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Sandia National Laboratories: A Product of Postwar Readiness

1945 - 1950

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Cover photo: In February 1946, the Z Division technical area was situated amid a graveyard for battle-scarred and obsolete airplanes. The base was a maze of abandoned hangars, warehouses, garages, and temporary buildings, one of which had been transported from Wendover, Utah to be used for assembly operations. Early attempts at building the stockpile are visible in the foreground.

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Abstract

The genesis and growth of Sandia National Laboratories, the nation's largest nuclear weapons lab, stands as a pertinent case study showing the oftentimes complex, but effective interaction of government, industry, and the growth of cooperative research. Originally a part of Los Alamos Scientific Laboratory under management by the University of California, Sandia traces its roots to Z Division, an ordnance-engineering arm located at Sandia Base on the desert outskirts of Albuquerque, New Mexico, in September 1945. For Sandia National Laboratories, the early postwar years—rather than representing a transformation to peacetime—were characterized by a continued mobilization of engineering and science in the name of national readiness.

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Sandia Base, Albuquerque, New Mexico (February 1946): To facilitate efforts to enlarge the stockpile, Z Division was moved from Los Alamos to Sandia Base in September 1945. Oxnard Field and the original Albuquerque Airport are seen center and center-right, respectively.

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Genesis

Nearly a half century ago, the events leading to World War II resulted in the creation of the United States' nuclear weapons program. To activate this effort, the government organized a vast complex of special laboratories under the auspices of the Manhattan Engineer District. An offshoot of this effort, Sandia National Laboratories stands as a pertinent example of the oftentimes complex but effective interaction of government and industry, and the growth of cooperative research.

During the 1945–1950 period, national and international events, such as the Crossroads Operation, the Berlin Crisis, and detonation of the first Soviet atomic device convinced government and military leaders that the United States was in danger of losing its lead in the developing arms race. From this time forward, a symbiotic relationship between the United States and Russia would exist, namely, "the greater the perceived power and weaponry of the opponent, the greater the need to expand military production at home." Thus the organization known today as Sandia National Laboratories, although established to meet temporary needs, gained permanence as an integral part of an action-reaction cycle resulting from the need to promote national readiness.¹

Originally a part of Los Alamos Scientific Laboratory, managed by the University of California, Sandia began as a small engineering-production arm called "Z Division." The group was organized at Los Alamos, New Mexico in July 1945 and named after its first leader, Jerrold Zacharias.² Genesis of the division can be traced to Project Alberta, implemented by Los Alamos to integrate and coordinate all activities associated with combat delivery of the first atomic bomb.

As part of Project Alberta, a secret training and assembly operation had been set up on the salt flats near Wendover, Utah, in preparation for the bombing of Hiroshima and Nagasaki. With the end of the war in sight, it was felt that a plan for the continued production and assembly of atomic weapons should be continued at a site closer to Los Alamos. Robert Oppenheimer, Director of Los Alamos Laboratory, explained the rationale for this decision: "We wished to make provision for the continuation of weapons development, especially in its non-nuclear aspects, at a site convenient to Los Alamos—as Wendover was not—and immediately accessible to aircraft and air strips."³

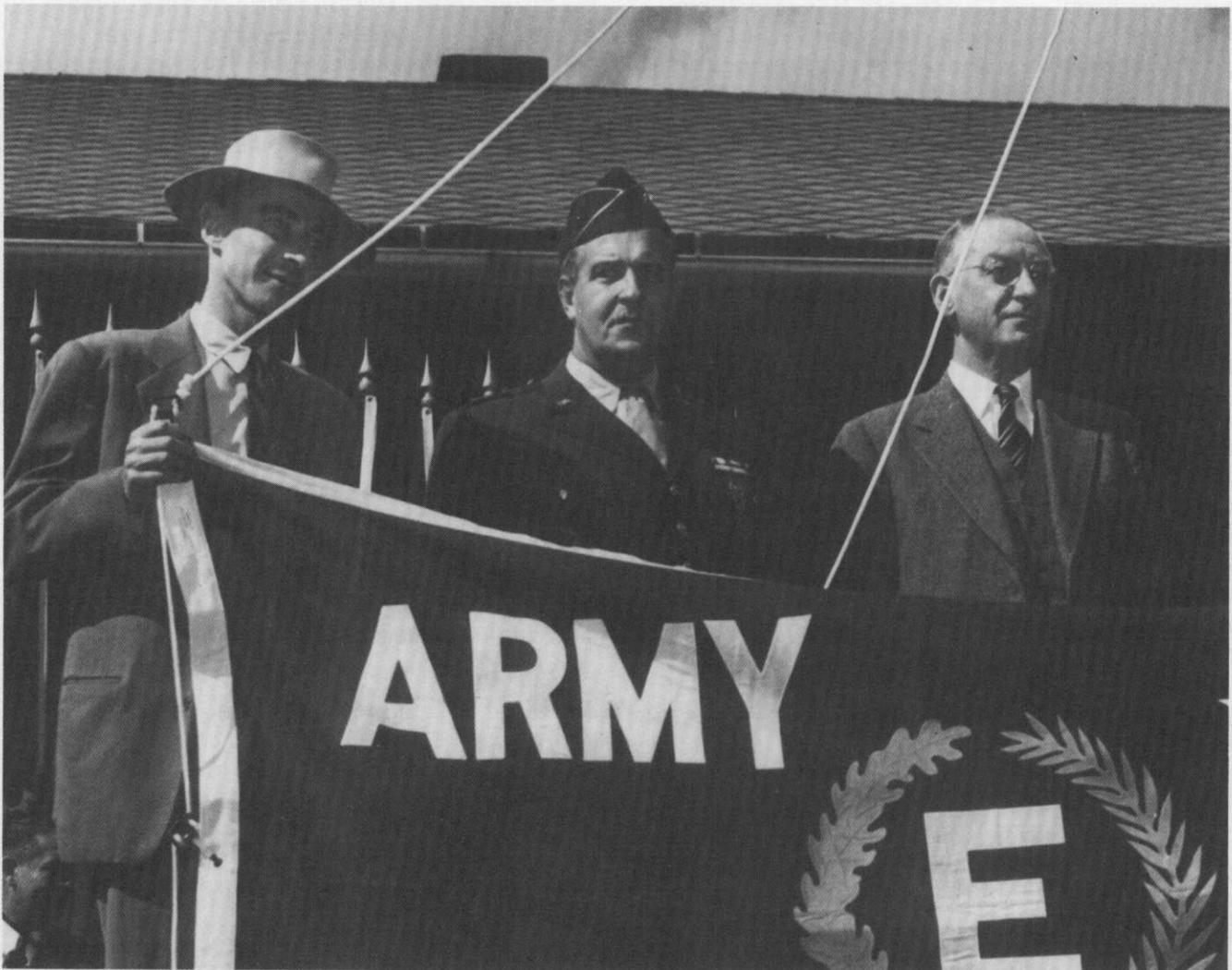
Oppenheimer also had more mundane reasons for his decision. Los Alamos—never a comfortable settlement at best—by June of 1945 was bursting at the seams.⁴ "It was our belief," Oppenheimer wrote, "that any major enlargement of activities there would not be practical; and that it was important to make the non-nuclear side of things easily accessible to members of the military services."⁵

