

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM  
SYNTHESIS OF HIGHWAY PRACTICE **163**

## **INNOVATIVE STRATEGIES TO UPGRADE PERSONNEL IN STATE TRANSPORTATION DEPARTMENTS**

**THEODORE H. POISTER**  
Institute of Public Administration  
Georgia State University  
Atlanta, Ga.

**LLOYD G. NIGRO**  
Institute of Public Administration  
Georgia State University  
Atlanta, Georgia

**RANDALL BUSH**  
Institute of Public Administration  
Georgia State University  
Atlanta, Georgia

*Topic Panel*

KENNETH E. COOK, *Transportation Research Board*  
JIM LOTHROP, *California Department of Transportation*  
ALFRED L. MILLER, *Federal Highway Administration*  
W. J. QUINN, *Oregon State Highway Division*  
ROBERT STULL, *Pennsylvania Department of Transportation*  
ROBERT WICKER, *Louisiana Department of Transportation and Development*

RESEARCH SPONSORED BY THE AMERICAN  
ASSOCIATION OF STATE HIGHWAY AND  
TRANSPORTATION OFFICIALS IN COOPERATION  
WITH THE FEDERAL HIGHWAY ADMINISTRATION

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Research Council was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as: it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; its relationship to the National Research Council is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the National Research Council and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Research Council and the Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

Project 20-5 FY 1986 (Topic 18-02)

ISSN 0547-5570

ISBN 0-309-04908-3

Library of Congress Catalog Card No. 90-70648

**Price \$7.00***Subject Area*

Administration

*Mode*

Highway Transportation

**NOTICE**

The project that is the subject of this report was a part of the National Cooperative Highway Research Program conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council. Such approval reflects the Governing Board's judgment that the program concerned is of national importance and appropriate with respect to both the purposes and resources of the National Research Council.

The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the American Association of State Highway and Transportation Officials, or the Federal Highway Administration of the U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical committee according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

The National Research Council was established by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the Federal Government. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in the conduct of their services to the government, the public, and the scientific and engineering communities. It is administered jointly by both Academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

The Transportation Research Board evolved in 1974 from the Highway Research Board, which was established in 1920. The TRB incorporates all former HRB activities and also performs additional functions under a broader scope involving all modes of transportation and the interactions of transportation with society.

*Published reports of the***NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM***are available from:*

Transportation Research Board  
National Research Council  
2101 Constitution Avenue, N.W.  
Washington, D.C. 20418

---

**NOTE:** The Transportation Research Board, the National Research Council, the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the individual states participating in the National Cooperative Highway Research Program do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

Printed in the United States of America

## **PREFACE**

A vast storehouse of information exists on nearly every subject of concern to highway administrators and engineers. Much of this information has resulted from both research and the successful application of solutions to the problems faced by practitioners in their daily work. Because previously there has been no systematic means for compiling such useful information and making it available to the entire highway community, the American Association of State Highway and Transportation Officials has, through the mechanism of the National Cooperative Highway Research Program, authorized the Transportation Research Board to undertake a continuing project to search out and synthesize useful knowledge from all available sources and to prepare documented reports on current practices in the subject areas of concern.

This synthesis series reports on various practices, making specific recommendations where appropriate but without the detailed directions usually found in handbooks or design manuals. Nonetheless, these documents can serve similar purposes, for each is a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems. The extent to which these reports are useful will be tempered by the user's knowledge and experience in the particular problem area.

## **FOREWORD**

*By Staff  
Transportation*

This synthesis will be of interest to administrators, personnel officers, and others interested in methods for upgrading capabilities of DOT employees through training and development. Information is provided on programs and processes used by states for recruitment, training (both for new employees and for retraining of existing employees), and management and career development.

Administrators, engineers, and researchers are continually faced with highway problems on which much information exists, either in the form of reports or in terms of undocumented experience and practice. Unfortunately, this information often is scattered and unevaluated, and, as a consequence, in seeking solutions, full information on what has been learned about a problem frequently is not assembled. Costly research findings may go unused, valuable experience may be overlooked, and full consideration may not be given to available practices for solving or alleviating the problem. In an effort to correct this situation, a continuing NCHRP project, carried out by the Transportation Research Board as the research agency, has the objective of reporting on common highway problems and synthesizing available information. The synthesis reports from this endeavor constitute an NCHRP publication series in which various forms of relevant information are assembled into single, concise documents pertaining to specific highway problems or sets of closely related problems.

High rates of retirement and a shrinking supply of civil engineering graduates mean that state DOTs need to expand and improve their professional staffs to meet an increasing workload. This report of the Transportation Research Board describes the programs used by states to recruit new employees, train them, develop their capabilities, and provide management and career development opportunities.

To develop this synthesis in a comprehensive manner and to ensure inclusion of significant knowledge, the Board analyzed available information assembled from numerous sources, including a large number of state highway and transportation departments. A topic panel of experts in the subject area was established to guide the researcher in organizing and evaluating the collected data, and to review the final synthesis report.

This synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As the processes of advancement continue, new knowledge can be expected to be added to that now at hand.

## CONTENTS

1	SUMMARY
3	CHAPTER ONE INTRODUCTION The Problem and Its Sources, 3 Purpose and Approach, 5
6	CHAPTER TWO OVERVIEW OF CUSTOMARY COMPONENTS OF THE PERSONNEL-MANAGEMENT PROCESS Human-Resources Forecasting and Planning, 6 Recruitment Programs, 6 Training and Development, 6 Performance Management, 7
9	CHAPTER THREE SUMMARY OF SURVEY RESULTS Existing and Anticipated Shortages, 9 Use of Techniques, 9
11	CHAPTER FOUR STRONGER EMPHASIS ON HUMAN-RESOURCE DEVELOPMENT Recognizing the Importance of People, 11 Developmental Approaches to Performance Management, 13
15	CHAPTER FIVE STRATEGIES FOR IMPROVED TRAINING Enhanced and Expanded Technical Training, 15 Information-Based Management of Training Programs, 18 Training Networks, 19 Increased Support for External Technical Training, 20
22	CHAPTER SIX MANAGEMENT-DEVELOPMENT STRATEGIES Management Development for Engineers and Others, 22 Executive-Development Programs, 25
27	CHAPTER SEVEN NEW EMPHASIS ON CAREER DEVELOPMENT Internship and Traineeship Programs, 27 Career Planning and Guidance Initiatives, 28 Job Rotation and Cross-Training, 29 Assessment Centers, 30
33	CHAPTER EIGHT INNOVATIVE RECRUITING AND RETENTION STRATEGIES
35	REFERENCES

## ACKNOWLEDGMENTS

This synthesis was completed by the Transportation Research Board under the supervision of Robert E. Skinner, Jr., Director for Special Projects. The Principal Investigators responsible for conduct of the synthesis were Herbert A. Pennock and Martin T. Pietrucha, Special Projects Engineers. This synthesis was edited by Judith Klein.

Special appreciation is expressed to Theodore H. Poister, Director, Institute of Public Administration, Georgia State University; Lloyd G. Nigro, Associate Professor, Institute of Public Administration, Georgia State University; and Randall Bush, Research Assistant, Institute of Public Administration, Georgia State University, who were responsible for the collection of the data and the preparation of the report.

Valuable assistance in the preparation of this synthesis was provided by the Topic Panel, consisting of Jim Lothrop, Chief, Office of Training and Management Analysis, California Department of Transportation; Alfred L. Miller, State Programs Training Officer, National Highway Institute, Federal Highway Administration; W.J. Quinn, Engineer of Materials and Research, Oregon State Highway Division; Robert Stull, Chief, Training Division, Pennsylvania Department of Transportation; and Robert Wicker, Safety Administrator, Louisiana Department of Transportation and Development.

Kenneth E. Cook, Transportation Economist, Transportation Research Board, assisted the NCHRP Project 20-5 Staff and the Topic Panel.

Information on current practice was provided by many highway and transportation agencies. Their cooperation and assistance were most helpful.

# INNOVATIVE STRATEGIES FOR UPGRADING PERSONNEL IN STATE TRANSPORTATION DEPARTMENTS

## SUMMARY

Given the mix of a high rate of retirement, program growth, and changing program emphases, along with a shrinking supply of new civil engineering graduates, many states are finding that they need to place a high priority on upgrading their professional personnel. Many departments of transportation (DOTs) need not only to recruit new engineers to keep pace with attrition, but also to expand their professional staffs in order to carry on an increasing and more varied work load. In light of these human-resources problems, this synthesis identifies existing public-sector recruitment, training, and management-development techniques that have been found to offer long-term as well as short-term solutions.

Many DOTs have initiated their own programs in response to the challenge; this report synthesizes these practices. Beyond describing the state of the practice, the objective is to identify innovative techniques employed by particular state DOTs that appear to be successful and have utility for other agencies facing similar problems.

This was initiated with a survey questionnaire mailed to the personnel directors of the DOTs of each state and Canadian province. Information was solicited on existing or projected shortages of qualified professional, technical, or managerial personnel, as well as on strategies for coping with such problems or preventing them from arising. Innovative programs that surfaced in the survey were then followed up through the use of telephone interviews or on-site visits.

The answers to the survey showed an increased emphasis on training and development activities (although most of the activity concentrated on improving current job performance rather than upgrading employees' capabilities to undertake more demanding work). Internal training capacities in many DOTs have been expanded, but an equally apparent trend is a growing reliance on training networks including other state agencies, professional associations, universities, community colleges, and private contractors. Rather than expanding or otherwise enhancing technical-training activities, other DOTs have concentrated on more cost-effective management of existing training programs, typically by using sophisticated information-management technology.

In addition to the direct approach of upgrading capabilities through training and development, many other management tools have at least potential developmental components, and several of these practices and techniques were included in survey questions. The practice most frequently cited as having substantial or extensive use for developmental purposes was the accretion of duties, simply assigning progressively more difficult and challenging responsibilities to individuals.

Techniques that were reported as not frequently used but having potential for the upgrading of personnel included management-by-objectives (MBO) systems, performance appraisals, task forces, job rotation or temporary duty assignments, and traineeships. The survey identified a number of innovative strategies or approaches for upgrading personnel that are planned or under way in DOTs, including training and development programs focusing on management and supervision; the establishment of

career-development programs, including the use of assessment centers; and the use of video-based training.

Recognizing that merely upgrading existing employees will not meet the demands imposed by program growth and changing emphases in the face of attrition caused by the graying of the workforce, DOTs have had to improve their ability to recruit qualified personnel. Trends in this area include competitiveness and flexibility in the areas of pay and benefits and programs to attract qualified minorities and women and to encourage their career development.



## INTRODUCTION

Many state departments of transportation (DOTs) are currently facing shortages of professional personnel, primarily civil engineers. Nationwide such shortages are expected to increase over the next several years. These shortages arise from the "graying" of the workforce and concomitant high turnover rates at senior levels as well as difficulties in attracting sufficient numbers of new entry-level professionals into the departments. At both the senior and entry levels, the inferiority of governmental salaries compared with what these professionals can earn in the private sector is a contributing factor to this problem, which if left unattended could leave many DOTs severely understaffed and unprepared to meet the demands placed on them in the future.

The Transportation Research Board (TRB), in a major report issued in 1985 (1), documented the roots of these problems and extrapolated the extent of shortages of professionals in DOTs over the next several years. The report noted that state DOTs were beginning to anticipate and respond to these problems, however, and concluded that a potential crisis would be avoided as long as the DOTs attended to several distinct professional needs created by changing internal and external conditions. Several strategies were identified for meeting these needs, including:

- Shifting the mix of skills as required by changing highway program emphasis from major construction to rehabilitation, maintenance, and bridge repair.
- Substituting consulting expertise for in-house expertise when it is efficient to do so.
- Improving the versatility, depth, and use of engineering technicians, when appropriate, in order to free professional engineers from many routine activities and reserve them for the most complex and demanding tasks.
- Exploiting more fully the potential of computers to improve the productivity of professional personnel in such areas as design and drafting, pavement management, and maintenance management.

Two other strategies identified in the TRB report that relate more directly to upgrading professional personnel in state DOTs include:

- Training mid-level and management engineers to generate the skills needed by senior professionals so that those engineers can be prepared to replace retiring top-level personnel.
- Upgrading recruitment practices, professional-development techniques, and compensation practices to ensure that DOTs attract, nurture, and retain highly qualified engineers.

Over the past few years many state DOTs have developed more proactive and innovative approaches in these areas, and this synthesis is concerned with the strategies they are employing for upgrading professional personnel in the face of actual or anticipated shortages discussed previously.

### THE PROBLEM AND ITS SOURCES

To a great extent the difficulties that state DOTs face in being assured of adequate complements of highly qualified personnel at various levels in the organization reflect global trends in the larger society. A recent study conducted for the U.S. Department of Labor entitled *Workforce 2000* (2) points out that between now and the end of the century the nation's population and workforce will grow more slowly than at any time since the 1930s and that the number of new young workers entering the labor force will decline. This report projects that in the 1990s the U.S. labor force will be expanding by only 1 percent annually compared with 2.9 percent during the 1970s, and that among other effects this trend is likely to tighten labor markets and force employers to use more capital-intensive production systems.

In addition, the fastest-growing jobs will be in the professional, technical, and sales fields, which require the highest educational and skill levels, and individuals entering the labor market with such qualifications will be the most sought after. Furthermore, the report projects that as the "baby boom" ages, and the "baby bust" enters the workforce, the average age of the workforce will climb from 36 today to 39 by the year 2000, whereas the number of young workers age 16 to 24 will drop by about 8 percent. Although there are advantages to a more experienced, reliable, and stable workforce, the *Workforce 2000* report (2) also points out that, under present policies at least, older workers are less willing to relocate, retrain, or change occupations at a time when the overall economy is demanding more flexibility in its workforce.

With respect to state DOTs in particular, these trends may well be more accentuated than in the general workforce. This is because many DOTs face the double-barreled problem of an aging workforce and high turnover at the upper levels as well as new job creation and shallow pools of qualified applicants at the lower levels. Thus, DOTs will be challenged to recruit sufficient numbers of qualified professionals into the organization while further developing the capabilities of mid-level and entry-level personnel on an accelerated schedule in order to have a cadre of experienced individuals who are ready to assume the more demanding positions opening up above them.

Many state DOTs may find themselves in a situation similar to that of various federal government agencies whose overriding requirement over the next 12 years will be to add more highly skilled employees to their workforces, according to a report entitled *Civil Service 2000* prepared for the U.S. Office of Personnel Management (3). Noting that few professionals in such fields as engineering and computer science will be hired from outside government at much above entry level because the pay and benefits are generally not competitive, this report states that these agencies will find it necessary to invest heavily in the continuing development of employees they do retain. Furthermore, the knowledge and skills needed for some higher-level positions are so specialized and agency specific, concerning contract and procurement regulations, for example, that government itself may be the only training ground available. Thus, agencies will have to reinvest continuously in their senior level workforces and may have to provide some of the most challenging training and development opportunities on an in-house basis.

### Coping with High Turnover

Of the approximately 41,000 professionals currently employed in state highway agencies, 30,000, or about 75 percent, are civil engineers. The TRB study (1) suggests that up to one-third of this current pool of transportation engineers is likely to have retired by 1995, as the generation that built the nation's Interstate highway system complete its career in government. This report projects differential retirement rates for those engineers in nonmanagement positions, half of whom are older than 45 years of age, and those in management positions, two-thirds of whom are older than 45 and one-quarter of whom are older than 55. The TRB study projected that 13.5 percent of the nonmanagement engineers and 17 percent of the management engineers in state DOTs would retire by the end of 1989.

Obviously there is wide variation among states on these trends, as well as fluctuation within states over time, so that at any particular point some states are likely to be hit harder by this problem than others. An article in *American City & County* (4) indicated that at least a dozen states would have lost 25 percent or more of their employees in the five-year period ending in 1989. This article showed the Iowa DOT in the lead, with a 41 percent turnover rate, and South Carolina in the midst of a 40 percent department turnover, whereas the Florida DOT was experiencing a 35 percent retirement rate among its senior people statewide.

In addition to retirements brought on by aging, some agencies' turnover rates are further heightened by senior staff taking advantage of early-retirement windows or opting for "informal retirement" prompted by financial considerations. These engineers, with perhaps 25 or 30 years of service in a given DOT but still at an age of prime earning potential, can collect full or partial pensions from state government and then go to work for top-paying consulting firms where they are often performing on a contract basis the same kind of work they were doing in the DOT. In fact, the strategy of contracting out more design work to consulting firms in the absence of sufficient in-house expertise can further aggravate the loss of highly qualified personnel to these private-sector firms.

