

From Peruvian Temples To CIA Spy Attacks: Infra Sound and Psy-Ops Acoustics

Peruvians may have used sound to get high on. Spies now use sound to kill and injure you.

Infrasound, sometimes referred to as **low-frequency sound**, is sound that is lower in frequency than 20 [Hz](#) or cycles per second, the "normal" limit of human hearing. Hearing becomes gradually less sensitive as frequency decreases, so for humans to perceive infrasound, the [sound pressure](#) must be sufficiently high. The ear is the primary organ for sensing infrasound, but at higher intensities it is possible to feel infrasound vibrations in various parts of the body.

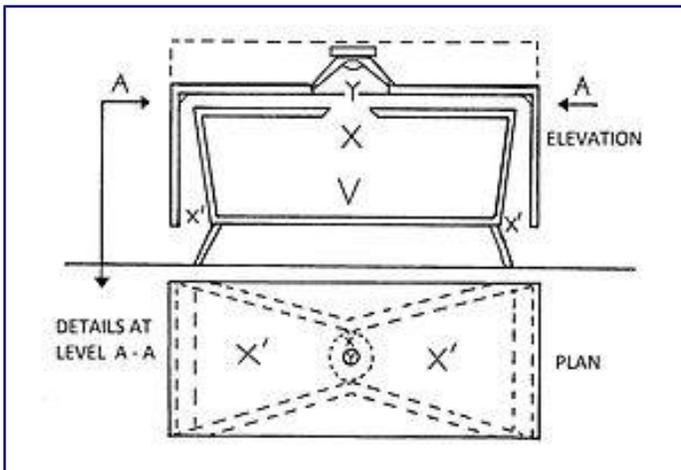
The study of such sound waves is sometimes referred to as **infrasonics**, covering sounds beneath 20 Hz down to 0.1 Hz and rarely to 0.001 Hz. People use this frequency range for monitoring earthquakes, charting rock and petroleum formations below the earth, and also in [ballistocardiography](#) and [seismocardiography](#) to study the mechanics of the heart.

Infrasound is characterized by an ability to cover long distances and get around obstacles with little [dissipation](#). In music, [acoustic waveguide](#) methods, such as a large [pipe organ](#) or, for reproduction, exotic loudspeaker designs such as [transmission line](#), [rotary woofer](#), or traditional [subwoofer](#) designs can produce low-frequency sounds, including near-infrasound. Subwoofers designed to produce infrasound are capable of sound reproduction an octave or more below that of most commercially available subwoofers, and are often about 10 times the size.

Infrasound is defined by the [American National Standards Institute](#) as "sound at frequencies less than 20 Hz."

The [Allies](#) of [World War I](#) first used infrasound to locate [artillery](#).^[1] One of the pioneers in infrasonic research was French scientist [Vladimir Gavreau](#).^[2] His interest in infrasonic waves first came about in his laboratory during the 1960s, when he and his laboratory assistants experienced shaking laboratory equipment and pain in the [eardrums](#), but his microphones did not detect audible sound. He concluded it was infrasound caused by a large fan and duct system, and soon got to work preparing tests in the laboratories. One of his experiments was an infrasonic whistle, an oversized [organ pipe](#).^{[3][4][5]}

Sources



Patent for a double bass reflex [loudspeaker enclosure](#) design intended to produce infrasonic frequencies ranging from 5 to 25 hertz, of which traditional [subwoofer](#) designs are not readily capable.

