



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

LOCKHEED AIRCRAFT CORPORATION, DOCKET NO. 50-172

8-18-64

AND GENERAL SERVICES ADMINISTRATION, DOCKET NO. 50-176

AMENDMENT TO FACILITY LICENSE

License No. R-86
Amendment No. 5

License No. R-86, as amended, is revised in its entirety to read as follows:

1. This license applies to the Radiation Effects Reactor (RER), a heterogeneous pressurized water-type nuclear reactor (Air Force Plant No. 67 hereinafter referred to as "the reactor") which is possessed by the General Services Administration and located on a 10,000 acre site in Dawson County, Georgia, and described in the Lockheed Aircraft Corporation application for license dated February 23, 1963; May 25, 1962; July 25, 1962; September 25, 1962; October 24, 1962; November 20, 1962; February 8, 1963; February 18, 1963; February 26, 1963; April 10, 1963; May 9, 1963; June 17, 1963; June 28, 1963; August 8, 1963; August 9, 1963; September 26, 1963; January 6, 1964; March 2, 1964; and June 12, 1964; and described in the Department of the Air Force application for license dated March 15, 1962 and April 11, 1962, and described in the U. S. Army Corps of Engineers (representing the U. S. Air Force, and later representing the General Services Administration) application amendments dated June 25, 1963, August 13, 1963, and October 29, 1963; and described in the General Services Administration application amendment dated June 15, 1964 (hereinafter collectively referred to as "the application"). The reactor was constructed for the Department of the Air Force as a facility exempt from AEC licensing requirements under Section 91 b of the Atomic Energy Act of 1954, as amended.
2. Pursuant to the Atomic Energy Act of 1954, as amended, (hereinafter referred to as "the Act") and having considered the record in this matter, the Atomic Energy Commission (hereinafter referred to as "the Commission") finds that:
 - A. The reactor as constructed will operate in conformity with the application and in conformity with the Act and the rules and regulations of the Commission;
 - B. There is reasonable assurance that the reactor can be operated at the designated location without endangering the health and the safety of the public;
 - C. Lockheed Aircraft Corporation, with whom General Services Administration has consummated a lease agreement to use the facility, is technically and financially qualified to operate the reactor, to assume financial responsibility for payment of Commission charges for special nuclear material and to undertake and carry out the proposed activities in accordance with the Commission's regulations;

- D. General Services Administration is financially qualified, and through its contractual relationship with Lockheed Aircraft Corporation, is technically qualified to possess title to the facility.
 - E. Issuance of a license authorizing (1) General Services Administration to possess title to the facility and (2) Lockheed Aircraft Corporation to possess, use, and operate the facility and to receive, possess, and use the special nuclear material, in the manner proposed in the application, will not be inimical to the common defense and security or to the health and safety of the public;
 - F. Lockheed Aircraft Corporation has submitted proof of financial protection which satisfies the requirements of Commission regulations currently in effect.
3. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses:
- A. Pursuant to Section 104c of the Act and Title 10, CFR, Chapter 1, Part 50, "Licensing of Production and Utilization Facilities," General Services Administration to possess title to the facility, and Lockheed Aircraft Corporation to possess, use, and operate the reactor as a utilization facility at the designated location in Dawson County, Georgia:
 - B. Pursuant to the Act and Title 10, CFR, Chapter 1, Part 70, "Special Nuclear Material," Lockheed Aircraft Corporation to receive, possess, and use up to 18.8 kilograms of contained uranium in connection with operation of the reactor; and
 - C. Pursuant to the Act and Title 10, CFR, Chapter 1, Part 30 "Licensing of Byproduct Material," General Services Administration to possess title to, and Lockheed Aircraft Corporation to possess, but not to separate, such byproduct material as may be incidentally produced by operation of the reactor.
4. This license shall be deemed to contain and be subject to the conditions specified in Section 30.32 of Part 30, Section 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70, Title 10, Chapter 1, CFR, and to be subject to all applicable provisions of the Act, and to the rules and regulations and orders of the Commission, now or hereafter in effect, and to the additional conditions specified below:
- A. Lockheed Aircraft Corporation shall not operate the reactor at power levels in excess of 3,000 kilowatts (thermal) without prior written authorization from the Commission:
 - B. Technical Specifications
The Technical Specifications contained in Appendix "A" attached hereto are hereby incorporated in this license. Except as hereinafter provided, Lockheed Aircraft Corporation shall operate the facility in accordance with the Technical Specifications. Lockheed may make

changes in the Technical Specifications only when authorized by the Commission in accordance with the provisions of Section 50.59 of the Commission's Regulations (Title 10, CFR, Chapter 1, Part 50, "Licensing of Production and Utilization Facilities");

