171R92010

AWBERC LIBRARY U.S. EPA

DEVELOPING A SYSTEM FOR EVALUATING THE EFFECTIVENESS OF INSPECTOR TRAINING

PHASE 1: IDENTIFICATION OF EVALUATION TECHNIQUES AND DEVELOPMENT OF MODEL FOR TRAINING PROGRAM OPERATIONS

Prepared for:
United States Environmental Protection Agency
Office of Air and Radiation
Stationary Source Compliance Division
Washington, DC

Prepared by:
Kathleen M. Reed
School of the Environment
Fuqua School of Business
Duke University

September 1991

DISCLAIMER

This report was furnished to the U.S. Environmental Protection Agency by the student identified on the cover page, under a National Network for Environmental Management Studies fellowship.

The contents are essentially as received from the author. The opinions, findings, and conclusions expressed are those of the author and not necessarily those of the U.S. Environmental Protection Agency. Mention, if any, of company, process, or product names is not to be considered as an endorsement by the U.S. Environmental Protection Agency.

ACKNOWLEDGEMENTS

This study was performed by Kathleen Reed under the National Network for Environmental Management Studies program. The project was listed as #91-1103, with Mark Siegler, Stationary Source Compliance Division, Environmental Protection Agency, acting as Project Sponsor. I would also like to thank Kirk Foster, Stationary Source Compliance Division, Environmental Protection Agency, for providing a historical background on the Air Inspector Training Program activities, as well as Martha Strobel, Air Quality Management Division, Environmental Protection Agency, and Laurel Sneed, Apprend Associates for their assistance with providing a better understanding of the mechanics of training.

TABLE OF CONTENTS

EXECUTIVE SUMMARY **4**
INTRODUCTION **5**
- PURPOSE 5
- BACKGROUND 5

METHODS OF CONTINUALLY EVALUATING TRAINING EFFORTS' EFFECTIVENESS **7**
- DURING THE SESSION OR COURSE... 9
- AT THE END OF A SESSION OR COURSE... 9
- SOME TIME AFTER THE COURSE OR PROGRAM... 10
- INDEPENDENT OF THE TRAINING PROCESS... 11

A MODEL FOR A TRAINING GROUP'S OPERATIONAL CYCLE **13**
- MISSION STATEMENT 13
- IDENTIFY GENERAL TRAINING GOALS AND NEEDS 14
- DETERMINE SPECIFIC OBJECTIVES 15
- DETERMINE TRAINING SEQUENCE 17
- PREPARE MEDIA 19
- CONDUCT PILOT STUDY 20
- COORDINATE ALL MEDIA AND FACILITIES TO PREPARE FOR TRAINING DELIVERY 20
- TRAINING DELIVERY 21
- EVALUATION 21

POSSIBLE EFFECTS OF TRAINING ON INSPECTOR QUALITY **22**
RECOMMENDATIONS **24**
EXHIBITS **28**
- EVALUATION BY TRAINEES AT END OF COURSE 28
- EVALUATION BY TRAINERS AT END OF COURSE 30
- DELAYED EVALUATION BY TRAINEES 32
- DELAYED EVALUATION BY TRAINEES' SUPERVISORS OR BY INSPECTORS SERVING AS ON-THE-JOB TRAINERS 34
- A MODEL FOR A TRAINING GROUP'S OPERATIONAL CYCLE 35
- MISSION STATEMENT LEADING TO SPECIFIC COURSE OBJECTIVES 36
- CRITICAL INCIDENT SURVEY 37
- A BEHAVIORALLY ANCHORED RATING SCALE FOR BEHAVIORS USED IN OBTAINING A SOURCE'S COMPLIANCE DOCUMENTATION 38
- A QUICK METHOD OF EVALUATING THE AIR STATIONARY SOURCE COMPLIANCE INSPECTORS' TRAINING PROGRAM 39

BIBLIOGRAPHY **41**
ABSTRACT **45**

EXECUTIVE SUMMARY

This document begins by focusing upon methods of continuously evaluating training program effectiveness. It is important to recognize that training developers have only recently begun to use evaluations to target training efforts, and have not yet found any generic techniques which are applicable in all cases. Each situation must be assessed individually in order to determine the best evaluation techniques to employ. Evaluation methodologies which directly investigate the educational process can be used during, immediately after, or some time after conducting the training effort. Methodologies which indirectly investigate training's effectiveness and appropriateness are also explored.

After investigating evaluation techniques, a model of an operational structure for developing, delivering, and evaluating training efforts is discussed. This structure must actively involve interactions with environmental influences external to the training group in order to proactively identify and eventually fulfill prioritized training needs. The described operation flows from the mission statement through training delivery, with feedback from later steps, including evaluation, being used to revise and better target previous activities. This model emphasizes using proactive techniques and adjusting the training continuously in order to best apply limited resources.

Next, possible effects of effective training on air stationary source compliance inspections are examined. Quite simply, the training is likely to result in better compliance in sources inspected by trained inspectors as the sources recognize that the improved enforcement of regulations. Although training provides the skills and knowledge necessary for job completion, these skills may not be employed if factors within the organization discourage their use. An accurate model including all possible influences on inspection quality must be developed in order to determine exactly what role training plays in the system.

Finally, several actions are recommended and suggested for further investigation or implementation.

RECOMMENDED METHODS OF CONTINUALLY EVALUATING TRAINING PROGRAM EFFECTIVENESS

- implement additional quantitative methods of continually evaluating training effectiveness
- conduct a preliminary evaluation

RECOMMENDATIONS FROM THE MODEL OF A TRAINING FUNCTION

- document specific objectives for educational efforts
- promptly meet demand for all types of courses

RECOMMENDED OVERALL IDEAS

- incorporate feedback from newly implemented evaluation techniques when designing training.
- document specific, quantitative objectives of each training session, course, and program.
- operate in the long run.

One should remember that inspectors facilitate effective environmental problem resolution. When all factors influencing job performance function correctly, well trained inspectors are very likely to help the EPA to meet its goals. Training seems to represent one of the best methods of ensuring that inspectors are able to complete their duties. The training cycle should result in the highest quality, most efficient, most effective training possible. Once the inspectors are given the tools necessary to complete their duties, they will be likely to do a better job of surveying for violations. That leads to better enforcement when necessary. The potential violators recognize that they are better off complying with the requirements than trying to hide excess pollution rates. A greater compliance rate with environmental requirements leads to a cleaner environment, directly furthering the EPA's goals.

INTRODUCTION

PURPOSE

This document explores NNEMS (National Network for Environmental Management Studies) project #91-1103, which is stated below:

> How can air stationary source compliance inspections be improved through effective training and how can these improvements be measured?

This topic was modified slightly during the course of the project. The primary focus became describing methods of evaluating educational effectiveness, while the secondary focus involved creating and describing a model of an operational structure for a training group in order to best deliver effective training. Possible effects of training on inspection quality are also discussed. One should note that while the information presented in this document is tailored to the air stationary source compliance inspector training program, it contains information that could be relevant to other programs as well.

The project was conducted primarily through searches of available literature and interviews with training experts. Although the project's scope was limited, it effectively served as a screening mechanism, focusing upon broad aspects of effective training design and thus highlighting areas which may warrant further study or action. Later projects will investigate and/or implement program modifications recommended by the initial project.

The project's primary sponsor was the Stationary Source Compliance Division, and the secondary sponsor was the Air Pollution Training Institute. Both sponsors are part of the Office of Air and Radiation, of the United States Environmental Protection Agency. This topic involves one of the training programs mandated by EPA Order 3500.1.

BACKGROUND

The Environmental Protection Agency was created to protect and preserve the American and world environment from excessive changes caused by pollution, increases in technology, and the general effects of increasing populations. The EPA completes this mission through various mechanisms. One key mechanism involves the following problem resolution cycle:

-> discovery of problem
  -> creation of law by Congress to minimize or resolve a problem
    -> targeting and refinement of law by the Environmental Protection Agency through regulations
      -> surveillance monitoring conducted to check for compliance with the laws and regulations
        -> enforcement of the requirements
          -> recognition by regulated parties of the penalties of noncompliance
            -> compliance of regulated parties with requirements
              -> positive changes
                -> goals of problem minimization or problem resolution achieved

One should note that inspectors play a key role in this process. The inspectors investigate whether or not the regulated parties are in compliance situations. This monitoring greatly enhances the requirements' enforceability. Although continuous emission monitoring systems, new analytical tools, record keeping requirements, and reporting requirements are being implemented, personal inspection still provides the backbone of compliance determination. Once the new techniques are fully implemented, inspections will probably still be used to verify the devices' accuracy and the facilities' compliance.

The inspectors are important for other reasons as well. For one, competent, credible inspectors seem to serve as an enforcement deterrent. The "Virginia Report" describes how the EPA Air program investigated the influence of training on improved compliance reporting. The findings indicate that various sources' compliance statuses improved after the well trained inspectors found more compliance violations.[1] The inspector is important because the inspection data provides the basis for actions and cases against noncomplying sources. Quite simply, the better the data, the better the case, and thus, the greater the likelihood that an enforcement action will occur. If the data is weak (for example, if it is incomplete or inaccurate), the case will be weak, and the enforcement probably will not occur. Without enforcement, the incentives for affected parties to comply with the requirements decrease substantially. While the inspectors' roles have been substantial in the past, the inspectors' responsibilities may soon increase to also include more enforcement, when the permitting process that the Clean Air Act Amendments of 1990 provided is activated.

Not only do the inspectors play a major role in facilitating the EPA's goals, they also represent a significant annual investment for control agencies. Stationary source compliance monitoring represented 32% of state agencies' reported annual compliance expenditures, and 37% of local agencies' reported annual compliance expenditures.[2]

When one considers both the critical role that inspectors play in the process of implementing programs and also the enormous annual investments made in the inspectors, one recognizes that great care must be given to guaranteeing that the inspectors fill their role to the peak of their abilities. A deficiency in skills and knowledge requisite to completing duties may pose the most basic potential problem affecting inspector performance. Any inability of inspectors to conduct their duties would impair the problem resolution cycle. If the inspectors are unable to survey, then enforcement is not likely to happen, compliance is even less likely, and problem resolution may not occur. Training provides one mechanism for rectifying a lack of skills necessary to perform the duties. If the agency is able to increase the inspectors' ability to complete their job requirements, it will most likely improve the quality of inspections, thereby facilitating the program implementation cycle and increasing the likelihood of meeting the EPA's goals.