General Leslie Groves, head of the Manhattan Engineer District, concurred: "It was simply impossible to keep on increasing the activities at Los Alamos," he said. "Relief was essential." Furthermore, Groves preferred to "separate, physically, production and production engineering from research and development."⁶

Among other considerations were the costs, difficulties, and time delays involved in transporting materials and equipment up to the mountain top laboratory and the finished product back down to embarkation points. Yet the new branch was not viewed as a permanent solution—especially by the

University of California management. According to Robert M. Underhill, Secretary and Treasurer of the Board of Regents, Z Division was "never to have more than five or six people down there to help the army with technical details of the installations."⁷ How and why this situation changed had been suggested by Oppenheimer when he expressed concern over the continued development and assembly of weapons—i.e., national readiness—a concern echoed by other officials who realized that the United States' monopoly of the atomic bomb could not be maintained.

The site selected for the new production facility was the old Oxnard Air Field located conveniently close to the larger Kirtland Air Base. Situated some ninety miles south of Los Alamos on the desert outskirts of Albuquerque, New Mexico, the motley collection of tarpaper structures and temporary buildings at the base of the Sandia Mountains became the new home of Z Division. By the end of September 1945, the first contingent, Procurement and Storage, had made the move, although all sections would not be consolidated in Albuquerque until January 1947.⁸



The decision-making of Robert Oppenheimer, General Leslie Groves, and Robert Sproul, President of the University of California, shown here during post-WWII ceremonies at Los Alamos, influenced the future of the ordnance and assembly facility known as Z Division. (Photo courtesy Los Alamos National Laboratory)

Z DIVISION

September 1945

Jerrold Rheinach Zacharias, Leader

Z-1—Experimental Systems, Norris E. Bradbury

**Z-1A—Airborne Testing, Dale R. Corson
Glenn A. Fowler (Alternate)**

**Z-1B—Informers (Telemetry), Jerome B. Wiesner
B. Wright (Alternate)**

**Z-1C—Coordination with Using Services,
Glenn A. Fowler**

**Z-2—Assembly Factory, Colonel Lyle E. Seeman
Roger S. Warner, Jr., Deputy**

**Z-2A—Procurement, Storage, and Shipment,
Colonel Robert W. Lockridge
Major Parker (Alternate)**

**Z-2B—Production Schedules, Manuals
Roger S. Warner, Jr.**

**Z-3—Firing Circuits, Lewis Fussell, Jr.
Commander Stevenson; Earl Thomas (Alternates)**

**Z-4—Mechanical Engineering, Robert W. Henderson
Richard A. Bice (Alternate)
Frank Oppenheimer (Coordinator for Redesign)**

**Z-5—Electronic Engineering, Robert B. Brode
R. B. Doll (Alternate)**

The Impact of Crossroads

During the first year of the division's existence, the Crossroads Operation, designed to test the effects of the atomic bomb on ships at sea, took place off the Pacific island of Bikini. As the stronghold for Los Alamos assembly operations, Z Division became a major source of personnel for the overseas effort. Assignment of the Assembly Group made the most serious impact, although the Telemetry, Fuzing and Firing groups all suffered severe depletions of manpower.⁹

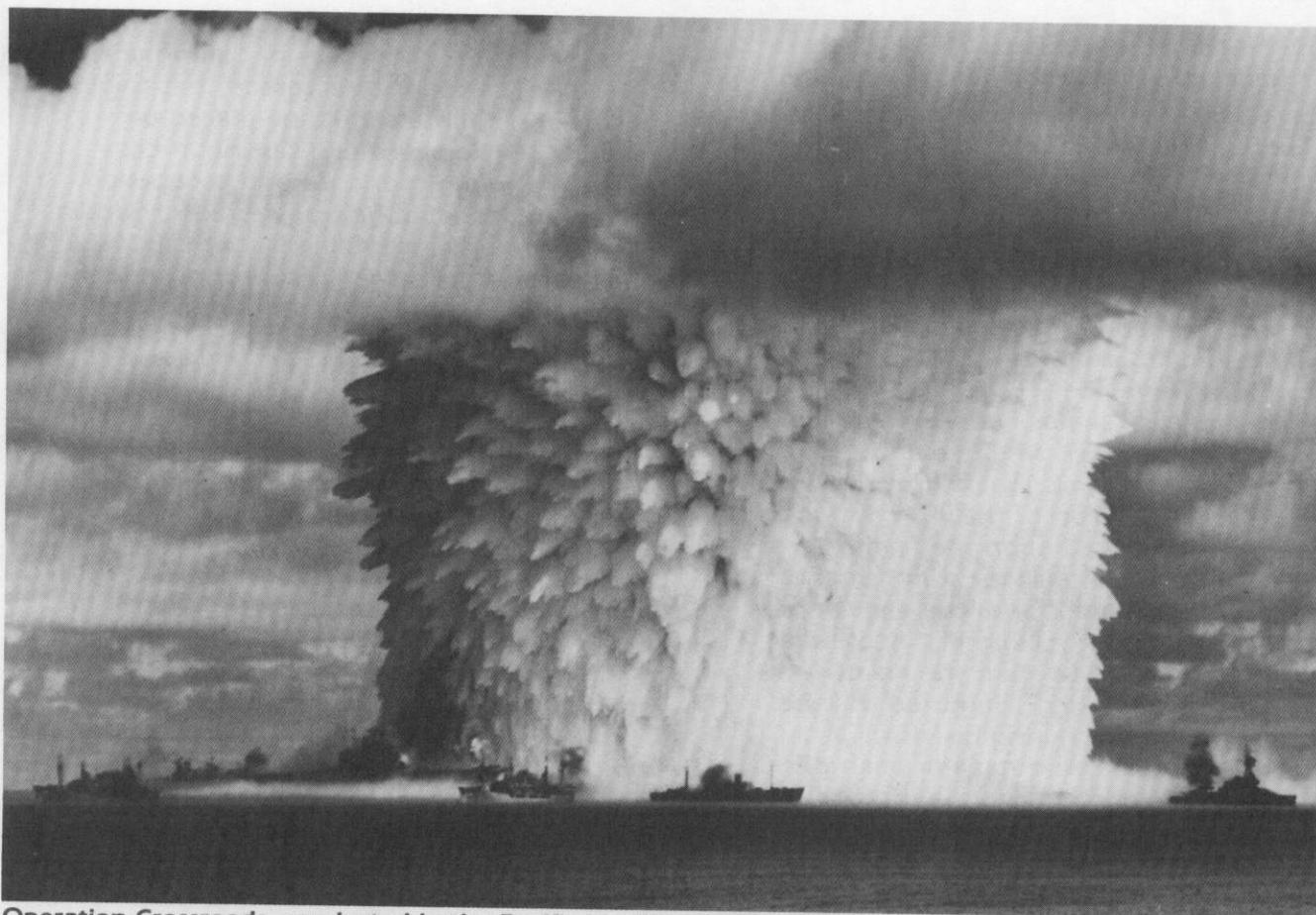
Yet, Crossroads had a positive as well as negative impact on the new division. As the Test Evaluation Board for the Bikini

