3. Transportation management, to prepare students for management positions in urban and regional transit authorities or service agencies.

The second and third tracks would be open to students who have a background in a nonengineering field such as urban planning. We are also promoting training programs in traffic engineering that are suitable for the local personnel responsible for this work in practice.

In conclusion, the new programs at the University of Oklahoma do not address all of the needs and concerns involved in transportation professional training, nor can this program solve the problem of the unattractiveness of many positions in urban and state transportation organizations. But if the program can succeed in attracting higher-caliber students to the transportation field, regardless of their undergraduate background, it is believed that a significant contribution to the profession will have been made.

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Reviving Railroad Education in the United States: Programs for the 1980s and Beyond

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The results of a survey on the modern educational needs of the railroad industry, conducted with more than 90 senior-level members of the railroad industry, government agencies, suppliers, consultants, associations, and universities, are discussed. The consensus view is that the industry's educational needs can best be met by a combination of focused and practical seminars and short courses for present and prospective professional employees, support for enrichment of the railroad content of university course offerings in transportation, a university railroad research program,

and support of fellowships. The railroads are having little difficulty in attracting talented people, but these new employees typically have no specialized railroad knowledge, and this adversely affects job expectations, career motivation, and employee retention. Railroads actively recruit the small number of new graduates who have training in the rail field. The other segments of the industry have greater recruiting problems and correspondingly greater needs for improved education programs. It is concluded that the recommended university programs will have an immediate and positive impact on railroad job recruiting and will help to strengthen innovation in the railroad industry.

As the railroad industry enters the 1980s, events are occurring that are primarily outside its control and that promise to affect it significantly. One is the movement to deregulate, in an economic sense, all surface freight transportation agencies. The other is the energy shortage, as a result of which the relatively fuel-efficient rail roads may have the opportunity to regain former traffic and to attract new traffic if they can satisfactorily meet the service demands of shippers.

Despite what appears to be an improving financial climate for the railroad industry, interested observers such as government regulators, planners, shippers, academicians, consultants, and investors question the capability of railroad management to take advantage of the new opportunities available to it. Sources for the development of future railroad management have attracted the attention of those related to the industry. The question is asked, Are currently used management sources adequate for the coming decade?

In response, the University of Tennessee, under a contract with the Federal Railroad Administration (FRA), has conducted a study of railroad educational needs (1) with the following specific objectives: (a) to determine the extent of the need for future qualified managers and engineers in this country's railroad industry, (b) to determine whether existing educational programs can meet this need, and (c) to recommend programs for resolving any deficiencies.

The study, which was carried out during December 1978 and the 1979 calendar year, concluded that the modern educational needs of the railroad industry can best be met by a combination of focused and practical seminars and short courses for both present and entering professional employees, by support for enrichment of the railroad content of university transportation courses, by a university railroad research program, and by fellowship support.

METHODOLOGY, RESEARCH PLAN, AND PROCEDURE

Primary research sources for the study reported in this paper were (a) interviews with members of the railroad industry, state governments, colleges and universities, industry associations, consulting firms, and various other agencies and (b) solicited materials on railroad in-house and outside educational programs offered and/or supported by the carriers.

Interviews

Because of the exploratory, somewhat open-ended nature of this study, the researchers decided at the start that interviews should constitute the primary study resource. Interviews were held with more than 90 individuals representing some 35 companies, associations, and educational institutions.

Interviews were held both individually and with groups, whichever the interviewer felt would be most effective. Generally, the purpose of the interview was to determine what the individual or individuals perceived to be the rail industry's present and future management needs in operations, engineering, and marketing and the degree of difficulty that would be involved in successfully meeting these needs.

The selection of railroads and of individuals within companies to interview depended primarily on the degree to which the researchers were personally acquainted with managers of the carriers. In choosing individuals, a careful attempt was made to include managers who worked with or were responsible for recently hired employees being trained for future management responsibilities—not the persons who actually carried out the hiring. As a result, fewer than 15 percent of those interviewed were involved directly in personnel and related activities.

