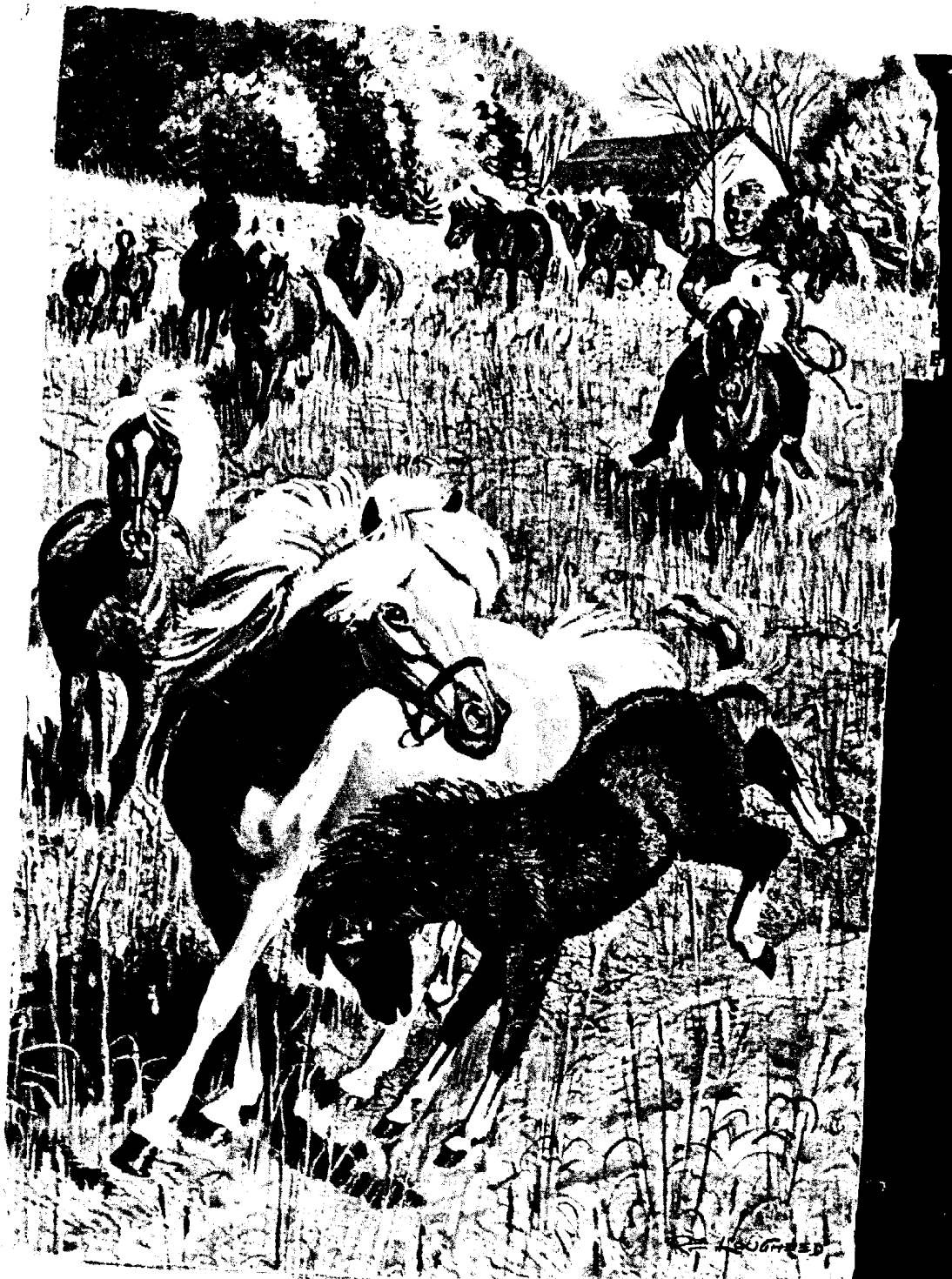

THE CASE OF THE MISSING H-BOMB

One of the most fascinating—and frustrating—detective stories of the nuclear age

Roving Editor, The Reader's Digest

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Reader's Digest, Sept. 1966

THE CASE OF THE MISSING H-BOMB

It was at once a great tragedy and a great mystery, and perhaps it was a miracle of sorts. It happened on the feast day of San Anton de Abad, patron saint of Villaricos, a poor and ancient fishing village tucked into the most remote corner of southeastern Spain. There were many witnesses, because for years the fishermen of Villaricos and the farmers of nearby Palomares had noted the spectacle of the great aircraft refueling each morning in the clear skies above. To the villagers the event had become as routine as the church bell that called them to Mass. But at 10:22 a.m. last January 17, the routine was broken: two U.S. Strategic Air Command (SAC) aircraft, a B-52 bomber and a KC-135 jet tanker, collided at 31,000 feet while attempting their refueling connection.

There was a thunderous explosion, so loud that many who did not ordinarily watch the daily ritual ran out from their homes, six miles below, to see what had happened. They saw the bomber, which had moved in directly behind and beneath the tanker, begin to break up; then it disappeared into a huge, burgeoning cloud of smoke and fire. The tanker seemed to rock ahead for a moment before it, too, began disintegrating. Some 200 tons of aircraft debris, much of it wrapped in flame, scattered across the morning sky and fell toward the horror-struck observers below.

Julio Ponce Navarro, a short, wiry, early-middle-aged farmer, had been irrigating the lemon grove by his house at the western edge of Palomares. He looked up from his work just in time to see the tremendous explosion, then stood transfixed. The wind was sweeping great balls of fire down the sky—they were heading *straight toward him!*

Frantically, he looked for his wife, María, found her watering her luxury of red geraniums on the south side of the house. She had heard the explosion, but the building had blocked her view and she could not see what was happening. Pointing to the sky, Julio shouted, "There is fire coming down! Come on!" He grabbed María's hand, and they ran away from the house. Julio looked back. One huge fire seemed certain to land on his roof, but at the last moment it passed low over it and crashed onto a narrow dirt road 30 yards beyond.

A thick pillar of smoke swirled up from the wreckage. Running to it, Julio and María found three men strapped to their seats in a portion of the tanker aircraft's cockpit. Two could not be helped; they obviously were dead. But the third, although unconscious, was moving, groaning

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feebly. Julio and María tried to get at him, but the fire was too intense. They began scooping up dirt and throwing it onto the flames. Then, after several minutes, Julio motioned to María to stop. The man had died. Sweat-drenched, covered with dirt, the husband and wife crossed themselves and bowed their heads.

Farmer Antonio Sabiote García, working his field in a wide valley near the northern edge of Palomares, also saw the collision. Dumbfounded, he watched thousands of tiny fires streaming down. Then an enormous scythe of flame hurtled toward him. As he fled, he heard a rending crash. A great wave of heat slammed against his back, washed over and past him. Uninjured, but terrified, he looked back and saw the wing and four engines of a B-52 burning.

Near the center of the village, monumental disaster came even closer. Concentrating on their lessons in their clean, bright schoolhouse, 51 young students and their teacher, José Molinero, heard but did not see the giant B-52 landing-gear assembly crash into the ground little more than 30 yards from them.

Multicolored parachutes had blossomed in the sky. The panels of some were alternately a bright orange-red and white; others were gray; a few supported men; clusters of others held unidentifiable objects, some of which were drifting seaward. One parachute landed hard in the field of José Toledo Alarcón. It held a large object with a man strapped tightly in it. On impact, the object toppled forward and the man lay still, face down. A woman cried, "He's dead! He's dead!"

"How do you know he's dead?" José shouted, angrily. "Maybe there is something we can do!"

Reaching the airman, José gently turned him over. He was not dead, but badly injured and in great pain. This was Maj. Ivens Buchanan, 34, a veteran of 16 years in the Air Force, radar-navigator in the B-52. When he hit his ejection trigger, a hatch blew away from the bomber's underside and Buchanan was shot downward, through the searing fireball of the explosion. He got clear of the fireball, but was unable to free himself from the ejection seat. Tumbling through the sky, he somehow fought his chute out from between his back and the seat and got it open. But the added weight of the seat, some 200 pounds, brought him down much too rapidly. He suffered a ruptured vertebra. Also, he was burned and deeply gashed over his left eye, and was going into shock. In a weak voice he kept saying, "I am very cold."

José tried to soothe him. Then, with the help of two other men, he got Buchanan into a pickup truck and on his way to a nearby clinic.

In the air, seven young, highly trained men had died: the entire crew of the tanker and three men from the bomber. Somehow three men besides Buchanan had been able to get out of the B-52 alive. And, miraculously, despite the storm of fiery steel raining earthward, not a

soul on the ground was injured, not an animal or building hit.

