

A History of the Department of Defense Federally Funded Research and Development Centers

This background paper is a brief history of the Department of Defense (DoD) Federally Funded Research and Development Centers (FFRDCs), with a focus on those that are study and analysis centers. As part of the Office of Technology Assessment's (OTA) combat modeling and simulation assessment, this background paper primarily addresses those study and analysis centers that are involved in supporting or creating DoD models and simulations. DoD laboratories and system engineering FFRDCs such as MITRE Corporation and The Aerospace Corporation are discussed only briefly to provide context. The Department of Energy (DOE) laboratories are not discussed to any extent, even though they are partially funded by DoD and some do considerable model and simulation work. This paper covers the period from World War II and the development of operations research, the discipline that helped lead to the creation of study and analysis centers, until the issuance of the revised Federal Acquisition Regulations (FAR) in 1990 that addressed FFRDCs. Budget data and the status of DoD FFRDCs presented in this report are reported through FY 1994.

The federal research centers that came to be known as FFRDCs are a varied group of facilities with differing individual characteristics founded at different times. They have no prescriptive definition, although a descriptive definition was attempted in 1967. The basis for their creation during World War II and the Cold War is described in this paper, with a history of their evolution and growth. The federal research centers grew along with the development of the disciplines of operations research, systems analysis, system engineering, and broader multi-disciplinary studies and analyses. The role of these centers and their relationship with the federal government has evolved over the decades since their

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inception. Lists of these centers appear in the appendices. The 10 current DoD FFRDCs are profiled in the last section.

The development of the federal research centers began during World War II. More scientists were used in this war effort than in preceding wars. In the West, scientists developed the atomic bomb, the proximity fuse, better radar and sonar, and fundamentally kept the Western allies in a state of overall technological superiority, even when compared to the very impressive German scientific and engineering establishment.

But in the U.S. at the war's end, most scientists were interested in returning to their research in the traditional university environments. The rapid epochal changes in technology, the advent of new disciplines like operations research, and the developing threat from the Soviet Union created a desire on the part of the military and the Atomic Energy Commission (AEC) to retain a number of these scientists for national needs.

Federal research centers were a logical development. Reasons for their creation include:

1. to attract the best scientific minds;
2. to provide an atmosphere conducive to freedom in research, usually a university-type atmosphere;
3. to provide independent and unbiased analysis;
4. to provide continuity;
5. to isolate the centers from the concerns of a profit motive;
6. to allow the centers to assemble stable, interdisciplinary teams of people; and
7. to develop the appropriate sciences and techniques (49,50,59).

There have been approximately 150 of these organizations certified, chartered, or funded by agencies in the federal government since World War II (83). (A list of all known DoD-sponsored FFRDCs is provided in appendix C.) Of these, more than 70 are DoD-sponsored FFRDCs. Originally, they were simply termed "research centers" (52) These were research organizations the federal government took an active role in helping to establish. They were often given seed money and were guaranteed a certain level of work. The struc-

ture and nature of each of the centers was unique, as was its contracting relationship with the federal government.

The nature and purpose of FFRDCs have evolved over the years. The reasons for their establishment in the late 1940s are not the reasons for their continuance to the present. Their origins are in World War II and in the highly charged Cold War atmosphere after the War. These institutions have evolved, some have dissolved, and the surviving successful FFRDCs are those that have:

- a function that cannot be carried out as effectively by a federal government agency or a for-profit company;
- a special relationship with the sponsoring federal government agency, based upon:
 - a) independence of the FFRDC, but commitment by the FFRDC to the objectives (not always the policies) of the sponsor;
 - b) responsiveness of the FFRDC, but not the daily response of an extended staff;
 - c) a pattern of cooperation that establishes a long-term partnership relationship, as opposed to the "arm's length" relationship required in for-profit contracts; and
 - d) significant investment over time by the federal government in the FFRDCs capabilities.
- a set of restrictions that makes this relationship safe: not-for-profit, not a producer of products, and not in competition with for-profit industry; and
- a body of scientific or technical expertise that cannot be recruited, sustained, and managed within the civil service.

Over time, this became the pattern, with all FFRDCs defined and characterized by the existence of their sponsoring agreements.

Some see the FFRDCs' emergent ability to provide a "quick response capability" for the federal government as the great advantage of FFRDCs (86). In contrast, the RAND Corporation was deliberately located in California so that it would not be interrupted with daily requests from the federal government. The 1990 Federal Acquisition Regu-

lations (FAR) may have been the first official codification of this added quick-response mission for FFRDCs. FAR Clause 35.017 states, “This relationship should be of a type to encourage the FFRDC to maintain currency in its field(s) of expertise, maintain its objectivity and independence, preserve its familiarity with the needs of its sponsor(s), and provide a quick response capability.” (17) The federal research centers’ ability to provide quick response to their sponsoring agencies acquired added importance as a shortcut to a contracting process seen by many to have become more complex, slower, and less flexible since the passage of the Competition in Contracting Act (CICA) in 1983.

