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DOT HS-803 961

MULTIDISCIPLINARY HIGHWAY COLLISION INVESTIGATION COURSE

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Western Operations
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DEPARTMENT OF
TRANSPORTATION

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JULY 1978
FINAL REPORT

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Technical Report Documentation Page

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16. Abstract The purpose of the contract was to provide training for traffic accident investigators and allied specialists. Approximately 30 students were trained in each of three classes of a 2-week, 84-hour course entitled "Multidisciplinary Highway Collision Investigation Training Course." Attendees were primarily from State and local multidisciplinary accident investigation teams, with a few from Federal organizations, such as the National Transportation Safety Board. The contractor provided all necessary resources for conducting the course, including instruction, recruitment, and enrollment of students; arrangements for student participation in the course; facilities; classroom spaces; transportation during the course; training materials; and vehicle crash observation for each participant. The course materials previously developed by Dynamic Science, Inc. were used to conduct the course. Major topics presented included: orientation; investigative techniques (classroom presentations and on-scene experience); human factors; vehicle factors; environmental factors; methods of accident data sampling; level II investigation; accident causation, collision severity, and injury severity; and computer simulation models of accident reconstruction applicable for in-depth investigations. This Final Report addresses the following topics: (a) general introduction; (b) purpose/objectives; (c) technical approach; (d) major topics, course hours, and allied areas; (e) course outline; (f) course planning and preparation; (g) student evaluation; (h) description of course sessions; (i) course evaluation; (j) program plan and schedule; and (k) conclusions, findings, and recommendations. Both end-of-course and six-month follow-up (Continued on reverse)					
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16. Abstract (Continued)

evaluations were conducted. Most of the participants rated the course from "good" to "excellent." The appendix contains general comments received from attendees.

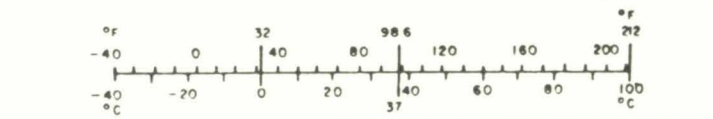
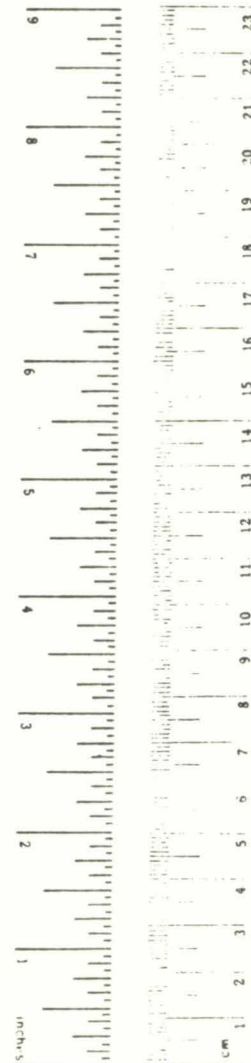
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.76	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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GENERAL INTRODUCTION

Dynamic Science, Inc. arranged for, conducted and reported on three, (2) two week courses for the training of accident investigators and allied specialists. The course syllabus previously developed by Dynamic Science, Inc. under Contract No. DOT-HS-6-01512, entitled, "Multidisciplinary Highway Collision Investigation Training Course:", was used to conduct the three (3) courses.

Other allied areas of accident investigation that were addressed, during each of the courses were:

1. Accident Sampling
2. Level II Investigation
3. Accident Causation, Collision Severity, and Injury Severity
4. Computer Simulated Models of Accident Reconstruction (SMAC/CRASH)

Historically, the Multidisciplinary Highway Collision Investigation Training Course was developed for training professional investigators who were part of the NHTSA-sponsored National Accident Investigation System (MDAI team). However, with the promulgation of Highway Safety Program Standard No. 18, greater emphasis has been placed on training accident investigators associated with state and local police and traffic safety related agencies. The training requirements for local and state agency personnel is not the same as for investigators, engineers, and medical doctors, used in the NHTSA teams.

The training course developed by Dynamic Science to fulfill the training requirements of state and local teams and bring them into compliance with Highway Safety Program Standard No. 18 was used.

The course and program were constructed to provide:

- Full consideration and integration of specific and special areas of accident studies advocated by NHTSA.
- The necessary training for a State Highway Safety Program, for accident investigation and reporting.
- Students with "real-world" on-scene accident experience instructed by experienced investigators.
- Formal instruction by acknowledged experts and international authorities in Investigative Techniques; Human, Vehicle, and Environmental Factors, New Techniques, and Methodology.
- Student involvement with facilities that are devoted to automotive safety, engineering research, development and testing, with emphasis on the crash environment.