- C. General Services Administration and Lockheed Aircraft Corporation shall not permit or authorize any organization other than Lockheed Aircraft Corporation to operate the facility.
- D. Notwithstanding any expiration, modification, cancellation or termination of the Lease Agreement between General Services Administration and Lockheed Aircraft Corporation dated April 4, 1962, Change Order No. 1 thereto dated August 13, 1963, General Services Administration's letters to Lockheed Aircraft Corporation dated April 1, 1964 and May 26, 1964 (hereinafter referred to as "the Agreement"), Lockheed Aircraft Corporation shall, so long as this license shall be in force with respect to Lockheed Aircraft Corporation, be responsible for assuring that the provisions of this license and Commission regulations for protection of health and safety from radiation hazards are observed with respect to the facility and materials covered by this license. Lockheed Aircraft Corporation shall also be responsible for maintaining the reactor and its components in a safe condition. In the event of any expiration, modification, cancellation or termination of the Agreement, Lockheed Aircraft Corporation or General Services Administration may apply to the Commission for an appropriate amendment of this license to terminate this license insofar as it is granted to Lockheed Aircraft Corporation. Until such amendment is issued, General Services Administration shall in no way prevent Lockheed Aircraft Corporation from observing the requirements set forth in this condition.

E. Records:

In addition to those otherwise required under this license and applicable regulations, Lockheed Aircraft Corporation shall keep the following records.

- (1) Reactor operating records, including power levels.
- (2) Records of all experimental irradiations.
- (3) Records showing radioactivity released or discharged into the air or water beyond the effective control of Lockheed Aircraft Corporation as measured at the point of such release or discharge.
- (4) Records of emergency reactor scrams, including reasons for emergency shutdowns.
- (5) Records of environmental surveys.
- (6) Records of meteorological conditions that prevail during reactor operations such that inversion conditions can be readily identified and the data taken can be used to calculate Argon-41 concentrations to demonstrate compliance with Title 10, Chapter, CFR, Part 20.

F. Lockheed Aircraft Corporation shall measure and record the following values after the reactor has commenced operation with each different core loading pattern for operation at 3,000 kilowatts (thermal);

- (1) Maximum excess reactivity of the facility, not including the worth of control rods or other control devices such as burnable poison strips or soluble poison, or any experiments;
- (2) Total control rod worth;
- (3) Minimum shutdown margin both at room and operating temperatures;
- (4) Maximum worth of the single control rod of highest reactivity value.

G. Reports

In addition to reports otherwise required under this license and applicable regulations:

- (1) Lockheed Aircraft Corporation shall make an immediate report in writing to the Commission of any indication or occurrence of a possible unsafe condition relating to the operation of the reactor, including, without implied limitations:
 - (a) Any substantial variance in the predicted operating conditions or characteristics of the reactor disclosed by operation of the reactor.
 - (b) Any accidental release of radioactivity, whether or not resulting in personal injury or exposure above permissible limits or property damage.
- (2) Lockheed Aircraft Corporation shall make a report in writing to the Commission within 60 days after August 1, 1964 and annually thereafter, which summarizes the following:
 - (a) Descriptions of the irradiation experiments performed and any unusual events involved in handling or operation.
 - (b) Number of emergency reactor scrams and unscheduled shutdowns with a brief explanation of the cause of each.
 - (c) Principal maintenance performed and replacements made in the reactor and associated systems.
 - (d) Results of environmental surveys in connection with the measurement of on-site soil activation, activated soil transport, and the levels in the Stowah River.
 - (e) Significant changes made in operating procedures and in plant organization.
 - (f) Changes made in the facility and tests or experiments performed pursuant to 10 CFR 50.59(b) without prior Commission approval.

- H. A copy of any notice of intent to terminate or modify the Agreement submitted by either party to the other shall be furnished simultaneously to the Commission. On or before October 1, 1964, the General Services Administration and Lockheed Aircraft Corporation shall notify the Commission as to whether the Agreement will expire on December 1, 1964. In the event the Agreement is amended and a new expiration date established, Lockheed and GSA shall notify the Commission within sixty days of the date upon which the amended Agreement shall expire.
5. Pursuant to Section 50.60 of the regulations in Title 10, Chapter 1, CFR, Part 50, the Commission has allocated to Lockheed Aircraft Corporation for use in connection with the facility 18.8 kilograms of uranium-235 contained in uranium enriched in the isotope uranium-235. Estimated schedules of special nuclear material transfers to Lockheed Aircraft Corporation and returns to the Commission are contained in Appendix "B", which is attached hereto. Shipments by the Commission to Lockheed Aircraft Corporation in accordance with Column 2 in Appendix "B" will be conditioned upon Lockheed Aircraft Corporation return to the Commission of material substantially in accordance with Column 3 of the Appendix "B".
6. This amendment is effective as of the date of issuance and shall expire on April 4, 1969 provided the Lease Agreement described in paragraph 4.D. above remains in effect continuously.