---

[1] Pedco.

[2] Radian Corporation, E-5.

METHODS OF CONTINUALLY EVALUATING TRAINING EFFORTS' EFFECTIVENESS

Evaluations are frequently used in order to determine the training effort's effectiveness and targeting. This is because training groups and departments need to verify that their efforts effectively teach the appropriate skills, knowledge, values, and behaviors. As one training expert states,

> "If you are happily training hundreds of employees yet have no idea whether they perform to the standards they've been taught- or even if they use the skills you've given them- you are failing in your mandate. Remember, the purpose of training is to bring about change. If you don't measure the change that has taken place, you can't know if you are performing the task." [3]

Quite simply, an evaluation's purpose is to determine whether the program is meeting its goals or not. The goals merely provide a basis for comparison. For example, if one were asked whether or not slide rules were quick calculating devices, the answer would depend on what slide rules were being compared to. They are fast when compared to working the problem with pencil and paper, but are slow when compared to using a calculator. In the same manner, the interpretation of the training evaluation's results depends on what the goals were. If the training is meeting its goals, then all is well. However, if it is not, then some changes need to take place. Feedback must occur and necessary changes must be made in order for the evaluation to have any purpose. This helps to ensure that scarce resources are allocated to areas where they will have the greatest impacts.

Training courses and their required amounts of targeting can be compared to shotguns and rifles, as very similar targeting processes are used both in training and in firing a gun. Shotguns require some focusing; however, the shot disperses over a relatively large area. This dispersion permits one to hit the target even if the aim is slightly inaccurate. The likelihood that at least some of the shot will hit the target is high, but there is also waste, as many of the pellets will miss the bull's eye. On the other hand, one must be extremely precise when aiming a rifle, as the single bullet does not forgive mistakes. If the aim is incorrect, there is extremely high waste, and there is no chance of hitting the target; however, as long as the rifle is aimed correctly, the bullet efficiently hits the target. Just as these two firearms require different amounts of aiming because their shot disperses differently, various types of training require different evaluative procedures to ensure that their dispersed or targeted educational efforts fulfill their purposes. Some training efforts are similar to a shotgun, in that the training efforts are assembled quickly and cover a wide range of topics in the hope that at least a few of these widely dispersed topics will teach what the trainees need to know. These do not require many mechanisms to verify that they teach the appropriate materials. On the other hand, one can develop extensively planned, efficient, precisely targeted training efforts which have been designed to complete only very specific objectives. This type of an effort is analogous to a rifle; the tightly packaged, well focused training materials are highly efficient but leave little room for inaccuracy.

Evaluations can be used for several purposes. In all cases, they help to employ limited resources in the most effective manner possible. The evaluations are commonly grouped as either summative or formative. Summative evaluations are used to determine whether or not to continue the program. These have been used extensively in the past. Elizabeth Hawthorne, a training expert, reviewed all of the training program evaluations published between 1966 and 1984 in order to provide broad models for later evaluations to follow. She found that most of the evaluations were used to determine whether to continue or terminate the

---

[3] Mitchell, p. 141.

training program in question.[4] The second group of evaluations, the formative evaluations, are somewhat different. They are used to identify areas of a current program which may require modification. Hawthorne also states that:

> Few of the evaluations conducted and reported in the literature were formative evaluations, that is evaluations that are intended to modify and improve the program in process.[5]

While the training industry recognizes the need for formative evaluations, there are no proven methods of conducting those evaluations. Each evaluator must determine an appropriate method from ground zero.

Formative and summative evaluations may also be better explained by continuing the gun analogy. Summative evaluations involve a process similar to that of determining whether or not to stop shooting the gun. On the other hand, formative evaluations can be compared to the process of aiming a gun, evaluating whether or not the firing was accurate, and determining the adjustments necessary to increase the next round's accuracy.

A logical path for any evaluation to take involves comparing actual results to ideal results. The training effort's ideal results should be determined in order to provide a basis for comparison. Perhaps the simplest and most comprehensive source for these projections is the statement of specific objectives for a given course, session, or program. If a model which accurately forecasts the programs effects exists, its results could also be used as the basis. Next, the actual results of the training effort should be obtained. Simply matching the actual to the ideal results can then provide an evaluation of the program's effectiveness.

It is important to recognize that all training sessions, courses, and programs should be evaluated. This includes short run courses even though the evaluation may be completed after the training group stops offering the effort. It is important for the course designers to see the effectiveness of previous courses so that they can either avoid similar mistakes in the future or continue to use very effective techniques. The need for evaluations of training efforts with long life spans is more obvious. A lack of evaluations could result in very costly mistakes.
Although a variety of techniques exist for obtaining information necessary when conducting evaluations, evaluators often use surveys. These surveys can take the form of either questionnaires or interviews. The interviews may be conducted either in person or over the telephone, and can be structured or unstructured. Structured interviews contain a set, unchanging series of questions.[6] Unstructured interviews are also based on a list of questions; however, the unstructured interviews maintain the flexibility to investigate areas of interest as they unfold.[7] A less common method of evaluating a course involves observing actual course sessions. As noted, this is rarely used, but allows evaluators to obtain an outside opinion of a course. A third well known technique is to use focus groups. This consensus building technique often serves either to explore an unknown or to measure a past occurrence. Focus groups consist of a panel of either subject experts or a representative cross section of a group targeted by the issue in question. The panel's diverse opinions are debated until a consensus is reached.

Evaluations for sessions, courses, and programs can be employed at several times. Some evaluations may be conducted during the course session, both to slightly modify the course effectiveness and also to make

---

[4] Hawthorne, p.26.

[5] *ibid.*

[6] Philips, p. 81.

[7] *ibid.*

long term changes to the course. Others are more appropriate at the courses' or sessions' conclusion, and affect future presentations. The evaluations conducted during and immediately following the session, course, or program can be thought of as short- run evaluations in that they measure only immediate features of the training effort. These features include the abilities both of the training to communicate and of the trainees to assimilate the educational objectives. In contrast, other evaluations investigate long- run issues. One long run issue could be the effects that the training effort has on job performance. Evaluations conducted several months after the course or program was presented can investigate long-run issues. The delay facilitates an investigation of how the training effort actually affected trainees' job performances. A fourth and final group of evaluation techniques investigates factors other than the actual training. We will now investigate these four groups of evaluations.

DURING THE SESSION OR COURSE...

There are several uses for these methods of evaluation. Their primary purpose is to ensure that a course already in session is achieving its goals. By monitoring the course as it progresses, trainers can tailor the course to the trainees' needs. These techniques can also identify necessary modifications to the course's basic format; repeated revisions of the same problems in the course may indicate that the course's outline should be changed. A trained observer may be helpful in objectively employing these techniques.

These in-session evaluations have several benefits and weaknesses. One benefit is that they are very inexpensive to implement, requiring only the trainer's willingness to observe the session, modify the course if necessary, and report any findings back to the training development group. However, these evaluations also have a number of drawbacks due to their superficial nature. They cannot show the long term effectiveness of the course; only its ability to communicate the material while in session. They can fail to recognize areas that require attention. Finally, they only look at material currently in the courses and therefore cannot determine whether the topics are appropriate or if other topics should also be addressed.

One method of evaluating a course in session involves monitoring questions to determine trainees' comprehension of course materials.[8] The trainer should monitor trainer initiated and also trainee initiated questions. If trainees neither answer nor ask questions, some probing may be necessary to determine the cause of their lack of involvement- be it that the material is too basic, too advanced, too dull, or any other reasons.

In class exercises present an excellent method of determining whether or not trainees are assimilating the material.[9] Practice simulations, including cases, discussions, and problems, can show whether or not the trainees have fully understood the material, and highlight which areas require more emphasis.

AT THE END OF THE SESSION OR COURSE...

Evaluations conducted at this time allow participants to reflect back on the entire session and present an overall opinion. One should note that participants may forget information about the early parts of the training effort, especially if it is long. These evaluations can only measure the perceived applicability of the educational materials to future job requirements, and can investigate only the perceived appropriateness and completeness of the topics included in the course. Examinations, trainee evaluations, trainer evaluations, and summary reports are frequently used methods.

---

[8] Mitchell, p. 126.

[9] Mitchell, p. 128.

Examinations generally come as either a set of pre- and post- tests, or a single test given at the end of the exam. The post-test method provides a picture of the trainees' abilities at the end of the course. This enables one to show overall competencies, but not to determine the exact effects that the course had. A better method involves the pre- and post- set, which measures not only overall competencies but also gains from the course. This method facilitates comparing abilities both before and after the course; this comparison can be used to show the precise effects that the course had.[10] Quite simply, the course is effective if trainees learn necessary material during the course.

Examinations can also be used to determine both course or session and media effectiveness. Raw data from each session's or course's tests should be gathered and assimilated according to question number. Poor wording of questions or a failure to achieve the objectives could cause large numbers of trainees to have difficulty with certain questions. The data can also differentiate between problems caused by the instructor's inability to communicate certain information or by the class design. If multiple types of media are used to teach the same information, then a comparison of results between media can determine if the difficulty is caused by the media. For example, if trainees under only one trainer miss a given question, and trainees instructed by other trainers do not have trouble with that question, then the instructor is probably causing the problem. If all of the trainees have difficulty regardless of who the trainer was, then it indicates a problem with the course or session design. One should be very careful to use proper statistical evaluation techniques when looking at test data, as oftentimes casual observations can lead to statistically incorrect conclusions.

In addition to final course examinations, trainee evaluations can also determine apparent training effectiveness as well as training acceptability. These evaluations generally investigate areas such as satisfaction with the course, the facilities, and the course materials. Different areas of the course can be rated on a set scale. Opinions regarding the best and worst parts of the course are often gathered, as are suggestions for improving the course. An example of this type of an evaluation can be found in Exhibit 1.

