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FIRE RESEARCH AND SAFETY ACT OF 1967

HEARINGS BEFORE THE SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT OF THE COMMITTEE ON SCIENCE AND ASTRONAUTICS U.S. HOUSE OF REPRESENTATIVES NINETIETH CONGRESS FIRST SESSION ON H.R. 6637

MAY 18, 23, 24, AND JUNE 8, 1967

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FIRE RESEARCH AND SAFETY ACT OF 1967

THURSDAY, MAY 18, 1967

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington, D.C.

The subcommittee met at 10 a.m., in room 2325, Rayburn House Office Building, Hon. Emilio Q. Daddario (chairman of the subcommittee) presiding.

Mr. DADDARIO. The meeting will come to order.

Dr. Hollomon and Dr. Astin come to the table.

Gentlemen, it is expected that these hearings on H.R. 6637, which is the Fire Research and Safety Act of 1967, and which was introduced by Chairman George P. Miller of California, the chairman of the full Committee on Science and Astronautics, will run into next week and will take 3 full days of hearings. The bill would amend the National Bureau of Standards Act to authorize the Bureau to inaugurate a fire research and safety program.

H.R. 6637 is as follows:

[H.R. 6637, 90th Cong., first sess.]

A BILL To amend the organic act of the National Bureau of Standards to authorize a fire research and safety program, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Fire Research and Safety Act of 1967."

DECLARATION OF POLICY

SEC. 2. Congress finds that a comprehensive fire research and safety program is needed in this country to provide more effective measures of protection against the hazards of death, injury, and damage to property. The Congress finds that it is desirable and necessary for the Federal Government, in carrying out the provisions of this Act, to cooperate with and assist public and private agencies. The Congress declares that the purpose of this Act is to amend the Act of March 3, 1901, as amended, to provide a national fire research and safety program including the gathering of comprehensive fire data; a comprehensive fire research program; fire safety education and training programs; demonstrations of new approaches and improvements in fire prevention, control and reduction of death, personal injury and property damage. Additionally, it is the sense of Congress that the Secretary should establish a fire research and safety center for administering this Act and carrying out its purposes, including appropriate fire safety liaison and coordination.

SEC. 3. The Act entitled "An Act to establish the National Bureau of Standards" approved March 3, 1901, as amended (15 U.S.C. 271-278e), is further amended by adding the following sections:

"SEC. 16. The Secretary of Commerce (hereinafter referred to as the 'Secretary') is authorized to—

"(a) Conduct directly or through contracts or grants—

"(1) investigations of fires to determine their causes, frequency of occurrence, severity and other pertinent factors;

"(2) research into the causes and nature of fires, and the development of improved methods and techniques for fire prevention, fire control and reduction of death, personal injury and property damage;

"(3) Educational programs to—

"(A) inform the public of fire hazards and fire safety techniques, and

"(B) encourage avoidance of such hazards and use of such techniques;

"(4) fire information reference services, including the collection, analysis, and dissemination of data, research results, and other information, derived from this program or from other sources and related to fire protection, fire control and reduction of death, personal injury, and property damage;

"(5) educational and training programs to improve, among other things—

"(A) the efficiency, operation, and organization of fire services, and

"(B) the capability of controlling unusual fire-related hazards and and fire disasters; and

"(6) projects demonstrating—

"(A) improved or experimental programs of fire prevention, fire control, and reduction of death, personal injury, and property damage,

"(B) application of fire safety principles in construction, or

"(C) improvement of the efficiency, operation, or organization of the fire services.

"(b) Support by contracts or grants the development, for use by educational and other nonprofit institutions, of—

"(1) fire safety and fire protection engineering or science curriculums; and

"(2) fire safety courses, seminars, or other instructional materials and aids for the above curriculums or other appropriate curriculums or courses of instruction.

"SEC. 17. With respect to the functions authorized by section 16 of this Act—

"(a) Grants may be made only to States and local governments, other non-Federal public agencies and non-profit institutions. Such grants may be up to 100 per centum of the total cost of each project for which such grant is made. The Secretary shall require, whenever feasible, as a condition of approval of a grant, that the recipient contribute money, facilities, or services to carry out the purpose for which the grant is sought. For the purposes of this section, 'State' means any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, the Canal Zone, American Samoa, and the Trust Territory of the Pacific Islands; and 'public agencies' includes combinations or groups of States or local governments.

"(b) The Secretary may arrange with and reimburse the heads of other Federal departments and agencies for the performance of any such functions, and, as necessary or appropriate, delegate any of his powers under this section or section 16 of this Act with respect to any part thereof, and authorize the redelegation of such powers.

"(c) The Secretary may perform such functions without regard to section 3648 of the Revised Statute (31 U.S.C. 529).

"(d) The Secretary is authorized to request any Federal department or agency to supply such statistics, data, program reports, and other materials as he deems necessary to carry out such functions. Each such department or agency is authorized to cooperate with the Secretary and, to the extent permitted by law, to furnish such materials to the Secretary. The Secretary and the heads of other departments and agencies engaged in administering programs related to fire safety shall, to the maximum extent practicable, cooperate and consult in order to insure fully coordinated efforts.

"(e) The Secretary is authorized to establish such policies, standards, criteria and procedures and to prescribe such rules and regulations as he may deem necessary or appropriate to the administration of such functions or this section, including rules and regulations which—

"(1) provide that a grantee will from time to time, but not less often than annually, submit a report evaluating accomplishments of activities funded under section 16, and

"(2) provide for fiscal control, sound accounting procedures and periodic reports to the Secretary regarding the application of funds paid under section 16."

SEC. 4. Nothing contained in this Act shall be deemed to repeal, supersede, or diminish existing authority or responsibility of any agency or instrumentality of the Federal Government.

SEC. 5. There are authorized to be appropriated for the purposes of this Act, \$10,000,000 for the fiscal year ending June 30, 1968, and such sums as may be necessary for each of the following four fiscal years, and such appropriations are authorized to be made without fiscal year limitations.

Mr. DADDARIO. This legislation would provide the Secretary of Commerce with the authority to strengthen and expand his own fire research programs as well as coordinate and supplement the efforts of others. Specifically, the Secretary would be directed to establish a national fire research and safety program with a fire research and safety center for administering the act. He would be authorized to conduct directly or through contracts or grants:

- (a) Research into the causes and nature of fires;
- (b) Improved methods for fire prevention and control;
- (c) Public education programs;
- (d) The collection, analysis, and dissemination of data related to fire protection;
- (e) Education and training programs for professional firefighters; and
- (f) Appropriate demonstration projects.

It is our intention to explore the need for this legislation during these hearings. What is being accomplished now with regard to fire research? What is planned for the future? What must the Federal Government do to assist in these plans?

We will be particularly interested in finding out how the Bureau of Standards will carry out these responsibilities. It is, as an example, of fundamental importance to determine the steps the Bureau would take to eliminate the possibility of duplication of efforts in research, training, data collection, and public education. I am not indicating that there is duplication. There are always very important questions to raise during a time when we concern ourselves about duplication of activities.

We wish to assure you we will be objective and take into consideration all that is being done and how, in the final analysis, the testimony before us puts that into prospective. We are interested in hearing from all parties concerned what can be accomplished by the passage of this act, and what its effects will be on officers and men of our volunteer as well as our paid fire departments.

The social and economic impact of fire causes all of us to be greatly concerned. From available data we know that in 1965 the material loss by fire exceeded \$1.8 billion and that the loss of life exceeded 12,000 persons. These figures are appalling and, unfortunately, as our cities become more and more concentrated with people they will continue to rise. We will try to determine during these hearings if we are on the right track. Will this bill do the job that we feel is necessary? Can we guarantee that the passage of this legislation will have a direct impact on the horrors of "unfriendly" fire?

These are important questions. We are anxious to hear the witnesses before us. We have them listed in this order: Dr. J. Herbert Hollomon, Acting Under Secretary of Commerce, first, and Dr. A. V. Astin, Director of the National Bureau of Standards, second. We are happy to have both of you before us again. We have seen you at the same table before advising this committee over the years on other subjects. It has always been an educational function that you have filled.

I know that you have thoughts on this legislation. I understand that you both are in support of the legislation that is before us. We would like to hear why and we would like to examine your reasons after you have finished your statement.

Dr. Hollomon, would you proceed?

STATEMENT OF DR. J. HERBERT HOLLOMON, ACTING UNDER SECRETARY OF COMMERCE, AND DR. A. V. ASTIN, DIRECTOR, NATIONAL BUREAU OF STANDARDS

Dr. HOLLOMON. Thank you, Mr. Chairman and gentlemen.

On my right is Dr. A. V. Astin, Director of the National Bureau of Standards, and on my left is Mr. James V. Ryan, Assistant Chief, Fire Research Section, National Bureau of Standards.

I would like to read parts of a very brief statement and interpolate from time to time some of the background reasons for this legislation.

Mr. DADDARIO. We didn't mean to ignore you, Mr. Ryan.

Dr. HOLLOMON. I appreciate the opportunity to appear before you in support of President Johnson's recommendation for the Fire Research and Safety Act of 1967. This subcommittee is considering several bills, not all identical, each intended to implement the President's recommendation. Of these, H.R. 6637, introduced by Chairman Miller, and identical bills introduced by Congressmen Brown of California, Corman, Davis of Georgia, and Roush—H.R. 7270, H.R. 7331, H.R. 6971, and H.R. 7583, respectively—are bills transmitted to the Congress by Acting Secretary of Commerce Trowbridge carrying out President Johnson's recommendation. The other bill, H.R. 9305, introduced by Congressman Hanna, differs in that it provides for a statutory advisory board.

I urge the enactment of H.R. 6637, to make Federal resources available for support of increased private and public efforts as well as for appropriate in-house efforts.

I think a little general background is in order. One of the major causes of accidents, deaths, injury, and loss of property in the United States comes from fire. Last year in the passage of the National Traffic and Motor Vehicle Safety Act an attempt was made to get at what was the major cause of accidental death, injury, and property damage, in that category. That act attempted to go into that problem.

A second major cause of accidental death, injury, and property damage is fire. It remains on the agenda to get at this major harm that comes to this country—to deal in some way with the fire problem.

There is a third major issue that is also before the Congress. The Commerce Committees of the House and Senate are dealing with the Commission on Product Safety. There are certain products sold on the market which are to some degree or other unsafe. They cause accidents, death, and injury. That particular legislation asks that the problem be studied because it is so diverse and complicated. The question is how and what, if anything, the Federal Government should do about these unsafe or possibly unsafe products. By these two actions, that is, the fire research and safety program and the National Commission for Product Safety, we will deal with two major problems relative to accidental death, injury, and property damage in this country.

Dr. Astin will discuss the problem in detail and will explain how the National Bureau of Standards will carry out the program authorized by the Fire Research and Safety Act of 1967. Suffice it to say that I believe that the available data indicate the seriousness of the problem, particularly in the lack of breadth and detail in that very data. I am convinced that the enactment of H.R. 6637 will lead to reduction of the problem through support of private, public, and Federal fire research and safety activities. It is unconscionable to accept the present loss of life and property as an inevitable consequence of our high standard of living.

In his statement, Dr. Astin will discuss the details of the legislation and of the program. I would only comment on major points that have been raised since the Fire Research and Safety Act was introduced.

First, this program will support existing programs and activities, both in the private sector and in government. That is the intent of the legislation before you. The language of H.R. 6637 is quite specific in this regard. It not only authorizes the use of contracts, grants, and reimbursement; it directs the Secretary of Commerce "to cooperate with and assist public and private agencies" and it requires that "The Secretary and the heads of other departments and agencies engaged in administering programs related to fire safety shall, to the maximum extent practicable, cooperate and consult in order to insure fully coordinated efforts." Section 4 of the act preserves the authority and responsibility of other Federal agencies.

The question has been raised whether or not the fire research and safety center proposed for administering this act should, or would be competent to manage the entire national program of fire protection and prevention. The legislation places a direct responsibility on the Secretary of Commerce, and through him on the National Bureau of Standards. Carrying out that responsibility will require good management and all that it implies: leadership, coordination, cooperation, seeking out and recognizing the viewpoints of all interested parties, and finding the common ground upon which to reconcile differences. I agree with the statement in H.R. 6637 that it is the sense of the Congress that a center is the proper place for the exercise of that responsibility. I am confident that we can find the needed people to do the job well, building on existing competence and with the advice of those engaged in fire prevention and control, and other experts, from outside the Federal Government. The role of the center regarding the national program, will be to engage in good management. Coordination of Federal programs is provided by the existing Interagency Fire Research Committee. At present, the Chairman of that Committee is from the National Bureau of Standards, giving NBS a strong, but not dictatorial voice in the coordination of the Federal program. The language in the act stresses that this is to be a cooperative program. The primary action groups in fire protection, the fire chiefs and fire fighters, as well as scientific experts and other appropriate groups, will be consulted as to the center's operation.

Mr. DADDARIO. Why are you leaning so far over in the direction of coordination of Federal programs? You indicate that this legislation will result in the development of a program where you will support existing programs and activities. Have you come to the conclusion that these existing programs are all being run well?

Dr. HOLLOMON. No, sir.

Mr. DADDARIO. You are going in opposite directions it seems to me. On the one hand, you are talking about supporting them and making sure they are not going to be tampered with, and on the other hand you stress that they must coordinate. I don't know how they can coordinate if, in fact, you are writing into this language the idea that you will support existing programs without question.

Dr. HOLLOMON. There are two points here. One has to do with support of existing private and other non-Federal government activities, rather than duplication of them. The other has to do with the coordination of the activities going on within the Federal Government agencies. I would like to discuss the latter first; that is, how to coordinate those Federal activities.

Mr. DADDARIO. That is what I am referring to.

Dr. HOLLOMON. The problem is that the Federal Government's program is aimed at very specific mission responsibilities. The DOD has a very small fire program having to do with the prevention of fire and its extinguishment for special DOD missions. It is related to missiles and any other activities that affect directly the military mission. There is a fire research activity in the Department of Agriculture, a good one by the way, that has to do with forest fires. It has been one of long standing and it is effective. There is no program within the Federal Government of any significance at all that deals with fires in cities or in rural areas, their prevention, control, and minimization or the improvement of firefighting techniques or the like. There is no such significant program. When I say it is necessary to coordinate within the Government, what I mean is that we have to be sure that what is learned by DOD in their special kind of mission activities and their research program, or what is learned by fighting forest fires, is coordinated with what we have to do in dealing with houses, buildings, cities, and the like. That is what I mean.

Mr. DADDARIO. I understand that. Even though you have shown us where work is being done which you agree is of a substantial nature, you do agree that there is not significant work going on in other areas.

Dr. HOLLOMON. Yes.

Mr. DADDARIO. Do you mean it is going on but it is not significant? It seems to me that this might be the time to be sure there isn't a scattered proliferation of such activity. If it is not significant it should be brought to a center so it doesn't become significant in size and then become difficult to deal with.

Dr. HOLLOMON. Let me give you what the Federal Government's present fire research program is in terms of dollars. I think this illustrates the relative insignificance of the Federal basic fire research. The Forest Service has the single largest fire research program. This is the program of research for the prevention and control of fire in forests and related activities. It is \$3 million a year.

The second largest fire research program is the DOD program which has to do with both the offensive use of fire—how do you use fire as an offensive weapon—and defenses against fire. The latter ranges from protection of military facilities, equipment, and personnel against thermal radiation from nuclear weapons to the prevention of accidental fires resulting from special hazards peculiar to military installations. The DOD fire research program is \$1½ million.

The Office of Civil Defense has a smaller fire research program. It is concerned with fires resulting from a nuclear weapon attack—how would we prevent or control fires under these circumstances. That program is \$1 million.

The National Science Foundation provides, through grants, something like \$40,000 a year for basic research related to fire, and NBS has an in-house program in this area, with direct funding of about \$200,000.

Two things already have happened. One is that the other agencies of the Government, where it is appropriate, contract with the NBS to do certain aspects of their program, and thus it is integrated. Second, we established recently the Interagency Fire Research Committee, that I mentioned earlier, to coordinate the Federal fire research programs, which total about \$11 million. The latest annual fire loss to the Federal Government was about \$330 million.

Now I have not meant to imply a judgment as to the adequacy of these mission-oriented programs. The Congress has judged them, and continues to reevaluate them, through the appropriations process. The language of H.R. 6637, and of my statement, was meant to assert that enactment of this legislation does not—I repeat, not—imply any specific judgment—either favorable or adverse—by the Congress on the present mission-oriented programs or any delegations by the Congress, to the Secretary of Commerce, of authority to pass judgment on such programs. The legislation does direct the Secretary to exercise leadership in coordinating the activities of all fire research programs approved by the Congress. This I support. We have, already, the mechanism for that coordination, with the expectation that it will identify areas of actual or potential duplication and provide the forum within which the affected agency heads can reach the most effective compromise.

The legislation authorizes support of private programs and projects. Here again, I do not believe a blanket endorsement of on-going programs is implied. Each program or new proposal will be evaluated, as to adequacy and freedom from duplication, as part of the decision whether or not to provide support. That authority is delegated to the Secretary or his designee.

Mr. MOSHER. Mr. Chairman?

Mr. DADDARIO. Mr. Mosher.

Mr. MOSHER. I plead ignorance. What is the particular and limited present mission of the National Bureau of Standards in this field?

Dr. HOLLOMON. We have a mission which is related to the building materials and building techniques. It has been a longstanding mission.

Mr. MOSHER. This is largely in-house research?

Dr. HOLLOMON. Yes. It amounts to about \$200,000 and is specifically related to the mission of the Bureau of Standards concerned with the behavior of materials. It is not directed to the overall fire problem at all, but primarily to the fire problems that are related to building materials and construction.

Mr. MOSHER. So at present, even in a limited fashion, you aren't doing what this bill calls for?

Dr. HOLLOMON. No, sir. Not at all. We have two organic responsibilities that have to do with why we got into this business at all. One has to do with the materials and how they behave. The second has to

do with the fact that the Bureau of Standards is interested broadly in standards and related test methods. That is why and how we have a relatively small program in this area.

Mr. MOSHER. The functions proposed in this bill or the missions proposed in this bill, are not being accomplished anywhere, either in Government or in the private sector at present?

Dr. HOLLOMON. Not adequately. We will, to the degree practical and efficient, support existing organizations. Let me give an example. The National Fire Protection Association collects certain data having to do with fires as you will hear, I am sure, in subsequent testimony. They receive data from, roughly speaking, half the States on incidents of fire—how many there were, how many people were injured, and so on. These data are useful, but inadequate. They do not receive data from the whole country.

Secondly, the NFPA investigates the cause of fires. This is the kind of investigatory problem which I am sure you are familiar with after the last month. While it would be inappropriate to make any commitments, if the NFPA could get at the problem of collecting the totality of the data and doing it effectively, we should support the activity.

Mr. MOSHER. Who supports it?

Dr. HOLLOMON. The NFPA is supported by its membership which consists of companies or organizations who are involved in fire business, such as fire departments, fire protection equipment companies, insurance companies.

There are 209 such organization members and associate members of the order of 21,000. The latter are individuals like firemen and fire engineers and the like. These data were taken, by the way, from their yearbook of 1967 and may be out of date. They have available something like \$2 million for the total of their activity. This includes funds derived from their membership dues, sale of their publications, advertising, contributions, and so forth.

Mr. MOSHER. This is the principal organization now engaged?

Dr. HOLLOMON. This is one of the principal organizations engaged in information, education, standards, investigation of fires, and collecting data.

The Underwriter Laboratories dealing with specific testing of devices to determine compliance with codes and the like, spends about \$3 million. The Factory Mutual Insurance Co., largely concerned with building construction and sprinklers, spends \$1 million. Then, while we haven't been able to add it all up exactly, we made the best estimate we could of all the industrial R. & D. that is related to fire, including research on flameproof fabrics. We estimate that about \$15 to \$16 million is spent privately and roughly \$6 million is spent by the Federal Government. That is a total of about \$21 million with very little of it going to the overall question of the basic cause of fire, or to the systems analysis that deals with the allocation of firefighters, or the application of modern firefighting techniques.

When I spoke of supporting existing activities, I meant that where there is an appropriate university or organization that has the talent to do the job, we wouldn't create a new one.

Mr. DADDARIO. If we were to find a couple of places where efforts are being duplicated, even though not significantly, would you mind if we made recommendations that they be eliminated?

Dr. HOLLOMON. No, sir; none whatsoever, none at all.

This subcommittee is aware of House Joint Resolution 498, introduced by Congressman Barrett and referred to the Committee on Banking and Currency. It provides for a national committee to study appropriate areas of the national fire problem and to report thereon to the President and the Congress in 18 months. The suggested study areas include some in which apparent problems had not been clearly enough documented to justify inclusion in the action program provided by H.R. 6637.

There is nothing in H.R. 6637 dealing with standards, mandatory or not, affecting firefighting equipment, not even as to compatibility. There is an old saw around, and I don't know the degree to which it is still true, that there remain after all these years, some instances where screw threads on firefighting hoses are not compatible. This means that when a massive fire is present and you have to bring in equipment from different areas, sometimes the hoses cannot be connected. As I understand, one of the biggest problems in the Brooklyn Navy Yard fire was the fact that there was equipment there not able to use the hydrants. They were not able to connect with them. This bill does not deal with that problem except as research on causes and severity of fires might identify it as a contributing factor.

Mr. DADDARIO. You wouldn't have to do much research to notice that doesn't make any sense.

Dr. HOLLOMON. No; but how do you deal with it? Do you put mandatory standards on the manufacturer? Do you tell the fire departments of every city what kind of equipment they have to buy? How do you deal with the problem?

There is a second question of whether or not there should be some support of firefighting activities within the city by the Federal Government. We think this is a question which obviously needs consideration. Those kinds of questions are what are proposed to be studied in the National Commission.

Now, these problems have not been clearly enough documented to justify inclusion in this bill. I would say that in preparing the background for the President's program we asked questions about those matters and we were not able to come before you with specific proposals to handle them. There has been suggestion of amendment of H.R. 6637, which I think this committee should consider, to add the Commission to this bill to study those problems which are still outstanding and extant after the passage of the legislation. As I see it, the Commission's scope should be extended from strictly urban problems, if it is included in this bill, to encompass the whole national fire problem. Its membership should include the Secretaries of Commerce and Agriculture, in addition to the Secretary of Housing and Urban Development. It should be clear that the Commission should consider the results of the program authorized by the Fire Research and Safety Act and advise and consult with the Secretary of Commerce to coordinate their efforts. If such modifications to House Joint Resolution 498 are agreeable to both committees, we would have no objection to such amendment which would assure prompt study to identify additional problem areas, if they exist. The stature of the Presidential Commission would assure that the study would put all areas in proper perspective, relative to the program authorized by H.R. 6637, but by a group not distracted

by the duty to advise on the operational details of that program. Such amendment to H.R. 6637 would be a valuable addition, as a complement to the action program already in the bill. On that basis, I favor the National Commission if it is included in this act. I must add, however, that I would oppose any suggestion that the Commission be substituted for, or cause the delay of, the program authorized in H.R. 6637.

MR. DADDARIO. Dr. Hollomon, we became aware of Mr. Barrett's bill which has been referred to the Banking and Currency Committee apparently because of the jurisdiction which that committee has over housing, and we have advised Mr. Barrett that this question will be raised at some time or other. If the subcommittee comes to a determination that it is a proper amendment to the bill which is before us, the chairman's bill, we would then attempt to work out the intercommittee jurisdictional problem. I would expect that we would not have any trouble. So as we go along, we ought to hear as much about this Commission as possible and get the benefit of an expert point of view as to its favorable and derogatory aspects, if any.

DR. HOLLOMON. Well, Mr. Chairman, we stand ready to work with the committee, obviously, or both committees. We believe that the effective way to handle the problem of the Presidential Commission is to explicitly define what it is to do, and have the results that will be beginning to be obtained under H.R. 6637 available to the Commission. It should be included in this legislation if that can be worked out and we will support such an arrangement.

This committee also has before it H.R. 9305. This bill provides for the same action program as H.R. 6637, but adds a statutory Board to advise the Secretary of Commerce. Two points should be clear about that proposed Board. It is not the Commission just discussed, which could be a presidentially appointed group empowered to study the national problem in the light of the results from, but without pre-eminent concern for, this program. Secondly, the proposed Board also is not consistent with the present pattern of technical advice to the activities which would be carried out under the legislation before you.

Each NBS division has a technical advisory panel, selected from the pertinent groups, associations, or professional societies. The fire center, because of the several facets of the program authorized by H.R. 6637, may well have more than one panel, of different compositions appropriate to the areas of the program on which they will give technical and other advice.

What I am saying is that if you are worrying about investigation of fires and how they are caused, you may have one group of advisers. As to dissemination, you would have another group. As to demonstration, you clearly want to have fire chiefs and others who know how to handle them. You don't have the same kind of advisers for each of these activities.

We fully intend that an advisory panel or panels will be established. This has been a tradition of the National Bureau of Standards for many, many years. And we would not intend to operate in any other way. I do not think it is necessary or desirable to provide for a fixed advisory Board in the legislation. This is quite different than a request that a Commission be established.

The statutory Board called for in H.R. 9305 is neither as flexible as the present advisory panel system nor does it have the functions of the proposed National Commission. If providing that Board was intended to enable the National Bureau of Standards to seek advice from non-Government experts, it is not necessary. If it was intended to assure an independent review of the total national fire problem, I believe incorporation of House Joint Resolution 498, broadened as I have already indicated, into H.R. 6637, would be more effective. Substitution of those broadened features for the present section 4 of H.R. 9305 would have the same effect. As I have already stated, I urge enactment of H.R. 6637 and would welcome amendment to add the broadened Commission thereto.

Mr. DADDARIO. Dr. Hollomon, when you started, you said this sort of closes down the gap in the area of injury and damage. You do not mean that it includes that great problem of traumatic injury which causes great loss of life and great injury to our people?

Dr. HOLLOMAN. Yes. Within the bill—

Mr. DADDARIO. We are talking about traumatic injuries coming by fire and not by accident?

Dr. HOLLOMAN. Yes.

Mr. DADDARIO. That remains an area that needs to be examined?

Dr. HOLLOMAN. Yes, we say that under section 17(b), the Secretary may arrange with and reimburse the heads of other Federal departments or agencies to perform any such function and delegate to them the authorized powers. Here NIH might be asked to examine the effect of fire on the injury of people, how to deal with it, and the health problem.

Mr. DADDARIO. That is only one part.

Dr. HOLLOMAN. Yes; that is one part with which we can deal.

Mr. DADDARIO. I thought we ought to comment on that. It appears to me we should not lose sight of traumatic injuries, especially among our younger and more active people. This leads to another point. Although you have spelled out the work being done in many areas, I am sure that it was not your intention to cover every possible area.

Dr. HOLLOMAN. No, sir.

Mr. DADDARIO. When it comes to treatment of injuries by fire, we do have programs within our country, which are extremely important, such as the work being done in San Antonio at the medical center there.

Dr. HOLLOMAN. That is correct. That is one of the things that will be necessary to consider under this legislation—what is being done under direct medical treatment—that would be fully coordinated with this activity.

You know the fire problem is something like the traffic safety problem. There is a problem of the first incident, or accident; there is then the problem of what happens to the building and the people after that accident; and then, third, how do you clean up the mess. This program tries to deal with all three of these activities. What do you do to prevent fires? What do you do to reduce the damage caused by fires? What do you do to clean up the damage caused by the fires?

Incidentally, one of the major problems is how to get people educated to deal with fire injury in their home. What do you do immediately with a person who has been burned? When do you call the

doctor? What do you do? A part of this program is to support information activities of that kind. That is one of the problems.

Mr. RUMSFELD. Mr. Chairman?

Mr. DADDARIO. Mr. Rumsfeld?

Mr. RUMSFELD. Before we go on with the other testimony, may I say, I have read through both of these statements and looked at the bill, and in line with the comment that you have just made, I would like to make a statement and express a hope.

It seems to me, in discussing proposals such as we have before us, that an approach something along the lines as follows is a reasonable one. First, that we try to clearly define and pin down the elements and the scope of the problem we are dealing with—totally, the whole thing. The witness has discussed just some of the elements of the problem. I can think of another element that wasn't commented on.

Second, it seems to me that we have to rather specifically enumerate both the qualitative and quantitative aspects of who is presently doing what and what is, in fact, currently being done to deal with these elements of the problem as defined in all sectors of the society: the private sector, you commented briefly on Underwriters Laboratories, which would fit there; the voluntary nonprofit sector, and I suppose the university and the NFPA would fit there; and the Government sector, including local, State, and Federal.

And third, that we then, after accumulating that information and analyzing it, consider the gaps between some ideal and what is in fact being accomplished, and then weigh alternative approaches to filling those gaps and coping with the problem, including a variety of possibilities: beefing up efforts that are currently taking place that are sound and reasonable, suggesting informational activities to discourage efforts that are not proving sound or reasonable, coordinating recommendations, instituting informational programs, training, as this bill proposes, and stimulating other levels of government to become more active. Finally, and always included, is a possible action effort by the Federal Government.

I do hope that we can, in the subcommittee, and I know that it is your hope, Mr. Chairman, with respect to the testimony that we are going to receive, approach it something along that line. Absent that preliminary information, it is just plain impossible for me to feel responsible in recommending a specific course of action.

Mr. DADDARIO. I would buttress that up, Mr. Rumsfeld, by both agreeing with it and suggesting that once Dr. Astin has finished his statements that we ask questions. I intend to do this. We are all free to do it, to get to the heart of that particular problem because I think it is important. During the course of these hearings, there will be an opportunity for us to get as much information as we need to come to some determination around which we can make a recommendation about the legislation before us.

Mr. Mosher?

Mr. MOSHER. I don't want to postpone Dr. Astin's statement, but just to put the things in perspective—

Mr. DADDARIO. There is no bar to any question.

Mr. MOSHER. I notice the bill calls for an authorization of \$10 million.

Dr. HOLLOMON. That is correct.

Mr. MOSHER. That is for fiscal 1968?

Dr. HOLLOMON. Yes, sir.

Mr. MOSHER. Is there a request for it in the President's budget?

Dr. HOLLOMON. He couldn't request it until we are authorized. The President stands ready to add it.

Mr. RUMSFELD. What do you mean, the President can't put it in his budget until it is authorized? Authorized by whom, the Congress?

Dr. HOLLOMON. You gentlemen.

Mr. RUMSFELD. It includes social security—

Dr. HOLLOMAN. If the item is \$10 million or less, it doesn't appear.

Mr. RUMSFELD. I wouldn't want it to be thought that there aren't items in the budget that haven't been authorized—there are.

Mr. MOSHER. The President stands ready to request it if it is authorized?

Mr. HOLLOMON. Yes, sir; this is part of the President's total program.

Mr. MOSHER. Well, will we have testimony as to why \$10 million as distinguished from \$12 million or \$8 million?

Dr. HOLLOMON. I hope Dr. Astin can reply in some detail. It is hard to answer.

Mr. MOSHER. In other words, it is a rather arbitrary figure?

Dr. HOLLOMON. We looked at the problem in terms of what is going on, we have gone over it item by item. Dr. Astin may have some estimates with him as to how we arrived at this. We will be happy to furnish it.

It is a difficult problem to come to precise terms with. We will be glad to tell you how we intend to spend the money.

(The information volunteered is as follows:)

FIRE RESEARCH AND SAFETY ACT BUDGET ESTIMATES

The amount of \$10 million was arrived at by looking at the present efforts and making estimates of the needed increases. In some cases there is no significant present effort directly related to fire (e.g. curriculum-development); the estimates are based on costs for similar efforts in general.

[In millions of dollars]

Item	Present effort	Increase
Data gathering and information dissemination	1 1	2 1
Research:		
Total	21	2 5
Federal	6	
Education:		
Curriculum development		4 1
Extension courses (fire services)		1
Public	1 1	1
Demonstrations		1
Total		10

¹ Approximately half of 1965 budget of National Fire Protection Association, the chief group engaged in this activity.

² Data currently submitted from 22 States; double present effort to bring in all 50 on uniform reporting system.

³ Slightly less than doubling present Federal research effort.

⁴ Should provide 1 new curriculum in 1 university.

⁵ Consists of available literature, etc., National Fire Protective Week, Spring Clean-Up Week, and Federal contribution to "Smokey the Bear," plus local and State programs.

The following is a tentative and approximate distribution of the expenditure of funds. The Contracts/Grants distribution is most tentative because it will be influenced by the proposals obtained.

*Expenditures**Percent*

In-house ----- 15-25
 Contracts/Grants ----- 75-85

[In millions of dollars]

Item	In-house	Contracts-grants	Total
Investigation of fires.....	0.2	0.2	0.4
Research.....	1.4	3.6	5.0
Education (public).....	.1	.9	1.0
Information services.....	.1	.5	.6
Education, fire services.....	.2	.8	1.0
Demonstration projects.....	.3	.7	1.0
Curriculums.....	.2	.8	1.0
Total.....	2.5	7.5	10.0

Mr. DADDARIO. Let us get Dr. Astin's statement over with so we can get the general information out of the way.

Dr. HOLLOMON. Mr. Chairman, may I briefly reply in part to Mr. Rumsfeld?

Mr. DADDARIO. Yes.

Dr. HOLLOMON. The way to get at the program is to understand what is going on and what is needed, if anything, to insure that we have an adequate program in the country. That is the problem. How to do it so we will be most effective is important.

There are some things we are not asking the Congress to do. For example, we are not seeking authority for the development of mandatory standards with respect to either firefighting equipment or building. What is in the legislation is investigation as to fire cause, frequency, and severity. That information is not adequate. Secondly, research in the causes and nature of fire—we can discuss what is known. Professor Emmons is going to submit a statement. I consider him to be a world expert on the subject. He has traveled the world over. We have reports from the National Academy of Science that the basic research is completely inadequate. An increased program of educating the public is needed, as well as for the education and training of fire services and people who are technically, trained. There are only three places in the United States where a college degree or engineering degree is granted in this field. These are inadequately supported. Modern curriculums need to be developed.

Finally, we need demonstration projects to show the fire departments and other related agencies how to use the best information that is available.

This is the character of the specifics. We can go into much more detail on each one of them.

Mr. RUMSFELD. Let me say that you, properly, are discussing what you are recommending.

Dr. HOLLOMON. Right.

Mr. RUMSFELD. The subcommittee has the responsibility to hold hearings on this bill but equally or more important, on the problem, and to decide whether what you are recommending is either too little or too much, or wise or unwise.

Dr. HOLLOMON. Or sensible at all.

Mr. RUMSFELD. And for you to say—I am not being critical but you say the work in this area is inadequate.

Dr. HOLLOMON. Yes.

Mr. RUMSFELD. The reason for my statement was that this subcommittee will want to get down to pretty hard facts, to find out if it is inadequate and if it is, what is the best possible way of fixing it. My statement was made when it was made because—I am sure the chairman's feeling is exactly as he indicated—I don't want to end these hearings without having weighed these proposals. I want to finish the hearings having weighed the problem and I do not want to take to the floor a bill requiring the Members to vote for fire or against fire.

I hope the witnesses from your department and other departments will think in terms of the statement I made in justifying or attempting to justify the recommendations they are making.

Dr. HOLLOMON. We are prepared to submit, now or later, any part of the information you need. That is exactly what you ought to do.

Mr. DADDARIO. I have some questions along those lines.

Mr. Lukens?

Mr. LUKENS. I would like you to make a list of the organizations or agencies that you have knowledge of that are participating in this kind of research.

Dr. HOLLOMON. I will be glad to submit it for the record.

Mr. LUKE. I would like to have a list.

Mr. DADDARIO. We will have them during the course of the hearings. (Information requested is as follows:)

LIST OF ORGANIZATIONS AND AGENCIES ACTUALLY CONDUCTING FIRE RESEARCH

NOTE.—This list does not correspond to those funding fire research. Office of Civil Defense, for example, supports but does not conduct research.

FEDERAL LABORATORIES

Federal Aviation Agency
Bureau of Mines
National Bureau of Standards
U.S. Forest Service
Federal Laboratories—Military
U.S. Air Force Aero Propulsion Laboratory
U.S. Army Electronics Command
U.S. Army Engineer Research and Development Laboratories
U.S. Navy Aeronautical Engine Laboratory
U.S. Navy Air Turbine Test Station
U.S. Navy Applied Science Laboratory
U.S. Navy Civil Engineering Laboratory
U.S. Navy Radiological Defense Laboratory
U.S. Navy Research Laboratory
U.S. Navy Weapons Evaluation Facility

UNIVERSITY LABORATORIES*

Cornell University
Harvard University
Massachusetts Institute of Technology
Mississippi State University
Purdue University
Rutgers University
University of California—Berkeley
University of California—Los Angeles

*From "Directory of Fire Research in the United States," third revised edition, 1965, NAS-NRC, Washington.

University of Chicago
University of Idaho
University of Maine
University of Maryland
University of Michigan
University of Minnesota
University of Missouri
University of Montana
University of Oklahoma
University of Wisconsin
Worcester Polytechnic Institute

PRIVATE AND INDUSTRIAL LABORATORIES

AeroChem Research Laboratories, Inc.
All American Engineering Company
American LaFrance
American Oil Company
Ansul Company
Armstrong Cork Company
Arthur D. Little, Inc.
Atlantic Research Corporation
"Automatic" Sprinkler Corporation of America
Battelle Memorial Institute
Bio-Dynamics, Inc.
California Flameproofing & Processing Co.
Dikewood Corporation
E. I. duPont de Nemours & Company
Factory Mutual Research Corporation
Fenwal Incorporated
Froehling & Robertson, Inc.
Gage-Babcock & Associates, Inc.
General Dynamics/Electric Boat
HRB-Singer, Inc.
IIT Research Institute
Monsanto Company
MSA Research Corporation
National Engineering Science Company
National Fire Protection Association (International)
National Foam System, Inc.
Parametrics, Inc.
Portland Cement Association
Sandia Corporation
Serendipity Associated
Southwest Research Institute
Stanford Research Institute
Textile Research Institute
Thiokol Chemical Corporation
T. Y. Lin and Associates
Underwriters' Laboratories, Inc.
URS Corporation
Walter Kidde and Company, Inc.
Westinghouse Research Laboratories

Dr. HOLLOMON. Mr. Chairman, I may have to leave a few minutes early. I am sure Dr. Astin or Mr. Ryan can answer.

Mr. DADDARIO. Yes. In the event we feel we need your advice, we will ask you to come back.

Dr. HOLLOMON. I think an appropriate time for me to move is at the moment.

Mr. DADDARIO. The appropriate time is whenever you can get away.

Dr. HOLLOMON. Thank you.

Mr. DADDARIO. Dr. Astin.

Dr. ASTIN. Thank you.

Mr. Chairman and members of the subcommittee, I appreciate the opportunity to support the Fire Research and Safety Act of 1967 recommended by President Johnson in his February 16, 1967, message on the American consumer. In that message he recognized the tradition of consumer protection started by the Congress nearly 100 years ago, and urged its continuation.

You have before you several identical bills that would implement the fire research and safety program recommended by the President. These are H.R. 6637 introduced by Chairman Miller, and identical bills by Congressmen Brown of California, Corman, Davis of Georgia, and Roush. I urge their enactment.

You also have before you a bill introduced by Congressman Hanna, H.R. 9305, which provides for the complete Presidential program, plus a statutory Advisory Board. Also of interest and closely related to the Fire Research and Safety Act is House Joint Resolution 498, introduced by Congressman Barrett, and referred to the Committee on Banking and Currency.

THE FIRE PROBLEM

The available estimates of a national death toll of 12,100 and property loss of \$1.75 billion in 1965 give the magnitude of the problem. The fact that the United States has the highest per capita fire death rate and property loss rate of any industrialized nation in the world puts the problem in international perspective. The U.S. death rate is more than twice that of the next highest nation, Canada; four times that of the United Kingdom; and $6\frac{1}{2}$ times that of Japan.

The facts that the best available figures on death and property loss are based on data submitted by less than half the States, and that those on causes are submitted by about one-third of the States, indicate the complexity of the problem.

These estimates have been made by the best source for information in the country, the National Fire Protection Association. The exact dimensions of the fire problem are not known.

Other aspects of the national fire problem include frequent tragic examples of ignorance of fundamental safety precautions and emergency procedures, plus public apathy, both indicative of need for increased and more effective public fire safety education at the National, State, and local levels; the variation among geographical areas in the quantity and quality of professional training available for the fire services; the shortage of college-level courses and curriculums on fire safety principles and applications; and the inability of many interested and competent groups, particularly in the fire services, to find support for investigation and demonstration of new and potentially superior fire prevention and control techniques, operations, or organization. Of fundamental importance is the lack of a broad base of fundamental and applied research.

Undoubtedly the fire problem would be even more serious were it not for the commendable efforts of industry, universities, and such private or public nonprofit organizations as the National Fire Protection Association, the National Safety Council, the International Association of Fire Chiefs, and the International Association of Fire Fighters. The work of many of these groups is hindered by inadequate financial bases, particularly the private nonprofit organizations

which are primarily dependent on membership dues and publication sales.

Compared to a loss of \$330 million of Federal property in 1965, the Federal fire research program is now funded at \$11 million annual level. Of this, about a quarter-million goes to broad basic research; the rest goes mainly to strongly mission-oriented applied research, particularly in the Department of Agriculture, Department of Defense, and Office of Civil Defense. In general, such research and related fire programs are excellent and should continue. For example, the information, education, and training programs of the Department of Agriculture, particularly "Smokey the Bear," are very effective, but that is only in the forest and range-fire category.

Mr. DADDARIO. Does your \$330 million Federal property include damage to park lands?

Dr. ASTIN. I am not sure whether it includes park lands or whether it is restricted to buildings and real property. I will check that and make the information available for the record.

(Information requested is as follows:)

WILDLAND LOSSES IN FEDERAL PROPERTY LOSS

The \$330 million Federal property loss includes \$26 million damage to Federal wildlands (forest, grass, and tundra).

Mr. DADDARIO. Thank you, Dr. Astin.

PROGRAM AUTHORIZED BY THE ACT

Dr. ASTIN. The Fire Research and Safety Act authorizes and provides support for a broad and coordinated program to reduce the national toll of fire-caused death, injury, and property loss. It calls for cooperation with and support of ongoing private programs and organizations and utilization of existing competence and expertise, all to the maximum extent feasible. It authorizes the use of contracts and grants as well as appropriate in-house efforts to implement the program. It specifically, and rightfully, precludes interference with, duplication of, or usurpation of present Federal agency programs.

The act will provide support for:

1. Investigations of fires as to their causes, frequency of occurrence, nature and severity of losses, and other pertinent factors.
2. Research into the causes and nature of fires, and the development of improved methods and techniques for the reduction of personal injuries and property damage.
3. Education of the public on fire hazards and on fire safety.
4. Education and training of fire service personnel in the utilization of new techniques.
5. Improvement of formal education curriculums in fire safety up to and including graduate levels.
6. Fire safety information services.
7. Demonstration projects on fire prevention, control, and the reduction of personal injury or property damage.

Mr. DADDARIO. Dr. Astin, before you go further, will you go back to page 3? The same question comes up as the one I raised with Dr. Hollomon. That is the matter of spelling out specifically as you do

and adding the word "rightfully" that you do not intend to interfere with or usurp any activities going on in other agencies. I again raise the question that this assumes everything that is being done is being done properly, in the right place, and that it ought not to be interfered with. I don't believe that is what you mean.

Dr. ASTIN. What we intend to do under this act is set up a national coordinated program which will deal with the total national requirements to prevent fire loss and injury. In doing this, we will certainly have to keep fully informed about what is going on in other areas—as, for example, the program in the Department of Agriculture which we think is a good program. If in carrying out the broad national program there are things that occur to us which we think would be helpful to the Department of Agriculture in their program we would certainly pass these on.

Mr. DADDARIO. I wouldn't want to get the idea across by our remaining silent that this committee would not consider recommendations about presently existing programs. Both your statement and Dr. Hollomon's surprise me and compel me to ask these questions. We have felt in almost every examination where basic research activities have been involved that this is certainly a matter that ought to be looked into.

Dr. ASTIN. It is certainly not our intent to take over in any way responsibilities for programs now assigned to other groups by the Congress or now being well done in the private sector. Certainly to deal with a total national program we must keep abreast of these and if, in our judgment, things in the national interest need to be changed, we could suggest it. But it is not our job to run those programs. They are separately authorized and would not at all be under our management.

Mr. MOSHER. But in the eyes of this committee no Government function or agency is sacrosanct; is it?

Dr. ASTIN. I agree.

Mr. MOSHER. You wouldn't suggest that this committee look at any of these functions as perfect as they are.

Dr. ASTIN. No.

Mr. DADDARIO. Just to follow this up, I don't have the information before me, Dr. Hollomon raised a point, that the DOD was doing a great deal of work to develop programs to meet an atomic attack.

I don't know what that includes, but I think we ought to get some judgment about it because he also said that the civil defense spends a million dollars a year in this same area. If we examine that, we might come up with a judgment that it ought to be done in one place rather than in both. I do think, without coming to any judgment at this time, that there could very well be areas where we would ask your advice and we wouldn't want you at that stage of the game to say that it wasn't your responsibility to make recommendations because you rightfully believe that they belong in these places. This seems to me to be a pre-judgment which isn't necessary at this time.

Dr. ASTIN. Many agencies, such as the Department of Defense and the Office of Civil Defense, have responsibilities that very much involve an understanding of the fire problem in order to carry out their missions. We are providing for coordination of these activities through this interagency committee that Dr. Hollomon referred to earlier.

But the civil defense program, for example, has to seek to understand the problem of potential general conflagration and that is a special sort of problem. It is not unrelated to the general problem, but it has enough special aspects that it seems to me that it is something that must be considered as one of the responsibilities of the Office of Civil Defense to take care of.

Mr. DADDARIO. I don't have enough information at this time to come to any judgment one way or another, but I do think that it is important that the committee spell out one of its fundamental characteristics. It has never taken the attitude that we ought not to interfere with what is presently going on in Government agencies because this would mean that the committee would forever support what was going on and this doesn't make much sense.

Dr. ASTIN. I can understand your viewpoint along that line.

I would like to discuss some details of the problems I discussed earlier beginning with "Information."

Detailed information, in a uniform format, will be sought actively from all the States. Modern operational analysis techniques and data-processing equipment will be used to carry out studies of the relationships between occurrence of death and injury from fires, frequency of fires, causes, and contributing factors. The information gathering and analyses will provide a base for establishing priorities in research efforts and evaluation of the effectiveness of research results, demonstrations, education, training, and related activities. Teams of experts will investigate selected fires and provide in-the-field advice and consultative services. Increased dissemination of information will be provided through support of clearinghouse services for all types of fire-safety information, including responses to specialized requests and location of personnel experienced in handling the usual problems.

Next, the research area.

Among the things which impede the advance of fire technology are the lack of understanding of why and how a fire develops and spreads, of the behavior of structural and other materials in fire, and our inability to predict these behaviors without actually burning down a building each time. Not enough research is going on—here or anywhere in the world. The Bureau would augment and broaden its existing fire research effort, and its contract program, to place significantly more emphasis on fundamental fire research studies in the areas of ignition, fire growth, smoke and toxic products, materials response, and fire detection and control. A balance would be maintained between laboratory scale and "real world" scale research.

The innovation of new building materials and products raises questions of how they would be affected by fire. This in turn raises the question of the proper method of testing these items. The Bureau would continue to develop methods by which these products and materials could best be evaluated. As is customary, the actual testing of commercial products usually would be undertaken by private industry and laboratories such as the Underwriters' Laboratories.

At present there is essentially no research directed toward the problems of the fire services beyond the limited exploratory work being done under the sponsorship of the Office of Civil Defense. The need for a major research program to aid the fire services is becoming critical because rapid social and technological changes are requiring ever

greater efficiency in fire prevention and control. The Bureau would initiate a broad research program of in-house work and contracts in fire defense analysis. The work would include special studies in such areas as communication systems and equipment, and in personal protection equipment for the individual firemen.

Next, in the field of education.

Education and training for the fire services are essential to attaining the highest levels of competence, of advancement opportunities, and of fire executive development. The Bureau will provide grants to support the development of and participation in professional extension courses for fire service personnel and fire officers. The objective of this increased education should be professional status, career development, and executive development of the fire officers.

Sound fire protection and safety principles should be applied from the beginning of design projects on all scales. Not enough fire protection information is included in the curriculums for architects, engineers, designers, city planners, and other professionals who should be aware of and apply safety principles in their work.

In addition, the increasing complexity of fire technology accents the need for graduates whose major educational specialty has been in the theories and application of fire research and safety. At present only two universities in the United States offer 4-year curriculums leading to bachelor of science degrees in fire protection engineering. The Bureau will support the development and introduction of fire-related courses and educational materials for addition to established curriculums and for establishment of new curriculums in the Nation's colleges and universities.

I might explain the difference. I refer here to two universities. Dr. Hollomon referred to three. There are only two with full 4-year fire protection engineering curriculums. The other one does have a full 4-year course in public administration with a fire specialty.

State and local fire safety programs will be improved to include more extension courses in the most effective methods of fire prevention and control for appropriate industrial and institutional personnel.

Many experts believe that the major continuing cause of fires, fire casualties, and high fire losses is the lack of adequate understanding by the general public of proper procedures for handling relatively simple but recurring fire situations. The fact that our property losses were spread over more than 2 million fires substantiates this belief. The Bureau will seek to strengthen existing efforts to educate the public on fire safety at the national level, by direct support, and at the State and local level by grants.

Assistance to these various educational and training programs is an integral part of the comprehensive approach to the fire problem. For besides the direct effect of well-trained professionals and a more fire-conscious public, these programs provide a way of introducing the results of research to those who can use it to prevent and fight fires.

From both the research and the education and training programs will come information and ideas which need to be tried in the "real world" of the fire protection engineer, the fire marshal, and the fire services. There will also be a feedback from the field of ideas which will need to be tried. The Bureau will provide grants to State and local governments and to nonprofit organizations concerned with fire

to demonstrate these new ideas. The purpose will be to spur technological innovation at all levels.

A center for administering the act would be established at the Bureau.

Our present fire research staff would be incorporated into an expanded research effort, both to handle an increased in-house program and to administer and monitor the research contracts and grants. The Bureau program would make increased use of systems analysis to better define critical problem areas and to determine the relative benefits to be derived from work in these areas.

Effective leadership by the National Bureau of Standards in implementing the Fire Research and Safety Act and coordinating the efforts of the many diverse groups having competence in one or more of the program areas will require continuous contract with and advice from the scientific community, the fire services, industry, State and local government, and other segments of the total public.

We would expect to call on experts in the fire services, in fire prevention, and the general fire community for assistance in identifying fire problems and for advice in formulating the program. I would expect these experts to be especially valuable in reviewing the results of research and demonstration programs to consider how these results can best be introduced into use. We would also expect to call on experts in the sciences to advise us on the technical quality of our research. These experts could be in panels, probably more than one, such as those presently appointed to provide advice on the programs of the Bureau. These advisory groups would be of a permanent, continuing nature.

The legislation authorizes appropriation of \$10 million for the next fiscal year. In carrying out the fire research and safety program, we believe that the major portion of the funds appropriated will be expended through the use of the contract and grant authority in the legislation. The minor portion of the funds will be used for in-house activities, mainly in research.

It will, of course, be our plan to assemble a panel, or panels, of individuals from industry, the fire services, and the scientific community to give us technical advice on the program. Therefore, I believe that the statutory advisory board provided for in H.R. 9305 is not needed.

It has been suggested that H.R. 6637 be amended to include provision for a Presidential Commission similar to that called for in House Joint Resolution 498. Dr. Hollomon has just outlined a broadening of the scope of that Commission to make it concordant with the national approach of H.R. 6637. I see no loss in the effectiveness of the fire research and safety program if amended to provide for a commission having such broadened scope, and therefore I would welcome it. Whether or not it is so amended, I urge the enactment of H.R. 6637.

Mr. DADDARIO. Thank you, Dr. Astin.

The two universities you referred to having 4-year curriculums leading to a bachelor of science degree, how long have they been in existence?

Mr. JAMES RYAN. One is the University of Maryland. They have had a curriculum in fire protection engineering for about 10 years. I believe a member of the staff will appear later.

The other school is the Illinois Institute of Technology.

Mr. DADDARIO. He will be able to supply us with statistics as to the number of graduates and how they have fitted themselves into fire prevention?

Mr. JAMES RYAN. I understand the two together have graduated less than 30 each year. The third university is the University of Southern California, which has as part of its public administration curriculum an option in fire specialties. It's a 4-year curriculum. But it is only a specialty in a broader curriculum.

Mr. DADDARIO. At the center would you conduct courses? Would you have men come from fire departments throughout the country from time to time for a short course such as the ones the FBI gives?

Dr. ASTIN. I believe our preference would be develop skills in the universities to do the teaching and instruction.

Mr. DADDARIO. You would support that effort?

Dr. ASTIN. We would support the educational institutions trying to get them to do a better job in this area.

Mr. DADDARIO. What would the center consist of as to facilities, equipment, and manpower?

Dr. ASTIN. The center would provide, first of all, a general office to administer the act. Then there would be a sector that deals with the investigation of fires, analyzing the data. There would be a public information sector that would attempt to develop educational programs. Then there would be a sector dealing with the training programs themselves. That is, working with universities on curriculums, perhaps encouraging fellowships and things of this sort in the fire technology area. There would be another sector that would deal with grants for both basic and applied research, and another unit with responsibility for the demonstration projects.

Now, the biggest part of this center would, of course, be the in-house research activity. The implementation of this program would require some augmentation of our present facilities, but we already have, in our 1968 appropriation request, an item which would permit us to design a facility to investigate the properties of buildings and structures when exposed to fire.

That is, of course, in line with our traditional functions in the building field. But we have never before had facilities which would permit us to look at building system. It is most important that we be able to look at the whole system if we are to deal properly with one of the most critical parts of the fire problem; namely, the toxic products, smoke. More people are injured or killed by smoke inhalation than fire, as I understand it. We have to deal with larger scale systems, not just components, if we are to understand the toxicity problem and the air movement problem in connection with fire.

So, in summary, the organization is a director of a center with a number of administrative units running the sectors of the program, then a significant sector dealing with in-house research.

Mr. DADDARIO. How does this work out in numbers of people?

Dr. ASTIN. Our present best estimate is that the number of professional technical people will be of the order of 85 and the support personnel of the order of 45 making a total staff of approximately 130.

Mr. DADDARIO. Do you have a plan which could be provided for the record as to how this would be organized?

Dr. ASTIN. Yes, we have a plan that could be furnished for the record. (Information furnished in answer No. 5 located on p. 33.)

Mr. DADDARIO. I would appreciate it if we could have that. You talk about the toxic effect of smoke asphyxiation. How would you, from a coordinating point of view, work that out? Would you develop an in-house capability or use the institutions presently doing work where personnel does exist such as NIH, and San Antonio so that they would provide your people with the kind of research around which information could be developed.

Dr. ASTIN. It would definitely be our intent to use centers or groups of competence wherever they exist and not duplicate them. In terms of the toxicity problem, we would certainly want to use the medical scientists in NIH, the Air Force, NASA, and the universities on studies related to toxicity factors involving humans. Our concern with the toxicity problem is at the origin and spread of the toxic matter.

Mr. DADDARIO. Prior to the inhalation?

Dr. ASTIN. Yes. We would then depend on others for data on toxicity factors.

Mr. DADDARIO. There is no work of that kind?

Dr. ASTIN. There is very little of that kind going on at the present time.

Mr. LUKENS. I would like a quick overview. I am intrigued by your fourth point about collection, analysis, and dissemination of this data. Has there been any drive to see that a technological utilization program that has been so successful in NASA be initiated here? Do we make sure that everyone interested in firefighting, fire preventing and research has access? This is a real sales point of any program of this type.

Dr. ASTIN. We are continually confronted with that problem in virtually all areas of our other programs. Our concern with precision data is not only to get the data combined and published. We are concerned with how it is used and with making sure that it is readily available to the scientists and engineers.

In still another area, we operate the national clearinghouse for federally generated research and development reports. Here our desire is to make sure that the report literature generated by the Government is effectively used in industry. So we are very conscious of this need and we are working at it in our other areas. It would have a dominant role in the fire program.

Mr. LUKENS. My specific question would be, if the \$10 million is granted in full, is any of this fund earmarked for the particular purpose of dissemination?

Dr. ASTIN. Yes.

Mr. DADDARIO. The National Bureau of Standards is actually in the business of doing just what you said. It develops a system which incorporates the Bureau information which has been developed in many places throughout the country, then beef it up, if necessary, by some in-house activity, and puts it together in such form so that it can be used by that section of the community which needs to have it.

Dr. ASTIN. That is right.

Mr. DADDARIO. That expertise which has been developed over a course of time would be utilized. For example, I think the point that Mr. Lukens raises is a very good one. The National Bureau has been

doing work in combustion behavior over a long period of time. We have seen this problem put before us in its most graphic terms, because of the effect of combustible materials in the Apollo capsule. I would expect that all of the information which came from the Apollo accident would somehow be put together and become part of the information you then would be able to provide.

Dr. ASTIN. This would certainly be our intent.

Mr. LUKENS. Thank you.

Mr. DADDARIO. Have you finished?

Mr. LUKENS. That is all. Thank you.

Mr. DADDARIO. The one point, that we want to be clear about, we have great faith in the National Bureau of Standards being able to put information together and to make it available and this has been illustrated over many years. During the hearings on standard reference data and statistics, this was borne out again in an extremely adequate fashion.

The Government has developed a policy of self-insurance on Federal properties over the course of years, how does it get its information to put together fire preventive measures within this vast complex of property? Does it do it adequately? Do we assume because we have been doing it that it has been done in an expert way, or do we assume that it has not been done as it should be done?

Dr. ASTIN. This problem is dealt with within the Federal Government under the auspices of a Federal Fire Council. The Federal Fire Council has a central administrative body chaired by the Administrator of the General Services Administration. It consists of a number of individuals in statutory positions from other agencies including the Defense Department. The Director of the National Bureau of Standards is a member. Under this governing body of the Federal Fire Council is a very active program with a great many technical committees dealing with specific problems pertaining to Federal fires. Under the auspices of the Council, data are collected on fires, and they attempt to develop some degree of standardization in how the data are collected. Training programs are organized and carried out. There are frequent meetings of the total Council and sectors of the Council in which information is exchanged.

I think they are doing a pretty good job. There is no doubt but what it can be done better, and they are trying to.

Mr. LUKENS. Could I ask a couple of questions about specific programs that this Federal Council is promoting?

You said training. What kind, and to what extent?

Dr. ASTIN. They indulge in seminars in which programs known to be successful are disseminated to others. To my knowledge, they do not conduct formal training courses, do they?

Mr. JAMES RYAN. They have had under consideration a formal training course purely for the Federal service. I don't believe this has gotten too far. It is under discussion. Certain Federal agencies have Federal fire forces. For example, the military have their own training program for this, their own system for determining what the qualifications should be.

The Federal Fire Council has drawn up a document that would essentially coordinate this program of determining what should be

the qualifications and putting out for debate whether or not a central office might be set up for actual training.

Now, this is only a document that is under consideration and early review. In this area they are coordinated.

Mr. LUKENS. I was also interested in the extent of the exposure. Is it a nationwide invitation list, or what?

Dr. ASTIN. Every Federal agency participates in the work of the Federal Fire Council.

Mr. LUKENS. Thank you.

Mr. DADDARIO. Could you get into the military firefighting capability. You talk about this program that is presently being contemplated. I would be surprised if the Army doesn't have a manual on how to fight fires at every level where there is a military command or a military function going on.

Mr. LUKENS. In fact, the Air Force has a firefighting school.

Mr. JAMES RYAN. Yes; the military has quite a competence in fighting fires. Largely, it is directed to specific problems. Obviously the Air Force has a fire-crash problem which is not unlike but not identical to a civilian aircraft crash. They have large installations, again the airport is the easy example, that are not frequently found in the civilian sector. They have problems in the parts of the world where the civilian sector doesn't go. The extremely cold sections, for example. Some work was undertaken at the Bureau, at the request of the military, to conduct fire tests of building construction designed for use in areas of the world where there is no other construction but military.

This information would only be peripherally applicable to the buildings in Washington.

I am getting a little away from their firefighting capability. They have it. They have barracks and they have housing. In this area they have a capability and training manuals related to that capability that would be not unlike the training capability that the civilian firefighting departments might hope to have.

Mr. DADDARIO. To follow, as the military engineers draw plans for construction, they certainly have developed a competence to make some determinations about materials, and how they would act under stress of fire. They have the ability to fight fires, too. Where do they get all this information? Why isn't it adequate considering the proposal you have before us. How would your proposal make this a stronger capability?

Dr. ASTIN. By collecting information on newer, advanced, firefighting, fire-prevention techniques in a systematic way all over the country, we would hope to be able to recognize the best of these and then make sure that the best of these techniques and procedures are available in all sectors that don't already have them.

Mr. DADDARIO. What would you be replacing, Dr. Astin? This gets us exactly to the point. I don't think that anyone can question the fact that we ought to be doing a better job in this area than we are now doing. The military, as an example, is doing from what you say a competent job in this particular area.

Dr. ASTIN. For the moment.

Mr. DADDARIO. They must be getting proper advice to be doing the job. Who gives it to them? What does it cost? What would we be saving by providing a capability to provide information different from the way in which they get it now?

Dr. ASTIN. The military would have a new and better source of information than they now have if we set up a coordinated national program on fire information. I don't know what they are spending on this now but most certainly there would be available to them better information, knowledge of better techniques than are now available to them.

Mr. DADDARIO. We could logically expect, if we can perhaps find this out, we should then be able through this program to provide a different and more efficient source of information. This could cause a savings because we ought to be able to eliminate the need of the sources which are now providing the information.

Dr. ASTIN. There will continue to be many primary sources for information. We expect that this legislation will lead to a single recognized focus to which inquiries can be directed with confidence they will know what information is available and can either provide it directly or give reference to particular sources for full details.

Mr. LUKENS. Are you inferring most of the information they are obtaining is from their own sources within the military?

Dr. ASTIN. No. Some of it is, because their problems are to some extent different than those of an urban fire department. But they have many things in common also. They get information from their own sources, from the National Fire Protection Association and other sources at the present time.

Mr. DADDARIO. How can you say this legislation would be beneficial to the Government when you consider the risk we have because we are self-insurers in Federal properties.

Dr. ASTIN. I would expect as we develop better information or through investigations of fires and analyses of the causes, through research which leads to better design techniques in structures and equipment, as we evolve better firefighting equipment and procedures, that losses would go down. The fire losses are around \$330 million a year. A third of a billion dollars is the Federal Government's loss. I think it is reasonable to expect that as the program gets moving and becomes effective that those losses, if they do not go down, would certainly not increase in proportion to increased capital value of Government facilities.

Mr. DADDARIO. Now, Dr. Astin, the point has been made by both you and Dr. Holloman about the private participation in this field. Could you touch on the point again as to how the private sector is developing its own capability in fire research? Is it sufficient or not? How would they fit into this program?

Dr. ASTIN. I think the private funds for fire research are very limited. Most of the private money is now used in the business of analysis of fires and information services, but there is some in the area of research. We have got long lists of important research problems that need to be investigated.

One of the major ones that I referred to briefly in my statement is the scaling factor. Our knowledge about the reliability of scaling—that is of going from laboratory tests to full-scale tests—is quite inadequate. It is completely unsatisfactory to have to burn a house down in order to test building materials or techniques. We must be able to do this through laboratory studies. This is just one area where increased research is needed: in the scaling factor.

We would certainly encourage and support ideas for studying fire problems in the universities and private organizations if the bill becomes effective. If it appears practical, we would strengthen the current information-gathering services of the National Fire Protection Association. They are doing a very good job in this area now with their limited resources, and I am sure that it would be in the national interest if these efforts could be strengthened.

Mr. DADDARIO. Is the National Fire Protection Association now in favor of this legislation?

Dr. ASTIN. I can't speak for the National Fire Protection Association. I would say their support is lukewarm at best. Their general viewpoint, as near as I have been able to understand it, is that they feel this is a possible undesirable intrusion by the Federal Government into an area where they are now dominant.

Mr. DADDARIO. Now, Dr. Astin, you have shown how you intend to get university participation in this area. And I have asked the question how the private sector is doing at the present time and I think you have some good examples as to what else needs to be done. I wonder if you might give us from the benefit of your experience the way through which the private sector will also be able to develop its capabilities through this program. I add to that that it would appear to me after listening to you here that by strengthening the university program and by getting more people properly trained, you would be certainly making men and women available in this work who are not now available and some of those would presumably be snapped up by private institutions. Therefore, you would have an enhanced capability in both directions, manpowerwise at least.

Dr. ASTIN. Well, one way in which efforts in the private sector could be stimulated would be through having available better evaluation techniques for new building materials, for new types of building design, for new types of firefighting equipment and so on. To the extent that we have available very sound methods of evaluating innovation in the private sector, I think that this innovation will be stimulated. Industry will do much more than it is now doing in coming up with better materials, better designs for structures from a fire resistance viewpoint, if we are able to provide the methods to evaluate them reliably. At the same time, if we have a sound method of evaluating firefighting equipment or devices, then I am sure that the private sector will do much more innovation in this area than it is now doing. These are two ways that I think the program would add significantly to the contributions of the private sector.

Mr. DADDARIO. Would it broaden the private participation, or restrict it?

Dr. ASTIN. This would definitely broaden the private participation.

Mr. DADDARIO. Dr. Astin, what would be the Bureau's policy for patents under research and development contracts? Since no provision is made, would you take cognizance of the President's memorandum of patents of November 1963?

Dr. ASTIN. Yes, we would follow his policy on that.

Mr. DADDARIO. Follow his guidelines?

Dr. ASTIN. That is correct.

Mr. DADDARIO. Mr. Roush?

Mr. ROUSH. Mr. Chairman.

Dr. Astin, I am pleased to see you here. I'm sorry that I have only been here for the last three-quarters of an hour, but I was testifying over on the Senate side and that made it a little difficult for me to be here for the first part of this testimony.

Mr. DADDARIO. We welcome you back safely to this side.

Mr. ROUSH. They treated me very kindly, but it was my own Senator who was chairman of the committee so it made a difference. He didn't dare treat me unkindly.

First, Mr. Chairman, I would like to point out that I have also introduced a similar bill and I would like permission of the chair to submit for the record a statement which would be my own testimony on behalf of this legislation.

Mr. DADDARIO. That may be done, Mr. Roush.

(Statement referred to follows:)

TESTIMONY IN SUPPORT OF H.R. 6637, THE "FIRE RESEARCH AND SAFETY ACT OF 1967," BEFORE THE SCIENCE RESEARCH AND DEVELOPMENT SUBCOMMITTEE OF THE HOUSE COMMITTEE ON SCIENCE AND ASTRONAUTICS, BY CONGRESSMAN J. EDWARD ROUSH (D-IND.)

Mr. Chairman, I would like to testify in support of the effort to amend the Organic Act of the National Bureau of Standards to pass the Fire Research and Safety Act as proposed by Mr. Miller, the esteemed chairman of the Science and Astronautics Committee.

Statistics indicate that the number of fires in the United States is on the increase, while other countries have a lower total number of fire tragedies and per capita losses. Our per capita death rate from fire is four times as high as that in the United Kingdom and over six times as great as that in Japan. Over 12,000 lives and 1¾ billion dollars in property is lost annually by the American people from fire. This represents \$8.98 in cost for every man, woman, and child.

Just last October in Anderson, Indiana, we had a major fire at the four-story Central Hotel which cost three lives and so damaged the structure of the building that it was razed. This is one of the many similar examples of the high cost of fire.

Yet we pride ourselves on being the leading nation in the world in the development of technology for all kinds of conveniences. Why have we not applied that technology to controlling a long-time enemy of man, namely the destruction of fire? Why is it that only two universities offer full degrees in fire engineering?

Our studies with space travel have alerted us to fire prevention materials and methods. These studies should be analyzed for application to every day life. We can render our property and our lives fire resistant, if not fireproof.

I am convinced, then, that there is urgent need today for federal support of a national fire safety program which would operate something like federal support for education to encourage the study, research, experimentation, demonstrations, improved services and resources for combating fire damage in the United States.

In the legislation proposed, H.R. 6637, all of these services would be placed at the disposal of local fire safety services. The latter would be encouraged to improve the quality of education of the public and the fire fighters in the community.

Increasing costs of operating community services, the trend toward moving to the cities, as well as rapid social and technological changes are imposing great demands on fire services. These demands are made upon antiquated methods and equipment. In rural areas, machinery plus large quantities of stored combustible agricultural products and great distances from facilities, render fire a constant, a major hazard.

Since introducing my bill on this subject I have received correspondence from local fire chiefs, from fire fighting equipment companies, Firemen Associations and local citizens. They all welcome assistance in improving our control of fire.

Mr. Chairman, I believe this legislation before us an important step in achieving that goal.

Mr. ROUSH. Dr. Astin, I want to ask this question and only this question. Why is new statutory authority necessary to do what we are attempting to do under this legislation? Does not the Department of Commerce or the National Bureau of Standards at the present time have statutory authority which would permit the establishment of such a center and do the work contemplated by these various bills?

Dr. ASTIN. The only authority we now have that is relevant to this matter is the authority to investigate the fire-resistant characteristics of building materials; the general authority that we have to develop test methods for materials, mechanisms and structures; and the authority to cooperate with other organizations, both Federal and private in the development of standard practices such as codes and specifications. We do not have authority for the fire investigation program that is specified here. We do not have authority for the education and training program that is specified here. We do not have authority for the demonstration projects that are planned here.

I think we would have to stretch our authority on the information part of it, particularly the promotion of programs to educate the public in prevention of fires. We would have to stretch our present authority, I am sure, to do that.

I would say the only segment of the six things spelled out in the statute that we have clear-cut authority to do now is the research.

Mr. ROUSH. Thank you.

That is all.

Mr. DADDARIO. Mr. Lukens.

Mr. LUKENS. No questions.

I would like to file a statement.

STATEMENT BY DONALD E. LUKENS ON H.R. 11284 (FIRE RESEARCH AND SAFETY BILL)

Mr. Chairman, there is no question in the minds of any of us but that action is urgently needed on proposals to fight fire damage and disaster in this country. This government and the American people are devoting much thought and attention to automobile safety, research, traffic and automotive engineering. This is as it should be. We are forgetting, however, that the tragedy of fire causes about one-fourth as many fatalities and property damage, and yet is receiving little attention either from our government or from the public at large.

In 1966 fire deaths amounted to twelve thousand human lives. Americans are dying of fire more rapidly than of warfare in Vietnam. Fire destroys an estimated two billion dollars worth of property annually and is responsible for billions of dollars of expenditures for insurance, medical care, loss of trained manpower and wage-earning manhours, and incidental costs. Certainly this problem is crying for solutions.

And yet, in spite of the gravity of this problem, our knowledge of the forces involved in combustion, of fire-fighting techniques and equipment, of fire-resistant materials, cannot be described as anything but primitive.

Architects and engineers in our nation's institutions of higher learning are not adequately taught what little we do know in the field of fire prevention and control. Our building-code regulations are archaic and often ineffective. Our public is ignorant. Our Federal fire programs are split among at least eight agencies and departments. Our National Bureau of Standards, with prime responsibility for anti-fire research, is spending but \$200,000 a year on the problem.

When there are only three laboratories in the entire United States with facilities to evaluate the fire resistance of building materials and construction facilities, it must be clear that our efforts are not commensurate with the grave proportions of the fire problem.

Ohio State University's Building Research Laboratory is one of these three centers of fire research, and it is manfully striving to solve some of the most

difficult problems in fire research. Under its director, Prof. Richard W. Bletzacker, Ohio State has attempted to educate public officials, give extensive and thorough tests to new construction materials, and experiment with new ideas in building design. In the process the University has served to train hundreds of students in fire safety procedures and techniques. Ohio State is hoping to rapidly expand its efforts in the fire safety area, but is limited by the absence of adequate Federal financial support.

Prof. Bletzacker describes the problem:

There is a crying need for an increased research effort in the area of fire protection. In many aspects the building industry at large and the fire safety area in particular have not kept pace with the rapid advancements made in other areas of science and technology. We need to comprehend better the fundamental concepts involved from both an academic viewpoint and a practical viewpoint. Unfortunately, too few are interested in understanding the basic concepts of fire safety as a field of academic interest. It is expensive to conduct test after test, and the time required to schedule test programs is severely handicapping development of new materials and constructions.

Mr. Chairman, there are many things which need to be done if we are to make satisfactory progress in fire prevention. We need to study the strategies of firefighting in all areas—from the methods by which we decide on building codes to the way we train our firefighters. We need to subject our firefighting equipment to rigorous and extensive tests and do all we can to develop new and more effective systems and individual units. Perhaps most important of all, we must study the entire science of combustion: what causes fires, how fire spreads, what are the real effects of smoke, what makes materials fire-resistant, how does high temperature affect various situations. We must consider how to best protect our firemen, who are continually risking their lives and not infrequently losing them. We should study how to locate our emergency exits so that they are not closed in a sudden emergency. Perhaps we can come up with practical and inexpensive fire detection systems for private homes, so that people are not caught in their sleep. We should study the merits of establishing a Federal Fire Academy to train those who must deal with fire. We must relate our knowledge of fire to civil defense problems and forest management.

It is important to remember, however, that we are trying to support and supplement local and voluntary efforts in firefighting, and not supplant them. I believe that we should, as much as possible, avoid "in house" efforts and emphasize grants and contracts to colleges and research institutions. By doing so we would muster a broader scope of talent against the problem and we would enormously benefit from the "fallout" effect of students learning while participating in this research, then proceeding to disseminate the information to a much wider audience.

Mr. Chairman, I welcome this bill, and support it with enthusiasm. It is a good bill, thoughtfully designed, and a very important and significant first step towards combatting the tragic and destructive effects of fire in the United States.

Mr. DADDARIO. Anything else?

Mr. YEAGER. On behalf of Congressman Brown, he left a statement to be filed. I wonder if we might submit some additional questions?

Mr. DADDARIO. Mr. Yeager, I will keep the record open so the committee may have the opportunity to ask questions of both Dr. Astin and Dr. Hollomon. I am sure they would cooperate.

Mr. ASTIN. We will be happy to.

(Additional questions submitted, and the answers thereto, are as follows:)

Q. 1. In your testimony of May 18, 1967, you stated that you were not asking Congress for authority for mandatory adherence to standards that might be developed for firefighting equipment or buildings. Do you foresee problems in gaining acceptance of the results of research under this act when acceptance is on a voluntary basis? How would you overcome the possibility of spending money for research and having it ignored?

A. 1. The real problem I see in the voluntary acceptance of research results is the lack of awareness of what information is available or of how to use it. The program of information dissemination provided by H.R. 6637 will include an active, rather than passive, effort to see that the results of research are published in a usable form and are made known to those in a position to put those results into use. The educational aspects of the program will make awareness of any ability to utilize fire research results part of formal education rather than a postgraduate, hit-or-miss acquisition.

I cannot guarantee that research results will be used universally. However, most people who are in a position to translate research results into improved technology, standards, or specifications are responsible and eager to use the best information available.

The Federal Government is in a position to assure wide utilization of research results both by supporting demonstration projects illustrating their applicability, and by utilizing them in drafting Government purchase specifications. The Federal buying power is large enough to make a significant impact on the total market.

Q. 2. Testimony suggests that one of the problems in our present system concerns the lack of complete and timely data, that data on incidents of fire are collected from only half of the States. What steps would NBS take to assure submission of data from all of the States?

A. 2. The support of the Congress and the President will clearly establish fire information gathering as a national program, deserving of the attention and participation of all the States. The establishment of a uniform format for the submission of information, and of guidelines on detail and scope, should encourage complete returns from the States. If a State does not have a central information gathering system, or has a system based on a specialized sampling (only insured deaths or losses, for example), we would offer assistance in establishing or modifying a mechanism whereby the needed information would be made available. Grant money could be used to assist in a transition, if needed. The participation of a State in the information gathering program could be made prerequisite to eligibility for other grants.

The information gathering program probably will be carried out through contract with a private organization. That contract should provide for the contractor's use of added incentives, including reimbursement if needed, to facilitate full participation by the States. Any direct assistance will be coordinated with the contractor's activities.

Q. 3. In your opinion, what has been the major cause of the limited amount of fire research now being conducted in the United States?

A. 3. The limits on the research and development of new materials and products by industry has been their belief that they are restricted by lack of uniformity among building codes. The low level of basic research by industry is attributable to the reluctance to fund something that may not pay out or may pay out to their competitors as much as to themselves. The low level of basic research by the universities and the Government has been due to a lack of appreciation that this subject was deserving of a higher priority in the allocation of available resources.

