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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of Pa'ina Hawaii, LLC Material License Application	)))))	Docket No. 30-36974-ML ASLBP No. 06-843-01-ML

INTERVENOR CONCERNED CITIZENS
OF HONOLULU'S AMENDED SAFETY CONTENTION 7

I. INTRODUCTION

Pursuant to 10 C.F.R. § 2.309(c) and (f)(2) and this Board's April 2, 2008 order, intervenor Concerned Citizens of Honolulu hereby files Amended Safety Contention 7, which challenges applicant Pa'ina Hawaii, LLC's failure to carry its burden to establish its proposed irradiator would be "adequate to protect health and minimize danger to life or property" in the event of an aviation accident, as required by 10 C.F.R. § 30.33(a)(2). As described in greater detail herein, Pa'ina's decision to locate its proposed irradiator immediately adjacent to active runways at Honolulu International Airport, "one of the busiest airports in the United States," creates a highly elevated risk the facility – together with the one million curies of cobalt-60 ("Co-60") for which Pa'ina seeks a license – would be struck by an airplane. Final Topical Report on the Effects of Potential Natural Phenomena and Aviation Accidents at the Pa'ina Hawaii, LLC Irradiator Facility at 2-1 (ML071280833) ("Final Topical Report"). Far from "generalized, conclusory claims of a potential for an aircraft crash because of a nearby aircraft," Concerned Citizens has come forward with "detailed studies" demonstrating that the likelihood

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of an aviation accident involving the irradiator would be as much as one-in-176 over the license's ten year period. CLI-08-03, 67 NRC ___, slip op. at 20-21 (Mar. 17, 2008) (hereinafter "3/17/08 Commission Order"); see infra Part III.A.

Moreover, Concerned Citizens has presented expert analysis that, in the event of an aviation accident, there are several "'reasonable scenario[s]' of potential consequences" involving radiation exposures in excess of applicable safety standards and off-site releases of contaminated pool water. 3/17/08 Commission Order at 21 (quoting Private Fuel Storage, LLC (Independent Spent Fuel Installation), CLI-04-22, 60 NRC 125, 138 (2004)); see infra Part III.B. Since Concerned Citizens has "set forth, with adequate elaboration and support, a plausible claim that [Pa'ina's] proposed facility would not be adequately protective in the event of an aviation accident and, therefore, "presents a unique threat," the Board should admit its contention that Pa'ina has failed to carry its burden on this important safety issue. 4/2/08 Board Order (Dismissing Outstanding Safety Contentions and Permitting Submission of New Safety Contentions) at 4 (quoting 3/17/08 Commission Order at 21) ; see infra Part III.C..

II. PROCEDURAL AND FACTUAL BACKGROUND[1]

On October 3, 2005, Concerned Citizens timely filed a request for hearing on Pa'ina's application for a license for possession and use of byproduct material in connection with the construction and operation of a commercial pool-type industrial irradiator using a cobalt-60 source at the Honolulu International Airport. In Safety Contention 7, Concerned Citizens claimed Pa'ina's application "fails completely to address the likelihood and consequences of an air crash," and that these issues needed to be addressed given the elevated risk of an aviation

[1] The facts of this case have been set forth in detail several times. Accordingly, Concerned Citizens will focus here on only those facts most relevant to Amended Safety Contention 7.

accident due to the proposed irradiator's location adjacent to active runways at Honolulu International Airport. Pa'ina Hawaii, LLC (Material License Application), LBP-06-12, 63 NRC 403, 418 (2006) (internal citation omitted).

On January 24, 2006, the Board granted Concerned Citizens' request for hearing, finding Concerned Citizens had standing and finding admissible two environmental contentions challenging the Nuclear Regulatory Commission ("NRC") Staff's failure to comply with the National Environmental Policy Act ("NEPA"). Pa'ina Hawaii, LLC (Material License Application), LBP-06-04, 63 NRC 99 (2006).

On March 24, 2006, the Board issued an order admitting three of Concerned Citizens' safety contentions, including Safety Contention 7. LBP-06-12, 63 NRC at 418-20, 423.

On April 27, 2006, the Board accepted the Staff's and Concerned Citizens' joint stipulation settling Environmental Contentions 1 and 2. 4/27/06 Board Order (Confirming Oral Ruling Granting Motion to Dismiss Contentions). The stipulation provided, among other things, that the Staff would prepare an environmental assessment ("EA") for Pa'ina's proposed irradiator. 3/20/06 Joint Stipulation and Order Regarding Resolution of Concerned Citizens' Environmental Contentions at ¶ 1.

In the course of preparing the EA, the Staff issued draft and final versions of a document entitled "Topical Report on the Effects of Potential Natural Phenomena and Aviation Accidents at the Pa'ina Hawaii, LLC Irradiator Facility." Draft Topical Report (ML063560344); Final Topical Report (ML071280833).

On January 8, 2007, following issuance of the Draft Topical Report, Pa'ina filed a motion to dismiss Safety Contention 7, arguing that "because the NRC Staff ... has now filed its Safety Topical Report (STR) addressing the likelihood and consequences of an aircraft crash involving

the Applicant's proposed facility," the omission in the contention was cured and Safety Contention 7 was moot. 1/8/07 Motion to Dismiss at 4. The Staff filed a response supporting Pa'ina's motion, asserting that Concerned Citizens' safety contention was moot because the "EA and Safety Topical Report include an analysis of the probability of an aircraft crash at the proposed facility and discuss expected impacts from an aircraft crash," providing "the information allegedly omitted from the application." 1/19/07 Staff Response to Motion to Dismiss at 3.

The Board denied the motion to dismiss on the grounds that Pa'ina had failed to comply with the consultation requirements of 10 C.F.R. § 2.323(b). 1/25/07 Board Order (Rejecting Motion to Dismiss) at 2. The Board observed, however, that the Draft Topical Report "addresses aircraft crashes and thus cures the originally alleged failure, requiring the dismissal of the contention" at a later date. Id. The Board noted that "the submission of new or amended contentions is the appropriate avenue for any challenges related to the Draft Safety Topical Report," which provided "entirely new information" regarding the threats to safety from aviation accidents involving the proposed irradiator. Id. at 4.

On February 9, 2007, Concerned Citizens timely filed Safety Contention 13 challenging the adequacy of the Draft Topical Report's analysis of safety risks from aviation crashes. See 4/30/07 Board Order (Posing Questions for the Parties) at 1 (noting new contentions "timely"). Following issuance of the Final Topical Report, Concerned Citizens timely amended this contention on June 1, 2007 to address information the final report presented for the first time.

Before ruling on the admissibility of Safety Contention 13 and the dismissal of Safety Contention 7, the Board certified two questions to the Commission. 8/31/07 Board Memorandum (Certifying Question to the Commission) at 6. "The Board's primary certified

question ... ask[ed] whether 'in the circumstances presented, 10 C.F.R. § 30.33(a)(2) requires a safety analysis of the risks asserted to be endemic (i.e., aircraft crashes and natural phenomena) to the proposed irradiator site at the Honolulu International Airport?" 3/17/08 Commission Order at 2 (quoting 8/31/07 Board Memorandum at 17; footnote omitted).

In responding to the certified questions, the Commission held that "contentions raising irradiator siting concerns are not barred, as a 'matter of law,' from irradiator proceedings." Id. To be admissible, contentions "must be based on more than generalized, conclusory claims of a potential for an aircraft crash because of a nearby airport." Id. at 20. Instead, "[p]etitioners must set forth, with adequate elaboration and support, a plausible claim that a proposed facility would not be adequately protective in the event of specific phenomena." Id. at 21 (emphasis added). In addition, petitioners must provide "an explanation of how a significant harm may result given the design of the facility and sources." Id. at 22 (emphasis added). The Commission then sent the matter back to the Board to determine whether Concerned Citizens' safety contentions satisfied the standard the Commission articulated.

In its April 2, 2008 Order, the Board dismissed Safety Contention 7 "[i]n light of the standard the Commission put forth in its March 17, 2008 Memorandum and Order." 4/2/08 Board Order at 2. It also declined to admit Safety Contention 13 because it focused on "deficiencies in the Draft Topical Report, adopted by the Applicant, which, based on the Staff's representations, the Commission determined is an environmental document." Id.; see also 3/17/08 Commission Order at 10 ("the Topical Report should only be considered part of the Staff's environmental review, not its safety review"); id. at 10 n.28 ("the contentions challenging the Topical Report are challenging the Staff's environmental review, not its safety review"). The

Board then gave Concerned Citizens thirty days "to file new safety contentions in accordance with" the Commission's newly prescribed standard. 4/2/08 Board Order at 5.

III. AMENDED SAFETY CONTENTION 7: PA'INA HAS FAILED TO CARRY ITS BURDEN TO DEMONSTRATE THE PROPOSED IRRADIATOR WOULD "PROTECT HEALTH AND MINIMIZE DANGER TO LIFE OR PROPERTY" IN THE EVENT OF AN AVIATION ACCIDENT, AS 10 C.F.R. § 30.33(a)(2) REQUIRES

A. Due To Pa'ina's Chosen Location Adjacent To Busy Runways At Honolulu International Airport, The Proposed Irradiator Would Be At Unusually Elevated Risk Of Being Struck By An Airplane.

Pa'ina proposes to locate its irradiator immediately adjacent to active runways at Honolulu International Airport, "one of the busiest airports in the United States," which are used by both civilian and military aviation for more than 300,000 departures and landings annually. Final Topical Report at 2-1; see also id. at 2-3 to 2-4; Exh. 1: M. Resnikoff, "The Probability of Aircraft Impact into the Proposed Pa'ina Hawaii Irradiator" at 3-5 (Feb. 7, 2007) ("Resnikoff Report"). Due to the proximity of the proposed irradiator site to busy runways, the Staff concluded the facility would have a one-in-5,000 chance of being hit by an airplane during each year of its operation (one-in-500 odds during the ten-year period of the requested material license). Final Topical Report at 2-18. After reviewing the relevant factors, Dr. Marvin Resnikoff, Concerned Citizens' expert, concluded that even this high probability underestimates the risk, calculating that the annual likelihood of an aviation accident involving the irradiator would actually be 1-in-2,786 or 1-in-1,757 (nearly one-in-175 over the license's ten year period), depending on the methodology used. See Resnikoff Report at 18; Declaration of Marvin Resnikoff, Ph.D. ¶¶ 4-9.

Whether the Board ultimately finds Concerned Citizens' or the Staff's calculations of the risk of an aviation accident more credible does not affect the admissibility of Amended

Contention 7. Whether the odds of Pa'ina's proposed irradiator being struck by an aircraft are one-in-500 over the license's 10-year term, as the Staff claims, or closer to one-in-175, as Dr. Resnikoff concluded, the evidence before the Board consists of far more than "generalized, conclusory claims of a potential for an aircraft crash because of a nearby airport." 3/17/08 Commission Order at 20.

B. Pa'ina's Proposed Irradiator Would Not Be Adequately Protective In The Event Of An Aviation Accident.

In the event of an aviation accident involving Pa'ina's proposed irradiator, there are several "reasonable scenario[s]" which could result in radiation exposures in excess of applicable safety standards and off-site releases of contaminated pool water. Id. at 21 (quoting Private Fuel Storage, LLC, 60 NRC at 138); see also Private Fuel Storage, LLC, 60 NRC at 139 ("contention would have to give the Board reason to believe that contamination from a defective canister could find its way outside of the cask") (emphasis added). To determine "[t]he degree of support necessary for" Amended Safety Contention 7, the Board should bear in mind that the proposed "irradiator's design and protective features" depend on maintaining adequate shielding water in the irradiator pool to keep radiation exposures within regulatory limits. 3/17/08 Commission Order at 21; see also Final Environmental Assessment Related to the Proposed Pa'ina Hawaii, LLC Underwater Irradiator in Honolulu, Hawaii at 2, A-3, C-10 (ML071150121) ("Final EA"); Resnikoff Declaration ¶ 13. The irradiator pool's liner consists of only six inches of concrete, with a ¼-inch of steel on the inside and outside. Final EA at 2.

One reasonable aviation accident scenario in which Pa'ina's proposed irradiator would not be adequately protective involves the irradiator pool being punctured by airplane debris or falling pieces of the irradiator building itself. Dr. Resnikoff has calculated that a commercial

aviation jet engine would have to travel at only 38.5 miles per hour to breach the pool liner, allowing vital shielding water to escape. Resnikoff Declaration ¶ 11. Since commercial airplanes commonly land and take-off at 160 miles per hour, it is clearly plausible that an aviation accident would result in the engine striking the pool liner at speeds far in excess of 38.5 miles per hour. Id. ¶ 12. Based on computer modeling, Purdue University Professor of Structural Engineering Mete Sozen likewise concluded that airplane and building debris from an aviation accident could breach the pool liner. Exh. 5: 2/8/07 Sozen Declaration ¶ 7; Exh. 6: 3/15/07 Sozen Supp. Declaration ¶ 9; see also Exh. 7: 2/1/07 Sozen/Hoffmann Report.

Since the irradiator facility's floor level is also the minimum water level necessary to retain shielding integrity for the Co-60 sources, a breach of the pool structure due to an airplane crash would reduce the irradiator's passive shielding. Final EA at A-3; Resnikoff Declaration ¶ 13. A rupture in the pool lining could cause shielding water to drain to the surrounding groundwater level, which lies eight feet below the facility floor, far below the minimum water level. See Final Topical Report at 1-2; Final EA at A-3. Losing eight feet of shielding water would result in a radiation dose at the facility floor level of 14 rem/hour. Resnikoff Declaration ¶ 14. In only twenty-two minutes, any irradiator personnel or emergency responders on the scene would be subjected to more than the annual occupational dose limit of 5,000 millirem/year. Id.; see also Final EA at 8.