Trainer evaluations may investigate the course's design, teaching materials, course content, and other areas. They can also be used to gather results from in-class evaluations, such as the questions and class exercises described earlier. An example of a trainer evaluation is located in Exhibit 2.

Finally, summary reports can evaluate sessions, courses, or programs. The Air program currently employs this method. Once the training effort is completed, the trainees fill out evaluations. The trainer sorts, reviews, and summarizes these evaluations. The trainer then evaluates the training effort and documents any recommended modifications to the course. The summary report includes the trainee examinations, trainee evaluations, the summary of the trainee evaluations, the trainer evaluation, and the recommendations.

SOME TIME AFTER THE COURSE OR PROGRAM...

These evaluations enable one to investigate long term results and issues of training efforts. The evaluations are often conducted between 6 and 18 months after taking a course. This method can investigate items such as effects on job performance, whether or not general topics were useful, or whether other topics should be added to the training effort. These evaluations' strength resides in their ability to determine actual and perceived impacts of the training on job performance.

One of these methods involves surveying the trainees. Two identical surveys can be conducted; one a few months after the training effort was completed, the other can be conducted 1-2 years after completing the effort. Areas to investigate include perceived usefulness of the course, perceived impact on job

[10] Philips, p. 102.

performance, subjects that were most helpful to the job, as well as areas that should have been covered, such as new technologies and techniques. These can also be used to determine whether the job has changed since the course was originally designed. If so, the course or program should be modified to reflect the changing work environment. An example of this survey can be found in Exhibit 3.

Another evaluation technique entails distributing questionnaires to trainees who have returned for additional courses.[11] The questionnaires could investigate any previous courses that the inspectors may have taken. This form may be similar to the previous survey, with the only difference being that it could request information about a number of courses. Although surveying returning trainees provides valuable information, this method should not be the sole evaluation method. This is because it surveys only the returning trainees (those trainees satisfied enough with the previous course to return for additional instruction) rather than the entire set of trainees.

A third evaluation technique involves surveying either the trainees' first line supervisors, or the inspectors serving as on-the-job trainers, or both. Again, two identical surveys could be conducted at different intervals. They could investigate the perceived usefulness of the course, the perceived changes in the inspectors' performances, and also the changing requirements for the inspectors' jobs. Exhibit 4 contains an example. A list of course objectives or other basis for comparison could be sent with the survey if specific skills and abilities are being investigated. In addition, the evaluation to the inspector/on-the-job trainers could ask them to describe any areas that consistently present a problem for the trainees.

INDEPENDENT OF THE TRAINING PROCESS...

The following areas can be continuously observed in order to monitor the training program's actual and perceived effectiveness. One should note that these evaluation techniques can be used regardless of when the training occurred. Many of these are qualitative rather than quantitative. Although this section describes how to use these methods for Air Stationary Source Inspector training programs, their general ideas can be applied elsewhere.

To begin, evaluators can collect information about inspectors. This information should reflect overall course goals (possibly key course objectives) and may include absenteeism, numbers and types of mistakes made, inspector turnover, and information from the exit interviews. Mistakes could be analyzed to determine (1) whether they were caused by failure to meet a course objective, and (2) whether they should be included in the objectives to prevent others from having the same difficulties. Evaluators may wish to determine why the inspectors leave the EPA, as stated in exit interviews. These results could be analyzed according to the reasons for leaving and the extent to which the inspector was trained.

Information about the actual inspections can also be used to evaluate training effectiveness. This information can be obtained either from EPA records or from the inspected sites. There is some reason to believe that personnel at the sites would be responsive to requests for this information, as it parallels the trend in the business world to become ever more customer driven. While the act of requesting information from inspected sources contains some immediate risk that the feedback may be negative, requesting information from the sources actually decreases total risk. By learning of and correcting problems in the present, problems can be minimized and resources can be used more effectively in the long run. Even if the evaluation used only EPA records, it would still carry some risk. By only using EPA documentation, the risk would involve obtaining incomplete information and therefore failing to respond appropriately. Inspection information that can be monitored includes, but is not limited to, the list in Figure 1.

---

[11] Mitchell, p. 142.

Figure 1

EXAMPLES OF INSPECTION INFORMATION WHICH COULD BE INVESTIGATED CONTINUOUSLY

- the inspector's image (whether or not the inspector appeared competent and professional)
- the disruption that the inspection caused to the source's operations
- numbers of repeat inspections required to collect additional information
- information that required repeat visits to fully obtain
- the numbers of contested versus uncontested inspection conclusions
- if lawsuits arise, the adequacy of the inspectors' evidence to prove noncompliance

This information should be grouped according to whether or not the inspectors had taken the training, and, if so, whether or not they passed the course.

A third method could be to monitor informal anecdotal feedback on the courses and programs. This includes feedback from regional, state, and local contacts, as well as comments made at meetings, such as national meetings. Informal comments from trainee supervisors and on-the-job trainers should also be noted. Complaints, compliments, and suggestions should be noted. Although this is helpful, it is neither comprehensive nor complete and therefore should be employed only in conjunction with other evaluation methods.

Formal feedback should be followed if at all possible. Formal letters of complaint or compliment should be noted.[12] These may be sent by training recipients, from inspected units, or from public interest groups. Complaints should result in either further evaluation or immediate changes, depending upon the complaints severity and validity.

The demand for the courses should be monitored. Total increases or decreases in both the numbers of potential trainees and in demand should be noted. Demand should be compared to the estimated or actual figures for competitive training courses and programs. The worst scenario would be for the total demand for the training program to decrease substantially while the number of perspective trainees and the competition's demand skyrocketed.

Finally, periodic surveys in media such as newspapers or bulletins that training customers would receive can be used to determine perceptions of the training courses and programs.

[12] Mitchell, p. 108.

A MODEL FOR A TRAINING GROUP'S OPERATIONAL CYCLE

This section will examine one method of organizing the operation of developing and delivering training. Exhibit 5, which contains a model of a training group's operational cycle, illustrates the ideas that will be discussed in rest of this section. The box in that Exhibit represents the border between the training department and the rest of the world. Everything within the box represents the training operations; all that occurs and exists outside of the training group is shown outside of the box. The arrows show information flowing in the direction that the arrows point. It is important to notice that information flows throughout the process, not just from the top down. Each major portion of the process will be described separately.

MISSION STATEMENT

The mission statement concisely states the training group's purpose and guiding principles. This mission must help to satisfy the missions and goals of the organizational structure above the group. Because the group is part of an entire organization, factors external to the group also influence the groups resources and future. In order to ensure that the group survives and thrives, it must respond to the needs of the organization and must help to fulfill the missions of the organizational structure above it. In the EPA, the air stationary source compliance inspector training development group's actual superior structure includes the Stationary Source Compliance Division, the Office of Air Quality Standards and Planning, the Office of Air and Radiation, and, of course, the parent Environmental Protection Agency.

Figure 2 shows a sample mission statement. This Figure is actually part of Exhibit 6, which illustrates how the mission influences the training department's activities through identifying the specific objectives of the training effort.

Figure 2

MISSION STATEMENT SHOWN IN EXHIBIT 6

To satisfy changing air educational requirements in a timely, effective, and efficient manner in order to further the Environmental Protection Agency's goals. This includes:

1) continuously searching for new training requirements.
2) operating the process as efficiently as possible.
3) complying with legislation, regulations, and EPA Orders that mandate training and associated standards.
4) training EPA, Regional, and State personnel to determine compliance with legislation and regulations.

The mission statement should be sufficiently global so that it can guide the training group throughout changing conditions; however, if conditions change so drastically that it no longer serves to appropriately guide the group, the statement should be changed.

IDENTIFY GENERAL TRAINING GOALS AND NEEDS

This involves determining the general need for training, be it a session, course, or program, and also preliminarily determining its subject matter. Figure 3 shows several possible course needs identified from the Mission Statement. The specific course content should not be determined at this point. Instead, decisions should be made on items such as subject matter, whether it should provide background knowledge or hands-on skills, and whether it will be used as training or development.

The training group could determine the need for a new course or program from a number of sources. The mission statement provides the most basic source of information. For example, Section 4 of the Mission Statement found in Figure 3 states that the group will train inspectors to determine compliance with new legislation and regulations. Note that one of the educational needs identified in this example involves preparing personnel to issue permits as described in the Clean Air Act Amendments of 1990.

Figure 3

MISSION STATEMENT

To satisfy changing air educational requirements in a timely, effective, and efficient manner in order to further the Environmental Protection Agency's goals. This includes:

1) continuously searching for new training requirements.
2) operating the process as efficiently as possible.
3) complying with legislation, regulations, and EPA Orders that mandate training and associated standards.
4) training EPA, Regional, and State personnel to investigate and manage source compliance with legislation and regulations.

POSSIBLE TRAINING GOALS AND NEEDS

- **training for evaluating air sources' compliance with the Clean Air Act Amendments of 1990 and the resultant regulations.**
- **materials to help prepare individuals to become inspectors' first line supervisors.**
- **training to enable personnel to issue permits according to the Clean Air Act Amendments of 1990.**

Courses will also need to be developed to comply with mandates including legislation, regulations, or EPA orders, all of which may specify training requirements. These mandates currently drive the training cycle. One undesirable operational method of determining these stated needs involves watching for applicable mandates to be officially published. This eleventh hour, reactionary method prevents long term planning and job scheduling. This results in a fast-or-famine mode of operation with only limited flexibility in responding to educational needs. A better method of operation would involve scanning the environment for clues that any requirements relevant to the training department's operations would soon be emerging. This desirable long run operational mode would enable the training group to plan and schedule jobs ahead of time and thus to avoid backups and to best utilize slack periods.

Courses may also be developed to fulfill superiors' direct requests. These requests may occur if management believes that a problem could best be resolved through training. The training group should respond to these requests as quickly as possible.

