FFRDCs—A Primer

Federally Funded Research and Development Centers
in the 21st Century

MITRE

FFRDCs are private-sector resources, operating in the public interest. They perform work closely associated with inherently governmental functions and assist the government with its long-term research or development needs. FFRDCs enjoy a special relationship with their government sponsors, marked by special and unique access to government data and resources. In exchange, FFRDCs must be free of organizational conflicts of interest and cannot compete with industry for government work, except for the right to operate an FFRDC or under sponsoring agreement with the government.

— Julie Bowen, senior vice president
and general counsel, The MITRE Corporation

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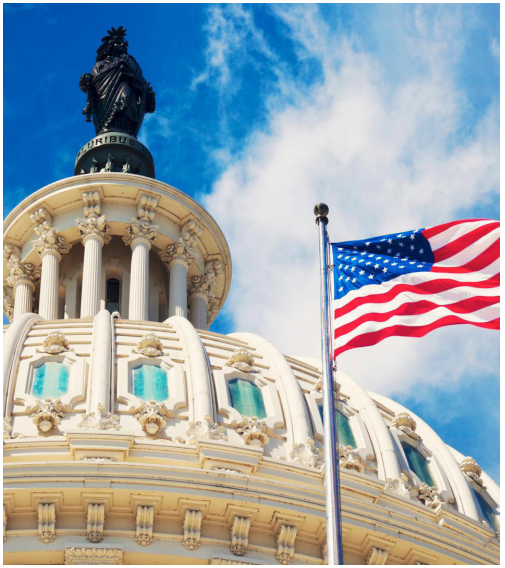
"The FFRDC is required to conduct its business in a manner befitting its special relationship with the government, to operate in the public interest with objectivity and independence, to be free from organizational conflicts of interest, and to have full disclosure of its affairs to the sponsoring agency."

— *Federal Acquisition Regulation, 35.017*:
"Federally Funded Research
and Development Centers"

What Are Federally Funded Research and Development Centers?

For nearly 80 years, federally funded research and development centers, or FFRDCs, have been vital to our nation's growth and security. They have supported the government by developing transformational capabilities in defense, transportation, energy, health, civil agency administration, homeland security, atmospheric sciences, science policy, and other areas. Yet their existence remains largely unknown to the average person. Even those familiar with FFRDCs may be hard-pressed to explain their history, purpose, and operation.

FFRDCs are part of a "three-legged stool" that supports government research, technology development, systems acquisition, and policy guidance. The three "legs" are commercial industry, academic and related not-for-profit organizations (including FFRDCs), and government employees. Each of these institutional players approaches problems from a somewhat different angle, and each has a vital role in driving innovation and solving problems.

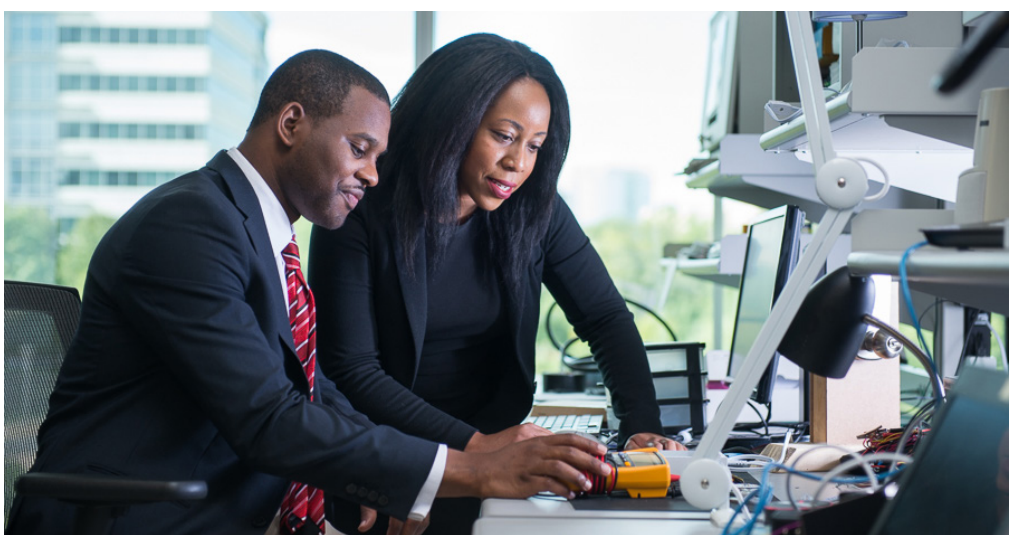


FFRDCs date back to World War II and its aftermath. Government agencies recognized the need to maintain and take advantage of a critical mass of science and technology knowledge not otherwise available in the standard civil-service environment that remains true today.

To achieve this, the government created the FFRDC model around two key needs and organizing principles. First, these new organizations had to provide the government with access to a specialized, agile workforce available to respond

quickly to complex national challenges. Second, they had to operate outside of the standard marketplace, so that commercial conflicts of interest did not compromise their objectivity.

This latter point is crucial: FFRDCs neither market nor manufacture the systems and technology the government must acquire. This distinction lies at the heart of the FFRDC concept. As part of the "third leg," FFRDCs can provide high-level analysis-based support that informs government decisions. The particular knowledge domains, skills, and services the government needs have evolved over the last seven+ decades. But the original motivation behind the formation of FFRDCs—to retain centers of technical excellence free from commercial interests—remains just as relevant today as it was in the 1940s.



Putting FFRDCs in Context

Since the founding of the first FFRDC, the world has changed in ways that affect nearly every aspect of our daily lives. In the last 35 years alone, we have witnessed the end of the Cold War, the events of September 11, several recessions of varying severity, wars that have stretched the capacity of our military, issues of affordability and accessibility in healthcare, and a revolution in information technology that few could have predicted. FFRDCs remain a vital and essential part of our national effort to meet these challenges.

Throughout this Primer, we explain what FFRDCs are, how they have secured their long-term place in our national research and development (R&D) landscape, and what they offer for the future. Among the questions we will answer are:

- How have FFRDCs evolved over time?
- What differentiates FFRDCs from other organizations? Why is this difference important?
- What specialized resources do FFRDCs provide to the government?
- How does the government assess its FFRDCs?
- How can FFRDCs best help the government meet national needs?

In today's dynamic fiscal, political, and technology environment, FFRDCs play an essential role in the application of government, commercial, and non-profit resources to address complex challenges. An understanding of that role adds an essential component to the conversation.

"Apart from agriculture, the federal government funded very little research in the sciences prior to World War II. Some federal money flowed to the sciences during the emergency of World War I; however, virtually all of this wartime R&D was performed in intramural government and military laboratories. World War II changed everything."

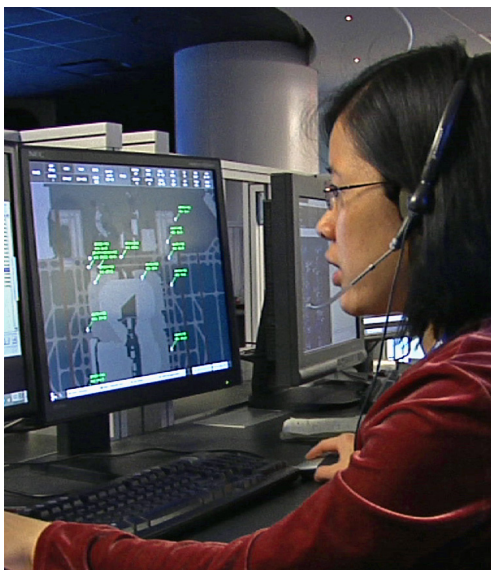
— *The Rise of Federally Funded Research and Development Centers*,
Bruce C. Dale and
Timothy D. Moy

Origins and Evolution of the FFRDC Model

How FFRDCs Began

Though World War I introduced the world to mechanized warfare, the scale and scope of technology developed and deployed in the Second World War proved far greater. Scientists, engineers, mathematicians, and other specialists became part of the United States' massive war effort—leading to evolutions in radar, aircraft, computing, and, most famously, the development of nuclear weapons through the Manhattan Project. The end of the armed conflict did not end the need for organized research and development in support of the government, however.

