

# Summary

**B**etween the onset of World War II and 1991, more than 70 centers were created that came to be known collectively as Department of Defense (DoD) Federally Funded Research and Development Centers (FFRDCs). The maximum in existence at any one time was 43, in 1972. An ongoing sequence of DoD reviews has affirmed a continuing need for some FFRDCs. Other FFRDCs have been either discontinued because they were no longer required or, far more commonly, decertified as FFRDCs and allowed to continue, whether on a not-for-profit basis or not, without the FFRDC mantle. Currently, there are 10 DoD FFRDCs. These can be categorized as study and analysis centers, systems engineering and integration centers, and laboratories. DoD study and analysis FFRDCs have had a special role in combat modeling and simulation. Their history over the past 50 years is the focus of this background paper, which forms part of the Office of Technology Assessment (OTA) study of defense modeling and simulation. To provide perspective, some information on other DoD FFRDCs is included.

FFRDCs, formerly called Federal Contract Research Centers (FCRCs), grew out of the semi-academic laboratories and research groups created by the federal government for defense research during World War II. In some cases the lineage traces all the way back to the war. The Massachusetts Institute of Technology's (MIT's) wartime Radiation Laboratory led to the peacetime Lincoln Laboratory, at first a federal research center, then an FCRC, and finally an FFRDC. The Navy's wartime Operations Research Group eventually turned into the Center for Naval Anal-

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yses. In still other cases, the lineage is collateral: the RAND Corporation and the Institute for Defense Analyses, to many the archetypal FFRDCs, are study and analysis centers created after the war.

Federally funded research centers grew out of the need to obtain objective assessments of military problems or programs of increasing technical complexity. To carry out this function, integral to the mission of the federal government, FFRDCs received long-term access to a broad range of information from both the federal government and industry. To keep their assessments free from the institutional pressures of either sector, FFRDCs were established as private not-for-profit organizations, independently operated either by universities or by not-for-profit corporations established for this purpose. To maintain their special working relationship with the federal government and industry, FFRDCs agreed to terms and conditions more restrictive than those accepted by other organizations doing business with the federal government. The substance of these agreements was that FFRDCs not make profit, not compete for federal work, not work for commercial clients, not manufacture products, and not carry out functions performed by DoD. They follow their sponsoring agreements' mission statements, and their sponsors do not assign work that could be carried out as effectively by for-profit companies except on a very limited basis to maintain expertise and continuity within the FFRDCs. More detailed aspects of these agreements arise from federal laws and procurement regulations.

The dynamic between the independent federal research centers and their sponsoring agencies has included conflicts. However, the centers have striven to maintain free research, independent from conflicts of interest including their sponsor's interests, while sponsors have wanted immediately useful outputs from their research centers. In a larger context, costs and competition have at times become issues. The pay differential between federal research center workers and their federal government counterparts, an intentional feature at the outset, led to situations in which people found themselves working side by side on a project at

very different salary levels and to a wider belief that federal centers were an expensive way for the federal government to accomplish its work even though they were not-for-profit. On the centers' side was the argument that at least in some cases the federal government ought to have a way of obtaining something other than the lowest bidder's least-cost work. This discussion opens the vexing issue of how to assess the quality of federal government work.

When the disciplines developed in these research centers became established parts of academic curricula, for-profit companies were able to offer the federal government services similar to those of the FFRDCs. The for-profit world of consultants, often associated with the Washington Beltway in the vernacular through such terms as "highway helpers," has flourished in the postwar era. Some see the DoD FFRDCs, especially those devoted to study and analysis, as dinosaurs that have had their day and now should make way for the new breed, the for-profits. Those who see a continuing role for the FFRDCs look on them as having developed a new role. While no longer monopolists of the methods they pioneered, they are now patient intellectual capital, more able than the for-profit companies to maintain expertise in specific areas regardless of the vicissitudes of year-to-year contracting, and able to develop new tools and skills in a way that would prove difficult absent a long-term partnership between the federal government and the research entity. FFRDCs also afford the federal government a means of integrating proprietary information provided by multiple for-profit companies.