Through their acceptance of constraints not commonly applied to other organizations, FFRDCs are subject to special federal government procurement and contracting regulations. This feature can make them very attractive to the DoD officer or civilian manager who needs work done quickly. Like other companies operating under a long-term, broadly-scoped contract, FFRDCs can provide responses to requests in weeks or months. They are not intended to replace in-house action officers or respond to daily requests, but they do not take months to change the direction of their research, or to shift to an urgent line of work. Inherent in the competitive contracting process with for-profit industry is a delay of several months before contract award. In dealing with for-profit companies, DoD uses in some cases the “Basic Ordering Agreement” mechanism to establish multi-year contractual relationships. Once a BOA is in place, individual tasks can be (and are) assigned rapidly, with little further paperwork. This omnibus contract approach was ratified and affirmed by Section 2304a (“Tasks and delivery order contracts”) of the Federal Acquisition Streamlining Act of 1994. But for-profit companies must compete for, and re-compete for, their BOAs.

The Competition in Contracting Act permits the federal government to use sole-source procedures to establish or sustain an FFRDC. DoD is now forbidden by law from establishing any new

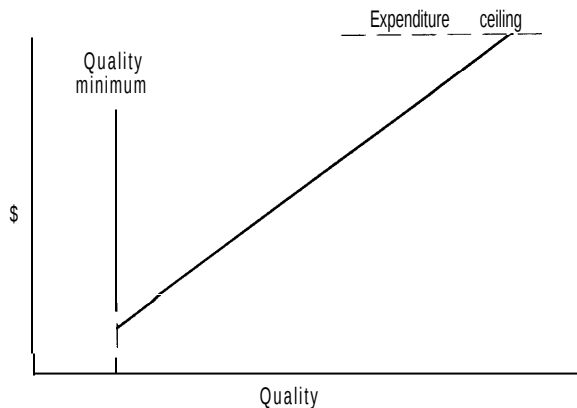
FFRDCs, but the FAR spells out the procedures for doing so, and other agencies may create new FFRDCs. The most recent FFRDC to be established was the Tax Modernization Institute, sponsored by the Internal Revenue Service in FY 1993. The most recent FFRDC established by DoD was the Institute for Advanced Technology, sponsored by the Army in FY 1991, but “decertified” as an FFRDC in November 1993 (52).

Some of the recently established FFRDCs, like the Software Engineering Institute (established February 1984) and the Internal Revenue Service-sponsored Tax Modernization Institute, were established by a competitive solicitation. Under CICA, the federal government could have made either a sole-source award, after providing sufficient justification. The renewal of contracts to FFRDCs is almost always done in sole-source awards, but must be justified in accordance with the CICA procedures.

The goal of the FFRDC system has been to obtain top quality without incurring needless expense. This goal differs from that of most federal government procurement, which is to incur the lowest expense consistent with satisfactory quality. Neither approach is perfect, though each reflects precedents in the world of business: major corporations may buy many goods and wage-grade services on a least-cost basis, but they usually pay whatever is necessary for top-quality professional services such as legal representation or architecture.

There being no such thing as a “lowest acceptable price” or a “highest acceptable quality,” very low price and very high quality are only of concern insofar as they are warning signs of unacceptably low quality and unbearably high price, respectively. Absent any known way for the federal government to choose “best buys” in the midrange of the price-quality tradeoff while maintaining adequate safeguards against waste, fraud, and abuse, the federal government normally follows its well-known policy of buying from the lowest bidder. The federal government tempers this policy by specifying a base level of quality that it deems acceptable, so as to avoid obliging itself to buy

FIGURE 1-1: Procurement Boundaries



SOURCE: Office of Technology Assessment, 1995.

shoddy goods just because the price is low.¹ When, as in the case of the FFRDCs the federal government permits itself to choose the highest quality instead of the lowest price, it must likewise temper this policy by placing a ceiling on expenditure. This ceiling plays the same role at its end of the price-quality trade-off that the lowest-acceptable-quality barrier plays at the opposite end.

In the case of buying the products of FFRDCs the ceiling is on the annual total expenditure, not on the cost of each buy as illustrated in figure 1-1.

Congress annually sets a ceiling on total expenditure of DoD-appropriated funds at FFRDCs (See also appendix D.) This ceiling does not apply to non-DoD work by the FFRDCs. Being below the current demand, the ceiling limits the availability of the FFRDCs to do work and the flexibility of the federal government program managers to award them work. The ceilings, through limiting expenditure, indirectly limit staff levels and therefore the size of the FFRDC system as a whole. One DoD FFRDC, the Software Engineering Institute, is also subject to a congressionally imposed ceiling on staff, specifically.