Operation concluded in its final report to President Harry Truman:

One enduring principle of war has not been altered by the advent of the atomic weapon. . . . Offensive strength will remain the best defense. . . . So long as atomic bombs could conceivably be used against this country, the Board urges the continued production of atomic material and research and development in all fields related to atomic warfare.¹⁰



Members of the Z-Division Assembly Group take a break during testing activities at Operation Crossroads. Roger S. Warner, Jr., who became Acting Z-Division Leader in October 1945, stands on the left. Glenn A. Fowler, in cap (center-right), was in charge of the group who conducted the first flight tests at the Los Lunas Test Range near Albuquerque. Among other Z-Division members are Art Machen (helmet-center) and Ira D. Hamilton (front-right).



Operation Crossroads, conducted in the Pacific in 1946, determined the impact of the atomic bomb on ships at sea and served as a mandate for continuation of production efforts at the national laboratories. Above, the underwater detonation, known as "Baker," forces water skyward in a feathery column as steam vapor is released from the cloud above.

The Crossroads Operation, therefore, served as a mandate for continuation of postwar reconstruction and production efforts at the national laboratories—a *modus operandi* considered to be essential if the United States was to retain its leadership role in the atomic energy arena. This realization, enhanced by the Soviet's unwillingness to accept the Baruch Plan for international control of atomic energy and the development of Cold War tensions, led to increased emphasis on readiness and concern over the nation's stockpile.¹¹

Throughout 1946, for example, General Groves worked actively to expand the national laboratories concept. The Advisory Committee on Research and Development supported the idea, advocating that laboratories under university management be established to pursue unclassified fundamental research while remote federal installations be used for more hazardous enterprises. The Research and Development Committee envisioned these laboratories as the means by which government funds could be channeled to nourish nuclear research and development.

Assessing the Stockpile

A series of visits to the laboratories in 1946 and 1947 caused Washington officials increasing concern over the status of the stockpile—a concern that resulted in transformation of Z Division into an integral facet of the nation's nuclear weapons complex. Initial visitors were the new AEC commissioners, who felt that their first order of business should be to inspect the collection of plants and laboratories inherited from the military. On November 16, 1946, after an all-day flight to Los Alamos, where they received a briefing on weapons research and production, the commissioners drove to Sandia Base. Chairman of the AEC, David E. Lillenthal, commented upon the "rather somber but highly intelligent scientists" he had met at Los Alamos and "the alert and handsome young West Pointers" at Sandia who seemed "eager to learn the art of putting things together." He noted that he "learned quite a lot" during his visit, particularly about "what has *not* been done in the way of planning, coordination, and the like."¹²

Six weeks later, in early January 1947, commissioner Robert F. Bacher also visited Los Alamos with the objective of assessing the nation's stockpile. His report, presented to a meeting of the General Advisory Committee (GAC), three commissioners, and several members of the Military Liaison Committee on February 1, 1947, gave those present a better—if more depressing—view of the state of the nation's nuclear arsenal.

Among the topics of discussion at the GAC meeting was the future of the weapons laboratory at Los Alamos, including Z Division at Sandia Base. There was talk of moving Los Alamos from its isolated location. Before the meeting adjourned, however, committee members agreed that Los Alamos should be revitalized and weapons research accelerated, particularly in view of the failure of various disarmament plans in United Nations negotiations.

On the weekend of March 28th, at the next meeting of the General Advisory Committee, the Commission's general manager, Carroll Wilson, announced that he

had extended the laboratory's management contract with the University of California to July 1948. The committee agreed that the number one priority should be placed on weapons development and testing at Los Alamos, although ordnance and production, they decided, should be transferred to Sandia under conditions acceptable to both the AEC and the military. Further decisions on a "new course for weapon production" would be delayed until after the committee got a "firsthand view of the situation."¹³

To obtain this firsthand view, Chairman of the GAC Robert Oppenheimer, accompanied by the Weapon's Subcommittee, also made a tour to assess the nation's weapons production complex. At Los Alamos, Oppenheimer's successor, Director Norris Bradbury, anticipated their concerns with a comprehensive report. He commented on the implosion and gun-type weapons, recent improvements made by the Los Alamos scientists, and stressed that it would be essential to test stockpile models as well as new models under development. The Weapons Subcommittee came away convinced of the need for another scientific test of the atomic bomb in the spring of 1948.¹⁴

On April 4, before returning to Washington, Oppenheimer's group stopped at Sandia Base. The facility was far from impressive. Among the few buildings was a quonset hut, brought from Wendover to house assembly operations. There, Sandia technicians sorted weapon components from the wartime project, tested new ones, and transferred them to the ordnance section at Kirtland where high-explosive charges would be added when available. Completed weapons were to be stored in igloos located in an arroyo south of the runways.

As AEC historians Richard G. Hewlett and Francis Duncan wrote: "To realize that the nation's vaunted power to wage nuclear war rested on this slender reed must have been a sobering experience." Although the visitors admitted that they saw "clear signs of initiative, enterprise, and even enthusiasm,"

this was not enough to dispell their concern about weapon production and the state of the atomic arsenal.¹⁵ Overall, according to Lilienthal:

The result of these inspections was a shock. The substantial stockpile of atom bombs we and the top military assumed was there, in readiness, did not exist. Furthermore, the production facilities that might enable us to produce quantities of atomic weapons and weapons so engineered that they would not continue to require a Ph.D. in physics to handle them in the field, likewise did not exist. No quantity production of weapons was possible under the existing handicraft setup.¹⁶

On April 16, 1947, Lilienthal briefed Truman on the actual number of bombs in stockpile. The President was also shocked. Of particular concern was the lack of high-explosive castings and initiators. As Bradbury

had indicated in his report to the commissioners: "The rate of stockpile attainment," he said, "is determined by the rate of metal fabrication at Los Alamos, by the rate of HE charge production at NOTS [Naval Ordnance Test Station], Inyokern, California, and by the rate of initiator production currently being carried out at Los Alamos."¹⁷

The Manley Evaluation

At Sandia, Bradbury's Z-Division personnel operated largely upon their own initiative and with little direction from the hill. An engineering group supervised production of mechanical mock-ups of standard weapon stockpile models; Military Liaison trained officers in assembly, developed standardized handling and test equipment, and documented new technology in military manuals, while Field Test personnel conducted tests on new weapon models at Salton Sea. Despite the activity, the ordnance branch was still a long way from production-line status.



