

build an interim bomber using the best technology left over from the aborted B-1 program.

- Reagan's advisers claim that the Administration has badly neglected the Navy. They would launch a massive new shipbuilding program to increase the total force from 500 to 600 ships.

- According to Reagan's advisers, something must be done immediately to attract more competent people into the armed services and keep them once they have enlisted. The candidate has endorsed the all-volunteer approach, meaning that a Republican administration would not consider using the draft unless other methods of improving the talent pool had failed. This is an expensive approach; Reagan's advisers say that salary limitations imposed in 1977 have brought about a loss in servicemen's real income of \$6 billion. The Reagan camp has not yet settled on a plan for making military service attractive to "middle class people of quality," as Rowny described the desired recruits.

If these promises are carried out, the proposed increase in the nation's \$160 billion annual defense budget will strain the system. The strain will be greater if Reagan wins the election, for he has promised not only to increase military

spending, but to lower total federal spending, to lower federal income by enacting a large tax cut, and to balance the budget. It will be a neat trick to do all of this. Reagan's advisers concede that their accomplishments might fall short of

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these objectives, but they insist that the defense budget would not be compromised. Van Cleave and Alan Greenspan, one of Reagan's economic advisers, are now trying to fit together all the pieces of this puzzle. No one will say when the public may see the results.

Without mentioning Reagan, Defense Secretary Harold Brown last July made a four-point attack on the Republicans' defense strategy, insofar as it is known. A

campaign to make the United States superior to the Soviet Union would be wasteful and dangerous, Brown said. It would (i) bring about "the end of arms control," (ii) start an "uncontrolled, open-ended, and very expensive arms race," (iii) run afoul of "real world constraints," which would force the government to cut back on conventional forces, and (iv) channel competition into building spectacular nuclear weapons, "the most dangerous arena—the one most likely to lead to nuclear war."

Reagan and his military advisers of course reject the notion that they would start an arms race. They maintain that they only intend to catch up with the Soviets in a race already under way. Yet they are clearly less concerned than the Administration about the dangers of a weapons buildup. Rowny, for example, was asked if there would be a period of no arms control under Reagan. He gave a personal view: "There's no arms control now. It would just be more of the same. . . . It's not going to be the end of the world. There's no way that [the Soviets] could unleash whole new resources, because they don't have them. . . . To put it simply, if the United States wanted to race, there would be no contest."—ELIOT MARSHALL

Ion Generators: Old Fad, New Fashion

The ion generator is back and selling like hot cakes. But does it do more than clean the air?

On the heels of hot tubs comes another appliance from the West Coast to promote your well-being. Chico Memorial Hospital's burn unit has one. A New Wave nightclub in Berkeley has one. Even the state of California is testing one in its Los Angeles hearing chambers.

The gadget is a negative ion generator—touted in the 1960's as a miracle device to cure your every ill. It was promptly labeled quackery by the Food and Drug Administration. Twenty years later, the air ionizer has been reincarnated with a different sales pitch that stops just short of claiming any medical benefit. According to one ad, the invention cleans up the air, recreating the freshness of the countryside: "Air quality can actually affect your moods, your feelings and your sense of well-being," claims the ad.

Believers swear that the generator is a panacea for everything from surliness to insomnia, but they concede that the effect may be psychosomatic. Scientific evidence as to the power of the ionizer is scattered and uneven. Some researchers believe that the negative ions most likely improve the people's health by altering hormone levels. If nothing else, the ions help plants grow faster, they say.

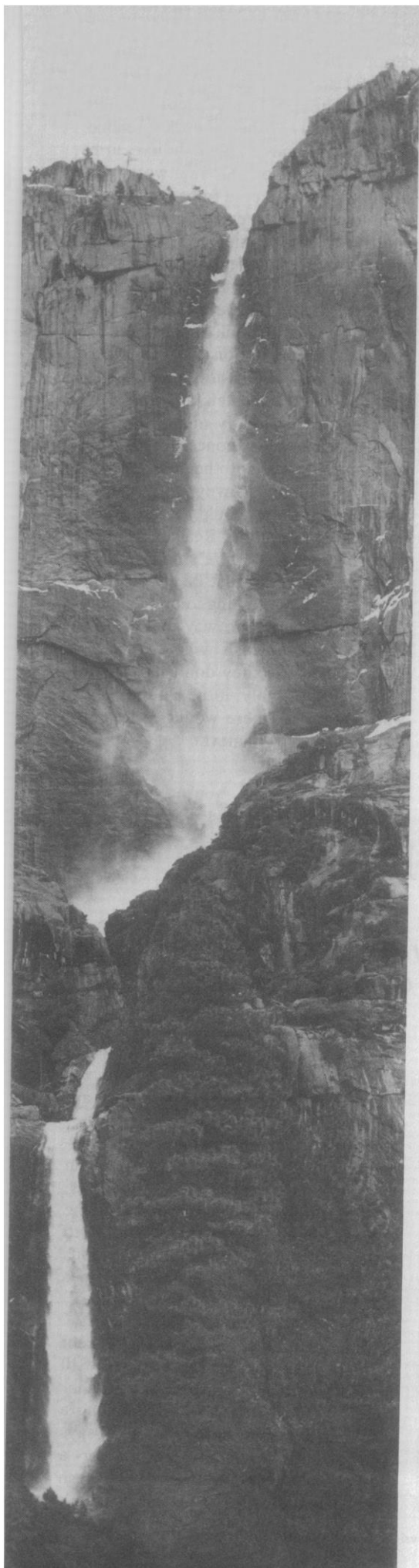
The ionizer's primary function is to clean the air. It emits a shower of negative ions that collide with airborne particles and make them settle onto electrically grounded surfaces such as walls and ceilings. The ions pull out smoke, pollen, and other particles.

