SYSTEMS GROUP

Your title DIRECTOR, VEHICLE PERFORMANCE OFFICE

Your phone number (213) 648-5752

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- [x] All government funding
- [ ] Some government funding
- [ ] No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- [x] Yes — Name of ~~Program~~ Study(s) HYBRID VEHICLE TECHNOLOGY CONSTRAINTS AND APPLICATION ASSESSMENT STUDY (OOT)
- [ ] No

3. Please list program names which are in a usable state.

HYBRID VEHICLE SIMULATION COMPUTER PROGRAM
1 — POWER TRAIN COMPONENT SIZING PROGRAM
2 — ENERGY CONSERVATION & EMISSIONS PROGRAM

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) HEAT ENGINE / BATTERY, HEAT ENGINE / FLYWHEEL

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on CDC 7600

The approximate number of source code cards 1: 2000, 2: 3500

The approximate number of routines 20

Core storage requirements 130,000 - 160,000 WORDS

8. Your simulation program(s) is:

- [ ] Well documented
- [x] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [x] Yes
- [ ] No

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10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [x] Some or all SAE J227 schedules
- [ ] Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? ANDREW F. BURKE
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name RAYMOND JACOBS, VICE-PRESIDENT

Your company MURRILL MOTORS

Your company address 6163 AUBURN BLVD
CITRUS HEIGHTS, CA. 95610

Your mail stop P.O. BOX 41588, SACRAMENTO, CA 95841

Your department MANAGEMENT - FINANCE

Your title VICE-PRESIDENT

Your phone number (916) 723-3377

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s) _____

☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name E.A.Gillis

Your company Electric Power Research Institute

Your company address P.O. Box 10412
Palo Alto CA 94303

Your mail stop

Your department Energy Management & Utilization Technology Dept.

Your title Project Manager, Fuel Cell Systems

Your phone number 415-493-4800 x 108

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

MERADCOM Fort Belvoir, VA 22060 Attn: Dr. J. Huff
Ford Motor Company
Los Alamos Scientific Laboratory
TRW?

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Steven K. Griffith

Your company Gilbert Associates, Inc.

Your company address Suite 201
1828 L. ST. N.W.
Washington, D.C. 20036

Your mail stop

Your department Program Development

Your title Planning Engineer

Your phone number 202-331-0252

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name A.A. Blackerby

Your company Power-Train, Inc.

Your company address 3665 South 300 West
Salt Lake City, Utah
84115

Your mail stop

Your department Corporate

Your title President

Your phone number 801-261-1616

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state.

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

International Harvestor, Fort Wayne, Indiana

_____

_____

_____

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name W.C. EDWARDS

Your company EDWARDS ELECTRONIC CORP.

Your company address 44 RAIL ROAD AVE
GLENHEAD N.Y. 11545

Your mail stop _____

Your department _____

Your title PRES.

Your phone number (516) 759-1226

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

   _____

   _____

   _____

   _____

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Eugene McManus

Your company Raytheon Company

Your company address Hartwell Road

Bedford, MA 01730

Your mail stop M1-46

Your department Marketing and Planning

Your title Marketing Manager, Laboratory Support Technology

Your phone number (617) 274-7100 x4019

If your company does not have an automotive simulation program, go to question 15.

No simulation

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name JOHN KENNEDY

Your company HUNTER MFG. CO.

Your company address 30525 AURORA RD
SOLON, OH 44139

Your mail stop _____

Your department _____

Your title _____

Your phone number _____

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

   _____

   _____

   _____

   _____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

INTERNATIONAL HARVESTER IN FT WAYNE, IND might be able to handle this. They have rather extensive truck testing facilities.

Gould Inc.
40 Gould Center
Rolling Meadows, Illinois 60008
Telephone (312) 640-4400

GOULD

(47)

November 21, 1977

Mr. O. Figueroa, Supervisor
Flight Project & Civil Systems Procurements
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91103

Dear Mr. Figueroa:

Enclosed is our response to your questionnaire about our automotive-performance simulation capability.

Our response relates only to the capability of Gould Laboratories-Energy Research. These data are given on the conditions that no specific attribution is made to Gould and that the information is accepted as Commercial Proprietary and protected from release under Exemption 4 of the Freedom of Information Act.

Yours very truly,

S. S. Nielsen
Associate Director-Operations
Gould Laboratories-Energy Research

h/
Enclosure

Will waive above restrictions per conversation with Mr. Nielson on 2/13/78.

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name C. C. Christianson

Your company Gould Inc.

Your company address 40 Gould Center

Rolling Meadows, IL 60008

Your mail stop --

Your department Gould Laboratories-Energy Research

Your title Assoiate Director-Energy Research

Your phone number 312-640-4410

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) Program's #77010, 77011, 77012, VSIMA1

☐ No

3. Please list program names which are in a usable state.

#77010 & #77012, EV Acceleration Performace

#77011, EV Stead-State Performance

VSIMA1, EV Analog Simulation

4. Is your program(s) available for public use?

- [ ] Yes
- [X] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [X] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [X] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used Basic, Fortran

The computer(s) it runs on HP-9830, Honeywell 1648

The approximate number of source code cards Not applicable

The approximate number of routines Varies

Core storage requirements Varies, 15000 words and up

8. Your simulation program(s) is:

- [ ] Well documented
- [X] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [ ] No

Not applicable

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10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [X] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [X] Some or all SAE J227 schedules
- [X] Other USPS Test Cycle

12. Can JPL use this data in a survey report for the Department of Energy?
per conversation with Mr. Christianson on 2/7/78.

- [X] Yes
- [ ] No

DATE PROVIDED HEREIN ARE CONSIDERED COMMERCIAL PROPRIETARY AND PROTECTED FROM RELEASE BY EXEMPTION 4 OF THE FREEDOM OF INFORMATION ACT.

- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [ ] Yes
- [ ] No
- [X] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Dr. Andrew Wortman

Your company AWD Inc.

Your company address 406 Alta Ave.

Santa Monica, CA 90402

Your mail stop

Your department

Your title Pricipal Engineer

Your phone number (213) 394-7332

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study? Yes

   ☒ Yes Name of Program(s) General Automobile Simulation Program (GASP)

   ☐ No

3. Please list program names which are in a usable state.

   Automobile Performance Study & Evaluation

   Automobile Resistance Using Coasting Timing

4. Is your program(s) available for public use?

- [ ] Yes
- [X] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [X] No

6. Can your simulation program in some manner simulate or predict performance of:

- [X] Heat-engine vehicles
- [X] Electric vehicles
- [X] Hybrid vehicles
- [X] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) Internal Combustion Engine - Electric Motor-Battery

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on IBM 360, 370

The approximate number of source code cards 1200

The approximate number of routines 6

Core storage requirements 90K

8. Your simulation program(s) is:

- [ ] Well documented
- [ ] Partially documented
- [X] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [X] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [X] Batch mode operation
- [X] Interactive mode
- [X] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [X] Some or all SAE J227 schedules
- [ ] Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?_____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

ANDREW WORTMAN DEVELOPMENTS
AERO-PROPULSION CONSULTING
406 ALTA AVENUE
SANTA MONICA, CALIF. 90402
(213) 394-7332

29 December 1977

T. A. Barber
Manager, Near Term Hybrid Vehicle Program
Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 91103

Dear Mr. Barber:

I attended the pre-solicitation industry briefing on the near-term hybrid vehicle program. It appears that there might be considerable interest in the Hybrid Automobile Simulation Program (HASP) which is described in the enclosed brochure. This computer code was developed by AWD Inc. from an earlier, more general program which was used by AWE in studies of engine-flywheel driven vehicles for the RAM Corp.

It is the intent of AWD Inc. to participate in the hybrid vehicle program in partnership with other concerns. The computer code is ideally suited for parametric studies and concept evaluation and I would like to offer it to JPL as outlined in the enclosed proposal. In view of the urgency of the situation, the proposed contract could be delivered in 45 days with a 25% increase in the labor costs. I shall take the liberty of calling you in a few days to discuss the project further.

Sincerely,

A. Wortman
AWD Inc.

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bc: T. Barber
P. Figueroa
J. Heie
File

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

January 13, 1978

Refer to: 624-MPK:mk

Andrew Wortman Developments
Aero-Propulsion Consulting
406 Alta Avenue
Santa Monica, California 90402

Attention: A. Wortman

Gentlemen:

Subject: Unsolicited Proposal to Transfer the Hybrid Automobile Simulation Program from AWD Inc. to the Customer, I.D. 11278

The subject unsolicited proposal has been received in this office. The proposal has been forwarded to the appropriate personnel for technical review and evaluation. Past experience indicates that the review and evaluation takes about thirty working days, depending on the number of personnel interested in the proposed effort.

You will be advised of any interest in the program when the review and evaluation is completed.

Very truly yours,

M. P. Kuhn
Procurement Services

100

Telephone 354-4321 *Telex 675421* *Twx 910-588-3294*

bc: T. Barber
C. Chapman
J. Heie
P. Figueroa
File

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

February 1, 1978

Refer to: 624-MPK:mk

Andrew Wortman Developments
Aero-Propulsion Consulting
406 Alta Avenue
Santa Monica, California 90402

Attention: A. Wortman

Gentlemen:

Subject: Unsolicited Proposal to Transfer the Hybrid Automobile Simulation Program from AWD Inc. to the Customer, I.D. 11278

The technical review and evaluation of the subject proposal has been completed. After a thorough review and analysis of the proposal by the appropriate technical and management personnel, we have determined that prior effort has been expended in this area. Therefore, we cannot give any further consideration to funding such a program at this time. One copy of the proposal is being retained for record purposes only.

We appreciate you interest in the activities and programs of the Laboratory.

Very truly yours,

M. P. Kuhn
Procurement Services

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Telephone 354-4321 *Telex 675421* *Twx 910-588-3294*

DR. ANDREW WORTMAN

Advanced research and development in fluid flow systems with heat and mass transfer phenomena. Analysis and evaluation of aerodynamic concepts, thermodynamic systems and chemically reacting flow processes. Over 20 years of experience in theoretical and experimental studies of complex engineering systems. Development and utilization of large computer codes for the analysis and optimization of new concepts and designs.

Consultant to Northrop Corporation, Science Applications Inc., Spectron Development Labs.

Education

PhD in Energy and Kinetics, U.C.L.A. (1969)

MS in Aerosciences, U.C. Berkeley (1958)

BS in Mechanical Engineering, U.C. Berkeley (1956)

Honors and Appointments

National Academy of Sciences Exchange Scholar (1971-1972), 1976

Highest Honors with BS

I. & L. Smith Scholarship (1956-1959) - Highest graduate scholarship, three consecutive years

F. E. F. Scholarship (1956) - Highest undergraduate scholarship

Sigma Xi, Pi Tau Sigma, Tau Beta Pi

Post Doctoral Scholar at U.C.L.A. - 1970-1975

Experience

At Northrop Corporation, Ventura Division, engaged primarily in the analysis of complex hydrodynamics and heat transfer problems of advanced underwater vehicles employing laminar flow control concepts. Under a Navy contract developed the first operational computer code using numerical solutions of the governing differential equations for the calculations of flow

around axisymmetric vehicles at angles of attack. Developed a computer code for the complete calculations of inlet duct-jet engine-exhaust duct-nozzle-jet plume systems to provide the basic data for infra-red signal studies.

At Science Applications Inc., manager of the Aerothermodynamics and Energetics Department of the Los Angeles Division. Primarily concerned with the development of a broad analytical capability in heat and mass transfer phenomena encountered in the coal conversion and utilization processes currently under study in the energy research and development program. Contributed the fluidized bed combustion R&D plan which SAI developed under contract to ERDA. Led the engineering effort in a review (under contract to ERDA) of a fluidized bed boiler plant and participated in the LERC Underground Coal Gasification Symposium. Led the studies under an Air Force SAMSO contract, of roughness induced heating augmentation on re-entry vehicles.

At Northrop Corporation, Aircraft Group, directed the development of viscous aerodynamics computation capabilities. Devised techniques for simple, inexpensive, free-flight testing in hypersonic wind tunnels. Among other accomplishments were theoretical and experimental studies of the dynamics of gun blasts and the dynamics of high-speed projectiles in liquid-filled tanks. A Mach 10 wind tunnel test of the effectiveness of foreign gas injection resulted in the development of a patented aerothermodynamic device for measuring altitude, velocity, and attitude of re-entry vehicles. Also engaged in the application of the solution technique developed in his doctoral dissertation to the analysis of three-dimensional aerothermodynamics phenomena in lifting re-entry vehicle flows. As a Postdoctoral Scholar in the UCLA Energy and Kinetics Department, performed fundamental studies in boundary layer heat and mass transfer phenomena.

Before joining Northrop, at STL/TRW (1961-1963), was responsible for the technical direction of the aerothermodynamics of the Tital and Minute Weapon Systems. Main effort was directed at the development of the methods of analysis of complex aerothermodynamics problems of re-entry vehicles and experimental studies of transient heat transfer during silo launches. At UTC/ United Aircraft (1960-1961), engaged in research in gas dynamics and heat transfer of liquid and solid propellant rocket motors.

Published numerous company reports and technical notes. List of publications in the open literature indicates the range of capabilities and interests.

PUBLICATIONS

1. AMBROSIO, A., and WORTMAN, A., "Stagnation Point Shock Detachment Distance for Flow Around Spheres and Cylinders," American Rocket Society Journal, Vol. 32, No. 2., Feb. 1962.

2. AMBROSIO, A., and WORTMAN, A., "Stagnation Point Shock Detachment Distance for Flow Around Spheres and Cylinders in Air," Journal of the Aeronautical Sciences, Vol. 29, No. 7, July 1962, p. 875.

3. WORTMAN, A., "Laminar Boundary Layer Heat Transfer in Shear Flows," presented at the 48th Bumblebee Aerodynamics Panel Meeting, Austin, Texas, Sept. 1963.

4. WORTMAN, A., "Comments on Simplified Solutions for Ablation in a Finite Slab," AIAA Journal, Vol. 4, No. 4, p. 760, April 1966.

5. WORTMAN, A., "Two Unconventional Methods of Testing in Hypersonic Wind Tunnels," IEEE Aerospace Systems Conference, July 1966, Seattle, Washington, USA.

6. WORTMAN, A., "Aerodynamics of Randomly Tumbling Bodies," Journal of Spacecraft and Rockets, Vol. 6, No. 2, Feb. 1969, pp. 205-207.

7. WORTMAN, A., "High Energy Recovery Pressure and Enthalpy Sensor," presented at the 3rd IEEE International Congress of Instrumentation in Aerospace Simulation Facilities, May 1969, New York.

8. WORTMAN, A., "Re-entry Vehicle Altitude Velocity Sensor," AIAA Paper No. 69-866, presented at the AIAA Guidance, Control and Flight Mechanics Conference, August 1969, Princeton, New Jersey.

9. WORTMAN, A., and MILLS, A. F., "Highly Accelerated Compressible Laminar Boundary Layer Flows with Mass Transfer," ASME Paper No. 70-HT/SpT-34, presented at the ASME 1970 Space Technology and Heat Transfer Conference, June 1970, Los Angeles. Published in the ASME Journal of Heat Transfer, Vol. 93, Ser. C., No. 3, August 1971, pp. 281-289.

10. WORTMAN, A., "Boundary Layers at Three-Dimensional Stagnation Points in High Speed Air Streams," AIAA Paper No. 70-809, presented at the AIAA Third Fluid and Plasma Dynamics Conference, July 1970, Los Angeles.

11. WORTMAN, A., "Foreign Gas Injection at General Three-Dimensional Stagnation Points," presented at the Aerospace Corporation Workshop on Transpiration Cooling in Three-Dimensional Flow Fields, San Bernardino, Jan. 1971. Figures for the presentation in the Proceedings of the Workshop, Aerospace Corp., Document No. SA-71-80036, edited by R. L. Strickler and F. L. Fernandez.

12. WORTMAN, A., ZIEGLER, H., and SOO-HOO, G., "Convective Heat Transfer at General Three-Dimensional Stagnation Points," International Journal of Heat and Mass Transfer, Vol. 14, Jan. 1971, pp. 149-152.

13. WORTMAN, A., "Three-Dimensional Stagnation Point Heat Transfer in Equilibrium Air Flows," AIAA Journal, Vol. 9, No. 5, May 1971, pp. 955-152.

14. WORTMAN, A., and MILLS, A. F., "Mass Transfer Effectiveness at Three-Dimensional Stagnation Points," AIAA Journal, Vol. 9, No. 6, June 1971, pp. 1210-1212.

15. WORTMAN, A., and MILLS, A. F., "Recovery Factors in Highly Accelerated Laminar Boundary Layer Flows," AIAA Journal, Vol. 9, No. 7, July 1971, pp. 1415-1417.

16. WORTMAN, A., and FRANKS, W. J., "Comments on the Method of Weighted Residuals Applied to Free Shear Layers," AIAA Journal, Vol. 9, No. 11, Nov. 1971, pp. 1415-1417.

17. WORTMAN, A., and MILLS, A. F., "Separating Self-Similar Laminar Boundary Layers," AIAA Journal, Vol. 9, No. 12, Dec. 1971, pp. 2449-2451.

18. WORTMAN, A., MILLS, A. F., and SOO-HOO, G., "The Effect of Mass Transfer on Recovery Factors in Laminar Boundary Layer Flows," International Journal of Heat and Mass Transfer, Vol. 15, No. 3, March 1972, pp. 443-456.

