Improving Communications Between Fire Researchers and Building Owner-Operators (1985)

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Commission on Engineering and Technical Systems
National Research Council

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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This report was prepared as part of the technical program of the Federal Construction Council (FCC). The FCC is a continuing activity of the Building Research Board (formerly the Advisory Board on the Built Environment), which is a unit of the Commission on Engineering and Technical Systems of the National Research Council. The purpose of the FCC is to promote cooperation among federal construction agencies and between such agencies and other elements of the building community in addressing technical issues of mutual concern. The FCC program is supported by 14 federal agencies: the Department of the Air Force, the Department of the Army, the Department of Commerce, the Department of Energy, the Department of Health and Human Services, the Department of the Navy, the Department of State, the Federal Emergency Management Agency, the General Services Administration, the National Aeronautics and Space Administration, the National Endowment for the Arts, the National Science Foundation, the U.S. Postal Service, and the Veterans Administration.

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This report reflects the results of a conference held at the National Academy of Sciences, Washington, D.C., on November 9-10, 1983,* and the deliberations of a study committee.

The committee gratefully acknowledges the contributions of the conference speakers, which provided the basis for its study and, therefore, many of the conclusions and recommendations presented in this report. The conference speakers were: Chin Fun Kwok, Associate Director for Engineering, Veterans Administration; James D. Stillwell, Manager of Design and Construction, United Technologies, Inc.; John L. Bryan, Chairman, Fire Protection Engineering, the University of Maryland; Ralph T. Rowland, FAIA, Director of Architectural Research, Fletcher-Thompson, Architects and Engineers; Charles M. Decker, Chief, Bureau of Code Enforcement, State Government of New Jersey; Jack E. Snell, Director, and Harold E. Nelson, Group Leader, Center for Fire Research, National Bureau of Standards; Howard Emmons, Professor of Mechanical Engineering, Harvard University; Lorne W. Gold, Associate Director, Building Research Division, National Research Council of Canada; Robert H. Barker, Professor, School of Textiles, Clemson University; Jack C. Sanders, Fire Marshal, State of Oklahoma; and David A. Lucht, Vice President, FIREPRO, Inc.

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*The proceedings of the conference, Communications Between the Fire Research Community and the Owner-Operators of Buildings, is available from the National Academy Press, Washington, DC 20418 for $8.00 per copy, and a summary of the conference is presented as Appendix A of this report.

EXECUTIVE SUMMARY

In investigating communications between the fire research community and the owner-operators of buildings, the committee of the Building Research Board (BRB) appointed to conduct the study found that legal decisions usually assign ultimate accountability for life loss and property damage in buildings to the owner-operator. Fire research is beginning to provide the basis for the development of practical tools to predict and evaluate fire safety that can offer substantial benefits to owner-operators in fulfilling both their legal and economic objectives and at the same time, can result in major reductions in fire losses. Effective communications between fire researchers and owner-operators are crucial to the realization of this potential. In particular, researchers must be aware of the needs of owner-operators; owner-operators must recognize the opportunities for risk and cost reduction resulting from application of research results; and a number of crucial intermediaries (fire protection engineers, educators, design professionals, and regulatory officials) must adapt, translate, and adopt or implement research results in the form of easily understood and readily used methods.

The committee also noted that direct communication between fire researchers and owner-operators occurs only sporadically and that such communication generally focuses only on specific problems involved in meeting code requirements. The committee agreed, however, that short- and long-term financial benefits are available to owner-operators through the funding of both basic and applied fire research, including the continued development of methods for fire safety prediction and evaluation.

The technology base needed to solve fire problems is now evolving. Owner-operators and design professionals have received little education in the use and benefits of this technology base and there is an urgent need for fire protection professionals to translate fire research into terms understandable by designers and the owner-operators they serve. This technology base will cause significant changes in traditional fire safety codes and practices and the institutions for their enforcement. Continued funding is essential to the development and acceptance of the new technology for fire safety, fire prediction, and fire evaluation.

