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ROBERTS DAIRY COMPANY
FALLOUT SHELTER TEST CONCLUDED

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Thirty five mooing cows, one bull and two bearded University of Nebraska seniors emerged from a large (108'x 45') fallout shelter on the Roberts Dairy Company farm at Elkhorn, Nebraska, on August 20th, after living there for two weeks. Working in conjunction with the Office of Civil Defense and the U.S. Department of Agriculture, the Roberts Dairy Company subjected the cows, one bull and their keepers to the same conditions of underground living they might have to face if this country received a surprise nuclear attack. Mr. J. Gordon Roberts, president of the dairy, stated that the purpose of the test -- as far as Roberts Dairy Company was concerned -- was to discover what the facts are with regard to shelters and what protection might conceivably be offered as a result of the shelter program.

Living for two weeks on alfalfa hay and a low protein pellet ration stored in their concrete shelter, the cows and lone bull, named "Aristocrat", showed little signs of discomfort, lost little weight, and adjusted quickly to the topsy-turvy life underground. Electric lights in the shelter were used to reverse the clock and reduce the amount of heat and humidity present. Lights were turned off during the hottest part of the day (11:00 P.M. until 8:00 P.M.) to reduce cattle activity, then during the cooler part of the day, they were turned on to permit the cattle to feed, drink and move around in their confined quarters.

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Normal Nebraska weather during the course of the two week exercise which began at 2:00 P.M., Tuesday, August 6th, averages in the 69 through 90 degree range. Early in the test, the weather turned cool in the Middle West. Since the test was designed to learn, in part, how much heat and humidity the animals could stand inside, artificial weather had to be introduced into the shelter. This "artificial weather" was on hand in the form of a large trailer with the necessary heating and humidifying equipment.. and air conditioning had the need arisen...ready to pump heat inside through a large flexible tube. A five-man crew from the University of Florida was also on hand.

Working under contract with the Office of Civil Defense in Washington, D.C., the University of Florida engineering department supplies crews of engineers to set up and operate shelter tests of this kind, throughout the country. Under the initial direction of Associate Professor Frank M. Flanigan, the crew wheeled their twelve ton trailer into position near the bovine shelter on Sunday afternoon, July 28th, and set about blocking off one-third of the shelter's main room, which is about 45' wide by 90' long. The "third" of the shelter to be used corresponded to the estimate that about one hundred cows could live in the entire shelter and that about one-third of these should begin the test, with more cows to be added as feasible. Using plywood sheets, insulation and plyofilm, they sealed off one end of the shelter, and installed one panel of plywood as a door, to be closed when the cattle were inside. Next to the cows, inside, heavy gates protected the walls from disaster in the form of a cow scratching herself, or getting playful with another cow.

Once the test got underway, under the direction of retired Navy Rear Admiral A. L. Danis, professor of meteorological engineering at the University

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of Florida, temperatures, humidities, and air flows were monitored and recorded for several points throughout the shelter. Probably the measurement of humidity was the most critical measurement made, for in a confined area like the shelter high humidity could make life unbearable. During the winter, when the University Crew's testing will be concluded for a time, the University of Florida team will turn their results over to electronic data computers for correlation, and from these tabulations will come recommendations about the amount of fresh air required, etc., to be disseminated through the Office of Civil Defense and the U.S. Department of Agriculture.

Probably the two "heroes" of the test were two University of Nebraska Animal Husbandry Seniors who cared for the cattle during the two week test, Arthur W. ("Ike") Anderson, Jr., 23, of Genoa, Nebraska, and 20 year old Dennis A. DeFrain of Fairbury, Nebraska.

They lived in a separate room, a few feet from the cattle, which was equipped with three bunks (for "full-strength" occupancy in event of attack), cooking facilities, electric lights and a "private" fan which brought in fresh, filtered air and kept possible offensive odors out of the room. During their stay, they heated their canned beans, spaghetti, stew or what-have-you on a small bottled gas stove. They washed down emergency wafers called "Nebraskits" with coffee, milk or orange juice made from powdered ingredients in the shelter. Did they shave? No, they did not, but found toward the end of the test that "cleaning up" for them meant shaving off their "beavers" just as soon as the test was over. Complained one, "The darned thing itches."

