GPU Nuclear

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March 4, 1983

Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Crutchfield:

Subject: Oyster Creek Nuclear Generating Station (OCNGS)
Docket No. 50-219
SEP Topic No. III-4D Aircraft Hazard
Site-Proximity Missiles

As part of the Systematic Evaluation Program (SEP), aircraft strike probabilities were evaluated for aircraft impact on OCNGS. The probabilities were estimated for three size categories including small general aviation, medium-sized commercial, and large commercial or military aircraft.

The methodology and results of the evaluation are described in the attachment to this letter. The results indicate that probabilities for an aircraft strike on the plant for all categories are extremely low based on available traffic information.

Very truly yours,

Peter B. Fiedler
Vice President and Director
Oyster Creek

PBF:jal
Attachment

cc: Mr. Ronald C. Haynes, Administrator
Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

NRC Resident Inspector
Oyster Creek Nuclear Generating Station
Forked River, NJ 08731

A035

ATTACHMENT

SEP TOPIC No. III-4D AIRCRAFT HAZARD

Aircraft strike probabilities were estimated for three size categories including small general aviation, medium-sized commercial, and large (heavy) commercial or military aircraft. The nearest airports of significance are at Lakehurst, 16 miles north-northwest and McGuire Air Force Base about 24 miles northwest. At these distances there is no significant hazard due to landing and takeoff activites. Low level military training routes in the area must be kept more than 5 miles from the plant by agreement between the military and the NRC. There is little traffic along these routes, and at this distance they represent an extremely low hazard to the plant.

There are several commercial routes within 10 miles of the site shown on the aeronautical charts as V312, an east-west route nearly over the plant and V44-229 running northeast-southwest about 16 miles southeast of the plant. Traffic along these routes is generally above 8,000' near the plant. The holding pattern at the LEGGS intersection passes about 2 miles east of the plant at its closest approach and is used infrequently. The Enroute High Altitude chart shows the closest jet route J55-121 to be about 10 miles east. Traffic along this route would not constitute a significant hazard to the plant.

There is a considerable amount of general aviation, light aircraft traffic activity in the area which is not aligned with any specific route. Informal surveys by plant personnel provided the basis for assumptions in this study for general aircraft activities.

Based on evaluation of the available information on air traffic conditions at the site, which showed that portion of the air routes (which are 4 nautical miles wide) are located near the site and that the frequency of use is low, it is concluded that the only potential hazard necessary to be evaluated is from the traffic along the V312 airway and general aviation in the area. Probabilities for a strike on the plant are developed below for three sizes of aircraft based on available traffic information for each size.

1. GENERAL AVIATION

The probability of a strike on vital areas of the plant is estimated by the following relationship:

$$Ps_{GA} = R_{GA} N d A_p / A_o$$

where

Ps_{GA} = probability of a general aviation aircraft strike on vital plant area (yr^{-1}).

R_{GA} = accident rate for general aviation aircraft (mi^{-1}).

A_p = vital plant area (mi^2).

A_o = observation area (mi^2).

N = number observed in A_o (yr^{-1}).

d = average distance across observation area (mi).

Surveys by plant personnel indicate overflight by small aircraft occurs at an average annual frequency of less than three per day. This study assumes 1,000 overflights per year with a 5% condifence lower bound of 300 and an upper bound of 3,000.

The target area A_p is assumed to be 80,000 ft^2 (0.0028 mi^2), which is approximately double the area of vital plant features to account for skid path and effective target area due to the taller structures. The uncertainty in A_p is expressed by assuming the vital areas could be a factor of 4 smaller but only a factor of 1.5 larger than assumed. A 1-mile radius is assumed for the observation area, $A_o = 8.7 \times 10^7\ ft^2$ (3.14 mi^2). An uncertainty factor of plus or minus 2 is assigned to the area of observation, A_o. The fatal accident rate for general aviation is about 0.3 accidents per 10^6 miles flow. An uncertainty of a lower value of 0.1 and a high value of 0.7 is estimated. The average distance flown in the circular observation area, A_o, is assumed to be d=1.5 miles with uncertainty bounds of 1.84 and 0.44 based on an equal chance of traversing 95% and 5% of the area of the circular observation area.

Table I summaries the results for general aviation aircraft. The general aviation aircraft hazard is assume to be characterized by a missile weight of 6,000 lbs which is the approximate average weight for aircraft considered in the general aviation class.