As the Cold War became the new reality, government officials and their scientific advisers advanced the idea of a systematic approach to research, development, and acquisitions, one independent of the ups and downs of the marketplace and free of the restrictions on the civil service. From this idea arose the concept of FFRDCs—private entities that would work almost exclusively on behalf of the government, be free of organizational conflicts of interest, and maintain stable workforces composed of highly trained technical talent. With FFRDCs, the government could reliably get the technical, acquisition, or policy guidance it needed while commercial industry continued to manufacture the products and provide necessary services.



The U.S. Air Force created the first FFRDC, RAND—a contraction of "R and D"—in 1947. Others grew directly out of their wartime roles. For example, Lincoln Laboratory, founded in 1951, originated as the Radiation Laboratory at MIT, and the Navy's Operations Research Group evolved into the Center for Naval Analyses. The first FFRDCs served the Department of Defense (DoD). Since then, government

organizations as diverse as the National Institutes of Health, NASA, the Department of Transportation, the National Science Foundation, the Department of Homeland Security, the Department of the Treasury, the Department of Commerce, the Veterans Administration, the Department of Health and Human Services, the Centers for Medicare & Medicaid Services, and the Department of Energy have sponsored FFRDCs to meet their specific needs.

Responding to a Changing Landscape

From the late 1940s onward, government agencies embraced the FFRDC concept as a model for augmenting and adding value to government-funded R&D efforts. In 1969, the number of FFRDCs peaked at 74. Today, the number of FFRDCs stands at around 42.

Why the fluctuating numbers? In large part, it has to do with the changing landscape of federal R&D. When the first FFRDCs opened in the 1940s, many of the capabilities they offered were unavailable in either the commercial sector or the civil service. As the technology development environment shifted to accommodate an expanded role for industry and government staff, the role of the FFRDC evolved as well. Over time, the government has continually reaffirmed the relevance of the FFRDC model while also adjusting the balance among in-house, commercial contractor, and FFRDC resources. FFRDCs also shifted to satisfy their own changed perceptions of where and how they could best add value. Some transitioned to become university affiliated research centers, or UARCs (such as the Applied Physics Laboratory at Johns Hopkins University). Others opted out of the FFRDC construct entirely so they could compete with industry free of regulatory constraints.

Although these decades-long shifts and restructurings have resulted in a smaller aggregate number of FFRDCs, the ones in existence today provide their government sponsors with enduring value within a fluid political and technological environment.

The nature of the issues tackled by FFRDCs has also evolved. Originally chartered to meet the challenges and threats of the Cold War, FFRDCs continue to be effective and vital in addressing the many challenges of the post-Cold War, post-9/11 era. In recent years, agencies have elected to establish FFRDCs to address a wide range of complex issues. Here are just a few examples:

- Heightened terrorist threats, which fueled the creation of the Department of Homeland Security
- Protection of the nation's information technology infrastructure against cyber threats and adversaries who bring these threats
- The rise of asymmetrical warfare, which has pushed the military to rely more on advanced technology and less on traditional massed forces
- A growing generation of military veterans, many qualifying for the Post 9-11 GI Bill or needing specialized medical care
- An increasingly costly and dysfunctional healthcare system
- The need to modernize the nation's civil-agency infrastructure to support financial stability and economic growth.

Within this demanding and dynamic context, FFRDCs continue to meet the challenges of the day by applying their unique combination of deep technical expertise, public-interest orientation, and commitment to objectivity.

"FFRDCs play a critical role in leading agencies to significant innovations in specific areas and are charged with giving agencies unbiased, objective and independent analysis and advice from leading experts who otherwise would not be available."

— *Federal Computer Week*,
Ben Bain

FFRDC Governance and Management

The Legal and Regulatory Framework

Government agencies are empowered to establish or "sponsor" FFRDCs under the same general contracting authority that allows them to acquire goods and services. The sponsorship of FFRDCs, however, is subject to a set of specific legal criteria and operating constraints that are set out in a designated section (Part 35.017) of the Federal Acquisition Regulation (FAR), which is the body of detailed regulatory law that governs all federal acquisitions. The government published FAR rules applicable to FFRDCs in 1990; the rules essentially codify a 1984 policy memorandum issued by the Office of Management and Budget.

Before an agency can sponsor an FFRDC, the FAR requires the agency to affirm its "long-term research or development need that cannot be met as effectively by existing in-house or contractor resources." In other words, FFRDCs are not set up to discharge short-term, task-oriented requirements; these are more appropriately the domain of commercial contracting organizations. FFRDCs provide government agencies with sustainable and persistent capacity to address research or development needs over a comparatively long time, typically defined in increments of five years.

For FFRDCs to perform their special functions, the FAR grants "access, beyond that which is common to the normal contractual relationship, to government and supplier data, including sensitive and proprietary data, and to employees and installations, equipment and real property." In addition, each FFRDC is organized

as a private-sector entity and run as an "autonomous organization or identifiably separate operating unit" of its parent. This gives the government agency access to a depth of technical talent that is otherwise difficult to assemble within the framework of federal employment.

In exchange for what the FAR describes as an FFRDC's "special relationship" with its sponsoring agency, the FFRDC must "operate in the public interest with objectivity and independence… [and with] full disclosure of its affairs to the sponsoring agency." Most important, the FAR requires that an FFRDC be "free from organizational conflicts of interest."

To ensure a complete absence of conflict, the FAR prohibits FFRDCs from "competing with any non-FFRDC concern in response to a federal agency request for proposal for other than the operation of an FFRDC." More than any of the other FAR-prescribed criteria, constraints, and obligations, the bar against competition is a supremely defining FFRDC value, which sharply differentiates FFRDCs from commercial contracting organizations.

The net effect of the FAR regulations, especially the prohibition against competing, is to constrain FFRDC actions in a way that most commercial organizations would consider both burdensome and fundamentally inconsistent with commercial operations. It is not surprising that non-profits run the overwhelming majority of FFRDCs, even though the FAR permits their operation by for-profit parent companies. However, some federal government agencies, most notably the Department of Defense, go beyond the FAR-imposed standards. The DoD mandates that only non-profits can operate its FFRDCs.

The Nature of FFRDC Work

The FAR-prescribed FFRDC governance principles and attributes are important for what they say about the fundamental orientation of FFRDCs and the regulatory constraints under which they must operate. What the FAR does not tell us, however, is the qualitative nature of the work performed by FFRDCs, nor how that work differs from tasks performed by commercial government contractors.

In 2011, the Office of Federal Procurement Policy (OFPP) published an official Policy Letter that both clarifies and codifies this aspect of the FFRDC identity. Against a background of growing confusion—and some controversy—over how the government decides to outsource its work, the OFPP set out to sharpen the boundary between work that is inherently governmental and work closely associated with inherently governmental functions.

Put simply, government employees must perform "inherently governmental" work, while "closely associated" work can be outsourced but requires special safeguards and considerations. The OFPP Policy Letter also designates a category of government work critical to maintaining control of an agency's mission and operations. This type of work requires federal employee participation at levels sufficient to ensure adequate governmental controls.

