

EXCERPTS

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A REPORTER AT LARGE

MICROWAVES-I

As for the military, since microwaves were indispensable to virtually the nation's offensive and defensive weapons systems, any objective evaluation of microwave hazards on its part was bound to be, as it had been for nearly fifteen years, a casualty of the Cold War. That is to say, for reasons they perceived to be of national security, military people felt obliged to protect the ten-milliwatt level at all costs, to ignore, deny, or, if worst came worst, suppress any information about adverse effects of low-intensity microwave radiation. In 1962, however, a bizarre discovery at the United States Embassy in Moscow threw the Department of Defense and the various agencies of the intelligence community into confusion over the possible neurological and behavioral effects of microwaves. At that time, security experts who were conducting an electronic sweep of the Embassy to detect hidden listening devices found that the Russians were beaming low-intensity microwave radiation into it from a building across the street. (Searches of the Embassy had been going on periodically since 1952, when security people discovered that the carved wooden Great Seal of the United States, which the Russians had presented to Ambassador Averell Harriman at the end of the Second World War, had been bugged; indeed, it was this same eagle that Ambassador Henry Cabot Lodge had displayed before the Security Council of the United Nations on May 26, 1960, on the occasion of his famous speech concerning Soviet perfidy.) At first, it was believed that the microwaves being beamed into the Embassy had something to do with the normal eavesdropping operations that virtually all nations conduct against one another. It was soon realized, however, that the Russians were using multiple frequencies and widely fluctuating microwave beams with highly irregular patterns, which did not appear to be applicable to intelligence gathering. As time went on, the motive for the Soviet micro-

wave bombardment of the Embassy became the subject of intense scrutiny by various American intelligence agencies, including the Central Intelligence Agency, whose officials had become belatedly aware of, and concerned about, the vast amount of research that the Russians had conducted on the effects of microwaves upon human behavior. For the usual security reasons, this scrutiny was carried on with the utmost secrecy, and cloaked in the usual euphemisms. The microwave beams being directed at the Embassy were referred to as the Moscow Signal; the investigation of them was dubbed Operation Pandora; and information about it was parcelled out on a strict "need to know" basis, which, as it turned out, excluded most of the State Department employees at the Embassy who were being irradiated. C.I.A. agents interviewed scientists who they knew were involved in microwave research, asking them such questions as whether it was reasonable to believe that microwaves beamed at human beings from a distance could affect the brain and alter behavior. In the autumn of 1965, the Institute for Defense Analyses—a think-tank outfit that does work for the Department of Defense—convened a special task force to assess the problem, and studies were undertaken to duplicate some of the Russian experiments showing that microwaves affected the central nervous system of test animals. In addition, the Advanced Research Projects Agency—a highly secret organization within the Department of Defense, which was engaged in developing a wide variety of electromagnetic weaponry, including electronic sensors and other devices that were designed to detect enemy movement on the Ho Chi Minh Trail and elsewhere in Vietnam—set up a special laboratory at the Walter Reed Army Institute of Research, in Washington, D.C., where, over a number of years, experiments were conducted in which rhesus monkeys were irradiated with microwaves at power densities and frequencies similar to those of the Moscow Signal. Although the

results of these experiments are said to have been inconclusive, they remain unknown, for the Department of Defense still classifies them as secret. It is known, however, that similar studies undertaken since have clearly demonstrated that microwaves can exert a profound effect upon the central nervous system and the behavior of rhesus monkeys and other primates. It has also been reported that at the summit meeting in Glassboro, New Jersey, in June of 1967, President Lyndon Johnson asked Premier Aleksei N. Kosygin to call a halt to the irradiation of the Embassy in Moscow.

AS it happened, during that same month the first of several bills providing that electronic products be designed and manufactured so as not to emit radiation endangering the public health and safety was introduced in Congress. The proposed legislation came about as a result of public disclosure by the General Electric Company that it was recalling ninety thousand color television sets whose shunt-regulator tubes were found to be emitting X-rays in excessive amounts. Initially, therefore, Congress was concerned with the hazard of ionizing radiation given off by TV sets, by medical X-ray machines, and by artificial radioactive materials used in industry. However, by the time the Senate Commerce Committee got around to holding hearings on the problem, in May of 1968, the measures had been expanded to include non-ionizing radiation as well.

As might be expected, none of the testimony presented at the hearings gave the senators any inkling that the Defense Department and the C.I.A. were gravely concerned about the possibility that low-intensity microwave radiation could affect human behavior. On the contrary, the Defense Department sent over two high-ranking officials from its Defense Research and Engineering branch, plus a high-ranking medical officer from each branch of the armed forces, to assure the senators that military-sponsored research into the biological effects of microwaves had been adequate, that the ten-

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Force was being exposed to hazardous amounts of microwave radiation. (Apparently, no one in the Defense Department had given much thought to the voluminous Soviet literature on the low-level effects of microwaves, or, for that matter, to a medical bulletin issued by the Air Force in December of 1965 which, under the heading "Unexplained Response of Man to Radar," stated that "epigastric distress and/or nausea occasionally occur at rates as low as five to ten milliwatts per square centimetre.") As the Soviet findings, the witness in five days of

ings to address this subject directly Professor Charles Susskind, of the Department of Electrical Engineering at the University of California at Berkeley, who told the committee that American investigators had scarcely dared to look for non-thermal effects of microwaves. After observing, "we cannot very well dismiss a whole body of scientific literature just because it is Russian," Professor Susskind urged that the Soviet experiments be duplicated in order that they might be corroborated or disproved. He also said, "though ionizing radiation seems to be no larger as a hazard, it would not surprise me in the least if non-ionizing radiation were ultimately to prove a larger and more vexing problem."

