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A Survey of Electric and Hybrid Vehicle Simulation Programs

Volume II: Questionnaire Responses

J. Bevan
D. A. Heimburger
M. A. Metcalfe

July 1, 1978

National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California
(JPL PUBLICATION 78-58, Volume II)
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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.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

1
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.
    ____________________________
    ____________________________
    ____________________________

2
SPEED MESSAGE

FROM: ORDEAN KILTIE - Advisory
2445 Fairfield - A201
Fort Wayne, Indiana 46807
Tel. 219-745-9139

TO: Mr. D. FIGUEROA - Supervisor

Mail Stop 125-241 - JPL

SUBJECT: 4800 Oak Grove Dr. - Pasadena, CA 91103

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 am to accompany Mr. J.R. Harkness, Vice President of Briggs and Stratton Co., Milwaukee, WI to review and discuss their newly developed 11, 14, and 16 HP gasoline engines suitable for hybrid electric vehicles with your Mr. Frank Suter, Mr. Noel Sandberg, Tom Barber and others. Since I prefer to not commit Briggs and Stratton, I am mailing your letter and questionnaire to Mr. J.R. Harkness.

I do thank you.

Sincerely

Signed

[Signature]

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 FERREORESONANT REGULATING TYPES.
Please provide the following information:

Your name: John P. Fraher

Your company: Salisbury 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.


Please provide the following information:

Your name: EVELYN C. VEEDER

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,


6
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. ULRICH

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
   - [x] 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)  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  ☒ No  
   ☒ No  **ALTHOUGH THE MATHEMATICAL MODELS USED HAVE BEEN WIDELY PUBLICIZED AND APPROX. 250 COPIES GIVEN AWAY ON FICHE.**

5. Is the program(s) described in any publicly available technical publications?
   ☐ Yes  ☒ No  
   ☒ 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
   ☐ Hybrid vehicles
   ☒ All of the above
   ☐ 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  
   ☒ No  **COULD BE EASILY ADDED**
10. Is your simulation program(s) designed for:
- [ ] Batch mode operation (LINE PRINTER PLOTTING)
- [ ] 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 PREPROGRAMMED TRIP

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.

Too Many to List

10
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  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 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 ____________________________

Your company _________________________

Your company address __________________

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.

   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

   13
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 fleet of fuel battery-turbine vehicles."
VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name ________________________________  B. H. ROWLETT

Your company ________________________________  AI Research Mfg Co

Your company address ________________________________  2525 W. 190th St

Torrance, CA 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.

MING-12
EVMTR
L44-NEW

15
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
   □ Hybrid vehicles
   □ All of the above
   □ None of the above

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

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: 2,500 each
   The approximate number of routines: 10 each
   Core storage requirements: 20 blocks each

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
   □ 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? Tom Barber, Ron Yoshida
   - [ ] No

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

☐ No

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

ELECTRIC VEHICLE SIMULATION

----

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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
   - [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 Brennan
Your company: SRC
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).
   - [ ] 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
   - [ ] No

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

2 1
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/battery electric

7. Please describe your program(s) in terms of:
   
   The programming language used: **Forlan**
   The computer(s) it runs on: **IBM, Univac, CDC**
   The approximate number of source code cards: **5000**
   The approximate number of routines: **50**
   Core storage requirements: **~20000 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

   22
10. Is your simulation program(s) designed for:

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

11. If your simulation(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 & Diamond)
- [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
- [ ] No

Who? Phil Chapman

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       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) 848-2539

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

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Please provide the following information:

Your name    

Your company    

Your company address  

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.
   ____________________________________________
   ____________________________________________
   ____________________________________________
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 ____________________________
   ____________________________
   ____________________________
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

Telephone 354-4321  
Twx 910-588-3269  
Twx 910-588-3294
VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name               WARREN HACHAY                PRESIDENT

Your company             ELECTRIC VEHICLE ASSOCIATES INC

Your company address     9100 BANK ST.
                          CLEVELAND OHIO 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) CAGE SIMULATOR
   □ No

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


30
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: Basic
   The computer(s) it runs on: BES/ PDP 11
   The approximate number of source code cards: Proprietary
   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 - At present

3 1
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.
   GE, DOD SERVICES DEARBORN MICH
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
   - [x] 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): 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
   - [X] No
   - [ ] Who?