Appendix "B" of the Policy Letter provides examples of closely associated work. These include:

- Budget preparation activities (e.g., analysis, workforce modeling)
- Activities in support of agency planning and reorganization
- Policy/regulatory development support (e.g., feasibility studies, strategy options, policy document drafting)

- Source selection support (e.g., acquisition planning, technical evaluation, serving as technical advisor to a source selection board, assisting in contractor performance evaluation)
- Contract management support (e.g., assisting in contractor performance evaluation, support for contract claims assessment, and preparation of termination settlement discussion).

The OFPP Policy Letter specifically connects FFRDCs (and UARCs) to work closely associated with inherently governmental functions and to work critical to maintaining agency control:

> "…work that is closely associated with the performance of inherently governmental functions, or work that is critical to maintaining control of an agency's mission and operations, may be performed by FFRDCs or UARCs…. These contractors [FFRDCs and UARCs] provide essential engineering, research, development and analysis capabilities to support agencies in the performance of their responsibilities and mission."

In the Supplementary Information that accompanied publication of the Policy Letter, the OFPP amplifies the point. It makes clear that the suitability of FFRDCs to perform closely associated work ties back to the FAR-prescribed FFRDC governance principles and attributes:

> "…limiting performance of functions closely associated with inherently governmental functions [to federal employees] could inappropriately limit an agency's ability to take advantage of a federally funded research and development center (FFRDC) or University Affiliated Research Center that provides essential engineering research, development and analysis

> capabilities . . . As explained in FAR 35.017: 'An FFRDC meets some special long-term research or development need which cannot be met as effectively by existing in-house or contractor resources. FFRDCs enable agencies to use private sector resources to accomplish tasks that are integral to the mission and operation of the sponsoring agency.'"

Taken together, the Federal Acquisition Regulation and OFPP Policy Letter establish the regulatory and policy framework that differentiates the distinctive role played by FFRDCs within the federal acquisition system.

How It All Comes Together

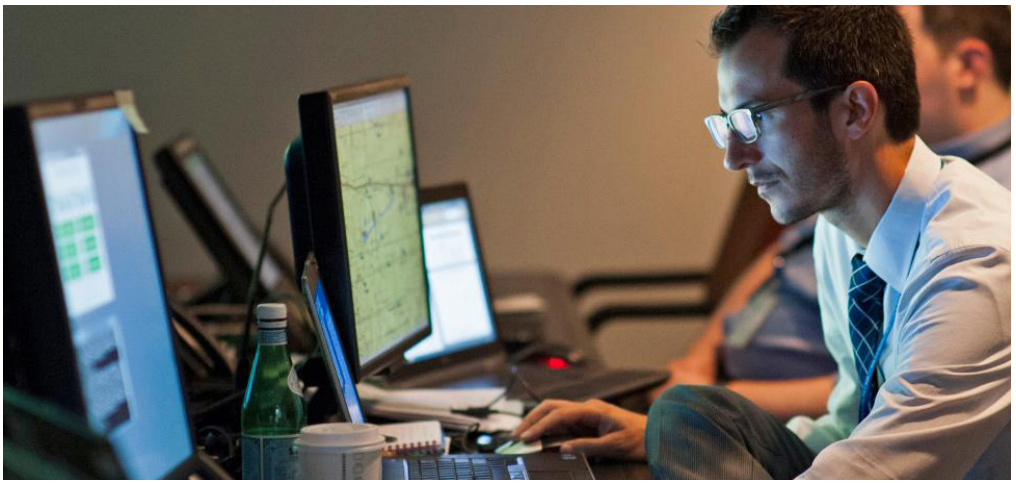
As noted previously, government agencies are legally empowered to establish or "sponsor" an FFRDC under the same general authority that allows them to execute a contract for the purchase of goods or services. Agencies, however, must first go through a series of FAR-prescribed steps and procedures aimed at validating need and ensuring the application of appropriate controls.

Once an agency has met these requirements, the two parties require a sponsoring agreement. This is a legally enforceable contract between the sponsoring agency and its FFRDC. The agreement serves, in effect, as the FFRDC's operating charter.

Typically running for a renewable term of five years, the sponsoring agreement sets out the broad terms and conditions under which the FFRDC conducts its affairs and performs its work. Sponsoring agreements may differ significantly in both form and content, but certain terms and requirements are common to all FFRDC sponsoring

agreements, regardless of the sponsoring agency or particular scope of work. These include:

- A statement of the FFRDC's mission and purpose. Without this, there would be no standard for measuring the FFRDC's success or failure in meeting its obligations.
- The prohibition against competition for government work (other than to operate another FFRDC).
- A statement of the conditions under which the FFRDC may accept work from agencies other than the sponsor.
- Provisions for the orderly termination or nonrenewal of the agreement, including disposition of the FFRDC's assets and settlement of liabilities.



Once the sponsoring agreement takes effect, the FFRDC may obtain and perform work assignments under contracts and tasking statements that conform in all respects with the standard FAR contract clauses and requirements.

Sponsoring agencies differ in the way they manage the allocation of funds to their FFRDCs. For example, staffing levels are typically subject to some form of congressionally mandated "ceiling"—a constraint that caps growth and sets a maximum level of effort, typically expressed in the form of staff years. This further differentiates FFRDCs from commercial government contractors and ensures that sponsoring agencies carefully prioritize the work performed by their FFRDCs.

Once an FFRDC begins operation, agencies may not extend or renew their sponsorship without first conducting a "comprehensive review." The review assesses the quality of the FFRDC's performance to date and determines whether a need for its services still exists. As described in the FAR, this includes review of "the FFRDC's ability to maintain its objectivity, independence, quick-response capability, currency in its field(s) of expertise, and familiarity with the needs of its sponsor." The comprehensive review also must include "an assessment of the adequacy of the FFRDC management in ensuring a cost-effective operation."

The ultimate decision to renew or terminate FFRDC sponsorship rests with the sponsoring agency head, who bases the outcome on the comprehensive review. In cases where the agency no longer needs an FFRDC but is otherwise satisfied with the current operator's performance, another agency may take over the sponsor's role. Conversely, an agency is free to open a new competition to manage its FFRDC if it still needs FFRDC-level support but is dissatisfied with the current operator's performance or cost-effectiveness.

"The historical strength of FFRDCs has been their reputation for high-quality, objective advice."

— *Military Transformation and the Defense Industry after Next*,
Peter J. Dombrowski, Eugene Gholz,
and Andrew L. Ross

A Model for Enduring Value

As previously noted, most FFRDCs are operated by non-profits. Some organizations, in particular the DoD, make this a condition of FFRDC sponsorship. The result is that FFRDCs are better able to carry out their public interest mission, unencumbered by investor or shareholder concerns. Because the FAR requires that FFRDCs operate as autonomous or separate units of their corporate parents, this is true even in the case of the few FFRDCs operated by for-profit concerns.

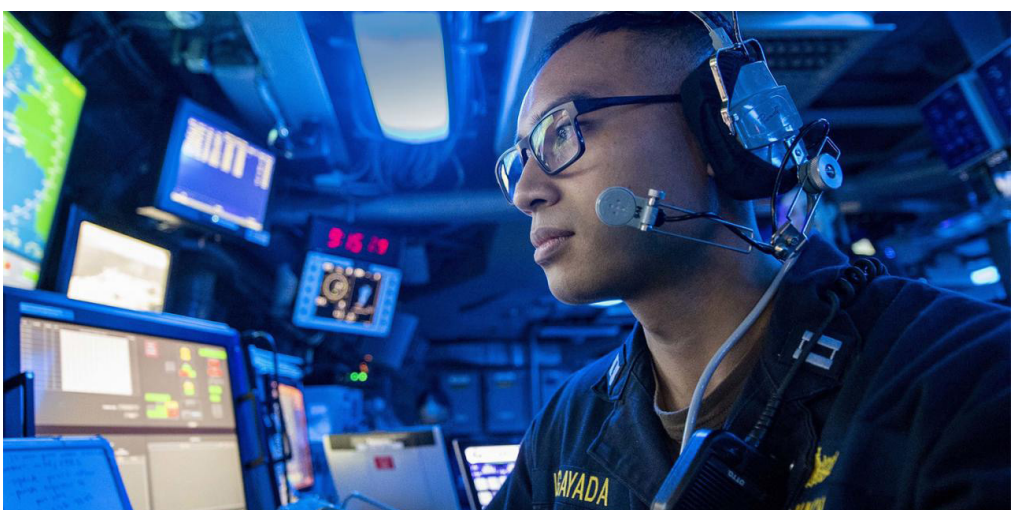
Just as important, the bar against competition mitigates against commercially driven concerns that might compromise FFRDC objectivity. It also reinforces the FFRDC collaborative model, which allows them to reach across organizations to share findings, promote cooperation, and resolve differences among parties with potentially competing interests. FFRDCs frequently mediate among multiple stakeholders, including commercial interests, to resolve issues involving technical, policy, and economic dimensions.