19. WORTMAN, A., and FRANKS, W. J., "Parametric Studies of Separating Turbulent Boundary Layer Flows," presented at the NATO-AGARD Conference on Fluid Dynamics of Aircraft Stalling, 25-26 April 1972, Lisbon, Portugal. Published in AGARD-CPP-102.

20. MILLS, A. F., and WORTMAN, A., "Two-Dimensional Stagnation Point Flows of Binary Mixtures," International Journal of Heat and Mass Transfer, Vol. 15, No. 5, May 1972, pp. 969-987.

21. WORTMAN, A., "Heat and Mass Transfer on Cones at Angles of Attack," AIAA Journal, Vol. 10, No. 5, June 1972, pp. 832-834.

22. WORTMAN, A., "Comments on Dynamics of an Explosive Reaction Center," AIAA Journal, Vol. 10, No. 6, June 1972, pp. 846-847.

23. WORTMAN, A., "Foreign Gas Injection into Three-Dimensional Stagnation Point Flow," AIAA Journal of Spacecraft, Vol. 9, No. 6, June 1972, pp. 428-434.

24. WORTMAN, A., "Non-Steady Flow at General Three-Dimensional Stagnation Points," presented at the 11th Yugoslav Congress Rational and Applied Mechanics, 5-10 June 1972, Basko Polje, Yugoslavia.

25. WORTMAN, A., "Exact Solutions of Non-Steady Navier-Stokes Equations at General Three-Dimensional Stagnation Points," presented at the European Mechanics Colloquium on "Numerical Methods for Solving Navier-Stokes Equations," Euromech 27, 16-20 Aug. 1972, Jablonna, Poland.

26. FISZDON, W., WALENTA, Z., and WORTMAN, A., "An Experimental and Theoretical Study of the Distortion of Travelling Shock Wave by Wall Effects," presented at the IUTAM 13th Congress 21-26 August 1972, Moscow, USSR. Also, in Archiwum Mechaniki Stosowanej, Warszawa, Vol. 26, No. 3, March 1974, pp. 479-497.

27. WORTMAN, A., "Foreign Gas Injection at Windwardmost Meridians of Yawed Sharp Cones," AIAA Paper No. 73-764. Presented at the AIAA 8th Thermophysics Conference, 16-18 July 1973, Palm Springs, California, AIAA Journal, Vol. 12, No. 6, June 1974.

28. WORTMAN, A., and FRANKS, W. J., "Reversed Boundary Layer Flows with Variable Fluid Properties," presented in the Open Forum Session of the AIAA 8th Thermophysics Conference, 16-18 July 1973, Palm Springs, California. AIAA Journal, Vol. 12, No. 3, March 1974, pp. 406-408.

29. WORTMAN, A., and MILLS, A. F., "Accelerating Compressible Laminar Boundary Layer Flows of Binary Gas Mixtures," Presented at the XIth Biennial Fluid Dynamics Symposium on Advanced Problems and Methods in Fluid Mechanics, 3-8, September 1973, Sopot-Kamienny Potok, Poland. Also, in Archiwum Mechaniki Stosowanej, Warszawa, Vol. 26, No. 3, March 1974, pp. 487-505.

30. WORTMAN, A., "Exact Solutions of Three-Dimensional Boundary Layer Equations Using Operator Techniques." Presented at the Conference in Three-Dimensional Boundary Layers and Boundary Regions, 28 January 1974, Old Dominion University (VARC), Virginia.

31. WORTMAN, A., "Comments on the Increase of Boundary Layer Heat Transfer by Mass Injection," AIAA Journal, Vol. 12, No. 4, April 1974, pp. 573-574.

32. WORTMAN, A., "Unsteady Flow Phenomena Causing Weapons Fire-Aircraft Engine Inlet Interference Problems-Theory and Experiments," presented at the Symposium on Unsteady Aerodynamics, Tucson, Arizona, 17-20 March 1975.

33. WORTMAN, A., "Three-Dimensional Turbulent Boundary Layer Calculations-Exact and Simplified Solutions," AIAA Paper No. 75-854. Presented at the AIAA 8th Fluid and Plasma Dynamics Conference Hartford, Conn., 16-18 June 1975.

34. WORTMAN, A., and SOO-HOO, G., "Exact Operator Solutions of General Three-Dimensional Boundary Layer Flow Equations." AIAA Journal of Aircraft, Vol. 13, No. 8, Aug. 1976, pp. 590-596.

A PROPOSAL TO TRANSFER THE HYBRID AUTOMOBILE SIMULATION PROGRAM FROM AWD INC TO THE CUSTOMER

AWD Inc proposes to transfer the HASP computer code which is described in the accompanying brochure to the customer. Dr. A. Wortman whose resume is attached will be responsible for making the computer code operational on the customer's computer, preparation of user's manual and the summing of demonstration cases to familiarize the customer's personnel with the functioning of the computational procedure. Assisting Dr. Wortman will be G. Soo Hoo (programming), and G. A. Brinlee (operations and manual preparation). The total time to effect the transfer will be 60 days from the receipt of contract. It is proposed to perform the following tasks:

TASK 1 - Discussions with customer's personnel to determine the exact form of input/output required

TASK 2 - Transfer of source decks to customer's computers, activation and checkout by comparisons with existing calculations

TASK 3 - Arrangement of output data into formats suitable for computer graphics displays which will be developed by the cutomer's programmers

TASK 4 - Preparation of user's manual in accordance with customer's requirements

TASK 5 - Detailed operational checks on customer's computers and final arrangements of input/output formats

TASK 6 - Instruction of customer's personnel in the operation of the computer codes

TASK 7 - Final demonstration runs, delivery of 20 copies of user's manual and recommendation for future development

COST PROPOSAL

DELIVERABLES

AWD Inc proposes to deliver an operational version of the HASP computer code on the customer's computers, instruction of customer's personnel in the use of the code, 20 copies of user's manual and 3 demonstration cases in 60 days from the receipt of contract. AWD will perform the proposed tasks on the basis of a best effort, cost plus fixed fee contract to be charged as follows

Fee for the transfer of the HASP computer code				$10,000
Principal Engineer		$		
Dr. A. Wortman	320 hr @ $25/hr	= 8,000		
Senior Programmer				
G. Soo Hoo	180 hr @ $15/hr	= 2,700		
Associate Engineer				
G. A. Brinlee	160 hr @ $10/hr	= 1,600		
		$12,300		
Overhead @ 27%		3,321		
	Total	$15,621		
General and Administrative @ 7%		1,093		
	Total	$16,714		16,714
Fixed fee @ 9%				1,504
Production of user's manual				1,250
			Total	$29,468

HYBRID AUTOMOBILE SIMULATION PROGRAM
(HASP)

AWD INC
406 ALTA AVENUE
SANTA MONICA CA 90402

PERFORMANCE OF AUTOMOBILES POWERED BY INTERNAL COMBUSTION ENGINES AND ELECTRIC MOTORS SIMULATED ON DIGITAL COMPUTERS

601

SERVICES OFFERED

- PARAMETERIC STUDIES OF FAMILIES OF CONFIGURATIONS
- STUDIES OF SENSITIVITY TO DESIGN PERTURBATIONS
- EVALUATION OF PROPOSED DESIGNS
- TRANSFER OF COMPUTER CODES TO CUSTOMER

DR. A. WORTMAN
(213) 394-7332

ELEMENTS OF THE HASP COMPUTER CODE

- ELECTRIC MOTOR - INTERNAL COMBUSTION ENGINE COUPLING
- RESISTANCE TO MOTION - INERTIAL, ROLLING, LAMINAR, TURBULENT, VORTEX
- REGENERATION AND CHARGING AT CRUISE CONDITIONS
- VARIABLE RELATION OF THROTTLE TO ENGINE-MOTOR POWER OUTPUT
- MULTIPHASE SCHEDULE OF PERFORMANCE
- AUTOMATIC EVALUATION OF BATTERY REQUIREMENTS

OPERATION OF THE HASP COMPUTER CODE

- STANDARD FORTRAN PROGRAMMING LANGUAGE
- REMOTE TERMINAL OR BATCH INPUT/OUTPUT
- COMPUTER GRAPHICS DISPLAY
- INTERACTIVE SCHEDULING OF PERFORMANCE
- STANDARD OR OPTIONAL DRAG CONTRIBUTIONS
- OPTIONAL REGENERATION
- OPERATION BATTERY CHARGING AT CRUISE CONDITIONS

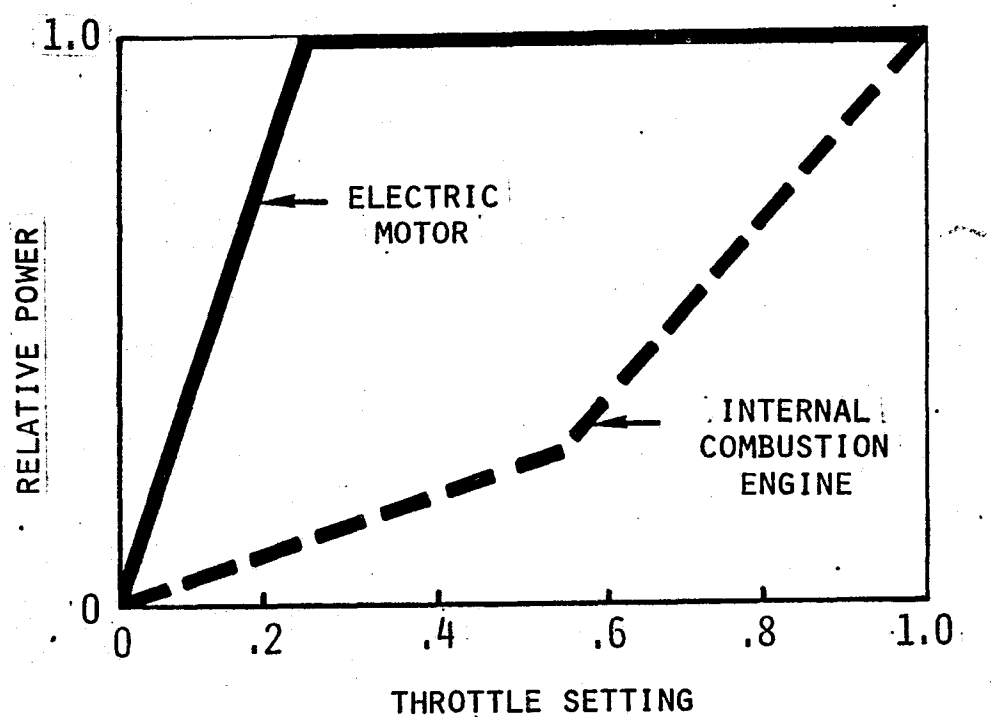
COMPUTER REQUIREMENTS

- LESS THAN 100K BYTE CORE ON IBM 370/168
- ABOUT 1 SECOND CPU TIME FOR A TYPICAL CASE

FORMULATION OF THE HASP COMPUTER CODE

- GOVERNING DIFFERENTIAL EQUATIONS IN DIMENSIONLESS FORM
- RUNGE-KUTTA ADAMS-MOULTON INTEGRATION PROCEDURE
- POLYNOMIAL APPROXIMATIONS FOR - ELECTRIC MOTOR POWER
  ENGINE POWER
  FUEL CONSUMPTION
  DRAG
- GEAR CHANGES AT SPECIFIED ENGINE SPEEDS
- OPTIONAL ENGINE-MOTOR COUPLING
- POWER SPLIT FOR RECHARGING AT CRUISE CONDITIONS

THROTTLE - POWER SETTING RELATIONS



- THROTTLE - POWER RELATIONS SPECIFIED IN INPUT
- MOTOR BECOMES GENERATOR AT CRUISE CONDITIONS
- OPTIONAL REGENERATIVE BRAKING

ILLUSTRATIVE EXAMPLE

- 3200 LB CAR, 36 HP ICE, 45 HP ELECTRIC MOTOR
- FULL THROTTLE ACCELERATION FROM REST
- CHARACTERISTIC CONSTANTS: V_0 = 120 FT/S, T_0 = 20S

A11

COMPUTER GRAPHICS OUTPUT

A. ACCELERATION $(T_0/V_0)DV/DT$ VS TIME, T, SECONDS

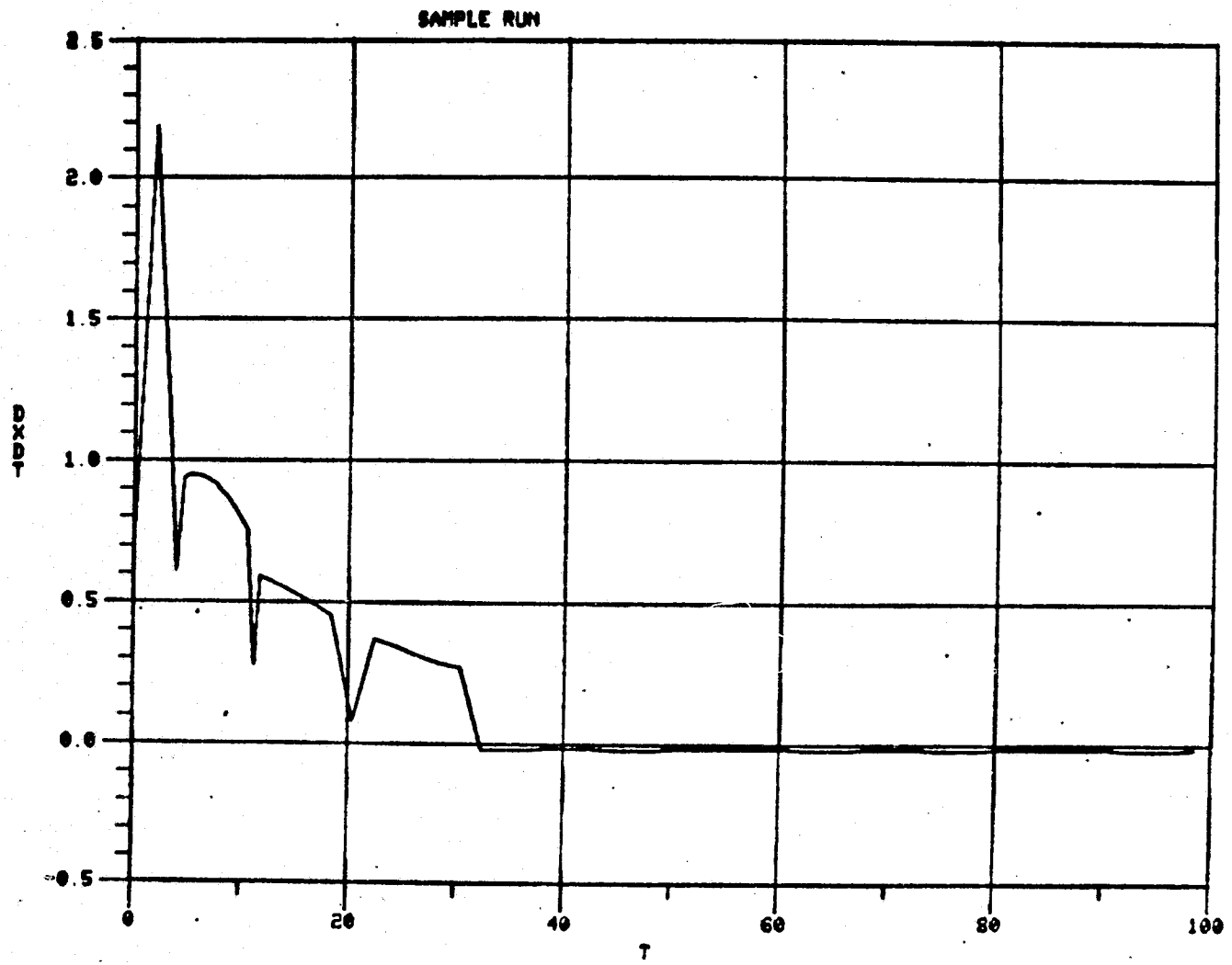
B. VELOCITY V, FT/S, VS TIME, T, SECONDS