Federal study and analysis centers (then known as Federal Contract Research Centers) came into the public eye in the 1950s when their long-range and strategic-planning studies sometimes took issue with established military policy. However, staff involved in such work never exceeded 1 percent of the FCRC population. The point at issue—the relationship between military and civilian experts in the formulation of defense policy—has undergone constant reassessment to this day. This reassessment has extended well beyond the

TABLE S-1: Profile of Current DoD FFRDCs

	CNA	IDA	PAF	Arroyo	NDRI	LMI	LL	SEI	Aerospace	MITRE C'I
Founded <sup>a</sup>	1942	1956	1946	1984	1984	1961	1951	1984	1960	1958
Sponsor	Navy	DoD	USAF	Army	DoD	OSD	USAF	ARPA	USAF	DoD
Type	S&A	S & A <sup>b</sup>	S & A	S&A	S&A	S&A	Lab	Lab	SE	SE
Owner	CNA	IDA	<-----	RAND	----->	LMI	MIT	CMU	Aerospace	MITRE
Staff <sup>c</sup>	500	800	<-----	1,100	----->	300	2,300	300	3,600	3,700
Location <sup>d</sup>	VA	VA <sup>e</sup>	<-----	CA, DC	----->	VA	MA	PA	CA	MA, VA
FY 1994 total <sup>f</sup>	\$50M	\$108M	<-----	\$108M	----->	\$36M	\$328M	\$33M	\$379M	\$590M
FY 1994 DoD	\$50M	\$108M	\$24M	\$20M	\$24M	\$30M	\$275M	\$30M	\$363M	\$450M

KEY: Aerospace = Aerospace Corp., ARPA= Advance Research Projects Agency; Arroyo = Arroyo Center; CA = California, CMU = Carnegie-Mellon University; CNA = Center for Naval Analyses, DC = Washington, DC; IDA = Institute for Defense Analyses, Lab = laboratory; LL = Lincoln Laboratory; LMI = Logistics Management Institute; MA= Massachusetts; MIT= Massachusetts Institute of Technology; MITRE C'I Corp.; NDRI = National Defense Research Institute; OSD = Office of the Secretary of Defense; PA= Pennsylvania; PAF = Project Air Force, RAND = RAND Corp.; S&A = study and analysis center; SE = systems engineering; SE I = Software Engineering; USAF = U.S. Air Force; VA = Virginia.

<sup>a</sup>Because of CNA's unbroken link to its wartime predecessor, the Operations Research Office, its wartime starting date is shown: a hiatus separates Lincoln Laboratory from its wartime predecessor, the Radiation Laboratory. NDRI was formed out of an existing division at RAND Corp., whose work effectively dates back to the 1960s, if not earlier.

<sup>b</sup>Most of IDA is a study and analysis FFRDC, but part of the center functions as a laboratory and is not in Virginia.

<sup>c</sup>Lincoln Laboratory has, for some purposes, been considered government-owned because it occupies government-owned land.

<sup>d</sup>Staff levels are rounded to the nearest 100. SEI, the only DoD FFRDC with a congressionally set ceiling on staff, is limited to 250 full-time-equivalent members of its technical staff.

NOTE: Project Air Force, the Arroyo Center, and the National Defense Research Institute are part of RAND Corporation.

FFRDCs, which now constitute a very small part of the industry that carries out studies and analyses for the DoD.

The close relationship between FFRDCs and the federal government requires FFRDCs to have access to classified information. Though Cold War compartmentalization did in some cases deny this information to FFRDC study efforts that could have benefitted from it, FFRDCs performed an important function in limiting the need to distribute classified information widely to industry, as they could provide specifications for system development or study scope without revealing the sensitive information that drove the specifications. In some cases, an FFRDCs' access to classified information has led to reconsideration of its relationship with a university sponsor. Because of universities' perception that the presence of classified information runs counter to a desired atmosphere of open inquiry, there has been a trend towards FFRDCs as independent not-for-profit corporations rather than university-sponsored centers.

