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FIELD TEST PLAN FOR EVALUATING THE COOPERATIVE BREATH ANALYZER

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TECHNICAL REPORT

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16. Abstract

This report provides basic inputs to the Transportation Systems Center for their continuing development and evaluation of cooperative breath analyzers. Its primary purpose is to indicate a number of potential field test sites and to describe various available testing modalities.

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SUMMARY

This report is intended to supply basic inputs for the continuing development and evaluation of the Cooperative Breath Analyzer. Its primary purpose is to indicate a number of different sites in which field tests could be conducted and to describe the various potential testing modalities available.

The contents of this report may be summarized as follows:

- Potential applications and corresponding objectives of the Analyzer are briefly reviewed in order to lay the foundation for the derivation of field test requirements.

- Specific test objectives are presented in terms of provisions which must be satisfied if the Analyzer is to be exercised with respect to each of its applications and objectives.

- Data required of the test are indicated. It is stressed that most of these data are subjective in nature and that their collection requires the participation of skilled observers/interviewers.

- Emphasis is placed upon the need for a phased approach to field testing, both to insure satisfaction of all test objectives and to permit the participation of many different agencies. Three distinct test phases are sketched.

- Five primary sites are selected as offering maximum benefits for conducting the tests. The test objectives which each site would address are indicated. Brief mention is also made of a number of alternative sites.

- Detailed discussion of the manner in which tests would be conducted are presented for each of the five sites. Participating personnel, schedules and costs are also indicated.

- Requirements for collection and subsequent analysis of test data are briefly summarized.

It must be pointed out that, in a very real sense, the enclosed test plan is incomplete. Before any worthwhile program of evaluation can be implemented, it is essential to have a clear understanding of the specific operational and

design requirements which the instrument is expected to satisfy. The ultimate goal of the field test, after all, is to determine the extent to which the Analyzer complies with these requirements. It therefore is unfortunate that the Contract Statement of Work calls for the submission of the test plan prior to the identification of operational requirements and acceptability criteria.

In the previously submitted Program Plan for the Study of Alcohol Analyzers and Alcohol Safety Interlock Systems, Dunlap and Associates, Inc. pointed out this inconsistency in schedule. In order to help overcome this problem, we strongly recommended that at least a preliminary analysis of requirements and criteria be undertaken in conjunction with developing the test plan. This analysis has been completed, and its results are documented in a report being submitted concurrently with this Volume. However, it is recognized that the field test described herein might have to be revised once these criteria and requirements have been established in final form and laboratory test results are available.

I. INTRODUCTION

This report, submitted to the U. S. Department of Transportation, Transportation Systems Center, under Contract Number DOT-TSC-251, documents the recommendations of Dunlap and Associates, Inc. for conducting field tests of the cooperative Breath Analyzer. The enclosed plan is felt to represent the basis for a comprehensive evaluation of the instrument's ability to satisfy its design objectives and thereby prove useful to the police and acceptable in court.

This report is comprised of two major sections. The first presents specifications of the Analyzer's goals and objectives, from which test objectives and data requirements are derived. The approach to the test, consisting of three distinct phases, is also briefly sketched. In the second major section, detailed procedures are specified for each of five recommended test sites. Topics addressed include:

- Description of test participants and subjects
- Test location and schedule
- Sample size
- Required data and associated collection instruments and procedures
- Analytic requirements
- Associated costs

Before focusing on the details of the recommended test plan, it is worthwhile to devote attention to the steps which led to its development. Of primary importance was a series of visits to Alcohol Safety Action Projects (ASAPs), the Police Departments with which they interact, and other organizations involved in the campaign against drinking driving. The agencies contacted included:

- Nassau County (N. Y) Highway Patrol Bureau
- The Boston (Massachusetts) ASAP
- Metropolitan District Commission Police Department (Boston)
- The Vermont ASAP
- Vermont State Police, Troop A
- The New Hampshire ASAP

- The New Orleans (Louisiana) ASAP
- New Orleans Police Department
- Louisiana State Police, Troops A and B
- Baton Rouge (Louisiana) Police Department
- The Columbus (Georgia) ASAP
- The Indianapolis (Indiana) ASAP
- The Canadian Ministry of Transport
- The Royal Canadian Mounted Police

Without exception, personnel from each of these organizations proved extremely cooperative and helpful. In certain instances, the extent to which they could participate in the field test was limited by manpower shortages, schedules or procedures incompatible with test requirements, and legal problems perceived for some of the test phases. In addition, cost and/or geographic considerations mitigated against the participation of some of these agencies. Nevertheless, everyone contacted made many helpful suggestions regarding potential approaches to field testing and offered numerous comments concerning the Analyzer itself. * Thus, while Dunlap and Associates, Inc. is solely responsible for the contents of this report, much of the credit for the enclosed test plan must be shared with the organizations listed above.

*Such comments are discussed in a companion report, Preliminary Operational Requirements and Acceptability Criteria for the Cooperative Breath Analyzer. The material presented in that document served as one basis for the recommended test plan.

II. TEST REQUIREMENTS

This section discusses the derivation of field test requirements leading to the development of the recommended test plan. This derivation was based upon the fact that the field test is an integral portion of the total Analyzer evaluation program; as such the goal of the test is to determine the extent to which the Analyzer can satisfy its objectives. Therefore, the first task pursued was the specification of these objectives. Once this was accomplished, it became possible to identify test objectives, expressed in terms of achievable conditions or provisions which would exercise the Analyzer with respect to its objectives. Finally, the types of data required to fulfill these test objectives were defined.

Given these objectives and data requirements, specific test situations were identified which could be constructed (or adapted) for evaluating the Analyzer. It was recognized that substantial savings in manpower, time, and cost would be realized if the test were conducted with the cooperation of the ASAPs. Accordingly, visits were made to a number of these projects in order to determine how their activities might be put to use. This effort proved highly successful, with the result that the second and third test phases will be conducted solely in conjunction with ASAP countermeasures.

In this section, then, lays the foundation for the field test plan in terms of:

- Analyzer objectives to be satisfied
- Corresponding test objectives
- Required evaluative data
- Constituent phases of the test

A. Applications and Objectives of the Analyzer

The contract Statement of Work originally described the cooperative breath Analyzer as an automatic, portable and accurate device to be used to measure blood alcohol equivalent (BAC). The Statement further specified that the instrument would be installed in police cars and used to furnish acceptable evidence in court. Therefore, the Analyzer was first envisioned as a field precision device for evidential purposes. However, through discussions with numerous police officials it became evident that this is only one of several uses to which the instrument ultimately will be put. Two additional applications received prominent mention:

- Use as a centrally-located (stationary) evidence producing device (i.e., simply as a replacement for the Breathalyzer, Intoximeter, etc.).

- Use as a field screening device, i.e., to establish reasonable grounds for arrest rather than to provide evidence.

Since the inception of this contract, TSC's goals have been modified to reflect this multi-purpose role. Initial effort will now be directed toward developing an instrument capable of satisfying the requirements for field screening. The extension of this capability to evidential applications is considered a relatively long-term goal. Thus, although primary attention should be paid to its suitability as a screening device, it is considered desirable to construct a field test which permits evaluation of the Analyzer's effectiveness in any of these three potential applications. Accordingly, the specifications of goals and objectives must be based upon the capabilities required for each mode of operation.

The Analyzer's goal may be described qualitatively in terms of other (existing) breath testing devices which presently fulfill one or more of the three applications. In order to prove useful as a stationary, evidence-producing instrument, the Analyzer should meet or exceed the levels of effectiveness exhibited by the Breathalyzer, Photoelectric Intoximeter, Gas Chromatograph, etc. As a field precision device, the Analyzer must also compare favorably with these instruments in accuracy, reliability and cost while simultaneously satisfying requirements of portability, durability, and operational simplicity. For use in field screening, the Analyzer must compare well with such instruments as the Alcolyser, Drunk-O-Tester, Sober Meter, and the various other balloon/bag-type devices. In this case, the Analyzer's accuracy should be considerably better than that exhibited by these other instruments, while proving roughly equivalent to them in terms of portability, reliability, operational simplicity, and ("long-run") cost.

From this general statement of goals, specific Analyzer objectives have been derived. These are discussed below in terms of the three potential applications.

1. Accuracy

Whenever it is to be used for evidential purposes, in either stationary or field applications, the Analyzer must be at least as accurate as the currently accepted precision breath testing instruments. Thus, for these applications, the design objective for accuracy should reflect the minimum standard deviation of error achieved by these other devices.