Solicited Material

Although the interviews constituted the primary source of information in the study, the team collected a wealth of material on existing educational programs from the carriers and other private and public agencies connected with the railroads and the transportation industry generally.

NEED FOR FUTURE RAILROAD MANAGEMENT

Preliminary Quantitative Estimates

Although a survey of the railroads to estimate future personnel needs was not included in the scope of the study, an attempt was made to bound the size of the potential problem. Railroad employment statistics showed that the total number of executives, officers, and staff varied between 16 000 and 17 000 for the 1971-1978 period. In interviews with railroad management, there was agreement that from two-thirds to three-quarters of top and middle management would have to be replaced in the coming decade. If it is assumed that 16 500 is an average yearly number of managerial and staff people, then two-thirds replacement in 10 years means 10 720 people, or 1072 yearly; a three-quarters replacement means 12 375 individuals, or 1238 annually.

The yearly figures, of course, assume an even replacement rate over the decade. Such an assumption may be heroic. It is anticipated that a majority of the replacements could be required as early as in the next five years. Such a development would obviously increase yearly replacement needs substantially.

In summary, the research team concluded that a definite need exists and will continue to exist in the next 5-10 years for replacement of managerial personnel, but it is virtually impossible to determine an exact annual number. It could vary from more than 1000 to 3000/year.

Views of the Railroad Industry

The researchers interviewed 66 employees representing 15 railroads. It is felt that these interviews constitute the greatest contribution of this study to the literature. The interviewees were candid and open, and all appeared genuinely interested in the study and sympathetic toward what it seeks to accomplish. The interviews included the following areas:

1. The extent of current and future needs in the rail industry in terms of engineering, operations, and marketing managers;
2. The degree of specialization in railroad subjects preferred by the industry in recruiting;
3. The industry's preference for in-house training,

vis-à-vis externally operated training programs, possibly fostered by one or more government agencies; and

4. The effect of the overall railroad image of decline and marginal financial status on hiring for entry-level management positions.

Current and Future Management Needs

For the industry as a whole, 50 percent of the current work force is scheduled for retirement in 10 years. The process has been accelerated for nonmanagement personnel in recent years through various early-retirement programs established by the carriers. Similar programs for management will be instituted, thereby hurrying the day when replacements will be necessary. The interviewees agreed that there would be a substantial need for managers at all levels of the industry in the coming years, but they were also in virtually complete agreement that the industry would be capable of providing its own replacements without any direct government assistance.

Specialists or Generalists

The railroads hire two types of college graduates on the bachelor's level: (a) engineers, primarily civil, but also including mechanical and electrical, and (b) graduates with degrees in virtually every other field of study. Only one carrier had trouble hiring all the civil engineers for which it had available positions, but this reflected its abnormally high requirements during the current period of widespread, substantial right-of-way rehabilitation. All carriers had trouble hiring the required number of mechanical and electrical engineers, but this merely reflected a nationwide shortage of such individuals and was not limited to the railroad industry.

In the second category, which included business, liberal arts, and all remaining majors, the carriers exhibited confidence that they could obtain the number of graduates they required as and when they required them. In fact, in many instances the graduates contacted the railroads for employment and not vice versa, as might be expected. This was particularly true in the case of marginal or money-losing carriers, to which the challenge of providing rail service under difficult circumstances evidently attracted candidates.

Particularly surprising was the carriers' preference for hiring what can be called generalists as opposed to specialists. This preference extended to both engineers and all other graduates. This is not to say that some specialized course work in rail is not helpful as a means of informing candidates on the background and nature of the railroad business, especially liberal-arts candidates and other non-business-oriented graduates. Some amount of rail orientation can accelerate job training and reduce the dropout rate among the newly hired, but, in the opinion of the managers, any advantage of a specially trained individual over a generally trained person would disappear in a year's time. A college record that shows rail or transportation content is often taken to signal genuine interest in the industry.

The managers were concerned about the overall inability of college graduates to communicate effectively or to approach problem solving with a realistic, logical attitude and procedure. An ability to deal with people was another missing ingredient, but most interviewees admitted that this capability had to be learned primarily through on-the-job experience.