There is a need for periodic communications between fire researchers, fire protection engineers and other fire safety professionals, educators, designers, regulatory officials, and owner-

operators. Important means of communication include conferences, seminars, and personal contacts. Participation by all these groups in the code development process also is recommended.

Graduate and continuing education programs should be developed specifically to convey to fire protection engineers and other fire safety professionals, designers, and regulatory officials information concerning the use of the scientific and technical tools that will form the basis for tomorrow's codes and practices. This approach will offer challenging and exciting opportunities for many institutions in the fire design and code fields.

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BACKGROUND

Statistics on fire losses in the United States for 1982 show a total property loss from building fires of approximately $5.7 billion and a fatality total of 6,000 people. A review of decisions handed down by the courts reveals that the building owner-operator is traditionally held accountable for loss of life and property from fire in a building. The following factors further affect the position of building owner-operators and their ability to provide for fire safety in a rational and cost-effective manner:

1. The tightening of existing fire code requirements or the creation of new code requirements is a typical response from code officials, particularly after a well-publicized major disaster or when they are faced with innovative designs involving new concepts for which fire performance data are not available. Examples of such designs include the fire safety requirements for high-rise buildings, atrium configured buildings, and the use of foamed-plastic building materials.
2. Reactive rather than predictive action by owners is the typical response to fire problems.
3. Architectural and engineering tools based on fire research results that would permit owner-operators to evaluate fire safety in existing buildings or new building designs generally are not available.
4. The best way to break the cycle of automatically adding regulatory requirements in response to fires or innovation is to focus research on the development of a technologically-based way to measure and assure safety and to make that way a viable element in the fire safety decision process.
5. To accomplish this, the research community must be made aware of the real needs and priorities of owner-operators and, in return, to input fire research needs into the fire safety decision process. Such a communications system does not currently exist.

It is clear that the application of engineering procedures and design techniques derived from fire research can significantly reduce fire loss and provide owner-operators with greatly increased control over the level and type of fire safety expenditures they make in fulfilling their obligations.

The purpose of this study was to identify the gaps in communication to explore methods for improving the necessary linkages between fire researchers in public and private research organizations and managers of organizations responsible for the design, production, and operation of public and private buildings. The study was conducted by a committee of knowledgeable individuals from both the private and public sectors representing the fire research community, building designers, code officials, fire safety engineers, insurance officials, and owner-operators of buildings. It consisted of a background study, organization of a conference, and preparation of this report. The conference provided the committee with the opportunity to hear the points of views of various experts in the field, and the conference proceedings* became a prime resource in preparation of this report. The reader should note, however, that for simplicity's sake, reference is made to the conference proceedings only when specific speakers are referred to or direct quotations are used.

Certain terms used in this report and during the conference deserve comment. The "community of fire researchers" includes public and private laboratories and research organizations such as the National Bureau of Standards' Center for Fire Research (NBS/CFR), Underwriters Laboratories, Inc. (UL), and Factory Mutual Research Corporation (FMRC). It also includes those academic centers that have similar programs as well as research centers funded by private companies. The term "owner-operators" refers to organizations, both public and private, that have an inventory of buildings. It also includes building designers (architects and engineers) and those fire protection engineers who are part of an owner-operator's design team and the few who are actually employed by major owner-operators. The term "crucial intermediaries" refers to professionals and organizations that function as important links in the communication system connecting "owner-operators" and the "community of fire researchers." Fire protection engineers and organizations built largely around them are emerging as central players in this role. Fire protection engineers permeate the fire protection field. As noted above, some are members of the owner-operator's design team and a few are actually employed by major owner-operators. Others are involved in code development and enforcement, fire insurance and appraisal, product development, and fire protection system design. Some are directly involved in fire research. Other important "intermediaries" include fire protection educators, design professionals, regulatory officials, insurance industry personnel, and product manufacturers. The major organizations in this category include the National Fire Protection Association (NFPA); the Society

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of Fire Protection Engineers (SFPE); the United States Fire Administration (USFA); the American Institute of Architects (AIA); the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); the model code groups; and the National Conference of States on Building Codes and Standards (NCSBCS). Also important in effecting communications between and among these groups are the lay and trade press and other media.