Although congress currently drives the system, changes in inspection technology, manufacturing techniques, emission control equipment, or other similar indicators should be used to investigate the needs for course development or modification. The training group could learn about these technological breakthroughs from technical trade journals, from contacts at universities, contacts in industry, or from other EPA personnel (inspectors, perhaps). The group should also watch for scientific discoveries, such as determinations that compounds which had been thought to be harmless actually are hazardous. Such a discovery would indicate that the industry will eventually be required to reduce that compound's emissions and that the air stationary source inspectors will be required to check for that compound. Both new technologies and scientific discoveries could also indicate that new types of stationary sources would soon be emerging, requiring new methods of inspection. Keeping the courses current maximizes their value to the trainees, provides the most impact for their resources, and helps to justify the training group's existence.

Specific requests may inspire course modification or creation to meet set needs. One method of handling these requests would involve processing them as they emerge. As discussed previously, a long run vision provides better operational results than does a short run viewpoint. The long term vision requires that the training group nurture ongoing relationships with the offices which may request training. Staff from the training department should regularly contact customers (in the air stationary source program, this includes regional, state, and local offices) to discover possible future needs. Once these have been identified, the training group may create a preliminary plan showing how courses meet the requirements. This plan then becomes a marketing tool. The training group may use the plan to convince the potential client that the it the only one that can meet the client's needs. Besides customers, those affected by training results (ie- the sources inspected by stationary source compliance inspectors) may request that inspectors be trained on specific technologies. These requests would only occur if the inspections began to cause severe problems, and would most likely occur in the form of registered complaints to the EPA.

Finally, feedback from training evaluations may either verify that the appropriate needs were addressed or may indicate that other needs exist. Quite simply, trainees may require additional skills. Also, some needs may no longer be valid as conditions change.

DETERMINE SPECIFIC OBJECTIVES

Once the training effort's general goals have been determined, the specific objectives necessary to fulfill those goals must be determined. Figure 4 shows examples of specific course objectives which could have been identified according to a possible course need. In this instance, a partial list of objectives has been created to train personnel to issue permits to stationary sources.

These objectives have many purposes. One is to shape the training; identifying course objectives facilitates the selection of appropriate training media such as videos or documentation. Trainee examinations should investigate whether or not trainees have met the objectives. These will be discussed in more detail in the section describing media preparation. If available funding would prohibit the training group's ability to meet stated needs, the group could request increased funds. The objectives also can be used as inspectors' performance standards if the training is for specific jobs.

Figure 4

ONE POSSIBLE TRAINING NEED

- training to enable personnel to issue permits according to the Clean Air Act Amendments of 1990.

POSSIBLE SPECIFIC OBJECTIVES OF A TRAINING COURSE[1]

- to be able to determine whether sources emit 10 tons per year or more of a hazardous air pollutant.
- to be able to determine whether sources emit 25 tons per year or more of a combination of hazardous pollutants.
- to know where to obtain a current list of sources required to obtain permits.
- to know how to determine the current tonnage fee to be collected.
- to be able to complete 100% of the processing procedures for permit application.
- to be able to obtain a historical record of modifications that would revise previous legislation, regulations, or standards.
- etc.

[1] based on Pytte, p. 3955.

The objectives can also be used to modify existing courses. If the objectives serve this purpose, they can then guide the changes necessary to improve the course. It is important to note that while investigating specific course objectives, the course designers may discover previously unstated goals and needs for the course. These should be verified, and either included in the same course or used as needs for a new course.

Although the discussion has been theoretically sound to this point, practical applications have not yet been discussed. Three practical methods of determining course objectives are described below.

One method of determining specific course objectives would involve analyzing a regulation or law's requirements.[13] Take, for example, the Clean Air Act Amendments of 1990. The training group in coordination with subject experts or program managers could analyze the law and resulting regulations to determine exactly what skills, abilities, and knowledge would be necessary to inspect for regulated parties' compliance. The program managers often are both knowledgeable about these issues and in control of funds, some of which could be used to facilitate training development. Again, if the funding prevents effective training, requests for additional resources would be justified. The objectives for a course or a series of courses would then consist of necessary competencies.

Utilizing critical incident reports is another method of determining course objectives.[14] This method is typically used for jobs that require employee discretion, such as that of an inspector. The critical incident technique, described in Figure 5, determines both productive, desirable behaviors as well as counterproductive, undesirable behaviors which may prevent employees from fulfilling job requirements.

---

[13] Fletcher.

[14] Zemke, Figuring Things Out, p. 134-8.

Figure 5

THE CRITICAL INCIDENT TECHNIQUE

1) Information about the job is gathered on critical incident forms, such as the example shown in Exhibit 7. These forms generally investigate three areas:
   (1) identification of the reporter (name, project title, office, etc.) in case additional information must be obtained.
   (2) a description of an incident, including the situation, the objective, the technique used, and the positive or negative results.
   (3) evaluator commentary regarding the usefulness of the behavior, alternative behaviors which could have been used, etc.
2) The critical incident reports are gathered and a Behaviorally Anchored Rating Scale (BARS) is created. This is completed by first grouping reports containing similar incidents. The behaviors are then arranged on a scale, from most productive to least beneficial. An example of a BARS can be seen in Exhibit 8.
3) Additional information required to fill in the gaps can then be obtained.
4) The final results should be verified for thoroughness and accuracy by experts.

Focus groups of job experts can facilitate this process.[15] These experts could include highly competent, experienced inspectors, supervisors, knowledgeable individuals who were once inspectors, or other individuals. The focus group could generate the initial group of critical incident reports, sort the reports between beneficial and detrimental behaviors, and complete any missing areas.

The critical incident technique can also be used to determine whether or not the program needs revision. If the program has been running for a period long enough that the job requirements may have changed, the critical incident technique can highlight areas that should be included in future courses.

A third method for determining course objectives involves basing them on job descriptions. The Environmental Protection Agency's CERCLA program currently uses this method.[16] A panel analyzes GS job descriptions to determine what the specific training requirements are. The panel first reviews the current GS descriptions to determine what the different activities are and to estimate the percentage of time that is spent on each activity. Surveying actual inspectors verifies the panel's findings and determines whether other activities should be included in the job descriptions. The results are used to update the GS job descriptions. The course objectives then involve preparing inspectors to complete those identified activities.

DETERMINE TRAINING SEQUENCE

The training sequence should respect both logical order and resource limitations. The objectives' priorities should be determined, they should be arranged according to their priorities, and then as many of the high priority items as possible should be included in the sequence as resources permit.

---

[15] Zemke, Figuring Things Out, p. 134.

[16] Thomas.

The objectives and their requisite tasks and behavior may be prioritized in a number of ways. One basis involves determining which objectives form conceptual bases for later, more advanced requirements. Another method assigns priorities according to pre determined penalties for noncompliance.[17] This could be appropriate if the course teaches skills necessary for specific types of inspections, Finally, objectives could be prioritized according to relative importance to the job.

The following describes one way to prioritize items according to job importance or compliance penalties. A questionnaire may be sent to knowledgeable parties to determine the item's frequency of occurrence and its absolute importance, either on a scale of 0 (never used) to 1 (critical) as shown in Figure 6 or in dollar amounts. A chart similar to the one below could then be created.

Figure 6

ITEM	FREQUENCY	IMPORTANCE	RELATIVE IMPORTANCE (FREQUENCY X IMPORTANCE)
A	1.00	1.00	1.00
B	.20	1.00	.20
C	.30	.70	.21

An illustration may help to better explain this method. Please refer back to Figure 6. Imagine that this technique was being used to determine the relative importance of different behaviors for inspectors. Questionnaires could be sent to highly competent, experienced inspectors and other inspection experts. Let's say that item A represented the behaviors required to gain entry to a facility. Because the fictional questionnaires indicated that this behaviors occurs for every inspection, the frequency is 1. Also, because it is critical to completing the inspection, its importance is also 1. Now, say that B represents the behaviors necessary to successfully obtain a warrant. If the questionnaires indicated that these behaviors are necessary only 20% of the time, the assigned frequency is .2. Now imagine that when required, these warrants are absolutely critical to completing the inspection. Based on this information, their importance is assigned a 1. Finally, imagine that behavior C represents the behaviors necessary to learn about new technologies while on the job. This time the questionnaires indicate that the behavior is used in 30% of the inspections (thus a frequency of .3) and that while important, it is not critical to completing the inspection. Item C's importance is therefore assigned as .7. Each frequency is multiplied by the corresponding importance to obtain the relative importance. In this instance, behavior A would be the highest priority, behavior C the second priority, and behavior B the lowest priority.

One should note that the training sequence may occasionally require modification. The pilot study's results may indicate that there is a much more effective sequence of presenting the materials. Also, priorities may change with time. Therefore, the evaluations' feedback concerning the training sequence should be reviewed on a regular basis.

In addition to the relative priorities of different items, the training developers should determine what limits there are on the resources. These could include time, finances, or any others. If the resources are limited to such an extent that there is only a questionable ability to create the necessary training, then requests to increase the resources would be appropriate. The discrepancy between the need for education and the inability to provide training could be used to justify these requests. The final course would include as many of the highest priority items as resources permit.

---

[17] Fletcher.

PREPARE MEDIA

Once objectives have been determined, the media for communication must be prepared. One should remember that each type of media is appropriate in different circumstances and for different purposes. Each objective should be analyzed to determine the most appropriate media for teaching that item. For example, swimming classes are held both in a swimming pool and on dry land. Strokes and techniques are taught in the water, where students can learn through experience. In contrast, issues of safety tend to be presented as lectures. It is better to hear about the dangers of running on deck or diving into shallow water than to learn through experience! The objectives of swimming lessons are taught using training media appropriate for each particular objective. Unfortunately, traditional training tends to present even the most practical information as theoretical documentation. This poses the same problem as would attempting to teach people to swim by discussing swimming theory. The trainees may know the theory, but not how to apply it. Regardless of the type of media used, the course developers must make certain that the presented information is consistent within the course and with other courses presented by the training department.

Examinations should be developed at this time. They should be used to measure the trainees' achievement of course objectives. If exams are based on anything other than the objectives, then there is no way to determine whether or not the objectives have been met. Because training in particular is used to enable trainees to better conduct their current job requirements, training exams should be very real world oriented. Quite simply, if the objectives are met in the classroom, then they are more likely to be achieved in the real world. If the objectives are to provide skills for use on the job, then the best examinations would include performance tests or simulations of performance tests.

