October 25, 1973

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

Before the Atomic Safety and Licensing Board

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| In the Matter of | ) | |
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| METROPOLITAN EDISON COMPANY, et al. | ) | Docket No. 50-289 |
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| (Three Mile Island Nuclear Station, Unit 1) | ) | |
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APPLICANTS' PREPARED TESTIMONY
RELATED TO
AIRCRAFT IMPACT

The Preliminary Safety Analysis Report in Section 2.2.3., LAND USE, identified the fact that there were two (2) airports in proximity to the site--one being Olmstead Air Force Base (now Harrisburg International Airport) on the north bank of the Susquehanna River, 2 1/2 miles NW of the site, and the other being Harrisburg York State Airport (now Capital City Airport) located about 8 miles WNW of the site. Upon inquiry from the Atomic Energy Commission, information was provided in Supplement 2 to the PSAR on the traffic patterns associated with these airports.

Upon further oral inquiry by the AEC Regulatory Staff at the time the State of Pennsylvania announced intent to acquire the Olmstead Air Force Base and make it Harrisburg

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International Airport, additional studies were performed concerning the possibility of an airplane striking the station while arriving or departing from Harrisburg International Airport. Until the time of this oral inquiry, Applicants had considered that the probability of an aircraft incident at TMI was such that it did not require design criteria which presupposed such an incident.

Applicants then commenced studies on the likelihood of an incident resulting from the projected increased use of Harrisburg International Airport and establishing criteria for the hardening of the critical plant structures and consideration of secondary effects such as fires. We decided that the most critical circumstance involving the structures would be the hypothetical impact of an aircraft normal to the dome of the containment vessel at its apex. While these studies proceeded and information was being generated on the structural characteristics of such an aircraft, the continuing probability studies by our consultants conservatively indicated that the likelihood of an incident involving an air carrier aircraft using Olmstead Airport colliding into the Three Mile Island Unit was $1.25 \times 10^{-11}$ per operation for any kind of a hit into any of TMI's structures and $2.1 \times 10^{-12}$ per operation for a high angle hit ($> 60°$) into a critical structure. In view of the relatively few movements (2,400 per year) of larger aircraft we determined that the likelihood of an incident involving

these larger than 200,000 lbs. aircraft need not be considered in design modifications. We determined the structural characteristics of the less than 200,000 lbs. aircraft and completed studies of the response of the containment building considering an attack angle normal to the apex of the building. Upon developing engineering information justifying the adequacy of the containment building for such an impact, we established criteria for the design of all critical structures on a similar basis.

The basic criteria were to insure that the impact of a commercial multiengine aircraft (equivalent to the Boeing 707 Model 720) traveling at a maximum speed of 200 knots, including secondary effects such as generation of secondary missiles, fire and pressure and temperature effects, would not prevent the safe shutdown of the plant. To meet this criteria a number of changes in design features were made. These included the following:

1. Reactor Building - The criteria resulted in essentially no change to the containment shell design. Exceptions included the addition of a parapet wall to protect the upper vertical tendon end anchors and the addition of a significant structure enclosing the equipment hatch.
2. Control Building - The Control Building had to be hardened and now consists of a roof slab and exterior walls of 5' thickness. This contrasts

with thicknesses of approximately 20 to 24" which would otherwise have been acceptable. Also, the interior structures were isolated from a vibration standpoint from the side walls by the use of special neoprene bearings. Concern also existed on the possible effects of fire and smoke from the hypothetical aircraft incident on continued occupancy of the Control Room. The HVAC system had to be modified to include the addition of an air intake tunnel with the air inlet end isolated and separated from the reactor and control building structures. The intake tunnel system includes instrumentation and protective systems to detect smoke, combustible vapors and impact shocks thereby preventing explosions or fires by initiating isolating of the outside air from the system air intakes. This system also involved the addition of some instrumentation necessary to insure that any intake potentially drawing in smoke would be closed.

3. Intermediate Building - Changes involved the addition of a substantial concrete structure in a portion of the Intermediate Building (i.e., the northeast corner) which was hardened with a concrete structure with thicknesses on all exterior surfaces of 5'-0".

This portion of the structure could potentially have otherwise been constructed of steel framing with metal siding.

4. Fuel Handling Building - We concluded that impact of the aircraft into the spent fuel pool had to be avoided. For this reason the entire superstructure over the Fuel Handling Building was hardened and consists of a structure with 5' walls and 6' roof slab. This structure could have otherwise been constructed with steel framing and metal siding. Additionally, special designs were required on the access door to the Fuel Handling Building to preclude the potential entrance of the impacting aircraft or any of its secondary effects into this building.

