

Jamming of VOA Soviet- and Baltic-language broadcasts ended in May 1987. However, VOA continues to be jammed in Polish, Dari, and Pashto. There also remains considerable jamming of other international stations in a number of languages. This booklet is distributed as a useful technical and historical discussion of deliberate interference of international broadcasting.

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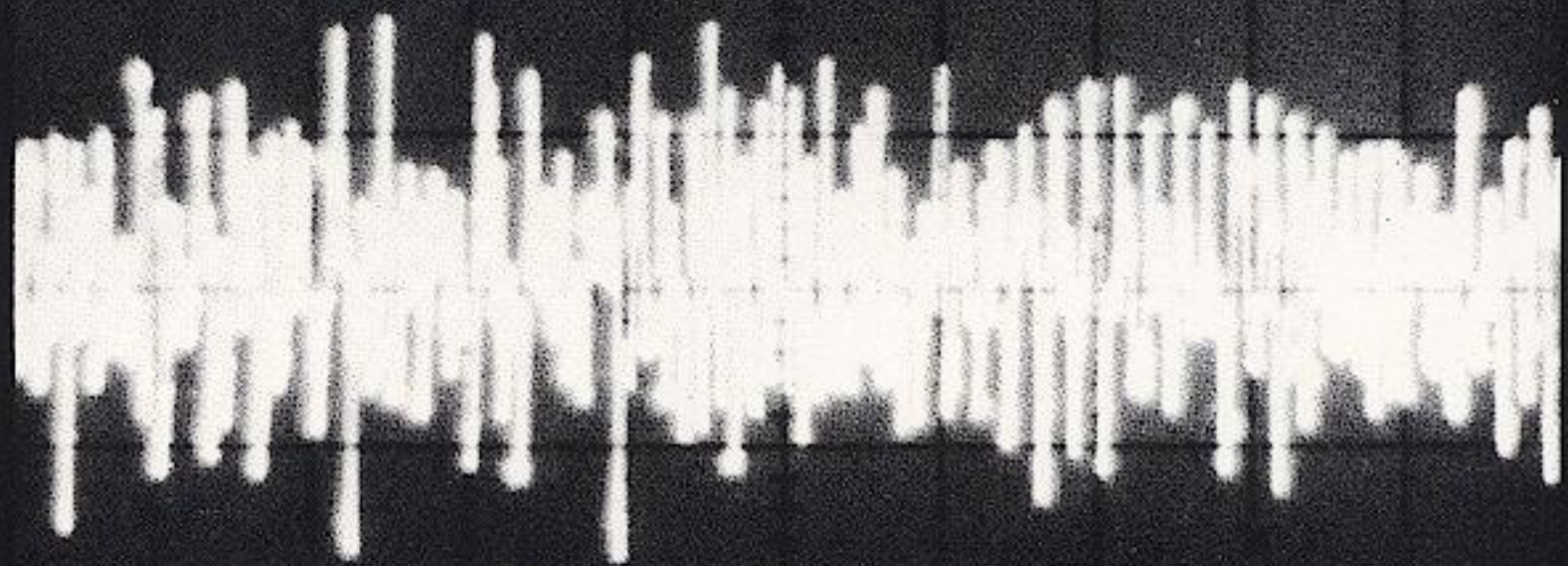
Interference

Soviet Jamming of International Radio Broadcasts





Oscilloscopes show a clear broadcast signal (above), jamming (below).



Interference

***Soviet Jamming
of International Radio
Broadcasts***

THE ISSUE

The question came from somewhere in Africa: a physician had just heard of a new drug on a Voice of America (VOA) radio broadcast. He immediately called the VOA to find out where to get the drug for a dying patient. Because of the international free flow of information, the medicine was flown to Africa, and a life was saved.

More than 150 countries now broadcast on shortwave radio. Countries assign frequencies to broadcasting stations in accordance with allocations drawn up under the auspices of the International Telecommunication Union (ITU). The ITU, a specialized agency of the United Nations, is responsible for regulating all forms of international telecommunications.

Given the limited spectrum available for shortwave broadcasting, experts agree that the demand for international broadcast frequencies would be hard to manage in any circumstances; but the situation is rendered far more difficult because of jamming by the Soviet Union and certain East bloc nations.