In-House Versus External Railroad Training and Orientation

The extent to which the managers opposed the teaching of practical railroad material to hirees by an agency or institution other than the rail industry itself was somewhat surprising. With the usual exceptions, the industry people regarded external educational influences with suspicion, evidently fearing that such teaching might vary from policies and practices regarded as sacred by the individual firms involved.

In the exceptions to the prevailing opinion, some managers emphatically supported the concept of external teaching, primarily as a vehicle for promoting change in the industry. In one particularly informative session, a young operations manager compared the way in which rail-freight-classification procedures would be taught by a railroad with the way in which they should be taught. In the former case, the process would simply be described and be accompanied by a visit to a classification facility. In the latter case, the description and visit would be included but, in addition, the procedure's effect on overall rail operations would then be analyzed and the implications of classification on each road's ability or inability to compete with other transportation modes in terms of price and service would be underscored. The fact that the procedure is extremely costly and causes delays and frequent unreliable delivery times should be acknowledged, yet traditional management probably would regard such an orientation as "rocking the boat" and consequently undesirable.

An alternative favored by several interviewees involved government aid to colleges and universities to establish orientation courses in railroading or to integrate surface transportation topics. A major in railroading or transportation was not necessarily recommended. Again, in dealing with teaching beyond the basic stages, the majority's preference for in-house intermediate and advanced training was reflected.

One alternative suggested consisted of financial support for respected individual professors of general engineering or economics and business courses. These people would not necessarily teach transportation courses per se but would inject railroading into their offerings in the form of examples, arousing student interest in it by their knowledge of and enthusiasm for the mode.

Railroad Image and Its Effect

The importance of the railroad industry's public image in the hiring of future management was raised in virtually all interviews. Not surprisingly, the profitable carriers said the overall image was no problem. Interested students knew which companies were financially stable and so were not affected by the often-accepted public view that all the roads were bankrupt. The marginal carriers did feel image to be a problem in hiring but, once an individual was employed, the problem disappeared. Of some surprise was the experience of bankrupt and money-losing companies. Rather than being forced to seek applicants, these companies were sought out by job candidates. The challenge of being part of a valid mode of transportation that currently finds itself in decline and precarious financial straits attracted individuals who seek responsibility early in their careers while simultaneously supporting a worthy cause.

Most of those interviewed recognized the need to change traditional railroad policies in handling entry-level management. Long hours without overtime pay, 24-hour responsibility, frequent assignment of responsibility without equivalent authority, stifling bureaucracies that discourage innovation, and forced moves around the system one or more times a year all contribute to a relatively high turnover rate among young managers. Furthermore, not only do the carriers have to satisfy the hiree, but they also have to win the support of the spouse and the family.

A few interviewees felt that such changes would not significantly alter the industry or its conditions and that the problem consisted merely of finding the right people.

Significance of Railroad Opinion

The researchers concluded the following regarding the opinions of rail management:

1. Management's reluctance to accept managerial changes in operating and marketing policies and practices, particularly changes advanced by relatively inexperienced employees, is very real. Any change, much less that advocated by a newcomer to the industry, is regarded with suspicion.
2. The industry—particularly the relatively profitable carriers—is suspicious of government intervention in its affairs. Most companies welcomed the researchers, but a few either failed to respond to the request for information or refused assistance outright. Regardless of the companies' reasoning in deciding to help or hinder the research, their attitude must be considered in evaluating various methods by which one or more government agencies can aid future rail education.

The railroad industry is still primarily privately owned and operated. The financial success of most of its member firms, at least to date, is not a function of government subsidy. Thus, its management, which is traditionally independent and conservative, does not have to embrace government programs or the products of those programs. In addition, since rail rights-of-way remain for the most part privately owned, there is not the opportunity for training individuals to build, maintain, and operate the rail infrastructure that there is in highway, water, and air transportation—unless, of course, the industry wants to turn this responsibility over to government, something it has shown little inclination to do.

