animals is much more worrisome than in humans because, at any one time, the number of animals feeding on antibiotics vastly exceeds the population of humans being treated, they say. This is compounded by the fact that the length of therapy in humans averages fewer than 10 days, while use of antibiotics fed to animals is "often continuous," according to the OTA report. Levy says, "Depending on the animal's size, its daily fecal excretion can be 5 to 400 times greater than the 100 to 200 grams excreted daily by adult human beings, and dispersal of animal feces is not well controlled." As a result, the disease would be transmitted much more easily to other animals and humans.

Cohen says that the issue in the past may never have found much favor because "people perceive *Salmonella* poisoning as a nuisance illness," which does not create the same concern as a chronic disease such as cancer. "But selective pressure caused by antibiotics chooses more virulent organisms," he says. "Once we have a large number of resistant organisms, it's going to be too late."

There is some movement on Capitol Hill to address the issue. Representative James H. Weaver (D–Ore.) is currently drawing up a bill that would put into legislation the FDA's proposed ban on the use of tetracycline and penicillin. Weaver planned to introduce the bill before Congress recessed, but it will have to be reintroduced in the next Congress. The bill, according to a staff aide, would probably be reviewed by the House health and environment subcommittee. House legislators introduced a bill in 1980 which embodied the goals of FDA's 1977 proposed ban, but the measure did not get far. The Natural Resources Defense Council is also considering several options to spur FDA action. Karim Ahmed, a senior scientist with the group, says that it may, for example, petition the agency to declare that antibiotics in animal feed pose an "imminent hazard" to human health. If FDA should agree, then an immediate ban would be required.

Renewed efforts at FDA to enact a ban might run aground once again in the Appropriations Committee, which is chaired by Representative Jamie Whitten (D–Miss.). Whitten, the champion of the farm community, oversees the budgets of both FDA and the agriculture department. It was the appropriations committee, under Whitten's chairmanship, which thwarted FDA's proposal and each year since has written into the hearing record that FDA will not proceed with rule-making until the appropriate studies are completed.

The issue appears to be on the front burner again at FDA. The Seattle study represents the final report on Congress' wish list. Crawford is now deciding whether to deliver the report to Congress next spring as scheduled or present the findings now, given the publication of the Holmberg studies. Crawford himself brings an unusual background to his post. He was head of FDA's veterinary branch in 1977, became dean of the University of Georgia's School of Veterinary Medicine, and then returned to the same FDA post in 1982. During his time away from FDA, he chaired a seminar on antibiotic feed additives for the Natural Resources Defense Council, the same group that last year circulated the letter in support of a ban. When he returned to FDA, he was required by law to excuse himself from any discussions for a year. Crawford went beyond this and stayed out of discussions for 2 years "to avoid any appearance of a conflict of interest," he says. Crawford also says he has been a consultant for American Cyanamid. Now new FDA commissioner Frank Young has asked him to take charge of the issue.

Crawford says there might be a better chance to proceed now. Drug resistance fostered by antibiotics is better understood by the general public now, he says. Nevertheless, "we will have to handle this [issue] gingerly. We will have to have the courage of our convictions."

—MARJORIE SUN

Waiting for Sonic Booms

The Air Force and Navy plan to start low-altitude combat training at supersonic speeds over sparsely populated rural areas; local residents are opposed

A year and a half ago, Leland and Gertrude Van Allen drove 50 miles east from their home in Fallon, Nevada, to Dixie Valley, where the Navy had promised to demonstrate what sonic booms sound like. Dixie Valley is in an area of central Nevada which, if the Navy's plans go through, will be subjected to 20 to 100 booms a day from planes flying at low altitudes, often as low as 7000 feet over the residents' heads. The inhabitants of Fallon also expect to hear booms but not so many as their Dixie Valley neighbors.

Before they heard the booms, the Van Allens thought they would not be too bad, that it would be possible to live with them. Afterward they changed their minds.