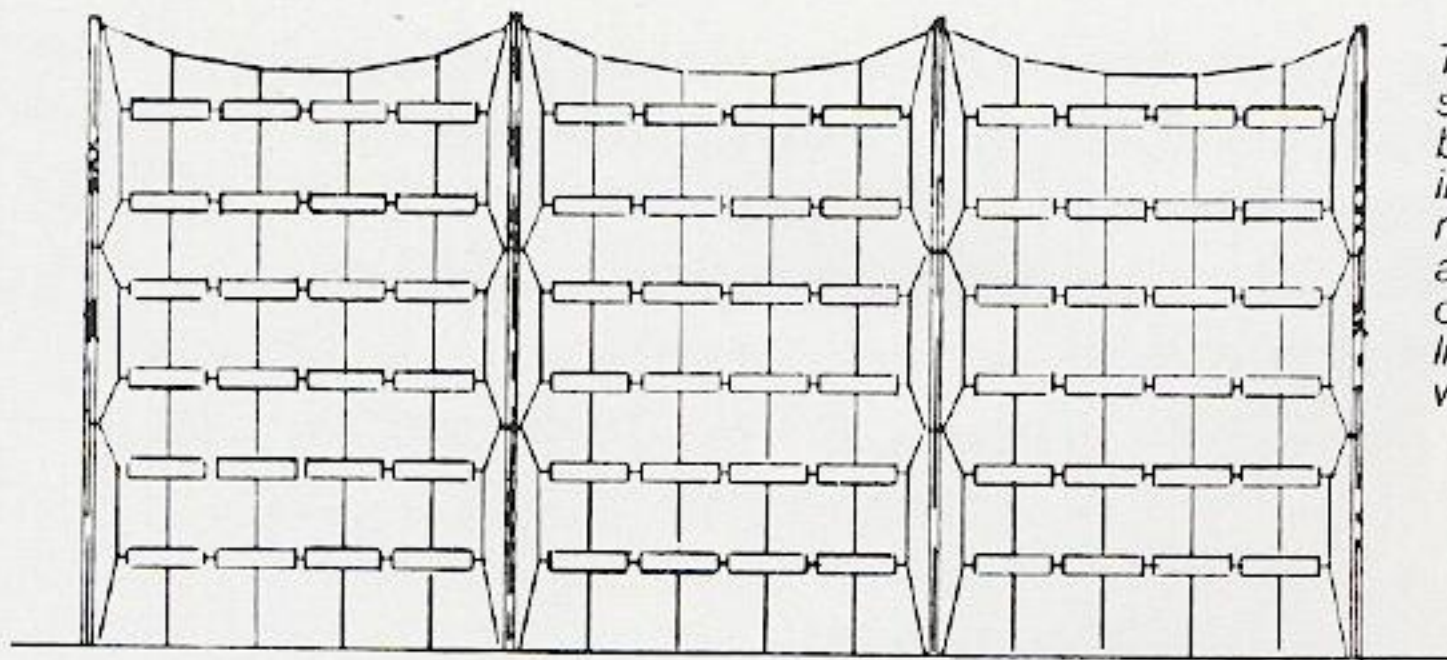
Jamming is deliberate, harmful interference with a radio transmission. Since 1948, the Soviet Union has been jamming Western broadcasts, starting with the Voice of America and spreading to Radio Free Europe/Radio Liberty (RFE/RL)*, the British Broadcasting

Company (BBC), the Federal Republic of Germany's Deutsche Welle and Kol Israel.

Soviet jamming is comprehensive. Many Western broadcasts in Russian and minority languages of the Soviet Union are jammed, as are broadcasts in most languages native to Eastern Europe. Broadcasts in Hebrew and Yiddish are jammed and, in recent years, broadcasts in the languages of Afghanistan. However, broadcasts in English and other languages not native to the Soviet Union or Eastern Europe are left alone.

Jamming is expensive. With an operating cost estimated at 500 million U.S. dollars a year or more, the Soviet government em-

* Radio Free Europe/Radio Liberty is a merged nonprofit radio broadcast corporation, funded by U.S. government grants, which mainly reports on events and trends in Eastern Europe and the Soviet Union. Radio Free Europe broadcasts to Poland, Romania, Czechoslovakia, Hungary, Bulgaria and the Baltic states, while Radio Liberty broadcasts to the Soviet Union. Their operations are overseen by an independent Board of International Broadcasting.



This model represents a highly sophisticated antenna which is being built by VOA for tests and evaluation in connection with its worldwide modernization effort. This type of antenna could improve the strength of VOA broadcast signals to all listeners, particularly those in areas where jamming is present.

employs about 15,000 technicians at perhaps 2,000 jamming stations to prevent its citizens from hearing Western broadcasts.

Moreover, jamming undertaken by the Soviet Union and its East bloc allies is costly to citizens of other nations. The interference cannot be confined to national borders and often disrupts international and domestic broadcasts in Western Europe, North Africa, South Asia and the Middle East, which are not the target of jamming transmitters.

In September 1986, the ITU's International Frequency Registration Board (IFRB)—which at the time had a Soviet chairman—took the unprecedented action of acknowledging that jamming transmitters located in the Soviet Union, Poland and Czechoslovakia were causing "harmful in-

terference" to U.S. broadcasts on 37 short-wave frequencies. The IFRB also prepared a report, for consideration at an international radio conference (WARC-HFBC) held in Geneva in March 1987, which clearly indicated the primary source of "harmful interference" (jamming) to be the Soviet Union and its allies.

In addition, an institute of the U.S. Department of Commerce has analyzed monitoring reports undertaken for the IFRB by the United States and 11 cooperating governments and found that Western broadcasts are jammed by "skywave" transmitters at more than 90 locations within the Soviet Union, Poland, Czechoslovakia and Bulgaria.

Jamming is contrary to international law

as well as to agreements signed by the Soviet Union. It violates the United Nations' Universal Declaration of Human Rights, the 1975 Helsinki Final Act, the International Telecommunication Convention and the ITU Radio Regulations. But despite condemnations of jamming by the United Nations and protests by many countries, the Soviets and their allies have persisted in this activity, denying their citizens a basic human right and preventing a better understanding of other peoples of the world. □

THE COSTS

Jamming is a costly operation, both in economic terms and in terms of the constraints it places on the free flow of information to individuals within and without the Soviet bloc. The right to seek, receive and impart information, through any media and regardless of national frontiers, is a basic human right guaranteed to all peoples in the 1948 U.N. Universal Declaration of Human Rights. But the Soviet and East bloc governments seem willing to bear these extraordinary costs in order to restrict their peoples' access to information from abroad.

Jamming represents a significant expenditure for the Soviet economy. The amount of money the Soviet government spends on jamming is not known, but for many years Western experts estimated the power costs at 100 to 300 million dollars per year. In late 1985, a senior engineer at the BBC estimated the jamming cost to the Soviet economy each year at no less than 750 million dollars and perhaps as high as 1,200 million dollars. Voice of America engineers have recently estimated the annual operating costs of the Soviet skywave jamming network to be around 500 million dollars per year. This figure includes estimates of power costs and other expenses incurred in day-to-day operations. It is based on an estimated seven million dollar annual operating cost for each of 70

Soviet skywave jamming facilities. But it does not include the initial cost of setting up each skywave installation. Nor does it include the cost of building and maintaining the extensive groundwave jamming network. (An explanation of "skywave" and "groundwave" jamming appears on pages 7-9.)