It is important to recognize that most of present rail management, particularly at the middle levels where personnel decisions are made, is the product of an educational system that provided little opportunity for studying railroad or other transportation subjects. Thus, they may not be able to fully appreciate the advantages to be gained from studies that prepare a graduate to deal effectively with the emerging technical, economic, and regulatory changes that promise to radically alter the railroad business in the medium- to long-term future.

The manifestations of changing circumstances for the railroad industry are numerous. The industry is daily being required to become more responsive to the dynamic nature of the business of providing transportation service. Market conditions in the railroad industry and factors related to competition are undergoing a continual process of change, and the response of the industry to such change must be managed effectively by those who have decision-making responsibility. In addition, the outlook for government regulatory policy suggests that the economic structure of the railroad industry may be subject to change, which emphasizes the need to be able to react to change as it occurs. Another example is the area of technology, where new developments in signaling and communications, railroad power systems, traffic control systems, data processing, automation of rail yards, rail-line electrification, intermodal equipment and services, and the performance of track systems under heavier loads require the attention of engineers and managers who are able to foster innovation. Thus, the expressed opinions of railroad management concerning the need for railroad specialists must be balanced against the fact that engineering and managerial philosophies that guided operations successfully years ago may no longer be valid.

Views of Rail Planners

Rail planners in state governments, federal agencies, and consulting firms have educational needs that differ substantially from those perceived by the railroads. In general, these segments have a greater need for university graduates who have specialized training in rail transportation and in other surface transportation subjects.

State Rail Planners

State government agencies involved in rail freight planning have a great need for experienced and skilled personnel. Unfortunately, there is a shortage of such individuals in state transportation organizations, and the states generally cannot readily hire recent graduates who have the requisite skills. Frequent personnel freezes and increasing resistance to the establishment of new programs are major factors. The inability of states to offer competitive salaries to new graduates, particularly those with master's and Ph.D. degrees, also contributes. Those states that are in a position to hire rail specialists are interested in hiring people who have taken courses in rail transportation and in supporting subjects such as public policy, public administration, and operations research.

Given the problem of attracting qualified personnel from universities and from the railroads, most state rail personnel enter the field from other areas. Typically, people who have been engaged in transit or highway planning, engineering, or administration are recruited to fill positions in the area of rail planning. Since these individuals have very little, if any, rail experience, there is a great need in the states for specialized short courses in rail. Almost any aspect of railroading that could be covered by this means would find support among the state agencies. Courses in railroad operations, railroad engineering, rail cost-accounting procedures, finance, rail regulation, and benefit-cost analysis were frequently mentioned as needs.

Federal Agencies

Federal transportation agencies have less problem in obtaining new hirees than do state agencies. Federal salaries are quite competitive with those available in the private sector. The federal agencies are particularly active in recruiting recent graduates with master's or Ph.D. degrees with a specialty in transportation.

Consulting Firms

Consulting firms are the least constrained of any segment of the industry in terms of their ability to attract and hire qualified personnel in the rail area. Because of the diverse nature of consulting practice, these firms are very active in recruiting people from transportation and operations research programs in the universities. Consulting firms basically want well-rounded individuals who have superior analytic and communications skills. They recruit from the same programs as those described for the federal agencies.

SURVEY OF EXISTING EDUCATIONAL PROGRAMS

A major portion of this study focused on the identifica-

tion of educational programs, courses, or seminars that pertain directly, or are broadly applicable, to the area of railroad transportation. Included were programs offered by universities, railroads, equipment suppliers, and consulting firms and associations. The primary purpose was to develop an understanding of the extent to which rail-oriented educational programs are in evidence, thus providing a firm basis for recommending the types of programs that should be developed or reinforced to meet the projected needs of the industry. Research sources included articles in the trade press, some unpublished research, and personal letters requesting information from representatives of academia, railroads, equipment suppliers, and consultants and interested individuals.

The following types of programs were included:

1. Degree programs—(a) engineering, (b) management, and (c) interdisciplinary;
2. Company programs—(a) railroad in-house and (b) equipment suppliers; and
3. Seminar programs—(a) general and (b) specific.