Workers would be exposed to even higher radiation doses should more shielding water be removed from the irradiator, either from the force of an explosion or through evaporation in a fuel fire. Resnikoff Declaration ¶ 15.[2] If all water were removed from the irradiator pool, the

[2] The commercial aircraft that use Honolulu International Airport carry tens of thousands of gallons of jet fuel, and, thus, there would be plenty of fuel to explode or burn following an

dose would be over 107,000 rems/hour, resulting in irradiator personnel or emergency workers receiving an LD50 dose in less than one minute. Resnikoff Declaration ¶ 15. Whether the water level fell to groundwater level or the irradiator pool were completely dry, emergency responders and irradiator personnel could be seriously injured from radiation exposure. Id. ¶ 16.[3]

The impact of airplane debris could also rupture one or more of the Co-60 sources, causing contamination of the pool water. Pa'ina's application states its irradiator would use Reviss Services, Inc., Model RSL-2089 and MDS Nordion, Model C-188, sealed sources, which have received ISO-2919 classification E64646 and E65646, respectively. Safety Review at 2 (ML072260186); see also 6/23/05 Application at 3 (ML051920106).[4] To receive this classification, these sources must be tested to withstand an impact of only a twenty-kilogram weight falling from a height of one meter. See ISO-2919:1999.

As Dr. Resnikoff explains in his declaration, in the event of an aviation accident, the forces that would applied to the Co-60 sources would be many orders of magnitude beyond those the sources were designed to withstand. Resnikoff Declaration ¶¶ 18-20. It is not only plausible, but probable, that the impact would not only rupture the source encapsulation, but shatter the plenum and the sources themselves. Id. ¶ 20. Physical destruction of the sources would

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aviation accident. See, e.g., Exh. 8: Boeing, "Technical Characteristics – Boeing 767-200ER" (23,980 gallons of fuel).

[3] The risks to emergency responders would be even greater in the event that the force of an airplane crashing into the facility and/or the ensuing fire and explosion of aviation fuel severely injured or killed the irradiator's safety personnel and led to loss of radiation detectors. Id. ¶ 17. In this entirely plausible scenario, it would be impossible to implement necessary emergency procedures. Id.; Sozen/Hoffmann Report at 5. In the absence of necessary guidance and radiation survey instruments, firefighters, police and other emergency responders could unwittingly receive extremely high radiation doses. Resnikoff Declaration ¶ 17.

[4] The Staff specified the use of these sources in the license it issued to Pa'ina. 8/17/07 License, Condition 7 (ML072320269); see also id., Condition 22.A (incorporating statements in Pa'ina's application).

contaminate the pool water, allowing dispersal of radioactive Co-60 into the surrounding groundwater and nearby Ke'ehi Lagoon via breaches in the pool lining. Id.

C. Pa'ina Has Failed To Carry Its Burden Of Establishing The Safety Of Its Proposed Irradiator In The Event Of An Aviation Accident.

The irradiator regulations' rulemaking history provide that, where "a unique threat is involved that may not be addressed by State and local requirements," the NRC may insist on safety review of facility siting. 58 Fed. Reg. 7,715, 7,725 (Feb. 9, 1993) (emphasis added). In this case, Concerned Citizens is unaware of any state or local requirement that would compel Pa'ina to modify the design of its proposed irradiator or to relocate the irradiator to eliminate the significant threats to public health and the environment described above. Pa'ina should have, but failed to, demonstrate its irradiator would be safe of in the event of an aviation accident.

1. Neither Pa'ina nor the Staff has prepared the requisite evaluation of safety risks from aviation crashes.

Pa'ina's license application fails completely to address the likelihood and consequences of an aviation accident involving its proposed irradiator. See generally 6/23/05 Application. In certifying questions to the Commission, the Board noted that Pa'ina has conceded that "safety analysis is beyond its grasp," and, therefore, "to the extent that any safety analysis has been done" in this proceeding, "it has been done by or at the behest of the Staff." 8/31/07 Board Memorandum at 6 n.13. The Staff, for its part, maintains it has never undertaken any safety evaluation of the risks that aviation accidents pose to Pa'ina's proposed irradiator. The Topical Report "was produced with only the requirements of NEPA in mind," and the Staff drew no

"safety conclusions" from it. 5/21/07 Staff Response at 4 n.3.[5] Thus, in this proceeding, no safety analysis of the ability of Pa'ina's proposed irradiator to "protect health and minimize danger to life or property" in the event of an aviation accident has been conducted. 10 C.F.R. § 30.33(a)(2).

2. The Staff's Topical Report does not satisfy Pa'ina's burden to demonstrate its irradiator would be safe in the event of an aviation accident.

Even if Pa'ina could properly invoke the Staff's "environmental document" to satisfy the applicant's burden to establish safety, the Topical Report is inadequate for that task. 4/2/08 Board Order at 2; see also Duke Power Co. (Catawba Nuclear Station, Units 1 and 2), CLI-83-19, 17 NRC 1041, 1048 (1983) ("It is well established that the Applicant carries the burden of proof on safety issues"). As discussed below, the Topical Report substantially underestimates the risk of an aviation accident involving Pa'ina's proposed irradiator. Moreover, it fails to provide a meaningful analysis of the consequences of such an accident.

a. The Topical Report underestimates crash probability.

In his declaration and accompanying report, Dr. Marvin Resnikoff explains that the Topical Report underestimates the probability of an aircraft impacting Pa'ina's proposed irradiator by a factor of 2 to 3. Resnikoff Declaration ¶¶ 4-9 (probability is 1 in 2,786 or 1 in 1,757, depending on methodology, not 1 in 5,000); see generally Resnikoff Report. There are many reasons for the Topical Report's substantial understatement of the crash probability, including, but not limited to, its reliance on obsolete crash data and its failure to account for

[5] In discussing the Topical Report, the Commission noted that, "had [the Staff] conducted a safety analysis of potential aircraft crash consequences, such an analysis 'would differ' from the Topical Report's consequence analysis, 'completed for the Staff's environmental review,' because 'there are different regulatory standards for environmental and safety reviews.'" 3/17/08 Commission Order at 10 (quoting 6/13/07 Staff Response to Board's 6/6/07 Order at 6).

unusually elevated crash rates at Honolulu International Airport and for the fact that landings have a higher crash rate than takeoffs. Resnikoff Declaration ¶¶ 6-7. Moreover, the Topical Report uses an unreasonably low number of aircraft operations at the Honolulu airport (apparently relying on a five-year average that includes the sharply reduced operations in the years following September 11, 2001) and fails to factor in the projected 20% increase in operations during the ten-year term of Pa'ina's license. Id. ¶ 9; see also Draft Topical Report at 2-13. Analysis of the safety of Pa'ina's proposed irradiator must be based on an accurate assessment of the likelihood an airplane will hit the facility, which the Topical Report's flawed calculations fail to provide.

b. The Topical Report does not provide a meaningful analysis of airplane crash consequences.

Even if the Board were to accept the Topical Report's estimated crash rate probability of 1 in 5,000, the Topical Report fails to take into account reasonable aviation accident scenarios and does not provide data or calculations to demonstrate the design of Pa'ina's proposed irradiator would be adequate "to protect health and minimize danger to life or property," as required by 10 C.F.R. § 30.33(a)(2).

The Topical Report improperly downplays the consequences of a loss of shielding water due to an airplane crash, which threatens exposures above regulatory limits. The report concedes that "a reduction in the water level may result in increased dose rates in a well-collimated beam directly above the pool," but fails to present any analysis of what dose rates would be expected. Final Topical Report at 1-3. As discussed above, a rupture in the pool liner that allowed shielding water to drop to the level of the surrounding groundwater would threaten doses to irradiator personnel and emergency responders in excess of 14 rem/hour, with even greater

exposures possible if more shielding water were removed from the irradiator pool from the force of an explosion or through evaporation in a fuel fire.

Moreover, the Topical Report completely ignores the potential for physical destruction of the sources to contaminate the pool water or allow dispersal of pulverized Co-60 via breaches in the pool lining, considering instead only rates of corrosion. See Topical Report at 1-3. Instead of quantifying the impact of flying aircraft or building debris on the Co-60 sources and evaluating the likelihood radioactive material would be dispersed, the Topical Report improperly takes it on faith the performance standards in 10 C.F.R. § 36.21 and ANSI test E65646 – which were not designed to ensure safety in the event of an aviation accident – would be adequate to protect the public and environment. Final Topical Report at 1-1 to 1-2, 2-12. The report does not present any calculations to back up its assumptions. For example, the report does not quantify the impact of flying airplane debris or building girders following a collision to allow a comparison with the impact associated with a 20-kg steel weight dropped from a height of one meter, the more stringent of the two impact standards. The report cannot merely assume an exploding airplane would exert no more force on the irradiator's sources than a weight falling from the height of a tabletop. Resnikoff Dec. ¶ 17; see also Sozen/Hoffman Report at 5 ("the mass and velocity of falling debris will deliver much more destructive energy than the NRC impact standard for source assemblies").

Dr. Resnikoff's calculations confirm that the forces that would applied to the Co-60 sources in the event of an aviation accident would be many orders of magnitude beyond those for which the sources were designed. Id. ¶¶ 19-20 & Exh. 4. Consequently, it is not only plausible, but probable, that an aviation accident would shatter the Co-60 sources themselves, contaminating the pool water, which could then escape the facility though ruptures in the pool

lining, spreading radioactive contamination to the groundwater and nearby Ke'ehi Lagoon. Id. ¶ 20; see also 2/8/07 Sozen Declaration ¶ 7 ("Flying debris could breach the source assembly or pool," releasing "radioactive Co-60 ... to the human environment"). The Topical Report fails completely to address this reasonable scenario.

IV. AMENDED SAFETY CONTENTION 7 SATISFIES THE REQUIREMENTS FOR ADMISSION

A. 10 C.F.R. § 2.309(f)(1).

In the foregoing discussion, Concerned Citizens has provided specific statements of the factual and legal issues to be raised, a brief explanation of the basis for its contention, and a concise statement of the alleged facts and expert opinions which support Concerned Citizens' position on the issues and on which Concerned Citizens intends to rely at hearing, as required by 10 C.F.R. § 2.309(f)(1)(i), (ii) and (v). The core issue raised by Amended Safety Contention 7 – whether Pa'ina has carried its burden to ensure adequate protection for the public and environment in the event of an aviation accident involving the proposed irradiator – is within the scope of this proceeding and material to the findings the Board must make herein. See id. § 2.309(f)(1)(iii)-(iv); see also 3/17/08 Commission Order at 2 ("contentions raising irradiator siting concerns are not barred, as a 'matter of law,' from irradiator proceedings"); LBP-06-12, 63 NRC at 420 (Board must ensure compliance with 10 C.F.R. § 30.33(a)(2)). By "set[ting] forth, with adequate elaboration and support, a plausible claim that [Pa'ina's proposed irradiator] would not be adequately protective in the event" of an aviation accident, Concerned Citizens has established its amended contention presents a genuine dispute on material issues in accordance with 10 C.F.R. § 2.309(f)(1)(vi). 3/17/08 Commission Order at 21.

B. The Contention Satisfies 10 C.F.R. § 2.309(f)(2).

Concerned Citizens' amended safety contention challenges Pa'ina's failure to satisfy its burden to demonstrate the safety of its proposed irradiator in the event of an aviation accident. Concerned Citizens timely presented the same core claim in its initial hearing request, and the Board initially admitted it. LBP-06-12, 63 NRC at 418-420. Subsequent to Safety Contention 7's admission, the Commission articulated new and more "rigorous safety contention admissibility standards with respect to irradiator siting." 4/2/08 Board Order at 5. Concerned Citizens files this amended contention to provide the additional information the Commission's new standard requires.

Prior to the Commission's March 17, 2008 ruling, there was no standard other than the one set forth at 10 C.F.R. § 2.309(f)(1) to govern the admission of contentions timely filed with an initial hearing request. See LBP-06-12, 63 NRC at 420 (concluding Safety Contention 7 "meets all ... pleading requirements for admissible contentions"). Consequently, the Commission's "newly prescribed" standard for safety contentions challenging the siting of an irradiator, 4/2/08 Board Order at 5, contains information that "was not previously available" and "is materially different than information ... available" at the time Concerned Citizens filed its hearing request. 10 C.F.R. § 2.309(f)(2)(i), (ii).

Concerned Citizens has filed Amended Safety Contention 7 within thirty days of the Board's April 2, 2008 order, and, accordingly, the contention is "timely." Id. § 2.309(f)(2)(iii); see also 4/2/08 Board Order at 5.

C. 10 C.F.R. § 2.309(c).

In analyzing contentions pursuant to section 2.309(c), "each factor is not necessarily applicable to the present case, nor is it necessary or appropriate to assign each factor equal

weight." 6/22/06 Board Order at 13. "Rather, the first factor, 'good cause,' is the most important factor." Id.

In this case, the Commission's "newly prescribed ... safety contention admissibility standards with respect to irradiator siting" were not in existence at the time Concerned Citizens filed its original hearing request. 4/2/08 Board Order at 5. "Newly available material information has long been held to provide good cause to file a new contention." Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc. (Vermont Yankee Nuclear Power Station), LBP-04-33, 60 NRC 749, 754 (2004) (citing Consumers Power Co. (Midland Plant, Units 1 and 2), LBP-82-63, 16 NRC 571, 577 (1982)).

The Board has previously held Concerned Citizens has standing to participate in this proceeding. LBP-06-04, 63 NRC at 103-07. Since the Board has already found Concerned Citizens' "interest may be affected by this proceeding," and no party has appealed that decision, Concerned Citizens unquestionably has a right to participate in this licensing proceeding. Id. at 103 (quoting 42 U.S.C. § 2239(a)(1)(A)); see also 10 C.F.R. § 2.309(c)(ii). As for the nature and extent of its "interest in the proceeding," it is to avoid or minimize threats of injury from radiation exposure associated with the irradiator, including exposures that could result from aviation accidents involving Pa'ina's proposed facility. 10 C.F.R. § 2.309(c)(iii).

"The proposed irradiator will not be operated without approval and a license from the NRC." LBP-06-04, 63 NRC at 105. Consequently, whether and the degree to which Concerned Citizens and its members face threats of injury from radiation is completely contingent on the ultimate decision on Pa'ina's license application. Since the hearing on this application is the only forum in which Concerned Citizens can seek to ensure Pa'ina's compliance with 10 C.F.R.

§ 30.33(a)(2), the factors set forth in section 2.309(c)(iv) and (v) weigh in favor of admitting the proffered contentions.