FFRDCs also have a duty to accelerate the commercialization of technology they create for their government sponsors. Through licensing, open-source software, and other means, FFRDCs collaborate with industry to help it gain access to government-funded innovation. This technology transfer process contributes to our nation's economic growth and speeds the production of technology the government itself needs.

Affirming a Continuing Need for FFRDCs

Despite shifts in the number and types of FFRDCs, government agencies continue to affirm the enduring value and relevance of the FFRDC model through word and deed.

In 2010, and again in 2011, then-Deputy Secretary of Defense Ashton Carter issued guidance to DoD agencies that emphasized the "high value FFRDCs provide to the Department." He added, "our FFRDCs maintain long-term capability in core competencies in domains that continue to be of great importance to the Department, such as analysis, engineering, acquisition support, and research & development. FFRDCs are immensely valuable capabilities, and the Department should use all means legally available to preserve and strengthen them."



Frank Kendall, Under Secretary of Defense for Acquisition, Technology, and Logistics, later amplified the point in an interview with *Defense News*. Echoing guidance in the FAR, Kendall said, "We are trying to communicate to our own workforce that FFRDCs have a unique role. They are very important to the process, and they should be used appropriately."

Addressing the relationship between government's use of FFRDC resources relative to those of the commercial and civil service sectors, Kendall noted that, in the "three-legged stool" model, FFRDCs form "a very skinny leg" compared to federal employees or industry contractors. "FFRDCs do not compete with industry," he said. "They're supporting the government—they're an extension of the government. We'd like to have them help us raise the standard on performance—help us make sure the products we're getting from the for-profit sector really are up to the level we'd like. We think they can be a catalyst for higher performance across the board."

Kendall also emphasized that FFRDCs offer the government "intellectual firepower and capital" to provide the "special assistance" it needs in many areas requiring technical expertise and objective guidance.

Although FFRDCs began with the Department of Defense, they have and continue to serve many other organizations that similarly recognize their value. More than a dozen different government agencies fund the approximately 42 FFRDCs in operation today. In 2009, Secretary of Energy Steven W. Chu reminded us of some of the core underpinnings of the original FFRDC model, underscoring

their continued value and relevance. “M&O [management and operating] contracts for FFRDCs are appropriate and desirable when an agency wishes an independent perspective on issues of importance to it, desires the ability to attract and retain world-class scientific and engineering talent at a laboratory devoted to government missions, and wishes to make use of the technical ability and managerial expertise available through private or non-governmental institutions.”

Most telling of all, the government’s affirmation of continued value comes in the form of its sponsorship of new FFRDCs to address complex emerging issues, such as two new FFRDCs authorized by Congress as part of its passage of the Homeland Security Act. More recently, in 2014, the National Institute of Standards and Technology established the National Cybersecurity FFRDC to address critical technical and policy issues relative to the nation’s cyber infrastructure.

The View from Beyond the Government

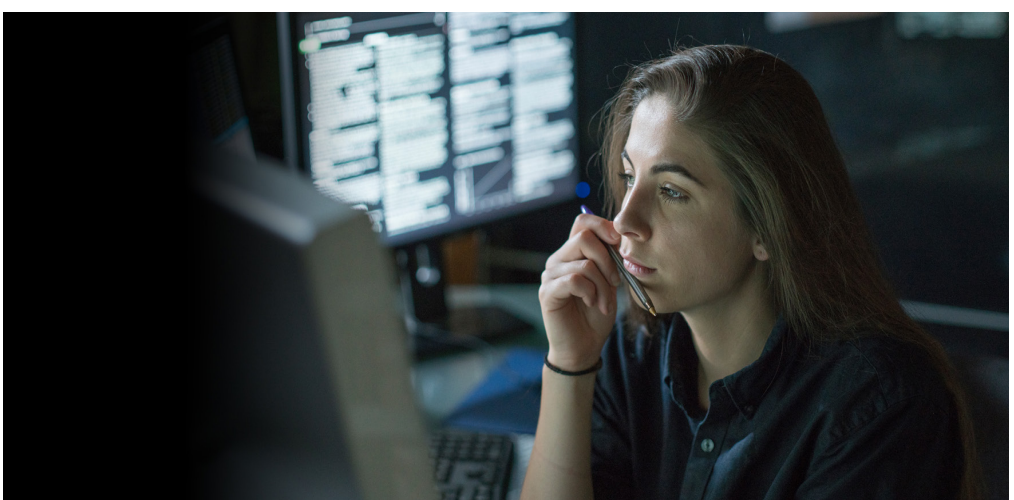
Numerous non-governmental bodies have endorsed and affirmed the FFRDC model. For example, in 2013, the National Academy of Engineering and the National Research Council (NRC) evaluated a plan from the U.S. Department of the Interior’s Bureau of Safety and Environmental Enforcement (BSEE) to found an independent research arm, the Ocean Energy Safety Institute. The goal: to address technical challenges related to offshore oil and gas exploration and drilling, such as those that contributed to the Deepwater Horizon disaster.

The report cautioned that the BSEE's plan to fund the new institute using short-term contracts would constrain its ability to perform complex technical assessments and economic analyses. The National Academy and NRC recommended that the BSEE broaden the proposed institute's charter "to evolve into either a federally funded research and development center or a university-affiliated research center, either of which would be permitted to receive funding over a longer period." The BSEE ultimately chose a consortium of Texas universities, led by Texas A&M, to manage the newly formed institute under a five-year contract—essentially following the FFRDC/UARC model.

In a 2009 paper, "Organizing for a Complex World: The Way Ahead," the independent, non-profit Center for Strategic & International Studies (CSIS) examines the realities of large-scale government program management in the 21st century.

The paper contends that as the world's challenges grow in complexity, "staying on budget, on schedule, and meeting requirements becomes harder. . . . It's as much about governance and organization as it is about technology and engineering."

Advocating that government agencies need to match governance and management models to the particular issues they face, the CSIS paper says there is no single solution. Each complex program needs to find its optimum blend of in-house resources, for-profit contractors, and FFRDCs (and/or UARCs). Paramount, however, according to CSIS, is the need for "flexibility and resilience," attributes that allow programs to adapt to complexity by "embracing it and being ready for the pitfalls and opportunities it offers."



In describing the enabling characteristics of flexibility and resilience, "Organizing for a Complex World" specifically highlights areas that are FFRDC strengths:

- A proven ability to be flexible in managing and sustaining technical teams in dynamic environments, even when challenged with different types of projects requiring a wide array of skills.
- A matrixed methodology for putting technical knowledge and expertise to use in a system-of-systems architecture approach.
- An ability to provide a broader reach across technical areas, integrating multiple disciplines for a single purpose. This ability will only grow more important as missions intertwine, such as aviation and homeland security; defense and homeland security; healthcare policy and tax policy; cybersecurity across the whole government enterprise; and so on.
- An ability to retain and attract top talent, which is particularly important for long-term programs requiring continuity.