Though the federal research centers were established by various federal government agencies including DoD, they evolved in an environment lacking in unified federal government regulations and policies. On the one hand, they enjoyed no protection for their special function. On the other, they were regulated by individual sponsoring agencies acting without a comprehensive policy framework specific to the research centers. Like all federal contractors, these centers were subject to the policies, explicit or implicit, of the acquisition regulations. Issues such as whether the assets of a research center belonged to the federal government or the center, the disposal of those assets in the event of the closure of the center, and who decided whether the results of studies should be accessible outside the sponsoring agency, were typically resolved on a case-by-case basis. For some of these issues, larger public values might outweigh the interests of the sponsoring agencies. The Office of Federal Procurement Policy published a government-wide FFRDC policy in 1984,

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subsequently codified in the Federal Acquisition Regulations, in sponsoring agreements between the federal government and individual FFRDCs and in FFRDC contracts with the federal government. In the 1990s, the DoD supplemented these regulations with a Management Plan for FFRDCs.

Today the FFRDCs inhabit a world much different from that of their predecessors in the late 1940s and 1950s. The FFRDCs history and current status are summarized in table S-1. Epochal change brings into question the continued need for institutions created during World War II and the

Cold War and whether their continued presence amid private sector competition is in the national interest. By law, FFRDCs are to be used only to meet special research or development needs that cannot be met as effectively by existing federal government or contractor resources. Some of the frequent questions raised are answered in box S-1. Re-examination of the centers' origins and history provides an opportunity to revisit the value of these research centers as a national resource. Discussion of specific policy options lies beyond the scope of this OTA background paper.

### BOX S-1: Answers to Frequently Asked Questions About DoD FFRDCs

*Q: What does "FFRDC" stand for? Is that the same thing as "FCRC"?*

A: "Federally Funded Research and Development Center." "FCRC" stood for "Federally Chartered Research Center," a term that grew into use without statutory definition and was supplanted by "FFRDC" after that term became formally defined.

*Q: How many DoD FFRDCs are there?*

A: Ten. They are the Center for Naval Analyses, the Institute for Defense Analyses, The Aerospace Corporation, MITRE Corp., Lincoln Laboratory, the Software Engineering Institute, the Logistics Management Institute, Project Air Force, the Arroyo Center, and the National Defense Research Institute. The last three are all parts of RAND Corporation. Generally speaking, the centers can be divided into those concentrating on study and analysis, those concentrating on engineering and technology, and laboratories, as shown in table S-1.

*Q: What about the Applied Physics Laboratory Los Alamos, the Concepts Analysis Agency the Naval Research Laboratory and all these other places of which I have heard?*

A: APL, like the Systems Development Corporation and many others, is a former DoD federal research center. Many former FFRDCs have continued to exist and to do business with the federal government, either on a for-profit or not-for-profit basis, without being FFRDCs. Los Alamos National Laboratory, like others, is a Department of Energy (DOE) FFRDC and not a DoD FFRDC. CAA and NRL, like many other centers and laboratories, are in federal government research operations.

*Q: Are FFRDCs the same thing as GOCOs---government-owned, contractor-operated entities?*

A: No. Of the current DoD FFRDCs only Lincoln Laboratory occupies a significant amount of federal government-owned or -leased space, and even it is not always counted as a GOCO. Some DOE FFRDCs are GOCOs

### BOX S-1: Answers to Frequently Asked Questions About DoD FFRDCs (Cont'd.)

*Q: What makes FFRDCs unique?*

A: Because FFRDCs are not allowed to compete for federal government work, and are restricted in many other ways, federal government sponsors establish long-term partnership relationships with their FFRDCs enabling the FFRDCs to provide continuity of effort and to be trusted with close access to federal government officials and highly sensitive data. Consequently the FFRDCs are able to address long-term problems of considerable complexity and to analyze technical questions with a high degree of objectivity borne of having renounced any possibility of selling products to the federal government or forming partnerships with those who do, while remaining outside of the federal government itself.

*Q: Why not just bring the FFRDC work in-house and let federal government employees do it?*

A: At their inception, one of the reasons—in addition to organizational independence—for creating the federal research centers was that the terms of federal government employment could not attract the needed scientific talent. In the present day, any move to bring FFRDCs in-house would run counter to decades of effort by Administrations and Congresses of both majority parties with widely disparate outlooks, to let as much work as possible be done in the private sector. The FFRDCs honest-broker status depends at least as much on their insulation from their customers as it does on their insulation from the rest of the private sector. A federal government employee or military person could find it difficult to pass judgment on equipment or procedures designed at the behest of his or her own boss or commanding officer. This insulation, in some cases intentionally reinforced by physical distance, also protects the FFRDCs from being drawn into the heated exercise of day-to-day federal government.