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. F. - 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,

   
   
   
   36
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.

   ________________________________
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.
   ____________________________________________________________________
   ____________________________________________________________________
   ____________________________________________________________________
   ____________________________________________________________________
   ____________________________________________________________________
   38
Mr. O. Figueroa  
Flight Project and Civil Systems 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 con- 
cerning 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
Please provide the following information:

Your name: M.A. POORBELLA

Your company: TREND SERVICES, INC.

Your company address: 10611 HAGUE ST
DEARBORN, MICH. 48126

Your mail stop: 

Your department: 

Your title: PRESIDENT

Your phone number: 313-584-075

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
   - [x] 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 VEHICLE DESIGN
   - [ ] No

3. Please list program names which are in a usable state,
   - EV RANGE
   - EV PERF
   - EVSRO
   - EVSEP

40
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:
   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
   The computer(s) it runs on: GENERAL
   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
   - 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
   - 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  Bonal Corporation
Your company address  1357 - 18 W. 81
                     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).
   • 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,
   ONE - MORE RESEARCH IS REQUIRED


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

EV 227

46
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, Fortran IV
   - The computer(s) it runs on, GE 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
   - 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. VROOM will accept any driving cycle input. EV227 uses SAE J227 a (D) cycle.

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.
Please provide the following information:

Your name  

George N. 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  

MR. 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
   - 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/Stored Energy Source
Of Either Parallel or Series Types

7. Please describe your program(s) in terms of:
   - The programming language used: Online 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
   - 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

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?

☒ 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: [Your name]
Your company: U.S. D.O.E.
Your company address: Bartlesville Energy Research Ctr
                      P.O. Box 1398
                      Bartlesville, Ok 74003
Your mail stop: [Your mail stop]
Your department: [Your department]
Your title: [Your title]
Your phone number: [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).
   - [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.


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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: FORTRAN
   - 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
   - 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:
   - [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 - ________
   - Ford ____________________________
Please provide the following information:

Your name  

Your company  

Your company address  

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  
   - 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

[Space for Who?]

☐ No

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

None to my knowledge

[Spaces for additional names]

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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
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.
Please provide the following information:

Your name ____________________________ Edward A Campbell

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.

   ____________________________

   None

61
Please provide the following information:

Your name ____________________________________________

Your company ____________________________________________

Your company address ____________________________________________

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

63
Please provide the following information:

Your name  

Your company  

Your company address  

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  
   □ 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 310
   The approximate number of source code cards 1100
   The approximate number of routines  15
   Core storage requirements  80000  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  65
   [ ] 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:

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

   Scott, SAE JD82

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
- [ ] 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.
Please provide the following information:

Your name ____________________________  C. A. Belsterling, Mgr., E.E.
Franklin Institute Research Labs.
Ben Franklin Parkway
Philadelphia, PA 19103

Your company ______________________________

Your company address ___________________________________________
________________________________________________________________
________________________________________________________________

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
   - [x] 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) Tunnel Entrance Safety
   - [ ] No

3. Please list program names which are in a usable state.
   - Hybrid System — no program names

(67)
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 - 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: Nine
   - The approximate number of routines: Seven
   - 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:
   - [ ] 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
   - [x] No
   - [ ] Who? ________________________________

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.
   - [ ] None

   ________________________________
   ________________________________
   ________________________________
   ________________________________
   ________________________________

   69
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
   - [X] 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)
   - [X] No

3. Please list program names which are in a usable state,
   1. HYBRID
   2. AUTOMOBILE PERFORMANCE SIMULATION PROGRAM

(70)
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 routines: **53**
   - Core storage requirements: **124 000 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:
   - [ ] 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

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
   - [ ] No
   - [ ] Who?    Ronald C. Heft

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

B. Borisoff, P. E.

BB:kh
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
Nebraska 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.

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

__________________________________________ 74
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
   □ No
   □ Yes Who? ____________________________

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,
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.