The authors also commend the resiliency inherent in FFRDCs, thanks to such factors as "their independence, absence of even the appearance of conflict of interest, the protection of proprietary information, and the provision of equal access to all potential interested and qualified parties (public and private)."

"FFRDCs assist in transferring technology between the government and the private sector by promoting development of new technologies. . . . [They are] a repository for knowledge accessible to the U.S. government and industry unencumbered with conflicts concerning for-profit institutions."

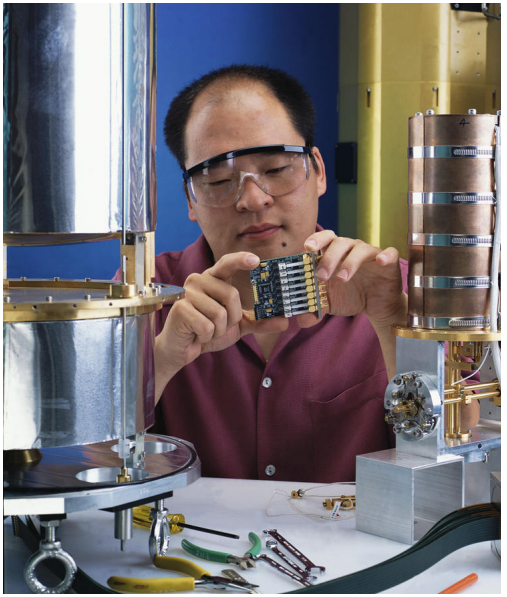
— "U.S. Science and Technology Leadership, and Technology Grand Challenges" in *Synesis, A Journal of Science, Technology, Ethics, and Policy*, Robert Hummel, Patrick Cheetham, and Justin Rossi

Conclusion: The Role of FFRDCs in Addressing National Challenges

When FFRDCs got their start, the government's research needs focused on the pressing challenges of the day: defense, aviation, nuclear proliferation. Decades later, the government's challenges are broader and deeper, influenced not just by national conditions but also by the global landscape. More than ever, federal R&D, acquisition, and related support require the combined efforts of government, industry, and the non-profit sector. Each sector contributes in its distinct way, forming the footing of the "three-legged stool." As we have described, FFRDCs have a special place in this overall effort.

In part because of their small size relative to federal and for-profit organizations, FFRDCs have kept a low public profile. Since their inception, however, they have made significant contributions to solving key national challenges. The unique attributes of FFRDCs, shaped by both law and tradition, have made these contributions possible.

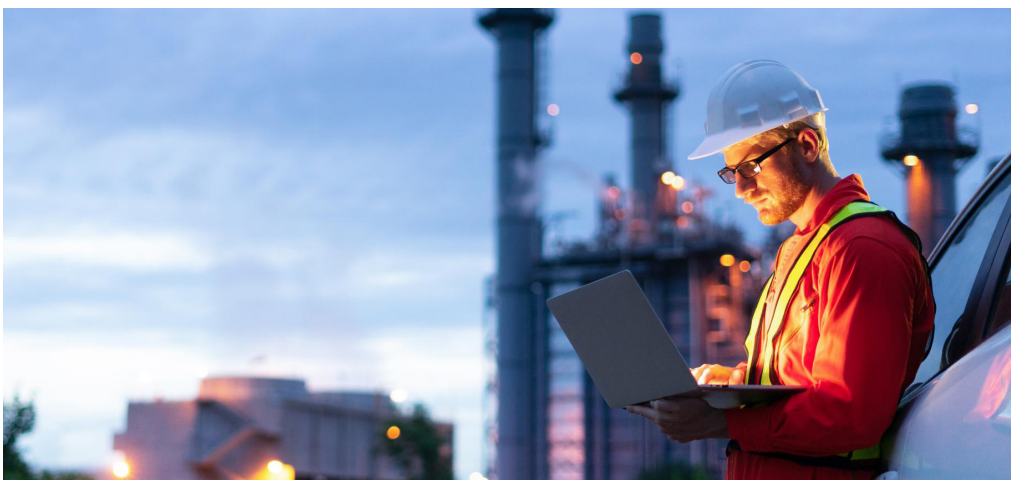
At their core, FFRDCs help the government make cost-effective choices in technology development, policy formation, systems acquisition and integration, and other vital elements of government operations. They do this through a mix of characteristics and constraints that emphasize commitment to the public interest, a long-term horizon, and an organizational structure outside of and apart from government, ensuring an absence of conflicts of interest.



FFRDCs also play an important role in spurring innovation. Apart from licensing and other technology transfer activities aimed specifically at encouraging commercialization of government-funded R&D, FFRDCs play a key role in preserving the nation's technical base.

Finally, mandatory government assessments periodically weigh the need for and performance of its FFRDCs. This process has caused fluctuations in the number of FFRDCs and shifts in substantive focus over the decades—and ensures that each FFRDC delivers value to our nation.

The IEEE History Center said it very well: "The FFRDCs are not a replacement for innovation in the private sector. Neither do they undermine it. Rather, in nurturing a national pool of scientific and technical expertise that can take on high-risk technical challenges, FFRDCs complement the private sector's market-driven



approach to innovation. The enduring FFRDCs created a body of scientific and technical expertise that could not have been recruited, sustained, and managed within the civil service."

We ultimately measure our government's research, technology, policy development, and acquisition efforts by outcomes: a safer nation, a well-functioning civil sector, and a healthier population, to name but a few. Working together—achieving the right balance—government, industry, and FFRDCs deliver the outcomes that make our nation stronger.

Appendix A.
Current FFRDCs and Their Administrators

The National Science Foundation maintains the list of current federally funded research and development centers (FFRDCs) at https://ncses.nsf.gov/resource/master-gov-lists-ffrdc. Today there are 42 FFRDCs, listed below. Since their inception, 58 or more FFRDCs have been discontinued as needs have changed or evolved (most sponsored by the Department of Defense, Department of Energy, and the now defunct Department of Health, Education, and Welfare).

FFRDC	Administrator
Department of Defense	
Aerospace FFRDC	- *The Aerospace Corporation*
Arroyo Center	- *RAND Corp.*
Center for Communications and Computing	- *Institute for Defense Analyses*
Center for Naval Analyses	- *The CNA Corporation*
Lincoln Laboratory	- *Massachusetts Institute of Technology*
National Security Engineering Center	- *The MITRE Corporation*
National Defense Research Institute	- *Rand Corp.*
Project Air Force	- *Rand Corp.*
Software Engineering Institute	- *Carnegie Mellon University*
Systems and Analyses Center	- *Institute for Defense Analyses*
Department of Commerce/National Institute of Standards and Technology	
National Cybersecurity Center of Excellence	- *The MITRE Corporation*