Q. 4. You stated that the U.S. death rate is twice that of Canada; four times that of the United Kingdom; and six and one-half times

that of Japan. Do you have any information available on the amounts that these nations spend annually on fire research?

A. 4. We have requested, but have not yet received, direct information on total fire research expenditures in Canada, Japan, and the United Kingdom. We will provide those data as soon as they are received. Meanwhile, the following data are on the main Government activities.

[Dollar amounts in millions]

	Staff	Annual budget	
		Amount	Percent GNP
United Kingdom (joint fire research organization).....	170	\$1.4	0.0014
Japan (fire research institute and building research institute).....	70	.31	.00036
Canada.....	(1)	(1)	(1)
United States (NBS).....	13	.25	.000036
All government.....	(1)	6.0	.00087

¹ Not available.

The significance of these figures lies in the fact that the total U.S. Government budget for fire research, including forest fires, civil defense, and military applications, is only about half as great, in percent of GNP, as that of a single laboratory in the United Kingdom. That laboratory has a program of considerably narrower scope than that provided by H.R. 6637. Two Japanese laboratories very analogous to the present National Bureau of Standards' Fire Research Section, employ five times as many people and spend 10 times as great a share of GNP.

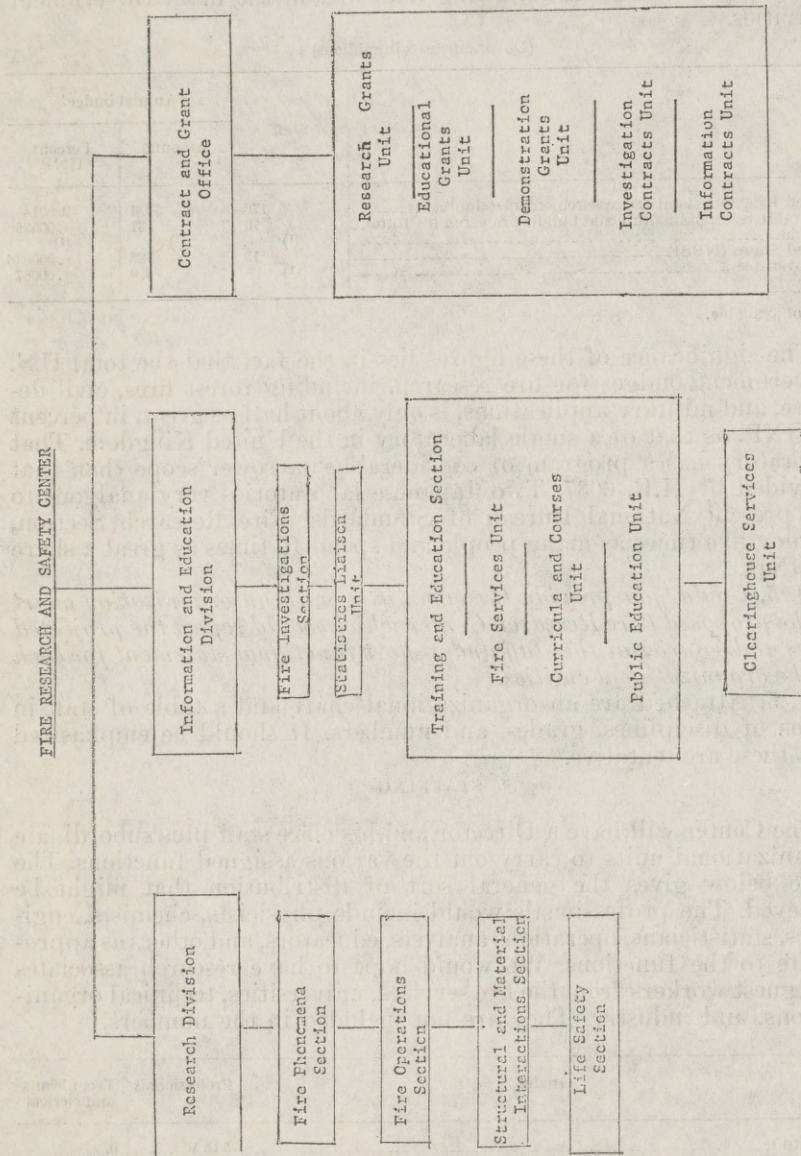
Q. 5. Could you provide the committee with an organization chart of the proposed Fire Research Center which would reflect the projected titles and salaries of the staff and a short functional statement for each of the organizational entities.

A. 5. Attached are an organizational chart and a table of staff in terms of disciplines, grades, and numbers. It should be emphasized that these are tentative.

STAFFING

The Center will have a Director and his office staff plus subordinate organizational units to carry out the various assigned functions. The table below gives the general sort of distribution that might be achieved. The professionals would include physicists, chemists, engineers, statisticians, operations analysts, educators, and others as appropriate to the functions. We would hope to have research associates and guest workers from the fire services, universities, technical organizations, and industry. They are not included in the numbers.

Grades	Professionals	Technicians and clerical
GS 16 to 18.....	5 to 10.....	0.
GS 11 to 15.....	40 to 45.....	0.
GS 4 to 10.....	30 to 35.....	45 to 50.
Total.....	80 to 85.....	45 to 50.



FIRE RESEARCH AND SAFETY CENTER

FUNCTIONAL STATEMENTS

Director's Office.—Overall supervision to assure implementation of the act and emphasis among the segments of the program relative to the problem.

Research Division.—(A) Research on the phenomena characterizing the nature of fire, including combustion, ignition, growth and spread, detection, and extinguishment mechanisms; research on the reactions of materials and simple and composite structures to fire, including fire resistance, restraints, thermal stresses, test method variables, and movement of combustion products and fire fronts within structures; research on fire operations, including development of inhibiting smoke or atmospheres and their venting, fire control organization and operation, and human engineering considerations applicable to equipment design; research related to life safety including toxic products of combustion, organization of casualty handling in coordination with fire operations.

(B) Carry out the above either in-house, through transfer of funds to appropriate Government agencies, or by monitoring technical progress of activities under research contracts and grants.

Information and Education Division.—(A) Investigations of fires to determine causes, contributing factors, severity, frequency, and after affects; information gathering, including development of a uniform format and guidelines for reporting, assistance to States in following format, analysis of data gathered, and dissemination of information; clearinghouse services including referral of inquiries, preparation of bibliographies, distribution of documents, and directories of highly specialized competences and facilities.

(B) Training programs, for fire services, in latest techniques and on equipment, operations, and organization of fire departments; development of training aids, texts, courses, and curriculums for fire services and for architects, engineers, and fire protection and science professionals; programs and material for use in educational efforts directed toward general public or major segments thereof.

(C) Carry out the above primarily through contracts and grants, providing technical review and monitoring progress under those contracts and grants; sufficient in-house work to maintain professional competence and to assure technical foundation for information and training programs.

Contracts and Grants Office.—

Establish administrative contract with existing centers of competence in fire research;

Seek proposals for contracts, grants, and demonstration projects;

Route proposals to appropriate staff of center for review as to scientific and technical merit of proposal and analysis of proposed contractors competence;

Review administrative details of proposals for compliance with established policies and practices;

In cooperation with scientific and technical staff, establish assignment of technical monitor for each contract or grant;

Monitor compliance with administrative details of contracts or grants.

Q. 6. What are the estimated cost and staffing of a National Commission on Fire Prevention and Control?

A. 6. Budget analysis prepared:

1. ASSUMPTIONS

A. The 20 members of the Commission will include eight Federal Government employees (not paid extra) and 12 others paid \$100 per day actually worked.

B. The Commission members will travel to and from Washington, D.C., once a month for Commission meetings and once every other month for subcommittee meetings. The average distance of travel will be equal to that from Chicago.

C. Commission members will actually work 108 days (3 days per trip, including traveltime).

D. Staff: the staff will have a 25-month working life. This includes 1 month after the Commission submits its final report.

Executive Director (GS-18) \$25,890 per annum-----	1
General Counsel (GS-18) \$25,890 per annum-----	1
Professionals (GS-15) \$17,550 per annum-----	2
Professionals (GS-13) \$12,873 per annum-----	3
Clerical (GS-6) \$5,870 per annum-----	4
Total staff-----	<u>11</u>

2. COST ESTIMATES

Compensation and salary:

Commission: 12 members X 108 days X \$100/day-----	\$130,000
Staff: 2 1/12 years X (2 X \$25,890 + 2 X \$17,550 + 3 X \$12,873 + 4 X \$5,870)-----	310,000
Staff benefits (retirement, insurance, etc.)-----	31,000

Total salary and related----- 471,000

Travel:

Commission:	
12 X 108 X \$16/day per diem-----	21,000
12 X 36 round trips X \$115 (\$95 round-trip fare + \$20 taxis) --	50,000

Miscellaneous staff travel:

(Consultation with Commission member, or Commission meeting other than in Washington—assume equivalent to 20 round trips, of 2½ days' duration) 20 X (\$95 fare + \$20 taxis + \$40 per diem) -----	3,000
--	-------

Supplies----- 5,000

Printing: Final and interim reports, stationery, questionnaires, etc.--- 40,000

Consultants: Assume 100 man days at \$100 per day----- 10,000

Reimbursement:

General Services Administration:

Rent -----	15,000
Financial and Administrative Services-----	10,000
Equipment -----	5,000

Subtotal ----- 630,000

Contingency ----- 35,000

This will allow for the possibility that there may be errors in the foregoing estimate, particularly in the assumption that the number of non-Federal employees appointed will be the minimum (12) allowed by the legislation. The direct cost (compensation, travel, and per diem) is estimated at \$16,700 per Commission member. The contingency would allow for a total of 14 non-Federal members.

Total ----- 665,000

Q. 7. What are the current Federal and private expenditures for fire research and safety?

A. 7. Current Federal agency fire research and safety activities—June 1967.

The following are figures for fiscal year 1966, and are rounded off.

Agency	Staff	Budget (in millions of dollars)	Activities
Forest Service-----	¹ 120-150	² 3	Basic research on wood and wood products, on fuel-weather effects; forest fire equipment development; statistics and causes of forest and wildland fires. ³
Defense Department-----	30-35	1.5	Fire prevention, detection, extinguishment peculiar to military operations, weapons, and materials; extinguishing foams; special clothing; shipboard and aircraft crash fires. ⁴
Civil Defense-----	1	1	Contracts on effects of thermonuclear weapons on target area, how to fight mass fires, fire storms; protection of target areas from thermonuclear thermal radiation.
Federal Aviation Agency-----			Aircraft in-flight and crash fires, cabin liner materials.
National Science Foundation-----		.04	Contract/grant support to individual projects, currently one.
National Bureau of Standards--	13	.20	Basic research on ignition, growth and spread, extinguishment mechanism, resistance of construction.
Total, Federal Government-----		⁵ 5.74	

¹ Estimated.

² Fiscal year 1967.

³ Refers to testimony of Jack S. Barrows;

⁴ Refers to testimony of Clarence Castle.

⁵ Approximate. See Communication, Appendix July 10, 1967—Dr. Astin's letter.

Private sector—Woods Hole estimates, 1962

National Fire Protection Association (information, education standards)-----	¹ 1.6
Underwriters' labs-----	3.0
Factual mutual insurance (construction, sprinklers)-----	1.0
Industry (product R. & D.)-----	10.0
Total private-----	¹ 15.6

¹ Approximately \$1,900,000, 1965.

Mr. DADDARIO. Fine, Dr. Astin.

We will accept the statement of Congressman Brown.

(The statement of Congressman George E. Brown, Jr., is as follows:)

Mr. Chairman, the picture painted by the statistics on human and material losses from fires in this country today is a picture of an unsolved national problem. No one has phrased the challenge facing us more succinctly than President Johnson in his consumer message, when he said, "We can do better, and we must."

The important elements in this national problem are known to all of us who have taken even a superficial look into the situation.

Twelve thousand lives lost each year.

More than \$1 $\frac{3}{4}$ billion lost in property damage.

A per capita death rate from fires that is twice as high as Canada, four times as high as England, and more than six times as high as Japan.

A per capita property damage rate which is the highest of all the major nations of the world.

No improvement in the per capita fire death rate during the past 5 years.

An increase in both the per capita number of fires and the per capita property damage during the past 5 years.

With respect to these last two statements, I might add that this lack of progress in combating the national fire problem has occurred in spite of commendable efforts by many private and public groups throughout the country. The lesson I draw from this fact is that the important work of these organizations needs to be supported and augmented.

For all of these reasons, I introduced, in March of this year, a companion bill to the bill under consideration by this subcommittee today. My bill calls for a comprehensive and coordinated fire research and safety program, based on the expansion and support of existing institutions wherever possible.

The program specified in my bill would include several interrelated components: (1) Factfinding studies of the causes and extent of fires in this country. (2) Laboratory research on the causes and control of fires. (3) Education of the public on fire hazards and lifesaving techniques. (4) Education and training of those who must fight fires. (5) Information services to give out the latest technical knowledge. (6) Model projects showing new methods for firefighting and prevention. (7) Grants to public and private organizations to accomplish the objectives of my bill.

I believe my bill reflects a reasonable and effective approach, and I urge thoughtful consideration of it by this subcommittee.

Mr. DADDARIO. Dr. Astin, we have had a very helpful morning. I believe we will now be able to get into the list of witnesses who will be coming before us next week much better prepared than we were when these hearings started.

I appreciate your coming here and bringing your staff people with you and I appreciate Dr. Hollomon's presence. I would expect that sometime either during the course of the hearings or informally after they have been concluded, that we will need to talk to you again to put things into perspective after hearing the other witnesses and I hope we might be able to do that as we have in the past.

Dr. ASTIN. I will be happy to.

Mr. DADDARIO. Thank you. This committee will adjourn until Tuesday next, at 10 in the same place.

(Whereupon, at 12 p.m., the subcommittee was adjourned, to reconvene at 10 a.m., Tuesday, May 23, 1967.)

FIRE RESEARCH AND SAFETY ACT OF 1967

TUESDAY, MAY 23, 1967

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington, D.C.

The subcommittee met at 10 a.m., in room 2325, Rayburn House Office Building, Hon. Emilio Q. Daddario (chairman of the subcommittee) presiding.

Mr. ROUSH. The subcommittee will be in order. Congressman Daddario, chairman of the subcommittee, is going to be detained a few moments. We will proceed. Our first witness this morning is Dr. Thomas F. Malone of the Travelers Insurance Co. Dr. Malone.

STATEMENT OF THOMAS F. MALONE, VICE PRESIDENT AND DIRECTOR OF RESEARCH, THE TRAVELERS INSURANCE CO., HARTFORD, CONN.

Dr. MALONE. Thank you, Mr. Chairman.

I appreciate the invitation to appear before your subcommittee and to register my warm support and that of my company for the Fire Research and Safety Act of 1967.

I shall attempt to keep my testimony brief since a host of arguments have already been advanced in the hearings before this subcommittee and in the hearings before the cognizant Senate committee. The economic toll and the cost in human lives from fire each year are well known. I will address myself briefly to four aspects of the total problem:

First, the prospective dimensions of direct fire losses in 1975.

Second, a national goal which I believe is attainable and desirable.

Third, the need for a productive interaction between the public and private sector.

And finally, some thoughts on the applicability of the so-called systems approach to this problem.

If one relates the direct fire losses over the past 20 years to the gross national product, a rather high correlation is noted. It turns out that about 94 percent of the variance in direct fire losses is explained by the gross national product. You can make a mathematical equation but it turns out that every time the GNP goes up \$100 billion, the direct fire loss is increased by \$230 million. Now if one looks at the growth in the labor force, the decrease in the workweek, the increase in productivity and the prospective changes in price level one arrives at a potential gross national product in 1975 of \$1.2 trillion. By way of comparison last year it was a little less than \$750 billion. From the

relationship between the gross national product and the direct fire losses we can then infer that the loss of \$1.8 billion dollars in 1966 will grow to nearly \$3 billion by 1975. This assumes that the relationship between the gross national product and the fire losses remains unchanged. I think that it is time that we as a nation consider conscious efforts to alter this relationship and I believe we should set for ourselves a national goal of holding the line on direct fire losses so that our target is to plateau these and hold them at no more than the \$1.8 billion.

(Additional information follows:)

Enclosed are the data, the correlation coefficient, and the regression equation that provided the basis for my remark that—unless the relationship is changed—we can expect approximately a 230 million dollar increase in direct fire loss for each 100 billion dollar increase in Gross National Product. These figures, of course, could be converted to a 1940 dollar, but I fail to see any compelling reason to make this transformation. In any case, the national goal I proposed in my testimony—in my opinion—is still a valid one and one we should do something about. The proposed governmental program—modest as it is—would be of assistance.

Naturally, I was speaking only for myself and my Company. There are several associations which speak for different parts of the insurance industry.

Direct fire losses projected to 1975

	NFPA direct fire losses (excluding forest fires) (in millions)	GNP (in billions)
1947	\$721	\$231.3
1948	744	257.6
1949	699	256.5
1950	729	284.8
1951	790	328.4
1952	878	345.5
1953	968	364.6
1954	973	364.8
1955	1,068	398.0
1956	1,189	419.2
1957	1,237	441.1
1958	1,254	447.3
1959	1,273	483.7
1960	1,365	503.8
1961	1,405	520.1
1962	1,328	560.3
1963	1,575	590.5
1964	1,543	631.7
1965	1,649	681.2
Projections		
1966	1,814	722.8
1967	1,916	766.8
1968	2,025	813.6
1969	2,140	863.2
1970	2,262	915.9
1971	2,393	971.8
1972	2,531	1,031.1
1973	2,677	1,093.9
1974	2,832	1,160.7
1975	2,997	1,231.5

$$r^2=0.957$$

$$r=0.978$$

Fire losses = $133.0141 + 2.3255$ GNP (in billions)
(in millions)

Dr. MALONE. If you take the difference between this target of holding constant \$1.8 billion and letting it grow as it would if the existing relationship applied over a 10-year period, the saving would be \$5

billion, and this figure of \$5 billion refers only to the direct losses. The undirect losses are several times that amount so that, in effect, our national goal would be something like \$15 or \$20 billion saving over what would happen if we don't intervene and bring to bear more vigorous measures on this problem than we have up to now.

This brings me to my third point. If we are to achieve this national goal, I am persuaded that a productive interaction between the private sector and the public sector will be required. I have studied H.R. 6637 with some care, and I believe that with its explicit provision for assistance to States, local governments, other non-Federal public agencies, and nonprofit institutions, it represents a tangible manifestation of the will of Congress that the public sector step up its efforts which you well know are something on the order of \$6 million per year at the present time.

I believe I might remark that this is not an unreasonable amount. We are talking about something like 10 cents per person, man, woman, and child, and as the testimony previously developed has indicated, the cost of direct fire losses is something like \$9 per man, woman, and child, so I believe there is an attractive benefit-cost ratio.

It is quite clear that care should be exercised in order that programs initiated in public sectors do not needlessly duplicate those underway in the private sector. There is a substantial volume of work underway in the private sector. The simple fact is that there is yet so much to be done that only a little bit of wisdom needs to be exercised in order to preclude this kind of redundancy. In the private sector we need to extend analysis of available statistics to identify more precisely the variable factors involved in total fire costs including losses, fire protection, fire prevention, organization, and education. The economics of increased use of private fire control measures such as automatic detection systems and automatic extinguishing systems need further exploration. It is quite possible that universal use of such equipment might be of sufficient value to have a beneficial effect on insurance costs.

I am pleased to note that the Fire Reporting Committee of the National Fire Protecting Association is working on a uniform fire reporting system, and it is quite apparent that this effort will require additional financial support in order to probe more deeply into the investigation and study of fires.

Finally, I believe it is imperative that we recognize that we are dealing with a "system" consisting of three major components:

Man.

Heating and cooling machinery.

The environment—both natural and manmade.

Any analysis of problems embedded in, or arising from, this system must take account its fundamental properties as an operating system—in short, a "systems approach" must be used. By this, I mean that, in contrast to a preoccupied concern with this, that, or the other individual aspect of the problem, the man-fire-environment combination must be simultaneously and comprehensively viewed as a single total complex system composed of many parts, fulfilling many functions, satisfying many needs, and exacting many tolls and costs. The systems approach, extensively applied in many other, and perhaps even more complex situations since its rapid emergence as a dominant and versatile intellectual concept following World War II, has been adequately

proven many times over to be capable of producing important gains in areas where the piecemeal approach has either failed or produced only disappointing returns. To avoid developing a detailed treatise in exposition of this approach, it will be simply asserted (and in many respects this is self-evident) that a total system study, viewing and analyzing simultaneously the principal actions and interactions of the key variables, has the potential for discovering solutions and effects that would literally be impossible to find from a piecewise attack (except perhaps by a brilliant flash of intuition and, even here, the mechanism for analytically verifying the worth of the intuitive solution would be lacking).

A further singular advantage of the systems approach is that the analyst is not inextricably wedded to the existing system. Thus, the research program of the Hi-X Foam designer or other engineering specialist presupposes and accepts the existence of the total present system as it is now. The systems analyst is under no such constraint. He is free to consider as alternative strategies not only major modifications in the existing system as we know it, but also totally different, dissimilar, or perhaps complementary substitute systems, inasmuch as he will be basically concerned with identifying the functions which the existing system as the optimum means for satisfying these functional needs. Lest it be misunderstood that the systems analyst is a "head-in-the-clouds unrealist," it should immediately be pointed out that, in any really adequate analysis of a complex system, an extremely important aspect of the work is a careful definition of, and ultimately the development of, a system design which satisfies a variety of constraints and restrictions within which the solution must be found. Obviously, in the present case these constraints will include overwhelming economic considerations at one extremely practical end of the scale and the highly intangible, but nonetheless equally dominant, needs for safety, comfort, and convenience at the other.

Lest it be thought that the systems analyst, presented with a problem involving a portion of a system, must always conduct a global analysis of not only the system involved, but also the systems in which it is embedded, I hasten to point out that, just as systems have subsystems and components, so also do system analyses—and resource and time constraints usually dictate that these be constructed separately. The distinctive feature of the systems approach, therefore, is the consciousness of the interrelations between the subsystem under analysis and the system in which it is embedded, and the explicit consideration of factors that affect the larger systems. The systems approach has never, to my knowledge, been brought to bear on the safety aspect of the man-fire-environment system, nor, as far as I know, is its use currently being contemplated elsewhere on a scale suitable to the importance and demands of the problem.

Appraisal of the fire safety problem indicates that, even taken as much by itself as possible, it is not the kind of problem for which one can expect to find a "solution," but rather that it is a formidable challenge of considerable scope that would readily entail a continuing program of major magnitude.

I think the total combined existing private effort with this proposed augmented public effort is not at all too large. What must be done then is to set some objectives which represent a genuine compromise between

the demands of the problem and the available (and prospective) resources:

To gain a clear overall perspective of the problem and its principal components.

To influence work on the problem by our findings and our approach.

To improve the national approach to this problem by effective communication and interaction with the various communities involved, the Federal Government, the research workers, the affected industries, the public, and others.

These objectives will be sought within the larger goal of gaining a quantitative understanding of the dynamics of man's total involvement with fire, with particular early attention to the problems of fire safety, but within the context of a systems approach to evolving optimum direction.

The nature of the fire safety field indicates that it has these characteristics:

It is problem, rather than discipline, oriented—that is, the organizing will involve combinations of contributions from many of the classical scientific and engineering disciplines.

The field is still so relatively uncultivated as not yet to have any clearly discernible or widely accepted structure to which narrowly focused research efforts can contribute—thus, the development of such a structure is clearly an early need.

There are clearly many diverse influences at work in the phenomena we observe—physical, psychological, sociological, economic, and environmental.

The available knowledge is actually widely scattered and disconnected—and is far from providing an organizing network for guiding one's explorations of the field.

In fact, for any researcher accustomed to other older and better developed fields of inquiry, the informational and structural poverty of the field of fire safety research is almost overwhelming. I speak as an outsider.

It is clear, however, the fire loss in the mass may be viewed as a process, or operation, in which many diverse elements meet and interact.

This diversity of involved elements yields a wide social, legal, and economic involvement—and all of these interests must be appropriately represented in evolving proposed solutions.

Because the field is so inadequately investigated and so poorly understood, and because its problems press for solutions, many solutions are adopted on the basis of "commonsense," or "traditional wisdom"—and it may confidently be expected that many of these articles of faith will be upset by competent research.

The knowledge poverty in the field of fire safety is actually barring us from choosing effective ameliorative actions and policies for many of the problem's facets. This is one element that is attractive. Thus, there is a particularly urgent need for knowledge to support immediately needed actions and policies.

The effort currently focused on fire safety research falls far short of the need for knowledge for either future policy or current action. Thus, perhaps the most vital early need is to augment this effort by

giving it more financial support and by drawing more research people into it.

I have presumed to deal at some length with the systems aspect of this problem because it seems to me that if we are to think broadly and constructively about a national program and developing an overall strategy, it must be done within the systems framework.

The opportunities in both the private and public sector appear to be almost unlimited.

Thank you.

Mr. ROUSH. Thank you. Are there questions of Dr. Malone?

Mr. BROWN.

Mr. BROWN. Doctor, perhaps I missed it here but could you give us some indication of the level of effort which the fire industry devotes to research in this field?

Dr. MALONE. The total effort has been estimated at about \$74 million per year, that is research for fire prevention.

Mr. BROWN. Does that include some overall system?

Dr. MALONE. The systems approach has been talked about but not pursued.

Mr. BROWN. The key element in what needs to be done is some really integrative function in terms of an attack on the problem rather than what anyone said?

Dr. MALONE. That doesn't say that things being done should be replaced or stopped. This is augmentation.

Mr. BROWN. You don't feel that this matter of avoiding duplication of existing effort is going to be a serious problem? You think we can develop a program here which will cover areas not being covered and avoid any needless duplication of existing effort without too much difficulty?

Dr. MALONE. Yes, I think that there is so much to be done with a reasonable amount of good will that exists in both the public and private sector that nothing beyond the normal competitive "give and take" will come out of this and that will actually be healthy.

Mr. BROWN. You don't identify any strong vested interest concerned with maintaining a high level of fire in the United States, like the firefighters that might be out of a job if we didn't have any more fires?

Dr. MALONE. Absolutely not. We are in the fire insurance business. We have about 500 men deployed around the country. We are spending about \$1 million a year trying to prevent fires.

Mr. BROWN. I don't have any further questions.

Mr. MOSHER. Mr. Chairman, I came in in the middle of Dr. Malone's testimony. From what I have heard I am very much impressed by the skill with which he has put this problem in perspective. The only question that occurs to me immediately is to ask what present working relationships does your industry have with the National Bureau of Standards. Are you already engaged in some limited way in activities with the Bureau of Standards along these lines?

Dr. MALONE. I am not familiar with any formal arrangement. There is an informal contact among engineers and scientists pursuing the same problem. They go to meetings and that kind of informal liaison goes on. There may be more formal arrangements, but I am not familiar with them.

Mr. MOSHER. No further questions.

Mr. ROUSH. Mr. Rumsfeld.

Mr. RUMSFELD. Do you have any criticism of the bill you have testified on? Do you know any way that it could be strengthened or amended? Any deletions or additions? Is there anything that you feel is premature in the proposal?

Dr. MALONE. I debated that. One might criticize it for being too modest an approach in relation to the magnitude of the problem. I think, however, after dwelling on that possible criticism, it is about the right level because if you put too many dollars in you don't have the kind of competent manpower, so I think the go-in level of \$12 million is about right. That was the point I first selected as one I might criticize. On second thought I think it is tuned in about right.

Mr. RUMSFELD. The \$74 million figure that it has been estimated that the industry is spending, is that an annual figure?

Dr. MALONE. Yes, sir. That is not research. That is all kinds of information and education.

Mr. MOSHER. Does this include institutional advertising?

Dr. MALONE. Yes, I believe it does; yes, sir.

Mr. RUMSFELD. It seems to me that some of what is being proposed to be done in this bill might already be underway in the private sector. I don't have knowledge that it is or that it isn't at this point, but could you speculate for me as to the reason why the various associations, for example those listed here including any association that Travelers Insurance Co. might be connected with, have not already taken some of the efforts described in this? Ten million dollars a year is not a large sum of money when one thinks of the resources of the interested groups in the private profit and private nonprofit sectors of our economy. It seems to me that here might have been an area for some initiative on the part of the private sector to fill a need that you have so appropriately and competently described as a very serious one.

Dr. MALONE. I don't like to talk about my own company, but we are doing precisely this kind of thing. We have established a project called man in his environment. It is man in relation to all of the hazards we are currently stressing. Man and his automobile are part of the manmade environment. We are taking a systems approach. We have engaged quite a number of the people who were involved in the operations research activities during World War II so we are just getting going in that simply because we shared your feeling. I wish it had started a long time ago, and I should also point out that the mutual insurance industries have established a research center in Rhode Island which I think is a highly commendable type of activity and one which will not be only for the research it produces but for the opportunity and attraction it will provide to the scientists who have not had a milieu in which to carry on this kind of work. I think, sir, that the ferment, the questioning that you see in this bill before you is present also in the private sector. It is sort of a national awareness that these are the kinds of problems that we should be giving more attention to.

Mr. RUMSFELD. Do you think if the Congress decided that it would be advisable not to pass this legislation that this vacuum would be filled through the private sector, that there would be some leadership shown from among those listed on our list of witnesses for today, or do you think there would not be an attempt to close the information gaps that you have described?

Dr. MALONE. I kind of think that there would be. I think the very existence of this bill has stimulated a lot of thinking. Not everyone agrees with me that this isn't going to duplicate activities in the private sector. There are people who hold honest convictions that this does represent a threat. I think that the fact that it was introduced, that it is being considered is going to be a powerful stimulus to a greater effort in the private sector. I personally look forward to the day that the Government complains that the private sector is invading its province.

Mr. RUMSFELD. I have no other questions, Mr. Chairman.

Mr. DADDARIO. Any further questions?

Good morning, Dr. Malone. My greetings to you are somewhat belated. I have no questions and Mr. Yeager advises me that he has none. I understand you have to rush off to another meeting.

Dr. MALONE. I have to go back home to your home district, Mr. Congressman, so I hope you will excuse me.

Mr. DADDARIO. Our next witness is Mr. Leonard B. Kershner of the International Association of Fire Fighters, accompanied by Mr. Alvin E. Davis, who is chairman of the legislative committee. I welcome you both. Mr. Kershner is a great friend and a member of the Connecticut Labor Council. He is a man in whom I have great faith. I appreciate your willingness to participate and we are anxious to hear your testimony.

STATEMENT OF LEONARD B. KERSHNER, MEMBER OF THE LEGISLATIVE COMMITTEE OF THE INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS

Mr. KERSHNER. Thank you, Congressman. It is a pleasure to meet with you under any circumstances, and I think these circumstances are most happy and fortunate. As the chairman has indicated, my name is Leonard B. Kershner. I am a member of the legislative committee of the International Association of Fire Fighters and I am accompanied by the legislative representative of the IAFF, Alvin E. Davis.

We appear here today, in support of H.R. 6637, provided that this bill is amended adding thereto, the provisions of House Joint Resolution 498, which calls for the establishment of a National Advisory Commission on Fire Prevention and Control.

It would seem that we would be imposing on the committee's valuable time if we were to again place into the record the widely accepted statistics which have been and will be submitted to you by other witnesses in attempting to describe the gravity and enormity of the problem.

Mr. MOSHER. May I interrupt? When you say you are here in support of the bill provided it is amended, do you mean you would be in opposition if it is not amended?

Mr. KERSHNER. We would not be in opposition but we would not be supporting it without the amendment which would establish the Advisory Commission. We think that of the two, the Advisory Commission is the more important. However, we think that the two do dovetail very well and provide the most compatible and effective solution.

Mr. MOSHER. You don't mean there is something in the bill that you are opposed to?

Mr. KERSHNER. No, I think as we continue with the testimony we will make this quite clear.

Mr. DADDARIO. When Dr. A. V. Astin and Dr. J. Herbert Holomon appeared before us, they recommended that this Commission be established and that an amendment as amended be added, but they said notwithstanding that they were in favor of the bill. Is that fundamentally your position?

Mr. KERSHNER. I would say this is very close to our position. However, again we would emphasize that it is our judgment that the more important of the two would be the resolution establishing the Commission.

Mr. DADDARIO. Why don't you proceed and we will see how it all fits in?

Mr. KERSHNER. All right.

We would prefer to talk to you about our reactions to the national fire problem as we in the fire service view it.

To begin with, we believe that the problem can and should be divided into two parts.

The first part would include those phases and aspects of the problem which can be easily identified, and for which solutions can be quickly discovered or are readily obtainable.

The second part should include those matters which are not easily identified, for which there are no quick solutions, but which, when identified and solved, will represent a much greater contribution to the goal of reducing losses in life and property due to fire.

By and large, the provisions of H.R. 6637 deal with those phases of the national fire problem which can be readily identified. The following is our analysis of certain key provisions of the bill. We hope to be as specific as possible.

SECTION 16 (A) (1)

This section would authorize the Secretary of Commerce to conduct directly or through contracts or grants, investigations of fires to determine their causes, frequency of occurrence, severity and other pertinent factors.

The fact is that investigations of fires are now being conducted at a multitude of levels and in a multitude of ways. Reporting on fire investigations is even more varied than is the manner of conducting such investigations. What obviously is needed here is standardization. State and local governments and privately supported organizations have not been able to effectively deal with this matter in the past, nor can they reasonably be expected to do so in the future. Only through the efforts of some Federal agency will we be able to develop standardized procedures. It would seem to us that the Bureau of Standards is the logical Federal agency to perform this function.

SECTION 16 (A) (2)

Research into the cause and nature of fires, and the development of improved methods and techniques for fire prevention, fire control and reduction of death, personal injury, and property damage lends

itself to both the action program, which H.R. 6637 is designed to provide, and the study approach suggested in House Joint Resolution 498.

That part of this work which deals with research into the cause and nature of fires can be handled as an in-house matter by the Bureau of Standards.

However, the development of improved methods and techniques for fire prevention and control have received so little nationally coordinated attention, that we will not be able to do anything worthwhile with it until a proper study has been made and more specific direction is supplied by a body such as the President's Study Commission proposed in House Joint Resolution 498.

Nevertheless, it makes sense to authorize the Bureau to work in this area of developing such improved methods and techniques, because this activity, when coupled with the authority to conduct demonstration projects (Sec. 16(a)(6)), will provide the President's Commission, if established, with some of the tools they will need for their study.

SECTION 16(A)(3)

There is an indisputable need to conduct educational programs which will inform the public of fire hazards and fire safety techniques, and which will encourage avoidance of such hazards and use of such techniques.

In the past, the biggest obstacle in the path of educating the public about fire was the lack of funds. In addition, there was no one central agency responsible for making certain that there was an ongoing public education program in every community, and for every segment of our society. This section of the bill will provide some funds and a central agency which will assume this responsibility.

SECTION 16(A)(4)

Fire information reference services have been provided by several privately supported organizations and some governmental agencies. The fact that it has not been handled by one central agency and they have suffered because of insufficient funds, thereby preventing these services from being as successful as everyone would want it.

One only has to think of the effectiveness of the FBI in providing crime information reference services to appreciate the value of having such services conducted or coordinated through one central agency.

SECTION 16(A)(5)

It is unlikely, Mr. Chairman, in our judgment, that the Bureau will be able to do more than skim the surface when it comes to the matter of conducting educational and training programs to improve the efficiency, operation, and organization of fire services, or to improve the capability of controlling unusual fire-related hazards and fire disasters. Unfortunately, this part of the problem has received so little attention that it is difficult to even know where to begin.

Some people might say that just about every municipality and every State has some kind of fire training program, and they would be right. Most fire departments do have training programs, and they do the best they can within the limits of their knowledge and ability.

But the hard truth of the matter, Mr. Chairman, is that the overwhelming majority of State and municipality operated fire training programs are totally inadequate.

One of the reasons why we urge this committee to amend H.R. 6637 and establish a Study Commission is that in such matters as fire training and education, most of the people in the field are not certain as to where to begin or how to go about it.

Should we have a National Fire Service Academy? Most of us think so, but there are a multitude of questions and varying opinions as to where it should be located, or what its specific function should be.

Should there be regional fire training schools, supported in part with Federal funds? Again, there are multitudes of questions and varying opinions.

Notwithstanding the fact that we believe that it will require exhaustive study to come up with the answers and supply the direction to fire training and education, we are equally convinced that the Bureau should have the authority to enter into such programs to that extent, which in their judgment seems practical. The Bureau's experience in this matter should be helpful to the Study Commission in weighing, evaluating, and developing new and better approaches to the problem.

SECTION 16(A) (6)

This provision which authorizes the conduct of demonstration projects is perhaps the most interesting and exciting part of this whole attempt to deal with the national fire problem.

Many of us in the fire service are anxious to have certain experiments tried under proper conditions; experiments which, if successful, will ultimately lead to the savings of countless lives, the lives of the citizens and our members.

It is expected and we trust that in conducting such demonstration projects, the Bureau will consult with the people in the field. We further hope that these experiments will be conducted in such a manner as to be of value to the Study Commission, should such a Commission be established.

SECTION 16(b)

There has been and is a pressing need for assistance in the development of fire safety and fire engineering curriculums, courses, and materials for same. We are persuaded that this can best be accomplished by the Secretary through contracts and grants, as provided for in this section.

The International Association of Fire Fighters sincerely believes that H.R. 6637 represents an important first step toward solving the national fire problem. But if we seriously hope to turn things around and effect a real reduction in the fire loss rate, House Joint Resolution 498 should be added to and made a part of this bill.

This resolution calls for the appointment of a 20-member Commission to be appointed by the President, which Commission is directed and empowered to make a thorough and unbiased study of the national fire problem and to report to the Congress and the President. We would be willing to have the Secretary of Commerce included along with the Secretary of HUD as members of the Commission.

We who have served at the grassroots level for many years are convinced that there is a desperate need to have this study made at the national level by a body with sufficient prestige and funding to review all phases of the problem.

The hard truth of the matter again, Mr. Chairman, is that the fire problem has become increasingly more serious, and, beyond question, is national in scope.

The total impact on the national economy of this annual loss is beyond calculation. To think of this in more personal and more identifiable terms one only has to recall such recent tragedies as the Penthouse Restaurant fire in Montgomery, Ala., and the fire in the Chicago Convention Center. The loss of lives was shocking and the monetary loss inestimable.

The Commission, which would be established by this resolution, will be required to meet new and compelling challenges. Fire prevention methods must be reevaluated in light of rapidly changing technological advancement. Fire control and suppression methods must be re-examined so as to develop and to maximize the use of new and sophisticated techniques.

In excess of 70 percent of all Americans live in our urban centers. It is estimated that this figure will increase to 80 percent in 1975 and ultimately to 85 percent. Clearly there is a need to study the fire problem as it relates to the problems of the city.

Building codes, materials and their character, the structural aspect as it relates to the spread of fire, and every other phase of fire prevention and control are matters of life-and-death consequence to the 140 million people who live in our cities. This must be a matter of grave concern to those who have a meaningful responsibility in the field of housing and urban development. We are persuaded that the study called for in House Joint Resolution 498 will supply solutions to many of these vexing problems.

In the absence of Federal support and direction, it has been impossible to have a comprehensive and coordinated study of the design of firefighting apparatus, equipment, and appliances. We believe that the research which would be entered into, pursuant to this resolution, would result in improvement and standardization of apparatus and equipment. This, Mr. Chairman, should accomplish great savings for communities and hopefully will reduce the hazards of the firefighter's occupation.

The matter of reducing the dangers of the job is a matter of prime concern to the International Association of Fire Fighters. The statistics with respect to service-connected deaths and disabilities are frightening.

Firefighters were killed at the rate of 55 per 100,000 in the year 1965. This is 275 percent greater than the rate for the overall work force.

Per 100,000 firefighters 330 were forced to retire because of service-connected disabilities; and in addition, 360 firefighters per 100,000 were forced to retire because of occupational diseases, lung and heart disease being the principal crippers.

Another problem of vital interest and concern today is that of recruitment. Every major city and most of the smaller ones are experiencing great difficulty in recruiting competent personnel. Some attention must also be given to this problem.

In accordance with the terms of this resolution, the Commission will be required to make an evaluation of present and future needs of training and education for fire-service personnel. As was stated earlier, we trust that this in part will eventually lead to the establishment of a much-needed National Fire Service Academy.

Mr. Chairman, we believe that the adoption of H.R. 6637, amended to include House Joint Resolution 498, is not only desirable, but absolutely vital to the national interest. Therefore, on behalf of the 100,000 members of our organization we ask that the members of your committee act favorably thereon.

Mr. DADDARIO. Thank you. Do you have anything to add?

Mr. DAVIS. No.

Mr. ROUSH. Is this truly a national organization with membership in the other countries?

Mr. KERSHNER. Just the United States and Canada.

Mr. ROUSH. Has your organization made any study as to what other nations are doing in regard to this particular problem?

Mr. KERSHNER. I don't believe that we have any precise information as to what other nations are doing. We do know the results. We know as has been testified to before this committee and other committees of this Congress the rate of fire deaths is so much greater in the United States than it is in the rest of the Western World that it is shocking.

Mr. ROUSH. This knowledge is what prompted my question. I wondered why. Is it that we haven't paid attention to this particular problem or are they doing a better job?

Mr. KERSHNER. I really don't have the answer to that, Mr. Roush.

Mr. ROUSH. One simple little question: Why is it that we don't have just one telephone number to report a fire throughout the country, one that a child in the first grade would learn and one which would be on the mind of every citizen and a part of his knowledge? Has an attempt been made to do this?

Mr. KERSHNER. I am certain no attempt has been made to do this but these are the kinds of questions that we think a national study commission would deal with.

Mr. ROUSH. I wouldn't think it would take a national study commission to do that.

Mr. KERSHNER. I think it would take a national study commission to have the prestige to move all the local interests, the telephone companies and local and State governments to get them to make as simple a change as this. I think in the testimony that Dr. Holomon gave on, I believe, Thursday, he pointed out that we had a very simple problem of standardized thread on fire hose; we have a national standard thread and a local standard thread. Chairman Daddario pointed out that this ought to be a very simple thing to solve and truly it ought to be. But unless you have a study made and the influence of the prestige that would go with this study, we are just not going to get the thousands and thousands of local fire departments to make the kind of changes that are necessary.

I think the same thing applies to the question that you raised about one simple telephone number. As we described it in our statement, we have the problem of investigations of fires, standardizing the investigation of fires and standardizing the reporting of fires. This

ought not to be terribly complicated. We need one central agency with sufficient prestige at the national level to get this accomplished and the private sector and the privately supported organizations who are well-intentioned and well-motivated just don't have sufficient prestige and don't have the ability to coordinate this problem and deal with this problem. Some of the matters that will be dealt with by the study commission will be terribly complex. Some will be relatively simple but in both cases there will be a need to have one central agency with the prestige to deal with this problem. The FBI in the field of crime is a perfect example.

Mr. ROUSH. I appreciate your comments, but I still can't believe that it would take that much effort for us to get one telephone number. I think I will start a one-man crusade to get just one telephone number and maybe start out by introducing the resolution saying it is the consensus of Congress that this be the case. That is all, Mr. Chairman.

Mr. KERSHNER. If you do it this way you are doing it through one central agency and this is our point.

Mr. DADDARIO. It is quite a brilliant suggestion, though.

Mr. KERSHNER. It is.

Mr. DADDARIO. I will support your resolution.

Mr. RUMSFELD. How many members in your association?

Mr. KERSHNER. 100,000 in the United States and 20,000 in Canada.

Mr. RUMSFELD. These individuals in your association work for various types of firefighting organizations, I take it?

Mr. KERSHNER. Primarily municipal firefighters.

Mr. RUMSFELD. Do you have individuals who work for firefighting organizations attached to private corporations?

Mr. KERSHNER. We have had very little, less than a thousand overall.

Mr. RUMSFELD. How many firefighters are there in the organization?

Mr. KERSHNER. We have organized about 90 percent of our potential. Those are professionals.

Mr. RUMSFELD. Why do you think this need that this bill is proposing to fill hasn't been filled by the private sector—by the insurance companies and the unions and the institutes and the universities and the vast number of organizations that have an interest, a proper interest, in seeing that some of these problems are met?

Mr. KERSHNER. Because no one local government, no one State government, nor any privately supported organization or any combination thereof can deal effectively with these problems unless it is done under the coordination of one central agency.

Mr. RUMSFELD. Then why hasn't such a central agency been established through the voluntary cooperation of the association such as yourself and the insurance associations and the others? This doesn't seem to me to be a terribly difficult thing for us to accomplish. I am curious to know why the absence of leadership by the private sector. Why are the groups coming before the Government and saying only the Federal Government can solve this? If there were no bar association the Federal Government would be deeply involved in doing those things that the bar association now does. Is this not correct?

Mr. KERSHNER. I am not at all certain that that is so. I know that we have not been able to accomplish it, and that no one organization or any combination thereof has been able to get this kind of coordination.

Mr. RUMSFELD. Has anyone tried?

Mr. KERSHNER. There has been an effort made, for example, to get standardization of reporting fires and investigating fires but it has just been an insoluble problem because of the layer upon layer of local governments that we have had to deal with and several types of privately supported organizations, each with their own concepts of what makes sense and the way things ought to be done. Each vested interest has attempted, and understandably so, to preserve its identity and integrity.

Mr. RUMSFELD. Let us take two things here: Training. Now, this bill talks about training and you suggested it would be very difficult to do much more than scratch the surface.

Mr. KERSHNER. Right.

Mr. RUMSFELD. There are organizations that today train firefighters, correct?

Mr. KERSHNER. Right.

Mr. RUMSFELD. How are they paid?

Mr. KERSHNER. When you say "organizations," almost all of the training that takes place in municipally operated fire departments is provided for by the municipality itself.

Mr. RUMSFELD. In the municipality?

Mr. KERSHNER. Right. And it creates problems.

Mr. RUMSFELD. They don't send them anywhere else?

Mr. KERSHNER. Yes. Let me give you an example. Let us say you have a special lecture you want to give the fire department of the city of Bridgeport, Conn. We have 15 fire stations and four platoons. This means that it would take 60 working days to give one lecture. There perhaps is a better solution to this problem of training, but how do you get—one instructor for 60 working days, this would represent 3 calendar months. These are the kinds of problems that we have come across that many people have given some thought and attention to but nobody has come up with the solution. Maybe the solution will be regional training schools, maybe some Federal funds to encourage States and regional districts to establish fire training schools. We are not certain what the answers are. This is one of the reasons that we suggest that a national study commission be established to go into this problem in depth and we are hopeful that this will produce some meaningful results.

Mr. RUMSFELD. You mentioned that it takes a single person or organization or a central authority of some kind with the prestige to solve these problems that you have described as insoluble?

Mr. KERSHNER. Or to get them implemented.

Mr. DADDARIO. I would think a rate structure in insurance that was favorable to those who had undertaken efforts in this area to standardize equipment and to do other things would be quite an incentive to the community, the State, and the region to see that the local municipalities and the other elements in this whole patchwork did in fact respond to reasonable steps in this area, wouldn't you?

Mr. KERSHNER. Absolutely. This would be a tool or a device rather than the solution itself. It is still our judgment that you would need a central agency through which these kinds of recommendations could be made.

Mr. DADDARIO. Would the gentleman yield on that point?

Mr. RUMSFELD. Yes.

Mr. DADDARIO. Mr. Rumsfeld has posed a question to you. Isn't it a fact that these incentives presently do exist?

Mr. KERSHNER. To a certain degree, but not in the kind of details and specifics that Mr. Rumsfeld's question went to.

Mr. DADDARIO. I recall some years back when I was mayor of the city of Middletown, we had an unusual water problem. Unusual to the extent that there were places in the community where pressure was so low that certain fire hydrants were painted one color and the others another color so that firemen would know which ones not to tap because they wouldn't be able to get sufficient pressure. We were shown, if we were able to correct this problem, that there would be a corresponding reduction in insurance. That was one of the statistics we were able to use to get support for the funding of the project. I do think Mr. Rumsfeld's point is an excellent one. You can take instances of that kind in many places throughout the country and the opportunity of cutting down fire losses should be a great incentive. I think it should be fed into the program, and I am sure it would be.

Mr. KERSHNER. Right now we are pretty much limited in terms of fire insurance rates to factors which now seem to be considered by the rating bureaus in establishing fire insurance rates, such as water supplies, the presence or existence of a professional fire department and building materials, materials used on roofing. But there is no consideration given, for example, as to whether or not the professional fire department has an effective ongoing training program. There is no consideration being given by rating bureaus as to whether or not there are experiments in research being conducted into improving the techniques to be used in fire suppression and control. We have been living with this problem for an awfully long time and there has been no substantial improvement, for example, in the construction of fire apparatus and equipment in the last 50 years in our judgment, no significant improvement. There have been modest changes, but no significant improvement.

The fact of the matter is that our members continue to be killed off at an alarming rate. One of the proposals that we would like to see tried as a demonstration project is the employment of computers, the use of computers in supplying ready information to those in the fire scenes as to the peculiar and special hazards involved in each building. It is our understanding that had such information been available in New York City, 12 of our members would not have made the supreme sacrifice. It is highly probable and possible, and certainly worth experimenting with having daily fire inspections made with every building and the information fed into a computer so that when you respond to the fire alarm, by simply dialing a number this information can be immediately supplied to the officers in charge of the fire scene.

These are the kinds of things that we think have to be gone into in depth and there is no privately supported organization and no local government that has the ability to deal with this.

Mr. RUMSFELD. I am through with my questions. But I would only say, when you look at the range of efforts that have taken place in the nongovernmental sector in this country and the fantastic sums of money that have been raised voluntarily to solve problems such as polio and dozens of others, I guess I bring to this question more confidence in the private and nongovernmental sector than possibly you

do. And I confess I have not been wrestling with it as you have month after month and year after year. I would say, however, that I am every bit as anxious to see some solutions in this area as you are.

Mr. KERSHNER. Thank you.

Mr. DADDARIO. Mr. Brown.

Mr. BROWN. Mr. Kershner, I am very pleased to see your testimony here this morning. I have had long and extremely cooperative arrangements with the firefighters in California, and I have always appreciated the good work they have done out there in a number of affairs, including political.

I might just comment with regard to Mr. Rumsfeld's point. I think the chairman would bear me out in saying that you almost have to have some experience with the local jurisdiction as he has in order to appreciate the constant pressures that are on a fire agency to secure enough money to keep their operation going at a reasonable level of efficiency, much less selling a local government body on the need for some of these more esoteric types of approaches to the fire problem.

This is the problem that exists all over the United States with local governments as far as I have been able to determine, the pressure on their funding is that they do not have the resources to engage in the type of development research and experimental activity that is called for in this bill. It seems to me this is probably the only way we are going to get it. I am convinced that once we begin a program that its merits are going to be so obvious that it will carry along at its own momentum to a considerable extent.

Your testimony was replete with testimony about the need for educational and training programs. It would seem our major problem is an information problem as much as any other single thing. This seems to be the area that we have most neglected. You pointed out computers to store information with regard to high hazard fire situations which I think would be very valuable. I would go even further and ask if you see a role for closed circuit television which would not only connect up all the fire stations but possibly other centers which might have a direct relevance to the fire operation and which could also be used in connection with the training programs of the personnel involved. Is that not a type of thing that could be envisioned as a development?

Mr. KERSHNER. Until you mentioned it, it had not occurred to me. It makes a lot of sense. It might deal with the kind of problem that I described for Mr. Rumsfeld's benefit, the matter of getting out special information to large numbers of firemen who are located in a large number of firehouses spread out through rather large areas, not necessarily within a given municipality but even through our regions of the State or the State itself. This seems to make a great deal of sense.

Mr. BROWN. We have in Los Angeles a situation that I am not intimately familiar with but about which I have a great deal of information wherein a great deal of training is done by the county of Los Angeles. There are 60 or 70 cities in the county. That is a population of 7 million. There are obvious benefits in centralizing this function. The problem is that it is not sufficiently centralized. There are still a lot of small jurisdictions that don't take advantage of the resources that are available. There are some that have competing programs. There are a lot of reasons that it hasn't functioned as it should, including a little competitive jealousy among jurisdictions. An area that

should be gone into, is the providing regional facilities to solve the training problem.

It seems to me that you put the emphasis on the need for public enlightenment with regard to the subject of fire hazards and safety technique, this is something that your membership does some degree of work in now, does it not?

Mr. KERSHNER. This is true.

Mr. BROWN. Here, again, if we would look on the fire service as an active service rather than a passive service and could develop the technology of both communication and mobility, we could do a great deal more in using the fire service as a training agency in the community.

Mr. KERSHNER. Right.

Mr. BROWN. Without impairing their effectiveness for the fires in specific areas.

Mr. KERSHNER. This is correct.

Mr. BROWN. No further questions.

Mr. DADDARIO. Just one question and then in the interest of time I hope we may be able to submit to you a series of questions which we would like to have answered and provided for the record.

(Additional questions submitted and the answers thereto are as follows:)

Question 1. "Is there any correlation between the wealth of the community and condition of work for fire fighters? By conditions of work, we refer to training, equipment, recognition by the population of the importance of the work of the fire fighter, etc."

Answer 1. Assuming that the wealth of a community is measured in terms of the per capita income of its citizens, or its tax base, there is a correlation between the wealth of the community and conditions of work for fire fighters. Generally, in our wealthier communities, there is better training, better equipment and greater recognition on the part of the citizenry as to the importance of the work of fire fighters.

However, even in our wealthiest communities, or in those communities which are most aware of the fire problem, the effort being made and the results achieved are inadequate.

Only through the comprehensive attack on the problem envisioned in H.R. 6637, amended to include the high level study Commission provided for in H.J. Res. 498, will any community begin to provide adequate conditions of work for fire fighters.

Question 2. "How much of the problem of public apathy can be attributed to the lack of positive, active programs by persons and associations that are engaged in firefighting? In other words, what is being done by associations such as yours to overcome the apparent problem of public apathy to the problems of unfriendly fires?"

Answer 2. The public apathy which is such a large part of the fire problem cannot be attributed to the lack of positive active programs by organizations that are engaged in fire fighting. Instead the difficulty is caused by (1) insufficient funds to carry out effective programs and (2) by the absence of a central agency which would be responsible for coordinating such programs in order to make sure that there was an overall program which would be continuing in nature and which would reach every segment of our society in every community.

Our organization has developed several public education programs which we have encouraged our 1,300 affiliates to use at the local level. These include informing the public concerning the hazards of fire through lectures and contests conducted for children in conjunction with and through the cooperation and assistance of local school systems and authorities, both public and private, and through news and feature stories in the newspapers, and on radio and television.

The effectiveness of our programs has been adversely affected by the shortage of funds, the absence of cooperation on the part of many municipal authorities, the lack of coordination among organizations in the field of fire protection, and by the fact that there is no central agency which assumes responsibility for seeing to it that the job gets done.

It can be reasonably expected that public apathy can and will be substantially reduced if the present efforts of state and local government and privately supported organizations are continued or improved, provided that such efforts are augmented by and coordinated through the educational programs called for in Section 16(a) (3) of H.R. 6637.

Question 3. "In your opinion, has there been much improvement over the last ten or fifteen years in the caliber of men seeking jobs as fire fighters? What must be done to upgrade the job of fire fighters?"

Answer 3. Unfortunately, not only has there not been much of a general improvement over the last ten or fifteen years in the caliber of men seeking jobs as fire fighters, but rather it would appear that, in many instances, there has been a decline. Where there used to be 5 or more qualified job applicants for each job vacancy, now we have more vacancies than applicants.

There is no doubt that the recruitment problem is caused by the fact that the wages, working hours and other job conditions of fire fighters have failed to keep pace with that paid and provided for in the private sector for work requiring comparable skills and abilities and involving lesser hazards. What makes this all the more vexing is that this disparity, which started during World War II, has reached its greatest proportions now at the very time when the work of the fire fighter has become more difficult and complex.

Many things can and must be done to upgrade the job of fire fighters.

The physical and intellectual qualification requirements must be raised so that applicants will have the capacity for the job.

On-the-job and specialized training and education for fire fighters and fire department administrators must be advanced so that they will be able to cope with the new and demanding challenges of present day fire fighting.

The wages of fire fighters must be increased and their hours of work brought in line with that of employees in the private sector.

And, if possible, the astonishingly high number of job-connected injuries and deaths must be reduced.

The International Association of Fire Fighters is convinced that the study called for in H.J. Res. 498 will produce the carefully thought-out answers which are needed in order to best implement the foregoing recommendations and upgrade the job of fire fighters.

Mr. DADDARIO. You mentioned that you had difficulty getting competent personnel. Is the problem fundamentally a financial one or are the hazards as quoted in your statistics also a deterrent factor?

Mr. KERSHNER. I think it is a combination of the two, Congressman. It is certainly difficult to attract people to seek a career in the fire service when the salaries by and large are inadequate in comparison to the salaries paid in the private sectors in jobs requiring lesser skills and lesser hazards.

Mr. DADDARIO. Because you aren't able to get the people you like, does this have an effect on the large percentage of occupational diseases? Are your physical requirements lower? Do you get people who are likely to have higher incidence of lung and heart disease?

Mr. KERSHNER. I don't think there are too many jurisdictions where the physical standards have been lowered in order to recruit. Most fire departments have been running without sufficient manpower and I believe this is a more important contributing factor toward the high rate of occupational diseases.

Firefighting is an unusual occupation. In most types of employment if you don't have a large enough work force they just do what they can and they have to let it go at that. In the case of firefighting the work is so challenging and so compelling that if you don't have a sufficient work force they are going to break their backs to get the job done in any event. You see somebody leaning out of a second-floor window that is charged with smoke, a firefighter can't very well say, "I don't have enough help to get that person down." You are going to break your back to get them out of that window.

This is an important contributing factor.

Mr. DADDARIO. In almost any fire they can be challenged by that kind of thing.

Mr. KERSHNER. This has been the chief cause of lung and heart disease.

Mr. DADDARIO. Thank you. We appreciate your coming. It is nice to see you.

Mr. KERSHNER. Thank you.

Mr. DAVIS. Thank you.

Mr. DADDARIO. The next witness is Mr. Donald M. O'Brien, general manager of the International Association of Fire Chiefs, and Mr. David B. Gratz, chairman of the board of trustees of the International Fire Administration Institute. We are glad to have both of you gentlemen here, and we are anxious to hear from you.

STATEMENT OF DONALD M. O'BRIEN, GENERAL MANAGER OF THE INTERNATIONAL ASSOCIATION OF FIRE CHIEFS

Mr. O'BRIEN. Thank you, Mr. Chairman.

Mr. Chairman and members of the committee, my name is Donald M. O'Brien, general manager of the International Association of Fire Chiefs. With me is Chief David B. Gratz, of our federal committee and chairman of the board of trustees of the International Fire Administration Institute, which is affiliated with the International Association of Fire Chiefs.

We appear before you today to indicate our support of H.R. 6637, provided that it is amended with the provisions of H.J. Res. 498, which would establish a National Advisory Commission on Fire Prevention and Control.

Mr. DADDARIO. You were in the room when Mr. Mosher asked Mr. Kershner where he stood. You would not be against H.R. 6637 if it does not include the Commission?

Mr. O'BRIEN. Yes. We will support it, but we think it will be stronger. As we read into our statement, you will see why.

Mr. DADDARIO. All right.

Mr. O'BRIEN. Our position results from a belief that the national fire problem is really two parts. First are those problems which are readily identified, and second are those areas which need further study before a course of action is appropriate. It is our judgment that H.R. 6637, provides an opportunity to begin work on known problems. An example of those problems which have been identified can be found in the report of the Wingspread Conference, which we would like to submit for the record. The Wingspread Conference, held in 1966, began as an ad hoc group of responsible and interested fire service persons who desired to isolate some of the national fire problems. This goal was accomplished, and 12 statements of national significance to the national fire problem were developed. This report was subsequently unanimously adopted by the International Association of Fire Chiefs and the International Fire Administration Institute.

The Wingspread Conference, and other studies, clearly point out that the national fire problem is a grave one. In 1966 the loss of life by fire exceeded 12,000 men, women, and children. Direct material loss of property was in excess of \$1.8 billion. The actual impact on our national economy of this direct loss is beyond comprehension. It is dis-

turbing that our per capita fire loss is twice that of Canada, four times that of England, and $6\frac{1}{2}$ times that of Japan.

Approval of H.R. 6637 will provide immediate attention to those problems which have been clearly defined. We feel this is proper and support this measure.

However, the national fire problem is complex, and a total solution will only be possible with additional study and planning. For this reason we also support the concept of the Presidential Commission, as proposed by Senator Sparkman in Senate Joint Resolution 46 and Congressman Barrett in House Joint Resolution 489. Such a commission should be composed of knowledgeable authorities from the fire service and representatives from appropriate Federal agencies, such as the Department of Commerce. The rapid urbanization of our country and the fact that most of the fire problem is in our cities, also indicates the importance of representation by the Department of Housing and Urban Development.

Such a Commission would insure additional high-level study and charting a clear course before we attempt to tackle those problems which, at this point, are not so clearly defined.

In conclusion, we believe that a properly implemented action program, called for in H.R. 6637, joined with a Commission undertaking additional study, would be a forward step to solving our national fire problem.

Mr. DADDARIO. Thank you. Do you have anything to add, Mr. Gratz?

Mr. GRATZ. Yes, with reference to the activities and performance of the private sector, an association such as ours is, I firmly believe, doing the job that we set out to do within the limits of our capabilities. The problem as I see it is that these organizations are so inundated with meeting today's problems that we don't have the opportunity or time to meet the challenges of tomorrow. During the Wingspread Conference one of the things discussed was human behavior factors. We seem to feel that psychologically there are many communities where there is a sophisticated fire service, and, therefore, there are a great number of fires; whereas, if you go to another community that does not have sophisticated protection, you do not have a great number of fires. We do know in our statistical comparison in other countries that in many other parts of the world where there is no fire service or fire insurance they have no fires. We don't know why. This needs to be evaluated further. If we could find the answer to this question, I think it would be very significant in meeting the national fire problem. This is the type of study that we would like to see done, and I believe it is beyond the scope of the resources and capabilities of our existing organizations, but I do feel strongly that we are and will continue to meet our responsibilities within the limit of the resources which are available today.

Mr. DADDARIO. Is your position, Mr. O'Brien, or the position of your association, comparable to that of the International Association of Fire Fighters? Do you have any disagreement about this?

Mr. O'BRIEN. The only area where we may differ is in implementation.

Mr. DADDARIO. In what way?

Mr. O'BRIEN. Basically, our approach is from the fire chief's point of view. We wish the administrative and operations area looked into perhaps more strongly than they would. We are concerned with the

total picture because the fire chief is the responsible person in a community as regards fire protection.

Mr. DADDARIO. Do you have anything to add to that?

Mr. GRATZ. I think insofar as implementation goes. I agree with Congressman Rumsfeld that in regard to the Federal Government involving itself in areas or participating in activities which can be better handled by private sector, the problem with the private sector is additional resources and perhaps better coordination. Generally we work very closely with the International Association of Fire Fighters and support them.

Mr. DADDARIO. This observation you make about there being hardly any fires in places where you have no firefighters or no insurance companies I hope doesn't prompt you to the point where you will recommend that we should eliminate insurance companies and all the fire departments.

Mr. GRATZ. Considering the fact that I have a family to support, I am not going to make that recommendation.

Mr. DADDARIO. Mr. Brown.

Mr. BROWN. Mr. O'Brien or Mr. Gratz, either one, getting back to the point we were touching on a while ago about the difficulties of funding adequate fire protection in most of our cities today, I have had the experience of being a very strong believer in upgrading and increasing Federal fire service. I have had experience of trying to find money for additional training programs, for additional salaries with funds to provide them, for improved communication or transportation or other equipment or to get them out in the community for the purposes of engaging in fire protection or fire and safety activities. I have generally found a great deal of reluctance to the additional cost of these rather simple things involved. Is this in your experience a general problem that faces most of the fire departments around the country?

Mr. O'BRIEN. I believe it is to this effect. The local budget is limited to the extent that they can provide the various services which the fire departments themselves would like to expand on. Our association has been encouraging all types of activities which would bring them in closer contact with the public. The home fire inspection program, for example. We have been on record for many years, we support it. We have at the present time a new pamphlet designed to show the fire chief how he can make these inspections and make them more meaningful. But again, he has the problem of how many people are available to do these things, and he has naturally certain responsibilities that he has to consider every moment of the day.

Unfortunately, the fire service is something that continues 24 hours a day. The fire chief has to think about these problems 24 hours a day. It would be nice if we could all close up at 4:30 or 5 o'clock and go home, but we can't. It is a 24-hour-a-day and year-round problem. The fire chief does the best he can with his limited resources. He has a number of people trying to support him but you have the problem of limits on the amount of money that is available to assist in this area.

Mr. BROWN. It actually seemed to me that there was sometimes a vested interest on the part of the administrative people, not the fire chief's level, but at the city manager's level or city council level in trying to minimize the requirements of the fire service and the diversity of activities which could be conducted there in order to maintain a low level of pay and qualification for the fire service.

Now, I don't have broad enough experience to know whether this is genuinely true, but I see in Los Angeles just in the last few days that there is an effort being made to distort the historic relationship which existed between fire pay and police pay. I see the arguments being used to justify this. It seems in part they stem from this fact, an effort to downgrade the requirements of the fire service in order to keep the pay level somewhat lower and I just wondered if this was a general phenomenon that might exist.

Mr. O'BRIEN. It is occurring in many areas of the country at this time, Mr. Brown, but, unfortunately, what I am afraid is going to happen, some of these people, I refer to them as municipal government theorists, if they get their way in their attempts to increase the benefits or the standing of the one service. They are merely knocking down the other service and tomorrow they are going to have the problem of bringing that up and they are going to have to reverse their arguments to bring the other service up to the same plane. It is a problem of keeping the pendulum of municipal dollars at a level plane. Frankly, in my opinion the morale of one service is not going to be raised by the mere fact that you give them more money. Many other factors are closely connected. They ought to take a better look. I speak as a former professional firefighter and the son of a police captain.

Mr. BROWN. Commenting on that aspect of integration of services I had the experience about 10 years ago where the local city management felt that there was so much spare time available on the part of the fire service that they wanted to merge the firemen and police. And let the firemen help out the police in particular situations. This is a city which had a very high fire insurance rate which had severe problems of maintaining an adequate fire safety program. They didn't see the possibility of upgrading the fire service by better utilization of the men. They saw the possibility of saving costs by utilizing the firemen in their spare time to help the policemen. This overlooks the growing importance of the fire problem.

Mr. O'BRIEN. You are absolutely correct. Our association has been on record many, many years against doing exactly what you discuss. It is becoming somewhat of a dead issue now.

Thank God it wasn't in places where they had civil rights disturbances. These same people have now taken the tack that they ought to pay police more than firemen as a means of reducing crime. I never knew we were responsible for it.

Mr. BROWN. I have nothing more.

Mr. DADDARIO. Mr. Roush.

Mr. ROUSH. Concerning the rates of fires in other countries, I wonder if you have further comments to make. It is disturbing that our per capita loss is twice that of Canada, four times as high as England, and six times as high as Japan. Has your organization made any study to determine why this is a fact?

Mr. O'BRIEN. This is a part of the problem. We would like to study it more. We are an international association. Ninety percent of our membership is in the United States, about 6 percent in Canada, but about 2 percent in 32 other countries.

At our conferences we usually try to bring in some of our foreign members to discuss their problems with us. Our president was in Europe—

Mr. ROUSH. We should be discussing our problem with them rather than their discussing it with us.

Mr. O'BRIEN. Our president was in England, in Austria, and in Switzerland and he did that. In Boston we had a fire chief from Sweden, a fire chief from France, and another from Austria, and this was a general subject of conversation.

Chief Gratz would comment probably even further.

Mr. GRATZ. We have a meeting tomorrow with a fire chief from Germany. We are acutely aware that there is a great difference in losses, deaths, injuries, incidents of fires—frankly, we do not know the answer. These are the answers that I think our country desperately needs.

Mr. DADDARIO. Would the gentleman yield?

Mr. ROUSH. Yes.

Mr. DADDARIO. Firefighting in other countries is considered to be a position of high responsibility.

Mr. GRATZ. This is one factor. I think another factor and, again, I really can't put our finger on it, is the psychological question of human behavior. There is a different attitude in other countries regarding incidence of fires. At one time arson was one of the most heinous crimes in the world, more so than murder, and the penalties were more severe. The enforcement of codes, also. Should a fire occur in your home through negligence you were punished. We have never had that philosophy. Whether or not this still permeates European countries or countries where there is no fire protection, I don't know. I know countries or areas of the country where there is no fire department and no fire insurance and they don't have fires—at least to the degree that we do.

Mr. DADDARIO. I can recall being in Tokyo back in 1950. This really made an impression on me. I was in the Dai Ichi Hotel when there was a fire, and I was astonished—I don't know why I should be, but as an American I think we do things better and more quickly than anyone else. I was astonished how quickly they appeared, how well dressed they were to fight a fire, and how well equipped they were. I think we have to take into consideration that these statistics don't happen by chance, and I think Mr. Roush's point is one point that we ought to have more information on. We ought to pursue it. The statistics are so large and in favor of other countries that their method of performance ought to be looked into, and the committee will do everything to help.

Mr. RUMSFELD. Is there a difference in reporting fire?

Mr. GRATZ. Yes. It is a factor, although I think there is much more to it. The National Fire Protection Association has a good reporting system. They report fires in other countries. They try to point out how their figures are different.

Mr. DADDARIO. Will you go into that?

Mr. GRATZ. For example, a country in Europe in their total fire statistics may classify their alarms differently. Let us say that New York City has 80,000 alarms a year that they would count as fire alarms. Another country may not have the same classification system, so the total would not actually be relatively as high, but they try to identify where there are differences in the classification system so we can get a more accurate comparison. Even at that, the difference in the number of alarms, I am sorry I don't have it at my fingertips, but I would

venture to say that we have more fire alarms in the city of New York than we have in most of Europe in a given year.

Mr. O'BRIEN. There is not only a difference between countries; not every fire department in this country has the same standard. Some don't report them at all.

Mr. RUMSFELD. The reason that I asked, statistics can be very misleading. I was looking at the relationship of killed to wounded in the South Vietnamese and United States. South Vietnam is 1½ to 2 to 1. They don't report the same kind of things that the U.S. soldiers do as wounded.

You made a statement after Mr. O'Brien finished his remarks saying that you felt that your organization and the other associations testifying today were doing a good job with the problems of today but you didn't have the time and resources to tackle the problems of tomorrow. Were you suggesting that this bill should be aimed not at today but at tomorrow if that is in fact an accurate statement and that is the need or am I misinterpreting your remarks?

Mr. GRATZ. If we are going to aim to solve tomorrow's problems we have to begin with today. Certainly, we need to reevaluate yesterday's and today's values and standards under which we are operating in order to be better prepared to meet the challenge of tomorrow. We have identified, in my judgment and I think in the opinion of other people in the field, a number of problems that need to be given attention.

As someone said, we spend so much time chopping the wood that we don't have time to sharpen the ax. We are inundated with our day-to-day problems.

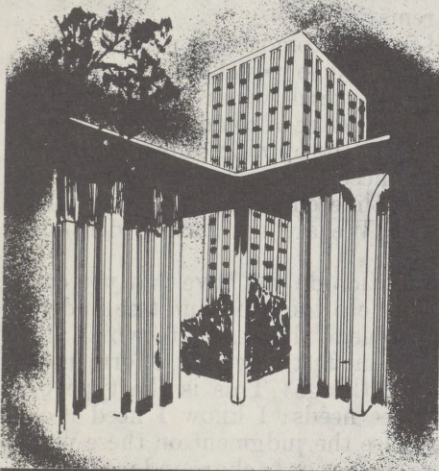
Mr. RUMSFELD. What kind of information do you have that you can present to this subcommittee that will help the subcommittee understand the problem, the scope of the problem, the degree to which the problems are being met effectively or ineffectively, the efforts now underway to cope with these types of things? This is the type of information that I think the committee needs; I know I need it if I am going to be in a position to exercise the judgment on these proposals that are before us. Do you have studies or background materials or suggestions or areas of need or areas where the need has been completely filled so that the subcommittee can have this?

Mr. GRATZ. Yes, sir. We will be happy to furnish you with additional supporting information on the role of institute as well as the International Association of Fire Chiefs. It was created by the International Association of Fire Chiefs to fill an educational void in the fire service, particularly at the college level. I think we have done extremely well. We need to do more. But I would say this: In the 10 years since the institute has been created that we have gone from a handful of junior colleges which offered fire science and fire protection courses to well over a hundred such institutions in the United States. We have made a dramatic advance.

Mr. RUMSFELD. That information would be helpful to me. I do hope that you will see that we are given the type of information you have described and anything you can think of that will help me better understand the scope of the problem and the elements of the problem and what is being done and what is not being done.

(The information follows:)

International Fire Administration Institute



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at Albany

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Objectives:

- To engage in research and otherwise obtain material for the preparation of courses of study in fire administration and related subjects and to prepare such courses of study.
- To make such material and courses of study in fire service administration and related subjects available for use by educational institutions, particularly at the college level, in the United States and foreign countries, and to work with and assist educational institutions in the development of such material.
- To give assistance by grants or scholarships to students in the field of fire administration; and to receive funds, grants and gifts for carrying out the objectives of the Institute.

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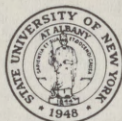
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To give assistance by grants or establishment of scholarships, or otherwise, to students in the field of fire administration; and to receive funds, grants and gifts for carrying out the objectives of the Institute.

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14. Chief Wayne Swanson, Fire Department Headquarters, 204 South First Street, Rockford, Illinois 61104
15. Chief Curtis W. Volkamer, Fire Department Headquarters, 558 West De Koven Street, Chicago, Illinois

INTRODUCTION

This bibliography has been compiled to meet the growing number of requests by individuals interested in the managerial function. It is evident today that education can no longer end with the granting of a diploma. The two strands of working and learning are intertwined in self development throughout the length of a man's career.

It is our hope that these selected readings will stimulate managers to explore in greater depth areas of special concern and interest. The bibliography has been prepared by the staff of the International Fire Administration Institute at the State University of New York at Albany.

Professor D. F. Favreau
Executive Director
International Fire Administration Institute
State University of New York at Albany

Appley, Lawrence A. Management in Action: The Art of Getting Things Done Through People. New York: American Management Association, Inc., 1956.

A collection of writings by the President of the American Management Association selected to give managers an idea of the character of the managerial profession. Included in these selected writings are numerous theories of management as well as practical tools that may be utilized by the manager. Mr. Appley's writings are a must for all managers who wish to improve themselves in carrying out the management function.

Argyris, Chris. Interpersonal Competence and Organizational Effectiveness. Homewood, Illinois: Richard D. Irwin, Inc. 1962.

The concept of whether the effectiveness of an organization is increased because of certain interpersonal relations is most thoroughly investigated in this volume. Mr. Argyris has studied this question by interviews, observations, and the laboratory. His conclusions supplement rather than overthrow the old value systems.

Argyris, Chris. Personality and Organization. New York: Harper and Row, 1957.

This book has been written to initiate an understanding of human behavior in on-going organizations. The author has integrated all of the existing research in attempting to lay a framework for the field of organizational behavior.

Barnard, Chester I. The Functions of the Executive. Cambridge: Harvard University Press, 1940.

Barnard discusses the functions, processes, and problems of the executive, emphasizing the management of cooperative systems and the leadership of organization. The cooperative system is presented as a combination of physical, biological, personal, and social elements. The book is most helpful to those who are interested in how organizations operate at the executive level.

Batten, J. D. Tough-Minded Management. New York: American Management Association, 1963.

This book provides managers with a workable philosophy which will assist the manager in solving many daily problems. Mr. Batten believes a successful manager must be tough-minded. This does not mean that a manager should be a strict disciplinarian or an autocrat. Instead, the manager should realize the organization's objectives and he should strive to achieve those objectives while also motivating his subordinates to do the same.

Beckman, R. O. How to Train Supervisors. New York: Harper and Bros., 1952.

Beckman includes outlines of thirty-two discussions concerning supervision and a number of practical methods of presenting discussion leadership. The author tends to stress the staff meeting as a vital tool of executive development.

Berelson, Bernard and Gary A. Steiner. Human Behavior. New York: Harcourt, Brace and World, 1964.

Many scientifically obtained facts on the behavior of humans have been secured by the behavioral sciences in recent years. The authors have systematized over one thousand of these facts as they relate to the so-called "human animal". How the individual reacts to his business associates and to his family are just a few of the areas which are discussed within this book.