Infrasound can result from both natural and man-made sources:

- Natural events: infrasonic sound sometimes results naturally from [severe weather](#), [surf](#),[\[6\]](#) [lee waves](#), [avalanches](#), [earthquakes](#), [volcanoes](#), [bolides](#),[\[7\]](#) [waterfalls](#), [calving of icebergs](#), [aurorae](#), [meteors](#), [lightning](#) and [upper-atmospheric lightning](#).[\[8\]](#) [Nonlinear ocean wave](#) interactions in ocean storms produce pervasive infrasonic vibrations around 0.2 Hz, known as [microbaroms](#).[\[9\]](#) According to the Infrasonics Program at [NOAA](#), infrasonic arrays can be used to locate avalanches in the Rocky Mountains, and to detect [tornadoes](#) on the high plains several minutes before they touch down.[\[10\]](#)
- Animal communication: [whales](#), [elephants](#),[\[11\]](#) [hippopotamuses](#),[\[12\]](#) [rhinoceros](#),[\[13\]](#)[\[14\]](#) [giraffes](#),[\[15\]](#) [okapi](#),[\[16\]](#) and [alligators](#) are known to use infrasound to communicate over distances—up to hundreds of miles in [the case of whales](#). In particular, the [Sumatran Rhinoceros](#) has been shown to produce sounds with frequencies as low as 3 Hz which have similarities with the [song of the humpback whale](#).[\[14\]](#) The [roar](#) of the [tiger](#) contains infrasound of 18 Hz and lower,[\[17\]](#) and the [purr](#) of [felines](#) is reported to cover a range of 20 to 50 Hz.[\[18\]](#)[\[19\]](#)[\[20\]](#) It has also been suggested that migrating birds use naturally generated infrasound, from sources such as [turbulent](#) airflow over mountain ranges, as a [navigational](#) aid.[\[21\]](#) Infrasound also may be used for long-distance communication, especially well documented in [baleen whales](#) (see [Whale vocalization](#)), and [African elephants](#).[\[22\]](#) The frequency of baleen whale sounds can range from 10 [Hz](#) to 31 kHz,[\[23\]](#) and that of elephant calls from 15 Hz to 35 Hz. Both can be extremely loud (around 117 [dB](#)), allowing communication for many kilometres, with a possible maximum range of around 10 km (6 mi) for elephants,[\[24\]](#) and potentially hundreds or thousands of kilometers for some whales.[\[citation needed\]](#) Elephants also produce infrasound waves that travel through solid ground and are sensed by other herds using their feet, although they may be separated by hundreds of kilometres. These calls may be used to coordinate the movement of herds and allow [mating elephants](#) to find each other.[\[citation needed\]](#)
- Human singers: some vocalists, including [Tim Storms](#), can produce notes in the infrasound range.[\[25\]](#)

- Human created sources: infrasound can be generated by human processes such as [sonic booms](#) and [explosions](#) (both chemical and [nuclear](#)), or by machinery such as [diesel engines](#), [wind turbines](#) and specially designed mechanical [transducers](#) (industrial vibration tables). Certain specialized [loudspeaker](#) designs are also able to reproduce extremely low frequencies; these include large-scale [rotary woofer](#) models of [subwoofer](#) loudspeaker, [26] as well as large [horn loaded](#), [bass reflex](#), [sealed](#) and [transmission line](#) loudspeakers. [27][28]

Sound

In “Of Earth and Air” by Lyz Cooper, [‘Featured in Sacred Hoop Magazine November 07’](#) a curious theory is proposed. She says:

Once thought by anthropologists to be nothing more than ‘amusing liquid containers’, the Peruvian whistling vessels are now telling their true story to anyone who is ready to listen. Andean creation legends say that the creator made the first men and women from clay which was then breathed into to form the first life on Earth. Alpamasca, the Inca word for a person’s body means ‘animated earth’.



For centuries, archaeologists were finding these vessels at many burial sites and sacred places, but their meaning and use was shrouded in mystery for centuries. In recent years their story is being discovered and they are once again being used for journeying to other realms as well as helping to improve health and well-being. Some of the oldest whistles have been dated at around 500 – 300BC and were made by the Vicus and Salinar people. The most commonly found are Moche, Chimu and Inca in origin and date from 1000 AD until shortly after the Spanish conquest in 1532. The vessels are usually made in the shape of animals, people or mythical figures.

Sound has long been associated with shifting consciousness and enabling the player or listener to contact other realms, nature and the different aspects of self. Acoustically the whistles are very interesting. The sound they produce is high pitched and similar to that of the old whistling kettles. When played on their own they sound rather uninteresting but when combined with groups of whistles it becomes clear why they were made in this way.