C. VELOCITY V, FT/S VS DISTANCE, S, FT

D. DISTANCE S, FT VS TIME, T, SECONDS

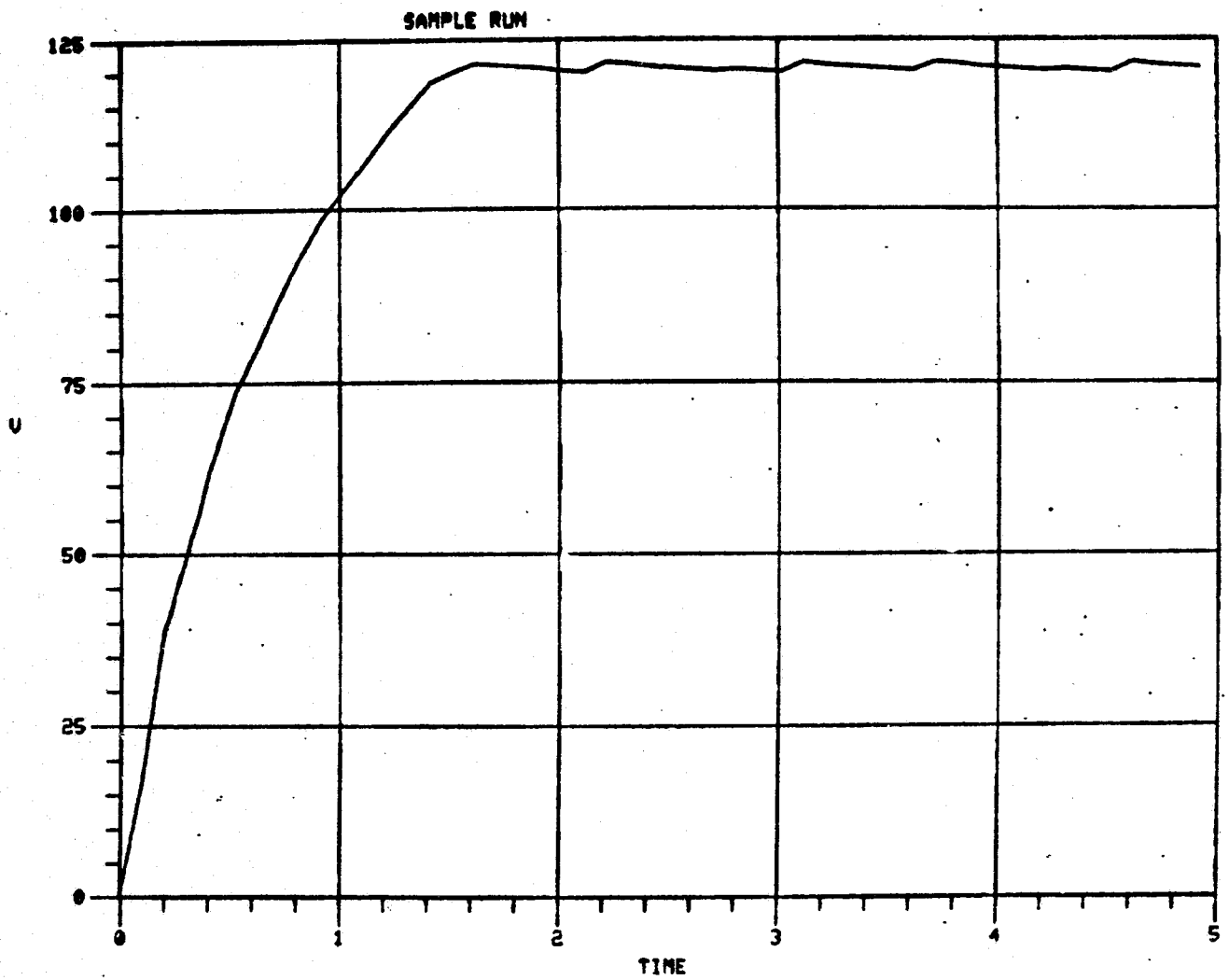
E. FUEL FLOW RATE, FFM, LB/HR, VS TIME, T, SECONDS