   
   
   [ ]

   [ ]

   [ ]

   [ ]

   [ ]

   [ ]

   [78]
VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name ________________________________

Your company ______________________________

Your company address ____________________________

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) HYBRID VEHICLE TECHNOLOGY

☐ No

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

HYBRID VEHICLE SIMULATION COMPUTER PROGRAM

1. POWERTRAIN COMPONENT SIZING PROGRAM

2. ENERGY CONSERVATION & EMISSIONS PROGRAM
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: **FORTRAN**
   - The computer(s) it runs on: **COC 7600**
   - The approximate number of source code cards: **1,300 - 1,500**
   - The approximate number of routines: **20**
   - Core storage requirements: **130,000 - 160,000 WORDS**

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.
   __________________________________________
   __________________________________________
   __________________________________________
VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name  RAYMOND JACOBS, VICE-PRESIDENT

Your company  MURRILL MOTORS

Your company address  6016 3 AUBURN BLVD
                       CITRUS HEIGHTS, CA. 95610

Your mail stop  PO. 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,________________________________________


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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name ____________________________

Your company __________________________

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 _________________________

415-493-4500 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.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

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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.

   HERB Com. Fort Belvoir, VA 22060  Attn: Dr. J. Huff
   Ford Motor Company
   Los Alamos Scientific Laboratory
   JPL
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 202-331-0852

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,


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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, Fort Wayne, Indiana
Please provide the following information:

Your name  W.C. EDWARDS

Your company  EDWARDS ELECTRONIC CORP.

Your company address  44 RAIL ROAD AVE

                          GLEN HEAD N.Y. 11545

Your mail stop

Your department

Your title  PRES.

Your phone number  (5-16) 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.


88
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,

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

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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.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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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.
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.
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: Associate 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, VSIMAl
   ☐ No

3. Please list program names which are in a usable state:
   #77010 & #77012, EV Acceleration Performance
   #77011, EV Stead-State Performance
   VSIMAl, 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
   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: USPS Test 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)

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

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
- [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         Principal 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
   X No government funding

2. Are you currently using any of your simulation programs for some type of vehicle study? Yes
   X 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:
   □ Heat-engine vehicles
   X Electric vehicles
   X Hybrid vehicles
   □ 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:
   - 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.
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.
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
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 your interest in the activities and programs of the Laboratory.

Very truly yours,

M. P. Kuhn
Procurement Services

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

Education

MS in Aerosciences, U. C. Berkeley (1958)
BS in Mechanical Engineering, U. C. Berkeley (1956)

Honors and Appointments

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

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


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 customer'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:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee for the transfer of the HASP computer code</td>
<td>$10,000</td>
</tr>
<tr>
<td>Principal Engineer</td>
<td></td>
</tr>
<tr>
<td>Dr. A. Wortman</td>
<td>$8,000</td>
</tr>
<tr>
<td>Senior Programmer</td>
<td></td>
</tr>
<tr>
<td>G. Soo Hoo</td>
<td>$2,700</td>
</tr>
<tr>
<td>Associate Engineer</td>
<td></td>
</tr>
<tr>
<td>G. A. Brinlee</td>
<td>$1,600</td>
</tr>
<tr>
<td>Overhead @ 27%</td>
<td>$3,321</td>
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<tr>
<td>Total</td>
<td>$15,621</td>
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<tr>
<td>General and Administrative @ 7%</td>
<td>$1,093</td>
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<tr>
<td>Total</td>
<td>$16,714</td>
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<td>Fixed fee @ 9%</td>
<td>$1,504</td>
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<tr>
<td>Production of user's manual</td>
<td>$1,250</td>
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<tr>
<td>Total</td>
<td>$29,468</td>
</tr>
</tbody>
</table>

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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

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, $T_0 = 20$s

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, $Q_F$, KW, vs time, $T$, seconds
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

POWER HP

V, FPS

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name ________________________

Your company ______________________

BOULDER ENGINEERING, INC.
4827 Thunderbird Dr. #46
Boulder, Colo. 80303

Your company address ______________________

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.

   ______________________

   ______________________

   ______________________

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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 do not have an automotive simulation program and was instructed to skip the questions 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 my gerontologist in New York assures me that I am still good for twenty years or more. I am one of his research 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 exhibit 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 later when 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 hundred 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,

E.W. Stitt.
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
   - [X] 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) 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.

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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?
   □ 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?

☐ X Yes  Who?______________________________
☐ 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 a

at Princeton University and I am somewhat out of date as to modern terminology and do not know what simulation program is. If it consists of research work of an empirical manner with mockups of roadable vehicles, I know what that might be, but where the computers come into the picture is beyond me.
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.