They kept in touch with the outside world through means of a two-way radio set loaned by the Omaha Civil Defense Office, and reported they missed cold foods and that they especially missed cold milk. Dairy President,

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J. Gordon Roberts heard about this and obligingly met them at the shelter entrance at the end of the two week test with a large pitcher of cold milk, paper cups and a supply of sweet rolls.

On the company farm, there is another shelter for farm employees. At the end of the first week inside their shelter, the two herdsmen were asked if they would want to exchange places with people in the personnel shelter--if it had been included in the test. In this way, they could get away from the animals, and see other people. Their immediate response was, "No." At that point, their main problems were boredom and monotony of food. As early as the fourth day of the test, they had reduced their meals to two per day, supplementing this with their supply of "powdered" milk and orange juice. Switching shelters would not have changed this, but their boredom would have been worse. In the cow shelter, their boredom was counteracted by having specific duties to perform; feeding the cattle, changing the straw bedding, taking temperatures, etc., keeping their diary every half hour, recording cattle respiration and pulse, as well. Turning the cattle out for exercise was something to look forward to, during part of the two week stint. Their duties and the physical work they had to perform kept their morale high. One might ask how these two young men would react if they had spent two weeks in a regular shelter with little to do to help pass the time. Boredom could lead to friction among the occupants of a personnel shelter, but to the busy herdsmen, there was little time for that.

During their two weeks in the shelter, the attendants read a lot, played chess and cards, listened to their portable radio until the battery grew too weak, maintained their records, cooked and slept. Somebody thought it was a picnic, for "Ike" and Dennis swatted flies, sprayed for flies, and spread fly-killer all over their quarters. Every time the cows went out

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for air, they brought in a fresh supply of the black varmint.

Prior to their participation in the test, the two received thorough physical examinations and took a battery of standard psychological tests. Likewise, after the shelter experiment was over, they underwent the same testing, to ascertain what possible changes took place within the boys. Their diary and a daily record of their reactions, which they kept as well, will be correlated with the psychological tests to help recognize possible problems other cow shelterees might encounter.

Toward the end of the second week, a water pump in their quarters began to make loud noises, keeping them awake. Their reports indicated that the noises bothered them to the point that Dennis took his blankets to a stack of alfalfa hay in the main room where the cattle were living, and separated from the cattle by only a gate, slept peacefully for the first time in several days.

Were the accumulated smells bad? After two days, the two recorded they were not bothered by smells, and that fresh straw spread around the cattle's portion of the shelter reduced odors appreciably. (The straw pile grew to twelve inches deep by the last day of the test, making it difficult to open gates with only a four inch clearance.) In their own room, filtered fresh air poured in to keep the atmosphere pleasant and cool. Since they were not receiving any hot air through their ventilating system, and had to keep their door closed, they found it became chilly during the nights when outside temperatures dropped into the fifties.

Would they go through another shelter test, later on? "Well, we don't want to look at another cow for a couple of weeks," one answered waiting reporters, as he emerged from his two week experience, on Tuesday, August 20th

The men did well, losing a few pounds, but how did the cattle fare?

Originally, thirty Guernsey heifers and one Guernsey bull were driven into the shelter on Tuesday afternoon, August 6th (the 18th anniversary

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of the A-bombing of Hiroshima, Japan). On Sunday afternoon, August 11th, five more cows were added to see how many more animals could live comfortably inside. Then on Tuesday afternoon, August 13th, the end of the first week, artificial weather had to be introduced with a mechanically controlled range of 69° low and a high of 90° to be reached in the afternoon, and taper off gradually. On Saturday, the 17th, additional heat was introduced into the shelter raising the artificial high to a more uncomfortable 95° during the afternoon. Still not sure the weather had reached its "toughest", on Monday before the cattle emerged, "weather" being blown into the shelter reached a sizzling 100° in the afternoon. This did not mean that the temperatures going in were the same as those present on the inside, because the controlled humidity entering the shelter was lower than the humid conditions caused by warm cattle. Each time weather conditions were changed inside, it seemed to take the cows about a day to become used to hot temperatures, based on the cow temperatures the boys recorded.

During the time cows were exercising outside the shelter in pens, each morning and--during the final week-- in the evenings, their herdsman placed fresh feed and alfalfa hay in concrete bunks and added fresh straw on the floor. Each time, the cattle were content to remain outdoors about ten minutes, then began mooing to return to their temporary home. Each time, they came back in more orderly fashion than before, in single file, at a walking gait.