The capacity problems created by high turnover rates in some DOTs may be exacerbated by a lack of experienced professionals

who are prepared to assume the responsibilities of the high-level jobs that are being vacated, a situation that arises from downsizing and hiring slowdowns in the past. Many state DOTs have gone through cycles of expansion and retrenchment of their total workforce commensurate with long-term trends in the emphasis on highway construction and associated expenditure levels. According to the TRB report (1), total employment in state highway agencies expanded from 203,000 in 1956 to 297,000 in 1970, an average increase of 2.5 percent per year, as these DOTs geared up for the Interstate program and the general boom in highway construction that prevailed during that period.

From 1971 to 1981, however, employment in these same agencies fell from 297,000 to 244,000, a decline of about 1.8 percent per year, as construction activities were phased down and public-sector priorities shifted elsewhere. Many state DOTs operated under a hiring freeze during this period, and although some could accommodate to reduced budget ceilings by attrition, others, such as Pennsylvania, had to furlough engineers and other employees under conditions of tight fiscal constraints. In some states, such as North Carolina, the principal result of this expansion/contraction sequence is a workforce in which a dominant cohort of professional engineers and others hired during the boom period of the 1950s has crested through the system to occupy most of the positions in the top several layers of the department. As these senior officials leave the DOT there is a dearth of seasoned professionals in the next oldest age group who have been developed to the point of assuming all these high-level positions, creating what some fear could amount to a leadership vacuum at the top.

### Increasing Demand for Entry-Level Professionals

In addition to replacing more experienced professionals whose services are lost to the organization through attrition, many DOTs also have increased demands for new, entry-level professional engineers to keep pace with program growth. After a decade of shrinking fiscal resources that plagued many DOTs, the user fees that finance highway programs have been increasing over the past several years, along with general economic growth and highway use, and the decline in highway construction seems to have bottomed out. Virginia, for example, has embarked on a massive new construction program in the past few years, and Pennsylvania has rejuvenated its highway construction program after a moratorium that was imposed to regain fiscal solvency. From a national perspective, at this point it appears reasonable to assume that funds will be available to finance moderate growth in highway programs well into the 1990s.

Somewhat ironically, DOTs are having to confront new challenges just as they are losing many of the most experienced engineers. As the dominant cohort of engineers in many DOTs has matured, so have their original projects. These major facilities, which tend to form the core of many state highway systems, are now coming due for renovation, major maintenance, and reconstruction as well as expansion. As pointed out in *American City & County* (4), "as state officials begin gearing up for those projects, their top people are leaving." Although new college civil engineering graduates just entering the workforce obviously cannot begin to replace the senior people who are leaving the DOTs, the departure of so many seasoned veterans, coupled with shifting program emphases, can be expected to trigger series

of promotions, reassignments, and reorganizations, which will ultimately create greater demand for entry-level professionals.

Thus many DOTs need not only to recruit new engineers to keep pace with attrition, but also to expand their professional staffs in order to carry on an increasing and more varied workload. The TRB report (1) projects conservatively that net employment in state highway agencies will grow at about 1.8 percent per year, based on an assumed real program growth of 2.5 percent and productivity gains of 0.7 percent per year. Combining both attrition and program growth indicates that nationally the need for new highway engineers in state DOTs will be equivalent to about 4.9 percent of the engineering workforce currently in these agencies, or about 1450 more engineers per year over the next several years.

However, although the supply of new engineers available to state DOTs nationally has been more than adequate in recent years, this trend may not last. In recent years fewer college students have been selecting engineering as their degree program, and within that pool the percentage entering the civil engineering field has been declining. If the competition to hire new graduates intensifies, the DOTs will be disadvantaged by the salaries they offer, which are typically well below those provided by private-sector employers of civil engineers.

This salary disparity exists not only at the entry level but throughout the system up to senior levels, where district engineers, for example, earn salaries on the order of 70 percent of those paid to their private-sector counterparts. The prospect of greater job security and other civil service advantages notwithstanding, these salary differentials make the entire career track in state DOTs less attractive to potential new entrants. The need to maintain an adequate cadre of professionals is aggravated by the fact that, as might be expected, some engineers join DOTs at the entry level, and after gaining experience over the first few years, during which the agency invests in them, move to private-sector jobs that offer the lure of higher salaries. Thus, the real challenge to many DOTs is to recruit and retain qualified engineering professionals.

Along the way, substantial upgrading of both junior-level and mid-level professional personnel must occur if DOTs are to maintain the capacity to perform up to standard and meet the demands placed on them. First, the diversification of many agencies' efforts beyond the traditional highway construction into rehabilitation, repair of bridges and structures, and a serious commitment to preventive maintenance will require a broadening of the mix of technical skills in-house. In addition, there is greater concern with the economic, safety, and environmental aspects of highway projects than ever before, which also requires a broadening of in-house capacity. Second, the accelerated pace of advancement of the technology available to DOTs, particularly with respect to computer applications, is a double-edged sword: its potential for substantial productivity improvement can be realized only if DOT personnel continuously upgrade their knowledge and skills in order to remain current with the state of the art.

Third, with one out of seven managers in state DOTs likely to retire in the next five years, there is a pressing need in at least some states to develop professional engineer/managers who are

prepared to assume the responsibilities of leadership in their agencies in the future. In addition to their technical expertise, analytical ability, and familiarity with computer capabilities, these professionals will also need to develop an understanding of management principles and systems, group dynamics and organization behavior, a sense of entrepreneurship and sensitivity to the larger political environment, and the ability to think strategically with a more global perspective. In summary, these continuing developmental requirements with regard to technical, technological, and managerial capabilities require substantial investment in the upgrading of state DOT personnel.

## PURPOSE AND APPROACH

As is apparent from the above discussion, there is wide variation among state DOTs in terms of the supply and demand equations for professional personnel that they face. Some states have had, or currently have, shortages in key occupational areas, whereas others anticipate such shortages, and some states will not face problems in this area. Some states face higher attrition of senior professionals than do others, and some states operate in a more competitive labor market for civil engineers than do others. Yet, given some mix of disproportional retirements, program growth and changing program emphases, and a shrinking supply of new civil engineering graduates, many states are finding that they need to place a high priority on upgrading their professional personnel.

Many DOTs have initiated programs in response to this challenge. The purpose of this report is to synthesize practices in this area. Beyond describing the state of the practice, the objective is to identify innovative techniques employed by particular state DOTs that appear to be successful and have utility for other agencies facing similar conditions.

This study was initiated with a questionnaire that was mailed to the DOTs in each state and Canadian province in an attempt to update the characteristics of the problem and identify programs or special initiatives these agencies have implemented in order to upgrade professional personnel. Innovative programs or techniques that surfaced in the survey prompted follow-up telephone calls. Most of the information contained herein was collected by extensive telephone interviewing with a total of 49 individuals in 20 DOTs and other organizations. In addition, site visit interviews were conducted in three DOTs. Although this effort obviously could not be expected to identify all the innovative strategies and techniques in use by DOTs across the United States, it is intended to provide a representative sampling of what DOTs are doing to further upgrade personnel.

Although the upgrading of professional personnel is a high-priority need in state DOTs at the present time, public-sector agencies have always been engaged in this kind of activity and maintain a repertoire of management strategies and human-resource development approaches that contribute to this function. These are overviewed in the next section of this synthesis. The following section summarizes the findings of the mail-out survey. This in turn is followed by five sections that discuss particular sets of strategies employed by state DOTs in this area based primarily on information elicited by the telephone interviewing.

## OVERVIEW OF CUSTOMARY COMPONENTS OF THE PERSONNEL-MANAGEMENT PROCESS

In light of the human-resources problems faced by a growing number of state DOTs, there exists an increasingly urgent need to identify recruitment, training, and management-development techniques that offer long- as well as short-term solutions. Attracting, developing, and retaining necessary human resources are challenges facing both public and private organizations. A wide variety of techniques addressing all phases of the personnel-management process have been developed, and innovations continue to emerge in public-sector organizations in response to changing demands and conditions. This section provides a brief overview of techniques that appear to be most relevant to the situation facing state DOTs.

### HUMAN-RESOURCES FORECASTING AND PLANNING

Many public-sector employers currently face or anticipate shortages of key professional, technical, and managerial personnel. They can no longer afford to assume that internal and external sources of supply will satisfy demand without positive actions by agency human-resources managers. Accordingly, public agencies are making efforts to enhance their capabilities in the areas of human-resources forecasting and planning. These activities have several broadly defined purposes. First, they are designed to allow management to anticipate labor market and other environmental trends relevant to the agency's existing and future needs. Second, they are intended to provide the information needed to formulate and implement effective policies and programs in such areas as recruitment, compensation, training, and career development. Third, they provide a necessary capacity to evaluate agency human-resources programs in light of organizational goals and performance objectives.

Forecasting and planning functions may be organized in a variety of ways. In some agencies, these activities are incorporated by an existing personnel department. Another model establishes a separate unit to perform a variety of analytic and evaluative tasks, including human-resources forecasting and planning. A decentralized approach under which human-resources specialists are deployed to the various operating units of the organization is also a possibility. In all cases, it is considered essential that the organization develop the integrated information systems and analytic capabilities necessary to provide a coordinated approach to these functions. Likewise, line management on all levels must be committed to this concept and be willing to provide the necessary support.

### RECRUITMENT PROGRAMS

Although a wide variety of factors influence the attractiveness of professional, technical, and managerial positions in public agencies, it is important that they offer competitive salaries and benefits throughout their job series and grade structures. Positive recruitment strategies, coordinated with increased supervisory discretion and accelerated hiring processes, are now being used to overcome some of government's traditional handicaps in the race to attract qualified candidates for entry-level as well as other positions. These positive strategies include:

- Expanding the geographic area covered by the recruitment effort, including visits by trained recruiters.
- Developing cooperative arrangements with suppliers such as universities, technical schools, and high schools including internships, traineeships, exchanges of personnel, scholarships, and other bilateral programs designed to prepare students for organizational tasks and to encourage them to consider working for the agency.
- Attracting minorities and women through affirmative action and upward mobility programs.
- Streamlining hiring procedures to eliminate long delays that result in lost opportunities to hire the most desirable candidates.
- Changing classification and pay structures to give management greater discretion in making competitive entry-level pay offers to candidates.
- Restructuring and simplifying jobs to expand the pool of qualified candidates available to the agency.
- Designing developmental career paths within the agency that are attractive to potential employees.
- Identifying existing groups of employees within the organization who are potentially candidates for open positions and encouraging them to develop the required skills and experience.
- Improving pay and benefits in order to make them more competitive at the entry level.

### TRAINING AND DEVELOPMENT

Training of all kinds is now recognized to be a necessary investment in the human-resources base of organizations. In general terms, training efforts may be divided into the following categories:

- *Employee orientation for entering personnel in all job categories.* This type of training is designed to familiarize new workers

with: (a) the organization's mission and programs; (b) personnel rules, procedures, and regulations; (c) job content, requirements, and resources; and (d) how their jobs relate to other jobs in the agency. Orientation training is almost always conducted by supervisors and personnel specialists.

- *Technical training for new and established employees in all job categories.* Technical training for new workers is designed to supplement the education, experience, and pre-entry training they bring with them to the organization. Depending on the nature of the position, more or less extensive training will be required to satisfy the performance needs and standards of the agency. Training for established employees is intended to keep them up to date with changing technologies, job content, and agency programs. As with entry-level training, the required frequency and extent of skills-upgrading training for midcareer and other workers has tended to increase as the pace of organizational and technical change has accelerated. Technical training may be conducted on the job site, at a training center, or at facilities provided by a central personnel agency or contractor. Instructors may be supervisors, specialized trainers employed by the agency or a central training facility, or personnel provided by contractors or educational institutions.

- *Supervisory training for personnel holding first-line supervisory positions and those about to assume such responsibilities.* Because supervisors are largely responsible for carrying out day-to-day activities of the agency, their ability to organize, lead, and motivate people is crucial to overall performance. Supervisors, therefore, need certain basic human-relations skills in addition to a command of those technical abilities required to carry out assigned tasks. Also, because many aspects of the agency's personnel system (e.g., performance appraisal, wage and salary administration, discipline, and contract administration) must be routinely implemented by supervisors, it is important that they fully understand these systems and their purposes. With increasing demands on public agencies for high levels of effectiveness and efficiency, the need for supervisors with appropriate knowledge, skills, and abilities in the technical, human-relations, and personnel system areas has become apparent. In response, many public agencies have established in-house training programs for their first-line supervisors. Others take advantage of programs offered by central personnel agencies, universities and colleges, and private contractors.

- *Management training and development.* As the demands on public managers for high levels of skill and ability across a broad array of responsibilities have intensified, it has become obvious that large-scale investments in training are required. Most public managers entered government as specialists in areas such as engineering, medicine, and law. Most also have never had any formal training in management or public administration. Many have become highly competent managers through their own willingness to seek out training/educational resources and years of "learning on the job." It is now recognized that public agencies need to assume major responsibility for the development of managerial talent.

In order to maintain and improve the managerial capacities of their organizations, many public agencies are: (a) providing or arranging training for their managerial personnel to enhance their command of human-relations and leadership skills and bring them up to date in such skill areas as computer applications, budget formulation, and human-resources planning and

(b) systematically linking their management career ladders with appropriate training opportunities and resources.

Across the public sector, there are wide variations in commitment and resources investments for management training and development. The pattern over the past 20 years, however, has been a steady expansion on all levels of government.

- *Executive development.* Although relatively small in numbers, public executives have primary responsibility for the policy formulation, program planning and evaluation, and boundary-spanning functions of their agencies. In recognition of the crucial role played by executives, the federal government and some states have established executive training facilities administered by their central personnel agencies.

In addition to state DOTs, many other government organizations are facing accelerated turnover of top-level senior executives through retirement and movement into the private sector. Consequently, these agencies are currently facing, or shortly will be facing, shortages of talent and experience at the highest levels of responsibility. The vast majority of public-sector executives have achieved their positions after long careers as line managers within their agencies or program fields, and most developed their skills without formal training in administration. The developing shortage of experienced executive-level personnel, however, will probably force many agencies to "fast track" promising managers to fill these positions.

In addition to requiring greater attention to career-development programs and the early identification of executive potential in the managerial ranks, accelerated promotions to the executive levels is associated with a need to substitute formal training and education for valuable experience that might otherwise be acquired through a slower climb up the management hierarchy.

Therefore, agencies that have not made substantial investments in executive development over the years are now placed in the position of having to formulate and implement policies designed to address this problem quickly. For most, this means using a combination of in-house training processes such as management internships, job rotation and cross-training, and agency-sponsored off-the-job training/education experiences made available by other agencies, governments, professional societies, and universities. In some cases, central personnel agencies have created executive development-oriented programs available to personnel selected by their organizations. Frequently, universities and colleges serve as valuable resources through their public administration and policy degree programs and through special seminars and training institutes designed for practitioners.

## PERFORMANCE MANAGEMENT

Human-resources management in the public sector has become increasingly performance oriented. Limited resources, fiscal stress, and public demands for higher levels of efficiency/effectiveness have contributed to a pronounced emphasis on the development and implementation of personnel-management structures, policies, and practices that foster higher levels of productivity. The federal government and a number of state governments have recently undergone civil service reforms designed to support management's efforts to improve productivity and performance. Specific examples of innovations in this area include:

- merit pay plans;
- performance appraisals keyed to performance goals and objectives;
- simplification and decentralization of personnel policy and rule-making authority in order to foster flexibility and adaptiveness to local conditions;
- creation of “senior executive services” operating under special career systems, pay plans, performance appraisal methods, and tenure rules; and
- experimentation with new classification plans and criteria intended to encourage mobility, retention of high performers, and competitive recruitment.

Implementation of these innovations has required a commitment to the selection, development, rewarding, and retention of supervisors and managers able to operate effectively within a

performance-oriented environment. To the extent that this commitment has developed, it has been reflected in:

- organizational personnel practices and incentives;
- administrative structures and procedures built around human-resources management concepts such as centralized analytic and policy-making units, goals-oriented manpower planning, and developmental career systems design; and
- the content of supervisory, managerial, and executive training.

