

SMALL BUSINESS IN GOVERNMENT-SPONSORED RESEARCH AND DEVELOPMENT PROGRAMS*

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President Eisenhower established on May 31, 1956, a Cabinet Committee on Small Business. The President gave the Committee the continuing assignment of "making specific recommendations . . . for administrative actions, and where necessary for additional legislation, to strengthen the economic position of small businesses and to foster their sound development."¹ The Committee comprises the Secretaries of Defense, Commerce, and Labor; the Administrator of the Small Business Administration; the Administrator of the Housing and Home Finance Agency; the Director of the Office of Defense Mobilization; and the Chairman of the Council of Economic Advisers. A number of other agency heads also participate from time to time.

One of the findings of the Cabinet Committee, as expressed in its progress report to President Eisenhower dated August 7, 1956, has deep implications for the long-range future of many small business enterprises in the United States. The Committee found:²

. . . the pace of technological change has been accelerating in recent years. Large and well-financed firms have been accustomed to undertaking costly research and development programs, which enable them to set the pace or meet the pace of industrial innovation and investment. Small business enterprises cannot normally do this.

In approaching this very difficult problem, it must be recognized that there is no "cure all" by which small business can be assured of maximum participation in all areas of federally-financed research and development. There are certain hard facts that cannot be changed by regulation or legislation. "Small" business by definition does not, in this advanced technological age, have the resources and facilities to undertake many of our nation's vital research and development programs. On the other hand, manpower and facilities for the conduct of research and development constitute a critically important national resource, and it is essential that the Government make the fullest possible use of nonutilized or underutilized research and development potentialities which may exist in small firms.

It is believed that much can be done to give the potential small business research and development contractor an opportunity to perform in this area to the limit of

*This article reflects the considered personal opinions of the author and does not necessarily represent the official position of the agency with which he is affiliated.

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¹ Letter from the President to the Honorable Arthur F. Burns, Chairman, Council of Economic Advisers, made public by the White House May 31, 1956.

² CABINET COMMITTEE ON SMALL BUSINESS, PROGRESS REPORT 2 (1956).

his capabilities. With this objective in mind, I have outlined certain identifiable problems and how, in my judgment, they may be resolved, at least in part.

I

CONDUCT AND FINANCING OF RESEARCH AND DEVELOPMENT

The conduct and financing of scientific research and development in the United States is a phenomenon characterized by rapidly increasing magnitudes and complexity. Government research and development contracts are but a segment—albeit a large one—of the total picture, and it is impossible to understand and analyze the part without a general comprehension of the whole.

A major aspect of American culture and technology in recent decades has been the growth of research and development in the natural sciences. Scientific research and development is becoming increasingly essential to industrial progress generally, and, in certain industries to *survival* with respect to competing establishments. Likewise, the role of the federal government in science generally, and research and development specifically, has enlarged greatly since the beginning of World War II. The universities continue to play a very significant role in the conduct of fundamental research upon which ultimately depends applied research and development and, consequently, technological progress.

The National Science Foundation undertook a group of surveys on expenditures for research and development conducted by organizations in the various sectors of the national economy, with the year 1953 as a starting point. Among the more significant findings were the following:

1. \$5,400,000,000 were spent on the conduct of research and development in the natural sciences in the United States in 1953. This figure, which does not include expenditures for capital equipment, was roughly 1.5 per cent of the gross national product of \$363,200,000,000 for the same period.
2. As indicated in table one below, the federal government and industry-oriented organizations together provided more than ninety-five per cent of the financing of

TABLE I
THE FOUR SECTORS AS SOURCES OF RESEARCH AND DEVELOPMENT FUNDS AND AS
RESEARCH AND DEVELOPMENT PERFORMERS, 1953 (PRELIMINARY)

Major Sectors	AS SOURCES OF R&D FUNDS		AS R&D PERFORMERS	
	Millions of Dollars	Per cent of Total	Millions of Dollars	Per cent of Total
Federal Government Agencies	\$2,810	52	\$ 970	18
Industry-oriented Organizations	2,370	44	3,870	72
Colleges and Universities	130	3	460	9
Other Institutions	50	1	70	1
Total ^a	5,370	100	5,370	100

^aDetail may not add to totals because of rounding. Percentages are calculated on the basis of unrounded figures.

research and development. Funds from the universities and "other sectors" were less than five per cent of the total.