Examinations can be used for several purposes. One is to provide an objective criteria for determining exemptions from the course. Quite simply, if the exam is based on the course objectives and the trainee demonstrates mastery of those objectives, then there is no need for the potential trainee to take the course. The exams can also be used to determine who "passed" the course and who "failed" it. If someone did not demonstrate mastery of the objectives, several options present themselves. One is to have the trainee retake the entire course. Another option is first to have the trainee study the trouble areas, and then to demonstrate mastery of those areas. If the cause for failure appears to be that the trainee has difficultly with written examinations, other less intimidating methods of investigating and documenting competence (such as personal, non threatening interviews) should be used. A third option for managing "failed" exams would be to ignore the incompetencies. This option should not be tolerated. The entire purpose of providing education is to ensure that trainees are qualified and competent. Lowering the standards to allow anyone to claim that they received the benefit of the training lowers the perceived value of the training.

This is especially true for the EPA's inspector training programs. The EPA Order 3500.1 mandates that inspectors meet certain standards before taking positions of responsibility in the field. "Passing" inspectors that do not have the necessary skills neither helps the inspectors nor does it further the EPA's goals of having a qualified inspector staff. It also damages the training program's reputation, as inspectors will not be able to do what the training program was supposedly preparing them to do.

As mentioned previously, exams can be used as evaluation tools. In this sense, they can determine both instructor and course effectiveness.
As a final word about this phase of developing training, one should modify media as feedback indicates. This feedback could be from the pilot study or from evaluations conducted after the course has been implemented. Cost effective changes in media selection should be made as soon as possible.

CONDUCT PILOT STUDY

The training group should determine whether or not to conduct pilot studies for media, sessions, or courses on an individual basis before implementing them on a large scale. A pilot study is simply a dry run before fully implementing new material. If the course is only going to be offered once the pilot study may be excessive preparation for limited returns. However, if the course is going to be offered many times over a long period of time, the pilot study would be very appropriate for checking to see whether there are any problems with the media or the course before full implementation. In this case, it would tend to be more cost effective to run a pilot study than to revise the educational materials once implemented.

The first step in conducting a pilot study involves finding a location to hold the study. The location should be similar to if not the same as the actual facility where the course will be taught. Next, a representative audience must be picked. The audience could consist of a group which would have received the training anyway. In any case, the audience must mirror the actual trainees in regards to mix of gender, background, job classifications, ages, etc., as much as possible. The pilot run should then be conducted.

The pilot test must be evaluated. The evaluation should include quantitative information, such as the results of the final exams. It should also include qualitative data- the audiences feelings, opinions, and attitudes about the course. Suggestions should be collected. Focus groups could be used to further delve into problem areas.

Feedback from the pilot study should be incorporated as appropriate. The training materials should then be revised to rectify any problems. If extensive problems were noted, another pilot study could be run to ensure that everything works effectively.

COORDINATE ALL MEDIA AND FACILITIES TO PREPARE FOR TRAINING DELIVERY

Once the course is ready, the training group must focus upon actually bringing the training to the trainees. Facilitating media communication involves finding presenters and trainers, finding facilities, determining when to offer the course, determining how often to offer it, and removing any barriers which may prevent trainees from experiencing the course. The training group should remember that just as it experiences resource constraints, the trainees also have limits on available time, travel funds, and educational funds. Therefore, every effort possible must be made to minimize the costs of training.

The presenters and trainers must be able to communicate to an audience. They should have both technical expertise and also teaching skills. Slight deficiencies can be corrected if the potential trainer has otherwise strong qualifications; however, a great number of deficiencies pose a barrier to trainer effectiveness. The trainer usually will not need to be a world expert in both the technical and teaching fields; however, some moderate degree of competency in both areas is requisite.

The facilities must be conducive to learning. There must be good lighting, resources necessary for the media used (slide projector, overhead projector, etc.), adequate support facilities, comfortable seating, and so on.

The timing of the course should be convenient for trainees. The literature suggest that the ideal time to train is just before the skills and abilities are used on the job.[18] That way, the real world experience can reinforce the largely theoretical training materials. Courses should not be scheduled if there are known conflicts with other events including key national seminars or religious holidays. Self study materials should

[18] Troy, p. 19.

be mailed quickly to the trainees. In order to deliver training as soon as possible, there should be sufficient supply to meet the demand for the training.

Once again, feedback from evaluations should be used to determine whether any changes should be made. Different facilities could be selected, different trainers and instructors could be used, other aspects of timing could be watched, and other changes could be made.

TRAINING DELIVERY

Once it has reached this point, the course is ready for implementation. This is where all of the training group's planning and preparation combine to meet the needs for the course. One should remember that the course can still be modified for the specific audience during delivery by using some evaluation techniques. Hopefully, in session targeting will be minimized as the extensive preparation accurately prepared the materials.

EVALUATION

As discussed earlier, the courses must be evaluated in order to determine whether or not they are meeting their goals. If they are found to be missing the targets, the courses should be modified until they do achieve their goals. Continuous evaluation techniques have been discussed more comprehensively in an earlier portion of this paper and can be reviewed for further information.

POSSIBLE EFFECTS OF TRAINING ON INSPECTION QUALITY

Effective training may improve inspection quality in a number of manners. First, it provides the inspectors with all of the requirements necessary for proper inspections. Quite simply, inspectors that do not know either how or what to investigate are not likely to gather the necessary information. Training may also help inspectors to prioritize their inspection activities, therefore enabling them to have the greatest impact for the limited amount of time that they are able to inspect. Competent inspectors are much more likely to be able to find the necessary depth and type of information to investigate a situation. Well educated inspectors are more likely to be able to determine whether the sources are in compliance or noncompliance. They would also be more likely to be able to determine the magnitude or extent of any violations. All of this may serve to encourage the sources to attain states of compliance. This hypothesis is verified by the "Virginia Report," which determined that inspectors who were better trained in fact found more compliance violations. The findings indicate that various sources' compliance statuses improved after the well trained inspectors found more compliance violations.[19]

Training EPA inspectors may also improve Regional, State, and Local inspections, as these inspectors frequently work together on teams. The competent EPA inspector can bring the necessary skills to the work at hand and under review. The well-trained EPA inspector could prevent mistakes and improve the inspection's quality if the other inspectors were not yet fully trained. The well-trained EPA inspector may also serve as an on-the-job trainer by showing other inspectors areas that they may not have been aware of. This would improve the other inspectors' abilities to conduct high quality independent inspections.

It is intellectually appealing to believe that after teaching someone how to do something, they would then do the job better. Unfortunately, it does not seem to be that simple. One national training expert states that:

> A well-known but less practiced maxim is that post-training support is as important as the instruction itself. New ways of acting or thinking must be reinforced in the work setting if training is to affect business functioning according to strategic initiations.[20]

Unfortunately, a number of influences besides training may also diminish the inspectors' job performances. If the only hinderance to high inspection quality is that an individual lacks the necessary knowledge and skills, then effective training can rectify the problem. However, it appears that other factors may also hinder job performance. Incentive systems which do not both establish priorities and reward high work standards may actually encourage inspectors to focus upon less beneficial activities, thus diminishing inspector effectiveness. In addition, the incentive systems for the inspectors' supervisors may conflict with the inspectors' priorities. This conflict may distract subordinates from their primary duties by encouraging them to focus upon their supervisor's priorities rather than their own. Other influential factors may include a supervisor's managerial skills, personal interest in the job, and peer support, to name a few. Rectifying problems in these areas would require changes in the way that the Agency handles human resources.

One must develop a model in order to know exactly how all of these possible influences can affect inspection quality. This requires first developing a preliminary model, possibly based on models representing similar situations. One must then analyze the actual situation to verify that the model includes

---

[19] Pedco.

[20] Gherson, p.6.

all possible influences on job performance. Next, actual data for the variables must be collected. This may require creative attempts to quantify qualitative information. The data should then be incorporated into the model and results obtained. The model should be revised until it predicts the real world fairly accurately.

There are many benefits to developing such a model. One can forecast the effects of changes in any influential factor in order to determine how these changes may affect the end result. It allows the group to monitor itself by providing a basis for comparison. The forecasted results can be compared with actual results to determine whether or not they are in an acceptable range. It can predict training's impact on the inspection quality of the trainee offices. It can be used as a basis for determining the appropriate size for the training group and effort. The training group should not be too small, therefore unable to provide requisite training, nor too large, therefore improperly allocating resources. It is important to note that the group should not grow indefinitely, as the diminishing returns to scale could eventually damage the group's performance. This is the same idea as in the phrase "too many cooks spoil the broth." Finally, by showing the impact that effective training can have on inspection quality, the model enables the group to protect itself. The model can justify requests for resource increases or can defend against reductions in resources by forecasting those actions' effects.

RECOMMENDATIONS FOR THE AIR INSPECTOR TRAINING PROGRAM

This section contains recommendations and suggestions for activities which either require further investigation or implementation. Although the recommendations and suggestions are slanted for the Air Stationary Source inspector training program to use in later phases of this project, their ideas may be applicable to many situations. The recommendations should be considered carefully. While helpful, the suggestions are not crucial to the training program's continued ability to function. One should also consider previous comments made throughout this document as a targets for which to strive.

METHODS OF CONTINUALLY EVALUATING TRAINING PROGRAM EFFECTIVENESS

The current Air Inspector Training Program uses several methods to estimate training effectiveness. While providing some feedback, the current processes may not present complete information.

Recommendations:

- **Implement additional quantitative methods of continually evaluating training effectiveness.**
  - Perhaps the simplest method to implement would involve statistically analyzing data from course examinations. The exams indicate not only trainee competencies but, when statistically analyzed, they also indicate overall course and media effectiveness. As a word of caution, the exams must test the course objectives in order to use them in evaluating training effectiveness.
  - Another easily implemented quantitative evaluation technique would involve surveying trainees 6 months after completing the course. This could be done through questionnaire in order to minimize the resources required to complete this technique. The 6 month time period appears to be as short as possible while providing enough time for the inspectors to really use the training and determine its effectiveness and completeness. The 6 month period is only an estimate- the appropriate time period should be verified before implementing this method.
- **conduct a preliminary evaluation.**

  There will be a delay before results of newly implemented evaluation techniques can be collected and analyzed. A preliminary evaluation would provide an overall picture of whether or not the Air Stationary Source Compliance Inspector Program appears to be meeting its goals. Conducting a quick evaluation will provide immediate feedback which can be used to prepare for possible results of other evaluation techniques or to begin to correct likely problem areas. Exhibit 9 describes a method that could be used for a quick, goal-based evaluation.