There are no other intervenors in this case, and, thus, no other existing parties who will or can represent Concerned Citizens' interests. See 10 C.F.R. § 2.309(c)(vi).

Admitting Amended Safety Contention 7 would not substantially broaden the issues in this licensing proceeding, since, even without the contention, the Board would be obliged to resolve related contentions involving the Staff's failure adequately to address the impacts of aviation accidents for purposes of complying with NEPA. See 12/21/07 Board Order (Ruling on Admissibility of Intervenor's Amended Environmental Contentions) at 10-11 (failure to respond to expert comments regarding aviation accident impacts), 16-17 (failure to take a hard look at impacts of aviation accidents); 10 C.F.R. § 2.309(c)(vii). While allowing Concerned Citizens to present evidence and argument regarding its amended contention may increase the time necessary to complete the licensing proceeding, that factor alone does not militate against admitting Amended Safety Contention 7. The primary effect of admitting the contention would be to ensure the Board has a fully developed and sound record on which to base its ultimate decision, with Concerned Citizens' experts providing information that otherwise would be missing from the proceeding. See id. § 2.309(c)(viii).

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V. CONCLUSION

For the foregoing reasons, Concerned Citizens respectfully asks the Board to admit Amended Safety Contention 7.

Dated at Honolulu, Hawai'i, May 2, 2008.

Respectfully submitted,

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of Pa'ina Hawaii, LLC Material License Application	)))))	Docket No. 30-36974-ML ASLBP No. 06-843-01-ML

DECLARATION OF MARVIN RESNIKOFF, Ph.D., IN SUPPORT OF CONCERNED CITIZENS' AMENDED SAFETY CONTENTION 7

Under penalty of perjury, I, Dr. Marvin Resnikoff, hereby declare that:

1. I am a physicist with a Ph.D. in high-energy theoretical physics from the University of Michigan and also the Senior Associate of Radioactive Waste Management Associates, a private technical consulting firm based in New York City. I previously filed declarations in support of Concerned Citizens of Honolulu's Request for Hearing and Concerned Citizens' contentions regarding the draft and final versions of the environmental assessment and of the Topical Report on the Effects of Potential Natural Phenomena and Aviation Accidents at the Pa'ina Hawaii, LLC Irradiator Facility ("Topical Report"). My credentials to discuss risk assessment and other technical issues related to Pa'ina Hawaii, LLC's proposed irradiator were previously stated in my prior declarations and will not be repeated here.

2. As described in greater detail below, in my opinion, Pa'ina's decision to locate its proposed irradiator immediately adjacent to active runways at Honolulu International Airport ("HNL") creates an unusually elevated risk the facility – together with the one million curies of Cobalt-60 ("Co-60") for which Pa'ina seeks a license –

would be struck by an airplane. Depending on the methodology used, the annual likelihood of an aviation accident involving the irradiator would be 1-in-2,786 or 1-in-1,757 (nearly one-in-175 over the license's ten year period). Moreover, should an accident occur, there are several reasonable scenarios of potential consequences resulting in radiation exposures in excess of applicable safety standards and off-site releases of contaminated pool water.

3. Pa'ina's license application does not address the threats to safety posed by an aviation accident involving its proposed irradiator. Instead, Pa'ina relies on the Topical Report to demonstrate safety. That document, however, significantly underestimates the probability of an aircraft striking Pa'ina's proposed irradiator and fails to provide any meaningful analysis of the potential consequences of an aviation accident. Because of the Topical Report's many flaws, Pa'ina cannot rely on it to establish its proposed irradiator design would be adequate "to protect health and minimize danger to life or property," as required by 10 C.F.R. § 30.33(a)(2).

4. **Probability of Aircraft Impact into Proposed Pa'ina Irradiator.** Using the Department of Energy ("DOE") standard, DOE-STD-3014-96, "Accident Analysis for Aircraft Crash into Hazardous Facilities," I calculated the expected accident frequency (i.e., the number of accidents per year) of an aircraft impacting the proposed Pa'ina irradiator. The DOE standard is similar to the Nuclear Regulatory Commission ("NRC") methodology (NUREG-0800) I employed in the NRC proceedings regarding the proposed Private Fuel Storage spent fuel storage facility at Skull Valley, Utah. Since NUREG-0800 is designed primarily for potential facilities located at some distance from an airport, not for facilities like the Pa'ina irradiator which would be immediately

adjacent to active airport runways, I question the Center for Nuclear Waste Regulatory Analyses's ("CNRWA's") decision to rely solely on NUREG-0800 for the Topical Report's analysis.

5. My report, a true and correct copy of which is attached hereto as Exhibit "1" and is incorporated herein by reference, details the methodology and calculations I employed to determine the probability of an aircraft impact into the proposed irradiator. In summary, I concluded that the yearly probability using DOE's national crash statistics would be 3.59E-04 (1 in 2,786). If HNL-specific crash rates are used, the yearly probability increases to 5.69E-04 (1 in 1,757).

6. Both crash rates are significantly higher than the yearly probability set forth in CNWRA's Topical Report, 2.0E-04 (1 in 5,000). There are many reasons for the Topical Report's substantial understatement of the risk of an airplane striking the proposed Pa'ina irradiator. First, CNWRA relies on airplane crash data that are more than thirty years old and not applicable to all aircraft. In contrast, the DOE data I used are applicable to all aircraft, including air taxis (which currently constitute over 20% of aircraft operations at HNL), and are updated to 1996. In addition, the Topical Report fails to account for the fact that air crash rates for HNL are higher than the national average, as I did in my alternate calculations using HNL-specific crash rates.

7. Second, the methodology CNWRA used for the Topical Report looks solely at the distance a proposed facility is from the end of the runway, failing to take into account that landings have a higher crash rate than takeoffs.

8. Third, the methodology CNWRA used for the Topical Report employs an equal probability of an air crash to all locations in the vicinity of an airport, and this is not

correct. To take one example, for military aircraft, planes fly parallel to the runway, then make a U-turn and land. The side where military planes first fly is called the "pattern" side. Accordingly, my analysis assumed that the pattern side is over the ocean. This type of fine detail is missing from the Topical Report's analysis.

9. Fifth, the number of aircraft operations at HNL used in the Topical Report's calculations understates the actual number of current operations, and also fails to account for anticipated future growth during the time period for which Pa'ina seeks a materials license. Although unstated in the report's analysis, it appears CNWRA used the average number of aircraft operations at HNL over the five years preceding the report's preparation in 2007, which would reflect the substantial decrease in the number of operations at HNL following September 11, 2001. Since the number of operations at HNL did not begin to increase until the last few years and, as the Federal Aviation Administration has determined, is expected to increase by another 20% during the 10-year period of Pa'ina's license application, the number of operations CNWRA uses in its calculations is unrealistically low. A more realistic, but still conservative, assumption is to use current operational levels. My analysis took this approach, using the most recent numbers then available, which are from airport operations in 2005.

10. **Consequences of Aircraft Impact into Pa'ina Irradiator.** Whether the Board accepts the Topical Report's crash rate or those presented in my report, there would be a significant risk of an airplane crash involving Pa'ina's proposed irradiator over the ten-year term of the requested license. The Topical Report fails, however, to take into account realistic accident scenarios and does not provide data or calculations to

demonstrate the design of Pa'ina's proposed irradiator would be adequate "to protect health and minimize danger to life or property," as required by 10 C.F.R. § 30.33(a)(2).

11. An aviation accident could damage the pool structure under the floor level, with the impact of airplane or building debris tearing the welds or puncturing the pool liner, resulting in loss of irradiator pool shielding water. Attached hereto as Exhibit "2" are calculations I performed to analyze the velocity at which a jet engine commonly used in commercial aviation (GE model CF6-80C2) would pierce the pool liner (which consists of only six inches of concrete sandwiched between ¼-inch steel), allowing shielding water to escape. My analysis demonstrates that the engine would have to travel at only 38.5 miles per hour to breach the liner.

12. Commercial airplanes commonly land and take-off at 160 miles per hour. Thus, it is clearly plausible that an aviation accident would result in the engine striking the pool liner at speeds far in excess of 38.5 miles per hour.

13. Since the irradiator facility's floor level is also the minimum water level necessary to retain shielding integrity for the Co-60 sources, a breach of the pool structure due to an airplane crash would reduce the irradiator's passive shielding. The Topical Report states (at page 1-2) the depth of the water table is 2.4 meters (8 feet) below the facility floor, and, thus, its assertion that sea water infiltrating through a breach would adequately shield the Co-60 sources is unsupported. In fact, any break in the pool lining below the floor level could dangerously reduce the shielding of the sources.

14. My calculations, attached as Exhibit "3," show that, if the shielding water were to drain to the level of the surrounding water table, the dose at floor level would be greater than 14 rem/hr. In only twenty-two minutes, any irradiator personnel or

emergency responders on the scene would be subjected to more than the annual occupational dose limit of 5,000 millirem/year.

15. In cases in which more shielding water were removed from the irradiator pool, either from the force of an explosion or through evaporation in a fuel fire, radiation doses would be far higher. If all water were removed from the irradiator pool, my calculations show that the likely dose would be over 107,000 rems/hr. Emergency personnel could receive an LD50 dose in less than one minute.

16. Whether the water level fell to groundwater level or the irradiator pool were completely dry, emergency responders and irradiator personnel could be seriously injured from radiation exposure.

17. The risks to emergency responders would be even greater in the event that the force of an airplane crashing into the facility and/or the ensuing fire and explosion of aviation fuel severely injured or killed the irradiator's safety personnel and led to loss of radiation detectors. In this entirely plausible scenario, it would be impossible to implement necessary emergency procedures. In the absence of necessary guidance and radiation survey instruments, firefighters, police and other emergency responders could unwittingly receive extremely high radiation doses.

18. The Topical Report also ignores the potential for contamination of the pool water in the event that an airplane crash breaches the sources. While the report asserts that Co-60 sources that can satisfy the criteria set forth in 10 C.F.R. § 36.21 and ANSI test 65646 would be robust enough to survive an aviation accident, CNWRA never performed any calculations to back up that claim. For example, the report does not quantify the impact of flying airplane debris or building girders following a collision to

allow a comparison with the impact associated with a 2.5 cm-diameter, 20-kg steel weight dropped from a height of 1 meter, the more stringent of the two impact standards. It is not intuitive that an exploding airplane would exert no more force on the irradiator's sources than a weight falling from the height of a tabletop.

19. Attached hereto as Exhibit "4" are calculations I performed that show that, in fact, the impact associated with an aviation accident would far exceed the standards the Co-60 sources must meet. For the purposes of these calculations, I assumed that a commercial jet engine (GE model CF6-80C2) was dropped onto the sources from 18.5 feet, the height of the water in the pool, and had no additional velocity. This is a very conservative assumption since, in an airplane crash, the engine would fall from a much greater height. Taking into account the buoyancy of the pool water (which, prior to the impact, would not yet have drained out), the energy imparted by a commercial jet engine falling from the top of the irradiator pool would be over 7,500 times the energy imparted by a 20-kg weight falling from a height of one meter, the standard applicable to the sources Pa'ina proposes to use. The impact would be far greater if the jet engine fell from a height greater than the top of the irradiator pool, as would undoubtedly be the case in any aviation accident involving the facility.

20. The foregoing analysis makes clear that, in the event of an aviation accident, the forces that would applied to the Co-60 sources would be many orders of magnitude beyond those for which the sources were designed. It is not only plausible, but probable, that the impact would not only rupture the source encapsulation, but shatter the plenum and the sources themselves, contaminating the pool water. The contaminated

water could then escape the facility though ruptures in the pool lining, spreading radioactive contamination to the groundwater and nearby Ke'ehi Lagoon.

I declare under penalty of perjury that the factual information provided above is true and correct to the best of my knowledge and belief, and that the professional opinions expressed above are based on my best professional judgment.

Executed at New York, New York on this 2nd day of May, 2008.

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The Probability of Aircraft Impact into the Proposed Pa'ina Hawaii Irradiator
NRC Docket No. 030-36974

By
M. Resnikoff, Ph.D.

For
Earthjustice

February 7, 2007

This report evaluates the expected accident frequency, the number of accidents per year, of an aircraft impacting the proposed Pa'ina Hawaii food irradiator. No quantitative assessment is made of the consequences of an aircraft impact into the irradiator, though some of the criteria used by the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC), as they are applicable, are discussed.

The methodology follows the DOE standard, DOE-STD-3014-96, "Accident Analysis for Aircraft Crash into Hazardous Facilities."[1] The DOE standard is similar to the NRC methodology employed by the author in the NRC proceedings regarding the proposed PFS spent fuel storage facility at Skull Valley, Utah, and the Atomic Safety and Licensing Board accepted that testimony.[2] Numerous other analysts have employed this standard to analyze aviation risks at DOE nuclear facilities.[3]

Generally, the NRC methodology[4] in NUREG-0800 is used for potential facilities located at some distance from an airport, not for facilities like the Pa'ina irradiator, which would be in close proximity to airport runways. Accordingly, we question the Center for

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[1] Department of Energy, "Accident Analysis for Aircraft Crash into Hazardous Facilities," DOE-STD-3014-96, October 1996, available at http://hss.energy.gov/NuclearSafety/techstds/standard/std3014/std3014.pdf.

[2] State Of Utah's Prefiled Testimony Of Dr. Marvin Resnikoff For Contention Utah K/Confederated Tribes B, Docket No. 72-22-ISFSI, ASLBP No. 97-732-02-ISFSI, February 19, 2002.

[3] DOE-STD-3014-96, p. B-24.

[4] NUREG-0800, NRC Standard Review Plan, Section 3.5.1.6, Aircraft Hazards.

EXHIBIT 1

Nuclear Waste Regulatory Analyses' (CNRWA's) decision to rely solely on NUREG-0800 for its analysis.[5]

We contrast our methodology with that of CNWRA in a section of this report, but many aspects are identical. Similar to the CNWRA analysis, we consider four types of aircraft: commercial air carriers, air taxis, general aviation and military aircraft. The specific aircraft types for commercial air carriers are generic, that is, no distinction is made for major aircraft carriers between a Boeing 727, 737, 747 or 767 aircraft. For military aircraft, as in the CNWRA analysis, we consider only light fighter jets, like the F-16, and ignore large military aircraft. Our calculation of the fly-in and skid-in area of the proposed facility is identical.

