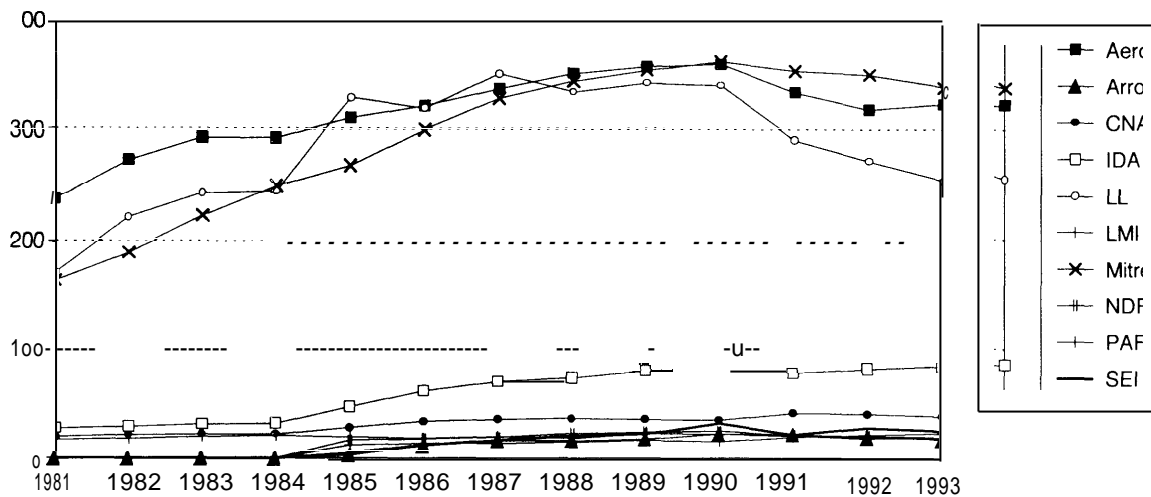


FIGURE 1-3: Total DoD Funds for Each DoD FFRDC (\$millions in 1987 \$)



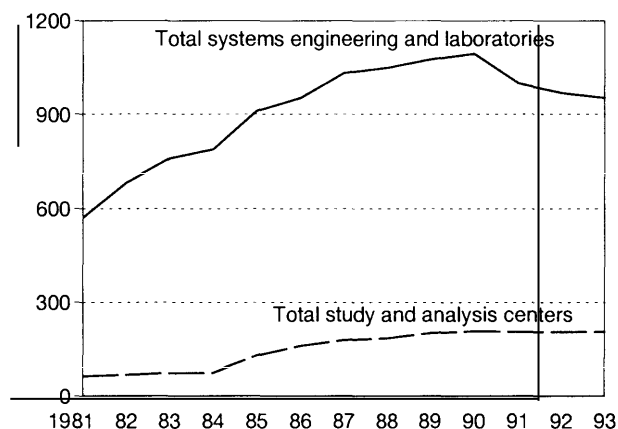
KEY: Aerospace = Aerospace Center; Arroyo = Arroyo Center; CNA = Center for Naval Analyses; IDA = Institute for Defense Analyses; LL = Lincoln Laboratory; LMI = Logistics Management Institute; Mitre = Mitre Corporation; NDRI = National Defense Research Institute; PAF = Project Air Force; SEI = Software Engineering Institute.

SOURCES: National Science Foundation, *Federal Funds for Science, Federal Funds for Research, Development, and Other Scientific Activities*, and *Federal Funds for Research and Development*, vols. I through XLII (Washington, DC, 1952 through 1994).

higher line on this graph is the sum of the funding of the two system engineering centers and the two laboratories. The bottom line on this graph is the sum of the funding of the six study and analysis centers.

The centers continued existence, over 50 years after their creation, is attributable to their filling a useful niche that may not be filled as well by the federal government or private industry. What independent research the FFRDCs still do is now one of many aspects of their services, as opposed to their reason for existence (the notable exception being Lincoln, a laboratory). The surviving study and analysis FFRDCs have evolved from the conflict between the centers' desire for independent, basic research and their clients' desire for concrete useful results.

FIGURE 1-4: Total DoD Funds for Think Tanks versus Systems Engineering Centers and Laboratories (\$ millions in 1987 \$)



SOURCES: National Science Foundation, *Federal Funds for Science, Federal Funds for Research, Development, and Other Scientific Activities*, and *Federal Funds for Research and Development*, vols. I through XLII (Washington, DC, 1952 through 1994).

## PROFILES OF THE EXISTING DOD FFRDCs

The FFRDCs can be differentiated from private industry and federal government laboratories by

## BOX 1-3: Disposition of Assets

FFRDCs differ in how their assets are to be disposed of if the FFRDC closes. For example, RAND's corporate charter specifically provides that upon the dissolution of the corporation, all assets will be distributed at the direction of the Ford Foundation for scientific, educational, and charitable purposes. If the Ford Foundation has ceased to exist, then the Superior Court of California will dispose of RAND's assets. Neither of these agencies have any official relationship with the Department of Defense. Up until 1962, the System Development Corporation assets devolved back to RAND.<sup>1</sup>

By contrast, in the later Aerospace Corporation charter, the Air Force specifically insisted that after settlements of all debts and obligations Aerospace's assets would devolve upon the federal government and would be disposed of by the Air Force in the event of the company's dissolution. MITRE's original charter provided for the reversion of the assets as directed by the President of the United States.