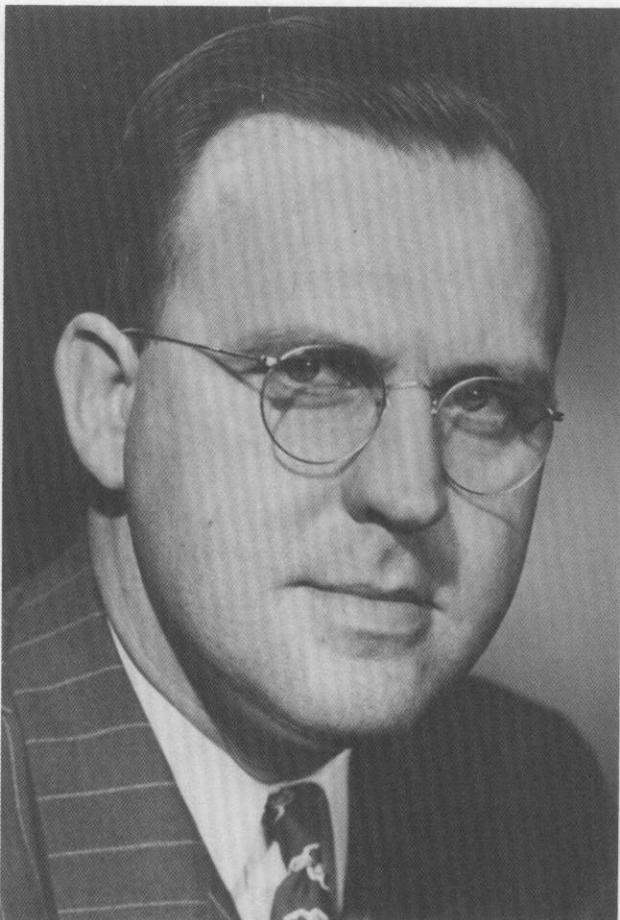
Members of the GAC pause outside their airplane at the Santa Fe airport on April 3, 1947 before heading on to Los Alamos and one day later to Sandia. Included in the tour (left to right) were James B. Conant, Robert Oppenheimer, General James McCormack, Hartley Rowe, John H. Manley (Executive Secretary of the GAC), Isidore I. Rabi, and Roger S. Warner. (Photo courtesy Los Alamos National Laboratory)



Los Alamos Director Norris E. Bradbury (above-center) confers with civilian and military leaders in the first Atomic Energy Commission/Sandia headquarters building 818. Of unusual design, the E-shaped building (below) had three corridors with a connecting hall. The AEC manager and staff occupied the northwest corner and west wing, and Sandia management and staff were in the northeast corner and east wing. Plant Services was located in the center.



In its original configuration, Z Division included five branches. Group leader Jerrold Zacharias left shortly after the move to Albuquerque began and was succeeded by Roger Warner. When Warner also left in November 1946 to become Director of Engineering for the AEC, Robert W. Henderson agreed to assume temporarily the difficult task of trying to rebuild the nation's nuclear arm during the transition period. Before the end of 1947, however, Bradbury realized that "a man of considerable prestige" would be needed to provide the necessary strong leadership. In retrospect, Bradbury explained that this decision did not reflect on Henderson, "who is very capable."¹⁸



Robert W. Henderson, remembered for his significant engineering contributions, served as Acting Z-Division Leader from 1946 to 1947.

In November 1947—almost a year since the first inspection tour—Z Division at Sandia Base again came under the scrutiny of the GAC, which requested that physicist John H. Manley of the Weapons Subcommittee conduct a special evaluation. Manley supported Bradbury's contention regarding the need for strong leadership. From conversations with Los Alamos officials and members of the Armed Forces Special Weapons Project (AFSWP), a technical liaison group formed July 8, 1947, he reported that the problems of Z Division were

very much a reflection of difficulties experienced at all other AEC installations—these difficulties arising from the loss of key personnel, lack of overall policy since the close of the war, security restrictions, inadequacy of physical plant, and cumbersome personnel and procurement policies.¹⁹

The flux of personnel, Manley felt, was a more serious problem than one might think. In his opinion, the result of having "different people with different concepts introducing different perturbations that might last beyond a person's tenure would be a lack of standardization of components and manuals and the eventual retardation of development programs." Manley also suggested a more careful criterion for selection of AFSWP assembly personnel. Although impressed by their intelligence, he observed that they lacked the necessary manual skills or electrical-mechanical sense. Finally, he advocated a careful evaluation of the organizational structure at Z Division, which he still considered to be a "shoestring operation."²⁰

Yet, the most basic problem, as Lilienthal and the commissioners acknowledged, was to redesign the bomb into a genuine field weapon. To do this, they agreed, "would require industrial experience and scientific experts with experience in dealing with industrial problems." What they needed, Lilienthal said, was "not something that could be done in a laboratory alone, but in a production center, with . . . factory management." They realized, too, the need for technical experience in dealing with

weapon systems and weapon development: what they envisioned was a "team working together as a unit."²¹

At Sandia, the Commission had the semblance of a team, in fact, the only team with assembly expertise. Z-Division personnel had the technical experience, but they lacked an effective organizational structure and a functioning production center. To meet these deficiencies, the AEC took a series of major steps involving the interaction of government and industry, and the development of cooperative research.

The AEC and Norris Bradbury first attacked the leadership and organizational aspects of the problem. The "prestigious" leader selected—Paul J. Larsen—was an outstanding individual from the Applied Physics Laboratory at Johns Hopkins. Larsen arrived in December 1947 to serve as director and soon launched a number of successful campaigns, including a major building program and increases in personnel and funding. By mid-1948, Sandia had grown to approximately 1000 employees. Larsen also improved cooperation with the military by acting on a suggestion made by AEC General Manager, Carroll Wilson, to establish a Joint Research and Development Board comprised of three civilians from Z Division and three officers from the military. Sandia interfaces with Los Alamos were facilitated by revision of the operations plan for the AFSWP and by establishment of the TX-5 Steering Committee, which coordinated Los Alamos research on nuclear portions of the weapon with ordnance support from Sandia.²²

Z Division Becomes A Separate Branch

On April 1, 1948, in an attempt to solve organizational problems, Z Division was declared a separate branch of Los Alamos. This action was supported by University of California personnel who were beginning to have increasing qualms about involvement of an academic institution in ordnance activities during peacetime. General James McCormack of the AEC had his own concerns. He believed that an industrial firm could better

manage the growing production activity at Sandia and better administer the large budget.