If the impact frequency exceeds 1 in a million per year, the NRC has customarily proceeded to the next step, evaluating the consequences of an airplane crash (i.e., the likelihood that, in the event of an airplane crash, radiation releases would occur). CNWRA devotes only a single paragraph to this important analysis and, without presenting any calculations or other meaningful analysis, simply asserts there are no consequences - end of story. This section of the CNWRA, and of the Environmental Assessment that relies on it, will clearly have to be supplemented to provide a meaningful discussion of the consequences of an aviation accident involving Pa'ina's proposed irradiator.

In the next section we discuss the methodology and the selected data. We also contrast our methodology and data with those of CNWRA. In the following section, we discuss the results of our analysis and recommendations.

Methodology

Aircraft crash frequencies are estimated with a formula that takes into account (1) the number of operations, (2) the probability that an aircraft will crash, (3) given a crash, the probability that the aircraft will crash into a 1-square mile area where the facility is located (the conditional probability), and (4) the size of the facility.[6] In the PFS proceeding[7], we evaluated non-airport activities, that is, the number of crashes per square mile per year expected to occur for Air Force fighter jets during the flight phase. In

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[5] Durham, J, *et al*, "Draft Topical Report on the Effects of Potential Natural Phenomena and Aviation Accidents at the Proposed Pa'ina Hawaii, LLC, Irradiator Facility," Center for Nuclear Waste Regulatory Analyses, December 2006.

[6] DOE-STD-3014-96, p. 38.

[7] Ref. 2 above

contrast, for Pa'ina's proposed facility, we take into account only takeoffs and landings, using a combination of Honolulu International Airport (HNL) specific information and generic information. A second calculation we perform employs the default assumptions of DOE's standard, DOE-STD-3014-96.

Mathematically the formula that is employed is the following:

$$F = \sum_{i,j,k} N_{ijk} P_{ijk} f_{ijk}(x,y) A_{ij} \qquad (1)$$

where:

F =	estimated annual aircraft crash impact frequency into the proposed irradiator (no./y),
N_{ijk} =	estimated annual number of takeoffs and landings for each aircraft category and each runway,
P_{ijk} =	aircraft crash rate per take-off and landing for HNL or generically for the U.S.
$f_{ijk}(x,y)$ =	crash location conditional probability – given a crash, the likelihood it will be into the facility,
A_{ij} =	the effective area of the facility that includes skid-in and fly-in effective areas for each aircraft, for takeoffs and landings,
i =	index for flight phase, i = 1,2,3 for take-off, in-flight and landing (for purposes of this analysis, we ignore in-flight crashes),
j =	index for aircraft category (Air Carrier Operations, Air Taxi Operations, General Aviation Operations, and Military Operations),
k =	flight source (4 runways).

We next evaluate each of the parameters in Equation (1).

Number of Operations

We first estimate the number of aircraft operations N_{ijk}, that is, the total takeoffs and landings at the Honolulu International Airport, by averaging the historical data. The data for each type of aircraft operation at HNL appear in Table 1; the data are provided by the Federal Aviation Administration (FAA). Over a 30-year period of time, the average number of aircraft operations at HNL, according to the FAA, is 356,772 per year.[8] For

[8] http://www.apo.data.faa.gov, "APO Terminal Area Forecast Summary Report, HNL"

2005, the number of air craft operations, according to the FAA, was 334,660.[9] Hawaii DOT says the number of aircraft operations in 2005 was 330,506.[10] The number of aircraft operations at HNL declined following September 11th, but increased in 2005. As noted in the CNWRA analysis, the FAA expects the number of persons visiting Hawaii and the number of aircraft operations at HNL to continue to increase, with an increase to 510,000 operations by fiscal year 2012. However, this potential increase is not factored into CNWRA's probability calculations, nor ours.

The accident rates at HNL for each aircraft category, except for military aircraft (for which HNL-specific accident rates were not available) appear in Tables 2 through 4.[11] The average number of accidents per year at HNL, averaged over all non-military aircraft, is 2.633; the average number of fatal accidents per year, averaged over all non-military aircraft, is 0.5. Expressed in terms of the average number of accidents per 100,000 takeoff and landings (excluding military aircraft), the number is 0.80; the average number of fatal accidents per 100,000 takeoff and landings of non-military aircraft at HNL is 0.153.

The NTSB defines a crash as "any aircraft accident that results in destruction or substantial damage to the aircraft."[12] A crash is therefore not necessarily an accident involving fatalities, but for this analysis, we equate a fatal accident with a crash. Further, we sum up all fatal accidents for all aircraft types to get an HNL-specific fatal accident rate. Also we carry out a separate analysis employing the crash rates for individual aircraft, as developed by the DOE.[13] The contrasting crash rates are presented in Table 6.

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[9] *Ibid.* In contrast, CNWRA claims the FAA has recorded 323,726 aircraft operations for the year 2005. Since both CNWRA and RWMA state they are using data from the FAA, the discrepancy between the two figures will have to be resolved.
[10] Schlapak, B, email to M Blevins, NRC, 10/31/2006.
[11] Table 5 sets forth the annual number of departures and landings of military aircraft.
[12] DOE-STD-3014-96
[13] *Ibid.*

Table 1. Departures and Landings for Honolulu International Airport, 1975-2005[a]

Year	Aircraft Operations	All Accidents	Fatal Accidents	Incidents	Acc/100,000 Dep + Land	Facc/100,000 Dep+Land
2005	318853	1	0	0	0.314	0.000
2004	290737	2	0	0	0.688	0.000
2003	294631	0	0	1	0.000	0.000
2002	300111	1	0	0	0.333	0.000
2001	323522	1	0	2	0.309	0.000
2000	326698	1	0	1	0.306	0.000
1999	323922	2	0	0	0.617	0.000
1998	312596	0	0	2	0.000	0.000
1997	340742	3	0	0	0.880	0.000
1996	351065	3	0	0	0.855	0.000
1995	352814	4	1	0	1.134	0.283
1994	335532	2	1	1	0.596	0.298
1993	341316	2	2	0	0.586	0.586
1992	381879	3	2	0	0.786	0.524
1991	369856	3	0	0	0.811	0.000
1990	368827	0	0	0	0.000	0.000
1989	362644	4	1	0	1.103	0.276
1988	331229	2	0	1	0.604	0.000
1987	365111	6	1	0	1.643	0.274
1986	334884	2	0	0	0.597	0.000
1985	323598	2	0	0	0.618	0.000
1984	312492	3	0	0	0.960	0.000
1983	297071	2	0	0	0.673	0.000
1982	278589	2	0	1	0.718	0.000
1981	320079	2	1	2	0.625	0.312
1980	352856	5	1	0	1.417	0.283
1979	379488	4	0	0	1.054	0.000
1978	329969	3	0	2	0.909	0.000
1977	296869	9	3	1	3.032	1.011
1976	274714	5	2	0	1.820	0.728
1975		5				
	329756.5	**2.633**	**0.500**	**average =**	**0.800**	**0.153**

a In this table, military operations at HNL are excluded in determining total operations and accident and fatal accident rates.

Table 2. Departures and Landings (HNL) Air Carrier

Year	Air Carrier Operations	All Accidents	Acc/100,000 Dep + Lnd
2005	184937		0
2004	166121		0.000
2003	167562	1	0.597
2002	174544		0.000
2001	196351	2	1.019
2000	206786	1	0.484
1999	192137	1	0.520
1998	183856	2	1.088
1997	186648	2	1.072
1996	205600	2	0.973
1995	199801	1	0.500
1994	191176	1	0.523
1993	187950		0.000
1992	201999		0.000
1991	194293		0.000
1990	194000		0.000
1989	195981	1	0.510
1988	187445	1	0.533
1987	214028	1	0.467
1986	184523	1	0.542
1985	163562		0.000
1984	150273	1	0.665
1983	137420	1	0.728
1982	126981	1	0.788
1981	123148	2	1.624
1980	125185		0.000
1979	132696	1	0.754
1978	117663	2	1.700
1977	112111	3	2.676
1976	106447	2	1.879

Table 3. Departures and Landings (HNL) Air Taxis

Year	Air Taxi Operations	All Accidents	Acc/100,000 Dep + Lnd
2005	65843		0.000
2004	51030		0.000
2003	46433		0.000
2002	44742	1	2.235
2001	35037		0.000
2000	30402		0.000
1999	38675		0.000
1998	42195		0.000
1997	68423	1	1.461
1996	60536		0.000
1995	70245		0.000
1994	55425		0.000
1993	55216		0.000
1992	59984		0.000
1991	63608	1	1.572
1990	56909		0.000
1989	67022		0.000
1988	57366	1	1.743
1987	65993		0.000
1986	71823		0.000
1985	78638		0.000
1984	75101	1	1.332
1983	74530		0.000
1982	69106	1	1.447
1981	75354		0.000
1980	77632	2	2.576
1979	87131	1	1.148
1978	81108		0.000
1977	66783	1	1.497
1976	53896		0.000

Table 4. Departures and Landings (HNL)
General Aviation

Year	General Aviation Operations	All Accidents	Acc/100,000 Dep + Lnd
2005	68073	1	1.469
2004	73586	2	2.718
2003	80636		0.000
2002	80825		0.000
2001	92134	1	1.085
2000	89510	1	1.117
1999	93110	1	1.074
1998	86545		0.000
1997	85671		0.000
1996	84929	2	2.355
1995	82768	3	3.625
1994	88931	2	2.249
1993	98150	2	2.038
1992	119896	3	2.502
1991	111955	2	1.786
1990	117918		0.000
1989	99641	3	3.011
1988	86418	1	1.157
1987	85090	4	4.701
1986	78538	1	1.273
1985	81398	2	2.457
1984	87118	1	1.148
1983	85121	1	1.175
1982	82502	1	1.212
1981	121577	2	1.645
1980	150039	3	1.999
1979	159661	2	1.253
1978	131198	3	2.287
1977	117975	6	5.086
1976	114371	3	2.623

Table 5. Departures and Landings (HNL) Military[a]

Year	Military Operations	All Accidents	Acc/100,000 Dep + Lnd
2005	15807		
2004	16847		
2003	15884		
2002	15978		
2001	16465		
2000	16598		
1999	21080		
1998	21685		
1997	23991		
1996	23900		
1995	23410		
1994	21584		
1993	23879		
1992	31846		
1991	23853		
1990	37998		
1989	43466		
1988	35912		
1987	23924		
1986	29011		
1985	30293		
1984	30938		
1983	29669		
1982	27403		
1981	31813		
1980	32607		
1979	31888		
1978	35564		
1977	33704		
1976	43473		

[a] In our calculations for crash rates we use the data from DOE-STD-3014-96.

From Tables 2,3 and 4, we see that the average number of accidents for air carriers, air taxis and general aviation is, respectively, 0.655, 0.5 and 1.768 per 100,000 takeoffs and landings. The accident rate for military aircraft was not provided by the Hawai'i Department of Transportation, so we employed the average crash rate for small military aircraft for the entire U.S., 0.18 and 0.33 crashes per 100,000 takeoffs and landings, respectively.[14] For all of the above aircraft categories, for the RWMA calculations, we averaged the accidents due to takeoffs and due to landings at HNL, assuming the number of takeoffs equal the number of landings. Table 6 compares our results to those of DOE.

Table 6. Aircraft Accident Rates

	DOE Crash Rate		RWMA
Aircraft	Takeoff per 100,000	Landing per 100,000	HNL Takeoff, Landing per 100,000
General Aviation[1]	0.35	0.83	0.153
Air Carrier	0.019	0.028	0.153
Air Taxi	0.1	0.23	0.153
Military[2]	0.18	0.33	0.18/0.33

Notes:
[1] Fixed wing turboprop
[2] Small military aircraft includes fighter jets, attack aircraft and trainers

The data for the DOE crash rates are taken from an NTSB data base, for the country as a whole.[15] As expected, the crash rate for landings is greater than the crash rate for takeoffs. The RWMA crash rate combines takeoffs and landings (except for military aircraft), but is specific to HNL. Except for air carriers, DOE's accident rate for all aircraft is generally greater than RWMA's, but this is somewhat misleading, since air carriers comprise over half the takeoffs and landings at HNL. Weighted by the number of aircraft operations for each aircraft, DOE's average crash rate is actually smaller than RWMA's, reflecting a higher than average crash rate at HNL.

The crash rate used in the CNWRA analysis is not directly comparable to the rates listed in Table 6, since CNWRA combines the overall crash rate with a type of conditional probability, as discussed further below. But it is important to note that the CNWRA

[14] FAA data, footnote 8.
[15] DOE-STD-3014-96

crash rate does not distinguish between takeoffs and landings, and this is clearly incorrect. Further, conditional probability analysis takes into account the spatial distribution of accidents, which will differ depending on whether a takeoff or landing is involved. In contrast, RWMA's analysis considers takeoffs and landings, as well as the specific aircraft involved, in calculating the conditional probabilities.

Conditional Probabilities

Given an air crash, we next have to determine the likelihood that the proposed irradiator would be hit within a square mile area; this is called the conditional probability, $f_{ijk}(x,y)$. These conditional probabilities come from NTSB national averages and appear in the DOE report,[16] updated to 1996. Essentially, from a large database listing locations of crashes near airports, NTSB has determined, for each type of aircraft, the probability of an air crash with distance from the center of a runway. To utilize the database, one must determine the location of the proposed facility with respect to the center of each runway. A Cartesian coordinate system must be set up. See Figure1 below. The origin is the center of each runway.