3. On the other hand, with respect to the *performance* of research and development, regardless of sources of financing, industry-oriented organizations accounted for almost three-fourths of the total.

4. The role of the university as a performer of research, though significant, is dwarfed *in dollar terms* by industry and the federal government; as a source of funds, it is insignificant.

5. Finally, more than half of the funds for research and development came from the federal government.

As the pace of technological advance quickens, the problems and subject matters to which scientific research is directed become increasingly complicated; they require increasingly complex and expensive instruments and equipment. The concept of a scientist using only his brain and simple "homemade" equipment has been outdated as a generalization. Without doubt, the speculative capacity of the individual researcher remains, and will continue to be, the most powerful and fundamental instrument of research. However, much of the spectacular scientific advance of recent years has been possible only through the utilization of complicated large-scale equipment, unknown in the decades past. It is, therefore, apparent that research is becoming increasingly dependent upon powerful, complex, and specialized types of research facilities, equipment, and instruments; and it is likely that the future progress of research will be accompanied by an increasing ratio of the cost of tools to the cost of manpower. Production of necessary particles for research in nuclear physics, for example, is dependent upon equipment such as the nuclear accelerator and the reactor, both elaborate devices. Research and engineering in many fields is dependent upon electronic computers for the solution of complicated or extended problems requiring weeks, months, or years with mechanical calculators. Biological research is necessitating electron microscopes which can make visible cellular arrangements and fibrous tissues not observable through conventional optical microscopes. Practically all areas of the physical and biological sciences are characterized today by an accelerating development of instrumental techniques permitting types of measurements and precisions which were not known a few decades ago. This progress has been made possible only through complex and expensive instrumentation. As the rate of technological advancement rises, the amount and quality of research that is performed in many areas is limited by the sheer expense of such instruments.

In essence, the foregoing boils down to the fact that the conduct of research and development in the United States by any governmental agency, firm, or other organization frequently requires large capital outlays for facilities and equipment. This is especially true in large-scale applied research and development projects in the fields of nuclear energy, aeronautical engineering, and weapon systems. Data are not at hand as to the magnitudes of capital outlays being made by private industry

for research and development. However, the presence of an upward trend is suggested in the Directory of Industrial Research Laboratories of the United States, published by the National Academy of Sciences—National Research Council. In 1950, the NRC Directory showed 3,333 laboratories of 2,845 companies. The 1956 canvass showed 4,834 laboratories and 4,060 companies.³

With respect to the university sector, preliminary returns from a survey of college and university physical facilities conducted by the Office of Education indicate planned outlays for undergraduate science laboratories in the next few years in an order of magnitude of around \$300,000,000. The National Science Foundation has estimated that college and university requirements for graduate-level laboratories and specialized research facilities associated therewith will require a capital outlay in the range of \$500-\$700,000,000 over the next three to five years.

With respect to research facility outlays of the federal government, more data are available. In 1948, the Government's annual expenditure of funds to make physical facilities available for scientific research and development was \$91,000,000. In 1958, \$435,000,000 was expended for this purpose.

In addition to the two resources necessary for the performance of research and development discussed above—money and physical facilities—a third and most important of all—human resources—must be considered. The shortage of highly qualified scientists and engineers in the United States is well known. Relevant to this article is the manner in which this scarce resource is deployed among the various sectors of the economy and especially within industry. "On the basis of preliminary information from studies by the National Science Foundation, it appears that there are now about 250,000 persons employed at the professional level in the natural sciences. Nearly two-thirds of them are employed by private industry and about one-fifth each by higher educational institutions and by Federal, State, and local governmental agencies."⁴

Except for astronomers and biologists, private industry is the largest employer of natural scientists. Among the various fields, industrial employment ranges from about ninety per cent for metallurgists to approximately fifteen per cent for astronomers. Government, on the other hand, is the largest employer of biologists. About three-fourths of the estimated 700,000 engineers in the United States are employed in private industry; about one-fifth work for governmental agencies of all types; and probably two per cent, or less, are employed by colleges and universities.

In its surveys of research and development in industry, the National Science Foundation found that more than 550,000 engineers and natural scientists were employed in January 1954 in the surveyed industries.