Suggestions:

- **Implement other continuous training effectiveness evaluation techniques.**

  These techniques could include:

  - following inspector information, including information from exit interviews

- following inspection results
- obtaining copies of complaints and compliments relevant to the trainees or the training itself, and
- following the demand for and opinion of this training programs courses versus competitive programs' courses.

THE MODEL OF A TRAINING GROUP'S OPERATIONAL CYCLE

Recommendations:

- **document specific objectives for educational efforts.**

  Quite simply, without a set of objectives, it is impossible to know what the program is supposed to achieve, when it requires modification, when to start over, or even when the educational effort has been successful.

- **promptly meet demand for all types of courses.**

  If demand is not met, chances are that the inspectors will attempt to meet their needs elsewhere. Enough classroom courses must be scheduled and enough self study course materials must be developed to meet the demand. In addition, other media of presentation could be investigated to determine whether or not they would facilitate meeting this demand.

Suggestions:

- **consider using previously described methods of determining specific training objectives.**

  These methods could be used as follows:

  - It may be very beneficial for course designers to analyze appropriate portions of the Clean Air Act Amendments of 1990 (CAAA '90) and their respective regulations in order to determine new training needs, goals and specific objectives.
  - The critical incident technique could be very helpful in determining how to train individuals to fulfill the permitting responsibilities under CAAA '90.
  - Employing CERCLA's method of verifying GS descriptions could help the department in two ways: first, it would provide information about course needs and specific objectives and second, it would update the inspector profile.

- **prioritize the objectives.**

  Determining both the frequency and the importance of the objectives not only helps in developing the courses, but also facilitates the process of reprioritizing the objectives when needs change.

- **base end-of-course examinations on previously determined specific objectives of the training effort.**

  This allows one to evaluate not only the trainees, but also the training media and the program itself.

Trainees who fail to show the requisite competencies should review the problem areas until they can demonstrate the necessary abilities. If the exam itself poses too intimidating a threat, other, more friendly methods could be used as long as trainee competency is demonstrated. Achievement of acceptable competency levels should be documented.

- **consider using pilot studies.**

  Pilot studies will probably be most cost effective for media, sessions, and courses that will be used repeatedly over long periods of time.

OVERALL IDEAS

Recommendations:

- **incorporate feedback from newly implemented evaluation techniques when designing training.**

  Evaluation feedback should be incorporated into the training if the resulting gains would exceed their implementation costs. If the feedback is ignored then the evaluation was not likely to have served any useful purposes.

- **document specific, quantitative objectives of each training session, course, and program.**

  A set of specific objectives for each session, course, and program to achieve provides the foundation requisite for first designing training efforts and later evaluating their effectiveness. These objectives provide the course and program developers with set goals to strive for, to teach, and to test. Checking for completion of the goals not only determines whether the students mastered the objectives, but also indicates the effectiveness of various instructors, media, and the course design.

- **operate in the long run.**

  While organizations tend to respond only to issues as they emerge, it is also important to look ahead for future trends. Some energy required to look to the future will be expended without any tangible results. Despite this risk, planning ahead will allow the group to use the limited resources more in the activities of greatest importance.

Suggestions:

- **develop a model describing various factors' influences on effective inspections.**

  This model will forecast the effects of changes in any of the factors influencing inspection quality, including effective and appropriate inspector training.

- **obtain the following documents:**

  Mitchell, Garry. The Trainer's Handbook. USA: American Management Association, 1987.

  Phillips, Jack J. Handbook of Training Evaluation and Measurement Methods. Gulf Publishing Company: Houston, 1983.

Troy, Kathryn L. "Quality Training: What Top Companies Have Learned." Report No. 959, ISBN No. 0-8237-0405-X. New York: The Conference Board, 1991.

Zemke, Ron and Thomas Kramlinger. Figuring Things Out *A Trainer's Guide to Needs and Task Analysis*. Reading, MA: Addison Wesley Publishing Company, 1982.

EXHIBITS

EXHIBIT 1

EVALUATION BY TRAINEES AT END OF COURSE

Course: _____

Date of course: _____

COURSE DESIGN

Was the course appropriately designed for someone with your background?

too advanced 1 2 3 4 5 too elementary

Were the course objectives clearly stated? yes no

If they were stated, were they met? yes no

If they were not met, which ones weren't?

_____

_____

FACILITIES

How were the facilities that the course was held in?

they met my needs	1	2	3	4	5	they were inadequate
conducive to learning	1	2	3	4	5	distracting

COURSE CONTENT

perceived applicability of course to current work

right on target	1	2	3	4	5	missed the mark

perceived usefulness of course to current work

critical	1	2	3	4	5	not useful

Did you find the course to be stimulating?

fascinating	1	2	3	4	5	deadly!

How challenging was the course?

too challenging	1	2	3	4	5	not challenging at all

How were the videos, slides, or any other such materials?

clarified topics and ideas	1	2	3	4	5	confusing or unclear

How were the in class exercises?

very helpful	1	2	3	4	5	pointless

Did the course units follow a logical sequence?	yes	no
Did later units build upon previous units?	yes	no
Were the instructors' presentations well coordinated?	yes	no
Were the training materials consistent?	yes	no

TRAINERS

Were the trainers enthusiastic?	yes	no
Did they seem to be knowledgeable about their subjects?	yes	no
Did they appear to be prepared for their sessions?	yes	no
Were they able to answer questions satisfactorily?	yes	no

EXAMINATION

Did the examination test the course objectives?	yes	no
Did the examination seem to be fair?	yes	no

OVERALL

How was this course compared to all others that you have ever taken?

one of the best	1	2	3	4	5	one of the worst

Did the course meet your expectations? yes no

If not, why not?

_____

_____

_____

_____

_____

_____

_____

_____

EXHIBIT 2

EVALUATION BY TRAINERS AT END OF COURSE

Course: _____

Date of course: _____

TRAINER'S MATERIALS

Did the materials coordinate with other units? yes no

Did the materials follow a logical sequence? yes no

Did they provide adequate coverage for you to teach the course? yes no

Did they contain current issues, examples, etc.? yes no

Please comment on any suggestions that you may have for improving these materials

_____

_____

_____

COURSE CONTENT

Was there appropriate timing for the units?

great timing 1 2 3 4 5 all the timing was off

Which units required more time? _____

Which units required less time? _____

Was the information up to date? yes no

What topics should be

added? _____

_____

omitted? _____

_____

emphasized more? _____

_____

emphasizedess? _____

_____

What changes would make the course more effective? _____

_____

_____

STUDENT QUESTIONS

How many of the questions were regarding clarification of the materials?

all 1 2 3 4 5 none

Did the questions indicate that the material was too advanced? yes no

IN CLASS EXERCISES

Did these appear to help the students understand the material?

yes no

Exercises that the students had difficulty with: _____

_____

Were exercises difficult because of problems with the course material preceding the exercises?

yes no

FACILITIES

How were the facilities?

they met my needs	1	2	3	4	5	they were inadequate
conducive to learning	1	2	3	4	5	distracting

Comments: _____

_____

OVERALL

How was this course designed compared to others that you have taught?

one of the best	1	2	3	4	5	one of the worst

Suggestions: _____

_____

EXHIBIT 3

DELAYED EVALUATION BY TRAINEES

Course: _____

Date that the course was taken: _____

I found this course...

helpful	1	2	3	4	5	not helpful
to improve my job performance	1	2	3	4	5	hurt my job performance
to be of appropriate depth	1	2	3	4	5	too shallow or too detailed

if too shallow or too detailed, which? _____

_____

The information and techniques in the course were

current	1	2	3	4	5	out of date

Overall, the course

met my expectations	1	2	3	4	5	did not meet my expectations

If it did not meet your expectations, why not? _____

_____

What topics were most helpful for you? _____

_____

What would have been more helpful for you? _____

_____

Do you have any suggestions for new technologies to add to the course?

_____

_____

How would you rate the course compared to all others that you have taken?

one of the best	1	2	3	4	5	one of the worst

Have your job responsibilities changed since you took the course? yes no

If so, please describe the changes: _____

_____

_____

_____

_____

_____

_____

_____

_____

EXHIBIT 4

DELAYED EVALUATION BY TRAINEES' SUPERVISORS OR BY INSPECTORS SERVING AS ON-THE-JOB TRAINERS

Course: _____

Date that the course was taken: _____

Did the inspector's performance seem to improve after taking the course? yes no

Did the inspector who took the course seem to perform better than comparable inspectors who have not taken the course? yes no

Did the results of the course fulfill your expectations? yes no

If you answered "no" to any of the above, please explain:

_____

_____

_____

_____

Have the inspectors' duties changed since taking the course? yes no

If so, please describe the changes: _____

_____

_____

_____

_____

Do you or your subordinates have any training needs that are not currently met? yes no