Berlo, David K. The Process of Communication. New York: Holt, Rinehart and Winston, 1960.

This book discusses modern communication theory as a foundation for the practice of communication in any field of endeavor. The author draws information from many disciplines to show how communications affect human behavior. Mr. Berlo develops a realistic model that can be applied to all communication situations to denote their meaning and logic.

Bethel, Lawrence L., Atwater, Franklin S., Smith, George H. E., and Harvey A. Starman Jr. Industrial Organization and Management. Fourth Edition. New York: McGraw - Hill Book Company, Inc., 1962.

This book is a survey of all phases of industrial organization and management. This edition has been completely revised to include all recent developments in organization and management. Besides revision, the authors have introduced entirely new chapters including recent ideas that are emerging as management principles. The authors provide introductions to each chapter to further orientate the reader to the more salient points discussed in each chapter.

Blake, Robert R. and Jane S. Mouton. The Managerial Grid. Houston: Gull Publishing Company, 1964.

The Managerial Grid is designed to help organizations attain maximum performance from their resources. This system is not a theory or formula, but a tested system that has displayed successful results in many organizations. This book provides an opportunity for managers to analyze their individual style of management while it also suggests methods of further development.

Boss, Bernard M. Leadership, Psychology and Organizational Behavior. New York: Harper and Brothers, 1960.

The purpose of this book is to apply recent findings in psychology to organizational behavior. The author using group theory and behavior of persons as they interact with others comes to conclusions related to the art of leadership and the ability to lead. Mr. Boss has done an effective job in applying psychological research to the problems of leadership within organizations.

Brown, Roy E. Judgment in Administration. New York: McGraw-Hill Book Co., 1966.

Mr. Brown firmly believes that specified instruction improves the effectiveness of an administrator. The art of administration is dealt with in depth, with particular emphasis on judgment. The author examines failures rather than successes. In fact, over two hundred mistakes practiced by various administrators are thoroughly discussed. Brown reiterates that judgment is the key for improved administration.

Calhoon, Richard P. and C. A. Kirkpatrick. Influencing Employee Behavior. Chapel Hill, North Carolina: The Colonial Press, Inc., 1962.

An important part of a manager's job is the influencing of subordinates' behavior. Unfortunately, many supervisors receive little or no training in this vital aspect of management. This book is designed to show how the influencing of employee behavior can be used to satisfy the needs and wants of the subordinate while also enhancing the organization in the long run.

Commerce Clearing House. Editorial Staff. 1967 Guidebook to Labor Relations. Chicago: Commerce Clearing House Inc.

Fifteen lively chapters launch the reader into a complete and understandable explanation of the basic principles of labor law as it operates today and analyze the federal statutes which influence and regulate union-management employee relations.

Dale, Ernst. The Great Organizers. New York: McGraw-Hill, 1960.

Mr. Dale presents new insights into management by his exciting discussion of some great organizers and their organizations. Dupont, General Motors, Westinghouse, and National Steel are used as case studies in successful business organizations. The author has made available to managers episodes of successful ventures that can be used as references by all organizations.

Dalton, Melville. Men Who Manage. New York: John Wiley and Sons, Inc., 1959.

This book concerns itself with constructive compromises. A compromise is a touchy situation that can explode if it is not properly handled. The author states all organizations whether large or small are connected with a community. From this vantage point, Mr. Dalton analyzes successful compromises that have accounted for all the needs expressed by the organization and the community.

Davis, Keith. Human Relations at Work. New York: McGraw-Hill Book Co., 1962.

This completely revised edition of Davis' earlier work Human Relations in Business has attempted to include recent findings of the behavioral scientists. This book is especially beneficial to personnel directors and employment officers.

Dickson, W. J. and F. J. Roethlisberger. Counseling in an Organization. Boston: Division of Res., Harvard Business School, 1966.

A sequel to the Hawthorne Research Study conducted at the Western Electric Company.

Doohar, Joseph and Vivienne Marquis, Editors. Effective Communication on the Job. New York: American Management Association, Inc., 1956.

This AMA publication was designed to inform all executives and supervisors of the importance of communication within an organization. All aspects of employee communication are discussed in detail. This publication can be used as a handbook for holding effective meetings, conferences and personal interviews. Barriers to good communication are presented in the hope they may be eliminated and replaced by proper and effective communication.

Drucker, Peter F. The Concept of the Corporation. New York: The John Day Co., 1946.

The book attempts to initiate contemplation of the relationship between a free industrial society and big business. Mr. Drucker does not answer questions, instead, he attempts to raise important questions regarding this relationship. The reader will gain insights into the social and political problems that are encountered by the industrial society.

Drucker, Peter F. Managing for Results. New York: Harper and Row, 1964.

Drucker's work is considered to be a proper guide for the manager. Systematically, the author presents the economic tasks the manager must perform. Drucker suggests that these pertinent tasks are recognized by most managers but are not necessarily practiced by them.

Drucker, Peter F. The Practice of Management. New York: Harper and Bros., 1954.

In this book, Drucker is explicitly involved with a definition of management and the tasks involved in management. The book provides a most valuable background for those managers who are functioning in a staff capacity. Drucker concisely discusses the nature as well as the intricate structure of management.

Enell, John W. and George H. Haas. Setting Standards for Executive Performance. New York: The American Management Association, 1960.

This research study proposes solutions to the question of standards of performance and whether such standards can be established for executives. Fifteen executives discuss the results they obtained in their experiments on executive performance standards. This book statistically describes performance standards at the various managerial levels.

Ewing, David. The Managerial Mind. London: Free Press of Glencoe, 1964.

What drives a man to become number one in an organization? What qualities are needed to be successful at a top management position? Mr. Ewing discusses these and other facets that drive a manager towards high levels of achievement within business organizations.

Fayol, Henri. General and Industrial Management. London: Sir Isaac Pitman and Sons, Ltd., 1949.

General and Industrial Management, translated into English from Fayol's original work of 1916, is considered a classic in the field of management. Fayol begins his work by explaining the possibility and the necessity of teaching management. The rest of this book is devoted to Fayol's principles of management which in actuality becomes a philosophy of management. His work is useful in all levels of management whether it be an industrial, financial or governmental field. Fayol has been called the "Father of Professional Management."

Fenn, Dan H. Jr. Management's Mission in a New Society. New York: McGraw-Hill Book Company, 1959.

Fenn's book originates from a conference of businessmen held at the Fiftieth Anniversary of the Harvard Business School. Leading executives attending were perplexed at the posture upper management had obtained in recent years. The conferencees wanted to know why they felt hemmed in by the government, labor, and public opinion. The major context of the book is a summation of the participants involved in this conference.

Flory, Charles D., Editor. Managers for Tomorrow. New York: The New American Library, Inc., 1965.

What type of man is capable of being a business leader today? What are the qualities needed to become a successful business leader? These questions are answered by the staff of Rohrer, Hibler and Replogle, Consultants to Management. These men draw their conclusions from specific case studies in order to give meaningful insights into the development of dynamic leaders. This book places emphasis on how modern executives must evolve a new concept in order to enhance the whole organization in our modern world.

Gardiner, Burlleigh B. and David G. Moore. Human Relations in Industry. Chicago: Richard D. Irwin, Inc., 1950.

This volume presents a particularly excellent analysis of many different role conflicts that occur between the worker and the supervisor in industry, business, and government. Also included in this book are suggestions on how to avoid and solve such problems.

Gellerman, Saul W. Motivation and Productivity. New York: American Management Association, 1963.

This book is useful to anyone who is responsible for getting things done through people. Gellerman first discusses motivation in terms of organizational behavior and then he considers motivational factors from the standpoint of the needs and desires of the individual. Lastly, the author demonstrates how motivational research can assist a manager to solve his own particular problems.

Haire, Mason. Psychology in Management. Second Edition. New York: McGraw-Hill Book Co., 1964.

This book has been written for the practicing manager in order that he may become acquainted with psychological research related to his field. No clear cut solutions to specific problems are found in this second edition. Instead, concepts that have arisen from recent research are presented to the manager for thoughtful interpretation to his particular situation.

Herzberg, Frederick; Mausner, Bernard and Barbara Black Snyderman. The Motivation to Work. Second Edition. New York: John Wiley and Sons, Inc., 1962.

Utilizing the results from two hundred individual studies of management personnel, the authors have developed a practical approach to job motivation. By using individual case studies the authors feel they have found many of the answers to motivational problems. The authors are certain that once the motivational problems of businesses are eliminated, employee production and satisfaction will increase.

Heyel, Carl. Appraising Executive Performance. New York: American Management Association, Inc., 1958.

This book discusses the varied procedures that have been used in executive appraisal. Mr. Heyel explains how one judges the strengths and weaknesses of the subordinate as well as how to explore his attitudes and motives toward his responsibilities. In addition to discussing the actual interview situation Mr. Heyel also explains how the executive arrives at certain standards of performance.

Heyel, Carl. Editor. The Encyclopedia of Management. Two Volumes. New York: Reinhold Publishing Corporation, 1963.

Management is a discipline that has been in constant transition since the industrial revolution. Today a manager is considered unprepared if he is proficient in only a few specialized areas. An understanding of finance, purchasing, manufacturing, advertising, selling, industrial relations, research and development, and long-range planning is critically important to the modern successful manager.

The Encyclopedia of Management is arranged in the traditional A-Z manner so that information on any topic may be readily located. Perhaps of more importance are the group of "core subjects" in management which have been devised in order that any reader may read in depth on many fields of management. These two volumes have been written by authorities in the field of management and are of crucial importance to the twentieth century manager.

Hoslett, Schuyler Dean. Editor. Human Factors in Management. New York: Harper and Brothers, 1951.

This book of readings involves the many significant areas concerning the human problems of organizations. The materials in this work represent the study and findings of experts in the field of organizational behavior. Problem areas such as leadership, personality, supervising and training are fully discussed in this book.

Kahn, Robert L.; Wolfe, Donald M.; Quinn, Robert P.; Snoek, J. Diedrick; and Rosenthal, Robert A. Organizational Stress: Studies in Role Conflict and Ambiguity. New York: John Wiley and Sons, Inc., 1964.

Beginning with role theory, this book attempts to delineate the various pressures that occur in large scale organizations. Using pertinent data from case studies and from a nationwide survey, the authors correlate personality characteristics with role conflict and ambiguity. The authors conclude their text by advocating a new approach to the stresses found within organizations.

Kepner, Charles H. and Benjamin B. Tregoe. The Rational Manager. New York: McGraw-Hill Book Company, 1965.

Managers have been solving problems and making decisions since the initiation of organization. This book stresses the fact that many managers have been problem-solving and decision-making most inefficiently. The authors believe that the proper use of information will improve a manager's ability to solve problems and make decisions. This book logically shows how a manager should separate problem solving and decision making. The authors indicate that this book is not a theoretical work since many of the case histories employed show the use of their personal concepts in industry, business and government.

Koontz, Harold and Cyril O'Donnell. Management: A Book of Readings. New York: Harper and Row, 1957.

This book was compiled in response to the definite need and desire on the part of practicing managers for a volume of selected readings. Although a great amount of material has been written on the subject, the information was so widely scattered that it became almost impossible for a manager to find selected reading materials. Mr. Koontz and Mr. O'Donnell have presented within this book selected materials concerning both the theory of management and also modern practical applications.

Koontz, Harold and Cyril O'Donnell. Principles of Management: An Analysis of Managerial Functions. Third Edition. New York: McGraw-Hill Book Co., 1964.

The authors have attempted to arrange the truths concerning management in a system that is understandable to all managers. The authors realize that managing is more of an art than a science. However, they believe that a foundation of managing based firmly on science will help managers to develop their art.

Laird, Donald A. and Eleanor C. Laird. The Techniques of Delegating. New York: McGraw-Hill Book Company, 1957.

The ability to delegate has been considered the most important feature of a successful executive. Following this assumption, Donald and Eleanor Laird have written a practical guide from case studies of successful business leaders. The authors discuss when and what to delegate and to whom delegated responsibility should be given. Operating from a psychological and sociological basis, the authors offer a practical list of the do's and don't's of delegating that is useful for all levels of management.

Leavitt, Harold J. Managerial Psychology. Second Edition. Chicago: The University of Chicago Press, 1964.

Dr. Leavitt has applied recent psychological findings in this readable second edition of Managerial Psychology. Included in this book are discussions on individual behavior, face to face relationships, psychological problems in small groups and the nature and problems of large organizations.

Lee, Irving J. How to Talk With People. New York: Harper and Brothers, 1952.

Why do people have communication problems? What communication problems arise in committees and conferences and how can we avoid them? From observations of many committees and conferences, Dr. Lee, an authority in semantics, has developed techniques that will reduce many problems in communications. The author illustrates sources of communication problems and also suggests specific ways to solve many of these problems.

Leys, Wayne A. R. Ethics for Policy Decisions. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1952.

Many administrators, after making a policy decision, feel they have made that decision without proper knowledge. The author, using ethical considerations, attempts to help administrators in formulating questions that can equip him with the knowledge he desires.

Likert, Rensis. New Patterns of Management. New York: McGraw-Hill Book Co., 1961.

The book deals with the different opinions of management toward the control of personnel. Mr. Likert and his research associate attempt to dispel many of these opinions through the results of their comprehensive research studies. The management system portrayed in this book is different mainly in its new use of motivational principles.

McConkey, Dale D. How to Manage by Results. New York: American Management Association, 1965.

Management by results is not just a passing fancy; instead it is a managerial philosophy which has developed a wide appeal from managers in diverse fields. Mr. McConkey has made use of case studies involving large organizations which have obtained successful results from this theory. The author presents his theory in a manner which is easily understood and readily adaptable.

McGregor, Douglas. The Human Side of Enterprise. New York: McGraw-Hill Co. Inc., 1960.

From the pen of one of the best known men in the field the text deals with policies and practices in the management of human resources in organizations. The author describes two important suppositions - Theory X - the assumptions upon which traditional organizations are based and Theory Y - assumptions consistent with current research. This book is a classic.

McGregor, Douglas. Leadership and Motivation. Cambridge: The M. I. T. Press, 1966.

This is a collection of writings on managerial problems in the modern world prepared by the late Douglas McGregor's colleagues. Douglas McGregor was respected as an authority in the field of industrial psychology for many years, and his analysis of behavioral problems have become classics in the field of management. This book of writings clearly shows how leadership can be diversified so that competence and self-respect can be achieved by all individuals.

Maier, Norman R. F. The Appraisal Interview: Objectives, Methods and Skills. New York: John Wiley and Sons, Inc., 1963.

A detailed description of three different types of appraisal interviews and the respective differences in skills needed to make these interviews successful. The "Tell and Sell" and the "Tell and Listen" interviews are considered important steps for those seeking help in the development of the employee, while the "Problem-Solving" interview is geared to improve the job of the employee.

Mayo, Elton. The Human Problems of an Industrial Civilization. New York: MacMillan Co., 1933.

This is the original story of the famous Hawthorne experiments. These experiments have been used as classical examples on why poor human relations exist in ongoing enterprises. This book should be read by all executives who are in quest of ideas to improve the human relation problems within their organization. The author has been called the "Father of Human Relations."

Merrill, Harwood F., ed. Classics in Management. New York: American Management Association, Inc., 1960.

This is the first survey of management as a profession. The works of Robert Owen, Charles Babbage, Captain Henry Metcalf, Frederick Winslow Taylor, Harrington Emerson, Henri Fayol, Frank Bunker Gilbreth, Harry Arthur Hopf, and George Elton Mayo are included in this anthology. An excellent description on how management theory and practice has evolved.

Metcalf, Henry C. and Lyndall F. Urwick. Dynamic Administration. New York: Harper and Brothers, 1942.

Colonel Urwick and Dr. Metcalf have edited a collection of lectures given by Mary Follett on business management. Miss Follett believes that both the individual and the group must be motivated if an organization intends to keep pace with our dynamic society. Miss Follett further suggests that a society will not survive if it is unable to motivate the individuals and the groups within that society.

Mitchell, William Norman. The Business Executive in a Changing World. New York: American Management Association, 1965.

This is an enlightening book that analyzes the executive's role and responsibility in our changing world. From his vast experience the author discusses in a frank manner executive problems such as the use of executive power, motivational factors in organizations, and the development of managerial talent. The author presents valuable suggestions applicable to both old and young executives which are certain to broaden their insights of the business world.

Newman, William H. Administrative Action. New York: Prentice-Hall, 1951.

What are the tasks of an administrator and how is he to perform these tasks? Administrative Action answers these questions for the practical use of executives in an attempt to keep them abreast of our dynamic society. Mr. Newman has integrated the existing knowledge on administration with new concepts in a readable form for all aspiring administrators.

Newman, William H. and Charles E. Summer Jr. The Process of Management: Concepts, Behavior and Practice. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961.

Mr. Newman and Mr. Summer use the findings of psychologists, sociologists, and anthropologists to form general theory which is then applied to actual managerial problems. This book considers central concepts important to all managers including organization, leadership, decision-making and planning. Case studies are used to illustrate the meaningfulness of each concept.

Odiorne, George S. How Managers Make Things Happen. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961.

This book explains many facets of management including innovation, leadership, authority, competition and discipline. However, more important than this are the techniques presented and discussed that will motivate subordinates to excel. The presented techniques have been tested and proven in many large organizations in the United States. Dr. Odiorne has developed his writings in a manner readable and useful to all levels of management.

Odiorne, George S. Management by Objectives: A System of Managerial Leadership. New York: Pitman Publishing Corporation, 1965.

Mr. Odiorne believes setting organization and personal goals will produce a more effective management. Besides being a type of leadership which will allow evolution of subordinates, Management by Objectives helps guide the whole organization toward expected goals. The author believes leadership by objectives will produce a team effort as well as maintaining individual initiative.

Planty, Earl and Thomas J. Freeston. Developing Management Ability. New York: Ronald Press Co., 1954.

A handbook that presents precise answers to specific questions within organizations. This book is excellent because of the inclusion of many problems that might be encountered by those developing managerial ability.

Redfield, Charles E. Communications in Management. Chicago: University of Chicago Press, 1958.

As modern industrial and governmental organizations become more complex, communications at all levels becomes increasingly difficult. However, modern executives realize that in order to function properly their organization must have clear communications. Communications in Management is an attempt to guide the executive through his communication problems. Mr. Redfield has directed this book to the many aspects of communication encountered by the executive each day such as stating policy decisions, interviewing, conferring, and simply exchanging information with others.

Roethlisberger, F. J. Management and Morale. Cambridge: Harvard University Press, 1941.

Since the explosion created by the findings of the Hawthorne experiments, many new ideas have been incorporated in the philosophy of management. This book reinterprets the Hawthorne conclusions based on these new philosophic assumptions.

Rowland, Virgil K. Managerial Performance Standards. New York: American Management Association, 1960.

Mr. Rowland believes that performance standards can and should be set for managers. The author suggests that these standards should be arrived at by group discussions between the manager and his subordinates. Mr. Rowland has described a method for developing standards that is useful for all levels of management.

Schleh, Edward C. Management by Results. New York: McGraw-Hill Book Company, 1961.

The results approach to successful management developed and successfully used by the author, encourages initiative by every member of an organization. Besides analyzing the results systems the author also gives insight into basic management, organization and administration. The results approach as professed by Mr. Schleh develops better relations between executives and subordinates, enhances individual achievement, allows for management by objectives and presents insights into complex problems and much more pertinent information.

Scott, William G. The Management of Conflict Appeal Systems in Organizations. Homewood, Illinois: Richard D. Irwin, Inc., and The Dorsey Press, 1965.

Scott believes there is a sizable gap in knowledge pertaining to administrative behavior. The author concentrates his study on judicial procedures of organization and the judicial function involved in management. Scott is vitally interested in the systems whereby organizational members may appeal to management if these members feel an injustice has occurred.

Secord, Arthur. How to Tell What You Know. New York: The American Press, 1956.

How to Tell What You Know is a handbook for managers who must convey information to others. In practical language Mr. Secord analyzes the many different communication situations encountered by a manager from face-to-face communication to large group situations. The author is not afraid to dispute theoretical positions that do not have practical functions. This is a very readable book that offers solutions to perplexing managerial problems.

Simon, Herbert A. Administrative Behavior. Second Edition. New York: The Macmillan Company, 1961.

This book was originally published in 1947. Since then, new knowledge in the behavioral sciences has affected the thinking of men in organizations and administration. Mr. Simon has discussed the relation of this book to these new developments as well as integrating the new discoveries into his text.

Sloan, Alfred P. Jr. Edited by John McDonald and Catherine Stevens. My Years with General Motors. Garden City, New York: Doubleday and Company, Inc., 1964.

This is the exciting story of how General Motors evolved from a loosely organized company to the world's largest and perhaps most efficient company. Presented by the individual most responsible for this dramatic change, Alfred P. Sloan Jr., this work describes how organizational balance between policy and operations has made General Motors such a competitive firm. Mr. Sloan discusses the management policies and strategy of General Motors which have revolutionized the automobile industry since the 1920's.

Spriegel, William R., Schulz, Edward and William B. Spriegel. Elements of Supervision. Second Edition. New York: John Wiley and Sons, Inc., 1957.

This book was originally published as a practical guide for supervisors during wartime. The second edition was written to include the new ideas occurring in management since the war. Still useful as a practical tool, Elements of Supervision now utilizes the many concepts that have evolved from the behavioral sciences as a basis for their suggestions to supervisors.

Edited by the Staff of Supervisory Management. Leadership on the Job. New York: American Management Association, Inc., 1957.

Developed from some of the best articles in the Supervisory Management magazine, this book indicates how improved supervisory skills will enhance organizations. New ways of improving supervisory skills are related to lower cost, higher productivity, and better employee morale. Personnel problems, communication problems, discipline, absenteeism, and community relations are just a few of the more important aspects that are dealt with in this handbook for supervisors.

Strauss, George and Leonard R. Sayles. The Human Problems of Management. Englewood Cliffs, New Jersey. Prentice-Hall, 1960.

Since managers are constantly interacting with other humans, they need reliable information on human behavior. This book discusses important behavioral problems that are encountered by managers. The authors use case studies to dramatize the material.

Tead, Ordway. The Art of Administration. New York: McGraw-Hill Book Company, 1951.

How can administration operate more effectively in our modern society? Are large organizations what society really wants? In this book the author examines these questions in addition to relating group and individual conflicts to the whole complex of administrative action.

Urwick, Lyndall. The Elements of Administration. London: Sir Isaac Pitman and Sons, Ltd., 1947.

Many writers have expressed their views on administration. Emphasizing the scientific approach to management, Mr. Urwick has consolidated these views in a readable text. The concepts of such writers as Follett, Fayol and Mooney have been included in the text.

Urwick, Lyndall F. The Golden Book of Management. London: Newman Neome Limited, 1956.

Today society demands that management be controlled by extremely competent individuals. This book, the first publication of the International Committee of Scientific Management, traces the development of management from its beginnings. The views of seventy pioneers who have made permanent contributions to the knowledge concerning management are presented in this publication.

Whislen, Thomas L. and Shirley F. Harper. Editors. Performance Appraisal: Research and Practice. New York: Holt, Rinehart, and Winston, 1962.

Men who manage have always been looking for new ways to appraise their employees. The editors of this book have gathered together all the significant research reported in journals, books, and other publications on performance appraisal. In order to orientate the reader each of the articles is introduced by the editors.

Whyte, William F. and Edith Lentz Hamilton. Action Research for Management. Homewood, Illinois: Richard D. Irwin, Inc., 1965.

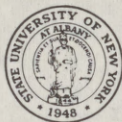
This book is designed for any manager who desires insight into organizational change as it logically occurs from action research. Action Research for Management is a play-by-play account of an action research project in the hotel industry. This book is easily read and familiarizes a person with the problems encountered in industrial psychology and sociology.

Whyte, William H., Jr. The Organization Man. New York: Simon and Schuster, 1956.

What effect does organization have on the "organization man?" What effect is the new Social Ethic having upon managers today? Is the manager losing his creativity and individualism to this Social Ethic that is becoming dominant in the business world? These questions are answered by Mr. Whyte in a most astonishing fashion. This book is a necessity for all managers whether they are in a large or small organization.

SUGGESTED PERIODICALS FOR MANAGERS

1. Academy of Management Journal. Champaign, Illinois: The Garrard Press.
2. Advanced Management Journal. New York: Society for the Advancement of Management.
3. Business Horizons. Bloomington, Indiana: Graduate School of Business, Indiana University.
4. The Business Quarterly. London, Canada: The School of Business Administration, University of Western Ontario.
5. Business Week. New York: McGraw-Hill, Inc.
6. California Management Review. Los Angeles: Graduate School of Business Administration, University of California
7. Dun's Review. New York: Dun and Bradstreet Publications Corporation.
8. Harvard Business Review. Boston: Graduate School of Business Administration, Harvard University.
9. Journal of Industrial Psychology. Margate, New Jersey: Elias Publications.
10. Management of Personnel Quarterly. Ann Arbor, Michigan: Bureau of Industrial Relations, Graduate School of Business Administration, The University of Michigan.
11. Management Review. New York: American Management Association.
12. Notes and Quotes. Hartford, Connecticut: Connecticut General Life Insurance Company.
13. Personnel. New York: American Management Association.
14. Personnel Administration. Washington, D. C. The Society for Personnel Administration.
15. Personnel Journal. Swarthmore, Pennsylvania: The Personnel Journal, Inc.
16. Supervision. Madison, New Jersey: Supervision Publishing Company, Inc.
17. Supervisory Management. New York: American Management Association.
18. Training in Business and Industry. New York: Gellert-Wolfman Publishing Corporation.



INTERNATIONAL

FIRE ADMINISTRATION INSTITUTE

**Fire Science Technology
Curricula Survey**

CENTER for EXECUTIVE DEVELOPMENT
STATE UNIVERSITY OF NEW YORK at ALBANY

INTERNATIONAL FIRE ADMINISTRATION INSTITUTE
SPONSORED BY THE INTERNATIONAL ASSOCIATION OF FIRE CHIEFS
CHARTERED BY THE REGENTS OF THE STATE OF NEW YORK
AFFILIATED WITH THE STATE UNIVERSITY OF NEW YORK AT ALBANY

PURPOSE:

1. To engage in research and otherwise obtain material for the preparation of courses of study in fire administration and subjects related thereto, and to prepare such courses of study.
2. To make such material and courses of study in fire service administration and subjects related thereto available for use by educational institutions, particularly at the college level, in the United States and foreign countries, and to work with and assist educational institutions in the development of such material.

To give assistance by grants or establishment of scholarships, or otherwise, to students in the field of fire administration; and to receive funds, grants and gifts for carrying out the objectives of the Institute.

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D. F. F.

FOREWORD

Fire protection in the United States is an important public service endeavor which is an integral part of the socio-economic life of any community. In 1965 there were 2,347,125 fires of all types in the United States, causing a property damage loss of \$1,741,300,000 according to estimates compiled by the National Fire Protection Association. Sophisticated fire protection equipment is ready to aid in the prevention, detection and suppression of destructive fires, however, its effectiveness is directly related to the training and development of the organization manpower. Well trained and drilled firemen can often minimize the effect of a deficiency in manpower, apparatus, and equipment, the opposite is not true, manpower and apparatus cannot eliminate the need for technically trained, proficiently drilled manpower teams. Men, not apparatus and equipment extinguish fires. Technically trained men must be developed to meet the multitude of hazards produced by our complex technological society. The entire fire protection field has been challenged by the explosive growth of this nation. Many new and interesting problems have grown out of the rapid scientific and technological developments of the past fifteen years. New processes and unfamiliar materials have contributed greatly to fire hazards; and many of these require continual study by members of the national fire service.

The Wingspread Conference on Fire Service Administration, held at the Johnson Wax Foundation's Research Center, Racine, Wisconsin during February, 1966, grew from timely recognition of this growth and need by leaders in the nation's fire protection service. Twelve significant statements reflecting their deep concern were formulated by the researchers as an aid to developing a clearer understanding of the posture of the national fire service. These statements though broad in scope focused sharply on the current dynamic educational, technological and socio-economic developments, as well as ingrained administrative problems that have developed through the years. Of specific concern to this survey are four Wingspread statements:

- o Unprecedented demands are being imposed on the fire service by rapid social and technological change.
- o The scope, degree and depth of the education requirements for efficient functioning of the fire service must be examined.

- o The career development of fire executives must be systematic and deliberate.
- o Professional status begins with education.

In response, a growing number of educational institutions e. g., technical community and junior colleges, encouraged by federal legislation and local pressures have developed and are implementing courses and programs to meet the need.

A generally acceptable educational philosophy and curriculum content which will produce technically trained and certified proficient fire protection technicians is thus badly needed. It now seems likely that in the foreseeable future a systematic, competent curriculum making effort in behalf of more adequate, more consistent, more rewarding curriculum proposals and specifications are likely to evolve to meet the challenge of the sixties.

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FIRE PROTECTION

SELECTED SAMPLING OF FIRE SCIENCE COURSES

Colleges and Universities

Course Description																				
	UNIVERSITY of MARYLAND	PASADENA CITY COLLEGE	MILWAUKEE INST. of TECH.	SAN JOSE CITY COLLEGE	N.Y. CITY COMM COLLEGE	CUNYONGA COMM. COLLEGE	COLLEGE of the REDWOODS	PHOENIX COLLEGE	L.A. VALLEY COLLEGE	TACOMA VOC. & TECH. INST.	ANTELOPE VALLEY COLLEGE	ROMAN TECHNICAL INSTITUTE	MOUNT SAN ANTONIO COLLEGE	ILLINOIS INST. of TECH.	ODESSA COLLEGE	RIO HONDO JR. COLLEGE	S.U.N.Y. of FARMINGDALE	LONG BEACH CITY COLLEGE	AMERICAN RIVER COLLEGE	SANTA MONICA CITY COLLEGE
MANAGEMENT ASPECTS OF FIRE SCIENCE																				
ORGANIZATION & PROCEDURE	✓		✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓				✓	✓
FIRE PREVENTION		✓	✓	✓	✓	✓	✓		✓		✓	✓			✓				✓	✓
LEGAL ASPECTS OF FIRE ADMINISTRATION		✓							✓			✓	✓				✓		✓	✓
FIRE INVESTIGATION AND ARSON			✓					✓		✓		✓			✓			✓	✓	✓
FIRE FIGHTING TACTICS & STRATEGY	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TECHNIQUES FOR FIRE TRAINING						✓	✓													✓
FIRE INSURANCE PRINCIPLES	✓										✓		✓							✓
FIRE ANALYSIS	✓												✓							✓
LEADERSHIP & SUPERVISION			✓		✓		✓					✓								✓
INSPECTION PRINCIPLES										✓	✓								✓	✓
TECHNICAL ASPECTS OF FIRE SCIENCE																				
ESSENTIALS OF FIRE PROTECTION	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RESCUE PRACTICES						✓			✓		✓				✓			✓	✓	✓
BUILDING CONSTRUCTION CODES	✓	✓	✓	✓	✓						✓				✓		✓	✓	✓	✓
HYDRAULIC TECHNOLOGY	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
INDUSTRIAL FIRE HAZARD											✓	✓	✓	✓				✓	✓	✓
EQUIPMENT APPARATUS & SYSTEMS	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
TRANSPORTATION HAZARDS	✓								✓									✓		✓
TECHNICAL REPORT WRITING		✓	✓				✓		✓	✓	✓							✓		✓
HAZARDOUS MATERIALS	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FIRE SUPPRESSION	✓	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓	✓	✓	✓
BASIC SCIENCES AND MATHEMATICS																				
CHEMISTRY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
PHYSICS	✓	✓		✓	✓						✓	✓	✓		✓			✓	✓	✓
TECHNICAL MATH.	✓	✓	✓	✓							✓							✓	✓	✓
CALCULUS	✓												✓						✓	✓
ENG. SCIENCE	✓												✓					✓		
TECH. SCIENCE		✓	✓							✓								✓		
STATISTICS				✓								✓						✓		

CHABOT COLLEGE
25555 Hesperian Boulevard
Hayward, California

FIRE SCIENCE

FRESHMAN YEAR	UNITS			SOPHOMORE YEAR	UNITS		
	A	W	S		A	W	S
FIRE SCIENCE 50 (Introduction to Fire Science)	3			FIRE SCIENCE 64A-64B (Basic Hazardous Materials)	3	2	
FIRE SCIENCE 60 (Fire Suppression)		3		FIRE SCIENCE 65A-65B (Tactics and Strategy)	3	2	
FIRE SCIENCE 61A-61B (Fire Prevention)		3	2	FIRE SCIENCE 66 (Related Codes and Ordinances)	3		
FIRE SCIENCE 62A-62B (Protection Equipment and Systems)		2	3	FIRE SCIENCE 67 (Fire Company Organization and Procedure)		2	
FIRE SCIENCE 63 (Fire Protection)			3	FIRE SCIENCE 68A-68B (Fire Hydraulics)		2	3
English 52A-52B	3	3					
Speech 30			3				
Natural Science		4					2
Social Science	4			FIRE SCIENCE 69 (Building Construction for Fire Protection)			
Health 1	3						
Electives	2		3				
Physical Education	1/2	1/2	1/2	American Institutions	3	3	3
1				Humanities			4
				Electives	.3	3	3
				Physical Education 1	1/2	1/2	1/2
					15	1/2	14 1/2
							15 1/2

The graduation requirement for mathematics must also be met.
Courses in the Major must be taken in sequence

Chabot College awards an Associate in Arts degree upon satisfactory completion of all graduation requirements.

Cuyahoga Community College
 Bronnell Science and Technology Building
 2214 E 14 Street
 Cleveland, Ohio
 Dean of Technical Occupational Education
 Dr. Fred C. Sutton

Associate Degree Program in
 Fire Technology

Preparation for a career in Fire Technology. The curriculum offers a balanced and broad education to students who plan to enter fire service as a career. The program also makes available excellent opportunities to practicing firemen for upgrading and advancement within the service. The program includes such specialized areas as fire prevention, investigation, fire protection systems and supervision.

Suggested Semester Sequence

First Semester	Cr Hrs	Second Semester	Cr Hrs
Fire Technology		Fire Technology	
100 Organization for Fire Protection	2	110 Fire Fighting Tactics	3
English	3	Speech	
Mathematics		101 Principles of Public Speaking	3
101 Intermediate Algebra	3	Chemistry	
Social Science	3	101 Introductory Chemistry	4
Physics		Social Science	3
101 Introductory Physics	4	Fire Technology	
Industrial Supervision		120 Fire Protection Systems	3
111 Practical Psychology for supervision	3		
	18		16
Third Semester	Cr Hrs	Fourth Semester	Cr Hrs
Fire Technology		Fire Technology	
210 Fire Fighting Tactics and command	3	231 Fire Prevention Practices	2
Fire Technology		Fire Technology	
220 Chemistry of Hazardous Materials	4	235 Fire Investigation Methods	2
Fire Technology		Fire Technology	
230 Fire Prevention Practices	2	240 Fire Hydraulics	3
Health or Phys. Ed	2	Fire Technology	
Humanities or Social Science	3	250 Municipal Public Relations	2
		Fire Technology	
		260 Personnel Training Methods	3
		Humanities or Social Science	3
	14		15

Illinois Institute of Technology
Chicago, Illinois 60616
Rolf Jensen, Chairman

FIRE PROTECTION ENGINEERING

Fire protection engineering is concerned in its broadest sense with the preservation of life and property from fire, explosion and other related hazards. The fire protection engineer deals with a wide range of problems, including among others the proper design, arrangement and use of building materials. He is also concerned with fire and explosion hazards resulting from industrial processes, with this aim he plans the proper design selection, and handling of equipment and materials.

Upon completion of this program a Bachelor of Science degree in Fire Protection Engineering will be awarded.

UNDERGRADUATE CURRICULUM

For the first and second semesters see Common Freshman Year

Third Semester

Math 201	Anal. & Calc.	4	0	4
Phys. 201	Elect. & Magnetism			
		3	3	4
BE 101	Prin. of Econon.	3	0	3
ES 201	Thermodynamics	4	0	4
FPE 201	Fire Insurance			
	Schedule Rating	2	1	2
	Totals	16	4	17

Fourth Semester

Math 202	Diff. Equations	4	0	4
Phys 202	Atomic Physics	3	0	3
ES 202	Statics & Dyn.	3	2	4
BE 102	Prin. of Economics	3	0	3
FPE 202	Fire Insurance			
	Schedule Rating	2	1	2
	Totals	15	3	16

Fifth Semester

FPE 303	FPE Laboratory	0	3	1
FPE 305	Property Insur.	2	0	2
FPE 309	Fire Protection	3	0	3
ES 203	Strength of			
	Materials	3	2	4
Chem 237	Organic Chem.	3	4	4
Math 301	Programming for			
	Digital Comp.	2	0	2
	Totals	13	9	16

Sixth Semester

ES 204	Fluid Mechanics	2	2	3
FPE 304	FPE Laboratory	0	3	1
FPE 306	Casualty Insurance	2	0	2
ES 307	Electronic Processes in Materials	3	0	3
FPE 310	Publ. Fire Prot.	3	0	3
ES 306	Heat & Mass Trans.	3	0	3
PS 420	Amer. Constit. Sys.	3	0	3
	Totals	16	5	18

Seventh Semester

Liberal Studies Elective		3	0	3
FPE 403	FPE Laboratory	0	3	1
FPE 415	Industrial Hazard Control	3	0	3
FPE 419	Electrical Hazard Control	3	0	3
FPE 420	Extinguishing and Detection Systems	3	0	3
ES 308	Electrical Circuit Analysis	3	0	3
	Totals	15	3	16

Eighth Semester

Humanities Elective		3	0	3
FPE 418	FPE Application	0	2	1
FPE 404	FPE Laboratory	0	3	1
FPE 417	Industrial Hazard Control	3	0	3
FPE 421	Extinguishing and Detection Systems	3	0	3
ES 309	Engineering Electronics	3	3	4
Liberal Arts Elective		3	0	3
	Totals	15	8	18

Total semester hours 137

University of Maryland
College Park Maryland
Director, John L. Bryan

Fire Protection Curriculum			Semester	
			I	II
<u>Freshman Year</u>				
Math 19	Elementary Analysis		4	
Math 20	Calculus I			4
Chem 1, 3	General Chemistry		4	4
E.S. 1	Introductory Engineering Science		4	
E.S. 10	Mechanics			4
	General Education Requirement			
Health 2	Personal and Community Health		2	
	Physical Activities		1	1
			18	16
<u>Sophomore Year</u>				
	General Education Requirement			
Math 21,22	Calculus II III		4	4
Phys 20,21	General Physics		5	5
E.S. 20	Mechanics of Materials			3
E.S. 21	Dynamics		3	
F.P. 80	Fire Protection Organization		3	
F.P. 90	Essentials of Fire Protection			3
			18	18
<u>Junior Year</u>				
	General Education Requirement			3
ENEE 50	Fundamentals of Electrical Engineering			3
E.S. 30	Materials Science or			
ENCE 50	Fundamentals of Engineering Materials)		3	
ENCE 112	Applied Mathematics in Engineering or)			
Math 66	Differential Equations		3	
ENCE 105	Fluid Mechanics			3
F.P. 110	Installations and Equipment		3	
F.P. 112	Fire Protection Fluids and Systems			3
F.P. 115	Water Suppression Systems			3
F.P. 120	Construction Fundamentals and Ins. Schedules		3	
	Approved Electives		2-3	2-3
			17 18	17 18
<u>Senior Year</u>				
	General Education Requirement		3	3
B.A. 191	Property Insurance			3
M.E. 100	Thermodynamics		3	
ENCE 106	Basic Sanitary Engineering		3	
ChE. 142	Environment Consideration of Nuclear Eng.			3
F.P. 111	Process and Transportation Hazards			3
F.P. 114	Fire Analysis		3	
F.P. 116	Problem Synthesis and Design		3	
F.P. 117	Technical Projects			3
	Approved Technical Electives		3	3
			18	18

Upon completion of this curriculum, the graduate will be awarded a Bachelor of Science Degree.

Milwaukee Institute of Technology
1015 North Sixth Street
Milwaukee Wisconsin
Faculty Counselor Edwin J. Taibl

FIRE TECHNOLOGY

Modern fire fighting techniques require an intelligent courageous and dedicated fireman. To keep pace with the rapid technical changes and to come with new fire problems, a highly skilled fireman who is thoroughly schooled in fire science is necessary. The need for job up grading to keep abreast of the higher technical standards of fire fighting is apparent in community fire departments. To meet community needs for a high degree of fire service the Fire Technology Department offers a two year degree program leading to the degree of Associate in Applied Science. The program also provides an individual with a background of general education which will enable him to achieve cultural advancement and also to develop an understanding of the social economic and civic responsibilities of a citizen.

Day Program			Credits	
			1st Sem.	2nd Sem.
First Year				
Fire T	100	Fire Protection Organization	2	
Eng.	151	Communication Skills 1	3	
Math	151	Technical Mathematics 1	4	
Nat Sci	111	Chemistry 1	5	
Soc Sci	153	American Institutions	3	
Soc Sci	100	Orientation	0	
Fire T	102	Fire Fighting Tactics and Strategy 1		3
Fire T	105	Chemistry of Hazardous Materials		3
Eng	152	Communication Skills 2		3
Math	152	Technical Mathematics 2		4
Nat Sci	151	Technical Science 1		4
			17	17
Second Year				
Fire T	103	Fire Fighting Tactics and Strategy 1	3	
Fire T	108	Building Construction and Fire Ordinances	3	
Mech T	130	Mechanics of Materials	3	
Nat Sci	152	Technical Science 2	2	
Soc Sci	151	Psychology of Human Relations . .	3	
Soc Sci	155	Business and Industrial Relations	3	
Fire T	110	Fire Investigation		3
Fire T	112	Fire Prevention		2
Fire T	114	Fire Protection Equipment and Systems		3
Fire T	116	Methods and Practices		3
Fire T	101	Fluid Power Fundamentals		4
Phy Ed	101	Physical Education		1
			17	16

Monterey Peninsula College
980 Fremont

Monterey, California 93940

Charles Mulkey, Dean of Technical-Vocational Education

Requirements for an Associate Degree

A) General Education	
1) Physical Education Activity	2 units
2) Personal and Community Health	2 units
3) English	3 units
4) American History	3 units
5) American Institutions	3 units
6) Language Arts	3 units
7) Social Science	3 units
8) Natural Science	6 units
9) Humanities	6 units
10) Mathematics	3 units
	<u>34 units</u>
B) Electives and departmental major	28 units
	<u>62 units</u>
Total	

Fire Science Courses

Fire Science 20	- Introduction to Fire Protection	3 units
Fire Science 22	- Introduction to Fire Suppression	3 units
Fire Science 24	- Fundamentals of Fire Prevention	3 units
Fire Science 26	- Fire Fighting Tactics and Strategy	3 units
Fire Science 28	- Hazardous Materials I	3 units
Fire Science 30	- Fire Protection Equipment and Systems	2 units
Fire Science 40	- Related Codes and Ordinances	3 units
Fire Science 42	- Building Construction Fire Protection	2 units
Fire Science 44	- Fire Company Organization and Procedure	3 units
Fire Science 50	- Aircraft Crash, Fire and Rescue	2 units
Fire Science 52	- Hazardous Materials II	3 units
Fire Science 54	- Emergency Rescue Practices	2 units
Fire Science 60	- Fire Apparatus and Equipment	3 units
Fire Science 82	- Fire Service Calculations	2 units
Fire Science 84	- Fire Hydraulics	3 units
Fire Science 93	- Reports and Records in the Fire Service	2 units
Fire Science 94	- Fire Investigation	3 units

Mount San Antonio College
 1100 North Grand Avenue
 Walnut, California 91789
 Irvin Colt, Dean of Vocational Technical Education

The following is a suggested curriculum for students desiring an Associate in Arts degree with a Fire Science major. Other course offerings in Fire Science not found in this suggested curriculum are:

Fire Science 55 - Related Fire Codes and Ordinances
 Fire Science 59 - Fire Rescue Practices
 Fire Science 60 - Fire Department Administration
 Fire Science 70 - Hazardous Materials
 Fire Science 72 - Fire Investigation

		FIRE SCIENCE			
		Units			
FRESHMAN YEAR		Fall	Spring	SOPHOMORE YEAR	Units Fall Spring
Introduction to Fire				Fire Company Organization	
Protection 50	3			& Procedures 58	3
English	3				
United States History				Fire Tactics & Strategy	
50			3	53	3
Fire Apparatus &				Speech 52	3
Equipment 57			3	Fire Protection Equip-	
Psychology	3			ment & Systems 54	3
Health Education I			2	Chemistry 53	4
American Institutions				Human Relations for	
50	3			Supervisors 102	3
Fire Hydraulics 56 ...			3	Fundamentals of Fire	
Introduction to Fire				Prevention 52	3
Suppression 51	3			Electives	3 7
Electives			6		
		<u>15</u>	<u>17</u>		<u>16</u> <u>16</u>

City University of New York
New York City Community College of Applied Arts and Sciences
300 Pearl Street Brooklyn, New York
Sylvan P. Stern Director

As the advances in modern technology have been applied to fire protection a corresponding need for personnel with higher education has developed to direct supervise, plan, and coordinate these activities. Fire protection services increasingly require the integration of the latest scientific and managerial concepts for effective preparedness and response. This associate degree curriculum developed with the cooperation of the New York City Fire Department, is designed to achieve several objectives for Fire Department personnel as well as others in fire protection and underwriting organizations. The program, consisting of a core of specialized courses along with a strong foundation of liberal arts and sciences, provides the background for upward grading and promotion, advanced specialized training for administrative and managerial positions, continuing education at the baccalaureate level, and development of new areas of interest by judicious choice of electives.

Fire Science

Course Code	Course Title	1st Sem.	Class	Lab	Credits
FS 101	Systems of Construction	3	0	3	
CAS 101	English Composition	3	0	3	
KC 100	Orientation	1	0	0	
MA 181	Mathematical Analysis I	4	0	4	
SC 411	Physics I	3	2	4	
SS 201	Intro. to Psychology	3	0	3	
		17	2	17	
2nd Sem.					
FS 201	Building and Fire Codes	3	0	3	
CH 110	General Chemistry I	3	3	4	
MA 281	Mathematical Analysis II	4	0	4	
SC 412	Physics II	3	2	4	
SS 206	Personnel Psychology	3	0	3	
		16	5	18	
3rd Sem.					
FS 301	Fire Hazards and Controls I	3	0	3	
FS 302	Hydraulics	4	0	4	
CAS 301	Effective Speaking or)	3	0	3	
CAS 3 2	Voice and Diction)				
CH 210	General Chemistry II	3	3	4	
MA 172	Statistics	3	0	3	
		16	3	17	
4th Sem					
FS 401	Fire Hazards and Controls II	3	0	3	
FS 403	Fire Dept. Administration	3	0	3	
CAS	Elective	3	0	3	
CH 430	Chemistry of Hazardous Materials	3	0	3	
SS	Elective	3	0	3	
	Elective	3	0	2.5	
		18	0	17.5	

OKLAHOMA STATE UNIVERSITY
The Technical Institute
Stillwater, Oklahoma
G. L. Sartain, Head
Fire Protection Department

FIRE PROTECTION TECHNOLOGY

The curriculum in Fire Protection Technology provides a fundamental background of technical subjects that teach the student to detect and correct fire hazards, make technical fire inspections, and conduct year around fire prevention activities. He also learns how to install, test, adjust, and maintain equipment for detecting, limiting the spread of, or extinguishing fire and to apply modern methods of municipal and industrial fire fighting. The student is guided into a well-balanced program of information and instruction that will qualify him for positions in the fields of insurance inspection, rating bureaus, fire protection equipment, installation and sales, fire prevention, and industrial and municipal fire protection.

FIRST YEAR

First Semester		Theory	Lab	Credit	
Tec	115	Technical Mathematics	5	0	5
Tec A	112	Fire Hazards and Causes	1	3	2
Chem	164	General Chemistry	3	3	4
Tec B	104	Architectural Drawing and Plan Reading ..	3	3	4
Tec A	132	Principles of Fire Inspection	1	3	2
				17	
Second Semester					
Tec	131	Personal and Occupational Guidance	1	0	1
Engrl	113	Freshman Composition	3	0	3
Tec A	122	Fire Protection	1	3	2
Tec A	162	Fire Codes and Standards	1	3	2
Tec A	182	Industrial Fire Hazards	1	3	2
Chem	174	General Chemistry	3	3	4
Tec	153	Basic Electricity Codes and Inspections ..	2	3	3
				17	
Third Semester					
Engrl	123	Freshman Composition	3	0	3
Tec A	272	Fire Protection Hydraulics	1	3	2
Tec A	102	Fire Extinguishing and Alarm Systems ..	1	3	2
Tec A	242	Automatic Sprinklers	1	3	2
Ind En	332	Industrial Safety Engineering	2	0	2
Gen Bus	303	General Insurance	3	0	3
Soc Sc	114	Challenges in American Democratic Life ...	4	0	4
				18	
Fourth Semester					
Tec.	124	Applied Physics	3	3	4
Tec.	242	American Industrial Development	2	0	2
Speech	203	Introduction to Public Speaking	3	0	3
Tec A	282	Water Supply Analysis	1	3	2
Tec A	232	Fire Inspection Practices	1	3	2
Gen Bus	353	Property and Casualty Insurance	3	0	3
				16	

Upon completion of this program an Associate Degree in Fire Protection Technology will be granted.

Pasadena City College
1570 East Colorado Boulevard
Pasadena California

Department Chairman: Vernon G. Spaulding

FIRE SCIENCE

Meets requirements for the Associate in Arts degree and employment or Junior standing in Government (Public Service option) at C.S.C.L.A.

Dept.	Course No.	Freshman Year	Sem. 1	2
PE Act		Physical Education Activity Elective	1 2	1/2
B Comm	1	Basic Communication	1	
Pol Sc	5 or 125	*American Institutions	3	-
Socio	128	Urban Social Problems or		3
Hist	25	*United States History		3
Tech	134	Technical Reports or	3	
Engl	1A	*Reading and Composition	3	
Speech	1 or 121	*Fundamentals of Speech/ Practical Speech		3
Fire	10	Introduction to Fire Protection	3	
Fire	12	Introduction to Fire Suppression	3	
Fire	14	Fundamentals of Fire Prevention		3
Fire	16	Fire Fighting Tactics and Strategy		3
H Ed	2	Health Education		2
-		*Biology 11A and Chemistry 2 or		
		**Science and/or Mathematics	3	3
			16 1 2 17 1 2	

Dept.	Course No.	Sophomore Year	Sem. 1	2
PE Act		Physical Education Activity Elective	1 2	1 2
---		** Art/ History/ Music	3	
Econ	1A	Principles of Economics		3
Engl		** Literature	3	
Fire	20	Hazardous Materials	3	
Fire	26	Fire Protection Systems	2	
Fire	28	Fire Laws and Ordinances	2	3
Philos	6A	** Introduction to Philosophy		3
Physics	10	** Descriptive Introduction to Physics	3	
Psych	1A	*Introductory Psychology or	3	
Psych	113	Psychology of Personal Adjustment	3	
Socio	1	**Introduction to Sociology		3
Socio	18	Elementary Social Statistics		3
			17 1 2 15 1 2	

Phoenix College
1202 West Thomas Road
Phoenix, Arizona

Advisor Mr. Calhoun

FIRE SCIENCE

Practical fire fighting operations will be emphasized in this curriculum with history and theory used where necessary to assist firemen to cope with current problems in the field.

This curriculum is designed:

1. To provide training for professional fire fighters in order that they may most efficiently perform their duties.
2. To prepare young men for a career in Fire Science.
3. To provide laymen with a better understanding of fire hazards and problems in the field.

FRESHMAN YEAR

First Semester		Second Semester	
Subject	Credit	Subject	Credit
Eng. 101 Freshmen English	3	Eng. 102 Freshman English	3
FS 101 Intro. to Fire Protec	3	FS 103 Hydraulics for Firemen	3
FS 107 Fire Prevention Theory	3	FS 108 Fire Protection Practices	3
Chem. 100 Intro. to Inorg. Chem.	3	FS 109 Chemistry and Chemicals	
Psych. 115 Psych. of Adjustment	3	in Fire Fighting	3
Required Physical Education	1	PA 141 Supervisory Training	
		for Firemen	3
Total	16	Required Physical Education	1
		Total	16

SOPHOMORE YEAR

First Semester		Second Semester	
Subject	Credit	Subject	Credit
FS 201 Fire Apparatus Practices	3	FS 204 Advanced Fire Tactics	3
FS 203 Basic Fire Tactics	3	FS 209 Arson and Fire Investigation	3
FS 207 Rescue Practices	3	PA 121 Supervisory Training for Firemen	3
SS 107 Selected Issues in		Jrnl. 131 Fund. of Public Rel	3
U. S. History	3		
SS 212 State & Local Govt.	3	Eng 219 Tech. Report Writing	3
Speech 100 Elements of Speech	2		
Required Physical Education	1	Required Physical Education	1
Total	18	Total	16

Upon graduation an Associate Degree is granted.

Rio Hondo Junior College
3600 Workman Mill Road

Whittier, California

Cloice E. Myers, Dean of Vocational-Technical Education

FIRE SCIENCE

This curriculum was developed jointly by the Curriculum Committee of the California Fire Chief's Association and the College Advisory Committee and is intended for student firemen and firemen desiring further training. A background of general education is also provided. Upon completion of the curriculum an Associate in Science degree will be awarded to the graduate.

First Year	Units	Second Year	Units
English 1A, 30, or 52	3	Public Address 1A	3
Introduction to Fire		Physics 21	4
Protections 21	3	History 7A or 7B	3
Introduction to Fire		Mechanical Drawing 50	3
Suppression 22	3	Codes & Ordinances 27	3
Fundamentals of Fire		Hazardous Materials	
Prevention 23	3	25-32	3 3
Fire Fighting Tactics 26	3	Health Education 10	2
Fire Protection Equipment		Fire Science Electives	3 3
and Systems 24	2	Electives	3
Psychology 20	2	Physical Education	<u>1/2 1/2</u>
Government 2	3		16 1/2 17 1/2
Chemistry 10	5		
Electives	2 3		
Physical Education	<u>1/2 1/2</u>		
	16 1/2 16 1/2		

Potomac Technical Institute
Interstate Highway 85 at Klumac Road
Post Office Box 1555
Salisbury North Carolina

Fire and Safety Engineering Technology is a two year program of technical education. It is designed to prepare the individual for entry level employment as a fire and safety engineering technician. The program provides a basic technical background in fire protection safety and related subjects. Technical mathematics Science and communication skills are included in the curriculum. Students are trained to identify fire and safety hazards and to propose effective measures for eliminating hazards. Specific skills are developed in many phases of the occupation.

This program is offered in full time day classes. Few students are enrolled in September of each year. Completion of requirements for the Associate in Applied Science degree requires six quarters of instruction offered in two academic years.

FIRE SAFETY ENGINEERING TECHNOLOGY

Course Title	Hours Per Week		Quarter Hours
	Class	Lab	
First Quarter			Credit
T Eng 101 Grammar	3	0	3
T Mat 101 Technical Mathematics	5	0	5
T Phy 101 Physics Properties of Matter	3	2	4
T Dft 101 Technical Drafting	0	6	2
T Fire 101 Introduction to Fire Protection Hazards	3	0	3
Second Quarter			
T Eng 102 Composition	3	0	3
T Mat 102 Technical Mathematics	5	0	5
T Phy 102 Physics Work Energy Power	3	2	4
T Dft 102 Technical Drafting	0	6	2
T Fire 102 Municipal Fire Protection	3	0	3
Third Quarter			
T Eng 103 Report Writing	3	0	3
T Fire 110 General Insurance	3	0	3
T Phy 103 Physics Electricity	3	2	4
T Chem 101 Chemistry	4	2	5
T Fire 103 Construction Codes & Material Rating	4	2	5
Fourth Quarter			
T Eng 204 Oral Communications	3	0	3
T Fire 220 Fire Fighting Strategy	3	0	3
T Fire 215 Chemistry of Flammable Materials	3	2	4
T Fire 211 Insurance Grading Schedules	3	0	3
T Fire 205 Industrial Hazards & Fire Prevention	3	2	4
Fifth Quarter			
T Soc 201 Social Science I	3	0	3
T Fire 240 Multiple Line Insurance & Rating Schedules	4	0	4
T Fire 230 Hydraulics & Water Distribution	3	3	4
T Fire 235 Inspection Principles & Practices	3	6	5
T Fire 225 Fire Protection Law	3	0	3
Sixth Quarter			
T Soc 202 Social Science II	3	0	3
T Fire 231 Sprinkler & Standpipe Systems	3	3	4
T Fire 245 Automatic Alarm & Extinguishing System	2	4	4
T Fire 216 Chemical & Radiation Hazards	3	2	4
T Fire 226 Industrial Safety & Security	3	0	3

Salem Technical Vocational Community College
 4389 Satter Drive N E
 Salem Oregon
 Director Technical Vocational Education
 Paul W. Wilmeth

FIRE PROTECTION TECHNICIAN CURRICULUM

This curriculum will provide the student with a knowledge adequate to understand the significance and implications of those procedures to be performed at the entry level of the fire protection field he selects to pursue. He will gain sufficient skills to make a desirable employee for more than one field of fire protection. Upon satisfactory completion of the Fire protection Technician curriculum an Associate in Science Degree will be awarded.

First Year

Term 1	Hours	Work	Course Title	Course No	Term Units
	Class	Lab			
	3		Introduction to Psychology	1.606	3
	3		Mathematics	4.200	3
	3		Communication	1.101	3
	2	2	The Physical World	1.616	3
	3		Introduction to Fire Protection	5.100	3
Term 2					
	3		Mathematics	4.202	3
	3		Communication Skills	1.104	3
	2	2	The Physical World	1.617	3
	2	2	Fire Apparatus and Equipment	5.102	3
	3		Blueprint Reading for Fireman	5.119	3
Term 3					
	3		Psychology of Human Relations	1.608	3
	3	2	Physical Science for Firemen	5.103	4
	3		Fundamentals of Fire Prevention	5.101	3
	3	9	Firefighting Skills	5.110	3
	3		Hazardous Materials	5.108	3
Term 4					
			Second Year		
	3	9	Firefighting Skills	5.111	3
	3		Hazardous Materials	5.109	3
	3	2	Rescue and Emergency Care	5.120	4
	3	2	Fire Department Hydraulics	5.104	4
	3		Fire Company Org. & Duty Assignments	5.112	3
Term 5					
	3		American Institutions	1.600	3
	2	2	Pump Operations and Practical Hydraulics	5.105	3
	3		Intro to Fire Dept. Administration	5.121	3
	3		Fixed Systems and Extinguishers	5.106	3
	3		Firefighting Tactics and Strategy	5.113	3
Term 6					
	3		Technical Report Writing	6.126	3
	3		Communications and Alerting Systems	5.115	
	3		Water Distribution Systems	5.107	3
	3	2	Fire Investigation	5.117	4
	3		Building Construction for Fire Protection	5.116	3

City College:
1425 Russ Boulevard
San Diego, California

San Diego Junior Colleges
Mesa College
7250 Artillery Drive
San Diego, California

Evening College
7250 Artillery Drive
San Diego, California

Provides instruction and technical training necessary to meet the requirements, responsibilities, and public safety obligations of the fire protection profession.

It prepares pre-employment students majoring in fire science for successful careers in municipal, county, state, federal and industrial fire departments. It also fits them for employment in private fire protection organizations; and in related fire protection fields.

Technical Courses Required for the
Degree or Certificate
Recommended Sequence for the Trade Extension Program

	Units		Units
Basic Fire Suppression		Engineering	
Fire Science 2, 9, 14	9	Fire Science 8, 17, 18	9
Fire Chemistry		Fire Prevention	
Fire Science 15, 3, 4	9	Fire Science 5, 6, 13,	9
		Fire Administration	
		Fire Science 7	3

Recommended Sequence for the Pre-Employment Program

First Semester	Units	Second Semester	Units
Fire Science 1	3	Fire Science 9	3
Fire Science 22	3	Fire Science 27	3
Fire Science 25	3	Fire Science 34	3
	<u>9</u>		<u>9</u>
Third Semester	Units	Fourth Semester	Units
Fire Science 5	3	Fire Science 6	3
Fire Science 23	3	Fire Science 13	3
Fire Science 28	3	Fire Science 24	3
Fire Science 38	3		
	<u>12</u>		<u>9</u>

General Education Courses Required for the Degree

(60 units are required)

Courses	Units	Courses	Units
Political Science 10	3	English 17	3
Psychology 1 or 55	3	Speech Arts 10	3
Health Education 1	2	Mathematics	3
Physical Education	2	Science	6

Recommended Electives:

Courses	Units	Courses	Units
Chemistry 2a	4	Fire Science 7	3
English 21	2	Mathematics	3

A Certificate of Proficiency in Fire Science will be issued for students completing the thirteen technical fire science courses required for the degree.

San Jose City College
2100 Moorpark Avenue
San Jose California 95114
Sidney E. McGraw
Dean of Vocational Education

FIRE SCIENCE ASSOCIATE IN ARTS DEGREE

Successful completion of the two year major qualifies the graduate for written examination required for positions in county and municipal fire departments. Courses with prefix Fire and Supervision are offered in the Extended Day only.

First Year	1st Sem	2nd Sem	Second Year	1st Sem	2nd Sem
Phys. Ed Activities	1/2	1/2	Phys. Ed Activities	1/2	1/2
English	3		Soc. Sci. 95A 95B American		
Speech		3	Hist. & Institutions	3	3
Health 11 Health Educ.	2		Soc. 10A Intro. to Soc.	3	
Health 12 First Aid & Safety		1	Fire 152A 152B Tactics &		
Psych. 94-Basic Psychology		3	Strategy	3	3
Fire 151A, 151B, Fire			Fire 153A 153B Fund. of		
Hydraulics	3	3	Prevention	3	3
Fire 154A Hazardous Mater.	3		Fire 154B Hazardous Mater	3	
Fire 155 Fire Reports		3	Super. 152 Elements of		
Fire 190 Phys. Principles		2	Supervision		2
Elective Group A, B	2		Elective Group A, B		2
Elective	2		Elective		2
	15	1 1/2 15 1/2		15	1 1/2 15 1/2

Certificate of Achievement in Firemanship

The Certificate of Achievement may be awarded to those who satisfactorily complete 30 units selected from the courses listed below and including those starred.

Health Ed. 12 First Aid and Safety	1	Fire 153B Fund. of Prevention	3
*Fire 190 Physical Principles	2	Sn 92 Effective Speech	3
*Super. 190 Elements of Supervision	2	*Fire 154A Hazardous Materials	3
*Fire 151A Fire Hydraulics	3	Fire 154B Hazardous Materials	3
Fire 151B Fire Hydraulics	3	*Fire 155 Fire Reports	3
*Fire 152A Tactics & Strategy	3	Fire 156 Company Organization &	
Fire 152B Tactics & Strategy	3	Procedures	3
*Fire 153A Fund. of Prevention	3	Soc. 101A Intro. to Sociology	3

Santa Monica City College
1815 Pearl Street
Santa Monica, California
Frederick J. Brierley, Dean of Trade and Technical Education

Fire Science

The Associate of Arts degree will be granted upon completion of 60 units in sections A and B below.

A. S.M.C.C. and State Graduation Requirements

B. Required courses (20 or more units from the following)

Fire Science 1 - Introduction to Fire Protection (3)

Fire Science 2 - Fire Company Operation and Procedure (3)

Fire Science 3 - Hazardous Materials I (3)

Fire Science 4 - Hazardous Materials II (3)

Fire Science 5 - Fire Prevention Law (3)

Fire Science 6 - Fundamentals of Fire Prevention (3)

Fire Science 8 - Fire Hydraulics (3)

Fire Science 9 - Fire Fighting Tactics and Strategy (3)

Fire Science 10- Orientation to Fire Service (3)

Fire Science 13- Fire Investigation (3)

Fire Science 14- Emergency Rescue Techniques (3)

Fire Science 15- Physical Science For Firemen (3)

Fire Science 16- Physical Science Laboratory (1)

Fire Science 17- Fire Apparatus (3)

Fire Science 18- Fire Fighting Equipment (3)

Fire Science 19- Introduction to Fire Suppression (3)

Fire Science 20- Building Construction for Fire Protection (3)

Tacoma Vocational and Technical Institute
 1101 South Yakima Avenue
 Tacoma Washington 98405
 Supervisor Bruce Brennan

Fire Science Technology

Fire Service Training is a four unit course of one and one half years duration consisting of three regular school semesters and one summer semester. Classes are in operation five days each week Monday through Friday six hours per day. Students may also enroll on a half time basis taking either a morning or afternoon class. Half-time students will require three years to complete the course.

An Associate Degree in Technical Arts is available to students who complete required academic courses at the Tacoma Community College.

Curriculum

Related Instruction	Hours
Safety and first aid	30
Oral and written communications	35
Human Relations	35
Fire service history and organization	60
Apparatus and equipment	70
Water distribution systems	15
Fire prevention	150
Fire fighting tactics	200
Fire protection equipment and systems	30
Fire hydraulics	60
Fire Science	60
Fire alarm systems and communications	20
Radiological hazards	15
Fire investigation and detection	30
Total Related Hours	810
 Practical Instruction	 Hours
Fire department equipment practices	820
Rescue evolutions	60
Portable fire extinguishers	8
Fixed fire protection systems	10
Fire alarm systems and communications	30
Radiological and hydrocarbon detection devices	16
Safe driving practices	60
Fire investigation and detection	10
Total Practical Hours	1014

WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York

SUGGESTED PROGRAM OF STUDY FOR THE ASSOCIATE IN APPLIED SCIENCE DEGREE IN
FIRE SCIENCE

NUMBER	TITLE	PRE-REQUISITE	CL.	LAB.	CR.
First Semester - Fall					
En 51	Composition and Literature		3	0	3
Ma 75	College Algebra		3	0	3
SPs61	Psychology		3	0	3
			<u>9</u>	<u>0</u>	<u>9</u>
Second Semester - Spring					
En 52	Composition and Literature	En 51	3	0	3
Ma 76	College Algebra	Ma 75	3	0	3
SPs62	Psychology	SPs 61	3	0	3
			<u>9</u>	<u>0</u>	<u>9</u>
Third Semester - Fall					
Ch 7	Introductory Inorganic Chemistry	Ma 76	3	3	4
Ph 93	General Physics	Ma 76	4	2	5
			<u>7</u>	<u>5</u>	<u>9</u>
Fourth Semester - Spring					
Ch 8	Introductory Organic Chemistry	Ch 7	3	3	4
Ph 94	General Physics	Ph 93	4	2	5
			<u>7</u>	<u>5</u>	<u>9</u>
Fifth Semester - Fall					
CT 4	Construction Methods & Materials		3	0	3
Ch 117	Fire Chemistry	Ch 8	3	2	4
FS 111	Fire Administration-Strategy & Planning		3	0	3
			<u>9</u>	<u>2</u>	<u>10</u>
Sixth Semester - Spring					
MT 116	Fluid Mechanics	Ph 94	3	0	3
FS 112	Fire Administration-Prevention and Inspection		3	0	3
			<u>6</u>	<u>0</u>	<u>6</u>
Seventh Semester - Fall					
Bu 173	Public Relations		3	0	3
FS 113	Fire Administration - Law		3	0	3
			<u>6</u>	<u>0</u>	<u>6</u>
Eighth Semester - Spring					
FS 114	Fire Administration - Supervision		3	0	3
Ch 128	Radiological Theory & Instrumentation	Ch 117	3	2	4
			<u>6</u>	<u>2</u>	<u>7</u>

State of Connecticut
Hartford State Technical Institute
401 Flatbush Avenue
Hartford 6 Connecticut
Andrew J. Flanagan Supervisor

FIRE TECHNOLOGY AND ADMINISTRATION
Five Year Evening Institute Program

The purpose of the Fire Technology and Administration program now being offered in the State Technical Institutes is to provide training on a post secondary level which will develop more competent individuals who are or will become leaders in fire protection, prevention and administration.

This program is also taught at these State Technical Institutes

Waterbury State Technical Institute
1460 West Main Street
Waterbury, Connecticut

Thomas Valley Technical Institute
574 New London Turnpike
Norwich, Connecticut

Norwalk State Technical Institute
Richards Avenue
Norwalk, Connecticut

Course of Study

First Year

1st Term Intro. to Fire Technology I
Technical Mathematics I
2nd Term Intro. to Fire Technology II
Technical Mathematics II
3rd Term Fire Dept. Organization & Management
Fire Science I (Physics)

Third Year

1st Term Fundamentals of Electricity
Technical Report Writing
2nd Term Industrial Processes & Hazards
Oral Communications
3rd Term Hydraulic Technology
Techniques of Training

Fifth Year

1st Term Fire Dept. Planning
Fire Dept. Specifications & Purchasing
2nd Term Fire Investigations
Fire Fighting Strategy
3rd Term Legal Problems of the Fire Service
Elective

Second Year

1st Term Fire Service Leadership & Psychology
Fire Science II (Physics II)
2nd Term Building Construction I
Fire Science III (Chemistry I)
3rd Term Building Construction II
Fire Science IV (Chemistry II)

Fourth Year

1st Term Water Supply & Sprinkler Sys. Economics
2nd Term Fire Prevention & Inspection
Fire Dept. Financial Administration
3rd Term Fire Insurance Principles
Elective

Electives

Public Relations for Fire Dept.
Fire Alarm & Communication Systems
Radiation Hazards & Instrumentation
Mutual Aid Seminar

It is possible that at the 1967 General Assembly the Institutes may be redesignated as Colleges

American River College
 4700 College Oak Drive
 Sacramento California 95841
 Louis Quint
 Coordinator of Vocational Education

FIRE SCIENCE

58 Introduction to Fire Protection 3 credits

Philosophy and history of fire protection history of loss of life and property by fire. Organization and function of local county state federal and private fire protection agencies survey of professional career opportunities.

66 Building Construction for Fire Protection 3 credits

Fundamental building construction and design fire protection features special considerations. Prerequisites: Fire Science 58 or 59 or employment as a fireman.

Los Angeles Valley College
 5800 Fulton Avenue
 Van Nuys, California
 Donald W. Click
 Dean of Evening Division

Orientation to Fire Service 3 Units 3142

A course designed to introduce prospective firemen to the fire service and its related agencies. History of the fire service prevention and fire insurance. An introduction to civil service related municipal agencies and national organizations. Basic information on types of companies alarm systems tools equipment and water systems.

Related Codes and Ordinances 3 Units 3141

National, State and local ordinances applicable to the fire service: electrical, plumbing, and building codes the State Fire Marshal Health and Safety code inter governmental coordination and relations.

Introduction to Fire Protection 3 Units 3140

History and evaluation of the fire department organization the role of the fire service in the community problems of the fire administrator including organization departmental functions interdepartmental relationships management of building and equipment techniques of fire fighting laws and ordinances fire prevention.

Hudson Valley Community College
80 Vandenburg Avenue
Troy, New York

G. James Patterson, Director of Extension

Fire Service Management

Certificate Available

Organization and Development of Fire Protection in
New York State
Scope of Fire Department Activities
Laws Applying to the Fire Service and Its Members
Fundamentals of Administration
Principles of Supervision and Leadership
Relationship of Fire Departments to Other Governmental
and Private Agencies
Public Relations
Fire Prevention
Fire Department Apparatus and Equipment
Training Programs.

College of the Redwoods
1040 Del Norte Street
Eureka, California 95501
William A. Stanton

Dean of Vocational-Technical Education

Fire Science

70A	Fundamentals of Fire Protection	3 units
70B	Fire Suppression	3 units
71	Fundamentals of Fire Prevention	3 units
72A	Fire Fighting Tactics and Strategy	3 units
72B	Emergency Rescue Practices	3 units
72C	Fire Apparatus and Equipment	3 units
73	Hazardous Materials	3 units
74	Equipment, Systems, Codes and Building Construction	3 units
75	Fire Hydraulics	3 units

Odessa College
Odessa Texas

P. L. Martin Dean of the Evening College

FIRE CONTROL INDUSTRIAL

The purpose of this first course is to give an up to date review of industrial fire control and fire extinguishment methods. Both classroom lectures and field demonstrations will be used extensively. It will be taught at a level so that safety personnel will benefit from the course.

Long Beach City College
Long Beach California

FIRE SCIENCE

Ser. No	Course No	Descriptive Title	Units
4107	51	Intro to Fire Protection	3
4111	52	Fire Fighting Tactics & Strategy	3
4115	54	Hazardous Materials	3
4119	55	Related Codes & Ordinances	3

State University of New York
at Farmingdale
Agricultural and Technical College
Farmingdale New York

Professor William W. Hewitt
Chairman Department of Police Science

FIRE SCIENCE

PS 260 Introduction to Fire Protection 3 cr

Philosophy and history of fire protection; history of loss of life and property by fire. Review of municipal fire defenses; study of the organization and function of Federal, State, County and private fire protection agencies. Survey of professional fire protection career opportunities.

PS 261 Introduction to Fire Suppression 3 cr

Fire suppression organization; fire suppression equipment; characteristics and behavior of fire; fire hazard properties of ordinary materials; building design and construction; extinguishing agents; basic fire fighting tactics; public relations.

Onondaga Community College
 Evening and Extension Division
 700 East Water Street
 Syracuse, New York 13210
 Edwin W. Flansburg
 Dean of Evening Division

Fire Science courses are being offered. Further development of the program is in progress.

Glendale College
 Extended Day and Adult Education
 1500 North Verdugo Road
 Glendale 8, California
 David C. Leek, Dean

Fire Science

Fire Science 1 - Introduction to Fire Protection	3 units
Fire Science 2 - Introduction to Fire Suppression	3 units
Fire Science 5 - Fire Protection Equipment and Systems	2 units
Fire Science 6 - Related Codes and Ordinances	3 units
Fire Science 7 - Fire Hydraulics	3 units
Fire Science 8 - Fire Apparatus and Equipment	3 units

Victor Valley College
Bear Valley Road
Victorville, California
Jack Seals, Professor

FIRE SCIENCE

Victor Valley College offers a Certificate of Completion in Fire Science. A Certificate of Completion is a college verification that a student has completed successfully 24 units in his specialized area.

The specific requirements for a certificate in Fire Science will be defined by the individual department.

Courses in Fire Science

Fire Science 130, Introduction to Fire Protection (3)
Fire Science 131, Introduction to Fire Suppression (3)
Fire Science 132, Fundamentals of Fire Prevention (3)
Fire Science 133, Fire Fighting Tactics and Strategy (3)
Fire Science 134, Hazardous Materials I (3)
Fire Science 135, Fire Protection Equipment and Systems (2)
Fire Science 136, Related Codes and Ordinances (3)

Antelope Valley College
3041 West Avenue K
Lancaster, California

Courses in Fire Science

Fire Science 1 - Introduction to Fire Protection. 3 units, 3 hours
Fire Science 3A- Hazardous Materials. 3 units, 3 hours
Fire Science 3B- Hazardous Materials. 3 units, 3 hours
Fire Science 8 - Fire Hydraulics. 3 units, 3 hours
Fire Science 9 - Fire Fighting Practices. 3 units, 3 hours
Fire Science 55- Physical Science for Firemen. 3 units, 3 hours

UNIVERSITY OF SOUTHERN CALIFORNIA

Special Courses for Fire Service Administration
under School of Public Administration

INTRODUCTION TO FIRE ADMINISTRATION

Fire department organization, budgeting, and planning
Personnel and equipment problems of the fire service
Interpretation of building and fire codes
Insurance rates and ratings

ADVANCED FIRE ADMINISTRATION

Departmental organization, functional duties and assignments
Training and educational programs, records and reports
Fire alarm and communication systems problems of water supply
Underwriters, grading schedule, survey

FIRE COMPANY ADMINISTRATION

Authority of the Company Officer
Care and maintenance of apparatus and buildings
The company supply problems: reports and records at company level
Public relations and fire prevention as a responsibility
of the company unit

LEGAL ASPECTS OF FIRE ADMINISTRATION

The history and background of laws relating to the fire service
Tort liability of municipalities: municipal employees and
members of the fire department
Clarification of legal terminology
Civil service laws and requirements
Pensions, mutual aid, and fire prevention codes

ARSON INVESTIGATION

How past fire investigations have influenced the present
How to detect the various kinds of arsonists and how to interrogate
a suspect
How to locate and preserve evidence and prepare a case and present
it in court.
How to coordinate the Arson Bureau with other departments

INDUSTRIAL FIRE HAZARDS

A study of plastic materials, heat treatment of metals, film manufacturing
and handling, dry cleaning plants and other hazardous industrial processes
Lectures by visiting experts on such specialized subjects as electrical
hazards and inflammable liquids, field trips through selected industrial
plants

REGULATIONS AND PRACTICES CONCERNING DANGEROUS CHEMICALS

How to administer general requirements relating to the use, processing,
storing, transportation, and disposal of hazardous materials
How to interpret the specific code provisions relating to acids, oxidizers,
compressed gases, flammable solids, explosive materials and flammable
liquids
How to apply a code with reference to industrial and university laboratories
drugs, paints, cosmetics, fumigants, refrigerants, etc.
How to prepare and submit reports, what agencies must approve, how to obtain
the required permit.