The 1962 Bell Report briefly addressed the issue of ownership of facilities and other property of federal research centers with the statement that, "We should think it equitable, where the Government has provided facilities, funds to obtain facilities, substantial working capital, or other resources to a contractor, it should, upon dissolution of the organization, be entitled to a first claim upon such resources."<sup>2</sup>

The OFPP Policy Letter 84-1, states that any new FFRDCs must have its assets devolve back to the federal government in the event of dissolution. These assets can include facilities, cash reserves, and intellectual property. Ownership of the assets of the corporations that evolved from existing FFRDCs (i.e., RAND, MITRE, and CNA) is not addressed by the Policy Letter.

SOURCE: Office of Technology Assessment, 1995.

<sup>1</sup>Bruce L. R. Smith, *The RAND Corporation, Case Study of a Nonprofit Advisory Corporation* (Cambridge, MA: Harvard University Press, 1966).

<sup>2</sup>Bureau of the Budget, *Report to the President on Government Contracting for Research and Development* (Washington, DC: U.S. Government Printing Office, 1962).

their combination of civilian personnel and federal government sponsorship. The specifics of their organizational structure, their relationship with their host, and ownership of their assets varies considerably. (See box 1-3.)

A number of independent not-for-profit corporations are not federal research centers. These include such organizations as Stanford Research Institute (SRI), Systems Development Corporation (SDC), the Hudson Institute (for parts of its history), Battelle Laboratories, and Technical Operations Inc. Also, several not-for-profit and for-profit organizations were created when federal research centers were closed out by the federal government. These included HumRRO; General Research Corporation, the successor to RAC; and

Abbott and Associates, established by a division manager of CRESS (25,26,66,68,77).

Most FFRDCs are *industrially funded*, meaning that within the financial ceilings imposed on their DoD work, the FFRDCs actual work is funded by the individual agencies within DoD that wish to use their services. This funding is passed through to the FFRDC via one contract (typically) that the sponsoring agency holds with the FFRDC.

There are some notable exceptions to the pattern. IDA, for example, holds three separate contracts. RAND holds a contract for each of its four FFRDCs (including one non-DoD FFRDC, the Critical Technologies Institute). MITRE C<sup>3</sup>I has two major DoD contracts, one with the Air Force and one with the Army. Furthermore, Project Air

Force is funded as a line item in the congressionally appropriated budget for DoD. The Arroyo Center at RAND is also partially funded through a line item in the DoD budget. Line item funding is an attempt to separate the funding decisions from the immediate departments for which the FFRDC is doing studies, but the recommendation and demand for the level of work to be requested for the DoD budget still comes from the sponsoring agency.

Attached at the end of each of the following descriptions of the 10 FFRDCs is a chart showing the funding for that FFRDC from 1981 through 1994 in millions of 1987 dollars. Where data were available, each bar on the graph shows DoD and non-DoD funding. These figures were obtained from each FFRDC. The only other public source, NSF, only reports R&D money for the FFRDCs. While R&D money usually includes the majority of the money spent for FFRDCs in a year, it can differ from the real financial picture. For several years the Arroyo Center's primary source of funding was Operations and Maintenance money, and therefore no funding was reported by NSF, nor was Arroyo listed in their reports as an FFRDC.

The funding figures in this report are not all comparable. In some cases (such as that of IDA) they represent all the annual income for that FFRDC, whether from DoD or other agencies. This figure can also include interest from any financial reserve the company maintains. In some cases (such as that of CNA) it includes only DoD funding. Obtaining funding figures is complicated by centers, e.g., CNA and LMI, that no longer issue complete financial reports in their annual reports.

## ■ Study and Analysis Centers

### *Center for Naval Analyses*

Having evolved directly from ASWORG, the Center for Naval Analyses (CNA) has been in ex-

istence since 1942, making it the oldest DoD federal research center.

In May 1983, the Navy informed the University of Rochester that it was opening the contract it held with them to competition. As a result, the not-for-profit Hudson Institute (once a federal research center) took over management of the CNA on October 1, 1983 (78). In 1990, it was decided that CNA could function as an independent entity, and on October 1, 1990, CNA began to contract directly with the Navy. In 1993, CNA restructured as the CNA Corporation with two divisions: CNA as the FFRDC sponsored by the Department of the Navy, and a new operating unit, the Institute for Public Research (IPR). CNA also does work outside of DoD (13, pp. 36,41), its primary non-DoD customer being FAA. CNA's non-DoD work makes up less than 10 percent of its effort (15,30).<sup>10</sup> IPR provides analytical and support services to non-Navy clients (but can include DoD clients.) This work is handled outside of the FFRDC umbrella.