An F-14 plane made two passes over the area where the Van Allens and other observers stood and they got the full impact of two sonic booms, one of which, a so-called focus boom, put a large crack in the town schoolhouse. Townspeople who were inside their homes saw the walls shake and Edwin Robbins, who lives in Dixie Valley, came home to find that the boom had broken new Sheetrock in his house. A miner said it was "the equivalent of a 50-pound block of gelatin [explosives]."

To the dismay of many citizens in the areas, the Air Force and Navy plan to train fighter pilots by allowing them to engage in low-altitude dogfights at supersonic speeds over sparsely populated sections of New Mexico, Texas, Utah, and Nevada. On 13 September, the Air Force announced that it will fly up to 600 supersonic sorties per month near Holloman Air Force base in New Mexico. The flights will begin in January. As a concession to the opponents, the Air Force has promised to monitor the booms, to restrict the pilots to fly supersonically only in 22 by 28 mile elliptical areas, and to reassess the program after 9 months. The Air Force and Navy plans for Nevada and eastern Utah are not yet finalized.

Defense Department officials contend that pilots need to gain proficiency in flying in combat situations and there simply is not enough airspace available over military ranges. "There are geographical limitations on where we could do these flights," says Gary Vest, deputy for environment and safety to the deputy assistant secretary of the Air Force. It is too expensive to send the

planes far away from their bases, refueling en route. It is expensive and disruptive to send pilots to coastal bases for flights over the ocean. And computerized flight simulators are not sufficient. "The state of the art simulation is not what it is cracked up to be," says Air Force Major T. E. Thurston, who oversees tactical air command bases. The simulators are too expensive, he says, and are not entirely realistic. Among other drawbacks, says Thurston, the simulators do not provide the pilots with the changing gravitational forces they experience in actual flight.

But the citizens who will be affected by the proposed supersonic operations do not accept these explanations. They have been protesting the flight plans for several years now, a fight that is seemingly endless. Even in New Mexico, where the Air Force feels it has reached a compromise, the citizens, led by Laurence Tackman, say they are only waiting now for the evidence to prove their case that the booms will be more numerous and extensive than the Air Force states. "The important thing is that the county and citizens have not given up their legal or political options," Tackman says.

The affected counties in Texas and New Mexico have retained lawyers and are prepared to sue the Air Force and the Environmental Protection Agency (EPA), which approved the military's environmental impact statement about the effects of the flights. In central Nevada a group of citizens, led by physician Richard Bargen, are acting as their own attorneys in suits against the EPA and the Navy.

The furor began a few years ago when the Air Force and then the Navy began announcing plans to maneuver over rural areas. In 1979, the Air Force proposed 600 supersonic sorties a month over Reserve, Texas, and Valentine, New Mexico, submitting a draft environmental impact statement and soliciting public comment. The comment was immediate and vociferous. The Air Force document, says Steven Rothman who lives near Reserve, was "full of internal inconsistencies and shabbily done." Rothman, a computer consultant who formerly worked for the Mitre Corporation as a systems analyst on Air Force contracts, was asked by Catron County, New Mexico, to comment on the Air Force documents on the county's behalf.

The Air Force agrees that the original draft environmental impact statement could be improved. "There was a great deal of reaction," says Vest. The EPA and the Air Force had a number of meetings, the substance of which, Vest says, was to determine how to evaluate and assess the impact of sonic booms. In 1983, the Air Force came back with a revised draft environmental impact statement.

But the revised statement "plays games with math and statistics," Rothman alleges, and it misuses references, quoting out of context and even citing references as saying just the opposite of what the authors intended.

For example, the Air Force attempts in its documents to determine how annoying the booms will be, concluding that about six out of 850 people in the Valentine, Texas, area will be "highly annoyed" by the booms and six out of 650 in the Reserve, New Mexico, area will be "highly annoyed." Since the booms will bother so few, concludes James Boatwright, who is deputy assistant secretary of the Air Force, the Air Force should go ahead. "This group represents a very small percentage of the population in each MOA [Military Operations Area], and I do not think their being highly annoyed represents a reason for not conducting supersonic flights," Boatwright says in a prepared statement.