In the last case, it is not unusual for this training to include group and program leadership skills, analytic techniques for the allocation of human and material resources, productivity measurement, management by objectives (MBO), the formation and management of temporary or task force types of organization, worker-based quality circles, and a variety of other approaches to increasing workforce productivity.

## CHAPTER THREE

**SUMMARY OF SURVEY RESULTS**

The survey was distributed to the personnel directors of the DOTs in each state and Canadian province in the fall of 1987. It was designed generally to solicit information on existing or projected shortages of qualified professional, technical, and managerial personnel and on strategies for preventing or coping with such a problem. Beyond confirming aggregate trends in this area, the primary purpose of the questionnaire was to identify particular programs, projects, and other initiatives that the departments were undertaking in order to further strengthen their human-resource-development efforts in light of current or impending shortages of qualified personnel. Innovative programs that surfaced in the survey were then followed up through telephone interviews or site visits, to be discussed in a later section.

Responses to the survey were received from DOTs in 32 states and two Canadian provinces (Table 1). Although the validity and reliability of the information thus obtained are obviously weakened by the fact that the survey results are based on self-reported data on the part of a self-selected sample, the findings can generally be taken as indicative of trends in the field. More important, to the extent that a response bias existed, it would be likely to be in favor of those DOTs that are the most active in developing and implementing innovative approaches for upgrading personnel, and along these lines the survey was valuable in terms of identifying projects and providing contacts for follow-up interviewing.

**EXISTING AND ANTICIPATED SHORTAGES**

This survey tends to confirm the findings of earlier studies cited to the effect that DOTs are indeed facing shortages of qualified personnel in critical areas because of high turnover rates and the aging of the workforce. If anything, the problem is becoming more pronounced. When asked whether their departments were currently facing shortages of qualified professional, technical, and managerial personnel, 20 respondents (59 percent) answered in the affirmative. The occupational categories mostly frequently cited were professional engineers, particularly those with managerial abilities, engineering technicians, construction inspectors, surveyors, and materials and research specialists. Moreover, almost half of the total respondents (16) indicated that because of shortages of available personnel they were having to fill some positions with individuals who were less than fully qualified for them.

Looking to the future, in response to the question of whether they anticipated shortages of qualified personnel in their departments over the next 10 years, 17 (50 percent) answered in the affirmative regarding professional personnel, 11 with respect to

technical personnel, and 6 with regard to managerial personnel. Again, the occupation most frequently cited was professional engineers, followed by engineering technicians, managers and administrators, computer technicians, construction inspectors, and right-of-way appraisers. Thus, it appears that many DOTs expect the problem of a shortage of qualified personnel to intensify in the future even as they develop programs to counteract it.

**USE OF TECHNIQUES**

In recognition of the greater human-resource developmental needs imposed on DOTs by personnel shortages that have developed over recent years, the most immediate response has been increased emphasis on training and development activities. Eighty-five percent of the respondents indicated that the amount of training and development provided to their employees had increased over the past five years. It is also clear, however, that the bulk of this activity is not particularly geared to directly preparing people for moving up in the organization and assuming positions of greater responsibility. When asked to estimate the percentage of all this activity that is *developmental* in the sense of upgrading employees' capabilities to undertake more demanding

**TABLE 1**  
**AGENCIES RESPONDING TO SURVEY**

Arizona	Nevada
Arkansas	New Hampshire
California	New Jersey
Colorado	New York
Connecticut	North Carolina
Florida	North Dakota
Georgia	Ohio
Illinois	Oregon
Indiana	Pennsylvania
Iowa	South Carolina
Kentucky	South Dakota
Louisiana	Texas
Maryland	Virginia
Michigan	Washington
Missouri	West Virginia
Montana	Alberta
Nebraska	New Brunswick

**TABLE 2**  
**REPORTED USE OF VARIOUS MANAGEMENT TECHNIQUES**  
**FOR DEVELOPMENTAL PURPOSES**

Technique	Not Used for Upgrading Personnel	Used for Upgrading Personnel	
		Slight to Moderate	Substantial to Extensive
Management by Objectives	19	10	4
Performance Appraisals	6	18	10
Accretion of Duties	4	13	17
Task Forces	12	16	6
Job Rotation or Temporary Duty	21	8	5
Assessment Center	29	2	2
Traineeships	6	22	6

work, as opposed to training intended to improve their performance in current jobs, half of the respondents gave estimates in the 0 to 20 percent range. At the other end of the spectrum, about 20 percent indicated that the proportion of their training activity that was developmental in this sense was in the range of 40 to 60 percent. Thus it is apparent that some DOTs are focusing substantial training and development activity on upgrading personnel.

In addition to the direct approach of upgrading capabilities through training and development, many of the management tools discussed earlier in this synthesis have at least potential developmental components. The survey presented several of these practices and techniques and asked respondents to indicate the extent to which each was used by their department for the express purpose of upgrading professional, technical, and managerial personnel. The results are summarized in Table 2. The practice most frequently cited as having substantial or extensive use for developmental purposes is accretion of duties, simply assigning progressively more difficult and challenging responsibilities to individuals, which was mentioned by half of the respondents.

Performance appraisal, which is often relegated to the status of routine bureaucratic process (although well-established doctrine holds that it should be truly performance oriented and developmental in nature), was cited by fewer than one-third of the respondents as being used extensively for developmental purposes in their departments. Somewhat surprisingly, MBO sys-

tems were reported as being used substantially or extensively for these purposes by only a handful of respondents. This is also the case with respect to task forces, job rotation or temporary duty assignments, and traineeships. Although many respondents indicated that these approaches have slight or moderate use for developmental purposes, many reported that these techniques are not used at all for developmental purposes in their departments. Thus, it would appear that many DOTs are not capitalizing fully on the potential of such techniques for upgrading personnel.

On the other hand, when asked to identify any innovative strategies or approaches for upgrading personnel that were planned or under way in the department, the respondents responded enthusiastically. More than half of them indicated that they had implemented, or were about to implement, training and development programs focusing on management and supervision, something that is especially necessary in technically oriented organizations such as DOTs. Other initiatives that were mentioned fairly frequently include the establishment of career-development programs and the use of video-based training. Other more scattered, less frequently mentioned initiatives range from cross-training and the use of automated systems to manage training activities to the establishment of new training units, "succession" planning, and educational-leave-with-pay policies. The development and implementation of these kinds of strategies by DOTs to upgrade personnel and compensate for the aging of their workforces are the subject of the following five chapters.



## CHAPTER FOUR

## STRONGER EMPHASIS ON HUMAN-RESOURCE DEVELOPMENT

The extensive telephone interviewing facilitated by the mailed-out survey summarized in Chapter 3 revealed a wide range of strategies, programs, and techniques that state DOTs have implemented and experimented with. Although most of these initiatives fall into the conventional categories of training, management development, career development, and recruitment (to be discussed in following sections), many others relate more generally to the role of human-resource development within the organization. Over the past several years many DOTs have begun to recognize people as their most important resource and have moved to revise organization culture, programs, and systems accordingly. More specifically, many DOTs are also revamping their approaches to performance management to go beyond the often routine evaluative component to emphasize the performance aspects and especially the developmental aspects of these functions.

### RECOGNIZING THE IMPORTANCE OF PEOPLE

Most public organizations, including state DOTs, now face fiscal environments that allow little if any "slack" in terms of the human and material resources available to them. Consequently, management is being asked to increase the efficiency with which existing human resources are used. Although innovations in technology, streamlined organizational design and process, and tighter controls on expenditures contribute to improved overall productivity, the motivation, commitment, and skills levels of agency personnel also substantially affect the extent to which productivity may be enhanced. The survey revealed that a number of DOTs have explicitly recognized the importance of people and their development through policies and programs designed to develop more supportive working environments and supervisory styles, increase employee participation, and enrich job content. In general terms, these initiatives are intended to help DOT personnel improve their skills and career potential, to build psychologically rewarding work settings, and more fully to tap the energy and abilities of veteran as well as new employees. It appears, therefore, that there is a trend toward a normative emphasis on the human side of organizational performance and, equally important, a growing willingness to make the necessary tangible investments in the required training, career development, management/supervisory systems, and human-resources planning capacities.

#### Virginia

In the Virginia DOT this emphasis on human-resource development has resulted in a management-training program entitled

"Creating a Positive Work Environment." The instruction is geared toward key managers in all the highway districts, a total of about 270 people. The class is taught by in-house staff using a workshop format involving case studies, exercises, and action planning. Some of the key topics covered are:

- Understanding Your Role as a Manager,
- Exercising Leadership,
- Communicating Effectively,
- Employee Recognition, and
- Delegating Effectively.

#### Pennsylvania

In Pennsylvania the effort toward human-resource development began in the early 1980s. During the mid 1970s, PennDOT had reached a low ebb in terms of productivity and morale because of fiscal mismanagement and political abuses. Many of the department's managerial positions (particularly in the maintenance area) were filled politically, and the appointees often had few relevant qualifications or little experience. A new gubernatorial administration, which won office in 1979 largely on the issue of a nonfunctional PennDOT, replaced the political patronage system with a merit selection process that stressed professional qualifications and experience. This reform represented PennDOT's first step toward recognizing the importance of its human resources. Although the early strategy of this effort to overhaul PennDOT was based on a heavily production-oriented approach, improvements in performance began to level off after two or three years. It became apparent that, rather than continuing to force productivity out of the workforce, a more enlightened people-oriented approach was required. With a well-qualified management cadre and workforce in place, PennDOT moved toward training and general employee development, along with a more participative management style.

A major step in the revitalization of PennDOT was the formation in 1982 of a strategic management committee as the top-level policy-making body in the department (5). Much of the committee's work is conducted through seven subcommittees created to deal with major issues confronting the department, such as program management, consultant selection, and driver and vehicle policy. That one of the seven subcommittees is devoted to management development and training is an indication of the high priority placed on this need; this subcommittee coordinates all departmental activity in this area to assure that PennDOT will develop and maintain essential management capacity.

In PennDOT, once short-term improvements in performance were accomplished, the top priority shifted to developing the organizational infrastructure needed to allow long-term improvements to be realized. Specific initiatives included the formation of a productivity center, the establishment of a department-wide quality circle program, a stepped-up and expanded training program, and a general enhancement of the PennDOT working environment and organizational culture.

One facet of this last initiative was the establishment of five department "values" to which every employee is encouraged to subscribe. The first four stress employee attitudes of service, excellence, integrity, and the work ethic. The fifth value is called "respect for our people" and is described by the following: "We must never lose sight of the fact that every PennDOT employee plays an important part in the Department's success. Only if we appreciate each individual's contribution and treat one another with respect, will we continue to improve and meet our goals." Thus, in the space of 10 years PennDOT has moved to a full appreciation of the importance of its human resources and of the need to support and develop these resources.

In keeping with this trend, PennDOT has recently revised and expanded its existing orientation program into a New Employee Orientation Process (NEOP). The major goals are to communicate to new employees organizational expectations for both work performance and behavior; to acquaint them with the PennDOT mission, its goals, and its policies; and to promote, from the very beginning, a positive attitude toward their jobs and the department.

The NEOP program is based on the belief that a good orientation can foster positive work impressions and increase employee satisfaction. The orientation includes both common and employee-specific elements and is composed of four phases. The first phase, In-Processing, takes place immediately and is given by the new employee's supervisor and the local personnel staff as the employee completes the various job-entry paperwork forms. In contrast to later phases this segment is conducted on a one-on-one basis.

The second phase, Personnel Session, is completed within the first two months of employment. This classroom session provides an overview of standard personnel topics. The third phase, Organization, is more specific to PennDOT and gives the overall picture of the department, conveying information about organizational structure, philosophy, funding, resources, and goals. In addition, an overview of the major divisions of the department, called deputates, is given so that employees can see where their job and section fits in the overall PennDOT structure. This leads in to the last phase of the orientation: Deputate and District Specific. These sessions are not common to the department but are specific to the deputate or district in which the new person is employed.

### **Arizona**

In Arizona the DOT, working through an active employee-development office, has developed a comprehensive training catalog, representative of those developed in other states, as a framework for its human-resources development program. In addition to a wide variety of technical and supervisory courses, there are job-enhancement offerings, programs of self-study courses, and community college courses. Arizona DOT's philosophy ad-

resses two goals: (a) to develop employees to their full potential in their current positions and (b) to allow and encourage ADOT personnel to attend training programs and develop additional skills outside their current job descriptions. This latter goal reflects a decision to move the department away from the specialist model toward a generalist approach.

### **Maryland**

In Maryland, the DOT has added various employee and people-oriented programs to its training opportunities. These programs were, in most cases, independent of each other, and they were often not well known to personnel or advertised by the department. About two years ago, in keeping with a new recognition and emphasis on human-resource development, the Maryland DOT moved to consolidate all of these programs into one overall employee-development plan. There were 10 programs available at that time, and the department quickly added 3 more to fill in what were perceived as gaps in a "package," which is now known as the Career Enrichment Program. To ensure employee awareness, descriptions of the 13 programs were prepared and placed in a binder. Copies were distributed to all department personnel.

### **Missouri and Florida**

In the Missouri Highway and Transportation Department and the Florida DOT, the increased emphasis on human-resources development extends to include off-the-job concerns. Both states require that all engineering trainees be visited once or twice a year by a central office trainer or personnel consultant. This visit is intended to demonstrate the department's continued interest in the individual trainee. Second, it also serves as an opportunity to resolve any problems concerning adjustments to the new job or community. Both states have found that this increased personal attention pays dividends in the form of smoother working relations and in the retention of new employees.

### **Alberta**

Rather than focusing exclusively on its training program, Alberta Transportation is moving toward the design and implementation of an overall "Human Resource and Development Plan." The driving force behind the plan is a group of 16 senior managers who compose the Human Resource Advisory Committee. The committee is developing inventories of current personnel in various job classifications, forecasting attrition rates, and projecting future human-resources needs. Currently the committee has identified a potentially large number of retirements in the bridge engineering area and growing departmental need for computer technicians. Accordingly, it has targeted these two areas for attention in the context of a comprehensive human-resources plan.

### **Oregon**

On the other hand, the aging of the engineering workforce, and the larger than normal number of retirements among senior

personnel, can actually provide opportunities for desired organizational change. In Oregon the DOT, partly to meet this impending managerial shortage, but moreover to improve its communications flow, began restructuring various managerial positions as they became vacant. This restructuring is being done on a case-by-case basis in light of the following goals:

- to broaden the supervisory scope of the position,
- to consolidate or eliminate managerial positions when possible,
- to place more emphasis on decision-making at the local level, and
- to streamline and improve the flow of communication between top management and the field.

The program started about one and a half years ago and received its initial impetus from the new state highway engineer, who had a concern for streamlining the organization. The program has really been facilitated by the high rate of retirement now going on in the supervisory and management ranks and is expected to continue for several more years. Returns to date include the elimination of one of the two assistant state highway engineer positions and the consolidation of the previously separate state maintenance engineer and state construction engineer positions into one. A long-range impact is expected to be the more effective functioning of the department by the placement of more responsibility in these managerial and supervisory positions.

#### **DEVELOPMENTAL APPROACHES TO PERFORMANCE MANAGEMENT**

The survey revealed considerable attention to matters of performance management in DOT organizations. A variety of personnel functions, such as performance appraisal, job design, training, and career development and planning are being considered in terms of their potential contributions to organizational performance and productivity. Performance appraisal, especially in the context of MBO approaches, has received particular emphasis. In a number of DOTs, supervisors have been identified as having primary responsibility for implementing objectives-oriented personnel-management approaches as part of performance appraisal, task design, and employee-development plans. These initiatives are often elements of a broader human-resources development strategy and an expanded use of organizational performance measures and standards by the agency.

#### **North Carolina**

In North Carolina, the DOT is replacing an old evaluation system, the Work Planning and Performance Review, with a new Performance Appraisal Review (PAR). The advantage of the new system over the old lies in its capacity to provide the basis for a more objective evaluation and a more systematic and individualized approach to training. The new appraisal system calls for the setting of specific expectations and objectives. These are embodied in a number of critical tasks that have been established for each occupational group. Districts and local divisions are expected to follow these centrally established critical task

guidelines, but they do have flexibility in assigning a weight to each. They can also modify performance standards for particular tasks according to their local terrain and climate. For example, a motorgrader operator in the rather flat eastern part of the state might be expected to service up to 10 miles of unpaved secondary road per day. However, the same operator might be held to only 5 miles per day in the mountainous western area. The new system also mandates that the supervisor identify training needs and undertake some developmental work for each employee. This can include formal training in certain skills or knowledge, college course work, or on-the-job training experiences.