- Evaluation of student assessments of course content, quality, and faculty.

PURPOSE/OBJECTIVES

The overall purpose of the program was the same as for prior programs, i.e., train accident investigators. In an effort to qualify the "Officer in the Patrol Car", there is a natural proclivity among some planners to enforce this doctrine to inflexibly, however, such an approach often serves to hinder development of new ideas and not allow integration of new technology. Since the proceedings of the Motor Vehicle Collision Investigations Symposium conducted under Contract No. DOT-HS-5-01135 served as a state-of-the-art guideline, a certain degree of sophistication was instilled to provide consideration for: (1) accident data sampling; (2) technician or level II investigations; (3) measures, or indices, of collision severity, injury severity, and accident causation; and (4) reconstruction models applicable for use by police technicians and other agencies involved in in-depth investigations.

Data collection methodology varies immensely between some states and it also varies frequently within individual state geographic regions. Standardizing methodology among the state through an educational process will serve to reduce regional differences. Further, if all states are provided with instruction that will enable them to unify their input to a national data collection effort, then the objectives of the National Accident Sampling System (NASS) and other national programs will be abetted. A basic approach for achieving this lies in conducting a course structured to satisfy the various provisions of Highway Safety Program Standard No. 18, Accident Investigation and Reporting (Part 1204, CFR 23). This standard establishes minimum requirements for a State Highway Safety Program, for accident investigation and reporting. The course was also a valuable source of instruction for law enforcement officers and other professional personnel involved in highway safety, at the city, county and state level.

TECHNICAL APPROACH

The contract period was for 1 year, however the three (3) courses required only six (6) weeks to conduct. The planning, coordinating, and course material preparation that took place was necessary because:

- The course was balanced to achieve qualitative and professional results compatible with NHTSA sponsorship.
- All course subjects were evaluated on the basis of value to investigative functions.
- New study areas/technology was integrated and instructors acceptable to NHTSA were contacted and scheduled.

SYLLABUS HOURS

I.	Orientation	3	Hours
II.	Investigative Techniques		
	a) Classroom and Lab	35	Hours
	b) On-scene experience	4	Hours
III.	Human Factors	21	Hours
IV.	Vehicle Factors	16	Hours
V.	Environmental Factors	5	Hours
Total Classroom & Lab Hours		80	Hours
Total On-scene Hours		4	Hours
Grand Total		84	Hours

ALLIED AREAS

The allied areas that were addressed:

- Methods of accident data sampling
- Technician or level II investigators
- Measures of collision severity, injury severity, and accident causation
- Computer simulated models of accident reconstruction applicable for use by police technicians for in-depth investigations.

Past experience acquired by the Dynamic Science MDAI team during their participation in earlier programs provided the necessary expertise for addressing the allied subject areas. In addition to basic statistical sampling procedures, also presented were examples of random sampling techniques and data stratification.

Technician or Level II investigations is essentially an after-the-fact investigation which employs technicians as data gatherers under the supervision of a senior researcher. The information obtained in this procedure includes (in addition to a police report), vehicle, medical, and environmental data as may be dictated by the objectives of the special problem being studied.

Measures of collision severity, injury severity, and accident causation factors have been included in the training. Dynamic Science updated these areas. Collision severity measures included discussions of delta ΔV impact speeds, and barrier equivalent speeds. Injury severity measures included discussions of the Abbreviated Injury Scale (AIS) as well as the more recently published Injury Severity Score (ISS) and Overall Injury Scaling (OIS).

Accident causation lectures included several human factors causal systems published by Fell, Perchonak, and Treat, et., al., respectively.

Computer simulation models for accident causation have been used routinely by Dynamic Science. Dynamic Science upgraded this area by discussing investigative techniques to obtain the data required for computer program operation, the potential use of such programs (state accident sampling systems), and the type of information that can be obtained from computer reconstruction procedures at the basic technician (police) level.

COURSE OUTLINE

1. Curriculum summary
2. Subjects by title and hours required
3. Source requirements
4. Equipment requirements
5. Technique and/or methodology
6. Rational or supportive inference
7. Alternatives, if needed

COURSE PLANNING AND PREPARATION

After NHTSA approved the MDHCIT Plan, time was devoted to detailed planning. From this effort came a division of duties among various staff members for accomplishing a great number of details relative to:

- Instructor communications and liasion
- Preparing and mailing invitations, schedules and general information
- Arrangements for instructor and student lodgings
- Group transportation
- Classroom arrangements and space
- Field exercise with Phoenix Police

Using the course guide and class schedule as basic planning tools, course management conducted staff meetings in which all persons responsible for DSI, MDHCIT functions, participated. All pre-course, in-course, and post-course activities were analyzed on a day-by-day, hour-by-hour basis and responsibility for each work item was assigned as it was discussed. From the time the first information was mailed until the final report was to be submitted, every detail was fully committed to discussion, decision, and responsibility assignment.