FIRE PREVENTION ADMINISTRATION

- How to organize a fire prevention bureau select and train men for the bureau
- How to administer a fire prevention bureau
- How to meet and deal with the public
- How to interpret and apply code regulations

FIRE PREVENTION INSPECTION

- An analysis of the job of the fire inspector
- Procedures and techniques of fire inspection
- Problems of public relations
- Coordination with other governmental agencies such as building departments
- Public information and education programs

Hydraulics for firemen

- How to apply principles of hydraulics to fire mains, hydrants, standpipes and water towers
- How to use the slide rule
- How to make the best hose layout
- How to compute nozzle pressures liquid pressures and the range and effectiveness of fire streams

SUPERVISORY TRAINING

- An analysis of the job of supervision
- How to break in a new employee, maintain discipline among the employees and improve efficiency
- How to increase the morale of the department reduce gossip and rumors and handle the employee's personal problems
- How to get coordination between your department and others
- How to conduct conference meetings

PUBLIC PERSONNEL TRAINING

- How to survey training needs and organize and administer a training program
- How to select and train instructors and how to motivate the trainee
- How to plan and organize teaching materials
- How to measure the effectiveness of your training

REPORT WRITING

- The scope, value, and need for good report writing in fire departments
- Correspondence practice in memos and in writing letters of complaint
- Annual or periodic reports gathering, interpreting, presenting
- Analysis and discussion of errors most commonly made in reports

A POSSIBLE ASSOCIATE DEGREE PROGRAM DESIGN

Associate of Applied Science: Fire Administration and Protection

General Subjects approx 18 units

math
chemistry
physics
English
psychology
political science
sociology

Technical Subjects approx 16 units

building codes and inspections
special hazards
strategy and tactics
insurance and grading schedules
equipment
pumps, sprinkler systems and hydraulics

Administrative Subjects approx 28 units ---

finances taxation
budgeting purchasing
law
leadership development
organization and management
cases and concerns in administration
fire prevention and public relations
human relations labor relations
fire department communications

Internship 3 units

Basic firefighting skills no credit

CALIFORNIA JUNIOR COLLEGE
UNIFORM FIRE SCIENCE CURRICULUM

for

JUNIOR COLLEGES

1. Introduction to Fire Protection (3)
2. Introduction to Fire Suppression (3)
3. Fundamentals of Fire Prevention (3)
4. Fire Fighting Tactics and Strategy (3)
5. Hazardous Materials I (3)
6. Fire Protection Equipment and Systems (2)
7. Related Codes and Ordinances (3)
8. Fire Hydraulics (3)
9. Building Construction for Fire Protection (3)
10. Fire Company Organization and Procedure (3)

Recommended electives directly related

1. Hazardous Materials II
2. Emergency Rescue Practices
3. Fire Investigators I

Recommended electives indirectly related:

1. Public Speaking
2. Physical Science
3. General Psychology
4. Typing
5. Public Relations
6. Drafting
7. Basic Accounting
8. Mid Management

SUGGESTED TOPICS FOR A TWO SEMESTER SURVEY COURSE
IN
FIRE SERVICE ADMINISTRATION

1. The Development of Fire Protection Organizations in New York State
2. The Organization and Structure of Fire Departments
3. The Nature and Scope of a Fire Department Services and Activities
4. New York State and Federal Laws Applied to Fire Departments and Their Operations
5. Fundamentals of Administration for Fire Service Personnel Including Budgeting, Specifications and Purchasing
6. General Communication Reports and Records
7. The Basic Psychology of Supervising Men
8. Increasing Personal Effectiveness as a Leader
9. Relationship of Fire Departments to Other Governmental and Private Agencies and to the Insurance Rating Organizations
10. Public Relations
11. Fire Prevention
12. Apparatus and Equipment Used by Fire Departments
13. Fire Department Training Programs
14. The Professional Fire Service Leader

Colleges, Universities and New Curricula

Rapid developments in all fields have over the last ten years increased astonishingly the requests of various groups for recognition of their educational needs in the nation's institutions of higher learning. The scope of collegiate instruction, research and service thus has expanded more since World War II than during any previous 25 year period. New publics, new programs and new policies characterize and dramatize the change. The general array of curricula and courses presented here gives simple testimony.

However, many community colleges, particularly, the senior colleges, and the graduate schools have been hard pressed to find resources, facilities and personnel to respond. At the same time they have in many places found it difficult to revise the concepts of higher education which have given direction to choice to what they will do over recent decades, not to speak of centuries. Wherein there are gaps, then, in areas or institutional types in this report, there are doubtless many and good reasons.

At the same time, one must recognize institutions of higher learning have on the whole not adapted easily to the needs of the application world, and those who would obtain recognition have not seldom found the route to approved courses and programs and degrees an easy one. Those who control most collegiate institutions, the faculties in the respected disciplines, have not yielded to a broad spectrum of petitioners without careful consideration and intensive searching. They have tended to guard jealously the limits of the subject matter appropriate and to require full evidence that competence for certain vocational and semi-professional tasks cannot be acquired under other auspices.

Albeit, the new breed of professor in institutions of higher learning is quite aware of the growing demand for higher skill, increased judgment, and more theoretical foundation for effective performance in many old and many more new areas of service. He is, as well, aware of the impact of further education upon the economic and human condition of the society. He is sympathetic to the upward reach of the technicians and the quasi-professionals and is particularly conscious of the general swell of ambition to be further educated, specially and generally, in vast numbers, not only of our youth, but of those who have but recently launched upon lifelong commitment.

Yet, the decision making bodies in most institutions rely upon relatively common reference points in acting upon requests which come to them from groups who feel the time has come for collegiate recognition. As those who would improve the fire service and would obtain collegiate cognizance of their need prepare proposals, it should be useful for them to keep in mind that

1. Generally, courses of study and curricula in collegiate institutions require a basis in theory and employ a teaching method which calls upon the intellectual processes for critical examination of this theory and for appraisal of possible alternatives in application. Although selected disciplines rely heavily upon demonstration and require the development of skills appropriate to higher order application, the usual sentiment is opposed to programs which are essentially focused upon the development of manual skills.

2. Recognition and specification of the theoretical base and emphasis upon competence in higher order intellectual skills have thus been sought by collegiate faculty in the proposals and materials presented by those who wish academic sponsorship. The stated objectives of courses and programs have been examined carefully by college curriculum committees and evidence of the level of instruction searched for in content outlines and recommended resources.
3. These items reveal in themselves the need for personnel authoritatively equipped to deal effectively with instructional level anticipated. It goes without saying that in an incipient professional group there are many with not only vocational knowledge and skills but substantial command of more esoteric and complex components of proper education of technicians and professionals. Unfortunately, such competence does not, as a rule, find acceptance in the university family. Faculties of collegiate institutions recognize the occasional lack in those who possess academic credentials in the form of degrees, but institutions of higher education seldom will compromise on their expectation to have degree holding instructors responsible for courses recognized as of collegiate quality. Those outside colleges and universities usually do not recognize this protective policy. Neither, of course, do they know that respectable and acceptable colleges are accredited and need to meet certain faculty standards before degrees will be accepted generally, and particularly for transfer to other institutions and to advanced programs. This fact of university life is indeed disturbing to some, yet there is also widespread recognition that it protects both quality and student.
4. Institutions are also concerned about the nature of the clientele to be served. After the Second World War higher educational institutions did find that thousands of G I's who had not finished high school could qualify for college attendance by examination. Since then most institutions have accepted a variety of alternatives to four year diplomas granted for high school attendance. The route is open. However, this does not mean that higher educational institutions are willing to accept those with less than capacity to do the intellectual tasks traditionally required. Programs are consequently examined in terms of what clientele is considered in the resource pool and evidence is requested with respect to the ability of prospective students to compete in studentship with those registered in other programs offered. With this naturally goes the question of the extent and of the continued sufficiency of the resource pool. Many institutions have offered courses, employed instructors, and developed courses and materials only to find that the promised volume of ambitious students was not forthcoming. Such institutions are not easily convinced subsequently of the great appetite for further education in new plaintiffs.

5. Colleges and university staffs, as a result, expect the following procedures to be used in developing proposals for their consideration.
 - a - Accumulation of sound descriptive and statistical evidence that growth in complexity and technical demand in the special field clearly call for increased numbers of those upon whom there are requirements for the use of higher order intellectual attributes.
 - b - Detailed analyses and translation of those attributes (skills, knowledge, understanding, attitudes) into terms meaningful for course of study development and program organization at the college level.
 - c - Promotion of and attainment of widespread support in voluntary organizations representative of and related to the activity; e. g., International Association of Fire Chiefs, The Society of Fire Department Instructors, State Chiefs Organization, and Fire Fighter Unions and Associations.
 - d - Intensive involvement of official bodies and units vested with the responsibility for setting qualifications, establishing certification conditions, employing and promoting personnel. e. g. Board of Control, city managers, licensure agencies, accrediting groups.
 - e - Active participation of advisory groups in further developing conditions which will insure the employment and continued growth and promotion of those educated through the programs offered.

STATE FIRE MARSHALS

<u>Alabama:</u> J. B. Kitchens Department of Insurance 400 State Administrative Bldg. Montgomery, Alabama 36104	<u>Georgia:</u> John R. Gore, Jr. State Capitol, Room 132 Atlanta, Georgia
<u>Alaska:</u> Robert Crouse, Dept. of Public Safety Box 2719 Juneau, Alaska	<u>Hawaii:</u> Sidney L. Hashimoto Dept. of Regulatory Agencies Honolulu, Hawaii
<u>Arizona:</u> G. A. Bushnell Director of Insurance 718 West Glenrosa Phoenix, Arizona	<u>Illinois:</u> William J. Cowley Div. of Fire Prevention 613 Armory Building Springfield, Ill.
<u>Arkansas:</u> Capt. William C. Stuebing Arkansas State Police P. O. Box 1751 Little Rock, Arkansas	<u>Indiana:</u> Norman M. Fesler 100 N. Senate Avenue 502 State Office Building Indianapolis, Indiana
<u>California:</u> Glenn B. Vance 1025 P Street Sacramento 14, Calif.	<u>Iowa:</u> Wilbur R. Johnson New State Office Building Des Moines, Iowa
<u>Colorado:</u> James A. Underwood Safety Inspection Div. Industrial Comm. of Colorado 150 East 13th Avenue Denver, Colorado 80203	<u>Kansas:</u> Fred R. Farr State Office Building Topeka, Kansas
<u>Connecticut:</u> Major Carroll E. Shaw Deputy State Fire Marshal Dept. of State Police 100 Washington Street Hartford, Conn.	<u>Kentucky:</u> Harold L. Foster Dept. of Public Safety New State Office Building Frankford, Kentucky
<u>Delaware:</u> William R. Favinger P. O. Box 109 Dover, Delaware	<u>Louisiana:</u> Milton Stirr 106 State Office Building New Orleans, Louisiana
<u>Dist. of Columbia:</u> Hugh A. Groves Fire Prevention Division Room 223, District Building 14th & E Sts. N. W. Washington, D. C.	<u>Maine:</u> C. F. Rogan, Acting State Director for Fire Prevention State House Augusta, Maine
<u>Florida:</u> Broward Williams State Capitol Tallahassee, Florida	<u>Maryland:</u> James C. Robertson 301 W. Preston St., Rm. 805 Baltimore, Maryland
	<u>Massachusetts:</u> Ralph L. Garrett Dept. of Public Safety 1010 Commonwealth Avenue Boston, Mass.

STATE FIRE MARSHALS
(Cont'd)

Michigan: Glenroy M. Walker, Chief
Fire Marshal Division
Michigan State Police
714 So. Harrison
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Mississippi: Walter Dell Davis, Comm.
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Montana: William A. Penttila
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Helena, Montana

Nebraska: Joseph F. Divis
State Capitol
Lincoln, Nebraska

Nevada: Richard H. Bart
Carson City, Nevada 89701

New Hampshire: Aubrey G. Robinson
Concord, New Hampshire

New Mexico: R. F. Apodaca
P. O. Drawer 1269
Santa Fe, New Mexico

New York: George H. Proper, Director
Office of Local Government
Division of Fire Safety
155 Washington Avenue
Albany, N. Y. 12210

North Carolina: N. E. Canady
Insurance Department
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Raleigh, N. C.

North Dakota: Vance Arneson
Deputy State Fire Marshal
State Capitol
Bismarck, North Dakota

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Oklahoma: Jack C. Sanders
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Oklahoma City, Oklahoma

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Salem, Oregon

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Rhode Island State Police
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South Dakota: J. P. Menning
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Pierre, South Dakota

Tennessee: Floyd M. Murphy
Dept. of Insurance and Banking
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State Board of Insurance
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Wyoming: Edwin P. Bradley
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- Alabama: W. L. Rickard
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State Training College
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Georgia Institute of Technol.
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Ames, Iowa
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- Michigan: Francois Hartman
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Fire Service Training
Public Service Institute
Penna. State Fire School
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- Rhode Island: Captain Michael Fox, State
Supvr. Fireman Training
East Providence, R. I.

So. Carolina: H. B. Wells, South Carolina State Firemen's Ass'n.
Fire Training Service
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Pasadena, California

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San Jose, California 95114

New York City Community College
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Brooklyn, New York

Cuyahoga Community College
Brownell Science and Technology Bldg.
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Cleveland, Ohio

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Rio Hondo Junior College
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Long Beach City College
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Santa Monica City College
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Salem Technical Vocational Comm. College
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Chatot College
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Hartford State Technical Institute
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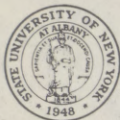
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Norwalk State Technical Institute
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INTERNATIONAL

FIRE ADMINISTRATION INSTITUTE

**Role of the International
Fire Administration Institute**

by

PROFESSOR D. F. FAVREAU

Gideon Putnam Hotel

Saratoga Springs, N. Y.

January 24, 1967

CENTER for EXECUTIVE DEVELOPMENT
STATE UNIVERSITY OF NEW YORK at ALBANY

ROLE OF THE
INTERNATIONAL FIRE ADMINISTRATION INSTITUTE

By

Professor D. F. Favreau

Presented at the

Symposium on Higher Education For The Fire Service
Gideon Putnam Hotel
Saratoga Springs, N. Y.
January 24, 1967

It is most gratifying to see executive representatives from coast to coast - border to border - and Canada - take time from their busy schedule to journey here to Saratoga - sitting down around the conference table - freely exchanging ideas and information related to the higher educational goals and professional aspirations of the fire service.

I'm delighted to have this opportunity to acquaint you with the ever increasing role of the International Fire Administration Institute in meeting the educational challenge of the Sixties.

At the New Orleans convention of the International Association of Fire Chiefs held in 1957 a motion was passed calling for the creation of an educational institute which would be concerned with professional, educational development of fire service personnel.

On June 27, 1958 the International Fire Administration Institute, sponsored by the International Association of Fire Chiefs, was incorporated by the Board of Regents of the University of the State of New York.

The Center for Executive Development at the State University

of New York at Albany was established in 1963 for the purpose of focusing the efforts of an interdisciplinary team of scholars from the several schools of the University upon the nature and sources of executive behavior and upon ways to improve the administrative process. The Center for Executive Development is concerned primarily with (A) conducting research upon the generic aspects of upper level administration (B) facilitating the presentation of upper level organizational problems to the University (C) applying appropriate University resources to particular concerns in the fields, and planning and promoting a variety of programs to aid in the development of executives in public service, business and industry, and in the other key institutions of the community.

In 1964 the International Fire Administration Institute affiliated with the State University of New York at Albany and The Center for Executive Development. This affiliation has enabled the Institute to broaden considerably the scope of its activities and to utilize the resources of a multi-purpose university which has long been concerned with developing administrative leaders. The Executive Offices of the Institute are located on the campus of the State University.

The objectives of the Institute are:

- 1) To engage in research and otherwise obtain material for the preparation of courses of study in fire administration and subjects related thereto, and to prepare such courses of study.

- 2) To make such material and courses of study in fire service administration and subjects related thereto available for use by educational institutions, particularly at the college level, in the United States and foreign countries, and to work with and assist educational institutions in the development of such material.
- 3) To give assistance by grants or establishment of scholarships, or otherwise, to students in the field of fire administration; and to receive funds, grants and gifts for carrying out the objectives of the Institute.

The continuing success of an organization regardless of its type or goal is determined primarily upon the caliber and performance of its staff - - particularly its management staff, both as individuals and as contributing members of the organization. It is becoming increasingly apparent today that education may well be a life long process, that dynamic conditions require that "professionals" constantly seek new techniques and new attitudes.

The Institute has conducted numerous workshops, seminars and conferences for fire service executives throughout the United States, Canada and Latin America. These educational programs are designed to:

- 1) Develop the executive fire officer's ability

- and decision making skills.
- 2) To achieve an awareness of the elements of organizational leadership.
 - 3) To acquire an understanding of the economic and social forces which affect the Fire Department organization.
 - 4) To develop an insight in human behavior and interpersonal relationships.

A comprehensive Personnel Development Program with a focus on three organization levels of the Fire Department, namely, Basic Management Training for Company Officers, Middle Management and Executive Development Programs for Chief Officers is under development. Emphasis will be placed on: Development of Supervisory Skills, Principles of Sound Organization, Organizational Communication, Job Instructor Training, The Management Process, Understanding Human Behavior, Leadership and Motivation, Community Relations, Administrative Vitality, Executive Behavior and Human Relations, Decision-Making, Political, Economic, and Social Trends and Problems.

The International Fire Administration Institute carries out basic and applied research in the areas of leadership and executive behavior, prepares and publishes material in these areas.

A research project now underway under the sponsorship of the Institute will attempt to: properly identify the scope of performance and responsibility assigned to the several officer ranks of the fire service. First, an extensive review of literature has been undertaken to focus on the breadth of knowledge requisite for fire

department personnel of officer rank. The conclusions reached from this approach deal with broad generalities and do not significantly isolate the specific body of knowledge essential to individual position classification; nor does the literature particularly exemplify responsible areas based on the size and type of fire service activity.

The second phase of this research study is designed to fill the void areas created by phase one. The present approach is to move directly into the nation's fire departments for a specific determination of duties, functions and activities performed by fire officer positions. The anticipated benefit of this technique is the establishment of composite educational needs at the various organizational levels.

The International Fire Administration Institute will submit shortly for review and funding a research proposal titled "An Occupational Analysis and Appropriate Curriculum Standard for Fire Science Technology."

The proposed study will seek to specify further the occupational skills and knowledge requirements which are presently found to be essential and which are definitely to be anticipated by those who bear responsibilities for the preservation of life and property from loss by fire. It will also seek to characterize and describe in detail the objectives, material and procedures appropriate to a proposed curriculum focused upon fire protection and related technologies in a post high school instruction program. It will

in addition attempt to try out and critically appraise in institutions with programs of fire prevention and protection training.

The project has four major objectives:

- 1) To specify more precisely the essential skill and knowledge requirements of a cluster of technological fire protection occupations.
- 2) To clarify objectives and to develop materials and instructional resources for courses of study in a pilot program of Fire Science Technology.
- 3) To assess the usability and appropriateness of the curriculum for the training and education of fire fighters.
- 4) To promote and develop a set of curriculum guides, revision of existing educational provisions in the light of changes made as a result of the pilot study.

Other research endeavors under consideration by the Institute will focus on: anxiety, interpersonal behavior, organization stress, recruitment and selection of personnel, development of broad gauged managerial personnel, alcoholism and professionalization. The latter "professionalization" is a vital and provocative issue facing many organizations in the world of work. Leonard Silk's article in The Education of Businessmen suggests four criteria for

defining a "profession".

- 1) A profession should rest on a systematic body of knowledge of substantial intellectual content and on the development of personal skill in the application of this knowledge to specific cases.
- 2) It must set up standards of professional conduct which take precedence over the goal of personal gain.
- 3) It should have an association of members, among whose functions are the enforcement of standards, and the advancement and dissemination of knowledge.
- 4) It should prescribe ways - controlled in some degree by the members of the professional association - of entering the profession by meeting certain minimum standards of training and competence.

Therefore, gentlemen, if members of the fire service are to attain the status of professionals they must engage in more informative and scientific research - through research, through a systematic and deliberate educational program leading to a broad knowledge base which is acceptable to the academic community is the surest approach to professionalization.

Last February the Institute's staff actively participated

at the Wingspread Conference on Fire Service Administration, Education and Research. Twelve statements of national significance were formulated at Wingspread for the purpose of providing guidelines for subsequent exploration and research.

I believe of particular concern to this Symposium are four Wingspread statements:

- o Unprecedented demands are being imposed on the fire service by rapid social and technological change.
- o The scope, degree and depth of the education requirements for efficient functioning of the fire service must be examined.
- o The career development of fire executives must be systematic and deliberate.
- o Professional status begins with education.

The Institute's new publication entitled "Fire Science Technology Curricula Survey", compiles a selected sampling of Fire Science programs being offered by some thirty colleges and universities. The document also points out certain difficulties which may be encountered in the development and implementation of Fire Science programs.

The Institute's staff consults with fire organizations, universities and colleges interested in implementing educational courses and degree programs in fire science technology and administration throughout the world.

If one tries to characterize today's world, it is an era of change, explosive change, subtle change and whether we like it or not, all of us resist change. The entire fire protection field is being challenged. We are in the midst of transition which has resulted in a knowledge explosion. In my opinion, fire executives are not born, they are made either through the school of hard knocks or through a formal, systematic and deliberate plan of developmental action. Unfortunately, graduates of the former school are too old to work.

I truly believe that if today's fire officers are to successfully guide human and physical resources into dynamic organization units which achieve their goals to the satisfaction of those served with a high degree of morale on the part of those rendering the service must, in addition to being technically competent, be conceptually, perceptually and administratively competent.

Thank you.

Any further questions, gentlemen? Thank you ever so much, Mr. O'Brien and Chief Gratz. We appreciate your coming.

Our next witness is Mr. Laurence Duhrkoop, Fire Protection Coordinator, U.S. Navy, Department of Defense.

Mr. RUMSFELD. I am having trouble hearing, Mr. Chairman.

Mr. DADDARIO. Mr. Duhrkoop is here as a replacement for Mr. Clarence F. Castle, who was to have appeared and Mr. Castle is Director of the Real Property Maintenance Staff, Office of the Deputy Assistant Secretary of Defense.

We will be happy to hear your statement, Mr. Duhrkoop.

Mr. DUHRKOOP. It is a fairly long one.

Mr. DADDARIO. We would hope that you could sort of summarize it and we will place it, intact, into the record. But proceed anyway you like.

Mr. DUHRKOOP. Yes, sir, Mr. Chairman.

STATEMENT OF CLARENCE F. CASTLE, DIRECTOR, REAL PROPERTY MAINTENANCE STAFF, OFFICE OF THE DEPUTY ASSISTANT SECRETARY OF DEFENSE, PRESENTED BY LAURENCE DUHRKOOP, FIRE PROTECTION COORDINATOR, U.S. NAVY, DEPARTMENT OF DEFENSE

Mr. DUHRKOOP. I think I will go into the policy of the Department of Defense as set forth in the Department of Defense Instruction No. 4165.2, a copy of which is attached to this statement. It is designed to provide fire prevention and protection services at all installations to prevent loss of life and property from fire in a manner consistent with sound fire prevention and protection engineering principles.

The policy further provides that—

Structural firefighting services will be accomplished with minimum facilities commensurate with total fire losses; and crash firefighting and rescue activities will be accomplished to achieve maximum safety to personnel and aircraft. The installation of automatic sprinklers or other fire protection aids will be considered where economically justified. Firefighting services available from municipalities and other governmental fire departments will be given full consideration as augmentation to defense installation facilities in the interests of economy and efficiency. At inactive and standby installations, maximum use will be made of maintenance and caretaking personnel as auxiliary firefighters to fill assigned positions in the fire department.

Fire prevention inspections of buildings, facilities, and areas; and inspection of fire protection equipment and systems, will be performed by technically qualified personnel.

Fire loss reports will be analyzed as to the cause and factors contributing to the loss, and determination made of appropriate corrective action required to prevent similar incidents.

In implementation of the Department of Defense policy stated above, the policies and standards governing installation of automatic sprinkler systems, automatic and manual fire alarm systems, and exterior fire reporting facilities are set forth in Department of Defense Instruction 4165.18, subject: "Installed Fire Protection Systems," copy of which is attached to this statement.

The provisions of this instruction apply to existing facilities and new construction at all installations under control of the military departments in the continental United States and overseas, and in occupied areas when considered appropriate by the military departments.

The policy states that installed fire protection systems to establish proper safeguards against loss of life and property by fire, will be provided in accordance with sound fire protection engineering practices to assure an optimum degree of fire protection consistent with the mission, risk involved, and economical utilization.

Factors to be considered when providing automatic sprinkler systems and fire alarm systems are stated in the instruction. Installed fire protection systems are installed in buildings and facilities to assure the maximum degree of safety to life or to reduce the fire loss potential to property where the type of construction and/or the occupancy is combustible by providing automatic means for extinguishment and detection of fire.

Mr. DADDARIO. When you say "in accordance with sound fire protection engineering," do you mean fire protection equipment as specified by the manufacturers?

Mr. DUHRKOOP. Actually when we said in consonance with sound fire protection principles, we were speaking of nationally recognized standards.

Mr. DADDARIO. There comes through in all of these hearings that there are not enough people who can qualify to give such engineering information and that we are, in fact, relying heavily on what the manufacturer claims its equipment will do.

Mr. DUHRKOOP. What we have done in DOD and in the three services and I am well acquainted with what has been done in the Navy, we have taken established standards that we can use, put them in our design manuals and published them to the field. We follow those instructions. The thing that might exist, this thing about not being able to get enough background, it may be that other organizations may not have the capability to get the information together and get it published.

Mr. DADDARIO. When Dr. Astin testified last week, he clearly explained the need for building models in which fires could be started and where under these conditions you could come to some better judgment about handling fires, rather than to take a building and burn it down in a one-shot venture or to learn by experience alone.

It would appear to me that you could not really get the kind of sound engineering advice unless you were able to build up through research the type of equipment and information so that you could say that you, in fact, had sound advice about equipment and materials.

I would imagine that there is a great deal that we don't know about how combustible materials worked in conjunction one with the other.

The members of this committee have just gone through hearings on the Apollo accident. What we learned and the experts learned about combustible materials separate and combined, was quite amazing from the standpoint of the lack of knowledge that there was about the combinations of combustible materials, not only that, but how combustible materials reacting to fire in small pieces and in larger lots, varied to a greater and more considerable extent than they had ever contemplated.

Mr. DUHRKOOP. That is correct. The only thing I can relate it to is that the engineering practice now being followed is based on an examination of thousands of fires, recorded results, performance of equipment. And the fire behavior patterns within a pretty wide range of buildings, as you suggested, probably there is a need for additional study to attack the fire behavior problem from all angles. It would be quite an extensive program.

Mr. DADDARIO. These manuals that you refer to are extremely inclusive and they do spell out exactly what to do under every set of circumstances.

Mr. DUHRKOOP. Yes, they are available in the Department of Defense and the different military departments.

Mr. DADDARIO. Is Chief O'Brien here or Chief Gratz?

Mr. DUHRKOOP. No, I believe they left.

Mr. DADDARIO. We can ask them. I am sure they are available. I wonder what use is made of these by civilian fire departments?

Mr. DUHRKOOP. I am not sure, but every once in a while I answer requests for manuals that we have out. We refer them to the Government Printing Office. They are available for purchase by outside agencies.

Mr. DADDARIO. Have you at any time gathered statistics to see how the Government Printing Office sales are doing in any of these areas?

Mr. DUHRKOOP. No, sir; I have never had occasion to do it. They have a lot of other information there that is not necessarily military.

Mr. DADDARIO. Fine, please proceed.

Mr. DUHRKOOP. Department of Defense Instruction 4165.17, subject: "Report of Fire Loss Experience Within the Department of Defense" establishes a uniform requirement for reporting fire losses and accumulating fire-loss experience within the Defense Department. This information is to be a source of current data on fire losses for use in developing and effectuating Department of Defense policies, plans, and programs with reference to fire prevention and protection activities. This instruction applies to all incidents involving fatalities or injuries to personnel, or damage to property by fire at and including—

Installations and facilities under the control of the military departments.

Facilities under construction including Government-furnished materials.

Damage to Government-owned supplies, materiel, machine tool and production equipment in privately owned plants.

The annual report furnished includes fire-loss data separately for the three categories listed above; each category subdivided into the

fire losses occurring at installations and facilities in the continental United States and overseas commands, and will include—

A tabulation showing by cause the number of accidents, total losses, injuries, and fatalities sustained.

A brief narrative report of each fire incident involving loss of life and/or damage exceeding \$50,000, to include nature and occupancy of facility, cause, contributing factors, extent of damage and loss. Other pertinent factors, such as indications of deficiencies, applied and potential corrective actions, type of construction, size, availability, and effective operations of fire-extinguishing systems.

Fire incidents involving fatalities to personnel and major incidents involving damage to property at military installations are carefully reviewed and with the military departments with a view of keeping the fire prevention and fire protection program of the Department of Defense current at all times.

In connection with new construction and alterations to existing facilities, regulations now require that fire safety shall receive maximum consideration in all aspects of planning and design and arrangement of heating, electrical, and other utility equipment. Noncombustible interior finishes are employed to the greatest extent practicable and adequate means of exit are provided for each living unit to afford prompt and unobstructed egress.

Mr. DADDARIO. Could you provide for the record the effective date when each of the Department of Defense instructions listed here become effective?

Mr. DUHRKOOP. Yes, sir; the date is on the attached instructions.

Mr. DADDARIO. All right, fine.

Mr. DUHRKOOP. The date is on each one of them.

Department of Defense Instruction 4270.14, subject: "Standards and Criteria for Construction—Fire Protection for Installed and Stored Critical Materiel," copy of which is attached to this statement, sets forth the basic construction standards and criteria for providing optimum fire protection for certain installed and stored critical materiel. This instruction applies, but is not limited to, the following types of buildings housing significant amounts of critical materiel such as—

Buildings for housing installation of special training devices and equipment such as flight simulators, Link trainers, celestial navigation trainers, CIC installations, gunnery trainers.

Buildings for housing of electronics, radio, radar, sonar, photographic, optical, or other similar types of equipment used for operational purposes, training, or manufacture, assembly, and/or repair. This type shall include electronic computers and weapons fire-control equipment.

Buildings for storage of training devices and other equipment as listed above, flyaway kits, aircraft engines, and similar vital spare parts and components.

The military departments have issued regulations and manuals which set forth fire-protection criteria for the design, construction, maintenance, and operation of structures and facilities which regulations implement the Department of Defense policies, standards, and criteria.

Where criteria and standards appearing in technical texts issued by governmental agencies, engineering and architectural groups, building and material associations are suitable and applicable to the military departments, such criteria and standards are used.

Modern large-scale operations and processes, upon which the economic welfare and national defense are dependent, present concentrations of facilities which are conducive to major losses of life and property by fire. In order to assure safety to personnel, to protect critical materials and facilities from fire damage, and to assure continuity of critical and strategic operations, fire-protection engineering provisions are incorporated as basic elements in design and construction.

Commercial and industrial fire-protection practices, which have been proven economically sound by long experience, are used as guides for fire protection of the Defense Establishment except where specific Department of Defense or military department criteria are required. Consideration is given to those cases where the risk may be less by reason of types of occupancy, maintenance of continuous watches, available firefighting equipment and personnel, fire-reporting systems, military control, and discipline.

The Department of Defense policy provides that structural firefighting services will be available at all installations. Aircraft firefighting and rescue fire services will be provided, based upon the nature and mission of flying activity of the installation concerned. Structural and aircraft firefighting and rescue services are equipped, manned, and cross-trained to be mutually supporting.

In fiscal year 1966, military departments and defense agencies reported 25,604 personnel were engaged full time in structural and aircraft firefighting activities at a cost of over \$127 million. The resident and nonresident population of the military departments worldwide in fiscal year 1966 amounted to 5 million.

The Department of Defense real and personal property as of June 30, 1966, was valued in excess of \$183 billion. Of this amount, the real property, buildings, land and improvements thereon, under the control of the military departments, was valued at \$38 billion, equipment and supplies in the supply system at \$37.7 billion; and plant equipment at \$10.7 billion; the remainder, \$96.6 billion, largely represents weapons and other military long-life equipment such as ships and aircraft in use. The values reflected in the report represent acquisition costs which are often substantially below current replacement values.

In fiscal year 1966, the military departments reported a worldwide fire loss to buildings, supplies and materiel amounting to \$10,765,053; of which \$5,996,413 occurred in the coterminous United States. The Department of Defense fire loss is reviewed in relation to nationwide experience. The data may not be too meaningful in view of the larger than 200 million population of the Nation and the national annual fire loss of \$1.5 billion. However, the major fires in the Nation which involve extensive loss of property or life are analyzed in order to take advantage of any lessons presented by these incidents.

Mr. DADDARIO. Analyzed by whom?

Mr. DUHRKOOP. The DOD and military departments by people like myself who are responsible for fire protection programs in our various departments.

Mr. DADDARIO. Is it an extensive group office?

Mr. DUHRKOOP. Yes. NFPA puts out a quarterly fire journal with real fine reports on investigation of fires. We look at them because if we can find a similar situation in our military situation, we apply it.

Mr. DADDARIO. And you have and do?

Mr. DUHRKOOP. Yes.

The military departments reported 85 deaths due to fire in fiscal year 1966. This is considered abnormal as 53 contractor employees lost their lives in a missile silo fire on August 9, 1965. In the previous 10-year period, fiscal year 1956 to fiscal year 1965, the average loss of life was 28 per year and the average property loss amounted to \$17 million per year.

In connection with research, the Department of Defense is cognizant of those programs conducted by the recognized testing laboratories such as the Underwriters' Laboratories, Inc., and Factory Mutual Engineering Division, etc.

The systems and materials developed through this research are, for the most part, equally usable by the Department of Defense as well as by others in the commercial, industrial, and public fields. Fire research in the Defense Establishment is generally directed toward prevention, detection, and extinguishment of fires which are peculiar to the military because of their particular missions, modes of operation, or the weapons and materials which they use.

The funds now supporting this effort are used by the military department in-house laboratories in the development of firefighting agents such as high expansion foams and the development and evaluation of techniques and systems for extinguishing fires including shipboard and aircraft crash fires. Other programs include the development of fire resistant materials and treatments to increase the fire resistance of available materials such as clothing for firefighters and aviators, tents, and a large variety of materials used where fire may become a hazard.

[Department of Defense Directive, No. 4165.2, Oct. 15, 1954]

OBJECTIVES AND POLICIES RELATING TO THE REAL PROPERTY MAINTENANCE AND UTILITIES OPERATION PROGRAM

I. PURPOSE

This Directive establishes Department of Defense objectives and policies governing the maintenance of real property and the operation of utilities.

II. APPLICABILITY

This Directive is applicable to the military departments. Copies of departmental regulations implementing this Directive will be furnished to the Assistant Secretary of Defense (Properties and Installations).

III. PROGRAM OBJECTIVES

A. To maintain in the most economical manner all active real property to a standard which will prevent deterioration beyond normal wear and tear, and inactive facilities to a standard commensurate with reactivation requirements.

B. To accomplish alteration, addition and other modifications to existing facilities, and minor new construction, as necessary to provide essential facilities for changes in mission or other circumstances which preclude programing under normal construction budget procedures.

C. To conserve natural resources through efficient land and forestry management.

D. To provide fire prevention and protection services at all installations to prevent loss of life and property from fire consistent with sound fire prevention and protection engineering principles.

E. To furnish refuse handling and disposal, insect and rodent control, packing and crating of household goods and organizational equipment, and custodial services efficiently and economically.

F. To furnish utilities services as required to accomplish missions assigned to military and industrial facilities under operating policies insuring conservation of such services.

G. To formulate and maintain a maintenance program which will accurately reflect the backlog of essential maintenance.

H. To provide management and engineering services to insure the most effective and economical operation of all program activities.

IV. POLICIES

A. General

Supervisory improvement programs aimed at improved management and supervision of maintenance and utilities operations activities, will be initiated and/or continued. Particular emphasis will be placed on effective use of budget, cost, operating, property and fiscal information at all levels.

B. Standards of Maintenance

1. Facilities to be used more than ten years will be maintained as necessary to preserve the asset and assure its most economical and efficient usefulness for an indefinite period.

2. Facilities to be used from three to ten years will be given maintenance consistent with the projected useful life of the structure or program to which it is related.

3. Facilities to be used for less than three years and only to meet a temporary demand shall be maintained to the minimum acceptable standard without jeopardizing the health and safety of personnel or seriously impairing the accomplishment of the mission.

4. Inactive facilities in mobilization plans will be maintained to the extent necessary to insure weather tightness, structural soundness, protection against fire and erosion, and as necessary to permit reactivation in period prescribed. Lay-up measures as appropriate for proper protection of the property will be applied to these facilities.

5. Maintenance will be programmed to permit orderly and economical accomplishment. Recurrent work such as painting will be scheduled on a cycle basis. Replacement materials which are more durable and provide longer life may be substituted for original materials provided the economic justifications are sufficient to warrant the increased cost.

6. To the extent that maintenance falls short of the standards established above, a list of those projects which must be deferred will be maintained in sufficient detail to clearly reflect the characteristics of the item and estimated cost of accomplishment.

C. Preventive Maintenance

Programs of preventive maintenance will be established and executed to the extent that this method effectively and economically assists in accomplishing the maintenance mission.

D. Utilization of Facilities

The activities of the installation will be concentrated in a minimum number of facilities to economize on maintenance and conserve utilities. Periodic review of the activities of the installation will be made to insure that only the minimum number of facilities required are being utilized.

E. Modifications and Minor New Construction

Accomplishment of minor new construction, alterations, and other modifications of real property, will be restricted to that necessary for providing essential facilities required for the assigned mission. This type of work will be authorized only when urgent requirements exist as a result of changes in mission or other circumstances which preclude programming under normal construction budget procedures.

F. Conserving Natural Resources

Management practices as necessary to conserve the land and forestry resources will be utilized. Provision will be made for protection against forest fires, reforestation as applicable, and other forestry management. Military lands not actively used in the current military mission will be maintained in accordance with the requirements of DOD Directive 4165.6, dated 5 July 1952.

G. Services

1. Structural fire fighting services will be accomplished with minimum facilities commensurate with total fire losses; and crash fire fighting and rescue activities will be accomplished to achieve maximum safety to personnel and aircraft. The installation of automatic sprinklers or other fire protection aids will be considered where economically justified. Fire fighting services available from municipalities and other governmental fire departments will be given full consideration as augmentation to defense installation facilities in the interests of economy and efficiency. At inactive and standby installations maximum use will be made of maintenance and caretaking personnel as auxiliary fire fighters to fill assigned positions in the fire department.

2. Fire prevention inspections of buildings, facilities, and areas; and inspection of fire protection equipment and systems, will be performed by technically qualified personnel.

3. Fire loss reports will be analyzed as to the cause and factors contributing to the loss, and determination made of appropriate corrective action required to prevent similar incidents.

4. Custodial services, packing and crating of household goods and organizational equipment, insect and rodent control, and refuse handling and disposal will be accomplished in accordance with acceptable business and engineering methods.

E. Utilities

1. Positive programs for conservation of utilities services will be initiated and continued to insure that usage does not exceed actual requirements.

2. Utilities services will be purchased from existing commercial systems where economically possible in lieu of construction or expansion of Department of Defense installations. Utilities maintenance practices will receive continued analysis with a view toward accomplishment by the most economical means. Maximum use will be made, on a cross servicing basis, of all government owned, or operated utilities.

3. Utility maintenance programs will be established consistent with accepted engineering standards and practices. Standby, emergency, or alternate facilities will be installed and maintained only as necessary to meet departmental emergency operational requirements. Heating plants, cold storage and refrigeration plants, and pumping plants, will be automatically controlled wherever practical.

V. EFFECTIVE DATE

This directive is effective immediately.

C. E. WILSON,
Secretary of Defense.

[Department of Defense Instruction, No. 4165.17, June 17, 1955]

REPORT OF FIRE LOSS EXPERIENCE WITHIN THE DEPARTMENT OF DEFENSE (DD-P&I(A)209)

Reference: DOD Directive 4165.2, "Objectives and Policies Relating to the Real Property Maintenance and Utilities Operation Program", October 15, 1954.

I. PURPOSE

The purpose of this Instruction is to establish a uniform requirement for reporting fire losses and accumulating fire loss experience within the Defense Department. This information is to be a source of current data on fire losses for use in developing and effectuating Department of Defense policies, plans and programs with reference to fire prevention and protection activities.

II. APPLICABILITY

A. This Instruction applies to all incidents involving fatalities or injuries to personnel, or damage to property by fire at and including:

1. Installations and facilities under the control of the Military Departments.
2. Facilities under construction including Government-furnished materials, financed from appropriations for construction or maintenance.
3. Damage to Government-owned supplies, materiel, machine tool and production equipment in privately-owned plants.

B. Excluded from this Instruction:

1. Fire losses in:
 - a. Officially-designated combat zones.
 - b. River, Harbor and Flood Control projects under the jurisdiction of the Secretary of the Army.
2. Damage to buildings, equipment, fatalities and injuries resulting from explosion originating in the manufacture, processing and storage of ammunition, incendiary material or explosives, unless the building and/or equipment are further damaged by an ensuing fire.
3. Fire losses where restitution has been made by reimbursement or replacement under the legal obligations of individuals, contractors, custodians or by insurance.
4. Aircraft and motor vehicles damaged incident to their operation or loss of life in connection therewith.

III. REPORT

The report will include fire loss data separately for the three categories listed in Section II, Paragraph A, each category subdivided into the fire losses occurring at installations and facilities in the continental United States and overseas commands, and will include:

A. A tabulation showing by cause the number of incidents, total losses, injuries, and fatalities sustained.

B. A brief narrative report of each fire incident involving loss of life and/or damage exceeding \$50,000, to include nature and occupancy of facility, cause, contributing factors, extent of damage and loss. Other pertinent factors, such as indications of deficiencies, applied and potential corrective actions, type of construction, size, standard plan identity, availability and effective operation of fire protective features, etc., will be indicated to the extent practicable.

IV. REPORTING AGENCIES

This report will be prepared by each Military Department. The Department of the Navy will be responsible for reporting the fire losses at Marine Corps installations. Reports on facilities under construction, in accordance with Section II, Paragraph A. 2., will be prepared and submitted by the Department responsible for accomplishment of construction.

V. DUE DATE

This report will be prepared annually commencing with Fiscal Year 1955 and submitted in quadruplicate to the Office, Assistant Secretary of Defense (Properties and Installations) not later than 1 December of the following Fiscal Year.

VI. IMPLEMENTATION

Information currently being received by the Departments regarding fire loss data shall be used as a basis for submitting the required report. It is recognized that special problems exist with regard to reporting of fire losses involving Government-owned supplies, material, machine tools and production equipment in privately-owned plants. The Office of the Assistant Secretary of Defense (Properties and Installations) will cooperate with the Military Departments in the solution of such problems. In any event, information required for this category will be submitted in the report for Fiscal Year 1956.

VII. REPORT CONTROL SYMBOL

Report control symbol (DD-P&I(A)209 is assigned to this report.

VIII. COPIES OF IMPLEMENTING INSTRUCTIONS

Two copies of any implementing instructions prepared by the Military Departments will be forwarded to Office, Assistant Secretary of Defense (Properties and Installations) after issuance.

FRANKLIN G. FLOETE,
Assistant Secretary of Defense,
(Properties and Installations.)

[Department of Defense Instruction, No. 4165.18, Mar. 9, 1965]

INSTALLED FIRE PROTECTION SYSTEMS

Refs.:

(a) DoD Directive 4165.2, "Objectives and Policies—Real Property Maintenance and Utilities Operation Program," October 15, 1954

(b) DoD Directive 7040.2, "Program for Improvement in Financial Management in Area of Appropriations for Acquisition and Construction of Military Real Property," January 18, 1961.

(c) DoD Instruction 4165.18, subject as above, July 27, 1955 (hereby cancelled).

I. PURPOSE

This Instruction implements reference (a), and outlines Department of Defense policies and standards governing installation of automatic sprinkler systems, automatic and manual fire alarm systems, and exterior fire reporting facilities.

II. APPLICABILITY

Provisions of this Instruction apply to existing facilities and new construction at all installations under control of the Military Departments in the continental United States and overseas, and in Occupied Areas when considered appropriate by the Military Departments.

III. CANCELLATION

Reference (c) is hereby superseded and cancelled.

IV. STATEMENT OF POLICY

Installed fire protection systems, to establish proper safeguards against loss of life and property by fire, will be provided in accordance with sound fire protection engineering practices to assure an optimum degree of fire protection consistent with the mission, risk involved, and economical utilization. The factors to be considered when providing automatic sprinkler systems and fire alarm systems are stated in Section VI. Types of installed fire protection systems required will be governed by the following principles:

A. Automatic Sprinkler Systems

Automatic sprinkler systems are installed in buildings and facilities to assure the maximum degree of safety to life or to reduce the fire loss potential to property where the type of construction and/or the occupancy is combustible by providing automatic means for extinguishment and detection of fire.

B. Automatic Fire Alarm Systems

Automatic fire detection and alarm systems are installed in buildings where safety to life and need for early detection and notification of fire are of principal concern, and in buildings which would normally require automatic sprinkler systems but where conditions and circumstances make such installations impracticable.

C. Manual Fire Alarm Systems

Manual fire and evacuation alarm systems are installed in buildings where the primary concern is to provide means for notifying occupants of fire.

D. Exterior Fire Reporting Systems

Exterior fire reporting facilities are installed in occupied areas of installations to provide means for manually reporting fires.

V. STANDARDS

A. Automatic Sprinkler Systems

Automatic sprinkler systems are authorized for installation in:

1. Hospital buildings and other medical facilities of combustible construction occupied by patients, and:
 - (a) Where construction or occupancy of other buildings of a hospital group are such as to create a fire hazard to areas used by patients.
 - (b) In buildings which constitute severe fire exposure to the hospital group.
 - (c) In certain areas of fire-resistive and noncombustible hospital buildings depending on the amount and nature of combustible and hazardous material.
2. Buildings of combustible construction used for:
 - (a) Confinement of military prisoners.
 - (b) Barracks and quarters of abnormally large area or three stories or more in height.
3. Warehouses, sheds (including transit and pier sheds) and similar storage type buildings containing materials, flammable liquids, or supplies of a critical nature, of severe fire hazard, of high monetary value or of vital importance.
4. Pier substructures or wharves of combustible construction.
5. Technical, industrial and commercial type buildings, including hangars, shops and laboratories, used for production, repair, experimental, testing, electronic, overhaul facilities, or other processes, services or equipment of a critical nature, of severe fire hazard, of high monetary value or of vital importance.
6. Combustible administration, training and community buildings including morale, welfare, recreational, and school facilities.
7. Windowless and underground structures when the combustibility of the contents, or life-safety features, warrant the protection.
8. Areas of buildings of noncombustible or fire-resistive construction where combustible materials are stored, and where such areas are separated by fire partitions from the unsprinkled area.

B. Automatic Fire Alarm Systems

Automatic fire detection and alarm systems are authorized for installation in:

1. Buildings, for protection of life, or in isolated and/or important facilities where automatic sprinkler protection would normally be provided but is not economically or technically feasible.
2. Combustible buildings used for the confinement of military prisoners where automatic sprinklers, normally provided, cannot be made available.
3. Combustible buildings of hospital groups and specific areas of noncombustible buildings of hospital groups, where automatic sprinklers are not provided.
4. One and two-story combustible dormitory type living quarters, including male and female bachelor officers' quarters, guest-houses, nurses' and doctors' quarters, civilian dormitories, and similar buildings used for sleeping purposes.

C. Manual Fire Alarm Systems

Manual fire and evacuation alarms are authorized for installation in:

1. Barracks, dormitories, bachelor officers' quarters and similar sleeping quarters, involving 20 or more persons not otherwise provided with automatic fire detection alarms.
2. Combustible buildings used for confinement of military prisoners, not otherwise provided with automatic sprinkler or automatic fire protection systems.
3. Buildings involving personnel occupancy such as administration, clubs, schools, classrooms, hospitals, laboratories, industrial, and similar structures. Normally, such buildings having an occupancy of 20 or more persons will be provided with this type of alarm system.

D. Exterior Fire Reporting Facilities

Exterior fire reporting systems of either telegraphic or supervised telephone type are authorized for installation in built-up areas at military installations. The type of system selected for use shall be established on the basis of dependability, initial cost and ability to maintain the system in operating condition. Extensions of fire reporting systems will require consideration of compatibility with existing equipment. Fire reporting facilities will not be provided at isolated small areas, ammunition and ordinance storage and similar restricted areas where personnel are not generally present to detect fires.

E. Transmission of Alarms

1. Automatic sprinkler systems will be equipped and automatic fire alarm systems will normally be equipped to transmit alarms to a suitable location where responsible personnel are continuously on duty.
2. Automatic fire alarm systems will include means for manual operation.
3. Manual fire alarm systems may be equipped to transmit alarms to a suitable location where qualified personnel are continuously on duty.

VI. FACTORS TO BE CONSIDERED WHEN PROVIDING AUTOMATIC SPRINKLER OR AUTOMATIC FIRE ALARM SYSTEMS

The following factors will be considered, as appropriate, in determining the necessity and justification for automatic sprinkler or automatic fire alarm systems in conformance with the Standards established in Section V.

- A. Where the lack of such systems will result in conditions hazardous to life and property.
- B. Importance of the particular supplies or facilities.
- C. Relative quantity of supplies or facilities involved to the available supplies or facilities of the same type.
- D. The ability to replace supplies and facilities, including consideration of replacement time, manpower, materials, and costs involved.
- E. Potential severity of fire damage due to the inherent hazard of structures, materials, or processes involved.
- F. Availability of other facilities which are adequately protected for the purpose.
- G. Present and future advantages which would justify the costs of such systems.
- H. Size of the building, value of the materials or processes involved, as related to ability to afford reasonable fire protection from available fire fighting resources.
- I. Permanency of the installation and the building under consideration.
- J. Such systems will be provided in existing buildings only where consistent in principle with criteria for similar facilities provided under the new construction program.
- K. Protection for local or conflagration hazards offered by exposed and exposing structures.

VII. FUNDING

Installation of automatic sprinkler systems, automatic and manual fire alarm systems, and exterior fire reporting facilities made in buildings and facilities will conform with the policy and standards contained in Sections IV. and V. Such equipment will be provided in accordance with a planned program to further protect life and property, and to reduce fire departments to the minimum. Initial installation of such equipment in existing buildings and facilities and new construction projects will be considered as construction, in accordance with reference (b).

VIII. EFFECTIVE DATE

This Instruction is effective immediately.

IX. IMPLEMENTATION

Two (2) copies of revised implementing documents shall be forwarded to the Assistant Secretary of Defense (Installations and Logistics) within sixty (60) days.

PAUL R. IGNATIUS,
Assistant Secretary of Defense
(Installations and Logistics).

[Department of Defense Instruction, No. 4270.14, July 5, 1955]

STANDARDS AND CRITERIA FOR CONSTRUCTION—FIRE PROTECTION FOR INSTALLED AND STORED CRITICAL MATERIEL

I. PURPOSE

It is the purpose of this instruction to set forth the basic construction standards and criteria for providing optimum fire protection for certain installed and stored critical materiel.

II. APPLICABILITY

These standards and criteria are applicable primarily to new construction in the United States and its possessions, and are to be utilized by the military departments as a guide in the design and construction of buildings to house certain critical materiel as defined below. Where feasible and warranted, the respective military departments may approve the alteration of existing facilities to comply with this instruction. These standards and criteria, to the extent practicable, also apply to major alterations to existing buildings for the purposes of rehabilitation or conversion into housing for installed or stored critical materiel.

III. DEFINITIONS

A. *Critical Materiel*—those equipment, devices, apparatus, and supplies which are essential to the accomplishment of vital military missions, are exceptionally costly, are normally in short supply, are highly complex, and/or require a long lead time for procurement.

B. *Fire Resistance Rating*—that rating, measured in hours and/or quarter-hour intervals, according to building materials, or assemblies of building materials, whose fire endurance period has been demonstrated to equal or exceed the given rating. The fire endurance period and test method are defined in the American Society for Testing Materials (ASTM) Standard E 119-50, "Standard Methods of Fire Tests of Building Construction and Materials."

C. *Fire Resistive Construction*—that type of construction in which the structural elements are of noncombustible materials with fire resistance ratings sufficient to withstand the fire severity and duration resulting from a complete burn-out of the combustible contents for which the construction is designed.

D. *Noncombustible Construction*—that type of construction in which the structural elements are of noncombustible materials without specific fire resistant ratings. For this purpose, noncombustible materials are materials which will not burn under normal fire exposure conditions.

IV. TYPES OF BUILDINGS TO BE PROTECTED

A. This instruction shall apply, but not be limited, to the following types of buildings housing critical materiel, as defined above, in significant amounts:

1. Buildings for housing installations of special training devices and equipment such as flight simulators, link trainers, celestial navigation trainers, CIC installations, gunnery trainers.

2. Buildings for housing of electronics, radio, radar, sonar, photographic, optical, or other similar types of equipment used for operational purposes, training, or manufacture, assembly, and/or repair. This type shall include electronic computers and weapons fire-control equipment.

3. Buildings for storage of training devices and other equipment as listed above, fly-away kits, aircraft engines, and similar vital spare parts and components.

V. FIRE PROTECTION REQUIREMENTS

A. Buildings housing critical materiel shall be provided with fire protection as follows:

1. *Types of Construction.* Buildings, or parts of buildings, housing critical materiel shall be of noncombustible or fire-resistant construction.

2. *Sprinklers and Fire Walls.* Automatic sprinkler systems shall be provided in building areas where combustible materiel is installed or stored, or where operations create fire or explosion hazards. Except as noted in paragraphs V.A.3 and V.A.4, below, these areas shall be separated from the remainder of the building by fire-resistive partitions of at least one-hour fire resistance rating.

3. *Special Extinguishing and Alarm Systems.* Special extinguishing systems, such as carbon dioxide equipment, and/or special alarm systems shall be installed in lieu of automatic sprinklers when the use of the latter is not operationally feasible. Special extinguishing and/or alarm systems shall also be installed, when warranted, in cabinets and other small inclosures housing critical materiel which is combustible or presents a fire or explosion hazard.

4. *Portable Fire Equipment.* Facilities which employ critical materiel warranting fire protection, but which are under continuous surveillance by operating personnel, such as aircraft control towers, and radio transmitter and receiver facilities, may not require installed fire extinguishing equipment, but, in that event, adequate portable fire extinguishing equipment shall be provided.

VI. FIRE-FIGHTING ORGANIZATIONS

With the provision of the required fire protection, as outlined above, fire-fighting organizations may be kept at the minimum necessary to provide optimum fire protection.

VII. EFFECTIVE DATE

This instruction will become effective upon date of issuance.

FRANKLIN G. FLOETE,
Assistant Secretary of Defense
(*Properties and Installations*).

Mr. DUHRKOOP. That is the sum and substance of our presentation. We appreciate the opportunity to come here.

Mr. DADDARIO. I appreciate that you have come. This will be a valuable addition to the testimony already given. There is no question that the Department of Defense does do an outstanding job in putting together its manuals. I know that work that goes into them. I am sure that they will be helpful as we review the legislation before us.

Do you have any questions, Mr. Brown?

Mr. BROWN. Just one. I think this is a very good demonstration of a very prudent system of fire prevention, fire protection, fire reporting as I would expect of the military departments, but I am wondering if there is that additional element within the Defense Department which we have commenced on here, some sort of a systems approach to the total fire problem as a part of the funds expended on general research and development on the part of the Defense Department.

Mr. DUHRKOOP. Yes, there is a new trend that we are following with the Naval Research Lab. We are going over into this area and trying to get a total picture of what we need to do.

In connection with the standardization program the other day, we recommended that a study group be put together to work with the National Academy of Sciences and their research facilities to come up with a total package for us. We were talking of aircraft fire protection.

Out of this group we came up with this idea that we need to go to the National Academy of Sciences and to some of our own people and come up with a systems approach. It is interesting that you asked that because it just came up last week.

Mr. BROWN. We would be interested in following that type of activity. If this legislation is passed, that would be one of the key elements that would be involved in total coordination of this national fire problem that we are spending so much time on here.

Mr. DUHRKOOP. With our structural fire equipment, we have been able to standardize it. We all have fires in buildings and they burn down. But the aircraft crash fire problem, we find out we have about

three different levels and a little bit different situation in combating an aircraft fire, the light aircraft, intermediate aircraft, and extremely large.

This doesn't lend itself to standardizing equipment. That is why we are inviting FAA participation.

Mr. BROWN. The Defense Department is known for starting fires in several areas so I hope they can develop something in this area.

Mr. DUHRKOOP. I wish we could put them out as quickly.

Mr. DADDARIO. Your approach on the systems fits in very well. This is a problem insofar as storage of information and construction of equipment and facilities which is amenable to coordination with civilian activities.

Mr. DUHRKOOP. It was directed toward our air crash fire problem. We can see once we get it out of the way, that it will go into something else. That is why we wanted to use the National Academy.

Mr. YEAGER. Perhaps I missed it, but you do provide in the statement a budgeting figure on what DOD is currently spending on research?

Mr. DUHRKOOP. I have it here. I have a breakdown on it.

Mr. YEAGER. Could you provide that for the record?

Mr. DUHRKOOP. Yes, sir, the R.D.T. & E. budget by the military department, this is in the area of fire protection only, is approximately \$820,000 per annum.

Mr. YEAGER. One other question. You mentioned the special work being done in research in areas of aircraft, shipboard fires, and this type of thing.

Is any effort made to circulate the results of that research outside the Department of Defense, other than to make it available in manual form which can be purchased at the Government Printing Office?

Mr. DUHRKOOP. The information that is published can be purchased at the Government Printing Office. In answer to your question, Do we make an effort to circulate it? The answer to that is "No," but it certainly is available.

Mr. YEAGER. Thank you.

Mr. DADDARIO. I hope we may be able to list additional questions for you to answer.

(Additional questions submitted and the answers thereto are as follows:)

Question 1. How do you assure that there is no duplication of research within the DoD? For example, why would it not be possible for the Army Quartermaster to be developing fireproof material for tents and a Navy laboratory to be working on the same problem for fireproof material for gun covers?

Answer 1: The Director of Defense Research and Engineering (DDR&E) reviews all Research and Development programs of the Military Services and attempts to detect and eliminate all undesirable duplication. Some parallel approaches, particularly in the areas of research and exploratory development, are believed to be desirable and in fact are, in some instances, encouraged in order to increase the probability of success. In the specific example mentioned, work on fireproof or fire-resistant materials would normally be reviewed by a specific element of the Office of the Director of Defense Research and Engineering where any duplication would be detected and eliminated if it is considered to be unwarranted. If such work is done as a part of an end item development, it is possible that some parallel approaches to similar problems could go undetected; however, they are usually detected and rectified.

The DDR&E also has a formal procedure through the use of Research and Technology Résumés (DD Form 1498) for information exchange on R&D projects.

This procedure is effective in coordinating similar work among the Services. In addition to the formal procedure the working level technical people in the Services have a personal acquaintance with their opposite numbers in the other Services and they engage in informal conferences to exchange data and coordinate their work.

Question 2. Is fire fighting equipment designed and procured by one DoD office for all of the services, or does each service determine its own needs and do its own procurement?

Answer 2: Fire trucks for the Military Services are usually designed by contractors to meet requirements established in military specifications covering performance requirements. These specifications have been standardized for building "structural" and "brush" fire fighting vehicles. Most of these are being procured by Defense Supply Agency for all military users with funding by latter. Aircraft crash fire fighting trucks are generally procured to meet special requirements in specifications of the individual services. While there is some common use of the same model, there is a difference in requirements resulting from a difference in size of aircraft in operation particularly by the Air Force. The Department of Defense is continuing to seek more commonality in aircraft crash fire trucks through improvements in future vehicles.

Question 3. Are the qualifications for military fire fighters standardized in the three branches? Is the training similar?

Answer 3. The qualifications for civilian fire fighters of the Military Departments are the same. All are required to use the qualification standards published by the Civil Service Commission.

The basic training for fire fighters is generally similar to that given to personnel of large municipal fire departments except that special training for fire fighting for shipboard, aircraft, or explosives are given by the Departments in accordance with their individual requirements.

Question 4. It is our understanding that it is a policy of the DoD that fire fighting services available from municipalities and other governmental fire departments are given full consideration as augmentation to defense installation facilities. How are these outside fire services paid for?

Answer 4: The Comptroller General has ruled that in view of the legal duty of a municipality or other governmental subdivision to extinguish all fires within its limits, the United States Government is under no legal obligation to make payment to a city (or governmental subdivision) for fire fighting services rendered in connection with a fire at a Government installation located within the limits of the city or Government subdivision (36 Comp. Gen. 286; 35 id 311; 26 id 382; 24 id 599). Installations located within the limits of a municipality normally will rely upon the fire fighting service available from the municipality.

Installation commanders may enter into reciprocal agreements with any fire organization for mutual aid in furnishing fire protection for property normally protected by the installation fire department and by the fire organization, except that such agreements will not be made with municipal or other fire organizations having a legal responsibility for extinguishing fires within the installation (P.L. 46-84th Congress).

In cases where property controlled by the Department of Defense is located outside of a municipality or other governmental subdivision, arrangements may be made by the DoD Components, within their normal contractual authority, to contract with any fire organization maintaining fire protection facilities to furnish the required fire protection outside its regular area of service.

Mr. YEAGER. Fine.

Mr. DUHRKOOP. Thank you.

Mr. DADDARIO. I would like to take a chance, Mr. Barrows, if you could come forward even though we are going beyond your time and see if we might be able to get your statement in.

Our next witness is Mr. Jack S. Barrows, Forest Fire Research, U.S. Forest Service, Department of Agriculture. We are pleased to have you, and will you introduce for the record your colleague?

Mr. BARROWS. Yes, thank you, Mr. Chairman. I have with me Mr. Eliot Zimmerman, who is the Director of Cooperative Fire Control for the Forest Service, and when we finish, Mr. Zimmerman will be glad to assist in answering questions.

**STATEMENT OF JACK S. BARROWS, FOREST FIRE RESEARCH, U.S.
FOREST SERVICE, DEPARTMENT OF AGRICULTURE**

Mr. BARROWS. I am Director of Forest Fire Research, U.S. Forest Service. It is a pleasure to be here today to give you some factual information and background of Forest Service activities in research, cooperative programs, and operations in the field of fire prevention and suppression.

The Forest Service is responsible for providing fire prevention and suppression action on some 186 million acres of national forests and national grasslands, for scientific application of fire as a management tool on these lands, and for cooperation with State fire control organizations to provide fire protection to an additional 500 million acres of non-Federal forest and watershed lands. In addition, it has the responsibility for developing wartime fire defense capability for all rural lands in the United States.

To meet these obligations, the Forest Service has maintained a progressive, scientific program of fire research and development since 1923. This research and development program, currently funded at an annual level of \$4 million, is conducted at the Forest Products Laboratory, Madison, Wis.; at three specially constructed Forest Fire Laboratories at Macon, Ga.; Riverside, Calif.; and Missoula, Mont.; and at three equipment development centers at Missoula, Mont.; Beltsville, Md.; and San Dimas, Calif. In addition, research and development field projects are headquartered at seven regional experiment stations, and advanced training and extension programs on fire prevention and control are regularly conducted in every State of the Union.

The Forest Service program of fire research and development is closely coordinated and integrated with similar programs being undertaken by other governmental agencies, both here and abroad. Under these cooperative arrangements, the Forest Service undertakes specialized fire research activities for other agencies, such as the Department of Defense, and in turn contracts out specialized projects to universities and other Government agencies with unique competence.

The fire research program at the Forest Products Laboratory is concerned primarily with fire problems associated with wood in use. The program covers a broad range of activities, but can be generalized into two major fields. Pyrolysis and combustion kinetics of wood—investigates the chemical and physical mechanics of the burning process as a necessary first step toward an understanding of the mechanisms of fire suppressing agents. Evaluations of flammability and fire endurance of untreated and treated wood products—determines the effects of various paints, finishes, and fire retardant coatings on the fire performance of furniture, paneling and wooden structural members. The work of the Forest Products Laboratory on the endurance of wooden structural materials under combined fire and load stress has been widely recognized in State and local building codes.

Work at the three Forest Fire Laboratories is centered around studies of fire behavior as affected by variations in fuel and environmental factors. Basic research on the thermal characteristics of common forest fuels such as leaves, twigs, and grasses is conducted at these Laboratories. The research includes an extensive program of highly instrumented test fires carried out under carefully controlled condi-

tions of temperature, humidity, and air flow. Test fires range in scale from a few square inches to hundreds of acres. One of the major accomplishments of this program has been to give the Forest Service recognition by the Atomic Energy Commission and the Department of Defense as the authoritative source of information on the fire potentials of nuclear weapons in forests and other rural areas.

The Equipment Development Centers conduct specialized programs for the Forest Service and other Federal and State agencies. The Centers develop all types of fire equipment, ranging from handtools through sophisticated electronic devices. Beginning with the smoke-jumper program before World War II, the Centers have become world famous for their designs of specialized equipment for aerial and chemical attack on fires.

Applied research and development programs which focus on specific fire control problems are carried on anywhere in the country where the need arises. Examples of this type of program are: Fire prevention studies to determine the precise causes and nature of forest and wild-land fires; testing of new technology for reducing concentrations of highly flammable fuels which contribute to forest conflagrations; and operations research and systems analysis to develop techniques for planning and organizing fire-control programs, including optimization of subsystem alternatives. A national fire danger rating system which integrates weather information from 1,200 reporting weather stations and interprets the data in terms of severity of burning conditions is used by most rural fire protection agencies. This system was developed cooperatively by the Forest Service and the Weather Bureau of the Department of Commerce and is being continuously refined and expanded to improve the ability of rural fire organizations to anticipate their fire control needs.

The Forest Service acts as a central clearinghouse for the collection, analysis, and dissemination of fire statistics for rural areas throughout the United States. Reports are prepared for each fire recording such details as cause, location, size, rate of spread, weather conditions, control costs and damages, both in dollars and in physical terms. This information is coded, programed for automatic data processing, and sent to central statistical processing facilities for further analysis. This includes assembly and compilation of nationwide forest fire statistics for all agencies dealing with forest land and nonforested watersheds in Federal, State, and private ownerships, as well as preparation of statistical reports for the use of public agencies, forest industries, universities, Members of Congress, and to the public upon request.

It is generally recognized among rural fire protection agencies that training together strengthens their personnel's ability to cope with fire emergencies together. Consequently, the Forest Service includes other protection agency personnel in training sessions at national and local levels. Lessons plans, training aids, and new training methods and materials are developed to help all rural fire protection agencies improve their capabilities, and many of these texts and training aids are used by colleges and universities in their fire educational programs. Fire training simulator equipment has been developed by the Forest Service, and use of this new training tool is expanding rapidly.

I might add that this is a unique development of nationwide importance over the last few years. It is a very important training device.

Mr. DADDARIO. I was just going to ask you about the simulator equipment. Are you talking about models?

Mr. BARROWS. Yes, sir; with the training simulator we can project models of fire and particularly fire situations. This is done through motion pictures and special dioramas that are prepared.

Mr. DADDARIO. Where do you do this?

Mr. BARROWS. Either in training halls or we have one type that is mounted in a trailer that can be hauled to the site of the training sessions. The people who take part in the training exercise are subjected to typical decision situations where they may be a fire boss on a forest fire or a sector boss. They are subjected to fire situations where certain facts are presented. With these facts the trainees go through the decision process on fire control action.

Mr. DADDARIO. Are your simulations in wood fires more than anything else?

Mr. BARROWS. They are all forest fires, and they have developed from actual situations that we have analyzed.

Mr. DADDARIO. You talked about lesson plans, training aids, and training techniques. Do you put that in a form so that the chief could designate in any department, volunteered or paid, a member to acquaint himself with that and to lecture on that subject?

Mr. BARROWS. Yes. In some cases this is supplemented by other training aids.

Mr. DADDARIO. There is an effective way to get this down to the working level rather than to have one person try to be an expert?

Mr. BARROWS. Yes, it takes a large number of qualified instructors to train all the people involved in forest fire control.

Mr. DADDARIO. Thank you.

Mr. BARROWS. Training centers are operating in several regions and a National Fire Training Field Support Center was established at Marana, Ariz., in 1967. A training systems group analyzes training requirements and designs integrated training programs to fit specific needs.

Forest Service fire training helps nationwide to strengthen proficiency of rural fire protection personnel, increases capabilities of numerous fire protection agencies to work together and extends fire research discoveries into operational use.

Mr. DADDARIO. When you say that, do you mean you have a program through which you actually bring people somewhere and train them under a grant or other method?

Mr. BARROWS. First of all, we have the professionals who hold staff positions; they go through annual training. This is supplemented during the fire season by temporary personnel. Many of these are college students employed for the summer for the various jobs that have to be done to fight fires. They are put through training courses. We organize a number of special crews. In the Southwest in cooperation with other agencies, we train a large number of Indian firefighting crews every year. These crews are then transported anywhere that they are needed for a fire emergency.

Mr. DADDARIO. Thank you.

Mr. BARROWS. In addition to formal training of fire protection personnel, the Forest Service conducts extension and education programs

for the general public. The Smokey Bear program, cosponsored by the Forest Service, National Advertising Council, and various State agencies, is the most widely known fire prevention education program in the world. Other important, but less widely known extension activities, include grants to universities to improve training in fire science—and I might add that in cooperation with the University of Washington at Seattle we activated a program leading to graduate degrees in forest fire science.

I think this is an important development. We hope to do more of this in cooperation with other universities in the future.

Mr. DADDARIO. Could you provide for the record the amounts of moneys involved and the universities with whom you deal in these programs? I would like as full a record as possible, including the degrees to which they lead and then whatever information you can provide as to the areas about dissemination of literature would be helpful.

Mr. BARROWS. We will be glad to.

(Information requested is as follows:)

Under this program, the College of Forestry, University of Washington, is developing courses in forest fire science and technology leading to advanced degrees. University of Washington departments in meteorology and engineering are also participating in this program. As a part of this activity, the Forest Service has awarded a research grant to the University of Washington in the amount of \$74,984 for a 2½-year period beginning in January 1967. In addition, the Forest Service is stationing a Ph. D. forest fire scientist at Seattle to work cooperatively with the University in developing graduate research and teaching programs.

The Forest Service has a modest grant program with various universities in several technical fields of forestry research. During FY 1968, we anticipate that two or three additional grants may be awarded for specific phases of forest fire research. In addition, we are exploring the opportunities to assist other universities in developing graduate teaching programs in forest fire science.

Mr. BARROWS. Fighting fires on national forests and national grasslands includes activities in 41 States. An average of 11,000 fires are dealt with annually and area burned during the past 5 years held to an annual average of 161,800 acres. The work is done by a strategically located force of approximately 12,000 professional and technical fire personnel supported by short-term personnel needed for emergencies. The Forest Service also provides the overall leadership, planning, and coordination of activities for cooperative fire control action by State foresters or comparable State officials on over 500 million acres of State and private land. This program includes studies, technical guidance, standards, training, reporting and recording, and special services to the States. As the Federal partner, the Forest Service makes allotments to the States and performs field reviews of State operations to assure proper and efficient use of these funds. Nationwide cooperative agreements between Federal agencies responsible for rural fire protection organizations insure adequate and immediate mutual assistance when conflagration-type fires threaten to overwhelm local firefighting resources. These cooperative agreements extend beyond rural areas into many zones where cities need protecting from encroaching rural wildfires.

This, I am sure, as Mr. Brown knows, is becoming an increasing problem.

Beyond the boundaries of the national forests, Forest Service programs operate to strengthen fire protection in rural America and assure rural wartime fire defense readiness. As a result, plans now exist to guide fire defense in all OEP-OCD regions; 45 States have plans and there are rural fire defense committees prepared to launch emergency fire protection measures in 49 States. A national committee coordinates fire defense activities between regions and States and would direct fire control operations during an enemy attack.

Upon the enactment of H.R. 6637, these activities and programs of the Forest Service will continue. Likewise, the coordination of these activities with other agencies will also continue.

Thank you very much.

Mr. DADDARIO. Mr. Barrows, this is an exciting report. We have reason to be extremely complimentary of the Forest Service. It has done a job which is generally recognized and we are proud of it. I wonder considering the long experience you have had and because you have developed a methodology, if the city departments have been coming to you to get advice. Do they coordinate their activities with you, even though you do, as you constantly emphasize, spend more of your time in rural activities, these things do have a common base?

Can you give us any information about how the coordination of this information has worked out?

Mr. BARROWS. Mr. Chairman, I appreciate your complimentary remarks. The cooperative program with other departments increases constantly; we have many of them coming to us for help. Now, this varies a lot by location. You can take an area like southern California. When there is a fire, nobody asks whose fire it is; everybody goes to it and worries about whose fire it is later. As a result of this attitude there is excellent cooperation and exchange of training information between the various groups.

I think Mr. Zimmerman, who directs the cooperative program in all the States, can add considerable to this.

Mr. DADDARIO. Yes, I would certainly like your comments.

Mr. ZIMMERMAN. Mr. Brown is certainly familiar with the cooperation we have with Chief Klinger in Los Angeles, one of the finest fire departments in the world, perhaps, and the coordination as Mr. Barrows has mentioned has always been 100 percent. Everybody fights all going fires regardless of where they might be and as you have mentioned, we are involved in rural fire work primarily, but it does get into working with the smalltown fire departments and we have given instructions, which involve training courses. In five pilot States, we did carry on an extensive training program under a Civil Defense grant to rural fire departments and it has been exceedingly successful.

Mr. DADDARIO. Mr. Brown.

Mr. BROWN. I can't help but comment on a point that has been raised here, I think that most people don't realize that the Los Angeles County includes a national forest and that many of the most severe fires we have had are brush, grass, or forest fires of one sort or another, including the Bel Air fire of a few years ago which was one of our most damaging fires. It was a wind-driven brush fire. It destroyed a large number of homes in the most affluent section of Los Angeles.

The county fire department and the city fire department to a lesser extent both have to take considerable cognizance of the technique developed by the Forest Service as to the control of these fires. It is an excellent example of the kind of relationship which exists. May I ask one question? I am sure that the Forest Service has had considerable to do with the development of new techniques such as the use of aircraft for dissipation of fires, the dropping of retardant on fire areas and so forth which we are using a great deal of in Los Angeles, but I have not seen as much attention devoted to the use of some of the new airlift facilities for use in fire fighting. I was well aware of the development of the "Smokejumper" program before World War II, but it seems to me that we have made remarkable advances in heavy duty helicopters which can be used to transport fairly large crews to locations.

Is the Forest Service working in this area?

Mr. BARROWS. Yes, sir. As a matter of fact, we have some research program underway to further explore aerial attack. One of these projects is at our Riverside Forest Fire Laboratory where we are developing night use of helicopters. At first, night helicopter operations looked too dangerous. We are finding out that we can develop appropriate safety techniques to use helicopters at night. This may extend our ability to fight fires more effectively over a period of 10 to 12 hours.

Mr. DADDARIO. How about other types of equipment—pumps, handtools? Have you had research and developed new equipment? Has this been effectively used not only in rural areas but urban areas?

Mr. BARROWS. This is one of the major mission of the equipment development centers. They do this in close cooperation with the industry that is involved. We don't undertake development activity if this can be done by private industry. It is often a stimulation process where they may do some and we may do some.

Mr. DADDARIO. The benefits of this type of research do flow into all areas of firefighting?

Mr. BARROWS. Yes. In the areas of pumpers and hose, we have done a lot of work and I am sure this has benefited everybody in the firefighting business.

There is one other area that I would like to comment on. I am sure this committee well recognizes it just by your mission. We are in a very explosive area of science. It is hard to keep up with it.

One of the things that is very important for us to do in this whole fire business is to keep our research programs in tune so that we can capitalize on many of the things stemming from the space program and many other programs in science.