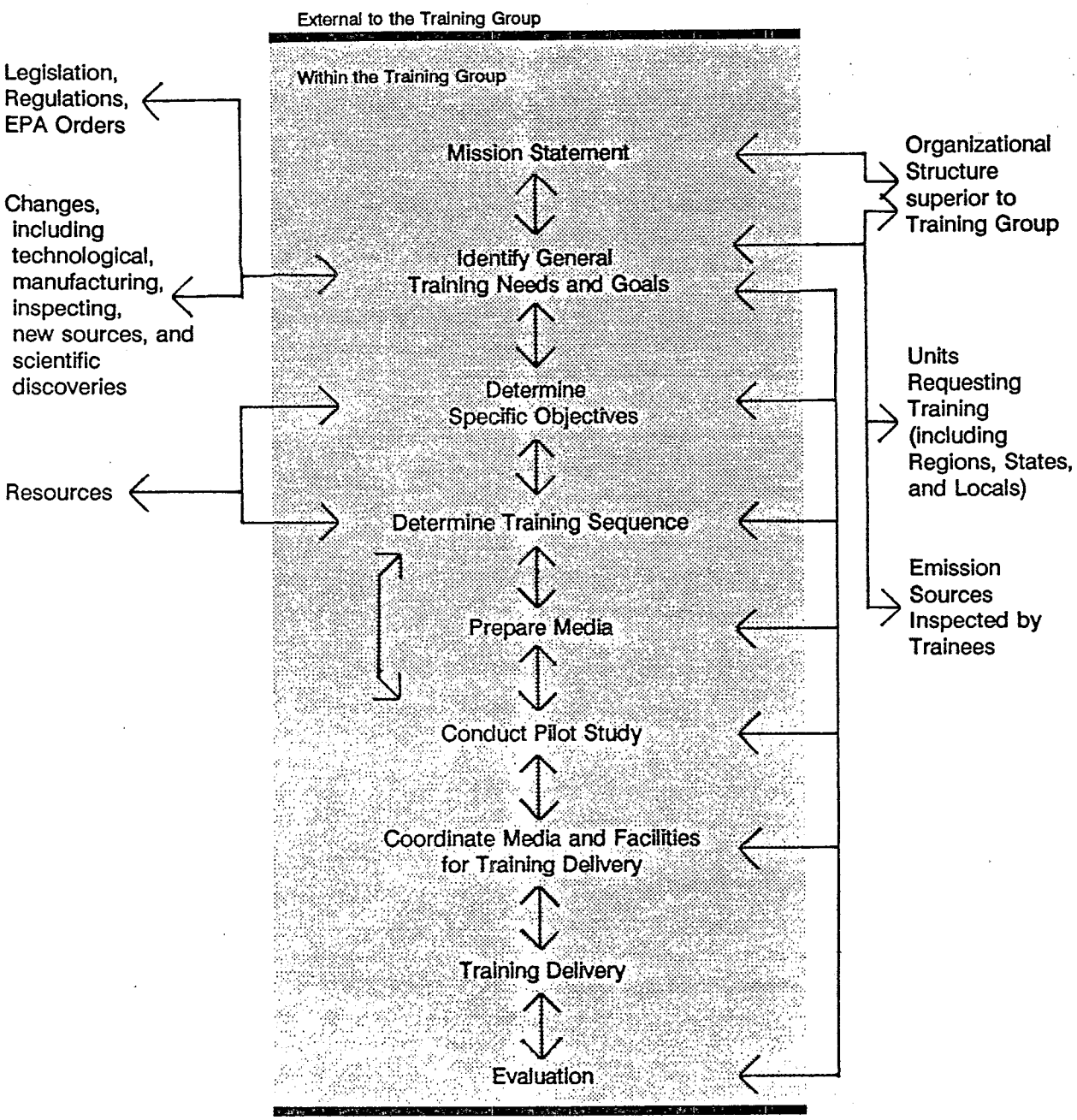
If no, please describe: _____

_____

_____

EXHIBIT 5[21]

A MODEL FOR A TRAINING GROUP'S OPERATIONAL CYCLE



[21] inspired by Nadler, p. 12 and Tracey, p. 42.

EXHIBIT 6

MISSION STATEMENT LEADING TO SPECIFIC COURSE OBJECTIVES

MISSION STATEMENT

To satisfy changing air training requirements in a timely, effective, and efficient manner in order to further the Environmental Protection Agency's goals. This includes:

1) continuously searching for new training requirements
2) operating the process as efficiently as possible
3) complying with legislation, regulations, and EPA Orders that mandate training and associated standards.
4) training EPA, Regional, and State personnel to investigate and manage source compliance with legislation and regulations

GENERAL TRAINING GOALS AND NEEDS

- training for evaluating air sources' compliance with the Clean Air Act Amendments of 1990 and the resultant regulations.
- materials to help prepare individuals to become inspectors' first line supervisors.
- training to enable personnel to issue permits according to the Clean Air Act Amendments of 1990

POSSIBLE SPECIFIC OBJECTIVES OF A TRAINING COURSE[22]

- to be able to determine whether sources emit 10 tons per year or more of a hazardous air pollutant
- to be able to determine whether sources emit 25 tons per year or more of a combination of hazardous pollutants
- to know where to obtain a current list of sources required to obtain permits
- to know how to determine the current tonnage fee to be collected
- to be able to complete 100% of the processing procedures for permit application
- to be able to obtain a historical record of modifications that would revise previous legislation, regulations, or standards
- etc.

---

[22] based on Pytte.

EXHIBIT 7

CRITICAL INCIDENT SURVEY[23]

name: _____

office: _____

Please think of an incident that you have observed which reflects effective or ineffective job performance.

What was the objective? _____

_____

_____

What were the results? _____

_____

_____

What specific behaviors led to the results? _____

_____

_____

What attitudes, values, abilities, knowledge, and skills seemed to cause the success or failure?

_____

_____

What alternative behaviors could have improved the results?

_____

_____

[23] based on Zemke, Figuring Things Out, p. 130.

EXHIBIT 8

A BEHAVIORALLY ANCHORED RATING SCALE WHICH COULD BE USED FOR BEHAVIORS EMPLOYED IN OBTAINING A SOURCE'S COMPLIANCE DOCUMENTATION[24]

EFFECTIVE BEHAVIORS	7	To request in a polite and non threatening manner the source's compliance information documenting the issues that the inspector had planned to investigate.
	6	
	5	
MODERATELY EFFECTIVE BEHAVIORS	4	To demand that the source turn over all of the compliance information documenting the issues that the inspector had planned to investigate.
	3	
	2	Aggressively demanding the necessary documentation, stating that the documents will enable the inspector to discover how the source is cheating, failing to obtain all of the necessary documentation.
	1	
INEFFECTIVE BEHAVIORS	0	Failing to obtain any of the source's compliance documentation necessary for completing the investigation.

[24] based on Zemke, Figuring Things Out, p. 130.

EXHIBIT 9

A QUICK METHOD OF EVALUATING THE AIR STATIONARY SOURCE COMPLIANCE INSPECTOR'S TRAINING PROGRAM

This document outlines one method of evaluating the Air Stationary Source Compliance Inspectors' Training Program (ASSCITP) as provided by the Air Pollution Training Institute (APTI) at a point in time. The evaluation will determine whether or not the Program is meeting its goals, and, if not, the areas that would require modification. One should note that this should not be the only evaluation of the program- it should only be used as a mechanism to determine areas which may cause problems so that planning can occur. Data from other, more comprehensive evaluation techniques should be obtained to verify and extend the quick evaluation's results.

Unfortunately, there are no set models to follow in formulating this type of an evaluation. One training expert, Elizabeth Hawthorne, reviewed all of the training program evaluations published between 1966 and 1984 in order to provide broad models for later evaluations to follow. She found that:

> Few of the evaluations conducted and reported in the literature were formative evaluations, that is evaluations that are intended to modify and improve the program in process.[25]

Instead, most of the evaluations were used to determine whether to continue or discontinue the training program in question.[26] Laurel Sneed, a nationally recognized consultant specializing in training programs, agrees with this observation.[27] While the training industry recognizes the need for formative evaluations, there are no proven methods of conducting these evaluations. Each evaluator must determine an appropriate path from scratch.

The process chosen for this evaluation of the ASSCITP involves three steps:

1) Determining the program's broadest goals
2) Investigating the ASSCITP training deliverables
3) If possible, delving into the discrepancies between the ideal and actual deliverables.

This method was chosen because it provides a basis for comparison; quite simply, one cannot evaluate an object, process or idea without comparing it against a standard. For example, if one were asked whether or not slide rules were quick calculating devices, the answer would depend on what slide rules were being compared to. They are fast when compared to working the problem with pencil and paper, but are slow when compared to using a calculator. In the same manner, the interpretation of the training program evaluation's results depends on what is used as the basis for comparison.

The EPA Order 3500.1 should be this evaluation's basis for comparison for two reasons. First, that Order now drives the training program. Second, this project is a screening mechanism; therefore, it should deal

---

[25] Hawthorne, p.26.

[26] *ibid.*

[27] Sneed.

with the overall program rather than focusing on more specific purposes. The EPA Order 3500.1 provides the most general and far reaching goals for the Program.

These goals could be determined both by examining appropriate documentation and also by interviewing key personnel. Specific goals stated in both the EPA Order 3500.1 and corresponding documentation should be noted. Interviews with personnel involved in creating the Order will verify that all goals had been properly identified. Ideally, these interviews should be in person rather than by telephone in order to facilitate communication between the interviewer and the interviewee. However, these interviews could also be conducted over the telephone without critically affecting the quality of the information obtained if resource constraints prohibit the use of personal interviews.

A similar process may be used to complete the next step- that of investigating the actual ASSCITP deliverables. This investigation should focus on those products which directly relate to the Order's goals. This process involves reviewing program documentation and interviewing appropriate personnel. The documentation review should include general descriptions of the program as well as the results of previous program evaluations. Interviews could be conducted both by telephone and in person. Again, personal interviews should be conducted whenever possible; telephone interviews may substitute for personal interviews when necessary. The interviewees could include trained inspectors, regional contacts, trainers, and personnel in the APTI. Ideally, the trained inspectors will have completed all of their training so that they can reflect back upon the entire program. The inspectors and trainers should be able to provide insight into a relatively small picture; that of their own experience. Regional coordinators should provide a much broader view of the actual program deliverables. Training program designers should provide their views of the goals as well as the process that they use to meet those goals.

Once any discrepancies between the stated goals and actual results are identified, these may be further examined. As the discrepancies have not yet been uncovered, one cannot say with certainty how best to further scrutinize them. However, one may speculate that interviews and document reviews would be suitable. Interviewees could include inspectors' first line supervisors, inspectors yet in training, trainers, and well as additional persons in the groups previously interviewed.

In summary, the evaluation will consist of up to three steps. These will all involve interviews with persons knowledgeable about specific areas, and may involve reviewing pertinent documentation. The first activity will involve determining the goals of the EPA Order 3500.1. Next, the actual training products will be determined. Finally, any discrepancies between the two will be investigated further as time permits.