The new system was implemented in staggered fashion throughout the department over a one-year period, beginning in July 1988. Classes were held to help supervisors with the setting of critical tasks and performance standards. The initial response has been generally favorable, although there is the usual resistance to change involving, for example, a definite dislike of the extra workload needed to set standards and to weight each critical task. Once the system is in place, however, the workload is expected to decline. When fully implemented the system will be department-wide, and cover all positions up to the level of the deputy secretary.

#### **Pennsylvania**

The Pennsylvania Department of Transportation began implementing MBO as its central management system 10 years ago. Currently it includes virtually all managerial personnel. Three categories of objectives are used (innovative, routine, and problem-solving), and managers are held accountable for performance in each category. Performance is appraised using the Commonwealth's Managerial, Supervisory, Professional and Technical (MSPT) evaluation system, which stresses the accomplishment of goals and objectives as the basis of individuals' ratings. Performance management at PennDOT is basically a matter of establishing expectations through participative goal setting in the MBO process and then appraising performance in the light of these objectives. In addition, the MSPT process also includes the assessment of so-called management factors, such as planning skills, largely as developmental-needs indicators. When weaknesses are noted, they are supposed to be addressed through training or assigned experiential learning.

#### **Iowa**

The Iowa DOT uses a performance-evaluation system that is government-wide. It was first introduced in 1978. Modifications have been made over the past 12 years, but there are still complaints about the complexity of the system. (The state does offer periodic classes on the use of the evaluation method.) The system itself calls for the setting of from three to seven critical tasks for each employee. These tasks are then weighted according to their importance and frequency in the employee's work. The employee's final numerical performance rating is the weighted average of the rating given for each critical task.

Task ratings are determined by comparing the employee's performance with preestablished written performance standards. These standards are set at the beginning of the annual evaluation period. Any employee whose overall rating is less than satisfac-

tory is automatically reported as an “underachiever.” This action triggers an informal interview, and can then lead to formal diagnostic efforts. Training, rehabilitation, or other intervention may follow. The department works hard to retain “underachievers” and to restore them to productive status. On average, 6 to 12 individuals are identified as “underachievers” each year, and the department is usually successful in its efforts to establish a satisfactory level of performance.

In addition to job-performance measures, the Iowa evaluation process calls for developmental needs to be specified on an annual cycle. This policy reflects a departmental commitment to training. There is some central office monitoring of these developmental needs, but it is recognized that this aspect of the process needs to be strengthened.

### Texas

Management by objectives has been the principal overall management approach in the Texas State Department of Highways and Public Transportation for many years. Because of a new emphasis on training and on identifying training needs, the department has quite recently revised its performance-appraisal system. The new Performance Planning and Evaluation form calls first for the identification of major job functions for each position. Each job function must be accompanied by a written performance standard and a statement of training requirements. Individual ratings for each major job function are not given a separate weighting. All figure equally into the final overall rating. The training needs for each job function are combined with career goals and department needs to produce a written action plan. A statement of progress on this action plan is then called for at the end of the annual evaluation period.

The Texas SDH&PT’s commitment to its employees and their development is summarized in the following statement taken from the *Supervisors Handbook* for the new performance system: “Supervisors are responsible for the effective use of resources and our people are our most important resource. Thus, performance planning and evaluation is the most important job of the supervisor.”

### New Brunswick

The New Brunswick DOT, in redesigning its performance-appraisal system, chose to examine the systems already used by other organizations. From this study, the department developed and began using its own hybrid version about six years ago, taking into account a very stable workforce and heavily maintenance-oriented operations. Recently, it has moved to further strengthen the program by encouraging monthly reviews between employees and their supervisors. The objective is to build an ongoing dialogue, in contrast to the typically perfunctory annual review found in many organizations.

### Colorado

In addition to a normal performance-evaluation process, the highway department in Colorado has instituted a Promotional Performance Appraisal system (PPA). This type of appraisal is still given by the employee’s supervisor but only when the employee is being considered for a new position within the department. In such a case the supervisor evaluates the employee on the basis of his or her *anticipated* performance in the requirements of the future job. The resulting appraisal is then used as one of the selection criteria in filling the new position and can account for as much as 50 percent of each individual’s rating.

This type of appraisal is only available for current department employees, and therefore its use is limited to those vacancies for which highway department employees apply. An additional drawback of the system is found in the tendency of various districts and divisions within the department to develop their own rating biases. Thus, a given performance might be rated higher or lower according to that unit’s rating atmosphere. This results in an uneven rating process and gives individuals from positive bias units an unfair advantage in the final selection. To compensate for this the department has adopted a normalizing factor based on each unit’s rating average compared with the overall department mean. This solution did not have the intended effect, however, because individual supervisors have learned to compensate for the normalizing factor.

## CHAPTER FIVE

## STRATEGIES FOR IMPROVED TRAINING

Although most DOTs have always provided some level of training for their employees, over the past several years many departments have intensified and upgraded their training programs. This effort has moved in a number of directions. Many departments have moved to expand and otherwise enhance their technical-training activities. Another thrust has centered on more cost-effective management of the training programs themselves, typically by using sophisticated information-management technology. A third approach has been to take greater advantage of the opportunities afforded by networks of external sources for conducting training programs on an interorganizational basis as well as providing increased support to DOT employees who pursue advanced education and professional development on an individual basis.

### ENHANCED AND EXPANDED TECHNICAL TRAINING

Although technical training for engineers and other DOT personnel has historically been a concern, DOTs across the country are currently in the process of responding to a variety of new challenges. Perhaps the most significant trend is a recognition of the need to develop integrated training systems and facilities that provide these organizations with the capacity to meet existing skills requirements across functional activities *and* to anticipate future needs. This trend is taking place against a background of increasing skills requirements in many DOT functions as technologies and organizational functions change to meet the transportation needs of the 1990s and beyond. Further, as a matter of policy, many DOTs require that employees and contractor personnel be certified as qualified to carry out their jobs by agencies such as the National Institute for Certification in Engineering Technologies (NICET). For many DOTs, therefore, technical training is taking on a much more developmental frame of reference, one that requires continuing attention to the qualifications, training needs, and opportunities of all employees.

Accordingly, in addition to recognizing the need for technical training on the level of the individual, a number of state DOTs have established, or are in the process of establishing, technical-training planning, delivery, and evaluation systems as elements of their overall human-resources management strategies. These systems vary in scope, and in the extent to which management has made a formal long-term commitment to technical-training resources and facilities. For example, there continue to be wide variations in the extent to which DOT organizations are willing to allow time off and to pay their employees' training costs. However, the current pattern would appear to support the conclusion that a growing number of DOTs are willing to see ongo-

ing technical training and associated support systems as rational investments in the future of the organization and its capacity to perform its mission effectively and efficiently.

A further indication of the growing commitment to technical training (as well as to other forms of training) is what appears to be a trend toward the elevation of the training and development function in the management hierarchies of state DOTs. In a number of states, training is now a clearly identified organizational function closely linked to the top management levels of the agency. A related development is the emergence of multiorganizational cooperative training ventures including personnel, funds, and facilities provided by the DOT, other state and local agencies, contractors, community colleges, universities, and professional associations.

In the context of the above, DOTs are also looking for ways to deliver technical training efficiently. Consequently, there is expanding use of programmed instruction packages, interactive computer-based learning technologies, and a variety of media, including videotapes produced by DOT personnel. Given the extended field structures of DOT organizations, efforts are being made to provide decentralized training through modern communications technologies such as satellite transmissions, training libraries in the form of video- and audiotapes, and programmed instruction manuals that reduce the need for trainees to meet in central locations.

### California

To ensure departmental productivity in the design, construction, and overall flow of highway projects in the face of a declining experience pool, The California Department of Transportation (Caltrans) decided to take positive steps. Within the department construction projects are overseen first by a project engineer, who takes the project from inception through design and on to bid opening and contract award. Then a resident engineer or assistant resident engineer oversees the actual construction. In the early 1980s Caltrans found that fully half its project and resident engineers had less than five years' experience, and that mostly on smaller projects. To give these young engineers a firm foundation, to fill information gaps about new techniques, and to provide a refresher course for more experienced personnel, the department's Division of Facilities Construction established in 1982 a week-long Training Academy for Resident Engineers. At that time class size was restricted to 20 and the course was given six times a year. This Academy was a distinct success and shortly afterward a second Academy for Project Engineers was added. Both courses are taught in Sacra-

mento at a local hotel, where all participants can train and socialize together for greater group interaction. Although most participants are Caltrans engineers, the courses are also open to city and county engineers.

The California Department of Transportation has a contract with California Polytechnic State University in San Luis Obispo to conduct computer-aided drafting and design (CADD) training for engineers and technicians. Although the university has incorporated Caltrans's CADD system into its undergraduate engineering curriculum, Caltrans has provided access to its data bases for use with both the university students and the department's engineers. Upon their graduation, Caltrans recruits the new graduates, who are already trained in using CADD.

In an attempt to create an opportunity out of a problem, Caltrans has taken advantage of the aging of the workforce by using highly skilled retired engineers to teach technical courses and to act as mentors to new engineers and, sometimes, new supervisors. These "retired annuitants" can work for the department 90 days per year at full salary and still collect their state retirement benefits in full.

To extend the base and uniformity of technical knowledge and expertise beyond its own personnel, Caltrans is participating in a new Cooperative Training Assistance Program (C-TAP). This program was designed for the technical training of city, county, state, and private consultant personnel. The target audience will largely be technicians and engineers from those entities. The program will not duplicate existing programs but is intended to create an atmosphere conducive to mutual cooperation and to the sharing of technical knowledge among the trainee population. The program hopes to foster the development of highly professional and motivated technical personnel at every level of its target audience. The side-by-side learning experience will enable all trainees to speak the same language and will optimize everyone's job performance. The first regular training sessions under this new program began in October 1989.

### Alberta

Approximately five years ago, Alberta Transportation mandated that all its employees receive appropriate technical training. However, the oil price crash had seriously eroded Alberta's financial base. Consequently, a search was made for an acceptable yet low-cost method of implementing this mandate. The answer, at least for nonprofessional positions, was to put specific training and support materials into a simple package that could be administered by individual supervisors. This idea developed into Alberta's "Competence Based Training Modules." By 1986, these modules accounted for 30 percent of all training.

A typical module includes an employee manual and questionnaire, a slide presentation, a written knowledge test, and a checklist to be followed by the supervisor in administering the training. The checklist includes a skills test to be given by the supervisor or other designated individual. The time allotted for each module varies according to the workload and learning ability of the employee. In the design of each training module, extensive input was solicited from the field. This approach has resulted in widespread acceptance of the concept and the program.

### Pennsylvania

A different situation exists in Pennsylvania, where, after a sustained effort to build training capacity, the level of training effort is considered to be appropriate. Therefore, rather than increasing training investments, the current emphasis is on improving quality and cutting costs. The financial goal, set by a Strategic Management Committee, is to reduce overall training costs by 25 percent without reducing training activities.

One reason that PennDOT has a fully developed training program is top management's participation in the training process. Responsibility for the entire spectrum of training activities has been assigned to small subcommittees, each overseeing one activity. These subcommittees report every other month to the Management Development and Training Committee, and this committee reports directly to the Strategic Management Committee. This structure assures department-wide input, training programs aligned with department needs, and management participation and approval on all levels.

A specific example of a training program that evolved out of this approach is the "Mechatronics" course for mechanics. It was determined that mechanics needed to have a general understanding of electronics, mathematics, and computer technology and a basic literacy in the terminology of these fields. Training modules in these areas were devised, and the training is done by outside vendors.

### Arizona

In Arizona, the technical-training program has evolved according to NICET certification levels. The departmental goal is to have all DOT technical employees become NICET certified. There is a clear incentive for employees because all promotions are keyed to successful completion of NICET levels II, III, and IV. A related innovation is ADOT's cooperation with others in the transportation field, including private contractors, other state agencies, and the community colleges. Together, they have established a training facility or center that is accredited by the Arizona community college system. Courses cover technical materials, mathematics, and communication skills. Many are geared to the various NICET tests. This cooperative program began about eight years ago, and about 300 ADOT employees have used its services. At this point, the Arizona DOT is well satisfied with the training center and hopes to expand it into a state-of-the-art training facility.

### Texas

The Texas SDH&PT, in contrast, has been in a holding pattern because of the oil price crash in 1983 and the subsequent heavy loss of state revenue. Recently, however, finances have improved and there has been considerable movement in training. The budget of the Technical and Skills Training branch has increased from \$45,000 (with a staff of 2) seven years ago to \$5,000,000 (with a staff of 37).

New training initiatives in several areas have been undertaken in response to both internal and external pressures. For example, the Texas legislature recently required that all traffic signals in cities with populations of less than 50,000 be maintained by the

state. A joint program between the Texas SDH&PT and Texas A&M University was quickly developed and put into place in order to train enough traffic signal technicians to meet this demand. A functioning intersection was built on university property as a field training site. A training curriculum was designed that covers the complexities of the new electronic traffic signal technology. The first class of 16 technicians was due to graduate from the 15-week course in February of 1989. Thereafter, classes of 20 will take the training until a total of 125 have been trained. After this initial cadre has gone through, the Texas SDH&PT plans to open the course to other DOT personnel and employees in other state agencies. The training will also be made available to private individuals and other state DOTs.

Another training initiative by the Texas SDH&PT involves the construction of automated traffic-controlled intersections. Because of faulty workmanship and poorly trained inspectors, the state has had a problem with improperly installed traffic signals and traffic-monitoring devices. Quite often the mistakes did not become apparent until after the state had accepted the work as complete. Department of Highways and Public Transportation personnel then had to rectify the errors at public expense. To solve this problem, the department has undertaken a project to train both its inspectors and contractor personnel in the correct techniques for installing traffic signals and detection devices. This is a joint project involving Texas A&M and the Association of General Contractors. A field practice site is being constructed on university property. The course itself lasts one week and costs \$300 per trainee.

Still another training initiative being undertaken by the Texas SDH&PT is an effort to get more productivity from its current cadre of design engineers. The state design engineer is preparing a computerized design course. This in-house project is expected to result in a 40-hr course covering various aspects of computerized design in relation to the department's needs. It will use existing computer software. Currently, selected employees are being trained as instructors and a training facility is being established.

### **West Virginia**

The West Virginia Department of Highways replaced its entire fleet of vehicles a few years ago. To keep its mechanics abreast of correct maintenance and repair procedures for the new vehicles, and to anticipate any future purchases, the department decided to create another level in its mechanic series. This new Mechanic IV position creates an additional step in the career ladder below the supervisory level. Sixteen of these positions are envisioned, with one in each of the 10 districts and the other six assigned to the central office as specialists in particular areas of vehicle maintenance. The Mechanic IV is to be the repair expert in each district, and he or she is expected to act as a liaison between the vehicle manufacturer and the local DOT mechanics.

Initially 50 employees were selected by competitive testing. They then began attending a series of training classes, most of which were provided by various equipment manufacturers as part of their original purchase agreements with the department. When the training cycle is completed, 16 of the 50 trainees will be promoted into the new positions and the other 34 will constitute an additional source of expertise to the department as well as a pool of potential applicants to fill future vacancies.

### **Georgia**

As part of an effort to enhance its training capabilities, the Georgia DOT has developed a program of video-based training packages. These packages are produced by DOT personnel. The most immediate need was in the construction inspection area, so it was addressed first. The program has since been expanded into maintenance and materials testing. Acceptance by field personnel is reported to be good. Managers particularly like the system's flexibility. They can use the videos whenever it is convenient without being constrained by a set training schedule. Video training can be used during bad weather or slow work periods, and it can also easily be rescheduled as needs arise.

### **Missouri**

A video program has also been used by the Missouri Highway and Transportation Department for two years. Here, the main emphasis has been on safety videos, but other topics include management issues and a new computer-aided design system for bridges and highways. Although the department has produced some of these videos in-house, it has purchased a great many more from outside vendors.

One interesting video produced in-house deals with new-employee orientation. It covers the standard orientation topics and has the added advantage of using familiar names and faces, thus acquainting the new employee with key highway personnel. The videos are kept in a library at the central office. Every quarter, a new listing of available videos is produced and distributed to Missouri's 10 district offices. These offices then request them as desired. In addition to their uses within the department, videos have been produced for showing at public functions and at the state fair. Public response has been good, and more videos are planned in order to further enhance public relations efforts.