As a concession, the Air Force has promised to monitor the booms.

The "highly annoyed" figures came from data from tests in Oklahoma City several years ago when the debate over the SST was going on. For 6 months, the Air Force flew planes supersonically over the city so the people heard one boom per hour for 8 hours a day. During this time, the population was surveyed to see whether it could tolerate this noise. Twenty-seven percent said they were highly annoyed by it. From that, and with the further assumptions that most of the populations nearby will hear far fewer than eight booms a day and that 60 percent of the population will never complain about a government activity no matter how much they dislike it, the Air Force derived its figure of six highly annoyed people in each area.

To many of the New Mexico, Texas, and Nevada citizens, these calculations seem absurd—"Kafkaesque," one Nevada citizen puts it. Even the idea of extrapolating from the Oklahoma test seems questionable, they say. For one, the Oklahoma population knew it was undergoing a test that would end in 6 months. In addition, they had been told repeatedly that the SST would be good for the area's economy, and they knew exactly when to expect the booms, thus eliminating some of the startle factor. Even so, the city and various organizations sued to have the test ended before the 6 months were up. Furthermore, the Oklahoma City booms were different from those anticipated in the Southwest. They were so-called carpet booms, which ensue when an aircraft flies straight and level, and the pressure waves were only a little more than 1 pound per square foot. The carpet booms over the Southwest will be 5 pounds per square foot because the planes will be flying faster. In addition, when a plane maneuvers in a dogfight, it produces "focus booms," in which the shock waves converge and are amplified. The resulting booms are at least two to four times more intense and the shock waves can converge on each other to produce "super focus" booms, which are at least nine times more intense. "The whole point of military maneuvers is to have two or more planes in a pretend battle. You get focus booms *all* the time," Rothman says.

Bargen submitted to the Air Force another example of alleged misuse of references. The Air Force states that a "test in 1968 in Tonapah, Nevada, showed sonic booms with overpressure ranging from 50 psf to 144 psf did not cause direct injuries to the exposed people." Bargen comments, "On reading the paper, one notes that the researchers' main conclusion was their surprise that, when the windshield was blown out of their station wagon, the glass fragments were propelled outward for a distance greater than 12 feet. It had been thought that sonic booms caused glass breakage with the fragments dropping neatly at the foot of the window. Additionally, the researchers noted that the windows of all the campers parked along the low-altitude routes were blown out. By the third day, there was considerable difficulty amongst the scientists taking readings due to the flinching and stress that occurred, beginning at the time when the aircraft first appeared, let alone when the sonic boom impacted."

The Air Force did not directly reply to Bargen's comments in its final environmental impact statement where all comments were supposedly answered.

The citizens of New Mexico and Texas also voiced concerns about reimbursement for sonic boom damage. They pointed out that when the Air Force conducted sonic boom tests in Oklahoma City and St. Louis, it received claims for

$30.6 million, of which it paid only $1.7 million. When this question was raised at a public hearing in 1979, an Air Force spokesman responded that the Air Force's structural engineers were not convinced that all of the alleged sonic boom damage was actually caused by sonic booms. "The claimant obviously thought and probably unintentionally, you know, thought the damage was sonic boom damage and the structural engineers disagreed," he remarked.

In the end, the EPA gave the Air Force's final environmental impact statement for New Mexico and Texas its highest rating, rejecting arguments that the statement was deceptive. An EPA spokesman says the agency looked at the statement to see whether the booms will affect peoples' hearing—and concluded they will not—and also to determine "how people feel about the noise." The second criterion, he remarks, "is very subjective." He notes that, "While we're not thrilled with the Air Force comments [on the criticisms of its initial environmental impact statement], we decided to accept them."