F. BATTERY DISCHARGE RATE, QF, KW, VS TIME, T, SECONDS



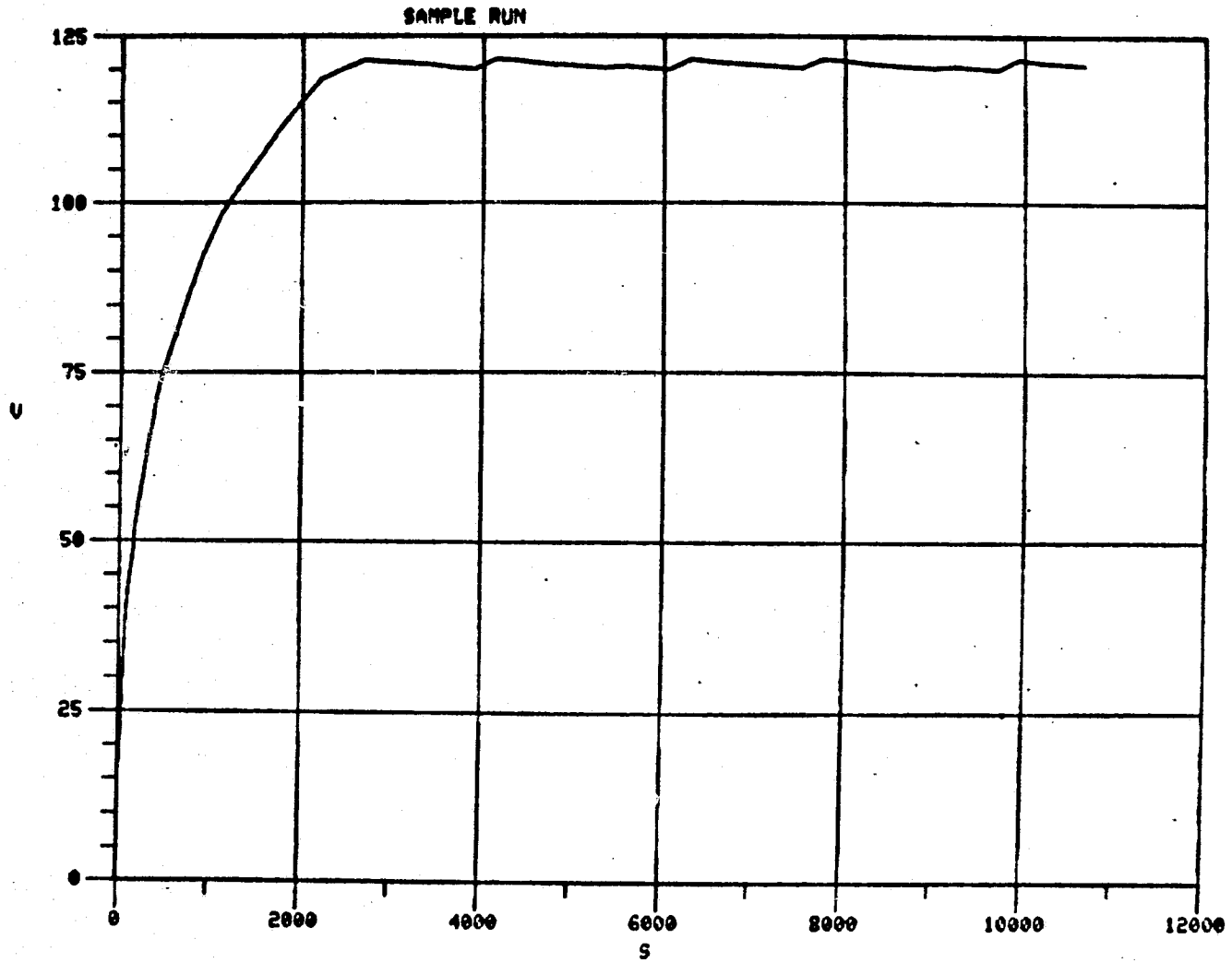
12/23/77

A



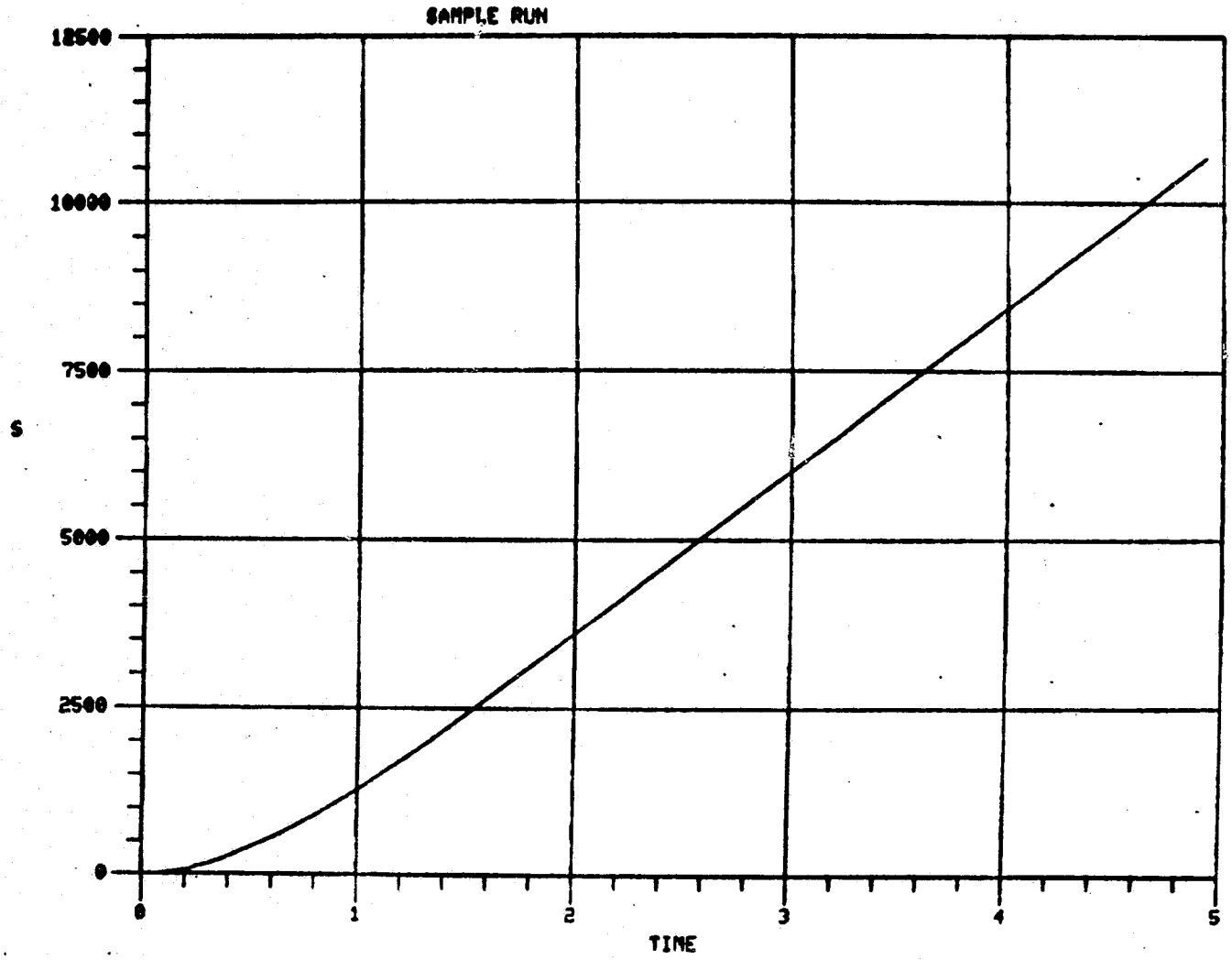
12/23/77

B


SAMPLE RUN
125
100
75
50
25
0
V
0
2000
4000
6000
8000
10000
12000
S

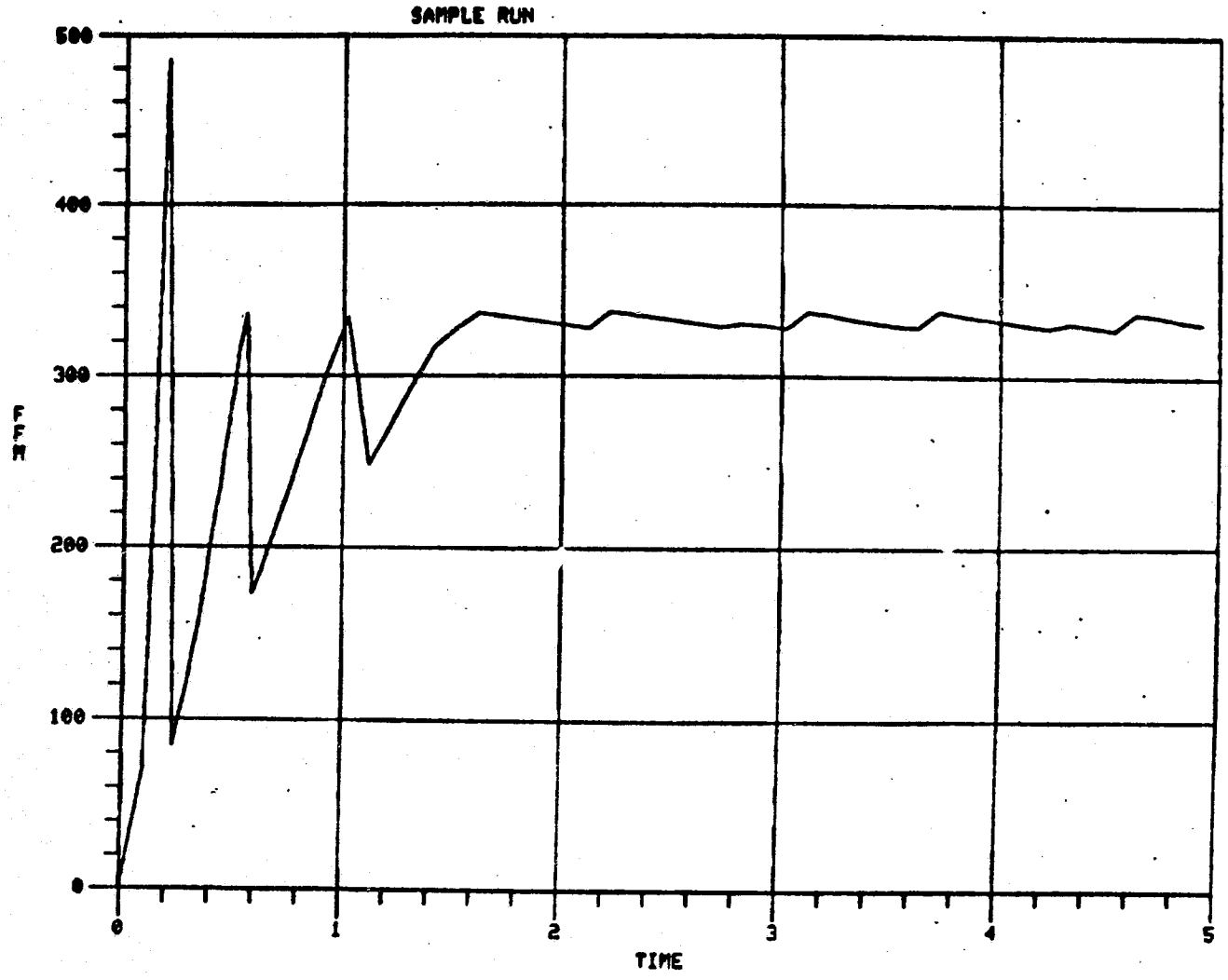
12/23/77

C



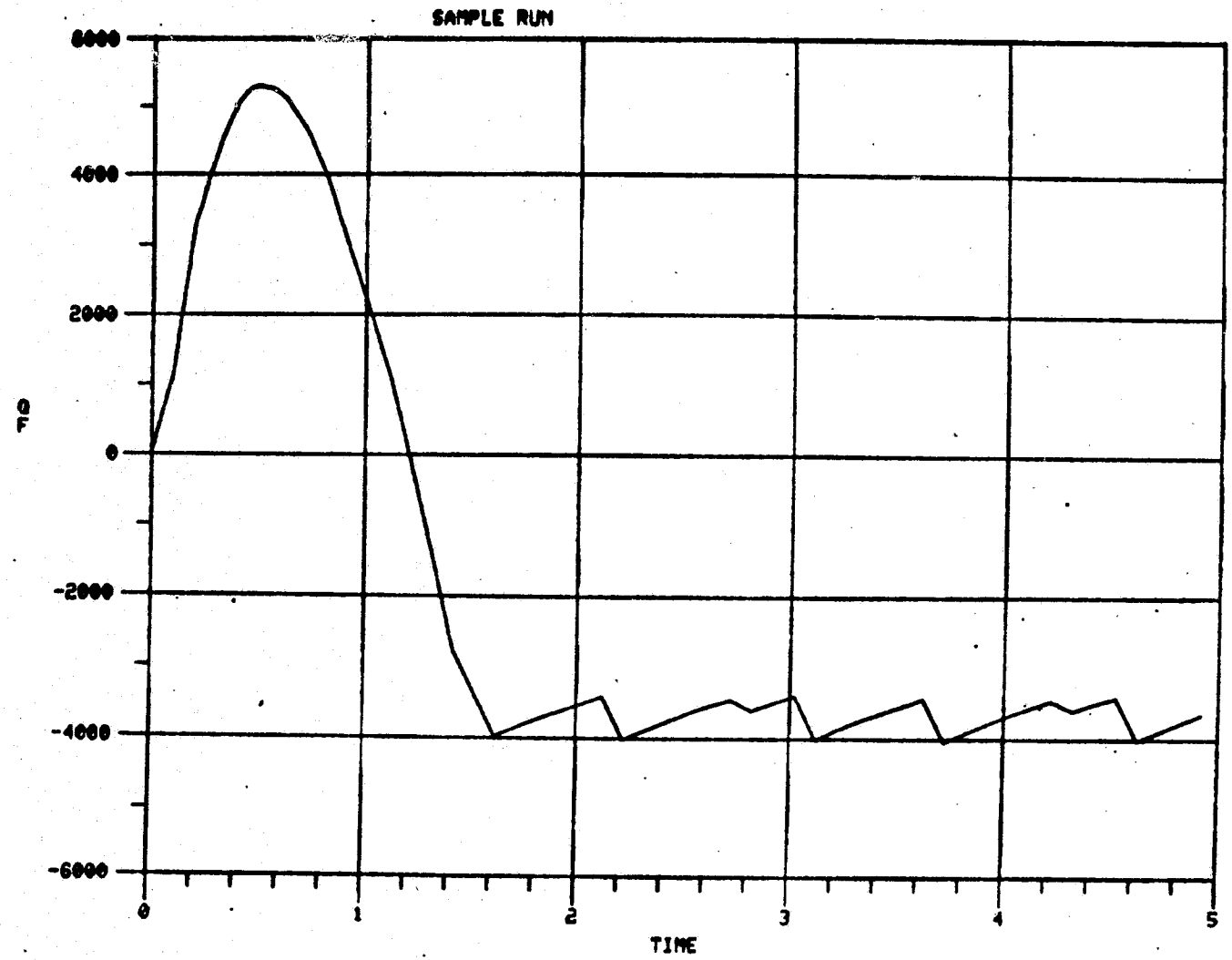
12/23/77

D



12/23/77

E



120

12/23/77

F

RELATED EXPERIENCE

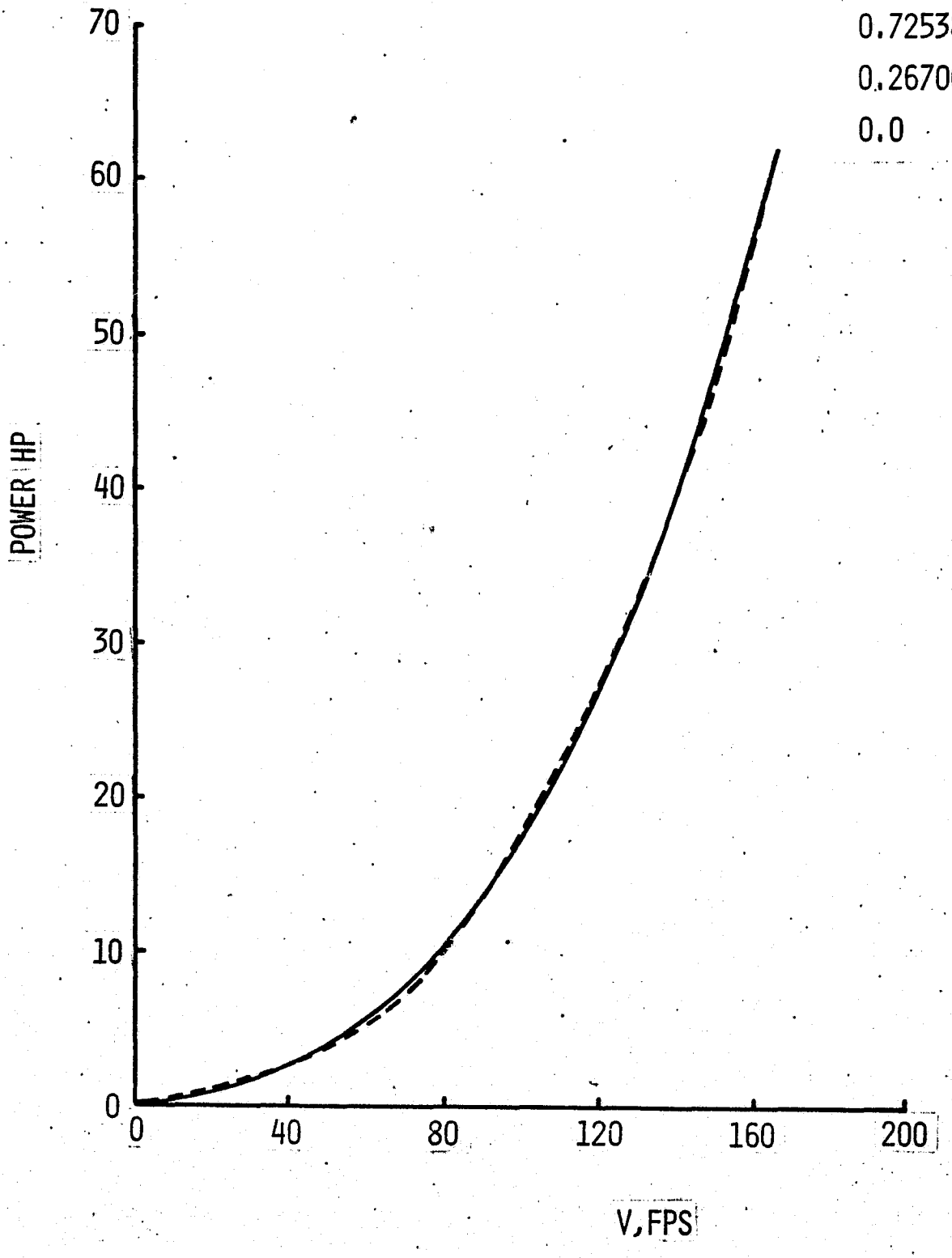
- EXTENSIVE COMPUTER SIMULATION OF RAM CORP ENGINE-FLYWHEEL AUTOMOBILES
- TESTING OF VEHICLES USING THE TRAPPED VORTEX CONCEPT
- DEVELOPMENT OF GENERAL AUTOMOBILE SYNTHESIS PROGRAM
- DEVELOPMENT OF AUTOMOBILE DRAG DATA ACQUISITION PROCEDURES AND ANALYSIS
- AUTOMOBILE PERFORMANCE AND DESIGN DATA BANK (25 YEARS)

EXAMPLE

- AUTOMATIC 4-TH ORDER CURVE FIT OF POWER REQUIRED VS SPEED
- COMPUTER PLOT OF ACTUAL AND APPROXIMATE POWER CURVES

LOTUS MK IX

0.12757E-07
0.60977E-05
0.72538E-03
0.26700E-01
0.0



(49)

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name PAUL ZANONI

Your company BOULDER ENGINEERING, INC.

Your company address 4827 Thunderbird Dr. #46
Boulder, Colo. 80303

Your mail stop

Your department

Your title President

Your phone number 303-494-6252

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s)

☐ No

3. Please list program names which are in a usable state.

(50)

STITTS Research and Development
Energy Conservation
Water Powered Generators
Sun and Disposal Heating

EDWARD W. STITT
Phone: 215 - 445-6821

Highway 23
Churchtown, Pa. 17510

November 19, 1977

Mr. O. Figueroa, Supervisor
Flight Project & Civil Systems Procurements
JPL, California Institute of Technology,
4800 Oak Drive, Pasadena, Ca. 91103

Dear Mr. Figueroa:

Since I donot have an automotive simulation program and was instructed to skip the ques tions pertaining to it there were a couple that I would like to answer. I will be ready for road testing of the hybrid VW Electric within a month and the Fairlane Ford shortly and I am marking the questions regarding funding in 1 and several of the others which I believe would be pertinent to your program even though I do not have a vehicle simulation program available for computer use.

According to insurance statistics I should be in a box six feet under but my gerontologist in New York assures me that I am still good for twenty years or more. I am one of his reasearch subjects and would like to help solve the fuel problem while I am still around. For this reason I will report any progress, good or bad with my work for public dissemination if you so desire, and unless the expenses get out of hand I do not expect any renumeration.

I attended the briefing at Washington and while I was waiting I visited the Space Center exibit across the street. There I found out that I was ten years old when my mother took me out to camp Meade outside of Washington and I saw one of the Wright brothers and Major Selfridge come up over a hill in one of their acceptance flights for the Army. Before they would let them fly, a handkerchief was dropped to see if the wind was too strong for the flight. Ten years laterwhen I was working for the Bureau of Standards I was at the Smithsonian just around the corner from the space display and I was assured that if the speed of flight went over two humdred miles per hour man would not be able to endure it.

Times have certainly changed in the air since then but technology on the ground as to the electric car has not. Now that JPL has taken it in hand we may see the same transformation as we have seen in air transportation. When I was a young man there were more electrics in the city of Washington than gasoline cars. Perhaps you can bring that about again.

Sincerely,

Ed Stitt

E.W.Stitt.

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name Edward W. Stitt.

Your company Stitts Research and Development

Your company address Highway 23, Churchtown, Pa. 17510

Your mail stop Same as above

Your department Research and Development, electric cars with internal engine supplements for hill pulling and braking in the hilly country of this area.

Your title Owner and researcher.

Your phone number (215) 445-6821

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) VW electric to Hybrid

☐ No

3. Please list program names which are in a usable state.

Volkswagen ready for the road electrically now. Waiting for machine work and parts for hybrid section.

4. Is your program(s) available for public use?

[X] Yes

[ ] No

5. Is the program(s) described in any publicly available technical publications?

[ ] Yes

[X] No

6. Can your simulation program in some manner simulate or predict performance of:

[ ] Heat-engine vehicles

[X] Electric vehicles

[X] Hybrid vehicles

[ ] All of the above

[ ] None of the above

(Please define your meaning of "Hybrid".) A basically electric vehicle with a small gasoline or other fuel such as alcohol engine used to supplement the electric power on hills which can also be used to charge the batteries down hills and at rest.

7. Please describe your program(s) in terms of:

The programming language used Technical but understandable.

The computer(s) it runs on _____

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

[X] Well documented

[ ] Partially documented

[ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

[ ] Yes

[ ] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Its been twenty years since I was skipper of U.S. Naval Research Company #1 at Princeton University and I am somewhat out of date as to modern terminology and do not know what a simulation program is. If it consists of research work of an emperical manner with mockups of roadable vehicles, I know what ~~that might be, but where the computers come into the picture is beyond me.~~

(51)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name John A. Bowles

Your company International Energy Systems Corporation

Your company address 3000 Sand Hill Road

Menlo Park, California 94025

Your mail stop _____

Your department _____

Your title Director

Your phone number (415) 854-1124

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

None in the U.S. - but both of the companies we are working with overseas have their own extensive simulation programs.

(52)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name J. MUIR

Your company DIMENSION V INC.

Your company address 598 SEABREEZE DR.
INDIALANTIC FLA 32903

Your mail stop —

Your department —

Your title PRES.

Your phone number 305 724 1414

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☐ Some government funding
- ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☐ Yes Name of Program(s) _____
- ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name BOB EVANS

Your company TITAN, INC.

Your company address P.O. Box 912 TEMPLE CITY, CA 91780
7915 SPOHN AVE. FONTANA, CA 92335

Your mail stop _____

Your department _____

Your title PRESIDENT

Your phone number 213-286-1739 714-823-2114

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Edward N Mrotek

Your company Globe Union INC

Your company address 5757 N. Green Bay Ave
Milwaukee, Wis
53201

Your mail stop 3XE

Your department Battery Engineering

Your title Product Development Engineer

Your phone number 414-228-2424

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

General Electric Company
Corporate Research & Development.
P.O. Box 43 (Bldg 37, Room 2083B)
Schenectady, New York
12301
Attn. Mr. E.A. Rowland

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Edmond X. Ramirez, Sr.

Your company AMECTRAN, INC.

Your company address 8585 N. Stemmons Fwy. Suite 900 Twin Towers South

Dallas, Texas 75247 (214) 638-8631

Your mail stop N/A

Your department N/A

Your title President

Your phone number (214) 638-8631

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) Amectran's criteria for practical use of electric automobiles

   ☐ No

3. Please list program names which are in a usable state.

   Amectran's criteria for practical use of electric automobiles

4. Is your program(s) available for public use?

☐ Yes

☒ No

5. Is the program(s) described in any publicly available technical publications?

☐ Yes

☒ No

6. Can your simulation program in some manner simulate or predict performance of:

☐ Heat-engine vehicles

☒ Electric vehicles

☐ Hybrid vehicles

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used Assemble & Basic

The computer(s) it runs on Quantell

The approximate number of source code cards 1800

The approximate number of routines 24

Core storage requirements _____

8. Your simulation program(s) is:

☐ Well documented

☐ Partially documented

☒ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☐ Yes

☒ No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [xx] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [xx] Other *Ametran's criteria for practical use of electric automobiles*

12. Can JPL use this data in a survey report for the Department of Energy?

- [ ] Yes
- [xx] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [xx] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [xx] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

None

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name FRED A COHAN

Your company SYSTEM DEVELOPMENT CORP.

Your company address 2500 COLORADO ST.
SANTA MONICA, CA 90406

Your mail stop 52-19

Your department SYSTEM ENGINEERING

Your title VICE PRESIDENT

Your phone number (213) 829-9562

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

ATTN: H. SOLOMON
SYSTEM CONTROL, INC.; 1801 PAGE MILL RD; PALO ALTO, CA 94304

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Laura L. Omohundro, Executive Assistant

Your company KINERGY RESEARCH & DEVELOPMENT (A Division of MARSHALL OIL CO., INC.)

Your company address P.O. Box 1128 (Corporate Mailing Address)

820 South Main Street (Corporate Physical Address)

Wake Forest, NC 27587

Your mail stop Same as Corporate Address

Your department KINERGY RESEARCH & DEVELOPMENT

Your title Executive Assistant

Your phone number (919)876-4963 (Research) or (919)556-2141

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

University of Wisconsin, Professor Andrew A. Frank, School of Engineering

Note: We are privately funded and have not installed a simulator. We have a chasis dynamometer and do actual driving tests on urban and highway cycles we designed.

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name RAYMOND J. TWARDZIK

Your company GENERAL ELECTRIC CO.

Your company address CORPORATE RES. & DEV.
BLD 37 - 2083
SCHENECTADY, N.Y. 12345

Your mail stop

Your department CORPORATE RESEARCH & DEVELOPMENT

Your title SYSTEM ENGINEER

Your phone number 518 - 385 - 0091

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☑ Yes Name of Program(s) NEAR-TERM ELECTRIC VEHICLE PROGRAM - PHASE II

   ☐ No

3. Please list program names which are in a usable state.

   ELCAR10

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on H-605

The approximate number of source code cards 700

The approximate number of routines 5

Core storage requirements 10K WORDS

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [x] Some or all SAE J227 schedules
- [ ] Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [x] Yes Who? T. A. ALMAGUER BILOG 198-112
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name THEODORE W. BLICKWEDEL

Your company ESB TECHNOLOGY CENTER (ESB INC.)

Your company address 19 WEST COLLEGE AVE.
YARDLEY, PA. 19067

Your mail stop

Your department

Your title SENIOR SCIENTIST

Your phone number (215) 493-3601 ext 305

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☒ No

3. Please list program names which are in a usable state.

   HYBRID

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles
- [x] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) Low Power Heat Engine plus Battery Powered Electric Engine for fast acceleration and high speeds.

7. Please describe your program(s) in terms of:

The programming language used Fortran IV

The computer(s) it runs on EAI 640

The approximate number of source code cards 435

The approximate number of routines 55

Core storage requirements 15232 16-bit words

8. Your simulation program(s) is:

- [ ] Well documented
- [ ] Partially documented
- [x] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [x] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other Any schedule where vehicle speed is specified in one or multi-second intervals. Maximum 1099 velocities to be specified

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name DAVID L. HARBAUGH, P.E.

Your company SOUTHERN CALIF EDISON CO

Your company address 7830 OTIS AVE
HUNTINGTON PARK, CALIF 90255

Your mail stop —

Your department AUTOMOTIVE SERVICES

Your title AUTOMOTIVE ENGINEER

Your phone number (213) 570-1822

If your company (does not) have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s) _____

☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

ORSHANSKY TRANSMISSION CORP
SAN DIEGO, CALIF.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Norman H. Beachley

Your company U. of Wisconsin – Madison

Your company address M.E. Dept., U. of Wisconsin
1513 University Ave.
Madison, WI 53706

Your mail stop

Your department Mech. Engineering

Your title Assoc. Professor

Your phone number (608) 262-3594

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- [X] All government funding
- [ ] Some government funding
- [ ] No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- [X] Yes — Name of Program(s): Flywheel Automotive Propulsion Simulator; CARSIM; Hybrid Car Simulator
- [ ] No

3. Please list program names which are in a usable state.

a) Automotive Propulsion Simulator (APS)
b) CARSIM
c) Flywheel Automotive Propulsion Simulator
d) Hybrid Car Simulator

4. Is your program(s) available for public use?

☒ Yes

☐ No

5. Is the program(s) described in any publicly available technical publications?

☒ Yes (Programs a & c)

☒ No (Programs b & d)

6. Can your simulation program in some manner simulate or predict performance of:

☒ Heat-engine vehicles

☒ Electric vehicles

☒ Hybrid vehicles

☒ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) A vehicle having 2 or more sources of power, one of which may be a reversible energy storage system.

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on UNIVAC 1110

The approximate number of source code cards ~100 to ~4000

The approximate number of routines 5 – 50

Core storage requirements _____

8. Your simulation program(s) is:

☐ Well documented

☒ Partially documented

☐ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☒ Yes

☐ No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other Can be readily adapted to any driving cycle

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [x] Yes Who? Andrew Burke
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

G. M, Ford

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name John C. H. Woo

Your company Trans Systems Corporation

Your company address 118 Park St., S.E., Madison Bldg.; Vienna, Va. 22180

Your mail stop N.A.

Your department

Your title President

Your phone number 281-4498; 281-1500

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state,

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name J. Arias

Your company Jeffrey L Arias Engineering Services

Your company address 9241 Cord Ave

Downey, CA 90240

Your mail stop —

Your department —

Your title owner

Your phone number (213) 861 4086

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state,

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Orshansky Transmission Corp
5141 Santa Fe St
San Diego, CA 92109
attn: Peter Hoadley

CHW INDUSTRIES IS A MANUFACTURER OF ELECTRIC VEHICLES (64)

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name ALBERT SHELMAN

Your company C.H. WATERMAN INDUSTRIES (CHW)

Your company address WHITE POND RD

ATHOL, MA 01331

Your mail stop

Your department SALES

Your title SALES MGR.