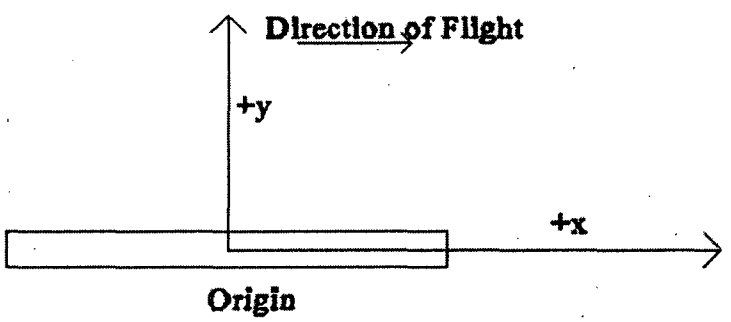

Figure 1. Coordinate convention for use with crash location probability tables for commercial and general aviation

The conditional probabilities for military aircraft are more complicated, but since the basic information is presently not available to us, we have had to simplify the data. Military aircraft land by first approaching parallel to the runway, turning 180 degrees and then landing. See Figure 2. For this reason, the side of the runway the military aircraft approaches before its base leg turn (called the pattern side), has a higher probability distribution. However, since we do not have information regarding military aircraft

[16] DOE-STD-3014-96, Appendix B.

landings at HNL, we have assumed that the pattern side is over the ocean. For military aircraft, there is no pattern side for takeoffs.

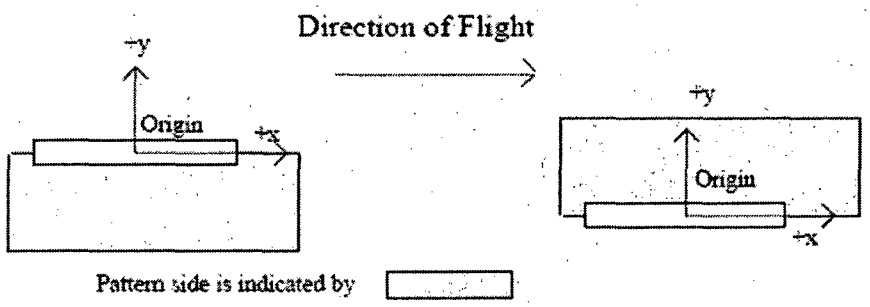

Figure 2. Coordinate convention and pattern side, for use with crash location probability tables for military aviation.

The conditional probabilities specify, given an air crash, the likelihood the accident will take place at a specific location. We therefore have to place the proposed irradiator facility in its relation to each of the four runways at Honolulu International Airport. The locations of the runways at HNL and of the proposed Pa'ina Hawaii irradiator are shown in Figure 3.

As seen in Fig. 3, the proposed facility is located extremely close to and lies between the runways (4R,22L) and (8R,26L), the reef runway. It is approximately ¼ mile from each runway and a little more than ½ mile from the major runway (8L,26R). Table 7 lists the distances of the proposed facility from the center of each of the four runways. The conditional probability distributions are probability estimates in one square mile blocks. That is, given a crash, the conditional probabilities provide the probability that the crash takes place in an area of one square mile. As seen in Table 7, the centers of all runways are within one mile of the proposed facility.

Effective Area Calculations

Employing the conditional probabilities developed by DOE from the NTSB database, we now have three parts of the probability calculation – the number of flights of each type aircraft, the probability of a crash per 100,000 takeoff and landings, and the conditional probability, if a crash takes place, that it will occur within a specific 1-square mile area. The final piece is to calculate the effective area of the facility such that if an unobstructed aircraft were to crash within the area, it would impact the facility, either by direct fly-in or by skidding into the facility. The effective area depends on the dimensions of the

Table 7. (X,Y) Coordinates of Facility with Respect to Center of Each HNL Runway[a]

	8R	26L
Landing coordinates	(-1.13,0)	(-1.13,0)
Facility coordinates	(0.47,0.43)	(-0.47,-0.43)
Distance from Runway Center	0.62 mi	0.62mi
	8L	**26R**
Landing coordinates	(-1.17,0)	(-1.17,0)
Facility coordinates	(0.3,-0.81)	(-0.3,0.81)
Distance from Runway Center	0.86 mi	0.86 mi
	4R	**22L**
Landing coordinates	(-0.84,0)	(-0.84,0)
Facility coordinates	(-0.28,0.55)	(0.28,-0.55)
Distance from Runway Center	0.60 mi	0.60
	4L	**22R**
Landing coordinates	(-0.65,0)	(-0.65,0)
Facility coordinates	(-0.36,0.73)	(0.36,-0.73)
Distance from Runway Center	0.81 mi	0.81 mi

Notes:

a. The center of each runway is located at (0,0).

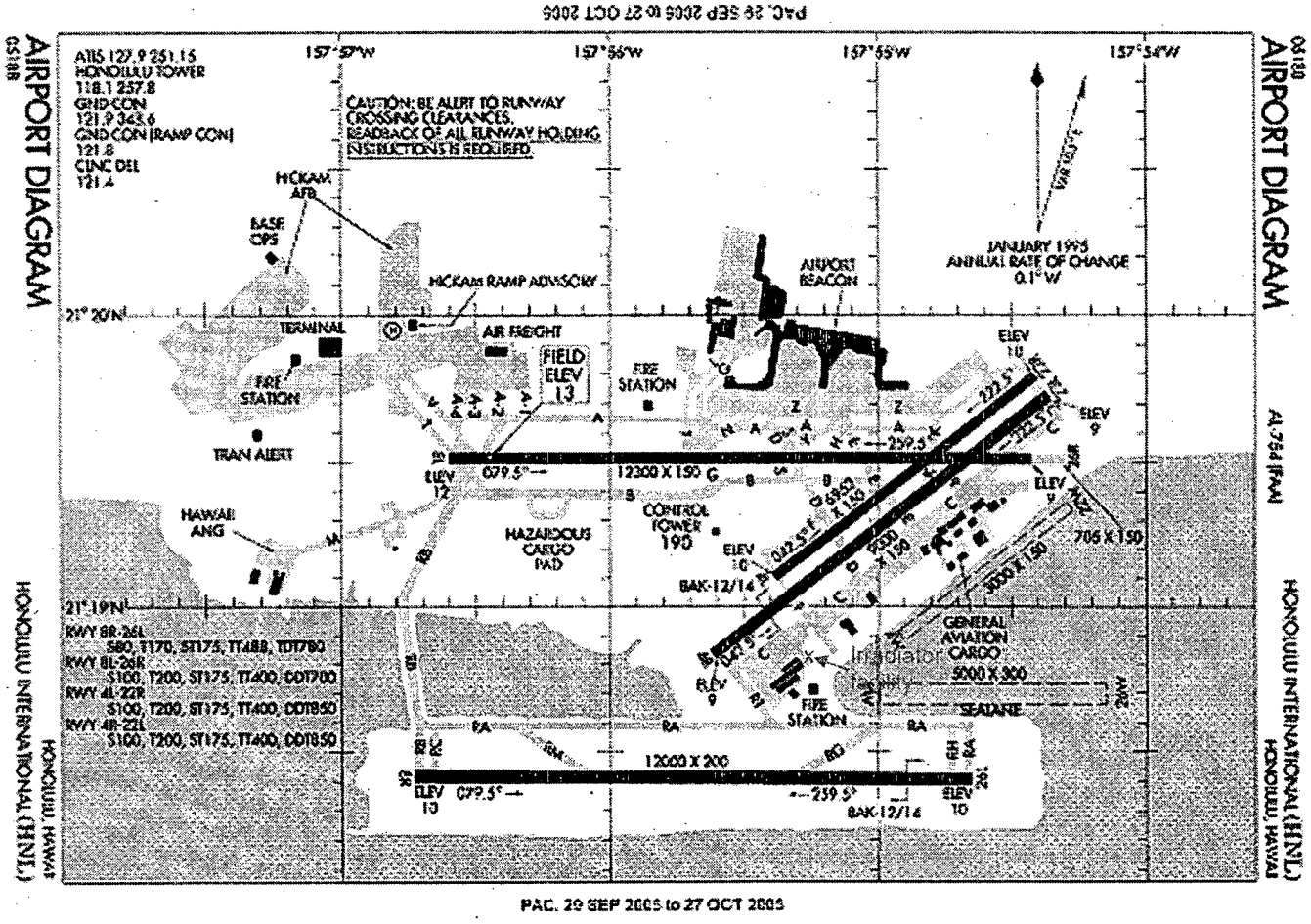

Figure 3. Airport Diagram Honolulu International Airport

proposed facility, the aircraft's wingspan and heading, and the length of the skid. The fly-in area is not just the two dimensional footprint of the building, but the shadow area that takes into account the height of the proposed facility. For this calculation, we will provide two effective area estimates, one for the entire building and another for the irradiator itself, which is a smaller area. We believe it is important to examine not only the probability of impacting the irradiator directly, but impacting the building as well. This is because, as the 9/11 attack has shown, air carriers, particularly on takeoff, carry a tremendous amount of fuel and this must be taken into account in any consequence analysis. Further, as the consequence analysis by M. Sozen and C. Hoffmann has shown, an air crash into the proposed facility will likely bring down part of the building.[17]

A general diagram that shows the parameters used in the equations to calculate the effective area is shown below in Figure 5.

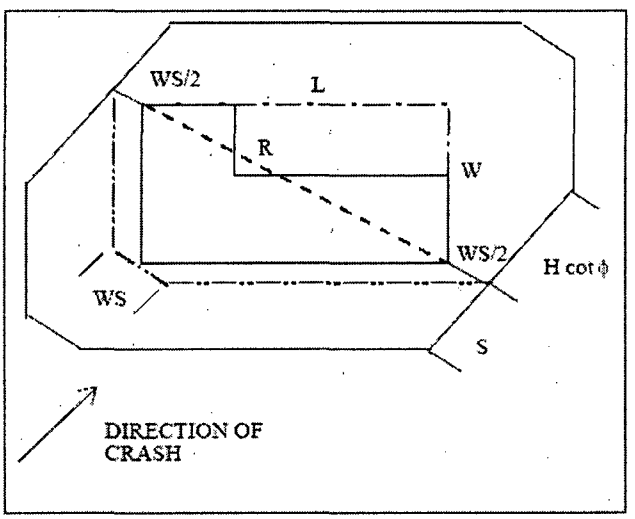

Figure 5. Rectangular facility effective target elements

The effective area of the facility is composed of two elements, the fly-in area A_f and the skid-in area A_s.

$$A_{eff} = A_f + A_s \qquad (2)$$

[17] Sozen, M. and Hoffmann, C., "Analysis of the Effect of Impact by an Aircraft on a Steel Structure Similar to the Proposed Pa'ina Irradiator," January 2007.

As shown in Equation (3), the effective skid-in area is the length of the diagonal of the facility R plus the wingspan of the aircraft WS times the skid distance of the aircraft S. The effective skid-in area is aircraft dependent.

$$A_s = (WS + R)*S \qquad (3)$$

where R is the length of the diagonal of the building or the irradiator, $R = (L^2 + W^2)^{0.5}$. The length L = 64 ft and width W = 116 ft of the proposed irradiator facility[18] and the L = 7.92 ft and width W = 6.75 ft of the irradiator itself[19] are taken from information provided by the applicant. The facility height is 29.6 feet.

Average skid-in areas and wing spans for individual aircraft types are shown in Table 8 below.

Table 8. Skid-In Area (sq mi)

Aircraft	Skid-In Distance (ft)[a]	Wing Span (ft)[a]	Skid-In Area (sq mi) Irradiator Facility	Irradiator
Air Carrier	1440	98	0.01667	0.005599
Air Taxi	1440	59	0.000611	0.000149
General Aviation	73	60	0.000641	0.00018
Military[b]	347	78	0.003763	0.004566

a. From DOE-STD-3014-96, App B
b. Small aircraft – jet fighters, average of take-offs and landings

Note that the skid-in distance and skid-in area for the major air carriers are much greater than for the other aircraft since it is difficult to stop a large, heavy aircraft. For small military aircraft we have averaged the takeoff and landing skid-in areas. Since there are far fewer small military aircraft movements at HNL than air carrier movements, this simplification has a small effect on the overall crash likelihood. The CNWRA and RWMA skid-in areas are the same.

[18] Pa'ina email communication (Oct. 23, 2006) (ML063060603).

[19] Paina Hawaii, Application for Material License, June 23, 2005, Fig. 9-F.

The fly-in area is a sum of three elements - the footprint of the building, an additional element due to the wing span, and a shadow area, taking into account the height of the building. The effective fly-in area can be expressed as follows:

$$A_f = (WS + R)*H\cot\Phi + 2*L*W*WS/R + L*W \qquad (4)$$

where $\cot\Phi$ is the mean of the cotangent of the aircraft impact angle, based on accidents investigated by the NTSB and the FAA. Based on the information provided by the applicant, the height of the irradiator facility is 29.6 feet. The same height is used to calculate the fly-in areas for the irradiator itself.

The results from Eq. (4) for the fly-in area appear in Table 9 below. As seen, the fly-in area for major carriers is much smaller than the skid-in area. Note: the fly-in and skid-in areas calculated by CNWRA are the same as employed by RWMA.

Table 9. Fly-In Area (sq mi)

	Fly-In-In Area (sq mi)	
Aircraft	Irradiator Facility	Irradiator
Air Carrier	0.003156	0.001212
Air Taxi	0.002171	0.000628
Genl Aviation	0.002349	0.000628
Military	0.003419	0.000925

Finally, we combine the fly-in and skid-in areas, with the number of crashes for each aircraft, the number of operations for each aircraft, and the conditional probabilities that estimate locational probabilities given a crash, to obtain the yearly probability of a crash into the irradiator facility, using HNL-specific crash rate (RWMA) and DOE crash rate averages, by aircraft, for the entire U.S. These results are presented in Table 10 below. As seen, the air carriers dominate the probability. The crash probability for RWMA crash rate, number/year, is 5.69E-04. Using DOE (i.e., NTSB) national statistics, the crash probability, number per year, is somewhat lower, 3.59E-04, but both rates are significantly higher than that calculated by CNWRA, 2.0E-04.