The degree programs noted in this study were limited exclusively to those offered by colleges and universities throughout the United States. Both regular and cooperative educational programs were considered. Company programs included both those offered internally by domestic railroads and any that have been developed by suppliers of equipment to the rail industry. Finally, seminar or workshop programs could have been offered by any of the groups under study. Included as possible sources of such programs were educational institutions, equipment suppliers, railroads, consulting firms, and various associations.

Research Findings

Several findings of a general nature deserve attention. There is no current, authoritative source of information on educational programs related to the railroad industry. Aside from the fact that there are a number of highly regarded and very visible programs, identifying lesser-known educational programs is at best a hit-or-miss proposition.

Although there are available a great number of educational programs that deal generally with transportation, there are very few that are tailored specifically to the needs of the railroad industry. Instead, the claim is made frequently by those who offer these programs that certain portions of the subject content are applicable to the railroad industry or perhaps that the value to the railroad industry is implicit in the structure of the program.

The number of programs to be considered is diminished substantially if one restricts attention to undergraduate and graduate engineering, interdisciplinary, or management programs; short courses; and seminars. This study does not adopt such a limitation, but it does emphasize the fact that a significant portion of the programs that are reportedly offered are not managerially oriented but focus on providing tools and techniques for skilled and semiskilled railroad employees.

There is no general consensus among executives of the rail industry as to what the industry's educational needs are. For this reason, it is difficult to claim that any of the courses or programs discussed here are of such overriding importance that the industry could not continue to function effectively without them.

Degree Programs

Engineering

The extent to which most colleges of engineering can devote specific attention to the engineering aspects of railroad operations is somewhat limited. For example, an American Railway Engineering Association (AREA) survey of undergraduate curricula related to railway engineering at 99 schools found that, even at the few schools that did cover the subject, no semester hours of required courses and an average of only 4.43 semester hours of elective courses pertained to the topic of railway engineering. Only 15-20 colleges and universities have formal engineering course offerings specifically devoted to railroads. It is possible, however, that the national attention given to the generally deteriorated condition of the track and roadbed of many railroad facilities will encourage greater future academic interest in railway engineering at the expense of the attention now directed toward highway construction.

It is appropriate here to comment on the value of cooperative programs in relation to the educational needs of the railroad industry. Cooperative education is defined as the integration of classroom theory with practical experience so that students have specific periods of class attendance and specific periods of employment. The railroad industry has participated in the program and is an ideal industry to make use of it. There are literally hundreds of jobs in railroading in which a student can learn the industry from the ground up and at the same time perform a useful service. This method of recruitment can supply a steady source of well-trained employees to the railroad industry.

Management

The management category includes degree programs that are oriented toward the management of railroads and rail operations rather than toward the technical aspects of such operations. Such programs, typically found as curriculum offerings in colleges of business administration, colleges of management or administrative science, and schools of management studies, tend to emphasize the economic aspects of transportation and transportation systems in general. Few business schools offer courses devoted specifically to railroad management or operations. Although the principles of rail management receive attention in many programs, such coverage is frequently in the context of the larger transportation perspective. This is not necessarily a deficiency, however, since a sound understanding of the general principles of business management provides a suitable background for those who aspire to careers in railroad management. In addition, familiarity with the managerial and operating aspects of competitor industries should be considered a positive aspect of the student's academic preparation.

Interdisciplinary

A limited number of schools were found to offer relevant interdisciplinary programs. As a complement to existing formal programs, however, it is important to note that an interdisciplinary approach to rail education is evident in the organizational format and research programs of the transportation research centers that exist at a number of leading colleges and universities.

Company Programs

Railroad In-House

Railroads support or provide their professional employees with college or university degree programs, management training and orientation, management development, specialized skills development, and technical education programs. The overall conclusion is that, although there are some differences among railroads, the industry recognizes a wide variety of educational needs and relies on both internal and external sources for the preparation and execution of many such programs.