A 1953 survey of research and development in United States industry produced several significant findings with respect to the role of small business. These findings

³ NATIONAL ACADEMY OF SCIENCES, INDUSTRIAL RESEARCH LABORATORIES OF THE UNITED STATES preface (Nat. Res. Council Pub. No. 379, 10th ed. 1956).

⁴ NATIONAL SCIENCE FOUNDATION, TRENDS IN THE EMPLOYMENT AND TRAINING OF SCIENTISTS AND ENGINEERS 6 (1956).

indicate that research and development is not confined by any means to the larger corporations, but they do indicate, as might be expected, that relatively greater emphasis is placed upon research and development by large companies than by the small establishments. The survey results which bear upon the distribution of research and development performance and manpower by size of firm are discussed in detail below.

Slightly more than 15,500 companies conducted research and development in 1953—exclusive of firms with less than eight employees and also exclusive of medical laboratories, scientific and engineering consulting firms, and a few other types of private businesses outside the scope of the survey. This estimate of the number of companies engaged in research and development is far above the top figure suggested by the most comprehensive previous data, primarily because this survey included a sample of small firms which were inadequately represented in earlier statistics of industrial research activities.

The great majority of companies participating in research and development are small. Of the nearly 14,000 manufacturers with research and development programs in 1953, about eighty-six per cent had fewer than 500 employees. However, when actual expenditures for research and development are analyzed, the concentration of research and development effort in the large companies becomes much more apparent.

How large a share do small companies have in scientific and engineering employment? Are scientists and engineers concentrated in large corporations to a greater or less extent than workers in general? Companies with 5,000 or more workers employed relatively more of the scientists and engineers in manufacturing industries (about three-fifths in January 1954) than of all workers in manufacturing (about two-fifths). The proportion of the estimated total research and development cost for manufacturing industries accounted for by these large companies was still greater (over two-thirds). In contrast, firms with 8-499 workers employed only one-fifth of the scientists and engineers and accounted for one-tenth of the research and development cost, although they employed over one-third of all workers in manufacturing.

Since this is the first time comprehensive estimates have been made of the distribution of scientific and engineering employment by size of company, there is no evidence as to whether or not the moderate numbers of scientists and engineers employed in small companies reflect an upward or a downward trend in utilization of technical personnel by small business. The number of small companies employing scientists and engineers was substantial, however—much larger than the number engaged in research, though quantitative estimates are not available on this point.

In general, small companies utilize relatively more of their scientists and engineers in nonresearch activities than large corporations. Thus, the proportion of scientists and engineers engaged in research was approximately thirty-one per cent in companies with 5,000 or more employees, compared with twenty-eight per cent in those with 1,000-4,999 employees and slightly under twenty-five per cent in those with less than 1,000 employees. This differential is one of the main reasons for the greater

concentration of research and development cost than of scientific and engineering employment in large companies, but it is not the only causative factor.

II

SOME HANDICAPS OF THE SMALL BUSINESSMAN

In assessing some of the implications of the Cabinet Committee's finding as to the handicaps which face small enterprise in keeping pace with technical change, it may be helpful to consider first some general United States economic trends as they relate to or are affected by research and development. The following points are worth noting:

- (1) United States industrial technology has advanced to such a stage that continued progress in the production of new materials, devices, systems, methods, designs, and processes is dependent upon intensive research and development.
- (2) Consequently, research and development is becoming an increasingly significant aspect of the industrial economy and of American culture.
- (3) In turn, research and development is becoming increasingly essential to the survival of competing establishments in many industries.
- (4) The advancement of science is rendering more complex the performance of research, necessitating increased specialization of research effort; fields of science continue to subdivide and specialize as new discoveries open up entire fields for further exploration and exploitation. This trend has been accompanied by increased reliance upon "team" as contrasted to individual research. In other words, a research problem frequently has facets extending into several different specialties and subspecialties; and in lieu of attempting to cover them with one or more "generalists," a team of specialists is formed to carry out a co-ordinated attack on the problem.
- (5) Likewise, as the subject matters to which research is directed become more complicated, the physical facilities and equipment required for research become commensurately complex, and it is likely that the future progress of research in industry, as elsewhere, will be accompanied, in many fields, by an increasing ratio of the cost of tools (*i.e.*, facilities and equipment) to the cost of manpower.
- (6) Furthermore, at the present time, the supply of qualified research scientists and engineers is not keeping up with the demand, with the result that not only are higher salaries required to attract these personnel, but they are becoming more difficult to obtain at any price.
- (7) Therefore, the conduct of research, which with increasing frequency involves the establishment of a research *organization* or *team* consisting of high-priced and highly specialized talent along with complex and costly facilities, is tending to require heavy initial capital outlays. More important, since research and development by nature is an overhead rather than a direct manufacturing expense, a large income from sales is frequently a requisite

justification for the conduct of research and development by a manufacturing establishment.