Some experts have speculated that jamming facilities inside the Soviet Union represent a total fixed investment of 250 million dollars. Others have estimated that some 5,000 to 15,000 technicians are employed to operate Soviet jamming transmitters.

Specialists at the Department of Commerce's Institute for Telecommunication Sciences point out that, if the United States were to maintain a system comparable to the Soviet jamming network, the cost might

well exceed 1,000 million dollars—well more than twice the combined annual cost of producing and transmitting the VOA, Radio Free Europe/Radio Liberty, the BBC and Deutsche Welle broadcasts to the East bloc countries.

In large part, the effectiveness of Soviet jamming depends on when and where someone is listening. There are times, during the twilight hours, when changes in the atmosphere almost totally incapacitate Soviet skywave jammers. And there are locations, mainly in rural areas, which are targeted by skywave but not groundwave (local) jammers, where jamming is more of a nuisance than a constraint. But at other times and in other areas, particularly large heavily populated ones, it can be extremely difficult if not impossible to receive Western broadcasts. When jamming succeeds, it denies Soviet citizens a basic human right to a free flow of information regardless of frontiers.

A 1986 Radio Free Europe/Radio Liberty study, based on interviews with recent emi-

grants from the Soviet Union, found that Soviet audiences have had more trouble hearing jammed broadcasts of the Voice of America, the BBC, Radio Free Europe/Radio Liberty, Deutsche Welle and Kol Israel, than the unjammed broadcasts of Radio Canada International and Radio Sweden. More than 50 percent of listeners to the unjammed broadcasts described reception as either "good" or "good-fair," while reception of the VOA and Radio Free Europe/Radio Liberty was described that way by only eight and two percent of listeners respectively.

The study also found that jamming deters many people who would otherwise listen to Western broadcasts. In the emigrant survey, researchers found that, of radio listeners who said they did *not* listen to Western radio broadcasts, about half gave jamming as their reason for not listening. On the other hand, those who continued listening to Western broadcasts in spite of jamming said that they were obliged to take measures to improve the reception; most said

they fiddled with their shortwave sets, adjusting the frequencies to try to make programs more audible.

Letters to the VOA confirm that jamming affects listening patterns. A letter received in October 1985 from Tallin, Estonia, said: "You have many listeners, especially in the country where the signal is better than in the cities. Also many people listen to your morning broadcasts...the reception in the morning is better than in the evening." Likewise, a letter received in October 1986 explained: "Although I am Estonian I still prefer to listen to your English language programs, not only because your Estonian and Russian language programs are jammed but also because I want to improve my English." □

SPILLOVER

The atmosphere cannot distinguish between regular broadcast signals and jamming signals. Both are reflected over great distances and neither stops at national boundaries.

For this reason, Soviet jamming causes interference to broadcasts not intentionally targeted by jammers, and to radio reception in countries outside the Eastern bloc. For example, a jamming signal intended to block reception of a Western broadcast in Kiev can cause interference to a local broadcasting station in South America if it broadcasts on the same frequency.

In addition, jamming of a broadcast on one frequency often causes interference to broadcasts on adjacent frequencies. Thus, a jamming signal intended to block reception of a Western broadcast in Odessa can cause interference to a local broadcasting station in Africa that uses an adjacent frequency; jamming intended to be heard in the Soviet Far East can also cause interference to broadcasts on adjacent frequencies throughout Asia.

Even without jamming, growing worldwide broadcasting requirements would cause severe congestion in the shortwave bands. But jamming has made effective in-

ternational management of broadcasting requirements more difficult. No broadcaster wants to be assigned the same frequency as, or a frequency adjacent to, one targeted by Soviet jamming. Thus, jamming is a waste of an extremely valuable resource.

More than a hundred countries participated in the two sessions of the World Administrative Radio Conference on the Planning of the HF (high frequency) Bands Allocated to the Broadcasting Service, held in 1984 and 1987 under the auspices of the ITU. As a result of the 1984 session, the ITU's International Frequency Registration Board (IFRB), asked member countries to monitor shortwave broadcasts and log instances of harmful interference to radio signals during four three-week monitoring periods. The data yielded a huge body of evidence on deliberate jamming.

The Institute for Telecommunication Sciences (ITS) of the U.S. Department of Commerce used jamming observations made at various locations around the world

GROWTH OF BROADCASTING

TRANSMITTERS WORLDWIDE

February 1986

Source: Annual report of
the Voice of America, 1987

	1976	1978	1980	1982	1984	1986
EUROPE	443	418	428	445	460	458
MIDDLE EAST	82	90	96	97	117	129
AFRICA	219	203	211	213	216	220
OCEANIA	31	36	42	42	52	56
ASIA	362	445	464	466	491	483
NORTH & SOUTH AMERICA	345	287	283	285	295	320
TOTALS	1,482	1,479	1,524	1,548	1,631	1,666

during the last IFRB monitoring period (mid-1986) to document the harmful effects of jamming on broadcasts that were not the primary target of jamming.

Cooperating nations—the United States, Canada, the Federal Republic of Germany, Italy, The Netherlands, Norway and South Korea (and several broadcasting organizations)—participated in an ITS survey designed to assess the effects of jamming on broadcasts situated on identical or adjacent frequencies to known jammed frequencies. These broadcasts were termed “third-party” broadcasts because of the potential for indirect interference from jamming.