STUDENT EVALUATION

Student assessment can make very valuable contributions to course refinement, instructor improvements, etc., if the instrument used to obtain the students' comments is designed properly.

An evaluation form was used, (copy attached), to allow the student to identify excellent, good, satisfactory, and poor elements of the course and make recommendations for improving the program of instruction. The student signature was optional. It provided a "Tool" whereby a student could make suggestions for an instructor to improve on his block of instruction, not just say he is inferior, without qualifying his evaluation. The form also indicates a desire for the respondent to give his reason for his rating. This proves very effective in obtaining evaluations, particularly on formal instruction. The completed forms were treated as sensitive material and furnished to NHTSA after each course.

COURSE SESSIONS

The dates for the three courses were determined after NHTSA had exercised its option of extending the contract for 1 year. Student selection was coordinated between the NHTSA and Dynamic Science.

The MDHCIT courses were taught near the Dynamic Science Corporate offices, located 25 miles north of Sky Harbor Airport, Phoenix, Arizona.

The classroom instruction took place in the very modern facilities of a Motel in the Phoenix area. A block of rooms was reserved for students who desired to stay at the motel; reduced rates were available.

A Dynamic Science staff member was present at the motel all day on the Sunday preceeding course registration to greet the students and assist with any problems and answer questions.

Registration took place during the first hour of the first day of the course. An orientation lecture followed registration and formal instruction began at 1000 hours. Daily, classes ended at 1635, except for days when night field exercises with the Phoenix Police were conducted. These exercises were conducted five/six nights during each course, and each time vehicles operated by senior Dynamic Science investigators transported students to "real world" accident scenes in the Phoenix area.

No course activities were scheduled for the Saturday and Sunday at course mid-point. Recreation and travel opportunities were made available to students on these days.

Laboratory demonstrations and additional field exercises were conducted at the Dynamic Science, Deer Valley Facility where a classroom was available. Transportation was provided for students and instructors to and from all activities conducted away from the motel classroom site.

COURSE EVALUATION

Course evaluation was a two-stage activity. After each course was completed and the student evaluations were analyzed, the evaluations and informal analysis of their merit was submitted to the CTM. Any changes deemed practical by the CTM were made before the other courses were conducted.

PROGRAM PLAN AND SCHEDULE

The MDHCIT program was accomplished during a 12-month period of FY 1978. The three two-week courses were conducted one each in Nov. 1977, March 1978, and May 1978.

RE-CAP OF ATTENDEES

Out of 50 States and the District of Columbia, 26 of the states and D.C. have sent persons to the course. In general, the attendees have been from law enforcement agencies, state, county, city and state departments of transportation, plus other traffic safety related agencies.

The following also sent participants:

Virgin Islands
American Samoa

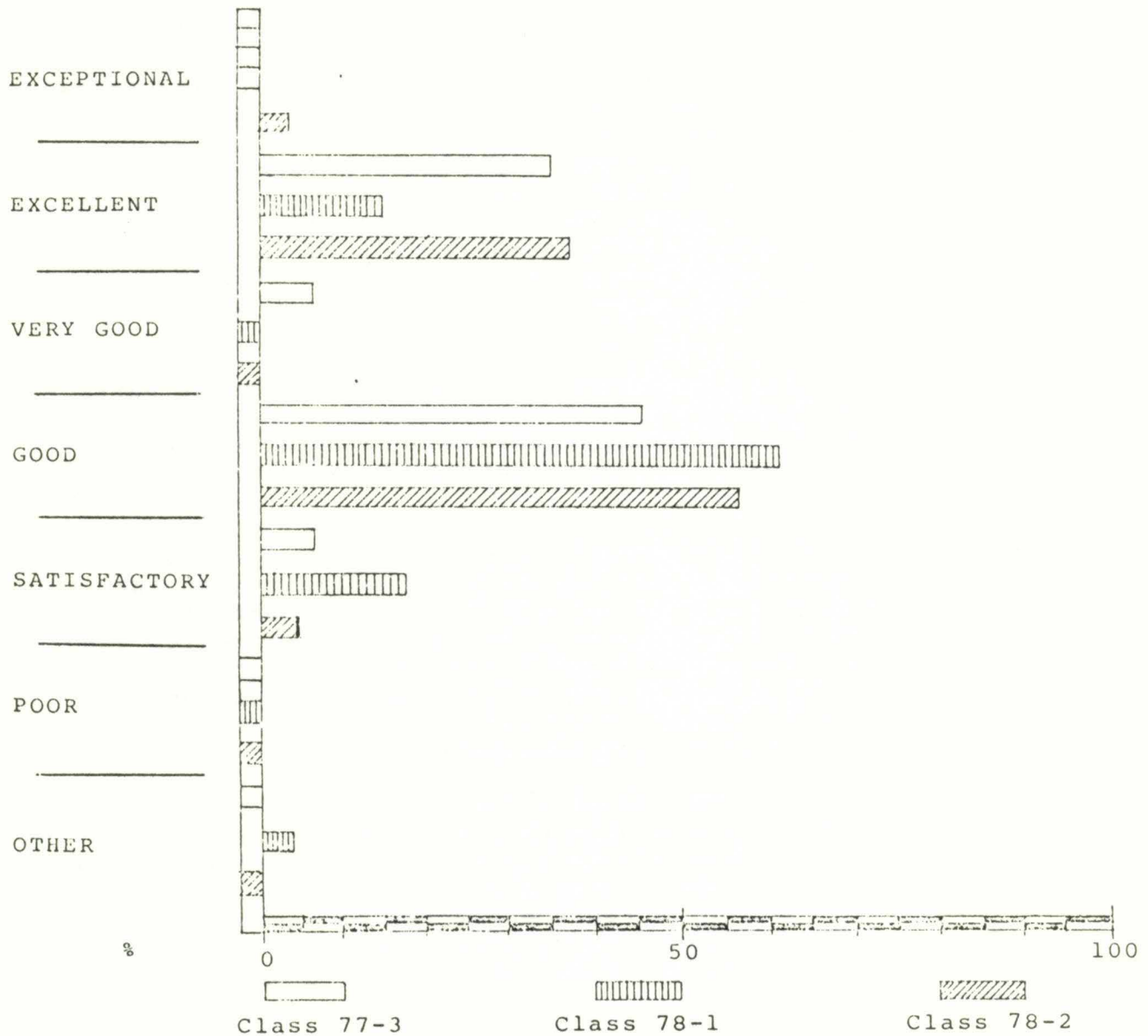
The MDHCIT Course has generated a tremendous amount of interest, nationally and internationally. Numerous requests to attend the course, over and above the accepted participants, have been received. These requests have not been honored primarily because of the lack of classroom space and since 30-40 students have been established as the best manageable class size.

In view of the vast interest in the course it appears highly recommended that the course be continued.

CONCLUSIONS, FINDINGS AND RECOMMENDATIONS

- 29 participants attended class 77-3, Nov. 7-18, 1977
- 33 participants attended class 78-1, March 6-17, 1978
- 38 participants attended class 78-2, May 15-26, 1978

THE STUDENTS IN CLASSES 77-3, 78-1 and 78-2 RATED THE COURSE AS INDICATED:



- A "screening process" was established whereby only those individuals who were or were going to be assigned to MDAI teams were selected for participation in the MDHCIT courses.
- The majority of participants comments indicated that the Collision Deformation Laboratory (CDC) was a worthwhile exercise and provided a "hands-on" compliment to the classroom lectures.
- Most participants felt that being on-scene investigating a "real world" accident was a valuable compliment to the classroom lectures, and they were able to apply the classroom knowledge acquired to an actual situation.
- It was unanimous that the books and handouts were necessary and worthwhile. The only negative comments were based on the feeling that some parts of the course and course material were not necessary because they did not directly pertain to the individual's job. These materials were those which dealt more with the research aspects of accident investigations. A small percentage suggested various other publications ranging from books devoted to human engineering (Chapainis, "Human Factors Engineering") to Collins and Morris, "Highway Collision Analysis") to traffic engineering manuals and specifications to copies of the FARS Annual Report.
- To assist in the screening process to select course participants, the brochure as well as all course announcement correspondence were revised, to give a more detailed description of the multidisciplinary nature of the course, (copy attached).
- A follow-up Course Evaluation Questionnaire was developed which is completed by each student and submitted to the Project Manager six months following course completion. This is used to determine how the course has affected the students' on-the-job work experience and solicit any suggestions and comments for course changes based on the individuals work experience relative to the course, and and other suggestions, (copy attached).
- To keep the individual State's Traffic Safety Representatives informed, letters were mailed to the Governor's Representatives in each of the States where individuals were selected for attendance in either of the classes. The letter informed the Governor's Representatives of the name of the attendees and his State agency affiliation. A similar explanatory letter was also sent to all the NHTSA Regional Administrator.