Individual railroads tend to be informed about and to recruit from specific programs offered at institutions within their respective operating regions. There is considerable disagreement among industry representatives as to the value of degree programs designed specifically to meet the needs of the railroad industry as opposed to more general approaches to the education of potential employees.

All railroads that participated in the personal interviews or responded to the written request for information indicated at least some formal, internal technical education programs. The main focus of this study, however, excluded technical offerings from consideration.

Equipment Suppliers

A letter was sent to a number of manufacturers and vendors of railroad equipment to request information on their education programs or courses. Since equipment suppliers generally focus on the technical aspects of railroading, their educational offerings do not assist the management development process. Virtually all railroads use this source for the detailed and practical technical knowledge needed for job performance.

Seminar Programs

General

The category of general seminar programs includes a wide range of seminar, workshop, or short-course programs that are of general interest to those engaged in the professions of business management and engineering. Although such programs are not designed specifically to meet the needs of the railroad industry, railroad personnel can often benefit from participation in high-quality course offerings of a general (as opposed to a disciplinary-specific) nature. Frequently mentioned examples are the advanced management programs offered by Harvard and Stanford Universities.

Specific

A number of management development and engineering programs are structured specifically to meet the needs of the railroad industry. Five schools in particular—Northwestern University, the University of Illinois, Pennsylvania State University, the University of Tennessee, and Princeton University—are representative of schools that are currently engaged in such programs.

Three transportation management programs that are somewhat more general in nature were cited by industry representatives as being responsive to the educational needs of the rail industry. These are programs offered by Northwestern University, Columbia University, and the Massachusetts Institute of Technology.

ANALYSIS AND CONCLUSIONS

Evaluation of the study findings leads to the following conclusions concerning the future educational needs of the railroad industry:

1. University programs in railroad education will probably never again be large enough to completely fill the demand for new managers and engineers, and this will force the railroads to continue to hire and train graduates with diverse backgrounds.
2. The railroads' practice of actively recruiting the few graduates who have done course work in rail transportation suggests that such individuals are perceived to be potentially valuable and highly motivated additions to their professional staffs.
3. A mixture of academic programs and continuing-education opportunities will be needed to respond to the broad array of railroad educational needs.
4. External teaching of railroad and rail-related subjects is a means of strengthening the industry's ability to innovate in response to a rapidly changing technological and business environment.
5. The expressed opinions of railroad management concerning the need for railroad specialists must be balanced against the fact that engineering and managerial philosophies that successfully guided operations in the past may no longer be valid.
6. Railroads actively use and support external educational programs, particularly those that complement their in-house programs, those that promise to enhance managerial effectiveness, and those that disseminate new technological developments.
7. Some form of introduction to the railroad industry—its characteristics, uniqueness, demanding nature, and problems—should be available to individuals who are considering it as a career.
8. Interdisciplinary skills are desirable for decision makers at all levels of railroad management.

RECOMMENDATIONS

In view of the conclusions reached above, four possible forms of federal assistance that will materially aid railroad education are recommended: (a) short courses, (b) curriculum enrichment, (c) university research, and (d) fellowships.

Short Courses

Short courses would last one week and would take in between a university quarter's and semester's work. Four specific short courses not currently available are recommended: (a) basic transportation, (b) surface transportation, (c) railroad transportation, and (d) railroad engineering. In addition to these, advanced courses of shorter duration that focus on specific technical and managerial subjects should be developed.

The recommended courses would be taught at a junior-senior university level and would be designed for two groups: (a) recent graduates or those entering their senior year who are interested in entering the railroad industry but have not been able to learn much about it either through college courses or work experience and (b) employees of the railroad industry who management feels should broaden their knowledge and outlook as a basis for future promotion (for example, orienting a union member who has management potential toward management's approach to problem solving and decision making). Ideally, these short courses would alleviate the potential shortage of railroad managers in the coming years by making college graduates more attractive candidates for entry-level management positions and by retraining promising personnel who are already part of

the industry for promotion to management positions.