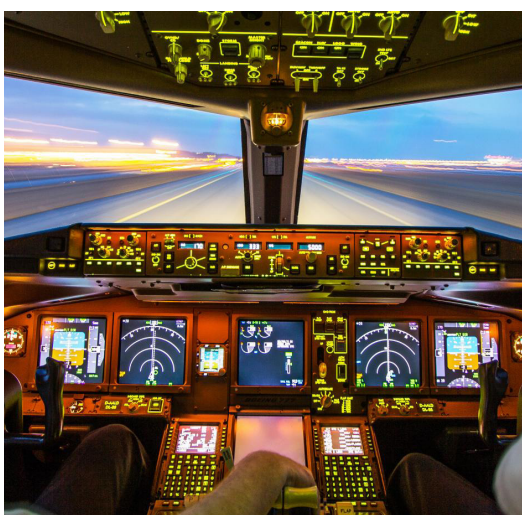
FFRDC	Administrator
Department of Energy	
Ames Laboratory	- *Iowa State University of Science and Technology*
Argonne National Laboratory	- *UChicago Argonne, LLC*
Brookhaven National Laboratory	- *Brookhaven Science Associates, LLC*
Fermi National Accelerator Laboratory	- *Fermi Research Alliance, LLC*
Idaho National Laboratory	- *Battelle Energy Alliance, LLC*
Lawrence Berkeley National Laboratory	- *University of California*
Lawrence Livermore National Laboratory	- *Lawrence Livermore National Security, LLC*
Los Alamos National Laboratory	- *Triad National Security, LLC*
National Renewable Energy Laboratory	- *Alliance for Sustainable Energy, LLC*
Oak Ridge National Laboratory	- *UT-Battelle, LLC*
Pacific Northwest National Laboratory	- *Battelle Memorial Institute*
Princeton Plasma Physics Laboratory	- *Princeton University*
Sandia National Laboratories	- *National Technology and Engineering Solutions of Sandia, LLC*
Savannah River National Laboratory	- *Battelle Savannah River Alliance, LLC*
SLAC National Accelerator Laboratory	- *Stanford University*
Thomas Jefferson National Accelerator Facility	- *Jefferson Science Associates, LLC*
Department of Health and Human Services	
CMS Alliance to Modernize Healthcare	- *The MITRE Corporation*
Frederick National Laboratory for Cancer Research	- *Leidos Biomedical Research, Inc.*
Department of Homeland Security	
Homeland Security Operational Analysis Center	- *RAND Corp.*
Homeland Security Systems Engineering and Development Institute™	- *The MITRE Corporation*
National Biodefense Analysis and Countermeasures Center	- *Battelle National Biodefense Institute*

FFRDC	Administrator
Department of Transportation	
Center for Advanced Aviation System Development	- *The MITRE Corporation*
Department of the Treasury/Internal Revenue Service	
Center for Enterprise Modernization	- *The MITRE Corporation*
National Aeronautics and Space Administration	
Jet Propulsion Laboratory	- *California Institute of Technology*
National Science Foundation	
Green Bank Observatory	- *Associated Universities, Inc.*
National Center for Atmospheric Research	- *University Corporation for Atmospheric Research*
National Solar Observatory	- *Association of Universities for Research in Astronomy, Inc.*
NSF's National Optical-Infrared Astronomy Research Laboratory	- *Association of Universities for Research in Astronomy, Inc*
National Radio Astronomy Observatory	- *Associated Universities, Inc.*
Science and Technology Policy Institute	- *Institute for Defense Analyses*
Nuclear Regulatory Commission	
Center for Nuclear Waste Regulatory Analyses	- *Southwest Research Institute*

Appendix B.
FFRDC Achievements—A Small Sampling

In the nearly 80 years since the founding of the first one, FFRDCs have made advances with both national and global impact—from medicine, space exploration, and aviation to defense, cybersecurity, and the environment. In many cases, FFRDCs or their government sponsors transitioned the achievements to commercial industry for production, thereby making the innovations accessible to wider audiences and adding value to the economy. The following list shows a few of the many contributions of FFRDCs.

- **Mars Exploration Rover Mission (MERS)** — The Jet Propulsion Laboratory designed, built, manages, and monitors the twin "robot geologists" exploring Mars on behalf of NASA. (Jet Propulsion Laboratory)
- **The RAS Initiative** — This program supports the development of therapies against tumors that contain mutations in members of the RAS family of oncogenes, which affect nearly one-third of all cancers. The program facilitates connections between and among researchers, making new ideas and technologies about RAS available throughout the medical community. (Frederick National Laboratory for Cancer Research)
- **Chlorofluorocarbons Ban** — Coupled with a National Oceanic and Atmospheric Administration chemical model of the atmosphere, RAND's economic analysis ultimately provided the policy-analytic basis for the global ban on the production of substances that deplete stratospheric ozone, mainly chlorofluorocarbons and halons. (The RAND Corporation)
- **The Global Positioning System (GPS)** — The now-ubiquitous GPS began as a defense technology to provide navigation and location capabilities to the U.S. military. Since then, its use has expanded fully into the civilian world, becoming an integral part of daily life. (Aerospace Corporation and The MITRE Corporation)
- **Synthetic Aperture Radar** — Among other uses, this advanced radar system allowed NASA's Seasat satellite to obtain high-resolution radar imaging of Earth and helped the Lunar Reconnaissance Orbiter investigate the possibility of water on the moon. It also provided the



foundation for a successful counter-IED device used by the U.S. Army in Afghanistan and Iraq. (Sandia National Laboratories)

- **Traffic Collision Avoidance System (TCAS)** — This alert-and-warning system is required on all large commercial aircraft. TCAS has prevented countless midair collisions for more than 30 years, making it one of the most important elements of aviation safety worldwide. (MIT Lincoln Laboratory and The MITRE Corporation)
- **Digital Forensics for Solving Crimes** — A team from the Software Engineering Institute aided the U.S. Secret Service in collecting and analyzing evidence in one of the largest cases of credit card fraud in history, involving more than 130 million credit and debit card numbers. The assistance helped lead to the conviction of hacker Albert Gonzalez and his associates. (Software Engineering Institute)
- **First Micro X-Ray Beam for Structural Biology** — Working at the Advanced Photon Source at Argonne National Laboratory, scientists developed this specialized beam, which has provided the foundation for many advances in pharmaceuticals. Researchers using the beam received the 2012 Nobel Prize in Chemistry. (Argonne National Laboratory)
- **The Arecibo Observatory** — Home of the world's largest single-dish radio telescope, the Observatory is available to scientists all over the world on an equal, competitive basis. More than 200 scientists yearly use the telescope to pursue their research, leading to advances in radio astronomy, planetary radar, and atmospheric sciences. (National Astronomy and Ionosphere Center)
- **World's First Programmable Nanoprocessor** — In collaboration with a team from Harvard, MITRE engineers and scientists designed the first processor created out of ultra-tiny nanocircuits. They operate using very little power, which will allow them to become the building blocks of small, lightweight electronic sensors and consumer electronics. (The MITRE Corporation)
- **3D Printing Expands Maritime Opportunities in National Security and More** —MITRE collaborated with MSI Transducers and Lithoz America to demonstrate how additive manufacturing (3D printing) could improve undersea acoustic sensing. The research team created a novel technique to 3D print the tiny ceramic structures used in undersea acoustic transducers. MITRE's compact, low-power prototype provides customizable transducer options with improved properties like sensitivity, directionality, and bandwidth—especially beneficial to autonomous undersea vehicles and unique undersea missions. (MITRE)

- **Body Sensors Detect Delayed Blast Injuries** —The Electrooculography and Balance Blast Overpressure Monitoring (EYEBOOM), developed by MIT Lincoln Lab and industry partners, monitors individuals' blast exposure and notifies them if they are at an increased risk of harm. The wearable device includes two body-worn sensors and an algorithm to capture physiological data and predict the likeliness of cognitive injury. The system is used by select U.S. Special Forces units. (MIT Lincoln Lab)
- **Quantum Computing for Nuclear Stockpile Stewardship** — Sandia National Laboratories partnered with Google Quantum AI to produce a quantum algorithm that calculates electronic stopping powers in extreme conditions that are difficult to reliably create and measure in terrestrial labs. Their work is the first major use case for quantum computing in the nuclear stockpile stewardship program established by the DOE. (Sandia National Labs)
- **First Powered, Controlled Flight on Another Planet** — In 2021, NASA's Jet Propulsion Laboratory successfully deployed the Ingenuity Mars Helicopter, a 4lb rotorcraft, to the surface of Jezero Crater. The landmark flight will help determine whether future explorations on Mars could be conducted from the air. (Jet Propulsion Laboratory)
- **Detection and Reporting Systems (DARS)** — Aerospace Corporation's DARS provides early indications of space threats and builds off more than 20 years of applying machine learning (ML) techniques to satellite telemetry. It combines human-machine teaming with multiple detection models to improve resilience and minimize false anomaly positives. DARS detects and characterizes GPS interference and spoofing, command receiver interference, optical threats and "lasing" events, and cyber intrusions. (Aerospace Corporation)
- **MITRE ATT&CK®** — MITRE's open-source cybersecurity framework is a knowledge base of adversary tactics and techniques based on real-world observations. It provides a foundation for threat-informed defense used by security teams and vendors in their enterprise security operations worldwide in the private sector, academia, and government. Many private and publicly traded cybersecurity companies have based their products and services around the MITRE ATT&CK framework. (MITRE)

Appendix C.
Federal Acquisition Regulation—Federally Funded Research and Development Centers

35.017 — Federally Funded Research and Development Centers.