When used as a field screening instrument, the required degree of accuracy can be relaxed somewhat. However, there are at least two reasons why the design objective should not be based upon the accuracy attainable with the balloon-type devices:

- The Analyzer will almost certainly not be as portable, durable, or simple to operate as these other screening instruments. Thus, it should offer increased accuracy if it is to prove attractive for use in this application.

- There are some indications that the balloon-type devices simply are not very accurate; thus, they would not provide a suitable "bench mark." *

While there is a lack of quantitative information regarding how accurate a screening instrument must be, there was general agreement among the police and ASAP officials contacted in preparation for this report that the Analyzer should be able to measure BAQ to within plus or minus .01% wt./vol. of actual value. It should be noted that it would suffice if this accuracy were achievable only in the "neighborhood" of the presumptive limit (0.10% in most states).

2. Portability and Durability

For use as a field precision or screening instrument, mobility is a sine qua non. It must be possible to transport the instrument in a standard patrol car with no degradation in its performance. It must also be possible for an officer to carry it in one hand if it is to be removed from the car during the suspect processing sequence. From the standpoint of durability, normal usage and handling, with attendant "bumps and scratches," must not result in breakdowns.

As a stationary instrument, the Analyzer faces no special requirements in this area. For this application, the Analyzer could prove useful if it were no more mobile than, say, the Breathalyzer; of course, portability would be a desirable improvement even in this case.

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* This feeling was voiced by a number of police officials contacted by the project staff, and is supported by recent research; see, for example, Prouty, R.W. and O'Neill, B., An Evaluation of Some Qualitative Breath Screening Tests for Alcohol, Insurance Institute for Highway Safety, Washington, D.C., May 1971.

3. Reliability and Maintainability

Quantitative requirements for mean time between failures (MTBF) and mean time to repair (MTTR) can also be based upon the performance exhibited by other precision breath testers, at least for the two "evidence-producing" applications. For field screening purposes, it is impossible to derive corresponding objectives by comparison with the balloon instruments, since each of these is used only once. However, the same degree of reliability required for evidential use would probably suffice for the screening application.

During the visits made in preparation for this report, some qualitative implications were uncovered regarding reliability and maintainability requirements perceived by potential users. The following two points, in particular, should be considered design objectives:

- The Analyzer's reliability should be such that preventive maintenance need be scheduled no more frequently than monthly.

- The instrument should be so designed that all preventive and most corrective maintenance can be performed locally, i.e., by the Police Department itself.

These requirements pertain to all three potential applications.

4. Operational Simplicty and Personnel Training Requirements

Perhaps the most often cited disadvantage of existing precision breath testing instruments is that they are cumbersome or difficult to operate. Thus, even in the stationary application, there is a definite need for the Analyzer to be well-designed from a human engineering standpoint. Specifically, the number of steps or activities required to operate the instrument must be kept to a minimum. Potential users of the Analyzer consider this objective as important as the achievement of the required accuracy. They have learned through bitter experience that the evidence brought to court can be seriously damaged if the procedures required to obtain it can be made to appear difficult to perform, and thus likely to result in erroneous readings.

In conjunction with operational simplicity, consideration must be given to the characteristics of the individuals who will operate the Analyzer.

Some police departments employ highly-trained breath examiner specialists whose sole duty is to operate the Breathalyzer, PEI, or similar device. Such an approach, of course, is most suited to the stationary application. For these departments, the Analyzer might prove useful even if its operational procedures were so involved that they required personnel with special skills acquired through lengthy training. However, for all use in the field, the Analyzer must be operable by officers and troopers for whom breath testing is only one of many duties. To ensure maximum acceptability for these applications, it must be possible for a police department to qualify most of its officers as Analyzer operators. Thus, training requirements must be kept to a minimum, since police departments can ill afford to provide each officer with an extensive program of instruction.

5. Operational Environment

This is another area in which the various applications face significantly different requirements. If the Analyzer is used simply as a replacement for existing equipment (i.e., in the stationary application), it would suffice if it functions properly in a controlled environment requiring a relatively narrow range of ambient temperature, humidity, lighting, etc. For field use on the other hand, it must be demonstrated that no degradation in performance is caused by variations in temperature, humidity, precipitation, lighting, wind, or the presence of contaminants (e.g., exhaust emissions) in the surrounding atmosphere. Moreover, because police departments employ varying suspect processing procedures, the Analyzer must be operable either inside or outside the patrol car.

6. Cost

Acceptable costs for the Analyzer also vary as a function of the particular application. For consideration simply as an alternative to existing equipment, it seems evident that the Analyzer at least should be competitive in price with the Breathalyzer and others of that class. Thus, a unit cost of $800 to $900 would be a reasonable upper limit, provided the costs of replacing fuel cells and batteries were roughly equivalent to those required for purchasing Breathalyzer or PEI ampoules (which might total $200 to $300 per year). For field precision use, acceptable costs are much more difficult to determine. Rural jurisdictions might find the instrument's mobility sufficiently attractive to warrant a relatively high price; metropolitan police departments might see little advantage in having a field precision capability unless the instrument costs a good deal less than the existing devices. As a screening device, the Analyzer would have to prove cost-effective in comparison with the ballon-type instruments. As a rule-of-thumb estimate, it can be assumed that a single patrol car

might use 400 to 600 "baggies" per year, * for a total cost of $300 to $500. Hence, a unit cost of $500 to $600 might be reasonable. The TSC design goal of $200 to $300 would be quite attractive for all applications.

The relationships between the objectives mentioned above and each of the three potential applications are exhibited in Table I.

B. Objectives of the Test

In the beginning of this section, it was noted that the goal of the field test is to determine the extent to which the Analyzer can satisfy its objectives. The objectives of the test can, therefore, be stated in terms of constructable conditions which exercise, and permit evaluation of, these Analyzer objectives. Such conditions are set forth below:

- Evaluation of Analyzer Accuracy
  - Provide for obtaining BAQ measurements using the Analyzer
  - Provide for obtaining control measurements of BAQ using established techniques and/or instruments
- Assessment of Portability and Durability
  - Select a sample of patrol cars/vans for Analyzer installation
  - Investigate alternative stowage positions (e.g., in trunk, on car seat, on floor, etc.)
  - Provide for identification of potential problems in transport and handling
- Evaluation of Reliability and Maintainability
  - Provide for long-term operation to determine types and frequencies of Analyzer failures
  - Provide for regular inspection of test instruments
  - Establish life-time of key components (e.g., fuel cell)
  - Establish stability of calibration and zero settings

* This can vary widely as a function of the officer's duties.

Table I

Relationship between analyzer objectives and applications

Application / Objective	Stationary, Evidence-producing	Field Precision	Field Screening
Accuracy	must equal or exceed level of accuracy obtainable from PEI, Breathalyzer, etc.	must equal or exceed level of accuracy obtainable from PEI, Breathalyzer, etc.	expected error should not exceed 0.01% blood alcohol equivalent
Portability and Durability	mobility is desirable but not essential	must be stowable in standard patrol car, easily carried in one hand, and not subject to failures due to normal hazards of transport and handling	must be stowable in standard patrol car, easily carried in one hand, and not subject to failures due to normal hazards of transport and handling
Reliability and Maintainability	must equal or better MTBF and MTTR evidenced by PEI, Breathalyzer, etc. In addition, should not require more than monthly preventive maintenance and all but catastrophic failures should be repairable locally	same as stationary application	same as stationary application
Operational Simplicity and Personnel Training Requirements	operations should require fewer steps than PEI, Breathalyzer, etc. Extensive training requirements might be tolerated	operations should be considerably simpler than Breathalyzer, PEI, etc. Should be operable by police officer after minimal training	simplicity in operation should be roughly comparable to that exhibited by balloon-type devices. Should be operable by police officer after minimal training.
Operational Environment	requirements for closely controlled conditions might be tolerated	must be operable under all expected variations of temperature, humidity, precipitation, lighting, etc.	must be operable under all expected variations of temperature, humidity, precipitation, lighting, etc.