### **Pennsylvania**

Pennsylvania is another state in which the DOT serves as an "idea store" and makes use of videos for purposes beyond assisting DOT personnel. As part of an outreach plan known as the Rural Technology Assistance Program, the department makes videos of some of its practices that are potentially applicable to local governments and it distributes these videos to municipalities throughout the state. The DOT also produces traditional training videos on numerous technical topics for its employees. In addition, the department supports a program called "Ideas for Us" that produces and distributes videotapes about individual employees and the innovative ideas they have come up with for improving productivity.

The Pennsylvania Department of Transportation is also working to develop a satellite-linked teleconferencing capability that will allow training programs to be delivered simultaneously to numerous audiences at dispersed locations. Programs originate at a public-television station in Harrisburg that has the equipment needed to transmit via satellite. This uplinking capability is too expensive for the department to maintain, but, using the television station, a one-hour program can be transmitted for approximately \$4500, including studio and satellite time. The

downlink sites are standard dishes whose operators simply have to tune in to the appropriate transponder signal.

The training program for one of these satellite-delivered sessions typically involves a mix of videos, slides, and live panel discussions. A particularly useful feature is an interactive capability that allows participants at the downlink sites to ask questions of panelists on the air via special telephone hookups. The satellite-delivered training sessions can obviously be extended beyond the department's workforce and the state's borders. A case in point was a major demonstration project developed for municipal officials consisting of five one-hour modules on highway maintenance technology and skills. These programs were transmitted to 33 downlink sites (hotels, universities, and hospitals) located in Pennsylvania and 14 other states.

The Pennsylvania Department of Transportation plans to establish a downlink site at each of its 11 district offices and its central office at a cost of approximately \$7000 for each site. In addition to a satellite dish, these locations will be equipped with several large-screen television monitors in order to accommodate a fairly large audience at any given time. This arrangement will allow PennDOT to use satellite technology much more efficiently as it delivers training programs to its employees around the state. The basic goal of the program is to increase communication within the department and to reduce the cost of training.

#### **INFORMATION-BASED MANAGEMENT OF TRAINING PROGRAMS**

In conjunction with their expanded efforts in the areas of technical, supervisory, management, and executive training and development, state DOTs show increasing interest in management systems designed to integrate the human-resources information base of the organization. As training programs become more extensive and complex and become integral elements of the overall human-resources management program of the agency, DOTs are apparently becoming increasingly aware of the need to provide management with a broad array of information critical to an understanding of the skills resources and needs of the agency. Several have moved to implement systems that integrate information from a variety of sources, including employee training and education records, data obtained through diagnostic techniques such as assessment centers, performance appraisals, personnel files, and payroll data. These data sets are to be used for several analytic purposes, primarily long- as well as short-term human-resources planning and development in light of ongoing and anticipated organizational programs. In addition, they are seen as important resources for those concerned with the design, implementation, and evaluation of a wide variety of training and development programs. Specific applications include assessments of the training, education, and experience of personnel in light of existing requirements and future expectations, matching of personnel needs with available training and development resources, maintenance of up-to-date training records, and evaluation of training effectiveness and costs.

The emergence of management-information systems specifically focused on the human-resources needs of state DOTs is a logical development, especially in light of the vastly enhanced information acquisition, storage, and manipulation capabilities afforded by modern computer technologies. It should, however, be noted that these systems require extensive managerial support

and personnel trained to establish and use them effectively. There are wide variations in organizational investments in these areas, and state DOTs are no exception. Often, it was noted that the necessary data existed, but that they were housed in a variety of organizations and offices, used for rather narrow purposes, and not integrated or available for managerial applications, especially human-resources planning and decision-making. In some cases, DOT organizations are moving to establish integrated systems designed specifically to meet management needs. It is reasonable to anticipate that the data management and analysis needs confronting all DOTs will stimulate similar initiatives across the United States in the relatively near future.

#### **Pennsylvania**

In 1982 PennDOT started an Automated Training Records (ATRA) system. Originally ATRA was developed in response to the need to track and anticipate the training needs for certification and recertification of motorized-equipment operators. From this beginning, the system continued to grow. Every PennDOT employee now has a training record stored in the data base. Beyond housing individual records, the ATRA system tracks all training activity conducted within the department, including central office bureaus, districts, counties, and relevant programs provided by agencies outside the department. It maintains a schedule of these courses that is broken down into six categories and organized by topic, time, location, and target audience. This schedule is updated daily and is accessible to inquiries by anyone on the PennDOT network. Managers can nominate employees for specific courses through the system itself. The system also keeps track of attendance at courses and posts individuals' participation with their training records when they complete programs. By querying managers and employees about training requirements, the system can also be used to determine the need for specific course offerings.

#### **Arizona**

The Arizona DOT also uses an automated system for maintaining employee-training records. Although the Arizona method electronically registers trainees in courses, it also contains considerably more background and development information for each employee than just training records. This is done through an employee-training profile, or record of the educational background, personal skills, and work experience of each employee. An additional part of the training profile, the Employee Enhancement Program, further records completed training, needed training, and personal career goals embracing desired education and future work assignments.

#### **Texas**

The Texas SDH&PT is also moving in the direction of coordinating training needs and resources. The first step, which has recently been taken, is included in the new performance-planning and evaluation system. Because the department uses MBO as its management style, the performance plan calls for up to six major objectives to be listed on a form for each employee. The form



further calls for training needs, either formal or on-the-job, to be specified for each objective. Additional space is provided for training needs associated with overall employee development. The training coordinator in each of the 25 districts is responsible for collecting and aggregating this information and forwarding it to the central office. This information is then used to more effectively plan and schedule training. This is in contrast to the old system in which there was no systematic field input. Instead, the course schedule was formulated on the basis of what seemed appropriate to the central office. The department is now studying the possibility of creating an automated training system using the existing mainframe computer network. The existing personal computer network (which has been running less than a year) covers only the central office, and it does not have scheduling capabilities.

Another initiative being undertaken by the Texas SDH&PT is an effort to obtain more feedback from participants in training courses. This feedback will be not only for evaluating the practicality and effectiveness of the training, but also for monitoring results and encouraging application of the training by employees. Thus the Texas approach is to obtain field input for the design and evaluation of training, coupled with emphasis on practical uses of training in the field.

### Colorado

Colorado uses a training program that is linked to its performance-appraisal system. A separate training plan is developed annually for each employee, with specified follow-up periods to monitor compliance. As in Texas, copies of these individual training plans are collected and aggregated by the district training officer. They are then forwarded to the central office for planning purposes.

### Iowa

Iowa maintains a computer-based information system for its general training records as well as its management-training system. At present this system is used for information only, and it is not used for planning purposes. Field input regarding future training needs is not systematically collected, except to identify underachievers.

Feedback on courses and instructors is used to plan future training. Participants are required to send a completed course evaluation to the training office. These evaluations are then used to evaluate courses and instructors.

## TRAINING NETWORKS

Many of the state DOTs that participated in this survey reported that their managerial as well as technical-training efforts included a variety of external agencies. Although internal training capacities in many DOTs have been expanded, an equally apparent trend is a growing reliance on "training networks" including other state agencies, professional associations, universities, community colleges, and private contractors. Several DOTs reported that they were actively working on developing extensive and coordinated interorganizational relationships in

order to strengthen their capacity to meet their training needs and to provide a wider variety of career-development opportunities for their employees. Although the use of external training and educational resources by DOT personnel seeking to upgrade their technical or administrative skills is a long-standing practice, it appears that DOTs are now seeking to establish more formal linkages with these resources. In contrast to the relatively informal and largely voluntary use of external training/educational resources by DOT personnel, the current trend signals a recognition on the part of those responsible for human-resource development policies that their agencies need to assume a leading role in the creation and management of cooperative arrangements that function to support the training and development objectives of several agencies.

Cooperative human-resources development strategies are designed to do more than simply exploit the training opportunities offered by external agencies. They represent an effort to administratively link DOT planning and implementation processes to those of other organizations. Therefore, cooperation and the management of interdependence are likely to become increasingly central concerns for DOT human-resources development specialists as well as general management. Issues such as the relevance of external training and management education to DOT concerns and to what extent and in what manner DOT management should participate in the policy-making and execution processes of these networks are likely to become increasingly salient. Clearly, DOT human-resources development efforts will not be independent of the state's overall strategy, and it appears that DOT management in several states is becoming an active participant in the making of human-resources development policies affecting these agencies.

Two external programs that are of particular significance to highway departments are those of the National Highway Institute (NHI) and NICET. The National Highway Institute's program, the older of the two, is a training program run by the federal government. The NHI publishes a yearly course catalog in which 90 courses are listed. These courses range from one to five days in length and are taught by NHI-approved instructors. States then choose which courses they would like to have offered in their locale.

National Highway Institute programs are conducted in all 50 states. When a particular effort is exhausted, the program is turned over intact to universities around the country, where it is often used with college courses and special workshops aimed at counties and local jurisdictions. In addition, NHI sponsors one or two multiweek courses on selected new or emerging technology-related topics each year. These courses are usually conducted by a university for NHI and present material intended for graduate-level and more advanced participants.

The NICET program is run by a nonprofit agency affiliated with the National Society of Professional Engineers. It had its beginnings 27 years ago, and in 1979 began working with state highway departments. It was also at that time that it began replacing its traditional testing system with a modular approach. Under this system a particular test is composed of only those specific modules that pertain to the technology of the position being tested. This allows great flexibility in the testing program. As a result, NICET tests are now used to pinpoint an individual's or a department's training deficiencies in addition to fulfilling their old function of certification.

Many states also take advantage of the American Association of State Highway and Transportation Officials (AASHTO) mid-level management course currently being taught at the University of Indiana. The course is designed for managers who are likely to move up to a higher position. The program is three weeks in length and is offered annually in the early spring. A variety of instructors are used, many of them coming from the School of Public and Environmental Affairs at Indiana University. Participation is open to all state highway departments and to the Federal Highway Administration. Normal class size is between 40 and 45, with each state normally limited to one enrollee. The program has received good reviews from its participants.

Although the AASHTO course is specifically geared to the needs of transportation and highway departments, state DOTs are also finding it useful and productive to participate in state-level management programs of a more general nature. These programs are designed to meet the needs of managers in a variety of agencies.

North Carolina has a Public Managers program and Pennsylvania offers the Commonwealth Management Training program. These programs are exclusive to their states. In contrast, the Certified Public Manager, or CPM, program is common to six states. This training effort was started in 1980 by the states of Georgia, Arizona, Florida, Louisiana, New Jersey, and Vermont. Each state operates the program individually but under the oversight of a CPM board. The training is targeted at middle- and upper-level managers. Graduates receive a CPM designation awarded by the governor of the state. To receive the diploma, candidates must complete a sequence of carefully designed management courses, additional elective courses, and job-related projects, in addition to passing a series of examinations. Transportation departments in these states have used the program, but they are finding it necessary to supplement it with training more specific to the DOT operating environment.

### Arizona

The Arizona DOT, moving in a similar direction, has participated in forming a nonprofit education group known as the Arizona Construction Training Center. The center is a result of collaboration between several public and private entities including city and county governments, engineering firms, construction companies, and materials suppliers. The center's primary objective is to help participants become certified by NICET.

### Virginia

A recent surge in construction in Virginia has created a critical shortage of construction inspectors. To fill this need Virginia opted for a cooperative training program in conjunction with community colleges. The department itself supplies the new-employee orientation and a one-month structured on-the-job program developed by its construction division. The community colleges provide a two-month instruction period covering technical math, surveying, plan reading, and interpersonal and communication skills. Upon successful completion of the three-month course, trainees are eligible to become construction inspectors.

### New York

Interorganizational training efforts in New York have been spurred by negotiations with organized labor. The NYSDOT is heavily unionized but the bargaining units are not exclusive to the DOT; rather, they encompass all state government agencies. As a result, the several different bargaining units have, over the years, reached separate training agreements with the state. These contractual agreements often contain detailed training provisions. The resulting training programs, although created by specific negotiations with a single bargaining unit, frequently become open to employees outside that bargaining unit. These statewide training agreements, plus the DOT's own training initiatives, have given the department and its employees an extremely diverse and comprehensive set of training opportunities. However, the strong influence of the unions in New York operates in effect to discourage lateral mobility, from construction, to design, to right-of-way. The major benefit of the unions along these lines is large training budgets.

Often, courses initiated to meet the requirements of a training agreement end up being adopted by the department. For example, a basic course in supervisory skills was originally developed by Cornell University for the Civil Service Employees Association. The original course, a five-day program for bargaining unit members, was at first conducted by outside contractors. Later the DOT developed its own in-house trainers, took over the program, and opened it to all supervisors within its ranks.

Another state government program, known as Management/Confidential, is for top-level managers and employees in personnel, budgeting, or confidential positions who are outside established bargaining units. The main focus of the program is on interagency-based management training designed to build a broader perspective on state government issues and specific management issues. As it has developed, the program places emphasis on management training, but it also includes computer and secretarial training. The program was organized by and is administered by the governor's Office of Employee Relations. All these courses are taught in Albany, for the most part by outside instructors, and are generally open to all qualified managers and other state personnel. Therefore, the classes usually include a broad mix of participants drawn from various state agencies.

### INCREASED SUPPORT FOR EXTERNAL TECHNICAL TRAINING

The survey revealed that state DOTs are increasingly taking advantage of training resources offered by external agencies. In order to build on their internal capacities, DOTs are providing opportunities for their personnel to attend courses at local universities and colleges and to participate in training courses offered by other state agencies and central personnel units. Training offered by professional associations is also exploited. A number of DOTs are encouraging such training by providing time off with pay and funds to cover tuition and other expenses. Overall, there appears to be a national trend toward an increased willingness to recognize that external technical training must become a continuous process if the agency is to avoid a gradual erosion of its skills base. The once widely held assumption that additional external training was a matter of individual initiative and investment seems to be in the process of being replaced by

agency human-resources development strategies and policies that approach internal and external technical training as an integrated "package."

Many state DOTs are giving increased weight to the professional registration of their engineers. Without registration, engineers may find their career progress in their departments blocked, and to facilitate continued upward mobility several states have started programs aimed specifically at helping individuals pass the professional engineer's exam.

#### **Iowa**

The Iowa DOT, for example, has established a P.E. review course, and it gives candidates time off and travel expenses to attend. The results have been gratifying, a 76 percent pass rate on the last exam compared with less than 40 percent before the program was initiated.

#### **Florida**

The Florida DOT has taken a somewhat different approach. Instead of using a separate review course, the department upgraded its entry-level training program from two to four years. Thus, trainees have had the minimum four years' experience necessary to qualify for the P.E. test. Florida also added its own testing program in an effort to ensure proficiency and to give trainees practice in taking engineering exams.

#### **Florida and Alberta**

States are also showing increased support for employee participation in existing university degree programs. The DOT in Florida and Alberta Transportation have educational-leave-with-pay policies. The leave may be as long as two years. It must result in a degree that pertains to the individual's job classification or career goals. In Florida, up to 0.5 percent of the workforce, around 40 people, may be in this status at any one time. Alberta, with its smaller workforce, sponsors six to eight employees a year; however, full salary and tuition costs are not always covered.

#### **New York**

New York State has an extensive college training program for professional, scientific, and technical employees. In this program, in which the DOT participates, a wide variety of courses

are taught at colleges throughout the state. Tuition is paid by the department, and time off is granted for classes held during working hours. The courses offered cover administration and supervision, professional workshops (which carry no credit), and a wide variety of college credit courses designed to meet the needs of professional, scientific, and technical personnel. Participants are encouraged to enter degree programs.

A few computer courses are taught on an on-line basis. To enroll in these the student must have access to an IBM-compatible computer, a printer, and a telephone modem. Lessons and messages then travel between instructor and student by an electronic bulletin board via the modem. Another New York initiative involves the use of video teleconferences via satellite. Two courses on nursing and supervision were held in December and represent the state's first efforts in that direction.

#### **Maryland**

To encourage more career movement, the Maryland DOT has an Upward Mobility Program for secretarial-clerical and technical personnel. The goal for secretarial and clerical personnel is to help qualify interested individuals to move up into a new Administrative Specialist series. For technical personnel, the goal is qualification for and movement into the Highway Engineering series at the HE III level. To qualify, interested technicians must have 11 years of experience in lieu of a degree in engineering and must also pass a competitive examination. Both programs function through a combination of experience, on-the-job training, in-house tutors, and formal training. When indicated, tuition reimbursement is available for outside formal training.