(a) Policy.

(1) This section sets forth Federal policy regarding the establishment, use, review, and termination of Federally Funded Research and Development Centers (FFRDC's) and related sponsoring agreements.

(2) An FFRDC meets some special long-term research or development need which cannot be met as effectively by existing in-house or contractor resources. FFRDC's enable agencies to use private sector resources to accomplish tasks that are integral to the mission and operation of the sponsoring agency. An FFRDC, in order to discharge its responsibilities to the sponsoring agency, has access, beyond that which is common to the normal contractual relationship, to Government and supplier data, including sensitive and proprietary data, and to employees and installations equipment and real property. The FFRDC is required to conduct its business in a manner befitting its special relationship with the Government, to operate in the public interest with objectivity and independence, to be free from organizational conflicts of interest, and to have full disclosure of its affairs to the sponsoring agency. It is not the Government's intent that an FFRDC use its privileged information or access to installations equipment and real property to compete with the private sector. However, an FFRDC may perform work for other than the sponsoring agency under the Economy Act, or other applicable legislation, when the work is not otherwise available from the private sector.

(3) FFRDC's are operated, managed, and/or administered by either a university or consortium of universities, other not-for-profit or nonprofit organization, or an industrial firm, as an autonomous organization or as an identifiable separate operating unit of a parent organization.

(4) Long-term relationships between the Government and FFRDC's are encouraged in order to provide the continuity that will attract high-quality personnel to the FFRDC. 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.

(b) Definitions. As used in this section--

"Nonsponsor" means any other organization, in or outside of the Federal Government, which funds specific work to be performed by the FFRDC and is not a party to the sponsoring agreement.

"Primary sponsor" means the lead agency responsible for managing, administering, or monitoring overall use of the FFRDC under a multiple sponsorship agreement.

"Sponsor" means the executive agency which manages, administers, monitors, funds, and is responsible for the overall use of an FFRDC. Multiple agency sponsorship is possible as long as one agency agrees to act as the "primary sponsor." In the event of multiple sponsors, "sponsor" refers to the primary sponsor.

35.017-1 — Sponsoring Agreements.

(a) In order to facilitate a long-term relationship between the Government and an FFRDC, establish the FFRDC's mission, and ensure a periodic reevaluation of the FFRDC, a written agreement of sponsorship between the Government and the FFRDC shall be prepared when the FFRDC is established. The sponsoring agreement may take various forms; it may be included in a contract between the Government and the FFRDC, or in another legal instrument under which an FFRDC accomplishes effort, or it may be in a separate written agreement. Notwithstanding its form, the sponsoring agreement shall be clearly designated as such by the sponsor.

(b) While the specific content of any sponsoring agreement will vary depending on the situation, the agreement shall contain, as a minimum, the requirements of paragraph (c) of this subsection. The requirements for, and the contents of, sponsoring agreements may be as further specified in sponsoring agencies' policies and procedures.

(c) As a minimum, the following requirements must be addressed in either a sponsoring agreement or sponsoring agencies' policies and procedures:

(1) A statement of the purpose and mission of the FFRDC.

(2) Provisions for the orderly termination or nonrenewal of the agreement, disposal of assets, and settlement of liabilities. The responsibility for capitalization of an FFRDC must be defined in such a manner that ownership of assets may be readily and equitably determined upon termination of the FFRDC's relationship with its sponsor(s).

(3) A provision for the identification of retained earnings (reserves) and the development of a plan for their use and disposition.

(4) A prohibition against the FFRDC competing with any non-FFRDC concern in response to a Federal agency request for proposal for other than the operation of an FFRDC. This prohibition is not required to be applied to any parent organization or other subsidiary of the parent organization in its non-FFRDC operations. Requests for information, qualifications or capabilities can be answered unless otherwise restricted by the sponsor.

(5) A delineation of whether or not the FFRDC may accept work from other than the sponsor(s). If nonsponsor work can be accepted, a delineation of the procedures to be followed, along with any limitations as to the nonsponsors from which work can be accepted (other Federal agencies, State or local governments, nonprofit or profit organizations, etc.).

(d) The sponsoring agreement or sponsoring agencies' policies and procedures may also contain, as appropriate, other provisions, such as identification of --

(1) Any cost elements which will require advance agreement if cost-type contracts are used; and

(2) Considerations which will affect negotiation of fees where payment of fees is determined by the sponsor(s) to be appropriate.

(e) The term of the agreement will not exceed 5 years, but can be renewed, as a result of periodic review, in increments not to exceed 5 years.

35.017-2 — Establishing or Changing an FFRDC.

To establish an FFRDC, or change its basic purpose and mission, the sponsor shall ensure the following:

(a) Existing alternative sources for satisfying agency requirements cannot effectively meet the special research or development needs.

(b) The notices required for publication (see 5.205(b)) are placed as required.

(c) There is sufficient Government expertise available to adequately and objectively evaluate the work to be performed by the FFRDC.

(d) The Executive Office of the President, Office of Science and Technology Policy, Washington, DC 20506, is notified.

(e) Controls are established to ensure that the costs of the services being provided to the Government are reasonable.

(f) The basic purpose and mission of the FFRDC is stated clearly enough to enable differentiation between work which should be performed by the FFRDC and that which should be performed by non-FFRDC's.

(g) A reasonable continuity in the level of support to the FFRDC is maintained, consistent with the agency's need for the FFRDC and the terms of the sponsoring agreement.

(h) The FFRDC is operated, managed, or administered by an autonomous organization or as an identifiably separate operating unit of a parent organization, and is required to operate in the public interest, free from organizational conflict of interest, and to disclose its affairs (as an FFRDC) to the primary sponsor.

(i) Quantity production or manufacturing is not performed unless authorized by legislation.

(j) Approval is received from the head of the sponsoring agency.

35.017-3 — Using an FFRDC.

(a) All work placed with the FFRDC must be within the purpose, mission, general scope of effort, or special competency of the FFRDC.

(b) Where the use of the FFRDC by a nonsponsor is permitted by the sponsor, the sponsor shall be responsible for compliance with paragraph (a) of this subsection.

(1) The nonsponsoring agency shall prepare a determination in accordance with 17.502-1(a) and provide the documentation required by 17.503(e) to the sponsoring agency.

(2) When a D&F is required pursuant to 17.502-2(c), the nonsponsoring agency may incorporate the determination required by 17.502-1(a) into the D&F and provide the documentation required by 17.503(e) to the sponsoring agency.

(3) When permitted by the sponsor, a Federal agency may contract directly with the FFRDC in which case that Federal agency is responsible for compliance with Part 6.

35.017-4 — Reviewing FFRDCs.