But not everything falling out of the sky was debris or men. At the eastern edge of Palomares, an object smashed against a stone retaining wall in a tomato terrace some 75 yards from the house of Eduardo Navarro Portillo. There was a jarring explosion. Part of the wall—and hundreds of tomatoes—were damaged, and every window in Navarro's house was blown out. Running to the terrace, Eduardo and some others found the object burning. They kicked it and threw dirt onto it, and eventually the fire went out. Eduardo did not know that what he and his friends were kicking was a hydrogen bomb.

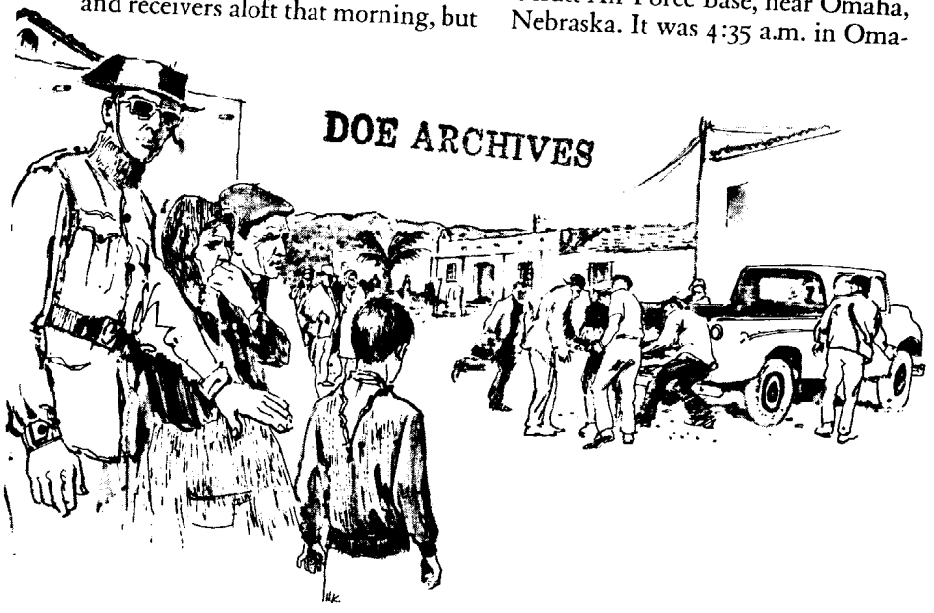
"Broken Arrow in Spain!"

THERE WERE two sets of tankers and receivers aloft that morning, but the other pair had not completed their connection. Immediately following the explosion, the second tanker radioed SAC flight controllers at Morón Air Force Base, near Seville: "A B-52 is on fire and spinning down!"

Instantly, word was flashed to Maj. Gen. Delmar E. Wilson, commander of the 16th Air Force, whose headquarters were at Torrejón Air Force Base, a few miles east of Madrid. Knowing that a refueling rendezvous was involved, Wilson surmised that there had been a two-aircraft accident. He asked the calling tanker, "What about the KC-135?"

Moments later came the reply: "We are unable to make contact."

At once Wilson put through a hotline call to SAC headquarters at Offutt Air Force Base, near Omaha, Nebraska. It was 4:35 a.m. in Oma-



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ha. Connected with the bedside phone of Maj. Gen. Charles Eisenhart, SAC's chief of staff, Wilson reported: *"Broken Arrow in southeastern Spain!"*

The code words "Broken Arrow" meant "Nuclear Accident."

Eisenhart responded by instructing Wilson to ask for whatever talent and equipment he needed; they would be delivered on the double. Four H-bombs had been aboard the B-52. They had to be retrieved—fast.

Next, Wilson briefed his Disaster Control Team—43 officers and enlisted men who had been specially trained to handle accidents. They were doctors, experts in operations and maintenance, communications, explosive-ordnance disposal. All boarded planes and headed south to the scene of the collision.

In the two decades since the development of nuclear weapons the United States had suffered 11 Broken Arrows, but never before one in foreign territory. The very thought of such an accident had long chilled the marrow of U.S. diplomatic and military leaders. In Madrid, Maj. Gen. Stanley J. Donovan, chief of the Joint U.S. Military Group and Military Assistance Advisory Group to Spain, knew that the accident was fraught with profound political implications. The fallen bomber had been a member of the Alert Force, that portion of the SAC fleet which stays constantly airborne, ready to move against assigned targets should the United States or any of its allies come under nuclear attack. The communists, therefore, could be expected to seize on the incident to whip up anti-American frenzy. So Donovan's first call was to U.S. Ambassador Angier Biddle Duke, who set out at once to see the Spanish foreign minister. It was imperative that the Spanish government be told immediately. Spain was a staunch friend, had willingly supplied the United States with strategic air bases and overflight rights, and had offered its naval facilities at Rota on the southwest coast as a Polaris submarine base when the United States needed it for Mediterranean operations, and had been turned away by other Mediterranean countries.

Meanwhile, other worried men were fast coming to grips with a situation without parallel in the nuclear age. Quickest recovery of the four missing bombs would be accomplished by searchers who knew exactly what they were looking for—and each type of H-bomb in the Strike Force's inventory is unique, custom-tailored to its own mission. Each has a thermonuclear yield designed to deal with a specific target; each has timing and sensing devices which react to, for example, the increasing density of the atmosphere as it falls over the target area; each has its own arming, fusing and firing devices and techniques. So, from secret files of the Atomic Energy Commission and the Defense Atomic Support Agency, staffs began assembling the serial numbers

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of the component parts of each bomb and matching them with the names of the men who had designed them and supervised their fabrication.

At 7:27 a.m., U.S. Mountain Standard Time, an Air Force transport left Kirtland Air Force Base, near Albuquerque, N.M., for Torrejón. Aboard were the members of an Air Force Nuclear Accident Investigating Team. They would confer with General Wilson at the accident scene, and survey the countryside to determine what kinds of expertise and equipment were needed.

One thing that knowledgeable men did *not* have to worry about was a nuclear explosion. So foolproof are the safeguards built into the handling and use of America's nuclear weapons, and into the weapons themselves, that explosion could not possibly occur; a U.S. H-bomb cannot be fired except deliberately. This is the way the system works:

To explode, the nuclear materials in an H-bomb must first be tightly compressed. Compression is achieved by a measured quantity of high explosive like TNT, surrounding the nuclear core. The TNT must implode (explode inwardly) so as to apply perfectly uniform force around the entire periphery of the core. Should the explosive detonate even slightly unevenly—as a result, for example, of fire or the shock of impact—there can be no release of nuclear energy because there would be no uniform squeezing of the nuclear mass. In such a situation, the shock wave from the explosive would simply seek to escape out of the weapon. Perhaps it would break the casing and scatter radioactive materials, but the bomb itself could not go off.

Furthermore, a U.S. nuclear blast cannot be accomplished unless several trained men, all certified to be physically and mentally well by competent, painstaking medical authority, agree that a "Go to War" code, originating with the President, has been received. The code is programmed to come in voice, not through any device subject to misinterpretation or failure.

Only when a bomber is at last irrevocably committed do the men, each working controls from widely separated stations in the aircraft, begin the arming, fusing and firing procedures which must be followed by the numbers and to the letter if there is to be a nuclear explosion.

The safety of U.S. unarmed nuclear weapons has been thoroughly tested. In a rigorous, years-long program at various test sites, such weapons were subjected to experiments which simulated the shock of being dropped from great altitudes, blown up with high explosives, burned, dragged at high speeds over rough surfaces, smashed against concrete walls. The United States has tried hard, but has never been able to achieve an accidental nuclear blast.