These groups clearly are not mutually exclusive. In some instances, all three--owner-operators, fire researchers, intermediaries--are represented in one individual or organization. In other instances, however, no such intermixing or bridging exists resulting in a communications gap.

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THE STATE OF THE ART OF FIRE RESEARCH

Fire research is often divided into two broad categories: basic research and applied research. Basic research is carried out by scientists who publish their results primarily for their peers. The study of the chemistry and physics of fire, for example, falls into this category. This type of research often is carried out by or is funded by government agencies. Applied or technological research is goal-oriented and is generally aimed at solving specific fire problems. One type of applied research is carried out by companies in search of a market or acceptance for a product or system. This type of research often is designed to produce specific answers to specific problems and its results generally are not transferable to other problems.

Over the past decade, a new category of fire research has evolved that is important in filling the communications gap. For the purposes of this report, it can be referred to as engineering methods research. This area of research is concerned with the development of credible, scientifically based engineering methods for identifying and evaluating fire safety and was discussed by several conference speakers.

For example, Jack Snell of NBS/CFR showed a film on the operation of a computer-based fire hazard simulation model. This film demonstrated the ability to combine state-of-the-art fire growth and smoke transport models to simulate the development of hazardous conditions from heat and smoke from a prescribed fire in a specified building as a function of time and location. The results were presented using state-of-the-art color graphics in a familiar and easily understood format.

For years fire research addressed a broad range of fundamental issues since collective knowledge of these phenomena was scanty. Now, however, many pieces of the puzzle are beginning to fit together. The evolving understanding is leading to powerful new analytic and predictive capabilities. New tools will stimulate and challenge the understanding of fire safety professionals and existing intermediary institutions and offer exciting new opportunities and alternatives for improving fire safety.

As Snell stated, fire protection practice is now where aeronautical engineering was in the mid 1940s--at the beginning of the change from tedious and costly practices that propelled the field of aircraft performance prediction and design evaluation forward. In fact, it has

become possible literally to "design" and "fly" an airplane on a computer. Further, Snell asserted that "the type of technical basis that enabled the energy conservation measures of the 1970s is only now being developed in the fire field."

Howard Emmons of Harvard University outlined progress in the deepening understanding of fire and identified some practical benefits of this new knowledge. "This information will make it possible for design engineers to generate alternate fire safety designs for buildings with computer verification of the feasibility of these designs," he stated and went on to note that these tools would address problems with existing buildings as well. Emmons further noted that: "To speed up the process, national priorities must be changed and funds reallocated to give the fire problem the attention and the solution it requires; [otherwise] it will be 20 years before we can satisfy a performance [fire] code."

Harold Nelson of NBS/CFR explained that the time of "burn to learn" fire research has passed and that through the efforts of a few dedicated individuals there is an emerging fire protection engineering technology which can evaluate the potential fire safety of buildings." Nelson presented a concrete example of just such an evaluation and stated that this technology "while beyond the embryonic state, is in need of support and encouragement." Nelson further maintained that scientifically based fire protection engineering technology "will provide the common language for the owner-operator (normally through his design team) to communicate clearly his needs to the research community and a route for responsive replies."

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THE COMMUNICATIONS GAP

The communications gap between the fire research community and the owner-operators of buildings requires a two-direction bridge as Harold Nelson of NBS/CFR explained at the conference:

1. One direction would provide the path for fire research results to be communicated to the owner-operator in a form that can be understood and applied to his needs.
2. The other direction would provide the path for the fire research community to be apprised of the fire research needs of the owner-operators of buildings and the priorities of these needs.

The design and capacity of the means provided to bridge the communications gap is critical to meeting the objectives of better fire safety decisions and solutions. John L. Bryan of the University of Maryland aptly reviewed the characteristics of an effective communications system: a willing and patient transmitter, a listening receiver, an interconnecting system of linkages, and messages delivered using a commonly understood frequency or language of communication. Generally, in the case of owner-operators and fire researchers, these components do not exist. This is true in cases involving direct contact between the two communities as well as in those involving indirect exchanges such as through codes and standards or the use of professional consultants.