FOR THE ATOMIC ENERGY COMMISSION

Original Signed By
R.L. Dorn

Director
Division of Reactor Licensing

Date of Issuance: AUG 18 1964

HAZARDS ANALYSIS BY THE TEST & POWER REACTOR SAFETY BRANCH

DIVISION OF REACTOR LICENSING

LOCKHEED AIRCRAFT CORPORATION

DOCKET NO. 50-172

TECHNICAL SPECIFICATIONS CHANGE NO. 2

By letter dated January 28, 1964, Lockheed Aircraft Corporation requested authorization to utilize a lithium hydride shield in conjunction with operation of the Radiation Effects Reactor (RER). Additional information in support of this request was submitted by letter dated March 13, 1964 and further clarified by a telegram dated March 26, 1964, later confirmed and amplified by a letter dated March 27, 1964. Lockheed's initial request sought authorization to use the proposed shield at reactor power levels up to 3 Mw. However, the application did not discuss plans for controlling hazards due to tritium that would be produced in the shield during the course of its use at such power levels. Pending development of this information Lockheed has requested authorization to use the shield in connection with experiments to be performed at a maximum reactor power level of 200 watts thermal for an exposure at this power level equivalent to no more than 60 hours. During such limited use, the amount of tritium produced in the shield would be negligible with respect to creating a potential hazard to operating personnel or the public. The following discussion pertains to use of the shield only at the 200 watt level and the attached Technical Specifications, in which Lockheed concurs, cover this limited use.

The proposed lithium hydride shield will be interposed between the reactor and experiments which are to be irradiated. The lithium hydride will be contained in a stainless steel container in the shape of a 75° annular sector of a cylinder having a curvature such that when it is positioned for a test, its entire inner surface will be approximately equidistant from the reactor vessel. The shield will be approximately 48 in. high and 16.5 in. thick. The shield will be mounted on a support structure which spans the reactor pool. The support structure is designed to move the shield in the vertical direction so that during the course of the experiment the shield may be remotely raised or lowered. This feature also permits the shield to be elevated for storage when it is not in use.

The principal concern with the use of lithium hydride is its chemical reactivity. The chemical reaction of lithium hydride with water is fairly vigorous, releasing large quantities of gaseous hydrogen which in turn could present a potential explosion hazard. In contact with air, lithium hydride may ignite spontaneously. However, the specific shield design proposed by Lockheed takes both of these possibilities into account.

When the shield is installed it will be supported in a position where it could conceivably be dropped into the pool along side the reactor if the support structure were to fail. We have reviewed the support structure in detail, and have found it to be conservatively designed with respect to all anticipated normal and abnormal loads. A minimum of two inches clearance is provided between the reactor structure and the shield support structure except on the

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bottom of the shield support structure where an interlock is provided which will deactivate the reactor lift 2 inches prior to contact. Clearances are thus ample to prevent contact between the shield and the reactor while the reactor is being raised or lowered. The shield will be moved vertically by an electric hoist. Failure of the hoist or hoist cable would not endanger the shield, however, since the shield is also supported by two other cables attached to a counter weight. This counter weight would limit the impact loading on the stops of the support structure to a safe value so that we do not consider it likely that the shield can fall into the pool. The support structure itself appears to be adequately anchored and braced to withstand any lateral loadings that can be anticipated.

There is a remote possibility that the shield support structure could be knocked into the reactor pool by runaway of the locomotive which is used to bring test cars to the reactor building since the railroad tracks extend to the edge of the reactor pool. However during use of the locomotive in the vicinity of the reactor building, the reactor is required to be shutdown and lowered into the pool. Such an incident under these conditions could lead to extensive damage to the reactor building if the hydrogen released from reaction of the hydride with water should detonate. However it is considered highly unlikely that any significant amount of fission product activity would be released from the reactor in such an event. As mentioned above there would be no significant hazard from tritium from this event due to the restriction on power level during use of the shield.

The shield container is in essence a pressure vessel designed for a positive pressure of 5 psig. In order to establish the integrity of the shield, leak tests at 50°C and design pressure have been performed and the results of the testing indicate that leakage should be negligible for the anticipated mode of operation. Overpressure protection is provided by a safety valve set to relieve at approximately 5 psig. Provisions have been made to keep the shield container filled with helium at all times to prevent air from reacting with the hydride. The possibility that a shield leak could lead to a fire is extremely remote when the shield is used at a reactor power level of 200 watts. Heat generation in the shield will be extremely small and the hydride will not reach a temperature high enough to ignite even if it were in contact with air. Furthermore, provisions have been made to bleed helium into the shield to exclude air in the event of a leak so that the possibility of a fire would be virtually eliminated.

It is our opinion that the lithium hydride shield can be utilized as proposed up to a reactor power level of 200 watts thermal subject to the limitations set forth in the proposed technical specifications without introducing significant hazards considerations not described or implicit in the Hazards Summary Report and there is reasonable assurance that operation of the reactor in accordance with these specifications will not endanger the health and safety of the public.

FOR THE ATOMIC ENERGY COMMISSION

Original Signed by

Saul Levine, Chief S. Levine
Test & Power Reactor Safety Branch
Division of Reactor Licensing

Date: April 1, 1964