People who have heard groups of whistles being played report hearing a buzzing sound that seems to come from inside their head and their eardrums are being vibrated. Every sound we hear produces minute vibrations on the surface of the eardrum which in turn are translated into nerve impulses which the brain decodes. The pitches of each vessel are almost identical but the minute differences in pitch produce a psycho-acoustic effect that has been likened to 'sonic ayahuasca'. Very close-matched sounds create multiple sets of ripples across the eardrum which the brain attempts to make sense of. The brain registers each sound separately but also perceives other sounds which appear to come from inside the head. This effect increases when a greater number of whistles are played until there is a build up of different buzzing sounds and pulses both inside and outside the head. This phenomenon is the key that unlocks the doorway to other realms. The whistles are made so that the sound-hole is level with the third eye as you play (which in itself is extremely interesting as this further highlights that the makers of these wonderful vessels fully intended to use the sound to alter consciousness).

The importance of the breath also features heavily in many cultures throughout the world. Life-force/chi/prana/vital energy is taken into the body on the breath. The player of a vessel is required to be attentive to the direction of their breath to enable their whistle to produce the best beating sounds. The slow, directed breath allows the player to relax and helps them to journey with the sound. It is also necessary for the player to listen to the other players in the group, therefore becoming less conscious of 'self' and more aware of the group energy. Even if you are not playing, the sounds can still produce amazing effects and receivers have also had powerful experiences. One listener reported shape-shifting into a black panther and prowling around the group on all fours until coming back to the 'here and now'. This experience proves that you don't have to be playing to receive the effect of these wonderful tools of transformation. Other players have been transported to the stars, taken deep inside the Earth and had conversations with spirit guides or relatives that have passed into spirit. There are too many experiences to mention in this article, but suffice to say that I am very respectful of the potential that the vessels hold within them.

It is very rare for a person not to have an experience with the whistling vessels but some people find that they need a few sittings with them until they have got used to the sound and feel comfortable. It is also important that a safe and supported sacred space is created before working in this way. Not every sound is for every body and some people do not like the piercing sound of the vessels or are not comfortable with the consciousness shifting effects that the whistles facilitate.

My personal journey with the whistling vessels began when I came across a copy of Daniel Statnekov's book, 'Animated Earth'. I had been working with sound for many years and after reading this book I knew that I had to experience the whistling vessels first-hand. I contacted Daniel Statnekov in the USA and spoke about my passion for sound and the desire to work with the whistles. Following a long telephone conversation he



informed me that he would be happy to make a set for me.

Over the next few months I received regular updates from Daniel regarding the progress of my vessels. He asked if I would like to contribute something to the fabric of the vessels so I sent a piece of quartz crystal which I had lovingly programmed and ground up for him to add to the special clay mixture that has taken him years to perfect. The making of each vessel is a sacred process and once fired, the whistles were left outdoors to be energised by the elements. A month or so later I found myself sitting in the living room of a house in San Francisco where I was to receive my first introduction to the power of the vessels.

In the centre of the room sat fourteen vessels arranged in a circle upon a rug. The vessels were replicas of a Chimu whistling vessel (picture attached). The Chimu kingdom stretched for more than six hundred miles along the northwest coast of what is now known as Peru. The Chimu were an extensive civilisation with a highly developed agricultural, artistic and political state.

After a few minutes of playing I felt a strong tug on my solar plexus as if someone had attached a string to it and was pulling fairly hard. In my mind's eye I saw a black hole open in front of me and my solar plexus lurched as if I had just gone over a hump-back bridge at speed. After a moment's hesitation I took the plunge and went in. It was like travelling down a wormhole at a tremendous speed for a few seconds and then suddenly I was spat out of the other end into silence and bliss. Every molecule of my being felt as though it was disconnected from 'self' and yet profoundly connected to all that is. I felt expansive, light and full of love and peace. I was not aware of the room that my physical body was still sitting in although in the distance I heard a faint sound of the whistling vessels being played. This sound reassured me part of me was still 'attached' to the room. It felt as though I had phased-out of one dimension and into another where peace and tranquillity reigned supreme.