Owner-operators of buildings in the private sector develop specific objectives relating to fire safety in their facilities. Typical of these objectives, which are linked with the owner-operators' economic goals, are those outlined by James D. Stillwell of United Technologies:

1. To provide facilities safe from fire.
2. To preserve property assets.
3. To meet the legal obligations of codes and regulations.
4. To reduce the probability of adverse publicity resulting from a fire.
5. To reduce building and operating costs for fire safety, and thus, maximize return on investment.

As long as owner-operators believe these objectives do not, for the most part, require communication between owner-operators and the fire

research community, such communication will not normally occur. Public sector owner-operators of buildings may have similar objectives in addition to their agency mission responsibilities. Some, such as the Veterans Administration, have profited from direct contact with fire researchers in addressing specific problems.

Many owner-operators perceive a need to communicate with the fire research community only on those specific occasions when such communication can be of immediate economic advantage. Even on those occasions, communication is generally through design professionals such as architects, civil or mechanical engineers, or fire safety engineers. Such infrequent and indirect contacts, often by professionals with little knowledge of the appropriate technologies or experience in dealing with researchers or research results, are not likely to be fruitful.

Communications between owner-operators and the fire research community are further hindered by the differences in the operational time scales to which each community adheres. The owner-operator works in the realm of present and readily available technology. For the owner-operator of a building with a problem concerning fire, time is money. He cannot wait for fire researchers to obtain a solution to today's problem; hence, communication does not occur. Although some realize that it should be possible to have better solutions the next time a similar problem arises, very few are motivated or even have the means to invest in research.

From the owner-operator's perspective, the code development system itself is one of the causes of the communications gap. Traditionally, owner-operators have found it to be more efficient to participate in the code-writing process than in the research process since the former tends to give results in less time. Owner-operators are often more interested in the form of the regulation and how it will affect them than in the technical basis of the code. Unfortunately, this often results in short-term fixes that can obscure or even obstruct long-term solutions.

Due to the virtual absence of professional fire safety education and training for architects and engineers, students have little background in or awareness of fire safety issues. Typically, architects and engineers (except for fire protection engineers) encounter the subject only through contact with fire codes and regulations. Even then, few architects and engineers are directly involved in the regulatory process.

The publications with which the architect and engineer come in contact contain little information on fire research. The typical practicing architect or engineer looks to his experience to solve a specific problem on a specific project. When that is not sufficient, expediency may dictate subjective negotiation with regulatory officials rather than a search for a technological solution through fire research.

Fire researchers communicate primarily with their peer group. Their professional reputation depends to a considerable extent on their publications and the judgment of their peers. For this reason, most fire researchers may have little communication with the owner-operators

of buildings. Their research reports are primarily prepared for the fire research community itself or for the research-funding agency. Even when written for intermediaries such as fire protection engineers or standards or regulatory officials, fire research reports often lack the understanding or insight that would be obtained, for example, if members of both groups had communicated with each other during the process of the research. Seldom are research reports written in a form that can be easily understood or applied by the owner-operator.

The fire researcher feels that there is no appreciation of the time frame in which he must work, which is far greater than that needed by the owner-operator for a specific building project under way. Funds for fire research often are in short supply and the researcher's work is curtailed by this constraint; thus, he/she often is unable to spend the additional time and money required to ensure the translation and communication of research results into engineering methods or other forms useful to the practitioner in the field.

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BRIDGING THE COMMUNICATIONS GAP

Since the needs, interests, motivation, time scales, and professional languages of owner-operators and fire researchers are so different and varied, effective communication between them will reflect this and typically will involve professional intermediaries. As our collective knowledge of fire grows and practical methods of fire safety evaluation and engineering evolve, the common language used by researchers and owner-operators will likewise evolve.