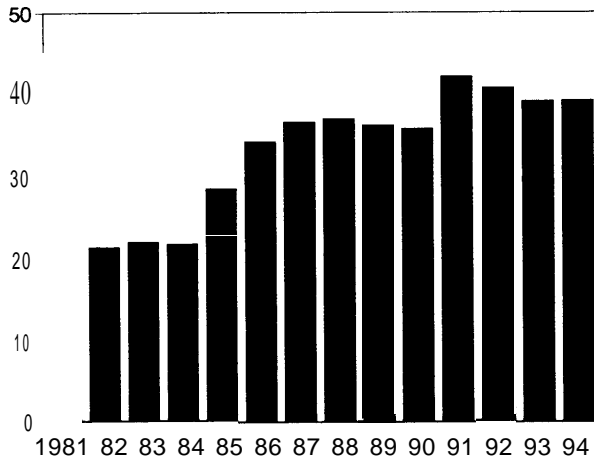
Figure 1-5 shows DoD funding for CNA and the FFRDC division of CNA after incorporation in current and constant dollars.

### *Institute for Defense Analyses*

The Institute for Defense Analyses was originally owned by a loose holding company. Five, and later eight, universities contributed to form this company incorporated in Delaware as a not-for-profit organization. IDA's early mission broadened until the IDA group that supported its founding sponsor, WSEG, was only one of five IDA working divisions. Over the years, IDA has modified its structure in response to sponsor needs and requests in addition to the Systems Evaluation Division and the Science and Technology Division (successors to the divisions originally created to support WSEG and ARPA, respectively), IDA has established divisions to provide cost analyses, assessment of computing and information systems

<sup>10</sup> This figure does not include IPR revenue.

**FIGURE 1-5: Center for Naval Analyses  
Annual Funding (\$ millions in 1987 \$)**



SOURCE: Center for Naval Analyses, 1995.

and technology, and strategy and force assessments, as well as operation evaluations. It now has nine divisions: six supporting OSD as a whole (including ARPA), and three supporting the NSA. IDA became the principal advisory agency servicing the OSD as a whole.

In December 1992, IDA had a staff of 832, including 425 research staff members. Of these research staff members, 62 percent held doctorates and another 29 percent had master's degrees. The composition of the research staff was 27 percent mathematics, statistics, and operations research; 24 percent engineering; 21 percent physical sciences; 13 percent computer sciences; 11 percent economics and social and political science; and 4 percent other. Apart from the work conducted for the NSA, the Institute's research program is focused in eight areas: systems evaluations; test and evaluation; technology assessment; information systems and technologies; force and strategy assessment; advanced simulation, resource and support analyses; and economic and environmental studies.

IDA's primary sponsor is still OSD (especially the Undersecretary of Defense (Acquisition and Technology)), but it does considerable work for

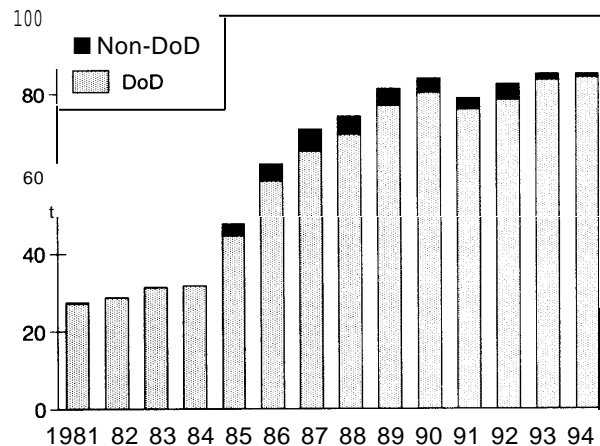
defense agencies such as ARPA and the NSA, as well as the Joint Staff. It does a small amount of work for other federal agencies, but none for other not-for-profits or industry (29). The research of the three IDA divisions working for the NSA is generally considered laboratory research.

Figure 1-6 shows the Institute's expenditures, both DoD and non-DoD, in constant dollars.

### *Logistics Management Institute*

The Logistics Management Institute was formed in 1961 on the recommendation of the Secretary of Defense and became an FFRDC in 1984 (52). The corporate charter of LMI permits it to work only for government agencies and other not-for-profit organizations (34). Its primary sponsor is the Undersecretary of Defense (Acquisition and Technology) and its executive agent is the Undersecretary of Defense (Logistics), but it also does work for a variety of other organizations in DoD, particularly the Air Force and Army Corps of Engineers. It does some work for other federal government agencies such as the Department of Veterans Affairs, Department of State, and Department of Transportation. All of its work is logistics related. Its revenues for 1993 were \$30 million,

**FIGURE 1-6: Institute of Defense Analyses  
Total Expenditures (\$ millions in 1987 \$)**



SOURCE: Institute for Defense Analyses, 1995.

with five-sixths of that work from DoD sources and one-sixth from non-DoD federal agencies (33,35,30). Figure 1-7 shows the Institute's DoD and non-DoD funding in constant dollars.

### *The RAND Corporation*

RAND now manages four FFRDCs. Three are DoD FFRDCs and one, the Critical Technologies Institute, is a civilian FFRDC, created at the request of Congress in 1992. RAND's three DoD FFRDCs are the Air Force's Project Air Force, the Army's Arroyo Center, and OSD's National Defense Research Institute. In addition, RAND has some defense work not included those three FFRDCs and has a domestic policy department.