A few minutes later I snapped back into the dimension that I presently call 'home' and became aware of the room and the people around me. I took a while to ground myself, but afterwards felt refreshed, centred and energised.

Working with sound in this way can be a powerful sacred experience and can open doorways to exploring the self and other realms. My experience is that the whistles have an accumulative effect and the more you use them, the easier and quicker it is to enter back into an altered state. I always work with the vessels in a mindful, sacred way. Working with them at a sacred site such as Stonehenge can be extremely powerful as the interaction between the energy of the sound and the energy of the earth adds a special quality. Working in caves or places with lively acoustics such as churches and temples is also a very special experience.

Measurements were made of the frequency and sound pressure level from 73 ceramic whistling bottles blown by compressed air. The bottles represent nine pre-Columbian civilizations which inhabited the north and central coasts and highlands of Peru during a 2000-year time span from 500 B.C. to A.D. 1550. We have found that Peruvian whistling bottles group acoustically by culture. The bottles are generally regarded by anthropologists as utilitarian liquid containers with the whistle providing an amusing method of venting. We are suggesting an alternative interpretation of the bottles as having been specifically produced as whistles. We base this interpretation on the clustering of frequencies by individual cultures, the fact that the frequencies fall in the region of the ear's greatest sensitivity, and the high sound pressure levels produced by the bottles when blown orally.

Ceramic whistling bottles were produced on the north and central coasts and highlands of Peru for two thousand years beginning ca. 500 B.C. and continuing until shortly after the Spanish conquest of Peru in 1532. Anthropologists generally regard the bottles as utilitarian containers with the whistle providing an amusing vent to facilitate the passage of air when pouring and filling with liquid.¹⁻⁵ It has also been suggested that these bottles were used as whistles, possibly in a ritual context.^{3, 6-8} The specimens tested in this study were found at gravesites by huaqueros (graverobbers) and there is nothing in the Spanish Chronicles of the New World or in the pre-Columbian Peruvian iconography that suggest their original use.

We have collected data on the harmonic structure of the sounds from 73 whistling bottles. The 73 bottles represent nine cultures from the north and central coasts and highlands of Peru, encompassing a time span from ca. 500 B.C. to A.D. 1550.

One of us (D.K.S.) assembled 73 whistling bottles from private collections, the Los Angeles County Museum of Natural History, and UCLA's Museum of Cultural History. All but three bottles were identified on the basis of physical appearance by Christopher B. Donnan, Director of UCLA's Museum of Cultural History, as belonging to one of the nine cultures listed in Table I. (Table I and Figures 1 - 3, 6 - 7 will eventually be included). Three bottles could not be assigned to a specific culture without ambiguity and four bottles had been restored. The integrity of the original acoustical signatures of the four restored bottles could not be assured and these were not included in the sample. Of the 69 bottles included in the sample, 53 were double chambered (Figs. 1 and 2), 14 were single chambered (Fig.3),

one was four chambered, and one was six chambered (Fig.3). The four bottles not included in the sample because of restoration were all double chambered.

All of the whistling bottles tested were made of ceramic. The physical dimensions are 15-30 cm high, 20-30 cm long, and 10-20 cm wide. The bottles are comprised of one or more chamber(s) connected by an upper bridge handle, often containing the whistle, and a lower pottery tube that enables liquid or air to flow from one chamber to the other (Fig. 4 and Fig. 5). The lower tube is the sole connection between the chambers through which liquid or air can flow. The single chambered bottles are surmounted by a tubular spout connected to an effigy by a bridge handle (Fig.3). When the bridge handle contains the actual whistle (hereafter referred to as the "exposed-type"), the whistle is "sounded" by means of an air stream which exits the effigy chamber through a small aperture in that chamber (Fig. 4). In the case of the "enclosed-type" whistle, the whistle cavity is contained within the effigy itself (Fig. 5).