Down at Sea

TRAWLING at sea five and a half miles off Villaricos, Bartolomé

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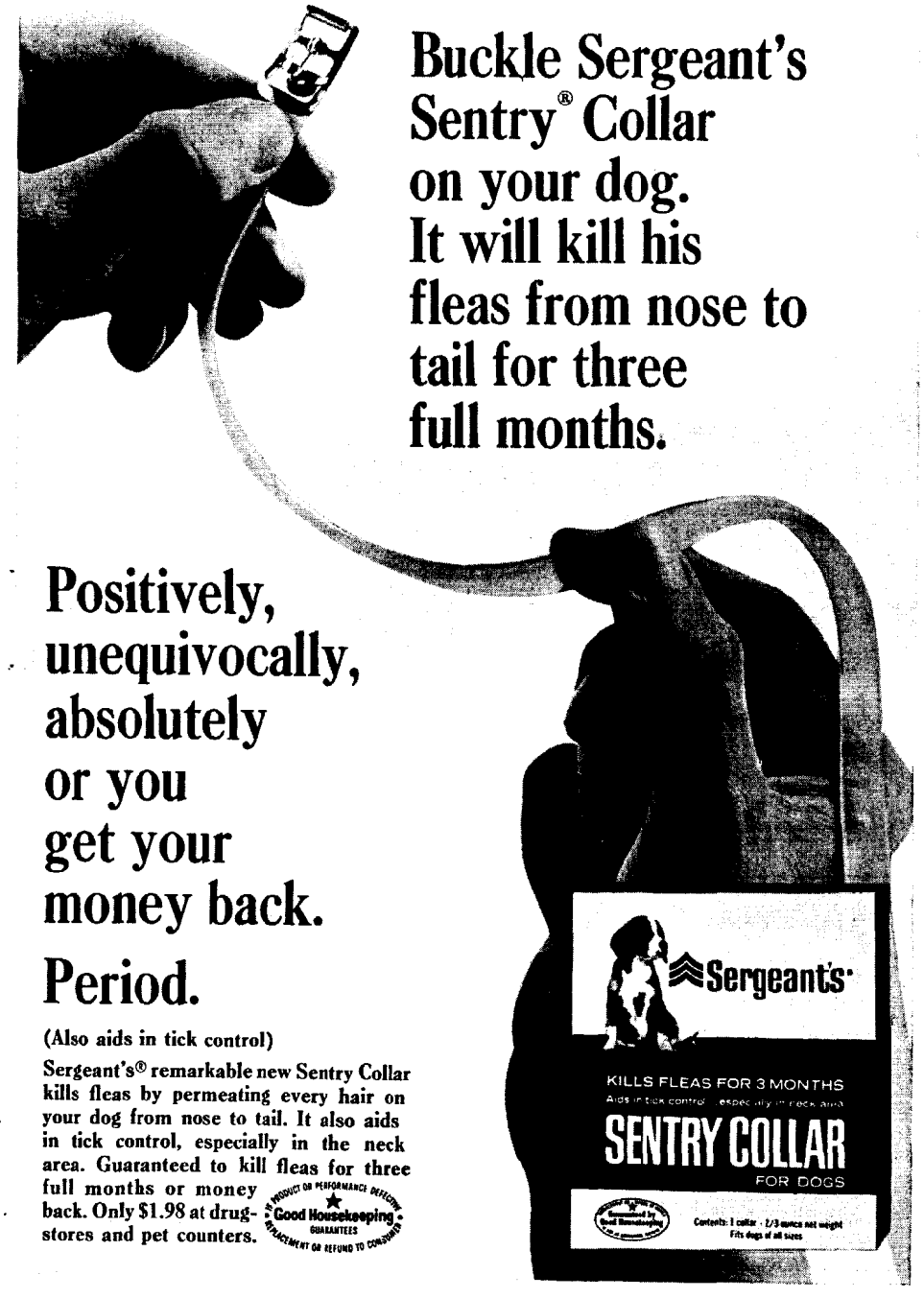


Roldán Martínez, master of the fishing smack *Dorita,* saw a number of parachutes headed for the water. "Pull in the nets!" he shouted to his crew.

Before they could comply, he pushed his diesel engine to full power, calculating that the nearest airman would land about a mile from him and hoping he could reach him before he went under. Bartolomé's six-man crew thought he was crazy. How could they pull in the heavy nets when he was traveling at top speed? "Pull them in!" Bartolomé roared. The nets were muscled in.

The offshore winds were strong—perhaps 40 knots—and the sea was rough. Reaching the spot where he thought the nearest airman had gone in, Bartolomé began circling over one high swell after another, his crew looking everywhere for the man. After several anxious minutes they found him and Bartolomé lifted him aboard. The survivor was Capt. Charles J. Wendorf, 30, commander of the B-52. Wendorf's left arm was broken.

Some 200 yards farther on, another parachute had fallen. The *Dorita* headed for it, and soon came upon another survivor. The crew heaved him a life-ring and dragged him aboard. The man was B-52 co-pilot Lt. Michael Rooney, 26. He was more than lucky to be alive. His ejection seat had failed to fire. Freeing himself, he had climbed down a ladder and fought his way along a catwalk in the burning, violently spinning bomber to the navigator's open ejection hatch. For desperate moments, the wind and wild maneuverings of the disintegrating bomber had kept him pinned against one side of the hatch. But at last he managed to dive through it and get his chute open. He had a long, deep cut across his buttocks. Bartolomé's crew stripped him, bandaged him, dressed him in dry clothes and bundled him into a half-dozen blankets.

Francisco Simo Orts, master of the *Manuela Orts Simo,* named for his mother, had been working two miles beyond the *Dorita.* He saw two parachutes in his area. One was drifting farther out, so he radioed his cousin Alfonso, on another boat, to go after it. In fact, Alfonso already had his craft running fast to seaward, and he picked up the survivor almost as quickly as he hit the water. This was Maj. Larry G. Messinger, 44, a SAC staff pilot who had been spelling Wendorf on the long mission. Messinger was uninjured.

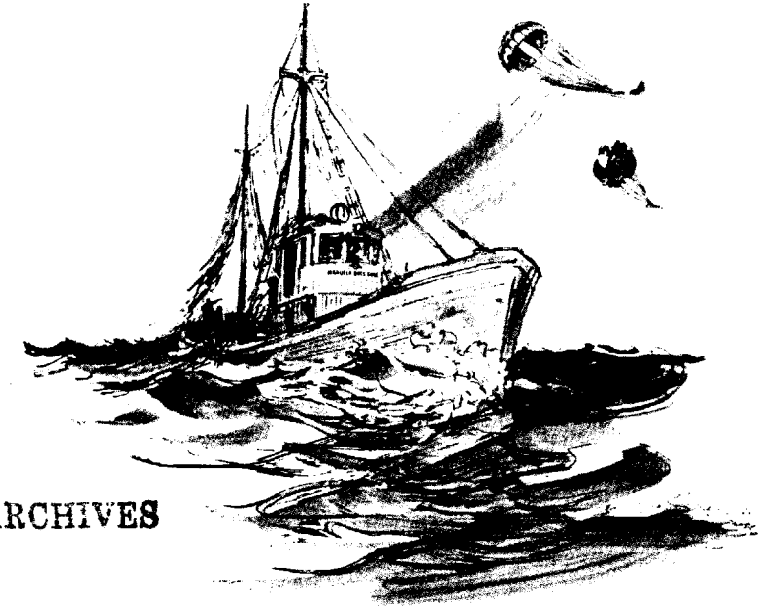
The chute that Francisco Simo Orts went for was coming down rapidly, and the object it held did not appear to be a man; it was some sort of cylinder, rigid and silvery. Simo saw it splash on the water, but when he reached the spot there was nothing there. Obviously it was important, since it had been attached to a parachute.

Mentally, Francisco Simo Orts drew bearing lines from peaks in the north and crossed them with lines from peaks in the west. This simple

act was later to make him world-famous.

On Hands and Knees

A CONTINGENT of the Guardia Civil (Spanish Rural Police) reached the road next to Julio Ponce Navarro's house 14 minutes after the mid-



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air explosion. A gathering crowd stood back in reverent silence as the young village priest, Father Francisco Navarrete Serrano, administered conditional absolution to the three dead airmen. When he finished, Guardia Civil Capt. Isidoro Calín Velasco sent some of his men for caskets. Then he enlisted the villagers' aid in searching the countryside.

Finding large pieces of wreckage was no problem. Black smoke was rising from beyond the low hills all around. Within a short distance were found the shattered cockpits of both aircraft; the tanker fuselage and tail were about 600 yards apart; the B-52 tail assembly lay a mile and a half to the east, in the long, dry bed of the Almanzora River, carried there by its drogue chute, normally used to help brake the aircraft during landing. But the aircraft had broken into additional thousands of smaller pieces, which had fallen around Villaricos and Palomares.

By midafternoon, all the larger wreckage had been roped off. The bodies of seven airmen had been placed in caskets and taken to a small, walled cemetery on a hill be-

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yond Julio Ponce Navarro's farm. They would be kept there until the Americans came to claim them. By now it was known that no one on the ground had been injured, and all agreed that San Anton de Abad had worked a miracle.

When General Wilson arrived at Palomares, he had to walk the two miles up to the cemetery—there was no driving it, for the road was choked with automobiles, trucks, bicycles, crowds of people. All were silent as the general opened the caskets to look at the remains. Then he thanked the priest and the Guardia, and asked that the caskets be taken to San Javier, to be flown to Torrejón and then home. While the caskets were being lifted onto a truck, a local official approached to ask permission to take the bodies first to the town hall. "The people would like to pay their respects," he explained. Wilson agreed, and followed the bodies to the little hall.