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

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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.

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name  

Your company  

Your company address  

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.
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,
Please provide the following information:

Your name: Edward N. Nrotek
Your company: Globe Union INC
Your company address: 5757 N. Green Bay Ave
                    Milwaukee, Wis 53201
Your mail stop: 326
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 20838
    Schenectady, New York
    12301
    Attn: Mr. E.A. Rowland 133
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

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4. Is your program(s) available for public use?
   □ Yes
   X X No

5. Is the program(s) described in any publicly available technical publications?
   □ Yes
   X X No

6. Can your simulation program in some manner simulate or predict performance of:
   □ Heat-engine vehicles
   X 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 Assemble & Basic ________________________________________
   The computer(s) it runs on Quantel ________________________________
   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
   X 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 X No

   135
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
- No

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

None
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,


137
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.

SYSTEM CONTROL, INC.; 1801 PAGE MILL RD, PALO ALTO CA 94304

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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.

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________

139
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 chassis dynamometer and do actual driving tests on urban and highway cycles we designed.
VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name ____________________________ Raymond J. Warden

Your company ________________________ General Electric Co.

Your company address

Corporate Res. & Dev.

Bldg 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) NGR-TERM ELECTRIC VEHICLE PROGRAM - PHASE II

☐ No

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

ELCARIO

141
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

142
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
   - [ ] No
   - [ ] Maybe
   - Who? ____________________________

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  

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


144
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"). 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
   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
   ❌ 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 Any schedule where vehicle speed is specified in one-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
   - [x] 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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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.
   ____________________________________________
   ____________________________________________
   ____________________________________________

147
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

148
VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name  ________________________
Your company ________________________
Your company address ________________________
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.
   a) Automotive Propulsion Simulator (APS)
   b) CAR$/M
   c) Flywheel Automotive Propulsion Simulator
   d) Hybrid Car Simulator

149
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  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

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:
   - [ ]
   - [ ]
   - [ ]

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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.

                         
                         
                         
                         

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name: J. Arias

Your company: Jeffrey C. 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 1036

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,

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

   153
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
     1141 Santa Fe St
     San Diego, CA 92109
   - attwn: Peter Houtley
CHW INDUSTRIES IS A MANUFACTURER OF ELECTRIC VEHICLES

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,

155
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?

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

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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 miles 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.

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

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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?
   - Yes  Name of Program(s)  Three NHTSA Research Programs
   - No

3. Please list program names which are in a usable state.
   - HVHP (Hybrid Vehicle Handling Program), 17 DOF Vehicle Model Solution
   - TVDS3 (Three Dimensional Vehicle Simulation), All Digital, Articulated
   - HSRE Articulated Vehicle Simulation

158
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
   - [x] Hybrid vehicles
   - [ ] All of the above with limited modifications
   - [ ] None of the above

   (Please define your meaning of "Hybrid"). Combination of energy sources: i.e., Gasoline/Electric, Flywheel/Electric, etc.

7. Please describe your program(s) in terms of:
   - The programming language used: [FORTRAN]
   - 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 KB]

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

   [159]
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.
   - CALSPAN CORP
   - HIGHWAY SAFETY RESEARCH INST. U. OF MICHIGAN
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 252-6220, (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. 35TH ST.

CHICAGO, ILL.
60616

Your mail stop: ____________________________
Your department: MECHANICAL & SYSTEMS RESEARCH
Your title: MANAGER
Your phone number: 312/567-4251

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) 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 CRASH WORTHINESS
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"). ICE/ELECTRIC

7. Please describe your program(s) in terms of:
   The programming language used  Fортран 11
   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
   □ 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 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
   □ 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 CAN ALSO ACCESS FLAT MODELS FOR ICE, ELECTRIC AND H.V. SIMULATION.
   ICE & H.V. MODELS CAN DO EMISSIONS.
Brian Christensen, now at Battelle (Columbus, Ohio), was sent a questionnaire. He called to state that he does not believe the questionnaire because of work he did while at the Uni of Wisconsin. He constructed a paper while at U of K, for O. Morton. He wanted to know if he should fill out the questionnaire on behalf of Battelle. I told him yes, if Battelle would provide the information that it would be OK.
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: IEOV
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

