Broken Arrow 14

When a Strategic Air Command B-52 crashed on the ice of North Star Bay off Greenland last week, it was the fourteenth crash or fire involving U.S. bombers armed with nuclear weapons in less than ten years—and the most recent since another B-52 collided with a KC-135 tanker over Palomares, Spain, two years ago. The Air Force even has a code name for nuclear accidents —"Broken Arrow"—and a step-by-step operating procedure for dealing with them. While a rescue team from Thule Air Force Base rushed to the crash site to help the crew, ordnance-disposal and radiation-decontamination teams were flown from bases in California and New Mexico.

The Air Force teams reaching the desolate arctic ice floe where the B-52 went down encountered temperatures of 22 degrees below zero and the almost perpetual darkness of the arctic winter. Scintillation counters and the pattern of fragments on the ice indicated that two of the 1.1 megaton H-bomb casings may have cracked open on impact or in the inferno of burning fuel, scattering radioactive plutonium.

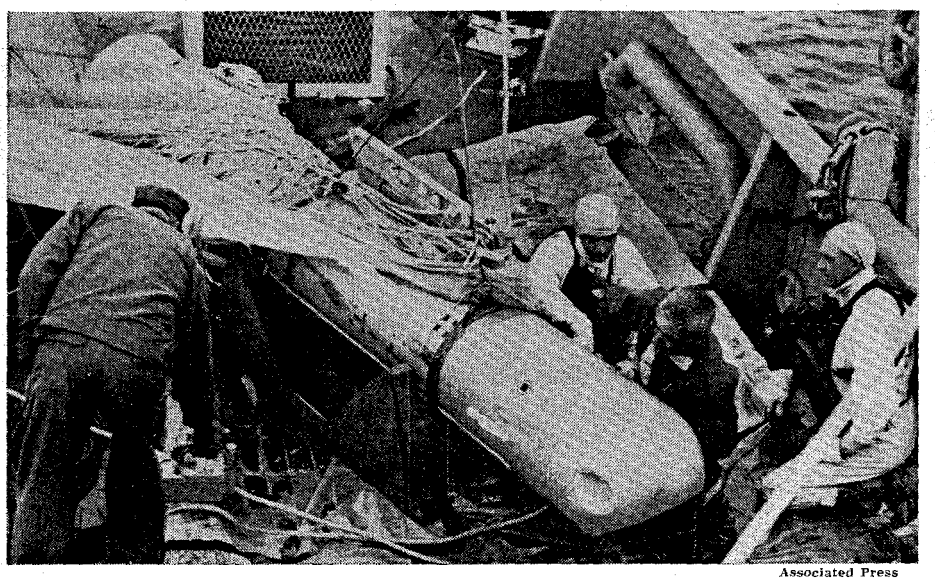
Toxic: Since the barren area supplies game for scattered Eskimo families, Air Force crews may have to scour the floe, scraping off snow and ice to make sure that it is cleansed of the radioactive plutonium—the white, powdery and highly toxic material that forms the fission trigger of the hydrogen bomb. Similarly at Palomares two H-bombs split on impact—and scattered the plutonium over a populated area. Special Air Force teams eventually had to remove tons of topsoil from the tomato fields where the crash occurred and bury it in U.S. radioactive waste dumps in South Carolina. Plutonium gives off low-penetration alpha radioactivity and does not represent a serious radiation hazard. But it can be highly toxic when inhaled or swallowed.

Fortunately no Broken Arrow incident has yet produced a nuclear explosion. Part of the reason lies in the design of the bomb itself. Conventional TNT detonators are arranged into an imploding lens which focuses the energy of the blast on a hollow mass of plutonium. The plutonium in turn undergoes a fission reaction which produces the intense heat necessary to trigger the thermonuclear part of the bomb. In order to produce the fission reaction, all of the TNT segments of the "lens" must go off simultaneously. In a crash the chances of simultaneous detonation are, the Air Force estimates, a million to one.

The likelihood that the bomb will explode accidentally is further reduced by an array of arming switches and levers, which are also designed to thwart a demented crewman who might try to start World War III. Each switch is protected from casual and accidental operation by a pin that fixes it in a "safe," "off," or "locked" position, or by a seal which covers it. As a further safeguard, some switches, which must be thrown simultaneously, are in separate compartments so that one man alone cannot arm the weapon. Delays or out-of-order actions wash out the firing sequence.

Aside from elaborate arming procedures, bombs and warheads are also protected by internal switches that can be manually reached only by literally taking apart the weapon. These switches can be activated only by physical forces. One switch, for instance, closes circuitry after a certain sustained speed has been reached by the plummeting bomb.

The best safeguard, of course, would be to prevent nuclear accidents entirely, or to curtail—in this missile age—nuclear airborne alerts. To date, the world has been indeed fortunate that the Broken Arrow incidents have occurred in tomato patches and on ice floes instead of over a large city.



Associated Press

Recovering H-bomb off Palomares, 1966: Will the world's luck hold?

Flight of the Bug

One hundred miles above earth last week the Project Apollo lunar module whipped through a series of maneuvers essential to landing American astronauts on the moon and bringing them back. The LM, built by the Grumman Aircraft Engineering Corp. and known as "the bug" because of its bulbous shape and spidery antennas, executed most of its 50 objectives without a hitch and NASA officials felt a growing confidence that the Apollo program was back on trajectory again.

NASA had intended the unmanned test flight to be a simulation in orbit of a lunar landing. According to the plan the on-board computer would, on signal from the ground, fire the craft's descent and ascent engines to simulate a lunar landing, and then a lunar lift-off. Another burst of the bug's ascent engine would test its ability to send the 16-ton craft back up into the safety of lunar orbit before touchdown—a vital maneuver if astronauts decide that the landing is unsafe. Houston controllers, however, had to scrap the first part of that plan. The 3,500-pound-thrust descent engine, which will brake the craft to a gentle lunar touchdown, began to fire but thrust did not build up fast enough. Consequently, an on-board computer, programed to detect malfunctions, shut the engine down after four seconds, ending what should have been a 39-second burn.

Soaring: To bypass the overzealous computer, NASA engineers activated the Program Reader Assembly, a device that "sits in" for the astronauts. On orders from Houston, the PRA varied the descent engine thrust from a low burn to a full 10,000-pound-thrust blast. After a second burn the descent engine cut off. Immediately Houston ordered the craft into the escape maneuver. The ascent engine started, and the two stages of the craft snapped apart, allowing the crew section of the LM to soar away from its landing section. "An excellent flight," pronounced NASA associate administrator George Mueller. Its mission done, the LM stages began to orbit back into the earth's atmosphere; both stages will have burned up by this weekend.

Both the Saturn 5 moon rocket and the command and service modules have been checked out in flight. LM was the last element in the Apollo package to be flight-tested. Now, after a second unmanned test of the Saturn 5, NASA will begin a series of manned flights to prepare astronauts for lunar landings. First Walter Schirra, Donn F. Eisele and Walter Cunningham will test a revamped command and service module to check out the changes made in the craft after last year's disastrous Apollo fire. The flight will probably slip from August into September or October. Then James A. McDivitt, David R. Scott and Russell Schweickart will test a complete Apollo moonship launched by the Saturn 5.