Company veterinarian, Dr. Jack Cady of Arlington, Nebraska, pronounced the herd "fit" and stated that they had maintained their condition well (nearly all were bred heifers) during the two weeks. The only medicines which the cattle needed as a result of being in the shelter were to combat excitement from being driven into the shelter the first day, passing a battery of cameras, flash bulbs, and bothersome white shirts the newsmen wore. Their grinding cameras and popping flashbulbs sent cow temperatures

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soaring a degree or two.

Did the cows and their attendants have to remain in the shelter throughout the entire two week period? According to the Omaha Civil Defense Office, in an atomic attack, the danger of fallout reduces greatly during the first 36 to 48 hours after bomb detonation. After that time, it is possible to remain outside a shelter for brief periods. The office helped to prepare a program of outdoor exercise periods which began two days after the test began, permitting the men and animals to receive "Theoretically" safe doses of radiation, and to lengthen their stays outside within safety limits. Due to the cool weather which set in early in the test making "artificial weather" necessary, cattle exercise periods were kept to a minimum to prevent cattle chills, and the return of a great deal of cooler air to the shelter after an airing period. This made the scientific observations more reliable, with the warm air only leaving the shelter as it was forced out by pressure of the fans.

How many cattle can the shelter hold safely? Although the data is not complete yet, it appears that the 45' x 90' main room could accommodate about 100 cows with a few minor changes in the shelter, leaving an area of about 40 square feet per animal.

What changes might be made in the shelter to make it more useful for everyday occupation by cattle and for use as a fallout shelter in case of necessity? In the case of some of these ideas, it is mainly conjecture until the information gathered by the University of Florida team is tabulated electronically, which may be in early 1964. Until then, these are some of the contemplated changes in this pioneer fallout shelter for cows. More fans to bring in filtered air and take away heat and humidity (how many to operate the full shelter we do not know yet); moving personnel quarters from the rear of the shelter to a point nearer the front, and adding a ladderwell to

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permit the men to enter and leave the shelter without going through the cattle; addition of sturdy catwalks built over the concrete feed bunks on opposite walls, making it easier to observe all the cattle--for illness, etc--without having to walk through them. Other items that might be changed include the addition of more feed bunks (larger animals made it difficult for smaller cattle to feed easily), and addition of a second automatic waterking box away from the one currently in use - since the animals occupy nearly all the floor space when they lie down and make it difficult to get around. With the full shelter in use, with 100 cows instead of thirty five, more feed and waterking facilities would be valuable additions.

A gas engine supplying emergency power in case of rural power failure was found to be inadequate since it overheats easily in its concrete block-house. It may need more ventilation, or be replaced by a diesel engine.

The raising of gates inside, due to the straw cover on the floor, was mentioned above. Wooden boards were considered to prevent accumulation of humidity in the shelter, so the idea was discarded.

The same team from the University of Florida is considering conduct of a test next year at the Roberts Company's personnel shelter on the Elkhorn farm. This time, it would be a test to see if people can supply a shelter with enough fresh air by cranking an air pump. Since this so-recently completed cattle shelter test was based on the ready availability of electric power to operate forced-air fans, it is reasonable to raise the question: "Could people operate fans successfully by hand, or would it be more feasible to have a group of family shelters (or one community shelter) connected to a diesel-power system to operate fans and lights?" After a few days of the test next year, it would be anticipated to switch the people for machines which could simulate the heat and humidity generated by the same number of people, and complete a two week trial run with the mechanical "simocs".

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Was this first cattle fallout shelter test a success? From the standpoint of the Office of Civil Defense and the U.S. Department of Agriculture--both agencies who are vitally interested in this area of research--the test was a success. The widespread notariety the test received was aimed directly at the great American gambler--the farmer, who gambles every spring on good weather, good crops, good prices, no insect pests, and so forth. He probably has been gambling that fallout from an Atomic attack, should it ever come, would not harm his farm. Unlike his city cousins who are having mass shelters made available to them, the farmer, rancher and dairyman must complete their own protection plans in case of attack.