One can envision as the ultimate solution professional fire protection engineers schooled in the principles of fire science and fire protection technologies; effective in the use of practical tools for fire risk and hazard analysis and management; and experienced in applying these methods to assist code officials, product manufacturers, designers and owner-occupants in making difficult trade-offs between function, safety and cost.

One can also envision periodically direct contacts between owner-operators and fire researchers, as well as many other logical pairings of the many players on this crowded stage, in the form of conferences, seminars, workshops, or tutorials. Such exchanges can be facilitated through the efforts and sponsorship of numerous organizations with varied interests in and perspectives on such communications.

Most certainly, improved communications of the sort necessary to improve fire safety and reduce its costs require greater attention and resources than have been available in the past. Support for fire research is minimal. Support for the improved communications essential to effective use of research results is also inadequate. Better understanding of the opportunities for reducing fire losses and costs through improved communications may be crucial to meeting these resource needs.

For example, certain organizations offer an opportunity for bridging the gap between fire researchers and owner-operators since they can provide noncompetitive and objective formal structures for meetings, seminars and conferences, tutorials or training. Organizations such as the American Institute of Architects, the American Society of Civil Engineers, the American Society of Heating Refrigerating and Air-Conditioning Engineers, the National Academy of Sciences, the National Institute of Building Sciences, and the Society of Fire Protection Engineers can provide a forum where both communities can meet to discuss their mutual goals. To date, however, both fire

researchers and owner-operators have tended to rely primarily on organizations representing their own interests and not on those with a broader base of representation. The conference organized as part of this project shows that the two communities can have meaningful dialogue if drawn together for a common purpose.

Code- and standards-writing organizations also can provide a forum for communication between the two communities. The model code organizations such as the Building Officials and Code Administrators International, the International Conference of Building Officials, and the Southern Building Code Congress International, and the standards-writing organizations such as the National Fire Protection Association and the American Society for Testing and Materials provide a forum for communication on a more formal basis. Unfortunately, the two communities of researchers and owner-operators have not found a means of utilizing this forum.

Organizations representing owner-operators could be of great assistance in identifying, on a collective basis, the fire problems and needs of that community. Such organizations could act as clearinghouses to which the fire protection engineer could go to provide technical assistance; and the fire researcher could go to identify research problems, the priority of these problems and possible funding. Such organizations also could help translate and disseminate the results of fire research and new engineering methods relevant to their members.

Some direct contact between fire researchers and building owner-operators is desirable since each group has much to offer to the other. Conferences and seminars may fill this need and may be especially effective when sponsored by a third party. The recent National Academy of Sciences conference is a good example of this. Over time, the fire protection engineering community will become an increasingly valuable facilitator for all parties in this process.

To permit rigorous peer review, fire research reports are first published as detailed technical documents, often unintelligible to those not involved in a similar kind of research. Nevertheless, the implications of research results must be conveyed to owner-operators if they are to affect the design and construction of buildings. This can occur only if the results are presented in a form that can be understood by the owner-operators and in publications with which they are familiar. Thus, mechanisms are needed for interpreting, translating and publishing the findings of the fire researchers in media that are widely read by the owner-operators.

Funding of fire research by both private and public owner-operators could improve communications between the two communities. In order for the owner-operator to ensure full return on his research dollar, criteria could be developed that require the research results to be communicated to the owner-operator community in a manner that serves that community's needs.

The communication resulting from such funding criteria will often require a third party knowledgeable in both fire research and the needs of the owner-operator. Funding could also be through a third party organization to which the owner-operators could provide a pool of money from which applied research could be funded. In those instances, the

third party would be responsible for ensuring that communications between the communities occurred on a regular basis and in a manner that both communities understood--through publications, seminars, or conferences.

Owner-operators and their design professionals have little direct knowledge of fire research or its benefits. As indicated previously, the education system for that community provides little background in fire or fire safety. An increased awareness of fire and its effects on both buildings and occupants would, no doubt, bring about an increase in the perceived need for fire research and for communication of that research.