As a result of the April reorganization, Sandia began to operate more and more independently. As Larsen pointed out to Santa Fe Operations Manager, C. L. Tyler, the only administrative tie-in with the University of California was through fiscal and legal channels, although the "highest degree of technical liaison" existed between Sandia and Los Alamos.²³

At the time of reorganization, a Department of Applied Physics was formally constituted at Sandia, adding a research emphasis to the engineering, production, stockpiling, surveillance, and training aspects of the mission. Established with the long-range objective of improving the design and effectiveness of atomic weapons, the Applied Physics department required additional space for test and handling equipment and was therefore responsible to a degree for the laboratory's expansion.²⁴



Paul J. Larsen was Director Sandia Branch, Los Alamos Scientific Laboratory from December 4, 1947 to October 31, 1948.

Emphasis on "Road"

The early focal point of the Lab, however, remained on production, code-named "Road" because of the secrecy surrounding Sandia's assembly and stockpiling tasks. The name was appropriate because most of the weapons were transported via "Road" to storage sites. There was also the connotation of "Let's get the show on the road."²⁵ Meanwhile, on the world scene, tensions were increasing between the United States and the Soviet Union.

On March 12, 1947, Truman had called for emergency measures to bolster Greece and Turkey against Communist subversion, and on May 31, the USSR ordered inspection of all military trains moving from West Germany to Berlin. The following March 1948, Jan Masaryk, the Czechoslovakian foreign minister, became the victim of an alleged suicide. By June the USSR had blockaded Berlin.²⁶ Such aggressive actions further focussed the attention of US policy planners on the readiness problem.

At Sandia, with organizational and personnel problems under control, the AEC addressed the production issue—how to convert from a handcraft job shop arrangement to a more effective factory production mode. It soon became apparent that a separate weapons manufacturing facility would be desirable—partly to meet the need for ever higher production quantities, and partly to prepare for the eventual divorce of production responsibilities from Sandia proper.

The Bendix Aviation Corporation, in a project known as "Royal," was requested to take over production phases of the Sandia operation, thereby relieving the University of California of production responsibility under its contract. This move prompted the regents to unanimously request release from administrative duties as well, although it was suggested that the University of California retain control over research and development. Study showed, however, that

these basic activities were "inseparable along any clean line, and that any attempted separation would be impracticable [sic] and technically unsound." As Larsen explained, "Close technical coordination must exist between weapon research and development, the ensuing production engineering phase and the production and final acceptance of the end products, to insure that they meet the original required and planned specifications."²⁷ On the premise that the AEC desired to centralize continuous responsibility for quality and performance of weapons in the organization that originated development, Larsen strongly objected to separation of research and development from production.

In this respect, the results of the Sandstone tests in the Pacific in 1948 were significant. The operation gave the Lab a sense of mission that had a unifying effect on personnel; furthermore, the tests were so successful in verifying the design of the new Mk 4 bomb that priority production of components for the new model superseded the completion of current stockpile items. With the Mk 4, the era of handcrafted weapons had passed. Mass production of components and assembly line techniques became the order of the day.

The Integrated Contractor Complex

The Economy Act of 1932 established the original legal guidelines and restraints pertaining to cooperation between government and industry, although provisions of the act were not converted into formal policy by Bureau of the Budget Bulletin No 60-2 until 1959.²⁸ Nevertheless, using the Manhattan Engineer District as a model, the AEC in 1947 began the process of setting up a complex of integrated contractors to produce the various components, high-explosive castings, and pit materials for nuclear weapons.

THE INTEGRATED CONTRACTOR COMPLEX

1947-1958

CONTRACTOR	PLANT LOCATION	ESTABLISHED	PRINCIPAL MISSIONS
UNION CARBIDE (Replaced by Martin Marietta Energy Systems in 1983)	Y-12 Plant Oak Ridge, TN	1947	Production of test and stockpile assemblies; fabrication of heavy case parts; fabrication and research in uranium; machining.
MASON & HANGER (Silas Mason Co, Inc)	Burlington Plant Burlington, IA (Consolidated with Pantex July 1975)	1947	Fabrication of chemical explosives and assembly of nonnuclear components; final assembly.
MONSANTO RESEARCH CORPORATION	Mound Facility Miamisburg, OH	1948	Fabrication of small HE units, explosive components such as detonators, timers, transducers, firesets, and pellets; pyrotechnic devices; responsible for stockpile sampling on boost systems.
BENDIX, KC (Acquired by Allied in 1983)	Kansas City, MO	1949	Fabrication and assembly of complex electromechanical and precision mechanical devices, rubber, plastics, and nonnuclear components; heavy machining; electronic systems.
DOW CHEMICAL (Replaced by Rockwell International in 1975; currently Atomics International)	Rocky Flats Golden, CO	1951	Fabrication of beryllium, plutonium and uranium alloy; plutonium recovery and research; fabrication of pressure vessels—e.g., boosting systems.
MASON & HANGER	Pantex Plant Amarillo, TX	1951	Production of large HE units; assembly of final product; heavy machining; preparation for shipment to the military; disassembly and retirement of weapons.
AMERICAN CAR & FOUNDRY (ACF Industries)	Albuquerque, NM	1952	Machining of case parts for the thermonuclear bomb.
DuPONT COMPANY	Savannah River Plant Aiken, SC	1953	Production of tritium and plutonium.
GENERAL ELECTRIC COMPANY (GEND)	Pinellas Plant Largo, FL	1958	Production of neutron generators, thermal batteries, RTGs, lightning arrestor connectors, capacitors, neutron detectors.

Simultaneously, the Y-12 Plant at Oak Ridge, Tennessee—originally operated by Union Carbide and currently by Martin Marietta—was contracted to fabricate test and stockpile assemblies and to conduct research in uranium. The Burlington Plant, also established in 1947, and managed by Mason & Hanger, fabricated and assembled complex electromechanical devices, rubber, plastics, and non-nuclear components. The following year, in 1948, the Mound Facility at Miamisburg, Ohio, was in operation under management of the Monsanto Corporation. There, small HE units, explosive components, pyrotechnic devices and nuclear arming baskets were produced. During the fifties, four more plants were established under the direction of industrial contractors. Among these was the Pantex Plant at Amarillo, Texas, where components from the entire complex were assembled into completed weapons ready for military use and eventually returned for disassembly and retirement.²⁹

Through this system of integrated contractors, Sandia's products—largely designs and prototypes—were converted into military hardware. Within ten years, Sandia had been transformed from a factory-style ordnance facility to a research and development lab working closely with industry.