A good example at the present time is our research on an electronic fire detection system. I think this is a very exciting and revolutionary development in fire control. We now have a flying laboratory operating in this research program. We have developed the technology to detect tiny fires from a high-flying aircraft. We can do this night or day. We can do it through dense smoke when our present systems are completely inoperative. We can do it rapidly and accurately. This kind of research can do a great deal to reduce fire losses.

But this is only one example of some of the things that are emerging from the scientific era that we are living in. They won't emerge unless we have a research organization that can understand these things and can perform the necessary work to apply new scientific developments to the solution of fire problems.

Mr. DADDARIO. What is your present research budget?

Mr. BARROWS. Our research budget for the Forest Service is \$2.9 million. In addition to this, we have about \$1.8 million of cooperative funds, mainly from the Department of Defense.

We are working with DOD on a number of fire research projects.

Mr. DADDARIO. Does this remain relatively constant over the years?

Mr. BARROWS. It has increased slightly over the last 4 to 5 years. About 7 years ago we initiated a program to develop three forest fire research laboratories in the United States. We have this job well started, but we still do not have these laboratories adequately staffed and equipped. We are working hard to increase the strength at these locations.

Mr. DADDARIO. What size is the funding for your program which uses electronic detecting devices from high-flying aircraft?

Mr. BARROWS. This is a program carried out in cooperation with the Department of Defense because this has some obvious military applications. We are, at the present time, putting in about \$300,000 a year into this program, both DOD and Forest Service dollars.

In addition, we have had much fine cooperation from the Air Force. They loaned us the Convair aircraft that we have made into a flying laboratory. We fly it with Forest Service pilots, but we certainly didn't have the resources to go out and buy this kind of airplane.

Mr. DADDARIO. Where do you stand at this stage of the game so far as achieving your objectives?

Mr. BARROWS. We have the research far enough along to know the approach is sound and that we can detect fires. We have to develop a prototype system and try it out to shake the bugs out. We are ready to go right ahead with a system development program.

Mr. DADDARIO. Mr. Yeager?

Mr. YEAGER. Does this involve equipment with DOD which is of a classified nature?

Mr. BARROWS. Yes, it does.

Mr. YEAGER. You said the Forest Service has been getting recognition by the DOD and the AEC as an authoritative source of information on the fire potentials of nuclear weapons. You mean the "possible effect"?

Mr. BARROWS. Possible effect in starting fires and type of conflagration that would result from nuclear weapons.

Mr. YEAGER. How much of an effort is being made? Can you assay a program that would be effective encountering the fire storms that might be anticipated?

Mr. BARROWS. This is currently one of our largest fire research programs. This is carried on with the support of the Defense Atomic Support Agency and also with the Office of Civilian Defense. We have established a field area in Nevada where we are burning large-scale fires that are ignited instantaneously by artificial devices so we can

simulate the instant ignition which you would get from a nuclear attack.

The problems that we are looking at are the characteristics of mass fires. We really don't understand them. We don't understand when mass fires may become fire storms.

While you can do this kind of experimentation on a small scale in the laboratory and develop theories, you still have to go out in the field and conduct large-scale experiments to understand these things.

Mr. DADDARIO. You can actually understand the large-scale conflagration as a result of the simulated activities?

Mr. BARROWS. Yes, in part. We know a lot of things today that we didn't know 10 years ago, but there are still many unknowns.

Mr. DADDARIO. But from what you have learned, you would certainly support a program through which the country would build up its capability to simulate other types of fires, especially those which cause us great trouble in the urban areas?

Mr. BARROWS. Yes, sir.

Mr. DADDARIO. I do regret that we have had to rush you through these hearings, but your papers and your answers to our questions have been very helpful, both you and Mr. Zimmerman. We will have additional questions to ask which we hope we might submit to you for answer. We will include them in the record.

(Additional questions submitted, and the answers thereto, are as follows:)

1. Difference between a fire storm and a mass fire

A fire storm is a fire burning simultaneously over a sufficient area and with sufficient intensity to result in indrafts of sufficient intensity to hold the area on fire in a relatively fixed position. These indraft winds may reach gale force. The fire may, under certain circumstances, take on a rotary motion assuming the characteristics of a stationary tornado. Natural winds aloft are usually light. Minimum fire size and fuel volume requirements have not been quantitatively defined.

A mass fire is any fire burning simultaneously over a large area, whether stationary or not. It thus includes, but is not confined to a fire storm. Most large fires burn with the wind. In these, the front of the fire burns into new fuel while the fuel at the rear gradually burns out. Hence, any fire burning with a relatively broad front, with the additional proviso that the distance across the burning area is also relatively large, may be termed a mass fire. This moving type of mass fire is often called a conflagration to distinguish it from fire storm.

2. Reimbursement between Forest Service and Cooperators

There is provision for two-way reimbursements for cooperative efforts between the Forest Service fire fighters and State, municipal and other local protection agencies. It is not a uniform provision, however, because of the great diversity among State and local protection agency policies, organizational structures and available finances. Hence, the provision is carried out through cooperative agreements between Forest Service field offices and State Foresters, counties, municipalities and private forest protection associations.

Forest fire cooperative agreements commonly cover three broad areas:

(a) Forest Service protection of private land inside National Forest boundaries in exchange for protection of scattered parcels of National Forest land outside the nominal boundary. Sometimes these services are provided by either side on a per annum agreed fee.

(b) Local definition of zones of mutual interest on both sides of a National Forest boundary. Fire does not recognize land ownership lines, and starting near a boundary between agency responsibilities may pose an equal threat to each jurisdiction. Under this principle, the closest fire fighting

unit is dispatched regardless of agency. If the attack is successful in holding the fire, by gentlemen's agreement there is no claim. If follow-up is required by the second agency, control costs are shared on a pro rata basis.

(c) Terms for two-day reimbursement of solicited assistance in fighting fire in the jurisdiction of another agency. In the case of Montana, the State would be requested to reimburse the Forest Service for solicited assistance rendered in fighting fire on State-protected land. The Forest Service would also reimburse Montana for like assistance in fighting fires on Montana National Forests. The National Park Service would most likely call on the Forest Service for assistance on a fire in a National Park.

Some of the less well financed State forestry organizations are not in a position to meet full parity with the Forest Service in fire fighting capability or reimbursement costs. Particularly in these, the Forest Service attacks fires considerable distances outside National Forest boundaries where these fires may subsequently threaten National Forest land. This is done without request for reimbursement and on the premise that it is less costly to put out a small fire than one approaching a forest boundary on a broad front. The Forest Service continues to urge and assist the States to alleviate this situation.

Mr. DADDARIO. This meeting stands adjourned until tomorrow morning at 10 o'clock in the same place.

(Whereupon, at 12:40 p.m., the subcommittee adjourned to reconvene at 10 a.m., Wednesday, May 24, 1967.)

FIRE RESEARCH AND SAFETY ACT OF 1967

WEDNESDAY, MAY 24, 1967

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington, D.C.

The subcommittee met at 10 a.m., in room 2325, Rayburn House Office Building, Hon. Emilio Q. Daddario (chairman of the subcommittee) presiding.

Mr. ROUSH. The subcommittee will be in order. Mr. Daddario, the chairman of the subcommittee, has been detained, and in order not to detain you unduly, we shall proceed. Our first witness is Prof. H. C. Hotte! Professor, will you take one of these chairs, please.

We have a prepared statement; you may proceed as you see fit, Professor.

Dr. HOTTEL. I think I shall read it, if I may.

Mr. ROUSH. Yes, surely.

STATEMENT OF PROF. H. C. HOTTEL, COMMITTEE ON FIRE RESEARCH, NATIONAL RESEARCH COUNCIL

Dr. HOTTEL. I shall first identify myself in relation to this hearing. I am a professor of chemical engineering and director of the Fuels Research Laboratory at Massachusetts Institute of Technology, and an industrial consultant on chemical engineering problems, primarily on combustion, heat transfer, and industrial furnaces in the oil and chemical industries. I have been chairman, since its organization, of the National Academy-National Research Council Committee on Fire Research; and am a member of the NA-NRC Advisory Panel 421 to the Bureau of Standards Building Research Division, where federally supported research on fire is conducted.

The decision on the Fire and Safety Act hinges on whether the Nation is convinced (1) that an enlarged program, federally supported, to understand, control, and prevent fire could produce a saving of human lives and a net economic gain, and (2) that we have a clear enough picture of how to go about the program to realize those gains. I am here because I believe the answer is "Yes" to both the above propositions. Since the weight of any opinion depends upon the experience and reasons of its holder, I wish briefly to give my background in fire and some of my reasons for support of the bill, and then to comment of House Joint Resolution 498.

During the Second World War, I was in the National Defense Research Committee as section chief on fire warfare, the section responsible for research and development on incendiary bombs and other flame

weapons and fuels. Our section spent millions studying the response of buildings and building subunits to fire. We built Japanese and German buildings in Utah and fired them, always with the urgency of war restricting any expansion of the effort into a true understanding of ignition and fire spread. After the war I was for about 10 years chairman of the Thermal Panel of AFSWP—the predecessor of DASA—concerned with military research on defense against the thermal effects of nuclear weapons. I have been involved in investigating various fire and explosion disasters, including a report to the fire commissioner of Boston on the 600-death Cocoanut Grove fire, reports to the Navy on the *Leyte* and *Bennington* aircraft carrier fires, and a report to the Atomic Energy Commission on the Cambridge electron accelerator liquid hydrogen explosion and fire in 1965. These experiences, together with a continuing research effort on combustion under control—friendly as against unfriendly fire—have convinced me of the gross inadequacy of our national research effort on the fire problem. Our knowledge of fire is largely empirical, unscientific, grossly incomplete.

Let me give a few examples of what I consider our fire needs. One good example of research need is the problem of model laws for fire. Can a large fire be modeled in a way such that it preserves the relative effects of the different forces of nature, but on a smaller geometrical scale and a shrunken time scale? The engineer knows that some bridge problems can be solved with models, that river and beach erosion problems can be scaled in distance and time; he has scaled some combustion problems; he suspects but does not know that some fire problems can be modeled, but he may need to operate at elevated pressures and in high gravitational fields to give validity to his model. So it is not a simple problem to learn how to model fire, but the yields from it would be very large. As an example of the practical significance of this research area, consider the million-dollar fire that occurred in Florida a few years ago in a sprinklered storage warehouse containing stacked rolls of newsprint paper. The fire led to a test series which expended some 1 thousand tons of paper—full-scale expensive tests which could have been greatly reduced in number and cost by a knowledge of how to model the phenomena on a small scale. I might add that the problem is still not solved and many more and bigger tests are under consideration in this narrow small area.

The fire engineer has developed small-scale empirical tests to give part-answers to a few of the full-scale fire problems; but his knowledge of modeling is so limited that the only present safe procedure for evaluating the fire properties of a new system—meaning a geometrical arrangement that includes combustibles—is full-scale testing; and we have to remember that the effect of starting a fire at different points in a system combines with the vagaries of fire spread to necessitate many tests to complete the evaluation of a single system. The result is that far fewer systems are studied than the public interest warrants, because of the expense. The explosive growth of our technology is subjecting us to new hazards and is daily producing new materials of construction and new combinations of old and new materials, in infinite geometrical array. We are much in need of some guiding principles to be established that will aid the building industry by de-

veloping methods of assessing the fire hazard of a new combination without full-scale tests. This is only one of the many pressing problems of fire-hazard evaluation.

The customers of the U.S. building industry cannot be expected to demand more fireproof construction if it is too much more costly. Progress in this area is related to codes and standards, and a fire code can be economically restrictive. It can be unnecessarily restrictive if not based on a sufficient understanding of the phenomenon the code controls, an understanding of the hazard it attempts to reduce. Consider the problem of a new building design coupled with the statement of the prospective owner, "What will it cost to reduce the fire risk one-half?"

A thoughtful consideration of the question of where to spend the next thousand dollars, to get maximum risk reduction, leads to the conclusion that it is today naive to expect a good answer; but it is not naive to ask the question and the citizen wants an answer and should have it. We need a vigorous continuing effort to understand ignition and fire growth in old and new materials and systems, an understanding which supplies to industry a background for the development of new materials and systems at the same time that it encourages innovation in construction without adding to hazard. This is not a plea for long-haired research for its own sake, but for a judicious mixture of ad hoc research to satisfy the direct needs of our cities, our fire departments and our building industry, plus a back-up operation of basic research on the understanding of fire growth and fire spread, a continuous inquiry into the validity of what we are supposed to know, and a continuous generation of new knowledge.

In providing for the gathering and analysis of fire statistics and for education and training programs—areas in both of which the National Fire Protection Association has done excellent work and should be encouraged under the new bill to do more—the bill recognizes what good engineers know: that most of our fires are a consequence of failure to disseminate and use the knowledge we presently have of fire rather than the absence of the existence of knowledge. Great benefits can come from the gathering of better statistics on fires and from the continuous interaction—using the methods of operations analysis between the data-gathering and interpreting group on the one hand and the workers on the firefront on the other hand—those responsible for fire department operations, for city ordinances, for codes and standards, for drives to reduce a spotted fire hazard.

Intelligent action in all these areas must rest on a firm foundation of statistical knowledge of what kinds of fires are starting how, of whether there is evidence that different codes in different areas have a measurable effect on fire losses, and many other problems that we can only begin to visualize when we have a statistical picture of the nature of the hazard and the extent of it.

Operations research is a phrase describing a method of systems analysis which came to fruition in the Second World War. That is another area where we should be doing research. It depends on having a mathematical model of the system of interest, whether a building fire, a fire department operation related to city traffic, the use of a piece of equipment, and so forth, and on the feeding into that model, set into a computer, of statistical data from past experience or of physical

data from the laboratory. The success of the method hinges on the availability of large computers, necessary because so much of the input information is in the form, not of numbers, but of probability curves rather than firm numbers. Operations research on city fire department problems, bolstered by a backlog of statistical data from the data collecting activity proposed under H.R. 6637, holds promise of significant improvement of the efficiency of our fire services, such as by replacing the present methods of choosing where and what new equipment is needed, whether merging or relocating of stations would be advantageous, how much fire reduction could be expected by shaving 2 minutes from the arrival time at a fire, and what that timesaving would cost in equipment or relaying traffic lanes. It is a measure of the times that the new chief of one of our large city fire departments has a master's degree in operations analysis, earned while in the fire service.

The House Joint Resolution 498 to establish a National Advisory Commission on Fire Prevention and Control is a proposal to study the fire problem for 18 months and make recommendations. There is perhaps no problem the attack on which is not improved, somewhat at least, by additional time spent on the planning phase; but on any problem there comes a time when the problem is well enough defined to justify getting on with it. I believe the problem of what we should be doing about fire safety is in the latter category. I do not mean that the planning phase should be stopped, rather that as in any healthy industrial research activity the attack on the problem should be continuously modified and reoriented by those in responsible charge of its direction. The "formulation of recommendations whereby the Nation can reduce the destruction of life and property caused by fire in its cities," called for by House Joint Resolution 498, is not something one makes a report on. It is a never-ending activity which it is the objective of the Fire Research and Safety Act to provide for. Research on fire, statistics gathering and interpretation, field experiments, and planning continuously interact, each modifying the other; but this interaction is most efficient when the research and the planning activities are under the same management. It appears to me that four of the seven "duties" of the National Advisory Commission (Nos. 1, 3, 4, 5) are of the nature of continuing activities better provided for in H.R. 6637, activities analogous for example to the continuing activities of the British joint fire research organization or the Canadian fire research board. I can see merit in a National Advisory Commission representing housing and urban development, other Federal departments and agencies, fire departments, State and city fire marshals, fire engineers, fire insurance companies, and private research organizations devoted to the fire area.

Such a commission could be helpful in representing, to the Fire Research and Safety Center established under H.R. 6637, the sometimes diverse views of the various groups represented, and it would be helpful in arriving at policy decisions as to the best direction of research effort. But I believe we have sufficient knowledge of the fire problem to proceed at once with the program called for under H.R. 6637, using the commission only as an advisory body. I was perhaps misunderstood on this point at the Senate hearing on S. 1124. I was

not and am not opposed to the commission if it is an advisory body to the activity contemplated under H.R. 6637.

With an annual U.S. outlay of the order of \$6 billion—I made some calculations to make me think seven is nearer—associated with fires (this includes direct losses plus the many indirect ones) the activities sponsored under the Fire Research and Safety Act need reduce fire costs only 10 percent to pay their cost 60 times over.

Mr. ROUSH. Thank you, Professor Hottel. This is a very fine statement. We are grateful for the contribution you made to these hearings. We have with us this morning the chairman of the Committee on Science and Astronautics, who is the author of this bill.

Mr. Miller, do you have any questions?

Mr. MILLER. No; I want to join in what you have to say about the statement of Dr. Hottel. I think it is an excellent one. I also foresee some of the problems he sets up here because fire control and prevention, although it is a very old part of our Government, is one that I think has never been fully attacked. I know some of the problems that we are going to be concerned with, the fact that you may be stepping on someone's sacred cat and the cat is going to holler. Yet, I believe the time is long past when this should be attacked on a national scale. I am certain that if we do this, we can at least set up the standards for fire safety and protection.

The fire chiefs are quite jealous of their respective jurisdictions. I know in the district I represent there are about four of them in a contiguous area and although there is a great deal of cooperation among them, there is also a great deal of jealousy that sometimes creeps in. These people are dedicated people. Maybe they need something like this. I feel they need something that will give them an objective to shoot at.

Doctor, won't we also bump into, and I think you have pointed it up here, certain standards of construction? I know that in California, where we have some very rapidly growing areas, every once in a while the laws have been relaxed, builders have been prone to go to the city council and get certain relaxation. I don't know so much in the case of fire, but I know adjacent to my own district, because they have not allowed sufficient time for certain fills to settle, we have had a very rainy season and have had some very expensive houses sliding down into gulches. This isn't good. I believe if you violate some fundamental laws that are well known to engineers in an effort to get on with the job you take chances.

The bay area in California, those of us who are old enough to remember, are quite conscious that the great disaster was not so much the earthquake as the breaking of fire mains and the lack of proper fire protection such as, sources of water. I saw a little article on it just the other day. It is a big problem. We certainly appreciate your contribution, sir.

Dr. HOTTEL. Thank you.

Mr. ROUSH. Thank you.

I notice at one place you asked the question how much fire reduction could be expected by shaving 2 minutes from the arrival time of the firemen and what that time shaving could cost. Yesterday I suggested something that I believe would not cost too much and that is that we

have a uniform reporting telephone number throughout the nation, a number that every child would learn in the first grade.

Mr. MOSHER. You mean a fire-reporting number?

Mr. ROUSH. Yes, where a person could go to a box or telephone and immediately know the number. Do you have any comments on that suggestion?

Dr. HOTTEL. To me this is one of the many things that ought to be standardized about fire. There is no reason why fire should be treated in a way that reflects the fact that you are from New England or California. The reporting of fire statistics in such a way that when any group makes a table of statistics it has to say: "But you mustn't make comparisons because the data aren't comparable," amounts to saying the data are meaningless. We can do nothing with them if they are not comparable and why even bother to print them if they are not usable. We need a uniformity in treating data and, as you say, in reporting fires, and what is good for one big city is at least worth our hard thought for acceptance by another big city.

Mr. ROUSH. Mr. Mosher.

Mr. MOSHER. Dr. Hottel, I find your statement very useful and very provocative all the way through, but I am particularly interested in page 2 where you consider it a crucial need that a large fire be modeled in a way which preserves the relative effects of the different forces of nature but on smaller geometrical and time scales.

What is involved, I see an expensive operation. It needs to be done but—

Dr. HOTTEL. This is a technical problem I spent many weeks on it in a graduate combustion class, and I am a little hesitant in saying much about it here. Almost all you can say can be technical. I can give you an example of the fact that you won't get a model if you are casual about it. If I build a small house and set it on fire—

Mr. MOSHER. Can I interrupt you? What authority would have the means to best accomplish this? I suspect that rather substantial costs are involved. Isn't this right?

Dr. HOTTEL. Yes; some of the work could be quite expensive. My present view is that one needs a pressure centrifuge inside of which to build small scale models to learn the limits on modeling, hopefully to move back out of the centrifuge after you learn some of the laws. In the course of building up the model laws one would have a program that might involve an outlay of a large fraction of a million dollars for a single piece of equipment. If we can afford electronic accelerators that run into billions, it seems that we ought to afford a centrifugal model tank that would cost a fraction of a million.

Mr. MOSHER. That is exactly the point I am making, the type of equipment that you just mentioned we have found in the past that only the Federal Government can really subsidize that.

Dr. HOTTEL. Yes.

Mr. MOSHER. Is it your opinion that only the Federal Government could subsidize a centrifuge of the type you are talking about?

Dr. HOTTEL. I think only the Federal Government could justify the expense. An extremely public-minded private organization could but probably would not. When you say "can afford," we have corporations which can afford a several million dollar expenditure, but they could not justify it. The findings are applicable to the Nation, not just the corporation.

Mr. MOSHER. This is several millions rather than hundreds of millions?

Dr. HOTTEL. Yes. The modeling study, I would say, is not expensive in terms of space research; it is expensive in terms of present fire research activities, a few millions.

Mr. ROUSH. Mr. Chairman, I spent last week in California and looked at another model which graphically portrayed to me the good use and the effects that can come from such a model. In San Francisco, the Corps of Army Engineers has constructed a model of the bay area in which they simulate the tide. They simulate the flow of the currents of the river. By the use of that model they can tell the effect of a barrier which might be constructed to prevent the saline water from going upstream, the effect of the siltation, or the effect of breakwater. This has been very useful and, according to the testimony of these people, has saved millions of dollars in unnecessary construction because they can simulate these various conditions before they actually happen. If this experience can be transferred to the use of a model in fighting or preventing fires, it would seem to me that it would be very worth while.

Mr. DADDARIO. Mr. Brown.

Mr. BROWN. Professor, you have concluded your statement by saying that one need only save 10 percent of the cost to pay their cost 60 times over. It leaves the implication that we might save 10 percent; but have you any way of making a reasonable guess?

Dr. HOTTEL. There are areas in which I claim expertness; but I think your guess is as good as mine as to how much we will, in fact, save by a fire-research program. I think it is more than faith; I am convinced that the saving will be large. I am in the area of guessing when I say it is 10 percent or any other number.

Mr. BROWN. Even 1 percent would be highly favorable.

Mr. MILLER. Will you yield?

Mr. BROWN. Yes.

Mr. MILLER. You are talking of dollars. Would we save some lives?

Dr. HOTTEL. I am sure we would.

Mr. MILLER. How do you evaluate dollars and lives? We just had a conflagration in Belgium, I believe, that killed 200 people. We have had some pretty bad ones in this country, holocausts that wiped people out. There is a human element. I don't know how you translate lives into dollars.

How many people do we lose a year or are killed by fires?

Dr. HOTTEL. About 12,000.

Mr. MILLER. About 12,000?

Dr. HOTTEL. Yes, sir.

Mr. MILLER. You cut that 10 percent, it would be a valuable asset.

Dr. HOTTEL. And those who do not die are in the worst way. There is no kind of accident that you would rather less have than to be badly burned, in terms of both pain and extreme medical costs.

Mr. BROWN. There is another area of questioning which has been brought up by some of our colleagues on this committee. That is the one of justifying the Federal role in this. Obviously the Federal Government is playing the role now. This would in effect establish the Federal Government as the primary coordinating body, and so forth. In an era in which we are talking about making the Post Office a private corporation, is there any reason why this function could not be

carried on by some sort of a private organization with encouragement and support of the Federal Government equally well? I am not advocating this course, but this is one of the inevitable questions that arises in this kind of a discussion.

Dr. HOTTEL. There is a rather strong interaction between fire and legislation which would make me hesitate to say that it would be equally well done. I could not deny that it might be effective to set it up as a nonprofit corporation, but I see no reason to do it that way.

In the case of mail operation there is a capacity to identify the cost of handling every piece of mail. There will never be a capacity to identify the saving from fire research. When I build a building some parts of which are too fire resistant, I am spending money unnecessarily, money that is capable of being saved by research, but I am absolutely unable to keep books on that kind of savings.

Mr. BROWN. I have no further questions.

Mr. ROUSH. Are there any further questions?

Mr. MILLER. Excuse me. On page 2 you say this, and I would like to emphasize this because this is to me very fundamental. I want to read it to you and see if you still subscribe to it. "Our knowledge of fire is largely empirical, unscientific, and grossly incomplete."

Dr. HOTTEL. I believe that, and I believe that those who have made the important empirical contributions will agree with this. We must rely on an empirical approach to problems when we don't yet understand them. All we can do is describe the phenomenon and say, to that extent we understand but we don't know why it works.

Mr. ROUSH. Mr. Yeager.

Mr. YEAGER. Just one question, Dr. Hottel. Since you have been associated with the oil and chemical industries or their work, do you have any notion of what sums those two industries as such may be putting into fire research?

Dr. HOTTEL. No, I don't.

Mr. YEAGER. Thank you.

Mr. ROUSH. Thank you very much, Dr. Hottel, for your contribution.

Dr. HOTTEL. Thank you.

Mr. ROUSH. Our next witness is Dr. John L. Bryan, president and head, fire protection curriculum, University of Maryland. Dr. Bryan. Do I understand, sir, that you have no prepared statement?

Dr. BRYAN. Yes, sir.

Mr. ROUSH. But you are prepared to comment upon the bill which is before the subcommittee?

STATEMENT OF DR. JOHN L. BRYAN, PROFESSOR AND HEAD, FIRE PROTECTION CURRICULUM, UNIVERSITY OF MARYLAND

Dr. BRYAN. First I would like to clarify that I am appearing as an individual. I am not attempting to present the views of the University of Maryland. I don't represent any national or local organization with a large membership. I shall have to speak from my experience on a local level and as an educator.

As to academic preparation and training, I am a psychologist so I am interested not only in the engineering and scientific aspects but the human aspects and the points Mr. Miller brought up in relation to the savings not only in money but the savings in the loss of lives,

injuries, and the loss that this poses on the citizen and the fire protective forces of the United States.

Now, I could quote national figures which have been quoted in hearings here and before the Senate, and I believe that these are rather meaningless because of the manner in which they are presently collected and I believe they are rather meaningless to the citizen of the United States whose contact with this problem arises when it affects his community, and primarily when it affects his family.

Now, there has been a lot of talk on the research aspects on the bill, and I would like to say first off, personally, I favor the House bill 6637 for the Fire Research and Safety Act. I believe it is long overdue, and I would like to quote some examples from the problems we run into in education in trying to turn out people who we feel, by preparation academically, may help to improve your protective services in insurance companies, in industry, in cities throughout the country.

In respect to this bill, when you talk of millions of dollars, this I can understand, but I do not comprehend fully. We operate on a budget of \$42,000 at the University of Maryland for our program.

Mr. ROUSH. Do I understand that the University of Maryland is one of the few, if not the only university in the country to give degrees in this area?

Dr. BRYAN. There are two, the University of Maryland and the Illinois Institute of Technology. The Illinois Institute of Technology started their program way back in 1903. We are a newcomer to the field. We started our program in 1957. We turned out our first graduating class of four students in 1962. This June we will turn out 14 graduates.

Mr. ROUSH. You may proceed. I am sorry for the interruption. I thought this was a good place to point out that there is not too much work being done at a university level in this area.

Dr. BRYAN. There are other programs on a university level at the technical or junior college level which have developed rather recently. In 1937 Oklahoma State started a technology program with a 2-year degree. Up to 1962 they were the only 2-year program in this country. Now, the University of Southern California had a program in fire administration. They still have, that is the University of Southern California at Los Angeles. They have turned out people with a major in fire administration under a degree of public administration and through this program you have had a great number of firemen in Los Angeles County and city who have gained baccalaureate degrees, associate degrees, and even master's degrees. Now, as a result of this experience, we have a phenomenon that is mushrooming right now of many fire science and fire administration problems in junior college, oriented to the man who is in the professional fire service and trying to give him academic professional training. I think this trend will continue. In Maryland we had the first such program started last February at Montgomery Junior College. This is what is needed to improve the leadership and efficiency of your public fire departments. I believe the trend will continue because the fire departments and the forward-thinking fire officers are the ones that are pushing this trend and going to the local colleges and saying, "Let us establish such a program," and they have provided the impetus for this development.

I think the value of the Federal Government's participation would be in the form of grants to develop curriculum for these programs, to

provide equipment, and then to assist cities and communities, where possible, in matching grants for the cost of people attending. Most counties now will pay tuition and fees and expenses like this to assist their personnel to upgrade themselves. This is the only way you are going to get the professional fire service upgraded. The majority of people that come out of academic programs, such as our program, will never go into the fire service. They do not go into it because the financial opportunities and the risks are adverse to their entering. They will go into private industry, the Federal Government, and insurance companies. So, for the fire service to be upgraded, there have to be academic educational opportunities available in their area while they are employed. I don't mean to downgrade the training activities that are carried on. This is good to a point. But when you train a man in skills and specialized knowledge to do a job, you are not training him to recognize problems that need research, that can be referred to agencies for study. You aren't preparing him to be an administrator so he can operate on a level where he should operate with county and city managers, boards, building departments, and other agencies, so I think this is a big trend and would be a place in which the Federal Government could be of great assistance.

I would like to give a little experience at Maryland that we have had with our program. We have had support from only two groups in the establishment of our program and the operation of it. And these groups are other than the State government, which has provided the basic funds. We have had financial aid and scholarships from the firemen organizations and most of these in our area are volunteer organizations. Secondly, the stock insurance companies, these stock insurance companies have provided scholarships and aid to students on cooperative programs whereby the student goes to school and then he is committed to work after he graduates with the insurance company. The Illinois Institute of Technology has had the identical sort of program since 1920. We have had no support other than from these two groups. Now even though in our program we get a great majority of people from outside the State, the State provides the majority of the support. We have students from eight States outside of the State of Maryland. Most of these come under the insurance scholarships. Most of these people also are students who would not be able to afford a college education without the insurance assistance. So this is a type of cooperative program. What I feel would be advantageous would also be cooperative programs with cities and counties from their fire department, fire marshal's offices, and the building departments. We have had a trend locally in the last 2 years where building departments in this area have hired alumni from our program and put them into the building department to review their building ordinances, their building plans of new construction and modifications from a fire-protection standpoint. Now, the majority of the features in any building code are concerned with fire safety and when you think about it, it is a little bit tragic that it has taken us this long to use qualified people to review plans when the majority of the building code requirements relate to fire safety and this is a trend that we have had in this area.

The State fire marshal in Maryland has hired one graduate. Prince Georges County hired the first, and they now have a student working

part time with a graduate fire protection engineer. The city of Alexandria has had a vacancy since July which they haven't been able to fill because there are no qualified people available. Washington, D.C., has a position in the Fire Prevention Bureau; it is a civilian position for a fire protection engineer to do the same sort of work in the Fire Prevention Division. This is a trend that I think will continue. The city of Philadelphia has taken a student for this summer. They have established the position as being permanent, not in the building department but as an aid to the fire commissioner to identify areas where engineering study and research could be applied to assist the Philadelphia Fire Department. I think this is very important. I think it is a trend that will continue. The problem is: You don't have the people to fill these opportunities that are developing. We had six job opportunities for every student coming out this June. This is bad for us because people are coming to interview and they can't get the students. It is bad for the profession and it is bad for the Nation. So I think we need more programs of this type.

Secondly, we have no graduate program in fire protection engineering in the United States. Illinois Institute of Technology did offer a program with a master's degree in the period from 1934 to 1940 and they granted, I understand, three master's degrees in fire protection engineering. That program was discontinued in 1940. There has been no graduate program in the United States since that time and to have university based fire research you have to have a graduate program. To have a graduate program, you need expensive equipment. You need expensive facilities and it is impossible to find support at the present time for these facilities. So I feel graduate programs are greatly needed in this area and especially if the fire services are going to identify problems in their communities that need study, you need people with graduate training that can recognize problems. The only people that see no problems in fire protection are the people that are not trained to recognize the problems that are there.

Mr. DADDARIO. Do you see, Dr. Bryan, this legislation before us and especially in this place where it emphasizes grants, helping to develop graduate capabilities in this area?

Dr. BRYAN. I would think in this area the grant for equipment and facilities would be the most helpful to establish graduate programs. We have to make projections at the university on the development of our department every 5 years. We made our last projection in 1965. At that time we projected that by 1975 we would have enough undergraduate students going out at the present rate of production to justify the establishment of a graduate program.

We were planning on this development at that time. At that time, in 1975 we will try to find funds to provide laboratories and equipment. If we don't get that, we won't have a graduate program, regardless of the need for a program.

Mr. DADDARIO. Recognizing the need for such graduate study and the expense, and as you contemplate ways and means through which you will obtain funds because you have a program, you must have some idea as to where these funds ought to come from so that you can have the kind of program you would like, and I would like the benefit of your opinion about that.

Dr. BRYAN. Ideally I would like to see funds come from the Federal Government because our students are drawn not from a local area but from a regional area as I indicated. Graduate students would be drawn almost nationally since there are no graduate programs, so obviously the first few graduate programs will draw people who have interest in the area and a lot of this interest comes from people who are working in the area in Federal and private agencies. They want to work for graduate degrees. Every year we have had two or three students from local or Federal agencies who are undergraduate people who desire additional studies. They come to us and we have no graduate program so they take a few of the undergraduate courses on a part-time basis. This is a means for them to pick up technical information, but it is very inadequate when you compare it to a graduate program.

Mr. DADDARIO. What are your plans? You have said you see a need for this and you have developed a program for graduate studies into the 1970's. What are you talking about so far as number of students, facilities, equipment? What do your cost analyses show this to be? Give us an idea of that if you can at this time. If you could it would be helpful to us.

Dr. BRYAN. We have projected that we would like to start a graduate program in 1975. We know we would need three additional faculty members for it. In terms of the cost of our facilities, in one of our design programs, in the course on fluids and systems we have had the students design, and we have worked with civil engineering, the equipment necessary for a fluids and systems laboratory.

We have also incorporated in this what we feel would be needed to carry on a student graduate research project in the area of fire phenomenon and behavior. We have come up with a preliminary plan which we had to submit. The cost of these facilities would be roughly half a million dollars. This would be equipment within a building and so on.

By 1970 our thinking here might change. This is what it is at the present time.

Mr. DADDARIO. How many students would you accommodate?

Dr. BRYAN. We would expect in 1975 the initial program for a master's degree only, and this is very tentative, we would expect to start out with half a dozen to a dozen students as the initial input. This is based on the present rate of production in this country. We are getting about 20 undergraduate fire protection engineers out of the Illinois Institute of Technology and the University of Maryland together a year.

Professor Jensen told me last Friday that their present enrollment is 47 students. Our present enrollment is 83. This is total, all 4 years.

Mr. DADDARIO. Your ideas then form themselves around what we could label a pilot program?

Dr. BRYAN. These could be pilot or demonstration programs.

Mr. DADDARIO. If we were to look at it that way and experiment a bit, we could then shake it out and come up with what would be a program which could most likely be used in other places as well?

Dr. BRYAN. That is right, a model for other sections of the country. In this respect I would like to say that I feel just as strongly support has to be put into the fire science programs which have developed out of the professional fire service in terms of upgrading their person-

nel. I feel that the real impact of any Federal efforts in this area will be measured two ways: By the fire research conducted through grants, contracts, and Federal agencies as this information is fed back to the local areas, let us say to the battleline. And here I am talking about the building departments, the fire department, the fire prevention people in every community. But then secondly, you have to prepare in those agencies people that can utilize this information that is fed to them and then secondly, that can recognize areas where we need additional information and make suggestions for study to the people conducting the research.

There is no reason that we couldn't have research bureaus in every large city fire department; many police departments have them. There are only one or two fire departments that have a research bureau and most of these are in California. There is no reason why this could not be incorporated into a fire department and it would be very beneficial. This is what Philadelphia has in mind with employing this student for the summer, not that they would conduct the research but to analyze the problem from their operations and identify areas for study. This is what a research bureau could do in the fire department and, particularly again in terms not only of economics in dollars and cents but where are they getting their fire injuries? Where are they getting their deaths in their fires and secondly, where are they getting their injuries to their own people and their deaths to their own people? The fire departments in the United States fight fires the best way they know how, but essentially this is the same way fires have been fought 50 years ago.

Mr. DADDARIO. At the root of the problem then is the training of adequate personnel to do this kind of work?

Dr. BRYAN. Not only that, but with your operations research to give them the advantage of improved methods and with human engineering into equipment design. The equipment developed by people for fire protection today is developed by the manufacturer, and he can sell all he can produce regardless of its inadequacies, so he is not interested in improving his equipment. I will give you an example. We require the senior students to do a research project. This basically should not be done in an undergraduate program. We do not have a graduate program. We do it for two reasons. It gives the students the ability to read technical publications and evaluate them. Secondly, it gives them an opportunity to review literature, prepare a study, formulate hypotheses, and carry through an experiment or an analytical study. They are very restricted. We have about \$400 to buy equipment and provide equipment for models and other supplies. For 14 students this doesn't go very far. One student wanted to evaluate the use of synthetic fiber firehose which has come out in the last 5 or 6 years as opposed to the cotton fiber, under heat conditions, abrasion, et cetera. He wanted three 50-foot sections of two-and-a-half-inch hose. We wrote six manufacturers on university stationery requesting could they supply this amount of hose for the project, explaining why, and the purpose of it. We got no answer from two. The four who replied all declined to supply the hose. Three of the four, although they could not supply the hose, wanted the copy of the research report. They wanted the information, but they would not put in approximately \$300, the cost of the hose, to get the information. They are produc-

ing synthetic hose; they can sell it, so they are not particularly concerned with the evaluation of the hose as long as they can sell what they are producing.

Mr. DADDARIO. How can they meet the specifications if they don't know—

Dr. BRYAN. They can meet standards and these are established by Underwriters Laboratories. This was not a question of standards; this was a question of trying to evaluate the comparative effectiveness in relation to abrasiveness, heat, and other variables of the firehose.

Mr. DADDARIO. Unless that is done, Dr. Bryan, how can this equipment be improved? My question goes not to the fact that they meet a standard which, as you call our attention to it is the least common denominator at best, but how can you come to some judgment about where you go unless you conduct these tests which you refer to and which appear to be basic in nature?

Dr. BRYAN. What is done now is that every fire department evaluates—in other words, if a fire department has a problem, they evaluate it from their usage of the hose. In other words, if they have some hose that tends to wear out from abrasion, they will switch to another type or another manufacturer. Many times this is not even done on the basis of experience. It is done on the basis of opinion.

Mr. DADDARIO. You touched on the need to improve equipment. The equipment which is presently available, is it adhered to more because it can be produced and whatever is produced will be, as you say, snapped up—what work is going on as you know anywhere in private industry or in government in this field of research? For example, you have not seen the statement but yesterday we had some Forest Service people in here talking about research work they had done to which they attribute improvement in equipment and handtools and whatnot. As you look at this whole field and see the amount of work which is being done, how do you evaluate it? How should it be improved and who ought to do it?

Dr. BRYAN. The type of work that the Forest Service is doing is not done by any one agency for the urban fire services. A particular fire department might want to evaluate some equipment and they will make an empirical study and they may get opinions of users in other departments, but they have a problem with a particular piece of equipment, they might determine if any other Federal agency had studied it or other people. The university continually gets requests from fire service protective departments for the evaluation of protective breathing equipment, clothing, nozzles. We ran a study with Federal money in 1954 on the evaluation of fog nozzles and it was very adequate at that time. It led to some good improvements in design. A constant flow fog nozzle came out. Five thousand dollars were obtained from the Office of Civil Defense, from Operation Fire Stop, which was the first major study of outside fires, and was directed by Mr. Layman who was formerly the Director of Fire Services in OGD. We got \$5,000 of that money through his efforts primarily to study fog nozzles and out of that we got the constant-flow nozzle. That was 1954. Most of those nozzles studied at that time—the majority of them are no longer being used, so the nozzles presently in use, of course, should be evaluated. Breathing apparatus are rated by the Bureau of Mines. You get a standard rating.

We have a rating for a self-contained air mask from the Bureau of Mines. The fire departments found out that there were people using it, and they didn't get the time it was rated for. So what happened? We have had some studies, a senior student last year ran a study through the cooperation of the fire service extension department. The study indicated the time of the usage related to the physical condition of the user, the experience of the user, how many times he used the mask previously, the type of work he did using the mask, exertion, whether it was a heated or a nonheated atmosphere. This was information that could be applied to the fire department's using the mask, but as for this information being used by designers of the mask, I am not sure it ever gets back to them. This would be the value of the proposal contained in your Fire Research and Safety Act for an information clearinghouse. I find it impossible to keep up with what is going on in this field right now.

I just came back from San Antonio where the Air Force has developed a protection system for their hyperbaric chambers after the fire last January, after Apollo, when they lost three men. What they are using is nothing new; it is basic equipment. What is unique is how they applied it. There were 250 people, and the majority were from Government agencies. The fact is that speakers there presented information—one from England, from the Royal Air Force, presented the studies they did in 1963 that very few people knew anything about. So this dissemination of information is, in my opinion, one of the strongest points for this act so that everybody can benefit from what everybody does, whether you are at College Park or in England or at Brooks Air Force Base or at the Forest Service laboratories.

Mr. DADDARIO. I would expect that would be so, Dr. Bryan, but I find it somewhat amazing that these basic things have not been done. You talk about the use of the gas mask and the size of the person, the number of times he uses it, and the skills with which he uses it. These things would appear to me to be fundamental steps which every manufacturer could explain to you. This information would be available to every new fireman who was hired.

Dr. BRYAN. Let me say that this may have been done somewhere else, but the fact was, in Maryland when this problem came up, we did not have the information, so we had to try to develop it ourselves. Now, somebody in Georgia may have this problem tomorrow, and they may do the same thing, go ahead and make an empirical study, but it was not available from the manufacturers.

Mr. DADDARIO. It seems quite a casual approach that we are all making to this.

Dr. BRYAN. Very true. But the manufacturer makes a product and as long as it sells he is not worried. If a competitor comes along and starts affecting his sales, then he wants to know why his equipment is not selling. But as long as he can sell what he is producing, and this is my personal observation, he is not interested in improving. I know an equipment manufacturer for pumpers that continually put the pumping controls on the officer's side, not the driver's side, of the equipment for years.

When you asked him why, he said this keeps the pump operator out of the street. In fire department operations you connect with a hydrant whether it is on the right or wrong side of the street, the closest one.

All this meant was every time that man went into operation he had to run around the vehicle, even for a booster line of 15 gallons a minute, and any human engineering analysis would have picked this up immediately. This was done for years and this was the answer you got when you asked the manufacturer why he put the pump controls on that side. He has since gone to the driver's side where the majority of the manufacturers have them.

Mr. DADDARIO. Information of this basic kind needs to be put together so that it can be best understood and disseminated in a standard way so that it gets to all of the people who need it relatively in the same form?

Dr. BRYAN. That is right.

Mr. DADDARIO. In this area, you really don't need much research. This would appear to me to be just a bit of hard work that could be done through the use of the machinery we would set up as a result of this legislation. Then some of this great research that everyone is talking about could then be built up on top of that. We are not really talking about research. This is a point that seems to be coming up time and time again.

Dr. BRYAN. What you essentially need, in my opinion, is the research as Professor Hottel pointed out on the basic understanding of fire because we don't understand it. But with this we need the dissemination of information as it is developed in the country, and we need an agency whereby the research can be related to the problems that are causing your losses in terms of dollars and lives. This has to be at the local level. You can't attack the loss of lives from fire from a national standpoint because they come from the local area. You have got to find out what is causing your loss of life in fires in the different communities. In New England it may be heating equipment in the winter. I don't know what it is. But this certainly wouldn't be the problem in southwestern Texas and New Mexico. They are having loss of lives in fires, so the value of this will be as it is applied on the local level, and it will not be applied on the local level unless you also have the educational facilities to improve your professional people that have these responsibilities to use the research, and then also, to identify problems that may be applicable to research solutions whether it is basic or applied research. This is, in my opinion, what is needed.

The fire service in this country is dedicated, and they want education. Captain Yocum, who is right here, comes in and bothers me all the time. "When are you going to offer courses at night so that the firemen who work in the area and have the problems can come in and get some education?" I think from the statement of the National Firefighters groups and chiefs, that by and large most of them realize they are faced with problems that they don't have the capability academically to solve and they want the education. That is why we have had the development of these 2-year programs, and we are going to have 4-year programs for firemen. We have got to have them. The fire chief in a city that administers a budget like the city of Baltimore of \$18 million and has close to a thousand men is a college graduate now—the first one in the history of the Baltimore Fire Department, and they have made more improvements in the last 5 years than in the previous 50 years. I don't know that you can

directly correlate this to the training and leadership ability of this man, but there must be some connection, and you need these types of individuals, not just in large cities but in every city of the United States where they have a fire problem, and there isn't a city in this country that doesn't have a fire problem. Some of the cities don't recognize it, but it is there.

I would like to say at this point, also in relation to education, the National Fire Protection Association has never supported with \$1 of money any educational effort in terms of training or academic preparation in the United States. The most you will get from the National Fire Protection Association is somebody to come down and talk to a seminar. Now why? Because they haven't had the funds to do this, and I am not sure that they should do it either. Education has to be suited as far as the fire services are concerned to the local area needs. In other words, if we would bring a lecturer in from New York City or even Baltimore to talk to a seminar put on by the fire service extension, such as they have on staff and command operations, where they simulate the placement of companies and tactics for a large fire—he would be out of place, because he has different resources, different organization from a volunteer department. So we teach this, the fire service extension, I say we—I don't, John Hoglund who is here from the fire service extension, it is one of his areas, and he does very well—they teach it where a chief is not talking to the companies under his command with paid men but he has to work with chiefs from 15 or 20 individual fire companies, and it is an entirely different problem. Although the fundamentals are the same, here you get into problems of human relationships and administration. So your education the way it is developing for the fire service in community colleges, and local State colleges I believe is very good. We just need to support these efforts in terms of equipment grants and facilities to let them grow faster.

I had a young man who called me from Arizona who works for a Federal agency. He is an alumni of our program. They are trying to get a 2-year program started in Tucson, and he wanted to know, did I think the Federal Government would have any matching grants for equipment or anything to start such a program? I told him go ahead and start your program the best way you can and don't wait for the Federal Government, because we have been waiting for the Federal Government for years. And he will have a program just as we have and he will do the best he can. We will continue to have a program whether this bill or any other bill passes, so the real point is the assistance we would get for the existing programs and for the development of new programs from an educator's viewpoint and from a fire service viewpoint. I think I can talk from the viewpoint of the fire service since I have had 26 years experience in the fire service. I am still a volunteer fireman. When the need arises I still operate the equipment. I do this for two primary reasons. I don't think you can teach any area if you isolate yourself from the basic problems that the basic man has to face. At the present time the fireman in the United States has to face situations and conditions, as far as he is concerned, with techniques and tools that have been very little improved over the past 25 years. Lloyd Layman, who is here, perfected techniques of fog firefighting. We have had that. We have had improved masks and improved communica-

tions, in terms of radio. Outside of these basic factors our improvements have been very limited.

Mr. DADDARIO. You must have joined the volunteer fire department because it is a lot of fun, too?

Dr. BRYAN. Well, basically, and I recognize this, I am a student of psychology and fire protection—I am not an expert in anything; I am a perpetual student—it keeps me in touch with the problems of the basic individual.

Secondly, it makes me feel good. I feel when I can go out and help in an emergency situation, I am helping somebody else. This makes me feel good so I do it for self-satisfaction.

Mr. DADDARIO. You bring up an important point. We have been concerned about science, research, and development everywhere throughout the country. A few years ago we had hearings on an important problem involving geographical distribution of Federal funds for research. Mr. Roush has been particularly active in this subject. When you gave advice to people in Arizona to start their program and not wait for the Federal Government, you were somewhat critical of the Federal Government. The fact is that we found during the course of these studies, and it was one of the basic considerations, that there must be local initiative, drive, and the development of capabilities to which the Federal Government can give support.

We did not feel that it was the Federal Government's responsibility to go everywhere throughout the country and to develop competence just because it decided that it ought to be done. The idea of local initiative, drive, and participation—the desire to risk capital either through the university, local industry, insurance companies, or people in this area of responsibility, is a very important part. The study showed that places where great improvement had come about in attracting research funds, not just Federal but private as well, developed by the impetus that came from within rather than from without.

Dr. BRYAN. I didn't mean to be critical.

Mr. DADDARIO. I understand. I am not being critical of what you said because I recognize it as being said with objectivity in mind.

I am pointing this out because the advice you gave was, I think, not only good, but imperative in anything that is done. Those people in the concerned community outside of the Federal Establishment who see problems and move to meet them then are the ones who lead the Government toward the development of policy in these areas. It is a very healthy situation.

What I think we are seeing here is the natural evolution of legislation through this particular process. The unfortunate part of it is that it is extremely late and we should have been at this task much sooner, but I think we all have to share the responsibility.

Dr. BRYAN. The reason I told him to go ahead was because they had the initiative and they had the enthusiasm for the program and if they had paused and waited for any action, not only from the Federal Government or from the State, then they would lose their momentum and this is what I was concerned about.

Mr. DADDARIO. Mr. Roush?

Mr. ROUSH. No questions.

Mr. DADDARIO. Dr. Bryan, I would hope we might be able to address questions to you for the record and perhaps have an additional oppor-

tunity to talk to you as we run into problems as we go along. You are nearby and I hope we can give you a call and have you come in and talk to us informally about some of this as we begin putting it together. I would appreciate that.

(Additional questions submitted and the answers thereto are as follows:)

(Question 1:) Could you describe the efforts that have been made by the University to secure grants or other financial assistance for the fire protection curriculum from the private sector?

(Response to question 1:) The financial assistance that has been secured for the fire protection curriculum has been developed by the efforts of the faculty of the curriculum and the staff of the Fire Service Extension Department. The faculty at the present time consists of two persons, one professor on a twelve month contract and one assistant professor on a ten month contract. It should be realized that prior to September, 1960, the faculty consisted of one person, and we have now the budgetary authorization to hire an additional faculty member. The financial assistance for our program has been developed through personal and professional contacts with some limited success in the form of donations of equipment, and the establishment of scholarships and grants for students.

In 1957 we approached Mr. Frederick W. Doremus, who was then Manager of the Eastern Underwriters Association, in relation to the establishment of a co-operative scholarship program. This program was established with the initial students entering the University of Maryland in September of 1959, and has been continued under The Fire Insurance Research and Actuarial Association with the able cooperation of Mr. James E. Blowers. The scholarships established under this program finance the full costs of tuition, fees, lodging, and board of the student, for the time required to complete his baccalaureate degree. The student is also employed by the insurance rating bureau in one of the eleven North Eastern States during the summer vacation periods, and for a period of four years following graduation. The stock insurance companies which provide the finances for this program have benefited with the introduction of technically competent individuals into the insurance rating bureaus and into the insurance companies. The fire protection curriculum has received the benefit of obtaining highly qualified students for the program from areas outside of the State of Maryland. This program is currently requiring an expenditure by the stock insurance companies of approximately \$75,000 to \$80,000 per year. These stock insurance companies have also supported a similar scholarship program, since 1920 at the Illinois Institute of Technology. The Illinois Institute of Technology program is administered for the stock insurance companies by the Western Actuarial Bureau.

We have also been modestly successful in obtaining the establishment of scholarships and grants to defray the expenses for the tuition and fees of students from within the state of Maryland. There are presently six organizations offering such awards, with the expenditure varying from \$375 to \$600 per year per student. These organizations are: The Nationwide Mutual Insurance Company, The Maryland State Firemen's Association, The Ladies Auxiliary to the Maryland State Firemen's Association, The Anne Arundel County Volunteer Firemen's Association, The Prince Georges County Volunteer Firemen's Association, and the Baltimore County Volunteer Firemen's Association.

We have actively sought and received donations of materials and equipment from private concerns within the fire protection industry, and the building materials industry. The manufacturers of automatic sprinkler systems, and fire detection equipment have been extremely helpful in the donation and installation of equipment. At the present time there is approximately \$20,000 worth of equipment installed in the Laboratory Area of the Fire Service Building. Equipment has been donated and installed by the following organizations: The Reliable Automatic Sprinkler Company, Inc., The Viking Corporation, Central Automatic Sprinkler Company, The Star Sprinkler Company, The Globe Sprinkler Company, Automatic Sprinkler Corporation of America, The Grimes Sprinkler Company, Grinnell Company, Inc., The American District Telegraph Company, Pyrotronics Incorporated, and The Notifier Corporation.

Some of the private companies which produce building and chemical materials have been of assistance in providing samples of products to be utilized by the senior students in their undergraduate research projects. This assistance has

been of a limited nature involving an expenditure of from \$50 to \$200, and has been essential for us to be able to conduct the very limited type of undergraduate research projects we have required from the students. The following organizations have donated materials since 1962 for this purpose: The Acoustical Materials Association, The Harvel Plastics Company, The Star Sprinkler Corporation, and the Ocean Chemical Company.

The Rohm and Haas Company is the only private organization that we have been able to induce to supply any instructional or testing equipment on a donation basis. This company in 1965 donated an XP-2 Smoke Density Chamber to the fire protection curriculum for use in our pyrometric laboratory. This test equipment has a financial value of approximately \$750.

(Question 2:) How much work has gone into securing research money from private sources?

(Response to question 2:) The Fire Protection Curriculum of the University of Maryland has not actively sought research funds from governmental or private sources. To properly conduct academically based research requires a graduate program of study, a graduate faculty, special laboratory equipment and special facilities, which we presently lack. Therefore, we have not sought such research funds since we have not been in a position to utilize these funds in a valid, comprehensive and intelligent manner. Under our present projected development of the fire protection curriculum (based on our present limited resources) we expect to establish a graduate degree program in 1975. Thus, we would expect to initiate the active solicitation of research funds about 1973.

(Question 3:) Is there any logical explanation for the limited number of schools that offer a degree in Fire Protection Engineering?

(Response to question 3:) The development of a new degree program in an institution of higher learning is dependent in my opinion on several critical factors.

First, there must be valid evidence presented to the administration of the university or college for justification as to the need for the program. This justification is usually presented in the form of a proposal with documentation from interested private and governmental organizations located in the area served by the institution. The state and local chapters of the professional organizations are most effective when they are available to participate in this effort. However, the Society of Fire Protection Engineers is just beginning to become an effective organization in this respect, since they were only formed in 1950 and presently have a limited membership of approximately 1500 members. In the initiation of the Fire Protection Curriculum at the University of Maryland the major support and justification for the establishment of the program was developed by the Maryland State Firemen's Association. This support culminated in a legislative appropriation to the University of Maryland for the initial operation of the program. Thus, there must be support from the local communities with the local initiative for the initiation of new programs, and this type of support has not been generated in many sections of the United States.

Secondly, the initiation of a Fire Protection Engineering program, as is true with any engineering program, requires rather extensive laboratory facilities, and equipment of a specific nature. The present facilities at the University of Maryland utilized by both the Fire Protection Curriculum and the Fire Service Extension Department represent a capital investment for buildings and facilities of approximately \$400,000 with an additional \$100,000 in equipment. These facilities were developed for the Fire Service Extension Department, and had these facilities not been available for joint use by the Fire Protection Curriculum, I seriously doubt that such a program would have been initiated at the University of Maryland. Therefore, the initiation of fire protection engineering programs requires a rather sizeable initial expenditure of funds from the resources of the institution. Thus, many institutions lack the financial resources to initiate such programs. Since 1963, I have had correspondence with the following institutions in relation to the initiation of a fire protection engineering program, and none of these institutions to date have established programs: Georgia Institute of Technology, Michigan State University, University of Miami, Georgia State College, The University of Tennessee, and California State College at Long Beach.

Thirdly, the establishment of a fire protection engineering program is dependent upon the availability of qualified faculty personnel. Faculty personnel must

possess graduate degrees and have obtained some professional experience in fire protection engineering. Thus, we are severely limited in the development of faculty personnel due to the lack of graduate programs in fire protection engineering. It takes a rather versatile individual to obtain a graduate degree in an area of study unrelated to his major area of undergraduate study, and usually the individual must obtain additional undergraduate courses in the area of study for his graduate degree. We have just completed a search for potential faculty personnel for the authorized position in our program. We located six individuals with a graduate degree and professional experience in fire protection engineering in the United States. From these six individuals we have been able to interest two gentlemen in joining our faculty. Thus, at the present time there is a scarcity of personnel within the United States with the minimum qualifications for faculty service and there are no established programs for the development of such personnel. I believe this scarcity of potential faculty personnel is a valid problem which has hampered the development of fire protection engineering programs.

(Question 4:) Are your fire protection courses incorporated in other engineering specialties, i.e., structural engineering, architectural engineering, etc.?

(Response to question 4:) The fire protection courses at the University of Maryland are not required courses in any of the other five engineering departments, listed below: Aerospace Engineering, Civil Engineering, Mechanical Engineering, Electrical Engineering, and Chemical Engineering. However, the junior and senior level courses are accepted as elective courses for students majoring in the other engineering departments, and for students majoring in other Colleges within the University of Maryland. We have had students enrolled in fire protection courses from the following departments: Public Administration, Industrial Education, Secondary Education, Civil Engineering, Mechanical Engineering, Electrical Engineering, Business Administration, and Health Education.

Mr. DADDARIO. Do you have anything further to add? You are in support of the legislation?

Dr. BRYAN. Oh, definitely. Definitely. As I indicated, I would have been in support of it 20 years ago if it had come up. The only thing that I would like to say is that I think that the big impact of this legislation will be how it affects the local communities and this is the importance of it—the research as it is applied to the local communities and by this I mean large cities as well as small cities. We have had a lot of national efforts but they don't have an impact on the local area and this is where your losses are.

Thank you.

Mr. DADDARIO. We would like now to hear from Commissioner Robert Lowery, of the city of New York. Commissioner Lowery.

Mr. LOWERY. Thank you.

Mr. DADDARIO. I understand you have a prepared statement which you gave to the Senate when you appeared before Mr. Magnuson's committee.

Mr. LOWERY. That is correct. I have resubmitted it. I think I covered in general terms the position of my department, the city of New York, but I was asked if I would come back again to Washington and I welcomed the opportunity because we feel so strongly about the need for this legislation that I feel that if I can in any way make a contribution toward its passage, it is something I very definitely wish to do.

Mr. DADDARIO. Commissioner, we have your statement. It is in the record of the Senate hearings.

Give us an idea of why you support the legislation and what you think it will do and how you believe it will be helpful to you and what is the cost of it in a major city.

**STATEMENT OF ROBERT O. LOWERY, FIRE COMMISSIONER,
NEW YORK CITY, N.Y.**

Mr. LOWERY. I will outline a few problems that apply generally, that apply nationally. I believe a national effort is needed to resolve and coordinate some of these problems.

Mr. DADDARIO. Yes.

Mr. LOWERY. Fire departments throughout the country have been plagued for many years with a rising incidence of false alarms. More than 25 percent of the street box alarms that were pulled in New York City last year were for false alarms and the past decade has seen a 300-percent increase of transmission of false alarms in New York City and last year they totaled 38,000.

To demonstrate the magnitude of this problem on a national basis and the direction in which we are going, I would like to cite the experience of Chicago in 1965. Nine out of every 10 fire alarms transmitted from street boxes in Chicago in the year 1965 were false alarms. The needless running of apparatus in response to false alarms results in stripping areas of protection; increasing vehicular accidents and injuries resulting therefrom; also it results in useless wear and tear on apparatus and the diminishing of fire protection. We know that these false alarms in the main are transmitted by children and teenagers and this problem has been widely discussed and explored by fire administrators and educators.

Many approaches have been attempted in order to limit the problem, but we have been unsuccessful. I think this is an area in which a national effort must very definitely be made. Millions of dollars have been expended in the development and installation of fire alarm cable plants. It is only a question of time before we won't need the street alarm box. I might point out—we won't be able to use it; I shouldn't say we won't need it.

In the city of Los Angeles, in an area where this became a critical problem, they removed the fire alarm boxes and are now relying on other means of transmission.

Another great area of need is the development of a uniform fire reporting system throughout the Nation. Present fire departments classify fires differently and if we are to draw meaningful conclusions from statistics generated, it is essential that every fire department classify fires in the same manner. Properly developed statistical data will assist in developing fire prevention programs and will point up the need for corrective legislation.

Another area in which we must move is the area of fire investigation.

Mr. DADDARIO. Before you get into that, on this question of standardization and reporting of fires, why is this a problem since you people are in the firefighting business and you do have means to keep in touch with each other, what is it that has prevented the development of a standard or best way to report?

Mr. LOWERY. I can only answer that based on my information and knowledge and it is highly personalized, and I would say generally it is because there has been no national correlation of fire statistics other than through the National Fire Protection Association, through the insurance companies. I think there was a similar problem with crime reporting.

Mr. DADDARIO. There has been no way through which it can be proven out that there is a better way to do it than that which you are using at the present time?

Mr. LOWERY. I don't quite follow that.

Mr. DADDARIO. Since you are all reporting differently?

Mr. LOWERY. Yes?

Mr. DADDARIO. You do have an opportunity to see what others are doing?

Mr. LOWERY. Yes.

Mr. DADDARIO. You can improve your own from time to time?

Mr. LOWERY. But it is not standardized.

Mr. DADDARIO. It is not standardized?

Mr. LOWERY. Yes.

Mr. DADDARIO. Somebody has to prove out—

Mr. LOWERY. Yes.

Mr. DADDARIO (continuing). That there is a best way to do it?

Mr. LOWERY. That is correct. That has not been done to date. As I recall a number of years ago there was a problem of crime reporting. I recall in my city, New York, the crime statistics were unacceptable because of the manner in which they were compiled. I think as we go from city to city what constitutes a fire, definition of it, reporting means—they differ based on the city, the way it is developed, the statistical data, the recordkeeping. And I believe that there should be some national standard set.

Mr. DADDARIO. Thank you.

Mr. LOWERY. Fire statistical reporting is an area that can be improved through national coordination. Information on arson fire is not available on a national basis and there is little knowledge on arson investigation at State and local levels. I personally feel that research in this area will produce startling information and will stimulate efforts to control this very serious crime.

Another urgent problem is one that most of the large urban areas, the fire departments in these areas are faced with heavy fire problem in depressed areas, the older residential areas inhabited in the main by persons of limited financial means. A disproportionate percent of false alarms and injuries and fatalities occur in these communities. The resources of the larger city fire departments are strained in dealing with this problem. Although it can be stated it is a local problem, still it is national in scope and I am sure that the country will benefit by an exploration of this problem by a national commission.

Mr. DADDARIO. What you are saying is the same problem of intensity in depressed sections of New York will repeat itself in other cities?

Mr. LOWERY. This is evident across the country. Chicago has a problem on its South Side. They have it in Los Angeles in Watts; we have it in Harlem, in the south Bronx; it is the depressed areas, the sections inhabited by peoples with lower incomes. It is a problem of great magnitude. It also relates to other conditions, crime, deteriorating housing—it is a problem of national import. It doesn't stop in New York. It is something that extends across the Nation.

Mr. DADDARIO. Crime and drug addiction can feed itself back into false alarms?

Mr. LOWERY. I believe there is a correlation between them.

Mr. DADDARIO. It ought to be looked at?

Mr. LOWERY. Yes. I also feel that there is a very definite need, and I support Dr. Bryan's statement of the need for improved training programs for fire personnel, training and educational programs. New York City has moved in this direction by establishing a fire institute and a fire science program in the community colleges.

In order to develop future managerial personnel skilled in fire service, operations and professionally oriented and scientific administration, programs of this nature must be developed. I might point out that they are very costly and Federal grants to support the development and educational training programs for the fire service are sorely needed.

Mr. DADDARIO. How long has this fire institute been in existence?

Mr. LOWERY. It was established in this past year, in April of 1966, I am sorry, it is a little over a year in existence.

Mr. DADDARIO. How was it set up? How many people does it aim to train?

Mr. LOWERY. 700 members of the department were registered in the last semester. The Board of Education, City of New York, has approved the courses. We have trained instructors. They have their teacher's licenses. The courses are in the area of fire administration, fire operations, personnel management. They relate to the subjects that are necessary in order to advance by promotion in the department. The fire science program in community colleges is directed to an associate degree in fire science.

Mr. DADDARIO. How long are the courses?

Mr. LOWERY. The fire department courses or the community college?

Mr. DADDARIO. Both.

Mr. LOWERY. The community college course is a 2-year course. The fire department courses are by semester and as of present it is a 2-year course.

Mr. DADDARIO. Do you support any of your firefighters in the 2-year community college courses or not?

Mr. LOWERY. You mean financially support them?

Mr. DADDARIO. Yes.

Mr. LOWERY. No; there is no subsidization at this time.

Mr. DADDARIO. Is it contemplated that you might?

Mr. LOWERY. If we can find the funds for them, we will.

Mr. DADDARIO. What is the funding level at the moment?

Mr. LOWERY. The members pay their own tuition. There is no subsidization or funding from the department.

Mr. DADDARIO. The city picks up the teaching tab?

Mr. LOWERY. That is correct.

Mr. DADDARIO. And the facility tab?

Mr. LOWERY. That is right.

Mr. DADDARIO. What does this cost each of the men?

Mr. LOWERY. I am sorry, I can't give you those figures.

Mr. DADDARIO. Could you provide that?

Mr. LOWERY. It is a nominal cost. It is not expensive.

Mr. DADDARIO. Enough to meet the demand?

Mr. LOWERY. That is correct.

Mr. DADDARIO. All right.

Mr. LOWERY. Finally, may I emphasize the need for research as relating to fire equipment and tools.

As Dr. Bryan says, and I agree very thoroughly with him, our present method of product research and development depends upon the willingness of capability of manufacturers to cope with the problem. Federal grants have proven effective in providing measurable advances in aerospace and military technology, and I think that results can be obtained by the fire service if similar techniques are employed. There is a need for research and development of improved fire service tools. At present many fire departments are forced to use imported equipment due to lack of availability of domestic—

Mr. DADDARIO. Imported from where?

Mr. LOWERY. England or Germany.

Mr. DADDARIO. The reason I asked that question is that we have been given some startling statistics about the incidence of fatality and damage overseas. We are apparently not doing too well. I wonder if you get more of your equipment from one country rather than another. This might be an indication as to why these other countries are doing better. Nobody we have asked can do anything but quote the statistics; they don't know why.

Mr. LOWERY. Why they have a lower fire incidence or loss?

Mr. DADDARIO. Yes. For example, we have six and a half times more fires than Japan.

Mr. LOWERY. I can only say that there seems to be a much greater concern and much greater fire prevention.

Mr. DADDARIO. Is their equipment better?

Mr. LOWERY. Japanese equipment better?

Mr. DADDARIO. Yes.

Mr. LOWERY. I don't believe so across the broad range. I have seen it. It is comparable. It is smaller.

Mr. DADDARIO. How about Germany? Are we getting it because it is better or more readily available?

Mr. LOWERY. Some of the equipment we are getting is because we haven't developed the equipment here.

Mr. DADDARIO. Then it is better?

Mr. LOWERY. For our use anyway. We do use pavement breakers for breaching walls, concrete floors, pier decks, powers saws and portable pumps that come from overseas. I would assume that the reason we are forced to go overseas is that we just haven't developed this equipment here. The manufacturers haven't developed equipment comparable or equal to the equipment as developed overseas. As a result we are using foreign equipment.

Mr. DADDARIO. You have been in this business for some time. Can you give us an idea why this is so? Why would our manufacturers allow a foreign manufacturer to preempt this field?

Mr. LOWERY. This is a question that I can't answer. Frankly, it may be that they don't see the financial advantage in developing this equipment. Maybe there is not an extensive enough use of it. As I look at it, we surely have the capability of developing but we just don't get it.

Mr. DADDARIO. Could you provide for the record the amount of money spent in the purchase of equipment of all kinds for your department and can it be broken down to see what funds were spent domestically and which funds were spent on foreign equipment?

(The material referred to may be found in committee files.)

Mr. LOWERY. I am sure I can get that for you from our procurement office.

Mr. DADDARIO. We would appreciate it if we could have it. Let me ask you another question.

This must remind you of a fire department with all these bells.

Mr. LOWERY. Buzzers.

Mr. DADDARIO. Let me ask you again one further question about equipment.

As you have experienced it, when you place a demand on industry to provide you with a certain type of equipment not presently available, what reaction do you get? Are they anxious to be helpful or are they not?

Mr. LOWERY. Well, I can only relate this to personal experience. When I say personal, I mean the city of New York. We moved in the direction of a snorkel that was not used by the other cities. The snorkel is an articulated aerial platform or an aerial platform that is raised by an articulated boom. The city of New York wanted a hydraulically operated boom and we took this up with the Mack Co. and our people assisted them in developing the idea and we came forth with an aerial platform that is unique. It is used in New York and it is now being used in other cities. I believe St. Louis has one. They did respond to our desires to develop new equipment. This also occurred in developing the super pumper. A tremendous amount of money was involved, \$875,000 to develop this new equipment. There are cost factors. To develop new equipment is, I am sure, a very expensive process for the manufacturer. As Dr. Bryan pointed out they can sell the equipment that they have so they don't see the need for it.

Mr. DADDARIO. There needs to be a spark ignited somewhere so that they can take their capability to manufacture good equipment and to move it from there to the point where they bring this up to date and fit your requirement. You must be constantly thinking of better ways to use equipment and improvements even on the most modern equipment you buy.

Mr. LOWERY. That is correct.

Mr. DADDARIO. This legislation could review this in all areas throughout the country and make some determinations about the direction of research, get the best judgment of the best people on this and perhaps come up with an even better platform, an even better pumper?

Mr. LOWERY. There is no doubt in my mind that this can be done. It has been done in many other fields. Why it can't be done in the fire service, as you say, we haven't had the impetus for it. I would assume that funding is a very important aspect of it.

Mr. DADDARIO. What would you say that the level of your training is and how do you think it could be improved through those methods explained to us by Dr. Bryan this morning? More 4-year courses? More graduate courses? More attention paid to the best techniques in this area?

Mr. LOWERY. Well, there is a need for this and as Dr. Bryan pointed out the fire service themselves, the personnel, the men are interested in advancing their knowledge, improving their knowledge. The fire problem becomes more complex every year, but you must realize that at the admission level, recruitment level, and I think this is true of most fire departments, I know it is true of ours, only a high school education is required. And the young men coming in to the department come in in to the main—an overwhelming percentage have a limited academic

background. As they serve, there must be an effort to improve upon their academic background. We have seen the need for it by instituting the programs that we have. I agree that there is a need for this at the college level, developing these capabilities, fire protection engineers and bringing them into the service from the college level rather than at the high school level.

How do you do this? This is something that we hope this act will be of some assistance.

Mr. DADDARIO. It certainly ought to give it some prestige. If you raise the quality at the college and graduate level, you will generate greater support in the community and probably help in getting the kind of funding necessary to bring competitive people in at the beginning level.

Mr. LOWERY. I might also point out the salaries that are paid at many places do not encourage the college level applicant.

Mr. DADDARIO. That has been expressed several times in the course of these hearings.

Mr. LOWERY. I think quite a few firemen who educate their sons past high school level don't intend for them to be firemen.

Mr. DADDARIO. We appreciate your coming.

Mr. LOWERY. I will get that information for you.

Mr. DADDARIO. We will probably ask some further questions. I don't know whether it would be possible or not, but I would like to see some of the members of the committee and someone from the staff could come up, if you could make arrangements for them to go through the Fire Institute and see the programs and let them talk to the people who run it.

Mr. LOWERY. Fine.

Mr. DADDARIO. As we wish to do in Dr. Bryan's case and others as well, so that we can have a personal view of the activity that is going on.

Mr. LOWERY. Fine. I will make them available to you.

Mr. DADDARIO. Fine. I certainly appreciate your coming. You have been very helpful to us.

I hope that we might be able to finish even though we are operating somewhat illegally here at the moment. But if Mr. Davis could come to the table—

Mr. FULTON. Could I tell the commissioner the experience of my great uncle on the New York Fire Department?

Mr. DADDARIO. Certainly, even though you are sitting on the wrong side.

Mr. FULTON. I am here as a guest. My Uncle Jonathan was a member of the New York Fire Department. He was of an inventive disposition and he felt they should have more resilient boots. He fell off the 38th floor one time and he kept bouncing so long they had to shoot him to keep him from starving to death.

Mr. LOWERY. We have resilient boots, but we are trying to develop some that are lighter.

Mr. DADDARIO. Sorry, we don't have much more time for this.

The next witness is Mr. E. N. Davis, vice president and chief engineer for fire protection, Underwriters Laboratory, Chicago, Ill. We welcome you.

Mr. DAVIS. If you are holding your committee over pretty much as a matter of courtesy because I have come here, I am very willing to come back on a different day.

Mr. DADDARIO. It is not a matter of courtesy. We are anxious to have you. We have invited you and we would hope that we can hear from you and get the benefit of your views before this morning is out. We just appreciate your willingness to participate.

Mr. DAVIS. Thank you.

STATEMENT OF E. N. DAVIS, VICE PRESIDENT AND CHIEF ENGINEER FOR FIRE PROTECTION, UNDERWRITERS' LABORATORY, CHICAGO, ILL.

Mr. DAVIS. Mr. Chairman and members of the subcommittee, my name is Edward N. Davis. I am the vice president and chief engineer, fire protection, of Underwriters' Laboratories, Inc. I am also a registered professional engineer in the State of Illinois.

I am grateful for the opportunity to comment on the proposed Fire Research and Safety Act of 1967 which has been introduced in the Senate by Senators Magnuson and Cotton, and in the House of Representatives by Congressman Miller.

My comments are based on experience gained in establishing standards and testing materials, products, and systems, and concepts related to fire prevention, extinguishment and control as a member of the staff of Underwriters' Laboratories, Inc. over a period of 30 years. Since 1964 I have served as chief engineer in our fire protection activity. These comments are also based on fire safety work with other organizations which are actively engaged in developing more effective methods of reducing life and property loss from fire. Such organizations include the National Fire Protection Association, the Society of Fire Protection Engineers, the Advisory Engineering Council of the American Insurance Association, and the National Academy of Science—National Academy of Engineering—National Research Council Advisory Panel to the Building Research Division of the National Bureau of Standards.

Accompanying this statement are copies of our building materials list and fire protection equipment list as indicative of the rather extensive activity of Underwriters' Laboratories in the fire safety field. This activity is backed up by a self-supporting organization of over 1,300 person with facilities and equipment valued in excess of 11 million dollars.

Mr. DADDARIO. Not all engaged, however, in research in this area?

Mr. DAVIS. No; our mission is safety.

Mr. DADDARIO. But in all fields?

Mr. DAVIS. Yes. This is our entire organization. The last count was 1,398, I guess I could raise it to almost 1,400.

Mr. DADDARIO. We will put down 1,398.

Mr. DAVIS. Underwriters' Laboratories agrees that more effective measures to reduce losses of lives and property from fires are needed. Some of the statistics which have been cited as indicative of insufficient or ineffective efforts in this field convey quite a different impression than is given if one uses statistics which relate losses on a proportionate basis to some measure of what there is to burn—such as

the gross national product. The picture is also modified when the effects of inflation are taken into consideration. Those charts are attached. What they show is that in 1940 dollars, our fire loss is increasing but much more gradually than you might think from looking at the total figures. In terms of percent of the gross national product or gross national wealth the fire loss is decreasing.

A particularly significant statement which accompanied the introduction of the bill is:

Present fire cause data are not detailed enough to permit analysis to determine where research and other activities will be most beneficial.

We fully agree with this statement and believe that additional efforts beyond those now being made, if they are to be really effective in reduction of losses, should be carefully directed to insure that the right problems in the firesafety area are being solved. Accordingly, Underwriters' Laboratories respectfully recommends that consideration be given to including in the scope of activities detailed in section 3 of the bill, a number of additional proposals advanced by Senator Sparkman (S.J. Res. 46) and Congressman Barrett (H.J. Res. 498) to establish a National Commission on Fire Prevention and Control, and that such a Commission for overall study of the problem be established as a most desirable prelude to authorization of specific action programs.

Legislation along this line would recognize that there are many activities both in industry and government which are contributing in varying degrees to fire safety. The establishment of a National Advisory Commission would permit the marshaling of individuals and organizations of the highest competence in both the public and private sectors to carefully analyze all aspects of the firesafety problem and develop joint industry-government recommendations as to how these problems might best be solved in the public interest. The 18-month study period proposed in House Joint Resolution 498 should provide an adequate safeguard to prevent undue delay in initiating needed action.