Within the above general framework, some observations can be made regarding economic and other factors which influence directly, and largely tend to inhibit substantial research and development undertakings by small business firms.⁵ Some, perhaps most, of these generalizations can be challenged, especially by pointing to outstanding exceptions. Nevertheless, they are submitted as indicative of some of the serious problems facing small enterprises which are endeavoring to meet the pace of technological change which is set by their larger brethren.

As stated earlier, the establishment of a research and development organization is requiring increasingly heavy capital outlays, which, in turn, usually requires a sizable sales volume to justify and make possible such an outlay. In addition, and regardless of financial outlay required, a complicated facility or a team of specialists frequently cannot be utilized effectively or at anywhere near a full-time basis by a single small firm. Furthermore, the commonly referred to "creative scientific environment," which is absolutely essential to advanced research, is not often found and is difficult to establish within the confines of a small enterprise. There are many noteworthy exceptions, but the generalization is advanced nevertheless.

Consequently, small firms may find it necessary to "purchase" research from commercial laboratories, research institutes, and other organizations (including suppliers of raw materials or semifinished products), rather than undertaking research and development within their own firms.

However, the "payoff" of research is very frequently found in terms of completely new lines of inquiry which may be opened up in the course of investigating a particular problem. These discoveries, upon further pursuit, may, in turn, open up completely new materials, products, or processes which, after perfection and development, constitute new "product lines" for the parent organization. It is for this reason that many large firms set aside a significant portion of their research and development budget for "undirected" or "blue sky" research to be undertaken at the initiative of the research and development department—with the full confidence that over the long run, the new knowledge gained will pay off in terms of new or greatly improved products and advanced skills of their scientists.

The "purchase" of research from other organizations by small firms, while affording on a contractual basis access to and service by adequate research facilities and manpower, does not afford the payoff from "by-products" of specific research projects which is enjoyed by firms having adequate research and development organizations of their own. Stated another way, the conduct of research by a firm tends to build up its "scientific capital"; if the research is purchased, the scientific capital created

⁵ The economic and other factors discussed here obviously do not apply in the case of small *research and development* firms, where the conduct of research and development is the sole or primary business of the firm.

through "by-products" of research accrues to the seller rather than the purchaser of the research.

Trade associations, made up of both large and small firms, perform a moderate amount of research, the results of which are made available to members. However, trade association research tends to be concentrated in problem areas not being covered, or not susceptible of being covered, by research activities of individual members. Consequently, a small firm cannot necessarily depend upon the trade association for the performance of the same kind of research which is available to large firms through their own research and development departments.

Financial exploitation of research results often depends upon the patent system; in fact, the purpose of the patent system is to encourage research and invention by affording to the inventor a temporary monopoly in exchange for making public the results of his research. However, as our technology has become more complex, the obtaining, utilization, and protection of a patent has become more complicated, both scientifically and legally. To obtain a patent, to administer it through licensing or other arrangements, and to protect it against infringement requires considerable time, money and know-how. This, in turn, often requires investment in relatively high-priced talent.

To the extent that participation in research and development contracts of the federal government constitutes an advantage in obtaining subsequent hardware procurement contracts, those small firms not engaging in research and development or not participating in federal research and development contracts may on occasion find themselves at a disadvantage in bidding on federal procurement contracts.

Criticism by the small business firms with respect to the inadequacy of advance notice of government procurement of supplies and services has been prevalent for many years and requires no recitation here. Such complaints, whether justified or not, are still heard frequently, despite the many steps taken by federal agencies to achieve widespread dissemination of procurement information throughout the entire business community. This problem assumes particular difficulty and complexity, however, with respect to the purchase by the Government of research and development work. A considerable portion of such work is so abstract or exploratory in nature as to render impossible the advertising for bids on a competitive basis.