Your phone number 617-249-6801 212-755-1077

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state.

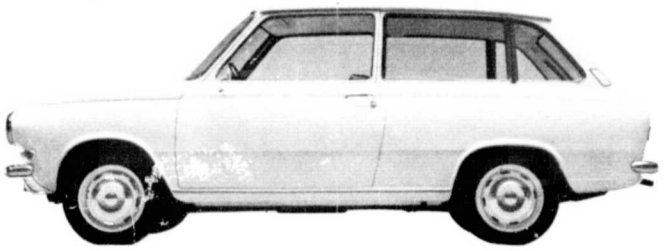
CHW ELECTRIC AUTOS

Model 886 Two Door Sedan

The CHW four passenger electric sedans are engineered for practical, low cost urban and short run driving. Operating solely on battery power they produce no air pollution and require only a fraction of the maintenance of conventional autos. All models have independent front suspension systems with drum brakes, automatic vari-speed transmission, bucket seats, fully instrumented dash, four way safety warning flashers, safety lights, windshield washers, vinyl upholstery, lap and shoulder harnesses and innumerable other creature-comforts.

Electric power eliminates two prime sources of pollution on the highway: engine noise and exhaust emission. Electric automobiles are the only practical answer to this threat to our ecology.

Why not drive a CHW today and be one of the first to experience what is surely in everyone's future — pollution-free electric transportation?



Model 887 Estate Wagon

Nothing beats electric vehicles for economy of transportation. The slightly higher cost is quickly offset by the fractional cost of operation both in fuel savings and much reduced maintenance charges. Imagine an automobile without mufflers and exhaust system, radiator and cooling system, spark plugs, carburetor and fuel tank and you quickly get the picture of a simple, easy-to-maintain vehicle. That's what the CHW Electric is all about; with only one moving part in the power plant and a once-a-year check of the the motor brushes the only important electrical concern you have the essence of carefree economical driving.

Instant Starts As Only Electric Power Can Provide!

Just turn the key and touch the accelerator and your CHW goes in any weather — unaffected by cold, dampness, fuel system condensation or the multitude of other ills that can disable gasoline engines. Truly dependable performance.

SPECIFICATIONS

DIMENSIONS

	886	887
Length	152″	153″
Width	61″	61″
Wheelbase	89″	89″

BRAKES

Tandem type hydraulic, drum.

LIGHTING

Parking and turn signals, brake fluid warning light, stop lights, interior light, safety side marker lights, four way safety flasher, sealed beam headlites, instrument lights.

POWER SPECIFICATIONS

Motor—48 Volt DC, traction.

Power Source—Sixteen 6 volt electric vehicle batteries.

Speed Control—Three step, foot operated.

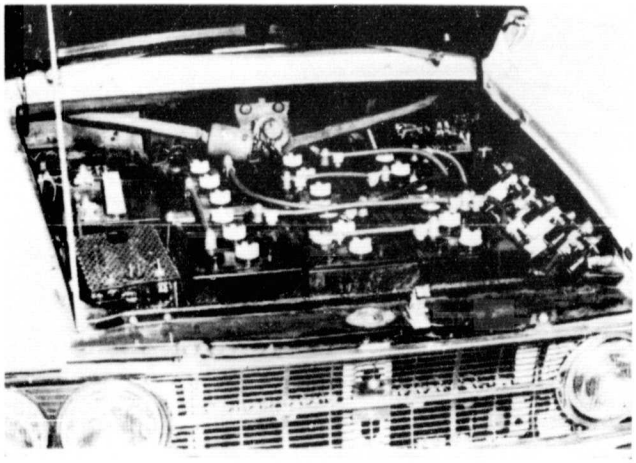
Speed—Maximum 45 MPH.

Acceleration—0-25 MPH/15 seconds.

Range—To 50 mile s standard. 80 miles with additional battery pack.

INSTRUMENTS

Speedometer, two speed windshield wipers, windshield washers, electric heater/defroster, glove compartment, sensitive battery-state meters, key with steering lock.



Under Hood View Showing Batteries and Speed Controller

RECHARGING

Overnight from standard 115 volt, 20 amp circuit. Rapid charging available with special wiring.

C. H. WATERMAN INDUSTRIES

White Pond Road ATHOL, MASS. 01331 Telephone 617 — 249-6801

OR SEE YOUR LOCAL DISTRIBUTOR

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name PAUL F BOHN

Your company APPLIED PHYSICS LABORATORY

Your company address JOHNS HOPKINS ROAD
LAUREL MARYLAND 20810

Your mail stc. 1-E-156

Your department —

Your title SECTION SUPERVISOR

Your phone number 301-953-7100 X2193

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☒ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study? THREE NHTSA RESEARCH PROGRAMS

   ☒ Yes Name of Program(s) TWO FHWA " "

   ☐ No

3. Please list program names which are in a usable state. THESE ARE HANDLING SIMULATIONS INTERACTIVE HYBRID COMPUTER SOLUTION

   HVHP (HYBRID VEHICLE HANDLING PROGRAM), 17 DOF VEHICLE MODEL

   TVDS3 (THREE DIMENSIONAL VEHICLE SIMULATION), ALL DIGITAL, ARTICULATED

   HSRI ARTICULATED VEHICLE SIMULATION

4. Is your program(s) available for public use?

☒ Yes

☐ No

5. Is the program(s) described in any publicly available technical publications?

☒ Yes

☐ No

6. Can your simulation program in some manner simulate or predict performance of:

☐ Heat-engine vehicles

☐ Electric vehicles

☐ Hybrid vehicles

☒ All of the above WITH LIMITED MODIFICATIONS

☐ None of the above

(Please define your meaning of "Hybrid".) COMBINATION OF ENERGY SOURCES; IE., GASOLINE/ELECTRIC, FLYWHEEL/ELECTRIC, ETC

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on IBM 360/91, EAI 680

The approximate number of source code cards TWO BOXES

The approximate number of routines 20

Core storage requirements 175 K BYTES

8. Your simulation program(s) is:

☒ Well documented

☐ Partially documented

☐ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☒ Yes

☐ No

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☒ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other ANY CAN BE ADDED. CURRENTLY HAVE NHTSA VEHICLE HANDLING TEST PROCEDURES

12. Can JPL use this data in a survey report for the Department of Energy?

- ☒ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☒ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☒ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

CALSPAN CORP

HIGHWAY SAFETY RESEARCH INST. U. OF MICHIGAN

(66)

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name Paul J. Dick

Your company Teledyne Energy Systems

Your company address 110 W. Timonium Road

Timonium, Maryland 21093

Your mail stop

Your department Advanced Programs

Your title Manager

Your phone number 252-8220, (301) Ext. 211, 212

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s)

☐ No

3. Please list program names which are in a usable state.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name HANIFY, DENNIS W.

Your company IIT RESEARCH INSTITUTE

Your company address 10 W. 35 TH ST.
CHICAGO, ILL.
60616

Your mail stop

Your department MECHANICAL & SYSTEMS RESEARCH

Your title MANAGER

Your phone number 312/567-4751

If your company does not have an automotive simulation program, go to question 15.

ANSWERS TO QUESTIONS REFER TO HVSIM MODEL ONLY

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) HVSIM

   ☐ No

3. Please list program names which are in a usable state.

   (HVSIM) HYBRID VEHICLE SIMULATOR

   (AVDS) ARTICULATED VEHICLE DYNAMIC SIMULATION

   (3DVS) 3-DIMENSIONAL VEHICLE SIMULATION

   (TRANSIM) TRANSPORTATION SIMULATOR

   (WRECKER) FINITE ELEMENT ANALYSIS MODEL FOR VEHICLE CRASHWORTHINESS

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [x] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) ICE/ELECTRIC BOTH SERIES AND PARALLEL

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on 1108

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

- [ ] Well documented
- [x] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other JARNEES 10 & 11 MODE

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes *per conversation with D. Hanify on 2/7/78.*
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [ ] Yes
- [ ] No
- [x] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

WE CAN ALSO ACCESS FIAT MODELS FOR ICE, ELECTRIC AND H.V. SIMULATION. ICE & H.V. MODELS CAN DO EMISSIONS.

RE TELECON 11/28/77 Brian Christensen / D. Engleman

Phil Chapman 125-241

Brian Christensen now at Battelle Col. Ohio, was sent a questionnaire. He called to state that he was probably sent the questionnaire because of work he did while at the Univ. of Wisconsin - He encountered a paper while at Univ. for his Masters He wanted to know if he should fill out the questionnaire on behalf of Battelle - I told him yes if Battelle could provide the information that it could be OK.

D. Engleman

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name DR. WALTER W. WIERWILLE

Your company VIRGINIA POLYTECHNIC INST. & STATE UNIV.

Your company address 142 WHITTEMORE HALL
IEOR DEPT.
BLACKSBURG, VA. 24061

Your mail stop _____

Your department IEOR

Your title PROFESSOR

Your phone number 951-5358

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☐ Some government funding
- ☐ No government funding

} ridiculous what about the other alternatives

GM funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☑ Yes — Name of Program(s) HUMAN PERFORMANCE IN SIMULATED DRIVING
- ☐ No

3. Please list program names which are in a usable state.

WE HAVE A DRIVING SIMULATOR. IT HAS 6° of DISPLAY MOTION, 4° OF PHYSICAL MOTION, ±4 channels of sound & vibration. It can be programmed to study effects of driver actions on fuel economy (166) can also be used for training re: fuel economy. Simulator has accurate handling.

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

} provided equations are available. In other words, given equations, we can examine driver/vehicle fuel economy.

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used Simulation is hybrid & analog; data processing is digital

The computer(s) it runs on _____

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes N.A., unless equations are given.
- [ ] No

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode N.A.
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway N.A.
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☒ Yes *per conversation with Dr. Wierwille on 2/14/78.*
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes yes, at your expense.
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☑ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name DAVID G. CURPHEY

Your company ENGINEERED SYSTEMS DIV. FMC CORPORATION

Your company address 328 BROKAW ROAD

SANTA CLARA, CA 95050

Your mail stop

Your department Government Operations

Your title MANAGER, CIVIL AGENCIES SECTOR

Your phone number 408-287-2372

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☒ No

3. Please list program names which are in a usable state.

   MISSION ANALYSIS (4 MAJOR SUBROUTINES - NAMES PROPRIETARY)

4. Is your program(s) available for public use?

☐ Yes

☒ No

5. Is the program(s) described in any publicly available technical publications?

☐ Yes

☒ No

6. Can your simulation program in some manner simulate or predict performance of:

☐ Heat-engine vehicles

☒ Electric vehicles

☐ Hybrid vehicles See below.

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) Also "Mission Analysis Capability" for Flywheel Powered Vehicle.

7. Please describe your program(s) in terms of:

The programming language used Mostly Fortran IV

The computer(s) it runs on HP Terminal to IBM 370

The approximate number of source code cards Proprietary Info.

The approximate number of routines 5

Core storage requirements 8K (min) (Local)

8. Your simulation program(s) is:

☐ Well documented

☒ Partially documented

☐ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☐ Yes

☒ No

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☒ Both of the above ?

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☒ Some or all SAE J227 schedules (NOT DIRECTLY - but close).
- ☐ Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☒ Yes *per sonversation with Mr. Curphey on 2/7/78.*
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☒ ~~Maybe~~

As this program is presently configured it is quite crude and would be of no use to anyone other than FMC Engineering Personnel!

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☒ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

ordinance engineering division of FMC has a substantial library of vehicle simulation programs.

(70)

VEHICLE
SIMULATION
QUESTIONNAIRE

RECEIVED
NOV 30 1977
SECTION 622

Please provide the following information:

Your name PROF ANDREW FRANK
DEPT. OF ELEC.+ COMP. ENGR.

Your company UNIV. OF WISCONSIN – MADISON

Your company address 909 ERB
1500 JOHNSON DRIVE
MADISON, WI 53706

Your mail stop

Your department

Your title

Your phone number (608) 262-1577

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☑ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☑ Yes Name of Program(s) 1. Automotive Propulsion Simulation Prog (APS)
2. Flywheel Propulsion Simulation

☐ No

3. Please list program names which are in a usable state.

1. APS
2. FEMP Flywheel energy Management Propulsion
3. RUN MODULE
4. CAR SIMULATION

172

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles
- [x] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) Vehicles with Primary and secondary energy available for drive.

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on UNIVAC 1110, HARRIS /6

The approximate number of source code cards 1000

The approximate number of routines 40

Core storage requirements _____

8. Your simulation program(s) is:

- [x] Well documented APS
- [x] Partially documented CAR SIM, RUN MODULE
- [x] Not too well documented FEMP

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [x] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other Accel, Cruise,

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [x] Yes Who? Gerhard Klose, Mack Dowdy, Andrew Burke
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

FORD

GM

Dept. Mgr. .....
Proj. Mgr. .....
File .....

(71)

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

November 11, 1977

Dr. Gelb will respond for TRW. Thank you for your inquiry.

R. H. Sparks
MS M1/1208
TRW Systems Incorporated
One Space Park
Redondo Beach, California 90278

Dear Sir:

The Jet Propulsion Laboratory (JPL) has been requested by the Department of Energy to conduct a survey of automotive-performance simulation capability within the United States and, in particular, electric and hybrid vehicle performance simulation capability within the industry and government sectors. The results will be published and made available to the public.

Attached is a questionnaire designed to give JPL a brief indication of your automotive performance simulation capability. The questions are yes/no or multiple-choice types which will convey information to JPL with a minimum expenditure of your time. The questionnaire should require approximately 10 minutes to complete.

Please help us by indicating your answers to the questions and returning the questionnaire in the self-addressed, stamped envelope provided. Your prompt response will be greatly appreciated.

It is emphasized that this is a request for information only and does not constitute a commitment, implied or otherwise, that JPL will take any procurement action. JPL or the Government cannot be responsible for any cost incurred in furnishing this information.

Very truly yours,

O. Figueroa, Supervisor
Flight Project &
Civil Systems
Procurements

RECEIVED
NOV 17 1977
R. H. SPARKS

PD:cm

enclosure

175

(72)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Douglas Dow, Consulting Engr.

Your company D.D. Consortium

Your company address P.O Box 14078
Detroit, Mi., 48214

Your mail stop _____

Your department _____

Your title _____

Your phone number 313-Val-4900

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☐ Some government funding
- ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☐ Yes Name of Program(s) _____
- ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

See attached list.

The following have some automotive performance simulation capabilities and should probably receive your questionnaire:

1. The University of Michigan
College of Engineering
Attn: David V. Ragone, Dean
Ann Arbor, Michigan 48104
Phone: 313/764-8470

2. Wayne State University
College of Engineering
Attn: Dean Stynes
Room 141 - 5050 Anthony Wayne Drive
Detroit, Michigan 48202
Phone: 313/577-3775
(Note: Extensive experience in crash studies.)

3. University of Detroit
Attn: Dr. Thomas Manos
College of Engineering & Science
4001 West McNichols
Detroit, Michigan 48221
Phone: 313/927-1216

4. Lawrence Institute of Technology
Attn: Dr. Stephen R. Davis
Dean, School of Engineering
2100 West 10 Mile Road
Southfield, Michigan 48075
Phone: 313/356-0200

5. Creative Industries of Detroit
att: Richard S. ~~Lee~~ Leasia
3080 East Outer Drive
Detroit, Michigan, 48234
Phone 313-366-3020

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name GORDON E HAYHOE

Your company THE PENNSYLVANIA TRANSPORTATION INSTITUTE

Your company address RESEARCH BUILDING B
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, Pa 16802

Your mail stop

Your department

Your title ASSISTANT PROFESSOR

Your phone number (814) 865-1891

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☒ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) PEVCON ELECTRIC VEHICLE.
   NCHRP PROJECT 20-7, TASK 10
   "REVIEW OF TRUCK/WEIGHT/HORSEPOWER RATIO"

   ☐ No

3. Please list program names which are in a usable state.

   "TRCLMB"

   "EVACCE"

   "EVSAE"

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [x] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on IBM 370/168

The approximate number of source code cards 400

The approximate number of routines 6

Core storage requirements 40 K

8. Your simulation program(s) is:

- [ ] Well documented
- [x] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [x] Some or all SAE J227 schedules
- [ ] Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

Dec 2, 1977 (74)

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name Gene W. Brown

Your company International Harvester

Your company address 3301 Wayne Trace
Ft. Wayne IN 46803

Your mail stop

Your department Sales Engineering

Your title Sales Engineer

Your phone number 219/461-6160

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☐ Some government funding
- ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☒ Yes Name of Program(s) TCAPE
- ☐ No

3. Please list program names which are in a usable state.

TCAPE

PERFOR

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used Fortran

The computer(s) it runs on Digital Equipment

The approximate number of source code cards Not Known

The approximate number of routines 10

Core storage requirements ?

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☒ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☒ Other We originated City, Suburban, & Highway Cycles for a Truck.