The budget reflects this transition. In FY51, the total operating budget was \$62 M, split about 50-50 between Weapons Production and Research and Development. This relatively high production emphasis continued through FY56. Beginning in FY57, and thereafter, R&D and test activities took an ever-increasing portion of Sandia's budgeted resources, with production budgets generally showing corresponding decreases.³⁰ Similarly, between 1947 and 1958, the integrated contractor complex grew to include nine plant facilities and was to have a significant impact on the American economy, the success of Sandia Corporation, and the growth of the nation's stockpile.³¹

In the postwar period, the effectiveness of the Sandia-AEC-Military-Contractor interaction is shown in the increase in the

number of bombs in the nuclear arsenal. In June 1947, the United States was still producing fewer than one atomic bomb every two months. One year later, in June 1948, there were "50 implosion type nuclear cores and 53 Mk 3 assemblies available." Although information on stockpile numbers beyond 1948 remains classified, documents from the Joint Chiefs of Staff at the National Archives make some general estimates publishable. In 1947, for example, the Joint Chiefs had established as their first production goal 400 bombs in stockpile by January 1, 1951. A May 1949 report noted that the AEC fully expected to meet that goal. Spurred on by Russia's detonation of an atomic bomb in 1949, the hydrogen bomb in 1953, and the outbreak of the Korean War in June 1950, US nuclear weapons production reached its peak between 1955-1967.³² While the impetus for this accomplishment originated in immediate postwar concerns, the wherewithal to meet readiness goals had been provided to a considerable degree by the successful activation of the Sandia ordnance branch of Los Alamos.

Changeover to Industrial Management

By 1948, Sandia operations had expanded beyond the purview of a purely academic institution; its parent organization, Los Alamos was also being scrutinized by the University of California management and the AEC. The university had never been pleased with the de facto, but informal, extension of its contract with Los Alamos to manage the ordnance activity at Sandia Base. Robert Underhill expressed these feelings explicitly as early as June of 1947 in a letter to Bradbury. "This whole Sandia matter," Underhill said, "is one that seems to have gotten out of hand," explaining that the University could not "protect its or the government's interests at branch stations."³³

Fellow regents agreed, maintaining that University of California activities at Sandia should be limited to research and development, that in fact it was not proper for the university to be associated with the ordnance aspects of weapons production. In addition, Bradbury candidly expressed personal concern over his ability to handle effectively the responsibilities relating to Sandia. "Much of this concern comes from administrative responsibility and the strong feeling that I actually contribute very little to the technical direction of the Sandia activities," he said. "This comes from my preoccupation with Los Alamos problems, our geographic separation from Sandia, and from our lack of appropriate engineering background."³⁴

Scientists making up the Technical Board at Los Alamos also favored breaking ties with Sandia. The conclusion was that "the best interests of government would be served" and the operation strengthened by bringing to it "engineering experience and . . . commercial administration which the University is . . . not equipped to provide."³⁵ Subsequently, the University of California formally requested separation as of July 1, 1949, "or sooner."³⁶

In the interim, Sandia Director Paul J. Larsen submitted to the AEC a proposal to form a New Mexico state corporation to operate Sandia Laboratory as a non-profit institution. Rather than accept this proposal verbatim, the AEC began a careful study to determine the true state of affairs at the two labs and to evaluate the feasibility of placing Sandia under industrial management.³⁷ Mervin Kelly, Executive Vice-President of Bell Laboratories, was retained by the AEC to conduct the evaluation.

During March and April, Kelly spent considerable time analyzing all the scientific, industrial, and managerial phases of the operations at both labs. Ultimately, Kelly reported that Los Alamos was "the best government lab he knew of from the points of view of scientific capacity, spirit, and sense of the job to be done." Sandia, on the other

hand—despite the progress made in the development of the Mk 4—would be more effectively operated as a production-type organization under industrial management.³⁸

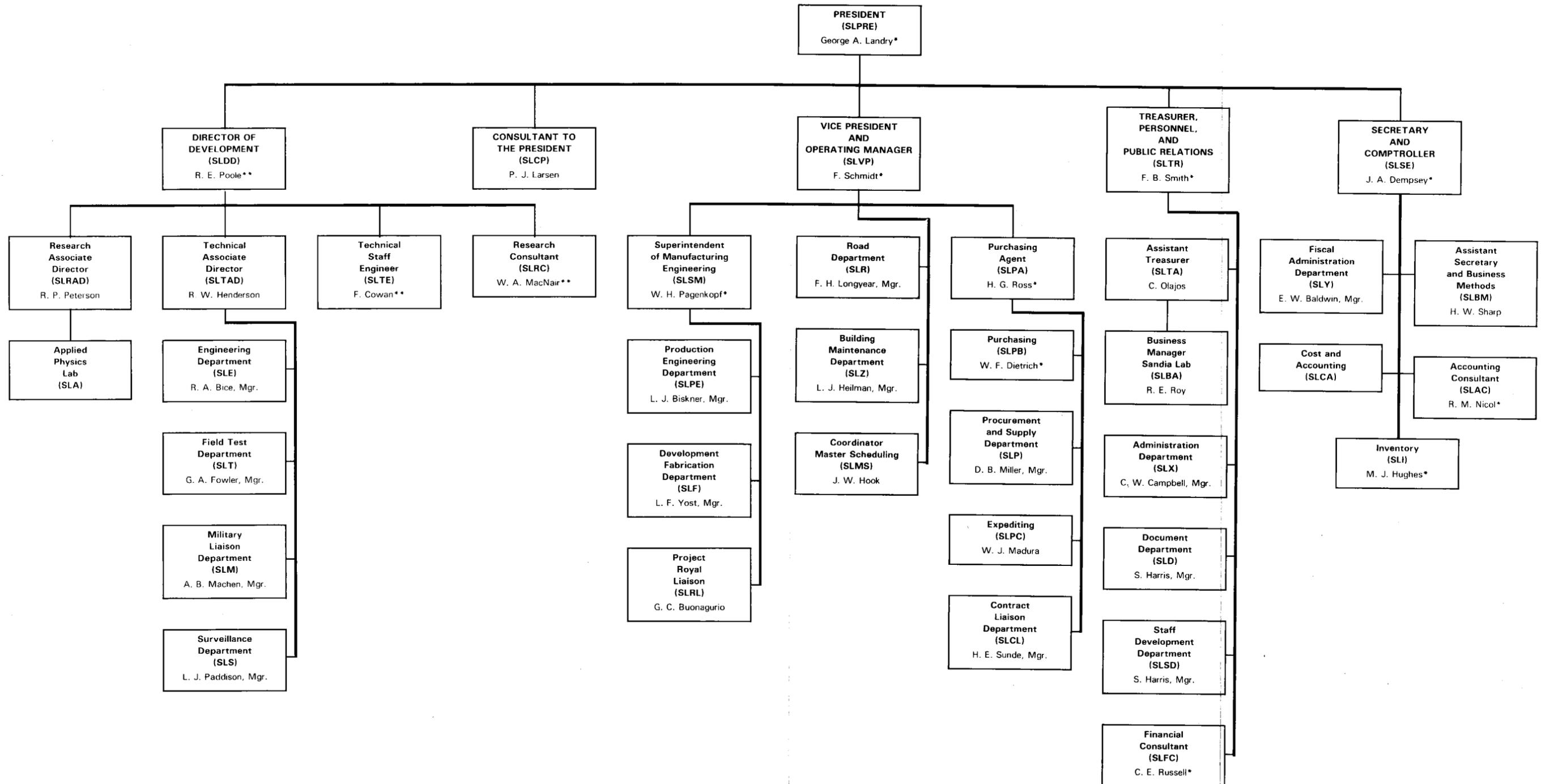
Although several organizations were considered initially, Lillenthal, as spokesman for the AEC, and representatives of the military recommended to President Truman that the Bell System assume the task. On May 13, 1949, Truman dispatched a letter to Leroy Wilson, President of American Telephone and Telegraph, asking that the organization assume managerial responsibility for Sandia—a task the president considered to be "an opportunity to render an exceptional service in the national interest." On July 1, 1949, Wilson indicated that its manufacturing subsidiary, Western Electric, Inc., would accept the management role. Because of a pending antitrust suit, however, Wilson insisted that the operation should be administered on a no-profit, no-fee basis.³⁹

