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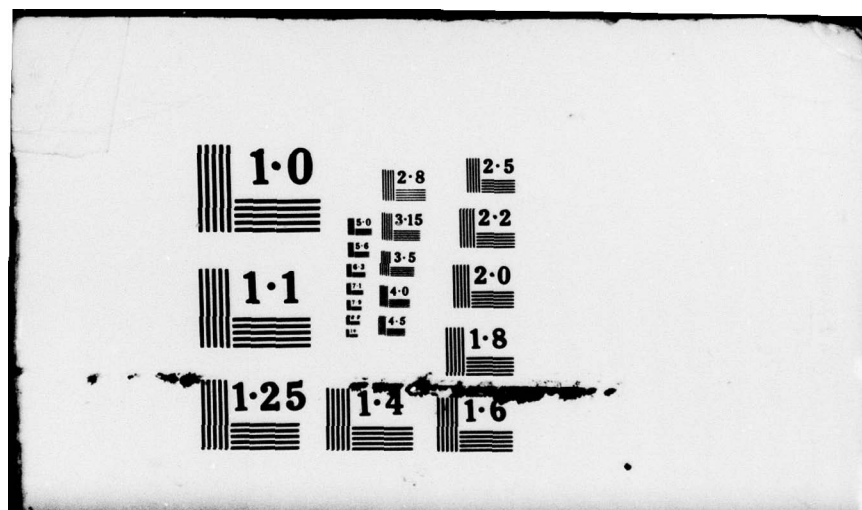
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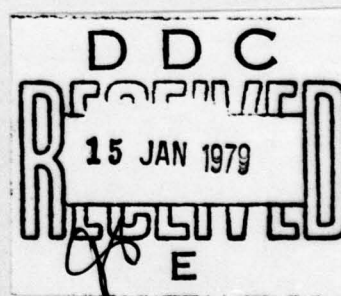
## FOREIGN TECHNOLOGY DIVISION



STORM OVER A SATELLITE CRASH

By

Hsieh Ch'u



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## EDITED TRANSLATION

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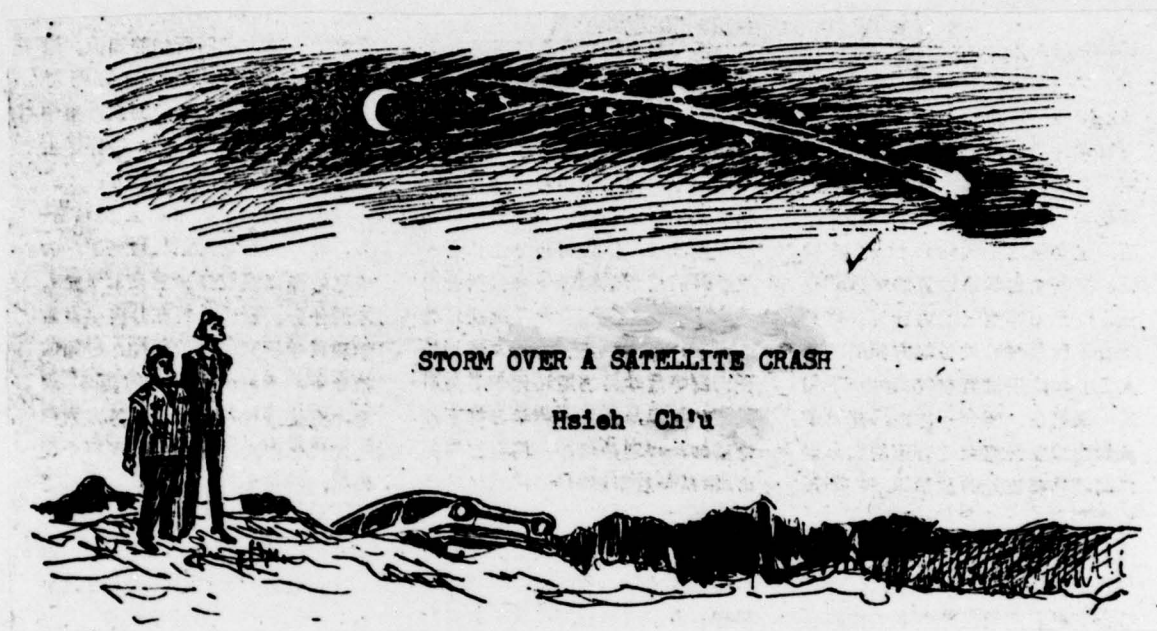
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### STORM OVER A SATELLITE CRASH

Hsieh Ch'u

In Canadian northwestern wintry wildness, a police patrol car was suddenly braked to a halt, and from the car dashed out two police officers. Both of them stared, with great astonishment, at a spectacular scene in the sky. It had not yet been daybreak, and in the darkness before dawn, a dazzling fireball followed by a stream of sparks hurtled down from the sky and quickly disappeared into the cold wildness.

" Strange. It is not an air accident nor a shooting star. What is it?" Officer Dale McLord panted and asked himself.

It was the scene of a Soviet spy satellite crash in Canada. The satellite was named Cosmos 954 and it carried a small nuclear reactor. The time when it crashed was 6:53 in the morning, January 24, 1978.

Besides these two Canadian police officers, there were a few more people

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who witnessed the ~~cr~~ashing of the satellite. The incident occurred at a place near by the Great Slave Lake of Canada. By the lake, there was a town called Yellowknife. Its population was less than 10,000 and most of them were gold miners. Mary Ruman, a night watch in a public building of the town, recalled and said, " I suddenly saw something in fire coming down from the sky and following it there were several tens of burning flakes. Each had a small tail and none of them made a sound."

From different reports it was known that the satellite fell at a place about 180 kilometres east of Yellowknife. Under the impact of frequent storms and severe coldness, few plants could grow in this area except for the scattered tiny pine trees. Nevertheless, lakes were numerous branching here and there, and rocks were plentiful everywhere. In the summer time, people often came here to fish sturgeons in the lakes. In winter, the temperature was always at 40° below zero, so everything and everywhere was frozen.

At 7:15 in the morning of that day, In Ottawa, the captial of Canada, there was a telephone ringing in the premier's mansion. When Pierre Trudeau, the Premier of Canada, answered the phone, he recognized that at the other end , the President of the United States, Jimmy Carter was speaking. Carter, based on the reports sent to him from the Space Defence Center of the North American Air Defence Command, knew that the Russian satellite had crashed within the territory of Canada, so he specially made the phone call to inform Trudeau and suggested that he could send American military technical personnel to help to locate the wreckage. At the time of



Carter's calling, Trudeau had not yet received any report from his own country.

As soon as reports from those who had witnessed the event reached Ottawa and the news of a satellite crashing proved true, a team named "Operation Morning Light" was organized and the activities of searching for wreckage started immediately.

#### The Discovery of an Ailing Spy Satellite

Before going into details of searching for the wreckage of the satellite, we would like to see briefly how the event had happened.

In Colorado of the United States, there is a Cheyenne Mountain, which was formed of pink granite. Beneath about half a mile of the granite mountain, is the headquarters of the North American Air Defence<sup>S</sup> Command that is responsible for commanding activities of American air defence<sup>S</sup>. In that isolated underground castle, there is a room, the area of which is ten square meters. In this room, there are control stands and each holds a television screen. On the walls, there are large display boards. This underground room painted with light green colour is the Space Defence<sup>S</sup> Center of the North American Air Defence Command. Every piece of the equipment here works twenty-four hours a day to monitor the activities in the space around the earth. It is the heart of American space tracking activities.

On September 18 of last year, in this underground center, the blue uniformed air force technicians discovered a new spy satellite which had

been sent into space from a launching site in Russia. This new satellite was Cosmos 954.

How did they discover the satellite? In order to monitoring the activities at the Soviet launching sites of Tyuratam, Kapustin Yar and Plesetsk, the United States has developed a system of premonition satellite and set up eavesdropping devices around the Soviets. These devices use radio, radar and sonar by way of measuring the changes of seismic disturbance as well as atmospheric pressure to detect the launching of Soviet carrying rocket. When a satellite is being sent into orbit by a carrying rocket, the surveillance system of the North American Air Defence<sup>S</sup> Command, which constitutes a network containing 30 stations around the world, begins to use radar and photo-tracking equipment to monitor the activities of the satellite. The data collected from the monitoring are then sent to be analyzed by an electronic computer in the Space Defence<sup>S</sup> Center. As a result, the orbit parameter of the satellite can be known. The precision of these monitoring activities can reach a degree that can only be counted by second.

What kind of satellite is this Cosmos 954? It has been under American surveillance. And what can its function be? Through a comparison of its orbit with those of the previous Soviet satellites, whose identity and function have been known, it has been determined by the technicians and analysts in the North American Air Defence<sup>S</sup> Command that this is an ocean monitoring satellite. It carries a small nuclear reactor as source to supply power to their ocean reconnoitering radar. The life span of this kind of satellite is usually no more than 70 days. When it becomes dead, the nuclear reactor it carries will be separated from it and fired into a higher orbit, so that



the nuclear power cell will have no danger of falling on earth and producing radioactive hazard when the satellite is burned at the time of its re-entry into the atmosphere. In this case, the reactor is supposed to be fired from the orbit of this ocean monitoring satellite about 200 kilometers high above into a higher altitude of about 1,000 kilometres, where the reactor can remain for several hundreds to more than one thousand years. The rest parts of the satellite will be soon burned when they re-enter into atmosphere.

By the early December, when this Soviet satellite had completed its reconnaissance mission, it should be separated from the reactor it was carrying, but it failed to do so. Then the Americans, who had been monitoring its activities, soon recognized that the satellite had developed some trouble. By the middle December, the ailing Cosmos 954 carrying its nuclear reactor began slowly to descend from its normal orbit and, after each orbiting, it lowered its altitude somewhat. Evidently, before long it would fall back into atmosphere and be burned. On December 18, the North American Air Defence<sup>S</sup> Command reported the possibility of falling back to earth of this Soviet satellite to the White House, the Pentagon and CIA.

On January 12, Zbigniew Brzezinski, the White House National Security Advisor, summoned Anatoly Dobrynin, the Soviet ambassador to the United States, to the White House and told him that according to the analysis of an American electronic computer, a Soviet satellite could possibly fall at one region in the continent of North America. In order to be able to make adequate preparation for the impending crisis, the United States would like to ask the Soviet government to give an explanation of what kind of dangerous objects this satellite was carrying with it. Dobrynin himself was

once an areodyamist in Soviet, and certainly he knew the seriousness of the event. He promised to give answers after he had consulted with his government. One day later, the Soviet ambassador's answer came and it was an "ambiguous guarantee" without giving any details of the satellite nor any definite explanation. The United States, two times through telephone, asked the Soviets for more details, and on January 17, Brzezinski once again summoned the Soviet ambassador and asked him whether or not the nuclear fuel in this satellite would explode like an atomic bomb when the satellite re-entered into atmosphere and crashed on earth. The ambassador assured him and said, "It is not a nuclear bomb and it will not explode."

Nevertheless, The US government ordered to organize an emergency team, which was composed of those from the US air force, who had had the training of preventing nuclear pollution and able to measure radiation levels, and some other well experienced nuclear technological experts. The emergency team was ordered to be ready at any time to go to the spot where such an incident had taken place. In regard to the impending crash of a Soviet satellite, the United States also noticed the governments of the 14 nations of NATO, Japan, Australia and New Zealand.

In the afternoon of January 23, this ailing spy satellite was approaching to its end of life. The display board in an American underground tracking center indicated that Cosmos 954 had passed through the sky over the desert of Australia, and then from northeast it flew over the Pacific Ocean and re-entered into atmosphere over the Queen Charlotte Island of Canada. No doubt, it would be crashed somewhere in Canada. In the very early morning of January 24, the White House National Security Advisor was waked up and was





Beneath the granite mountain, the underground tracking center of the North American Air Defence Command is monitoring the Soviet spy satellite orbiting the earth

told that the Soviet satellite was finally crashed.

#### The Satellite Mission: Spotting Submarines

The search for radiative debris was quickly put into action. More than one hundred nuclear scientists and technicians and the emergency team were sent to the area where the satellite crash had taken place. The United States also dispatched high flying U-2 reconnaissance jet and WC-135 weather observation plane equipped with radiation detecting instrument to investigate the radiant clouds in the upper atmosphere over that area. The C-130 planes of Canada crisscrossed in the sky over this desolated area day and night. Each plane was equipped with two radiant cloud investigators, each of which weighted 600 kg, to search for radiative debris on the ground. One search team of 22 people, each of them wore heavy anti-radiation clothes and mask, was sent from Edmonton to Yellowknife. They carried Geiger counters with them to investigate the area near by the Great Slave Lake and to see if there was any phenomenon of radiative pollution. One American military experts team of 44 people were sent from two air bases in the United States to the area to help



to locate the wreckage. The Soviets also proposed<sup>85</sup> to both the United States and Canada that they were as well interested in taking part in the searching activities, but the proposal was politely rejected.

Why the United States, Canada and the Soviets were so much interested in locating the wreckage? The reasons were numerous. For one thing, they all wanted to prevent the radiative debris from harming the inhabitants of the area, so they must try their best to clear the ruins away. Although this Northwest Territory of Canada was sparsely populated, there were Eskimos, who led their nomadic life here and they might be harmed by the radiative debris left in the wilderness. However, the most important reason for such a quick and serious search was military. The Cosmos 954 was a unique satellite. Its length was 14 meters and it weighed 5 tons. It was equipped with ocean scanning radar of high recognition ability. It monitored the vast ocean by using a parabola antenna. The data it collected could be through a radio emitter sent to a ground station in the Soviets. The Russians continuously tried to improve the ability of this kind of satellite so as to monitor the activities of ships in the ocean, and they hoped especially to use it to track the US submarines in deep seas. By speculation, one method the Russian used was to develop a radar, which would be able to sense the changes of life habit of the plankton on the surface of the sea. Such changes were mostly caused by the movement of deep-sea submarine. So when there was a change of the life habit of the plankton, there could be the movement of a US submarine. Thus the US submarines could be tracked. This kind of ocean scanning radar of high recognition ability needed greater power, so the Russians chose to use nuclear reactor as source to supply power to the radar.

The crash of this Soviet satellite was indeed an unexpected opportunity for the intelligent organizations of the United States and its allies in the Western World. Of course, the American as well as the Canadian military technical experts hoped that they could begin to know more about the Russian's ocean monitoring techniques and how well they had developed through analysis of the wreckage of this satellite.

What was the result of the search? On April 4, Barnett Danson, the Minister of National Defence of Canada, announced that Canada had spent six million dollars and a period of more than two months in search for the wreckage of the Soviet spy satellite, which had fallen within the territory of Canada, and the search had been concluded. What they had collected was a basketful of scattered radiative metal fragments. He further stated that those fragments were sufficient legal proofs for Canada to ask the Soviets to compensate the damage in Canada by the radiative debris of the crashed Soviet satellite. But there could be no way to compensate the damage to the health of the people who had long lived here. The Ministry of Foreign Affairs of Canada had notified the Soviets that Canada would soon send a list of the expenses for the searching activities and the environmental damages cause by radiation.

#### Danger Remaining

The climax of the drama of Soviet satellite crash was over. But the event once again made peoples over the world aware of the fact that the armament race between the two superpowers of the United States and the

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Soviets could bring threat and disasters to the life of common people. Some experts had pointed out that it was completely lucky that this nuclear powered satellite crashed in a desolated area. Should that satellite make one more cycle in space, its crash would take place in the densely populated New York, and the time would<sup>be</sup> the rush hours in the morning.

The Time magazine in the United States pointed out that the nuclear reactor carried by Cosmos 954 contained 49kg of highly enriched uranium, and its power would be equivalent to hundred-thousand tons of T.N.T. It would be five times larger than that atom bomb dropped to Hiroshima of Japan before the end of World War II. Even if it would not explode when it re-entered into atmosphere, if the total radiation reached New York, the destructive area would be more than six acres. The magazine continued to say that Cosmos 954, in fact, had gasified uranium 235 and other particles during the process of its falling, and the gasified uranium and other particles already formed a layer of radiant cloud in the upper atmosphere, which stretched to a length of 40 kilometers, and floated eastward.

Aviation and Cosmos, a journal in France, said that the uranium 235 reactor in Cosmos 954 weighted 508kg. Its overall diameter was 2.28m. and the center diameter was 0.6m. Its fuel was uranium dicarbonide, which was weighted 49 kg. Its working temperature was 1,170°C. It used 2% efficiency of silicon-germanium thermoelectric couple to transform thermal energy of 40 kilowatt into electrical energy, which could provide a power of 500-800 watt.

This French journal also reported that it was no longer new that a

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satellite or its fragments re-entered into atmosphere and fell on earth. It often took place without anyone knowing it. Once a resident in Chicago found one piece of wreckage of a Soviet satellite weighted about ten kilograms. The fragments of Soviet Cosmos also once dropped somewhere in Finland. In 1969, a Japanese seaman was injured by a fragment of a Soviet satellite on a Japanese cargo ship in the sea.

This incident of small nuclear powered space vehicle crash in Canada was not the first time. In 1969, two Soviet moon investigators equipped with nuclear reactor were burned and spread radiation when they re-entered into atmosphere. In 1973, one Soviet nuclear powered satellite crashed in the Pacific Ocean north of Japan. In 1974, one satellite of US navy equipped with nuclear reactor failed and was burned in the sky over Indian Ocean and its radiation spread all over the world. In 1968, the Pu 238 nuclear fuel box of a US weather satellite fell into St. Barbara straits and it was recovered completely. In 1970, the Pu 238 fuel box of US Apollo 13 dropped into the Pacific Ocean about 7,000-8,000m deep when the vehicle tried to return to earth due to some trouble. It has not yet been recovered till today.

The space accidents of the United States and the Soviets have caused disturbance and protest throughout the world. Once people from Canada staged a demonstration before a Russian consulate to protest against their satellite crash.

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