The dimensions of the whistle cavities of seven Chimú bottles were measured by filling the cavities with water from a syringe to determine their volume. The effective diameter and length of their orifices were measured with a steel rule. Since the whistles were in some cases partially obscured by other features of the bottles and their orifices did not always have circular cross sections, uncertainties in measuring the diameters and/or lengths were occasionally as high as 30%. The Helmholtz frequencies f_h of the seven bottles were calculated from the following expression, with an effective length l' with a correction which is a compromise between that for a flanged and unflanged tube.

$$f_h = (c/2\pi)(S/l')^{1/2},$$

where $S = 1/4 \pi d^2$, d is the average diameter of the orifice, V is the volume of whistle cavity, $l' = l + 0.7d$, and c is the speed of sound in air. Cavity volumes were typically 0.6 to 1.0 cm³; orifice diameters were 3.5 - 4.5 mm, and orifice lengths, determined by the thickness of the ceramic, ranged from 1 - 3 mm. Averaged over the seven bottles, the deviation of the calculated frequencies from the measured frequencies was less than 7%. This is excellent agreement in consideration of the uncertainties in measuring the small physical dimensions of the whistle cavities.

With respect to the multiple chambered bottles, the traditional explanation for the whistle's function is that it acts as an air vent to permit the flow of liquid from one chamber to the other. In the case of the single chambered bottles, the function of the whistle is again that of an amusing way to vent the vessel. When a bottle containing liquid is returned to an upright position after a portion of its liquid is poured from the tubular spout, the remaining liquid, seeking its own level, displaces the air in the effigy chamber. This produces an air stream which is directed across the whistle's orifice.

The current interpretation is that whistling bottles were "sounded" in this manner by means of a displacement of air by liquid. However, when a bottle is "sounded" in this way, the tone produced is barely audible, not at all the intense sound created when a bottle is blown orally through the tubular spout. When a whistle is "sounded" orally the chamber(s) act as a surge tank to reduce wavering in the tone which may occur because of slight short-term variations in pressure at the spout.

The bottles were placed in an anechoic chamber and pressurized air was used to produce the tones (Fig. 6). A Brüel & Kjær 2203 sound-level meter was suspended inside the chamber approximately 10 cm from the whistle in a position close to where a person's ear would be if the vessel had been blown orally. The air flow was then adjusted to give the maximum wide-band sound pressure level as indicated on the sound-level meter. We chose the maximum sound pressure level as the place to

measure the frequency of the bottles for two reasons. The first being that it was always a unique point for each bottle. The volume flow rate of air or the blowing pressure varied from bottle to bottle and depended on physical properties of each bottle that were irrelevant to the actual whistle. The excess static pressure at the spout necessary to achieve the maximum sound varied from 1 - 3 kilopascals above ambient pressure, 10 - 3- cm of water as measured by a water filled U-tube. The necessary pressure was the same whether the bottle was blown orally or by compressed air. The second reason was that the blowing pressure necessary to achieve maximum sound pressure level was always low enough so that a person could sustain this maximum level for 15 - 20 sec. The maximum sound pressure level for each bottle was recorded and the average sound pressure level for all bottles from a single culture is reported in Table I under L. "Delta" L is the standard deviation of the sound pressure levels for each culture.

The output of the sound level meter was connected to a Hewlett-Packard model 3580-A Spectrum Analyzer with its bandwidth set at 10 Hz. The frequencies and relative sound pressure levels of the fundamental and partials for each bottle was recorded. The sound pressure level of the fundamental for each bottle is plotted against its frequency in Fig. 7. The average frequency of the fundamental for all bottles in a single culture is listed under f in Table I and the standard deviation of the fundamentals from that culture is listed under "delta" f. In the case of double-noted whistles, the frequency of the partial with the highest sound pressure level was chosen for calculating the averages in Table I and plotting the frequencies of the bottles in Fig. 7.

The partials were harmonics of the fundamental and typically decreased monotonically with increasing frequency. The fundamental was typically 60 dB above the noise level which was produced by the sound of the air rushing out of the bottle. In some cases as many as seven partials were distinguishable.