12. Can JPL use this data in a survey report for the Department of Energy?

- ☒ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☒ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☒ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Cummins VMS
Detroit Diese PREPP
Caterpillar
International Harvester Engineering Research

Have Electric Vehicle Program

7 South 600 County Line Rd.
Hinsdale, IL 60521
Att: Gene Wallace

(75)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Fritz G. Will

Your company General Electric Co., R&D Labs

Your company address Schenectady, NY 12301

No Program in my work area

Your mail stop _____

Your department _____

Your title _____

Your phone number _____

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

   _____

   _____

   _____

   _____

198-220

82 MECHANIC STREET
PAWCATUCK, CONNECTICUT 02891
(203) 599-1100

Yardney ELECTRIC CORPORATION (16)

YARDNEY ELECTRIC DIVISION

November 29, 1977

Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, California 91103

Attn: ~~Mr. O. Figueroa~~, Supervisor
Flight Project & Civil Systems Procurements

Gentlemen:

I am responding to your letter to Mr. Steve Schiffer received on November 18, 1977. I have completed the Vehicle Simulation Questionaire as requested, describing our program for battery electric vehicle performance prediction. The enclosed paper, presented at EVS 4, shows how this program is typically used. Output is in the form of vehicle range vs. speed for a given set of inputs as noted in the program equations.

The program is available for use on a funded basis and we would be pleased to discuss this aspect further with JPL or DOE representatives.

Please let me know if we can be of further service.

Very truly yours,

YARDNEY ELECTRIC DIVISION

John H. Kennedy
Staff Director
Nickel Battery Development Center

JHK/dlj

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name John H. Kennedy

Your company Yardney Electric Corp.

Your company address 82 Mechanic Street

Pawcatuck, Connecticut 06379

Your mail stop

Your department Nickel Battery Development Center

Your title Staff Director, NBDC

Your phone number 203-599-1100 Ext. 368

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☐ Yes Name of Program(s)

☒ No

3. Please list program names which are in a usable state.

Vehicle Energy Consumption Program

Battery Energy Available Program

4. Is your program(s) available for public use?

[X] Yes

[ ] No

5. Is the program(s) described in any publicly available technical publications?

[X] Yes - brief description in enclosed paper

[ ] No

6. Can your simulation program in some manner simulate or predict performance of:

[ ] Heat-engine vehicles

[X] Electric vehicles

[ ] Hybrid vehicles

[ ] All of the above

[ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used Coded sequence of arithmetic operations

The computer(s) it runs on Monroe Model 1655 Desktop

The approximate number of source code cards 4

The approximate number of routines 2

Core storage requirements NA

8. Your simulation program(s) is:

[ ] Well documented

[X] Partially documented

[ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

[ ] Yes

[X] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other _____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [ ] Yes
- [ ] No
- [x] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Ford

A. D. Little

General Motors

(77)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Richard A. Evans

Your company Honeywell Inc

Your company address Energy Resources Center
2600 Ridgway Parkway
MPLS, Minn. 55413

Your mail stop MN 17 T123

Your department Energy Resources Center

Your title Section Chief

Your phone number 612 378 4232

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☐ Some government funding
- ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☐ Yes Name of Program(s) HYDROCAR-
- ☒ No machine

3. Please list program names which are in a usable state.

4. Is your program(s) available for public use?

☐ Yes

☒ No

5. Is the program(s) described in any publicly available technical publications?

☐ Yes

☒ No

6. Can your simulation program in some manner simulate or predict performance of:

☐ Heat-engine vehicles

☐ Electric vehicles

☒ Hybrid vehicles

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) Engine/Hydraulic Accumulator Study.

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on Honeywell Network Time Share

The approximate number of source code cards 200

The approximate number of routines ? N. A.

Core storage requirements 2K - 3K

8. Your simulation program(s) is:

☐ Well documented

☐ Partially documented

☒ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☒ Yes

☐ No

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☒ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☒ Some or all SAE J227 schedules
- ☒ Other Minneapolis Driving cycle - Self Defined

12. Can JPL use this data in a survey report for the Department of Energy?

- ☒ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☒ Yes Probably handled with phone call to Robert Gartner. 612-542-6025
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☒ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

(78)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name J.D. MOSIL

Your company IOWA ST. UNIV.

Your company address 107 COOVER HALL

Your mail stop

Your department EE

Your title ASSOC PROF

Your phone number 515-294-4072

If your company does not have an automotive simulation program, go to question 15.

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

(79)

MBAssociates
SAN RAMON
(NEAR SAN FRANCISCO)
CALIFORNIA
94583

TELEPHONE
AREA CODE 415
837-7201

December 5, 1977

Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 91103

Gentlemen:

Thank you for your interest and consideration in including MBAssociates in your automotive-performance simulation capability survey.

We have reviewed your letter and attached questionnaire, and determined that we do not possess the required technology.

Again, thank you for your consideration.

Very truly yours,

James L Boyland

JAMES L. BOYLAND
Vice-President

JLB:eg

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(80)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Michael Orchowski

Your company Minicars, Inc.

Your company address 35 La Patera Lane
Goleta, CA 93017

Your mail stop

Your department

Your title Senior Staff Analyst

Your phone number (805) 964-6271 x45

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   [x] All government funding

   [ ] Some government funding

   [ ] No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   [x] Yes Name of Program(s) 1, CARSIM; 2, Automotive Propulsion Simulation

   [ ] No

3. Please list program names which are in a usable state.

   1, CARSIM (Manual Transmission)

   2, APS (Automatic Transmission)

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [x] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on Xerox Sigma, CDC 6000, IBM 360

The approximate number of source code cards 1, 630; 2,

The approximate number of routines 1, 5; 2, 40

Core storage requirements 1, 32 K Bytes; 2, ≈54 K Bytes

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [x] Yes
- [ ] No

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10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other Sinusoidal road; level road of constant speeds 0-90 sec. acceleration

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes *per conversation with Michael Orchowski on 2/7/78.*
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

General Motors (GPSIM)

(81)

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

no such capability
thanks you for considering us
see enclosure
W. Strumpell

EVC, Inc.
Attn: Mr. Strumpell
9016 Aviation Blvd.
Inglewood, CA 90301

Dear Sir:

The Jet Propulsion Laboratory (JPL) has been requested by the Department of Energy to conduct a survey of automotive-performance simulation capability within the United States and, in particular, electric and hybrid vehicle performance simulation capability within the industry and government sectors. The results will be published and made available to the public.

Attached is a questionnaire designed to give JPL a brief indication of your automotive performance simulation capability. The questions are yes/no or multiple-choice types which will convey information to JPL with a minimum expenditure of your time. The questionnaire should require approximately 10 minutes to complete.

Please help us by indicating your answers to the questions and returning the questionnaire in the self-addressed, stamped envelope provided. Your prompt response will be greatly appreciated.

It is emphasized that this is a request for information only and does not constitute a commitment, implied or otherwise, that JPL will take any procurement action. JPL or the Government cannot be responsible for any cost incurred in furnishing this information.

Very truly yours,

O. Figueroa, Supervisor
Flight Project &
Civil Systems
Procurements

PD:cm

enclosure

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NOV 17 1977

Telephone 354-4321 *Twx 910-588-3269* *Twx 910-588-3294*

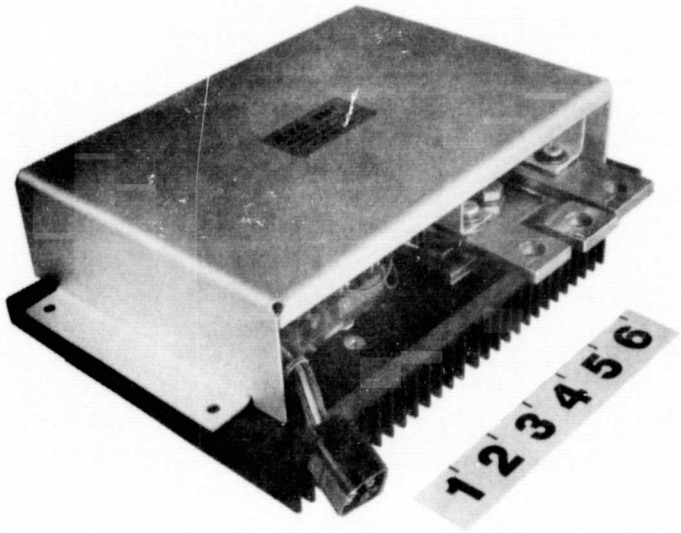
EVC INC

EVC
MOTOR
CONTROLLER

technical bulletin

EVC - 400 - 600 AMP-1

ISSUED: AUGUST 12, 1977



EVC - 400 - 600 AMP-1

SPECIFICATIONS

Voltage	—	12 to *72 VDC
Current	—	400 to *600 amp models
Voltage drop:	—	1.2 V at 400 amp
Weight	—	12.5 lbs.
Size	—	10¼ x 7¼ x 4

(*) 300 amp-72v models (plus all 400, 500 and 600 amp models) are double-width.

DESCRIPTION

EVC motor controllers utilize the unique characteristics of a very high current switching transistor which is produced by the Semiconductor Division of EVC, Inc. The primary function of this controller is to smoothly and efficiently control the speed of DC wound field or permanent magnet traction motors from zero to full speed using a chopper circuit.

An unusual feature of the controller is that of current multiplication at low motor speeds, increasing torque and efficiency at start-up and acceleration. Transistor current controllers do not use the complex commutation circuits used in SCR controls. Operating efficiency is at 98% or more throughout the entire control range greatly increasing operating time of battery operated systems.

DESIGN FEATURES

• Operation	Controller transforms high voltage and low current from the battery to a low voltage, high current to the motor resulting in extremely efficient use of the battery.
• Low Voltage Protection	Controller turns off if battery is too low. Circuitry protects from low voltage. Can prevent motor burnouts.
• Thermal Protection	Output current cuts back if overheated.
• Short/Circuit/Protection	Output stops if controller is shorted.
• Current Limiting	Controls maximum battery current. Reduces battery drain.
• Soft Start	Factory set delay circuit makes for more gradual acceleration Helps conserve battery charge.
• Led or Audible Warning	Battery condition indicator circuit can operate LED or horn low voltage warning.

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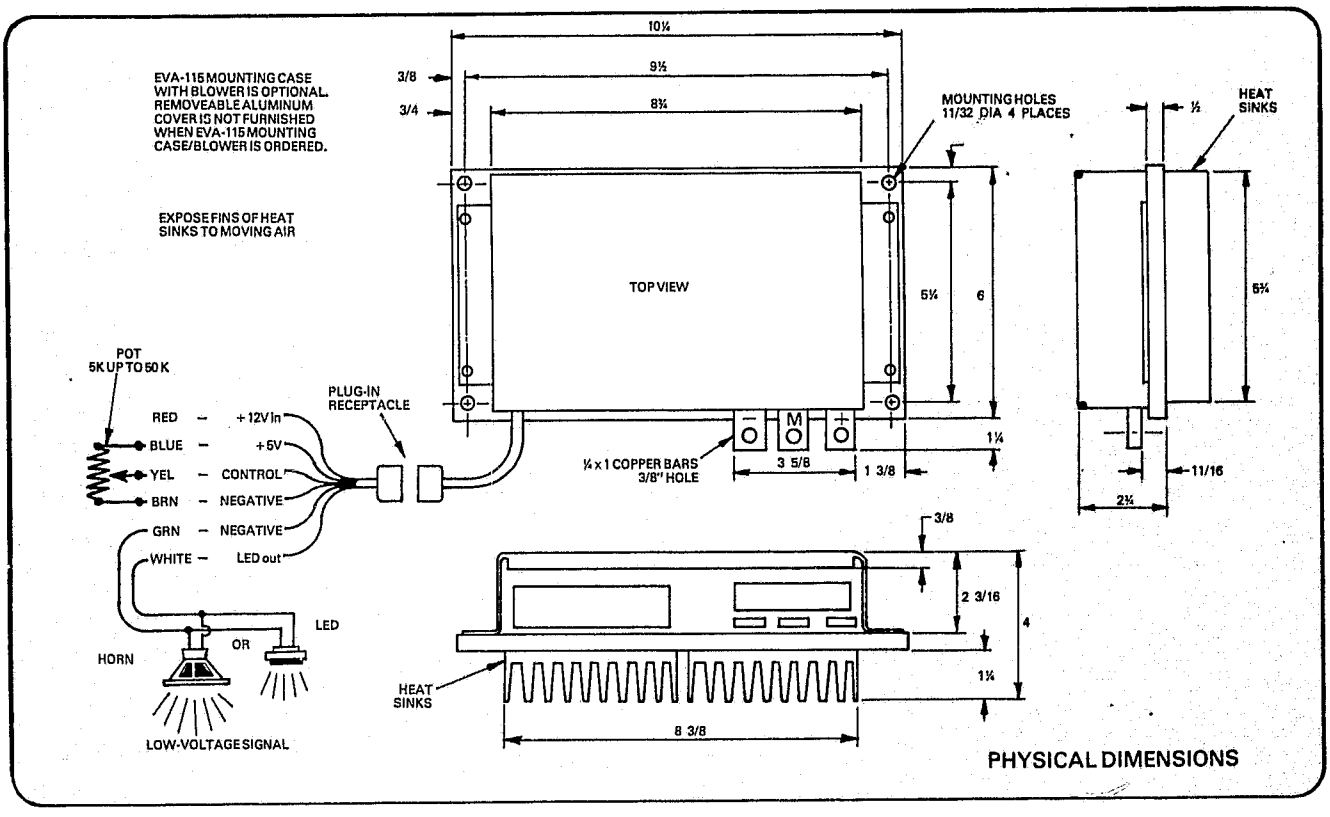

INSTALLATION

100 or greater amps per horsepower are required. This varies with the load; i.e., weight and grades involved. A motor inductance of at least .5mh is necessary for proper operation.

The series wound motor and most PM motors are ideally suited for operation by the controller. Shunt motors are unsuitable.

Use #4 cable or heavier dependent on lead length and current. Long cables create destructive "spikes". Keep controller to battery cables to a minimum, preferably less than 36 inches.

It is essential to mount the fins exposed to open air. The controller must dissipate at least one watt per amp during peak load conditions. Should the motor slow after heavy current drain, thermal cutoff has been reached (approximately 70°C), indicating that more cooling is required. A small blower strategically located will alleviate this condition.

An emergency contactor may be added in the battery positive lead but MUST be first on, last off, in relation to the motor contractor/reversing device.

WARNING

MOMENTARY reverse battery connection will PERMANENTLY damage controller. Service battery connections monthly to maintain good contact, as this increases life of system.

EVC INC
ELECTRIC VEHICLE COMPONENTS
9016 AVIATION BOULEVARD
INGLEWOOD, CALIFORNIA 90301
(213) 645-3020

200

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name George E. Gliss

Your company Univ. of Colorado

Your company address ECOT 2-32
Univ. of Colorado
Boulder, Colorado 80309

Your mail stop

Your department Electrical Engineering

Your title Professor

Your phone number 492-7003

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

(93)

Engineering Staff
General Motors Corporation
General Motors Technical Center
Warren, Michigan 48090

December 1, 1977

Mr. O. Figueroa
Supervisor, Flight Project &
Civil Systems Procurements
Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, California 91103

Dear Mr. Figueroa:

Mr. Walter Cattin of Transportation Systems Division forwarded your questionnaire to me for completion. Engineering Staff developed the GPSIM simulator (and predecessor programs) over a period of more than fifteen years. We maintain the program for all of General Motors, where it is widely used.

I have added some explanatory notes to your questionnaire. You may obtain further details from Dr. Klose and Mr. Heinburger at JPL who have (non-current) documentation.

I hope this information is helpful. We would be willing to provide additional information on GPSIM, provided the inquiry has some reasonable relationship to the business interests of General Motors Corporation. Please address any additional inquiries to Dr. F. W. Bowditch, Environmental Activities Staff, General Motors Technical Center, who coordinates inquiries from organizations such as JPL.

Very truly yours,

D. T. Lewis

D. T. Lewis
Advance Product Engineering

DTL/fk

enc.

cc: C. E. Scheffler
F. W. Bowditch
C. Marks
W. J. Cattin

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name D. T. Lewis

Your company General Motors Corporation

Your company address Advance Product Engineering
General Motors Engineering Staff
General Motors Technical Center, Warren, Michigan 48090

Your mail stop APE/2-E

Your department Advance Product Engineering

Your title Sr. Staff Project Engineer

Your phone number (313) 575-1153

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) GPSIM

☐ No

3. Please list program names which are in a usable state.

GPSIM

4. Is your program(s) available for public use?

☐ Yes
☐ No

We have previously supplied GPSIM to the Department of Transportation, and to the National Research Council of Canada. We would be willing to discuss the implications of this question.

5. Is the program(s) described in any publicly available technical publications?

☒ Yes SAE 720043 (Jan. 1972)

☐ No

6. Can your simulation program in some manner simulate or predict performance of:

☒ Heat-engine vehicles
☒ Electric vehicles
☒ Hybrid vehicles
☐ All of the above
☐ None of the above

Any engine which can be represented with data tables, including gas turbines with time delays due to gas dynamics. For electric vehicles, battery effects are estimated after simulation to simplify computation and limit costs (quite successful). Program extensions might be required for hybrid engines using energy storage (batteries, etc.), but flywheel hybrids have been simulated successfully.