This history follows the development of federal research centers through four stages of their development. The initial stage was the wartime laboratories and operation research efforts. This phase culminated after the war with the establishment of a study and analysis center for each branch of the service. The second phase was a period of growth from the conflict in Korea until the early 1960s, corresponding to the darkest days of the Cold War and the heightened threat to U.S. interests from the Soviet Union and the People's Republic of China. At the end of this period, the phrase "federal contract research center" was invented to provide a label for these 66 centers (43 sponsored by DoD). The third period covers a time of intense change in the social and political culture of the country, when the FCRCs came under scrutiny and criticism, expanded seriously into nondefense work, and ended with many of them falling into disfavor. This period of turmoil ended in the mid- 1970s, with approximately 40 FFRDCs surviving, but fewer than 10 sponsored by DoD. The final stage carries the FFRDCs to the present, with limited changes in their number and types, steady use, declining employment of late, and growing missions. They have become integrated with the communities they serve, with their role and missions more clearly defined.

■ FFRDC Nomenclature

The federal research centers have their roots in operations research done for the military by civilian scientists during World War II. At first they were simply called research centers. From 1961 to 1967 (and sometimes after 1967) the research centers established before 1961 and additional centers were called Federal Contract Research Centers FCRCs. Then in 1967 they were called Federally Funded Research and Development Centers FFRDCs. All these terms were labels for diverse entities that were neither federal government agencies nor for-profit companies, but somewhere in between. FFRDCs range from RAND's Project

¹As notoriously occurred during the Civil War, when equipment supplied by lowest bidders simply disintegrated in the field.

Air Force, the prototype analytical “think tank”; through MITRE, a large systems engineering and technical integration organization similar to many for-profit companies; to the large nuclear laboratories, where the facilities are owned by the federal government.

What differentiated these centers from other federal government centers or for-profit defense research companies was a combination of nonfederal government personnel and federal government sponsorship. The federal government encouraged the establishment of these centers and intended to fund them over a period of time and to take an interest in supporting their survival for national needs. Facilities could be owned either by the contractor or the federal government. Work could be varied. But the original conception that germinated these centers was the federal government’s World War II need to harness independent scientific inquiry to solve federal government (specifically military) problems. By 1960, a second theme had emerged: the need for private support whose objectivity was strengthened by separation from industry, and by other restrictions.

The defining trait of an FFRDC is a sponsoring agreement with the federal government, clearly identifying the entity as an FFRDC and placing limitations on competition with non-FFRDCs. The federal government’s commitment to the existence of an FFRDC implies that there will be a long-term stable financial relationship. Ultimately, FFRDCs become FFRDCs because the federal government says they are. Clause 35.017-8 of the Federal Acquisition Regulations states that the National Science Foundation (NSF) will maintain a master federal government list of FFRDCs (17). This list was formally established in 1967 (73) and is the final record of which organizations are FFRDCs (10). The agencies themselves determine which contracts and sponsoring agreements will be written as FFRDCs and report the information annually to the National Science Foundation (11).

Each DoD FFRDC is governed by six documents:

- the OFPP Policy Letter 84-1,
 - the Federal Acquisition Regulations,
 - the FFRDC Defense Management Plan, issued by the Director of Defense Research and Engineering (DDR&E) August 1992, and revised 13 September 1994,
 - the individual sponsoring agreement for each FFRDC,
 - the individual charter for each FFRDC, and
 - the individual contract(s) with each FFRDC.
- In addition, DoD FFRDCs are subject to:
- Internal Revenue Service regulation as tax-exempt organizations,
 - state not-for-profit corporation law,
 - Departmental regulations, and
 - specific provisions in annual DoD Authorization and Appropriation Acts.

In its report, *Federal Funds for Science*, Vol. I, produced in 1952, the National Science Foundation clearly identified “research centers” as separate entities different from federal government entities, laboratories, universities, for-profit corporations, and other not-for-profit corporations. The report enumerated 23 in 1950 to 1951 and 24 in 1951 to 1952. The 12 mentioned in the text of that report were all later considered FCRCs and FFRDCs, including RAND. In the sixth annual report, a “List of Research Centers” for the fiscal years 1956 through 1958 appeared as an appendix. There were 46 centers listed, including one that had been deactivated since FY 1956. The list also appeared in the subsequent report, and then was not shown in the next two reports. Almost the same list reappeared in the FY 1960-1962 report in the same format and was titled “Federal Contract Research Centers.”

The Federal Council for Science and Technology named the FCRCs Federally Funded Research and Development Centers in 1967, but the acronym FCRC remained in general usage for a number of years (56). The difference between the last list of “Federal Research Centers” and the first list of “Federal Contract Research Centers” was that five were removed from the FY 1957-1959 list, including three that were later returned to the list, while 19 new ones were added. Substantially the same list, relabeled “Master List of Federally