An examination of the frequency data in Table I and Fig. 7 strongly suggests that the nine cultures represented produced whistles in a frequency range specific to the particular culture which produced the bottles. The standard deviation for any one culture is significantly less than the standard deviation for the entire sample. The average frequency is not the sole distinguishing cultural characteristic of the bottles. In 20 of the 69 bottles in the sample, the whistle was contained within the effigy chamber. All 14 bottles from the Gallinazo, Vicus, Moche, and Huari cultures spanning a time period from 400 B. C. to A. D. 700 were of this "enclosed-type." In addition two of the four bottles not included in the sample because of restoration were "enclosed-type" whistles and both of these were from the Vicus culture as well. Of the remaining six "enclosed-type" whistles two were unspecified culturally, three were Chimú, and one was an Inca whistle.

Fourteen whistles produced two distinct tones depending on the blowing pressure applied at the spout. A lower frequency tone, with a frequency 0.65 ± 0.1 times the higher frequency tone, is produced when the blowing pressure is reduced by $1/3$ to $1/2$ of the pressure necessary to produce the tone of maximum sound pressure level. The wide-band sound pressure level of the lower frequency tone is typically 4 - 16 dB less than the tone of maximum sound pressure level for these double-noted whistles.

Thirteen of the 14 double-noted whistles were of the "enclosed-type," and one was of the "exposed-type." The single "exposed-type" double-noted whistle was from the Inca culture. Nine of the 14 double-noted whistles belonged to the Gallinazo, Vicus, Moche, or Huari cultures. Additionally, the two restored Vicus whistles not included in the sample were also double-noted "enclosed-type" whistles. Of the remaining five double-noted whistles, one was Chimú, two were Inca, and two were unspecified culturally.

Only one of 50 examples where the whistle was of the "exposed-type" produced a double note and this was the Inca example mentioned above. All three examples from the Recuay culture, spanning a time period of A. D. 100 through A. D. 500 were single-noted "exposed-type" whistles. All but three of 48 examples of Chancay, Chimú, and Inca cultures spanning a time period of A. D. 700 through A. D. 1550, produced a single tone irrespective of the air pressure, and all but four of the 48 were of the "exposed-type." The four which were of the "enclosed-type" were three Chimú, and one Inca. One of the "enclosed" Chimú and the Inca "enclosed" were double-noted. Two "enclosed" Chimú were single-noted, and one "exposed-type" Inca was double-noted as mentioned above.

The average frequency of the Gallinazo, Vicus, Moche, and Huari whistling bottles is 1320 Hz while the average frequency for the Recuay bottles is 2000 Hz. The average frequency for the Chancay, Chimú, and Inca bottles is 2670 Hz. It is apparent that the earlier cultures tended to produce double-noted, low-frequency, "enclosed-type" whistles while the later cultures generally produced single-noted, high-frequency, "exposed-type" whistles. In that the frequency is determined by the whistle cavity and not the pottery style, the frequency would be an additional method for determining cultural origins of whistling bottles.

On the basis of these data we suggest the possibility of using the frequency and type of whistle (enclosed vs exposed) as an additional means for determining cultural origins of Peruvian whistling bottles.

Reconsideration of Table I and Fig. 7 show that the frequencies of the bottles produced by a single culture tend on the average to be within $\pm 14\%$ of the average frequency for that individual culture. On the basis of the small fraction of an octave spanned by the frequencies of all bottles in any single culture we are reasonably certain that the bottles were not used as musical instruments. However, when two or more bottles from a given culture are played simultaneously the perception of a wavering low frequency tone is very distinguishable. The clustering of frequencies by individual culture, the position of the frequencies in the region of the ear's greatest sensitivity (1 - 4 kHz), and the high sound levels produced by the bottles when blown orally, strongly suggest that the Peruvians produced whistling bottles as whistles - as contrasted to the traditional interpretation of them as utilitarian liquid containers.