ITS found jamming to have wide ranging effects on third-party broadcasts, particularly in Europe. Among the evidence:

- Information collected at the monitoring station in Vienna, Austria, showed a very high level of interference from jamming to third-party broadcasts. At that location, 90 percent of third-party broadcasts from Italy were subject to interference from jamming. Likewise nearly 63 percent of the monitored Radio Vatican programs were subject to interference from jamming.
- Observations from monitoring stations in the Federal Republic of Germany and The Netherlands revealed that the primary

source of interference in Europe was from jamming.

- Interference to third-party broadcasts from jamming is not as great in other parts of the world as it is in Europe, but monitoring reports from North Africa, Pakistan and Hong Kong show that jamming interference is still present.

According to ITS staff members involved in the analysis of jamming, “It is readily apparent that no telecommunication service—the high frequency broadcast service in particular—can be efficiently organized and utilized in the presence of such disruptive behavior.” □

Technical Aspects of Soviet Jamming

Jamming is a deliberate effort to prevent a potential radio audience from hearing certain broadcasts. This is accomplished by broadcasting intentionally irritating noise or another signal on or near the same frequency as the broadcast to be blocked out.

The Soviet government has used several kinds of transmissions to interfere with incoming broadcasts. Initially, the Soviets transmitted mechanically produced noise using such sounds as chirps, squeals, gull cries and other exotic tones. Later, the Soviets overlaid incoming radio signals with distorted radio programs, which may or may not have been intended for domestic audiences. Currently, the Soviets favor the use of noise similar to "white noise" for blocking incoming broadcasts. "White noise" is produced electronically and covers a wider range of the audio spectrum than mechanically produced noise.

The Soviet Union uses two methods for blocking Western radio broadcasts. The first, called local or groundwave jamming, is produced by transmitters set up in the audience area targeted by Western broadcasters. Groundwave jamming is very effective and relatively inexpensive—the transmitters use about 10 to 20 kilowatts of electrical power an hour. But

interference produced by groundwave stations is usually limited in range to about nine to 12 kilometers.

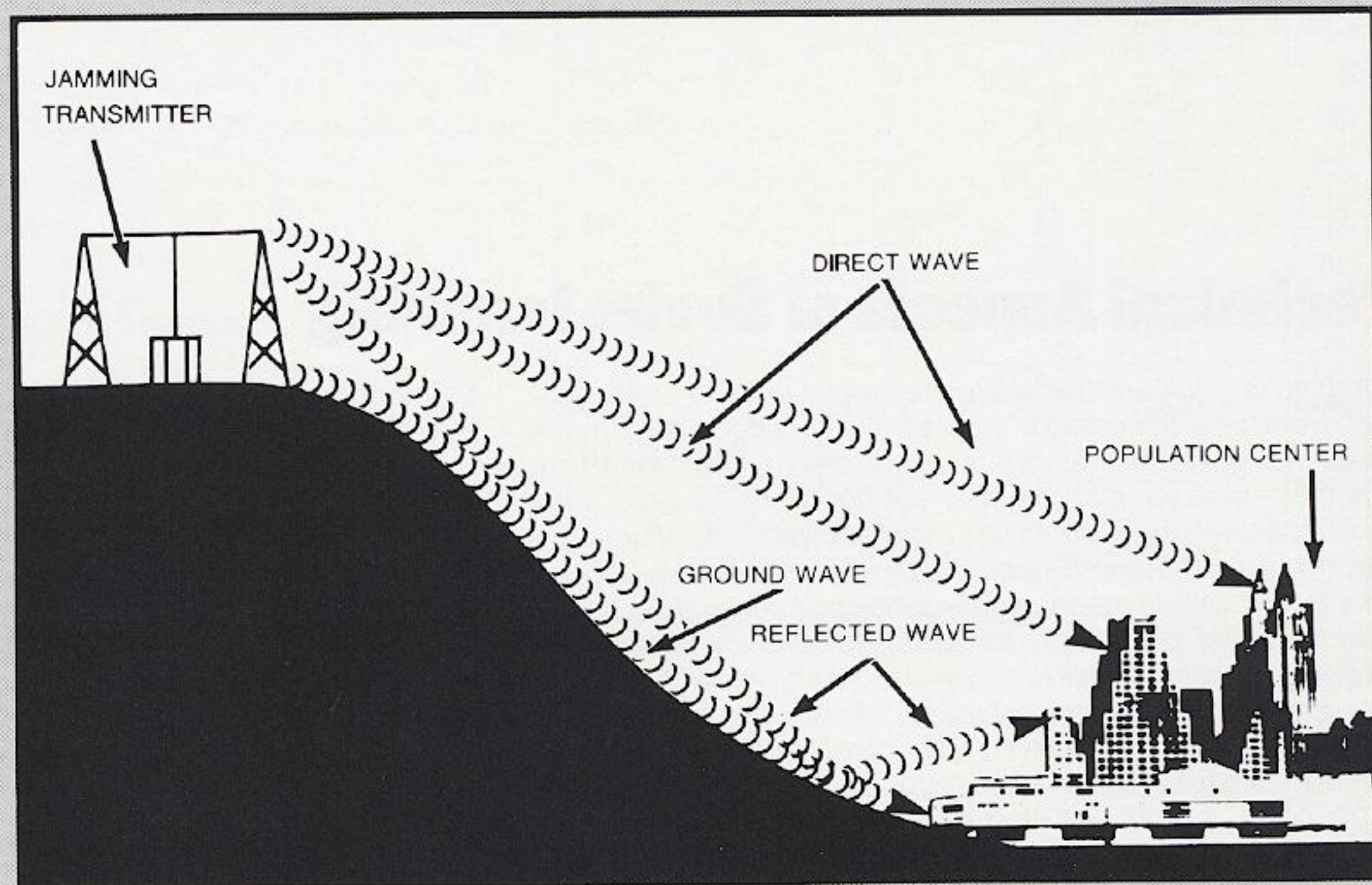
Virtually every Soviet city with a population in excess of 500,000, and many cities with populations as low as 200,000, have groundwave jamming transmitters. In fact, recent reports suggest that groundwave jamming installations have been appearing in cities with as few as 100,000 inhabitants.