Table 10. Probability of Aircraft Accident at Irradiator Facility (#/yr)

Aircraft	DOE	RWMA
General Aviation Takeoff	5.87E-05	2.56E-05
General Aviation Landing	1.25E-04	2.30E-05
Air Carrier Takeoff	3.21E-05	2.59E-04
Air Carrier Landing	2.50E-05	1.36E-04
Air Taxi Takeoff	4.99E-05	7.63E-05
Air Taxi Landing	6.04E-05	4.02E-05
Military Aviation Small Aircraft Takeoff	2.90E-06	2.90E-06
Military Aviation Small Aircraft Landing	5.32E-06	5.32E-06
sum =	**3.59E-04**	**5.69E-04**

Critique of the CNWRA Analysis

1) The crash data in NUREG-0800 employed by CNWRA is apparently based on a 1973 paper by Eisenhut.[20] CNWRA thus relies on airplane crash data that are more than thirty years old and not applicable to all aircraft. In contrast, the DOE data we use are applicable to all aircraft, including air taxis, and are updated to 1996. In addition, the CNWRA analysis fails to account for the fact the air crash rates for HNL are higher than the national average.
2) The NRC and CNWRA methodology, in NUREG-0800, is not specific to take-offs and landings. The crash rates shown in Table 2-6, which are taken from NUREG-0800, are functions of the distance from the end of the runway. However, as the NTSB data shows, landings have a higher crash rate than takeoffs, and this is not taken into account in the CNWRA report.

[20] Eisenhut, D.G., "Reactor Siting in the Vicinity of Airfields," Paper presented at the American Nuclear Society Annual Meeting, June 1973.

3) Further, the NRC and CNWRA methodology employs an equal probability of an air crash to all locations in the vicinity of an airport, and this is not correct. To take one example, for military aircraft, planes fly parallel to the runway, then make a U-turn and land. The side where military planes first fly is called the "pattern" side. In the RWMA analysis, we assume that the pattern side is over the ocean. This type of fine detail is missing from NUREG-0800 and the CNWRA analysis.
4) The number of aircraft operations at HNL used in the CNWRA analysis understates the actual number of current operations, and also fails to account for anticipated future growth during the time period for which Pa'ina seeks a materials license. Although unstated in the CNWRA analysis, it appears it used the average number of aircraft operations at HNL over the past five years, which would factor in the substantial decrease in the number of operations at HNL following September 11, 2001. Since the number of operations at HNL did not begin to increase again until 2005 and, as the CNWRA analysis concedes, is expected to increase by another 20% during the 10-year period of Pa'ina's license application, the number of operations CNWRA uses in its calculations is unrealistically low. A more realistic, but still conservative, assumption is to use current operational levels. The RWMA analysis took this approach, using the most recent numbers available, which are from airport operations in 2005.
5) Because of its methodological flaws, CNWRA underestimates the probability an airplane will crash into the proposed Pa'ina irradiator. Instead of the 2E-4 per year probability CNWRA calculated, the probability should be 3.59E-4, if DOE/NTSB data are used. If HNL-specific data are used, the crash probability should be increased to 5.69E-4.
6) The consequence analysis by the NRC and CNWRA fails to provide any data or calculations to support its conclusions and does not take into account realistic accident scenarios. The CNWRA report asserts that sources that can satisfy the tests set forth in 10 C.F.R. § 36.21 would be robust enough to survive an aviation accident, but never performs any calculations to back up that claim. For example, CNWRA never quantifies the impact of flying airplane debris to compare it with the impact associated with a 2.5 cm-diameter, 2-kg steel weight dropped from a height of 1 meter, the standard set forth in 10 C.F.R. § 36.21(d). Nor does CNWRA assess the extreme temperatures that would be associated with burning thousands of pounds of jet fuel, which could far exceed the 600 °C for 1 hour standard in 10 C.F.R. § 36.21(b). The CNWRA's analysis must be quantified to provide meaningful information about the

possible consequences of an aviation accident involving the Pa'ina irradiator.

7) Damage to the irradiator pool due to an air crash (such as from the shaft of a jet plane striking the pool) may damage the pool structure under the floor level, such as tears of the welds and consequent loss of irradiator pool shielding water. Since the floor level is also the minimum water level necessary to shield the Co-60 sources, such a breach of the pool structure would eliminate the irradiator's passive shielding, on which the NRC and CNWRA rely to justify their "no significant impact" conclusion. Since the CNWRA analysis assumes the depth of the water table is 2 meters (6.6 feet) below the facility floor, its assumption that sea water infiltrating through a breach would adequately shield the Co-60 sources is unsupported. It also ignores the potential for contamination of the water in the pool in the event that an airplane crash breaches the sources. If the aviation accident also ruptured the pool lining, water contaminated with radioactive cobalt could escape the facility, contaminating groundwater and nearby Ke'ehi Lagoon. All of these risks need to be, but were not, analyzed by the NRC and CNWRA.

8) The force of the impact from an air crash into the facility and/or the ensuing fire and explosion of aviation fuel will likely lead to loss of all monitoring equipment, loss of the structure itself, loss of irradiator shielding, and the loss of all personnel (and consequent inability to implement necessary emergency procedures). The NRC and CNWRA fail to analyze any of these potential consequences, any of which would pose significant threats to public health and safety.

Conclusions and Recommendations

As seen, using NTSB data and the DOE methodology, which is standard for these calculations, the expected frequency of an aircraft impacting the proposed Pa'ina Hawaii irradiator is quite high (3.59E-4), over 300 times greater than the NRC's guideline, 1 in a million/year crash probability. The applicant and the NRC must therefore take the next step, conducting a detailed, quantitative investigation of the consequences of an impact. Using HNL specific crash rate, the expected frequency is 5.69E-4.

In this report, we have focused on the likelihood of an aircraft impact. The reason for the high probability we identified is the proximity of the proposed facility to active runways at HNL. If the proposed facility were located over ten miles from the center of the runways, the conditional probability would decline by a factor of 1,000, placing the yearly probability within the limits the NRC generally deems acceptable for nuclear

facilities. The NRC should consider in its environmental review alternate locations, which would substantially reduce risks to the public associated with aviation accidents.

The skid-in distance for air carrier operations appears to be the dominant factor behind the high risk to the Pa'ina irradiator. If the facility remains in its present location, the NRC must consider requiring Pa'ina to surround the facility with major obstructions, such as earthen berms, or substantially hardening the facility, to mitigate and minimize the threats to the public.

Potential aviation accidents include impacts into the proposed facility and into the irradiator itself. Based on experience with the 9/11 attack, it is crucial, in evaluating the consequences of an impact, to analyze the potential for a major fuel fire and explosion. The NRC and CNWRA improperly fail to consider such consequences, which could cause the loss of the Radiation Safety Officer and facility personnel, as well as the loss of electricity and monitoring instruments, all of which would prevent implementation of emergency procedures vital to protecting the general public. The fire and explosion from an airplane crash could also evaporate or displace the irradiator's shielding water or damage the irradiator pool, allowing the shielding water to escape. Sea water infiltrating through a breach in the pool structure could cause contamination of the pool water. Moreover, contaminated water could escape the facility through a breach in the pool structure, contaminating groundwater. Any of these eventualities could expose surviving facility personnel, emergency responders, the public and/or the environment to very high radiation doses.

A direct fly-in into the irradiator itself, particularly if the engine shaft of a military aircraft or major carrier were to strike the irradiator, could puncture the irradiator pool, leading to a loss of shielding water, and shatter the Co-60 pencils.[21] The forces exerted by such a crash would far exceed the impact standards set forth in 10 C.F.R. § 35.21 on which CNWRA bases its claim the public would be safe. The NRC and CNWRA need to provide data and calculations to back up their currently unsupported claims of "no significant impact."

[21] This type of accident could also cause the loss of the RSO and facility personnel and the loss of electricity and monitoring instruments, with the serious consequences described above.

Concrete Penetration

$t_p = (U/V)^{0.25}(MV^2/DP_c)^{0.5}$

t_p = perforation thickness into concrete (ft)	0.5
U = reference velocity (fps)	200
V = missile impact velocity (fps)	
M = missile mass (slugs)	312.5
D = missile diameter (ft)	1.5
P_c = ultimate compressive strength (psi)	576000

V =	13.36	fps	9.108486
tp =	0.499757	ft	

Steel Penetration

$T^{1.5} = (0.5MV^2)/(17400*K_s*D^{1.5})$

Where T = penetration depth in steel (inches)	0.5
M = missile mass (slugs)	312.5
Ks = constant, depending on steel grade	1
D = missile diameter (inches)	18

V =	54.83357	fps	37.38652	mph
T =	0.499827			
V =	56.43745	fps	38.48008	mph

EXHIBIT 2

Line Source

$$\phi = \frac{S}{4\pi h} 2\theta$$

$$\tan(\theta) = \left(\frac{L/2}{h}\right)$$

S L=	7.8E+16	photons/sec
φ =	4.9058E+10	photons/cm2/s
	6.1323E+10	MeV/cm2/sec
	107315.27	R/h at bldg flr

where h is distance pool floor to bldg floor
L is width of plenum (cm)
S is photons/sec/cm
φ is photon flux (photons/cm2/sec)

Point Source

$$R \cong 0.53CEn$$

distance pool floor to bldg floor	18.50	ft		R/h at 1 m
top plenum 82"	6.83	ft		
water shield, pool filled	11.67	ft	C=# Ci	
			E energy	
water shield, 6' water drop	5.67	ft	(MeV)	
water shield, 8' water drop	3.67	ft		
water shield, 6' water drop	172.82	cm	104723.52	R/h at bldg flr
water shield, 8' water drop	111.86	cm		

EXHIBIT 3

Gamma Attenuation

$$I = bI_0 e^{-\mu x}$$

where b = buildup factor

I_o = initial gamma flux

μ = linear attenuation coefficient

x = absorber thickness

I_6= attenuation 6' water shield

I_8= attenuation 8' water shield

$$I_8 / I_6 = \left(\frac{b_8}{b_6}\right) e[\mu(x_6 - x_8)]$$

μ=6.323E-2 cm2/g		6.32E-02
		1.09E+01
$\left(\frac{b_8}{b_6}\right)$	0.605364	7.07E+00
	3.85E+00	
I_8 / I_6	47.21	
	14.16	R/h at bldg flr

v = sq rt (2*g*h)

v =	48.48	ft/sec	14.78	m/sec

Energy

$E = 0.5*m*v^2$

E =	10.00	joules	ANSI standard
	185000	ft-lb	engine falling 18.5 ft
	250675	joules	

Taking into account buoyancy

56705.57	ft-lb	engine falling 18.5 ft
76836.04	joules	

Use engine volume to determine buoyancy

engine volume	931017	cubic inches
	15256635	cc
	15256.64	kg water
	6934.834	lb

EXHIBIT 4

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of Pa'ina Hawaii, LLC Material License Application	)))))	Docket No. 30-36974-ML ASLBP No. 06-843-01-ML

DECLARATION OF DAVID L. HENKIN

I, David L. Henkin, declare:

1. I am an attorney at law, duly licensed to practice before all courts of the State of Hawai'i, the U.S. District Court for the District of Hawai'i, the U.S. Court of Appeals for the 9th Circuit, and the U.S. Supreme Court. I am the lead attorney for intervenor Concerned Citizens of Honolulu.

2. I make this declaration in support of Concerned Citizens' Amended Safety Contention 7. This declaration is based on my personal knowledge, and I am competent to testify about the matters contained herein.

3. Attached hereto as Exhibit "5" is a true and correct copy of the February 8, 2007 Declaration of Mete A. Sozen, Ph.D. In Support Of Concerned Citizens' Contentions Re: Draft Environmental Assessment And Draft Topical Report, which Concerned Citizens originally filed herein on February 9, 2007.

4. Attached hereto as Exhibit "6" is a true and correct copy of the March 15, 2007 Supplemental Declaration of Mete A. Sozen, Ph.D. In Support Of Concerned Citizens' Contentions Re: Draft Environmental Assessment And Draft Topical Report, which Concerned Citizens originally filed herein on March 19, 2007.

5. Attached hereto as Exhibit "7" is a true and correct copy of Dr. Sozen's and Dr. Christoph Hoffmann's February 1, 2007 report entitled "Analysis of the Effect of Impact by an Aircraft on a Steel Structure Similar to the Proposed Pa'ina Irradiator." Concerned Citizens originally filed this report in support of its February 9, 2007 Contentions Re: Draft Environmental Assessment And Draft Topical Report.

6. Attached hereto as Exhibit "8" is a true and correct copy of a page from the Boeing website describing the technical characteristics of the Boeing 767-200ER.

I declare under penalty of perjury that I have read the foregoing declaration and know the contents thereof to be true of my own knowledge.

Dated at Honolulu, Hawai'i, May 2, 2008.

DAVID L. HENKIN

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
Pa'ina Hawaii, LLC	)	Docket No. 30-36974-ML
	)	ASLBP No. 06-843-01-ML
Materials License Application	)	
	)	

DECLARATION OF METE A. SOZEN, Ph.D. IN SUPPORT OF CONCERNED CITIZENS' CONTENTIONS RE: DRAFT ENVIRONMENTAL ASSESSMENT AND DRAFT TOPICAL REPORT

Under penalty of perjury, I, Dr. Mete A. Sozen, hereby declare that:

1. I am the Purdue University Kettelhut Distinguished Professor of Structural Engineering, and have a Ph.D. in Civil Engineering. I have considerable training and experience in the field of structural engineering, and I have assisted in the development of structural criteria for earthquake and fire resistant building design and helped develop the first set of regulations for earthquake-resistant design. I have been retained by numerous private organizations and state and federal agencies, including the Nuclear Regulatory Commission (NRC), on special projects concerned with structural safety and potential structural damage. A true and correct copy of my resume is attached to this declaration as Exhibit "4."

2. My research currently focuses on vulnerability assessment of building and transportation structures and effects of explosions and high-velocity impact on building structures. Together with Dr. Christoph Hoffmann, I recently simulated the September

EXHIBIT 5

11, 2001 attacks on the Pentagon and the World Trade Center using LS-DYNA (LSTC2005) code.

