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Comments Concerning the Ensuing Ten Years 1/

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The Los Alamos Scientific Laboratory was established under a contract with the University of California in the early part of 1945 to provide a focal point for the previously diversified research directed towards the feasibility of an atomic bomb. Its initial staffing was partly military and partly civilian, although the major technical direction was primarily the latter. It attained its wartime peak strength during the summer of 1945, with about 1500 civilians and 2000 military personnel more or less directly involved in Laboratory activities.

The Laboratory conducted the first nuclear test at Alamogordo on July 16, 1945, and provided the actual bombs and the technical crews associated therewith for the strikes against Japan immediately thereafter.

By the time of the adoption of the Atomic Energy Act of 1946, the technical military staff of the Laboratory had essentially vanished and the civilian staff had decreased to about 1300. Nevertheless, the Laboratory successfully provided the nuclear devices for use in Operation Crossroads at Bikini in 1946 and participated in other technical aspects of this operation. Following the adoption of the Atomic Energy Act of 1946 and the decision by the AEC to continue the Laboratory as a permanent institution under the continuing administration of the University of California, the Laboratory began to increase in size, ultimately reaching approximately its present strength of 3250 by about 1956. Its size has been primarily limited by the availability of local government housing and has remained essentially constant over the last several years.

During the first half dozen years after the war, the Laboratory concentrated almost all of its programmatic attention on problems of atomic weapons develop-

1/ Full text as submitted by the Laboratory September 14, 1959.

ment climaxed by the successful development of the thermonuclear fusion process in 1951. Since then, the Laboratory has broadened the base of its activities by applying various of the skills and technologies developed in connection with weapon activities to other areas of national interest.

The current missions of the Los Alamos Scientific Laboratory follow:

General conduct of basic and applied research in the fields of nuclear weapons, thermonuclear and fission power programs, and nuclear rocket propulsion systems. The Laboratory contains research facilities and equipment appropriate to fundamental research in nuclear physics, chemistry, metallurgy, and cryogenics; computational techniques, biophysics, and bio-chemistry. Research is conducted in all of these fields.

The primary mission of the Laboratory is weapons development. In addition, a major mission of the Laboratory is the study of the feasibility of nuclear rocket propulsion. In this field, the Laboratory is responsible for:

- A. Theoretical design and system studies of various types of potential uses of nuclear energy for rocket propulsion.
- B. Experimental studies of the behavior of materials under the conditions of temperature, radiation, and propellants appropriate to various designs of nuclear rockets.
- C. The construction and operational test of prototype and preliminary models of various types of nuclear rocket engine systems in order to evaluate their problems and potential feasibility for actual propulsion use.
- D. Participation with NASA and other agencies in system studies potentially utilizing nuclear rocket propulsion.
- E. Participating in the nuclear aspects of full-scale nuclear motor or nuclear flight tests in collaboration with NASA.

Another major mission of the Laboratory is the study of the production of power from the fission process. In this field, the Laboratory primarily concerns itself with:

- A. Nuclear reactor systems in which the cost of fuel refabrication is minimized through the use of homogeneous or mobile fuels.
- B. Systems which burn plutonium particularly under conditions when a breeding cycle is effective.
- C. Very high temperature gas-cooled systems whose character, in part, may be related to technologies developed in the nuclear rocket systems.

- D. Systems in which there is a direct conversion of thermal to electrical energy, such as the plasma thermocouple.

Another mission of the Laboratory is the study of the possible production of power from the thermonuclear fusion process. In this field, the Laboratory primarily concerns itself with:

- A. The theory and experimental characteristics of the "pinch" effect.
- B. The construction, study, and understanding of various Laboratory size devices exploring the containment, stability, temperature, and neutron production of differently generated and contained plasmas.

A final mission of the Laboratory is participation in the scientific life of the United States through basic research and its publication in those areas which are peripheral to and stimulate the more specifically programmatic missions of the Laboratory, through cooperation with education and industrial research institutions, and through participation in programs designed to improve the national level of scientific education and achievement.

Weapon Research and Development at LASL

Under Various Conditions of Test Moratorium

It should be obvious that the precise character of weapon development a decade hence is as unknown as that which would have been predicted in 1960 from the status of knowledge in 1950! However, with this reservation in mind, there follows some delineation of the areas of investigation which would seem at this time to be the most fruitful and likely for further exploration during the next ten years under one or another condition of testing.

Moratorium "A": All atmospheric testing prohibited. Under these circumstances presumably, testing would have to occur in outer space, underground, or under water. The last situation seems improbable because of oceanographic biosphere problems, and attention will be confined to the first two situations. Testing underground, if legal and requiring only containment, probably would permit the testing of a number of weapon systems. Attempts would also be made to extend the area of applicability of so-called clean weapons. Weapons of greater economy, safety, and yield per pound or per inch of diameter would receive attention, as well as bizarre and exotic systems of producing nuclear yield of potential interest in weapon development.