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used PL/I

The computer(s) it runs on IBM 370/145 and up

The approximate number of source code cards 300,000

The approximate number of routines 90 compileable modules

Core storage requirements 430 K bytes min. variable (uses dynamic storage)

8. Your simulation program(s) is:

☒ Well documented
☐ Partially documented
☐ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☒ Yes
☐ No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [X] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [X] EPA urban
- [X] EPA highway
- [X] Some or all SAE J227 schedules
- [X] Other All GM, any USA-specified schedules

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [X] Yes Who? Dr. Gerhard Klose, Mr. D. Heinburger
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

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U of C-AUA-USERDA

ARGONNE NATIONAL LABORATORY

RECEIVED
DEC 8 - 1977
SECTION 622

December 2, 1977

Mr. O. Figueroa
Flight Project &
Civil Systems
Procurements

Dear Mr. Figueroa:

In accordance with your request of 11 November 1977 to complete a Vehicle Simulation Questionnaire, the attached completed questionnaire is transmitted.

Our work involves the testing of electric vehicle batteries; therefore, simulation programs are important to us. The list that you are compiling will be most helpful. May we request that a preliminary copy be mailed to us so that we can have the advantage of this information as soon as possible.

Sincerely yours,

Fred Hornstra

Fred Hornstra
Group Leader,
National Battery Test Laboratory

FH/sb

Enclosure

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9700 South Cass Avenue, Argonne, Illinois 60439 · Telephone 312-739-7711 · TWX 910-258-3285 · WUX LB, Argonne, Illinois

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name William H. DeLuca

Your company Argonne National Laboratory

Your company address 9700 S. Cass Ave
Bldg. 205
Argonne, Ill. 60439

Your mail stop

Your department Chemical Engineering Div.

Your title E.E.

Your phone number 312-739-7711 Ext. 5889

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☒ All government funding

☐ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) Electric Vehicle Simulation Program

☐ No

3. Please list program names which are in a usable state,

EVSP

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN for CSMP III (CSSL)

The computer(s) it runs on IBM 370-195

The approximate number of source code cards 400-500 including data tables

The approximate number of routines 4

Core storage requirements 200K Bytes maximum for program

8. Your simulation program(s) is:

- [ ] Well documented
- [ ] Partially documented
- [x] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

N/A

- [ ] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [x] Some or all SAE J227 schedules
- [ ] Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?_____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name Lewis E. Vnnewehr

Your company Ford Motor Co.

Your company address Research Lab, Rm. 3036
Box 2053
Dearborn, MI 48121

Your mail stop Rm. 3036

Your department Electrical Systems

Your title Principal Staff Engineer

Your phone number

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) all

☐ No

3. Please list program names which are in a usable state.

D2.F4 - All-electric vehicle
P1 - Engine-Battery parallel hybrid vehicle
SERHYB - Turbine-Battery series hybrid vehicle
FWHYB - Flywheel-Battery hybrid vehicle

4. Is your program(s) available for public use?

☐ Yes

☒ No

5. Is the program(s) described in any publicly available technical publications?

☒ Yes D2-F4

☐ No

6. Can your simulation program in some manner simulate or predict performance of:

☒ Heat-engine vehicles

☒ Electric vehicles

☒ Hybrid vehicles

☒ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) In general, a vehicle with two or more types of energy storage

7. Please describe your program(s) in terms of:

The programming language used Fortran 4

The computer(s) it runs on DEC-10

The approximate number of source code cards — (time-sharing)

The approximate number of routines In P1 (the biggest) there are 12 subprograms or subroutines

Core storage requirements

8. Your simulation program(s) is:

☐ Well documented

☐ Partially documented

☒ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☒ Yes - P1 211

☐ No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [x] Some or (all) SAE J227 schedules
- [ ] Other TAXI, UPS, ECE, Ford City, Ford Suburban

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [x] Yes Who? Harvey Frank
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Garrett Airesearch, GM, GE, Westinghouse, General Research, Exxon

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name JOSEPH M. SALVAGGIO

Your company UNIVERSITY OF ALABAMA IN HUNTSVILLE

Your company address BOX 1247 HUNTSVILLE ALABAMA 35803

AUTO CHECK CENTER

Your mail stop

Your department JOHNSON ENVIRONMENTAL & ENERGY CENTER

Your title RESEARCH ASSOCIATE

Your phone number

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state,

   THESE PROGRAMS HAVE BEEN ADAPTED FROM MILITARY APPLICATIONS AND HAVE NO TITLE AS SUCH

4. Is your program(s) available for public use?

☒ Yes

☐ No

5. Is the program(s) described in any publicly available technical publications?

☐ Yes

☒ No

6. Can your simulation program in some manner simulate or predict performance of:

☒ Heat-engine vehicles

☒ Electric vehicles

☐ Hybrid vehicles

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) Combination of two or more methods for producing power for an automobile

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on UNIVAC 1108

The approximate number of source code cards 1200

The approximate number of routines 7

Core storage requirements 60K

8. Your simulation program(s) is:

☐ Well documented

☐ Partially documented

☒ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☐ Yes

☒ No

10. Is your simulation program(s) designed for:

- [x] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [x] Some or all SAE J227 schedules
- [ ] Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

CHRYSLER CORPORATION - ADAS DEVELOPED UNDER A GOVERNMENT CONTRACT

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Frederick T. Elder

Your company Elder Engineering

Your company address 7788 Cherry Wood
Verona, Wi 53593

Your mail stop

Your department

Your title Owner

Your phone number 608-836-3969

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- ☐ All government funding
- ☐ Some government funding
- ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- ☐ Yes Name of Program(s)
- ☒ No

3. Please list program names which are in a usable state.

Computer Design and Simulation of a Hydraulic Hybrid Vehicle Power Train

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More information is available should you desire it for your use. Please write if you want sample outputs, etc. T.E.

4. Is your program(s) available for public use?

☒ Yes

☐ No

5. Is the program(s) described in any publicly available technical publications?

☒ Yes Ph D Thesis by Frederick T. Elder
Published & Copy righted in 1974.

☐ No Also, various papers.

6. Can your simulation program in some manner simulate or predict performance of:

☒ Heat-engine vehicles

☐ Electric vehicles

☒ Hybrid vehicles

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) This work considers a series type hybrid with an internal combustion engine prime mover and with energy stored by compressing a gas in a hydraulic accumulator.

7. Please describe your program(s) in terms of:

The programming language used Fortran V

The computer(s) it runs on UNIVAC

The approximate number of source code cards 850

The approximate number of routines 2

Core storage requirements 25,000

8. Your simulation program(s) is:

☐ Well documented

☒ Partially documented

☐ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☒ Yes In a digitized Format

☐ No

10. Is your simulation program(s) designed for:

- [X] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones: It can accept any schedule in a digitized form (Velocity at one second intervals.)

- [X] EPA urban
- [X] EPA highway
- [X] Some or all SAE J227 schedules
- [ ] Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?_____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Professors Beachley & Frank
University of Wisconsin
Madison, Wi

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Don P. Wilson

Your company Lester Equipment Mfg Co., Inc

Your company address 2840 Coronado St

Anaheim, Ca 92806

Your mail stop N/A

Your department

Your title Pres.

Your phone number (714) 630-2260

If your company does not have an automotive simulation program, go to question 15.
We are manufacturers of Battery Chargers & DC Power Supplies

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state.

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Harold H. Valentine

Your company NASA-LeRC

Your company address 21000 Brookpark Road

Cleveland, OH 44135

Your mail stop 500-125

Your department Systems Analysis & Assessment Office

Your title Section Head - Propulsion Systems Analysis

Your phone number FTS 294-6347

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   [XX] All government funding

   [ ] Some government funding

   [ ] No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   [XX] Yes Name of Program(s) Vehicle Fuel Economy Program

   [ ] No

3. Please list program names which are in a usable state.

   Same as above

4. Is your program(s) available for public use?

☐ Yes

☒ No

5. Is the program(s) described in any publicly available technical publications?

☐ Yes

☒ No

6. Can your simulation program in some manner simulate or predict performance of:

☒ Heat-engine vehicles

☐ Electric vehicles

☒ Hybrid vehicles

☐ All of the above

☐ None of the above

(Please define your meaning of "Hybrid".) Heat Engine - Flywheel

7. Please describe your program(s) in terms of:

The programming language used Fortran

The computer(s) it runs on IBM 360, Univac 110

The approximate number of source code cards 1000

The approximate number of routines 10

Core storage requirements ?

8. Your simulation program(s) is:

☐ Well documented

☒ Partially documented

☐ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

☐ Yes

☒ No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [XX] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [XX] EPA urban
- [XX] EPA highway
- [XX] Some or all SAE J227 schedules
- [ ] Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [XX] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [XX] Yes A listing of the program was sent to JPL early in November through the Electric Vehicle Office. We have discussed our program previously with Don Heimburger of JPL.
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [XX] Yes Who? Don Heimburger
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name W. H. Fengler

Your company Meteor Research Ltd.

Your company address 29440 Calahan Road,
Roseville, Michigan, 48066.

Your mail stop 23651 Fordson Drive, Dearborn, Mich. 48124

Your department Manufucturing Engineering

Your title General Partner

Your phone number (313) 779-6800 & 562-7629

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state,

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Ernest H Wakefield

Your company Linear Alpha Inc

Your company address 1927 Sherman Ave
Evanston Illinois 60201

Your mail stop

Your department

Your title President

Your phone number

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) Electric vehicle

   ☐ No

3. Please list program names which are in a usable state.

4. Is your program(s) available for public use?

[ ] Yes

[x] No

5. Is the program(s) described in any publicly available technical publications?

[ ] Yes

[ ] No

6. Can your simulation program in some manner simulate or predict performance of:

[ ] Heat-engine vehicles

[x] Electric vehicles

[ ] Hybrid vehicles

[x] All of the above

[ ] None of the above

(Please define your meaning of "Hybrid".) Double energy source

7. Please describe your program(s) in terms of:

The programming language used Fortran

The computer(s) it runs on _____

The approximate number of source code cards 8 inches

The approximate number of routines _____

Core storage requirements Use CDC 6600

8. Your simulation program(s) is:

[x] Well documented

[ ] Partially documented

[ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

[ ] Yes can be accomdated

[ ] No

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10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [x] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other any can be accomodated

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [ ] Yes
- [ ] No
- [x] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name B. T. Macauley/E. J. Peters/D. H. Anderson

Your company Ford Motor Company

Your company address New Concepts Research Department

Scientific Research Lab. - Room S-1055

Dearborn, Michigan 48121

Your mail stop -

Your department KO507 - New Concepts Research Department

Your title

Your phone number 32-29345/59-41563/32-21504

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☒ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) TOFEP (Corporate P & E Programs)

   ☐ No

3. Please list other program names which are in a usable state.

   . VEHBASIC (Perf.) NEWD2.F4 (Electric Vehicle P & E)

   . VEHIPERF (Perf.)

   . CVRT (Fortran Economy)

   . P1 (Electric Hybrid P & E)

4. Is your program(s) available for public use?

[ ] Yes

[X] No

5. Is the program(s) described in any publicly available technical publications?

[ ] Yes

[X] No

6. Can your simulation program in some manner simulate or predict performance of:

[ ] Heat-engine vehicles

[ ] Electric vehicles

[ ] Hybrid vehicles

[X] All of the above

[ ] None of the above

(Please define your meaning of "Hybrid".) Vehicle has on-board 2 or more separate but integrated propulsion systems.

7. Please describe your program(s) in terms of:

The programming language used Basic, Fortran & Structured Fortran

The computer(s) it runs on DEC-10 & Honeywell 6000

The approximate number of source code cards Unk.

The approximate number of routines Unk.

Core storage requirements Unk.

8. Your simulation program(s) is:

[ ] Well documented

[ ] Partially documented

[X] Not too well documented *per telephone call by D. A. Heimburger 3/21/78 to B. Macauley*

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

[X] Yes Some can.

[ ] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [X] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [X] EPA urban
- [X] EPA highway
- [X] Some or all SAE J227 schedules
- [ ] Other SAE Driving Cycle and Corporate Cycles

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes Willing to discuss capability.
- [X] No Not willing to discuss program details.
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

G.M., Chrysler, AMC, TECO, Aerojet - General, G.E., Eaton
(Based upon publically available information)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name D.L. Ivey, Assistant Director

Your company Texas Transportation Institute

Your company address Texas A&M Univ.
College Station Texas

Your mail stop NA

Your department NA

Your title Assistant Director & Head Highway Safety Research Center

Your phone number 713 845 1711

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ ~~All~~ government funding

☒ Some government funding (~ 60% Govt. Funded)

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) HVOSM, SMAC, GUARD, BARRIER VII, CRUNCH ADUMMY

☐ No

3. Please list program names which are in a usable state.

Same as above.

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [x] Hybrid vehicles

} Handling & Collision Dynamics Only

- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) Propulsion derived from unlike sources of power.

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on Amdahl 470 V/6

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

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10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

None of above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules

N.A.

- ☐ Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☒ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☒ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who? _____
- ☒ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name L. E. WALDORF

Your company TRAFALGAR, LTD

Your company address 4109 JACKSON Rd.
ANN ARBOR, MICH. 48103

Your mail stop

Your department

Your title

Your phone number 313-769 3033

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state.

4. Is your program(s) available for public use?

- ☐ Yes
- ☐ No

5. Is the program(s) described in any publicly available technical publications?

- ☐ Yes
- ☐ No

6. Can your simulation program in some manner simulate or predict performance of:

- ☐ Heat-engine vehicles
- ☐ Electric vehicles
- ☐ Hybrid vehicles
- ☐ All of the above
- ☐ None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used _____

The computer(s) it runs on _____

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

- ☐ Well documented
- ☐ Partially documented
- ☐ Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- ☐ Yes
- ☐ No

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

We have used GM's simulation program as well as the University of Michigan's.

General Motors Research Laboratories
Warren, Michigan 48090

January 3, 1978

Mr. O. Figueroa, Supervisor
Flight Project & Civil Systems
Procurements
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California 91103

Dear Mr. Figueroa:

Some time ago you addressed a request for information concerning simulation programs to the General Motors Research Laboratories. We use a large number of simulation programs for varied purposes and I have attached three separate responses to your inquiry.

Sincerely,

JBB:el
Attach.

Joseph B. Bidwell
Executive Director

(96)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name PAUL T. VICKERS

Your company RESEARCH LABS, G.M. CORP.

Your company address 12 MILE & MOUND ROADS

WARREN, MI 48090

Your mail stop

Your department ENGINE RESEARCH

Your title ASST. DEPT. HEAD

Your phone number (313) 575-2993

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) GPSIM

   ☐ No

3. Please list program names which are in a usable state.

   GPSIM

4. Is your program(s) available for public use?

- [ ] Yes
- [X] No

5. Is the program(s) described in any publicly available technical publications?

- [X] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [X] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used PL/1

The computer(s) it runs on IBM 370/168

The approximate number of source code cards 2 BOXES

The approximate number of routines 50

Core storage requirements 500K

8. Your simulation program(s) is:

- [ ] Well documented
- [X] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [X] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [X] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [X] EPA urban
- [X] EPA highway
- [X] Some or all SAE J227 schedules
- [ ] Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [X] Yes Who? RHOADS STEPHENSON, ET AL
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name John S. Collman

Your company General Motors Research Laboratories

Your company address Warren, Michigan 48090

Your mail stop

Your department Power Systems

Your title Department Head

Your phone number 313-575-3144

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) SI Engine/Flywheel Hybrid

   ☐ No

3. Please list program names which are in a usable state.

   Single shaft gas turbine/CV transmission (of many types)

   Split flow compressor - single hsaft gas turbine

   SI Engine/flywheel hybrid

   Dual shaft gas turbine/torque converter

   Gas turbine electric hybrid

   SI electric hybrid

240

4. Is your program(s) available for public use?

- [ ] Yes
- [X] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [X] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [X] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) More than one power source

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on IBM

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

- [ ] Well documented
- [X] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [X] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [X] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [X] EPA urban
- [X] EPA highway
- [X] Some or all SAE J227 schedules
- [ ] Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes *per conversation with John Collman on 2/7/78*
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [X] Yes Who? S. G. Liddle, formerly of GMR
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Tsih C. Wang

Your company General Motors Corporation

Your company address General Motors Research Laboratories

Warren, Michigan 48090

Your mail stop

Your department Electrical Engineering

Your title Assistant Head

Your phone number (313) 575-3119

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) EVSIM

   ☐ No

3. Please list program names which are in a usable state,

   EVSIM

4. Is your program(s) available for public use?

- [ ] Yes
- [X] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [X] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [X] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used PL/I

The computer(s) it runs on IBM 370

The approximate number of source code cards 1,000

The approximate number of routines 7

Core storage requirements 267 K bytes

8. Your simulation program(s) is:

- [X] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [X] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [X] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [X] EPA urban
- [X] EPA highway
- [X] Some or all SAE J227 schedules
- [ ] Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?_____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

General Electric, Ford, TRW Systems, etc.

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name CECIL E. DIETRICH

Your company AMERICAN ELECTRIC CAR COMPANY, LECTRAN DIVISION

Your company address 5452 BUSINESS DRIVE

HUNTINGTON BEACH, CALIFORNIA

Your mail stop 5452 BUSINESS DRIVE, HUNTINGTON BEACH, CA. 92649

Your department

Your title PRESIDENT

Your phone number (714) 898-3933 (213) 431-3903

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s)

   ☐ No

3. Please list program names which are in a usable state.

(100)

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name W. A. Buzzell

Your company REI

Your company address 1209 Lake Ave.