The second method, called "skywave jamming," uses transmitters to bounce signals off the ionosphere at an angle calculated to return to earth in the audience area targeted by Western broadcasters. The ionosphere is the layer of the atmosphere about 260 to 375 kilometers above the earth which is composed of electrically charged particles.

Skywave jamming has the advantage of being able to cover large areas. Experts say that a cluster of transmitters located near Leningrad can place a uniform blanket of interference over most of the southern half of European Russia and beyond. Skywave jamming is flexible, since it can be directed at different geographic areas at different times. It is expensive, however: Each skywave jamming transmitter is estimated to use

GROUNDWAVE (LOCAL) JAMMING

CONSISTS PRIMARILY OF A DIRECT
WAVE AND A REFLECTED WAVE.



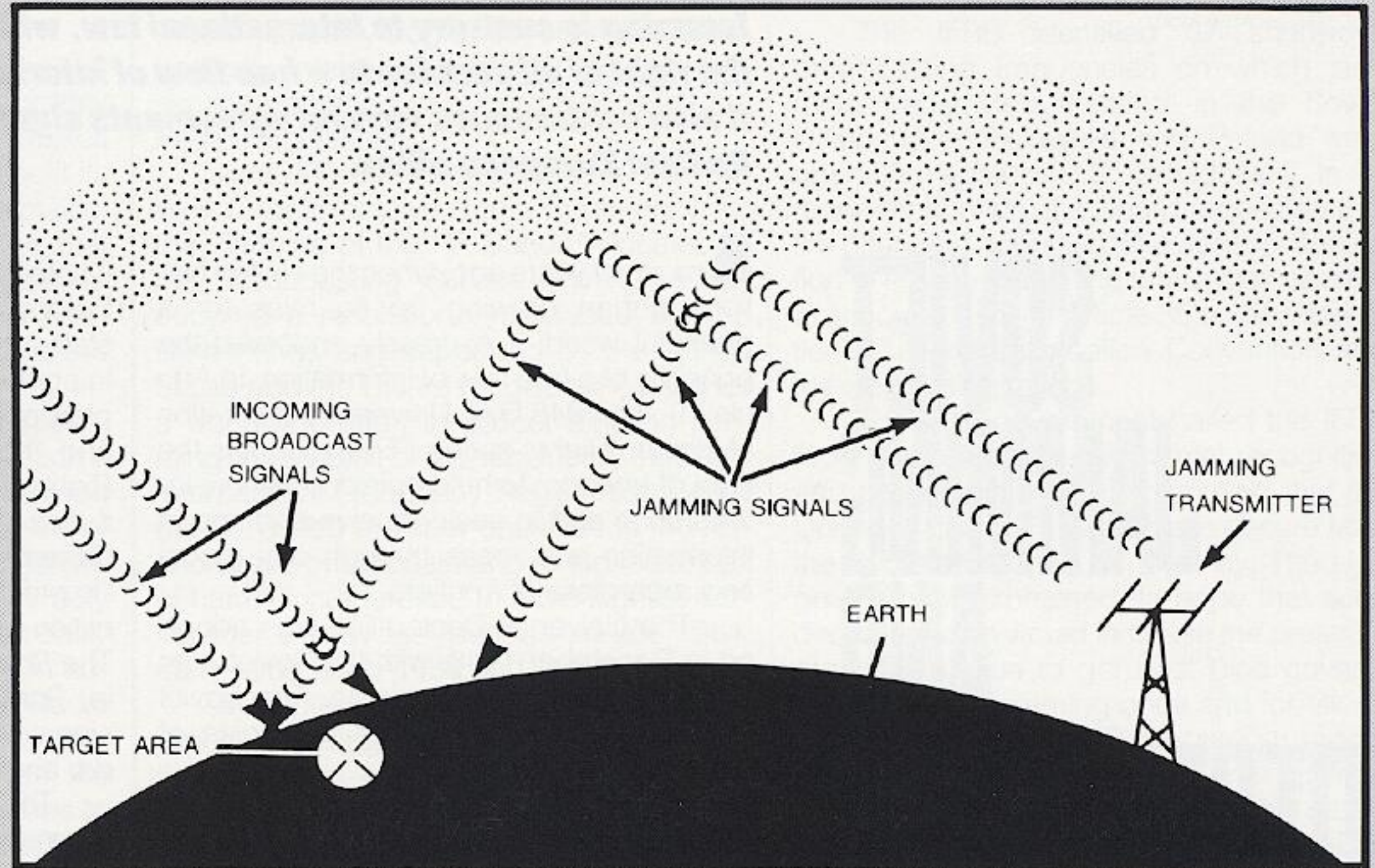
between 100 and 250 kilowatts of electrical power. And they can never be aimed with total accuracy. To ensure effectiveness, four or five jamming transmitters are often aimed at an area served by only a single Western broadcasting transmitter.

Occasionally, Western broadcasters can take advantage of

"twilight immunity," a condition that exists during the early evening hours which renders skywave jammers relatively ineffective. Because the sun goes down earlier in the East than in the West, the ionosphere begins to lose its electric charge and reflecting quality earlier in the Soviet Union than in the West. Soviet

SKYWAVE JAMMING

USES THE IONOSPHERE TO PROPAGATE JAMMING SIGNALS OVER GREAT DISTANCES.



skywave jammers can no longer bounce their signals off the ionosphere while broadcasters in the West are still able to do so.