Jeffrey Mishlove, a noted psycho-acoustic researcher and whistle-pot expert, claims that combinations of whistle-pots, water levels within the pots and timed deployments of the pots in a tribal circle, by coordinated individuals using the pots, creates measurable sounds in the center of the brain which are different sounds than those heard by a microphone near the human ear.

These reports indicate that sound can affect the mind. Is it possible to harm the brain, project sensory experiences into the brain and read sensory experiences from the brain? Yes! Scientists in Russia and China have reported doing it and Cambridge and Stanford scientists are reporting increasingly improved abilities to undertake these efforts in Science Daily.

Spy agencies have spent over \$900 billion dollars trying to see how to weaponize these sonic potentials. The Cuban diplomat probes may be the most public disclosures of such efforts. CNN describes the latest attacks:

“US diplomats, families in Cuba targeted nearly 50 times by sonic attacks, says US official”



FBI probes mysterious sonic device in Cuba 01:19

Story highlights

- At least 21 US diplomats and relatives affected by possible sonic attacks
- US Embassy in Havana may be scaled back to limit number of people at risk

Havana, Cuba (CNN) Some of the 21 US diplomats believed to have been impacted by mysterious acoustic attacks in Cuba were targeted multiple times, CNN has learned from a senior US official.

There were nearly 50 attacks in total, the official said. The incidents have challenged the US government's assessment that Cuba is a safe country for US diplomats and their families and threatened the future of the newly reopened embassy.

Despite the often-empty supermarkets and antagonistic relations with the communist-run government, Cuba for years offered US diplomats a rare benefit: It was safe.



[Rex Tillerson: US considering closing Havana embassy](#)

Unlike in many other countries, in Cuba, US Embassy employees didn't have to worry much about terrorist attacks, kidnapping or even petty crime. The Cuban government's tight control over the island made Havana one of the safest cities in the world.

Diplomats -- especially those Cuba suspected of being spies -- might suffer harassment at the hands of the powerful state security apparatus, but there were established lines neither of the Cold War adversaries would cross.

But starting early this year, US diplomats heading to the island to begin their postings were quietly warned they could face a mysterious threat that was causing American Foreign Service officers to fall ill, some with long-lasting symptoms.

Investigators haven't determined the cause of the incidents, but US officials told CNN they are convinced someone has targeted American diplomats in Havana with a sophisticated device never deployed before, at least not against US personnel.

[Canadian diplomats have suffered similar health problems](#), according to US and Canadian officials. At the United Nations on Friday, Cuban Foreign Minister Bruno Rodríguez Parrilla denied that Cuba was involved in attacks on diplomats and said the United States was politicizing the incidents.

But seven months after complaints to officials and assurances from Cuban President Raul Castro that the incidents would be investigated, US officials are frustrated by the lack of progress and may scale back the embassy to limit the number of people who risk exposure.

Options include sending families and nonessential staff back to the United States to a full-on [shuttering of the embassy](#), three senior US officials told CNN.

"We have to consider it. We thought we had corralled this, and then the two cases in August took place," a senior US official said. "It is not as if the attacks address individual personnel officers. Our personnel is broadly at risk. So we have to consider next steps because we need to protect our people."

If the United States were to recall diplomats, it would be a devastating setback to US-Cuban relations and come at a crucial moment as Castro prepares to step down as President in February and Washington needs eyes and ears on the ground.

Ties between the countries were severed in 1961 shortly after Fidel Castro took power. As confrontation between the two nations loomed, US diplomats hurriedly lowered the American flag at the embassy and boarded a ferry to sail across the Straits of Florida.

In 1977, the United States and Cuba took the first step toward restoring diplomatic relations by opening interests sections in each other's capitals, and US diplomats moved back into their seafront offices.



[US and Cuba have long history of undiplomatic relations](#)

They were hardly welcomed back with open arms. Then-President Fidel Castro called the interests section "a nest of spies" and led frequent demonstrations in front of the building. Castro also kept a close eye on the Americans.

"Surveillance was pretty constant," said Vicki Huddleston, who headed the interests section from 1999 to 2002. "The security officer used to say we don't even look for listening devices in the residence because the Cubans will just replace them. But it was not malicious. They just wanted to know what I was saying or other diplomats are saying."