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 DEGREES OF DISPLAY MOTION, 4 DEGREES OF PHYSICAL MOTION,
   4 CHANNELS OF SOUND PRODUCTION. IS THE SIMULATOR Programmable TO STUDY EFFECTS OF DRIVER ACTION ON FUEL ECONOMY? IT CAN ALSO BE USED FOR TRAINING ON FUEL ECONOMY. SIMULATOR HAS ACCURATE HANDLING.
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

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


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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name  DAVID G. CURPHEY

Your company  ENGINEERED SYSTEMS DIV. FMC CORPORATION

Your company address  328 BOKAW ROAD
                      SANTA CLARA, CA 95050

Your mail stop

Your department  Government Operations

Your title  MANAGER, CIVIL AGENCY'S 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)

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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: **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 conversation 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.

ordination engineering division of FMC has a substantial library of vehicle simulation programs.

______________________________

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Please provide the following information:

Your name: PROF ANDREW FRANK

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 (APS)

☐ No 2. Flywheel Propulsion Simulation

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
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".) 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 16**
   The approximate number of source code cards: **1000**
   The approximate number of routines: **40**
   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:
   - [ ] EPA urban
   - [x] EPA highway
   - [ ] Some or all SAE J227 schedules
   - [ ] Other: [Accel, Cruise]

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? [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

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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

enclosure

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name: Douglas Dow, Consulting Eng.
Your company: D.D. Consortium
Your company address: P.O. Box 4078
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.


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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.

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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
   Attn: Richard S. Leasia
   3080 East Outer Drive
   Detroit, Michigan 48234
   Phone 313-366-3020

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VEHICLE
SIMULATION
QUESTIONNAIRE

Please provide the following information:

Your name  GORDON F. 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"

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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?
   
   [ ] 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
   [X] 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:
   - [ ] 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.
    ________________________________________________________________
    ________________________________________________________________
    ________________________________________________________________
    ________________________________________________________________
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

[Signature]

Dec 2, 1977
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 [X]

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: 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:
   - 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 [X]
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.

Cummins VMS
Detroit Diesel PREPP
Caterpillar

Have Electric Vehicle Program
International Harvester Engineering Research
7 South 600 County Line Rd.
Hinsdale, IL 60521
Att: Gene Wallace

(Handwritten note: 184)
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.


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

2. Are you currently using any of your simulation programs for some type of vehicle study?
   - [ ] Yes Name of Program(s)
   - [x] 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?
   ☑ Yes
   ☐ No

5. Is the program(s) described in any publicly available technical publications?
   ☑ Yes - brief description in enclosed paper
   ☐ 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: 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
   ☑ 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
   ☑ 188
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
VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name _____________________________ Richard A. Evans

Your company __________________________ Honeywell Inc.

Your company address Energy Resources Center

2600 Ridgeway 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 __________

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

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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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: **FORTRAN**
   - The computer(s) it runs on: Honeywell Biiwopm Tumi Kaue
   - 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
   - [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
   - [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?
   - [x] Yes
   - [ ] No
   - [ ] Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?
   - [ ] Yes
   - [x] No
   - [ ] Who?

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 ____________________________
Your company __________________________
Your company address ____________________
Your mail stop __________________________
Your department _________________________
Your title ______________________________
Your phone number ______________________

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.

________________________
________________________
________________________
Jet Propulsion Laboratory  
California Institute of Technology  
4800 Oak Grove Drive  
Pasadena, CA 91103

Gentlemen:

Thank you for your interest and consideration in including MB Associates 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. ROYLAND  
Vice-President

JLB:eg
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).

   ☑ 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, 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)

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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
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 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 Orzechowski 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)

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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

Telephone 354-4321
Txx 910-588-3269
Txx 910-588-3294

EVC, Inc.
Attn: Mr. Strumpell
9016 Aviation Blvd.
Inglewood, CA 90301

Thank you for considering us.

enclosure

NOV 17 1977
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 for low voltage warning.

**SPECIFICATIONS**

- **Voltage**
  - 12 to 72 VDC
  
- **Current**
  - 400 to 600 amp

- **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.
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 0.5mH 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.
Please provide the following information:

Your name: George E. Atlas

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.