Table I

Relationship between analyzer objectives and applications

Application / Objectives	Stationary, Evidence-producing	Field Precision	Field Screening
Cost	acceptable unit cost might range up to $800-$900	acceptable unit cost might range up to $800-$900, although this may vary widely with individual police departments	acceptable unit cost might range up to $500-$600

. Determination of Task Difficulty and Training Requirements

- Investigate requirements for training police officers as Analyzer operators

- Provide for conduct of breath tests by trained officers

- Provide for observation of breath tests to uncover operational problems

- Provide for debriefing of operators to discuss and critique operational procedures

. Evaluation of Performance in Various Operational Environments

- Provide for conduct of breath tests under controlled conditions of stationary application

- Provide for conduct of breath tests at actual or simulated arrest sites:

  a. Conduct a sample of tests inside patrol cars and/or vans

  b. Conduct a sample of tests outside cars

- Select test sites exhibiting variations in temperature, humidity, precipitation, etc.

There are no test objectives directly relating to the ability to produce the Analyzer at an acceptable cost. However, the participation of various police departments in the conduct of these tests will afford an opportunity to explore its "marketability" among a group of potential users who will have become quite familiar with its characteristics.

C. Test Data

Each of the test objectives listed in the preceding paragraph generates requirements for data collection. Some of these data are quantitative in nature and easily identified. Such, for example, is the case with the test objectives relating to accuracy, reliability, and the performance of the Analyzer under various environmental conditions. It is clear that the satisfaction of these objectives requires the compilation of such information as:

- The BAQ readings obtained with the Analyzer
- Control readings obtained with such instruments as the Breathalyzer, PEI, etc.
- Results of calibration and zero setting checks performed on the Analyzer
- Rate of replacement of batteries and fuel cells
- Counts of the number of breakdowns experienced
- Weather conditions and other environmental factors pertaining at the time of each test
- Time to train Analyzer operators

However, a large portion of the information required is essentially subjective. For example, evaluation of the Analyzer's portability and operational simplicity hinges upon the field test's ability to uncover any and all instances where the instrument's design or operation:

- Detracts from the admissibility of its evidence
- Conflicts with human engineering principles
- Impedes the police officer in the performance of his normal duties

Data relating to these and similar considerations are almost totally unquantifiable. In fact, it is not even possible to predict with certainty the nature of the information which will prove relevant in these areas. For this reason, the use of "rigid" forms or questionnaires in the collection of these subjective data would prove of little value and might actually detract from the test. * Instead, experience shows that subjective instrument-evaluation data of an indeterminate nature can best be collected in "free format" by personnel possessing a great deal of familiarity with the instrument in question and a strong background in

*Since the total set of problem areas which might be encountered cannot be predicted, any such data collection form would fail to incorporate provisions for recording certain possibly relevant information. Experience has shown that forms of this type tend to affect seriously the recorder's judgment as to what is important: often, very valuable data is lost simply because it does not "fit" the form.

human engineering. These individuals will be called upon to observe closely each breath test conducted, * note their observations on a portable tape recorder, and, after completion of the testing session, conduct thorough interviews of the Analyzer operators to solicit their comments and criticisms. Fortunately, TSC's Human Factors Branch is an excellent source of the personnel required in this essential role.

The importance of these subjective data, and the corresponding need for skilled observers/interviewers, cannot be overemphasized. Much of the quantitative data collected in the field test, while of undeniable value, will replicate information already obtained through laboratory testing. The field test, however, is the sole means--short of the ultimate deployment of the instrument--of an uncovering of potential problems of a more abstract nature.

D. Test Phases

The recommended plan for field testing the prototype breath Analyzer consists of three discrete phases, designed to provide a series of distinct evaluative checks on the instrument in question. Each of the three is actually an independent test plan. They differ primarily in the extent to which they account for the environmental and circumstantial conditions that will be encountered when the Analyzer is "fully operational." The first phase incorporates relatively tightly controlled experimental conditions--as such, it may be considered "one step removed" from the laboratory. The second holds an intermediate ground, permitting the gradual introduction of "real world" constraints while retaining a significant degree of experimental control. The final phase simulates as closely as possible the circumstances of actual use--this test is "one step removed" from ultimate deployment.

The decision to construct distinct phases rather than a single, uniform test plan was motivated by several considerations. These include the facts that:

- The Analyzer is undergoing a continuing development process, with the expectation that significant design modifications will be required. A phased approach should permit the major requirements in this area to be identified and addressed in a timely manner. This will help to avoid time consuming and costly tests of an "unworkable" version of the instrument.

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*Except during those portions of the field test in which on-site observation is impossible. These instances are discussed in Section III.

- Like the design parameters, operational procedures are in a state of flux. These can be optimized during a relatively short-term initial phase, thus avoiding any need to retrain the individuals participating in the more exacting and extensive portions of the test.

- Evaluation with respect to some objectives (e.g., accuracy) is best performed under rigidly controlled experimental conditions; others (e.g., reliability) require more nearly realistic circumstances. It is unlikely that a single test could incorporate all such required conditions.

- While every ASAP and Police Department contacted was willing and even anxious to participate in this evaluation, few (if any) could adapt to all required conditions of testing. A three-phase plan permits each cooperating agency to be put to best possible use.

Brief descriptions of each of the three test phases are presented below.

1. Simulations

The first phase of testing will employ volunteer subjects who will imbibe measured amounts of alcohol in order to attain desired levels of BAQ. This same approach likely will have been used in the laboratory evaluations which must precede the field test. However, this phase differs from the laboratory experiments in two significant ways:

- Police officers, some of whom are experienced breath examiner specialists, will operate the Analyzer

- Tests will be conducted under environmental conditions similar to those encountered at arrest sites and/or station houses.

The primary objectives of this phase will be to establish the accuracy of the instrument and the practicality of its operational procedures. Accuracy can be assessed by comparing the Analyzer measurements with results obtained from parallel breath tests using "proven" instruments. Procedural problems will be uncovered through debriefing of the participating officers and by on-site observations conducted by TSC and/or contractor personnel. This will be the shortest of all phases, with actual testing lasting no more than one week. Of course, pre-test training will be required for all participating officers.

2. Roadside Interviews

The second phase will afford an opportunity to evaluate the Analyzer under more nearly realistic conditions than can be achieved through simulation. This portion of the test will take advantage of the roadside interview programs undertaken by certain ASAPs. These programs provide ready-made random samples of passing motorists or pedestrians, some of whom will be indistinguishable from individuals arrested for drinking driving offenses. Likewise, the interviews will be conducted under the precise environmental conditions of arrests.

Throughout this phase, the Analyzer will be operated by police officers and/or ASAP personnel, all of whom will be familiar with other breath testing instruments. Comparative measurements of BAQ will be available from the Breathalyzer and/or the Photo-Electric Intoximeter (PEI). In addition, this phase will permit excellent evaluation of the instrument's operability and portability. It will also be possible to assess its reliability and maintainability.

3. Arrests

The final phase will subject the Analyzer to the strictest possible test of its effectiveness. In fact, the Analyzer will be subjected to all requirements of its eventual deployment short of the introduction into court of the "evidence" it provides. Test subjects will be individuals actually arrested under suspicion of drinking driving. The Analyzer will be operated by highly trained police officers employed in special enforcement programs undertaken by ASAPs, with BAQ measurement performed at the site of the arrest. These officers will, in fact, be making operational use of the Analyzer as a field screening instrument.

The primary objective of this phase will be the assessment of the instrument's operability, portability and maintainability under completely realistic conditions of use. Some of the more important data provided will be the subjective comments and criticisms voiced by the participating officers.

In a sense, this third phase is "open ended." As refinements and modifications are introduced into the instrument's design, it can be "returned to the field," allowing the testing process to continue. As the instrument improves, and as the participating officers gain increasing confidence in it, it may be possible to select one or more test cases in which the Analyzer measurements will be introduced as evidence. In this way, assurance may be had that the instrument will come to judicial notice under the most favorable circumstances possible, thus facilitating its ultimate deployment.

III. SPECIFIC TEST SITES AND PROCEDURES

This section contains the detailed recommendations of Dunlap and Associates, Inc. for conducting field tests of the Analyzer. Five distinct sites have been identified as offering maximum benefit for this effort. In the order in which they are subsequently discussed, these are:

- Nassau County, New York, where members of the Police Department's Highway Patrol Bureau will participate in the simulation phase of testing.

- The State of Vermont, whose Alcohol Safety Action Project offers a flexible schedule of roadside interviews as an excellent testing mechanism.

- New Orleans, Louisiana, where the ASAP's public education and special enforcement programs provide opportunities for intensive and long-term testing under roadside conditions as well as the actual circumstances of arrests.

- Columbus, Georgia, where an intensified enforcement program will employ the Analyzer as a field screening instrument in arresting drinking drivers.