Outer space testing would presumably be reserved for proof test of those systems with yield so large that underground containment would be impractical.

The general character of a moratorium of this sort would be somewhat slower and more expensive progress than the country has been accustomed to under previous circumstances of testing. It seems unlikely, however, that any promising line of development would be ruled out by this type of moratorium if the country were willing to pursue testing under these circumstances with sufficient vigor and adequate funds.

Moratorium "B": All testing above a few tons prohibited. Under these

circumstances, weapon development would be limited to further development and refinement of very low yield tactical weapons. Development of new, large yield weapons would be essentially impossible. Further, nuclear weapons would be restricted to systems interpolative between physical situations explored in earlier test series.

Moratorium "C": Limited testing after July, 1960. The progress under these circumstances would be similar to and in the same areas as Moratorium "A" above. Progress would be somewhat easier, cheaper, and faster - particularly in the higher yield areas which might otherwise have to wait for outer space vehicles.

Non-Weapon Activities at LASL Under Various

Conditions of Moratorium

Moratorium "A": No atmospheric testing, but testing permitted elsewhere. The non-weapon activities of the LASL would probably increase slightly since it would not seem probable that the rate of testing under these circumstances and the return and analysis of information therefrom would permit quite so large a weapon activity to be effective as heretofore. It is, however, impossible to make a quantitative guess as to this decrease or increase since it depends entirely upon what rate of dollar expenditure the country is willing to put into underground and outer space testing activities.

Moratorium "B": All testing over a few tons prohibited. There are at present a number of essential weapon activities which must be completed, and one may anticipate still further new and interpolative weapon demands which will continue to occupy a substantial portion of the Laboratory's time.

Moratorium "C": Limited atmospheric testing after 1 July 1960. Under these circumstances, it is probable that both weapon and non-weapon activities will remain at about their present level.

Activities of the LASL and Their Relationship
to Universities and Industry

What is the relationship between LASL activities and those of Universities and industry and could any be transferred?

There exists a great similarity between many LASL research activities in non-weapon fields and similar activities carried on in Universities - usually with government funding. In any laboratory with programmatic responsibilities and objectives, a broad basis of research is imperative to provide the best atmosphere for productive scientific activity. Laboratories without such research activities soon cease to have new ideas and become dead. Laboratories like LASL do, indeed, do research like Universities - and it has been one of the important sources of their strength. Take it away or decrease it and the health of the Laboratory will suffer extraordinarily rapidly.

It should also be pointed out that most proposals to transfer activities to Universities or industry always involve government support along with them. It is cheaper and more effective for the government to do its work in its own laboratories than it is to farm it out. Small research contracts are frequently ineffective - the concept of adequate staffing and adequate varieties of intellectual disciplines should be maintained so that government Laboratories always have very much more than a "critical mass" of people.

It should also be pointed out that the existence of strong, ingenious and versatile research groups is an important asset to the government in taking on new and, particularly, classified programmatic objectives in a hurry. As an example, the existence of a strong group of nuclear physicists with appropriate supporting group has been effective at Los Alamos in the past support of testing programs as well as in certain high priority proposals now being made.

In general, while it is always possible to transfer almost any kind of work away from Los Alamos (except, probably weapon work), it will cost the government more, it will be less well coordinated, and it will seriously and adversely affect the government's chances of getting important work (including weapons work) done rapidly and effectively in its own laboratories.

It may finally be pointed out that the only large scale programs which have been really well done have been done by the government in government laboratories operated by industrial or academic contractors. Radar, the proximity fuze, and the atomic energy program are conspicuous examples. Universities, by themselves, have done nice but uncoordinated research programs. And while it is perhaps an unfortunate example, the U.S. missile program - done by industry - is not always regarded as a shining example of how to get to an objective most rapidly and most effectively!

General Comments on the Future of LASL

It is probable that the overall size of the LASL should show only slow growth over the next decade - a growth permitted primarily by the availability of additional housing as areas such as Barrancas Mesa and White Rock are opened up. There would seem no pressing need for it to expand much more than possibly ten or fifteen percent beyond its present level and then under a philosophy which would suggest the maximum use of its existing facilities.

Perhaps the greatest single question is whether, under a maximum of weapon responsibilities, this will permit adequate progress to be made in areas such as nuclear rocket propulsion, plutonium burning reactors, and similar fields in which the LASL has a unique capability and one which could be duplicated or installed elsewhere only at extraordinarily great expense. This question cannot be answered in a quantitative sense at the present time.

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| US DOE ARCHIVES | |
| 326 U.S. ATOMIC ENERGY COMMISSION | |
| RG | <u>DOE Historian (DBM)</u> |
| Collection | <u>1132</u> |
| Box | <u>3375</u> |
| Folder | <u>41</u> |