Furthermore, in the case of research and development, the Government is more often than not in a position of being able only to state a problem, with the development of "specifications," so to speak, dependent upon what potential contractors are able to come up with in terms of possible attacks on the problem. Consequently, a "chicken and egg" dilemma frequently confronts both the Government, on the one hand, and the potential contractors, on the other. The Government has the problems, and the potential contractors may have the ideas provided they know the problems. The large firms dealing with the Government on a continuous basis with respect to hardware procurement and those firms already having research and development contracts are generally aware of the fields of activity in which new research and

development are desired. For others, however, searching out the information may not be easy.

Constructive steps are underway by certain technical services of the military to better publicize their areas of research and development interest. The Air Force, for example, by its ARDC—AFPI Supplement 80, outlines its procedures for assisting small business concerns to participate in the research and development effort. Intensification of these efforts would not only be conducive to better opportunities for small business participation in research and development contracts, but would also provide the Government with a larger reservoir of potential contractors.

A further constructive step, in my opinion, would require that federal agencies engaged in contracting for research and development prepare and disseminate periodically on a broad base, descriptive booklets and other materials indicating in as much detail as feasible the research projects and programs being financed by the agencies, with a further indication of the specific areas in which research proposals are desired or encouraged.

Converse to the problem discussed above is the lack of information among federal agencies of the research capabilities of small firms.

Although small business is generally following the most *logical* course to present its capabilities in the research and development field, I believe that it is relatively *ineffective*. This method consists of a simple brochure outlining the facilities available to the firm; a listing of technical personnel on the payroll, with their respective qualifying backgrounds; and a statement of the firm's financial position. These brochures are given an average amount of distribution to research and development procuring activities, but once submitted, in most instances, they are treated in the same manner as requests for invitations to bid—*i.e.*, available for reference purposes if required.

With respect to research and development, however, these brochures all too frequently reside in the files of the contracting officer and do not get to the attention of the technical specialist who is "calling the shots" as to firms which should be invited to submit research proposals on a given problem. This points up one of the many problems of communication existent between technical specialists and contracting officers. The need for government-sponsored research and development, by reason of its very nature, is generated within a technical area of the agency. The contracting officer is generally not technically qualified to determine the full scope of research and development effort needed in the contract performance; therefore, he must place full reliance upon advice received from the government scientist. Unfortunately, however, the government scientist is inclined to rely almost entirely upon personal knowledge or contacts he may have within industry as to where qualified scientific personnel and know-how is available for the fulfillment of his project or program. As previously stated, scientists and technicians in industry are concentrated in large business firms. Consequently, the personal contacts of the

government scientist may, more frequently than not, lead to contract placement with larger and better known organizations.

In addition to the foregoing, there are also very logical reasons why the contracting officer would tend to place the contract with a larger organization of proven technical capabilities as well as an ability to operate within the complex accounting framework required by such a contract. In the first place, the contracting officer, more likely than not, will tend to rely heavily on "safe"—that is to say, large—businesses to the exclusion of qualified small businesses, even where the latter might produce fully satisfactory results. If a large, well-known firm fails in performance, the contracting officer is not apt to be blamed because of poor contract selection. However, if a small business fails in performance, the contracting officer is more likely to be subject to criticism for poor selection.

In the opinion of many, this burden of responsibility on the contracting officer is the greatest single factor accounting for the small share of government research and development contracts going to smaller business. The contracting officers generally have no technical or engineering training. Rather than take chances on highly technical matters, they are likely to be cautious and deal only with companies with a record of proved performance. And if a smaller business has not established its reputation through past performance, it may never get its chance through the medium of a government contract. The burden of convincing the contracting officer of its ability to perform might be extremely difficult.

It has been found in discussion with successful small business research and development contractors that in acquiring government contracts, success has come only after many personal visits by the contractor or his staff to *technical* areas which are concerned with the specialty he has to offer. These contacts are not only time-consuming, but costly; and, of course, the average small businessman is at a disadvantage in establishing such contacts.

By its very nature, research and development effort does not normally lend itself to the solicitation of bids in the sense that one usually considers bid solicitation. However, a contracting agency in this area of procurement must have some method available for the placement of research and development contracts. One method which has been criticized by small business contractors is the solicitation of informal quotations. It is contended that much expense is made necessary by this method, since the preparation of such quotations requires a definite engineering study and practically a solution on paper of the problem presented.