3. In conjunction with Dr. Hoffmann, I prepared a numerical analysis, using LS-DYNA (LSTC2005) code, to simulate the potential for damage from an aircraft striking a steel structure adjacent to active runways at the Honolulu International Airport, similar to the proposed Pa'ina irradiator. To prepare this simulation, I reviewed Pa'ina's materials license application and other documents on file in this proceeding, including the Draft Environmental Assessment Related to the Proposed Pa'ina Hawaii, LLC Underwater Irradiator in Honolulu, Hawaii and the Draft Topical Report on the Effects of Potential Natural Phenomena and Aviation Accidents at the Pa'ina Hawaii, LLC Irradiator Facility. The result is a three-dimensional simulation that accurately reflects the physics of the collision. A compact disc containing a true and correct copy of this simulation (which can be viewed using QuickTime software) is attached as Exhibit "5."

4. The use of LS-DYNA to simulate the potential for damage from an aircraft striking a steel structure similar to the proposed Pa'ina irradiator is well-accepted. The NRC has used LS-DYNA antecedents and derivatives in the past to analyze impact effects on various nuclear facilities.

5. The simulation Dr. Hoffmann and I prepared, in my best professional judgment, shows that a disastrous accident could occur in the event of an airplane crashing into a steel structure built adjacent to the Honolulu International Airport, similar to the proposed Pa'ina Hawaii nuclear food irradiator.

6. Because Pa'ina Hawaii failed to provide the building specifications for its proposed irradiator, Dr. Hoffmann and I applied conservative assumptions to create a

model structure that is stronger than what is likely to be achieved in practice. A true and correct copy of the written analysis is attached as Exhibit "6," and describes the modeling in greater detail, including the conservative assumptions built into the analysis. The simulation assumes that the Boeing 767-200ER will crash into the building head on at 100 miles per hour. Since commercial airplanes takeoff and land at much greater speeds, modeling the impact at 100 miles per hour is a credible accident event. Impact of the structure at any angle would produce similar results.

7. The simulation results in acute bending of the columns and the girders, however, because the building was modeled with a toughness that could not be achieved in practice, under actual conditions, many of the columns and girders would fracture or be torn off the connections. Such an impact could directly destroy the building housing the irradiator and the 3 ½ foot lip of the irradiator pool. Destruction of the pool lip could undermine the integrity of the pool, causing the water shielding the Co-60 sources to drain out. A high-temperature conflagration caused by the impact could destroy the pool by melting the steel. Flying debris could breach the source assembly or pool. In all of these instances, radioactive Co-60 could be introduced to the human environment. None of these eventualities was considered by the NRC's draft Environmental Assessment or Topical Safety Report.

8. If Concerned Citizens' contentions are admitted, I would offer additional testimony regarding the opinions set forth herein.

I declare under penalty of perjury that the factual information provided above is true and correct to the best of my knowledge and belief, and that the professional opinions expressed above are based on my best professional judgment.

Executed at West Lafayette, Indiana on this 8th day of February, 2007.

Dr. Mete A. Sozen
Licensed Structural Engineer (Illinois)
Lafayette, Indiana
550 Stadium Mall Drive
West Lafayette, IN 47907-2051
Phone (765) 494-2186
Fax (765) 494-0395

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of Pa'ina Hawaii, LLC Materials License Application	)))))	Docket No. 30-36974-ML ASLBP No. 06-843-01-ML

SUPPLEMENTAL DECLARATION OF METE A. SOZEN, Ph.D. IN SUPPORT OF CONCERNED CITIZENS' CONTENTIONS RE: DRAFT ENVIRONMENTAL ASSESSMENT AND DRAFT TOPICAL REPORT

Under penalty of perjury, I, Dr. Mete A. Sozen, hereby declare that:

1. As stated in my original declaration, I am the Purdue University Kettelhut Distinguished Professor of Structural Engineering, and have a Ph.D. in Civil Engineering. I have over 50 years of training and experience in the field of structural engineering, and I have been retained by numerous private organizations and state and federal agencies, including the Nuclear Regulatory Commission ("NRC"), on special projects concerned with structural safety and potential structural damage. A true and correct copy of my resume is attached to my original declaration.

2. Together with Dr. Christoph Hoffmann, I prepared a numerical analysis to simulate the potential for damage from an aircraft striking a steel structure adjacent to active runways at the Honolulu International Airport, similar to the proposed Pa'ina irradiator. I then concluded, based on this simulation and my expertise and experience as a structural engineer, that an aircraft impact at the considered ground speed (which, as discussed in our report, was chosen to ensure our analysis would be conservative) could

EXHIBIT 6

destroy the building housing the irradiator and the 3 ½ foot lip of the irradiator pool. I also concluded that destruction of the pool lip could undermine the integrity of the pool, causing the water shielding the Co-60 sources to drain out; a high-temperature conflagration caused by the impact could destroy the pool by heating the steel; and flying debris could breach the source assembly or pool. In all of these instances, radioactive Co-60 could be introduced to the human environment.

3. I have reviewed Pa'ina Hawaii, LLC's Answer to Concerned Citizens of Honolulu's contentions, with particular attention to the declaration of Gray*Star, Inc. Vice President and Chief Operating Officer Russell N. Stein. Pa'ina does not dispute Dr. Marvin Resnikoff's conclusion that the likelihood of an aviation crash is more than the one-in-a-million threshold the NRC uses to evaluate aviation risks or Dr. Hoffmann's and my findings that the building housing the irradiator, as well as the irradiator pool's lip as modeled, would be destroyed in the event of an aircraft impact. Pa'ina does attempt to refute, through Mr. Stein's declaration, my conclusion that an aircraft crash may cause radioactive Co-60 from the irradiator to be introduced to the human environment. I address Mr. Stein's declaration below.

4. Initially, it troubles me that Mr. Stein claims to be responsible for all design and engineering for the Genesis irradiator that Pa'ina proposes to build and operate, because Mr. Stein has not demonstrated he has any training or experience as an engineer. In fact, it appears from the files of another NRC proceeding that Mr. Stein's only "formal education" was as an economist, having received a Bachelor of Arts degree in that field. See 5/3/04 Email from GrayStar (ML041250238), a true and correct copy of which is attached hereto as Exhibit "13." It is obviously one thing to design an irradiator

that can be economically viable, and entirely another to design an irradiator that can withstand the forces of an airplane crash.

5. Despite his stated lack of expertise evaluating the "potential severity of various incidents that may have impact at the site of the facility," Mr. Stein nonetheless asserts, with no basis in fact or quantitative analysis, that his irradiator design could prevent nuclear materials from dispersing, even in the event of an aviation accident. Stein Decl. ¶ 7. He claims the numerical model Dr. Hoffmann and I prepared is based on "false premises" because we allegedly did not have a "proper understanding of the design." Id. ¶¶ 6 and 8. According to Mr. Stein, we failed to consider that the 42" lip of irradiator is to be made of only ¼" stainless steel, with no concrete or structural I-beams, and is "designed to be sacrificial." Id. ¶ 10(A).

6. Any misunderstanding about the construction of the pool lip is due to the imprecise description provided in Pa'ina's application, which states that the pool is "constructed of two steel layers with a concrete filled six-inch space between them." Application at 23. The application notes that "[t]he pool is mainly below ground with a 42" upper lip extending above the facility floor;" it does not indicate explicitly that the construction of the lip differs from that of the rest of the pool, of which it is a part. Id. The drawings to which Mr. Stein refers similarly do not clearly indicate the pool lip is made up of only ¼" stainless steel.

7. In any event, Mr. Stein's comments about the construction of the pool lip serve only to demonstrate his lack of understanding of the structural defense mechanisms of the system. The lip that Dr. Hoffmann and I modeled with concrete and structural I-beams (based on the description in the application) is much stronger and tougher than the

design Mr. Stein describes. Thus, damage to the lip and resulting damage to the irradiator pool that Pa'ina apparently proposes to build would be considerably more than what was calculated. That Dr. Hoffmann and I modeled using conservative assumptions merely confirms that Mr. Stein's less robust design could certainly not stand up to a similar aircraft impact. Mr. Stein's notation in paragraph 10(A) that "most of the stainless steel inner liners on other irradiators are less than ¼" thick" misses an important point: Other irradiators are not located immediately adjacent to active runways at an international airport and, thus, do not have to be robust enough to withstand the impact of a passenger jet.

8. Further, Mr. Stein's assertion that he intended the irradiator pool lip "to be sacrificial" is irrelevant to the structural analysis of what would happen to the integrity of the pool in the event of an aviation accident. As stated in my report and prior declaration, damage to the lip, which is attached to the pool, will undermine the structural stability of the pool, creating a situation of potential release of radioactive material. Mr. Stein has not provided quantitative evidence to challenge this conclusion (and, since presumably his irradiator design has not previously been hit by an airplane, has no empirical data on which to rely) and has not even attempted to show that radioactive material could not be released under the phenomena associated with an aviation accident.

9. Mr. Stein's declaration notably fails to address situations in which flying debris – pieces of the airplane that hit the irradiator facility and/or portions of the building itself – breach the source assembly or pool. As discussed in my previous declaration and attached report, it is my opinion, based on over five decades of

experience in the field of structural engineering, that, in such circumstances, radioactive Co-60 could be introduced to the human environment.

10. While Mr. Stein accuses Dr. Hoffmann and me of speculation, he offers no hard proof contradicting the conclusions we derived from our numerical modeling and professional experience. For example, Mr. Stein asserts that the source retaining mechanisms are designed to disconnect and leave the source at the bottom of the pool, yet offers no experiential proof or mathematical modeling to demonstrate the sources could not be pulled out of the pool in the event of an aviation accident. Similarly, rather than offer alternate analysis, he merely asserts that impact to the lip could not transfer significant forces to the pool itself. Mr. Stein also fails to provide any evidence to back up his assertion that damage to the sources from an airplane crash would "not lead to an environmental issue." Stein Decl. ¶ 10(B).

11. I stand by the opinions offered in my original declaration, which were based on a reliable numerical modeling study using methodologies accepted in the structural engineering field, as well as my experience as a structural engineer and researcher.

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I declare under penalty of perjury that the factual information provided above is true and correct to the best of my knowledge and belief, and that the professional opinions expressed above are based on my best professional judgment.

Executed in San Diego, CA, on this 15th day of March, 2007.

Dr. Mete A. Sozen
Licensed Structural Engineer (Illinois)
Lafayette, Indiana
550 Stadium Mall Drive
West Lafayette, IN 47907-2051
Phone (765) 494-2186
Fax (765) 494-0395

ANALYSIS OF THE EFFECT OF IMPACT BY AN AIRCRAFT ON A STEEL STRUCTURE SIMILAR TO THE PROPOSED PA'INA IRRADIATOR

Mete A. Sozen and Christoph M. Hoffmann[1]

February 1, 2007

Summary

The numerical analysis generated by LS-DYNA (LSTC2005) indicates that a disastrous accident could occur in the event of an airplane crashing into a steel structure built adjacent to the Honolulu International Airport, similar to the proposed Pa'ina Hawaii nuclear food irradiator. Such an accident would create conditions that could lead to introduction of radioactive Cobalt-60 into the human environment. None of these eventualities was considered by the NRC's EA or Safety Report.

Introduction

This report describes a detailed numerical analysis conducted to investigate the potential for damage from an aircraft striking a steel structure adjacent to active runways at the Honolulu International Airport, similar to the proposed Pa'ina irradiator. The analysis involves modeling in finite elements a realistic aircraft and typical industrial building using LS-DYNA computer code. The use of the finite elements results in spatial discretization, allowing powerful computers to solve engineering problems through the application of complex algorithms, with the result in the form of a 3-dimensional simulation that is faithful to the physics of the collision. LS-DYNA antecedents and derivatives are commonly used in the private sector and government laboratories, including the Nuclear Regulatory Commission (NRC), for analyzing impact effects.

The numerical analysis assumes a typical industrial structure and one of the possible combinations of aircraft type and speeds – a Boeing 767, traveling at 100 mph – that could strike such a structure built near active runways at the Honolulu airport. An overall view of the aircraft and the building is shown below in Figure 1.

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[1] Dr. Mete A. Sozen has been the Purdue University Kettelhut Distinguished Professor of Structural Engineering since 1993. He has assisted in the development of structural criteria for earthquake and fire resistant building design and helped develop the first set of regulations for earthquake-resistant design. Dr. Sozen's current research focuses on vulnerability assessment of building and transportation structures and effects of explosions and high-velocity impact on building structures. He has been retained by numerous private organizations and state and federal agencies, including the NRC, on special projects concerned with structural safety.

Dr. Christoph M. Hoffmann has been a Professor of Computer Science at Purdue since 1989 and is currently the Director of Purdue's Rosen Center for Advanced Computing. Dr. Hoffmann recently spearheaded the effort to simulate and visualize the September 11, 2001 attacks on the Pentagon and the World Trade Center applying the same finite element crash analysis used in the present analysis.

Resumes for Drs. Sozen and Hoffmann are attached. Please note that Drs. Sozen and Hoffman have performed this analysis independently; it is not a Purdue University undertaking.

EXHIBIT 7

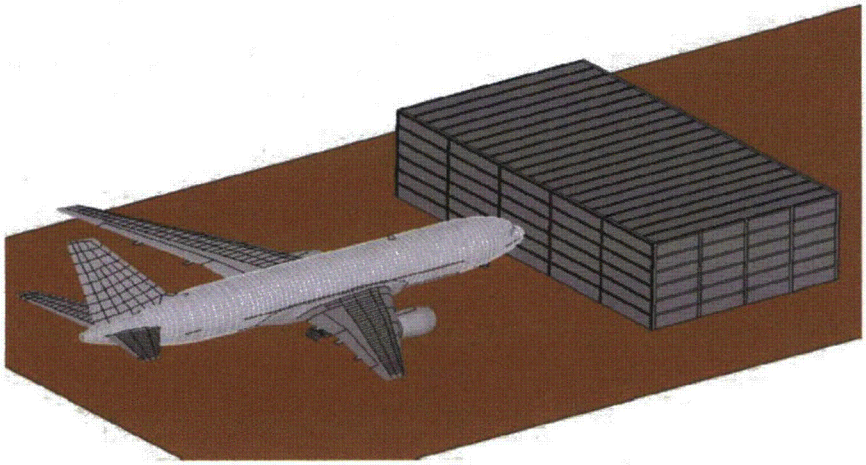

Figure 1. B767 and typical steel industrial structure.

