HAZARDS ANALYSIS BY THE TEST & POWER REACTOR SAFETY BRANCH

DIVISION OF REACTOR LICENSING

LOCKHEED AIRCRAFT CORPORATION

DOCKET NO. 50-172

TECHNICAL SPECIFICATIONS CHANGE NO. 3

By letter dated March 10, 1964, Lockheed Aircraft Corporation requested that the Technical Specifications governing operation of the RER under License No. R-86 be changed to require a minimum of two composite water samplers in the Etowah River (one upstream and one downstream of the reactor) rather than the four now required, and to decrease the sample collection frequency from weekly to bi-monthly. Data submitted by the applicant indicates that there has been no measurable activity transported from the site into the river at any time. Upstream and downstream water sampling records will continue to be accumulated under the revised sampling procedures so that an historical record will be maintained to indicate any activity increase in the river due to plant operations. Consideration of the sampling points selected and the data accumulated to date leads us to the belief that the proposed changes in sampling stations and procedures will not materially change the effectiveness of the present water sampling program, and we have concluded that the revised water monitoring program will be adequate from a safety standpoint.

By letter dated January 28, 1964, Lockheed requested authorization to utilize a lithium hydride shield in conjunction with operation of the RER at power levels up to 3 Mwt. Sufficient information was not then available on the potential hazards associated with tritium which would be produced within the shield during the course of its use at a power level of 3 Mwt. Accordingly Lockheed revised its request to seek limited authority to use the shield at 200 watts reactor power for no more than 60 hours pending further study of the tritium problem. On April 1, 196 the RER technical specifications were changed to permit the limited operations requested.

By letter dated April 6, 1964 and by telegram dated April 29, 1964 Lockheed submitted additional information on the tritium hazard incident to operations at 3 Mw.

During use of the shield at the power level proposed, the lithium hydride will become heated, causing a decrease in the available free volume inside the container with an attendant increase in pressure. Gas generation due to nuclear reactions within the shield material and possible slight thermal decomposition of the hydride in high temperature regions may also contribute to pressure build-up. The shield container would not be subjected to pressure high enough to cause a rupture, since the container is provided with a safety valve set to relieve at the design pressure of 5 psig.

However, because swelling could occur in the shield material, there does appear to be a significant possibility that the shield container could develop a leak. Although ample clearances have been provided for thermal expansion alone, the phenomena described above could lead to abnormal swelling and possible breakage or sloughing of the hydride in such a manner that the clearances provided would be decreased. Available data on irradiation behavior of lithium hydride indicates that these possibilities are remote for materials manufactured by processes similar to those used for the RER shield but these data are not complete enough to be conclusive. In view of these uncertainties, Lockheed will inspect the

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shield before each irradiation run to determine whether dimensional changes have occurred which would be indicative of significant stress on the container. Use of the shield will be terminated if significant changes are found. Since the shield will not be used if its integrity is suspect, we believe that the possibility of a significant leak during use appears remote.

At a reactor power level of 3 Mwt, it is expected that the temperature of the lithium hydride may be above the temperature at which spontaneous ignition would be possible if the hydride were to lose its helium blanket and be exposed to air. Consideration of the manner in which leaks in the shield container would be expected to develop leads us to the belief that it is unlikely that any leak would be large enough to admit air at a rate which would sustain combustion of the hydride As additional back-up, provisions have been made to bleed helium into the shield so as to exclude air if the operator is alerted to the presence of a leak by pressure instrumentation or a low pressure alarm in the operations building. It appears, therefore, that the possibility of a fire is exceedingly remote.

A shield leak could, of course, lead to uncontrolled release of a fraction of the tritium that had accumulated in the shield during operation. However, in the absence of a fire, such an event would be unlikely to lead to a hazard beyond the immediate vicinity of the reactor building since a major fraction of the accumulated tritium inventory would be expected to be retained by the hydride. It is unlikely that operating personnel would be overexposed by such a release since the reactor building is unoccupied during reactor operation and occupied control areas are supplied by ventilation air brought in from a point several thousand feet away.

During use of the shield, it is anticipated that the shield will probably be vented at intervals during an irradiation run via its relief valve. In order to comply with Commission regulations pertaining to discharge of wastes to the environment, the applicant has provided instrumentation which will continuously monitor such release. Calculations indicate that continuous release of all the tritium formed during 3 Mwt operation over a period of several hundred hours would not lead to an average yearly concentration at the site boundary in excess of those permitted by 10 CFR 20. Accordingly no provisions are being made to terminate tritium release by use of a stop valve and necessary control will be effected by terminating a reactor run or curtailing use of the shield as necessary. In view of the very small potential for venting to lead to tritium concentrations in excess of permissible average values at the site boundary it is our opinion that such administrative controls over tritium release will be satisfactory. It will be necessary, however, to maintain records of releases so that compliance with Part 20 limits can be demonstrated.

The tritium monitor is located in the operations building. Consequently, consideration has been given to the possibility that a leak in the sample lines to the monitor could lead to overexposure of personnel in the control areas. It is highly unlikely that the monitor lines could be subjected to overpressure sufficient to rupture them. In order to assure leak lightness Lockheed will leak check the system with a helium mass spectrometer initially and at intervals of three months. It appears that these measures will assure that the possibility of personnel exposure to undue concentrations of tritium is negligible.

As discussed in our previous analysis, there is a remote possibility that the shield could be knocked into the reactor pool by an accident with the locomotive.

In this case, essentially all of the tritium inventory in the shield could be released due to reaction of the lithium hydride with water. The applicant's calculations indicate that the potential dose at the site boundary due to an accidental release of the entire tritium inventory within the shield after essentially infinite reactor operation at a power level of 3 Mwt, would be well within the guide line doses set forth in 10 CFR 100.

Conclusion

It is our belief that the proposed changes in river water sampling procedures will not materially change the effectiveness of the present monitoring program. We also believe that the design of the lithium hydride shield and the procedures developed for its use are such that the shield can be safely used at reactor power levels up to 3 Mwt, subject to the limitations in the proposed technical specifications, as revised, set forth in Attachment "A". We have concluded, therefore that the proposed changes do not involve significant hazards considerations not described or implicit in the Hazards Summary Report and there is reasonable assurance that the health and safety of the public will not be endangered.

FOR THE ATOMIC ENERGY COMMISSION

Saul Levine

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

Enclosure:
  Attachment A

Date: April 30, 1964