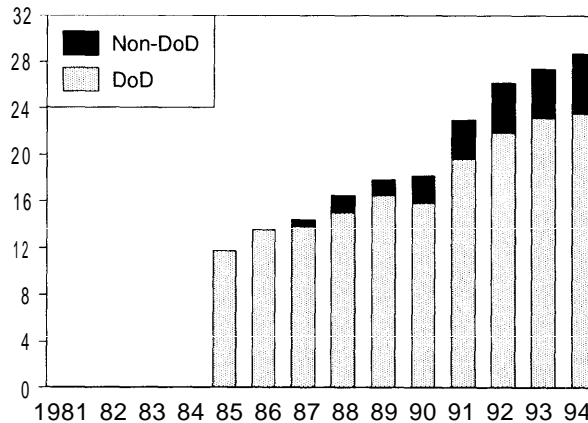
The work load for the whole RAND organization is roughly broken into quarters. For example, in FY 1992, the RAND revenues were split almost equally between the National Security Research Division (\$27.5 million, with \$25.9 million from the National Defense Research Institute); Project Air Force (\$25.1 million); the Domestic Research Division (\$27.0 million); and the Army Research Division (\$23.3 million, including the Arroyo Center) (48, p. 13).

Each of RAND's FFRDCs is supported by a five-year contract. Project Air Force and the Arroyo Center receive line-item funding from their service sponsors, while NDRI receives funds primarily from its sponsor, the Office of the Secretary of Defense. This mechanism is intended to provide the organization some insulation between the recipients of the studies and those who make the funding decisions. Additional budget monies are obtained from agencies within DoD that wish to fund specific research.

Each RAND FFRDC has a board that determines the general direction of the research and the level of budget. For Project Air Force and the Arroyo Center, the majority of the members of the board are general officers, with some senior civilian members. In 1994, the board for the National Defense Research Institute was composed entirely of senior civilian members of OSD.

The supporting professional staff of RAND consists of approximately 600 personnel organized into six research departments. Operations

**FIGURE 1-7: Logistics Management Institute  
Annual Funding (\$ millions in 1987 \$)**



SOURCE: Logistics Management Institute, 1995

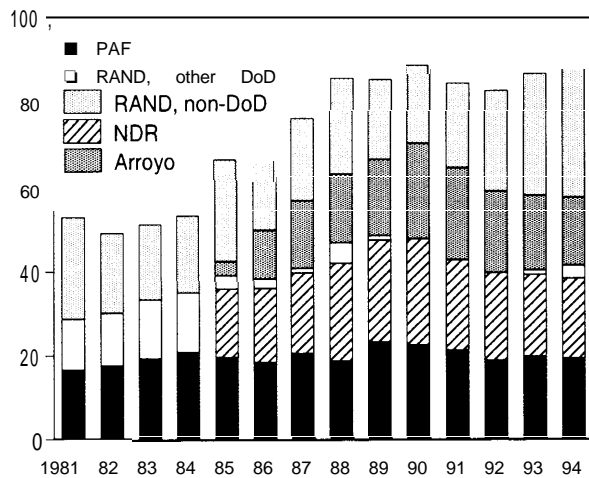
researchers, statisticians, mathematicians, and the physical scientists account for approximately 20 percent of the staff. The social sciences (e.g., political science, humanities, sociology, public policy, and behavioral sciences) account for over 40 percent of the staff. Economists and engineers each make up over 10 percent of the staff.

Domestic research began at RAND in the early 1960s and by 1970 was nearly 25 percent of RAND's work. In the late 1970s, concurrent with the reduction in RAND's Air Force work, it made up 50 percent of RAND's work. Since that time, it has declined as a percent of RAND's work, partially due to increases in RAND's other defense work, until by the late 1980s, its share returned to about 25 percent of RAND's work. At that level, RAND has the largest domestic policy analysis program of any not-for-profit firm (67,64,48).

RAND has ensured that its reports receive wide distribution. In the case of unclassified reports, RAND set up (in 1953) 40 public libraries as deposit libraries throughout the United States and seven repositories for its reports overseas (62).

Figure 1-8 shows the aggregate DoD and non-DoD expenditures for all of RAND, including the four FFRDCs and non-FFRDC expenditures in constant dollars.

**FIGURE 1-8: RAND Total Expenditures**  
(\$ millions in 1987 \$)



KEY: Arroyo = Arroyo Center; PAF = Project Air Force; NDR = National Defense Research Institute

SOURCE: RAND Corporation, 1995.

### ***Project Air Force***

Project RAND was at its largest in the late 1950s and early 1960s. The Air Force was just beginning to develop technological and systems analysis capabilities of its own; therefore, it depended more heavily on RAND for these functions.

In 1950, when RAND began expanding from its Project RAND contract, it established, at the suggestion of the Air Force, a smaller contract with the Atomic Energy Commission (68). RAND reached its peak employment in 1957 when it had 2,605 people. However, this included the significant training effort for the Air Defense Directorate that was later spun off to form the Systems Development Corporation. In 1959, it began work with ARPA and NASA. At that point, the Air Force announced that it intended to freeze its support of RAND at its current dollar level. In 1961 it added NSF and the National Institutes of Health to its clients.