- A CERTIFICATE OF TRAINING was produced for each student and was submitted to the CTM for obtaining the signature of the Associated Administrator, Traffic Safety Programs, NHTSA.
- Comments submitted by some students regarding the course are attached.

GENERAL COMMENTS REGARDING THE MDHCIT COURSE
BY SOME OF THE ATTENDEES

Three officers from my command were presented the opportunity of participating in an exceptional training experience. The purpose of this letter is to convey my sincerest appreciation and support to your sponsoring agency for making this valuable educational environment available.

Captain, Arizona Highway Patrol

It was a fulfilling experience that developed an excellent foundation for quality accident investigation.

Chief, Office Traffic Safety
Virgin Islands

I would like to commend you and the entire staff for a great school.

Sgt., First Class
New Jersey State Police

Upon my return, I wrote a course critique of the school for my Chief. I gave my highest recommendations for the faculty, curriculum and facilities. It was one of the most useful educational experiences of my career.

Sgt., Accident Investigation
Unit, Salem Oregon, P.D.

I would like you to know that I thought your school was one of the better ones, I have attended.

Traffic Officer
Sioux Fall, S.D., P.D.

I certainly enjoyed the school. You should all take pride in what you have to offer.

Sgt., Arizona Highway Patrol

(Occupation)

(MDHCIT Course Completion Date)

COURSE EVALUATION

MULTIDISCIPLINARY HIGHWAY COLLISION INVESTIGATION TRAINING COURSE

IMPORTANT: Certificate of Course Completion cannot be Awarded until
this form has been completed and submitted to the Program
Manager.

USE CONTINUATION SHEETS WHERE NECESSARY

1. What is your overall Evaluation of the Course?

- ____ Excellent
- ____ Good
- ____ Satisfactory
- ____ Poor
- ____ Other (explain)

2. What Comments or Suggestions do you have relative to the Subject
Matter, Faculty, Instructional Methods, and Time Allocation for
each unit included in the course? (Please identify Instructor
related to your Comments)

PART I ORIENTATION

a) INTRODUCTION

b) NHTSA PROGRAMS

Part II INVESTIGATIVE TECHNIQUES

- a) Sampling Techniques and Problems
- b) Investigation Equipment and Usage
- c) CRASH Dynamics: Standard Investigation Techniques
- d) CRASH Dynamics: New Investigative Techniques
- e) Specialized Data Coding Forms

Part III HUMAN FACTORS

- a) Psychological Factors
- b) Interviewing Techniques

c) Physiological Factors

d) Human Anatomy

e) Injury Mechanisms

f) Injury Severity Scaling and Coding

g) Postmortem Studies

Part IV VEHICLE FACTORS

a) Vehicle Systems

b) Structural Factors

c) Vehicle Dynamics

Part V ENVIRONMENTAL FACTORS

a) Roadway Design

b) Roadway Properties

c) Environmental Hazards

d) Ambience In Accident Causation

3. What Comments or Suggestions do you have Relating to the Field Exercises?

a) CRASH Demonstration

b) C D C Laboratory

c) Accident Scene Exercise

4. What Comments or Suggestions do you have Relative to the Course Facilities and Administrative Support?

5. Other Comments:

6. Books, Handouts, and Class Materials

BOOKS/DEVICES	(1)	(2)	(3)	COMMENTS
Traffic Accident Investigation Manual for Police (Baker)				
Human Anatomy, Impact Injuries, and Human Tolerance (Huelke)				
The Wonderful Human Machine (AMA)				
Abbreviated Injury Scale (AIS)				
Traffic Template and Calculator				

(Occupation)

(MDHCIT Course Completion Date)

FOLLOW-UP EVALUATION QUESTIONNAIRE

MULTIDISCIPLINARY HIGHWAY COLLISION INVESTIGATION TRAINING

(USE CONTINUATION SHEETS WHERE NECESSARY)

1. Briefly describe your type of employment.

2. Has the subject matter learned in the MDHCIT Course been beneficial, by improving your ability in your present employment.
 - a) Beneficial Material

 - b) Non-Beneficial material

3. What comments or suggestions do you have for changes (additions, deletions, change in emphasis, etc.) in the Course which would be of Greater Benefit to you in your job?

4. Has the completion of the Course improved your opportunities for advancement?

Name

Address

Telephone

If you could please spare a moment to complete this form, it would be extremely beneficial to future classes.

Please return the completed questionnaire in the envelop provided.

Best Regards,

Jack D. Baird