201
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  
Advance Product Engineering

DTL/fk  
enc.  
cc: C. E. Scheffler  
F. W. Bowditch  
C. Marks  
W. J. Cattin
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
   X 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) ____________ GPSIM
   □ No

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

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4. Is your program(s) available for public use?
   Yes 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.
   No

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 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.
   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 370/145 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:
   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 204
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 All GM, any USA-specified schedules

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? ____________________________ Dr. Gerhard Klose
       Mr. D. Heinburger
   □ No

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

                                      ____________________________________________
                                      ____________________________________________
                                      ____________________________________________
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  
Group Leader,  
National Battery Test Laboratory

FH/sb

Enclosure
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

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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 [H]
   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?
   [ ] Yes
   [N/A]
   [ ] 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

12. Can JPL use this data in a survey report for the Department of Energy?
   - Yes [X]
   - 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 [X]
   - No
   - Maybe

14. Have you discussed your simulation program(s) previously with JPL personnel?
   - Yes Who?
   - No [X]

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. Unnewehr
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
   (x) 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)  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
   FW HYB - Flywheel-Battery hybrid vehicle

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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

   (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) their are 12 subprograms or subroutines
   - 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?
   - [x] Yes - P1
   - [ ] 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
     - [ ] 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 Airsearch, GM, GE, Westinghouse, General Research, Exxon
Please provide the following information:

Your name: Joseph M. Salvaggio

Your company: University of Alabama in Huntsville

Your company address: Box 1347, Huntsville, Alabama 35803

Your mail stop: Auto Check Center

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
   - [x] 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) ____________________________
   - [ ] No

3. Please list program names which are in a usable state.
   
   These programs have been adapted from military applications and have no title at such.

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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"). A 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: 320
   - 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:
   - [ ] 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? [Handwritten: 9-28-71]
   - [ ] No

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

   CHRYSLER Corporation - MOAT developed under a government contract

   ________________________________

   ________________________________

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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

More information is available should you desire it for your use. Please write if you want sample outputs, etc.
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
     - Ph.D. Thesis by Frederick T. Elder
     - Published & Copyrighted in 1974.
   - [ ] No
     - Also, various papers.

6. Can your simulation program(s) simulate or predict performance of:
   - [x] Heat-engine vehicles
   - [ ] Electric vehicles
   - [x] 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 "gals" in a

7. Please describe your program(s) in terms of:
   - The programming language used: **Fortran**
   - 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
   - [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
     - In a digitized format
   - [ ] 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.

   Professors Beachley & Frank
   University of Wisconsin
   Madison, WI

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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 92805
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.

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: 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).

☒ 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) Vehicle Fuel Economy Program
☐ No

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

Same as above

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4. Is your program(s) available for public use?
   □ Yes
   X X No

5. Is the program(s) described in any publicly available technical publications?
   □ Yes
   X X No

6. Can your simulation program in some manner simulate or predict performance of:
   X X Heat-engine vehicles
   □ Electric vehicles
   X X 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
   X 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 X 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.


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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: Manufacturing 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.

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

224
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
     - 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:
   - 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 accommodated
   - 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 accommodated

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.

   __________________________________________
   __________________________________________
   __________________________________________
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 program names which are in a usable state,

   . VEHBASIC (Perf.)  NEWD2.F4 (Electric Vehicle P & E)
   . VEHIPERF (Perf.)
   . CVRT (Fortran Economy)
   . Pl (Electric Hybrid P & 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
☒ 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"). 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
☒ Not too well documented

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

☒ 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)

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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
   - [x] 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?
   - [x] Yes Name of Program(s): HOSM, SMAC, GUARD,
   - [ ] No BARRIER VII, C.RUNCH

3. Please list program names which are in a usable state. ADUMMY
   
   Same as above.

230
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"). Propulsion derived from unlike sources of power.

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.

________________________________________________________________________
________________________________________________________________________

232
Please provide the following information:

Your name __________________________

Your company _________________________

Your company address ___________________

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,

_______________________________________

_______________________________________

_______________________________________

233
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 simulated program as well as the University of Michigan's.
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,

Joseph B. Bidwell
Executive Director

[Signature]

JBB:el
Attach.
Please provide the following information:

Your name  Paul T. Vickers
Your company  Research Labs, G. M. Corp.
Your company address  12 Micle & 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
   - [x] 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)  GPSIM
   - [ ] No

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

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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 **PL/I**
   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
   ✔ 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 238
   □ 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
- No

- Who? THOMAS STEPHENSON, ET AL

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
   X 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) 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
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"). 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
   - 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 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?