The central theme of the contract—specifically, that the operation be run on the basis of "good industrial practice"—is simple and straightforward. On November 1, 1949, the official change from academic to industrial management occurred. A press release issued in July 1949 succinctly explained to the public a part of the rationale for transfer; namely, the growth of the Laboratory which, according to the announcement, "has been the result of the Commission's effort to integrate research, development and production activities in accordance with the best academic and industrial practice and with the most competent available supervision in each technical area."⁴⁰ What the press release did not mention, however, was that the change in management also signified the Commission's recognition of Sandia as an integral part of the defense complex and the overriding desire to ensure its continued success.

Thus, for Sandia National Laboratories, the early postwar years—rather than representing a transformation to peacetime—were characterized by a continued mobilization of science in the name of national readiness.

Organization of Sandia Corporation

November 1, 1949



*Western Electric Personnel
**Bell Telephone Laboratories Personnel

Endnotes

1. See Rone Tempest, "Kremlin System Looks Familiar," *Los Alamos Times*, 10 July 1983, Part IV, for discussion of the Russian Military-Industrial Complex. Herb York and G. Allen Greb in "Military Research and Development: A Postwar History," *Bulletin of Atomic Scientists* (January 1977), p. 13, support the idea that major events taking place within the Soviet bloc "elicited long-lasting programmatic and organizational responses on the U. S. side." The authors contend, therefore, that the "so-called 'action-reaction cycle' has, on the largest scale at least, played a fundamental role in determining the course of events."

2. Memo for record, Subject: "Z Division—Ordnance Engineering," N. A., July 1945, Sandia National Laboratories Archives, Albuquerque (hereinafter cited as SNL Archives).

3. Robert Oppenheimer to F. C. Alexander, Jr., Princeton, New Jersey, 25 May 1961, SNL Archives.

4. See photo caption in Peter Goodchild's *J. Robert Oppenheimer: Shatterer of Worlds* (Boston: Houghton Mifflin Company, 1981), p. 170.

5. Oppenheimer to Alexander, Princeton, New Jersey, 25 May 1961, SNL Archives.

6. Leslie R. Groves to F. C. Alexander, Jr., Stamford, Connecticut, 6 June 1961, p. 1, SNL Archives.

7. Memo, R. M. Underhill to N. E. Bradbury, File 310.1 Z-Organization, Los Alamos Mail and Records, SNL Archives.

8. Hartley Rowe to F. C. Alexander, Jr., Newton Centre, Massachusetts, 24 November 1961, SNL Archives; Memo, Robert W. Lockridge to All Concerned, Subject: "Transfer of Group Z-2A to Sandia," 26 September 1945, Los Alamos Archives; Interview, Robert W. Henderson, 23 January 1984, SNL Archives. Henderson's Z-4 Engineering Group was the last to make the move from Los Alamos in January 1947.

9. Memo, Dale R. Corson to N. E. Bradbury, Subject: "Future Z Division Program," 11 April 1946, Los Alamos Archives; Memo, N. E. Bradbury to All Division Leaders, Subject: "B-Division," 23 January 1946, Los Alamos Archives.

In Bradbury's report to the AEC Commissioners in January 1947, he stated that: "The actual accomplishments of this division during the last year were seriously limited by the responsibilities placed on them by the Crossroads operation." See Bradbury, "Weapon Program of the Los Alamos Laboratory," 27 January 1947, Los Alamos Archives.

10. *Manhattan District History*, Book VIII, Los Alamos Project (Y), Vol. 3, p. 8.48, quoting the "Report of the President's Evaluation Board," SNL Archives, also on microfilm, Sandia Technical Library.

11. See United Nations Atomic Energy Commission, "Official Record of the First Meeting, Remarks by the Provisional Chairman Bernard Baruch," Hunter College, New York, 14 June 1946, The National Archives, Record Group 326, Records of the Atomic Energy Commission, Miscellaneous, Relating to the U. N. Atomic Energy Commission 1946-1949; and Gregg Herken, *The Winning Weapon, the Atomic Bomb in the Cold War 1945-1950* (New York: Vintage Books, 1982), p. 172.

12. Richard G. Hewlett and Oscar E. Anderson, Jr., *The New World, 1939/1946*, Vol. I (University Park: The Pennsylvania State University Press, 1962), pp. 633-42 (hereinafter cited as *AEC History*, I.); David E. Lillenthal, *The Journals of David E. Lillenthal*, Vol. II (New York: Harper & Row, Publishers, 1964), p. 106, entry dated 16 November 1946.

13. "Conference Notes Re: Genesis of Sandia Corporation," Kimball Prince with General James McCormack and Mr. Carroll Wilson (at McCormack's Office, M.I.T., Cambridge, Massachusetts), 29 September 1959, SNL Archives; Richard G. Hewlett and Francis Duncan, *Atomic Shield, 1947/1952*, Vol. II (University Park: The Pennsylvania State University Press, 1969), pp. 15, 30-32, 45-46, 58 (hereinafter cited as *AEC History*, II).

14. *AEC History*, II, p. 58; Bradbury, "Weapon Program of the Los Alamos Laboratory," 27 January 1947, Los Alamos Archives.

15. *AEC History*, II, pp. 60-61.

16. David E. Lillenthal, "The Kind of Nation We Want," *Colliers*, 14 June 1952, p. 49, SNL Archives.

17. "Report to the President of the United States from the Atomic Energy Commission January 1–April 1, 1947," and "Appendix C, 2 April 1947," US DOE Archives, Collection: Energy History, Germantown, Maryland. The report to the President had been drafted previously with blanks provided for the actual number of bombs in stockpile. On April 16, Lillenthal met with the President and orally supplied the stockpile figures. See *AEC History*, II, p. 53 and Bradbury, "Weapon Program of the Los Alamos Laboratory," 27 January 1947, Los Alamos Archives.