Reports suggest that more than 250 powerful skywave jamming transmitters are located in clusters throughout the Soviet Union, working in tandem with some 3,000 groundwave trans-

mitters. The effectiveness of the Soviet jamming network ranges from minor annoyance to total blockage, depending on the location, number and power of transmitters assigned to jam a particular broadcast, the time of day of the broadcast and the strength of the Western broadcasting signal.

□

Jamming is contrary to international law, which has long recognized the right of all peoples to a free flow of information. It also contravenes several agreements signed by the Soviet Union and its East European allies.

Almost 40 years ago, when the United Nations began drawing up its rules for a peaceful world, it expressly endorsed the principle of a free flow of information. In Article 19, the 1948 U.N. Universal Declaration of Human Rights states: "Everyone has the right of freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers."

The Universal Declaration was adopted in December 1948, with the Soviet bloc nations abstaining in the vote. The Soviet Union had started jamming the Voice of America 10 months earlier.

In 1950, the U.N. General Assembly took a more direct stand in opposition to jamming, condemning all interference with foreign broadcasts as a violation of the principle of freedom of information.

The right to a free flow of information also was recognized in 1975 in Helsinki, Finland by the signatories of the Final Act of the

Conference on Security and Cooperation in Europe (CSCE). The Helsinki Final Act states that participating countries shall act in conformity with the purposes and principles of the Charter of the United Nations and the Universal Declaration of Human Rights. The signatories also agreed to "make it their aim to facilitate the freer and wider dissemination of information of all kinds" and "to promote the improvement of the dissemination of filmed and broadcast information." The Soviet Union, Czechoslovakia, Bulgaria, Romania, Hungary and Poland are all signatories, as is the United States, Canada, and 27 other European countries.

The United States and other Western nations have protested directly and indirectly to the Soviet government about jamming for nearly 40 years. The United States first approached the Soviet Union with a low-key indirect protest in 1948. It was ignored. In April 1949, the U.S. addressed a written protest on Soviet jamming to the International Telecom-

SOVIET JAMMING AND INTERNATIONAL LAW

munication Union (ITU), without result.

The ITU, which currently has over 160 members, works to achieve the orderly sharing of radio frequencies and makes studies and recommendations to benefit its members. The United States maintains, along with the great majority of nations, that intentional interference to radio transmissions is a violation of the International Telecommunication Convention. Article 35 of the Convention (Nairobi, 1982) states:

"All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Members or of other recognized private operating agencies or of other duly authorized operating agencies which carry on radio service, and which operate in accordance with the provisions of the Radio Regulations...."

"Further, the Members recognize the desirability of taking all practicable steps to prevent the operation of electrical apparatus and installations of all kinds from causing harmful interference to the radio services or communications mentioned (above)."

The definition of harmful interference in the 1982 Convention and in the 1979 ITU Radio Regulations includes interference

which "seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with" the Radio Regulations.

In 1984, the first session of the ITU World Administrative Radio Conference for the Planning of the HF Bands Allocated to the Broadcasting Service (WARC-HFBC) adopted a resolution—introduced by The Netherlands and supported by the United States and the United Kingdom—calling for a worldwide effort to collect data on jamming. As a result of this resolution, the ITU's International Frequency Registration Board (IFRB), asked member countries to monitor shortwave broadcasts and to log instances of harmful interference to radio signals during four 21-day test periods: In late 1984, early 1985, early 1986 and mid-1986.

In September 1986, the IFRB issued a report—drawing from the monitoring mentioned above—acknowledging that "emissions" from the Soviet Union, Czechoslovakia and Poland do not conform with the Radio Regulations or Article 35 of the International Telecommunication Convention. This report, made in response to U.S. complaints lodged in 1985, confirmed that the Soviet Union, Czechoslovakia and Poland were causing harmful interference to U.S. broadcasts.

The IFRB identified 37 shortwave broadcasting frequencies on which jamming transmitters located in the Soviet Union, Czechoslovakia and Poland were operating against U.S. broadcasts. In its recommendation, the Board requested that the offending countries take appropriate action to ensure that in the future they operate in accordance with Article 35 of the International Telecommunication Convention and the Radio Regulations.

The U.S. government hailed the IFRB report, which is the first formal recognition and notification of Soviet jamming that the United States has been able to secure from the Secretariat of a U.N. agency. The U.S. government expressed its hope that such documentation would increase the pressure of world opinion to get East bloc governments to stop jamming once and for all.

Moreover, the IFRB prepared a report, Document 9, consolidating its findings from all of the monitoring periods, for consideration at the second session of the WARC-HFBC, which was held in Geneva in early 1987. This report clearly documented the primary source of harmful interference to be the Soviet Union and its allies.

The IFRB report was based on over 97,000 monitoring observations made by 28

countries at 70 monitoring stations during one or more of the four monitoring periods. Of these, over 59,000 observations were usable and some 1,300 transmissions caused by "harmful interference" were identified. In the report, the IFRB noted that a "very limited number of isolated (monitoring) reports appear to be inaccurate," but the IFRB emphasized that a small number of errors "should not be allowed to detract from the overwhelming majority of confirmed results determined with a high degree of accuracy." The overwhelming majority of the stations causing harmful interference, some 80 to 90 percent, were found to be located in the Soviet Union and Eastern Europe.

The U.S. Commerce Department's Institute for Telecommunication Sciences (ITS) also has used countries' monitoring observations to identify specific jamming transmitters. ITS has analyzed data based on more than 95,000 jamming observations made by the United States and 11 cooperating nations—Australia, Brazil, Canada, West Germany, Israel, Italy, Japan, The Netherlands, Norway, South Korea and Great Britain—during one or more of the four coordinated monitoring periods. In collating and analyzing the data, ITS applied strict standards, confirming the location of

jamming transmitters only when they had been heard at least 10 times.