Thus, education in fire safety, either at the university level for the design professional or through continuing education seminars, is essential if the full value of fire research is to be obtained. With education, groups can communicate in the same technical language from the same knowledge base.

Building codes provide an indirect means of communication between the fire research community and the owner-operator community. The fire researcher views the code as a means to put his research results into practice while the owner-operator views the code as a document that affects the financial viability of his projects.

Building codes, having been developed by committees over a number of years, often use traditional norms or accepted practice as a basis for requirements. Many such requirements are not based on fire research. Fire researchers encounter difficulty in having their results incorporated into building codes since these results may contradict traditional norms or may be perceived as not being directly applicable for code use.

Codes, as legal documents, further frustrate the two communities. The code time frame may be far shorter than the time frame with which the researcher is familiar. Further, in order to ensure maximum safety for building occupants, building codes have a natural tendency towards conservatism. This tendency may present financial and time constraints in dealing with a building project. Such constraints, especially the time constraint, often stimulate the owner-operator to "beat the code" rather than to seek a technologically sound basis for proposals. Since fire research is not utilized in this process, communication with the fire research community does not occur.

Communication on a continuing basis between the two communities in the preparation of codes can occur through active participation in the code development process. It can also occur on a project basis by recognition of the value of fire research in the development of equivalencies to satisfy code requirements. This type of communication through codes can be two-directional and can be of great benefit.

One of the most successful means of communication between the two communities is through a third party knowledgeable in the needs of both. Fire protection engineers, given their education and training, are able to communicate fire research results to the owner-operators in a manner that is understood and to pass on problems requiring attention to the fire researchers. Fire protection engineers can also "translate" fire research results for publication in periodicals used by the owner-operators, and can "translate" fire safety problems to

form the basis for a research project. Through these techniques, two-direction communication can occur.

Design professionals representing the owner-operators are making increased use of fire protection engineers in code negotiations since they can develop technologically based proposals for review by the code officials. Such proposals often provide a technical basis for future code changes and indirectly result in the interface of research and owner input to the code document.

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CONCLUSIONS AND RECOMMENDATIONS

The committee, as the result of its study and deliberations, has concluded that:

1. There is little direct communication between the fire research community and the building owner-operator community in either the private or the public sector.
2. Neither the fire research community nor the owner-operator community perceives a need for continuing communication with the other.
3. The communication of fire research results to the owner-operator community would result, over the long term, in a significant reduction in fire losses and costs.
4. Continued basic and applied fire research is needed to resolve the fire safety problems facing owner-operators and the general public.
5. Owner-operators as well as the general public would realize financial benefits by funding fire research aimed at solving specific fire safety problems.
6. Both owner-operators and fire researchers would benefit financially from improved communications: the owner-operator would gain technologically based means to solve fire safety problems, and the fire researcher would receive increased funding from owner-operators in search of these means.
7. The state of knowledge in fire research is changing from an opinion basis to a technological basis, and tools are being developed to increase the technology base.
8. The communication of research results will often require a third party knowledgeable in the needs and working languages of both the research and owner-operator communities. Fire protection engineers, by their education and training, can be the needed intermediary.
9. Owner-operators and their design professionals receive little education in fire and fire safety.
10. There is a need for technologically based solutions to fire problems for incorporation in building codes. These solutions may differ significantly from traditional practices and codes.
11. Additional funding is required to ensure that the technological base being developed is available in a reasonable time frame.