The analysis of the impacts to the structure are considered in reference to the NRC's Draft Environmental Assessment Related to the Proposed Pa'ina Hawaii, LLC Underwater Irradiator in Honolulu, Hawaii (DEA) and the Draft Topical Report on the Effects of Potential Natural Phenomena and Aviation Accidents at the Proposed Pa'ina Hawaii, LLC, Irradiator Facility (Safety Report).

Aircraft Model

The structure of the Boeing 767-200ER aircraft, including dimensions, mass, material, and yield strengths, was modeled in detail based on known aircraft material property information that was obtained from public sources. Figure 2 shows the overall dimensions of the aircraft.

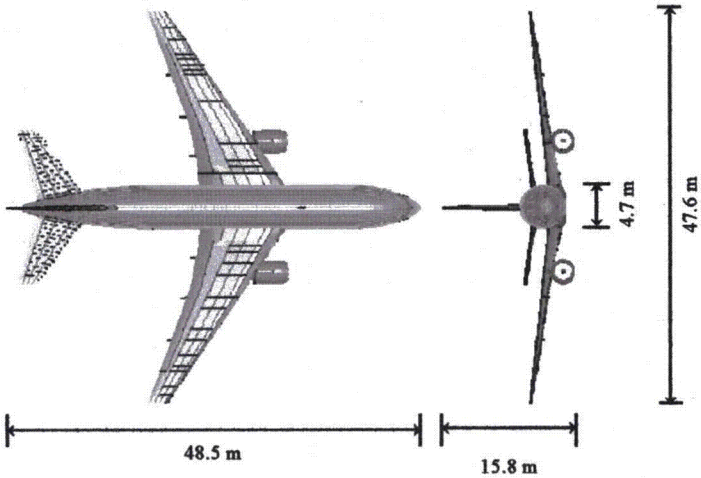

Figure 2. Dimensions of a Boeing 767-200ER.

Approximately 110,000 elements were used to numerically model the solid parts of the aircraft, with a total dry mass of 98 tonnes. The fuel mass totals 30 tonnes and was modeled using approximately 90,000 smoothed particle hydrodynamics (SPH) elements. SPH elements account for the difference in impact effects of solids and fuel. The distribution of the mass along the length of the aircraft is shown in Figure 3.

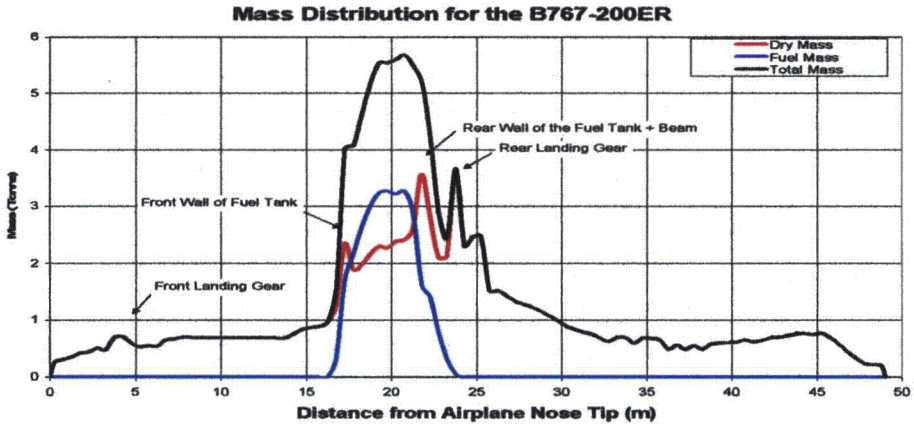

Figure 3. Mass Distribution for a Boeing 767-200ER.

An aluminum material model with yield strength of 380 MPa (55,000 psi) and limiting unit strain of 12% was used for the aluminum parts. For titanium elements, a titanium material model with yield strength of 860 MPa (125,000 psi) and limiting unit strain of 12% was used. Metal sheeting on the surfaces are 3 mm thick and have the same material properties as the main elements.

Structure Model

The structure of the building was modeled as a ductile moment-resisting frame with perfect continuity at the joints and at the bases of the column. Because the actual properties of the building are unknown (due to Pa'ina's failure to provide construction plans), these conservative assumptions were employed to create a model structure that is stronger than what is likely to be achieved in practice. In other words, the proposed irradiator, if built, would suffer greater damage in the modeled aircraft collision than the structure used in this analysis.

Normal specifications were also assumed. The columns (14WF48) and the girders (12WF40) were modeled as structural steel with a normal yield strength of 345 MPa (~50,000 psi) and a limiting unit strain of 40%. Columns were spaced at 24 feet in the long and 16 feet in the short direction of the structure. Height to the roof was set at 30 feet, and the roof girders were spaced at 6 feet. A total of ~210,000 elements were used in the modeling of the building. The framing is shown in Figure 4.

The irradiator pool is modeled as made of a 1/4-inch stainless steel inner tank connected by welded I-beams to a 1/4-inch carbon steel outer tank, with a 42-inch lip extending above the facility floor. The space between the pool's inner and outer steel tanks is modeled as filled with concrete with a yield strength of 4,000 psi.

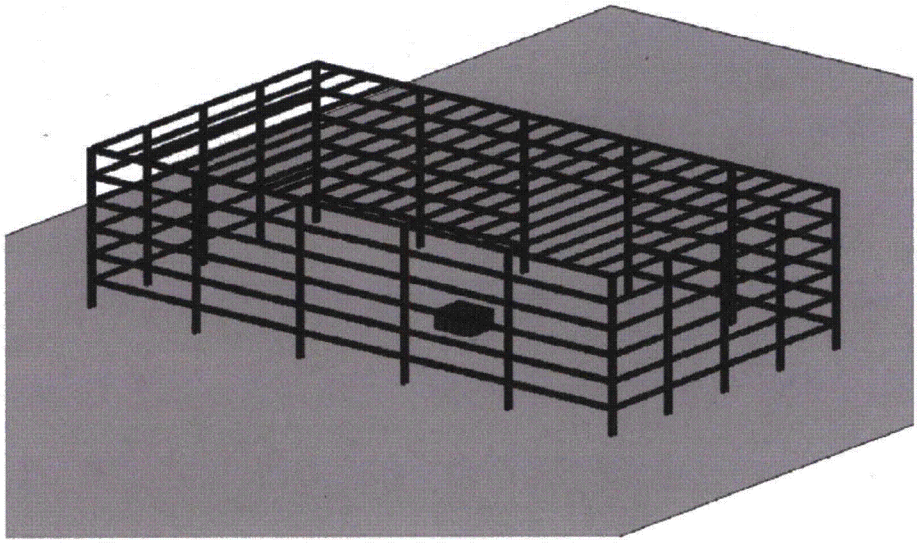

Figure 4. Model framing of steel structure and pool lip.

Impact Simulation Results

Impact simulations were performed using the nonlinear finite-element-based dynamic analysis software LS-DYNA [version 970 r5434a SMP] (LSTC2005) on a multi-processor nano-regatta computer system.

The aircraft was assumed to impact the structure head-on while traveling on the ground at a speed of 100 mph.[2] The "flight path" was assumed to be parallel to the ground and perpendicular to the rear façade of the structure. As depicted in Figure 5, the calculations indicated that the aircraft will crash through the columns and girders of the building. Impact of the structure at any angle would produce similar results.

[2] 100 mph is a conservative assumption for the aircraft speed, because most aviation crashes occur at landing or take-off, and aircraft generally land and take off at speeds exceeding 100 mph.

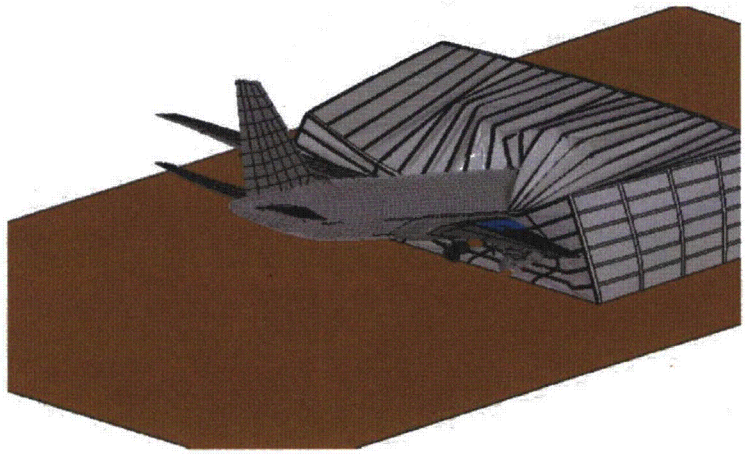

Figure 5. Impact of B767 with steel structure at 100 mph.

Because the building was modeled with a toughness that could not be achieved in practice, this simulation results in acute bending of the columns and the girders, visible in Figure 5. Under actual conditions, many of the columns and girders would fracture or be torn off the connections. Debris and fuel would fill the structure, and the fuel would be expected to ignite explosively, causing a massive conflagration. The total damage within the structure would depend on the existing fire load, including the fuel load and the flammable materials within the building. However, the fire is likely to soften all metals, burn all non-metals, and deteriorate the concrete. This could result in a breach of both the source assemblies and the pool, allowing shielding water to escape. The Co-60 sources could also be exposed if extreme temperatures evaporate the pool water or if the force of the impact disperses the source. In addition, all personnel in the building would likely be killed or incapacitated in the event of a crash and conflagration, and Pa'ina Hawaii's proffered emergency procedures would be rendered useless, because no personnel would be there to implement them.

Chunks of debris, such as engine and landing-gear components, traveling through the building at great speed would likely destroy all equipment, controls, and instrumentation in the building. It is possible that debris could enter the pool and breach the radioactive sources. Debris may directly impact the sources or cause heavy equipment held in place above the pool to snap, fall into the pool, and strike the source assemblies, resulting in dispersal of radioactive material.

The "very strong forces" that the source assemblies will have been tested against, according to the Safety Report, will not stand up to the forces of an airplane crash. For example, the mass and velocity of falling debris will deliver much more destructive energy than the NRC impact standard for source assemblies, which is a 2-kg steel weight falling from a height of 1 meter.

The lip of the irradiator pool, which extends 3 ½ feet above the floor, will likely buckle under the impact of an aviation crash, despite a 6-inch layer of reinforced concrete between two ¼ inch metal shells. Further, because the pool's inner and outer steel layers are likely connected with welded I-beams, which do not perform well under extreme impact, the shock of the impact could affect the welds and cause the pool to breach, allowing the water to drain out.

Conclusion

The preceding analysis leads to the conclusion that the effects of a plane crash on an industrial building housing a nuclear irradiator would be devastating. Because the modeled steel structure is more robust and more tenacious than what Pa'ina Hawaii is likely to build, the effects in reality are likely to be greater than the modeled effects. Such an impact could directly destroy the building housing the irradiator and the 3 ½ foot lip of the irradiator pool. Destruction of the pool lip could undermine the integrity of the pool, causing the water shielding the Co-60 sources to drain out. A high-temperature conflagration caused by the impact could destroy the pool by melting the steel. Flying debris could breach the source assembly or pool. In all of these instances, a plane crash would create conditions that could lead to introduction of radioactive Cobalt-60 into the human environment. None of these eventualities was considered by the NRC's EA or Safety Report.

BOEING

Technical Characteristics -- Boeing 767-200ER

Passenger Seating Configuration **Typical 3-class** **Typical 2-class** **Typical 1-class**	 181 224 up to 255
Cargo	2,925 cu ft (82.9 cu m)
Engines **maximum thrust**	Pratt & Whitney PW4000 60,200 lb GE CF6-80C2 62,100 lb
Maximum Fuel Capacity	23,980 U.S. gal (90,770 L)
Maximum Takeoff Weight	395,000 lb (179,170 kg)
Maximum Range	6,590 nautical miles (12,200 km) Typical city pairs: New York to Beijing
Typical Cruise Speed at 35,000 feet	Mach 0.80 (530 mph, 851 kph)
Basic Dimensions **Wing Span** **Overall Length** **Tail Height** **Interior Cabin Width**	 156 ft 1 in (47.6 m) 159 ft 2 in (48.5 m) 52 ft (15.8 m) 15 ft 6 in (4.7 m)

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EXHIBIT 8

CERTIFICATE OF SERVICE

The undersigned hereby certifies that, on May 2, 2008, a true and correct copy of the foregoing document was duly served on the following via e-mail and first-class United States mail, postage prepaid:

Fred Paul Benco
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Honolulu, Hawai`i 96813
E-Mail: fpbenco@yahoo.com
Attorney for Pa'ina Hawaii, LLC

Office of the Secretary
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Washington, DC 20555-0001
Attn: Rulemakings & Adjudications Staff
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Michael J. Clark
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Administrative Judge
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Atomic Safety & Licensing Board Panel
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E-Mail: ajb5@nrc.gov

In addition, the undersigned hereby certifies that, on May 2, 2008, a true and correct copy of the foregoing document was duly served on the following via e-mail:

Lauren Bregman
LRB1@nrc.gov

Johanna Thibault
JRT3@nrc.gov

Dated at Honolulu, Hawai'i, May 2, 2008.

DAVID L. HENKIN
Attorneys for Intervenor
Concerned Citizens of Honolulu

EARTHJUSTICE

BOZEMAN, MONTANA DENVER, COLORADO HONOLULU, HAWAI'I
INTERNATIONAL JUNEAU, ALASKA NEW YORK, NEW YORK OAKLAND, CALIFORNIA
SEATTLE, WASHINGTON TALLAHASSEE, FLORIDA WASHINGTON, D.C.

May 2, 2008

Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
Attention: Rulemakings and Adjudications Staff

Re: In the Matter of Pa'ina Hawaii, LLC, Docket No. 030-36974-ML, ASLBP No. 06-843-01-ML

To Whom It May Concern,

On behalf of Intervenor Concerned Citizens of Honolulu, we are filing an original and two copies of Intervenor's Amended Safety Contention 7. Please note that the signature page for the declaration of Dr. Marvin Resnikoff is a scanned copy. We did not receive the original in time for this filing, but will file it as soon as we receive it.

Sincerely,

David L. Henkin

DLH/tt
Enclosures

cc: Service list

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