In 2015, after President Barack Obama announced a thaw in relations, the two countries re-established full diplomatic relations and reopened embassies. Some hard-liners in Cuba -- including Fidel Castro, who had retired by then -- criticized the opening with the United States.

But many Cubans rejoiced as Americans returned to the island in large numbers for the first time in a half century. The normalizing relationship led to restored flight services and greater exchanges between the two countries.

But in November, following the US presidential election, American diplomats began to experience a series of strange incidents. As CNN first reported in August, diplomats were awoken late at night in their homes feeling unwell and hearing sounds that resembled insects or metal dragging across the floor.

They were unable to determine the source of the sound; by leaving the room or area they were in, the incidents stopped immediately, two US government officials said.

By February, the State Department had concluded their diplomats were the targets of a campaign of harassment and they needed to raise the issue with Cuban officials.

The devices used in the incidents had never been found, two US officials said, but appeared to be a type of sonic weapon that emitted sound waves capable of inflicting physical harm.

But the physical symptoms that people exhibited varied greatly, preventing doctors consulted in the United States from reaching a conclusion about what caused the trauma, two US officials said.

US government technical experts were also baffled. Some affected diplomats had lines of sight to the street in their homes, while others had shrubbery and walls that blocked views of their homes. Some heard loud sounds when the incidents took place, while others heard nothing.

It does not appear either the US Embassy or the ambassador's residence were ever targeted, three senior US officials told CNN.

How much did Cuba know?

At the time, Donald Trump had just won the presidency. Raul Castro congratulated Trump on his unexpected victory in the Cuban state-run media, even though Trump had promised to take a tougher line on Cuba.

Still Cuban officials were hopeful that a modus vivendi could be reached with the new administration. At the same time, the Cubans were racing to capitalize on the final months of goodwill from the Obama administration and sign as many agreements with the US government and American companies as possible.

Using sound to attack: The diverse world of acoustic devices

It made no sense for Cuba at that moment to begin a campaign of harassment against US diplomats, US officials said.

Shortly after US diplomats complained for the first time to their Cuban counterparts, Raul Castro summoned the top US diplomat in Havana, Jeffrey DeLaurentis, to a meeting. Castro denied any Cuban involvement in the alleged attacks and promised a thorough investigation, according to US and Cuban officials.

US officials felt Castro would not have personally assured the Americans that Cuba had no part in the incidents if it had been a Cuban operation, a US official told CNN.

Since then, the United States has received cooperation from Cuba, if not many answers. The FBI was permitted to travel to the island and met with officials from Cuba's Interior Ministry, which is directing the investigation, a US official said.

Many diplomats live in Havana's upscale Siboney neighborhood, which was called Country Club before the revolution. The area's well-maintained mansions and tidy lawns are a far cry from the city's iconic decaying colonial buildings. There are surveillance cameras throughout Siboney and Cuban security guards posted in front of many diplomats' homes.

Top Cuban officials -- including Raul Castro -- have houses in the same area and are heavily guarded. Other incidents took place in hotels in Havana where US diplomats were staying, said three senior US officials, also locations that Cuban intelligence services closely monitor.

US officials said they believe even if the Cubans didn't know about the incidents at the beginning of the investigation, they must have a clearer idea of what transpired than they are letting on.

"It is increasingly apparent the Cubans are involved in some way," a senior US official said. "The Cubans are all over our people while they are down there. If it was a few attacks, you could say that maybe it was the Russians or Iranians screwing with us, but when it happens so many times, especially in the same hotel, it is hard for us believe someone can get close enough to our people so many times. Unless these are beams from outer space."

Speaking at the UN General Assembly in New York, Rodríguez, the foreign minister, said his government "has taken into account the data contributed by the US authorities and so far has found no evidence whatsoever that could confirm the causes or the origin of the health disorders referred to by US diplomats and their relatives."

Rodríguez said Cuban officials would continue to investigate.