Given these conclusions and the expertise of its members, the committee makes the following recommendations aimed at improving communications between fire researchers and building owner-operators:

1. The owner-operator community must identify and provide priorities for the fire problems it perceives as requiring research and must communicate this information to the fire research community.
2. The emerging fire protection technology must be further developed, reviewed, and accepted by a group of experts and then tested and verified to provide the solutions to the technical and legal questions imposed by the regulatory system.
3. The level of fire and fire safety education and knowledge of professionals (architects and engineers) representing the owner-operator community and of regulatory officials should be increased through courses at the university level and through continuing education.
4. Fire protection engineers should become more active participants in the design and regulatory development process and should use their talents to bridge the communications gap between the owner-operator and the fire research communities.
5. Fire protection engineers should take on a special obligation to publish "translations" of fire research for the owner-operator community and to help translate the needs of owner-operators for the fire research community.
6. Publications from the fire research community should be published in periodicals normally available to owner-operators.
7. Increased funding of basic and applied fire research by government and the private sector is required.
8. Funding for fire research should include provisions requiring "translation" of results into a form that can be understood by the owner-operator community and by practitioners in the field.
9. Funding of fire research by owner-operators on a collective basis should be investigated as a long-term investment in solving common fire problems. Such a system would provide sufficient time to develop research results in an effective manner.
10. Code regulatory bodies should be made aware of the technological base available from the fire research community and should be capable, through education and regulation, of accepting this technology as the basis of evaluating fire protection to satisfy specific code objectives.
11. Fire researchers and owner-operators and their professional consultants should play a more active role in the model codes and standards development process. By active participation on committees and in code change forums, each side would gain an appreciation of the other's concerns and needs.
12. Professional organizations should provide conferences and seminars of interest to the two communities. When both communities are in attendance, both formal and informal communications can occur.
13. Professional organizations should provide a forum for involving all parties where fire research needs and the needs of owner-operators can be identified and be made available to the fire safety community.

14. Some direct contact between fire researchers and owner-operators is necessary to facilitate understanding of the fire problems facing the two communities.

APPENDIX A

SUMMARY OF THE CONFERENCE ON COMMUNICATIONS BETWEEN THE FIRE RESEARCH COMMUNITY AND OWNER-OPERATORS OF BUILDINGS
November 9-10, 1983
NATIONAL ACADEMY OF SCIENCES
WASHINGTON, D.C.

John P. Eberhard
Executive Director
Building Research Board
National Academy of Sciences

J. Armand Burgun, Partner, Rogers, Burgun, Shahine, and Deschler, began the conference by restating the hypothesis that there is a communications gap between those who do research in the fire field and the owners and operators of buildings. He noted that in the past buildings were made of local materials by local labor with a variety of skills but that today most buildings are the end product of a system that is more complex than the one used to build an aircraft carrier.

IDENTIFICATION OF THE COMMUNICATIONS AND INTERACTION GAP

Chin Fun Kwok, Associate Director for Engineering, Veterans Administration (VA), indicated that the VA has a large, technical staff and an advisory committee with qualified fire engineers on both that enable the VA to access research knowledge directly. He explained that the VA also supports research that can provide responses directly to the agency's unique fire research problems. James Stillwell, Manager of Design and Construction, United Technologies Corporation, said that private owner-operators vary in size but share concern for having safe buildings that preserve the regulations (and, thus, prevent litigation), maximize their return on investment, and help them to avoid adverse publicity associated with fire-related disasters. John Bryan, Chairman, Fire Protection Engineering, University of Maryland, pointed out that there need to be effective transmitters and receivers operating at the same frequency if the results of researchers (whom he characterized as "lone rangers" out to save lives) are going to be communicated effectively to the owner-operators (who are out to maximize the effectiveness of their investments). Ralph Rowland, Director of Architectural Research, Fletcher-Thompson, Architects and Engineers, indicated that the professional design community, in the process of designing a building, establishes the design parameters of the building's performance that will, by intention or by default,

affect fire safety. He explained further that the designer tends to rely on building codes as reservoirs of human knowledge (as interpreted by code officials) that will assure his clients that they are obtaining safe buildings. Charles Decker, Chief, Bureau of Code Enforcement, State of New Jersey, pointed out that the regulatory process is changing along with the rapid technological changes in other sectors of society and that it now must be managed in a timely manner that provides predictable results. The courts, he stated, need to be assured that regulations are in the public interest, which means that they must be firmly based on knowledge (rather than opinion).