In nature, ions are created by waterfalls, lightning, and hot desert winds. In country or mountain air, thousands of positive and negative ions swirl around

in every cubic centimeter. But an urban office may have as few as 50 ions per cubic centimeter because the ions are snatched up by pollutants.

Distributors, who promote the ionizers for all kinds of uses, have sold them to bars, beauty salons, restaurants, chicken farms, and florist shops. Some urge nonsmokers to take an ionizer to restaurants without no-smoking sections and set it up on their table. With names like "Air Alive" and "Air Energizer," the units sell for \$80 to \$160.

Manufacturers, enjoying the recent boom in sales that may reach roughly \$10 million this year, want to avoid another run-in with the FDA. "We're selling a clean air machine, nothing more," says Thomas Michaels, a salesman for a Berkeley store, "A Breath of Fresh Air." The FDA says as long as ads don't



make specific medical claims, the firms are on safe ground. But the agency has already sent out six letters this year to companies, ordering them to quit making medical claims.

Is the ionizer a help or a hoax? One consumer convinced that the device cleans the air is Jane Downes, supervisor of Chico Memorial's burn center. "When we get ready for inspection we shut off the machine so there's less dust around."

But the main reason the burn center bought the ionizer was to reduce patient's levels of a neurohormone called serotonin, a substance associated with conditions such as migraines and nausea. When the ionizer is turned off, Downes says she feels grumpy. Does it really uplift one's mood? "When people ask me if it works, I tell them, 'Well, after all, this is California.'"

An ionizer owner in New Jersey says, "It's a definite feeling of aaaaaahhhhhh. It really feels good. I turn it on when I take naps," says Bruce Rosenberg, an engineering research psychologist from New Jersey.

Scientists give the ionizer mixed reviews. The medical benefits of negative ions have not been proved, says Joseph B. Davis, who recently retired as director of the FDA's bureau of medical devices. Davis was the official who originally clamped down on the devices in the 1960's. "I wouldn't recommend them," he says. When asked about the safety of exposure to large doses of negative ions,

California at Berkeley. He is one of the few researchers to have examined the biological effects of negative ions even though the flap in the 1960's over the device caused a considerable setback for serious research.

"We don't know how neurotransmitters respond to negative ions," he says. But when the air concentration of negative ions goes up, serotonin levels go down, based on mice and rabbit studies, he explained. Good clinical studies have yet to be done because necessary funding is scarce.

Krueger himself keeps ion generators running in his home and office. "It provides a comfortable environment," he says.

Apart from the serotonin hypothesis, Krueger reported other biological effects of negative ions in a survey article [*Science* 193, 1209 (1976)]. As early as 1933, Russian studies showed that high concentrations of ions slowed bacterial growth. Other studies indicated that ions could precipitate out bacterial aerosols by their charge. But Krueger knows of no explanation as to why the ions can kill or inhibit growth of bacteria.

Krueger noted from his own studies that negative ions appear to protect mice from influenza. Plants too are said to benefit from ions. According to Herbert Pohl, a physicist at Oklahoma State University, Persian violets, tomatoes, *Coleus*, radishes, and green beans all grow more rapidly when raised in a greenhouse filled with negative ions.

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Davis suggests that health studies are so far inadequate.

The Environmental Protection Agency has a laboratory that studies air quality. But the lab's director had never heard of the negative ion generator.

Academic scientists who study the effects of ions confirm that the generators clear the air. But the ionizers vary in quality and performance, depending on the manufacturer, they say.

One scientist who believes the ions go beyond air cleaning is Albert P. Krueger, emeritus professor of bacteriology and biometeorologist at the University of

One group interested in promoting research and distributing reliable information on ion effects is the Institute for Medical Climatology in Philadelphia. Its 120 members are mainly scientists although about five ionizer manufacturers belong. The group plans to propose manufacturing standards later this month when it holds a conference. The meeting is an effort to tell what is known about ion research, says George King, the group's executive vice president. "There's a lot of hearsay going around."

Ionizers may very well be an effective air cleaner, but the dust of debate has yet to settle on the issue of ionizers and whether they're a medical marvel. As one distributor put it, "Negative ions affect different people in different ways."

—MARJORIE SUN

U.S. Department of Interior/
National Park Service Photo

Waterfalls and winds: natural ion generators.