#### **Arizona**

In Arizona, where the legislature has mandated NICET certification for all personnel (public or private) who work on public construction contracts, the DOT has developed some new initiatives in the area of technical training. In addition to participating in the new Arizona Training Center, the department offers tuition reimbursement for basic courses in core subjects such as English and math, and in computer software and programming. The department is also becoming a participant in a "no walls community college" concept by opening its facilities to classes offered by the community colleges. This latter approach is common in many states and appears to be on the increase. In some cases the community college course is imported into the DOT and then opened up to other participants from outside the agency.

## MANAGEMENT-DEVELOPMENT STRATEGIES

Because the higher than normal rates of attrition experienced by many DOTs have produced vacancies in managerial positions that are sometimes difficult to fill, many departments emphasize management-development programs intended primarily to help professional engineers acquire managerial and supervisory skills. In addition, higher-level executive-development programs have also been established to help prepare individuals to be able to meet the responsibilities of the highest positions in the organization, largely in anticipation of the leadership vacuum that could result from accelerated retirements of top-level people.

### MANAGEMENT DEVELOPMENT FOR ENGINEERS AND OTHERS

State DOTs appear to be increasingly aware of the need to prepare their engineering personnel for managerial and supervisory roles. Central to this awareness is the recognition that the movement of professional engineers to positions involving managerial responsibilities is an ongoing process that must be anticipated by the career-development and training program of the agency. Highly skilled engineers, in other words, cannot automatically be expected to be effective in managerial roles without the necessary mix of experience and training in such areas as leadership, decision-making, communication, supervision, and the administration of their agency's personnel procedures. Accordingly, increasing numbers of DOTs have developed or are developing career-planning and skills-oriented training systems designed to prepare engineering as well as other personnel for management jobs.

In general terms, these programs are designed to address the training and career-development needs of (a) DOT personnel at the point of assuming first-line supervisory responsibilities and/or (b) those who have entered the management structure of the agency and are likely to be promoted to higher levels of responsibility within the relatively near future.

For the first group, DOTs nationwide have established training and on-the-job-training programs operating at varying levels of sophistication intended to prepare employees for the tasks and responsibilities of first-line supervision. Often, these programs offer brief classroom and/or programmed instruction in such areas as basic human-relations skills, supervisory responsibilities such as training and performance appraisal, and the personnel policies of the agency. The training may be delivered in-house, off-site, by contractors or agency personnel, or through some combination of these methods.

The focus on the development of those in the managerial hierarchy is seen as particularly important because of the succession problem being faced by many state DOTs. These DOTs

anticipate that large numbers of management positions will be opening up during the next 5 to 10 years, and the need for well-prepared candidates will become critical. Thus, in addition to preparing personnel for top-level executive jobs, attention is being paid to identifying and training those who are in line to fill middle- and upper-middle-level management positions. A wide variety of approaches may be found in this area, but the common denominator is that attention and resources are being invested in the long-term management capacities of these DOTs.

Increasing attention is also being paid to upgrading and expanding the skills and knowledge bases of existing DOT management cadres. Many DOT managers have assumed their current positions without benefit of any formal training or education in management functions and skills, relying instead on experience gained throughout their careers. The increasing complexity of management tasks, changing organizational environments and technologies, tighter fiscal constraints, the need to achieve higher levels of productivity, and other challenges confronting their managers have led many DOTs to recognize that a highly professionalized *management* as well as engineering capacity is now required. Therefore, many DOTs have established management-development and training programs in which many of their managers are either required or encouraged to participate. In some cases, these programs are rather informally structured, and individual managers are encouraged to participate on a "self-improvement" basis, often with the understanding that this training will be a positive factor in promotion decisions. On the other hand, in some states these programs are highly formalized, have received support and resources from the highest levels of the organization, and are structured in such a way as to lead to the participants' earning "credentials" and/or academic degrees. For many DOTs, the "bottom line" in this area is that the organization requires well-prepared and -trained *managers* and that progress up the management hierarchy will increasingly require such training.

### New York

Under its current commissioner the department of transportation in New York State has given a high priority to management development. The underlying philosophy of this effort is that the best management-development process is largely a matter of self-development. Therefore, the agency's overall strategy is to assist that process of self-development. This begins with an evaluation of the individual's strengths and weaknesses. This information is used to design a career-development plan. On the basis of these plans, managers and supervisors in the NYSDOT participate in

a wide variety of managerially oriented training and development programs. Many of these programs are available to all state agencies through provisions of collective bargaining agreements, as discussed in the preceding chapter, and the DOT has developed others specifically for its employees.

One of the NYSDOT's initiatives is called "Careers in Management." It is open to all career fields in the department. Developed by a private firm, it is targeted at three levels of employees: prospective supervisors, first-line supervisors, and managers of managers. Currently, emphasis is being placed on the highest levels, because a top-down approach is being used. Accordingly, all executive-level personnel have already gone through the training. The focus now is on putting senior managers through. Some 200 to 250 of these senior managers are expected to participate during 1989 and 1990. Only a few first-line supervisors have gone through the program, and it has not yet reached down to prospective supervisors.

The program itself is delivered by the firm that developed it. The first step is to have each participant's subordinates fill out a survey in which they describe his or her supervisory style. It involves such behavioral dimensions as communication, performance appraisal, and team-building. Once in the program, participants are shown prerecorded video case studies followed by question and answer periods. Through their responses, participants analyze their own strengths and weaknesses with the help of the instructors. This assessment is then matched up with the earlier employee survey. Using the resulting profile, participants are encouraged to formulate their own action plan for further developing their managerial capabilities.

Participants then go back to their jobs and discuss the plan with their supervisor, who presumably has already gone through the same process. In many cases, this action plan, which typically entails behavioral objectives and detailed steps for achieving specified results, is formalized as a performance contract. The individual's future performance appraisals are then based in part on actual managerial performance in light of the objectives set out in the performance contract.

Because it is common for engineers to rise quite high in the structure of the organization on the strength of their technical expertise alone, without any managerial responsibilities, the NYSDOT has developed a second management-development program called "The Technical Manager." It is aimed at all technical and professional people, especially engineers. The program involves a very concise two-day experience that aims at changing the mindset of the trainee from that of a doer to that of a manager. This program is also delivered by an outside contractor. It makes use of video-based cases. These cases portray specific management issues relevant to design managers, laboratory managers, and computer managers.

Both of these DOT programs are in response to a top-level push in the direction of management development. They are designed to complement rather than to replace or to compete with existing management-development programs. They are not intended to be comprehensive.

## Texas

For its management courses, the Texas SDH&PT needed instructors with field experience in the specific management area they were teaching. Familiarity with the department's manage-

ment structure and its operating procedures was considered important. Therefore, the department chose to look within its own ranks for the instructors best prepared to satisfy these requirements. Its Adjunct Instructor Program is the result. Qualified and experienced individuals in each specific management area were selected and put through an instructors' course led by the chief of management and staff development. The newly trained instructors then prepared their own course outlines and materials.

Adjunct instructors are used to teach applied and general management courses. Instructors in the general management area relocate to Austin for 18-month periods. Those dealing with applied management only come to teach individual courses. In either case, instructors work in their regular department jobs when they are not in the classroom.

The combination of practical field experience and familiarity with the Texas SDH&PT gives instructors good credibility as teachers. Trainees relate well to their instructors and are confident in the relevance of course content. As a result, useful and practical management skills that have been proved in the Texas environment are taught and learned. The Adjunct Instructor Program has been in place for four years and the department's evaluation is very positive. At present, most of the students are engineers. However, some consideration is being given to getting away from using only engineers to fill department management positions on the theory that management primarily involves people-related rather than technical skills, and therefore that many management jobs could be well filled by non-engineers.

## Georgia

Currently the Georgia DOT is assessing whether its management cadre will meet its needs five years from now, and a fast-track management-development program is under consideration. Because the department never went through an early-retirement "crisis" it did not experience any sudden loss of experienced personnel at the upper levels. Instead it has used attrition to reduce its size from some 9000 positions to its current level of 6300. This has had the effect of keeping the management cadre proportionately intact, but it also has reduced opportunities for promotion. Increasing technical requirements for its maintenance foremen led the Georgia DOT to establish an Academy Training Program. The first program consisted of one week of training on supervision and a second week on specific technical needs of maintenance foremen. As these academies for foremen were judged to be quite successful, the DOT expanded the program to include construction foremen and project engineers. Again a two-week schedule was devised that blended technical and managerial topics. The program emphasizes the idea that first-line supervisors are expected to *manage* as well as to make technical decisions.

Academy training is conducted at the North Georgia Technical School, and the overall cost has been kept low. The participants are housed at the school for two weeks at the rate of \$50 per day. Much of the benefit from the training has been found to come from informal discussions. The overall result has been an improved quality of supervision, even while the supervisory cadre has been getting younger.

A new initiative by the Georgia DOT, designed to further help supervisors manage people, is a "Behavior Modeling Program."

This program was developed centrally but is run on the district level by district training coordinators. It involves substantial role-playing and interaction exercises designed to strengthen performance-management skills through more effective leadership, communication, motivation, direction, and control. Eventually, all supervisors within the department will be expected to go through this training.

For its middle- and upper-level managers the Georgia DOT adopted in the late 1970s the management-development program developed by AASHTO and run by the Mississippi Highway Institute at the University of Mississippi. After several of its people had attended the Institute in Mississippi and returned with substantial enthusiasm, the DOT contracted to "import" the program for an offering in Atlanta. About 75 managers participated in this three-week program, and this group has become the management core of the Georgia DOT. The AASHTO program has not been repeated in Atlanta, but Georgia still sends two or three employees per year to the training.

More recently, the DOT has tied in to the state's CPM program. The CPM uses a more general approach and, although judged useful, is not seen as the complete answer to the department's specific management needs. A further concern is that it is difficult for engineers to relate to and learn from classes that are largely composed of and oriented toward human-service employees. Nevertheless, the CPM program has been found to be useful as part of an overall management-development approach, and some 100 DOT employees went through the CPM program during 1987 and 1988. The CPM is undergoing some changes, such as requiring individualized projects and exams, which may make it more useful to the highway department.

### **Pennsylvania**

For the last four years PennDOT has used its Leadership Academy Program for supervisory training. There are actually two separate academies, one for supervisors and one for managers. Both use in-house and outside instructors to teach one-week resident courses. These courses teach basic supervisory or management skills while communicating departmental values and priorities. The target audience is those who are in their first year as supervisors or managers. The Pennsylvania Department of Transportation is also working on a two-year package for new executives. This will be a very specialized program aimed at the "top 40" managers in the organization. It will be designed to supplement the state's Commonwealth Management Training Program.

### **New Brunswick**

The province of New Brunswick DOT has an ongoing program for developing and training its first-line supervisors that is nearly four years old. The program uses a series of workshops taught both by in-house personnel and outside consultants. The department hopes to expand this program to include workshops for middle managers and prospective supervisors. Within the current format, a new two-day workshop on constructive discipline is being developed.

### **Maryland**

Maryland's approach to management development started as a response to a large turnover in its management ranks. Its objective is two-fold: (a) to better equip existing managers and supervisors to perform in their positions and (b) to build a pool of highly qualified managers and supervisors to fill management vacancies as they occur. The program is for managers and first-line supervisors. The main focus, up to this point, has been on middle managers.

The Maryland program is two years in length, and it normally graduates small classes of three managers and three supervisors every year. Because there are 120 managers and 400 supervisors in the Maryland DOT, the process for choosing class participants is very selective. The curriculum is quite flexible and includes on-the-job development, special assignments, self-initiated development, and professional affiliations in addition to formal classroom training. Two core courses, which are taught at the University of Maryland or Penn State University, are included in the formal training.

### **California**

Like other DOTs, Caltrans is experiencing a loss of supervisory and management personnel. This has resulted in larger-than-normal recruitment—1100 new engineers were hired last year—and a lowering of the average age of supervisors. Second-level supervisors, for example, are now as young as 30, whereas previously it was unusual to find any younger than 45.

Supervisory development in Caltrans begins with the standard 80 hours of training that state law mandates for every new supervisor to receive during his or her first year as a supervisor. The department meets this requirement by a set of 12 formal classroom sessions of four hours each. An additional three hours of preclass work is required before each session, thus bringing the total training to 84 hours and fully satisfying the state requirement. The sessions are given once per week to minimize time away from the job site and to allow the lesson of each session to be absorbed and used before the next one is taught.

Beyond this basic supervisory training the state uses a series of seminars and other training devices. One example is the three-and-one-half-day Mid-Level Management Conference. Rather than working on hypothetical problems each participant is expected to identify and work on a problem from his or her own management area. The problem should be fairly specific and directly involve the individual. Then during the conference each participant is to formulate a plan of action using his or her own initiative plus the input of the other participants. They are then expected to implement the plan upon returning to their jobs.

To ensure a continuity of outlook and direction, the department is always careful to include some of its own personnel and managers among the training staff. Usually a given level of supervisors or managers is taught by individuals taken from the next higher level of management within the department. This approach has proved successful by fostering trust in the trainers and by establishing good communications and rapport between levels of management.

The department has also found it useful to establish criteria for a hypothetical, well-developed manager. These criteria include relevant work experience, educational background, training, and

personal experience such as community involvement. Individuals are given opportunities to add these experiences to their background. One result of this approach has been that when a management vacancy occurs in the department, Caltrans does not rush to find a replacement. Instead it often rotates another manager or supervisor into the position on a temporary basis.

### Virginia

In addition to its management-development program, the Virginia DOT is in the process of developing a presupervisor orientation program. The orientation will focus on the topic "So you think you want to be a supervisor." It will ask participants to think about their prospective new role and what they will be expected to do. After six months of a supervisory experience, Virginia DOT personnel are eligible for the department's in-house management-development program. This program uses the Myers-Briggs personality test to assess each participant's personality profile. Various leadership styles are then discussed and related to the different personality types. Other parts of the program include training in effective oral and written communication, time management, situational leadership, and performance management.

### Colorado

The Colorado Department of Highways, in common with many state highway departments, has an aging administrative cadre. Anticipating shortages in this area within the next five years, the department is moving to create a management-development program. The training plan will cover the standard human-resource management topics. It will be targeted, at least initially, at the more than 80 upper-middle-level managers within the department. In-house resources are not available to conduct the program, so it will be delivered by an outside contractor. At this point, the program is not envisioned as being required for promotion. Even at this preliminary stage, some resistance is being felt from the engineering cadre within the department. They feel that there is little incentive for them to participate, because they would have to relocate or leave engineering jobs to be promoted.

### Iowa

In Iowa, the DOT projects an attrition of approximately 10 percent of its engineering force over the next few years, with the loss reaching as high as 25 percent among its senior-level managers. To meet this challenge, Iowa has expanded its Management Training System. The system now offers extensive training opportunities based on short courses (less than one week) offered in a multitude of areas. Some 56 different courses are now taught each year under the program. These courses cover basic supervision topics, sexual harassment, decision-making, computer applications, management skills, and stress management.

The courses are grouped into three components. The first component, consisting of six courses, is required of all new supervisors and managers. The other two components are split into

the three areas of executive, managerial, and supervisory topics. Courses may be taken on an individual basis or the participant may opt to apply for the state's "Certificate Completion Program." Applicants for this program must complete all course work, approximately 300 hr, within five years after their acceptance in order to be eligible for a certificate. Certificates may be earned in the executive, manager, or supervisor program or in a separate area of administrative management. In 1987, the governor of Iowa awarded a total of 27 completion certificates. There are currently more than 120 employees enrolled in the Certificate Completion Program.

Iowa is also starting a new "seminar program" for engineers, and it is planning a related "college of management" for non-engineers. These programs are intended for prospective supervisors. They will involve at least two days of training per month. Those completing the 18-month program will be given a diploma. The goal is to graduate 25 engineers every year in addition to an unspecified number of non-engineers. The program for engineers started in January 1989. The overall objective is to build a pool of engineers and non-engineers who are qualified to fill supervisory vacancies as they occur.

## EXECUTIVE-DEVELOPMENT PROGRAMS

One significant trend in the human-resources development efforts of state DOTs appears to be in direct response to the "succession" problem discussed earlier. In order to prepare those who are currently holding middle-management positions for executive responsibilities, several states have implemented executive-development programs, and others are planning to institute such programs in the near future. In all cases, these programs are designed to accelerate the acquisition of administrative skills, knowledge, and abilities required of executive-level personnel in DOT organizations.