The Roberts Dairy fallout test raises the question that cattle fallout shelters could be made useful 12 months of the year as regular barns or shelters, in the every day housing problem encountered by farmers, ranchers and dairymen. With data compiled from this test, it is not unlikely that many recommendations can be made as to how existing buildings like trench silos can be made a part of any civil defense plan on the rural scene. Such information will be made available through the OCD and USDA next year, probably. Other data will be made available through the Roberts Dairy Co., as it is compiled.

"In a Democracy," Mr. Roberts observed at the conclusion of the test on August 20th, "the citizens ultimately determine what foreign policy should be." If we have our people prepared for the worst, and tests like this one can contribute a great deal to that preparedness, then both Russia and Chine must think twice about using atomic weapons on our country.

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Two Weeks In A Cow Shelter

Two boys and 20 cows recently underwent a survival test in a fallout shelter on a Nebraska farm

By **DAVE MALENA** Associate Editor

RECENTLY one afternoon an air raid siren broke the silence on a northeastern Nebraska farm. Thirty Guernsey cows, one bull and two herdsmen hurried into an underground fallout shelter.

There was no actual nuclear attack. The activity was a test conducted by the office of Civil Defense and U. S. Department of Agriculture on the Roberts dairy farm near Elkhorn—a test that could be important to farmers all over the country.

In the future, a number of farmers will be thinking about remodeling some existing structure or constructing a new dual-purpose building that will serve not only as a hog house or dairy barn but also as a fallout shelter. University of Nebraska agricultural engineers already have plans available for a dairy barn that can be used as a fallout shelter for both livestock and family.

The Reason

The reason for the test was this: No one really knew how animals and humans would react when shut up in a shelter for several weeks.

The Roberts shelter is one of the first built specifically for livestock. It is a large 108 by 45 feet underground concrete structure. Al-

ably high. To correct the situation, the herdsmen reversed the cows' nights and days.

The lights were turned off during the hottest part of the day—from 11 a.m. to 8 p.m.—to reduce cattle activity. The lights then remained on during the night when it was cool to permit the cattle to feed, drink and move around in their confined quarters.

A week after the test was started, five more cows were added to see how many more animals could live comfortably in the shelter. Shortly thereafter, Civil Defense officials began to create artificial weather conditions in the shelter.

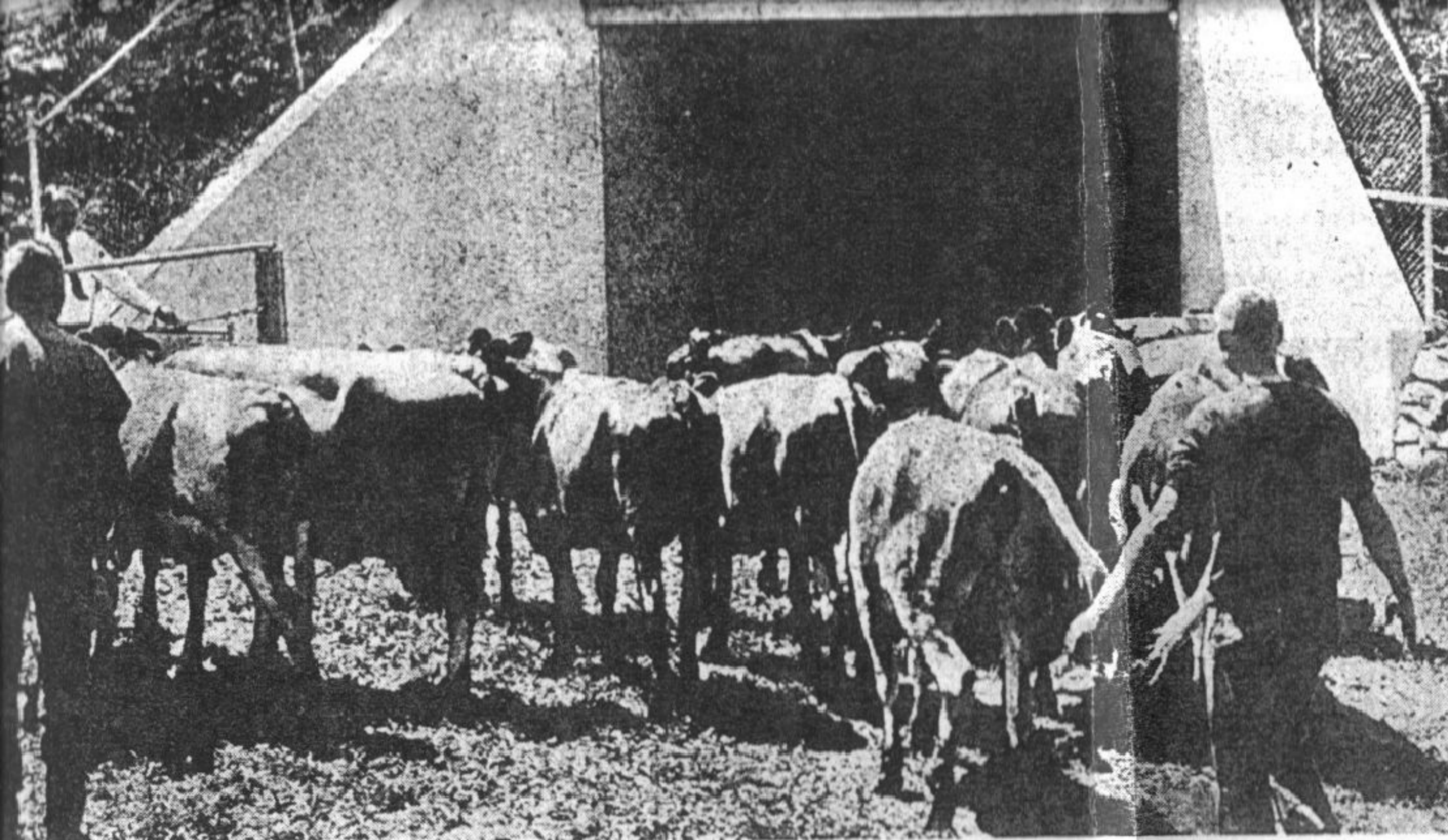
At the beginning of the second week, the temperatures introduced from the outside ranged from a low of 69 degrees to a high of 90 degrees. Toward the end of the test, additional heat was introduced to raise the temperature to 95 degrees and then to 100. Each time as weather conditions were changed inside, it seemed to take the cows about a day to become used to the high temperatures.