Data collected by ITS revealed that broadcasts of the VOA, RFE/RL, BBC, Deutsche Welle and Kol Israel were jammed by transmitters associated with more than 200 distinct skywave jamming identifiers regularly in use at more than 90 locations within the Soviet Union, Poland, Czechoslovakia, and Bulgaria. At any given time, anywhere from one to 12 skywave jammers may be called in by a sophisticated command/control network to block a specific program on a particular frequency.

In its third report on observations made during the four coordinated monitoring periods, ITS stressed that it found the vast majority of sources of harmful interference to be located within the Soviet Union. Of the 99 emitters located during the June 1986 monitoring period, 81 were in the Soviet Union alone. Six were located in Bulgaria, seven in Czechoslovakia and three in Poland. Of the 66 emitters located during the January 1986 monitoring period, 56 were located within the Soviet Union while the remaining 10 were located in East European countries. For the October 1984 monitoring period, 68 emitters were identified, of which 44 were located in the Soviet Union and 24 in the

East bloc countries. For the March/April 1984 monitoring period, 55 of the 69 emitters located were within the Soviet Union and the remaining 14 were located in East bloc countries.

ITS also found that Soviet bloc countries appear to coordinate their jamming efforts and that jamming is often aimed at interfering with reception in countries other than where the jammers are located. □

JAMMED AND UNJAMMED SERVICES TO THE USSR, EASTERN EUROPE, AFGHANISTAN AND IRAN

(February 10, 1987)

■ BROADCAST JAMMED
● UNJAMMED BROADCAST

Major Western International Shortwave Broadcasters	Language	ALBANIAN	ARMENIAN	AZERBAIJANI	BELORUSSIAN	BULGARIAN	CZECH	CZECH-SLOVAK	DARI	ENGLISH	ESTONIAN	FARSI	GEORGIAN	GERMAN	HEBREW	HUNGARIAN	LATVIAN	LITHUANIAN	PASHTO	POLISH	ROMANIAN	RUSSIAN	SERBO-CROAT	SLOVAK	SLOVENE	TARTAR-BASHKIR	TURKISTANI	UKRAINIAN	UZBEK	YIDDISH
Argentina (SOR)									●				●																	
Austria (ORF)									●				●																	
Belgium (BRT)									●																					
China*	●			■	●								●		●				●	●	●	●	●							
Canada (RCI)							●		●				●		●				●		●							●		
Ecuador (HCJB)							●		●				●							●	●									
Egypt									●				●						●											
France (RFI)									●				●							●										
West Germany (DW)				■	■	■							●		●				■	●	●	■	●		●					
Greece (ERT)	●			■					●				●							●	●	●								
Guam ((KTWR)																						●								
India (AIR)								●	●		●								●			●								
Israel (IBA)									●			■		■	●						●	■								■
Italy (RAI)	●			■	●								●		●					●	●	●	●	●			●			
Japan (NHK)									●				●									●								
Korea (RK)									●				●									■								
Monaco (TWR)	●	●		●	●				●	●			●		●	●	●			●	●	●	●	●				●		
Netherlands									●																					
Portugal (RDP)									●				●																	
So. Africa (RSA)									●				●																	
Sweden (RSI)									●				●										●							
Switzerland (SRI)									●				●																	
Turkey	●	●		●					●	●			●		●						●	●		●						
UK (BBC)**				●	●				●				●		●						■	●	●	●	●					
USA (RFE/RL)		■	■	■	■		■	■		■		■				●	■	■		■	■	■				■	■	■		
USA (VOA)	●	■	■	●		●	■	●	■	●	■				●	■	■	■	■	■	■	■	●	●			■	■		
Vatican	●	●		●	■	●			●				●		●					●	●	●	●	●			●			

* Soviet jamming of China's Russian language broadcasts stopped October 1986.

** Soviet jamming of the BBC's Russian language broadcasts stopped January 1987.

Source: VOA Engineering, February 1987.

CHRONOLOGY OF SOVIET JAMMING

The chronology of Soviet and East European jamming shows that it has varied in accordance with major changes in East-West relations, tending to increase during periods marked by internal and external tension. Although the Soviet government has drastically reduced the level of jamming at times, the technical apparatus has always remained in place, to be brought back into service on short notice.

- In February 1948, at the time of the Berlin Blockade and the beginning of the Cold War, the Soviet Union began jamming Russian language broadcasts of the Voice of America. In 1950, most of the East bloc countries joined in the jamming effort and, by the end of 1951, virtually all local-language broadcasts beamed to Eastern Europe from the West were jammed.
- In 1956, the first easing occurred, when Poland stopped jamming. This break in jamming may have been spurred by the 1956 Poznan riots during which rebellious workers attacked, among other facilities, local jamming stations. Intermittent jamming returned to the Polish airwaves around 1959, but it is unclear whether it emanated from within or outside Poland's borders.
- The first real break in jamming occurred in September 1959, during Soviet Premier

Nikita Khrushchev's visit to the United States. Informal bilateral discussions led to the end of most jamming against the VOA and BBC, except for selected news items and commentaries. However, selective jamming resumed after Khrushchev's return to the Soviet Union.

- In June 1963, following President Kennedy's famous American University speech calling for U.S.-Soviet negotiations to end the Cold War, the Soviets stopped jamming the VOA completely for the first time in 15 years. Soviet jamming of most other Western broadcasters also stopped. But jamming of Radio Liberty continued.

- In July 1963, Romania ceased all jamming, followed by Hungary in February 1964. In April 1964, Czechoslovakia also discontinued its jamming of the VOA and the BBC, but not of Radio Free Europe.