- The State of New Hampshire, where another intensified enforcement program will exercise the Analyzer as a field screening device.

In addition to these five, a number of other locations have been identified as potential sites for field testing. These are not included among the primary sites due to various considerations including geographic location, scheduling problems, cost factors, etc. However, their assistance could be called upon in the event that unforeseen problems arise in any of the five primary locations.

The principal advantages offered by the five sites listed above may be cited as follows:

- Three of the five are situated in relatively close proximity to the Transportation Systems Center, thus reducing the difficulty of maintaining liaison and travel costs.

- They present a fairly representative cross-section of environmental conditions under which the Analyzer will be required to operate.

- Each of the five is presently working with the U. S. Department of Transportation in the Alcohol Countermeasures Program. Thus, they have already demonstrated requisite levels of capability and cooperation.

Most importantly, the participation of these sites insures complete (and even redundant) coverage of all the test objectives listed in paragraph B of Section II. The specific objectives on which each site will focus are indicated in Table II.

The remainder of this section is devoted to detailed discussions of the test procedures, schedule, and cost for each of these sites, and a brief sketch of the potential test approaches offered by the alternate sites. The final paragraph indicates the test implementation procedures and highlights requirements for data collection and analysis.

A. Nassau County, New York

The Highway Patrol Bureau of the Nassau County Police Department has agreed to participate in the simulation phase of the Analyzer field test. Dunlap and Associates, Inc. has received excellent cooperation from this agency in previous and current projects, and feels that it can contribute greatly to the successful completion of the recommended testing program.

1. Test Subjects

This portion of the test will use volunteer subjects as "drinking driver simulators." Some of these may be TSC and/or contractor employees, but at least a subset should be composed of individuals known to be heavy drinkers. Thus, the group will exhibit a "problem drinker/social drinker" mix similar to the individuals currently participating in the interlock testing. Each volunteer will imbibe, prior to starting each testing session, and amount of alcohol calculated to achieve a desired level of BAQ. For the "social drinkers," the maximum BAQ attained probably will lie between 0.06 and 0.08; for those with histories of heavy drinking, attempts will be made to reach levels exceeding 0.10. A total of eight to ten volunteers is recommended, roughly equally divided into groups of "social" and "heavy" drinkers.

2. Test Conductors

Personnel required to conduct this test may be categorized as follows:

- Operators of breath testing equipment -- On any given day, three officers and one lieutenant from the Highway Patrol Bureau will be selected to conduct and supervise the breath tests. Some of these officers will be highly experienced breath examiner specialists; others will be relative novices.

Interaction of test sites and test objectives

	Test Objectives \ Test Sites	Nassau County	Vermont	New Orleans	Columbus	New Hampshire
1.	Provide for obtaining BAQs, using the Analyzer	x	x	x	x	x
2.	Provide for obtaining control BAQs, using established instruments	x	x	x	x	x
3.	Provide for installation in patrol cars/vans	x	x	x	x	x
4.	Investigate alternative stowage positions				x	x
5.	Provide for identification of problems in transport and handling	x	x	x	x	x
6.	Provide for long-term operation to determine types and frequencies of failures			x	x	x
7.	Establish expected lifetime of key components			x	x	x
8.	Establish stability of calibration and zero settings	x	x	x	x	x
9.	Investigate requirement for training of police officers	x	x	x	x	x
10.	Provide for conduct of breath tests by trained police officers	x	x	x	x	x
11.	Provide for observation of breath tests	x	x	x		
12.	Provide for debriefing operators	x	x	x	x	x
13.	Provide for conduct of tests under controlled conditions of stationary application	x		x		
14.	Provide for conduct of tests at actual or simulated arrest sites	x	x	x	x	x
15.	Select test sites exhibiting variations in environmental conditions	x	x	x	x	x

- Observers -- Three observers will oversee the conduct of each test. Two of these will be TSC or contractor employees with human engineering backgrounds, while the other will be a legal expert. It is hoped that one or both of the Nassau County special prosecutors* will be able to serve in the latter role.

- Instructors -- One or two TSC or contractor employees will attend each session to provide pre-test training for the participating officers (these instructors can be the same individuals selected as observers).

- Support personnel -- TSC will supply personnel to serve as "escorts" for the subjects.

3. Location

Tests will be conducted in and around the Nassau County Police Headquarters Building. Specifically, test sites will include:

- A room in which a Breathalyzer is located

- A parking lot immediately adjacent to the building.

4. Conduct of the Test

Each day of testing will begin with a training and/or review period to instruct the participating officers in the proper operation of the Analyzer. If the same officers could participate on each day of testing, a single training session could be held. However, the Analyzer operators will be serving on off-duty time, so their availability is somewhat restricted.

The major points to be covered in the training session include:

- Equipment design features and operating principles
- Nomenclature and functions of switches, pushbuttons, etc.
- Operating procedures
- Possible malfunctions
- Factors affecting accuracy

It is expected that the training session will last approximately two to three hours. At the close of this session, each officer will conduct at least two measurements, using a simulator, to insure that the desired level of performance has been achieved.

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*Two Assistant District Attorneys prosecute virtually all of the drinking-driving arrests made in Nassau County,

Simultaneously with the training session, each subject will begin to drink the amount of alcohol required to achieve the desired BAQ. A 45-minute delay will follow ingestion of the last drink; during this time the subject will be kept under close observation by his escorts, and will not be permitted to smoke, eat, or drink. A room in the Headquarters Building will be provided for this controlled drinking session.

As each subject completes his 45-minute waiting period, he will be escorted to the adjacent parking lot. There he will be tested on an Analyzer by one of the participating officers, with the result recorded on a data sheet. Weather permitting, the parking lot tests will be conducted inside and outside a patrol car on an alternating basis; that is, subject #1 will be tested outside the car, subject #2 inside, and so forth.

After completion of the first measurement, the subject immediately will be escorted back into the building where another officer will administer a breath test on the Breathalyzer. Subsequently, a third officer will conduct a final test on the second Analyzer, located in the same room as the Breathalyzer.

Immediately before each subject is tested on the Analyzer, the batteries, zero setting, and calibration of the instrument will be checked by its operator. It is recommended that the Nalco 10 Alcohol Standard, or some other portable simulator, be used for the calibration checks. The Breathalyzer will also be calibrated in conjunction with each measurement, in line with the standard operating procedures employed by the Nassau County Police Department. Post-test Analyzer calibration checks will not be required since the next subject's pre-test calibration will be performed almost immediately. Each officer will be supplied with a data sheet on which he will record such information as:

- Time at which each test was administered
- Results of the battery, zero setting, and calibration checks
- BAQ reading obtained

When all subjects have completed this sequence, it will be repeated in reverse order. That is, measurements will be made on the indoor Analyzer, the Breathalyzer, and the outdoor Analyzer. Thus, each of the eight or ten subjects will have submitted to four tests on the Analyzer in any given test session.

While each test is being conducted, the observers will record any pertinent data on portable tape recorders. Special attention will be paid to any operational or procedural problems noted.

After all tests have been completed, the participating officers and observers will meet for an extensive debriefing session. During this period any problems noted previously will be discussed thoroughly. Subjective comments and criticisms will be solicited from the officers and legal advisors.

5. Sample Size

A total of 32 to 40 measurements will be obtained on the Analyzer in each test session; in addition, there will be one-half this number Breathalyzer readings. Primarily for cost considerations, the entire test will be limited to four or five sessions. Thus, a total of roughly 130 to 200 Analyzer tests will be made.

6. Number of Analyzers Required

A total of three instruments should be provided for this test, one for "indoor" use, one "outdoor," and the third to serve as a back-up.

7. Schedule and Cost

This portion of the test should be implemented as soon as the prototype instruments are available, say, beginning on 15 November 1971.

The bulk of the costs which will be incurred consist of the officers' salaries and the subjects' pay. All participating police will be reimbursed at overtime rates (time-and-one-half). On a daily basis, these costs can be computed as follows:

Patrolman = $103
Lieutenant = $135

8. Relevant Personnel

Captain Richard C. Ketcham, Commanding Officer of the Highway Patrol Bureau, will oversee the testing in Nassau County. His chief assistants for this effort are Lieutenant G. Walbroehl and Lieutenant J. Omeis. All of the above are located at:

Nassau County Police Department
1490 Franklin Avenue
Mineola, New York (516) 535-4136

B. Vermont

The Alcohol Safety Action Project in Waterbury, Vermont, has signified a willingness to participate in Analyzer field testing in conjunction with their roadside interview program. Their cooperation affords an opportunity to conduct a relatively large number of tests in a fairly short period of time and at minimal cost.

1. Test Subjects

Test subjects will be selected on a random basis from the total set of motorists driving along the particular section of roadway chosen as the test site. While it is impossible to predict with certainty the levels of BAQ which these subjects will exhibit, it has been the experience of this ASAP that roughly 42% show positive BAQ and some 5% of the total register 0.10 or greater. Moreover, although no one is compelled to participate in these interviews, refusals are seldom, if ever, encountered.

2. Test Conductors

The ASAP roadside interview team includes both State Troopers and civilian researchers, and personnel from both groups normally conduct breath tests. One trooper will be selected and trained as the primary Analyzer operator; however, another trooper and a civilian staff member will also be instructed in the operation of the instrument to insure the availability of a test conductor at all times.

In addition, one or two TSC and/or contractor employees are required to serve as instructors and on-site test observers.

All other personnel requirements, e.g., for conducting comparative breath tests on the Breathalyzer, escorting the subjects, etc., are subsumed in the normal duties of the roadside interview team.

3. Location

The specific site(s) for conducting the test will be selected by the Vermont ASAP in accordance with its own needs.

4. Conduct of the Tests

One or two days prior to the implementation of the roadside interview session, a two to three hour training program will be presented to the personnel selected as Analyzer operators. The location of this training session will be selected at the convenience of the ASAP and State Police. During this period, each potential operator will conduct at least two tests on the Analyzer, using either simulators or live subjects.

The actual test of the Analyzer at the chosen roadside will be conducted as an appendix to the standard interview procedures. The analyzer will be located in or near a patrol car or standard automobile parked in close proximity to the ASAP's mobile van. Immediately after being tested on the Breathalyzer (inside the van), the subject will be requested to walk to the car for the purpose of submitting to a second test on "an experimental instrument." The Analyzer operator will administer this test as soon as the subject arrives at the car, thus requiring as little of his time as possible. The operator will have used the two to three minutes during which the subject was inside the van to check the Analyzer's batteries, zero setting, and calibration. As each test is administered, the observer will note pertinent remarks on a portable tape recorder.

Conditions permitting, Analyzer tests will be conducted inside and outside the patrol car on an alternative basis.

The Analyzer operator will be provided with a data sheet on which he can record:

- A sequential number for each subject (no names will be recorded) using the ASAP coding scheme
- The reading obtained and the time of the test
- The results of each battery, zero set, and calibration check
- The test location (i.e., inside or outside the patrol car)

After completion of the evening's session, these data will be augmented by information obtained from the ASAP's independent records. Specifically, this will include:

- The BAQ reading obtained on the Breathalyzer
- The subject's estimate of the time expired since he last consumed alcohol

This latter datum is significant since it is impossible to keep each subject under observation for fifteen to twenty minutes before administering the breath tests. Thus, some results may be contaminated by residual mouth alcohol.

After gathering these data, the observer and operator will discuss and comment upon any operational problems encountered throughout the session. The observer will compile these comments and his own notes in an informal report.

5. Sample Size

It is conservatively estimated that twelve to fifteen subjects could be tested per hour. The ASAP normally conducts its interviews on Thursday, Friday, and Saturday evenings, using two different sites per night. A three-day series of "roadsides" is expected to yield 100 to 175 tests, and provide six to nine hours of test observation time.

6. Number of Analyzers Required

Three instruments will suffice for this test, with one serving only as a back-up. However, if several different Analyzer models are fabricated, one representative of each type could be incorporated in the test.

7. Schedule and Cost

It is suggested that the Vermont Roadside tests be run on December 9, 10, and 11 of this year. However, if the previous simulation tests indicate a need for major modifications of the instrument, this test could be delayed until all such changes have been completed. Additional series of roadside tests will probably not be required unless it is necessary to evaluate a relatively large number (e.g., more than three) of different Analyzer models. Should this be the case, additional test dates may be selected at the convenience of the ASAP.

Most of the costs incidental to the conduct of the roadside interviews will be borne by the ASAP. However, the Department of Transportation is expected to reimburse the project for the salary and subsistence of the Analyzer operator. This can be computed on the basis of $45.00 per day per man. In addition, a token charge of $25.00 per hour will be issued as DOT's contribution to the conduct of the interviews. Thus, the actual conduct of a three-day series of four-hour-per-day interview sessions would cost DOT approximately $435.00. To this, of course, must be added the cost of training the operators ($20.00 per day per man), salary and subsistence for the instructors/observers, preparation and handling of data forms, and subsequent analyses.

In the event that the roadside interviews are conducted solely for the purpose of testing the Analyzer (i.e., if it proves impossible to conform to the ASAP's own schedule), TSC would incur an additional cost of $60.00 per evening.

8. Relevant Personnel

The principal contact for Vermont's involvement in this test is:

Mr. Darwin G. Merrill, Project Director
CRASH - Vermont Alcohol Countermeasures Project
P.O. Box 535
Waterbury, Vermont 05676 (802) 244-7871

C. New Orleans, Louisiana

The Alcohol Safety Action Project in New Orleans plans to implement a unique public education countermeasure which will provide an opportunity for long-term roadside testing of the Analyzer at extremely low cost. In addition, the project has signified a willingness to use the Analyzer in its special enforcement countermeasure in conjunction with actual arrests of drinking drivers.

1. Test Subjects

During the roadside portion of the New Orleans test, subjects will be selected on a random basis from the total set of pedestrians walking past a mobile van parked on a major thoroughfare (Bourbon Street). From the ASAP's viewpoint, the major purpose of this countermeasure is to acquaint the populace with the nature and goals of the project and thereby obtain necessary public support. The van will be "on display" five to seven nights per week, and this program will continue throughout the life of the ASAP. Passers-by will be invited to enter and observe the van, furnished with promotional literature describing the ASAP, and asked to take a breath test. While this program has not yet been implemented, everyone concerned feels that the rate of refusals will be very low. Moreover, there is general agreement that the Bourbon Street location will insure that a high proportion of the subjects will have been drinking.

For the arrest phase, individuals actually arrested on suspicion of drinking driving will serve as test subjects. During this portion of the test, one Analyzer will be installed in each of the four mobile vans operated by the special enforcement team, and a fifth instrument will be located at Police Headquarters.

2. Test Conductors

The Analyzers will be operated by New Orleans Police officers assigned to these public education and enforcement programs. A number of different individuals will participate, all of whom must be given the requisite level of pre-test training. As in all cases, therefore, TXC will provide competent personnel to serve as instructors before the actual onset of testing. Once the program begins, these same individuals can serve as on-site observers in the Bourbon Street van*. However, the projected duration of this portion of the test (discussed subsequently) mitigates against continuous observation. TSC personnel will, therefore, visit the New Orleans site occasionally (say, twice each month) and conduct observations for two or three evenings on each visit. Intensive interviews of all participating officers will also be conducted at these times.

3. Location

As mentioned above, roadside tests will be conducted on Bourbon Street in the French Quarter. Since this program will tend to draw a crowd, it will probably be necessary to conduct all Analyzer measurements inside the mobile van. In conjunction with the enforcement program, testing will take place at various arrest sites within the city limits of New Orleans and in the Police Headquarters building.

4. Conduct of the Test

As in the case of Vermont, two to three hours of training in the operation of the Analyzer will be given to the participating officers one or two days prior to the implementation of the test. At the conclusion of this session, each officer will conduct at least two tests with the Analyzer, using either simulators or live subjects.

A Photoelectric Intoximeter will be installed in each van and at the Police Headquarters. Each subject (pedestrian or arrested driver) will be asked to take a breath test on both the Analyzer and the PEI**, and the two readings will be recorded on a data sheet. The Analyzer will also be checked for calibration and zero setting; however, since the operation of these two instruments is somewhat time-consuming for a single officer, calibration and zero checks might not be performed at each test.

After perhaps four weeks of testing, the PEI will be removed from the Bourbon Street van and the Analyzer will be the only instrument used to measure BAQ during the roadside interviews.

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*It will not be possible to place observers in the enforcement vans or in the Headquarters building.

**The Louisiana Implied Consent Law permits multiple tests to be requested of an arrested driver.

It is recommended that the Analyzers undergoing testing be replaced on a semi-monthly basis (to coincide with the observers' visits). As each instrument is removed from the field, it will be returned to TSC for detailed inspection and maintenance. Thus, essential test data regarding effects of aging on fuel cells and other key components will be "collected" at TSC.

This test can continue for virtually any length of time. Thus, as many different Analyzers as desired can be evaluated. If distinctly different Analyzer models are introduced in the roadside phase, the PEI can be reinstalled in the Bourbon Street van for comparative purposes.

5. Sample Size

It is conservatively estimated that ten subjects can be tested per hour in conjunction with the public education countermeasure. Assuming that this program operates four hours per evening five nights each week (which may be a gross underestimation), at least 200 subjects can be tested each week. It is more difficult to estimate the sample size available from the arrest phase of this test. However, this should total at least fifty subjects per week, and perhaps a good deal more.

6. Number of Analyzers Required

An unlimited number of instruments can be introduced into this test. It is suggested that these be replaced on a semi-monthly basis (to correspond to the observer's visits) and that one representative of each distinct model be included in the set undergoing tests at any given time. However, if the various models are sufficiently different in operation, they should be introduced separately to avoid the problem of "negative transfer."

The ASAP project director has indicated a desire to use the Analyzer in other phases of his public education program. Accordingly, in addition to the instruments undergoing testing, one or two Analyzers should be provided by TSC purely for the ASAP's use.

7. Schedule and Cost

The Bourbon Street van program will begin operation on 1 November 1971. It is, therefore, possible to initiate Analyzer testing at any time after that date. It is suggested, however, that testing be delayed until approximately 13 December to allow the ASAP sufficient time to "debug" this countermeasure's procedures. Thereafter, testing can be continued until TSC determines that sufficient data have been obtained.

The arrest phase of testing can be initiated anytime after 1 January 1972.

TSC is expected to reimburse the police for all costs incidental to their participation in these tests. It is suggested that TSC contract directly with Lieutenant Elmond Randolph, who estimates that total costs for all portions of a six-month test will be of the order of $6,000.

8. Relevant Personnel

Contacts with New Orleans should be made through:

(1) Allen Rosenzweig, Project Director
Alcohol Safety Action Project
Room 304 Gallier Hall
545 St. Charles Avenue
New Orleans, Louisiana (504) 581-7665

(2) Lieutenant Elmond Randolph
New Orleans Police Department
New Orleans, Louisiana

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A special note of thanks should be given to Mr. Rosenzweig. It was solely through his efforts that judicial sanction was achieved for conducting Analyzer tests in conjunction with arrests in New Orleans.

D. Columbus, Georgia

The Columbus Alcohol Safety Action Project looks forward to participating in the third (ARREST) phase of Analyzer field testing. Beginning on 1 January 1972, this project will implement a special enforcement countermeasure, in which field screening tests will play a key role. The involvement of the Analyzer in this countermeasure provides an excellent opportunity for evaluating its effectiveness under fully operational conditions while simultaneously furthering the objectives of the ASAP.

1. Test Subjects

Drivers actually placed under arrest will serve as test subjects. It should be emphasized that most (if not all) of these arrests will be for specific vehicular violations. For example, the arresting officer may have observed the suspect's vehicle weaving erratically (reckless driving) or committing some other moving vehicle violation (passing stop sign, etc.); alternatively, the suspect may have caused an accident. However, each subject will be characterized by the fact that he exhibits indications which lead the arresting officer to suspect that alcohol might be a contributing factor. The officer will, therefore, administer a screening test to determine if a charge of driving under the influence should be lodged instead of, or in addition to, the original arrest charge. This program has already been implemented on a limited basis, using the Alcolyser balloon-type screening device.

2. Test Conductors

Sixteen officers, three sergeants, and one lieutenant from the Columbus Police Department will be assigned to the special enforcement countermeasure. They will serve on alternating days, "sharing" the eight patrol cars devoted to this program (one shift per day). Each of these individuals will be trained as an Analyzer operator.

As in all other cases, TSC will provide one or two instructors to provide the requisite pre-test training. There will be no opportunity for on-site observation of Analyzer tests in Columbus. However, TSC personnel will visit the Columbus Police Department approximately once each month to interview, and solicit comments from, the participating officers.

3. Location

Analyzer tests will be conducted at actual arrest sites within the city limits of Columbus, Georgia.

4. Conduct of the Test

Prior to the implementation of the test, two training sessions of two to three hours' duration will be held. Roughly half of the participating officers will be present at each session. Each trainee will have an opportunity to conduct at least two measurements on the Analyzer, using a simulator.

One Analyzer will be assigned to each of the eight patrol cars. A definite stowage position will be selected for each car. The total set of these positions will include at least the following:

- In car trunk
- On floor of forward compartment
- On passenger side of front seat
- On floor of rear compartment

Each car will also be furnished with a portable simulator (e.g., the NALCO breath standard).

The officers will perform their normal duties as members of the countermeasure team. Breath screening tests using the Analyzer will be administered inside or outside the patrol car, as dictated by departmental procedures. However, prior to the conduct of the test, the officer will check (and record on a data sheet) the Analyzer's zero setting and calibration. If the latter requires adjustment, a post-test calibration check will also be performed and recorded.

Officials from the Columbus Police Department report that their procedures call for a subsequent breath test for evidential purposes if the suspect registers sufficiently high on the screening test. Thus, in these cases, the officer will transport the suspect to the station house, where a test will be administered on the PEI.

As mentioned above, TSC personnel will visit the Police Department once each month. Two interview sessions of roughly four hours' duration will be held during these visits; again, half of the participating officers will be present at each session.

In conjunction with these visits, the Analyzers undergoing testing will be replaced and returned to TSC for detailed inspection and maintenance. However, if the instruments continue to "hold up" under field use, this replacement might be scheduled on a bi-monthly basis.

5. Sample Size

It is conservatively estimated that each Analyzer will be used in two breath screening tests per day. Thus, some 100 tests will be conducted each week.

6. Number of Analyzers Required

At any given time, a total of 11 or 12 instruments should be made available for testing in Columbus. Eight of these will be issued to the special enforcement patrol cars. The remaining three or four will serve as back-ups, and will be available for occasional use by the ASAP Project Director in his public education program.

7. Schedule and Cost

It is recommended that this portion of the test be delayed until a substantial amount of data has been compiled from the simulation and roadside phases. This delay will insure that any essential design or procedural modifications will have been put into effect before the Analyzer is subjected to operational testing. Accordingly, a starting date of 1 March 1972 is suggested for the Columbus tests.

The Columbus Police Department expects to be reimbursed for the time involved in training and interviewing the participating officers. These costs are estimated to average $25.00 per day per man. Two four-hour training sessions, each involving 10 officers, would therefore cost roughly $250.00 (one-half day's pay for 20 men); interview sessions would probably total something less than this figure.

8. Relevant Personnel

Contacts with Columbus should be made through:

Mr. Jerry B. Mullinax, Project Director
Alcohol Safety Action Project
P.O. Box 1340
Columbus, Georgia 31902 (404) 322-5040

NOTE: Before the Columbus ASAP will be able to cooperate in this effort, the Analyzer must receive preliminary approval from the Georgia State Crime Laboratory in Atlanta. Dunlap and Associates, Inc. has corresponded with Dr. Herman Jones, Assistant Director of the Crime Lab, from whom this approval must be obtained. He is willing to cooperate in any way possible. However, before passing final judgment, Dr. Jones requests a demonstration of a working model of the Analyzer. Thus, if TSC elects to accept the recommended participation of the Columbus ASAP, a visit will have to be made to Atlanta in the near future.

E. New Hampshire

The Alcohol Safety Action Project in Concord, New Hampshire, plans to implement a special enforcement countermeasure similar to that described above for Columbus, Georgia. Concurrently with this program, New Hampshire will begin to employ breath testing equipment for the first time, using the Stephenson Breathalyzer as the sanctioned evidential instrument. This instrument, of course, cannot provide on-the-spot measurement of BAQ.

The ASAP is very anxious to provide its special enforcement team with a field breath testing capability, and the Project Director views the Analyzer as being well suited to this purpose. The recently enacted Implied Consent Law specifically states that multiple tests may be requested from an arrested driver. Thus, New Hampshire appears to provide another opportunity to subject the Analyzer to legally sanctioned operational testing as a field screening instrument.

