WASHINGTON—The State Department is cutting more than half its staff from the U.S. Embassy in Havana and warning Americans against traveling to Cuba, as Washington investigates a mysterious rash of illnesses that has left more than 20 diplomats with dizziness, concussions, hearing loss and other symptoms.

The embassy cut comes as investigators scramble to figure out what and who is behind what officials are describing as “targeted attacks” in hotels and residences that have affected the health of at least 21 U.S. government employees. The U.S. hasn’t blamed Cuba for the illnesses.

“Until the government of Cuba can ensure the safety of our diplomats in Cuba, our embassy will be reduced to emergency personnel in order to minimize the number of diplomats at risk of exposure to harm,” Secretary of State Rex Tillerson said in a statement.

The warning advising Americans not to travel to Cuba was issued because officials said they have no way to guarantee travelers’ safety.

“The Department doesn’t have definitive answers on the cause or source of the attacks and is unable to recommend a means to mitigate exposure,” Mr. Tillerson said in the statement.

U.S. officials are referring to the illnesses as targeted attacks because all of the Americans who have been stricken are affiliated with the embassy. A small number of
Canadian diplomats have reported similar symptoms. No American travelers have been affected, officials said.

Cuban officials expressed dismay over the U.S. decision.

“We consider that the decision announced by the Department of State is hasty and that it will affect the bilateral relations,” Josefina Vidal, the General Director for U.S. affairs in Cuba, said in a statement.

Some U.S. officials have suggested a sonic device might be responsible for the attacks, but no such device has been found. The combination of symptoms makes it unclear that such a device could be the cause.

State Department officials said that they haven’t ruled out the possible involvement of a third country and that Cuba is cooperating in the investigation. Cuban officials said earlier this week that they haven’t identified a source or cause of the attacks.

Sen. Patrick Leahy (D., Vt.), said the attacks appear aimed at disrupting the effort to normalize ties between the U.S. and Cuba.

“Someone or some government is trying to reverse that process,” Mr. Leahy said. “We should do all that is possible to minimize the effects of these protective steps on our diplomacy and on our ability to assist Americans in Cuba.”

Sen. Tom Cotton (R., Ark.), who opposed normalizing ties with Cuba, said the drawdown shows “just how untrustworthy and malicious the Castro regime is” and urged the State Department to take further steps.

Cuba and the U.S. reopened embassies in each other’s capitals in the summer of 2015 after they had been closed for more than 50 years. President Barack Obama loosened trade and travel restrictions as part of the normalization push, though President Donald Trump moved earlier this year to tighten them.

The U.S. won’t send official delegations to Cuba or conduct bilateral meetings in Cuba, though such meetings can happen in the U.S., officials said.

Some career diplomats in Havana and Washington opposed the decision announced Friday, saying American diplomats take risks all over the world and want to continue their work.

“To say, ‘Oh well, let’s just take the flag down,’ that’s just a recipe for abdicating America's global leadership role... that is not a good idea,” said Amb. Barbara Stephenson, president of the American Foreign Service Association, the union that represents foreign service officers.

Mr. Trump, speaking to reporters outside the White House on Friday, said, “They did some bad things in Cuba.”

The attacks could be the work of hard-line elements of the Cuban regime opposed to the rapprochement between the two countries, said Brian Latell, a retired CIA analyst who wrote a book about Raúl Castro, Cuba’s president.

“It could be a rogue element in the Cuban intelligence services,” said Mr. Latell, who now teaches at Florida International University. “The hard-liners are not happy with Raúl’s policy and want to undermine the relationship.”

A Cuban American businessman with ties with the regime agreed.

“Nothing happens in Cuba without the intelligence service knowing about it,” he said, adding the incident could be tied to a behind-the-scenes struggle over who will succeed Mr. Castro if, as he has announced, he steps down as head of state next February.

The health episodes began late last year, as the Obama administration was moving to solidify a normalization of ties. Some U.S. personnel began suffering from the symptoms as recently as August. There are about 50 U.S. government personnel at the embassy.
The attacks affected U.S. personnel who were staying at hotels at Havana as well as in other residences. Officials said they don’t know of any hotel staff or Cubans employed by the U.S. Embassy who have suffered similar symptoms.

As part of the U.S. drawdown, the State Department is ordering all nonemergency staff and family members to leave the country. The U.S. will suspend regular visa-processing operations while staffing is limited, and officials said the U.S. wouldn’t restore personnel levels at the embassy as long as they can’t be assured by the Cuban government that staff members will be safe.

“We don’t know the means, the methods or how these attacks are being carried out,” the senior State Department official said. While not blaming Cuba, the U.S. is holding Havana responsible for the security of U.S. personnel.

Mr. Tillerson said earlier this month that he was considering closing the U.S. Embassy in Havana. He met this week with Cuban Foreign Minister Bruno Rodriguez to discuss the health incidents.

But the meeting didn’t appear to convince Mr. Tillerson that Americans were fully safe on the island.

“This was seen as a major step toward addressing some of our vulnerabilities and reducing our exposure,” a second Senior State Department official said Friday of the staff cuts.

Travel industry officials worried about the move. Collin Laverty, president of Cuba Educational Travel, said hundreds of people are scheduled to travel with his company next week; most have already called to inquire about their trips but haven’t yet canceled.

“We’ve got tens of thousands of people scheduled to travel in the next six months,” he said. “I’m concerned about how this will affect future bookings.”

—Aruna Viswanatha and José de Córdoba contributed to this article.

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