Mr. DADDARIO. Now, Mr. Davis, you are talking about adequate safeguards to prevent undue delay in initiating needed action. The adequate safeguards referred to, are they aimed at industry and Government participation? Are you concerned that precipitative action could prevent the private sector from participating in this? Is this what you have in mind?

Mr. DAVIS. When I said adequate safeguards what I was saying was that this puts a deadline on this Commission's work. I think the Commission could turn into quite a debating society. There is a lot to talk about in fire research.

Mr. DADDARIO. You are only concerned here that the Commission finish its work in time?

Mr. DAVIS. Yes.

Mr. DADDARIO. You have no concern that this legislation could lead to the Government doing all of the work and not allowing industry, a private sector which is already participating, from developing a competence together with Government? You see no danger in this?

Mr. DAVIS. No, sir. The work that is now being done by the Government, and I wish it were more, is helpful to us in our private industry work because we are an empirical testing organization. We take

the product and subject it to fire. It is in the basic sort of research that we need the support of organizations who develop basic theory, so we are certainly not opposed to the idea of money being spent to develop basic information which then can put to work in our empirical testing of products.

Mr. DADDARIO. You believe that any developments which result from this legislation would be helpful to organizations such as yours in private industry?

Mr. DAVIS. If carefully administered. I think that is the "if" that I have in all of my comments.

Mr. DADDARIO. This is a problem as you see it and it is something that you would like this committee to keep in mind?

Mr. DAVIS. Yes. This that I have mentioned here is one proposal. If for some reason that doesn't go across, then the other proposal would be tried.

If, however, it should be determined that the specific problem areas are so well defined that further detailed study and exploration by the proposed commission would be unlikely to increase the overall effectiveness of the program of reducing fire losses, and that such program should proceed immediately, we would then recommend that there be included in the bill provision for the establishment of an advisory group to assist the National Bureau of Standards in implementing the fire-safety program.

Mr. DADDARIO. Mr. Davis, it is our understanding and it was emphasized by Dr. Astin when he appeared before us that the National Bureau of Standards operating as it does in all fields by the heavy use of advisory groups would continue that technique in this area and that it would, in fact, be done even if a commission was formed and that it would be a part of their standard operation procedure.

Mr. DAVIS. I am a member of the advisory group to the Building Research Division appointed by the National Academy of Sciences.

Mr. DADDARIO. That advisory group is not set up legislatively?

Mr. DAVIS. No.

Mr. DADDARIO. Why are you recommending that one be set up here?

Mr. DAVIS. Because we are now speaking of a specific authorization of funds to be allocated by Congress and, certainly, the advisory group of which I am a member would not be suitable for the mission that we are talking about here, even though they are the advisory group for the Building Research Division.

We have certain members of the group who would be most helpful; Professor Hottel, for instance, is also a member.

Mr. DADDARIO. I understand that that group that you belong to would be able to apply its talents to this problem, but since the National Bureau of Standards does, in fact, establish advisory groups of all kinds, could we not assume that in this instance it would establish, as has been said by Dr. Astin, an advisory group or advisory groups as they may be necessary so that they could get the advice and assistance they would need to carry out the requirements imposed upon them through the Congress by this legislation?

Mr. DAVIS. Certainly if Dr. Astin assured me that he was going to do something, I would believe him. I would say that.

Mr. DADDARIO. The reason I go into that is that in the interest of

writing the right kind of legislation, the simpler it is, the better off we are. And if, in fact, an agency of Government has demonstrated its competence over a long period of time and has operated through the use of such groups, such as the one you are on, and I know many others who serve on advisory groups of the National Bureau, we could assume that it would bring in that type of mechanism or tool to help it in the performance of its new duties if this legislation is passed.

Mr. DAVIS. That might be a practical solution. However, such groups are not responsible to Congress. We meet and talk over general items.

Mr. DADDARIO. Isn't it enough for Dr. Astin to be responsible?

Mr. DAVIS. Well, I am not sure. Dr. Astin has a responsibility to the Bureau of Standards and through him, to the Secretary of Commerce, who is responsible to Congress, but this gets a little far down the line.

I am reminded of something that came up in the advisory panel where we certainly had thought that there was going to be money used in the Bureau of Standards to plan new fire research facilities and someplace, as I understand it, the allocation was there in the money that Congress allocated but, by the time it got down through all of these stairsteps to the fire research section of the Building Research Division, they didn't spend any money on planning fire research facilities.

Mr. DADDARIO. "Something happened on the way to the bureau?"

Mr. DAVIS. It is a long handing-down and I would like to see this group have some responsibility reporting back directly, probably to your subcommittee.

Mr. DADDARIO. I am pleased to have had this opportunity to discuss this point with you, because it is an extremely important one and I don't want you to assume by the nature of my questions that I am opposed to it, but I do think that people such as yourself who have participated can give us the best advice and what you have said is something we will take into serious consideration.

Mr. DAVIS. I want to reinforce that. I said we considered this work as important to us. I am much distressed that the Fire Research Section is now down to 11 people including all the typists and clerical help. This is an alltime low.

Mr. RUMSFELD. That is about the size of our domestic staff to handle a \$5 billion budget for NASA.

Mr. DAVIS. We are talking about \$10 million here and a hundred thousand dollars worth of salary into that section would bring about miracles; it would really produce some outstanding work.

Mr. DADDARIO. You think we need more than an 11-man team in that instance?

Mr. DAVIS. Yes; and it isn't 11 men. This includes clerical.

Mr. DADDARIO. Why don't you proceed?

Mr. DAVIS. Our experience in testing products, materials, systems, and concepts indicates that there is a very fine line distinction between work which will produce information of broad general use versus that which will benefit one industry or one product. Fire testing of products and materials has strong commercial overtones and we foresee serious problems presented to the Bureau in delineating between potential benefits that accrue to the public versus disproportionate benefits that may flow to particular manufacturers or construction interests.

An advisory group to assist the Bureau in determining the nature and type of research to be conducted could do much to avoid the above situation, which we consider fraught with political dangers. The group could further assist in selecting areas of work where practicable solutions were needed for existing problems.

Such an advisory group should include a wide spectrum of interests in this field—professional, commercial, academic, and government. It should be drawn from those organizations, companies, and agencies that have demonstrated knowledge and competence in dealing with fire prevention and control problems, and from academic circles having known research capabilities in this field.

To summarize, Underwriters Laboratories concurs with the objectives of the Fire Research and Safety Act in creating more effective means to reduce loss of lives and property from fire. We believe, however, that the most effective efforts can be produced by utilizing the highest competence in both government and industry in first exploring and defining specific problem areas before launching broad corrective programs.

We endorse the concept of a National Advisory Commission on Fire Prevention and Control whose members are drawn from both the public and private sectors as a sound and logical first step in increasing fire safety.

Underwriters' Laboratories would be pleased to cooperate with such a commission should it be created, as well as with other agencies of the Government who may be given increased responsibilities under provisions of the act.

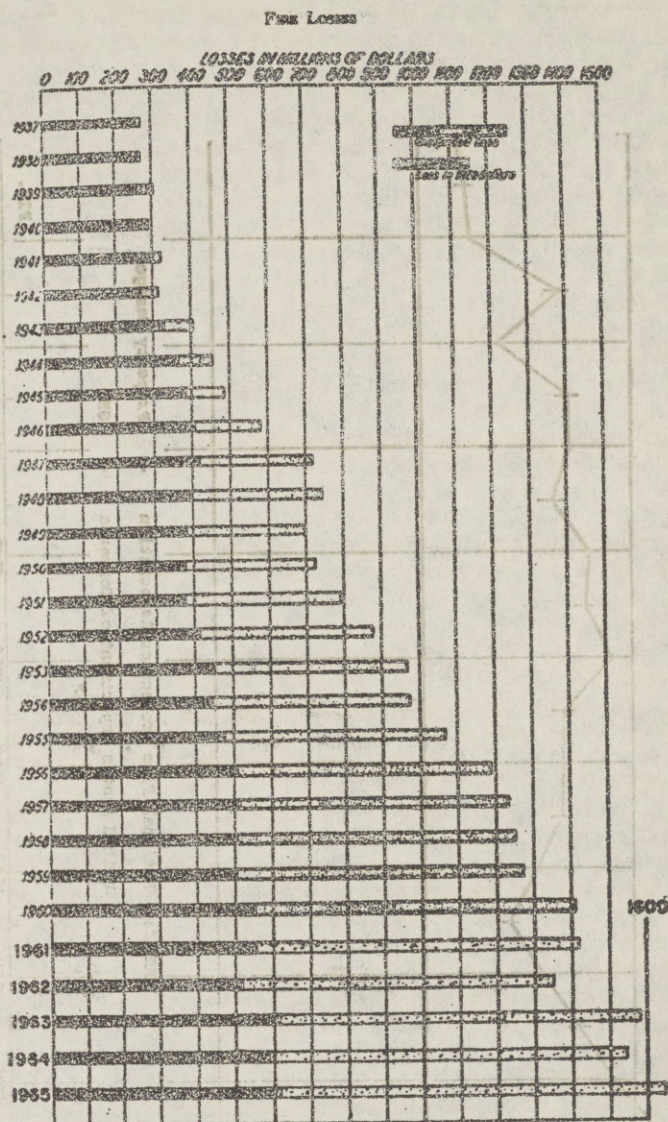
Mr. DADDARIO. Go back to page 4, please, the last sentence of your first full paragraph and will you talk about the last sentence?

Fire testing of products and materials has strong commercial overtones and we foresee serious problems presented to the Bureau in delineating between potential benefits that accrue to the public versus disproportionate benefits that may flow to particular manufacturers or construction interests.

Mr. DAVIS. In your conversation with Dr. Bryan, you have a specific example. He started talking about dacron firehose. It is a product of Du Pont. It is in the public interest to study products to see whether they would improve the fire service and this sort of thing, but, on the other hand, this is tax money that is contributed in part by Eastman, who also makes a polyester fiber and they are helping to pay for research to establish Du Pont's fiber superiority in firehoses.

This is the guiding principle under which Underwriters Laboratories operates. When dacron first came out; while it was still called fiber-V before it had a name, the Du Pont people wanted an evaluation of it for use in firehose.

Later they made a contract with the Quaker Rubber Co. to make a firehose and submit it for test. I don't know what the arrangement was. We had a cooperative student from Northwestern University with us. He received the assignment to be the leg man on the job and he put out a very nice paper on the use of dacron in firehoses that is the basis for the requirements under which the Du Pont company has been very successful in marketing dacron firehose. It is a leading firehose. They benefited from it.

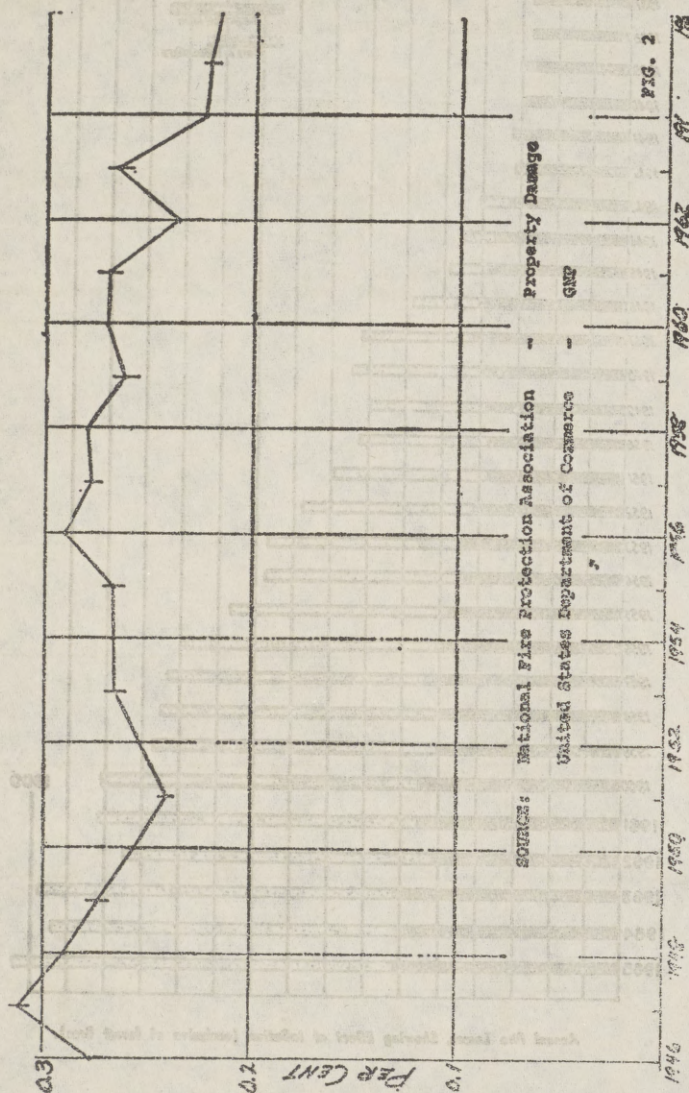


Annual Fire Losses, Showing Effect of Inflation (nominal or current dollars).

SOURCE: National Fire Protection Association

FIG. 1

PER CENT OF GROSS NATIONAL PRODUCT
WASTED BY FIRE, 1946 - 1966



PER CENT OF NATIONAL WEALTH, OTHER THAN LAND, BULLION, AND FEDERAL PROPERTY, WASTED BY FIRE, 1896 - 1963

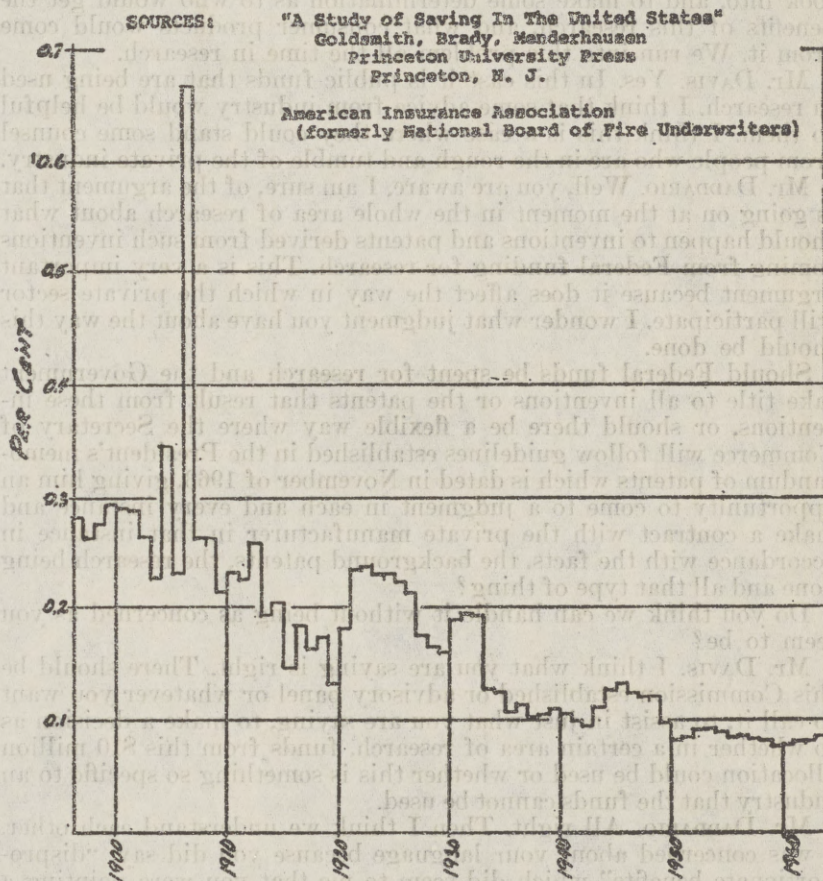


FIG. 3

They used their money to pay for the work that was necessary to establish the worth of this hose and this is the area that I speak of where the fine-line distinction occurs it is so hard to lay down general rules because as was pointed out, research on this dacron is to the public interest, the protection of the public, yet shouldn't Du Pont pay for that instead of taking it from tax money contributed by their competitors?

Mr. DADDARIO. That is saying something different, isn't it?

Mr. DAVIS. No, that is what I meant to say.

Mr. DADDARIO. It seemed to me that your sentence here poses the problem where the Bureau would have a difficult time in coming to a judgment as to what materials to look into, what materials not to look into, and to make some determination as to who would get the benefits of this research, and what consumer products would come from it. We run into this problem all the time in research.

Mr. DAVIS. Yes. In this case it is public funds that are being used in research. I think that some advice from industry would be helpful to them. I think this is a case where they could stand some counsel from people who are in the rough and tumble of the private industry.

Mr. DADDARIO. Well, you are aware, I am sure, of the argument that is going on at the moment in the whole area of research about what should happen to inventions and patents derived from such inventions coming from Federal funding for research. This is a very important argument because it does affect the way in which the private sector will participate. I wonder what judgment you have about the way this should be done.

Should Federal funds be spent for research and the Government take title to all inventions or the patents that result from these inventions, or should there be a flexible way where the Secretary of Commerce will follow guidelines established in the President's memorandum of patents which is dated in November of 1963, giving him an opportunity to come to a judgment in each and every instance and make a contract with the private manufacturer in that instance in accordance with the facts, the background patents, the research being done and all that type of thing?

Do you think we can handle it without being as concerned as you seem to be?

Mr. DAVIS. I think what you are saying is right. There should be this Commission established or advisory panel or whatever you want to call it, to assist in just what you are saying, to make a decision as to whether in a certain area of research, funds from this \$10 million allocation could be used or whether this is something so specific to an industry that the funds cannot be used.

Mr. DADDARIO. All right. Then I think we understand each other. I was concerned about your language because you did say, "disproportionate benefits" which did seem to me that you were pointing a finger at private participation. That there ought to be restrictions placed upon it. Now that is not my understanding of what you meant.

Dr. DAVIS. No; all I wanted was as I explained it. I would like to see somebody take a look. Research problems look interesting and we have this with our own engineers. They will run into something be-

cause it is an interesting problem and when it gets to the management level, then we have to say: "Stop, you are infringing upon somebody else's rights here. This is a nice research problem, but you can't spend this manufacturer's money to determine that problem." I think this kind of advice is needed in administering this \$10 million.

Mr. DADDARIO. Again I am happy that I have had an opportunity to discuss this because I am concerned. I think it is extremely important that we do concern ourselves with what words mean and what definition you, as an expert, give to it, because I find that if we don't get this on the record, it will come back to haunt us. I personally am a very strong believer in the Government establishing a flexible patent theory where the agency head recognizing his own mission requirements can come to contract terms with the private sector as the requirements are imposed upon him at that time and that he have the flexibility to come to a proper decision, rather than have them impose upon him an inflexible position.

A red flag came up when I saw this "disproportionate benefits."

Mr. DAVIS. I am pleased to hear you say that.

Mr. DADDARIO. Sometimes we use these words where a great deal of money is spent and there is no disproportionate benefits. Sometimes there are no benefits.

Mr. DAVIS. It was a side meaning. Be sure they have practicable results.

Mr. DADDARIO. Fine. I am extremely happy to have had a chance to have you come before us. The charts you have provided are extremely valuable. We recognize the work Underwriters Laboratories has done over the course of many years, and we are grateful for your advice.

Mr. Rumsfeld may have a point to make since this is an Illinois organization.

Mr. RUMSFELD. We have been a little heavy on the east coast until this point and I am delighted to see someone from Illinois.

On page 4 you referred to something which says "which we consider fraught with political dangers."

Can you elaborate on that briefly?

I want to thank you for yielding to me at the point that the buzzers rang, Mr. Chairman.

Mr. DADDARIO. I still have about 20 minutes.

Mr. DAVIS. I think what we mean there is that this business that I was discussing just above there, deciding whether this is a research to benefit one industry or research to benefit the general public, has all kinds of—in the first place, just money implications and on top of that, political implications.

Certainly you are aware of the amount of pulling and hauling that goes on in this field right here in Washington, not to speak of other places.

Mr. RUMSFELD. That only refers to the previous paragraph?

Mr. DAVIS. Yes.

Mr. RUMSFELD. Just so that I understand these charts am I correct that your figure indicates that in 1940 dollars the loss as a result of fire has roughly doubled since 1937?

Mr. DAVIS. Just about.

Mr. RUMSFELD. We have had a lot of statistics prior to this time. I have not seen a graphic presentation that takes into account these other factors.

On figure 2 you are indicating that the property damage by fire as figured into a relationship with gross national product, has actually gone down since 1946.

Mr. DAVIS. That is right.

Mr. RUMSFELD. Figure 3; does this take into account both inflation and the relationship with gross national product?

Mr. DAVIS. It automatically takes in inflation because the dollars are the same, no matter what is here. What we are saying here is that the percent of what there is to burn is going down. And this, incidentally, also explains some of those comparisons that have been made that seems to indicate that we are so much poorer in our fire protection than other countries.

Mr. RUMSFELD. The title is "Percent of National Wealth Wasted by Fire." You said it shows that the percent of what there is to burn has gone down?

Mr. DAVIS. Yes, the national wealth other than land, bullion and Federal property.

Mr. RUMSFELD. You mean what there is to burn or what has burned?

Mr. DAVIS. You have a certain number of millions or billions of dollars worth of property in this country.

Mr. DADDARIO. You are talking about that pile after you remove the land, bullion and Federal property?

Mr. DAVIS. Yes.

Mr. RUMSFELD. This refers to what has been burned?

Mr. DAVIS. Yes. I don't have the data, although I have some rough figures; it would be very interesting to get this as a comparison with other countries, because I think that is one of the reasons that makes us look bad when we speak of fire loss in other countries.

I do have some rough figures, they are for 1964 alone. They are expressed in terms of how many times the U.S. figure, the foreign country figure is of this percent of what there is to burn and we come out a little worse than England, but better than most foreign countries.

Mr. DADDARIO. Could you write us a little memorandum on that and send it in?

(Information requested is as follows:)

UNDERWRITERS' LABORATORIES, INC.,
Northbrook, Ill., May 31, 1967.

Hon. EMILIO A. DADDARIO,
Rayburn House Office Building,
Washington, D.C.

DEAR MR. DADDARIO: In connection with my statement before the Science Research and Development Subcommittee of the House Science and Astronautics Committee concerning the proposed Fire Research and Safety Act of 1967, you asked me to submit comparative data on fire losses in the United States of America relative to that in other countries, taking into account factors which might affect the loss. The two tables attached are in response to that request.

Table I refers to loss of dollars by fire, and Table II refers to loss of life by fire. You also asked me to develop the theory behind the comparative tables, and I will attempt to do that.

Table I is based on the relatively simple and straightforward concept that a dollar valuation of loss by fire must be related to the value of material available for loss. I have been unable to locate data on the value of buildings in enough countries, but do have data on gross national product of various countries. Expression of fire loss as a fraction of the GNP for these countries is a valid basis for comparison, and has the advantage that it reflects the industrialization of the country as well as the volume of dollars value available.

Explanation of the differences shown would require a detailed analysis of climate and customs in each country. In Great Britain, for example, the general high humidity, the overwhelming prevalence of masonry construction, and the absence of central heating with the resulting cool damp atmosphere inside buildings is held responsible for the fact that the City of London did not experience a single major fire in the period from the Great Fire of 1666 up until the fire storm attacks of World War II. As a result, the fire brigades of London were ill-equipped to deal with the fires encountered under the bombing attacks, and depended heavily upon the equipment and technical assistance rushed to them from the United States. Ironically, though fire-fighting facilities, fire research, and fire protection regulation have improved markedly in Great Britain, the increasing use of central heating and the introduction of combustible building interior finishes have produced an alarming rate of increase in fire loss in just the last few years; if data more recent than 1964 were available, it is probable that Great Britain would show a less favorable ratio of fire losses to other countries.

It is interesting to note the very low ratio found for Switzerland. Perhaps this is because the principal part of value added by manufacturing processes in Switzerland consists of the labor of highly skilled craftsmen on small articles such as watches. There are few huge factories and large warehouses filled with combustible materials available to be burned.

Table II attempts the much more difficult task of finding a meaningful method for evaluating comparative loss of life by fire. Here the relationship is affected by so many factors, including industrialization of the country, amount of smoking, intelligence level of the population, density of population, style of clothing, types of building material, and type of heating, all influencing the loss of life, and I am sure there are many other factors which enter. Nevertheless, the degree of industrialization must be considered important, and a recognized measure of this is the production of electricity in a country. This factor has an additional correlation because electricity is given as the cause for so many fires. For this reason I will attempt to show a comparison between countries in terms of relative fire deaths per million population per billion kilowatt hours of electricity produced. I will also give a relation in terms of fire deaths per million population per billions of dollars of gross national product. The relationship is perhaps not so clear here, but the gross national product does give some measure of the degree of industrialization of the country. It is interested to observe that France, which has one of the larger losses in terms of dollars of value burned, is the lowest in terms of loss of life. I have not been able to develop any explanation for this anomaly.

During my presentation there was a discussion of the meaning of the phrase used in my statement—"... which we consider fraught with political dangers." When I returned home, I found an article in the Christian Science Monitor of May 26 which illustrates very well the meaning of my comment. A copy is attached for your convenience.

I am grateful for the opportunity to present the views of Underwriters' Laboratories, Inc. before your Subcommittee, and I will be happy to respond to any requests for further information along the lines you mentioned during my appearance.

Very truly yours,

E. N. DAVIS,

Vice President and Chief Engineer, Fire Protection.

TABLE I.—Relative property loss by fire, 1964

Country	Fire loss in millions of U.S. dollars ¹	Gross national product in billions of U.S. dollars ²	Fire loss per billion dollars of GNP (millions of dollars)	Fire loss per GNP relative to United States
United States.....	1,652.70	628.7	2.63	1.00
Canada.....	136.20	38.5	3.54	1.35
Denmark.....	19.48	8.9	2.19	.83
France.....	306.10	87.5	3.50	1.33
Norway.....	18.00	6.3	2.86	1.09
Sweden.....	30.00	17.5	1.71	.65
Switzerland.....	9.88	12.9	7.77	2.99
United Kingdom.....	215.00	92.2	2.33	.89

¹ Source, "NFPA Fire Journal," November 1965.² Statistical abstract of U.S. Department of Commerce Office of Business Economics and Canadian Counsel General (Chicago).

TABLE II.—Relative loss of life by fire, 1964

Country	Population (millions) ¹	Number of fire deaths ²	Production of electricity (billions of kilowatt-hours) ³	Fire deaths per million population per billion kilowatt-hours	Relative fire deaths based on population and electrical products	Relative fire deaths based on population and gross national product ⁴
United States.....	191.5	11,900	1,082.4	0.057	1.00	1.0
Australia.....	11.2	195	32.1	.542	9.45	20.5
Belgium.....	9.3	181	20.8	.419	7.29	8.7
Canada.....	19.2	596	134.3	.231	4.03	8.0
France.....	48.9	219	93.8	.048	8.83	1.5
Japan.....	96.6	936	179.6	.054	9.94	(*)
Sweden.....	7.7	72	45.2	.207	3.60	5.3
United Kingdom.....	53.9	1,060	182.8	.108	1.87	2.1

¹ NFPA Fire Journal, November 1965.² Statistical abstract of the U.S. Statistical Yearbook and Demographic Yearbook.³ GNP from table I.⁴ GNP not available.

[From the Christian Science Monitor, May 26, 1967]

U.S. SUBSIDIES HIT

WASHINGTON.—A New Jersey congressman says it is scandalous and indefensible for the National Bureau of Standards to step up subsidies for large corporations during a budgetary crisis.

Rep. Charles S. Joelson (D) leveled the charge at Dr. A. V. Astin, the bureau's director, last month before a House appropriations subcommittee. The transcript was made public May 25.

Noting the bureau's request for a \$7 million increase for research, Mr. Joelson asked Dr. Astin if the bureau is still doing research for the drug and chemical industry.

"We are doing research which helps the drug and chemical industry, yes," replied Dr. Astin.

Dr. Astin said the bureau is continuing research that benefits major auto and electronics manufacturers, the roofing industry, "and the entire economy."

Mr. Joelson said he could understand "a subsidy for someone who is marginal such as the farmer, but I would suggest to you that subsidy for what you have yourself called in the past blue-chip corporations is indefensible at a time when belt tightening should be the order of the day."

Mr. DAVIS. I would be happy to. It isn't very specific information but it gives us an indication.

Mr. DADDARIO. We have had no indication whatsoever. It would be extremely helpful if you gave us this information, even theorize it a bit. It would be helpful.

Mr. DAVIS. I will do that.

Mr. RUMSFELD. We have received testimony from different associations and groups and interested individuals that has been critical of the information that is available, of the research that hasn't been done, the lack of imagination and incentive in communicating information and research that has been accomplished to other interested organizations.

Repeatedly it has been suggested that the same techniques and materials and approaches that were used 50 years ago are being used today.

How do you account for this success on these charts? Is it just dumb luck?

Mr. DAVIS. These things that are being said just aren't so.

Mr. RUMSFELD. Then it wasn't just dumb luck or happenstance. You are contradicting the testimony that I have just described has been given. You are saying that things aren't quite that way?

Mr. DAVIS. No, they are not.

Mr. RUMSFELD. This is what I want the record to indicate. I think it is worth looking at. Quite honestly, I don't pretend to know the answer, but I am trying to learn about it. I read your testimony as being conflicting with some of the prior testimony.

Mr. DAVIS. I tried to express the fact that I agree that we need more fire research than is now going on, but I am not in agreement with some of the things that were stated here that seemed to indicate that we are just going along with leather hose yet and this sort of thing. The developments that have occurred in extinguishing fires and detecting fires and giving early warning of fires are many, and also the amount of research work that is being done in this country—we handle about \$20 million a year and, of course, we are just one. You know, we are right in your backyard.

Mr. RUMSFELD. You are in my district.

Mr. DAVIS. And if someday it should turn out you are home with nothing to do and no hands to shake or anything like that, I would certainly like to have the opportunity of showing you what there is right there in Northbrook in fire research facilities.

I think, though, of course, this may be a slanted view. They are the finest fire research facilities in the United States and perhaps in the world.

Mr. DADDARIO. Do you think your opinion is slanted in the direction of the Underwriters Lab?

Mr. DAVIS. Slightly.

Mr. DADDARIO. Would you yield for just a question?

Mr. RUMSFELD. Certainly.

Mr. DADDARIO. I take your testimony as being somewhat in conflict with what has been said, but not greatly so. You support this legislation, as I understand it?

Mr. DAVIS. I certainly do.

Mr. DADDARIO. Recognizing what is being done, you believe it can be done better and more ought to be done; is that correct?

Mr. DAVIS. Yes.

Mr. DADDARIO. Let be put a supposition before you and ask a question.

Is there need for more education, more directed research, a wider dissemination of that information than is presently available?

Are the points raised by Commissioner Lowery important so that they ought to be looked into and that we ought to get a national standard of reporting?

This matter of arson that has come up time and time again is an extremely important factor. You are in agreement with all of this.

Mr. DAVIS. Yes. And in agreement with all the testimony this morning. But something is going on in fire research.

Mr. DADDARIO. You do not believe the equipment is as bad as it has been said. There have been advances in tools and all of that. It is my understanding that the criticism about much of this is that there have not been enough advances and information available as to what, in fact, this equipment can do under a certain set of circumstances. That the specifications about this equipment, in the hose instance, is not necessarily helpful to the firefighters.

Mr. DAVIS. I think that is right. Incidentally, I can't say that there was any testimony this morning with which I disagreed.

Mr. DADDARIO. You must be a pretty good researcher because you waited until five bells rang.

Mr. RUMSFELD. I don't believe my comment indicated that his testimony was in conflict with any of the points you raised. My point was that his charts, to me, are contradictory to the perspective that has been given to the subject by some other witnesses as to what exactly is the situation in the country, and my comments certainly do not indicate disagreement with respect to the legislation as your question suggested and certainly not with the other points that you raised.

Mr. DADDARIO. I am not in disagreement with what you have said, Mr. Rumsfeld. All I am trying to point out is that Mr. Davis is looking at the same problem in a different way. I don't think there is any disagreement with the fundamental facts.

Mr. DAVIS. I don't think so. Certainly not with conclusions. I tried to summarize in that last paragraph that I agree that we need more fire research. There are organizations like our own——

Mr. RUMSFELD. So do I.

Mr. DAVIS. There are organizations like our own that are doing a lot of empirical testing. We could stand some backup from the theoretical testing. We could stand to know more about the theory of what it is that we are doing by quite a lot.

Mr. DADDARIO. You would not be as critical about what is being done as some of the others, but you are still looking at the same set of facts.

Mr. DAVIS. Yes.

Mr. DADDARIO. And you are making an analysis about those facts?

Mr. DAVIS. Yes, sir.

Mr. DADDARIO. It has been helpful. Different points of view are helpful to us. I appreciate your being here. We appreciate your invitation. We may be able to convince Mr. Rumsfeld to go out sometime as a committee of one to look at your plant.

Mr. RUMSFELD. I am back there every other weekend, Mr. Chairman.

Mr. DADDARIO. This committee stands adjourned subject to the call of the Chair.

(Whereupon, at 12:45 p.m., the committee adjourned subject to the call of the Chair.)

FIRE RESEARCH AND SAFETY ACT OF 1967

THURSDAY, JUNE 8, 1967

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND ASTRONAUTICS, SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT, Washington, D.C.

The subcommittee met at 10:12 a.m., in room 2325, Rayburn House Office Building, Hon. Emilio Q. Daddario (chairman of the subcommittee) presiding.

Mr. DADDARIO. The meeting will come to order.

Our first witness this morning is Mr. Myron Solter. Mr. Solter, good morning.

Mr. Solter is the general counsel for the Imported Hardwood Products Association.

We are happy to have you with us here this morning, Mr. Solter. Mr. Yeager has advised me of your scheduling commitments. I understand you have to take an 11 o'clock shuttle, is that correct?

Mr. SOLTER. I can take the 12 o'clock. I have ample time for whatever use the committee may wish to make of me.

Mr. DADDARIO. All right. We will try to work things out as quickly as we can for you. You go right ahead, then, and we will save as much time as we can.

STATEMENT OF MYRON SOLTER, GENERAL COUNSEL, IMPORTED HARDWOOD PRODUCTS ASSOCIATION

Mr. SOLTER. Thank you very much, Mr. Chairman.

With the committee's leave, I would prefer rather than read my statement, to summarize and speak to it, if the statement can be incorporated into the record.

Mr. DADDARIO. It may be. And you may proceed in that way if you like.

(The prepared statement of Mr. Solter is as follows:)

PREPARED STATEMENT OF MYRON SOLTER, Esq., ON BEHALF OF IMPORTED HARDWOOD PRODUCTS ASSOCIATION, INC. (IHPA) IN CONNECTION WITH H.R. 6637, JUNE 8, 1967

Mr. Chairman, Gentleman of the Committee. My name is Myron Solter, and it is my pleasure to appear before you today as General Counsel to the Imported Hardwood Products Association, Inc. (IHPA), World Trade Center, Ferry Building, San Francisco, California.

The IHPA is a trade association embracing 54 regular member firms concerned with the importation of hardwood products such as plywood, lumber, hardwood, and particleboard into the United States, and 57 associate members which are concerned either with the processing or remanufacture of such products in the United States or are firms engaged in servicing the industry.

The IHPA supports H.R. 6637.

We think there is urgent need for the development of objective, scientifically derived data on causes of fires in residential structures, the behavior of such fires, the principal factors directly responsible for causing death, injury, and property damage, the formulation of architectural principles designed to minimize the fire hazard, improvement of fire fighting techniques, and general education of the public.

Some public authorities and some industry elements urge that the true path to fire safety lies in the severe restriction or exclusion of combustible materials. Actually, an easy solution to the problem would be to build a completely fire safe home. Such a structure would be made of stone, bricks, cement, and other earthy materials, its interior furnishings would be entirely of mineral materials and metals and there would be no heat or light appliances to make flames or sparks. Such would be truly a fireproof home—if its occupants could be prohibited from bringing in any combustible matter of animal or vegetable origin, such as clothing, carpets, furniture, drapes, etc. But obviously it would also be forever a vacant house because no one would live in such a structure.

In the final analysis, fire safety must be a judicious and practical compromise between the economic and aesthetic necessity of using combustible materials and furnishings in residential housing, on the one hand, and, on the other, the use of such materials and furnishings in ways realistically calculated to reduce the hazard of fire to the lowest practical minimum.

H.R. 6637 could contribute very substantially in elucidating the ways of attaining that optimum compromise. Among its various features, we believe, most important would be the provisions for—

Investigations of fires to ascertain causes, results, and so on, and systematically to develop such data, and

The conduct of experimental programs and stimulating the application of fire safety principles to design and construction.

The members of IHPA are vitally concerned that the programs contemplated by H.R. 6637 be conducted in an objective, emotion-free context.

The building products handled by its members—hardboard, lumber, and most especially decorative plywood panelling—have on several occasions been subjected to difficult and unwarranted limitations in unscientific attempts to solve fire safety problems through the vehicle of building codes. It is that segment of the fire safety problem complex which stands most in need of objective, scientific experimental work, for it has been precisely this area where emotional public reaction to fire tragedies has made objectivity most difficult to attain.

One example of the problem would be appropriate. In 1964 the local government of San Francisco city and county adopted an ordinance amending their building code to require that combustible interior finish materials with a surface flame spread rating of between 75 and 225 (which includes virtually all plywood, printed hardboard, and lumber panelling) could be used in residential housing construction only if such materials were either more than one-half inch thick or were backed by gypsum wallboard at least one-half inch thick. The effect of this building code requirement has been to so increase cost as to virtually eliminate the use of decorative plywood panelling in low and medium-priced housing construction in that area.

The San Francisco city fathers had been prompted by public outcry to take this action after several dramatic and tragic fire in houses containing plywood panelling. One of these fires was reported by a local newspaper, in part, as follows:

"MOTHER, 3 SONS DIE IN S.F. HOME BLAZE—TRAPPED IN BEDROOMS"

"San Francisco codes should be changed to prohibit plywood veneer paneling in home construction, Assistant Fire Chief Albert Hayes said yesterday after inspecting the charred ruins of a Geneva Terrace 'rowhouse' in which 3 children and their mother perished . . . Referring to the highly flammable plywood panelling [Chief Hayes said] . . . 'You can light this stuff with a match.'"

The Assistant Fire Chief's comments concerning the flammability of plywood and its supposed contribution to that particular tragedy were considerably less than correct. Subsequent testing of identical plywood panelling by Underwriters Laboratories at Santa Clara, California, confirmed that the plywood had a surface flame spread rating of 158 in unfinished condition and 173 in finished condition—both rating well within the specified code limits and impossible to ignite by striking matches.

However, so often children are the tragic victims of such fires, and it was the understandable emotional reaction of the citizenry to this and similar fires which was the principal factor in the code change in San Francisco.

Probably San Francisco's attempt to eliminate the effect pursues completely the wrong cause. What relatively limited objective and scientifically acceptable data as are available on this subject indicate that several factors, none of which is directly concerned with surface flame spread, play the major roles in fire fatalities:

The generation of carbon monoxide and other toxic airborne products, together with concomitant anoxia, is most often the real cause of death.

The generation and flueing upward of superheated combustible gases and their explosive ignition when they come in contact with oxygen in combustible mixture appear to be the most frequent cause of entrapment of victims in upper levels of houses.

Once trapped, lack of alternative means of escape from upper floors most often seals the doom of the victims.

Underlying these conclusions and illustrating the kind of objective, emotion-free study and investigation which is required, is a series of experimental dwelling-room fires conducted by the Forest Products Laboratory and reported in USDA Report No. 1941, April, 1959. In that series, a variety of combustible interior finish materials were applied to the walls and ceiling of a test burn out-room. The fires were commenced by igniting standard room furnishings from a crib of wood kindling. As the fires progressed, temperatures and air pressures were measured and flue gases were sampled and analyzed, in addition to which the time sequence of fire development was observed visually and photographed.

These tests generally indicated that three stages may be expected in dwelling fires, assuming the presence of sufficient oxygen to support combustion: an initial stage of burning of materials with relatively slow development of temperatures and toxic products, followed by a period of rapid acceleration of burning action, which appeared to commence at an average flue gas temperature of 249° F. and average wall temperature 149° F., succeeded by the third, "flash-over" stage when temperatures reached levels high enough to cause materials, including wall and ceiling finishes, to emanate combustible gases. *The interior became untenable for human life during the first stage. The combustible interior finish materials did not develop surface flame spread action until the third, flash-over stage was reached, considerably after human occupants would have died.*

Several of the conclusions reached by the Forest Products Laboratory after these tests are most significant.

"6. The nature of the walls, whether plaster, fiber insulation board, or plywood, had little or no effect on the time or temperature of the critical [life safety] point and only small effect on the flash-over. Regardless of the type of wall material or the rate of temperature rise in the early stages, fires of conflagration proportions eventually developed. The flash-over occurred in all cases at a wall temperature too high for human life."

"8. Carbon monoxide was produced in toxic concentrations in these test fires, both with plaster and fiber insulation board as the wall and ceiling materials, although the concentration of this gas varied considerably depending on the supply of air to the fire and its path through the room. The intense heat would have made the burning room unbearable by a human occupant before the carbon monoxide. An upstairs room, however, into which fumes from the fire might have been rising, would probably have been made unbearable first by smoke and toxic gases.

"9. *It can be concluded from these test fires that the customary furnishings of most dwelling rooms provide enough fuel to create a serious fire regardless of whether the walls and ceilings are combustible or noncombustible.* Once a fire is started, it spreads not only by direct contact of the flames and by movement of hot air and combustible gases through channels not provided with fire stops, but also by elevating the surface temperature of combustible materials to their ignition point by direct radiation." [Emphasis added.]

Accordingly, when scientifically-based information is brought to bear on the problem witnessed in the San Francisco area, it would appear that the remedy adopted by San Francisco is ineffective to reduce the incidence of fatal or injurious fires and serves but to deprive numerous new homeowners of useful and attractive interior decorations. The noncombustible backing requirement in San Francisco could conceivably prolong the period required for a wall burn-through, but as is indicated by the Forest Products Laboratory data, when a fire reaches

the proportions and heat generation capability required to burn through a wall, the point at which life could no longer be sustained would have long since been passed.

Our experience suggests that two paramount principles of fire safety should be applied in housing design and construction:

1. Provision of safe means of emergency egress from all floors of a residential structure.

Typically, a home of more than one floor will have a central stairwell and, typically, with fire commencing on the first floor or basement, smoke and superheated gases very quickly make the stairwell impassable. Houses should be designed to provide safe means of emergency egress from all rooms on the upper floors so that victims entrapped by impassable stairwells may escape without injury. A great many houses being erected at the present time do not apply this elemental principle.

2. The development of an efficient, fool-proof, economic fire detection alarm system for use in residential houses.

Available information is inconclusive but appears to indicate that fatal fires with children and adults trapped in bedrooms frequently occur at night. It is obvious that the victims awaken only after their path of escape has been closed off by the advancing fire or are suffocated or intoxicated by smoke before they can awaken. Obviously, such tragedies could in most instances be averted if the victims could have been awakened and warned of the fire before it reached such proportions. It is technically quite possible to manufacture alarm devices which would do this, either smoke or heat actuated, or both. At the present time, however, I am not aware of any efficient and dependable device which is within the economics permitted to low and medium cost housing.

I do not wish to imply that the IHPA opposes reasonable limits on the extent and manner of using building materials. We do believe that most of the prohibitions that have so far been proposed or put into effect are not based on adequate objective evidence of necessity and that careful, well-conceived, disinterested study and experimentation is necessary in order to accomplish the optimum compromise between the achievement of fire safety objectives and the necessity of using combustible building and finishing materials.

To this objective, if administered disinterestedly, H.R. 6637 would contribute much.

Mr. SOLTER. Mr. Chairman, gentlemen of the committee, my name is Myron Solter, and it is my pleasure to appear before you today as general counsel to the Imported Hardwood Products Association of San Francisco.

The IHPA, as the association's name is abbreviated, is a trade association embracing 54 regular members and 57 associate members concerned with the importation and processing and sale of imported hardwood products in the United States. This covers, for the most part, plywood, hardboard, particleboard, other building board products, and lumber, logs, et cetera.

The IHPA supports H.R. 6637. We think there is an urgent need for the development of objective and scientifically derived data on the causes of fires and ways of reducing or minimizing the hazard of fires, particularly in the residential structures.

Now ultimately it is obvious that the elimination or reduction of the hazard has to treat with the design, architectural design of structures; it has to treat with the materials which are used in the construction of structures and, more complicatedly, combinations of design and materials.

To date, in our opinion, the treatment that has been given this question by public authorities who, after all, exercise the regulatory function at the local building code level in this regard—the approach has been, to some extent, haphazard in that regulation has been based on empirical reaction, some of it more empirically political than empirically scientific, and not the result of controlled scientific investigation.

Some public authorities in some places, and some industry elements have urged that, after all, fire safety ultimately is a matter of eliminating combustible materials from structures. Now it is true the problem could be solved by building a completely fire-safe home. It would be built of bricks, stone, mortar, plaster, and other noncombustible substances. It would have to be furnished with bricks and stone and other noncombustible substances. It could not have heat or electricity, because those involve fire or sparks or some element which can contribute to fire. And the inhabitants could not wear clothes, use blankets, drapes, rugs, or anything.

Mr. DADDARIO. What about the inhabitants? What are you going to make them of?

Mr. SOLTER. Well, that is the conclusion: That it would be a fire-safe house, but it would also be a vacant house because no one obviously is going to live in such a structure.

The point is that ultimately fire safety is a judicious and practical compromise between the economic and esthetic necessity of using combustible materials both in the construction of a home and the furnishing of a home, but using them in such a way and in combinations which minimize or eliminate insofar as possible the fire hazard. That is the problem.

Now we think H.R. 6637 would contribute very substantially to striking this compromise between the necessity of using combustible materials and articles and minimizing the fire hazard. We think that the development of scientifically derived data, however, has to proceed obviously in an emotion-free context. This we think is very significant.

And I would like to illustrate by one example why this becomes an important aspect of this proposed legislation. Now one example will suffice.

In 1964 the local government of San Francisco city and county adopted an ordinance which amended their building code to require that combustible interior finish materials with a surface flame spread rating of between 75 and 225—this would embrace plywood, printed hardboard, lumber paneling, almost anything that has the combustible characteristics of wood; it also embraces a lot of plastic material finishes as well—could be used in residential housing construction only if such materials were either one-half inch thick or if they were backed by gypsum wallboard or some other noncombustible material such as plaster. The effect of this building code requirement has been to virtually eliminate the use of decorative plywood paneling in low- and medium-priced housing in the area.

This ordinance resulted from a series of rather tragic fires which had occurred in medium- and low-cost housing amply paneled with plywood, and a typical headline from one of these fires, just to quote:

MOTHER, 3 SONS DIE IN SAN FRANCISCO HOME BLAZE—TRAPPED IN BEDROOMS

And the text of the article goes:

San Francisco codes should be changed to prohibit plywood veneer panelling in home construction, Assistant Fire Chief Albert Hayes said yesterday—

After inspecting the fire, and so forth—

Referring to the highly flammable plywood panelling, Chief Hayes said "You can light this stuff with a match."

Well, the plywood in question was tested by Underwriters Laboratory at Santa Clara, and they found that its surface flame spread rating characteristics were well within the then building code requirements of between 75 and 225. And the assistant fire chief was considerably less than correct in stating that the plywood could be ignited with a match. He could have struck matches indefinitely without ever succeeding in igniting the plywood.

However, the point is that so often it is children and mothers who are the victims of these tragic fires. We all read it, we think of our own, and empathy operates to generate a pressure from the public at large on the local government authorities, "Fod God's sake, do something."

Mr. DADDARIO. If I might ask a question at this point, your expert adviser in this instance was the Underwriters Lab. Did you have any information from them prior to these fires? Did you have advice that you could have offered with this kind of support at the time of the charges made against you, or did you react by getting the advice afterward? What was his advice, on whom was he relying to make the statements he made?

Mr. SOLTER. You mean the Underwriters Laboratory?

Mr. DADDARIO. No, the fire chief. I would like to know when you sought the advice. Was it only after the fires or before? What was his source of advice?

Mr. SOLTER. Well, the statement attributed to the fire chief was apparently made by him immediately after the fire, picked up by a reporter at the scene, and in the paper the next day.

It was, oh, 2 months or so, as I recall, later that the city government of San Francisco had Underwriters Laboratory test identical plywood.

Mr. DADDARIO. And then made changes in the code?

Mr. SOLTER. Yes. The plywood was found to be within the code as it then existed, but then the government proceeded to amend the code to introduce the restrictions on it.

But the whole point here is that probably the San Francisco attempt to eliminate the effect pursues completely the wrong cause. They made an error insofar as one can judge from what scientifically derived evidence is available in that they attacked not the cause of the problem, but something which has relatively little, if anything, to do with the problem, and therefore creates a sense of false security. The problem still exists, really.

Mr. DADDARIO. Did you disagree with the change that was made or disagree with the method that was used in order to come to a determination based on expert opinion which then caused the legislative body to come up with regulation changes?

I agree that it may have started off with emotions; many of these things do. But then if they follow a pattern of investigation, examination and advice to the city fathers, legislation can be developed.

Mr. SOLTER. The theory on which the San Francisco code change was based is the reduction of the incidence of burnthrough, wall burnthrough, or to delay the time of wall burnthrough. Frequently it is found that fire can travel in between walls if there is a flueing action and no fire stops in the wall to prevent the flueing of super-heated gases.

To the extent that wall burnthrough is a contributing factor in the kind of problem that San Francisco sought to attack by this means,

then requiring the use of one-half inch thick noncombustible backing would serve to increase the time durability of wall burnthrough. However, the point is that the deaths in these fires concerned out there were not the result of wall burnthrough. In every case the fire commenced in furnishings, either in the basement or first floor of these houses, cigarets on mattresses, that sort of thing, or rags or clothing, or some combustible personal articles or furniture.

In this kind of fire it would appear that there are three factors which are principally operative in causing the fatalities. One is the generation of carbon monoxide and other toxic airborne products, together with concomitant anoxia, which often is the real cause of death—asphyxiation or intoxication from carbon monoxide.

Secondly, the generation and fluing upward of superheated combustible gases which then undergo explosive ignition when they come in contact with sufficient oxygen to permit combustion. And this most often causes the entrapment of victims on the upper levels of homes.

And then the third factor, once trapped, there is no alternative means of escape from the upper floors. And in the San Francisco fires, this is what happened. The furnishings or clothing ignited, generated the toxic products of combustion; there was superheating of air moving up stairwells, blocking the stairwell. There was entrapment of the victims on the upper floors in all of these cases.

The code regulation that they have passed out there does not contribute to the solution of this problem.

Now, the contribution of interior finish materials to the operation of these three factors appears to be minimal on the basis of what evidence is available. For example, the Forest Products Laboratory, which is an organism of the Government—Federal Government—conducted some experimental fires back in the 1950's, thoroughly, insofar as they went, for the purpose of testing the effect of combustible interior finish materials on the rate of progression and nature of propagation of dwelling fires.

The result of the tests indicated that typically one can expect three stages to occur in a dwelling room fire. The first stage, an initial burning of materials with relatively slow development of temperatures and toxic products, followed then by the second stage which is an accelerated rapid burning action which then leads to the third, flashover stage where temperatures reach levels high enough to cause combustible interior finish materials to emanate combustible gases, and there is a flashover with fire burning on anything which happens to be combustible or under the action of heat will generate combustible gases. And in every case the Forest Products Laboratory concluded that the interior of these rooms became untenable for human life during the first stage, and that the interior finish materials did not become involved in the fire until the third, flashover stage occurred.

One of the points of conclusion I quote just briefly. They said, quote:

The nature of the walls, whether plaster, fiber insulation board, or plywood, had little or no effect on the time or temperature of the critical—

That is, the life safety point—

and only small effect on the flash-over.

So I suggest to the committee that the example which I have discussed, that of the San Francisco Building Code regulation, is an

example of action induced by public authorities who wish very genuinely to respond to the public need for something to be done, but acting without ample objective information on which to base wise legislation. And this brings us back to the purpose of the legislation, of course, which is to stimulate the development of studies.

Mr. DADDARIO. While those regulations were being changed, did you or anyone else participate in the process so that your points of view could have been brought to the attention of the legislative body?

Mr. SOLTER. Yes, they were, Mr. Chairman. And also several other industry groups, plywood and other materials, participated in the public hearings which preceded the enactment of the ordinance.

Mr. DADDARIO. Notwithstanding that the only changes, which were made, were those involving the thickness of the materials? There were no other building code changes or regulations which would affect the architectural structure of new buildings?

Mr. SOLTER. As I recall, this was the only change in the local code there intended to have anything to do with fire safety. There were some other changes concurrently, I think, considered, but they were not concerned with the fire problem at all.

Our experience indicates there are two paramount principles of fire safety which should be applied in housing design and construction. The first is provision of a safe means of emergency egress from all floors of a residential structure. Typically, houses are built year after year with a central stairwell. That is a very useful thing, having a central stairwell. However, it is just a chimney which flues upward the fire beginning in the basement or the first floor. It blocks egress down the stairway because superheated gases become a mass or sheet of flame as they rise.

In so many houses having second and third floors, they have no means of emergency egress other than—aside from down the impassable stairwell. One has to leap from windows or suffocate or burn to death. More attention should be given to emergency egress in residential structures, in design.

And secondly, so often these fatal fires occur at night while residents are asleep and usually on the upper floors where bedrooms are customarily located in most residential structures. And quite often the evidence indicates the victims are never really awakened. They were asphyxiated or rendered unconscious before they had a chance to awaken.

What obviously is needed here is a dependable means of fire alarm to awaken the inhabitants in time to allow them to get out—not to fight the fire, but to get out.

Now there are quite efficient devices used in commercial structures, in multifamily dwellings. But I understand one of the problems is to devise a sufficiently foolproof unit for use in residential structures which would be economic, particularly in medium and low-cost housing. We are not aware that there is on the market such an alarm device at the present time.

We suggest that the two most effective measures which could be taken, therefore, would be more attention in design to emergency means of egress from burning residential structures, and a workable, economic alarm device actuated either by smoke or by heat, or both. Those are our observations.

We have no scientific data to point to infallible conclusions along that line. We do support the legislation because it is intended to create the financial basis, which is most important, and otherwise, for the pursuit of objective studies which ultimately will have to be test fires and test burnouts to form the basis for wise legislative regulation to reduce or eliminate the fire safety hazard.

That concludes my testimony, Mr. Chairman.

Mr. DADDARIO. Mr. Lukens?

Mr. LUKENS. No questions.

Mr. DADDARIO. Mr. Roush?

Mr. ROUSH. Mr. Chairman. Mr. Solter, what is the hardwood industry doing by way of research directed toward making your product either fireproof or fire resistant? Is there any such research being conducted by your industry?

Mr. SOLTER. A number of individual companies in the United States and elsewhere in the world have from time to time given attention to attempting to fireproof wood products. Wood products can be either fireproofed or made materially fire retardant in any number of ways. Most ways are either very expensive and competitively non-feasible, or ruin the appearance of the wood. And we are talking about interior decorative wood such as the top of this table. This is a beautiful—well, the edges are walnut. To ruin the appearance of an exotic and very expensive piece of veneer, the public wouldn't buy such a thing even if they were impressed by the fire retardant or other fireproof qualities of it.

Mr. ROUSH. In this modern era it would seem logical to me that by experimentation and research it is possible to develop something that would not ruin the appearance of the wood and which at the same time might make it more fire retardant. That is the purpose of research, is to solve these problems; is it not?

Mr. SOLTER. I believe, Mr. Roush, that many R. & D. labs over the country are working very diligently on this problem, because the first company to arrive at something which is really economically feasible and does not ruin the appearance of the wood is going to be—it will be a significant competitive advantage to them.

Mr. ROUSH. This was really my question: Do you have R. & D. labs which are working on this problem? Does the hardwood industry have R. & D. labs which might be working on this problem?

Mr. SOLTER. Well, I represent the imported industry, and I am not the most familiar or most qualified to speak as to what the manufacturing industry in the United States is doing. I understand, however, that in the big companies which can support such R. & D. efforts, considerable sums and attention is being expended on this problem not only by the wood producers themselves, but by the chemical industry, which would in the first place devise and fabricate the fire retardant and proofing elements. I don't think one would be justified in reaching the conclusion that industry is sitting on its hands and not doing anything to attempt to solve the problem of combustibility of wood products.

Mr. ROUSH. But how about your labs abroad, then? Are there labs abroad working on this?

Mr. SOLTER. Oh, not really. A good part of the plywood comes from such places as Taiwan, Korea, where they are lucky even to be able to

manufacture plywood, much less get into such sophisticated chemistry as fire retarding of plywood.

In Japan some attention has been given to it because Japan also has a fire problem, as the committee is aware. But not too much, really.

Mr. MILLER. You do not import plywood from Japan, do you?

Mr. SOLTER. A substantial quantity of decorative plywood is imported from Japan, made from Philippine mahogany logs.

Mr. MILLER. I was going to say it is imported from some other place. Japan has no surplus of timber, has she?

Mr. SOLTER. No. Japan is a net deficit timber country. But the logs are imported from the Philippines, fabricated into plywood in Japan, and then exported.

Mr. MILLER. Did you ever see a tree in Japan when they had to take it down? They strip not only all the branches off it, they also the bark and it is sold separately. Nearly every ounce of the tree is put to some good use because timber is so scarce in that country.

Mr. SOLTER. That is true, Mr. Miller.

Mr. DADDARIO. Mr. Rumsfeld?

Mr. RUMSFELD. I have no questions, Mr. Chairman.

Mr. DADDARIO. Mr. Davis?

Mr. DAVIS. No questions.

Mr. DADDARIO. Mr. Brown?

Mr. BROWN. No questions.

Mr. DADDARIO. Mr. Chairman?

Mr. MILLER. I just wanted to say I am in a quandry. You tell us that if we try to do something to make the wood fire resistant it is going to be costly, yet you suggest that in the building of some of these new homes we ought to have egress from upper floors.

I am certain that builders of most housing units would resist this very much, because it is going to cost a whole lot more to do that too.

The type houses that are being built now to apply to people of moderate or lower incomes are pretty much thrown together on a line basis, but if we are going to establish means of egress from the second story, it is going to add to that cost. So it is going to cost somebody more money to get away from fire no matter how you add it up, is it not?

Mr. SOLTER. Mr. Chairman, our conclusion is, based on what reliable information is available, that the fire hazard in multifloor residential structures is not altered one bit by whether or not there is plywood paneling in that home. There is always sufficient combustible materials in furnishings, draperies, carpets, and whatever, even if the structure itself is completely fireproof or fire retardant, to support a fatal fire. The problem is we cannot render the home completely fire safe. The next best thing, we believe, is to concentrate on getting out in the case of a fire which could be a fatal fire.

I might say that in my own home I have considerable plywood, but that does not bother me at all. I am most concerned with getting my family out. My home is built so it is very difficult to get out of the bedrooms, and I have devised elaborate escape mechanisms and I drill my family periodically on how to get out. The instruction is, if a fire starts, get out; don't try to save anything. Never mind the plywood or whatever else; just get out.

Mr. MILLER. I used to drive across the continent quite frequently, and I remember staying in a very old hotel in a Midwestern city on

the second floor, and at each window there was a big lug in the frame and a rope with instructions "In case of fire, throw out the rope out the window and slide down."

Mr. SOLTER. Well, it is better than either suffocating from fire or suffering from broken legs or worse leaping from second- and third-story windows.

Mr. MILLER. I appreciate that.

Now I have to think at my age that I don't know which would be the worse: To try to slide down the rope and burn my hands——

Mr. SOLTER. The best solution would be that the builder build some emergency egress from upper floors.

Mr. MILLER. Well, it resolves itself a great deal down to this: That American industry and our technology have never given a great deal of study to this problem.

Mr. SOLTER. I am not so sure that American industry as such is capable of giving the necessary coordinated study to it, because American industry in this question is a mass of conflicting interests. You have the insurance companies on one hand with one interest; you have various building materials industries with their own conflicting interests. You have the noncombustible materials producers, you have the medium-combustible materials producers, you have the highly inflammable building materials producers. And for that reason and also because such research is fairly expensive—after all, you don't put up structures and burn them down without spending considerable amount of money. For that reason, we come back to the proposed legislation here.

I think it is highly desirable, if it is administered in an objective way and individual industry interest is not allowed to influence the path of planning of experimentation or the conclusions or results obtained from such experimentation.

Mr. MILLER. We have just been going through in the last few years a great exercise looking to the safety of the automobiles. Now I think that when you build an automobile it is about as complicated as building a house. You have the tire manufacturers, the battery manufacturers, the parts that go into it, many of them built by the same company, most of them are bought on the outside.

But the people are becoming awakened to this problem, and perhaps in the effort to get some business the manufacturers cut corners to sell cheap automobiles and now they are being called upon to call these in and fix them up. Maybe we have to pay more to get a safe automobile, and maybe we have to pay more to get a safe house.

Isn't it true that the hardwood manufacturers and the plywood manufacturers that you represent would not like this because if you have to pay more there wouldn't be as many houses built?

Mr. SOLTER. No, there wouldn't be any plywood. The noncombustible materials, plaster, lath, et cetera, would be used instead.

Mr. MILLER. I do not think that a house just because it has a plaster wall in it is safer from a fire standpoint; it is the construction within. As a matter of fact, in the old days when we used to build them you made a lot of flues to encourage fires, not retard them. In most cities, they require you to put firebrick between the joists. People think they are in there to stiffen the wall, but they are not; they are to retard fire.

So in the final analysis, isn't it that we just have not given a great

deal of thought to this problem any more than we did in the beginning to safety of automobiles?

Mr. SOLTER. We would be in complete agreement with that statement, Mr. Chairman. We think that there is a need for wise legislation, either Federal, State, or local, in the fire safety area.

We do think—and again in agreement with your statement—that there is not sufficient knowledge of these problems on which to base wise legislation.

Mr. MILLER. That is right.

Mr. SOLTER. And again for that reason we indicate strong support for the proposed legislation.

Mr. MILLER. That is the thing, and I am very happy that you are for the legislation. I hope that the different facets of the building industry will take cognizance of this and lend their support to what we are trying to do, because certainly in this bill we are struggling in the dark—and we would like to stay in the dark; we don't want to be lit up by a lot of flames of burning houses.

Mr. DADDARIO. Mr. Solter, even though you have talked about plywood, your support for this legislation, comes about because you believe that plywood and all kinds of materials could be better assessed insofar as how they were to be incorporated into building through the developments of the research processes which this legislation would support. You are really talking about all materials in a house and how these can be put together so that people will not emotionally say that this type of material or that type of material should be arbitrarily barred from use, as you indicated the case to be in the San Francisco situation?

Mr. SOLTER. Yes, completely, Mr. Daddario. Plywood happens to be the most widely used combustible interior finish material. There are others, lumber, some plastic coatings, and a few other things.

If incontrovertible scientific investigations should—rather, if scientific investigation should incontrovertibly demonstrate that plywood must absolutely be eliminated to minimize fire hazard and thereby achieve a public gain in the question of fire safety, then so be it. However, the information that is available so far would indicate that it is not necessary to eliminate the beauty and utility of certain combustible interior finish materials such as plywood to accomplish any reasonable fire safety purpose.

Mr. DADDARIO. You have been very helpful, Mr. Solter, and I realize you do have a close schedule.

In your remarks to the chairman, Mr. Miller, you corrected what I am sure you did not intend to indicate in the first instance, and that was when you said “this legislation, if administered objectively.” It corrects your prepared text, when you said if it were administered disinterestedly. I am sure you would not want it administered objectively and without interest.

Mr. SOLTER. I do not think the two statements are irreconcilable. You just said it: If objectively and disinterestedly administered.

Mr. DADDARIO. Thank you.

We will be in touch if there are further questions which we have.

Mr. SOLTER. Thank you very much.

Mr. DADDARIO. Thank you.

Our next witness is Mr. Lloyd Layman. Mr. Layman?

Mr. Layman, we are pleased to have you with us. Mr. Layman is the former Director of Fire Services, Office of Civil Defense. He has a long and interesting history of participation in firefighting, research into fires, and the like.

We are pleased to have you with us, Mr. Layman. We are anxious to hear what you have to say about the legislation which we are considering.

STATEMENT OF LLOYD LAYMAN, FORMER DIRECTOR OF FIRE SERVICES, OFFICE OF CIVIL DEFENSE

Mr. LAYMAN. Mr. Chairman, members of the committee, I don't think I can be classified in this field as anything. I represent no one. I speak merely as an individual that has expended a considerable amount of Government funds in experimental fire projects and training.

I might say that I am a student of the field yet at my age. Any individual member of this committee can ask me many questions which I will frankly tell you I don't know the answers. If anybody appears before this committee and can answer all the questions that you ask, they are a lot smarter than I am.

I hold no degrees. But I have had 30-some years of experience. I want to start this story in a strange way.

In 1942 I accepted a commission with the U.S. Coast Guard with an understanding that I was to enter the Coast Guard and set up a firefighting training school. That school was established at Fort McHenry, Baltimore, Md., early in 1942. By 1943 we had provided the physical plant, the equipment, the training personnel, and our training quota was 1,000 men per month.

We didn't only train Coast Guard crews and members of port security groups; we trained Army Transportation Corps personnel involved in fire protection and fire prevention in the many ports of the United States. We did work for the Ordnance Department and other governmental agencies.

What I want to start with is an incident that occurred in April of 1943 in New York Harbor. It was classified at the time, but classification has been removed and I can speak about it freely.

A Panamanian cargo vessel, the *El Estera*, taking on cargo at a New Jersey pier, was fully loaded and ready to sail with thousands of tons of high explosive. A fire occurred in the engine room from a broken fuel pipe.

The Coast Guard maintained many improvised fireboats in the harbor, together with the pumping capacity of the municipal fire department. The only harbor in the United States that had sufficient gallons per minute pumping capacity to have scuttled this vessel.

Twenty-four hours before, a commander by the name of Stanley had been appointed port security officer, and he was responsible for taking action in case of emergency. He came on board and they had been fighting the fire for some time, making no progress, and he ordered the ship cut loose, necessary tugs to move it to deep anchorage and scuttle it.

The only way you can scuttle a vessel is by pumping water into the hold and into the engine room.

Fortunately, by the time they got to deep anchorage, they had pumped sufficient water in to sink the ship. That ship laid there in the harbor with the mast above the water for several weeks until they could raise it, take it to sea, and sink it by gunfire.

You cannot remove high explosives after they have been under salt water with any degree of safety.

I became very interested in that fire. I made a number of inquiries, and I was told that this type of fire could not be extinguished. There was no known method of extinguishment. By that time we had a pilot plant, a small building representing an engine room of a small ship, where we could build fuel oil fires, teach our men to extinguish them.

I imagine that I ran 150 tests, and I didn't even discuss the purpose of these tests with members of my staff; I thought we might find an answer to that problem. Later on a number of the men who were engaged in fighting the fire aboard the *Elestera* became members of my staff. We made a search of records and we found one record, one case history where a fire had been extinguished in the engine room of an English ship, but they had an empty hold adjoining the engine room where they could cut a hole in the bulkhead and pump in foam until they covered the burning surface.

By late 1943 I suggested to headquarters that if I was given a ship to conduct full-scale experiments, that I might come up with an answer. This is a long story, but I am going to cut it short as possible.

The Commandant accepted the suggestion, and in conference with Admiral Vickery, Vice Chairman, Maritime Commission, they decided I should be given a disabled Liberty ship that was anchored in the James River, a number of them, which the cost of repairs and the time required would exceed the cost of a new vessel.

By the middle of July that vessel was delivered to Fort McHenry, ballasted with sand, and set down. It took some time to procure the necessary scientific instrument to conduct the tests. By September of that year we were ready to proceed with our experiments. These were conducted solely by my staff of instructors and did not in any way interfere with the training program.

We ran a couple of pilot fires to test the airflows through the ventilators, different openings, and I would say after the second full-scale fire we cracked it wide open. It is so simple that it is difficult for ordinary individuals to believe.

We found by closing all the air intake openings; that is, the ventilators, the skylight openings, and by using a very small volume of water, fog injected at the upper atmospheric level within the space, that we could extinguish 1,800 square feet of burning oil.

Now that is the largest burning surface that you can have in this type of ship—that was about twice the surface that they had in the *El Estera*, because it had a divided engine and boiler room, which Liberty ships we had had a combined engine and boiler room, which had an atmospheric volume of approximately 85,000 cubic feet, total volume. It had a net atmospheric atmosphere volume of 65,000 cubic feet; the machinery—I mean the engine and different equipment took up the rest of the space.

The bilge of the ship is on top of the tank tops, and in most ships it is 3 or 4 feet between the tank top and the floor plate level where the

crew walks around. Now two-thirds of this space, 1,800 square feet, is covered by floor plates, where not a single drop of water touched it directly.

The Coast Guard was very pleased with the result. We brought our fire protection officers from all the ports of the United States to witness test fires and demonstrations. They even brought observers from the allied navies of the world to observe these. We didn't use a single thing other than the independent pumping unit that was on board the ship. We used a canvas cover, or tarpaulin from the cargo hold to cover the openings of the skylights. We used canvas covers for covering the ventilators.

We found that the hotter the fire was, the higher the temperatures, the more easy it was to extinguish.

June 1, 1945, an official report was published on that, and I am going to have to refer to some of my notes, because these things—my memory doesn't serve me too well. The report was well received. In fact, we had to make reproductions of the report. I know Major General Gross, Chief of Army Transportation, asked for 500 additional copies for distribution to his personnel.

I don't know whether you are acquainted with it, but the Army Transportation Corps operated more ships during the war than the U.S. Navy. And that's why we cooperated so closely with the Army Transportation Corps, because under a Presidential Executive order, the Coast Guard and the Army Transportation Corps were jointly responsible for port security, moving flammable and combustible and explosive cargoes through the ports of the United States—continental United States.

This report was published and we continued with that program up to October 31, 1945, because some of the private companies that manufactured carbon dioxide protective systems requested a series of tests and they were run, and a report was published in November of 1945 covering those tests.

As a result of the success of those tests, the Commandant expressed a desire that this program should be continued in cargo holds involving solid combustibles. This was previous to the end of the war.

Some negotiations had been conducted. The Army Transportation Corps was interested; some of the other governmental agencies were interested.

October 31 the firefighting school at Fort McHenry was closed and I was transferred to Washington, the staff of Rear Adm. Lyndon Spencer, Chief of Merchant Marine Safety. My job was to sell this project to the other governmental agencies that were interested—they were the Bureau of Ships, Maritime Commission, War Shipping Administration, Army Transportation Corps—and to private industry that manufactured safety equipment and alarm equipment for use aboard cargo vessels.

Fort McHenry was unsuitable for this project. The Harbor of San Francisco was selected, and by March of 1946 we had an agreement. The Navy agreed to furnish 1,500 bales of surplus cotton that they had in a warehouse in Houston, Tex., on which they were paying storage charges, short staple cotton that had been used for making mattresses. That was the principal cargo, because cotton fires, our record showed, had been the most frequent of cargo fires at sea over a period of years.

By the latter part of May we brought together the equipment in the Harbor of San Francisco. They wouldn't allow us to use a pier for fear that we would set the pier on fire. So we picked deep anchorage off of Treasure Island, and we used the Navy Firefighting School which had been closed at the time for our pilot work in connection with the fire.

Now I had about three or four members of my staff, my instructor staff, that agreed to remain in the service to assist carrying out this project. I had engineers from Mine Safety Appliance Co., CO₂ Co., Kidde Co., and the Mearle Corp. that manufactured safety equipment. I had a very outstanding staff of engineers and qualified men, including a physicist from the Bureau of Standards. These tests were set up under the most scientific conditions possible.

We purchased all the scientific instruments that was necessary. We took gas samples every 5 minutes and analyzed the samples during the burning of the cargo.

That project continued from June to October 15.

Now bear in mind I had a deadline of 6 months to complete this project, and we had definite objectives. And in that course of time we attained our objective and we destroyed some—or disproved some fallacies that had haunted the merchant marine for years. One was that we disproved beyond any reasonable doubt, that steam was the worst controlling and extinguishing agent that you could use onboard ship. And steam had been prescribed for years and years in the merchant marines of the world: steam piped into the hold of vessels.

Now I might go further and say that the basic cause of the Texas disaster was that the captain coming on board and ordering the hold to be closed and steamed it. That's what caused the Texas disaster—Texas City disaster which you are all acquainted with.

Another thing we proved was if you would seal the cargo hold; that is, if you would seal the ventilators leading to the cargo hold and other openings, you could take a cotton cargo around the world with a fire in the hold and bring it into port and unload it, and you could have about 80 percent of salvage materials. If you hadn't known that this 80 percent had been in the hold, you could have sold it on the open market with no evidence of damage.

We proved another thing. We sent up to Seattle and tore off a little inerting gas unit from an aircraft carrier that was used for inerting the tank of the ship after the gasoline had been removed. An empty tank is far more dangerous than a full tank.

We set up this little machine that generated 300 cubic feet of inert gas an hour, washed and scrubbed the gas, injected it into the hold, and by using a continuous injection method, for every cubic foot of inert gas we put in, we forced out a cubic foot of heated smoke and other gases, and in about 40 hours we could effect complete extinguishment of the fire.

Mr. DADDARIO. Mr. Layman, when Dr. Astin, who is the head of our National Bureau of Standards, was here, one of the reasons he gave in support of this legislation was that he would be able under it to create laboratory conditions where experiments could be made going to the cause of fires. What you are saying here seems to me to be so strongly in support of that, because by following this line of attack you have spelled out for us, you were able to determine by this

research that the way fires have been extinguished in the past has in some instances added to their intensity and that there was available through such research a method so that the fire could be extinguished in a relatively simple way.

I would expect then from what you say that for these reasons—and I am sure you have others—you feel that this is a very important part of this legislation, the research that can be done and, which your statement this morning so well illustrates, is needed to shed light on what seems to be traditional practice based on someone's assumption rather than on any basic knowledge and real research consideration.

Mr. LAYMAN. Mr. Chairman, I have been a voice crying in the wilderness for years for fire research. And I have made many pleas, many speeches, talks, and I fought for it for 7 years in Federal Civil Defense, and I got very few dollars.

Now you bear in mind this: The total amount of cash available to us on Operation PHOBUS was \$10,000, and the Army Transportation Corps found that in a research fund that they had forgotten about. That was the total cash.

The rest of it was materials that the services provided. The stevedore labor, for unloading this cargo and reloading, was furnished by the Army Transportation Corps.

It was governed by a joint committee which Brigadier General Wiley, Assistant Chief, Army Transportation Corps—he was the chairman of the committee. The committee never met during the time. They were busy. Demobilization was underway.

He talked to me one time—he was in San Francisco, and by phone he said, "How are you getting along?" and I said, "We are proceeding according to schedule." He said, "That's all I wanted to know."

I had no supervision; I had nobody telling me how to do it. Maybe that is why it was successful.

I have often said if you—and I am not casting any reflection on this committee—if you don't want anything done, appoint a committee. In the management of such a project, a committee can't run it. It has got to be an individual responsible. And I was responsible for the project.

Mr. DADDARIO. You were just lucky there weren't any regulations around to prevent you from doing it, that's all.

Mr. LAYMAN. Well, let me say this about regulation: I never in the course of my 5 years in the Coast Guard ever opened a book of regulations. [Laughter.]

I attended a port security meeting in Washington where a commander of the Regular Coast Guard got up and said "The trouble with the Reserve officers in the Coast Guard is they don't read regulations." He said, "They don't know what the regulations are."

And the Commodore who commanded the Coast Guard section got up and said, "Thank God they haven't read any of them, because," he said, "you can always find a regulation that will keep you from doing what should be done."

And I didn't have time to read the regulations.

Let's follow this a little further. I was relieved of active duty June 15, 1947, and I returned to my fire department. I was chief of the Parkersburg Fire Department, and I had been on military leave.

Now, I couldn't stand on a platform or prepare a paper stating that we had developed at Fort McHenry would work in building fires. Now I had no facilities to test it. It took me about a year and a half to obtain the necessary equipment, proper nozzles, and improvise equipment—now you couldn't buy some of this; you had to buy parts from one company and parts from another and improvise—and to train my personnel.

Fortunately, I had two men, members of my fire department that had been on these projects, that had been members of my staff. We set up a training program and in about a year and a half we started getting initial successes, and then from then on they rolled faster and faster.

We proved that this can be used in building fires very successfully. And in 1951, at the fire department instructors conference, I delivered a paper known as "Little Drops of Water."

Now, I had sufficient case histories to support every word I said. We photographed every important fire. We took the measurements of the building, we made diagrams of it. And I can say that I have in my files today a more complete history—case histories of fires than any organization in the world. And that's a big statement.