Lake Worth

Florida 33460

Your mail stop

Your department Engineering

Your title Senior Project Engineer

Your phone number 305 -- 588 - 1148

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☒ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) see below

   ☐ No

3. Please list program names which are in a usable state.

   Cyclic Simulation of Vehicle Performance

   Steady State Performance Simulation / Vehicle Parametric Sensitivity Study

4. Is your program(s) available for public use?

- [ ] Yes
- [X] No

5. Is the program(s) described in any publicly available technical publications?

- [X] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [X] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) A vehicle having a heat engine as a prime mover which is utilized in conjunction with a short term energy storage system (usually electric) to propel the vehicle.

7. Please describe your program(s) in terms of:

The programming language used Fortran IV.

The computer(s) it runs on Virtually all larger computers can handle Fourtran

The approximate number of source code cards 200

The approximate number of routines 20

Core storage requirements 550K

8. Your simulation program(s) is:

- [X] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [X] Yes
- [ ] No

10. Is your simulation program(s) designed for:

- [X] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [X] EPA urban
- [ ] EPA highway
- [X] Some or all SAE J227 schedules
- [X] Other Any general driving cycle may be input on a point by point basis. The cycles indicated, in addition to several others, are already incorporated.

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Gerald J. Roth

Your company Defense Intelligence Agency (DT-1A)

Your company address Defense Intelligence Agency (DT-1A)
Washington, D.C. 20301

Your mail stop —

Your department DT-1A

Your title Branch Chief / Technological Capabilities Branch

Your phone number OX-45860

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

DIA does not have any holdings on US Automotive simulation programs. US state-of-the-art is not followed by DIA. And we are not aware of any US companies with programs of the sort in which you are interested.

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name ROBERT SANDERS

Your company SEBRING VANGUARD INC.

Your company address P.O. BOX 1479
SEBRING FL 33870

Your mail stop _____

Your department _____

Your title VICE PRESIDENT/OPERATIONS

Your phone number 813 - 655 - 1835

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name RALPH W. HOLMES

Your company PRESTOLITE

Your company address PRESTOLITE ELECTRICAL DIVISION
511 HAMILTON STREET
TOLEDO, OHIO 43694

Your mail stop

Your department MECHANICAL SYSTEMS ENGINEERING

Your title SENIOR ENGINEER, ELECTRIC VEHICLE SYSTEMS

Your phone number 419/244 2811

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) ELECTRIC VEHICLE TRACTIVE PERFORMANCE

   ☐ No

3. Please list program names which are in a usable state.

4. Is your program(s) available for public use?

- [ ] Yes
- [x] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [x] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN

The computer(s) it runs on IBM VM/370

The approximate number of source code cards _____

The approximate number of routines 6

Core storage requirements 60 K BYTES

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other POST OFFICE DRIVING CYCLE

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

ASL, GOLETA, CALIFORNIA

Calspan Corporation
P.O. Box 235
Buffalo, New York 14221
Tel. (716) 632-7500

104

Calspan

31 January 1978

Jet Propulsion Laboratory
Attn: Mr. O. Figueroa
4800 Oak Grove Drive
Pasadena, California 91105

Dear Mr. Figueroa:

Please excuse the long delay in returning your questionnaire. At the time we received it, we were beginning to develop a program to simulate a heat engine-flywheel-battery hybrid concept that I hoped to describe in our response. It is now running in a simple form.

We had developed another simulation earlier, primarily for electric vehicles. I have made an extra copy of the questionnaire to make it easier to list the quite different characteristics of these two programs.

Sincerely yours,

D. H. Bock

Ditmar H. Bock

DHB:eb-4
Enclosure

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Ditmar H. Bock (or T.R. Sweet)

Your company Calspan Corporation

Your company address Box 235

Buffalo, NY

14221

Your mail stop -

Your department Electronics (Defense Analyzer Systems)

Your title Principal Physicist (Principal Research Engineer)

Your phone number (716) 632-7500 X781

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   [X] All government funding

   [ ] Some government funding

   [ ] No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   [ ] Yes Name of Program(s) Personal Rapid Transit/Urban Deployability Programs

   [X] No

3. Please list program names which are in a usable state.

   1. Kinematics 2. Vehicle/Guideway Dynamics

   3. Human Interaction 4. Merge 5. Station

   6. Coarse Network Simulation 7. Detailed Network Simulation

4. Is your program(s) available for public use?

[X] Yes

[ ] No

5. Is the program(s) described in any publicly available technical publications?

[X] Yes

[ ] No

6. Can your simulation program in some manner simulate or predict performance of:

[ ] Heat-engine vehicles

[X] Electric vehicles

[ ] Hybrid vehicles

[ ] All of the above

[ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used Fortran

The computer(s) it runs on IBM 360/370

The approximate number of source code cards 8000

The approximate number of routines 500

Core storage requirements 800K Bytes (Program #7, Question 3)

8. Your simulation program(s) is:

[X] Well documented

[ ] Partially documented

[ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

[ ] Yes

[ ] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [X] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other _____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name Ditmar H. Bock

Your company Calspan Corporation

Your company address Box 235
Buffalo, NY
14221

Your mail stop -

Your department Electronics

Your title Principal Physicist

Your phone number (716) 632-7500 X781

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☐ Some government funding

☒ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) FLETSM (FLET Simulation)

☐ No

3. Please list program names which are in a usable state.

FLETSM

4. Is your program(s) available for public use?

- [ ] Yes
- [X] No

5. Is the program(s) described in any publicly available technical publications?

- [ ] Yes
- [X] No

6. Can your simulation program in some manner simulate or predict performance of:

- [X] Heat-engine vehicles
- [ ] Electric vehicles Planned
- [X] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) Heat engine - flywheel - electric transmission

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on IBM 360/65

The approximate number of source code cards 150

The approximate number of routines -

Core storage requirements 46K

8. Your simulation program(s) is:

- [ ] Well documented
- [X] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes Planned
- [ ] No

10. Is your simulation program(s) designed for:

- [X] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban } Planned
- [ ] EPA highway }
- [X] Some or all SAE J227 schedules
- [X] Other Cycles including terrain effects are being run

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [X] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

BCS BOEING COMPUTER SERVICES COMPANY
A Division of The Boeing Company

SPACE, ENERGY & MILITARY APPLICATIONS
P.O. BOX 24346, SEATTLE, WASHINGTON 98124
(206) 773-9130

Judith Bevan
Mail Stop 125-241
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA. 91103

February 3, 1978

Dear Ms. Bevan:

Enclosed you will find our completed questionnaire concerning Vehicle Simulation. In addition to this questionnaire, we have had a brief discussion with Phil Chapman, Don Heimburger and Ron Slusser concerning our capabilities, and we left some data with Mr. Chapman concerning specific components used in some of our earlier work.

We appreciate the opportunity to respond to your survey and to demonstrate both our special simulation capabilities and our interest in the EHV program.

Sincerely,

John L. Gunter

Enclosure

cc: Phil Chapman
Don Heimburger
Ron Slusser

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name Dr. John L. Gunter

Your company Boeing Computer Services

Your company address Energy Technology Applications Division
P. O. Box 24346
Seattle, Washington 98124

Your mail stop 38-09

Your department New Business Development

Your title Manager

Your phone number (206) 433-1373

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☒ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☒ Yes Name of Program(s) EASY Program

☐ No

3. Please list program names which are in a usable state.

EASY-EHV

EASY-SIMWEST

Note: Flywheel and battery components from SIMWEST given to Phil Chapman on 1/24/78

4. Is your program(s) available for public use?

[X] Yes

[ ] No

5. Is the program(s) described in any publicly available technical publications?

[X] Yes* *In Government publications

[ ] No

6. Can your simulation program in some manner simulate or predict performance of:

[ ] Heat-engine vehicles

[ ] Electric vehicles

[ ] Hybrid vehicles

[X] All of the above

[ ] None of the above

(Please define your meaning of "Hybrid".) A combination of two or more power sources with one or more energy storage devices (Power Sources: Electric Motor and other- ICE, etc; Storage Device: Battery and other - FLYWHEEL, etc.)

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV (FTN 4.6)

The computer(s) it runs on CDC 6600/CYBER 175

The approximate number of source code cards 20,000

The approximate number of routines 145

Core storage requirements 100K (Octal) (Moderate sized model)

8. Your simulation program(s) is:

[X] Well documented

[ ] Partially documented

[ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

[X] Yes

[ ] No

10. Is your simulation program(s) designed for:

- [X] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [X] EPA urban
- [X] EPA highway
- [X] Some or all SAE J227 schedules
- [ ] Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [X] Yes Who? Phil Chapman; Don Heimburger; Ron Slusser
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name PAUL FANCHER

Your company UNIVERSITY OF MICHIGAN, HIGHWAY SAFETY RESEARCH INSTITUTE

Your company address HURON PKWY AND BAXTER RD.
ANN ARBOR, MICHIGAN 48109

Your mail stop —

Your department PHYSICAL FACTORS DIVISION

Your title RESEARCH SCIENTIST

Your phone number 313 764 2168

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

☐ All government funding

☑ Some government funding

☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

☑ Yes Name of Program(s) (1) Yaw divergence of commercial vehicles (2) Influence of Increased Size and Weight (3) Directional Response of Tractor-semitrailer Vehicles

☐ No

3. Please list program names which are in a usable state.

(1) Phase III (a computer based mathematical method for predicting braking performance of Trucks and Tractor-semitrailers),
(2) Phase II (... for predicting the directional response of Trucks and Tractor-semitrailers), (3) simplified interactive programs called "TBS" and "BRAKES2."

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4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [ ] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

Our programs predict the response to control inputs. They are not engine simulation programs. They are for studying vehicle control and safety related performance.

(Please define your meaning of "Hybrid".) _____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on IBM 370, AMDAHL 470 V/6

The approximate number of source code cards 4200

The approximate number of routines 35

Core storage requirements 90K word

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [x] No

10. ~~Is~~ are your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [x] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who? _____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Cummins Engines

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name WILLIAM BAUER

Your company WILLIAMS RESEARCH CORPORATION

Your company address 2280 W. Maple Road, Walled Lake, Michigan 48088

Your mail stop B2-1A

Your department Marketing

Your title Chief Applications Engineer

Your phone number 624-5200

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☒ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) Automotive Fuel Economy Simulation program

   ☐ No

3. Please list program names which are in a usable state,

   Automotive Fuel Economy Simulation Program

4. Is your program(s) available for public use?

[x] Yes

[ ] No

5. Is the program(s) described in any publicly available technical publications?

[ ] Yes

[x] No

6. Can your simulation program in some manner simulate or predict performance of:

[x] Heat-engine vehicles

[ ] Electric vehicles

[ ] Hybrid vehicles

[ ] All of the above

[ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used Fortran IV .

The computer(s) it runs on Univac 1108, Honeywell 6607

The approximate number of source code cards 600 cards

The approximate number of routines 4 routines

Core storage requirements 60K words

8. Your simulation program(s) is:

[ ] Well documented

[x] Partially documented

[ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

[x] Yes

[ ] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [x] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [ ] Yes Who?_____
- [x] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

_____

_____

_____

_____

VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Patrick M. Miller

Your company MGA Research Corporation

Your company address 4245 Union Road

Buffalo, New York 14225

Your mail stop ---

Your department ---

Your title President

Your phone number 716-634-6950

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☒ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☒ Yes Name of Program(s) HVOSM, CVS, CRASH, SMAC

   ☐ No

3. Please list program names which are in a usable state.

   HVOSM - Highway Vehicle Object Simulation Model

   CVS - Crash Victim Simulation

   CRASH - Impact Speed Reconstruction Program

   SMAC - Accident Reconstruction Program

4. Is your program(s) available for public use?

[X] Yes

[ ] No

5. Is the program(s) described in any publicly available technical publications?

[X] Yes

[ ] No

6. Can your simulation program in some manner simulate or predict performance of:

[ ] Heat-engine vehicles

[ ] Electric vehicles

[ ] Hybrid vehicles

[X] All of the above

[ ] None of the above

(Please define your meaning of "Hybrid".) Propulsion power derived from battery stored energy or conventional heat engine fuels

7. Please describe your program(s) in terms of:

The programming language used _____

The computer(s) it runs on _____

The approximate number of source code cards _____

The approximate number of routines _____

Core storage requirements _____

8. Your simulation program(s) is:

[X] Well documented

[ ] Partially documented

[ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

[ ] Yes

[X] No

10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [ ] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [ ] EPA urban
- [ ] EPA highway
- [ ] Some or all SAE J227 schedules
- [ ] Other Can be programmed to simulate all of the above modes of operation.

12. Can JPL use this data in a survey report for the Department of Energy?

- [X] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [X] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [X] Yes Who? _____
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

Calspan Corporation

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name PHIL CHAPMAN

Your company JET PROPULSION LABORATORY

Your company address 4800 OAK GROVE DR.
PASADENA, CA 91103

Your mail stop 198-220

Your department ELECTROCHEMICAL POWER GROUP

Your title TASK AREA MANAGER, VEHICLE SYSTEMS MODELING AND SIMULATION

Your phone number (213) 354 7693

If your company does not have an automotive simulation program, go to question 15.

1. Indicate the funding source of your simulation program(s).

- [x] All government funding
- [ ] Some government funding
- [ ] No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

- [x] Yes — Name of Program(s) ELECTRIC AND HYBRID VEHICLE SYSTEM RESEARCH AND DEVELOPMENT PROJECT (DOE)
- [ ] No

3. Please list program names which are in a usable state?

PARAMET

4. Is your program(s) available for public use?

- [x] Yes
- [ ] No

5. Is the program(s) described in any publicly available technical publications?

- [x] Yes
- [ ] No

6. Can your simulation program in some manner simulate or predict performance of:

- [ ] Heat-engine vehicles
- [x] Electric vehicles
- [ ] Hybrid vehicles
- [ ] All of the above
- [ ] None of the above

(Please define your meaning of "Hybrid".) _____

_____

7. Please describe your program(s) in terms of:

The programming language used FORTRAN IV

The computer(s) it runs on IBM 370

The approximate number of source code cards 2000

The approximate number of routines 19

Core storage requirements SOURCE & OBJECT 4940
OBJECT CODE ONLY 1330

8. Your simulation program(s) is:

- [x] Well documented
- [ ] Partially documented
- [ ] Not too well documented

9. If your simulator(s) can accommodate hybrid vehicles and/or heat-engine vehicles, can it accept emission maps?

- [ ] Yes
- [ ] No

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10. Is your simulation program(s) designed for:

- [ ] Batch mode operation
- [x] Interactive mode
- [ ] Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- [x] EPA urban
- [x] EPA highway
- [x] Some or all SAE J227 schedules
- [x] Other ANY USER DEFINED

12. Can JPL use this data in a survey report for the Department of Energy?

- [x] Yes
- [ ] No
- [ ] Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- [x] Yes
- [ ] No
- [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- [x] Yes Who? MODELING & SIMULATION TASK AREA TEAM
- [ ] No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name Darryl L. Kane

Your company National Motors Corporation

Your company address Post Office Box 1523

Lancaster, Pennsylvania 17601

Your mail stop _____

Your department _____

Your title President

Your phone number (717) 299-7349

If your company does not have an automotive simulation program, go to question 15.

REFER TO COMMENTS UNDER "15"

1. Indicate the funding source of your simulation program(s).

   ☐ All government funding

   ☐ Some government funding

   ☐ No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study?

   ☐ Yes Name of Program(s) _____

   ☐ No

3. Please list program names which are in a usable state.

_____

_____

_____

_____

10. Is your simulation program(s) designed for:

- ☐ Batch mode operation
- ☐ Interactive mode
- ☐ Both of the above

11. If your simulator(s) accommodates any SAE or Federal driving schedules, please indicate which ones:

- ☐ EPA urban
- ☐ EPA highway
- ☐ Some or all SAE J227 schedules
- ☐ Other_____

_____

12. Can JPL use this data in a survey report for the Department of Energy?

- ☐ Yes
- ☐ No
- ☐ Maybe (A "maybe" will be considered a "no" until resolved)

13. Are you willing to discuss your simulation program(s) further with a JPL survey team?

- ☐ Yes
- ☐ No
- ☐ Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?

- ☐ Yes Who?_____
- ☐ No

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.

NMC is in possesion of a well documented program which should be capable of predicting the performance of electric, hybrid and I/C powered vehicles. As yet the program has not been tested although it has been de-bugged by others.

(212) 986-2873

(111)

Cable Address: WOUKA

VICTOR WOUK ASSOCIATES

342 MADISON AVENUE
Suite 831
NEW YORK, NEW YORK 10017

December 14, 1977

Mr. O. Figueroa
Supervisor, Flight Project &
Civil Systems Procurements
Jet Propulsion Laboratories
4800 Oak Grove Drive
Pasadena, Ca 91103

Dear Mr. Figueroa:

Your undated form letter concerning automotive performance simulation capabilities has been received. In accordance with the filled out simulation questionnaire, you will see that we do not have an automotive simulation program.

However, with regard to question 15, we believe that there is an automotive performance simulation program at:

Mechanical Technology, Inc.
968 Albany-Shaker Road
Latham, N.Y. 12110

I have been involved in two vehicles, an all-electric and a hybrid described in the enclosed papers. We predicted the performances of both the electric and the hybrid by reference to well known electrical and automotive phenomenon. The performances came very close to the predicted values.

I hope this is of some help.

Very truly yours,

:mc/11621
encls: 690454
760123

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