It was dark when he got back to Palomares. General Donovan had arrived from Madrid, and the two men and some senior staff officers went to the only lighted public place in the vicinity, a small, lantern-lit tavern, to make plans for recovering the missing weapons. Depending on whether any or all of their parachutes had opened, they could be spread out for miles in this rugged countryside. But an effective search could not be conducted in the dark. Helicopters would be brought in from Morón, and a ground and air search begun at first light.

A member of the Guardia Civil entered and said he had found what he thought was a bomb about 500 yards from the dry riverbed, near the sea, some 1300 yards from the B-52 tail. Ordnance men from the Disaster Control Team confirmed that this was a hydrogen bomb. It was entirely intact. Air Police were stationed around it until it could be crated and removed.

The find buoyed spirits. Most believed that all the weapons would be recovered quickly. The plane wreckage could be removed in a few days. It would be a routine cleanup job.

All were back at the riverbed site by dawn. With helicopters overhead, three search teams, including about 60 members of the Guardia Civil, spread out over a front a mile wide. They began walking from a line two miles north of Palomares toward a line four miles down the coast. It was rugged going. There were hundreds of acres of cultivated fields, most of them rich with ripening tomatoes on vines which climbed on thousands of small, teepee-shape trellises.

The search lines moved slowly. Every plant, and the ground beneath it, had to be examined. It was hard, hot, dirty, hands-and-knees work. Men sweated, ripped their fatigues, barked their shins, cursed—and moved on. There were fields of beans, alfalfa and wheat. There were dikes to be climbed, little hidden canals in which to get wet. A series of low, undulating hills sur-

(Continued on page 254)

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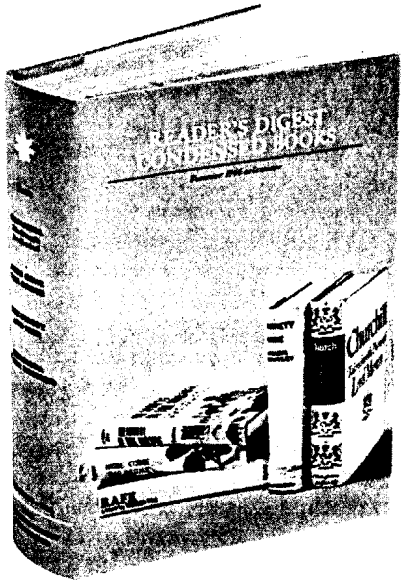

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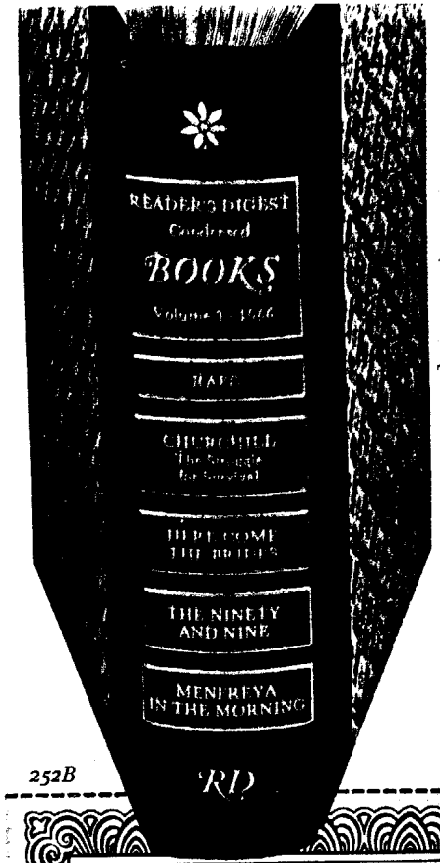

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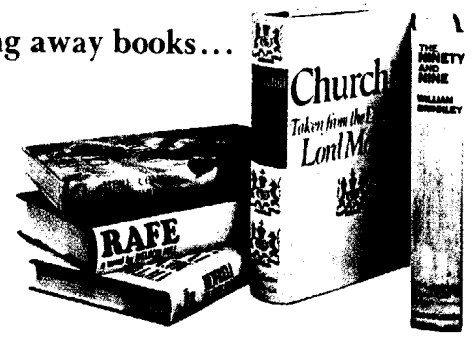

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rounded most of the town; utterly barren, they looked like the mountains of the moon. Clouds of choking dust rose as lines of searchers mounted these hills, plunging sticks deep into every slightest indentation that might be a bomb crater.

Within a few hours, a helicopter found a second H-bomb lying in a field beyond the cemetery; then a search team found a third, the one which had smashed down next to Eduardo Navarro Portillo's tomato terraces at the eastern end of the village. Difficult as it was, the search seemed destined for swift, complete success.

The Price of Vigilance

THERE WERE complications: the high explosives in two of the weapons had detonated on impact. Each weapon had split like an axed pumpkin. The nuclear cores had popped out and been vaporized by the conventional explosion.

To be sure, there had been no splitting of atoms, hence no release of nuclear energy, none of the lethal products which fall out of a nuclear blast. The materials which had scattered would emit alpha radiation. Unlike the highly penetrating, deadly gamma rays which spring from the nucleus of a split atom, the range of alpha rays is extremely short. They cannot penetrate skin or even tissue paper. Plutonium can safely be held in the hand in the form in which it is used in weapons. When exposed to air, plutonium forms an insoluble compound so that even if swallowed it would pass quickly through the system.

Plutonium contamination is also easy to deal with; it takes only a thorough scrubbing with water to wash it from the body and clothing. Plutonium on the ground can be plowed a few inches under the surface to dissipate any radiation reading at all, and its high insolubility prevents its being taken up in the roots of plants.

Nevertheless, U.S. atomic safety procedures were designed with an enormous margin for error. While the contamination on these lands could almost certainly do no damage, they were to be cleaned of all trace of it; *no* exposure was better than some exposure, no matter how harmless. Guardia Civil and Air Police were posted around the damaged-weapons sites with instructions to let no one enter.

There still remained one bomb to find when the bodies of the seven dead airmen were airlifted to Madrid on the night following the accident. In Palomares, General Wilson had time to reflect on the sad improbability of the accident: in-flight refueling had been routine for SAC for 15 years, and in accomplishing more than a million hookups since 1957 there had been only ten accidents. Indeed, there were no accidents at all in 1965, when SAC bombers were refueling somewhere in the world every six and a half minutes.

Such an accident was costly beyond calculating. This time it had taken the lives of seven brave and skilled men, all in the bloom of their years: Maj. Emil J. Chapla, 42, the KC-135 commander; Capt. Paul R. Lane, 31, his co-pilot; Capt. Leo E. Simmons, 28, his navigator; Lt. Stephen S. Montanus, 23, the B-52 navigator; Lt. George J. Glesner, 26, the B-52 electronic warfare officer; M/Sgt. Lloyd Potolicchio, 41, the KC-135 refueling-boom operator; and T/Sgt. Ronald P. Snyder, 28, the B-52 gunner. All left families. All had seen much Air Force service—in aggregate, more than 80 years. This valuable experience was lost forever to the nation.

Plotting the Unknowns

THAT afternoon, the search teams went foot by foot from west to east over the same ground they had covered from north to south in the morning. The fourth weapon was nowhere to be found.

By now Air Force accident investigators had interrogated dozens of witnesses. The Air Force Nuclear Accident Team from Albuquerque was combing their testimony. The most likely description of the missing weapon had been given by fisherman Francisco Simo Orts. If he was right, it was in deep water about five and a half miles at sea. But he might not be right; he was not qualified to recognize an H-bomb, and under the stress of excitement people often make mistakes.

The search went on. From Torrejón 175 more men came; from Morón, 130. At Wheelus Air Force Base, Libya, a 136,000-pound Air Force "Gray Eagle" kit, a tent city complete with field kitchens and sanitary equipment, was packed aboard big C-130 cargo aircraft. At American bases in France and Germany, more C-130's and C-124's took on communications trailers, a Signal Corps unit, an Army mine-detector company and a field laundry.

The Palomares-Villaricos region had been largely forgotten by mapmakers, so Air Force reconnaissance aircraft photographed completely an area 12 miles long and eight miles wide. By noon on January 19 a scaled aerial mosaic was delivered to Wilson. This was gridded into 1000-foot-square plots. As each plot was searched and each smallest piece of wreckage found, the location was marked on a plastic overlay.

The teams kept searching. The Albuquerque team and newly arrived technicians surveyed the area, studied the mosaic and, again, the witness interrogations. They began reconstructing the accident. There were a few known factors: the aircrafts' estimated ground speed at the time of the explosion had been 365 knots; they had been at 31,000 feet on a compass heading of 270 degrees (due west); at that altitude, there had been a 67-knot wind from the northwest; nearer the ground the winds blew at about 35 knots.

But there were even more unknowns. At exactly what point in the sky had the accident occurred? How much time elapsed before the

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weapons left the aircraft? Did they tumble as they fell? Did the parachutes on all weapons open fully, or did some of them stream, burn or fail to open at all? If any chutes did open, how far and in which direction would such winds carry such loads? If chutes failed to open, what ballistic trajectory would a weapon of this size, shape and weight follow, and where on earth or in the sea would it land? To these and myriad other questions there could be no precise answers. But every possibility would have to be examined.

Computing machines in Washington, at Wright-Patterson Air Force Base in Ohio, at Eglin Air Force Base in Florida, at Los Alamos, at Sandia Laboratory in Albuquerque, at the Naval Station in San Diego, Calif., and at the Boeing Aircraft Co. in Seattle, where the bomber had been manufactured, went to work. From the sites at which the three weapons had been found, ballistic and aerodynamic trajectories were plotted back into the sky in an effort to locate the precise point of collision. From this point, hypothetical ballistic and aerodynamic trajectories for the still missing weapon were plotted downward. Depending on whether a chute had opened partially or fully or had burned or had not opened at all, the bomb could be far inland or miles at sea. The search broadened.

Cleanup Squad

MEANWHILE, decontamination got under way. On January 19, the first officials from Spain's Bureau of Nuclear Energy (JEN) arrived in Palomares. Eventually 23 of them under Prof. Eduardo Ramos Rodríguez joined 28 U.S. Air Force men who had come from bases throughout Europe and as far distant as Omaha, specialists in radioactivity detection. They pulled on white coveralls, surgical caps, work gloves over surgical gloves and heavy boots—their standard work clothing. Col. Alton E. White, director of engineering for the 16th Air Force, showed them the two sites of the high-explosives detonations.

Donning face masks, the specialists established a circle of examination around each crater, then drew lines out from the circle every 15 degrees. Two-man teams—a JEN member and an Air Force specialist—worked along each line. Each team carried an alpha-ray counter, a shoebox-size device with an indicator on top, attached by a short cable to a flat sensing surface. Holding the sensing surface flush against the ground, one man would take a reading and show it to his colleague, who would note it down. Then they walked exactly 12 feet and took another reading. They kept on in this fashion until the counter showed no radiation. At that point, they planted a stake flying a red streamer. A line of zero contamination was drawn from stake to stake. The area within would be cleaned.

It was slow, back-straining work, stooping through fields thick with crops, through gullies and steep ra-

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vines, up and down precipitous hills and over houses, six of which were ordered thoroughly hosed and whitewashed. Complicating matters, high winds spread the contaminated dust farther and farther. To keep dust down, 16 water trucks spread 125,000 gallons daily.

Working as fast and carefully as possible, a man could read about an acre in a dawn-to-dark day. It was to take nearly three weeks to define the contaminated area, a rough rectangle three fourths of a mile wide and more than two miles long. Within it there were 385 cultivated acres on 854 separate plots of land owned by 854 different people.

The decontamination was to exceed by far the most stringent safety standards set by both the United States and Spain. To eliminate all possibility of ill-intentioned people coming into the region, collecting samples of contaminated soil and, no matter how harmless, making propaganda capital of it, every grain of even the most slightly radioactive soil was to be scraped from the countryside and transported to the atomic-waste burial ground near Aiken, S.C. The crops also would be taken, and the owners paid for them. The food was safely edible; it needed only to be washed. The on-scene military forces were to eat a large proportion of these crops.

News Blackout

THE United States immediately announced that there had been a crash, and on January 20 stated

that the bomber had been carrying unarmed nuclear weapons, and that radiological surveys showed the region was in no danger. No mention was made that a bomb was missing; it would be folly to advertise that secret parts might be lying about, and, hopefully, the weapon soon would be recovered. There, for all practical purposes, the flow of news stopped. Both the U.S. and Spanish governments were alarmed at the possible economic consequences if the incident were given wide publicity. Would the rest of Europe, even Spain, continue to buy the fruits and vegetables grown in Palomares and the fish caught off Villaricos? What would happen to Spain's most lucrative business, tourism—valued at $1.15 billion in 1965? The policy of secrecy sharpened reporters' interest. But Spain would not talk, and the United States was bound to honor its ally's wishes.

The area calculated to be the most probable site of the missing weapon was a circle more than two miles in diameter. Patchworked with farmland, it also contained arid hills honeycombed with entryways and airshafts to old, abandoned mines. One day more than 300 men lined up fingertip to fingertip and began moving slowly across this terrain. At each slightly suspicious depression in the ground, each crater, each well and mineshaft, they planted stakes with red streamers. There were nearly 400 such features. Helicopters then landed ordnance men

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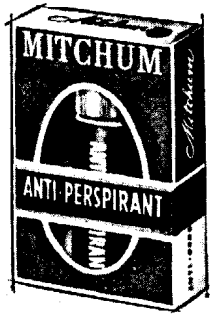

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rived, Navy divers recovered two B-52 ejection seats.

Guest's unit, designated Task Force 65, swelled with the addition of Capt. Horace "Cliff" Page, who acted as the admiral's chief of staff; Comdr. Roy M. Springer, a submariner; Lt. Comdr. J. B. Mooney, who in August 1964 piloted *Trieste,* the Navy's deep-diving bathyscaphe, to a depth of 8400 feet in the Atlantic and found a major portion of the lost submarine *Thresher.* Lt. Comdr. DeWitt Moody, a scuba and deep-sea diver, and a knowledgeable man in nuclear weaponry, came to head a team of 130 frogmen and divers, gathered from the Atlantic and Mediterranean fleets.

A fantastic array of equipment also funneled in. From the Philadelphia Naval Shipyard came the Navy's research ship *Mizar.* Equipped with an underwater still camera, fitted with its own powerful light sources to penetrate the black depths, the ship began delivering daylight-clear pictures of sunken aircraft debris—as well as beer cans and old tires. The camera, mounted on a sled, was towed near the bottom. On board, computers determined the exact position of the sled at any moment, while the recovered film showed the time the photograph was taken. By coördinating the two, a photo-mosaic of the sea bottom was constructed.

A Navy oceanographic ship, *Dutton,* read the contours of the search-zone bottom, and soon Guest had a plaster cast of the ocean floor. It was frightening. The sea bottom was a replica of the rugged terrain behind Palomares, and in the southeast of the search area there was a submarine canyon which plunged precipitously down, eventually to a depth of 9000 feet. This was an area of steep slopes and gullies.

On the basis of sonar sweeps and the debris pattern, Guest reduced the primary search zone to 27.33 square miles. Francisco Simo boarded a minesweeper and directed the admiral to what he said was the exact spot the weapon had gone in. Marking this on a chart, Guest drew around it a circle with a one-mile radius. This was "Alfa 1"—the area of highest probability. Closer to shore was "Alfa 2," where much debris had been found and where the weapon could have landed if the chute had not deployed fully. Areas "Bravo" and "Charlie" were calculated trajectory end points if, during the collision, the weapon had come apart.

The sea-search plan was then organized by depths. Down to 80 feet would be searched visually by frogmen. From 80 to 130 feet would be searched by frogmen, minesweepers and electronic Sonar Scanners sent by Honeywell, Inc.

From 130 to 200 feet, swimmers worked out of the Navy's Sealab II, a 57-foot-long cylinder equipped with laboratory space, a galley and bunks. They were assisted by minesweepers and other ships equipped with sonar and underwater television, as well as Ocean Bottom

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who began an arduous task: they went with lights into each old mine, climbed down every well.

It took nearly seven hours for the search line to complete a single north-to-south sweep. Then they searched again, from west to east. The area was to be searched eight times, each time more intensively than the last. The suspicion waxed stronger that the fisherman, Simo, had indeed seen the weapon fall into the sea.

Underwater Detectives

On January 22, five days after the collision, the Navy turned to the Oceanographic Institute in Woods Hole, Mass., and asked Dr. Earl Hays, director of deep-submergence research, if the Institute's deep submersible, *Alvin*, could help search for the lost H-bomb. *Alvin*, named for her chief proponent, Dr. Allyn Vine, is an experimental vessel, 22 feet long, which had been as deep as 7500 feet.

The boat was not designed for recovery work. Even if the heavy weapon were found, *Alvin* could not lift it. Indeed, no one was sure that any existing device *could* lift it; nothing had ever been recovered from such depths—they were in excess of 2000 feet. Hays, Dr. Paul Fye, director of Woods Hole, and *Alvin's* three pilots, William O. Rainnie, Valentine Wilson and Marvin McCamis, decided *Alvin* should go. The missing weapon had to be found, and *Alvin* had to do what she could.

On January 23, Rear Adm. William S. Guest, deputy commander of Naval Striking and Support Forces, Southern Europe, took charge of the sea portion of the search-and-recovery operations. The next day he arrived at Palomares and made a helicopter reconnaissance, studying the debris pattern from various altitudes, over land and over sea. Later he would delineate a search area of 120 square miles.

Four minesweepers already were at work, plotting sea-bottom contacts with sonar and underwater mine-detection gear. Each contact was to be examined by either divers or submersibles. The primary target was the bomb, but anything deemed important to the accident investigation was to be lifted. The day Guest ar-

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Scanners (mechanisms which move above the ocean floor locating small objects up to 200 feet away), plus the Perry *Cubmarine,* a two-man submersible sent by Ocean Systems, Inc.

At the depth of 200 to 380 feet, helmeted divers worked with the above equipment. All depths beyond were worked by men in submersibles, using the side scanner and *Mizar's* special sonar. The *Cubmarine* went to 600 feet. Below that, searchers used *Alvin* and another deep submersible, *Aluminaut,* owned by Reynolds International, Inc. *Aluminaut,* 75 tons and 51 feet long, was designed to operate as far down as 15,000 feet. It was fitted with underwater telephones, sonar, underwater searchlights and two TV cameras.

An H-bomb's casing is made of special metals. Since nobody had ever searched the sea for one, there could be no certainty that the weapon would reflect sonar probes. Ocean Systems' Ray Pitts and Jon Lindbergh, the deep-sea-expert son of Col. Charles A. Lindbergh, made a mock weapon with a casing like that of the real bomb. Sonar could detect it at a depth of 250 feet, but the test brought out dramatically the difficulty of distinguishing the bomb from a vast number of rocks.

But despite all the proved talent and marvelous equipment, Guest found himself developing a fearsome analogy: the undersea search would be like going into steep, dark hills inland on a moonless night, covering one eye, looking with the other through a long, hollow tube, and with a pencil flashlight hunting for something like a can of soup.

High Morale—And Low

General Wilson's search ashore went on, over the same ground, again and again. An 80-tent city, called Camp Wilson, was set up on the beach, and at night the 700-odd men now involved in the hunt were strictly confined to it. The only thing young men could do in the nearby villages was drink, and the United States had a big enough incident on its hands—it couldn't afford another.

Despite this, General Wilson had never seen morale so high. The field cooks had vowed to try to win the 1966 Hennessy Trophy, awarded annually to the mess hall which serves the best meals in the U.S. Air Force. Someone had bought out the local supply of black berets, worn by some male residents of the region; to these were affixed shield-shape emblems, featuring General Wilson's two stars, mountains, a teepee for Camp Wilson and, stretching across the entire scene, a long, broken arrow.

Suddenly, each 25-man search team had a name emblazoned on a homemade pennant: "Meredith's Marauders"; "Wesson's Warriors"; "Hopper's Stompers." At evening formations men were summoned front and center to be decorated. One, who had found the boom noz-

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zle of the crashed tanker, received "The Order of the Optics" medal—an overcoat button with a big eye painted on it. Another, whose conversation with farmers had led to the discovery of other important debris, won the "Friendship Award," clasped hands painted on a tin-can top. Wilson knew that when the mission was completed there would be ample reason for plenty of real citations.

In the villages, morale was lower. With every effort bent to the search, no one had thought to explain things to the residents. While the military worked, uncommunicative Guardia Civil members and American airmen barred farmers from their fields, which were ready for harvesting. To prevent accidents, the U.S. and Spanish navies barred fishermen from their fishing grounds. The men in the white suits, face masks and gloves were everywhere with their instruments. Sticks with red pennants—surely a sign of danger—were being planted in the fields. Then officials of Spain's Bureau of Nuclear Energy invited the people to Palomares, where everyone was checked with instruments, asked to give urine specimens, told to bathe, launder his clothing and try not to breathe too much dust.

Idle men gathered to worry in the tavern and plaza. They listened to their radios. The national station's calm assurances that all was well could not completely counteract Radio España Independiente (REI), a Spanish-language communist broadcast beamed into Spain from Prague, Czechoslovakia.

REI said that the Spanish people were victims of a great catastrophe, that the American "nuclear devices" had painted their fields and fishing grounds with deadly radioactivity. It spoke of deformed babies.

A ripple of fear began turning into a wave. Some went home, burned their clothing and bathed incessantly. Some sent children to live with relatives in distant towns. Many thought of moving away for good, but wondered if it was too late.

Had the *radioactividad,* which they could not see, hear, feel or smell, infected them? When would they die?

One night, Lt. Col. Henry Hirsch, who had been in the fields all day and was covered with dust and dirt, jeeped to Palomares to pick up Spanish-speaking Capt. Joe Ramirez, an Air Force lawyer who was helping set up a claims office where the farmers could collect for their crops. Hirsch found Ramirez in the tavern. On one side of the room were 14 local men.

Ramirez said, "They are all scared to death. They think their lands have been poisoned, and that maybe they have been poisoned, too. They have all decided to move away."

Hirsch looked at the group. They were silent, all staring at him. Reaching down, Hirsch, realizing that danger of contamination harmful to health had long since been cleaned

away, ran his hands over his dirt-caked boots and his filthy coveralls. Then, cupping his hands together, he rubbed the dust and dirt into his face. The farmers sighed in relief and sat back, looking at one another, smiling. They began ordering beer and cognac. Some came to the bar to make friends with Hirsch and Ramirez. There was, after all, no place like home.

The protective clothing used early by the decontamination men had also not helped the residents' morale. Now, however, this clothing could be dispensed with. Men everywhere were handling debris, crops and soil with their bare hands. When villagers were about, they would wash "radioactive" tomatoes and eat them, praising their flavor.

Airmen approached residents saying, "I have a wife and children, too. Do you think I would do this if there were any danger? There is not enough *radioactividad* here to hurt you or your crops. But we are cleaning your lands anyway, just as we would clean off ink we had spilled on your floor."

One night, the heads of families in the villages were summoned to a meeting in Palomares' little movie house. General Wilson assured them that they were safe, and would be paid for their crops. He also directed that as much local labor as possible be hired. There were many who could operate tractors, rototillers, soil mulchers; others could earn money at kitchen-police duty, releasing more airmen for the search. Local wages were 125 pesetas per day—about $2.08. Wilson's scale was 150 pesetas—about $2.50. Morale began picking up.

"No Comment"

THE SPANISH and U.S. governments still insisted that the less publicity given the accident, the better. In desperation, reporters assigned to the story and badgered for information by distant editors sneaked through the Guardia Civil cordon, then tried to make scientific sense and educated guesses from interviews with local residents.

The world began hearing dark hints that Palomares and Villaricos were awash in a sea of "lethal" alpha radiation; there was speculation that the contaminated fields might have been ruined for years to come.

In Paris, it was reported that 1000 Palomares residents had been evacuated. In London, the *Sunday Express* headlined a story on Palomares, "The Village of Fear," while United Press International (UPI) even turned up a "victim" of radiation. The man had knelt beside one of the bombs, and eight days later, certain that he was contaminated, he had arrived in Madrid demanding an examination. Doctors found infinitesimal alpha radiation on a small dot of skin and washed it off. Dr. José María Otero Navascuez, head of the JEN, said, "The radiation was minimal and unimportant. The man's bathing habits were in question. If he had taken a bath during

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those eight days, there could have been no reading."

Many of the wildest stories seemed to be communist-inspired. Continually, the communist press harped on the dangers to peace created by a stockpile of American atomic weapons in Spain—although there is no U.S. atomic stockpile in Spain. At the Disarmament Conference in Geneva, Soviet delegate Semyon Tsarapkin accused the United States of having made a nuclear volcano of Europe.

Finally, Soviet Foreign Minister Andrei Gromyko sent a memorandum to U.S. Ambassador Foy D. Kohler in Moscow, calling for an immediate end to the criminal U.S. military flights over foreign countries. The United States, Gromyko suggested, had violated the 1963 Nuclear Test Ban Treaty in Spain and had contaminated the sea, thereby violating the 1958 High Seas Convention, which contained an agreement among nuclear powers not to dump atomic wastes in the ocean.

The United States dismissed the charges as "sheer propaganda," pointing out that overflights were made with the permission of the nations involved and refuting the other accusations one by one.

