February 23, 1989

Dr. Robert C. Nelson, Lt. Col., USAF
Executive Officer, TNRSSG
Directorate of Nuclear Surety
Kirtland Air Force Base, New Mexico 87117-5000

Dear Lt. Col. Nelson:

SUBJECT: COMMENTS ON THE STATIONARY NEUTRON RADIOGRAPHY SYSTEM (SNRS)

Please find enclosed our comments on certain aspects of the SNRS which is being installed at McClellan Air Force Base in California. The staff has examined the areas requested in your letter of December 2, 1988 with the exception of emergency planning. It is our understanding that the emergency plan is undergoing revision and therefore will not be reviewed by us at this time. Our comments on the computerized control system for the reactor will be sent under separate cover in several weeks. Because your facility is not licensed by the NRC, these comments are not binding on the Air Force and no response is required.

If you have any questions concerning this review, please contact me at FTS 492-1121 or 301-492-1121.

Sincerely,

/s/
Alexander Adams, Jr., Project Manager
Standardization and Non-Power
Reactor Project Directorate
Division of Reactor Projects - III, IV,
V and Special Projects
Office of Nuclear Reactor Regulation

Enclosure:
As stated

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(LTR TO DR. ROBERT NELSON)

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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ENCLOSURE

COMMENTS ON THE SNRS

1. Proximity to an active military runway

We find that the general approach and methodology used by the Air Force is reasonable and is similar to that used by the staff with respect to nuclear power reactors. The Air Force concludes that a major radiological accident due to aircraft crashes has a probability of occurrence on the order of 10^{-8} per reactor year. This level of risk is well within the guidelines of Standard Review Plan (SRP) 2.2.3 and represents a negligibly small contribution to the total risk of a release. However, as outlined below, we believe that parts of the analysis are incomplete or in need of clarification. Hence, we are not able to conclude that the calculated probability of 10^{-8} is a reasonable estimate.

Specific comments regarding the Air Force analysis are listed below:

a. The postulated aircraft accidents are characterized in terms of missile impacts on the facility. The analysis does not address the possibility of a fire associated with an aircraft crash. Elsewhere in the analysis it is noted that the reactor core is capable of withstanding a loss of coolant without melting the fuel. This is based on the estimated convective cooling due to natural circulation of ambient air. It is possible that the heat transfer configuration would change appreciably in the presence of a fireball fed by aviation fuel. Ingestion of aviation fuel inside the building also needs to be addressed with respect to fire and explosion effects. A useful reference for addressing the above is the aircraft crash/fire analysis that was performed in the licensing of the Zion nuclear power plant.

b. The analysis presents missile penetration results without identifying the perforation model. Reference A-2 cited in the analysis does discuss perforation calculations. However, it also does not identify the perforation model. Hence, it is not possible to verify the validity of the penetration probabilities presented in the analysis. In addition, the discussion of missile impacts does not characterize the missile itself. Typically, aircraft engines are the most penetrating components with respect to aircraft crashes. It is not clear if the missiles considered in the analysis represent engines or entire aircraft.

c. In the analysis, the effective target area for aircraft crashes includes building "shadow" area. However, it does not appear to include the area in "front" of the building. This area is associated with aircraft ground impacts prior to striking a structure. The aircraft may skid for some distance after ground impact, eventually striking the target structure. The total target area should include the "frontal" area as well as the "shadow" area.

In our review, we relied primarily on past review practice and the guidelines in SRP 2.2.3 and SRP 3.5.1.6.

2. Radiological Safety

On the basis of this review, we find that the Air Force has committed to the application of ALARA and 10 CFR Part 20 for radiation protection purposes. Following are our comments on Chapter 12.

a. Page 12-14, Line 1
The units for the surface area of the stainless steel plate should be in "m^2" not "m^3".

b. Page 12-16, Section 12.3.3.
We recommend that the recirculation mode ventilation system include a charcoal filter as well as a HEPA Filter in order to have the potential to reduce air concentration of radioactive iodines.

c. Page 12-17, Section 12.3.4.
In addition to the interlocks and warning light that has been incorporated into the facility design, we would recommend a radiation work permit (RWP) system be developed to control the entry into radiography bay areas.

d. Page 12-22, Section 12.4.1.
We note that to transfer an irradiated fuel element into or out of a fuel storage pit requires the operator's hands and forearms to be in a radiation field of 20 r/hr. Even though the suspected dose to an individual is expected to be approximately 6 rem (1/3 of 10 CFR, Part 20 limits), we would recommend that a remote system be developed to perform this task.

e. Page 12-27, Section 12.5.3.
We recommend that the facility radiographers be required as a minimum to have the training outlined in section 34.31 10 CFR, Part 34.

f. Figures 12.6, 12.7, and 12.8 show worst-cast dose rate curves at the exterior of the four radiography bays. You should clarify what these curves represent and state if the dose rates indicated on the figures are the maximum contact dose rates at the outside surface of the building roof and walls, or whether they are the dose rates at some distance from the roof or walls, as suggested by the shape of the curves. According to the dose rates indicated in Figure 12.6, the areas above and adjacent to Bay 1 appear to be radiation areas. If so, you should describe how you plan to control personnel access to these areas.

g. Chapter 12 should include facility layout figures showing expected dose rates (neutron and gamma) throughout the facility during reactor operation.

h. Chapter 12 should include a table giving the expected annual man-rem incurred at the TRIGA reactor facility. This data should be broken down by job and work function and should include calculations to show how these figures were derived.

i. Consideration should be given to monitoring radiation levels inside the radiography bays using an area monitor with remote read out.