Roger S. Boyd, Assistant Director
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THRU: Charles G. Long, Chief, RPB-3
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March 27, 1968

MARCH 20, 1968 MEETING WITH METROPOLITAN EDISON ON AIRCRAFT CRASH EFFECTS

On March 20, 1968, we met with Metropolitan Edison to discuss potential aircraft crash effects at the Three Mile Island site. An attendance list is attached.

The applicant presented preliminary design information on fire effects which will be documented in Amendment 10 to the application. A single air intake for the auxiliary building and control room is planned with a minimum length of about 130 feet. Since the velocity of air in the intake duct will be about 1000 feet per minute, several seconds reaction time will be available to detect and isolate the buildings from the air intake.

The combustible gas detectors will consist of two platinum wires, one exposed to the air in the intake duct. A signal would be generated when the temperature of the wire in the duct increased due to a catalytic reaction with the gas mixture. The detectors (a Johnson-Williams design was referenced) can detect gases at a level 20% of that required for an explosive mixture. A concentration below this level could be breathed by the operators for a number of hours without detriment to health. (The intake duct could be manually isolated when the gas odor is noticed by the operators). The applicant stated that very little reaction time would be required since the wires are directly in the path of the air and are not dependent on a sampling mechanism. The number and location of detectors would be such that stratification of the gases would not prevent detection. Flame detectors will also be installed.

In addition to closing fire dampers and air-tight valves in the intake and exhaust ducts, the sensors would actuate a water deluge system in the ducts. About 1 lb. of water per lb. of air will prevent combustion at any gas concentration.

An analysis involving general aviation as well as commercial aviation was performed to evaluate the probability of having combustible gases at the air intake or exhaust points. Because of the smaller target area, a recurrence interval of 10^{-10} was arrived at as compared to 10^{-6} for a large craft impact anywhere on the facility.

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The potential for concrete spalling due to high flame temperatures will be discussed in the submittal. This is not thought to be a problem by the applicant because of the thickness of the concrete walls.

The auxiliary building lower floors will be protected from fuel entry from the upper, unprotected level by providing a water seal in lines which will not be filled with water and by welding flat plates normal to the pipe which extend into the two-foot-thick concrete floor. The largest line which penetrates the floor is two inches in diameter. The stairwells are protected from impact by shielding and from fire by fire doors.

The diesels are protected from most secondary missiles by about one foot of concrete and from fire effects by a water deluge system in the air intakes. Although the diesels could not take a direct impact, they are separated from the off-site power source by several hundred feet. Even if both power sources were lost, the plant could survive without any AC power for several hours allowing time for power to be restored. The water deluge system will be fed from an elevated tower or alternately from a protected diesel driven pump taking suction from the cooling tower basins.

Mr. J. Haley of Aviation Safety Engineering and Research (Dynamic Sciences Corporation) presented his calculations on the characteristics of the load applied to the containment from the impact of a large plane. His results were obtained from a momentum exchange calculation and are primarily dependent on the impact velocity and the mass per unit length. The method was checked by comparing it to a test crash of a 53,000 lb. plane into a vertical wall at 123 knots. The results of the calculation indicate high "g" loadings on the containment (60 to 70g) and the shape of the loading curve is similar to that which Mr. Proctor obtained from Lockheed. (Mr. Proctor said later that he was basically satisfied with the method of load application.)

Preliminary results of an impact on the dome apex with the new loading were satisfactory for the 200,000 lb. plane but showed possible failure for a 300,000 lb. plane (707) which the applicant had previously specified as the design basis. The applicant intends to make a more sophisticated calculation in which the loading is applied at three points rather than one but this may take six months. Mr. Reddis indicated that the design basis might be changed to 200,000 lb. which would cover all aircraft now flying except the 707 class. We said that we could take no position on the acceptability of the proposal at that time.

We suggested further calculations to show the capability of the rest of the structure relative to the dome and to show that the junction of cylinder and dome was not a critical location.

Mr. Lowe had the following statistical information:

(1) Of seven large air carrier crashes, four were at angles of less than 45 degrees, one occurred during horizontal flight and two were at angles between 70 and 80 degrees.

(2) Only one crash of a large plane was at a speed as high as 200 knots (most were 130 to 170 knots).

Attachment:
Attendance List

Distribution:
Suppl.
DRL Reading
RPB-3 Reading
M. Mann, REG
P. A. Morris, DRL
F. Schroeder, DRL
RP Branch Chiefs
B. Grimes, DRL
T. Engelhardt, OGC

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OFFICE ▶	RPB-3	RPB-3				
SURNAME ▶	BGrimes:th	CGLong				
DATE ▶	3/27/68	3/27/68				

ATTENDANCE LIST

MEETING WITH METROPOLITAN EDISON

MARCH 20, 1968

Gilbert As[illegible]s

John [illegible]s Head
Bela Karlovitz - Consultant on Fire Effects
Jos[illegible]ph [illegible]ley - Aviation Safety Engineering & Research of Dynamic Science
Hans [illegible]derick Wolfgang Lorenz
Fred Walter Symons
Carrol Herbert Bitting
Duane Aubrey Godfrey
Sumner Willard Reid
Jorge Daniel Riera
William Bryan Shields

Metropolitan Edison Company

George Filmore Bierman
John Gwaltney Miller
Ralph Edgar Neidig
Louis Harry Roddis, Jr.
Richard Weamer Heward, Jr.

Pickard, Lowe and Associates

William Webb Lowe

Shaw, Pittman, Potts, Trowbridge & Madden

Gerald (none) Charnoff

AEC

C.G. Long, RPB-3, DRL
B.K. Grimes, RPB-3, DRL
J. Proctor, Naval Ordnance Laboratory

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