It has been contended that, in certain federal activities, practices governing the processing of security clearances are such that, in order to be processed for clearance, a firm must have been selected for a contract award. On the other hand, a firm not having security clearance would not be able to find out enough about a classified problem to be in a position to submit a research proposal.

Allegedly, too, in some instances, ideas or technical approaches presented in proposals by an unsuccessful applicant for a contract have been passed on to, and used

by, the successful contractor. These allegations continue to be made despite the provisions of section 3-109 of Armed Services Procurement Regulations, which specifically prohibit the unauthorized disclosure of data contained in research proposals. A further strengthening and full enforcement of such prohibitions would appear to be in order.

In any discussion of the relative participation of small firms in government procurement, a mandatory "set-aside" for small business comes immediately to mind. Establishment of a mandatory percentage of federal research and development contracts which should go to small business would be unworkable and not in the national interest. Each federal agency is assigned a specific mission and is enjoined to carry out its mission as effectively as possible. Whenever an agency contracts with an outside concern to assist the agency in carrying out its mission, the contracting officer's primary responsibility must be to assure himself that the award of the contract to a specific concern is in the best interest of the Government—that the award made to that concern is the most effective way for the agency to carry out its statutory objectives.

In the case of normal supply or construction contracts, it is possible to draw up specifications that permit several concerns to be considered when awarding a contract. If the Government desires to favor small business in making such awards, there is no loss in the effectiveness with which the agency is carrying out its mission—the specifications drawn up beforehand make certain that all proposals are on an equal footing with respect to performance.

This is not true for research and development contracts. In selecting a particular concern to conduct research and development work, the agency must determine that the probability for success is greater with the selected concern than with any other. Judgments must be rendered by individuals or boards responsible to the agency to make certain that the award to a specific concern will most effectively carry out the assigned mission. If it were mandatory that a fixed percentage of research and development work be awarded to small business, an agency would thereby be prevented from carrying out its mission in the most effective manner.

On the other hand, it must be recognized that technological trends are dictating the integration of much federally-financed research and development work into larger and larger prime contracts—namely, the "weapon system" approach. The interrelationship of weapon-system major components is such that the placement of contracts with large companies is inescapable.

There are no statistics available to determine the degree of participation of small business as a subcontractor to the large research and development prime contractors. However, subcontracting offers a means of increasing the small business participation.

Almost all research and development contracts are of the cost-reimbursement type. The reason is evident, since a research and development requirement cannot be spelled out in the same manner as "hardware." This introduces the requirement

on the part of the Government to verify a research and development contractor's "cost" under the contract, and, in turn, leads the Government to demand, for accounting purposes, records which generally exceed those needed by small business for their normal management purposes.

In negotiating a contract, the Government must first determine the contractor's financial stability and whether or not his accounting system will reflect every increment of cost, both direct and indirect, that will be incurred in the performance of the contract. This would appear to be a simple matter but, in fact, is most complex, since the allowable cost must come within a prescribed framework of allowable costs as determined by regulations which, of necessity, are but broad guidelines. These numerous cost determinations introduce a judgment factor initially for the contractor and subsequently for the auditor and the contracting officer.

III

SOME PROPOSALS

A variety of economic factors, it has been pointed out, are tending to inhibit, and often prevent, the undertaking of research and development by small business firms. While this problem is broader in nature than the degree of small business participation in federal research and development contracts, it is basic, nevertheless, to the question as to whether small firms can, in fact, become a significant reservoir of research and development talent for government-sponsored work. This leads one to consider the possible pooling of financial resources by small firms for the conduct of research and development. Such a plan could conceivably be outlined as follows:

1. *Objective*

To set in action countervailing influences upon those economic and other factors set forth above which militate against small businesses by enabling the establishment of a mechanism whereby small business firms in a given industry may pool their financial resources for the creation of a strong research and development organization designed to provide to member firms the same kind of direct *and indirect* benefits from research and development as are afforded by research and development departments to individual, large firms of which they are a part.

2. *Membership*

Membership would be open-end, but limited to firms coming within the federal government's definition of "small business." Firms growing to a size beyond "small business," as so defined, would be deemed to have "graduated" and would not be eligible to continue as members.

3. *Incorporation*

The organization would be incorporated as a profit organization under the laws of an appropriate state. It could be established on either a mutual or a stock-ownership basis, with transfer of stock limited to members or those eligible to become

members. The members or stockholders would elect a board of directors which, in turn, would select and maintain appropriate management.

