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TESTIMONY OF

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SENATE VETERANS AFFAIRS COMMITTEE
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My name is Robert Conard. As an atomic veteran and one who actively participated in Operation CROSSROADS I would like to share with you some of my recollections of the radiological safety of the operation.

During the war I was medical officer aboard a Cruiser in the Pacific. After my return, later on, I was on duty at the Naval Medical Center in Bethesda and was asked by the Navy to participate as a radiological safety officer at Operation CROSSROADS. I agreed and thus began for me a life-long career in the field of radiation effects. Following CROSSROADS I participated as a Rad-Safe officer at Operation GREENHOUSE at Eniwetak and on several Nevada tests. Later, at the Naval Medical Research Institute I carried out research studies on the effects of radiation in animals. On March 1, 1954, the unfortunate accidental fallout exposure of 240 Marshallese and 28 American servicemen occurred in the Marshall Islands following detonation of a large thermonuclear device at Bikini. I was a member of the medical team involved in the examination and care of these people. I then went to Brookhaven National Laboratory after leaving the Navy where for twenty-five years, until my retirement six years ago, I headed up the continuing medical care of the Marshallese people.

In preparation for CROSSROADS Operation I was sent, along with a group of medical officers, to various National Laboratories for intensive indoctrination in radiological safety procedures for four

to five months. At Los Alamos, Chicago, Oak Ridge and University of Rochester we were given intensive training in radiological safety procedures including instrumentation, measurement, protection and decontamination. Those of us involved in this training program were later to become key men in the operation, supervising those with less training.

At Bikini we in the Rad-Safe section were under the able direction of Drs. Stafford Warren and George Lyon. Both were highly regarded in the field of radiology and radiological safety. Dr. Warren had been with the Manhattan District. They were ably assisted by Drs. Robert Newell, Wright Langham and others. They ran a "tight ship" and admonished all of us to make every effort to keep radiation exposures as low as possible. The Task Force Command gave high priority to the Rad-Safe program.

At Test Able, I was senior monitor on one of the patrol boats, the first to enter the lagoon and clear my sector for target ship boarding. The operation went smoothly with no great radiation problems that I remember and by the end of the day we were able to clear ships for the boarding parties.

The BAKER test caused a much more serious radiation situation due to the contamination of the target ships with water mixed with fission products. My assignment was Rad-Safe representative on the USS

KENNETH WHITING (AV-14), the Technical Director's ship which was involved with recovery of scientific instruments from the target vessels. The working parties boarding these ships were exposed to a greater radiation hazard than other personnel. I established a strict set of written rules for the ships which was approved by Rad-Safe Administration. These involved issuance of film badges, protective clothing, careful recordings of personnel movements and doses, establishment of a change station and checking every man and his clothing on return to tne ship. Cooperation with these procedures was excellent. Colonel Warren told me he was pleased with the way we handled the situation on our ship.

Though I cannot remember precise doses of personnel boarding target ships I do not recall many cases of overexposure. Monitors accompanying the boarding parties reported estimated doses received by men during their work day. Those doses did not appear to be out of line with the film badge doses. I had the opportunity yesterday to review the film badge readings of 397 of these people based on the KENNETH WHITING. Ninety percent were less than .1 rem and only about one percent were greater than .2 rem. These are very low doses and are in the range received by all of us, year in and year out, from natural and medical radiation.

Later in the operation, I was put in charge the Rad-Safe Laboratory at Kwajalein. We were responsible for radiological safety of crews

boarding target ships returning to Kwajalein. The most difficult responsibility concerned removal of ammunition from the ships. Due to the uncertainty about internal absorption of radioactive material, we required men to wear respirators during the operation on the ship. The safety procedures at Kwajalein were well adhered to and I do not recall any overexposures.

CROSSROADS was an operation great in scope and number of participants. There had been no previous radiation experience with operations of this type. It is not surprising that unexpected radiation hazards developed. However, I was impressed with how well the Rad-Safe administration kept abreast of the radiation situation, acting promptly to prevent overexposure of personnel when hazardous situations developed. In spite of the problems faced by the Rad-Safe section, I think they functioned well. The scarcity of individuals exceeding the permissible level attests to this.

As a post-script I would like to comment on several aspects of the fallout effects on the Marshallese exposed to fallout which have a bearing on exposures of CROSSRAODS personnel.

First, with regard to radiation of the skin. The Marshallese had heavy contamination of the skin which resulted in development of so called "beta burns" in three fourths of the Rongelap people within a few weeks of exposure. However, the burns healed rapidly and after

more than 30 years there is no evidence of cancer of the skin. In fact I do not know of a case of cancer of the skin resulting from beta radiation. At CROSSROADS, I examined many men for skin contamination and I do not recall any excessive exposures and no evidence of "beta burns" were noted. So it seems extremely unlikely that any skin cancers would result.

My second reference is to internal absorption of radiactive materials. Internal absorption of fallout in the Marshallese was readily evident from radiochemical urine analyses. Absorption was largely from ingestion of contaminated food and water with much less absorption from inhalation. This may have been partly due to the fact that the particle size of fallout was generally too large to get into the lungs. Animals removed from the island, who had been exposed showed most of the radioactivity in the gut with little in the lungs. Radioiodine, which later resulted in thyroid tumors in the Marshallese, was the only radioelement to exceed the permissible level. No other late effects have been noted from absorption of other radionuclides. It seems probable that the internal absorption of radionuclides in CROSSROADS personnel would have been for less than in the heavily exposed Marshallese since (a) there was little or no fallout from Test Able; (b) after Baker inhalation of radioactive particles would have been minimized due to washing down of the ships prior to boarding, the water tending to scrub out

radioiodine and remove loose material from the decks; (c) the principal sources of internal absorption would have been from ingestion, but since food and water were protected this source of absorption must have been negligible.

A few words about internal absorption of plutonium. The Marshallese were exposed to a much greater hazard from this source than CROSSROAD personnel. I just received word that on the basis of sensitive urine tests recently developed at Brookhaven National Laboratory the Marshallese people had only absorbed plutonium in amounts that were 1/100 to 1/200 of the maximum permissible body burden and that based on 50 years of exposure the dose to the bone would have been very low. As an atomic veteran this is very reassuring to me.

With regard to genetic effects we have not detected any increase in abnormalities in children of exposed Marshallese parents. Of greater importance are the results of studies of thousands of Japanese children whose parents received hundred of rads of radiation. Some of the best geneticists in the world have studied these children and have found no increase in abnormalities that could be attributed to radiation exposure of the parents. Therefore it seems extremely unlikely that genetic abnormalities from radiation exposure would be detected in children of CROSSROADS personnel.