A composite picture of state DOT executive-development programs reveals that they have the following general characteristics:

- Systematic efforts in the identification of skills, knowledge, and abilities required of DOT executives, and use of the results for diagnostic and planning purposes.
- Development of information acquisition and analysis systems intended to provide human-resources planners with data concerning the training, experience, qualifications, and career goals of potential executives.
- Identification of those most likely to benefit from participation in formally structured executive-development programs.
- Identification, creation, and coordination of a variety of internal and external training and educational resources needed to provide the conceptual and experiential foundation upon which executive-level administration rests in DOT organizations.
- Establishment of positive supports for participants in executive-development programs, including counseling, evaluation of training and experience, tuition reimbursement, time off to attend courses, and special assignments intended to enhance familiarity with various organizational functions and programs.
- Development of performance-evaluation systems intended to provide developmental feedback and to formulate training and/or educational plans.

- Creation of centralized data banks for purposes of tracking and evaluating career progress and training of participants in executive-development programs.

Few of the state DOTs reported that their existing or planned executive-development plan included all of the above. However, a common feature is the recognition of the organization's need to anticipate and to respond to qualitative as well as quantitative needs on the executive level, and a corresponding willingness to make substantial investments in the managerial, educational, and training resources needed to support such a program. Apparently, underpinning all of these executive-development initiatives is the idea that the executive role is qualitatively different from that of the middle manager or supervisor. Therefore, DOT executive-development programs (existing and planned) recognize the need to provide training, education, and experience in a managed or coordinated manner that specifically prepares participants for executive positions. Accordingly, state DOT innovations in this area represent a distinct and organizationally significant trend within the overall pattern of DOTs' efforts to more effectively develop their human-resources bases.

#### **Pennsylvania**

Executive development may well begin with orientation for those who are promoted or brought into higher-level management positions. In addition to its basic four-phase process for all new employees, PennDOT also felt a need to give additional orientation to new managers at the middle-management-and-higher levels. Accordingly, the department has designed a New Executive Orientation Process for middle managers, senior managers, and executives. The entire program consists of 21 different training sessions, with each management level taking a different mixture of required and optional courses. Executives, for example, are required to attend 10 of the training sessions, with a second 10 being optional. For Senior Managers there are 11 required and 9 optional courses. Eleven other sessions are required for Middle Managers, who have only 6 optional courses. Feedback is unavailable because of the newness of the program,

but it represents a recognition by PennDOT that its leadership and supervisory training is inadequate for higher-level managers and is a first step toward correction of this deficiency.

#### **Colorado**

In direct response to its aging administrative cadre and in the anticipation of shortages within five years, the Colorado Department of Highways has begun to develop a training program known as the Management Development Program that will target middle-level managers. It is currently being designed by an outside contractor. It will provide training in standard management topics for approximately 80 middle managers and senior highway engineers. In connection with this program, Colorado is also working on management-succession planning. Some of the questions it is considering in this area include the nature of the qualifications required and the promotional criteria to be used in conjunction with the program.

#### **Virginia**

The Virginia DOT, with nearly four times as many employees as the Colorado Department of Highways, has moved in a similar direction. Faced with the anticipated shortages in top-level managerial and assistant managerial positions, Virginia is gearing up to start an Executive Management Institute. The first step, currently under way, is to survey top managers and to identify the attributes and traits of successful DOT managers. This survey is being sponsored by the department's executive committee. The resulting executive profile will then be used to structure training under the new program. It is anticipated that the program will consist of three one-week training sessions, with practical work assignments given between the sessions. Employees will be able to nominate themselves for the program, but final selections will be made at the executive level. Virginia is hoping that its Executive Management Institute will produce a pool of highly qualified managers who will apply for top-level managerial jobs as they become open.



## NEW EMPHASIS ON CAREER DEVELOPMENT

Along with the general recognition of people as the organization's most critical resource has come a renewed emphasis on holistic career development for DOT employees. For the most part this has taken the form of strengthening programs and strategies that DOTs have used for years, such as internships, traineeships, and job rotation. This heightened concern with career development, however, has also resulted in new career-planning and guidance programs and, in a few cases, in experimentation with a relatively new approach, the initiation of assessment centers.

### INTERNSHIP AND TRAINEESHIP PROGRAMS

Internship and traineeship programs are designed to provide accelerated familiarization with DOT functions, technical activities, and managerial responsibilities. Internship programs are most commonly used to introduce student-engineers to the DOT environment and to the various technical skills required of full-time DOT personnel. College students, for example, are employed for summer work in the agency, and assigned to tasks intended to provide them with some introductory experience. Typically, these programs are administered in conjunction with a sponsoring university or school of engineering seeking to introduce their students to the "applied" side of their engineering specialty. From the DOT point of view, these internships allow low-cost access to useful skills, and they are often used as recruiting tools.

Post-entry internships or traineeships focus on broadening the new employees' understanding of DOT programs and their associated technologies. Often, they are also used to familiarize personnel with the alternative career lines open to them in the organization and to allow supervisors and managers to evaluate the competencies, training needs, and career interests of the trainees. A frequently mentioned function is to promote the "socialization" of new workers to agency goals, procedures, and expectations.

Typically, traineeships involve planned rotation of duty assignments through major organizational departments or functions. Formal training experiences in support of accreditation or licensing requirements may be an element of the trainees' program, but the more typical model is to focus heavily on on-the-job training and evaluation. Mentoring and coaching are often formal parts of the process. In a number of instances, formal mechanisms such as site visits and interviews with trainees are used to evaluate the program. Programs vary in duration, although four years is not unusual. The duration of rotational experiences is also varied—in some states lasting up to four years, in others involving only a few weeks.

Traineeships may also be used to facilitate the development of those who have been identified as "fast track" candidates for managerial and executive responsibilities. In these cases, trainees' experiences include planned exposure to a variety of managerial and executive functions. As the need to fill future gaps in the managerial/executive levels of DOTs through accelerated development of required skills and experience has become apparent, increasing numbers of these agencies have moved to implement this type of traineeship program.

#### California

With a budget of nearly \$4 million, the Caltrans student assistant program is one of the largest in the United States. Since the program was initiated, more than 2000 student interns have been hired. They have been hired to work in a variety of areas, and currently fill positions in every district and many units in the Sacramento headquarters complex. Approximately 90 percent of the students who have interned with the department continue to work for Caltrans following graduation. The interns come from all over the United States, but the department's main emphasis is in dealing with California schools. By working closely with particular schools the department gains the ability to have some input into the school's instructional program. Besides giving Caltrans a look at prospective new employees, the program also provides the flexibility to fill in labor force gaps for peak times or for the summer construction season.

#### Florida

Like many states Florida has had a basic rotation program for its entry-level engineers for several years. It includes rotation through the various major engineering areas, with specialization in one area of choice for the last six months. Two years ago Florida passed a law mandating registration as a professional engineer for many DOT positions. As a result, several changes were made in the entry-level training program. The old two-year rotation was renamed the Junior Engineer Trainee Program. It was strengthened with the addition of an exam for each area of rotation and a final requirement of successful completion of the national Engineer In Training (EIT) test. (Entry-level engineers are encouraged to take the EIT exam before leaving school.) A new Senior Engineer Trainee Program has been added. This second program covers an additional two years. It does not involve job rotation, but is specifically geared to preparing the trainee to pass the registration test. Upon completion of both programs, trainees have the required four years of experience

needed to qualify to take the P.E. exam, and they are expected to take it. Those who do not pass on their first or second try are reduced in grade and pay.

Both programs include personal attention to the trainee's development. Each trainee is visited at regular intervals by a statewide coordinator. The goal is to provide moral support and to resolve any difficulties or conflicts. All trainees are on temporary-employment status until successful completion of the combined four programs. There are a total of 59 engineering trainee positions statewide. So far, the dropout rate has been very small. Personal attention and attractive salaries have apparently contributed to the low turnover rate. The Florida legislature has given approval to a salary schedule that gives each trainee a 5 percent pay raise every six months throughout the four years of the program.

Florida has also developed a training program for right-of-way specialists. It is a two-tiered program, with entry into the first level for college graduates only. Entry into the second level is restricted to good students from the first tier. The first tier (the Right-of-Way I program) lasts two years. It includes training in surveying and advertising and considerable course work from the American Institute of Real Estate Appraisers. There is a mandatory exam at the conclusion of the two years that must be passed on the first or second attempt.

The second tier is the Right-of-Way II program. It lasts an additional three years. This program is for appraisers. It leads to certification as a "Member Appraisal Institute." For both programs, the legislature, after being sold on the idea of in-house training, has approved reasonable starting salaries and regular increases. To avoid losses of trainees, considerable personal attention is given. So far, there have been no dropouts for personal reasons or exam failure. Florida believes that if it can keep people for at least seven years they will usually stay after that.

### Missouri

Although Florida has chosen to strengthen and expand its basic entry-level engineering program, Missouri has taken a different approach. After a review of other state programs, the Missouri Highway and Transportation Department designed one of its own, based on the conclusion that trainees spent too much time in job rotations in which they were not very productive. Missouri's engineer-development program, initiated in early 1989, involves very short rotations through the major engineering areas for a few weeks each. Then the new engineer is placed in one of the divisions for the remainder of the three-year training program.

Once assigned to a division, individuals are rotated around to a variety of projects to gain exposure to all the different kinds of work carried out in that division. The purpose is to provide well-rounded training by making sure that new engineers do not become isolated on individual special projects. This program, which is characterized by one official as "structured on-the-job training," is designed to assure that the department obtains productive work from its new engineers as they advance through their training program. Written verification by both the new engineer and the supervisor is required to certify that training goals are actually being met. All new engineers in the department, typically 25 to 30 each year, are included in Missouri's engineer-development program in preference to separating out a

group of "fast trackers" for special treatment. If during the course of the initial three-year period an individual is transferred or promoted into a different division, he or she begins the program over again in that division.

The program also includes some classroom training in typical engineering topics, along with exposure to business writing and management instruction. However, the emphasis is on professional engineering knowledge and skills rather than moving individuals into managerial or supervisory roles too quickly. As in Florida, there is also a personal side to the program. Each trainee is visited twice per year by a program counselor to discuss training needs and accomplishments as well as more personal concerns. In addition, meetings are conducted periodically with all the participants to solicit feedback on the effectiveness of the training program and to identify career-development objectives that the program might be able to address.

### Texas

Florida and Missouri, as do most states, have trainee programs of a statewide nature. In Texas, by contrast, the 25 individual highway districts have maintained considerable autonomy. Consequently, virtually all training of new engineers is done at the district level, with little oversight or input from the central office. The districts do their own hiring and have evolved their own training programs based on their size and their needs. All the programs, however, are about four and a half years long. They are geared to preparing the new engineer to pass the P.E. test. Engineering registration is the key to career advancement in the Texas SDH&PT.

Although district office autonomy is still respected in Texas, there have been efforts recently to develop some standard training guidelines. These guidelines are intended to provide some common training exposure for all trainees. For example, at some time in their program all trainees usually attend a one-week management-development course that covers basic supervisory and management topics. With the active participation of Texas A&M University, other courses have also been devised for delivery in Austin. The central office will bring in various district trainees (as their schedules permit) for these courses. An in-house training course in design is also being developed. Currently, it has two levels in operation, and a third, advanced level is being put together. The first level will be open to technicians and engineers. It will be offered in the districts. The other two levels will be open to engineers only. They will be taught in Austin by central office.

### CAREER PLANNING AND GUIDANCE INITIATIVES

A number of DOTs report that they have established formal career planning and guidance procedures for their employees. These initiatives involve regular consultations with supervisors and/or personnel specialists prepared to help the employee assess his or her current status in the organization in light of future opportunities. In some cases, information provided by performance evaluations, diagnostic tests, and reviews of experience is used to assist personnel to: (a) improve performance in their current positions, (b) plan training, education, and experience in order to prepare for different or higher levels of responsibility in

the organization, and (c) develop familiarity with the requirements of positions to which they aspire. Agency personnel may also be offered the opportunity to take special courses designed to prepare them for credentialing examinations and to improve basic skills in such areas as reading and writing. In some DOTs, the planning and guidance function is the responsibility of personnel or human-resources management offices; in others, the process is largely a decentralized supervisory responsibility, with supervisors receiving at least some training in the counseling role.

Overall, this growing interest in career planning and guidance suggests that state DOTs, like many other public agencies, are recognizing that the development of their human resources cannot be left to the voluntary and largely individual efforts of their employees. Although traditional public personnel systems have tended to neglect the career concept in favor of a position-oriented approach, current thinking in the human-resources area encourages management to see the organization as a series of career ladders leading from entry-level positions to middle- and higher-level technical and managerial responsibilities. Apparently, at least some DOTs are thinking in these terms, and have recognized that their personnel should routinely be provided with the needed support and guidance.

#### Virginia

In Virginia, the DOT has formulated an "Employee Development System," which is voluntary and open to every employee. It functions at the level of the immediate supervisor, who acts as the initial counselor in the process, although not all supervisors are enthusiastic about filling this role. Employees are encouraged by the department to think more clearly about their aspirations and their career goals in general. They then communicate their ideas to their supervisor, who in turn suggests appropriate training or other avenues of development. Counseling is available to an employee at any time. Often, the annual performance appraisal proves to be the most convenient occasion.

#### Iowa

The Iowa DOT also uses a positive counseling style in its approach to career planning and guidance. Counseling sessions are built in to the four-year entry-level program for new engineers. Counseling is also available to other professional employees on an as-asked-for basis. Counseling is automatically required for all employees whose performance ratings fall below the acceptable level. The goal is to diagnose the problem and to keep the individual in the department as a productive employee. This approach has been successful.

#### New Jersey

The New Jersey State DOT is also moving in the direction of formulating an individual career-development system. Because of severe budget cutbacks, it has been unable to field a complete program. The current program actually represents a retrenchment from earlier efforts. At the present time, employees must initiate requests for career assistance. Some referrals are made

to the training office based on performance or other problems, but there is no systematic canvassing method to identify individuals interested in career guidance.

In giving guidance, the program relies on counseling, aptitude testing, training, and tuition aid for outside courses. When indicated, a search is made for other positions within the department that might be more appropriate for the employee. For well-qualified and well-recommended employees, degree programs in areas relevant to the transportation department can be pursued with department assistance.

#### North Carolina

The DOT in North Carolina is implementing a comprehensive career-development program that will start with new-employee orientation and end with either retirement or an exit interview. The major elements of the program have been delineated and the department is in the process of bringing the major components on-line. A key feature of the program will be an assessment center, which is already functioning but will be expanded. The principal avenues for career development in the North Carolina plan will be career planning, career counseling, job enrichment, formal and informal training, quality circles, and job listings. Career planning will be an integral part of the new performance-appraisal system, and additional career counseling will be available on request from training staff personnel. The training offerings are quite varied, including on-the-job training, technical training, self-study with department-provided materials, management and supervisory training, cross-training, and a well-used education-assistance program. The ongoing quality circles program is designed to keep existing circles functioning and to form new circles. A department policy of listing its job vacancies in all sections is designed to stimulate career thinking and to promote job transfers, when desired.

#### JOB ROTATION AND CROSS-TRAINING

As part of their career-development strategies, a number of DOTs are systematically using job rotation and cross-training in order to broaden the experience and skills of their personnel. Job rotation is used both to familiarize personnel with mainline organizational functions and activities and to help them to make informed long-term career plans on the basis of that experience. Cross-training is also used in some cases to provide the agency with technical personnel who are able to work in a variety of activities. Thus, cross-training enhances organizational flexibility and capacity without requiring new hires. Cross-training improves the agency's ability to make shifts in its task and goal structures without disruptive turnover in personnel or performance "lags" while the agency restaffs to handle new challenges. It is also intended to produce a cadre of employees who may qualify for several career-line options within the agency's technical and managerial job structure.

The major application of job rotation in most state DOTs is still contained in training programs for entry-level engineers. These traineeships are usually two to four years long and involve several rotations among the major engineering divisions during at least the first two years. The four-year programs often specify concentration in a single area for the last two years and manda-

tory passing of the professional exam for engineers at their conclusion. An exception to this pattern is found in the Missouri Highway and Transportation Department, where new engineers spend approximately one week in each major area and are then assigned to a single department.

