UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

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January 29, 1969

ADMHR:HDB

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NOTES ON ACBM MEETING AT LAS VEGAS, NEVADA, NOVEMBER 7-9, 1968

Thursday, November 7, was spent touring the test site by plane, bus, and afoot. The overall level of activity, the expansion into Pahute mesa and the new facilities were impressive. The pack marks in the earth from the vehicle series of the Plowshare program were examined from close up. The new ecology laboratory at Mercury is a great improvement.

On Friday and Saturday, we met at the AEC Operations Office in Las Vegas. Jim Reeves, Manager of Nevada Operations, welcomed the Committee cordially. Mr. Landover (LRL) described the contributions of the LRL/Livermore and LRL/Berkeley to the ABM programs that have given us our present nuclear attack posture. The ABM (anti-ballistic missile) program has proved its feasibility technically and now is developing in the political area. Lawrence Radiation Laboratory is also responsible for making Plowshare's clean excavation explosives; "Schooner" is the next event in this series. These have a high energy yield with minimal "fallout" yield. Most of his presentation was classified.

H. Cofer (Conoco-EG&G, Geonuclear) considered the commercial possibilities of underground Plowshare shots. Subsidence craters occur only when the overlying material is fine enough to compact into the cavity or bubble. In hard rock the filling of the cavity bulks large and there is no subsidence. The size of a cavity can be predicted from the type of rock and yield; also containment can now be calculated accurately.

In addition to canal building, nuclear explosives can build cavities underground as at Gnome; make fractures in all directions for extractions (increased permeability) or for storage (iodine and krypton are fission products that might cause problems, but the iodine is adsorbed to the rock). Two more shots are planned, a 26 kt, "Dragon Trail" and a 40 kt, "Rutison," for increased gas production besides being able to use a 10-inch base. "Bronco" will form a cavity-retort for recovery of oil from the oil shale. "Sloop" is designed to break up low-grade

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CuO_2 ore in a cavity and extract the Cu using H_2SO_4. "Ketch" is a storage cavity for natural gas.

"Redundant" safety is costing the commercial people and this is an area where he felt they could save money. Present shots are over-instrumented and excessive (4 x) precautions are being required, he felt.

W. R. Cooper (NVOO) discussed the way NVOO selects sites and energies and how yields and depths are being varied and raised as cleaner yields are being obtained. Battelle Memorial Institute is doing the biological safety for NVOO at Amchitka. Nevada Operations Office feels very strongly about being safe first and last. The Palanquin failure set back the program by two years.

Bill Allaire (NVOO) noted that the shooting has to stay within the Test Ban and the Safety Guides and Limits and to do so may conduct (support) research in radiobiology, seismology, health physics, meteorology, etc. They must collect accurate data on events before and after execution and make data available to the public. The safety reviews are well organized and very broad and end up on the President's desk. But as in "Pin Stripe" accidents happen--a fault in the ground allowed leakage. He mentioned the ARMS, PHS and the Air Force U-4 planes, and their function for off-site tracking.

Bill Bootman (NVOO) described the radiological safety program which now is highly practiced and operates both by well developed models and hunches based on experience. The weather people like at least a year's experience with the local weather especially the vertical profiles. The ESSA people are active here. The bioenvironmental studies are carried out by Battelle Memorial Institute. They concentrate on both the environment and on man and the food chains of all species for the Amchitka Site. The On-site Rad Safety is by REECO at NTS and by Eberline everywhere else. They film badge, do air and radiological sampling, waste material disposal, etc.

Dick Coleman (SWRHL) reviewed the activities of the field part of the contamination of air, foods, and milk as reported in "Rad Health Data." The area surrounding the NTS has a special alarm system for air and routinely for milk and water. Thus, they get close-in data very quickly; the film badge is being supplanted by TLD. Their sampling of materials, air and things in general seems very hit or miss, whereas other parts of the sampler system are infinitely detailed, but as he said they are

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interested in "protection of the public."

This group has also been engaged in the particle problem of Nerva by warning people to stay under cover or to cover hay stacks, etc.

This HEW program runs on a continuous annual basis with added activities based on test events, their number and complexity. Typical annual total costs for PHS participation in rad-safety programs come to $\$1.7 \times 10^6$ for weapons testing on a cumulative event by event basis. Plowshare events have cost about $300,000 per year up to this date.

Del Barth (SWRHL) described the predictive programs used to decide what protective actions (FRC #2 or #5) should be taken when the releases from planned events are computed. They do a computer study, then do field experiments to check this, such as feeding field-contaminated hay to cows on the experimental farm. They also do experimental releases of I^{131} and fission fallout. When an area and cows are contaminated as with I^{131}, they study the effect of providing fresh hay for contaminated fresh green forage. The T/2 for I^{131} in milk after going on fresh hay is 1 day compared to 3 to 5 days on I^{131}-contaminated fresh forage. Where the uptake is from air alone the T/2 is 1 day and is about 2% of that from contaminated forage.

The Animal Investigative Program maintains continuous surveillance over beef cattle and large game animals such as deer, elk, etc. Six animals are sacrificed every six months and 20 specimens taken for intensive radiometric analyses. Nothing has been found yet but it is good for investigating and satisfying complaints. All complaints are accepted and looked into by DVMs and consequently there have never been legal claims. The total AIP costs $30,000.

The MLON (Medical Liaison Officers Network) is operated by Van der Smissen. There are 50 PHS MDs over the western states that investigate claims and complaints and work with the patient's own physician.

The PHS is doing a dose/effect study of hot particles from the Phoebus-Nerva tests. The particles may read 200 mr/hr $\beta + \gamma$ on contact--they are pieces of the fuel and in size range from submicron to 200 to 300 microns. They have collected these field particles and 1 uc of $< 10\mu$ of these materials are given by Cember's incubation method in 200 rats with 200 controls. The main nuclides are Ba-La and Zr-nb; the T/2 equals to 1.1.

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Al Klement (NVOO Isthmian Studies Group) reviewed briefly the organization and objectives of the study. His section has established seismic, tsunami, and seiche; past earthquakes; ground motion; and structural response of the area. Air blasts have been tested for high altitude winds, high altitude reflecting layers and window damage. The bioenvironmental program is managed by the BMI which has subcontracted to a number of University groups and laboratories; emphasis is on ecology! They began in late'66 and finished in April '67. Tritium, strontium, cesium, plutonium, tungsten, ruthenium, and calcium are the radioelements to be worried about. It will take about 300 Mt. He thinks this could be done without going too high above MPBB. Studies are going on by Oak Ridge and Battelle Memorial Institute as to doses assuming a large exclusion area.

Bernard Weisman (EG&G) described the equipment in the Beechcraft air monitor. The detectors and positioning equipment allow excellent contouring as well as isotopic identification.

Henry Lucas (EG&G) briefly noted the dosimeters developed by EG&G for special uses such as the mice at Rock Valley; a high dose meter; Rossi's tissue equivalent (dose equivalent) chamber used for π-mesons and neutrons versus LET; the neutron spectrum from Henre; a TLD chip using foil thickness and/or air.

Bill Rhodes (EG&G) presented dosimetric evidence that the β-doses are much greater than the γ-doses (6 to 12) and the material adheres to the fronting face of the plants. The destructive effects are observable only when the plants begin to sprout, grow, and/or blossom.

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