1. Test Subjects

Test subjects will again be motorists arrested by the special enforcement team. Unlike the situation in Columbus, however, each subject will have been charged with "driving while under the influence of intoxicating liquor" before the Analyzer test is administered*. From the arresting officer's point of view, therefore, the Analyzer will not be used to establish reasonable grounds for arrest; rather, it will be employed to furnish an immediate indication as to whether the evident impairment or intoxication is caused by alcohol, or whether it stems from other factors (drugs, concussion, shock, etc.) which necessitate prompt medical attention.

2. Test Conductors

The Analyzer will be operated by each of the ten State Police Officers assigned to the special enforcement countermeasure. The only other personnel participating in the test will be one or two TSC or contractor employees, who will be assigned to provide pre-test training and to conduct occasional interviews of the participating officers. Again, on-site observation will not be possible.

3. Location

Tests will be conducted at actual arrest sites within the jurisdiction of the special enforcement program. This will encompass the entire State, with the possible exception of Cheshire County, which the ASAP may use as a control region for evaluation of its countermeasure.

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*Of course, additional charges may be lodged as well.

4. Conduct of the Test

This portion of the test will employ the same procedures as were described previously for Columbus. These can be summarized as follows:

- Each of the ten officers will be given two to three hours' of pre-test training, during which he will conduct at least two Analyzer measurements.
- A definite Analyzer stowage position will be assigned to each officer's car.
- Tests will be administered inside or outside the patrol car, as dictated by police procedures.
- Pre- and post-shift checks of batteries, zero setting, and calibration will be conducted.
- Interviews of the participating officers will be conducted occasionally throughout the duration of the test.
- Analyzers undergoing testing will be returned to TSC on a monthly or bi-monthly basis for extensive inspection and maintenance.

5. Sample Size

The duty cycle of the special enforcement team members has not yet been finalized. For this reason, it is difficult to estimate the number of tests which they are likely to conduct over a given period of time. However, a figure of 100 tests per week for the entire team is probably a reasonable approximation.

6. Number of Analyzers Required

At least three instruments should be included as a minimum in the New Hampshire test at any given time, and as many as 11 can be accommodated. One unit will be devoted to the Project Director's use in his public education efforts.

7. Schedule and Cost

Since New Hampshire will not begin its breath testing program until 1 January 1972, Analyzer testing should be delayed until 1 March to allow the ASAP and officers an unencumbered "break-in" period. Thereafter, testing can continue as long as TSC sees fit.

DOT will be required, as in all other cases, to cover the costs of the officers' training and participation in interview sessions and the time which ASAP management devotes to coordinating the testing. TSC should contact the ASAP Project Director to obtain estimates of these costs.

8. Relevant Personnel

All contacts with the New Hampshire ASAP should be made through:

Mr. John M. Muir, Project Director
Alcohol Safety Action Project
Prescott Park Office Building
105 Louden Road
Concord, New Hampshire (603) 271-3375

F. Alternatives

In addition to the five sites discussed above, several other locations have signified a willingness to participate in field testing. Also, the five primary sites offer potential approaches to testing other than those cited above. In order to acquaint TSC with the full range of possibilities, and to provide avenues for avoiding any presently unforeseen problems, these alternatives are sketched briefly below.

- Boston, Massachusetts -- The Metropolitan District Commission (MDC) operates a special police force primarily oriented toward traffic safety. This force implements an extensive breath testing program as part of its enforcement of drinking-driving statutes, and presently has approximately 60 qualified Breathalyzer operators out of a total complement of some 625 men. While departmental procedures would prohibit any operational testing of the Analyzer -- that is, conjunction with actual arrests -- the MDC police are willing to consider participating in simulation tests.

- Canada -- The Canadian Ministry of Transport currently is developing a roadside interview program to assist in evaluating countermeasure projects to be undertaken by the individual Provinces. Pilot series of interviews will soon be undertaken in New Brunswick and Alberta. The Ministry would be happy to consider involving the Analyzer in this program.

- Lincoln, Nebraska -- Mr. Marvin Wagner of the Office of Alcohol Countermeasures, U. S. Department of Transportation, has been in contact with the Alcohol Safety Action Project in Lincoln, Nebraska. He reports that this project is very interested in acquiring a number of Analyzers for use in implementing a breath testing program in compliance with a recently encacted pre-arrest screening statute. Unfortunately, Dunlap and Associates, Inc. was informed of the existence of this new law too late to permit visiting this ASAP prior to the submission of this report.

- Additional Roadside Interviews -- In addition to Vermont, at least two of the other four primary sites, New Hampshire and New Orleans, hope to conduct roadside interviews of passing motorists. At the present time, schedules for these programs have not been finalized. However, if field testing is delayed, or continues longer than currently anticipated, the involvement of these two sites could easily be extended to incorporate these programs.

- Classroom Testing -- In two of the States visited, Vermont and Louisiana, "Alcohol Experience Sessions" are incorporated into the breath examiner specialist training program. A few members of the class are selected as drinking subjects, and subsequently submit to breath tests administered by other trainees. Officials from both States agreed that the Analyzer could be tested in these sessions. However, it would not be possible to achieve the degree of experimental control available in the Nassau County simulation.

G. Basic Implementation Procedures

At each test site there will be certain basic implementation procedures to be followed. These are:

- Operator training
- Subjective data collection
- Objective data collection
- Debriefing of operators

These basic procedures are required for a successful field test, and are discussed in the following paragraphs.

1. Operator Training

All officers participating in the test will require training. Those officers who are familiar with current breath testing equipment might require proportionately less training than those unfamiliar with any breath testing equipment. The training session will have to be tailored to the level of sophistication of the officers and the type of test (e.g., roadside interviews) being run. The average training time should be approximately two to three hours, covering the following points:

- BAQ measurement
- Breath testing devices now used (brief review)
- Analyzer -- basic principles and advantages
- Analyzer -- field test objectives
- Analyzer -- operations with simulators and/or live subjects.
- Explanation of forms used for data collection
- Importance of maintaining objectivity and consistency in the observation and reporting of test results

The operator training is best conducted by the observer/interviewer team assigned to the particular field test site.

2. Subjective Data Collection

As was stressed in Section II, paragraph C, the most important data obtained from the field test will consist of the observers' notes* and comments elicited from the participating officers. These will be collected in two principle ways:

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*As indicated earlier, on-site observation will not be possible in Georgia or New Hampshire or during the Arrest phase of the New Orleans test.

- Each observer will be supplied with a portable tape recorder on which he will note any instances where:
  - The officer deviates from standard operating procedures
  - The instrument appears difficult to handle or operate
  - The instrument is bumped, scratched, etc.
  - The subject experiences difficulty in providing the breath sample
  - Any other relevant information, including "ad lib" comments voiced by the officer and/or subject

- Each interviewer will conduct thorough debriefing of the participating officers, during which he will attempt to uncover problems encountered at each step of the operational procedures. Prior to the debriefing session, the observer's recordings (if available) should be played back to refresh his memory and insure that all pertinent points are covered in the subsequent interview.

It was noted in Section II that it is inappropriate to supply the observer/interviewer with a "rigid" data form for collecting the subjective information sketched above. However, it is essential to provide these individuals with some guidance concerning points deserving their attention. As a means to this end, it is suggested that an observer training program be undertaken before implementing the field test. This might consist simply of an informal two-to-three day meeting of the selected individuals, during which their "operational procedures" will be agreed upon and "dry run" observations and interviews conducted. Laboratory tests of the Analyzer would provide ample opportunites for holding these trials.

Although data collection forms will not be issued, the observers' effectiveness might be enhanced if they were provided with a check-list itemizing general areas where problems, or points worthy of note, are anticipated. Figure 1 exemplifies the type of list envisioned. The observers might refer to such a list frequently during the initial stages of the test and, thereafter, having committed it to memory, might glance at it only occasionally or have no further need to refer to it.

At each test site, one TSC or contractor employee will be designated as chief observer/interviewer. At the completion of each test session it will be his duty to prepare an informal written report compiling the notes and comments obtained. As these reports begin to come in from the field, they will be reviewed carefully by TSC's human factors and legal experts. In the course of this review the problems cited in the informal reports will be grouped into specific categories. Tabulations will be prepared showing the number of times each category was cited at the various test sites. While this "analysis" is a lengthy process, it is absolutely essential if the Analyzer's operational and design deficiencies are to be uncovered and corrected.

Note: This list is intended to highlight general areas in which design and/or procedural problems might be uncovered during the Analyzer field test. It is not expected that all points worthy of note are included herein. The observer is cautioned against allowing his judgement to be restricted by its contents.