While most of the testimony given at the hearings supported the ten-milliwatt level, there was some testimony that cast doubt upon it and retarded the confusion and uncertainty surrounding the whole problem of exposure to microwaves. Perhaps the most surprising source of such testimony was Professor Schwan, who not only had proposed the ten-milliwatt level to begin with but also had been chairman of the Sectional Committee on Radiofrequency Radiation of the American Standards Association—a private organization largely funded by industry and the government, and now headed by the American National Standards Institute—which in 1966 had recommended that it be adopted as an official standard. Professor Schwan told the committee that much more research would be needed to determine whether long-term exposure to low-intensity microwave radiation was harmful; whether a level of exposure that was safe for adults would turn out to be unsafe for children; whether microwaves did interact with tissue on a molecular or microscopic level; and whether microwaves could cause genetic damage.



point out that investigators who tried to acquire information about microwave injuries were encountering difficulties from employers, and he deplored a tendency on the part of the military and of industry "to dismiss the possibilities of microwave-induced damage in order to avoid legal and compensation problems." After defending the ten-milliwatt standard as "the best we can formulate on the basis of presently available knowledge," he admitted that it had been "crudely set" and "badly needs refinement." According to Professor Schwan, the ten-milliwatt level had not been

formulated with any regard to frequency, yet there was "good scientific reason to believe that the standard ought to be frequency related, since the lower-frequency radiation penetrates much deeper in the body and can heat it more effectively than higher frequencies." He also pointed out that the standard "becomes practically meaningless in the presence of complex field configurations"—highly irregular and unpredictable wave intensities that often occur in close proximity to microwave-generating equipment—and so it could not be safely applied to microwave ovens. About the specific hazards of the ovens, Professor Schwan had this to say: "If microwave ovens should become very popular, which may be quite possible, and if there occurs a leak in a microwave oven and if a housewife happens to be standing in front of that leak accidentally, then she could be hit by a severe dose of microwaves. And if the oven is placed so that the radiation hits her face, she may be blinded."

This statement by Professor Schwan had a considerable impact on the members of the Senate Commerce Committee, for surveys of microwave ovens made in two states and the District of Columbia had shown that even when their doors were shut, anywhere from a sixth to a quarter of them leaked radiation in excess of the ten-milliwatt level, though this had been adopted as a voluntary performance standard by all microwave-oven manufacturers, and that, of thirty ovens delivered to the Walter Reed Army Medical Center, twenty-four had to be rejected because they were leaking radiation up to twenty milliwatts per square centimetre. Indeed, the Senate hearings marked the beginning of a long and bitter controversy over the safety of microwave ovens, which still continues. In a statement submitted for the record, the Raytheon Company—then

domestic and commercial microwave ovens—assured the committee that microwave leakage from its ovens was substantially less than ten milliwatts per square centimetre, and that, in any case, unlike X-rays, microwaves did not have a cumulative effect. On the other hand, Professor Carpenter, of Tufts University, wrote the committee, "We have clearly demonstrated a cumulative harmful effect of microwave radiation on the eye, so that single exposures to radiation which are not of themselves harmful may become truly hazardous if they are repeated sufficiently often."

Faced with testimony that was inconclusive, incomplete, and often contradictory, Congress, not surprisingly, threw up its hands over the enormously complex and long-neglected problem of exposure to microwave radiation and passed the Radiation Control for Health and Safety Act of 1968. Basically, the act authorized the Secretary of Health, Education, and Welfare to establish a broad program to coordinate, conduct, and support research on radiation hazards, and to develop and administer performance standards that would minimize unnecessary emissions of X-rays and other radiation from electronic products. However, it contained no provision whatever for the development and promulgation of standards governing the actual exposure of not only consumers but the general population to microwaves and other non-ionizing radiation. Nor did it give anyone any statutory authority to develop emission standards for electronic equipment under the control of the federal government, though the government was then (as it is now) far and away the largest single user of microwave devices in the United States. The extent to which Congress's hands were tied in this regard was clearly stated in a letter sent on June 5, 1968, to Senator Warren G. Magnuson, chairman of the Commerce Committee, by the acting general counsel for the Department of Defense:

It is understood, however, that the development of product standards to protect the public health will not necessarily preclude the use of devices, e.g., radars, communications transmitters, etc., which are designed to intentionally emit large quantities of radiation. The use of such devices is often essential to meet requirements of the national defense. It is anticipated that in developing standards, the Department of Health, Education, and Welfare will give consideration to the use and purpose of these devices and will consult with other federal agencies on the development of standards which could have such an effect on these devices. Moreover, if standards are devel-

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ation of devices essential to the national defense it is understood that this will be a matter subject to exemption under section 360 (A) (b).

After the 1968 act was passed, the Environmental Control Administration's Bureau of Radiological Health was given responsibility for administering its provisions, and dutifully set out to establish performance standards for television sets, microwave ovens, certain kinds of electron tubes used in schoolrooms, and diagnostic X-ray equipment. The work was necessary, of course, but it hardly began to deal with the real dimensions of the microwave problem. This had been described for the Commerce Committee by James G. Terrill, Jr., director of the National Center for Radiological Health, who had testified at the outset of the hearings that as a result of the widespread use of microwave generators for military purposes, radio navigation, tracking, communications, food ovens, and various industrial processes, the entire population of the United States was subject to some microwave exposure, and that the number of persons exposed to excessive levels of microwave radiation was unknown. Indeed, the Radiation Control for Health and Safety Act, with its narrow focus and its many limitations, amounted to little more than a license for continuing the vast proliferation of microwave devices that, having gone on unabated since the Second World War, had brought about this very situation.

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(This is the first part of a two-part article.)