RAND had also done work for OSD, jeopardizing the special relationship with its Air Force customer by doing work for the Air Force's superior. In particular, it developed the Program Planning

and Budgeting System to which Secretary of Defense McNamara made all the services conform. It was also at this time that OSD expanded and became more civilianized. RAND also did major projects for the Office of the Assistant Secretary of Defense for International Security Affairs. This office was not always on the best of terms with members of the Air Force.

As the decade continued, RAND worked for the U.S. Agency for International Development and the Defense Atomic Support Agency and received grants from other not-for-profit organizations to do studies in urban transportation, heuristic programming, and simulation of cognitive processes. Project RAND support shifted from being 95 percent of RAND's budget to 68 percent: RAND had over a dozen different clients. Parallel to the shift to a more diversified client base, RAND was forced to acquire all the functions of a large corporation. In 1951, with only two clients and almost all its work from the Project RAND contract, 51 percent of its staff were researchers. In 1963, the proportion of researchers in the organization had dropped to 40 percent, the rest being taken up with departmental and corporate support staff (68).

During the 1960s, the Air Force work declined by nearly 50 percent, but up until 1968 work with other agencies was able to keep the staff doing defense work at a stable level of approximately 450 professionals. After 1968, that work continued to drop until a nadir was reached from 1972 through 1974 of about 250 professionals involved in defense work (60). In 1975 Project RAND was renamed Project Air Force and set up as a separate FFRDC within the RAND Corporation. During this period, RAND's work in the domestic sector continued to expand until it constituted a program of nearly equivalent size.

During the 1960s and 1970s, RAND added a range of sponsors both within and outside of the DoD, including state and local governments and private foundations. Only later in its history did it sign contracts with the other services. One internal Air Force study in 1952 had declared that it was inappropriate for RAND to represent more than

one of the services because the three branches of the armed forces compete for budgets, facilities, and military responsibilities (68, p. 83), though of course today RAND's Arroyo Center is an Army-sponsored FFRDC.

Oversight of Project Air Force is conducted by a panel of senior civilian members of the Department of the Air Force and general officers. This panel determines the research priorities and the budget for Project Air Force. In 1993, this panel consisted of 11 general officers and two senior civilians. The RAND budget is primarily passed by Congress as a single line item in the Air Force budget. There is some direct funding of research. Project Air Force also provides some direct assistance to the Air Force. In FY 1993, direct assistance was estimated to cover about 20 percent of its work.

Since 1991, funding for Project Air Force has declined. In FY 1993, the funding supported 116 years of labor for professional staff, down from its usual 1980s level of approximately 140.

Project Air Force, after a 1992 reorganization, consists of seven major projects:

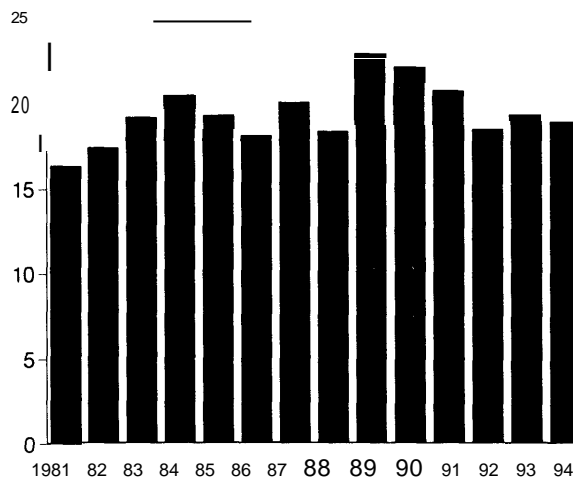
- strategy and doctrine,
- force structure,
- force modernization,
- force employment,
- command, control, communications, and intelligence (C<sup>3</sup>I)/space,
- logistics, and
- acquisition.

Figure 1-9 shows Project Air Force (PAF) funding in constant dollars.

### ***The Arroyo Center***

The Arroyo Center came to RAND in 1984 at the request of the Chief of Staff of the Army. The Arroyo Center had originally been established in the early 1980s within a NASA FFRDC, the California Institute of Technology's Jet Propulsion Laboratory (JPL). In 1984 the university, at the urging of its faculty, decided to divest itself of the Arroyo Center. RAND and the Army agreed that the research agenda pursued at JPL did not fully match

**FIGURE 1-9: Project Air Force Annual Funding**  
(\$ millions in 1987 \$)



SOURCE: RAND Corporation, 1995

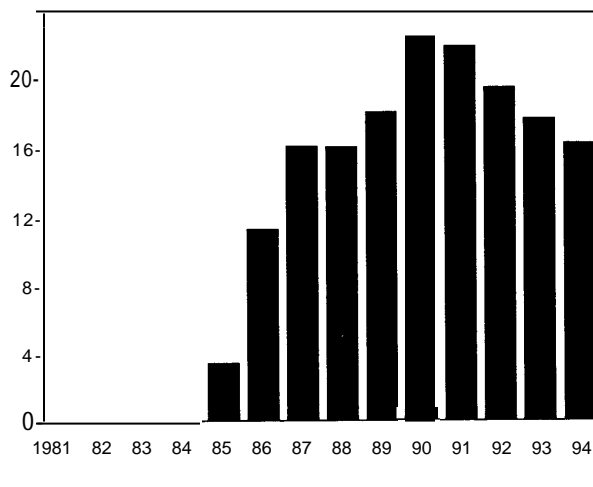
the Army's needs. Therefore anew agenda was developed, a new director was chosen, and only 13 employees made the transfer from the Center's old incarnation to its new one (23). Since its research was developing an emphasis on policy as opposed to technical matters, it was decided to locate the Center at RAND as a new FFRDC (61, p. 57).