THE STATE OF FIRE RESEARCH

Jack Snell, Director, Center for Fire Research, National Bureau of Standards, made it clear that significant changes in the incidence of fire losses will not result from incremental (as contrasted to substantial) investments in fire research and that any significant increase in the knowledge base is likely to change the processes of design for fire safety, the education of professionals in the fire field, and the fire management system in general. Howard Emmons, Professor, Mechanical Engineering, Harvard University, provided a graphic example of how fundamental knowledge grows through the research process into a complex understanding of fire events. This understanding, he explained, can be communicated effectively only by being incorporated into computer programs able to handle the large data bases and calculations needed for good simulations of building safety performance.

POSSIBLE WAYS OF BRIDGING THE COMMUNICATIONS GAP

Harold Nelson, Group Leader, Center for Fire Research, National Bureau of Standards, said that "credible engineering methodologies," which are beginning to emerge from the fire research community (after a long history of pragmatic research of the "burn and learn" type), will provide a two-way bridge over the hypothetical gap as soon as verification efforts begin to make possible a detailed engineering model of building fires. Lorne Gold, Associate Director, Division of Building Research, National Research Council of Canada, in describing the relationship of Canadian building codes to fire research knowledge, noted that the owner-operator lacks a coherent community to serve as the focus for communication. He suggested than an institutional arrangement for that purpose needs to be created and that such an arrangement would facilitate the work of the fire engineering and code communities in creating a "knowledge system." Robert Barker, Professor, School of Textiles, Clemson University, pointed out that fire research encompasses more than fire models and fire testing (e.g., it includes the materials sciences) and that the policy decisions used in allocating research funds determine, in large measure, how the

results of the research will be made available--either in the private sector or the public sector. Jack Sanders, Fire Marshal, State of Oklahoma, explained that attention should be given to institutions that can fill the "middleman" role between the researcher and the owner-operator. He noted that interdisciplinary institutions such as the National Fire Protection Association, American Society for Testing and Materials, American National Standards Institute, National Safety Council, and National Academy of Sciences can serve in this way. David Lucht, Vice President, Firepro Inc., indicated that the new conceptual tools emerging from the fire research community dictate that educators reshape their programs to provide graduates with greater analytic skills. He noted, however, that the educators still lack the appropriate textbooks.

SYNOPSIS

A general consensus of how terms were to be understood seemed to emerge from the conference. It was generally believed that research produces knowledge and technology, some fundamental and some ready for application by technically competent people, and that specific problem-solving work should be called "consulting" or "management services," not research. Routine testing also was not considered to be research in the sense understood here. Thus, the basic goal is to provide mechanisms for communicating to the owner-operator the knowledge and technology emerging from research.

It also was accepted that owner-operators make private or public investments in facilities design and construction to house human activity, that they want these facilities to be both safe and good investments, that the public process of regulation requires owners to provide facilities that are safe, that the courts assure that the owners and their consultants act in a responsible manner, and that the press serves to publicize any dramatic failures. Therefore, there is enormous motivation for supporting the creation and extension of knowledge and technology related to fire safety--both publicly and privately--and that government should be made aware of these needs. Once this knowledge and technology are created, it can be communicated to the owner-operator community in the following ways:

1. By ensuring that there are knowledgeable people to serve on the owner-operator's staff and as competent fire safety consultants.
2. By producing readable reports (probably not written by the researcher) for publication in journals read by the owner-operators and their staffs.
3. By having presentations made at professional society meetings.
4. By holding joint professional society meetings.
5. By incorporating fire research programs internally in the owner-operator's organization or by providing for direct support of research by others.
6. By incorporating research results into new products available for use by the owner-operators in their facilities (e.g., control devices).

7. By incorporating research results in building codes and standards.

8. By incorporating descriptions of research on which code requirements are based by reference in code-related administrative guides.

9. By incorporating research results in the curriculum of colleges and universities.

10. By incorporating research results in continuing education programs for professionals.

11. By developing "case histories" of major fire events on a retrospective and analytical basis.

12. By incorporating the new knowledge base and the associated data in computer simulations that can be used both as design tools and as code evaluation methods.