*Q: Do FFRDCs get budget line-items?*

A: Some do; some don't. Line-item funding is less than a tenth of total DoD FFRDC funding. The bulk of DoD FFRDC funding comes out of the appropriations for the DoD programs on which the FFRDCs work.

*Q: How is it decided how much FFRDC work is needed?*

A: Beyond the small fraction of their revenue that is a line item, Congress sets a ceiling on the total amount of DoD-appropriated money that can be spent at the FFRDCs. The Office of the Director of Defense Research and Engineering (DDR&E) decides how this ceiling is partitioned among the centers, and the centers' sponsors assign the work. Nonsponsors within DoD who would like to have work done at an FFRDC must find the money within their own budgets and then persuade the FFRDC's sponsor to assign the work.

*Q: Do FFRDCs compete with private industry?*

A: Although not-for-profit, FFRDCs are themselves a part of the private sector. Many people think that DoD FFRDCs compete with for-profit industry in the sense that work that otherwise might be competed winds up being done by FFRDCs. Strictly speaking, that should not happen because the centers' charters forbid them from being assigned work that could be done as effectively outside. People being only human, budgets being tight, time being short, and contracting regulations being onerous, it is certainly possible that from time to time FFRDCs receive work because it is cheaper, easier, or quicker to give it to them rather than to compete a contract among all comers. Perhaps for this reason, some people have the mistaken impression that FFRDCs actually bid against other companies on competitive DoD contracts as well as contracts let by other parts of the private sector. These people may also have confused FFRDC bidding on DoD contracts, which would violate the centers' charters and the law, with

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### BOX S-1: Answers to Frequently Asked Questions About DoD FFRDCs (Cont'd.)

something else. For example, some FFRDCs can and have bid on state and local government work or work for foreign countries. The DoD FFRDCs or their "parent organizations" (universities or, increasingly, not-for-profit corporate entities designed for the purpose of possessing FFRDCs all do some work that is outside their FFRDC's mission, but which draws on the expertise created in performing that mission. Such work is also subject to restrictions analogous to those imposed on FFRDC work.

*Q: If FFRDCs are not-for-profit, how are they able to charge a fee?*

A: Some of the federal research centers have charged the federal government fees, above and beyond the cost of doing the work contracted, to provide capital funds for the organization and funds for other activities: the Defense Acquisition Regulations explicitly provide for such fees, and recent legislation limits the uses to which they can be put. Some centers charge fees to cover ordinary and necessary costs of doing business that are not otherwise reimbursable, but that the federal government explicitly recognizes must be incurred. They also make possible a small but important amount of independent research.

*Q: If these FFRDCs were invented in the Cold War and some of them even started under other names during World War II, do we still need them? Why hasn't anyone addressed this?*

A: This question has actually come up repeatedly. The need for each individual FFRDC is formally re-evaluated every five years. Over the years more than 60 DoD FFRDCs have in one way or another ceased to be FFRDCs (though most have lived on in other forms), suggesting that the Department of Defense is in fact capable of weeding out unnecessary FFRDCs while continuing to make use of others, and of the FFRDC role in general. Congress has addressed the question of continued need for FFRDCs several times.<sup>1</sup>

SOURCE: Office of Technology Assessment, 1995

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<sup>1</sup>Producing or causing to be produced such efforts as the Office of the Director of Defense Research and Engineering's, Report of the Defense Science Board Task Force on *Federal Contract Research Center Utilization* (Washington, DC: February 1976) and their subsequent *Management of the Federal Contract Research Centers* (Washington, DC: Department of Defense, June 1976); the Executive Office of the President, Office of Management and Budget, *OFPP Policy Letter 84-1 to the Heads of Executive Departments and Establishments, Subject: Federally Funded Research and Development Centers* (Washington, DC: letter April 4, 1984, printed in the *Federal Register* volume 49, no. 71, April 1, 1984); *Competition: Issues in Establishing and Using Federally Funded Research and Development Centers* (U.S. General Accounting Office, Washington, DC: 1988), and several other investigations including at least three (by the General Accounting Office, the DoD Inspector General, and the Defense Science Board) current with this Office of Technology Assessment effort.