The Center's purpose is to provide the Army with objective, independent analysis of medium- and long-term problems. The potential for objectivity is enhanced by having much of its funding as a separate line item within the DoD budget. The funding decisions are not made by all the same people within the Army that receive the studies. The Arroyo Center also receives a portion of its budget from individual agencies within the Army.

The annual allocation for the Arroyo Center's research is assigned to projects based on priorities set by the Arroyo Center Policy Committee, consisting in January 1994 of three senior civilian members of the Department of the Army and nine general officers from the various commands.

The work is managed within four programs: 1) Strategy and Doctrine, 2) Force Development and

**FIGURE 1-10 Arroyo Center Annual Funding**  
(\$ millions in 1987 \$)



SOURCE: RAND Corporation, 1995

Technology, 3) Military Logistics, and 4) Manpower and Training (8).

Figure 1-10 shows Arroyo's funding in constant dollars.

### ***The National Defense Research Institute***

The National Defense Research Institute (NDRI) was established in 1984 at RAND by amalgamating the various programs already being done at RAND for OSD, the Joint Staff and other defense agencies. It was established as a separate FFRDC to assemble all the work being done for DoD (as opposed to the Army and Air Force) into one independent organization. RAND had been working directly for OSD since the late 1950s.

NDRI serves the long-term analytic, planning and innovation needs of OSD, the Joint Staff, and other defense agencies. It is intended to fulfill the following objectives:

- to conduct a sustained research program,
- to establish a reservoir of expertise,
- to allow flexible response, and
- to provide unbiased analysis.

The research program for NDRI is established by a policy board consisting (in September 1992) of 11 senior DoD civilians, usually at the level of

an undersecretary and assistant secretary. They determine both the research program and the DoD budget request for NDRI. Additional funding for NDRI (usually about 30 percent of its budget) comes from the additional budget monies awarded to it, usually from the departments of its policy board members.

The NDRI is organized with four programs and a center. The programs are 1) International Security and Defense Strategy, 2) International Economic Policy, 3) Applied Science and Technology, and 4) Acquisition and Support Policy. The center is the Defense Manpower Research Center. The NDRI also does some limited independent research and operates some facilities jointly supported by all the RAND FFRDCs (Project Air Force, the Arroyo Center, and NDRI). NDRI researchers are drawn from the corporate staff at RAND (48).

Figure 1-11 shows NDRI's funding in constant dollars.

## **■ Laboratories**

### ***Lincoln Laboratory***

The Massachusetts Institute of Technology Lincoln Laboratory was established as a federal research center in 1951 at the joint request of the Air Force, Navy, and Army to conduct research in advanced electronics pertinent to national defense. In 1958, when ARPA was created, it also became a sponsor (75), although Air Force-related work continued to provide more than 50 percent the work of the laboratory. Non-DoD sponsorship currently amounts to 18 percent of staff and is limited by policy to 30 percent (30,40,75). Contracting is primarily done through the Air Force Systems Command, Electronics Systems Division. Until recently all programs were sponsored by federal agencies, but Cooperative Research and Development Agreements (CRADAs) are now permitted with industry, subject to federal government approval for pre-competitive technology transfer.

The mission of Lincoln Laboratory is to carry out a program of research and development pertinent to national defense, with particular emphasis



on advanced technology. The thrust of the Laboratory's activity is in the areas of surveillance, identification, and communication. Mission areas include ballistic missile defense, space surveillance, air defense, and communication (76).

MIT has management oversight and participates in mutual research activities with Lincoln Laboratory. MIT management provides general policy, financial accountability, and review of Laboratory activities. A DoD Joint Advisory Group reviews and approves the Laboratory program annually. Like many other university FFRDCs it is effectively an independent organization. MIT has never received a fee for the operation of Lincoln Laboratory. Student interaction is limited: the interns, graduate students, and visiting researchers from the university make up less than 5 percent of the staff (42). Currently the Laboratory employs 2,300 people with just under 800 principal members of the technical staff. Almost all hold advanced degrees in scientific and engineering fields (40).

Lincoln Laboratory particularly prides itself on technology transfer through having companies created by its former employees. These spin-offs include the MITRE Corporation, which currently runs two FFRDCs. Lincoln Laboratory also claims to have spun off more than 60 other companies that employ over 130,000 people nationwide, of which the largest is Digital Equipment Corporation (DEC), founded by two former employees of the Lincoln Laboratory in 1957. DEC employs just under 121,000 people worldwide (39,38,41).