BIBLIOGRAPHY

Air Compliance Inspector Training Informal Advisory Group Members. Memorandum from Seitz, John S., Director, Stationary Source Compliance Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency: May 26, 1989.

Air Pollution Training Institute. "Student Course Critique."

Air Pollution Training Institute. "Instructor's Course Summary." R 12/86.

Air-Specific Inspector Training Implementation Plan for Headquarters Stationary Source Compliance Program (OAQPS/OAR)-Narrative. Memorandum from Seitz, John S., Director, Stationary Source Compliance Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency: February 17, 1989.

Barclay, Becky, Office of Compliance Analysis and Program Operations, Environmental Protection Agency, Washington D.C. Personal Interview. June 14, 1991.

Carnevale, Anthony P. and Eric R. Schulz. "Return on Investment: Accounting for Training." Training & Development Journal. Vol. 44, No. 7: 41-72.

Centifonti, Gary J. and Richard M. Ritota. "New Jersey Cleans Up Its Permit Process." Asbestos Issues. Vol. 4, No. 5: 50-53.

Compliance Policy and Planning Branch, Office of Compliance Analysis and Program Operations, Office of Enforcement. Building the Enforcement Infrastructure: Compliance Inspector Training. 10/90.

Compliance Policy and Planning Branch, Office of Compliance Analysis and Program Operations, Office of Enforcement. Report on Regional Status of Compliance Inspector Training. 10/90.

Evaluating Business and Industry Training. Ed. Leslie S. May, Carol A. Moore, Stephen J. Zammit, Kluwer Academic Publishers: Boston, 1987.

Fletcher, Donna, Office of Cooperative Environmental Management, Environmental Protection Agency, Washington D.C. Personal Interview. June 13, 1991.

Gherson, Diane J. and Carol Anne Moore. "The Role of Training in Implementing Strategic Change." Evaluating Business and Industry Training. Ed. Leslie S. May, Carol A. Moore, Stephen J. Zammit, Kluwer Academic Publishers: Boston, 1987, 3-18.

Hanlin, James R. and Nancy J. Johns. "Championship Training." Training & Development Journal. Vol. 45, No. 2: 57-62.

Hannum, Wallace and Carol Hansen. Instructional Systems Development in Large Organizations. Englewood Cliffs: Educational Technology Publications, 1989: Ch. 13.

Hawthorne, Elizabeth M. Evaluating Employee Training Programs. New York: Quorum Books, 1987.

Inspector Training and Development Workgroup. Inspector Profile. U.S. Environmental Protection Agency: July, 1987.

Jean, Paul, Office of Human Resources Management, Environmental Protection Agency, Washington, DC. Personal Interview. June 21, 1991.

Kovalick, Walter W. Jr., Ph.D., Director, Technology Innovation Office, Environmental Protection Agency. Memorandum, Directors Waste Management Division, Environmental Services Division, Emergency & Remedial Response Division, Hazardous Waste Management Division, Toxic and Waste Management Division, Hazardous Waste Division: Dec. 20, 1990.

Lai, Larry. Project Manager, SAIC. McCleaton, VA. Personal Interview. June 24, 1991.

Mayo, C. Douglas and Philip H. DuBois. The Complete Book of Training: Theory, Principles, and Techniques. San Diego: University Associates Inc., 1987, 32.

Mitchell, Garry. The Trainer's Handbook. USA: American Management Association, 1987.

Nadler, Leonard. Designing Training Programs, the Critical Events Model. Reading, Mass: Addison-Wesley Publishing Company, 1982.

Office of Air and Radiation, Office of Air Quality Planning and Standards. Air Specific Inspector Training Plan for the Stationary Source Compliance Program. SSCD SR-89-002. U.S. Environmental Protection Agency: February 1989.

Office of Cooperative Environmental Management. EPA Inspector Profile, Draft. 9/10/89.

OSC/RPM Basic Training Academy. "Session A- Agenda." 6/90.

OSC/RPM Training Academy. "A Comprehensive Program For Incident/ Site Management."

OSC/RPM Training Academy. "Overall Objectives for Session B."

Phillips, Jack J. Handbook of Training Evaluation and Measurement Methods. Gulf Publishing Company: Houston, 1983.

Pedco, for Stationary Source Compliance Division, Environmental Protection Agency. Development of Pilot Inspection System for Virginia State Air Pollution Control Board. EPA 340/1-83-021: 1983.

Polvi, Gary, Office of Water Enforcement and Permits, Washington, D.C. Personal Interview. June 17, 1991.

Pytte, Alyson. "Clean Air Act Amendments." Congressional Quarterly. 11/24/90, Vol. 48, No. 47: 3934-63.

Radian Corporation, for Regional Operations Branch, Environmental Protection Agency. Survey of State and Local Air Pollution Agencies' Activities and Costs. EPA-450/2-90-006: February 1990.

Rassett, Allison. Training Needs Assessment. Techniques in Training & Performance Development Series. Englewood Cliffs, NJ: Educational Technology Publications, 1987. 133-55.

Rae, Renelle, Office of Human Resources Management, Washington, D.C. Personal Interview. June 17, 1991.

Rifkin, K. I., R. L. Dueker, W. F. Diggins, F. C. Foss, and Michael Senew. Task Analysis of State and Local Air Pollution Control Agencies and Development of Staffing Guidelines. Volume C: Detailed Task Data, and Staffing Guidance FIELD ENFORCEMENT. U.S. Environmental Protection Agency, Office of Air Programs, Manpower Development Staff: November 1972.

Rogoff, Rosalind L. The Training Wheel. New York: John Wiley & Sons, 1987.

Schwartz, Charles G. "Training Providers Look to New Challenges." Asbestos Issues. Vol. 4, No. 5: 16, 18, 59.

Seitz, John S., Director, Stationary Source Compliance Division, Office of Air Quality Planning and Standards, Environmental Protection Agency. Memorandum, Air-specific Inspector Training and Implementation Plans for the Stationary Source Compliance Program: February 17, 1989.

Seitz, John S., Director, Stationary Source Compliance Division, Office of Air Quality Planning and Standards, Environmental Protection Agency. Memorandum, Air Compliance Inspector Training Informal Advisory Group: May 26, 1989.

Siegler, Mark S. and Kirk Foster. Stationary Source Compliance Inspector Training Program. U.S. Environmental Protection Agency, Stationary Source Compliance Division.

Smith, W. Douglas, Senior Compliance Investigator Engineering and Inspection Section, EDD. Memorandum, "Draft" Inspector's KISS Manual: June 27, 1991.

Sneed, Laurel, President, Apprend Associates, Research Triangle Park, NC. Personal assistance. May 24, June 7, July 9 1991.

Stationary Source Compliance Division. Interim Guidance on the Enforcement Provisions of the Clean Air Act Amendments. U.S. Environmental Protection Agency: October 19, 1990.

Thomas, Debbie, Office of Waste Programs Enforcement, Crystal City, VA. Personal Interview. June 17, 1991.

Townsend, Ron, Office of Air Quality Planning and Standards, Durham, NC. Personal Interview. June 27, 1991.

Tracey, William R. Designing Training and Development Systems, *Revised Edition*. New York: American Management Associations, 1984.

Training and Development Journal. Vol. 43, No. 10.

Training and Development Journal. Vol. 44, No. 2.

Training and Development Journal. Vol. 44, No. 7.

Training and Development Journal. Vol. 45, No. 2.

Troy, Kathryn L. "Quality Training: What Top Companies Have Learned." Report No. 959, ISBN No. 0-8237-0405-X. New York: The Conference Board, 1991.

Zemke, Ron. "Measuring the Impact of Management Development." Designing and Delivering Cost-Effective Training and Measuring the Results. Ed. Ron Zemke, Linda Standke, and Philip Jones, Minneapolis, MN: Training Books, 1981. 267-268.

Zemke, Ron. "Are Sales Training Results Measurable?" Designing and Delivering Cost-Effective Training and Measuring the Results. Ed. Ron Zemke, Linda Standke, and Philip Jones, Minneapolis, MN: Training Books, 1981. 269-272.

Zemke, Ron and Thomas Kramlinger. Figuring Things Out *A Trainer's Guide to Needs and Task Analysis*. Reading, MA: Addison-Wesley Publishing Company, 1982.

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE DEVELOPING A SYSTEM FOR EVALUATING THE EFFECTIVENESS OF INSPECTOR TRAINING Phase 1: Identification of Evaluation Techniques and Development of Model for Training Program Operations		5. REPORT DATE September, 1991 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Kathleen M. Reed School of the Environment, Fuqua School of Business Duke University		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Stationary Source Compliance Division US EPA (EN-341W) 401 M Street SW Washington, DC 20460		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. U-913530-01-0
12. SPONSORING AGENCY NAME AND ADDRESS Stationary Source Compliance Division US EPA (EN-341W) 401 M Street SW Washington, DC 20460		13. TYPE OF REPORT AND PERIOD COVERED Final Draft 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
Project Officer: Mark Siegler FTS: 398-8673 Comm.#: (703) 308-8673
Stationary Source Compliance Division, US Environmental Protection Agency

16. ABSTRACT

This study was performed under the NNEMS Grant Program for the Stationary Source Compliance Division of the US Environmental Protection Agency. The study was initiated in order to identify general approaches and techniques for evaluating inspector training program effectiveness.

This document discusses the following:

- methods of evaluating training appropriateness and effectiveness
- operational activities for developing and delivering effective, targeted training
- possible effects of training on inspection quality, and
- recommended and suggested courses of action.

The research was conducted through literature searches and interviews. Only practical techniques have been described in the document. These include both well established methods as well as newer procedures. It was noted that formative evaluations have no standard formulas to follow; they must be tailored to each unique situation. Although the document frequently refers to the EPA's Air Stationary Source inspector training program, the ideas and techniques are applicable to many other programs.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Training Development Inspector Training Training Training Effectiveness Training Evaluations		

18. DISTRIBUTION STATEMENT Release Unlimited	19. SECURITY CLASS (This Report) Unclassified	21. NO. OF PAGES 45
	20. SECURITY CLASS (This page) Unclassified	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE