

DISASTER
RELIEF

CASE REPORT

St. Vincent Island, W.I.—Volcanic Eruption
October—December, 1971

Agency for International Development
Washington, D.C. 20523

Foreign Disaster Case Reports are publications of the Office of the Foreign Disaster Relief Coordinator, Agency for International Development. This office has responsibility for coordinating U.S. Government foreign disaster relief responses and for the further coordination of such activities with those of the U.S. private and international disaster relief communities.

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ST. VINCENT ISLAND, WEST INDIES

Volcanic Eruption October-December 1971

... threatened an estimated population of 90,000 and caused the temporary evacuation of 2,000 people from the north end of Saint Vincent Island. In addition to providing assistance to evacuees, the U.S. Government joined with the British in working with St. Vincent scientists conducting aerial surveillance and making ground studies of the volcano, Mt. Soufriere.

Value of U.S. Assistance\$ 145,000

Value of Assistance by Others was not available.

BACKGROUND:

St. Vincent is in the southern part of the chain of Caribbean volcanic islands comprising the Lesser Antilles. The Soufriere volcano, with a diameter of 11 kilometers at sea level, constitutes one third of the northern part of the island. Geological studies indicate that for at least 4,000 years Mt. Soufriere has been dominantly explosive, depositing numerous heavy ash falls and discharging pyroclastic flows. In historic times there have been three major eruptions — in 1718, 1812, and 1902. The eruption on May 8, 1902, killed 1,565 people. The following day an even more devastating eruption took place on Mt. Pelee in the neighboring island of Martinique — 30,000 people lost their lives in three minutes.

The Lesser Antilles has numerous active volcanos. Four of these (besides Mt. Soufriere and Mt. Pelee) — Mt. Misery on St. Kitts, La Soufriere on Guadeloupe, the Valley of Desolation on Dominica and Qualibou on St. Lucia — have erupted in historic times. Historic submarine eruptions have also been recorded at Hodger's volcano west of St. Lucia and Kick-em-Jenny north of Granada.

DETAILS OF THE EMERGENCY:

Abnormal activity of the Mt. Soufriere volcano was detected on October 17, 1971, when the Deputy Chief of the U.S. Mission in Bridgetown, Barbados, on a climb to the crater's rim, observed numerous white vapors rising from the surface of the crater lake and smelled sulfurous fumes. On October 31, a pilot reported steam rising from the lake and a change in its color.

By mid-November, the lake water had risen 20 meters and its temperature increased from 20° Centigrade to 82° Centigrade. Its color had changed from its usual clear greenish blue to a turbid yellowish green. On November 20, 1971, the black top of a lava dome emerged above the lake's surface and continued to enlarge both vertically and laterally by extension and coalescence of prominent radial ridges.

Because such activity in the past had progressed to violent explosive stages resulting in great loss of life, there arose widespread and understandable concern.

COOPERATIVE SCIENTIFIC MONITORING OF THE VOLCANO BY THE GOVERNMENT OF ST. VINCENT, USG AND OTHER SCIENTISTS:

Scientists of the Seismic Research Unit (SRU) of the University of the West Indies began ground monitoring the activity on November 1, 1971.

Premier Milton Cato requested scientific survey assistance from the United States. In response the USG provided a team of scientists from the U.S. Geological Survey (USGS) and specially equipped U.S. Navy planes to make aerial infra-red photo reconnaissance. Flights began on November 28.

The SRU scientists were the principal investigators and the primary source of information on the activity of the volcano. Assisted by the USGS Survey Team, they installed seismographs on the slopes of the volcano and made daily measurements of the growth of the lava dome and changes in level and temperature of the crater lake. They continued to operate five of the seismographs even

after the emergency period was over. At considerable personal risk, two SRU scientists rowed a small boat through the heated crater lake carrying out bottom soundings and recording temperatures at different points. They recorded 81 degrees Centigrade in the bubbling hot springs on the northern shore of the emerging lava mass, collecting samples for analysis.

U.S. Navy planes, fitted with remote sensing equipment, flew daily over Mt. Soufriere as well as other volcanos in the island arc to record heat and geologic changes. Analysis of collected data together with ground observations and measurements provided a basis for evaluating the nature of the volcano activity and basic line data against which the significance of future changes could be weighed. The overflights were discontinued on December 13 when it was determined the geodometric and seismic instrumentation installed on the ground should be adequate to continue monitoring the situation. It was understood that aircraft surveillance could be resumed if conditions changed.

The U.S. Geological Survey team assisted the SRU scientists in the installation of scientific instruments, in training them in the operation of the geodometer, and in interpreting findings. Data collected confirmed the danger inherent in the Soufriere situation, but the future course of the volcanic activity could not be predicted by the volcanologists. They commented on the possibility that inward water seepage from the crater lake might trigger a steam eruption or that an explosive eruption, based on the pattern observed prior to the 1902 eruption, could be several months away.

Dr. Richard Fiske, USGS volcanologist and coordinator of the U.S. survey operation, said: "There is no question that there is a very real possibility of a violent eruption. Eruptions from a volcano such as Soufriere pose a number of specific hazards. Hot mud flows, for example, could develop if the walls of the crater lake were to collapse. Dense choking clouds of ash could blanket much of the island. But the greatest potential danger is from avalanches of hot, incandescent debris that move swiftly, destroying everything



in their paths." The USGS team remained in St. Vincent until December 16.

The support provided by the British Royal Navy helicopter pilots from the HMS Phoebe and HMS Berwick to both the American geodometer team and the SRU scientists greatly facilitated early establishment of the ground monitoring system.

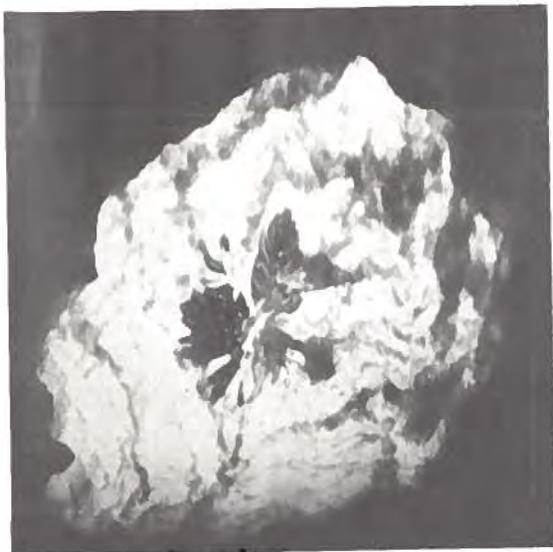
The rapid and smooth response of both the U.S. and British Military, as well as civilian units, to meet the threat imposed by the volcano was a fine example of international cooperation and demonstrated the constructive use of military capability in a peacetime emergency.

Ground monitoring by SRU continued into the spring of 1972 when it was observed that the following changes had occurred:

(1) The lava dome rise slowed down on March 1, increasing by only 2 feet, 4 inches from then until March 22. At that time the highest point of the dome, the western summit, was 226 feet.

(2) The water level dropped. On November 20 the lake level had been 92.5 feet above its pre-eruption level. By March 22 it had dropped to its pre-eruption stage.

(3) Water temperature dropped. While a maximum temperature of 81° Centigrade was still being recorded in the bubbling hot springs on the northern shore of the lava



mass, surface water temperature near the southern shore of the crater island was, on March 22, 62° Centigrade. A minimum temperature of 49° Centigrade was measured in the center of the wide bay east of the island. (4) Seismic activity had become minimal with an average of one crater tremor per day. It was estimated by the scientists that should activity again develop, at least 24 hours warning would be given by an increase in seismic activity.

SUR continued its observations, despite this major decrease in the rate of eruption, to determine if this was a long-term trend.

In March 1972, the USGS team issued a preliminary project report on its investigations. The report was cleared by the British representative in St. Vincent. A copy of this report, from which most of the scientific information in this case study has been summarized, is on file in the FDRC office.

ACTION TAKEN BY THE GOVERNMENT OF ST. VINCENT AND LOCAL ORGANIZATIONS:

The Government of St. Vincent arranged for the scientific monitoring of the volcano as previously indicated.

The Government also established a Central Eruption Committee, which began formulating plans for the evacuation of inhabitants.

On December 6, as seismic activity increased, the committee began organizing reception centers for evacuees. On the same date the British ship HMS Phoebe arrived off the coast of the island to give helicopter and personnel support. A direct Telex link was established between the Government of St. Vincent, the British High Commission, and U.S. Embassy in Bridgetown, Barbados.

On December 8 the Government announced its decision to evacuate the north end of the island above Chateaubelair on the leeward coast and Georgetown on the windward coast. The evacuation was designed primarily to remove inhabitants located in predicted paths of possible glowing avalanches. Approximately 2,000 people were involved. At the same time Premier Cato announced that contingency plans had been made to evacuate the rest of the island's inhabitants to the Grenadines, St. Lucia, or even to Trinidad, should such action be required.

The local Red Cross set up communal kitchens in one of two main reception centers. The other main center was in the early stages serviced by the HMS Phoebe. Later, equipment was brought in for a permanent kitchen at this center. Approximately 5,000 people were given anti-typhoid shots. Late in January, when it appeared the immediate danger was over, the evacuees began to return to their homes.

ASSISTANCE PROVIDED BY THE U.S. GOVERNMENT:

On November 26, American Ambassador Eileen R. Donovan at the U.S. Embassy in Barbados requested guidance from A.I.D./ Washington in offering U.S. Government assistance to the Government of St. Vincent. Because of the immediate danger to lives and property should there be an explosive eruption, the Foreign Disaster Relief Coordinator (FDRC) agreed with Ambassador Donovan that she should exercise her disaster relief authority to help the people and Government of St. Vincent.

FDRC determined that U.S. military aircraft equipped with photographic and infrared scanner surveillance instruments and a U.S. Geological Survey team to assist the Seismic



Research Unit from the University of the West Indies were available and could be provided if desired. Ambassador Donovan relayed his offer to the Premier of St. Vincent who gratefully accepted.

Within a matter of hours, U.S. Navy reconnaissance jet aircraft were dispatched from Albany, Georgia, to Roosevelt Roads Naval Station, Puerto Rico and two USGS experts were enroute to Puerto Rico to interpret the first photographic and infrared returns. Because Mt. Soufriere is part of an island-arc volcanic environment, appropriate arrangements were made through the British High Command for permission to overfly islands to the north of St. Vincent, and also with the Prefect of Martinique for permission for flights over Mt. Pelee.

The U.S. Navy reconnaissance aircraft commenced operations on November 28 and made daily overflights of the volcano arc until December 13.

The cooperation and assistance of the American Ambassador and the Embassy staff in Barbados, and of the British and French Government representatives in the West Indies contributed substantially to the success of the geologic mission.

The speed and efficiency with which Navy air and photographic support units went into operation, their willingness and ability to adjust their flight paths and methods, as well as their working hours to meet geologic requirements, received the special commendation of both U.S. and British personnel involved in the emergency.

The U.S. Government also donated P.L. 480 food commodities and paid airlift costs for 10,000 blankets donated by Church World Service to be used in the evacuation centers. Breakdown on value of U.S. assistance follows:

Reimbursement to DOD for U.S. Navy surveillance flights	\$ 82,500
USGS team-travel expenses, per diem and use of ground monitoring devices	1,500
Air transportation of CWS blankets	8,300
314,000 pounds of nonfat dry milk, corn/soya/milk (CSM) mix, flour, cornmeal, bulgur, rolled oats, and vegetable oil	22,700
Total value USG assistance	<u>\$115,000</u>

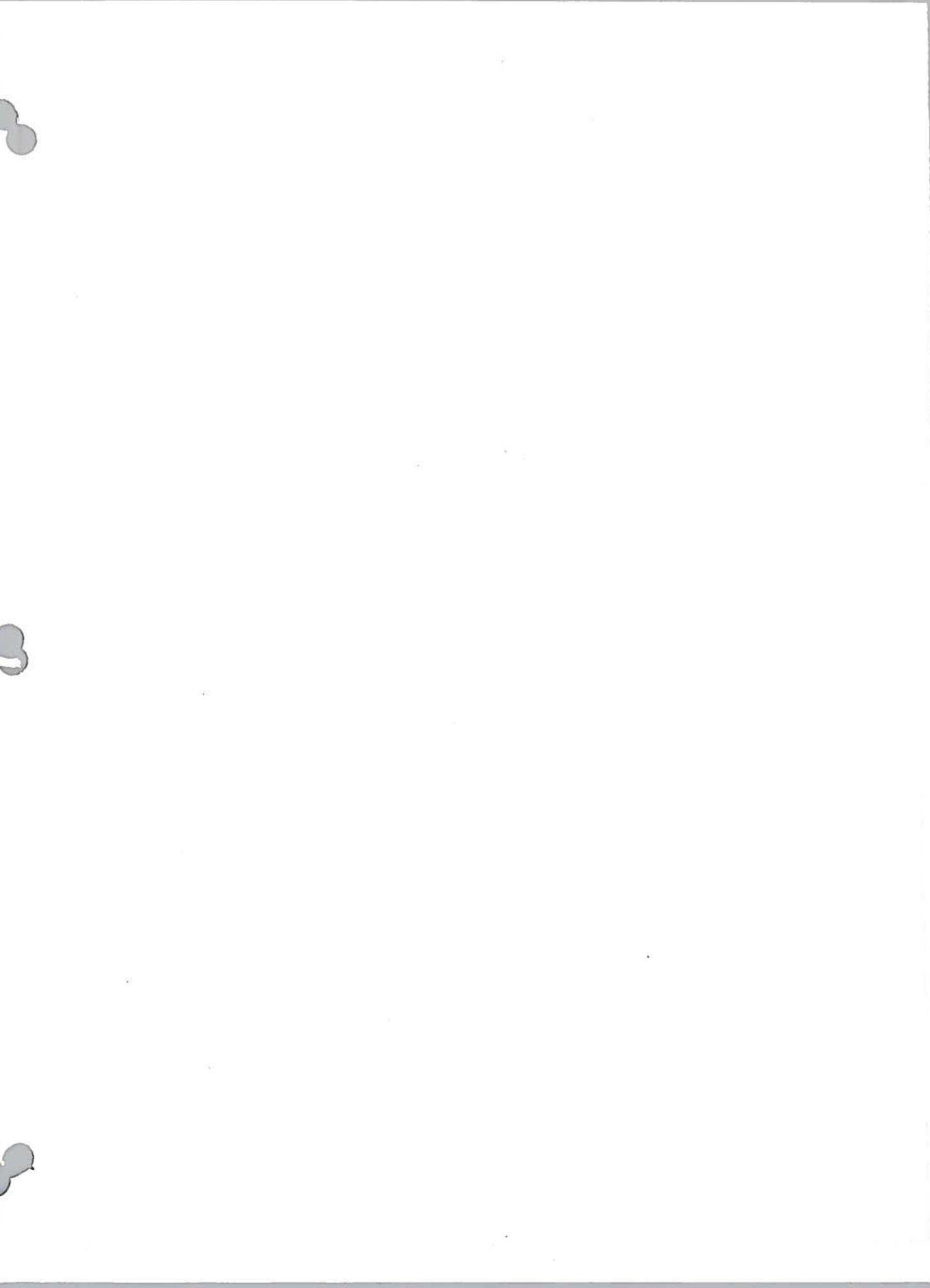
ASSISTANCE PROVIDED BY U.S.

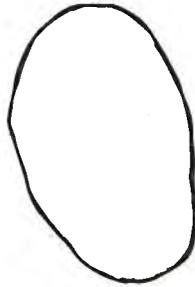
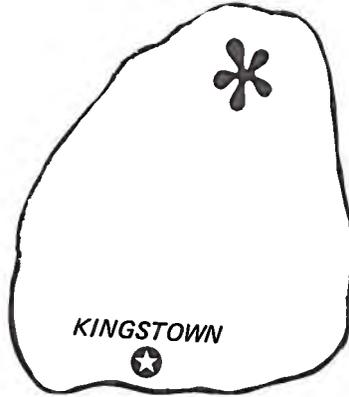
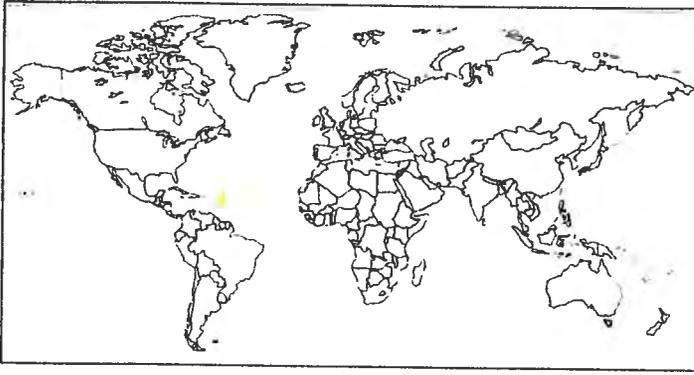
VOLUNTARY AGENCIES:

Church World Service in Granada arranged for delivery and distribution of USG P.L. 480, Title II food commodities to evacuation centers. Church World Service in New York airlifted from the U.S. 10,000 blankets for the evacuees. Value of the blankets was approximately\$30,000

ASSISTANCE PROVIDED BY OTHER NATIONS AND INTERNATIONAL ORGANIZATIONS:

The assistance and cooperation of the British, French and neighboring islands is covered in other sections of this report. The value of this assistance was not available.





ST. VINCENT ISLAND