5. Auxiliary Building - We concluded that major portions of the Auxiliary Building had to be hardened. The main upper floor of the Auxiliary Building is at elevation 329'-0". Vital equipment on that floor was moved down to lower elevations and the structure was consequently hardened from that elevation down. This floor slab consequently was required to be 5' thick instead of the normal 1' - 2' dimensions that otherwise would have been needed. Likewise, the heat exchanger vault to the west of the Auxiliary Building had to be hardened, in this case, from the roof slab at elevation

305'-0" and down.

6. Intake Screen House - Buried redundant cooling water piping was considered to be sufficiently protected and not requiring special design considerations. However, the Intake Screen House had to be hardened consistant with the basic philosophy for the other structures. The above grade exposed portion of this intake structure consists of 5' thick concrete which under other circumstances might have been replaced by a steel framed structure.

7. Diesel Generator Building - Because of the separation between the location of the Diesel Generator Building and the off-site power source, it was not assumed that the aircraft incident could jeopardize both power sources. Consequently, the Diesel Generator Building was not aircraft hardened.

Starting in early 1968 and continuing down to the present time, Metropolitan Edison Company has conducted a series of meetings and held discussions with officials of the Harrisburg International Airport, Pennsylvania Department of Transportation or its predecessor agencies, with officials of the Federal Aviation Agency, as well as with other groups and individuals interested in aviation. A number of meetings involving only a few individuals were conducted during this period to discuss particulars. The most recent meetings involving all parties were held May 11, 1972 and July 11, 1973. The purpose of these meetings was to explain to those

in attendance the plant installation and to describe to them the studies that were going to be conducted by Metropolitan Edison to determine the likelihood of the plume of the Three Mile Island cooling towers having an adverse effect on Airport operations. The results of the study as it progressed were reported to the Commonwealth aviation officials and the Airport officials periodically, with the most recent meeting narrowly directed to this end being the July 11, 1973 meeting.

As well as giving the results of these studies, which show that the impact of the cooling tower plume on Airport operations would be negligible, the meetings also served as a basis for responsible Metropolitan Edison Company personnel to become familiar with the individuals involved with the Harrisburg International Airport operation and to establish lines of communication with them that would permit us to continue to maintain communications on matters of mutual concern and interest. One of the areas of information developed during these meetings was the flight patterns that were generally followed in the utilization of the Harrisburg International Airport, and also the frequency of movements of greater than 200,000 pound aircraft. We have concluded from these discussions that probably in less than ten per cent of the operations at the Airport are the flight paths over, or in the vicinity of, the Three Mile Island Station. It was

also established that the average number of operations which involve greater than 200,000 pound aircraft was on the order of 5 to 6 operations per day (2,190 operations per year). By comparison, our consultants have calculated that to attain a probability of $1 \times 10^{-6}$ per year for a high angle ($>60°$) hit by an aircraft of greater than 200,000 lbs. into a critical structure, there would have to be 500,000 operations per year of such aircraft at Harrisburg International.

Also out of one of these meetings there developed agreement which has since been implemented, that Three Mile Island would be able to determine on a monthly basis the number of aircraft greater than 200,000 pounds operating out of the Harrisburg International Airport. Our Technical Specifications will require that we report this data annually to the AEC. This administrative control will permit the early detection of any significant trends in the number of aircraft movements and will allow necessary steps to be taken in a timely manner to control flight patterns of large aircraft if future traffic changes warrant.

For the larger aircraft (greater than 200,000 lbs.) extensive conservatisms have gone into the probability studies (see, for example, the discussion in Section 2.4.2 of the FSAR) and the probability of impact by these aircraft is still extremely small. Although the number of greater than 200,000 pound aircraft has increased somewhat since the

original probability studies were conducted, most aircraft movements at Harrisburg International Airport continue to be by aircraft significantly smaller than 200,000 pounds and it is almost inconceivable that operations of the larger aircraft could increase to the 500,000 operations per year necessary to reduce the probability of their critically impacting the TMI plant to a probability as low as $10^{-6}$ per year. For the smaller aircraft, the station building hardening is more than adequate. Consequently, it is Metropolitan Edison Company's conclusion that at the present time it is neither necessary nor desirable to restrict the use of the air space in the vicinity of the Three Mile Island Nuclear Station.

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