Although the animals (nearly all bred heifers and one bull) went through these periods of stress, they showed little signs of discomfort and lost little weight.



Herdsmen Dennis DeFrain (left) prepares a can of stew for one of two boys' meals during their stay in the fallout shelter. "Ike" Anderson is busy making a report of conditions in the shelter to Civil Defense officials.





People made cattle frisky . . . at shelter entrance.



—World-Herald Photos.

Guernsey bull . . . led to shelter by Len Neidermyer.



Cows Off to Nervous Start in Test of Fall-out Shelter

A herd of cows got off to a nervous start Tuesday in the nuclear fall-out shelter test at the Roberts Dairy Farm near Elkhorn.

Photographers and others on hand to watch the drive-in gave the 30 cows the jitters. Herdsmen had to work to get the animals into the underground shelter.

There, the cows, all "dry" Guernseys, one Guernsey bull and two keepers will remain most of the time for two weeks in a simulated retreat from nuclear fall-out. The bull was led in first and ensconced in a separate stall.



Dennis DeFrain of Fairbury and Arthur E. Anderson, Jr., of Genoa, seniors in the Dairy Animal Husbandry Division of the University of Nebraska College of Agriculture, will live in the shelter to keep check on the animals.

The Office of Civil Defense and United States Department of Agriculture are participating in the test, believed to be the first of its kind.

The OCD has contracted with Prof. Frank Flanigan, associate professor of mechanical engineering at the University of Florida, to conduct the test. He has a crew of three to monitor such things as temperature, respiration and heartbeat of the cows and to measure heat, humidity and air flow in the shelter.

Dr. George Fries of the USDA, Beltsville, Md., is an observer.

Dr. Jack Cady, Arlington veterinarian, will also be available to check on the animals.



Dr. Cady (center) and keepers in shelter . . . DeFrain (left), Anderson.



Students, Cows In Shelter 2 Weeks

Arthur E. Anderson Jr., 23, Genoa, left, and Dennis DeFrain, 20, Fairbury, hold one of the 35 cows with which they spent two weeks in a nuclear fallout shelter in an experiment conducted by Omaha dairyman J. Gordon Roberts at Elkhorn. The boys "preferred being busy with cows to being bored with people in a shelter," Roberts declared. The two University of Nebraska agriculture students said that boredom and monotonous food were their biggest problems.

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