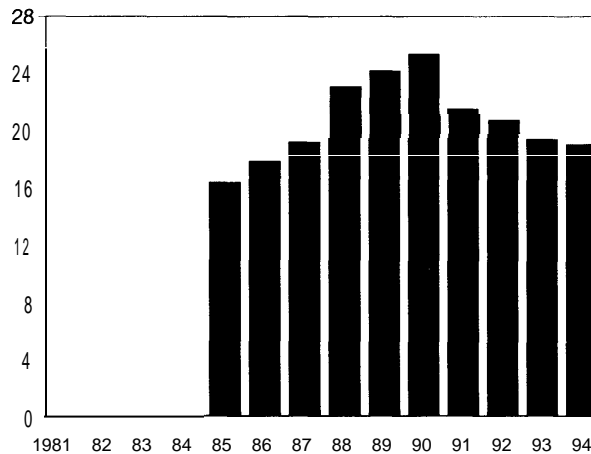
Figure 1-12 shows Lincoln Laboratory's total funding, including both DoD and non-DoD, in constant dollars.

Software Engineering Institute, Carnegie-Mellon University

The Software Engineering Institute (SEI) is sponsored by DoD through ARPA and administered by the Air Force. The SEI contract was competitively awarded to Carnegie-Mellon University in December 1984. It is staffed by approximately 270 technical and support people from industry, academia, and the federal government.

Software has become an increasingly critical component of U.S. defense systems. DoD

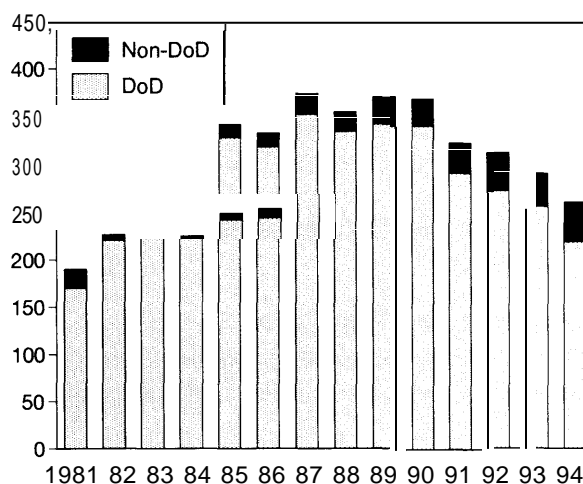
**FIGURE 1-11: National Defense Research Institute  
Annual Funding (\$ millions in 1987 \$)**



SOURCE: RAND Corporation, 1995

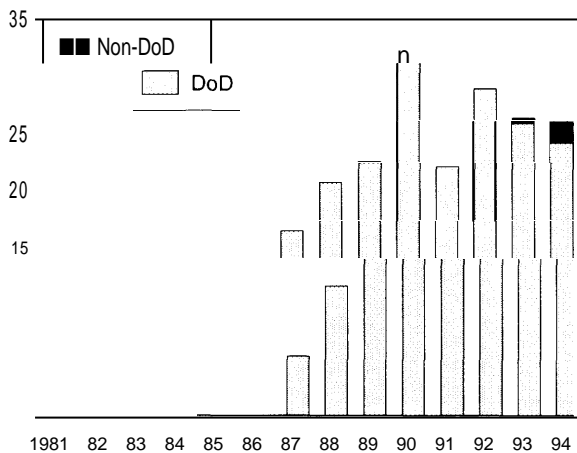
established the Software Engineering Institute with a charter to advance the practice of software engineering, so as to produce quality software on schedule and within budget. The SEI mission is to provide the means and leadership to bring the ablest professional minds and the most effective technology to bear on rapid improvement of the

**FIGURE 1-12: Lincoln Laboratory Annual Funding  
(\$ millions in 1987 \$)**



SOURCE: Lincoln Laboratory, 1995

**FIGURE 1-13: Software Engineering Institute  
Annual Funding (\$ millions in 1987 \$)**



SOURCE: Software Engineering Institute, 1995

quality of operational software in software intensive systems, accelerate the introduction to practice of modern software engineering technology, promulgate the use of this technology throughout the software community, and establish standards of excellence for improving software engineering practice.

In pursuit of its mission, SEI's fundamental emphasis is on technology transfer, and all efforts undertaken by SEI reflect this emphasis. SEI is also allowed to receive funding from other federal agencies for work consistent with its charter (70,69,72,36,71 ).<sup>11</sup> The non-DoD work constitutes less than 4 percent of its effort (30).

Figure 1-13 shows SEI's total funding, including both DoD and non-DoD, in constant dollars.

## ■ Engineering and Technical Direction Centers

### *The Aerospace Corporation*

The Aerospace Corporation is primarily involved in the Air Force space programs, including almost

all of its space launch and satellite programs. It was also involved in launch vehicles for Projects Mercury and Gemini, the one- and two-man space capsules and for NASA's Viking and Voyager programs. It was involved in the Ballistic Missile Program and in establishing the design of the Space Transportation System (the Shuttle) and in supporting Air Force activities that used that vehicle. Aerospace's role in space has been increased with the increased use of other launch vehicles since the Challenger disaster. It has been involved in the current major efforts of the Air Force including military communications satellites, weather satellites, early-warning satellites, the Global Positioning System (GPS), other National Security space systems, and ballistic missile defense.

In 1969, Secretary of Defense Melvin Laird encouraged Aerospace to increase work in nondefense programs, as DoD expected its funding of federal centers to be reduced: DoD wanted the civilian economy to benefit from some of the technology developed for military and space uses. Participation in domestic programs, including NASA, reached its peak in the early 1970s but never exceeded 20 percent of the company's business (2). It is currently less than 5 percent of its total effort (30).