That paper attracted a lot of attention. My most conservative estimate is that there have been over a million copies of that paper distributed and translated into a number of foreign languages. I have correspondence from most of the free countries of the world regarding it.

I think the Fire Service is interested in new and better methods, especially the younger group. Now I can't speak for the ones who know all the answers. I don't waste much time talking to the older group in the Fire Service. I would rather talk to the boys that are going to be commanding officers day after tomorrow, because they are the ones that are going to run the show.

The only thing I have done is provided them with a better method. More effective tactical employment of water. Water fog is not new. I can leave with the committee here an article that appeared in *Scientific American* in 1877 that lays down every fundamental that I lay down except one, and I can only pick one thing that he said with which I don't agree. He said steam was a good extinguishing agent. He just didn't know. That man took the first patent on his fog nozzle in 1863; it is over here in the Patent Office. He got a modified patent in 1865. And do you think the Fire Service accepted it?

With slight modification of that nozzle, it would be as good as any nozzle we have today.

There has been a lot of knowledge lost in this field. I might describe the Fire Service or this whole field of fire protection and fire prevention in just a few words. It is everybody's business and it is nobody's business. That's been the history of it.

I have preached for years and years for research on water. Now you think I know a lot about water? I know so little that it is pitiful. I read everything that I could find that has been written on the subject of water in connection with the controlling and extinguishment of fire. Yet I know so little that it is pitiful.

Water is nature's answer to control and extinguishment of fire. Man learned that early. Without the knowledge of the process of combus-

tion and flame propagation, we would still be living in the cave age. We could never have penetrated beyond the tropic or semitropic areas of the world, and we would still be eating raw meat.

Now we know of other ways of generating heat, the nuclear process. But unless we had discovered the process of combustion, we would never have arrived where we are today.

Our whole progress of the human race has been based upon fire, the use of fire. Yet there has been little effort made to control the unfriendly fire, little effort.

I am very sincere when I say I believe the most productive early research in this field, and I mean applied research, would be to learn more about water: how to produce it in larger volumes, how to project it. And I think that problem can be solved.

I think the answer for larger fires lies in the ability to generate large volumes of water in the form of finely divided particles, by the use of air. You've got to divide these particles by air. And I have no sympathy or no time to hear people talk about air entrainment. I have studied air entrainment and fog streams as much as anybody. I have figures here that I can quote to you, and it would be unnecessary. I will leave them with the committee, that show that if I am able to put a very small volume of water in this room in the form of finely divided particles—now not in the form of mist, but in the form of liquid, finely divided particles—you cannot start a fire in this room. And those are scientific figures.

In support of the legislation let me say this: Who do you think would have furnished me three and a half million dollars worth of resources except the Federal Government? Do you think there is a city in the United States, do you think any of these organizations have that kind of money? But yet, as for the actual cost of that project, that actual cost of that project was a fraction of that. The ship was salvageable. The ship was just as good, with some minor repairs, as the day we took it.

We found out I needed 200 carbon dioxide cylinders for that project, and when I went out on a preliminary trip to San Francisco I found the Coast Guard fire officer in the Port of San Francisco was a pretty bright chap; he knew where everything was in the harbor. I asked Headquarters to retain him in service, and they did. We needed 200 carbon dioxide cylinders, and I didn't know where to get them. We couldn't buy them; didn't have the money. He said, "I know where there are thousands of those stored, in a warehouse." I said, "Find out about them."

He came back and he said, "It will take the time of this project to get the necessary paperwork done to get 200 cylinders."

Mr. DADDARIO. Don't tell me you went down and stole them? [Laughter.]

Mr. LAYMAN. We didn't steal them; we just requisitioned them.

Mr. DADDARIO. "For a while."

Mr. LAYMAN. And we returned them 6 months later in as good a condition as they were when we requisitioned them.

Mr. DADDARIO. And you put them to good use.

Mr. LAYMAN. Yes.

There are some other points I want to cover. I don't want to bore you, because—

Mr. DADDARIO. You are not boring us at all. It is very interesting, Mr. Layman.

Mr. LAYMAN. I do have some notes I want to check on here.

Mr. DADDARIO. Are you going to tell us somewhere along the line how you feel about this legislation?

Mr. LAYMAN. I think I have already expressed it, haven't I?

Mr. DADDARIO. I am not sure.

Mr. LAYMAN. I may say to you, I am in favor of both the Commission and the bill. But I want to make some qualifications.

I attended a conference here in 1947. I hope I can find the report. And I want to leave that with the committee, the President's Conference on Fire Prevention, called by President Truman.

Here is a copy of the report of the Committee on Research. I don't know whether the committee has ever seen this.

Mr. YEAGER. I don't think so.

Mr. LAYMAN. I am going to leave it with the committee.

Mr. DADDARIO. I would appreciate it if you would.

Mr. LAYMAN. It covers just about what has been covered here. This was all a voluntary proposition, and you know what you get: One agency to do one thing and one agency to do the other. And I'll bet it would be difficult to find a copy of this in the Government files right now. It was forgotten 3 months after it was written.

You are not going to get action unless Congress directed it. And, of course, it takes money to make the wheels turn around.

Now listen, you can waste money on research. You can squander it.

I tried to get a certain amount of money out of my Office of Civil Defense for research on water. Maybe it is fortunate that I didn't get it, because I don't know of a single research organization in the United States which was qualified to perform that work. It would have had to have been farmed out in pieces to different research setups.

The Committee on Fire Research, which while I was Director of the Fire Office was established in the National Academy of Science—and I can tell you frankly it was a battle, it was a battle each year to get enough money to carry it on. Now I think the Committee has served a useful purpose. It is not a research committee. The National Academy doesn't do research work. They advise—if you ask for advice, that's what the Committee is for. But on applied research, in fundamental research—or basic research, it is pretty hard to set time limits or even objectives. But on applied research you can set objectives and you can set a deadline, that is the way it should be conducted. If you are going to issue money to people to just do research, they can research a thing for the next hundred years and come up with nothing. Does that explain?

Mr. DADDARIO. Yes, I think it does. There is no question that it falls into the category. We always have a question about defining what basic research means and what applied research means, but somewhere along the line I think in England there was a term used about "directed research." I would think this is really something that you are talking about here, where you are seeking fundamental knowledge for a purpose and where you can come to some kind of an idea about time limits and goals of attainment. I do think that your admonishment in this regard is a very important one.

Mr. LAYMAN. Now on basic research, it is not possible, as I understand. And I have heard this basic, fundamental, and applied research

discussed by the leading scientists of this country. I have sat in conferences where they couldn't agree on just exactly where you draw the line.

But applied research, you are saying you have a definite objective where if you could obtain that objective it would have a practical application to the problem.

Mr. DADDARIO. As your example of your attempt to obtain research funds for more knowledge about uses of water in this regard.

Mr. LAYMAN. Yes.

I have written two books on this subject, in addition to my paper. And I can say that they have attracted a lot of attention. They are still being published.

The last translation I know of was made by the Tokyo Metropolitan Fire Board. They translated "Attacking and Extinguishing Interior Fires," which is this indirect method of application, and published 2,000 copies as training manuals. And that is the largest firefighting complex in the world.

I came to find out that European fire chiefs and fire services knew more about it than some of the American fire departments did. They grab every piece of technical literature that we produce and then translate it, and they keep tab on it. I don't think we pay much attention to what they do.

Mr. DADDARIO. And we should.

Mr. LAYMAN. Yes.

Let me tell you: We don't have a monopoly on knowledge in this country. We have good scientists, but there are other scientists. Maybe the best-informed man in the world on water is Prof. Henri Coanda of France. And he has made a hobby of studying it most of his life. He is well known in the aviation field. He was chief consultant to the British Government during the war on the development of the delta plane, and he will tell you frankly that he has limited knowledge of water.

Mr. DADDARIO. When you were with the Civil Defense as Director of Fire Services, what did they allow you to do? Is there available, as a result, a symposium of domestic or foreign information of the people and their research which might be helpful to us?

Mr. LAYMAN. I doubt if there is. I doubt if there is.

Mr. DADDARIO. Then one of the problems here is to recognize that there is available some information which ought to be put together and then culled for the best data to be used within the scope of this particular program as incorporated in Mr. Miller's bill?

Mr. LAYMAN. I think the National Fire Protection Association has a lot of the information. I know my logs on the Operation FOBUS, which amounted to several boxes, I got tired of shipping them around all over the country and I sent them to their library. The Coast Guard has the records; Army Transportation Corps has the records. The Bureau of Standards should have them; they had a man on this job.

I think a lot of this knowledge is pigeonholed.

The reason why I wrote my books is because I committed myself to writing. If it is not put in book form—you can write all the papers you want, and you will find most of those in the wastepaper basket when the conference is over, but a book that they have to pay \$3 or \$4 or \$5 for, they don't throw it away, they read it.

Mr. DADDARIO. Mr. Layman, I hope that we might be able to get together as a result of the testimony you have given here so that we might be able to fill in the testimony. I hope you might allow us to, because I do think that you have so much more to offer to the record than we are able to put together here today. We do have one other witness.

I am sure the chairman has got a question or two to ask of you.

Mr. MILLER. No. I have been very much interested, though, in everything that he has been saying. It has been quite revealing.

Mr. LAYMAN. I can tell you this: I have only scraped the surface on water, just the surface. And I will leave with the committee—and I have plenty of documentations in my files.

Mr. DADDARIO. We are going to take advantage of you, Mr. Layman, if you will allow us to.

Mr. LAYMAN. All right. I will be very happy to cooperate with the committee. I am very happy to cooperate with the program.

I have told you a very rough story, and I have only touched the high spots.

I will say this: That I think I have contributed a little to the art of firefighting. But there is much to be done. We have only scraped the surface.

And I can say without support of Government funds and without some directive or objective set, we will still be wandering in the wilderness.

Mr. DADDARIO. Mr. Brown?

Mr. BROWN. No questions, Mr. Chairman.

Mr. DADDARIO. Well, you certainly have been extremely helpful to us. I do think you have established certain guidelines, which the committee has in the past looked to. We do like to recognize that there are objectives which we must reach, and we will keep closely in mind what you said.

Mr. LAYMAN. I will leave with Mr. Yeager the documents I have.

Mr. DADDARIO. All right, fine. Thank you.

Mr. LAYMAN. Thank you.

Mr. DADDARIO. Thank you ever so much.

Mr. MILLER. Thank you so much.

Mr. DADDARIO. Our next witness is Mr. Charles S. Morgan, who is the assistant general manager for the National Fire Protection Association.

Mr. Morgan, we are happy to have you here.

Mr. MORGAN. Thank you, sir.

Mr. DADDARIO. And recognizing that we are beginning to get to the end of our time period, I think you should just proceed, if you would.

STATEMENT OF CHARLES S. MORGAN, ASSISTANT GENERAL MANAGER, NATIONAL FIRE PROTECTION ASSOCIATION

Mr. MORGAN. Thank you, sir, and gentlemen, my statement is a brief one. My purpose in appearing before you is not to read the statement in respect to H.R. 6637 which has already been filed with this committee by our general manager, Percy Bugbee, but, rather, with your permission, to clarify and emphasize certain aspects of our position as expressed to this and other congressional committees concerned with the proposed Fire Research and Safety Act of 1967.

(The statement of Percy Bugbee, general manager, National Fire Protection Association, is as follows:)

STATEMENT BY PERCY BUGBEE, GENERAL MANAGER, NATIONAL FIRE PROTECTION ASSOCIATION WITH RESPECT TO THE PROPOSED FIRE RESEARCH AND SAFETY ACT OF 1967

We have given careful study to H.R. 6637 which proposes a comprehensive program for the purpose of reducing loss of life and destruction of property by fire and the establishment of a national fire research and safety center to be operated by the National Bureau of Standards "to provide a central focus for management of the national fire safety program."

President Johnson, in his message calling for a fire safety act, said, "The Federal Government must also begin to support and supplement private research efforts in fire fighting and fire protection."

In our opinion, H.R. 6637 goes far beyond this and gives to a single Federal agency the power to supplant the present public and private efforts in this area. The authority proposed to be granted appears to be all inclusive.

The National Fire Protection Association is strongly in favor of programs and activities which will contribute to a reduction of fire losses. The existing programs of many Federal departments and agencies are now making substantial contributions; the same is true of programs of hundreds of state and local governmental agencies. There are scores of privately supported organizations doing effective work at national, regional and local levels. Take-over or duplication of these programs by the Department of Commerce would not serve the public interest.

We believe that basic fire research is a proper and logical function of the National Bureau of Standards and that an appropriate program for such research should be developed and supported.

It appears to us that a careful delineation of areas of activity and responsibility is needed prior to taking action of H.R. 6637. For this reason we favor H.J. Res. 498 which proposes a National Advisory Commission on Fire Prevention and Control to "undertake a comprehensive study and investigation to determine practicable and effective measures for reducing the destructive effects of fire."

(This bill was the subject of a hearing before the Housing Subcommittee of the Committee on Banking and Currency on April 21, 1967.)

If indeed there is a need that can best be filled by the federal government, we believe that this determination and the character of any measures which may flow therefrom can best be made by just such a National Advisory Commission on Fire Prevention and Control as is contemplated by the joint resolution. We believe that this is much to be preferred to a determination arrived at by the employees of any single government department or agency, or for that matter by any single, independent, private group, as in both cases there is always the possibility that their views may be unduly influenced by selfish economic, political or philosophical factors which really have nothing to do with the merits of the case. Thus, we plead that before any sums are appropriated for programs offered as means for reduction of the national fire waste, a highly qualified commission be created to assess the extent and nature of the problem, appraise the effectiveness of the numerous programs and efforts already well established and then determine exactly what helpful further role the federal government may play to give these efforts greater effectiveness and to supplement and support them in whatever ways may be deemed most appropriate and in the public interest.

So that your committee may understand the vital interest that our Association has in this proposed legislation, following is a brief description of the work of our Association.

The National Fire Protection Association is a non-profit, technical and educational organization solely devoted to the reduction of loss of life and destruction of property by fire. It was organized in 1896. Membership in the Association is open to any organization or individual interested in fire waste control. There are two classes of membership, organization and associate. Present organization membership includes 215 national and regional associations representing many segments of business and industry, government at federal and state levels, professional groups and public service organizations. Associate membership is made up of more than 20,000 companies and individuals from a wide range of business and industry, from federal, state and local officials and many other interested groups such as universities, hospitals, libraries, architects and engineers.

Membership fees—currently \$150 annually for organization members and \$20 for associate members—are kept deliberately low to encourage the widest possible participation in and use of Association services.

The influence of the Association is world-wide and it has members from more than 70 countries. However, its activities are directed primarily to the United States, and to a lesser extent, to Canada.

One of the Association's fundamentally important activities is the development and issuance of standards and recommended practices for fire waste control, with life safety the paramount consideration. These standards originate in technical committees balanced to represent all interests effected, and go through a quasi-legislative process before adoption and issuance.

Some 1,700 fire protection experts serve on these committees without pay; there are now more than 130 technical and sectional committees, each responsible for a particular subject area. To date, 188 standards have been issued. They are updated frequently and published annually in the National Fire Codes, consisting of more than 6,600 pages in ten volumes. Subjects range from aircraft rescue and fire fighting techniques, flammable liquids handling, and fire apparatus specifications, to life safety provisions in buildings, hospital operating room safety, and flammability of wearing apparel. NFPA standards, such as the National Electrical Code, are widely used by federal, state and local governments as the basis for legislation and regulation, by insurance organizations and by general industry.

The Association maintains a Fire Record Department which reports on all fires resulting in large loss of property, fires involving multiple fatalities, and other fires carrying important lessons, makes annual estimates of the distribution of fires by cause and occupancy and publishes special studies of fires for the benefit of its members and the public.

An extensive educational effort to reach all segments of the public is carried on by the Association, working directly and through many state and local agencies. NFPA has over 600 current publications, of which some 13,000,000 copies were distributed last year. It publishes three periodicals: the bimonthly Fire Journal, of general interest to all concerned with fire problems; the quarterly Fire Technology, reporting on research and technical developments; the monthly Firemen, serving fire departments.

The Association sponsors the Fire Marshals Association of North America which is made up of the state, provincial, county and municipal fire marshals and fire prevention officers of the United States and Canada.

The Society of Fire Protection Engineers, the professional technical Society in this field, is sponsored by the Association.

Over the years, the Association has become a world-wide clearinghouse for information on fires, fire protection methods and fire prevention measures. Its 2,200 page Fire Protection Handbook is recognized as the most comprehensive reference and textbook on the subject of fire in the world. In general, NFPA is considered the central organization in the field of fire safety in this country, and because of the wide range of its membership, an organization which serves the public interest rather than any special interests.

The following is an analysis of the various proposals in the Fire Research and Safety Act, and our views with respect to each one.

The Fire Research and Safety Act proposes:

1. Investigations of fires to determine their causes, frequency of occurrence, severity and other pertinent factors.

As indicated in the description of our Association, we have carried on this type of activity for many years. At present, the NFPA's Fire Reporting Committee (composed of qualified personnel knowledgeable on this subject) is working on a uniform fire reporting system that can be adopted by states and local communities. It should also be mentioned that the Organization for Economic Cooperation and Development of the Federal Government has appointed a U.S. Representative on an international "Committee on Harmonization of Fire Statistics" and, for effective U.S.A. liaison, has appointed NFPA's Director of Technical Services to serve in a personal capacity on this Committee. Additional effort and financial support for statistical evaluation of fire loss experience would obviously be desirable. We would observe, however, that the causes of fires are pretty well known and understood at the present time and that what is really needed is more intelligent use and dissemination of the knowledge already available. Clearly, more complete investigation and study of more fires would add to the science of fire protection. The basic problem is the quality of local investigations. If the federal government took steps to encourage and support the establishment of technically qualified state, county and municipal fire marshals, a great deal could be accomplished. We suggest, therefore, that the

program be so directed along this line of approach with assistance from the Fire Marshals Association of North America.

The Fire Research and Safety Act proposes:

2. Research into the causes and nature of fires, and the development of improved methods and techniques for fire prevention, fire control and reduction of death, personal injury and property damage.

The research needed to achieve the desired goals falls basically into two categories: (1) basic or fundamental research and (2) solving current practical problems. The National Bureau of Standards could do much to fill the voids in our current knowledge. The National Academy of Sciences-National Research Council has a Fire Research Committee and Dr. Astin has outlined a program for federal action including the establishment of an Interdepartmental Committee on Fire Research. He has done this at the request of the Federal Council for Science and Technology. This Committee should guide the Bureau in its planned program of fire research and the Congress is urged to support such activity when a definitive program is offered. It should be pointed out that millions are now being spent today by federal agencies in fire research on practical problems and for nuclear fire defense needs so that any new program should be carefully integrated with existing activity.

The Fire Research and Safety Act calls for:

3. Educational programs to inform the public of fire hazards and fire safety techniques and to encourage avoidance of such hazards and use of such techniques.

There is little question that more effort and more money spent in this area would be productive. There is no lack of knowledge to foster such an educational campaign. NFPA activity in this field is, frankly, restricted by budget problems. The Advertising Council's support of a general program of fire prevention education was withdrawn in favor of their support of forest fire prevention. Federal support of a fire prevention educational campaign via television and other media would undoubtedly aid and abet the existing programs of the NFPA and other fire service agencies.

The Fire Research and Safety Act proposes:

4. Fire information reference services including the collection, analysis and dissemination of data, research results and other information derived from this program or from other sources and related to fire protection, fire control and reduction of death, personal injury and property damage.

We would observe that our Association has been carrying on this activity. We believe that our Library is potentially the best fire reference Library in the world today. This is not to imply that more effort and more money would not provide better collection and dissemination of data although any effort along this line should be closely integrated with the engineering information retrieval system now being developed with the help of the Engineers Joint Council and the Society of Fire Protection Engineers.

The Fire Research and Safety Act calls for:

5. Educational and training programs to improve, among other things, the efficiency, operation and organization of fire services and the capability of controlling unusual fire-related hazards and fire disasters.

Again, a very large amount of information is available in this area. The Association maintains a Fire Services Department that provides information to all of the 20,000 or more fire departments in the United States. Most of our states and cities operate fire training programs. Many municipal fire departments like the idea of a Federal Fire Academy for fire administrative training of officers. We favor use of Federal funds for this purpose. Grants to state training programs would help.

The Fire Research and Safety Act calls for:

6. Projects demonstrating improved or experimental programs of fire prevention, fire control and reduction of death, personal injury and property damage and application of fire safety principles in construction and improvement of the efficiency, operation or organization of the fire services.

We are not clear as to what this proposal intends, but will readily agree that improvement in any of these areas might produce fruitful results.

The Fire Research and Safety Act suggests more fire protection engineering in colleges and universities. There is little question about the desirability of such courses. Architectural courses certainly need more fire protection information.

Finally, the Act proposes a national research and safety center to carry on certain kinds of research not presently being conducted by other government or private facilities.

There is certainly an opportunity for more fundamental research on the phenomena of fire as against the large amounts applied research that is now being carried on by various agencies and organizations.

The Act suggests that this center would provide a central focus for management of the national fire safety program. We question whether one federal agency can, or should, effectively manage the entire program of fire protection and prevention. Can this not be better done by the cooperation of various federal, state and local fire agencies, industry and others concerned working together as is presently being done through the National Fire Protection Associations?

Mr. MORGAN. First, I should like to emphasize that our position as expressed by NFPA spokesmen has been and remains a positive and not a negative one. We are very much for fire prevention, very much for fire protection, and very much for fire research. We take no issue whatever with the statement of President Johnson in his message calling for a Fire Safety Act, when he said:

The Federal Government must also begin to support and supplement private research efforts in fire fighting and fire prevention.

As Mr. Bugbee has said in the statement filed with this committee:

The National Fire Protection Association is strongly in favor of programs and activities which will contribute to a reduction of fire losses.

This being so, it has been somewhat disconcerting to find that our position has been misunderstood and misrepresented as negative and obstructionist by a number of persons who heard Mr. Bugbee deliver his statement on S. 1124 to the Consumer Subcommittee of the Senate Committee on Commerce or who presumably read his statement thereafter.

We are, indeed, concerned however about the means and the methods that are proposed by H.R. 6637 ostensibly to implement the worthy purposes expressed by the President. We believe it is a very long jump from the statement of purpose by President Johnson to legislation which would make a single Federal agency virtually omnipotent in respect to fire matters, particularly when this jump is made without benefit of prior broadly based study by an authoritative commission. It is for this reason that we have urged before this and other congressional committees the establishment of a National Advisory Commission on Fire Prevention and Research such as is contemplated by House Joint Resolution 498 prior to the authorization and appropriation contemplated by H.R. 6637. To appoint such a Commission after granting authority and appropriating large funds to a single agency is to put the cart before the horse and an empty gesture.

Much has been made of the 12,000 lives lost annually in fires in the United States and the billion and a half dollars in property destruction. The implication is that we are losing ground in the war on fire. This is not so. The reasons for this toll are known and the technical know-how to reduce it is also known. Only a fraction of what is already known about fire prevention and protection is in general use. To be sure, the loss of life is tragic and excessive and the property destruction constitutes a shameful economic waste. Nevertheless, in terms of relationship to the expanding population and the gross national product, the toll is diminishing. There is still a big job of public education in fire prevention to be done; there are new techniques of firefighting to be explored; and new discoveries in the physics and chemistry of fire to be made. Let us be sure that we spend our public tax moneys in the ways most likely to produce public benefits in these areas.

We have heard the proposed \$10 million appropriation which is a part of this bill referred to by supporters of H.R. 6637 as "peanuts"

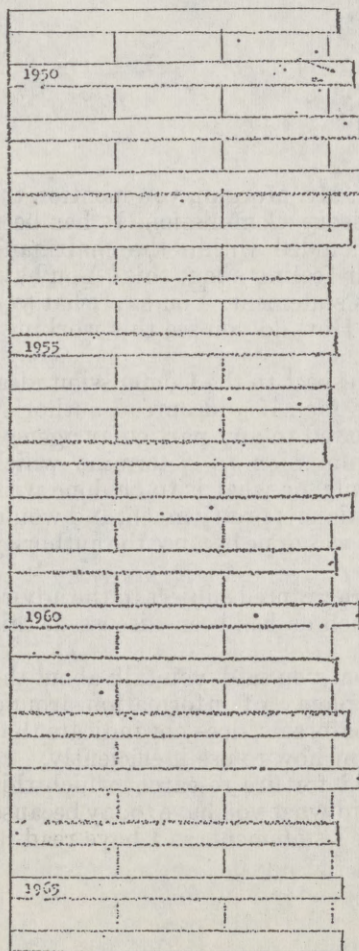
and unworthy of any delay for purposes of study as to the purposes for which it might most effectually be spent. To us, \$10 million in tax revenues is still a lot of money and deserves to be spent wisely.

The patient may be ill, though probably not as ill as some would have you believe, but in any case, let us provide for a medical consultation before dosing the patient with medicine that may have serious undesirable side effects.

That is my statement, Mr. Chairman, but it is supplemented in the material that has been left, by three or four very simple graphs which I think may be found of interest relative to the toll of fire deaths in proportion to the population of the country, the percent of national wealth in relation to fire losses, and similar relationship as to the percent of gross national product. Also a chart which attempts to reveal the effect upon real fire losses of the diminished value of the dollar over a very considerable period of years.

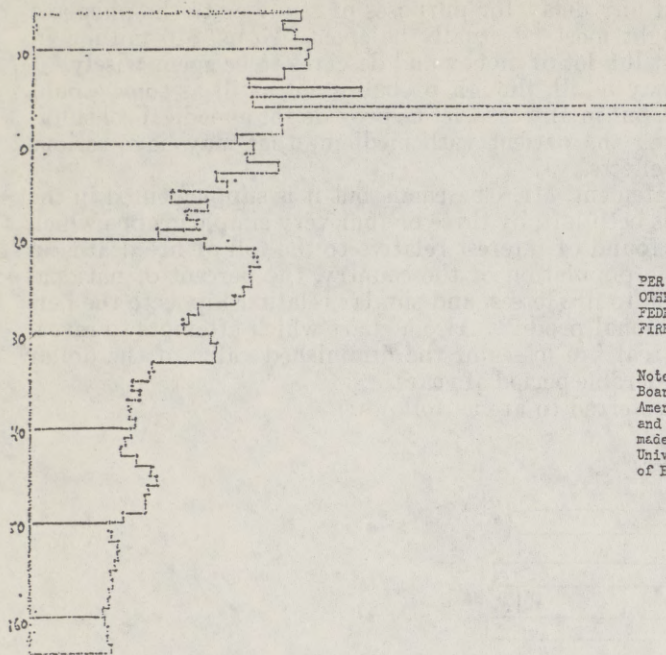
(The graphs referred to are as follows:)

20 40 60



FIRE DEATHS PER MILLION PEOPLE,
UNITED STATES, 1949 - 1966

Note: Fire deaths are taken from "Vital Statistics of the United States," a publication of the Department of Health, Education, and Welfare. The non-vehicular fire deaths as reported here are increased by an NFPA estimated number of vehicular fire deaths.



PER CENT OF NATIONAL WEALTH
OTHER THAN LAND, BULLION, AND
FEDERAL PROPERTY WASTED BY
FIRE, 1896-1963

Note: Fire loss from National Board of Fire Underwriters, (now American Insurance Association), and national wealth from studies made under auspices of Princeton University and National Bureau of Economic Research.

Mr. DADDARIO. Thank you very much. Mr. Morgan, you mention the support you have for a National Advisory Commission. It has been suggested that that Commission be included within the chairman's legislation by amendment. What is your feeling about this? You have countered the reaction to Mr. Bugbee's statement. You say what you are for, you say what you are against. How do you see this working? What is your relation?

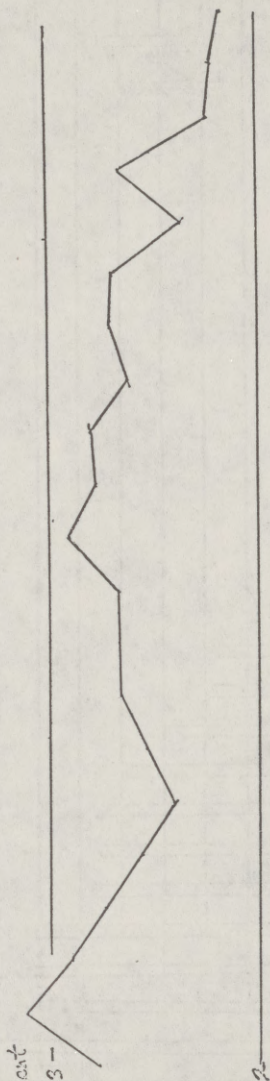
Mr. MORGAN. Our observation with respect to the Commission idea, sir, is simply that if it comes after the fact, if widespread authority and large sums of money are appropriated to any particular agency, the subsequent appointment of a commission to determine which agency it might properly be, for example, or what is to be done with the funds appropriated becomes a redundancy, pretty much, and would be unlikely necessarily to influence what was done because the authority would have already been granted.

Now it is conceivable if authority were granted subject to the advice of a National Advisory Commission such as has been discussed, this could present a different sort of situation.

Mr. DADDARIO. When, we consider what you said, you talk about the patient being ill and all and there is plenty of information around and available. The testimony, which is before us, does not indicate that if that information is available, we know how to use it efficiently.

You say that there is very much need for fire research, which this bill proposes. I am glad that you have said what you have today because it would appear to me that Mr. Bugbee's statement, as I have read it, is negative.

PER CENT OF GROSS NATIONAL PRODUCT
WASTED BY FIRE, 1946 - 1966



Note: Includes property damage in the United States from all fires except forest fires, as estimated by NFPA. GNP from Department of Commerce.

327

1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966

FIRE LOSSES

1-21

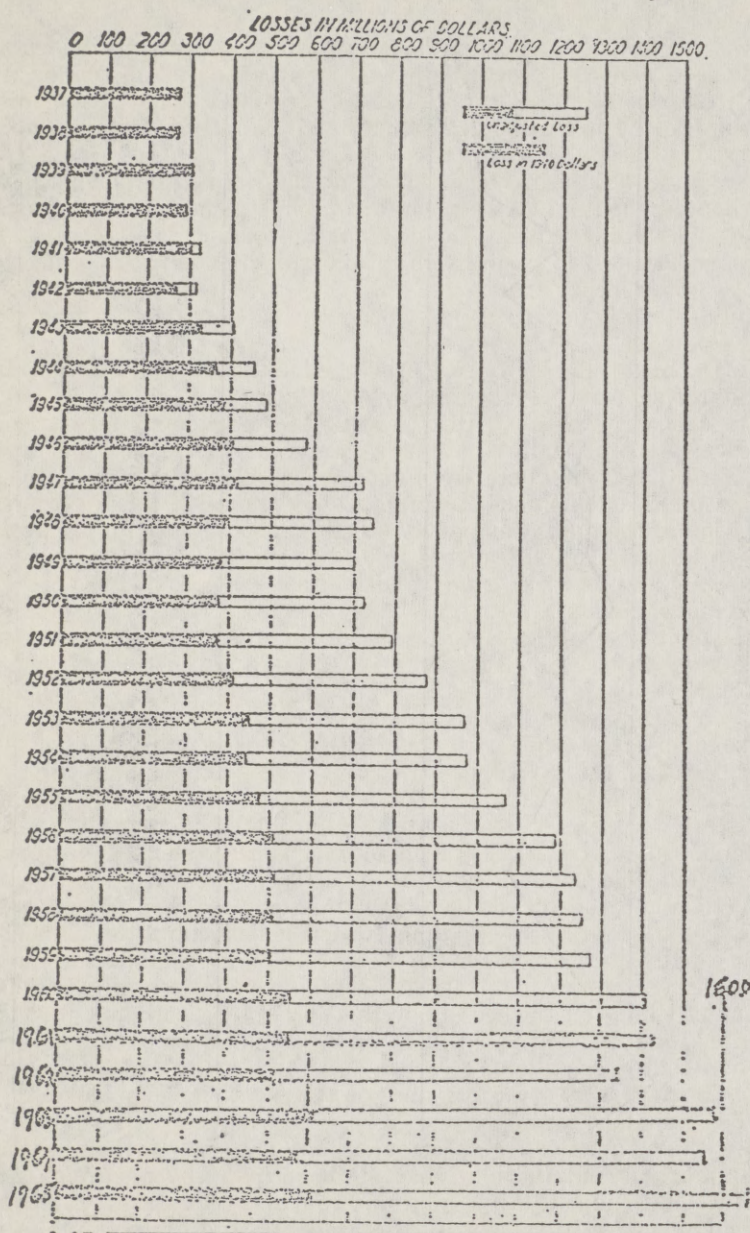


Fig. 1-21. Annual Fire Losses, Showing Effect of Inflation (exclusive of forest fires).

I call your attention to one sentence where he says:

However, the scope of the proposed legislation appears to imply a takeover of the entire fire prevention, fire protection machinery, to be operated from Washington.

Frankly, until I read that, I could not have understood that anyone could come to this conclusion. I wonder what language in the legislation causes you to believe there will be a takeover? I wonder if it isn't just philosophical. Because the recommendation is being made for the lead be taken here to fill what apparently is a gap, you are against it philosophically.

I can understand it if you are, but I do think this is important. Have you thought about it? Can you show us in the legislation what indicates there will be a takeover? Do you have recommendations about the language in the bill which would accomplish these great objectives that you are talking about?

You are interested in fire prevention, protection and research.

Mr. MORGAN. We are indeed.

Mr. DADDARIO. These things are included in the bill. But I see nothing, frankly, to show it is a takeover.

Mr. MORGAN. Well, as we read the bill, it seemed to us to go extremely far to cover practically the entire gamut of the subject of fire as outlined in the bill. There are numerous areas of involvement, everything from fire department training to presumably basic fire research, education of the public, expansion of educational efforts in fire protection engineering in institutions of higher learning.

It seemed to us to be an extremely broad approach.

We know, for example, that the National Bureau of Standards is entirely competent to handle a research program and undoubtedly such a program should be instituted and expanded over what they have been able to do in recent years. I have no doubt they could make a valuable contribution in this direction.

Mr. DADDARIO. I agree with you that it is broad, but that doesn't—

Mr. MORGAN. It looked open ended to us.

Mr. DADDARIO (continuing). Indicate that it is takeover. It would necessarily have to be broad; considering the testimony that is before us. This is an area where so much activity is necessary. The history of governmental activity in these areas has been one where the research is put together, the knowledge is accumulated, and then disseminated. None of these are now being done so that it is meaningful. The legislation is filling a gap when the Federal Government does come in. Because if you, your organization, and all of the fire people throughout the country had felt the need to do this and if they had done it so that a national requirement is fulfilled, we would not even be having hearings here today.

Mr. MORGAN. A very great deal of this work is being done. A lot of it has been done for many years.

Now this is not to suggest that there are not gaps or that there are not important contributions that might be made by agencies of the Federal Government. As a matter of fact, there is a great deal of Federal agency involvement in fire protection and fire research at the present time. There has been for years. It has not been all in one place by any manner of means.

But, on the other hand, there has been exchange of information and there is a vast amount of information available to those who wish to have it and can use it. A great deal of this is no secret at all.

Now this is not to say that you can't learn more. We know that you can; and it is for this reason that we support the idea of research and possible additional involvement by the Federal Government in areas where it can be demonstrated that a real need exists.

Mr. DADDARIO. Are you saying, Mr. Morgan, that all we need to do is to set up a collection center? That if the information is then disseminated, that is all that needs to be done?

Mr. MORGAN. To tell you the truth, we thought there was pretty much of a collection center. This is one of the things that NFPA has been doing for many years, is to be a collection center. We were under the illusion that we were a clearinghouse for information on fire, and we know there is an awful lot of information that is available that is not currently being used.

Now it won't serve any purpose to duplicate what is already available, and I think that we should exhaust our present resources before going beyond this.

Mr. DADDARIO. Well, if you believe this is the case, where is the breakdown? Because it does not come through to us that there is a central clearinghouse where information is available which could be taken by fire departments. They have come in here and have complained about the lack of such capability and have urged, as I have understood their testimony, the need not only to put the presently available information together, but to examine it and to come to some determination as to the quality of the information and its applicability—its applicability, rather, to firefighting and prevention.

Mr. MORGAN. There have been many references in the testimony in connection with this bill to National Fire Protection Association and what is available. The fire services I think pretty generally have a pretty fair idea of what might reasonably be available through NFPA.

There has been a great deal of feed into NFPA over a great many years even as referred to by Chief Layman a few years ago. We have his large stock of "PHOBUS" experimentation reports and I dare say they would be pretty difficult to find anywhere else.

Mr. DADDARIO. How is it computerized? How do you make it available? One of our big problems is, of course, that things could be accumulated in such vast amounts so that we do not know where it is or how to use it.

Mr. Layman talked about a fire nozzle described in a publication of the 1870's which with slight adaptation could be used today. It is not unusual that we sometimes need vast information which can answer our problems.

Mr. MORGAN. This is very true. Our library resources are not at this very moment computerized. We have computer equipment coming into our shop in the very near future. We have been waiting quite a while, but it is imminent now as our staff can testify because it is dislocating things considerably in the transition. And we hope eventually to get this information that is in our library in some form, computerized, to use your word, sir. It is not at the present time.

Mr. DADDARIO. Mr. Brown, I did not mean to not allow you to get in. I just had that line of thought.

Do you have a question?

Mr. BROWN. No, I don't have any questions.

Mr. DADDARIO. Mr. Miller?

Mr. MILLER. Why, you seem to build down the fact that there are 10,000 or 12,000 deaths a year. How does this compare per capita with other countries? England, for instance?

Mr. MORGAN. I do not think I can answer off the top of my head your question. I have seen references made to the total number of deaths by fire in various countries. I do not diminish for one minute the fact that 12,000 deaths are 12,000 individual tragedies to just that many families. I do not underestimate that at all.

There probably is at some point a level below which you are not going to be able to save lives simply—unless and until many of the things that we know now about fire are translated into compulsion in areas where people now are still left some freedom of voluntary action, maybe to their own demise, but the fact remains they are not compelled to do lots of things which probably would save their lives if they were compelled to. And it is in this respect certainly a philosophical question as to how far compulsion is used to make people do what would be good for them.

Mr. MILLER. Now I asked you about this because it has been represented to me—and I have no personal knowledge on the matter, I have never had an opportunity to go into it, but I will have some research done in it—that percentage-wise we lead the rest.

Mr. MORGAN. I think this is probably—very likely true, sir.

Mr. MILLER. I am talking about the civilized world, now.

Mr. MORGAN. Yes, I understand.

Mr. MILLER. It is much less in Germany, it is much less in England, it is much less in these other countries.

Mr. MORGAN. Quite true. There is a reason.

Mr. MILLER. Why are we bringing up the tail?

But in the meantime, have we just transferred our firefighting apparatus from horses to motor vehicles and done nothing much more in the last 80 years?

Mr. MORGAN. No, I think not, sir. I think that a very large part of the reason why fire losses generally are less in European countries, for example, and why there are fewer deaths from fire in European countries than there are in terms of population in the United States largely derives from two things: One, the characteristics construction to be found in those countries, the lessons that they have learned and applied over centuries of conflagration which have destroyed major cities of Europe repeatedly in Middle Ages and since, with the consequence that thatched roofs, for example, are not permitted, the very extensive use of masonry construction in buildings in European cities. This we think has a very marked effect on fire losses. In terms of death, also.

European people have not enjoyed the resources, the luxurious resources, if you will, that Americans have had since the times our forefathers landed here. It has created a different attitude of mind. European people have a degree of thriftiness, if you will, and inborn caution so that whatever they have they don't mean to lose by any act of their own carelessness, and hopefully also neither by the carelessness of any of their neighbors.

We have always enjoyed a great deal in this country and it is a mental attitude as much as anything else that has led the American people into much greater tolerance of careless behavior, negligent behavior in terms of fire. It has been demonstrated for years. I have heard it described as a disease. Well, I don't know if it is a disease, but it is a common characteristic of the American people. It is reflected in what we have done with our forests in past years. Happily, this has been under control now for some time.

But our characteristic construction in the United States from the very beginning was with combustible materials. Well, so it was also with Europe when they had the combustible materials with which to build. And over a period of centuries, the transition took place with the result that the characteristic building in those countries is very substantially different from what it is here.

You only have to go to Mexico to find that they have many fewer fire losses, but they build everything out of brick, stone, or adobe, and these are influences.

Mr. MILLER. Let me ask you this, because our time is getting short. I think within the next 5 minutes we may have to go. Isn't it pretty true that any advances we have made in fire protection in this country are the result of the continuous needling by fire insurance companies and fire departments, putting in preventive and educational things in order to solve their losses that has brought this about? Isn't this the thing that has forced fire departments and cities to try and improve themselves and put in preventive measures, rather than treating the thing objectively and seeing what they could do to make some of these savings?

Mr. MORGAN. I am not altogether sure that I understand your point. There is no—

Mr. MILLER. I will make it very simple.

In my town where we have a very fine fire department, my insurance rates are less than in the town where my daughter lives where they haven't such a good fire department. This is brought about by the board of fire underwriters coming over and looking down the necks of the fire departments and saying if you do this and do that we will do this; then the chamber of commerce gets on them.

Maybe you don't do this in the East, but, the fire underwriters in California sure do do it.

Mr. MORGAN. This is done—

Mr. MILLER. Isn't that the whip that has made you make any advances at all?

Mr. MORGAN. The economic influence is what you are really talking about.

Mr. MILLER. Now isn't this the whip, this economic influence, and the fact that the fire people and the insurance underwriters can go to the city commission who then starts calling the fire chief in and saying get off the dime and do something, we want the same rate if we are going to attract people here that our sister city across the street is getting?

Mr. MORGAN. Sir, it is my belief that the fire insurance rates are not the cause, but the result. And the economic advantages to be achieved by a community in having a favorable insurance rate will undoubtedly cause them to do things that they might not otherwise do, but the insurance rate would be a byproduct, not the real gain. The real gain would be the reduction in losses and the saving of lives.

Mr. MILLER. Most certainly philosophically you are right, but the thing that brings it about, isn't the initiative which has been taken by the people; but is the initiative which has been taken by the pressure not to save lives, but to save money in insurance rates?

Mr. MORGAN. Very possibly.

Mr. DADDARIO. Mr. Morgan, a very important part of these discussions is to get the experience of organizations such as yours. We are pleased to have you here.

I think it is important that any strong feelings you have be put before us so that we can take them into consideration, which we indeed will. I want you to understand that.

I find strange the thoughts that you have put before us about how we have reached the point where we are still having these great losses, as the chairman referred to, and these other countries have not. It almost gets to the point that we will lose less lives after we burn down everything.

Mr. MORGAN. That would take quite a long time.

Mr. DADDARIO. I am stretching it.

Mr. MORGAN. We still have fires, this is true. I don't really think that we are going to change—

Mr. DADDARIO. I bring it up because in the final analysis whether it is wood or brick or what, we still have concern about fire.

Mr. MORGAN. You do indeed.

Mr. DADDARIO. We do need to consider the testimony that is before us. There needs to be research done so there could be better firefighting equipment and knowledge about how to approach a fire under certain conditions. These are all methods that if available have got to be understood—

Mr. MORGAN. By the public.

Mr. DADDARIO. And used. This is really, is it not, the best way for us to cut down the loss of life and property regardless of what we build things with?

Mr. MORGAN. This is true.

I would not want to leave the impression of oversimplification in talking about building from combustible materials, because they are with us in large quantities, because we know perfectly well that fire-resistant buildings predominate in industrial properties and we have lots of industrial losses. We know perfectly well that in a fire-resistant building you can have a serious, devastating fire. I do not want to be misunderstood on that score.

I was talking in the historical sense when you come right down to it, going back to our very beginnings.

Now I know that the chairman did not raise the question about what went on in 1700; he was talking about 1967.

Mr. MILLER. That is what I am interested in.

Mr. DADDARIO. We are going to continue building homes of wood and so have a highly concentrated industrial potential with tremendous fire hazards involved.

Mr. MORGAN. We have a tremendous fire prevention responsibility.

Mr. DADDARIO. Exactly. We have a great responsibility in education and research, because our job in preventing fires is much more difficult than other countries.

Mr. MORGAN. True enough.

Mr. DADDARIO. Because it is more difficult, we have to create higher standards to meet this requirement. This bill is aimed in that direction.

I would like to say further that I do have a feeling that your organization is philosophically opposed to the Federal Government getting in here. I think it would be helpful for you to do some research into the attitude of this committee in approaching matters of this kind. It has always been our concern that we have the Federal Government do what it needs to.

We have all protected and fought to protect the patent rights of people who get themselves involved with research projects of this kind. We have felt that there needs to be a developing relationship between the private sector and the governmental sector.

I think that if you do a little research into what your Government is doing, you will have less fear about cases such as this where it becomes necessary to fill a gap. The work it does is not to control, but rather to allow general participation for the common good.

Mr. MORGAN. Well, let me assure you that we are fully aware of the contributions that agencies of the Federal Government are making and have been making for quite a long time in the fire field. They participate actively in our work. So it isn't a question of fear that they are going to be doing things that don't need doing or shouldn't be done; it is a question as to where the responsibility is placed and the ability to carry out the—filling these gaps that you speak of, rather than becoming, as I suggested, omnipotent in the field, which could tend to discourage private industry, it could tend to discourage other Federal agencies from undertaking anything. And these are some of the side effects that I had in mind.

I don't know what the attitudes of these groups that are making contributions are now.

Mr. DADDARIO. I refer to them because these are your words, omnipotence and ill side effects. If you look a bit, you would find that this is an imaginary concept.

Mr. MILLER. The Bureau of Standards is merely an investigatory agency and one of the most sophisticated scientific agencies within the Government. If you would like to go out and visit the Bureau of Standards, I think you might be surprised to learn that in, say, the automotive industry or the airplane industry, all of the highly technical instruments that must be calibrated are sent out there by private industry to have them calibrated.

Mr. MORGAN. Let me assure you, sir, that the Bureau has worked very closely with us.

Mr. MILLER. So they do a great deal of work. What we are asking them to do is to take a look at a situation that has bothered us for a long time. Maybe someone approaching it from an entirely new and objective point of view might come up with some new ideas. I am certain you are not afraid of new ideas.

Mr. MORGAN. We are not against new ideas by any means.

Mr. MILLER. That is all we want to do.

I want to get on record right now saying I think the firefighting people in this country are some of the bravest and finest people, and I am very happy to call many of them friends, the chiefs of the fire departments in my own district right on down. I think they do a great job. But can we give them a few new tools to work with, or perhaps some new ways of doing it through an investigation like this.

I assure you, the Federal Government does not want to get into the firefighting business.

Mr. DADDARIO. Mr. Chairman, I think it would help further—and it is not that we are trying to convince Mr. Morgan—but I do think the National Fire Protection Association is a very important organization and I do think that its participation without qualification in a program of this kind is extremely important.

The chairman is the author of the bill which we call the standard reference data bill which was before this committee in the last year. There were extensive hearings. We had some of the publishers come here before us with blood in their eyes. I am not saying that you have done so.

Mr. MORGAN. I hope not.

Mr. DADDARIO. But with strong reservations about this activity. The National Bureau of Standards being the agency involved, we were able to show during the course of the hearings and in our report and by the rewritten legislation, that the private sector would be adequately protected. From conflict rose cooperation. In the final analysis I am sure that that legislation is going to work to the betterment of the entire community, including those who felt that in this instance the Government was going to step on their toes. And it was certainly not our intention to do so.

It is with that same philosophy that this committee approaches this situation. I say that because I do think that you ought to have your organization examine its position in the light of the experience that this committee has had in relation to similar kinds of interindustrial-governmental-type relationships.

Mr. MORGAN. May I make one statement, and that is I think the record will support me when I say the National Fire Protection Association has never been found wanting in terms of cooperation insofar as any aspect of fire or fire protection is concerned, and I am sure there will be no change in the cooperative attitude upon the part of the association now or in the future.

Mr. DADDARIO. Mr. Yeager?

Mr. YEAGER. One question. I am not certain that the record is clear on this. Mr. Daddario mentioned at the beginning of his questioning, I believe, the possibility of joining the resolution and the bill.

Mr. MORGAN. Yes.

Mr. YEAGER. This has been discussed. Did you answer the question as to whether or not this would solve the reservations that you have in mind?

Mr. MORGAN. I suspect that it could, sir. It is just a question of how it is done. And not being a legislative draftsman, I think it is perfectly possible if the work of the Commission, the input of the Commission has influence on what transpires subsequently. It would not serve any useful purpose to give carte blanche, for example, to anyone to proceed and then appoint a commission whose findings would be after the fact, so to speak. This, I think, is our only reservation.

Mr. DADDARIO. Mr. Morgan, thank you.

Mr. MORGAN. You're welcome.

Mr. DADDARIO. You have been extremely helpful, and we appreciate your cooperation.

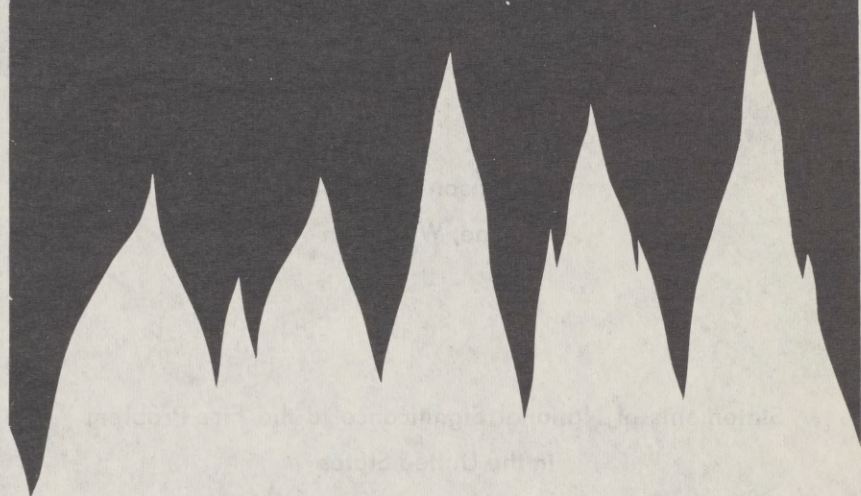
This committee stands adjourned until the call of the Chair.

(Whereupon, at 12:12 p.m., the subcommittee was adjourned to the call of the Chair.)

APPENDIX A

WINGSPREAD CONFERENCE

ON FIRE SERVICE ADMINISTRATION,
EDUCATION AND RESEARCH



***Statements of National Significance to
the Fire Problem in the United States***

THE JOHNSON FOUNDATION ■ FEBRUARY, 1966 ■ RACINE, WISCONSIN

Wingspread Conference on

**FIRE SERVICE
ADMINISTRATION,
EDUCATION
and
RESEARCH**

**The Johnson Foundation
Racine, Wisconsin**

**Statements of National Significance to the Fire Problem
in the United States**

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12. The traditional concept that fire protection is strictly a responsibility of local government must be re-examined.

THE RESPONSIBILITY FOR WINGSPREAD CONFERENCE STATEMENTS OF NATIONAL SIGNIFICANCE TO THE FIRE PROBLEM

This statement has been approved for publication as a statement of the Ad Hoc Committee which gathered at Wingspread and its drafting subcommittee. The individuals who are responsible for this statement are listed on the opposite page. Institutions and associations are included for identification only; the institutions and associations do not share in the responsibility borne by the individuals.

It was mutually agreed by all conference participants that discussions be thoroughly objective in character and that the approach in each subject area be from the standpoint of the general welfare and not from that of any special political association or economic group. The integrity and dedication to a common purpose that prevailed throughout is a gratifying testament to the ability of the fire chief and the educator to enhance their contributions to society.

The statements, discussions and suggestions presented herein are not necessarily endorsed by the Johnson Foundation, their staff or advisers who were most helpful in handling all the conference requirements both efficiently and graciously.

This Ad Hoc Committee offers these statements of national significance as an aid to clearer understanding of the fire problem and of the steps to be taken in achieving the objectives of bringing the national fire problem into sharp focus. The committee is not attempting to pass on any specific pending legislative proposals, programs or methods. Its purpose is to urge careful consideration of the objectives set forth in the statements and of the best means of accomplishing those objectives through administration, education and research.

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FOREWORD

The direct material fire losses in the United States have continued to rise each year. Available records indicate that in 1965 this loss exceeded 1.8 billion dollars.

The life loss from fire has annually exceeded 12,000 men, women and children for the past several years.

Losses of this magnitude would indicate, then, that unfriendly fire is a major social and economic problem.

Basically, the suppression effort is organized and financed as a local government function. The guarding of local government prerogatives makes it extremely difficult to bring into being any organized method for general improvement in any large segment of the fire service. The fire service as a whole lacks uniform standards of performance, educational achievement or skill. Many individual fire departments have made progress in technology, tactics and strategy, administration and organization; however, this progress has been largely dependent on the caliber of leadership of individual fire chiefs, and there is no assurance that this progress will continue or the standards be maintained when there is a change of leadership in a given fire department.

Often this struggle for progress is made under adverse conditions. The economic base of the community may place such heavy demands on the service dollars available for all local government functions that the financing of the fire function simply cannot be afforded at local level.

Management systems enhancing the coordination of the fire function above local level must be considered. Without this coordination at a national or state level, it is difficult to maintain open lines of communication within the service itself so that improved methods, techniques, and the systematic exchange of information and ideas can be facilitated.

This deficiency in the service as a whole has been pointed out in the study made by the Office of Civil Defense titled "National Fire Coordination Study, Phase I Report, 1965."

Hence, we seem to have in the fire service thousands of individual fire department organizations, each trying to cope with the fire problem, uncertain of its responsibility, its jurisdiction and its level of competency to cope with the day-to-day problems that are related to the total fire picture.

This has been recognized by many individuals and many educational institutions and service associations. Some of the individuals who recognized the need for a comprehensive study in the area of fire service administration, education and research formed this Ad Hoc Committee as a first hopeful step in trying to isolate and define some of the major problems, so that additional research and study could be given to problems with a high priority. This committee is especially grateful to the Johnson Foundation for its interest in supporting this study of the fire problem and its relationship to the socio-economic-political community. It is hoped that once these problems are more clearly defined and understood, foundations, government agencies and educational institutions will bring their resources to bear on the issue.

1. UNPRECEDENTED DEMANDS ARE BEING IMPOSED ON THE FIRE SERVICE BY RAPID SOCIAL AND TECHNOLOGICAL CHANGE.

The scale of business and government operations today, the complexity of modern technology and organization, and the swift increase in new knowledge, the population explosion, rapid growth of urban communities, need for efficiency and economy on the part of the commercial and industrial community to compete in our private enterprise system, particularly under the pressure of imports of our foreign trade commitments, require that fire executives and administrators be better educated than their predecessors and better prepared to understand and facilitate change.

The mobility of individuals and whole segments of our society brings about societal change and behavioral patterns which pose tremendous problems for the fire service.

The erection of high-rise structures, large undivided commercial and industrial buildings and solid-wall structures in outlying areas, brings to many small, undermanned and ill-equipped fire departments problems of a magnitude never before faced:

The deterioration of central business sections and the transition of older residential areas help to create slums. Certain ethnic groups are affected by environmental change in a way which compounds the fire problems.

Technological changes in manufacturing processes, science, use of chemistry, nuclear energy, etc., are confronting fire departments with problems far greater than they can handle.

This societal and technological change should be thoroughly researched to determine causes and possible relationship to fire service planning needs.

2. THE PUBLIC IS COMPLACENT TOWARD THE RISING TREND OF LIFE AND PROPERTY LOSS BY FIRE.

What are acceptable limits? Certainly we have reached the limit insofar as crime is concerned, and it would appear that we are rapidly approaching the limit for traffic deaths.

Society in general in the United States seems to establish tolerable fire loss limits which we are willing to accept. Many fire officials felt that a one billion dollar loss was the maximum. Now we are approaching two billion dollars with apparent apathy. The United States leads the world in number of fires, fire deaths and property loss.

Acceptable loss limits are attributable in part to public attitude. For example, the person who has a fire in the United States is approximately described by Wainwright: 1

1 Wainwright, L. *The View From Here*, Life Magazine, Vol. 60, No. 6, Feb. 11, 1966.

In the next two days, numb with shock and relief, protected by the fast sympathy and affection of friends and neighbors, we did not think too much about the loss. A friend's sweater fit almost as well as my own, and my younger daughter's bicycle and menagerie of stuffed animals were magically replaced. The fact of insurance coverage insulated us still further.

This is in contrast to the attitude in other parts of the world toward the individual who has a fire. For example, in some European countries it is against the law to have a fire. In some countries when a person has a fire, he is placed in jail and is guilty until proven innocent.

Industrial concerns have found, many times, that when a new process is developed, it is more economical to build a new building to house the new process than to modify an existing building to accommodate the new process for production efficiency. Therefore, this gives rise to a situation in which buildings are built for a single use and for a single generation rather than for long-term use.

Our system of fire protection and our insurance coverage are definite factors in this complacent attitude. The attitudes of "Why worry, I'm insured" or "The fire department will take care of it" are quite common.

The impact of these attitudes should be studied to determine cause and effect on the total fire loss problem.

3. THERE IS A SERIOUS LACK OF COMMUNICATION BETWEEN THE PUBLIC AND THE FIRE SERVICE

The individual citizen's understanding of what constitutes fire protection seems to be very limited. This lack of understanding is also shared by those persons primarily responsible for protecting the public welfare, the elected and appointed governmental administrators.

When changing geographic locations, the average person, business or industry researches the availability of community services such as education, recreation, health and welfare, but seldom evaluates the fire protection function, assuming "it is there"!

The fire service itself seems to be hesitant to go much farther in explaining its function than to indicate "We save life and property." A thorough analysis of the men, money and material which go into the achievement of such a noble goal needs to be carefully analyzed by the fire service, and ways and means devised to communicate the objectives of the service for the protection of life and property in the community.

Most citizens judge the fire service by one or two contacts they have had with individual members of the service. If this contact has

been positive, the image of the service is positive to that individual. If the contact has been negative, the picture of the entire service is negative.

A continuing public relations program designed to project the desired image needs to be devised and implemented to improve the picture of the fire service.

4. BEHAVIOR PATTERNS OF THE PUBLIC HAVE A DIRECT INFLUENCE ON THE FIRE PROBLEM.

Fire frequency has been directly related to human activity. This is reflected in timetables as to when the highest frequency rate occurs during each 24-hour period.

There are many striking examples throughout the United States of times when people knew that protection was not available to them for reasons such as isolation by flood, snowstorm, ice conditions, etc., and the frequency rate has been practically nil. This seems to be related to the fact that if the public is aware that a service does exist, there are psychological reasons why they become careless in relation to fire problems because they seem to feel that they have the backstop of the service to fall back on.

This is also related to the social problem when segments of our society are moved out of their environment and moved into another environment much more susceptible to problems related to fire.

Frequency rate does not seem to be related to type of construction used in this country. Tokyo, which has long been referred to as a paper city, does not have the frequency rate we have. Other examples: In Cairo, Egypt, the incidence of fire was 3,200 in 1965 and in Chicago, 85,000. The population of the two is approximately the same.

Possibly some research is indicated to determine if the loss in groups which have small material possessions, but have no insurance, is very different from the groups which are financially secure and protected by insurance.

5. THE INSURANCE INTEREST HAS EXERTED A STRONG INFLUENCE ON THE ORGANIZATION OF THE FIRE SERVICE. THIS DOMINANCE SEEMS TO BE WANING. THE FIRE SERVICE MUST PROVIDE THE LEADERSHIP IN ESTABLISHING REALISTIC CRITERIA FOR DETERMINING PROPER LEVELS OF FIRE PROTECTION.

The original concept of organizing public fire protection in this country was to minimize the conflagration hazard. This was originally initiated by the Mutual Assistance concept where all would share in any individual's loss. As a result of this, the criteria for determining

the required levels of fire protection have seemed to be in the direction of establishing fire protection levels to meet insurance requirements.

As a result of many factors such as municipal planning, building construction codes, advanced technology, etc., the same type of conflagration hazard does not exist in cities of the United States today that existed, for example, at the turn of the century.

It can be stated that insurance industry interests have, in fact, solicited the assistance and cooperation of fire officials in the establishment of criteria and standards through the process of committees, associations, etc. However, due to the limitations placed on fire officials by local fiscal problems, the fire official, many times, has not been a member of a committee which formulates these criteria and standards for determining the level for fire protection.

Municipal officials look to their fire officials for this type of technical guidance. The fire official then often finds himself in the peculiar position of trying to apply standards and criteria which he may not understand and which have been virtually handed to him by insurance and industry-oriented interests. This has led many fire officials to use as justification for their request at local level, the statement "This is what the Rating Bureau or the National Board of Fire Underwriters (American Insurance Association) requires."

This has led municipal administrators and governing bodies who are hardpressed to spread the available service dollars over the entire area of municipal services to seriously question the fire official for further justification of his requests for large expenditures of tax dollars.

There is no medium existing in the United States today through which fire officials can take a realistic look at the problems related to determining adequate fire protection requirements.

Since fire protection in this country has been limited to local government jurisdiction, this also inhibits uniformity of fire protection levels as far as equipment and manpower are concerned, as well as forming blocks on determining knowledge and skill levels of individual members of the fire service.

Many times the efficiency level of an individual fire department is entirely dependent upon the leadership and the progressive abilities of the individual fire chief, and there is no assurance that this level of efficiency will be continued by his successor when he retires or leaves the position of fire chief.

If the fire problem is a social problem, then there is a need for new channels of communication opened from the national level to the state level, to the county level, and to the local level. This vehicle or channel of communication does not now exist in the fire service in the United States. Therefore, the efficiency level of personnel, the equipment, codes and all items related to control and suppression activities are left pretty much in the hands of the local community.

There has been considerable evidence in recent years of a gradual withdrawal of ancillary services by the fire insurance industry; so

much so, that the operational fire service would do well to prepare now for complete cessation of these activities.

The insurance companies are businesses. Their primary obligation is to conduct their business in a manner that is satisfactory to their policyholders and profitable to their stockholders. They are not obligated to improve municipal fire protection. This is a public responsibility, through government. Public officials must recognize that adequate protection of lives and property is their obligation.

The operational fire service must have the maturity, professional approach and capability to establish its own standards and to keep them current. Public officials must become willing to accept criteria that are realistic and based on life and property protection without depending upon insurance rates as the primary guide.

This whole area of evaluating today's fire protection requirements needs to be studied in light of the many changes that are taking place in our whole way of life in the United States.

*6. PROFESSIONAL STATUS BEGINS WITH EDUCATION. THE GORDON-HOWELL REPORT SUGGESTS FOUR CRITERIA FOR DEFINING A "PROFESSION"*².

1. A profession should rest on a systematic body of knowledge of substantial intellectual content and on the development of personal skill in the application of this knowledge to specific cases.
2. It must set up standards of professional conduct which take precedence over the goal of personal gain.
3. It should have an association of members, among whose functions are the enforcement of standards, and the advancement and dissemination of knowledge.
4. It should prescribe ways—controlled in some degree by the members of the professional association—of entering the profession by meeting certain minimum standards of training and competence.

A systematic and deliberate educational program leading to a broad knowledge base which is acceptable to the academic community is the surest approach to professionalization.

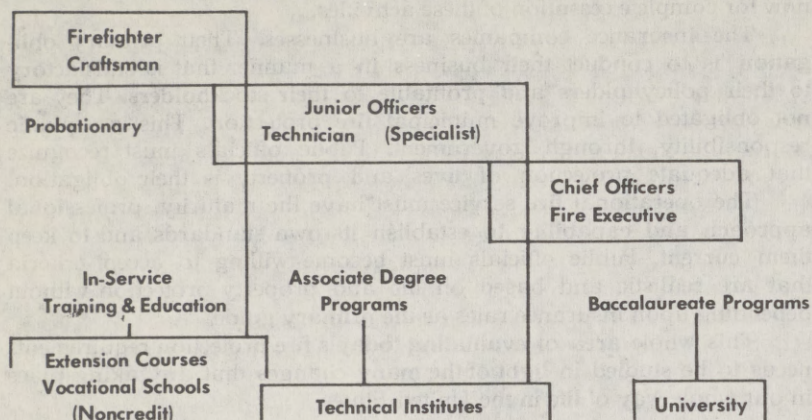
It is unrealistic to assume that every member of a fire department has a formal education (college degree).

Therefore, levels need to be established within the profession.

The following charts suggest a method of determining what these levels might be and the source of education and training to meet the desired need.

²SILK, Leonard S. *The Education of Businessmen*, Committee for Economic Development No. 11, p. 9, New York. 1960.

A MEANS OF ACHIEVING PROFESSIONAL EDUCATION



Formal education achievement should help a person acquire a considered sense of values that will give direction, meaning and integrity to his life and his work. He will need certain basic abilities and skills that are widely transferable and needed in nearly every walk of life, including:

- Mastery of the scientific method—that is, the process of objectively seeing and solving problems.
- An understanding of human relations.
- Skill at communicating—in speech and writing.
- An ability to organize limited resources to achieve set goals and objectives.
- An ability to concentrate and apply himself wholeheartedly to the job at hand until it is completed.
- An open and flexible mind that, nevertheless, has a foundation of fundamental convictions and principles.
- An ability to keep on learning on and off the job.

A fire executive is likely to achieve more if he also finds zest, satisfaction and sense of fulfillment in the exercise of his abilities.

7. THE SCOPE, DEGREE AND DEPTH OF THE EDUCATIONAL REQUIREMENTS FOR EFFICIENT FUNCTIONING OF THE FIRE SERVICE MUST BE EXAMINED.

Many individual fire departments do have specific educational and skill requirements which must be met by existing fire service personnel.

Virtually all crafts, vocations, technical areas and professions have established minimum in-service training requirements. Specific educational requirements are achieved or internships completed before they are allowed to practice in their field.

Today, craftsmen serve as apprentices, being required to have approximately 8,000 shop hours and 760 related hours before they can become journeymen. The technician occupational fields have seen a rapidly expanding technical institute program, leading to the associate degree. These graduates are the highly skilled technicians who complement many of the professional activities.

Each of the true professions has very rigid educational criteria to be met before one can enter the profession.³

Although efforts are being made in the fire service in several sections of the country to follow such guidelines, at present no uniform criterion is established for the individual or the service as a whole to determine the degree of competency expected of the fire service.

To date, we have approached this problem from one extreme of minimal education, to the other end of the continuum requiring a college degree. An investigation must be made to determine what the educational needs are at various organizational levels.

This whole area needs to be thoroughly studied to arrive at acceptable knowledge and skill requirements to be met by fire service people to achieve the craftsman level, the technician or specialist level and the executive level.

8. INCREASED MOBILITY AT THE EXECUTIVE LEVEL OF THE FIRE SERVICE WILL BE IMPORTANT TO THE ACHIEVEMENT OF PROFESSIONAL STATUS.

Mobility is present within virtually all fields of endeavor. In the fire service, many restrictions have been established which limit mobility. Some of these archaic restrictions are individual state pension programs and individual residential requirements. Others have been devised by local and state groups which limit mobility in any level in the fire service.

If uniform knowledge and skill criteria were established on a nationwide basis, there should be no reason why mobility at the various levels in the fire service could not be facilitated.

Professionalism and mobility go together. The parochial attitude that all advancement must come from within the department stifles many competent persons and precipitates incompetency. In many respects the service may be admitting that educational standards for

³SILK, Leonard S. *The Education of Businessmen*, Committee for Economic Development, No. 11, p. 9, New York. 1960.

fire officers are lacking and implying that service with a particular department is the only way to career advancement.

Some states have achieved a degree of mobility for executive and specialist levels in the fire service. However, a comprehensive study needs to be made to determine specific ways in which increased mobility can be attained within the fire service.

9. THE CAREER DEVELOPMENT OF THE FIRE EXECUTIVE MUST BE SYSTEMATIC AND DELIBERATE.

As in any other professional field or quasi-professional field, the requirements for the fire executive must be identified. Once this is accomplished, ways and means of individuals to meet the needs and requirements should be established.

This gives rise to the thought of direct entry into the executive level of the fire service as well as coming up through the ranks of the service. Traditionally, in the fire service in this country, we have promoted men into higher ranks or higher levels and then attempted to train and educate the individual to meet requirements of the level to which he has been promoted. This is contrary to the practice in virtually all other professions and technical areas.

The hit-or-miss approach which assumes that x number of years experience is the criterion for advancement *cannot* meet the needs of today, much less tomorrow. Some ways must be found to identify those individuals with potential and develop them for future responsibility, providing a comprehensive program of career development.

Once a systematic and deliberate course of action is established for development of the fire executive, programs need to be established in educational institutions for in-service training of executives as well as those who are interested in entering the field of fire service management to acquire a wide frame of reference.

10. GOVERNING BODIES AND MUNICIPAL ADMINISTRATORS GENERALLY DO NOT RECOGNIZE THE NEED FOR EXECUTIVE DEVELOPMENT OF THE FIRE OFFICER.

The fiscally hard-pressed governing bodies and municipal administrators find it difficult to justify sending their fire executives to educational courses for long periods of time. This, it is felt, is partly due to recognition of the fact that there are no specific achievement levels established in many of these courses and activities. It is felt that if various achievement levels or acceptable ends could be shown to governing bodies and municipal administrators, these groups would be more receptive to allowing fire executives to participate.

The full scope and extent of the fire problem often is not understood by governing bodies and municipal administrators because membership in governing bodies is generally transitory. The office holder generally is not in the same office for a long enough period of time for him to understand the full depth and scope of fire service organization, operation, etc. Therefore, he must rely primarily upon his fire executives to justify their participation in educational and improvement activities. The fire executive then finds himself in a position without standards, without specific acceptable development programs, hard pressed to justify to governing bodies and municipal administrators why his fire service people need to participate in extended educational activities.

Executive development programs will not be possible until the people responsible for policy and decisions recognize, pay for and support the development process. Increasing economic and sociological problems justify the immediate need for more competent executive fire service officers.

Lawrence A. Appley, president of the American Management Association, made the following statement during an interview for the New York Times:

"We are entering the worst leadership crisis this country has ever seen in all spheres.

"The fantastic growth of our economy and the needs of our rapidly expanding population, mean that in 25 years management jobs will have quadrupled.

"The depression years deprived many executives now in their 50's from getting proper training and the heavy casualties of World War II drastically cut off a large pool of potential managers.

"If you want someone to perform a task for you, you must place into his mind a clear image of what you want him to do. We must develop people so they will use their potential in full, whether in character, personality or productivity.

"An organization should be run as a football team where everybody knows what he is supposed to do. As for the coach, leadership requires followship but you cannot order it; you must win it."4

11. FIRE SERVICE LABOR AND MANAGEMENT, MUNICIPAL OFFICERS AND ADMINISTRATORS MUST JOIN TOGETHER IF PROFESSIONALISM IS TO BECOME A REALITY.

If professionalization within the fire service is to be achieved, then professionalization must be made a common goal toward which all fire service organizations, municipal officers associations and professional management associations can work.

4 New York Times, Sunday, Feb. 27, 1966.

All must recognize that professional status begins with education. There is growing evidence of the emergence of a systematic body of a knowledge which can be applied to fire science and administration.

Without this close cooperation and coordination in the development of such a body of knowledge, acceptance of the fire service as a profession will be slow and difficult.

If professionalization is to be achieved, studies need to be made as to ways and means for coordination, and communication channels need to be devised and kept open, so that all organizations which have an interest in the fire problem can work toward a common goal of professionalization of the fire service.

12. THE TRADITIONAL CONCEPT THAT FIRE PROTECTION IS STRICTLY A RESPONSIBILITY OF LOCAL GOVERNMENT MUST BE RE-EXAMINED.

A principle of fire protection which many fire departments and governmental jurisdictions have had to learn the hard way is stated as follows:

"It is economically unfeasible for any single governmental jurisdiction to equip and man itself with sufficient forces to cope with the maximum situation with which it may be faced." The lack of understanding of this principle has caused many communities to be caught short of fire suppression resources. As a result, catastrophes have not been minimized as fully as possible.

Many local governmental jurisdictions find themselves, in too many cases, too small to be large and too large to be small. As a result, individual communities cannot do some of the things which can be done if the economic base for the service involved is enlarged.

In many governmental service areas, we have seen the expansion of or consolidation of jurisdictions. Good examples of this are school consolidations, sanitary sewer consolidations, water distribution over intra-jurisdictional areas, central purchasing, police protection and, in some instances, fire protection.

Examples of this type of broadening of the economic base to provide adequate fire protection services are found in England. Prior to World War II, there were approximately 15,000 independent fire jurisdictions. During World War II, because of conditions which made it necessary, the fire service was nationalized and became a fourth arm of national defense upon which survival was greatly dependent.

In the denationalization of the British Fire Service in the late 40's, they did not return to 15,000 independent fire jurisdictions, but rather went back to approximately 150 fire jurisdictions. It has been commonly agreed by many fire officials that this method has improved the services and efficiency of the fire service in this situation.

Taking one state as a typical example, the state of Iowa has 940 organized fire jurisdictions. There are 99 counties in the state,

with a total area of 52,290 square miles and a total population of 2,822,000.

By contrast, England has 50,874 square miles with a population of 42,000,000 and now has approximately 150 fire jurisdictions.

Many of these individual fire jurisdictions find themselves unable to cope with the financial burden of providing fire protection as a service. The economic stresses and strains become very pronounced as increased demands for other governmental services occur.

We have seen the trend in certain sections of the country, of the metropolitan concept of merging a city with several of its satellite communities.

A thorough cost analysis study needs to be made to determine if fire protection, as a responsibility of local government, is economically feasible.

APPENDIX B

PREPARED STATEMENTS

STATEMENT BY CONGRESSMAN RICHARD T. HANNA BEFORE THE HOUSE SCIENCE
AND ASTRONAUTICS COMMITTEE

Mr. Chairman, I want first to thank you and the Committee for allowing me this opportunity to add my views to the record. The Fire Research and Safety Act of 1967 will number among the major accomplishments of the 90th Congress, and I know this distinguished Committee will favorably report a meaningful bill, hopefully including some of the suggestions incorporated in my version, H.R. 9305.

Mr. Chairman, many thousands of years have passed since the first men found that fire could be harnessed for beneficial purposes. Man's effort to bend the element fire to his will has resulted in many rich rewards for civilization.

Unfortunately, fire has also been an instrument for ravaging man and his environment. From the earliest days fire has served, under the direction of man, as a destructive and painful weapon. Equally unfortunate man has been the unwitting victim of fire. Countless times through his own stupidity, laziness, or ignorance, man has accidentally unleashed the searing painful rage of flame that has hungrily burned, maimed, and devoured. Nature, too, at times blindly fans the flames that destroy her own domains as well as the fruits of man.

Our painful experiences with fire have taught us that the element is an unstable servant. Obedient when carefully tended and understood, the servant fire will become death and devastation when neglected or ill-used.

Advancing technology has only been allowed to achieve limited success in controlling the diabolical side of the "servant." And ironically the United States, the most technologically advanced society in history, suffers from 12,000 deaths and \$1.75 billion in property damage caused by the same servant fire that plagued man in less advanced ages.

More than any industrially-advanced country, the United States, yearly, falls victim to the ravages of fire. In 1965, the per capita cost to each American amounted to almost \$9. This is \$2 higher than Canada, the nation with the second highest per capita loss from fire.

One can easily understand the inability of past ages and nations to successfully cope with the harmful aspects of fire, but why does the United States tolerate such a deplorable record? It is difficult to justify the loss from fire suffered by the world's wealthiest and most technologically modern nation and one with a most useful imagination.

The explanation is a discouraging one. Apathy on the part of most Americans has generated an inertia which has precluded a national concern and hence, no meaningful national effort exists to reduce either the yearly loss in lives or property caused by fire. The recently concluded Wingspread Conference on Fire Service Administration, Education and Research suggested * * * "Society in general in the United States seems to establish tolerable fire loss limits which we are willing to accept."

This attitude is contradictory to the views held by citizens in most of the advanced nations. Many European countries make it a crime to have an accidental fire, and the person to whom such accident occurs is jailed and considered guilty until proven innocent.

To most Americans fires are not a crime but an insurance claim. The proportion of concern is related to the amount of insurance one holds. The fire, its causes, prevention and ramifications are secondary to the insurance considerations. America has concentrated on preventing fire by purchasing insurance, and as a result of our prevention research and information programs are inadequate, fragmented, uncoordinated, under-financed and suffering from acute disinterest.

Fire prevention and suppression is organized at the very local level. Standards of quality from one area to another are at great variance. Technological progress and breakthroughs in research, when accomplished, are difficult to share amongst and between the thousands of local departments.