18. F. C. Alexander, *History of Sandia Corporation Through Fiscal Year 1963* (Albuquerque: Sandia National Laboratories, 1963), pp. 12-13; Interview, R. W. Henderson, 7 March 1984, SNL Archives; Memo, Dale R. Corson to N. E. Bradbury, Subject: "Future Z Division Program," 11 April 1946, Los Alamos Archives.

19. J. H. Manley, "Report on Z-Division (Prepared for the General Advisory Committee)," 10 November 1947, Los Alamos Archives.

20. *Ibid.*

21. Lillenthal, "The Kind of Nation We Want," p. 49.

22. Memo, N. E. Bradbury to Distribution, Subject: "Z Organization," File 310.1, Los Alamos Mail and Records, SNL Archives; Teletype, Roger Warner (describing background of Paul J. Larsen), USAEC to AEC Santa Fe, New Mexico, Los Alamos Mail and Records, File 322, SNL Archives; P. J. Larsen to C. L. Tyler, AEC, 11 January 1949, Los Alamos Archives; Memo, Dwight D. Eisenhower to Chief of Naval Operations, Subject: "Organization of Armed Forces Special Weapons Project," 8 July 1947, SNL Archives. The TX-5 Steering Committee held its first meeting November 3, 1948.

23. Memo, Paul J. Larsen to All Concerned, Subject: "Z Organization," Los Alamos Mail and Records, File 310.1, SNL Archives; "Conference Notes Re: Genesis of Sandia Corporation," Kimball Prince with General James McCormack and Carroll Wilson, SNL Archives.

24. "Sandia Branch of the Los Alamos Laboratory," Report by the Manager, Office of Santa Fe Directed Operations and the Chief of Engineering, 5 August 1948, p. 6, US DOE Archives, Record Group 326, US Atomic Energy Commission, Collection: Secretariat, Box 1235, Folder 601 LASL, Germantown, Maryland.

25. Alexander, *History of Sandia*, p. 16.

26. Good secondary source material on this period includes the aforementioned Gregg Herken, *The Winning Weapon: The Atomic Bomb in the Cold War 1945-1950*. See pp. 245-46, 251, and *AEC History*, II, p. 158.

27. Paul J. Larsen to C. L. Tyler, 11 January 1949, Los Alamos Archives; *AEC History*, II, p. 175.

28. Science Policy Research Division, *A Case Study of the Utilization of Federal Laboratory Resources* (Washington: USGPO, 1966), pp. 34, 38-39.

29. According to the *Ninth Semiannual Report of the AEC, January 1951*: "To carry out necessary production and research operations, the Commission has followed the Manhattan Engineer District's practice of using contractor-operators. Contracts are made with industrial concerns, universities, and other scientific organizations to carry out the principal research operations." See page 5.

The Burlington Plant was eventually consolidated with Bendix in July 1975.

US Atomic Energy Commission, *The Story of Albuquerque Operations* (Washington: USGPO, 1961), pp. 17-18; Interview, John Sundberg, Nuclear Weapons Lab, Albuquerque, New Mexico, 30 April 1985.

30. SNL Budget History, p. 29, and accompanying documents: Temporary SCI 3036, 10 November 1950; SCI 3506 in ref: "In reviewing some of my SCI's, it seemed that SCI 3506 was in need of . . . elimination. I discussed it with Cost Division and we agreed that in view of the fact that we *no longer do any manufacturing*, this SCI should be eliminated—ERW 9/2/60."

31. David C. Morrison, "Energy Department's Weapons Conglomerate," *Bulletin of Atomic Scientists* (April 1985), p. 35.

32. Robert T. Duff, Director of Classification, "Declassification of Early Stockpile Data," Bulletin #WNP-46A, 12 February 1982, DOE, Washington, DC.

33. Memo, R. M. Underhill to N. E. Bradbury, 24 June 1947, File 310.1 Z Organization, Los Alamos Mail and Records, SNL Archives; Robert M. Underhill to Carroll L. Tyler, Manager Santa Fe Operations Office, Los Alamos Mail and Records, File 322, SNL Archives.

34. N. E. Bradbury to President Robert G. Sproul, University of California, Berkeley, 18 November 1948, p. 4, Los Alamos Archives.

35. *Ibid.*; Robert M. Underhill to Carroll L. Tyler, Manager Santa Fe Operations, Los Alamos, New Mexico, 31 December 1948, Los Alamos Archives.

36. Robert M. Underhill to Carroll L. Tyler, 31 December 1948, Los Alamos Archives.

37. *Ibid.*, Paul J. Larsen, "Information Presented to Sandia Laboratory Department Managers, Division Leaders and Staff Assistants at Sandia Base Theater on May 12, 1949," p. 2, Los Alamos Archives.

38. Larsen, *ibid.*; Mervin J. Kelly, Executive Vice President of Bell Telephone Laboratories to President Robert G. Sproul, University of California, Berkeley, 29 July 1949, File 322 Sandia, SNL Archives; "Administration of Sandia

Laboratory—Report of Mr. Mervin J. Kelly," (Notes by the Secretary), US DOE Archives, Record Group 326, US Atomic Energy Commission, Collection: Secretariat, Box 4944, Folder 635.123, Sandia Branch LASL, Germantown, Maryland.

39. *Ibid.*; Carroll L. Tyler to President Robert G. Sproul, University of California, Berkeley, 9 March 1949, Los Alamos Archives; David Lillenthal to Leroy Wilson, 6 July 1949, AEC Files, Series 199, ALO Archives, Kirtland AFB, Albuquerque; President Harry Truman to Leroy Wilson, Washington, DC, 13 May 1949 (copy), SNL Corporate Files; Memo, Brigadier General James McCormack, Director of Military Applications, to Carroll L. Wilson, General Manager, AEC, Subject: "Sandia Laboratory Forms Attachment to AEC," 15 June 1949, Staff Paper, 199/7, SNL Archives.

40. "Conference Notes Re: Genesis of Sandia National Laboratories," Kimball Prince with General James McCormack and Carroll Wilson, SNL Archives; Sandia Corporation Contract AT-(29-1)-789 between U. S. Atomic Energy Commission, Western Electric Company and Sandia Corporation—Correspondence: 1949, Folder 1, SNL Corporate Files. The contract was executed 4 October 1949, although the "Takeover Agreement" between the AEC and Western Electric had been negotiated at Los Alamos, August 29, 1949. See also "Press Release by the AEC," 12 July 1949, SNL Archives; "News Briefs for Western Electric Management," 13 July 1949, New York, SNL Archives; "Private Firms to Run AEC Plant at Sandia," *New York Times*, 12 July 1949, SNL Archives.