But such propaganda had its effect. In West Germany, samples of crops imported from Spain were being examined with Geiger counters. And even in the marketplace in Vera, six miles from Palomares, farmers whose crops had not been contaminated could not sell them. "We do not want your radioactive foods," they were told. "Do not bring them here anymore."

To minimize such effects, the cordon of security was bound ever more tightly around Palomares and Villaricos. Yet reporters still produced stories. Occasionally they would meet officers in nearby towns who would berate them for their inaccuracies. "What inaccuracies, specifically?" the newsmen would ask. And the answer always came, "No comment."

Deep Secret

Alvin came by air, *Aluminaut* by sea, both reaching Palomares on February 10. As they were being transferred to the Landing Ship Dock (LSD) *Fort Snelling*, a 70-m.p.h. wind came slamming down out of the mountains. Aboard *Alvin*, Oceanographic Institute pilots Valentine Wilson and Marvin McCamis were ordered to tie up to a buoy instead of risking damage to *Alvin* by trying for the well deck of the *Fort Snelling*. Robert Serfass and Robert Canary and the four crewmen of the *Aluminaut* did the same. For 21 hours, the eight men sat out a howling, blinding dust storm which seemed certain to turn the sea upside down.

Finally, on February 15, *Alvin* and *Aluminaut* began diving. A Soviet "fishing trawler," heavy with listening gear, stationed itself on the horizon. Admiral Guest sent two destroyers to guard the search zone.

Fisherman Simo's primitive navigational techniques had had disap-

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pointing results. Nothing had been found at the spot where he said he had seen the weapon fall. He had come out twice more and marked two more spots, several hundred yards apart. The general area was plotted in 1000-yard squares, and it was planned that each submersible would search one square each day. This soon proved impossible. Visibility was poor. The sea floor was too rugged to be covered that quickly. *Aluminaut* had the task of searching the rolling hills with her sonar; *Alvin* crept among the more precipitous ravines. Both had to surface frequently to recharge their batteries.

The two craft stayed within a few feet of the bottom, probing the black depths with sonar and powerful searchlights. The men inside could rarely see more than a dozen feet. Sometimes, when a boat hit bottom, visibility became nil—a huge cloud of silt, fine as women's face powder, would explode high and far into the water. If there was a current in the area, it would dissipate the cloud in 20 minutes; but if the current was negligible, the cloud might hang for hours.

The bottom was a mishmash of shallow, V-shape trenches, made by fishing trawls, running in every direction. *Alvin* and *Aluminaut* had to follow the suspicious-looking ones. There was little debris out here—only an occasional oil drum, tin can or piece of aircraft wreckage. The last major finds—the intact galley of the B-52 bomber, and a 10-by-32-foot wing panel—had by now been discovered three miles closer to shore.

For weeks, day and night, *Alvin* and *Aluminaut* prowled the silent world, searching every trench, gully and ravine, climbing every hill and mountain, looking under every ledge and outcropping. Operations stopped only for rough weather, or for sleep, maintenance and battery recharging. The boats averaged four dives every five days. Surface ships continually examined samples of sea water and cores of sea bottom. There never was a sign of radioactive contamination.

On March 1, *Alvin* was on its tenth dive. The pilot was Valentine Wilson. He was just above a mountain slope that fell away southwesterly, when suddenly he spotted a new kind of track—not wedge-shape, like the trawl marks, but semi-cylindrical. It appeared to have been made by an extremely heavy object, sliding or being dragged into a steep gully. Wilson shouted into his underwater telephone, "I have a mark!" *Alvin* nosed down to follow the track, but current and gravity pulled her down the slope too rapidly, and she lost it.

The find was greeted with the skepticism with which men guard against having high hopes dashed. The track could have been made by any of a number of things—by an oil drum, for example. And the skepticism mounted, for on her next six dives *Alvin* could not locate the track again.

On March 1 in Madrid, press frustration began to end. Plain-spoken

Dr. José María Otero Navascuez, chief of the JEN, decided it was time to clear up the confusion about the contamination. He told newsmen that not a single case of contamination worthy of the name had been found, that reports describing contaminated individuals were quite untrue, that there was absolutely no risk in eating or drinking products from the region and that the decontamination steps taken, standard for any U.S. nuclear accident, were excessively prudent in order to establish the widest possible safety margin.

The information dike was broken. Within 24 hours, Pentagon information officials, doubtless heaving a huge sigh of relief, confirmed Otero's remarks, and announced publicly—after 44 days—that an American H-bomb was missing. Soon, reporters were summoned to a briefing by General Wilson, then taken aboard ship for another briefing by Admiral Guest.

On March 8, indulging in a little propaganda of their own, U.S. Ambassador Duke and Spain's Information and Tourism Minister Manuel Fraga Iribarne took the nuclear age's most celebrated swim, off the search-zone beach, to dramatize the safety of the waters. Water temperature was 59 degrees. After three and a half minutes, Duke emerged, blue with cold, smiling. "It was exhilarating!" he exclaimed.

Valentine Wilson, piloting *Alvin* down a mountain face on March 13, spotted the track he had been trying to find again for nearly two weeks. *Alvin* had been down nearly eight hours, and her batteries were weak. She would have to surface soon. But Wilson went on, over the ridge of one gully, then down along another. He looked for a reference, spotted an eggshell. The track continued on beyond it. Wilson looked at his clock, checked his batteries. It was time to go up. Next day, when *Alvin* went down to hunt for the track again, the search was unsuccessful.

"Alvin" Proves Her Mettle

By March 15, General Wilson's land forces had combed every plot of ground in his search area. Convinced that the weapon was in the sea, he drafted a message to Washington saying that he meant to scale down the land hunt. At almost the same moment, Valentine Wilson spotted the track. This time, so as not to be swept away again, he turned the boat around and began backing slowly down the slope, following the track into deeper and deeper waters. In a few minutes he saw a parachute canopy, covering and billowing about something lying lengthwise on the edge of a steep gully. A code had been devised for this moment to avoid prematurely exciting the task force or telling anything to the listening Soviet trawler. The word for parachute was "Benthasaurus," the name of a three-legged fish that walks on the bottom of the sea. The code for the bomb was "Instrument Panel." But Wil-

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son, in his rush to report, forgot the code, and shouted to Bill Rainnie, on the surface, "I see a *rusty nail!*"

The words were meaningless, but Rainnie, sensing the excitement in Wilson's voice, blew the code once and for all. "You mean you see *the bomb?*"

"No," said Wilson. "I see the *parachute!*"

Admiral Guest checked his chart. The parachute had been found more than a mile to the east—against the current—of where fisherman Simo had marked the initial impact point. *Alvin* moved closer. Under one edge of the canopy, Wilson and observer Marvin McCamis could see what looked like a piece of bomb rack. Wilson piloted *Alvin* past the object twice, studying its lie, keeping his distance, careful not to disturb the water, for whatever lay beneath the chute was resting precariously on a 70-degree slope. Beyond lay fathomless depths.

The slope oozed, looking like freshly poured cement. Wilson described the situation to the surface. He did not want to go up. He feared that the object might tumble unseen into the blackness below, or that he might not be able to navigate back to it. He wanted *Aluminaut* there, standing watch, when he left. But *Aluminaut,* recharging batteries after a long submergence, was not ready. Wilson turned *Alvin* crosswise in the narrow gully, buried her nose in one bank, her tail in the other, and cut power. Depth was 2550 feet. It was cramped and cold.

For more than seven hours the two men sat waiting in the parked submersible until *Aluminaut* could begin *her* 24-hour vigil.

While recharging *Alvin,* the men began laying their plans. No gear had ever been designed to recover anything from such a depth. Some imaginative improvising would have to be done. It was impossible to tow wire or cable down to the object; neither *Alvin* nor *Aluminaut* was strong enough to drag a heavy weight. But *Alvin* was equipped with a mechanical arm. In the claw of this arm was placed a spike, and to the spike was attached a 3000-foot-long polypropylene line, weightless in water and smaller in diameter than a pencil. Even this proved almost too much, but after a long, slow struggle *Alvin* towed the line to the bottom and pounded the spike into the claylike bottom 50 yards from the chute. On the surface, the polypropylene line was tied to a buoy, marking the location of the chute below.

Next, *Alvin* carried down two sonar transponders—devices which put out homing signals—hung with lines and ordinary fishhooks. Moving to the target, Wilson deftly worked *Alvin's* claw, punching the hooks through the chute. He had never been more watchful. If the chute should suddenly billow out, it could snare *Alvin* in the canopy, entangle the craft in the shroud lines.