Training of personnel is often inadequate. Only two universities in the United States offer substantial programs in fire prevention and administration. Very often lack of up-to-date information, equipment, and expertise hampers effective suppression of particular kinds of fires.

This suggests the area of greatest weakness. Although much is known about fire, much more is unknown. Modern causes of fire are complex. New materials, heavy electrical requirements, novel chemicals, and the modern synthetics carry with them flammable dangers that were non-existent just a few short years ago. The rapid pace of our technology has produced a whole series of new problems for our fire fighters, and yet these people are often ill-equipped and under-financed to deal adequately with them. The research gap in fire prevention programs is immense, and while there are a number of efforts being made, we're falling farther behind.

The tremendous yearly loss in life and property in the United States must shake us into reality. We cannot afford to allow our present apathy toward fire prevention to boost the price of a meaningful program beyond our willingness to pay. The present cost from loss is already staggering. However, if we are willing to make the investment in fire safety programs now, the catch up cost will be more than repaid by the savings gained from the reduced losses from fire.

In April I introduced a companion measure to the Fire Research and Safety Act of 1967. This Act is a positive step in the right direction. The statement of policy that forms Section 2 of my bill announces the Federal responsibility in fire safety.

"Declaration of policy

"Congress finds that a comprehensive fire research and safety program is needed in this country to provide more effective measures of protection against the hazards of death, injury and damage to property. The Congress finds that it is desirable and necessary for the Federal Government, in carrying out the provisions of this Act, to cooperate with and assist public and private agencies. The Congress declares that the purpose of this Act is to amend the Act of March 3, 1901, as amended, to provide a national fire research and safety program including the gathering of comprehensive fire data; a comprehensive fire research program; fire safety education and training programs; demonstrations of new approaches and improvements in fire prevention, control and reduction of death, personal injury and property damage. Additionally, it is the sense of Congress that the Secretary should establish a fire research and safety center for administering this Act and carrying out its purposes, including appropriate fire safety liaison and coordination."

As the statement of policy suggests, the Act will focus national attention and concern on a problem of national scope. For the first time, we are recognizing that an effective and meaningful fire safety program requires a coordinated, well-financed, and nationally encouraged posture. Mustering all available resources and making the most of efficient use of these resources is a responsibility and obligation of the national government.

Although the International Association of Fire Chiefs, the National Fire Protection Association, other foundations and public and private agencies have been doing a remarkable job with limited resources, still an effective national fire safety program is non-existent. Less than half the States now report fire statistics and information to any agency. The lack of information is discouraging. The dissemination of information is difficult. Coordinated research is inadequate.

To all these problems and others, the Fire Research and Safety Act addresses itself. The Act will set up machinery for the gathering and reporting of information on the nature and causes of fire. Up-to-date coordinated research on the physical nature of fire, and the way that it acts on the various modern materials and structures will be authorized.

A national information clearinghouse will be established. Research data will be collected and disseminated through this institution. With cooperation, this center can become particularly meaningful and assist in reducing the present expensive and often inefficient duplication of effort.

A massive public education program on fire safety is authorized by the bill. The bill authorizes funds for upgrading the education and training of firemen and other fire prevention professionals.

State demonstration projects would receive support. Local research and demonstration projects would be encouraged and supported.

My bill will also create a National Fire Safety Advisory Board. Recognizing the many valuable contributions being made by private foundations and associations in the field of fire safety, the bill instructs the Secretary of Commerce to appoint a panel of fifteen members . . . "knowledgeable in the field of fire prevention and safety, including officials of private non-profit organizations active in fire prevention and education, fire department personnel, Federal, State and local officials and persons engaged in commercial fire prevention programs."

The purpose of the National Fire Safety Advisory Board will be "to facilitate efficient fire safety liaison and coordination between the Federal Government and those other private and public agencies and institutions engaged in fire research, prevention and safety programs, the Board shall advise, consult with, and make recommendations to the Secretary (of Commerce) and other appropriate Federal officers and employees as to fire prevention and training education programs, and fire research and safety programs."

The National Advisory Board has been included in this legislation in order to insure that our fire safety program is truly a national effort. Without such a coordinating and liaison board there is the institutional danger of working in a vacuum. Fire safety programs have too long been subject to this ill. Unless the Federal Government's role is part of and in tune with the overall effort, it will be meaningless. The fact that the Federal Government participates in an effort does not guarantee anything. It is important that our fire safety program not degenerate into a fragmented effort in which each element talks only to itself. This is so often the case with Federal programs that are not obligated to communicate with the other interested elements in our society.

The Fire Safety Advisory Board would preclude noncommunication between the various segments working in the program. Rather, it would facilitate meaningful communication and enhance the overall effort.

For the purposes of carrying out the Fire Safety Act the bill authorizes \$10 million for the fiscal year ending June 30, 1968. I believe this is the minimum figure necessary to accomplish the task before us.

Mr. Chairman, it is time our citizenry and its Government demonstrated the necessary concern and attention to problems of fire safety. Our effort must be in proportion to the problem. It has not been in the past. Devastation and loss from fire is increasing yearly and unless we escalate our efforts immediately we may find the problem aggravated to a point beyond our ability to deal effectively with it.

I am optimistic that this will not be the case. I am confident that Congress will pass meaningful legislation this year. I am confident that a concerted national effort will be initiated through the machinery established by the Fire Research and Safety Act of 1967. And I am confident that with an intense and effective program of education, the American people will respond to the challenge and overcome it.

I look forward to the day when, as the mythical Prometheus intended when he gave man the precious gift of flame, fire will truly be the controlled servant of man.

In conclusion, Mr. Chairman, I urge the Committee to incorporate the National Fire Safety Advisory Board into the Committee's bill. I am confident that every consideration will be given to this approach, and I look forward to early House consideration of this important legislation.

STATEMENT OF THE AMERICAN MUTUAL INSURANCE ALLIANCE, MAY 18, 1967

The American Mutual Insurance Alliance is a trade association of 121 mutual fire and casualty insurers, with principal office in Chicago, Illinois, and Mid-Atlantic office in Washington, D.C.

The Alliance and The Federation of Mutual Fire Insurance Companies (a former sister association since merged into the Alliance) have long been organization members of the National Fire Protection Association. We are aware of the statement submitted to your Subcommittee by Percy Bugbee, General Manager of NFPA. In principle, we subscribe to the views expressed by Mr. Bugbee.

There seems no question that there is need for additional basic research in the area of fire safety which can likely be accomplished only with governmental assistance or by direct government performance. On the other hand, much

applied research has been done and is underway by private organizations such as NFPA.

While the Alliance supports the need at the Federal level for basic research in the fire safety field, it would be our hope that there would be no overlap between governmental research and private research. Not only would any such overlap be wasteful of manpower resources and involve costly duplication of effort, it could well act to reduce incentive for the private sector to continue its many activities in the fire safety field. Therefore, while we support the basic objectives of this legislation, we are of the opinion that the creation of a commission to contemporaneously study the many aspects of the fire problem, would manifestly increase the effectiveness of the bill. While we have no preference as to how such a commission should be established, we draw your attention to H.J. Res. 498, introduced by Congressman Barrett on April 11, 1967, which was the subject of a hearing before the Housing Subcommittee of the Committee on Banking and Currency on April 21, 1967. It may be that the National Advisory Commission on Fire Prevention and Control proposed by such Resolution would be an appropriate means of accomplishing such studies.

Serious examination should be given to the provision of the bill which calls for central management by the Bureau of Standards of the fire safety program throughout the entire United States. Without careful consideration, such centralization could very well retard, restrict, or confuse the present cooperative accomplishments between the private sector and Government. The necessity for central management of the nation's fire safety programs and the means by which they might be accomplished is a proper subject for study by the commission as recommended above. In any event, we urge that there be a thorough examination of the private and public fire safety activities now in existence in order that H.R. 6637 and its important work be concentrated in those fields beyond the capacity of existing facilities.

STATEMENT BY JOSEPH ROMM, ACTING DIRECTOR OF CIVIL DEFENSE, OFFICE OF THE SECRETARY OF THE ARMY

The Office of Civil Defense is fully aware of the importance of fire as a potential threat to the safety of the population of the United States in the event of nuclear attack on the United States. We put this problem in proper perspective during various hearings in 1961 and 1962. At that time we stated that the primary threat was fallout, a problem that could be greatly mitigated by use of existing buildings as shelter. Nonetheless, we also recognized the potential threat of fire and this we outlined in a 1964 OCD technical report titled "Fire Aspects of Civil Defense."

Underlying this report is a considerable research effort in the Office of Civil Defense, complemented by projects in the Defense Atomic Support Agency. Since the early days of civil defense, we have consistently looked to the National Bureau of Standards for a stronger program in the peacetime fire area. For example, in August 1964, we supported the National Bureau of Standards "Outline of a Proposed Fire Research Program," and in fact, suggested they strengthen and broaden certain areas of study.

We recognized then, and now, that to be in a position to deal with the civil defense fire problem, we need a firm foundation of peacetime fire data. This is especially true in the area of fire service direction and control, communications, and operations.

Over the past four years we have explored the general boundaries of the fire problem. We have an understanding of where one can most profitably conduct research to mitigate the problem and where there is only a marginal benefit to be gained.

Further, with guidance from personnel of the fire services, supporting organizations, fire education organizations, and various Federal Government offices, the National Fire Coordination Study of 1966 outlined what could be done now to aid the fire services in a program of fire defense. This has set in perspective the civil defense fire problem and outlined what needs to be done. Many of the problems and needs apply to peacetime fire aspects as well. That is, there is a pay-off in peacetime for studies of fires in nuclear war, and vice versa. And, not of least importance, there is now an excellent research capability in the universities, nonprofit institutions, and in the fire protection industry; all these groups are quite familiar with fire problems. With this background, an action program

as proposed in the "Fire Research and Safety Act of 1967" can, and should, be undertaken now. It would permit us to concentrate on the civil defense aspects of fire with full confidence that our program would be supported by a firm peacetime foundation.

The Office of Civil Defense is strongly in favor of the "Fire Research and Safety Act of 1967."

STATEMENT OF AMERICAN INSURANCE ASSOCIATION WITH RESPECT TO PROPOSED
FIRE RESEARCH AND SAFETY ACT OF 1967, H.R. 6637, MAY 18, 1967

We have reviewed with interest the Fire Research and Safety Act of 1967 introduced as H.R. 6637 noting that its proposals would expand the Federal government activity in fire prevention and control, an area in which the American Insurance Association and its predecessor organizations have been active for the past one hundred years. Our companies have recognized fire prevention and improved programs of fire protection and control as properly the interest of everyone so that their interest in this area is definitely parallel to the public interest. We have also recognized that participation in fire prevention efforts by any other agencies able and willing to assist is equally proper, and welcome all such efforts, including that of the Federal government.

The total contribution of the insurance industry per year in efforts related to fire prevention and control has been estimated at not less than \$74,000,000. The American Insurance Association has a broad and continuing activity in this area which we briefly describe for the benefit of the committee, but first a word about our Association.

American Insurance Association is an association of 168 capital stock fire and casualty insurance companies. It started operations January 1, 1965 as a combination of the former American Insurance Association, the Association of Casualty and Surety Companies and the National Board of Fire Underwriters. The American Insurance Association carries on the fire prevention, protection and research activities of its predecessor, the National Board of Fire Underwriters.

Association representatives serve on a large number of committees of the USA Standards Institute, the National Fire Protection Association, the American Water Works Association and other organizations.

MUNICIPAL PROTECTION

The American Insurance Association through its predecessor organization, the National Board of Fire Underwriters, has been involved in municipal fire protection work since 1889. In 1904, after a series of disastrous conflagrations, a program of municipal fire protection surveys was initiated by the National Board of Fire Underwriters to evaluate the conflagration potential of cities and to provide the municipal officials with recommendations to improve the effectiveness of public fire protection. This work has been continued and expanded over the years so that at present 465 of our larger cities are periodically surveyed by the Association engineers. In addition to providing each city with a fire protection report with map, and recommended improvement program at the conclusion of each survey, the Association furnishes city officials advice upon request on various fire protection problems pertaining to fire departments, fire communication systems, water supply, fire prevention and building codes.

As part of this work the Association developed a set of municipal fire protection standards published in its "Standard Schedule for Grading Cities and Towns of the United States with Reference to their Fire Defenses and Physical Conditions" that is used to evaluate municipalities and determine their relative fire protection classification.

The National Board of Fire Underwriters was long a leader in the program for standardization of fire hose threads, working with local communities to make conversions of existing hose threads to national standard.

The high degree to which municipal fire defenses have been developed is in a large measure due to the technical advice and assistance rendered to city officials as part of our municipal survey program. The close working relationship between our engineers and the city officials responsible for water supply, fire department, fire alarm systems, fire prevention and building construction has done much to produce many of the good features of municipal fire protection that exist in our cities today.

CODES AND STANDARDS

In an effort to influence and encourage the introduction of improved and safe methods of building construction, the National Board of Fire Underwriters and its successor, the American Insurance Association, have published a recommended building code continuously since 1905, when the first edition appeared. Staff members, working closely with responsible municipal officials interested in providing safety to life and property, have attended numerous meetings with planning committee study groups, and governing boards in an effort to promote the adoption of adequate laws and ordinances governing construction. This effort has resulted in the acceptance, by law, of the provisions of the National Building Code in over 1,700 communities of the United States. The Code is also used by many architects and engineers as a general reference book and by architectural schools as a text.

The Fire Prevention Code recommended by the American Insurance Association has gained wide national acceptance since first introduced in 1930. This Code, prescribing regulations governing conditions hazardous to life and property from fire, has been adopted as law in over 2,800 communities.

By serving on many and varied technical committees and in other ways, the staff keeps pace with changing technological conditions. Changes in building and fire protection standards are effected, where necessary, by amendments to our recommended Codes. Where a detailed explanation of a topic is indicated, our Special Interest Bulletin series, with a distribution of 30,000, is used to advise those interested in building and fire safety.

A number of booklets and standards designed for professional as well as lay use are published to fill the need for better understanding of the cause and prevention of fire. To keep abreast of the ever-changing problem, our staff reviews hundreds of fire reports in order to detect trends leading to serious fire losses.

RESEARCH

Assistance with practical fire research problems has been an active part of the program. A number of major fire test projects have been sponsored at Underwriters' Laboratories, Inc. These have included research on sprinkler protection for high piled stock and a variety of other projects. Underwriters' Laboratories was organized and sponsored by the National Board of Fire Underwriters. It is now sponsored by the American Insurance Association.

Realizing the need for keeping our insurance people and municipal fire services properly posted on developments presenting increased fire and explosion hazards, research reports on a variety of technical subjects have been published. These were developed through extensive studies, conferences and meetings with specialists in the fields under consideration. The reports have received wide distribution and have been trail blazers in the consideration of high hazard subjects. Typical subjects included are plastics, molten salt baths and organic peroxides.

Many of the most useful lessons learned in studies of fires have come from analysis of major fire and explosion losses approaching catastrophe proportions. Special reports on occurrences of this kind have been published for the purpose of focusing public attention on the situations which lead to the catastrophes. Reports included in this series are reports on the Texas City Disaster, the Holland Tunnel Fire and the Roseburg Explosion.

Comprehensive reports covering fire and explosion problems in industry have been prepared to assist in obtaining industry-wide attention and stimulate effective action in safeguarding hazards. Survey reports of this type have dealt with warehouses and metal working industries.

Major fires and explosions involving highway transportation of extra-hazardous commodities have received attention. Research was conducted on the causes and the necessary steps to minimize such accidents. A suggested guide for state legislation on the subject was issued and highway emergency training bulletins were issued to police and fire department training groups.

Bulletins covering many special hazard items have been prepared and distributed to member companies, the benefit of which filters down through company personnel and agents to commercial and industrial firms generally.

FIRE PREVENTION EDUCATION

The American Insurance Association (successor to the National Board of Fire Underwriters) is recognized as a leader in the field of fire prevention and in initiating fire prevention education programs. Coordinated programs of fire prevention have been introduced and carried out under its leadership.

A variety of fire prevention literature, posters and other instructional material for use at the grass roots level is prepared. Programs stress fire prevention and fire safety in the home, on the farm, in commerce and in industry. Seasonal fire prevention campaigns are conducted during the spring, fall and winter.

The implementation of the programs has been carried on by many and diverse groups in their own communities. These activities enlist the support of federal, state and municipal agencies of government; the support of fire chiefs, safety organizations, business and civic groups, and the fire insurance business in a cooperative effort toward preservation of lives and property.

The American Insurance Association is a sponsor of Fire Prevention Week; traditionally established each year by proclamation of the President of the United States, State Governors and Insurance Commissioners. To highlight this occasion, we prepare a poster calling attention to the need to "Stop Fire—Save Lives." Last year, more than 1,800,000 such posters were distributed during Fire Prevention Week. In addition, some 22 million pieces of fire prevention literature were distributed for use by organizations and individuals who are directly concerned with local programs.

To heighten the impact of Fire Prevention Week and cooperate with mass media facilities, 5,000 kits of spot announcements are sent out to radio and television stations. A minute movie is also prepared for use by TV and motion picture theatres. In addition, fact sheets containing information and feature stories on fire prevention are prepared for use by the press.

Folders are printed for distribution during the Holiday Season and for the Clean-up Week observances in the spring. A minute movie is produced for television use at Christmas time and spot announcement kits prepared and distributed. This year-round activity increased the total distribution of literature to more than 26 million pamphlets and folders.

A film library of over 29 different subjects is a vital part of the contact with the public. These films dramatize the story of fire prevention and are a potent force in fire prevention education. These films are distributed through five film libraries in strategic locations around the country and reach an audience of over 2 million people. There are normally over 38,000 showings of films before varied groups which include the young and the old, students, householders and civic, business and industrial audiences.

The American Insurance Association welcomes assistance from the Federal government in this fight against fire. The Federal government can be helpful in those areas which are beyond the control of private business. A good example of this is the training of fire fighters. The American Insurance Association holds itself ready to assist and cooperate in any Federal Study Commission effort.

STATEMENT IN FAVOR OF HOUSE BILL 6637, THE FIRE RESEARCH AND SAFETY ACT OF 1967, BY HOWARD W. EMMONS, PROFESSOR, MECHANICAL ENGINEERING, HARVARD UNIVERSITY

This Act proposes to set up a Federal mechanism by which a number of badly needed fire-related activities will get the attention they need. The fire problem, like many protection problems, is a problem with aspects not adequately handled through our system of private enterprise. The basic idea of our private enterprise system, which works so well, is that one person has a need, another recognizes that need, finds a solution, negotiates a contract with the person in need to supply the required answer. However, the fire problem strikes at random. Many of us go through life without ever having a personal fire problem at all, and all of us hope that fire will not strike us. Thus, our need is only vaguely felt and our willingness to pay for a solution is one of low priority. If we are caught in a building on fire and are standing on the windowsill of the fifth floor waiting to be rescued, we certainly have a need for which we would pay dearly; however, the man with a solution does not have time to negotiate a contract. Thus, while some portions of the fire problem are very well carried out by our private enterprise system, there are other aspects in which this is not true, and it is largely these aspects to which the Bill now before the House is addressed.

Very wisely this legislation provides that all segments of society can be brought to bear in the most effective way in reducing the large annual fire loss and death toll. The Bill makes provision for work through the private enterprise system, which operates best through the private enterprise system, but provides assistance in those areas for which our present organizations are unable to provide all that society needs.

I have just completed a world-wide study trip on the fire problem. I have made about 50 visits in 18 countries. My visits included fire research laboratories, fire departments, fire training schools, fire colleges, fire protection associations. It is clear from these visits that there is a world-wide lack of effort in exactly those areas which the present Bill provides for.

Fire loss data of many kinds are required; the simple counting of losses, estimate of their magnitude, and classification by occupancies is needed, just to provide a picture of how bad the fire problem is and what portion of the fire problem needs the greatest attention. Such data in the United States is collected through the states by the NFPA (National Fire Protection Association, a private non-profit association). The source data of the NFPA comes from 20 states, who supply data in a useful form. This data is extrapolated to indicate that last year there was 1.7 billion dollars worth of fire loss in the United States. Although the data thus collected is not very accurate, it is also not very important whether the actual loss is 1.5 or 2 billion dollars per year; it is too large in either case. However, this is only one item of statistics that is needed; many more and much more accurate types of statistics are needed for various economic and operational analyses. Should a city have fewer fire stations with larger forces and more equipment in each one? To answer this question requires a knowledge of the fact that the larger force could attack the fire more successfully when it arrives. However, a certain loss of time would occur in driving somewhat farther from the fewer stations to the average fire. The average fire would therefore have burned a trifle longer, and serious question arises—what is a minute worth? Perhaps stations should be more numerous and not so well manned for the optimum of time loss and striking force. Data on such questions as these would require detailed experimentation, with fires in various abandoned buildings, in buildings burned on purpose, and through a detailed study of selected fires. Special teams would have to be appointed, and statistical techniques used to select those fires which would be studied intensively; the teams would have to be put in the field during and after selected fires. Such essential data has not been obtainable through the voluntary data collection schemes available, and the Bureau of Standards must have authority and responsibility to provide such essential information. This is only one illustration of the type of special purpose data which will be needed in order to make progress with many of the phases of the fire department organization and activity.

Let me comment on educational activities. At the present time various private agencies, particularly the NFPA, supply what educational brochures and information that are available to the general public. The present limitation to progress in education is a financial one. How much the fire losses would be decreased by a given expenditure on public education is difficult to estimate. However, it is agreed by all that more needs to be done; such things as movie films, TV programs, radio programs, slides and brochures made available to schools would all increase the public awareness of the fire problem and would presumably increase public care from a fire protection point of view. In the area of public education, as in the direction of data collection, the new Federal effort should cooperate to the fullest with existing agencies; notably, the NFPA, and apply any new effort to supplement present programs.

In the United States the responsible fire fighting unit is the municipality. Each little town has its own fire department, fire apparatus, fire houses, and all aspects of its own fire protection. These are organized under state fire marshals and each state endeavors to provide certain training for firemen. The training thus made available varies enormously from state to state; some do a very excellent job, some a very poor job. It would seem well to have the general firemen training program continue as a state function. For the higher levels of training, however, for the fire chiefs and senior officers, it would seem desirable to have a national academy of science. In many countries of Europe the first requirement for a fire officer, including fire chief, is the possession of an engineering degree. This has never been a requirement in the United States and it seems somewhat unnecessary. However, it is clearly necessary to provide the fire chief with additional information on handling men, organizing a department, estimating a budget, and supporting that budget before suitable local authorities. These operations will demand even higher levels of understanding in the future when operational analysis techniques are applied to the operations of fire departments. Such techniques, with the proper use of modern computers, should be able to help a great deal with many of the problems raised by fire departments and their operations. A fire chief will need special training as to when to use these techniques, and how to use these techniques, and how to interpret the techniques once he gets

the results. To do this adequately on a state-wide basis would seem like unnecessary duplication of educational and training facilities, and a national fire academy for such a purpose would seem highly desirable.

Thus, under the new Act the Bureau of Standards would be responsible for seeing to it that an adequate program of training exists. Such a program could be organized by the Bureau of Standards on its property. On the other hand, the Bill wisely provides for contracting with non-profit organizations, and perhaps the best way of organizing a proper fire officer training program would be through some one of the existing universities, if some one or two would be interested in setting up such a national training program.

And now for the need of fire research. The basic knowledge of fire and how it behaves enters the fire safety problem in a number of places. We must devise and use materials that are less susceptible to fire, we must so design and construct our homes and buildings that they minimize the fire hazards, and we must provide the fire departments with the necessary equipment to have maximum effectiveness with respect to control of the fires once they get started.

In the matter of selecting materials and designing buildings, the successful approach is by way of standards; standards and codes adopted by cities and states or perhaps the Federal government. Such codes try to specify what properties the materials must have in order to be acceptable, what design features a building must have in order to be acceptable. Thus, provisions of fire-safe surroundings has two aspects; one, the efforts put forth by suppliers of materials, architects, and construction firms in attempting as best possible for their own personal advantage to satisfy the codes as they exist. In order to do this the companies or organizations concerned must have extensive knowledge of the physics of fires, the chemistry of fires, the behavior of fires in general, so as to take advantage of the potentialities of their own business. Secondly, the public authorities, in devising and adopting codes, must likewise have extensive knowledge and understanding of fire and its effects in order that the codes be so written that they will produce the desired safety effect. In order to make a code specific, one has to refer to specific test procedures by which a material does or does not pass, and thus indicate its suitability; in which a building design for a proposed structure does or does not pass the requirements. Thus, again, very extensive knowledge is required so that the codes at any one time can be the best possible compromise that anyone can devise to accomplish the desired safety. At present most codes for fire are devised through the committees of the NFPA. The procedures of this organization are the best that can be devised and the resulting codes are very specific, very practical and, to the extent that present knowledge permits, very good. However, the phrase "to the extent that present knowledge permits" is an essential one, because the present organization of the approach to fire safety does not have a proper mechanism for satisfying the needs for additional information when the current information is found wanting. The present procedure is for a committee, attempting to devise a code through the NFPA, to observe that in a certain area data would be highly desirable. If the data required is neither too extensive nor too expensive, steps are taken to urge various manufacturers and other interested groups to contribute a certain amount of money, to do a certain amount of research in order to satisfy in a certain way, at least, the minimum requirements for this knowledge. Frequently, however, the knowledge demanded is very large indeed, the expenses are out of the question, and so the committee makes up its mind as best it can on the basis of the present information.

In the course of my travels one man who has worked in the fire area for many years said that the present state of fire techniques and knowledge is the accumulated opinions of committees. We must recognize, as in every field of human endeavor, that there are many questions which can only be settled at a given time through the opinions of those concerned. However, in many technical areas in the fire problem, modern technology knows precisely what has to be done in order to supply exact information, so that opinions need not be expressed on those matters which can surely be known.

At the present time there are many aspects of the fire problem in which guessing has been done and where the resulting codes are worse than useless, since they give one a false impression of security. Having said that present codes are worse than useless in some respects, let me be quite specific by giving two examples. We select wall board, floors, ceilings, wood, paint finishes, etc., on the basis of a combustibility test of some kind. Sometimes such tests are called flammability tests, but whatever they are called there must be a test made in

order to discriminate between acceptable and unacceptable materials. Every country has recognized this need, and every country has adopted a national test for such discrimination; that is, every country except the United States. The United States informally has adopted the tunnel test, developed through the Underwriters' Laboratory and others. This test effectively serves as our national flammability test. So far, I have indicated that each country has a test of its own; there are, therefore, a large number of different tests that are available for the screening of materials. These tests were not agreeing with each other very well, so that a European group under the International Standards Organization formed a committee which selected twenty-four more or less combustible building materials, sent samples to every laboratory (six of them) and had them tested and rated in order, in each of the laboratories. The agreement between the ordering of the material for acceptability for construction was abominable. In fact, one of the materials was the least flammable of all twenty-four in Denmark, and the most flammable of all twenty-four in Germany. There was another material of the twenty-four which was almost in the reverse order of acceptability. Such an unacceptable scatter of results means that a manufacturer might well supply material regarded as excellent in one country and completely unacceptable in another. Certainly fire isn't going to care which country it is in! It will either burn it or not burn it, in spite of the tests. Such scatter of results does not indicate that some laboratory has done a very stupid job with respect to selecting a test. Quite the contrary; the men devising these tests have been the best men available in each of the countries in which this work was done. The reason for the wide discrepancy is the lack of knowledge of exactly what it is that we are looking for in accepting a material for construction of our buildings. The different tests rate different aspects of the materials differently, and as a consequence they disagree. Nowhere is there a program of purposely set fires designed to study exactly what characteristic or characteristics are desired of an acceptable material. In each case the groups have guessed what they thought was best and obviously the guessing has not been very good to date. But even good agreement from the guess, such as an adoption of an international standard, which is now being attempted, is no guarantee that the correct characteristics are being tested. One must consult nature for the answers to these questions and the program of research required is an extensive one. Hopefully, this would be one of the major tasks of the new Bureau of Standards' effort.

As a second example let me cite the strength testing of building structural members for fire endurance. Many codes ask for a two-hour fire life or some other endurance in fire. This means that the structure, built more or less standard size, about 10 feet by 12 feet, is to be placed on top of a furnace, the standard fire built under the panel, which is loaded by its design load, the panel is supposed to support that load in spite of the fire for two hours, or whatever the rating is. So much for the stated procedure! There are two things wrong with it; first, the stated procedure has not said what restraints are to be applied to the panel during the test. Some laboratories have a rigid frame around the panel being tested. Others have no frame at all around the panel, but support it around the outer edges by resting on the furnace wall. The difference for time of collapse can be four to one. Thus, a four-hour panel in one test becomes a one-hour panel in another. This may be regarded as simply a poor specification of tests. One should have stated more precisely what kind of support the panel should have had. However, even if we do succeed in agreeing on what kind of support the panel should have, the whole approach is incorrect. What the code should ask for isn't a performance of a panel in a given test. What the occupants of a building want, what the firemen want, is a *knowledge that the building as built* should have a given endurance of, say, two hours. What we are really asking is that the engineer who designed the structure of the building for its strength, should also calculate how long the various panels of the building will last if there is a fire, and assure that the building would indeed satisfy a fire endurance rating. Ordinarily the engineer uses steel properties from a small, half-inch diameter steel bar that has been tested for strength. He uses the standard six-inch by twelve-inch compression test for the concrete. This information permits him to calculate with precision how the building will perform in carrying its everyday load. Similarly, the engineer should not care whether the fire test has been performed with a rigid frame or a "simple" support, but should use the data however it is taken to calculate what the performance of the building as built would be. This all sounds straightfor-

ward; however, *at the present time we do not know how to calculate the performance of the building as built from the given fire tests of panels.* We do not know how to compute a panel twice the size of the original one tested; in short, we do not know what the engineer would call "the scaling laws." To find these it will take very extensive testing over a considerable period, combined with much large scale computing machine work, and yet nowhere in the world is this kind of work being done at the present time. Only in England and Japan do they have a program sufficiently broad in its scope and sufficiently sustained in its financing to be able to even consider such a test program. In England such a program is under consideration, but has not yet been started. In this country we have no mechanism at all for carrying out such a study and it is past time that we do. This Bill makes for that provision.

At the present time cities are building taller and taller buildings and more and more of these buildings are completely sealed and weather conditioned. What happens if a bad fire breaks out on the fifth floor? Does the ventilating system immediately distribute all the toxic gases to the twenty-fifth floor and kill all the occupants? Does the smoke get into the stairwells and elevator shafts, so that people are trapped on the upper floors? These problems are everywhere receiving careful attention from many different groups. An extensive program is needed of experiment and calculation related to the performance of ventilating systems and the convection, natural and forced, of gases throughout such a building. Some of this work is being done, of course, by various of the manufacturers of various materials. In a number of other countries there are test buildings that have been built, something of the order of ten stories high, in order to make fundamental studies of these problems. Such a facility is needed in this country too, in order that we too may have a public body capable of assessing the total problem and assisting with the obtaining and evaluation of the basic data on which codes will eventually be built. The new Act provides that, again, the Bureau of Standards would be the central organization in which the need for such data could be evaluated in detail and steps taken to obtain it.

And now consider to some extent the operations of the fire department. There is no mechanism by which the fireman's problems are examined in detail and generalized solutions sought. The equipment manufacturer does what he can, but the market is small, the competition is large, and very little progress has been made compared to what modern technology could accomplish. We find, for example, that a city fire department has to argue with the manufacturer about installing a searchlight on top of the aerial ladder, so that the windowsill can be properly lighted and the man manipulating the ladder from below can see how he is doing with respect to rescuing the people on that windowsill. It is obviously ridiculous that the fire department, having recognized the problem, has then to think up the solution to the problem and argue with the manufacturer about having it accomplished. In the specific case of the spotlight on the aerial ladder, the fire department had to install the light themselves. And yet what can modern technology do? A man sitting at a console in Houston, Texas, can instruct a digging arm on a spacecraft sitting on the moon to dig for another sample, to dig to the left, to dig to the right; he can direct the arm to dig in a location to which the cameras have been directed to photograph and transmit the picture to Houston. And yet the man at the bottom of a hundred-foot aerial ladder has to wonder where the windowsill is that he is trying to find, or else send a man up the ladder to tell him! Why can't the man at the controls of the aerial ladder have a picture of the desired windowsill appear on a screen immediately in front of him; the picture being transmitted either through a periscope, optically, or through a closed circuit TV?

As another example, consider the hazards to which our firemen are subjected in going into a building to rescue occupants or going inside to fight the fire. They put on breathing apparatus, which is rather heavy and awkward. The breathing apparatus has a megaphone attached so that he can yell at the man across the room. In a fire which is noisy he often cannot hear the man across the room, and yet apparently no one has tried to install modern electronic devices. This is surely a very simple matter for modern technology to provide. Furthermore, in a smoke-filled room he can't see very far on account of the smoke, yet it is well known that infrared and other wave lengths will pass through very much more smoke than will visible light. Why doesn't the breathing apparatus also contain a suitable seeing apparatus? If these things were provided it would be much safer for the firemen to enter a building; it would be much easier for them to do their job, and yet we have no mechanism by which our most skilled

men in various fields of modern technology can be put to work and seek solutions to these everyday important social problems.

And as a last illustrative example, consider what the fireman does when the fire appears to be out. He cannot leave the building until he is sure it is out, because there have been many cases in which a fire thought to be extinguished had actually still been burning in a wall, under a ceiling, which (after the firemen had gone) grew and rekindled the fire, sometimes destroying a building in its entirety. The fireman must be sure it is out. He then gets out his axe and other equipment and starts hacking up the building, looking into all the nooks and crannies in which a fire might conceivably be hiding and to which water did not penetrate. He must do considerable damage to the building himself just to be sure that the building will not rekindle and burn down. It is well known that the infrared radiation varies rapidly with temperature; it is well known that flames have a certain small degree of ionization. Why can't an infrared seeker test the temperature of walls throughout the building and indicate where the fire might be lurking, so that the axe could be applied to the right spot where there was indeed fire to be extinguished? Why is it not possible for a suitable microwave-length to be used to detect the ionization in flames, which might be lurking inside of a wall somewhere behind a partition? Such devices, if available, might also be used by the fireman when he enters a building, thus determining whether there is a serious fire below the floor on which he is walking. If the firemen in New York during the recent fire had such a device, they would not have ventured onto the floor which collapsed, dropping them into the basement and killing twelve.

There are innumerable devices which experts in the various branches of modern technology could think up and apply to the fire problem if there was only some mechanism by which they could be paid for doing that kind of thinking. We have all been in awe of what has been possible in putting a man on the moon; the same technical qualifications are required for solving many of the fire problems of society. Many of these solutions, while of great value to society are, at least initially, of very little value to the private entrepreneur. He cannot afford the huge sums of money required over long periods of time, in view of the relatively small return that he would receive on it; the payoff is too slow in coming in many cases. This is why we find in many fields new, unique and startling solutions to old problems, while if you want to put out the fire you use the same technique as the caveman—you put water on it! I do not imply by this last remark that I think there is some magic to be obtained by which fires can be put out in some new and unique way; no doubt we will continue to use water for many centuries to come. However, there are certainly many additional techniques and operations and supporting facilities that we could provide to our firemen and the public by which the tremendous loss in life and property could be further decreased.

The Fire Research and Safety Act of 1967 takes the first steps toward providing a program which can answer these many essential questions. The idea of having a Commission to work simultaneously with this program is a good one; not only could the Commission evaluate and assist the Bureau of Standards in setting up a good program, but its charge could be to further examine the fire problem in all of its social, economic and technical aspects in order to continue to direct the work of the Bureau of Standards and their various contractors in the most useful and practical direction. It must be understood, of course, that the most useful and practical direction has to be examined from a long range, as well as an immediate point of view. Many of the research studies that need to be made are of a very fundamental variety with no appearance of immediate practical use. Yet this kind of knowledge is essential in order to have a sound basis for the practical devices of the future. Thus, the program in order to be a practical one, must include suitable, long range studies as well as those directed toward a more immediate end.

I think the Bill very wisely does not provide that the Bureau of Standards should manufacture and distribute various kinds of fire-related devices. This is clearly the province of private industry, it is clearly the area in which the profit motive is adequate, and the area in which much progress has already been made, as soon as the fundamental work has progressed far enough to show that it is possible to develop a new device. Thus, the Bureau of Standards would carry out the appropriate fundamental studies, but it would be left to private industry to exploit the results of the research when it is possible to apply them to saleable products.

STATEMENT BY DR. DONALD F. HORNIG, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY ON THE FIRE RESEARCH AND SAFETY ACT OF 1967, JUNE 12, 1967

The Fire Research and Safety Act of 1967, H.R. 6637, assigns broad responsibility for a comprehensive national fire research and safety program to the Secretary of Commerce. The passage of this Act will establish for the first time a local point within the Federal Government for the conduct of fire safety activities and permit the efficient planning and management of a *balanced* program to achieve important goals of increased fire safety. The Act accordingly authorizes the Secretary to:

- Gather comprehensive fire data.
- Implement a comprehensive fire research program.
- Support fire safety education and training programs.
- Demonstrate new approaches to fire prevention, control and damage limitation.
- Establish a fire research and safety center.

THE FIRE PROBLEM

The suffering, hardship and economic loss inflicted by destructive fires is a national tragedy. In 1966, property loss caused by fire amounted to nearly \$2 billion. Fire protection, insurance, medical care, and loss of production cost this country billions of dollars in the same period. Perhaps most important was the loss of more than 12,000 lives. Thousands more were injured in fires and large numbers of families suffered a loss of income because of death or disability of the breadwinner.

Fire losses on this scale are not inevitable. A war on fire is being waged every day; the resources available and the effectiveness of their use determine the number of casualties and "battle damage". Strengthening of professional fire-fighting forces and the work of many private organizations has prevented the run-away growth of fire fatalities and property losses in recent years in spite of continuing urbanization and population growth. But much more could and should be done to reduce the danger of fire confronted by every citizen.

There are hidden costs of fire which are difficult to quantify but must be considered. For example, there is evidence that present fire codes and inspection requirements introduce an inflexibility in building design and construction which inhibits the development and use of advanced building technology and design concepts. Because relatively little is known about the theory of fire safety of structures, there is only limited information applicable to structures using new materials and structural systems. Consequently, there is a tendency to over-design with the attendant waste and inefficiency, or to avoid the use of advanced construction technology and retain older construction and design techniques in the face of uncertainty. With a greater fundamental understanding of combustion and fire spread phenomena, it would be possible to make sound engineering judgments about the fire safety of proposed designs incorporating new technology. Decisions could be made on the basis of fact and enlightened engineering judgement instead of being perversely influenced by fear of the unknown.

RELATED GOVERNMENT PROGRAMS

The Federal Government has not played a major role in the reduction of fire losses in heavily populated regions of the country. Programs are generally limited in scope of fire problems of government agencies. The Federal Government spends about \$6 million for fire research but this research is almost wholly focused upon special fire problems of the Forest Service, the DOD and the Office of Civil Defense. In addition, NSF, HEW, and Bureau of Mines have limited programs in basic fire research, public fire safety and burn treatment, and mine fire control. Major programs are conducted by NASA and FAA in support of aerospace and aviation fire safety.

The National Bureau of Standards, which bears Federal responsibility for the development of fire testing methodology, the impartial fire testing of building materials, and supporting research on fire phenomena, and for providing technical support in these areas to the nation, supports very little fire research. Annual funding is roughly \$200,000 or the equivalent of less than ten professional man-year of efforts.

FIRE R & D NEEDS AND PRIORITIES

Three major R & D areas require concentrated attention and support by both governmental and private institutions. They are the analysis of fire-fighting and prevention strategies, the development of improved fire-fighting equipment and systems, and the scientific exploration of combustion and fire spread processes. In the first area the opportunities for operational analysis abound. Many subjects for analysis are obvious such as fire department training, the deployment of men and equipment in response to emergency calls, fire warning systems, emergency communications, fire-fighting operations management, and fire contingency planning. Analytical studies are also required for developing better long-term fire-prevention strategies. Penetrating evaluation is required of the effectiveness of alternative approaches to zoning, building inspection, urban planning, code modernization and enforcement as well as public education.

Fire-fighting equipment has improved with time and many individual items of equipment are now reasonably well design and relatively efficient. But much greater use could be made of the design knowledge and technology accumulated during the past 20 years. There are also some major problems in making the most efficient overall use of collections of equipment. Systems studies are required to point up inadequacies and to indicate the contribution in terms of fire-fighting effectiveness of a variety of possible improvements. Obviously, much more effective fire-fighting could be done if the individual fireman had better environmental protection, instantaneous communication with a tactical control center, and the power to see through smoke and to identify the actual site of combustion. Much more must be learned about appropriate mixes of equipment, trade-offs between first costs and operating costs of major equipment items and the role each element in the fire-fighting system is expected to play. Technological development is also much needed in fire warning systems, sprinkler, ventilation and water supply systems, emergency egress devices, etc.

The balanced development of improved hardware is often difficult for an industry in which the existence of established product lines tends to bring about relatively heavy emphasis on the improvement of a fire hose or a nozzle while relatively little concern is given to overall fire-fighting effectiveness. We have learned, however, in fields such as education, transportation, and crime control, as well as the field of national defense, that industry has much to offer if stimulated to explore a complex problem from a broad perspective.

Perhaps most significant over the long run is our lack of knowledge about the science of combustion and the basic processes related to fire spread and control. Our state of understanding about fire phenomena is comparable to our knowledge of aerodynamics in the early part of this Century. We had then no real capability to predict the characteristics of a body in flight. Airplanes were built on the basis of experience and poor design was identified by rapid and often spectacular failure. Now, in contrast, flight testing is conducted only to verify detailed predictions about performance. In fact, the design is expected to satisfy performance requirements and is dependent at every stage upon performance predictions. In the same way, an understanding of fire processes—a flexible predictive capability—would permit the establishment of meaningful fire performance requirements for a building or a neighborhood which an architect or an engineer would be required to attain in the most efficient manner possible. Fire testing then would be conducted only as a test of the engineering application of fire theory and a few tests would suffice to establish the validity of a wide range of designs.

A large part of any building code today deals with fire protection requirements. It reflects reliance upon empirical testing of building materials, components and assemblies rather than a predictive system of performance. It deals with elements of a building—a beam, a partition or door—rather than the capability of a whole building to provide personal safety and minimize property loss. Currently, building products may be submitted by the manufacturer to private laboratories, mainly the Underwriters' Laboratories, for testing under standard fire exposures for a "rating". However, there are increasing questions of the relevancy of various test procedures to the actual fire resistance or life safety of a building.

It is not yet clear what part of the R&D and analysis task must ultimately be carried out by the Federal Government. It is obvious that the Federal Government does bear a responsibility which is not being carried out adequately, due

to unclear authority and lack of funds. The proposed legislation is a much needed step in the correction of this deficiency. The strengthening of Department of Housing and Urban Development efforts to apply science and technology to urban problems is another compatible step in the same direction. The use of federal funds for high priority studies and fundamental research will doubtless trigger increased R&D activity in industry. Periodic review of activities undertaken in the private and public sectors will lead to the definition of an appropriate long-term role for the Federal Government.

Finally, I wish to stress the importance of the provisions made in H.R. 6637 for effective coordination and management of a comprehensive fire safety program. Section 17 permits the Secretary to exert leadership in the implementation of a broad program within the Federal Government by arranging with and reimbursing the heads of other Federal departments and agencies for the performance of appropriate parts of a national program and by redelegating powers under the Act when and if appropriate. Also, the Secretary is authorized to request appropriate statistics, data, and reports for other agencies and departments in order to carry out his responsibilities most effectively. These arrangements will facilitate an effective response by the Federal Government to the massive and too long ignored problem of fire safety.

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STATEMENT BY CLARENCE J. WINQUIST, P.E., VICE PRESIDENT, GAGE-BABCOCK & ASSOCIATES, INC., WESTCHESTER, ILL., JUNE 19, 1967

Mr. Chairman and members of the subcommittee, I sincerely appreciate the invitation to file a statement reflecting my views on H.R. 6637 and H.R. 9305 bills known as the "Fire Research and Safety Act of 1967".

First, to identify myself in relation to the bills, I am vice president of Gage-Babcock & Associates, Inc., an independent consulting engineering firm specializing in the field of fire protection engineering. I am a graduate engineer, a registered professional engineer in four states (Illinois, Missouri, Wisconsin, and New York) and have been engaged in the field of fire protection engineering for 18 years, 12 years as an employee of the insurance industry and 6 years as an independent consultant. Gage-Babcock's services cover the entire field of fire protection including research and development, design, evaluation, technical investigations, etc. We have been retained by the Federal Government, state governments, county and municipal governments, private industry, the insurance industry, and other architects and engineers. Because of our work in fire protection, we are well aware of the areas in which additional knowledge of fire protection is needed and of the efforts being made to obtain such knowledge by both the private and public sectors of our economy.

I have had the opportunity of reading the statements already presented by many individuals representing various interests. These statements contain many

statistics which illustrate the large magnitude of the fire problem in the United States. I am not going to take up your time by repeating these.

Basically, it seems that there are two important questions which must be answered for the Subcommittee to arrive at proper decisions in the matter of the "Fire Research and Safety Act of 1967", namely:

1. Is there a need for the proposed research in fire safety?

2. If there is a need, must it be done by the Federal Government or can it be (or is it being) done by private industry?

The extent of our fire losses is, by itself, the best indication that there is a definite need for additional information on means of controlling such losses. The statements already presented have well presented the need for research in the field of fire safety, both basic and applied. At the request of a government official, Gage-Babcock recently prepared a brief description of some studies needed to improve fire protection in the urban area. These are as follows:

1. ECONOMICS OF PROVIDING FIRE FIGHTING CAPACITY IN MUNICIPAL WATER SYSTEMS

In all except the largest U.S. cities, fire fighting demand is the primary factor in establishing system capacity. Fire fighting demands are largely determined through purely arbitrary methods based mainly on population and bear no relationship to physical and chemical properties of fuel or the extinguishing capacity of water. Development of practical means for determining fire fighting capacity based on sound fire protection engineering principles would permit much more economic efficiency in water works operation.

2. MUNICIPAL FIRE PROTECTION LEVELS

Currently, the *only* procedure for determining the amount and types of fire fighting apparatus, the manpower levels for the fire department, the number and locations of fire stations, the sizes of water mains for fire fighting, the number and location of hydrants and, to a lesser extent, the adequacy of building and fire prevention codes is the Grading Schedule of the American Insurance Association (formerly NBFU). The schedule establishes OPTIMUM levels and assigns deficiency points for anything less. A procedure is needed for establishing MINIMUM DESIRABLE levels of municipal fire protection, independent of insurance aspects but adequate to safeguard the public health and welfare.

3. BASIC CONCEPTS FOR FIRE EVACUATION FROM BUILDINGS

Current life safety and building codes contain requirements to assure the safe evacuation of a building in case of fire. Based on experience, the requirements generally have proved themselves sound even though they, as a whole, have no scientific basis. A very basic study into the parameters affecting the evacuation of a single space module (a room), a series of such modules, an entire building, etc. is needed, asking such questions as "When are two, separate exits required?" "When must that combustibility of interior finish be considered?" "At what point are exit signs needed?" "At what point is emergency lighting needed?" "What is the value of windows as emergency means of escape?" "At what point must doors swing out and panic hardware be provided?" etc.

4. A SPECIFICATION FOR EXPERIMENTAL BUILDING BURNS

Due to the lack of standard procedures, much valuable information is lost when an old building is burned deliberately for experimental or training purposes. A specification is needed to set forth standard methods of preparing a building for a test fire, for arranging and igniting the kindling, for instrumentation, the recording of test data and the format of the report.

5. ECONOMICS OF PUBLIC VERSUS PRIVATE FIRE PROTECTION

There is an inverse relationship between the amount of private protection provided (superior construction, automatic extinguishing equipment, automatic detection equipment, private water supplies, etc.) and the need for public fire protection (fire departments, water supplies, etc.). In spite of the ever increasing cost of providing public protection, no study has ever been made of the cost-effectiveness relationship between expenditures for private and public protection.

It is probable that the subsidization of private protection could result in economies in public protection, as well as reducing losses, maintaining property on the tax rolls, and reducing insurance costs.

6. AUTOMATION IN FIRE SERVICE

Higher labor costs and reduced work weeks have caught municipalities in a severe financial squeeze in their efforts to maintain service, but lower levels of service are often necessary. Industry has countered such trends by introducing automation but fire departments still rely on essentially the same manual techniques used for 100 years or more. A study of the possible areas of automation and development of basic criteria for development of hardware is needed to reduce this trend.

7. FIRE SERVICE CONSOLIDATION

Several studies have indicated that considerable savings can be achieved and better public fire protection provided by combining all or part of the fire department services from separate jurisdictions in a metropolitan area into a single service. The ramifications of such unification, the cost involved, the legal barriers, the advantages in central purchasing, communications, training, and other factors should be the subject of a study.

8. LOCAL PARAMETERS AFFECTING FIRE INCIDENCE

Why do some cities have more fires per 1,000 population and have more serious fires than other cities having similar urban conditions? High humidity conditions, alone, do not account for the differences. Neither do population density, per capita income, or other yardsticks. Why does Mexico City seldom have a serious fire despite large areas of ramshackle, combustible construction? Why does Chicago have a larger fire incidence rate than Detroit, which has essentially identical urban, geographical and weather conditions? The answers might provide a valuable insight on urban fire losses and fire control.

9. REDUCING DWELLING FIRE FATALITIES

Although the largest number of fatalities due to fire occur in the home, the least amount of effort is devoted to preventing this loss of life. Building codes are exceptionally lenient in their attitude towards "man's castle" and place few restrictions on open stairs, interior finish, heating systems and other factors known to be responsible for losses to life and which are strictly controlled for other occupancies. Guides should be developed for improving home fire safety without materially increasing construction costs.

10. USE OF URBAN RENEWAL AND URBAN PLANNING TO REDUCE CONFLAGRATION POTENTIAL AND COST OF FIRE DEFENSES

Considerable funds have been expended in recent years on urban planning and urban renewal but little, if any, thought has been given to using these as tools for improving fire protection.

A study could disclose that this aspect results in considerable economic savings to municipalities.

These are all in the area of applied research. There is even a greater need for basic research to provide information on the nature of fire. It must be remembered that the foregoing were prepared for another purpose prior to the introduction of the "Fire Research and Safety Act of 1967". The studies are concentrated in one area of fire protection. They do well illustrate the need for research in the entire field.

Thus, in my opinion, the answer to the first question is an emphatic yes.

As an independent businessman, I am of course, opposed to any encroachment by any level of government in areas of private enterprise. There has been much work done by private enterprise in the area of fire protection. However, the fact that additional information is needed demonstrates that in this particular area, private enterprise does not meet the needs of the nation. This is understandable. The responsibility for fire protection has largely been placed in the hands of local governments who operate fire departments, operate water systems and develop and enforce building codes. Much of the research which has been done

in fire protection has been financed by the fire insurance industry. The fire insurance industry is to be highly commended for their efforts, which in many instances, have been beyond their scope of interest and actually can be considered in the area of public service. The insurance industry is concerned with keeping fire losses to a minimum. It is not their responsibility to develop new hardware or more effective means of utilizing available fire protection manpower. Equipment manufacturers have also conducted research, but here again, their scope of interest has limited the research primarily to what might be called hardware development.

As a practical matter, the Federal Government has been the only agency doing any research in basic fire safety. Much of the recent developments in this field have been due to the activities of the Department of Defense, National Bureau of Standards, Bureau of Mines, and the Department of Agriculture.

Thus, in my opinion, the answer to the second question is also an emphatic yes. The lack of a profit motive rules out private industry in many areas in which knowledge is needed although the end result can be nothing but an improvement in the economy by a reduction of fire losses.

One of the proposals submitted is for a National Fire Safety Advisory Board. Although such a Board has definite merit, it should not hold up the start of a needed research program. Quite frankly, the problems are well known. What is needed are answers, not a restatement of the problem. The Fire Safety Advisory Board could very well function within the Department of Commerce. From my knowledge of the operations of the National Bureau of Standards, it has always been a policy to consult with private enterprise in all their efforts. The establishment of a Fire Safety Advisory Board would be a continuation of this policy. The establishment of a special Commission to study national fire problems prior to authorizing any research would, in our opinion, result in an unnecessary delay in obtaining needed results.

To briefly summarize, I strongly endorse the "Fire Research and Safety Act of 1967" and urge favorable action on the bill by your Subcommittee. The Act is in the public interest and will provide many benefits for the public.

Respectfully submitted,

CLARENCE J. WINQUIST, P.E.

APPENDIX C

COMMUNICATIONS

CITY OF SAN LEANDRO, CALIF., *March 28, 1967.*

HON. GEORGE P. MILLER,
U.S. Congress,
Rayburn Office Building,
Washington, D.C.

DEAR CONGRESSMAN MILLER: I want to commend you for initiating the Bill H.R. 6637, authorizing a Fire Research and Safety Program. Your remarks regarding this Bill are excellent, and we in the fire service have felt the need for fire safety programs on a national level for some time.

It is very gratifying to us that people like yourself have taken steps in the right direction to alleviate the loss of life and property as a result of fires.

As I understand it, this Bill if enacted would be administered by the Bureau of Standards, which could present some problems in instituting the program because of delays in the chain of authority, as well as normal red tape.

The only suggestion that I have to offer is that, nonprofit fire service agencies, such as the National Fire Protection Association and particularly the International Association of Fire Chiefs, be placed in a consulting and more active capacity during the planning stages, and the implementation of intent of the Bill, in order to expedite whatever program is developed.

Thank you very much for writing to me, and if I can be of any assistance to you on this, or any other matter, please don't hesitate to contact me.

Cordially yours,

MANUEL RODRIGUEZ,
Fire Chief.

SAN MATEO, CALIF., *March 31, 1967.*

Representative GEORGE P. MILLER,
House of Representatives,
Washington, D.C.

DEAR REPRESENTATIVE MILLER: We wish to indicate to you our wholehearted support for the proposed Fire Research and Safety Act of 1967 (HR-6637). We believe all aspects of the Act are important, but we will confine our comments to the collection of information and the research programs, areas with which we are closely associated.

URS has been conducting fire research and development work for about seven years under contract to the U.S. Forest Service, the Office of Civil Defense, and the U.S. Naval Radiological Defense Laboratory. Although this work has been associated with the fire problems resulting from nuclear weapon thermal radiation, many of our findings are applicable to peacetime fire problems.

In particular, we have studied the ignition, buildup, and spread of fires in rural, industrial, and urban areas and have developed mathematical models to permit predictions of these phenomena; we are developing models to describe and evaluate the capabilities of municipal fire departments to cope with mass fire environments; and we have developed procedures to permit effective actions to be taken in case of fires in shelter buildings.

In all of this work we have attempted to use available fire records, data, and statistics as bases for our investigations. Unfortunately, most of the information is in the form of narrative historical descriptions of fires. The quantitative data available generally do not differentiate between estimates and measurements, and many quantities that are needed to improve our understanding of fire behavior are not reported. The limited amount of information resulting from past and current fire research efforts is related to isolated segments of the entire problem,

thus preventing a clear understanding of the overall phenomena involved, as well as making it difficult to apply the results to building design and to fire control system design.

Our investigations of fire service operations have convinced us that great reductions in fire losses can be achieved in present cities and even greater improvements in cities of the future. However, such improvements must be based on research, development, and systems analysis that have not yet been done. This research effort must cover the interacting aspects of fire department equipment and tactics, the design of water supply systems, and the character of the urban areas to be protected.

We are most enthusiastic about the value of the Act. We believe that it will save for the American people many more dollars than it will cost, to say nothing of eliminating much anguish and suffering. We do not wish to cast any aspersions on fire service personnel. No group of civil employees receives greater (and better deserved) respect from the population for their dedication, integrity and heroism. However, they are forced to design their systems by rote and to conform to arbitrary requirements established by long-enduring precedence. Very few systems of any type in this country (except fire services) are expected to respond effectively to modern environments using concepts, tactics, and equipment inherited from their forefathers. Instead, modern systems are based on research, development, analysis, and engineering performed by trained scientists and engineers; and industry, government, and the military traditionally assign these functions to groups other than those responsible for operations. The same concept should apply to the problems of fire safety; the fire service operational forces cannot be expected to function effectively without the benefits of research or by using their own research or the research of groups without objective interests in certain aspects of the fire problem.

We believe that this Act will provide the means of developing the information necessary to achieve significant and vital improvements in fire safety. We believe also that the concentration of the program management in the National Bureau of Standards is most appropriate to achieving these results.

If we can be of assistance in demonstrating the requirement for the Act, please let us know.

Sincerely,

RICHARD DE LANCIE.

NATIONAL LEAGUE OF CITIES,
Washington, D.C., May 17, 1967.

Hon. EMILIO Q. DADDARIO,
Chairman, Subcommittee on Science, Research, and Development,
U.S. House of Representatives, Washington, D.C.

DEAR CONGRESSMAN DADDARIO: As with other urban problems, the city's task in fulfilling its responsibilities related to fire protection is becoming an increasingly complex one. In carrying out this basic local responsibility, the city's duty extends far beyond merely providing the men and equipment to pour water on a fire after it has been discovered. It must provide highly trained personnel and sophisticated equipment to meet the various challenges posed by fire in our modern, urban, and industrial society; it must provide a water supply system adequate to meet all the needs of both fire protection and rapidly expanding consumer demands; it must make and enforce zoning regulations and building codes designed to minimize fire danger; and it must initiate programs to educate citizens in fire protection.

The National League of Cities supports the greatly increased research efforts in the areas of fire prevention and control, which can be stimulated by H.R. 6637. Our National Municipal Policy calls for considerable research in this field.

Modern society demands improvement of city firefighting capability in three significant areas.

First, methods of dealing with fires in the deteriorating sections of urban areas must be improved. It is in these areas that the fire hazards are the greatest and loss of life from fire most prevalent. These areas are generally overcrowded. Buildings are often in disrepair and were built before fireproofing techniques were well developed. Heavy demands are put on heating and electrical systems that are often dangerously outmoded. Rubbish accumulates without being disposed of, and the threat of fire ignited by vandals or derelicts in abandoned buildings is constant. All these problems combine to make slum areas high hazard fire areas.

Ultimately, these problems will be erased by urban improvement programs now under way, but, in the meantime, improved techniques of response and fire control must be developed to minimize these immediate hazards. Techniques can be developed through research to discover more effective means of deployment of fire equipment and personnel, to find faster ways to evacuate people from buildings, and to learn how to control fire with a minimum of damage to property not involved in the fire.

Second, there is a need to consider the problems presented by the possibility of fires in large buildings as a distinct firefighting situation. Tearing down a slum area eliminates one fire control problem. Replacing it with a highrise building creates another. At present, fire control in large buildings is a very inexact art. Because of rapid expansion in business, housing, and education, many communities that have trained and equipped their fire departments for conventional fires are suddenly faced with the possibility of fires in these large buildings. Often it is assumed that, as these buildings are new, they are fireproofed so that the problem of a major fire in them will never arise. Recent fires at McCormick Place in Chicago and elsewhere have proven this a dangerous assumption.

Aside from the obvious special problems of controlling fires in these large buildings, there is a related problem which merits equal concern and study. This is the logistical problem of protecting people in and around the buildings when a fire is discovered. The simple answer that all people should evacuate the building may no longer be practical. People may be put in greater danger by attempting to get out than by staying in a safe part of a building, and thousands of people suddenly emerging from a convention hall or office building at the sounding of a fire alarm may hinder firemen attempting to reach those in the danger areas and control the fire. Much study is needed in this area, so that local personnel may be trained to fight such fires and so that large buildings may be designed to maximize the safety of those who use them.

Third, as our technology develops, there is an ever increasing need to deal with chemical and electrical fires which do not respond to conventional firefighting methods. Often, specialized training, unavailable to local departments, is needed to deal with such fires. Research is needed to discover ways in which local departments can respond to these fires competently, without unnecessary risk to their personnel. Such research might lead to specialized training and equipment for local fire departments, or it might lead to the development of specialized units on an interjurisdictional basis to deal with such fires.

These are major problems of urban fire protection which urgently need the research which would be stimulated by H.R. 6637. Communities with different patterns of economic and physical development face different fire control problems. For this reason, it would be difficult to obtain a general view of fire control problems from a study of fire department activities in one community or even in one region. A national research program is necessary. Local governments do not have the facilities or personnel to carry out research on the scale necessary for a comprehensive study of the problem. Such research, done individually by local governments, would result in much wasteful duplication of effort.

Local officials want to provide adequate fire protection to their communities, but, before they can do this, they must have available means to objectively evaluate their existing fire defense systems. At present, such information as would allow a comprehensive evaluation of local fire defense systems is unavailable because there have not been sufficient studies of general fire protection problems.

Fire protection research is oriented toward product development in either the building materials or fire equipment fields. General research is needed in the fields of fire prevention and fire department operation. We believe that local fire defense will be improved as information gained from a national research program becomes available to local communities. Improved techniques of fire department operations may be suggested which will reduce costs by increasing equipment standardization and providing means to use highly trained fire protection personnel more efficiently. Concepts of fire control may be developed which can increase the local department's ability to respond and control fires quickly. Building construction methods may be discovered which will greatly reduce the fire hazards present even in new buildings today.

The Fire Research and Safety Act can stimulate new lines of research, oriented to those more general fields.

Means must be devised to study the general problems of fire protection and to make information on these problems readily available to local officials. The report of the President's Crime Commission has made many useful recommenda-

tions and pinpointed many of the problems of local law enforcement. We think a similar study of fire protection problems in the nation would be very beneficial, and therefore the National League of Cities endorses the proposal embodied in H.J. Res. 498 to establish a national advisory commission on fire prevention and control.

Research, stimulated by the Fire Research and Safety Act, and a study by a national advisory commission, as would be initiated under H.J. Res. 498 can lead to great improvements in local firefighting capability. We hope that the Committee will act to establish both the research program and the advisory commission.

Sincerely,

ALLEN E. PRITCHARD, Jr.,
Assistant Executive Director.

FIRE DEPARTMENT,
New York, N.Y., May 3, 1967.

HON. JOHN F. MURPHY,
Congressman 16th Congressional District,
Staten Island, N.Y.

DEAR CONGRESSMAN MURPHY: The Chairman of the Federal Committee of the International Association of Fire Chiefs has provided me with a copy of the Congressional Record of April 18, 1967, into which you inserted the New York Times Article by Mr. David Bird.

I would like to thank you for your support in this matter on behalf of the International Association of Fire Chiefs and the men of the New York Fire Department.

One of the problems in the past which has obstructed advances in the firefighting field has been the lack of opportunity afforded to professional firefighters to participate in the research and development that has been attempted. This has been the private preserve of the engineer, the architect and the insurance representative. The men who are responsible for the control of unfriendly fire in its most critical form have not been provided the opportunity to offer their knowledge and experience towards the solution of this problem. If the proposed legislation is passed and a Presidential Commission established to study the problem, it is vital that proportionate representation of professional Fire Chiefs be included in the body of the Commission. A failure to avail the Commission of the experience of these men will result in another theoretical, impractical program to resolve a difficult problem.

I hope that you will use your good influence to see that the composition of the Commission realistically reflects the problem involved.

Very truly yours,

JOHN T. O'HAGAN,
Chief of Department.

CHAMBER OF COMMERCE OF THE UNITED STATES,
Washington, D.C., May 26, 1967.

HON. EMILIO Q. DADDARIO,
Chairman, Subcommittee on Science, Research and Development, House Committee on Science and Astronautics, U.S. House of Representatives, Washington, D.C.

DEAR MR. DADDARIO: The Chamber of Commerce of the United States strongly supports all sound programs directed toward the reduction of loss of life and property by fire.

Effective fire prevention and control can only be achieved by local area actions based on national, state and local research. All voluntary and governmental national and state programs should be geared to stimulate effective fire safety programs at local area levels.

The actions which H.R. 6637 and S. 1124 propose for the Secretary of Commerce in the amendments to the National Bureau of Standards Act seem to ignore existing programs and activities of Federal departments and agencies, of hundreds of state and government agencies and of great numbers of private organizations.

The language of the proposed amendments, contrary to the legislation's statement of purpose, appears to give the Secretary, acting through a national fire research and safety center, a directive to duplicate and supplant present programs and activities, including those of the National Fire Protection Association

(see Attachment A). We suggest that past experience with Federal programs designed to help communities argues strongly against such an approach.

We suggest that any new Federal program should be directed toward supporting the cooperative work being done by Federal, state and local fire agencies, and by business and industry through the coordinating efforts of the NFPA.

The need for Congress to have a foundation of facts before it authorizes \$10 million for the initial year of operation of a program as all inclusive as that proposed H.R. 6637 has been indicated by the introduction by Senator Sparkman of S.J. Res. 46 to establish a Commission to undertake a thorough study of the problem of controlling and preventing destructive fires.

We urge your Committee to give thorough consideration to our views, and we request that this letter be included in the record of the hearings on H.R. 6637.

Cordially,

DON A. GOODALL, *General Manager, Legislative Action.*

ATTACHMENT A

The National Fire Protection Association's programs and activities include:

1. the development of standards and recommended practices for fire waste control by committees made up of over 1,700 fire protection specialists;

2. the issuance and publishing of standards in the annual National Fire Codes which are utilized by local, state and federal governments and insurance and other business enterprises;

3. a Fire Record Department which analyzes all fires causing large property loss and multiple loss of life; estimates annually the distribution of fires by cause and occupancy and publishes special studies of fires for the education of its members and the public;

4. sponsoring the Fire Marshalls Association of North America which is made up of municipal, county and state fire marshalls and fire prevention officers;

5. sponsoring the Society of Fire Protection Engineers;

6. an educational program aimed at all citizens and carried on directly and through state and local groups and agencies. Included among 600 current publications, of which 13,000,000 copies are distributed annually, are the Fire Journal, Fire Technology and Firemen. The 2,200 page Fire Protection Handbook is the world's most comprehensive text and reference book on fire.

AMERICAN INSURANCE ASSOCIATION,
Washington, D.C., June 9, 1967.

HON. GEORGE P. MILLER,

Chairman, Committee on Science and Astronautics, U.S. House of Representatives, Washington, D.C.

HON. EMILIO Q. DADDARIO,

Chairman, Subcommittee on Science, Research and Development, Committee on Science and Astronautics, U.S. House of Representatives, Washington, D.C.

DEAR REPRESENTATIVES MILLER AND DADDARIO: Supplementing our recent correspondence to you respecting our organization's position on the captioned matter, we wish to provide addenda for the benefit of the record and in recognition that testimony was concluded yesterday before Mr. Daddario's Subcommittee.

We have now had an opportunity to review the statement of Mr. E. N. Davis, Vice President of the Underwriters' Laboratories, Inc., on this proposal and we wish to be recorded as supporting the statement of Mr. Davis. It points up some of the areas referred to in the concluding paragraph of our statement.

Private research has developed, and is capable of continuing to develop, a vast body of information which has been and will be helpful in the fight against fire. This activity should not be discouraged or impinged upon. A research effort expended in studies of methods for motivating people to use existing information developed by private research and pertaining to fire safety would be, in our judgment, a most helpful Federal activity. The advisory group referred to in Mr. Davis' statement would be an excellent vehicle for achieving this working relationship between private research and Federal activity.

We shall appreciate your making this letter part of the record in addition to the other information we have furnished in recent weeks.

Sincerely yours,

MELVIN L. STARK,
Manager.

FIRE EQUIPMENT MANUFACTURERS' ASSOCIATION, INC.,
Evanston, Ill., June 16, 1967.

Representative GEORGE P. MILLER,
House Office Building,
Washington, D.C.

DEAR REPRESENTATIVE MILLER: At the unanimous direction of the members of the Fire Equipment Manufacturers Association we are writing to add our wholehearted support to the Fire Research and Safety Act now under consideration in S. 1124 and H.R. 6637. This Association has been personally represented at all public hearings and our membership has been apprised weekly since February 28 of the activities surrounding this legislation.

The Association felt that your bill in the House and the Sparkman and Magnuson bills in the Senate were needed and we are pleased that they have been combined. S. 1124 as amended can and will mark the initiation of programs vital to the safety of American lives and property.

The Fire Equipment Manufacturers Association represents most manufacturers of portable fire extinguishers, manufacturers of stationary systems and wheeled units, as well as manufacturers of chemicals used in such extinguishers and/or systems. We take great pride in the long standing research programs carried out by our individual members and the many cooperate programs completed over the years which we have been responsible for our products being more effective in protecting property and saving lives.

There are only two basic approaches to fire safety and each is part of this legislation. Fire and resultant tragic losses of life and property must be prevented through every possible educational and technological avenue. But when it unavoidably occurs, the fire must be extinguished with minimum loss; it is naturally for this latter course that FEMA members manufacture the portable equipment and agents that form the first line of fire defense. Every industrial and commercial occupancy has portable fire extinguishers as required by local codes and insurance regulations—authenticated records show that over 90% of all fires are not reported to the municipal fire departments but are extinguished by such portable methods by occupants of the premises.

The extinguished manufacturers through local distributors and service personnel have the most reliable access in America to the true incidence of non-residential fires. The distributors themselves have formed an Association and have collected this type of data. A survey of a cross section of the United States which confirms the above follows:

Year 1965:

Total fires reported.....	2,389
Fires extinguished.....	2,599
Fires not extinguished.....	130
Total extinguishers used.....	6,597
Fire department called:	
1. Yes.....	225
2. No.....	2,464
Fire department needed:	
1. Yes.....	142
2. No.....	2,547

Average number of extinguishers per fire: 2.45.

The manufacturers and their distributors have conducted extensive research, development, and statistical programs. However, they are the first to acknowledge the need for studies of greater magnitude and for programs and grants to organizations and private industries who have devoted themselves within their economic capabilities to fire safety.

Because our membership has over 500 years of combined technical experience and has for years made studies within our financial limitations to accomplish, even in a small way, some of the goals set forth in the bill, we feel that representation from our group on the National Advisory Commission for Fire Prevention and Control would be beneficial to the Commission to accomplish its assigned task.

We would like to work very closely with the administrative personnel in the National Bureau of Standards in preparing proposed research projects. We have testing facilities available and would be willing to work cooperatively in any area of fire research and technology. Our individual members are asking their Congressmen to support your bill.

The United States of America can and should lead the world in fire safety, tragically we do not. The Magnuson bill is urgent and, as stated before, we pledge our complete support.

Sincerely yours,

MARY MCHENRY,
Account Executive.

INTERNATIONAL ASSOCIATION OF FIRE CHIEFS, INC.,
New York, N.Y.

NEW ENGLAND DIVISION, INTERNATIONAL ASSOCIATION OF FIRE CHIEFS, CHIEF
WALTER R. MESSER, SECRETARY-TREASURER, KEENE FIRE DEPARTMENT, KEENE,
N.H., RESOLUTION No. 2

WHEREAS: The fire problem, the loss of 12,000 lives, and the loss of \$1.8 billion dollars annually to fire has been brought to the attention of the United States Congress by the President of the United States in his Consumers Message to Congress, and

WHEREAS: As a result thereof there has been placed before the U.S. Congress four (4) bills designated to study and combat this broad and complex problem which relates to the safety of the public and the economic well being of the country, and

WHEREAS: These bills are known and numbered as follows: In the Senate, S. J. Resolution 46 entitled "National Advisory Commission on Fire Prevention and Control", and S. 1124, entitled "Fire Research and Safety Act of 1967", and in the House of Representatives, H. J. Resolution 498, entitled "National Advisory Commission on Fire Prevention and Control", and H. R. 6637 entitled, "Fire Research and Safety Act of 1967", and

WHEREAS: The New England Division of the International Association of Fire Chiefs recognizes the urgent need for the Federal Government to support the efforts of Municipal, State and private enterprise to combat Fire problems in the United States, and

WHEREAS: The results of such coordinated study and effort will be of direct benefit to the Citizens of the respective communities we represent, and

THEREFORE BE IT RESOLVED: That the New England Division of the International Association of Fire Chiefs endorse the aforementioned Bills in Congress, and

BE IT FURTHER RESOLVED: That the New England Division of the International Association of Fire Chiefs recommend the amendment of S. 1124. to include the content and intent of S. J. Resolution #46, and

BE IT FURTHER RESOLVED: That the New England Division of the International Association of Fire Chiefs recommend the amendment of H. R. #6637 to include the content and intent of H. J. Resolution 498, and

BE IT FURTHER RESOLVED: That the New England Division of the International Association of Fire Chiefs request the support of Congressional Representatives representing the States of Massachusetts, Connecticut, Rhode Island, Vermont, Maine, and New Hampshire, and

BE IT FURTHER RESOLVED: That The Secretary-Treasurer is hereby instructed to send a copy of this Resolution to the elected Congressional Representatives in each of the States as indicated above.

Passed and approved this 19th day of June, 1967.

U.S. DEPARTMENT OF COMMERCE,
NATIONAL BUREAU OF STANDARDS,
Washington, D.C., July 10, 1967.

HON. EMILIO Q. DADDARIO,
House of Representatives,
Washington, D.C.

DEAR MR. DADDARIO: I would like to call your attention to a new estimate of the funding level of the federal fire research program. In my testimony I quoted \$6 million which represented the major identifiable programs of the Department of Agriculture, Department of Defense, and Office of Civil Defense.

A recent survey by the Interagency Fire Research Committee, which is chaired by Mr. John Eberhard in the National Bureau of Standards, suggests a level of slightly over \$11 million as more representative. This increase is due to:

1. a broader interpretation of research to include development, testing and evaluation activities;
2. the inclusion of medical research in the Departments of Health, Education, and Welfare and the Army on burns and their treatment;
3. the inclusion of combustion and heat transfer research in National Aeronautics and Space Administration which, while directed towards hardware applications in aerospace, could add to our understanding of similar processes in unwanted fires; and
4. inclusion of programs in aircraft flight and crash fire, mineral industry combustion and explosion, and of several previously unreported minor programs in other agencies.

Sincerely yours,

A. V. ASTIN,
Director.

PARKERSBURG, W. VA.,
June 29, 1967.

MR. PHIL YEAGER,
Committee on Science and Astronautics,
Rayburn Building,
Washington, D.C.

DEAR MR. YEAGER: Under separate cover I am mailing you the June issue of "Firemen". As you know the Editorial which appeared in the May issue raised certain questions regarding the Fire Research and Safety Act of 1967. The June issue is supposed to convey the latest information regarding marine fire protection. Also enclosed is a copy of a paper presented before the Marine Section, National Fire Protection Association, May 27, 1947.

I wish to direct your attention to the "Editorial" page 11, "Task Force" pages 12-14, marked paragraph page 21, and "Shipboard Fire Fighting" pages 22-25. In my paper please read pages 4-5-10-11. I believe you will agree with my statement to your Sub-Committee—"I think a lot of this knowledge is pigeonholed".

I wish also to direct attention to the 11th and 12th Editions of the "Fire Protection Handbook" published by the NFPA. In the 11th Edition (copyright 1954) my paper was recommended as reference material concerning marine fires. This paper had been published in a 1947 issue of the NFPA Quarterly. In the 12th Edition of the Handbook (copyright 1962) Section 20, Chapter IV, titled "Marine" no mention is made of this paper.

From a brief review of the June issue of "Firemen" and the latest edition of the "Fire Protection Handbook" it is apparent that within twenty years both the U.S. Coast Guard and the NFPA have either forgotten or have discarded the knowledge acquired from the research and experimental projects conducted at Fort McHenry and San Francisco.

Sincerely,

LLOYD LAYMAN.

(Material referred to is in committee files.)

NATIONAL FIRE PROTECTION ASSOCIATION,
Boston, Mass., July 14, 1967.

HON. GEORGE P. MILLER,
*House Office Building,
Washington D.C.*

DEAR CONGRESSMAN MILLER: I have read with interest H.R. 11284 introduced by you on June 29. I note that this bill provides for a comprehensive fire research and safety program to be administered by the National Bureau of Standards and, in addition, provides for a National Commission on Fire Prevention and Control "to undertake a thorough study and investigation of this problem with a view to the formulation of recommendations whereby the nation can reduce the destruction of life and property caused by fire."

We have testified before your Committee on Science and Technology and the Senate Commerce committee that in our opinion the study commission should precede the adoption of the Fire Research and Safety Act that gives to a single agency of the government the authority and money to undertake a comprehensive program of fire waste reduction. It does not seem to us consistent to create a competent study commission to explore the subject and make recommendations as to appropriate action and at the same time to give the Bureau of Standards the money and authority for a comprehensive program.

I hope very much that you and your committee may be willing to give consideration to our views on this bill which I am sure you will recognize is of vital importance to the National Fire Protection Association.

Cordially yours,

PERCY BUGBEE, *General Manager.*





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