Clearly, there must be a certain degree of professional uniformity in the presentation of the short courses. This requirement is one reason for the direct involvement of the federal government in putting on the programs. For example, they could be offered by FRA or under a program similar to that of the National Highway Institute. But, in view of the rail industry's attitude toward government involvement in activities directly or indirectly related to it, the programs should be organized and presented under the auspices of one or more properly accredited colleges or universities. The U.S. Department of Transportation (DOT) would establish uniform minimum standards to be met and would arrange whole or partial funding of the courses until such time as they become self-supporting or until a decision is made that FRA will sponsor a continuing program in rail education similar to the transit and highway programs of the Urban Mass Transportation Administration (UMTA) and the Federal Highway Administration (FHWA), respectively.

The cost to present a five-day course that involves 30 participants will vary from $10 000 to $40 000, depending on which specific expense categories are included (the latter figure includes course-development costs). This estimate excludes travel and per-diem costs for participants, which would average about $500/person. Most railroads are willing to underwrite these costs for worthwhile programs. FRA might want to consider funding these expenses for government employees.

These estimated cost levels are the principal argument for initial federal support. Because some of the desirable and recommended courses are experimental in nature, most universities and other course offerors would be reluctant to commit significant development resources to them. Federal funding would thus accelerate the process of course development and would keep attendance costs low enough to encourage participation by a wide range of people, including personnel of marginal and bankrupt railroad companies; rail planners employed by federal, state, and local government agencies; and individuals interested in entering the railroad field. The railroads themselves do not fund external course-development efforts but support them by sending paying participants. Thus, once the courses are operating, they could be supported by attendance fees. In this instance, FRA should consider continued funding of attendance fees for public employees and other eligible individuals.

Curriculum Enrichment

The rail industry strongly favors assistance to existing university programs for maintaining and enhancing their coverage of the rail mode. This would have the benefits of keeping the university community involved in the future of the railroads and maintaining the relevance and technical accuracy of university rail-related education and research programs. Funds channeled to university faculty members to improve the railroad content of transportation course offerings would be used for salary support, student assistants, support staff, travel to various railroads and to rail-related conferences, materials, and small, exploratory research efforts. In essence, this program would establish one or more "minichairs" in rail (or perhaps surface) transportation. The trucking and package-express industries and a few other segments of the transportation industry currently support university professorships. FRA should explore the development of similar programs for the railroad industry, perhaps in cooperation with the Association of American Railroads (AAR).

Funding for curriculum enrichment will be attractive to universities if there are assurances of continuity. Universities are somewhat reluctant to accept program specialization in the face of possible funding curtailment each year. This is less of a problem if established programs with existing rail coverage are selected for support. Funding needs vary directly with faculty salaries and with the percentage of program commitment that FRA is willing to invest. The typical annual funding for an enrichment program large enough to have an impact is approximately $40 000/recipient/year. The railroads have indicated their willingness to make available data, case studies, guest speakers, and similar resources but have not shown any interest in providing funding. The involvement of AAR in program development could be instrumental in changing this.

University Research

All segments of the rail industry support the idea of a federally sponsored university railroad research program. Several rail carriers have suggested that the industry could make use of the research results and should be willing to provide financial support (the latter idea, of course, is less attractive to the marginal roads). All interviewees appreciated the educational value and the curriculum-enrichment aspects of such a program. There was also considerable sentiment among the railroads for enlisting the aid of AAR in ensuring the relevance of the research and to provide access to industry data.

There are ample precedents and guidelines for FRA to follow in establishing a university research program. Three existing programs in the transportation area are the Office of University Research (OUR) Program of DOT, the UMTA University Research and Training Program, and the Maritime Administration's University Research Program.

Railroad research projects at universities are most effective if they are funded for a period of one or two years and involve several faculty members and students. Annual funding requests in the range of $60 000-$120 000 would be typical. Annual total funding of $1 million would provide for an average of 10-15 active projects. This number would currently cover most of the institutions that have sufficient rail expertise to warrant support.