Currently Aerospace has a staff of 3,100, almost two-thirds of whom are scientists and engineers. Of the technical staff, two-thirds hold advanced degrees and one-fourth have doctorates. Its gross revenue for 1993 was \$422 million. Its estimated revenue for FY 1994 is \$380 million (5, pp. 3,7). Aerospace carries out work for DoD, NASA, the Department of Transportation, the Environmental Protection Agency, and some foreign countries. Its primary customer is the Air Force Space and Missile Systems Center. By 1994, DoD funding in the face of stable military space budgets had declined 19 percent in real terms since 1990, but Aerospace is trying to expand by offer-

<sup>11</sup>The SEI charter states in part, "Systems developments are still typically plagued by schedule slippage and cost overruns. In addition, software intensive systems frequently fail due to poor quality and an inability to be rapidly modified to meet changing needs."

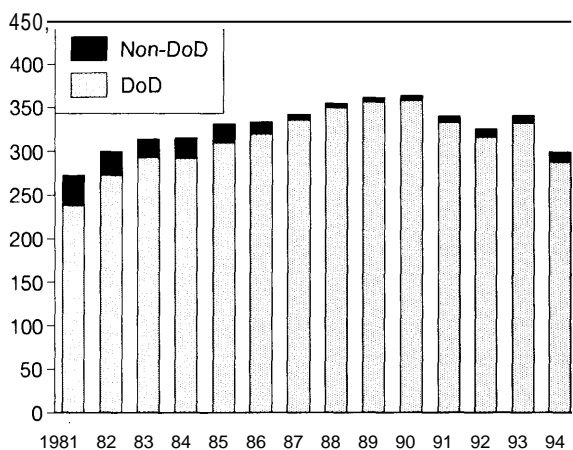
ing its expertise in space and environmental technology to other federal government agencies (3,2,5). Aerospace clearly prides itself on its 7-year record of 71 consecutive launches of launch vehicles developed with Aerospace Corporation technical oversight with no major failures, while commercial systems have an average of one failure every six launches (6, p.2; 4, p. 2; 5, pp.2,8).

Figure 1-14 shows Aerospace's funding, including both DoD and non-DoD, in constant dollars.

### The MITRE Corporation

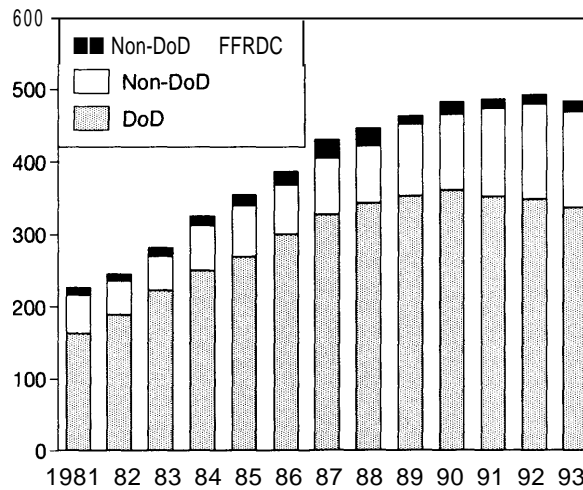
The MITRE Corporation operates two FFRDCs the DoD's C<sup>3</sup>I FFRDC and the Federal Aviation Administration's Center for Advanced Aviation System Development. It supports more than 50 additional clients, most of which are agencies of the federal government (notably the Federal Bureau of Investigation and the General Services Administration), or foreign, state, or local governments. No part of MITRE competes with service companies, manufactures products, or works for a supplier of information system components (47). In 1994, MITRE's overall revenues were almost \$600 million and its staff about 5,000, of whom about two-thirds were technical staff.

FIGURE 1-14: Aerospace Corporation Annual Funding (\$ millions in 1987 \$)



SOURCE: Aerospace Corporation, 1995,

FIGURE 1-15: MITRE Corporation Annual Funding (\$ millions in 1987 \$)



SOURCES: MITRE Corporation, 1995; President's Council of Economic Advisors, *Economic Report of the President*, Transmitted to the Congress (Washington, DC: US Government Printing Office, February 1994),

About three-fourths of MITRE's work in 1994 was performed by the C<sup>3</sup>I FFRDC, of which more than 90 percent was for the Department of Defense and about half was for the Air Force (67).

Originally, the entire MITRE Corporation was one FCRC, funded by the Air Force (44). MITRE is now organized into six centers. DoD's C<sup>3</sup>I FFRDC (sponsored by the Assistance Secretary of Defense (C<sup>3</sup>I)) is composed of three centers: the Center for Air Force systems, which performs Air Force C<sup>3</sup>I work; the Center for Integrated Intelligence Systems, which does work throughout the intelligence community; and the Washington C<sup>3</sup> Center, which works for the Army, Navy, Defense Information Systems Agency, and others. The Center for Advance Aviation System Development is the Federal Aviation Administration's FFRDC. The Center for Environment, Resources, and Space and the Center for Information Systems do non-FFRDC work, including some work for DoD that falls outside the C<sup>3</sup>I mission area (47).

Figure 1-15 shows MITRE's funding.