There was one other remote possibility: this weapon—if the chute was hiding the weapon—had fallen six miles, impacted on the sea, hit

bottom and been dragged and bounced no one knew how far over extremely rugged terrain. Might one more jar, even a slight one, set off the bomb's high explosives? Such a concussion would crush *Alvin's* hull. Wilson worked gingerly, finished hooking the transponders into the chute and surfaced. Now, even if the

The missing H-bomb and its parachute, photographed at 2500 feet by Alvin

object moved, *Mizar* could keep track of its transponder signals—or so everyone thought.

Undersea Cloud

In workshops aboard the destroyer tender *Cascade,* Lt. Commander Moody and Ocean Systems' Ray Pitts and Jon Lindbergh hastily devised what they hoped would be an effective H-bomb recovery gadget. It was a steel framework, standing on several long metal legs, whose pointed feet would bite deeply and firmly into the ooze on the bottom. Sonar transponders were attached, as well as three lengths of special one-inch nylon line, each 300 feet long, with multifingered grappling hooks and snap-hooks at the ends. These would be attached to the chute, and the object would be hoisted up. The contraption looked like nothing ever seen before. It was christened "Poodle."

A 1250-pound anchor was used to steady Poodle's main lifting line; then *Alvin* went down. The sub hooked one line to the chute, but found that the remaining two had become hopelessly fouled because Poodle had fallen over. More lines, with hooks on both ends, were lowered, and *Alvin* spent the next half day and part of another trying to hook one end to Poodle and the other to the chute. On each attempt, the lines tangled and fouled.

By March 24, nine days after *Alvin* had found the chute, the task force was desperate with frustration. Admiral Guest queried his experts. It was agreed that he should try with the single attached line to hoist it.

The move would be risky because of the danger that the line might be cut by metal parts of the ship. But the men reasoned that even if the line parted, the transponders on the object would enable the submersibles to find it again quickly. Guest decided to accept the risk.

By 8 p.m. the weather was clear, the winds down, the seas easy. A winch on *Mizar* took a slow, even strain on the line to Poodle, began hauling it in. *Mizar,* reading transponder signals, reported that Poodle

PHOTO: WIDE WORLD

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had cleared the bottom, then that its anchor was off, too. The winch kept turning. An hour passed. Men began to believe that success was close. But after 75 minutes, the line suddenly slackened. The payload below Poodle was gone! The line had parted. (It was later learned that the line had been cut, either by an anchor fluke or by an outcropping of rock.)

It was a shattering disappointment, but there was no time to brood. Next day, after recharging batteries, *Alvin* and *Aluminaut* plunged down, searching, listening for transponder signals. There were none. The object had tumbled or rolled, and the transponders were buried deep in mud. Nothing was to be found anywhere in the vicinity where the chute had been located.

Worse, there had been a horrendous undersea disturbance, and an enormous silt cloud hung everywhere. Somewhere deep below the murky cloud lay the chute and whatever it held, perhaps buried beneath the ooze. The submersibles went deeper, spent days groping just above the surface of the steep slope, their operators scanning *Aluminaut's* sonar, and straining to see through the seemingly eternal silt cloud. Finally, the cloud settled and visibility improved. The mountain face was torn up for hundreds of yards. *Alvin* and *Aluminaut* would have to search every inch.

"Well Done"

OFF THE California coast, another search was under way. An object similar in size, shape and weight to the missing weapon was placed on a steep, deep-water Pacific slope. An unmanned mechanism called CURV—Cable-Controlled Underwater Research Vehicle—was brought out to find the bomb facsimile and bring it up.

CURV, designed mainly for recovery of practice torpedoes, looked like a Rube Goldberg invention. It was all arms, legs, ears and eyes, a tubular aluminum frame six feet high, five feet wide and 13 feet long. There were two ballast tanks on each side of the frame. There were three motors, to drive the thing up, down or to either side. It was loaded with the latest sonar, transistorized TV, a still camera with a strobe light, and a recovery clamp which could fit around a torpedo—or an H-bomb. On its practice run, it quickly found the object in the Pacific, grabbed it and took it up. CURV was brought back to Pasadena to be crated for a trip to Spain.

On April 2, nine days later, Marvin McCamis and Bill Rainnie, *Alvin's* pilots that day, again found the chute. It still completely covered its burden, and now lay on a glass-slick clay slope at 2800 feet. Two days later, CURV was lowered from the submarine rescue ship *Petrel* off Palomares. It took nearly half a day to grapple a line onto the chute's risers. Then CURV surfaced with the other end of the line, which was made fast to a buoy.

No one slept now. Days and nights kaleidoscoped. *Alvin* went down to

inspect. Visibility was poor. To minimize chances of the sub's sliding past the chute before he could see it, pilot Wilson decided to approach from below. He would go downslope 300 feet west of the chute, turn and come upslope to it. *But suddenly he was in it!* Great folds of parachute were falling over the observation ports. Wilson backed all engines full, but *Alvin* plunged on until she was completely enshrouded.

On *Petrel,* Admiral Guest was frantic. If only the propellers were caught, *Alvin* could jettison them and still surface; but if the whole of *Alvin* became entangled in canopy and risers, there was no way to get the craft—or the men—off the bottom. There was nothing that could be done but to talk calmly to Wilson and pray that his excellent seamanship would pull them through. Losing an H-bomb was bad; but far better to lose it forever than to sacrifice two skilled, courageous men.

Aboard *Alvin,* Wilson was more irritated than worried. He could not back out of the chute against the upslope. He began jockeying the submersible against the big, opaque trap, billowing the chute up, slowly, inch by inch turning *Alvin* sideways. After 15 minutes, he saw his opening, plunged *Alvin* downward and sharply to the right under the edge of the canopy. Calmly, he reported that he was clear.

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Guest went weak with relief, but Wilson's report left no time to think about the near-disaster. The target object had moved 300 feet, and still was moving slowly. There were chasms before it. Soon, it might fall into greater depths, out of CURV's reach.

Guest moved *Petrel* directly over the target. A second line was fastened to the chute, and at 1:30 a.m. on April 7, CURV headed down to attach yet a third. But at 3:15 the device's TV monitor showed that it was becoming badly entangled in the canopy and shroudlines. For two hours, CURV's operators tried to work it loose, but every move only made things worse. It was hopeless—there was no chance of freeing the device from that monstrous, tightening spiderweb. Guest thanked heaven that it was an unmanned vehicle, then said, "We've got to take it now."

Alvin again attached transponders to the chute and made certain that a line was fixed to the apex of the canopy so it would not open and act as a sea anchor. Then, at 7:02 a.m., *Petrel's* winches began to move. Slowly, steadily, the awful load came up. Fifteen minutes passed—25—60.

Guest had no intention of risking another parted line. This was most likely to happen just beneath the surface, because of tensions on the rope generated by wave action. At 8:19 a.m., before this dangerous region was reached, winches were stopped. Lt. Commander Moody sent some of his divers down. They pulled the chute away from the object it enshrouded—and for the first time the weary searchers were certain that they had the silvery, cigar-shape hydrogen bomb, missing for so long.

The divers wrapped it with metal straps to which they attached cables. Winches turned again. At 8:45—79 days, 22 hours and 23 minutes after the accident—the weapon was pulled aboard and was back under positive U.S. control.

Admiral Guest sent a "Well Done" to his task force, then personally congratulated the crews of *Alvin* and *Aluminaut,* and all the other civilians who had come to Spain to help. A great deal had been learned—about the art of deep diving, about how to handle a nuclear accident, about the abilities and strengths of a cold-war ally. The United States and Spain, faced with a potentially disastrous incident, had coolly and determinedly turned it into a striking achievement. It had taken 3000 men nearly three months of the most exhaustive effort, involved some of the most outlandish and sophisticated equipment ever conceived, and had ended with an unparalleled technological feat.

Wearily—he had been without sleep for more than 70 hours—Admiral Guest wrote out a message to be encoded and sent simultaneously to the U.S. embassy in Madrid, his Navy superiors in Europe, and the Chief of Naval Operations in Washington. It read simply: "This mission has been completed."

DOE ARCHIVES

If you like to draw, you may have a God-given talent

by Norman Rockwell

NORMAN ROCKWELL, America's best-loved artist

I can't think of a greater waste than being blessed with a natural ability and doing nothing about it. A talent for drawing is a wonderful gift. It can bring you such a rewarding life that it just doesn't seem right not to give it a chance to develop and grow.

Nobody knows this better than I. I was born in a shabby tenement in New York City. I guess I always wanted to be an artist. I remember, when I was six, drawing pictures to amuse my friends. At fifteen, I had earned enough from odd jobs to go to art school. Then, over my parents' objections, I left high school after my first year so that I could attend two art schools at once.

I become an artist

Many times I became terribly discouraged and wanted to give up art school to start earning money. But my instructors encouraged me to continue and got me work illustrating children's

(continued inside)

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