DOT already funds some university railroad research under the auspices of the OUR program. However, rail research proposals must compete with projects in all areas of transportation for the limited OUR funds. Furthermore, some meritorious rail research may be too specific to justify OUR support. Universities are sometimes successful in competing for FRA research contracts, but these often lack the long-term commitment and flexibility that are prized elements of university research. The research sponsored by AAR is highly problem oriented and often short term and therefore incompatible with most university programs. For these reasons, a special university railroad research program is necessary if this avenue for improving academic programs is pursued. This option has been found to be highly effective in other transportation specialties; research increases faculty involvement, interest, motivation, and competence, which in turn leads to improved undergraduate and graduate courses and to new short courses. In view of the benefits to the industry, a joint FRA-AAR university research program would be appropriate.

Fellowships

A university research program would provide student funding in the form of graduate research assistantships or funding for undergraduate hourly employees. In place of or in addition to this, grants for railroad education could be made directly. A program of support to individual graduate fellows would require $7000-$12 000/year/fellow, depending on the level of tuition and fees. A $1 million program would fund about 100 graduate fellows. In comparison, FHWA currently offers about 186 fellowships/year for studies in highway transportation.

Again, there are existing models for FRA to follow. Both FHWA and UMTA sponsor fellowships. Their enabling legislation and program guidelines can be useful in structuring a similar program for FRA.

Railroad funding of graduate study is extremely rare, since individual railroads find it difficult to grant an employee a full year of leave and are concerned about losing the employee after they have paid for his or her education. Yet the industry as a whole benefits from the advanced education of its professionals. This is a strong argument for federal funding of railroad fellowships or, for that matter, for funding of the other university programs described above.

SUMMARY

A well-coordinated and government-aided program consisting of short courses targeted to entry-level professionals, enrichment of university curricula, university railroad research, and fellowships for studies in rail management and engineering will meet the modern educational needs of the railroad industry. Annual funding of $1 million would support any one of the following (although combinations are obviously preferable): 40 one-week short courses, 25 rail transportation professorships, 15 university research projects, or 100 graduate fellows. This program would do much to provide the railroads with a new pool of talent, people with strong career motivation and the skills needed to respond to the changing business and technological environment of the railroad industry.

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Program for Certifying Transportation Engineering Technicians

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The results of a joint effort by the Institute for the Certification of Engineering Technicians (ICET), the American Association of State Highway and Transportation Officials, and the Federal Highway Administration to establish and pilot-test a program for certifying transportation engineering technicians are summarized. The program that resulted from this effort provides four levels of certification in each of six broad disciplines: construction, design, materials, traffic operations, surveys, and maintenance. Under the program, technicians may be certified by ICET once they demonstrate relevant experience and performance capabilities, as verified by professional engineers and qualified technicians, and satisfactorily complete tests administered by ICET. The certification program was pilot-tested in the state highway departments of North Dakota, Rhode Island, and Utah. These tests were successful, and the ICET certification program is now open to anyone who wishes to use it. A second facet of the joint effort is discussed—i.e., the attempt by ICET to identify training materials that technicians can study to bolster their knowledge in specific fields and to prepare themselves for certification examinations. Numerous training materials were identified. It was found that the International Correspondence Schools offer many courses that are closely aligned with the training needs of transportation engineering technicians.

Highway administrators and personnel managers have for several years discussed the potential values of developing a national program for certifying transportation engineering technicians. Among the benefits they thought could be derived from such a program were

1. Nationwide acceptance of criteria for assessing and determining career status for technicians and technologists in highway transportation,
2. A rigorous means for relating state civil-service position classifications to staff technical capability,
3. A rational basis for collective-bargaining negotiations to help ensure proper recognition of technical competence as opposed to longevity,
4. Increased assurance that work assignments within agencies are based on job proficiency and that demonstrated proficiency receives due recognition across agency lines,
5. Improved work performance and sharpened knowledge and skills that result from a certification program undergirded by appropriate training, and
6. Improved employee morale and motivation resulting from personal satisfaction and from employer recognition of the employee's milestone accomplishments as the employee works toward certification and career advancement.