- Massive Soviet jamming of the VOA, BBC and Deutsche Welle resumed in August 1968, coincident with the Soviet invasion of Czechoslovakia. Broadcasts in Czech and in several languages spoken in the Soviet Union were affected.
- In 1970, following serious worker riots on Poland's Baltic coast, Poland resumed jamming of Radio Free Europe.
- In September 1973, on the eve of the initial meetings in Helsinki of the Conference on Security and Cooperation in Europe (CSCE), jamming of VOA, BBC and Deutsche Welle broadcasts in Russian and minority languages of the Soviet Union ended. Jamming of Radio Liberty continued.
- Following the Egyptian-Israeli War of 1973, the Soviets intensified jamming of Soviet-language broadcasts from Kol Israel as well as broadcasts in Hebrew and Yiddish.

Jamming of these language broadcasts continues unabated.

- By 1978, almost all Soviet and East European jamming had ceased except for that directed against Radio Free Europe/Radio Liberty.
- In August 1980, following Polish government concessions to the Solidarity movement, the Soviet government resumed massive jamming of VOA, BBC and Deutsche Welle broadcasts to the Soviet Union.
- In December 1981, jamming of VOA, BBC, Radio Free Europe and other Western Polish-language broadcasts resumed, presumably by jamming transmitters in the Soviet Union, East Germany and Czechoslovakia. Bulgaria joined in the jamming about 10 months later. Jamming of Polish-language broadcasts intensified in 1982 following the imposition of martial law and the

banning of Solidarity.

- In 1982, jamming was initiated against Western broadcasts to Afghanistan.
- In October 1986, jamming of Chinese government broadcasts in Russian ceased.
- In January 1987, jamming of BBC broadcasts in Russian ceased. □

MAJOR INTERNATIONAL BROADCASTERS, 1986

(MORE THAN 300 HOURS WEEKLY)

Source: Annual report of the Voice of America, 1987

Broadcaster	Languages	Hours Weekly
UNITED STATES (VOA, RFE, RL)	48	2368:34
USSR (all external services)	82	2259:17
CHINA (all external services)	43	1411:05
TAIWAN	17	1098:25
WEST GERMANY (DW & DLF)	37	821:25
EGYPT (includes Middle East Radio)	30	820:15
UNITED KINGDOM (BBC)	36	737:00
NORTH KOREA	9	534:55
VOICE OF THE ANDES (religious)	11	499:55
INDIA	25	461:25
SOUTH KOREA	11	458:30
EAST GERMANY	11	452:45
ALBANIA	21	448:00
TRANS WORLD (religious, with stations in Netherlands Antilles, Guam and Swaziland)	31	412:17
CUBA	8	380:20
FAR EAST BROADCASTING (FEBC—religious)	21	368:40
AUSTRALIA	9	345:20
IRAN	13	323:45
NIGERIA	6	322:00
NETHERLANDS	7	316:20
POLAND	11	319:40

International Broadcasting

No form of communication has greater possibilities for reaching large numbers of people in other countries than radio broadcasting. It is the cheapest and easiest way to send information, opinions and ideas across national boundaries. The sender only requires a transmitter; the listener, an inexpensive receiver. For this reason, international radio broadcasts are a particularly effective way of meeting the need, foreseen in 1975 in Helsinki by the signatories of the Final Act of the Conference on Security and Cooperation in Europe (CSCE), "for an even wider knowledge and understanding of the various aspects of life in other participating states." In fact, the Helsinki Final Act specifically expresses the hope for continued "expansion in the dissemination of information broadcast by radio."

In 1986, 95 broadcasters—government, religious and commercial—transmitted nearly 24,000 hours of programming each week in 140 languages to listeners in other countries. Leading broadcasters such as the Voice of America, Radio Moscow, the British Broadcasting Company, Deutsche Welle and Radio Beijing transmitted programs to every area of the world, while others directed most of their broadcasts to specific geographic regions. Twenty-one international broadcasters produced more than 300 hours of programming each week.

Some 50 clandestine or quasi-clandestine stations were also seeking to reach radio listeners, particularly those in some of the world's most troubled countries. Some of these stations are old, some new; some are located outside the countries to which they broadcast, while others are located within the countries' borders. Collectively they transmitted some 1,500

hours of programming targeted for specific audiences. A number of the clandestine stations oppose the existing regimes in the countries to which they aim their broadcasts—in Iran and Afghanistan, for example.

It is somewhat harder to estimate the size of the audience that listens to international radio broadcasts than the number of broadcasters. There were over 1,500 million radio-broadcast receivers in the world in 1984, according to BBC estimates published in 1985. Worldwide, ownership rates of radios range from about one radio for every eight people in sub-Saharan Africa to about two radio sets per person in North America. Another 250 million "wired" radio sets—with a controlled choice of stations—were concentrated (97 percent) in China and the Soviet Union.

Most adults throughout the world either own a radio or have access to one on a daily basis. According to VOA's most recent annual report, Voice of America, 1987, listener surveys and inspections of retail stores indicate that:

- In capitals of the developing nations, almost all adults have access to a radio; in other urban areas, about 75 percent have access. About half of all adults living in urban areas in the Third World can use a radio to receive shortwave transmissions. In rural areas of the Third World, about half the adults have access to a radio, and over 20 percent can use one with shortwave bands.
- In highly industrialized countries, virtually every adult (15 years old and older) has access to a radio; about 66 percent have access to one with shortwave bands.

Unhindered, radio broadcasting can facilitate the fullest

international exchange of information, permitting nations and individuals to adapt, innovate and fully exploit new ideas and technologies. It also offers a chance to gain a better understanding of aspects of life in other nations.

As long as the Soviet Union persists in jamming international radio broadcasts, its citizens will be denied an opportunity to participate in—and reap the benefits of—this enriching free flow of information. ■

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