(a) The sponsor, prior to extending the contract or agreement with an FFRDC, shall conduct a comprehensive review of the use and need for the FFRDC. The review will be coordinated with any co-sponsors and may be performed in conjunction with the budget process. If the sponsor determines that its sponsorship is no longer appropriate, it shall apprise other agencies which use the FFRDC of the determination and afford them an opportunity to assume sponsorship.

(b) Approval to continue or terminate the sponsorship shall rest with the head of the sponsoring agency. This determination shall be based upon the results of the review conducted in accordance with paragraph (c) of this subsection.

(c) An FFRDC review should include the following:

(1) An examination of the sponsor's special technical needs and mission requirements that are performed by the FFRDC to determine if and at what level they continue to exist.

(2) Consideration of alternative sources to meet the sponsor's needs.

(3) An assessment of the efficiency and effectiveness of the FFRDC in meeting the sponsor's needs, including the FFRDC's ability to maintain its objectivity, independence, quick response capability, currency in its field(s) of expertise, and familiarity with the needs of its sponsor.

(4) An assessment of the adequacy of the FFRDC management in ensuring a cost-effective operation.

(5) A determination that the criteria for establishing the FFRDC continue to be satisfied and that the sponsoring agreement is in compliance with 35.017-1.

35.017-5 — Terminating an FFRDC.

When a sponsor's need for the FFRDC no longer exists, the sponsorship may be transferred to one or more Government agencies, if appropriately justified. If the FFRDC is not transferred to another Government agency, it shall be phased out.

35.017-6 — Master List of FFRDCs.

The National Science Foundation (NSF) maintains a master Government list of FFRDC's. Primary sponsors will provide information on each FFRDC, including sponsoring agreements, mission statements, funding data, and type of R&D being performed, to the NSF upon its request for such information.

35.017-7 — Limitation on the Creation of New FFRDCs.

Pursuant to 10 U.S.C.2367, the Secretary of Defense, the Secretary of the Army, the Secretary of the Navy, the Secretary of the Air Force, the Secretary of Transportation, and the Administrator of the National Aeronautics and Space Administration may not obligate or expend amounts appropriated to the Department of Defense for purposes of operating an FFRDC that was not in existence before June 2, 1986, until

(a) The head of the agency submits to Congress a report with respect to such center that describes the purpose, mission, and general scope of effort of the center; and

(b) A period of 60 days, beginning on the date such report is received by Congress, has elapsed.

Resources

The Aerospace Corporation. "The Global Positioning System (GPS)."
Retrieved from www.aerospace.org/innovations/gps/, February 13, 2015.

Argonne National Laboratories. "Discoveries."
Retrieved from http://www.anl.gov/about-argonne/discoveries, January 12, 2015.

Bain, Ben. "DHS turns to old model for R&D: Officials hope new research and development centers will improve procurements and programs." *Federal Computer Week, February 5, 2009*. Online: https://www.nextgov.com/people/2009/02/dhs-turns-to-old-model-for-rd/204232/.

Berteau, David J., Guy Ben-Ari, and Matthew Zlatnik. "Organizing for a Complex World: The Way Ahead." Washington, D.C.: Center for Strategic and International Studies, 2009.

Bowling, Stephen Bryan. *Developing a Sustainable Future for Federally Funded Research and Development Centers*. Cambridge: Massachusetts Institute of Technology, Sloan School of Management, 1997.

Chu, Steven W. "Policy Regarding the Competition of Contracts to Manage and Operate its National Laboratories." Statement from the U.S. Secretary of Energy. Washington, D.C.: U.S. Department of Energy, December 22, 2009.

Dale, Bruce C., and Timothy D. Moy. "The Rise of Federally Funded Research and Development Centers." Albuquerque: Sandia National Laboratories, 2000.

Dombrowski, Peter J., Eugene Gholz, and Andrew L. Ross. “Military Transformation and the Defense Industry after Next.” Newport, R.I.: The Naval War College, 2003.

Federal Acquisition Regulation, 35.017: “Federally Funded Research and Development Centers.”

Frederick National Laboratory for Cancer Research. “The RAS Initiative.” Retrieved from http://frederick.cancer.gov/science/ras.aspx, February 12, 2015.

French, Michael R., and Dennis R. Schrader. *Federally Sponsored, Not-for-Profit Research and Development Centers: Evolving Regional Roles to Engineer State and Local Emergency Preparedness Capabilities*. McLean, Va.: The MITRE Corporation, 2010.

Golden, William T., and Joshua Lederberg, editors. *Facing Toward Governments: Nongovernmental Organizations and Scientific and Technical Advice—A Report of the Carnegie Commission on Science, Technology, and Government*. New York: The Carnegie Corporation, 1988.

Harvard School of Engineering and Applied Sciences. “Researchers at Harvard and MITRE produce world’s first programmable nanoprocessor.” *SEAS News & Events*, February 9, 2011.

Hayes, Charlene, and Richard Seligman. “Report of the Subcommittee on Recompetition of Major Research Facilities.” Pasadena: California Institute of Technology, Office of Research Administration, 2012.

Hruby, Jill M. “Statement before the Committee on Homeland Security, Subcommittee on Cybersecurity, Infrastructure Protection, and Security Technologies, United States House of Representatives.” Washington, D.C., April 12, 2012.

Hruby, Jill M., Dawn K. Manley, Ronald E. Stoltz, Erik K. Webb, and Joan B. Woodard. “The Evolution of Federally Funded Research & Development Centers.” *Public Interest Report*, Spring 2011.

Hummel, Robert, Patrick Cheetham, and Justin Rossi. ”U.S. Science and Technology Leadership, and Technology Grand Challenges,” Synesis, A *Journal of Science, Technology, Ethics, and Policy*, 2012.

IEEE History Center (Staff). “A Brief History of the U.S. Federal Government and Innovation (Part III): World War II and Beyond (1945 – 1987).” *Today’s Engineer,* August 2011.

Jet Propulsion Laboratory/NASA. “Mars Exploration Rovers: Summary.” Retrieved from http://mars.nasa.gov/mer/overview/, February 12, 2015.

MIT Lincoln Laboratory. “Surveillance and Navigation: Traffic Alert/Collision Avoidance System (TCAS). Retrieved from https://www.ll.mit.edu/mission/aviation/surveillanceandnav/tcas.html, February 11, 2015.

National Astronomy and Ionosphere Center (Arecibo Observatory). “Arecibo Observatory General Information.” Retrieved from http://www.naic.edu/general/, February 11, 2015.

National Academy of Engineering and National Research Council, Marine Board. *Best Available and Safest Technologies for Offshore Oil and Gas Operations*: Options for Implementation. Washington, D.C.: National Academies Press, 2013.

Office of Management and Budget, Office of Federal Procurement Policy (OFPP). Policy Letter 11–01, Performance of Inherently Governmental and Critical Functions. Washington, D.C.: *Federal Register*, Vol. 76, No. 176, September 12, 2011.

OSD Studies and FFRDC Management Office. *Engagement Guide, Department of Defense University Affiliated Research Centers (UARCs)*. Alexandria, Va., April 2013.

Professional Services Council White Paper (no author cited). "Federally Funded Research and Development Centers: A Strategic Reassessment for Budget-Constrained Times." Arlington, Va.: Professional Services Council, 2012

The RAND Corporation. "History and Mission." Retrieved from http.www.rand.org/about/history.html, January 25, 2015.

Sandia National Laboratories. "IED detector developed by Sandia Labs being transferred to the Army." June 26, 2014.

Software Engineering Institute (CERT Division). "Case Studies: TJX & Heartland." Retrieved from http://www.cert.org/digital-intelligence/case-studies/tjx-heartland.cfm, February 11, 2015.

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