

HAZARDS ANALYSIS BY THE TEST & POWER REACTOR SAFETY BRANCH

DIVISION OF LICENSING AND REGULATION

LOCKHEED AIRCRAFT CORPORATION

DOCKET NO. 50-172

By application dated November 20, 1962, Lockheed Aircraft Corporation has requested that Facility License No. R-86 be amended to permit installation of an aluminum reflector in the 1 Mw Radiation Effects Reactor (RER) and to permit reduction in the presently required number of operating remote area monitoring stations on the RER site during reactor operations.

The proposed aluminum reflector would replace the present water reflector on one side of the core and would act as a neutron window thereby increasing the fast and thermal neutron leakage flux available in an irradiation experiment area.

The net change in reactivity of the system, occasioned by installation of the reflector, is estimated by the applicant to be about minus 0.6% in the core configuration presently authorized. Inasmuch as the aluminum reflector is not bolted or otherwise rigidly fastened in place, the possibility of reactivity perturbation due to movement of the reflector during reactor operation has been investigated. As a result of this investigation, it was found that there is little likelihood of the reflector undergoing significant movement while the reactor is operating; since the reflector is held in place vertically by gravity and downflow of coolant and is held in place laterally by guides on the grid plate which fit into slots in the bottom of the reflector. Significant radial motion of the reflector is precluded by vertical guides on the reflector which limit possible motion to no more than a few thousandth of an inch. In addition, there is a hold down plate which fits over the core and will not allow the reflector to move vertically more than 3 inches under any circumstances. The staff is therefore convinced that the proposed aluminum reflector will not lead to significant reactivity perturbations during reactor operation.

The staff has investigated the possible effects which the presence of the shield might have on flow distribution and heat removal from both the fuel and reflector regions. Although the flow channel between the outer fuel elements and the reflector will be increased, redistribution in flow will not materially effect cooling of any region of the reactor during operation at the full authorized power of 1 Mwt. Possible bowing of the reflector due to the temperature gradient across it, which in turn might effect cooling in that region, was examined and found to be negligible. Thermal stresses are negligible, consequently, there is little likelihood that the reflector would be permanently distorted. We conclude therefore that the presence of the proposed aluminum reflector will not significantly alter the ability to adequately cool any portion of the reflector.

The reflector modification will alter the flux distribution in the vicinity of some of the nuclear instrumentation located in shield tanks external to the reactor vessel. However, the applicant will check instrumentation during

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the first start-up following the modification in order to assure that safety trip points are properly set and to assure that adequate information on instrument response is available to the operators. In addition, water will be drained from around the instruments in order to observe the indicated flux response of all chambers; and a complete set of calibration data will be secured for shield tank windows full and empty. These measures will assure that adequate information is available with which to monitor the condition of the reactor at all times.

Lockheed, further, requests an amendment which will allow them to reduce their minimum requirements for remote area system monitoring in view of the fact that they are operating at 1 Mw rather than the 10 Mw for which the initial monitoring requirements were set. Formerly, Lockheed had 10 stations within the perimeter fence and 7 stations outside the fence. Now Lockheed will have 9 stations within and 3 stations outside of the perimeter fence. In addition to their proposed minimum number of basic stations, they have specified backup stations which will serve as alternates in the event of failure of any of the basic stations. The back-up stations, proposed as alternates in case of failure of basic stations, would not be as sensitive as the basic stations because of their greater distance from the reactor. However, coverage by the back-up stations will provide adequate interim monitoring while primary stations are being repaired or reactivated. Having reviewed the proposed minimum remote area monitoring system, we concur in the conclusion that the proposed minimum system will provide adequate monitoring of radiation levels during presently authorized reactor operations.

We conclude that the operation of the reactor with the proposed modifications will not present any substantial changes in the hazards to the health and safety of the public from those presented by the previously authorized operation of the reactor, and that the operation of the reactor with the proposed modifications will not result in undue hazard to the health and safety of the public.

FOR THE ATOMIC ENERGY COMMISSION

Original Signed by

S. Levine

Saul Levine, Chief
Test & Power Reactor Safety Branch
Division of Licensing and Regulation

Date: MAR 13 1963

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
United States Atomic Energy Commission
Washington 25, D. C.

JUL 18 1963

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C.

SUBJECT: REPORT ON LOCKHEED RADIATION EFFECTS REACTOR (RER)

Dear Dr. Seaborg:

At its forty-eighth meeting, at Los Alamos, New Mexico on July 11-13, 1963, the Advisory Committee on Reactor Safeguards considered the request of the Lockheed-Georgia Company to increase the power of the Radiation Effects Reactor from one megawatt to three megawatts thermal. The Committee previously considered the one megawatt operation of this reactor and reported to the Commission following its thirty-second meeting. In the present review, the Committee had the benefit of the documents listed below and discussions with representatives of the Lockheed-Georgia Company and the AEC Staff.

This reactor can be operated either immersed in a deep pool of water or as an unshielded reactor above the pool surface. Operation above the pool surface permits the neutron and gamma irradiation of large samples which can be moved to the unshielded reactor on a movable platform. The licensee does not intend to irradiate samples within the core.

Representatives of the Lockheed-Georgia Company have stated that, to date, there has been no evidence of attempts by the general public to enter the exclusion area. Operations to date have caused no overexposure of operating personnel and no excessive radiation levels have been observed at the inner exclusion fence. The operating group has stated their intention to carry out refueling operations with the reactor immersed in the pool at a depth of approximately twenty feet to minimize the consequences of any postulated refueling accident. The licensee does not now propose to irradiate explosive materials. The Committee has been assured that the licensee will review with the AEC Regulatory Staff any proposal to irradiate potentially explosive materials.

The proposed increase in power to three megawatts places additional emphasis on the reliability of the cooling water supply to the core. Experiments elsewhere have shown that it is highly unlikely that the type of fuel used in this reactor will melt even if all water coolant is lost immediately after steady operation at one megawatt. Some melting may occur if coolant is suddenly lost

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immediately after three megawatt operation. The Committee suggests that due attention be given to the reliability and adequacy of coolant supply to the core under all conditions of operation. In addition, the Committee suggests that the available excess reactivity be limited to that required for three megawatt operation and that continuing attention be given to procedural safeguards and environmental surveillance.

With proper consideration given to the comments above, the Committee believes that the licensee can operate the facility at powers up to three megawatts thermal as proposed without undue risk to the health and safety of the general public.

Sincerely yours,

D. B. Hall
Chairman

References:

1. LNP/10331, Amendment No. 6 to License R-86, dated February 8, 1963.
2. LGD/162926, Supplement to Amendment Request to License R-86, dated June 17, 1963.