. Environmental Factors

At the beginning of the test, record a brief description of the ambient conditions of temperature, humidity, lighting, precipitation, etc. Update this description as appropriate.

. Subject's Behavior

Record any aspects of the subject's state, behavior, actions, etc., which might possibly influence the results of the test. For example, note instances where the subject

- sways, staggers, etc.
- burps, belches, or otherwise contaminates his breath
- deliberately or accidentally touches Analyzer pushbuttons
- indicates reluctance to furnish the breath sample
- ceases exhaling before the officer so directs
- dislodges mouthpiece

. Administration of Test

Note any instances where the officer deviates from the standard operating procedures. Specifically, watch for failures to

- check batteries
- check and/or adjust zero setting
- check and/or adjust calibration
- depress START pushbutton

Note any apparent problems which the officer encounters in holding, placing or operating the Analyzer. Describe the position of the Analyzer during the conduct of the test.

. Handling and Transport

Record specific instances and circumstances where the officer and/or subject

- drops the Analyzer
- causes it to bump against another object
- scratches its surface

. Breakdowns

When failure occurs, describe in detail any and all indications which led to its detection and any factors possibly contributing to its cause.

Figure 1. Observer's check-list

3. Objective Data Collection

Objective data available from the field test fall into three general categories. These are:

- Results and circumstances of BAQ measurements
- Information reflecting on reliability and maintainability
- Training requirements

Data of the first category include all information pertaining to the measurement which "normally" would be introduced into court as evidence, together with descriptions of various circumstantial factors which could possibly affect the accuracy and/or operability of the instrument. In addition, control data obtained from other proven breath testing instruments must be collected.

As a means of indicating the types of data needed in this regard, Figures 2, 3, and 4 present sample data collection forms for use by the Analyzer operators in each of the three test phases.

Data of the second category ("reliability and maintainability") include such items as the number and types of failures which occur, the lifetime of fuel cells and batteries, time and cost of repairs, etc. These data can originate from two primary sources:

- If failures occur in the field, the officer assigned to the instrument may report on the circumstances and probable cause of the breakdown.

- As the Analyzers are returned to TSC, detailed inspection will reveal the effects of aging on key components and the extent of maintenance required.

It is expected that the majority of data of this category will stem from the second source.

Data of the third category ("training requirements") will be obtained primarily from the simulation phase of the test. During that period, unlike the later phases, there will be an opportunity to employ as Analyzer operators both experienced breath examiner specialists and officers with little or no exposure to breath testing devices. It will, therefore, be possible to determine the amount of time required by personnel from both groups to achieve acceptable levels of performance (which will be measured by the proficiency they exhibit in conducting measurements using a simulator). At the close of the simulation phase, a "final" set of procedures will be constructed for training the officers who will participate in the roadside and arrest phases.

DATE: _____

TEST SESSION: _____

OBSERVERS: _____

_____

_____

	OUTDOOR	INDOOR
TEMPERATURE:	_____ °F	_____ °F
HUMIDITY:	_____ %	_____ %
WIND:	_____ mph	_____ mph
PRECIPITATION:	_____	

SUBJECT	OUTDOOR ANALYZER I.D. NUMBER _____ OPERATOR _____						BREATHALYZER I.D. NUMBER _____ OPERATOR _____			INDOOR ANALYZER I.D. NUMBER _____ OPERATOR _____					COMME
	TIME	BATT	ZERO	CAL	BAQ	LOC.*	TIME	CAL	BAQ	TIME	BAT	ZERO	CAL	BAQ	

* To be coded as follows:
I -- Inside Patrol Car
O - Outside Patrol Car

Figure 2. Simulation data collection form

DATE: _____

OBSERVERS: _____

_____

_____

LOCATION: _____

TEMPERATURE: _____ °F

HUMIDITY: _____ %

WIND: _____ mph

PRECIPITATION _____

SUBJECT (I.D. NO.)	ANALYZER I. D. NUMBER _____ OPERATOR _____						PEI I. D. NUMBER _____ OPERATOR _____			TIME SINCE LAST DRINK	COMMENTS
	TIME	BATT	ZERO	CAL	BAQ	LOC*	TIME	CAL	BAQ		

* To be coded as follows:
I -- Inside car/van
O -- Outside car/van

Figure 3. Roadside data collection form

OFFICER: _____

STOWAGE POSITION: _____

ANALYZER I.D. NUMBER: _____

SUBJECT ID NO.	ANALYZER							PLACE OF TEST	DATE	TIME	ENVIRON-MENT**	CONTROL		COMMENTS
	TIME	BATT	ZERO	CAL	BAQ	CAL	LOC*					TIME	BAQ	

* To be coded as follows:
I - Inside patrol car
O - Outside patrol car
S - Station house

** e.g., hot, raining, etc.

Figure 4. Arrest data collection form

There appears to be little need for performing sophisticated statistical analyses of these quantitative data. However, it might prove worthwhile to estimate linear regression equations and correlation coefficients to determine the relationship between Analyzer and control instrument readings. These can be established separately for each test site.

The bulk of the analytic effort applied to these quantitative data will consist of tabulations of the information shown in Figures 2, 3, and 4, together with compilations of the results of the inspection and maintenance performed at TSC. Numbers and types of failures can be tabulated as a function of test site, length of use, stowage position, etc.

4. Debriefing of Operators

Throughout the field test the observer/interviewer will debrief the officer to obtain information on the Analyzer operation. In addition, the officer's reaction to the device will be solicited as well as the officer's impression of the subjects' reactions. It is important to obtain this information immediately after the administration of a test, before the thoughts are lost or transformed. Figure 5 is a sample debriefing questionnaire.

Note: This questionnaire is designed to provide the observer with a framework for discussions on the operation and utility of the Analyzer. It need not be rigorously adhered to during the debriefing. (The first two questions are applicable only to the "arrest" test phase.)

Test Location _____ Test Type _____

Analyzer Operation

Where in patrol car was Analyzer stowed? _____

_____

Was it secured? _____ How? _____

_____

Where was the Analyzer set-up? _____

_____

Was Analyzer easily handled? _____

Was it stable and self-supporting? _____

_____

Was there any difficulty in handling the clean air sample? _____

_____

Was a zero adjustment required? _____

Was there any difficulty in handling the NALCO Simulator? _____

Was any calibration adjustment required? _____

Was there any difficulty in handling or attaching the subjects mouthpiece?

_____

Did the subject have difficulty getting close enough to the mouthpiece?

_____

Figure 5. Debriefing questionnaire for analyzer operators

Were there any problems in determining when to start the test (that is, when deep-lung air was present)? _____

_____

Were there any difficulties with observing and recording the BAQ reading? _____

Subjects Reaction

Was the subject cooperative? _____

What were some of his/her reactions to the Analyzer? _____

_____

_____

_____

Analyzer Operators Reaction

Were any problems encountered that were not previously mentioned?

_____

_____

Was any aspect of the procedure awkward or difficult to accomplish?

_____

Assuming there were no legal implications, would a device of this type be helpful as a screening device to determine if an arrest (or suspension) should be made? _____

_____

Assuming that the Analyzer was proven to be as accurate as the Breathalyzer or Photoelectric Intoximeter, could you forsee any problems in testifying in DWI cases with BAQs obtained with the device? _____

_____

_____

Figure 5. Debriefing questionnaire for analyzer operators (cont.)

This report has described a program which will permit extensive evaluation of the cooperative Breath Analyzer under field conditions. However, it is clear that a good deal of work remains to be done before this program can be implemented. In particular, the following preliminary steps must be taken:

- To the extent possible, any and all essential acceptability criteria and operational requirements should be accounted for in the Analyzer's design before the instrument is subjected to field testing. To some degree, these factors are singled out in the report issued as a companion to this document. However, such criteria and requirements will not be covered exhaustively until completion of the next major task of this contract.

- The prototype instrument should be investigated thoroughly in the laboratory before being introduced into the field.

- The Transportation Systems Center should contact directly each of the five primary sites, and as many of the alternates as desired, to establish formally the Department's commitment to conduct field testing.

- Personnel should be selected who will form the nucleus of an instructor-observer-interviewer team. These can be TSC and/or contractor employees.

It is recognized that the performance of these preliminary steps might require revision of the field test schedule. Fortunately, each of the five sites is completely flexible in this regard. A delay of even several months will pose no significant problems for any of the agencies which have agreed to cooperate.