4. *Activities of the organization*

(a) To construct, acquire or otherwise establish laboratories and other capital facilities for the conduct of research and development.

(b) To collect research information related to the industry and disseminate such information among member firms.

(c) To conduct applied research and development on a protected, proprietary, contractual basis with member or nonmember firms, government agencies, or others. (In other words, the organization would be free to undertake research on a sponsored or contracted basis when and if it desired to do so.)

(d) Conduct applied research and development on its own initiative and share information related thereto among members.

This would be the most important activity of the organization. It would pursue lines of inquiry deemed most promising from the standpoint of its own patenting and licensing activities, as described hereafter, and from the standpoint of greatest ultimate benefit to the members or stockholders. On occasion, it might undertake basic research or contract with universities, commercial laboratories, or other organizations for the conduct of specific research projects.

(e) To prosecute applications for patents or inventions or discoveries arising from research initiated by the organization.

(f) To negotiate and grant licenses, receive royalties, and otherwise administer and defend patents owned by the organization. This might include the establishment of subsidiary corporations designed to exploit particular patents obtained by the organization. It would also include negotiation with firms (large or small, members or nonmembers) regarding the interchange of patents and the cross-licensing thereof.

(g) To render a patent service to member firms which would include keeping continually informed of the patent situation in the entire industry and advising member firms relative thereto.

(h) To afford to member firms a facility for prosecution and administration of patents similar to that afforded to universities by the Research Corporation.

Specifically, a member firm which, in the course of research carried on by the firm, made discoveries which it felt might be patentable could negotiate with the organization with a view toward turning over the discovery to the organization. If the organization felt the discovery to be a "good bet," it would take title to the information and apply for a patent in the name of the organization. If a patent were obtained, the organization would administer it and defend it in any future litigation. Profits accruing to the organization from the patent would be shared with the member firm.

This plan would not in any way inhibit patent activities which any member

firm decided to pursue on its own account. On the other hand, it would constitute an alternative to selling patent rights to a large firm in those cases where the small firm did not have the time, money, or legal talent to endeavor to defend and administer the patent in its own behalf.

5. *Financing of the organization*

(a) The organization should be a self-supporting profit organization. In the light of national policies directed toward stimulating the establishment of conditions more favorable to small business, and because of possible difficulties in raising the relatively large initial financing involved, an act of Congress might be desirable, which would authorize federal insurance (through the Small Business Administration or other appropriate instrumentality) of a private loan for the purpose of initial establishment.⁶ Among other things, such congressional authorization should require as a condition of federal insurance that the organization be limited to small business firms in a particular industry.

In this connection, since the coverage of the organization would be intra-industry rather than interindustry in scope, the first such organization might be considered to be of a pilot character, additional organizations being established in other industries if the innovation proved successful. Perhaps the incentive of federal insurance of the initial loan would be necessary only in the case of the pilot undertaking.

The authorizing legislation might leave to the insuring agency the discretion as to which industry was selected for the first undertaking. Such a decision would no doubt be largely influenced by the degree of private financial support obtainable and the proportion of small firms interested within particular industries. Needless to say, the choice of the industry within which such a pilot operation is attempted would constitute a critical decision.

(b) The immediate goal of the organization would be profit-making in character, yet compatible to a maximum extent with the interests of the members. Profits resulting from operations of the organization and its subsidiaries (if any) could be disbursed as dividends to members in amounts proportionate to their contributions or stock ownership, plowed back into further research, or such combination thereof as determined by the board of directors, subject to the ultimate control of the membership.

⁶ Another alternative, which would involve more direct and continued participation of the federal government, would be a pattern similar to the Research Associations in Great Britain, but limited here to small firms. In the United Kingdom, the Government several years ago authorized the establishment of industry research associations, open to any firm in the given industry, subject to payment of regular contributions. The Government and industry both contributed to the associations, with government support decreasing as industry support picked up. At the present time, the Government contribution has dropped to a low of 10% in the case of certain associations, with complete government withdrawal a definite possibility in several.

6. Antitrust statutes

While it might be argued that certain activities of the organization might tend to restrict competition among members, the competitive position of small firms participating in the organization vis-à-vis large firms in the industry would certainly be strengthened. Furthermore, any marked improvement in the situation of individual members would tend to push them out of the "small" category, after which they would no longer be eligible to participate.