2. MEDIUM-SIZED COMMERCIAL AIRCRAFT

The V312 airway passing over the site is 4 nautical miles wide on each side of the centerline. The relationship used to determine the probability of a strike on the plant is taken from the NRC's Standard Review Plan, Section 3.5.1.6, as follows:

$$P_M = RNA_p/W$$

where

P_M = probability of a medium-sized aircraft strike on the plant (yr^{-1}).

R = in-flight accident rate for medium-sized aircraft, assumed average weight of 150,000 lbs (mi^{-1}).

N = number of flights along airway (yr^{-1}).

A_p = area of plant vital structures (mi^{-2}).

W = width of airway (mi).

Based on the National Transportation Safety Board's published statistics covering 10 years of commercial flight, the rate for all fatal

accidents is about 0.002 per million miles flown. In-flight accidents constitute about one-third of the total fatal accidents; therefore, $R=0.0007 \times 10^{-6}$ mi^{-1}. The uncertainty is estimated to be represented by a lower bound of 0.0003×10^{-6} mi and an upper bound of 0.0009×10^{-6} mi. The number of flights along V312 in this size class is estimated by personnel contacted at the McGuire Air Force Base and the Kennedy Air Traffic Control Center to average less than 60 per day; therefore, N = 20,000 per year. The assumed uncertainty range is 10,000 to 25,000. The vital plant area is assumed to be 160,000 ft^2 (0.0057 mi^2) including a larger skid path and an effective target area due to tall structures. This area is assumed to be larger than for general aviation aircraft due to the greater momentum at impact which could result in the aircraft sliding into the plant. This is conservative since aircraft falling from the higher altitudes used along this airway would likely have little forward velocity on impact. Velocity is expressed by assuming the upper bound is a factor of 1.25 higher and a factor of 4 less for the lower bound. The width of the airway is 8 nautical miles or W = 9.2 mi. All aircraft are assumed to be in this corridor.

Substituting in the equation yields the results for medium-sized aircraft shown in Table II.

3. LARGE AIRCRAFT

Military air traffic heading east from McGuire Air Force Base frequently utilize V312. Most aircraft are of the cargo type in the 300,000-lb or greater size class typified by the C-141. The safety record of these aircraft is about the same as for the commercial carriers previously discussed. Large commerical aircraft apparently do not normally utilize this airway.

The same relationship is used for flights of heavy aircraft, i.e.,

$P_H = RNA_p/W$ = probabilty of a heavy aircraft strike on the plant (yr^{-1}).

Assuming there are less than ten heavy flights per day along V312 or N = 3,000 per year with a range of from 1,500 to 4,000 and that R, A_p, and W do not differ from the analysis presented previously for medium-sized aircraft, the probabilties shown in Table III are computed. Greater uncertainties are placed on accident frequencies since the data base is considerably smaller than for the smaller aircraft.

TABLE I GENERAL AVAIATION STRIKE FREQUENCIES, YR^{-1}

Parameter	R_{GA}	N	d	A_p	A_o	$P_{s_{GA}}$
Mean	0.3×10^{-6}	1,000	1.5	0.0028	3.14	4.0×10^{-7}
95% Confidence Upper Bound	0.7×10^{-6}	3,000	1.84	0.0042	6.28	2.6×10^{-6}
5% Confidence Lower Bound	0.1×10^{-6}	300	0.44	0.0007	1.57	5.9×10^{-9}
Variance	-	-	-	-	-	4.75×10^{-12}

TABLE II MEDIUM-SIZED AIRCRAFT
STRIKE FREQUENCIES, YR^{-1}

Parameter	R	N	A_p	W	P_M
Mean	7.0×10^{-10}	2.0×10^{4}	0.0057	9.2	8.7×10^{-9}
95% Confidence Upper Bound	9.0×10^{-10}	2.5×10^{4}	0.007	9.2	1.7×10^{-8}
5% Confidence Lower Bound	5.0×10^{-10}	1.0×10^{4}	0.0014	9.2	7.6×10^{-10}
Variance	-	-	-	-	1.09×10^{-14}

TABLE III LARGE AIRCRAFT
STRIKE FREQUENCIES, YR^{-1}

Parameter	R	N	A_p	W	P_H
Mean	7.0×10^{-10}	3.0×10^{3}	0.0057	9.2	1.30×10^{-9}
95% Confidence Upper Bound	1.0×10^{-9}	4.0×10^{3}	0.007	9.2	3.0×10^{-9}
5% Confidence Lower Bound	3.0×10^{-10}	1.5×10^{3}	0.0014	9.2	6.8×10^{-11}
Variance	-	-	-	-	4.6×10^{-18}