The Air Force submitted essentially the same draft environmental impact statement for its planned 3000-square-mile "supersonic operations area" in eastern Nevada and western Utah near the Gandy mountain range. The EPA approved this statement also, although, according to Bargen, "the same scientific errors and deception" occur in this statement.

In fact, Bargen points out, the Gandy range statement is mostly a copy of the Texas and New Mexico one. This copying of the other document led to the absurd statement that the residents living below the proposed supersonic area whose homes are below 5000 feet mean sea level will not be bothered by the booms. As Bargen notes, "no regions of habitation exist below the [supersonic area] that are under 5000 feet mean sea level." The Air Force has not yet submitted its final environmental impact statement for the Gandy range, and the residents of central Nevada are still waiting for the Navy's draft environmental impact statement on the proposed 5900-square-mile supersonic operations area there. But in the meantime, says Robbins of Dixie Valley, "We've been subjected to 175 to 180 booms in the past 2 years. The Navy planes fly overhead from 8:00 in the morning until 9:30 at night. We feel like we're in a combat zone and the Navy hasn't even started yet." (The booms are, presumably, accidental.)

Although the Air Force and Navy are required by law to submit environmental impact statements before beginning any supersonic operations over populated areas, they are not required to get high ratings for their statements from the EPA. The ultimate decision on whether to go ahead with their plans is the military's alone. The role of the EPA, says Air Force general council Douglas Heady, "is to comment on the technical adequacy of the environmental impact statement. EPA does not have a veto or approval role."

As the Air Force prepares to begin its supersonic flights in New Mexico and Texas, it believes it has reached the best possible agreement with the citizens of those areas. According to Vest, the Air Force arrangement means that "the process [of citizen comments] works. The Air Force takes it seriously." But the citizens are not so sanguine. They see the agreement as a means to gather ammunition in what they foresee as a long fight to get the military to stop supersonic flights over populated areas. The claims by the Air Force that the booms will not be unbearable, says Tackman, are "a fairy tale." The key, he says, is to "get good monitoring and verification [of the booms]." Then, he emphasizes, "we will have proof."

—GINA KOLATA

World Bank Puts Priority on Africa Program

Problems of how to inject science and technology into development projects are acute in Sub-Sahara

The mood at the annual meeting of the World Bank late last month in Washington was one of relative optimism as the crisis conjured up by the Third World debt burden recedes. The debt scare, however, has substantially influenced the policies and organization of the World Bank and of other agencies involved in development assistance. One result is that the bank's effort to infuse science and technology into development projects has lost some visibility.

The recent merging of a separate science and technology unit into a reorganized office of environment and scientific affairs, for example, has prompted speculation among outsiders that science and technology is being downgraded. But the bank's current arrangements for injecting science and technology into its projects are less an issue than is the question of how the function will be performed in the longer term. The bank is now undergoing the most ambitious self study in its history with a view to laying out changes in its operations for the rest of the decade and beyond.

Trends in bank thinking are defined most clearly in a new action program for Sub-Sahara Africa,* the only major region in which per capita income and per capita food production fell in the past decade. The bank's prescription calls not only for increased capital flow—it urges a boost of some $2 billion to the $9 billion a year being allocated to the area—but for significant policy changes by both African countries and donor organizations. First and foremost, African governments will be expected to undertake policy reforms designed to provide a firmer foundation for economic growth, particularly to encourage the growth of agricultural production, where most African countries have lagged badly. The bank, for its part, will be concentrating harder on making current projects productive, and be more amenable to providing loans to help governments carry out reforms that may be financially difficult and politically unpopular.

Some critics see the bank's new policies as entailing a shift in focus to short- and medium-term goals that will divert attention from efforts to deal with problems of the environment, education, population, and science and technology that are regarded as essential to long-term development strategy.

The bank's record in incorporating new technology into its projects is mixed. The bank is the largest multilateral source of funds for development and in

*The proposal is contained in a World Bank report, "Towards Sustained Development in Sub-Saharan Africa" (1984).