### Oregon

The Oregon DOT has developed a multifaceted system of job rotation possibilities. Called the Developmental Assignment Program, it allows for "shadow assignments" of 1 day, "informational assignments" of up to 30 days, and actual job rotation assignments from 6 to 18 months long. Besides their obvious career-enhancement and upward-mobility aspects, these temporary assignments are a quick way to fill vacant permanent positions or temporary special-project positions. Up to 75 percent of the employees involved in the rotations end up making a permanent transition. In order to fill in for the employees who are on such assignments, the Developmental Assignment Program has a yearly budget item specifically designated to hire temporaries. The program has been quite successful, and the new state highway engineer is calling for a 50 percent increase in rotational assignments.

Names of people volunteering for rotational assignments are kept on a computer. Currently there are 250 names on the data base out of approximately 5000 total employees. The department hopes to attract another 500 volunteers, and advertises the program through its career-counseling efforts, group workshops, and nontraditional workshops. These last are specifically designed to make people aware of the various career options and mobility choices within the Oregon DOT.

### Texas

Another type of job rotation occurs in Texas, under its Adjunct Instructor Program. This program was described in the section on management development. Department employees are proving very effective as instructors because their background and work record gives them immediate credibility with and acceptance by the course participants. Whether the temporary loss of these highly qualified individuals from their normal duties will be a significant detriment of the program remains to be evaluated.

### Louisiana

The Department of Transportation and Development (DOTD) in Louisiana, although hampered by severe budgetary constraints, has moved ahead in designing a rotation program for new engineers. The planning is now complete and implementation is anticipated by July 1990. The program will consist of two different rotations: (a) a 24-month schedule for engineer trainees who will work in the central office and (b) an 18-month schedule for those who will work in a district office. The rotation scheme for district trainees will be limited to district assignments only and include no central office experience. By contrast, the central office trainees will spend six months in a district, which accounts for their total program being longer by that amount.

There will be no permanent assignment of trainees until the rotation is completed in order to prevent any loss of interest or involvement with the trainee on the part of individual units.

Before 1970 the DOTD also had a rotation program in use, although it was of much shorter duration and considerably less structured. The favorable memory retained by some of the department's older engineers of the valuable exposure gained through that earlier program may have helped provide the impetus for this new effort.

### Pennsylvania and Arizona

A general trend across many highway departments is to phase out single-function employees, to develop broader job descriptions, and to use cross-training to equip employees with multiple capabilities. Part of the impetus for this move comes from difficulties associated with replacing single-function employees when they retire, especially if they have acquired considerable expertise in their position. For example, three years ago PennDOT found that 80 percent of its right-of-way negotiators and appraisers would soon be eligible for retirement. The department's response was to combine these two roles and to institute a voluntary cross-training program for its current right-of-way employees. The Arizona DOT is also finding the generalist approach to be appealing, and is moving in that direction. This opens up new training possibilities, because training is no longer confined to strictly single job-related functions.

### North Carolina

Other cross-training initiatives do not involve new job descriptions or multiple-skilled employees, but instead focus on improving communication, understanding, and cooperation between departments. Lack of rapport between various engineering departments, such as construction and design, is common. To overcome this problem, the North Carolina DOT has instituted a voluntary cross-training program whereby engineers may rotate into another section for one week. Crossovers have been taking place between maintenance and construction, design and construction, and traffic and construction. Lower-level managers who are about to be moved up can also rotate for short periods into the higher-level management positions they are likely to receive. In the last year, 66 employees took advantage of this North Carolina program.

### ASSESSMENT CENTERS

Although not widespread in the DOT environment, assessment centers offer one approach to the problem of evaluating the human-resources base of the organization in terms of existing competencies, experiences, and career progress. In effect, the assessment center provides a mechanism for integrating a broad spectrum of information about the competencies, interests, goals, and training needs of organization personnel. They also allow management to evaluate these data with regard to existing and future agency requirements in supervisory, managerial/executive, and technical areas.

In general terms, assessment centers are formally established organizational units within the human-resources management structure of the DOT. They may employ counselors and other testing specialists who support employee-development efforts through a variety of techniques, including testing, skills evaluations, and counseling with regard to career planning and training. The center may also serve as a clearinghouse for information concerning training opportunities and job opportunities throughout the agency. A fully developed center concept also involves systematic follow-up of employee training and career-development programs, a process that allows line management to participate in the planning as well as evaluation phases of employee jobs and careers.

Assessment centers also produce information that, at least potentially, strengthens the agency's usable data base on its human resources. In at least one instance, information developed by the assessment center has been integrated with data available from other sources to produce a human-resource data base judged to be extremely valuable for evaluation and planning purposes.

#### **New Jersey**

The New Jersey State DOT's initial interest in assessment centers began as a result of age projections showing a heavy potential for near-term retirement among top-level managers. The immediate concern was with facilitating the career bridge from engineer to manager. The first steps in this direction came in 1981 when a DOT training officer was sent to a private firm, Development Dimensions Inc. (DDI), to learn more about assessment centers. Eventually a total of 18 people went through the DDI assessment program.

When the first assessment center was formed by the New Jersey State DOT, however, all of the assessors had not been trained. In addition, the program provided no counseling and no follow-on training, but relied instead on written reports and feedback on a standard form. A new training director was hired in 1983 and revamped the project. Senior managers who had gone through the process were given training to be assessors. Instead of written reports, feedback was provided by a 2-to-3-hr meeting with each participant within two weeks of their going through the process. This was followed, within four weeks, by another meeting with the participant and his or her supervisor to further discuss developmental needs. The program itself consisted of one-day sessions covering 12 different areas. The assessment center director often provided counseling to individuals who participated in the program, and also provided follow-up training for these individuals in such areas as leadership and communication. The assessment center, however, was located under the Associate Commissioner for Administration and was not part of the training division. Furthermore, there were no formal linkages between the assessment center and the department's training programs.

A total of 80 people went through this program. The official policy was that all division directors and bureau chiefs should go through the assessment center, but a proposal to put all new engineers through was not implemented. The project faltered after a few years because of the loss of the assessment center director and the hiring of a new commissioner who had other priorities. During its brief period of operation, however, it did

garner some enthusiastic support from senior managers. Currently two consultants, after a year's work, are recommending that the assessment center be revived.

#### **North Carolina**

The assessment center concept had an earlier beginning in the North Carolina DOT, where an initial attempt was made in this direction in the mid 1970s. The DOT followed the assessment center concept as used by the American Marketing Association. With a change in administration, however, the fledgling program became a nonpriority and so fizzled out.

More recently a new attempt has been initiated, prompted in part by the large number of current and potential management retirees. The new assessment center is run by a full-time director and a part-time consultant (13 days/month). The assessors are top managers (levels 5 and 6 in the North Carolina hierarchy) who have each received five full days of instruction on the purpose and method of assessment centers, along with training on behavioral observation and recording skills. The assessment center is tailored to the requirements of the North Carolina DOT. It focuses on management skills. The aim is to evaluate and prepare people for level 4 positions, which are primarily administrative and nontechnical. Potential candidates, usually civil engineers in levels 1, 2, or 3, either request the program themselves or are nominated by their supervisors. There is a current waiting list of 60 individuals.

The assessment program is run once a month, when six employees go through a two-day session. A team of three assessors observes the session and rates performance. The director then schedules a feedback session with each individual. In the feedback session the director goes over the individual's strengths and weaknesses and discusses what can be done about them, pointing out resources available both inside and outside the DOT. Participants are encouraged to take the results back to their supervisors, but this is not a requirement. Center personnel feel that the program should entail more systematic feedback, such as meetings with participants' supervisors, developing action plans for career development, and conducting six-month reviews over the next two years. This will not be possible until the program is allocated a full-time position.

The assessment center has come to be considered as the first step in the North Carolina DOT's career-development program. More than 70 employees have gone through the process. The goal is to put 72 employees per year through the center. Unlike the earlier ill-fated assessment program, this one appears to have a future, because the need for it is recognized and top managers like and are involved in the program. Indeed, the center is getting requests for information from the department's review board when it considers personnel decisions or promotions.

#### **Alberta**

Alberta Transportation does not have an assessment center of its own, and therefore relies on the provincial government, which does have such a center within its Career Assignment Program. Alberta Transportation, however, is only allowed to send one or two people a year through the program. A few other "high

flyers," up to four or five a year, are sent to a private industrial psychologist for individual evaluation and appraisal. This is an expensive process, and Alberta Transportation would like to start an assessment center of its own under the direction of a clinical psychologist. As currently envisioned, this psychologist

would have a three-fold role: (a) career counseling and development, (b) stress counseling for troubled employees, and (c) an assessment role. One potential drawback to the assessment process has surfaced in Alberta: those individuals who receive a less-than-favorable assessment are likely to leave the organization.

## CHAPTER EIGHT

**INNOVATIVE RECRUITING AND RETENTION STRATEGIES**

In an effort to improve their ability to recruit and retain needed technical, professional, and managerial personnel, a number of DOTs have moved to implement innovative recruitment and retention policies. In the area of pay and benefits, the trend appears to be toward competitiveness and flexibility. In the face of competition for highly qualified personnel in certain job categories, efforts have been made to improve salaries, to reward those who stay with organizations for specified periods, and to accelerate the pace at which high performers may increase their pay. In at least one state, an effort has been made to offer employees the opportunity to select benefits packages best suited to their particular needs. In addition, financial support for relocation, even in the case of promotion, has been increased in response to employees' reluctance to absorb these costs. Cost-of-living differences are recognized by Florida in the form of regionalized pay scales. In a number of states, recruitment efforts have been broadened, in some cases to a regional or national level. In California, for example, nationwide recruitment, instant offers, and targeted recruitment at minority universities has been very successful. Efforts have been made to decentralize the applicant examination process and to maintain relatively extensive lists of eligible applicants. Programs designed to attract qualified minorities and women, and to encourage their career development, have been implemented in a number of DOTs.

**Florida**

In Florida the DOT has been very successful in getting legislative approval to increase the pay of entry-level engineers and right-of-way specialists. The department's approach was to present a complete in-house training package that included the revised pay schedules to the legislature. The proposed program itself was a response to the earlier legislative mandate for all highway engineers to be professionally registered.

Currently, starting engineers in Florida are given a salary of approximately \$25,000, with a 5 percent pay raise every six months for the duration of the four-year traineeship program. Thus, their ending salary, pending successful passage of the professional exam, approaches \$40,000. The salary adjustment for right-of-way trainees starts at a lower level, but it includes generous salary increases. It begins in the range of \$20,000 for BA/BS degree entrants, and has a cumulative increase of 80 percent after five to seven years. As a result of these initiatives and other factors, Florida is not currently experiencing any recruitment problems. In addition, the dropout rate from these programs is very low.

**Missouri**

Like Florida, Missouri is a state in which the Highway and Transportation Department is showing a strong personal interest in its employees. Every engineering trainee is visited at least twice each year by a training representative from the central office. The visit is to show support and to defuse any personal problems before they become serious. As in Florida, concern is shown for both on- and off-the-job problems. The department has not been able to offer such attractive salaries and raises as some states and, as a result, has a more active recruiting program. At present it actively recruits from seven in-state and neighboring universities. Expansion of recruitment efforts, particularly for minorities, is being considered, because the applicant pool is shrinking because of decreasing civil engineering enrollments.

Although the Missouri department is not having a recruiting problem, it is experiencing some retention difficulties. To identify the problem it has begun conducting mandatory exit interviews, in the hopes of pinpointing some specific complaints.

**Colorado**

Colorado's recruiting efforts are limited to its own colleges and universities. Only state residents are eligible for employment. If severe shortages develop within particular divisions, a waiver permitting recruitment outside the state can be obtained. So far, shortages have not developed in any section except traffic engineering. The Colorado department, however, is experiencing a difficulty common to many states—finding enough minority applicants to meet its goals.

**Georgia**

In anticipation of a significant loss of civil engineering technicians in its construction division, the Georgia DOT is making two changes in its recruiting techniques. First, to avoid declines in productivity caused by a long training period for its new technicians, the department is authorizing the hiring of replacements *before* the incumbent employee leaves. This produces an overlap in which specific job skills can be passed on by the incumbent employee. Second, the department is moving toward the hiring of more temporaries to fill gaps during the construction season.

**New York**

In New York, the State DOT expects to hire 100 new engineers in each of the next two years. Applicants, in addition to being

engineering graduates, must take a civil engineering exam. The department has begun administering the exam itself at frequent intervals and at locations across the state. A list is compiled of those passing the test and their scores. At present, the list is quite long, which proves very helpful in recruiting minorities. The department anticipates no shortage of applicants in the near future. The department does offer attractive starting salaries for new engineers, with good pay increases upon completion of the first year and passage of the EIT test. One interesting problem has surfaced, however, involving foreign nationals. These individuals, who compose as many as 50 percent of engineering students, are not eligible for full-time employment with the state. Yet they are eligible for summer internships and to take the qualifying civil service exam.

### California

In its engineering recruiting efforts, Caltrans is experiencing a shortage not in the lowest entry level, but at the second tier, or associate level, which calls for professional registration. There is considerable retirement at this level, and lower-level engineers are not moving up and passing their professional exams in sufficient numbers to make up the deficiency. As a further restriction on the available applicant pool, only engineers registered in California are eligible, because other states do not include earthquake engineering in their professional exams. The shortage is particularly acute in Southern California, where the cost of living is the highest.

The California Department of Transportation is mounting a statewide and nationwide recruitment initiative to find qualified applicants. It is placing notices in newspapers and appropriate periodicals that are coupled with profiles of successful Caltrans employees. Minority and female personnel specifically are being targeted. At its lowest entry level for engineers, Caltrans has a list of eligible engineers to which names are being added continually. The relatively high starting salary of more than \$27,000 doubtless contributes to this surplus of graduate applicants, as does its rotation training program for new engineers, as well as the climate and general allure of California.

On the theory that the future supply of well-trained engineers depends on the high schools, Caltrans has piloted an adopt-a-school program with two high schools in Southern California. Engineers from the department teach math courses with engi-

neering applications in these schools, and summer internships are offered to promising minority students. The overall idea is to encourage students to become interested in engineering and to go to college in that field. It is hoped that in the future some will become Caltrans employees.

### Iowa

In Iowa, the DOT has already gone through its period of heaviest retirements and has lost a considerable portion of its senior management cadre. As a result, many young engineers have been moved rapidly into management positions and more are expected to do so in the future. Still, even with the stress this has created, the department is satisfied with the results and is not currently experiencing a shortage of engineers. There is concern about a possible future shortage, particularly because a salary survey revealed that although neighboring states offer similar starting salaries, their salary ranges are broader and have higher maximum salaries. This situation could lead to retention problems, with trained engineers being hired away after reaching their maximum salary level. A salary adjustment would be the obvious answer, but this is quite difficult because Iowa has been under a prevailing rate salary system since 1985. All salaries are set by their score relative to 13 job factors, and cannot be increased except in the face of proven inability to recruit or retain qualified personnel in a given area.

With a salary adjustment almost out of the question, the Iowa DOT is moving to enhance other benefits. A full flexible-benefits program had been planned, but budgetary considerations have scaled this back to a partial plan. This plan would allow employees the opportunity to pay for health, life, and dental plans with pretax dollars, and give them some other limited options. It would fall short of a completely flexible benefits plan, which would allow options such as cash payments for unused annual and sick leave. A more generous moving policy is another benefit Iowa is working to obtain. Reimbursement for incidentals such as house-hunting and realty fees would be raised from the present \$7500 limit. The current maximum of 45 days of subsistence in the new location would be increased to as many as 90 days. Another problem, stemming from the very depressed farm economy in parts of the state, is that many relocated employees are unable to sell their old houses. For this reason some now own two or three houses. The department is working on methods to help sell, or even temporarily to acquire, these residences.



## REFERENCES

1. TRB, *Special Report 207: Transportation Professionals: Future Needs and Opportunities*, Transportation Research Board, National Research Council, Washington, D.C. (1985).
2. *Workforce 2000: Work and Workers for the Twenty-first Century*, The Hudson Institute, Indianapolis, Indiana (1987).
3. Johnston, W.B., et al., *Civil Service 2000*, prepared by the Hudson Institute for the U.S. Office of Personnel Management (June 1988).
4. Felgner, B., "Rough Road Ahead for State DOTs," *American City & County* (August 1988) pp. 79-82.
5. Poister, T.H., "The Revitalization of PennDOT: A Case Study of Effective Public Management," Pennsylvania Transportation Institute (1986).