☒ Yes
☐ No
☐ Maybe

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

☒ 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.


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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

   ☐

   243
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
   1550
   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?  
   □ 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, Ford, TRW Systems, etc.

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VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name: CECIL E. DIETRICH

Your company: AMERICAN ELECTRIC CAR COMPANY, LECTRON 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.

____________________________________________________________________

246
Please provide the following information:

Your name  W. A. Buzzell

Your company REI

Your company address  1209 Lake Ave.

                               Lake Worth
                               Florida  33469

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

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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 Fortran
   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:

☑ 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 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?

☑ 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.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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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)

WPASSINGTON, D.C. 20331

Your mail stop ______________________________

Your department ________________ DT-1A

Your title __________________________ Branch Chief/ Technology 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
   - [x] 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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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
   - [ ] No
   - [ ] Who?

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 kind in which you are interested.
Please provide the following information:

Your name ________________

Your company ____________________________

Your company address ____________________________

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,

__________________________________________

__________________________________________

__________________________________________

252
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
   - [x] 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 VEHICLE TRACTIVE PERFORMANCE**
   - [ ] No

3. Please list program names which are in a usable state,
4. Is your program(s) available for public use?
   - No

5. Is the program(s) described in any publicly available technical publications?
   - No

6. Can your simulation program in some manner simulate or predict performance of:
   - Electric vehicles
   - All 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:
   - Well documented

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

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.

   ASL, GOLETA, CALIFORNIA

255
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,

Ditmar H. Bock

DHB:eb-4
Enclosure
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).
   □ 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/Urn Barbility Programs
   □ No

3. Please list program names which are in a usable state.
   1. Kinematics 2. Vehicle/Guideway Dynamics
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 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:
   □ 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
   - 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
   - No
   - Who?

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 ___________ 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
   X 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) ___________ FLETSM (FLET Simulation)
   □ No

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

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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 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:
   □ 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 □ Planned
   □ Some or all SAE J227 schedules
   □ Other. Cycles including terrain effects are being run

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
   □ Yes

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

__________________________________________
__________________________________________

262
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

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4. Is your program(s) available for public use?
   □ Yes
   □ No

5. Is the program(s) described in any publicly available technical publications?
   □ 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
   □ 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:
   □ 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
   - 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? Phil Chapman; Don Heimburger; Ron Slusser
   - 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  **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
   - [X] Some government funding
   - [ ] No government funding

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

   - [X] Yes
   - [ ] No

   Name of Program(s)

   (1) *Yaw Divergence of Commercial Vehicles*
   (2) *Influence of Increased Size and Weight*
   (3) *Directional Response of Tractor-Semitrailer Vehicles*

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-semi-trailers),
   - (2) **Phase II** (--- for predicting the directional response of Trucks and Tractor-semi-trailers),
   - (3) Simplified interactive programs called "TBS" and "BRAKES2"
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

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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

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 Engines

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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
   - [X] 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): Automotive Fuel Economy Simulation program
   - [ ] No

3. Please list program names which are in a usable state,
   Automotive Fuel Economy Simulation Program

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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: 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
   - 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?
   □ 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
   □ No
   x 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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272
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

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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

(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?
   - 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
   - [ ] No
   - [ ] Who?

15. Please list other U.S. companies you know with automotive performance simulation programs of any type.
   - Calspan Corporation
VEHICLE SIMULATION QUESTIONNAIRE

Please provide the following information:

Your name: PHIL CHAPMAN
Your company: JANET 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).

☑ 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 AND HYBRID VEHICLE SYSTEM RESEARCH AND DEVELOPMENT PROJECT (DOE)
☐ No

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

PARAMET

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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

   The programming language used: FORTAN IV
   The computer(s) it runs on: IBM 370
   The approximate number of source code cards: 8000
   The approximate number of routines: 19
   Core storage requirements: SOURCE & OBJECT: 4940
   OBJECT CODE ONLY: 1330

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
   - 277
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
   - [ ] No
   - Who? [NAME]

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.
REFERR 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.

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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 possession 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.

280
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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