Cambridge Explosion: Study of Accelerator Accident Continues

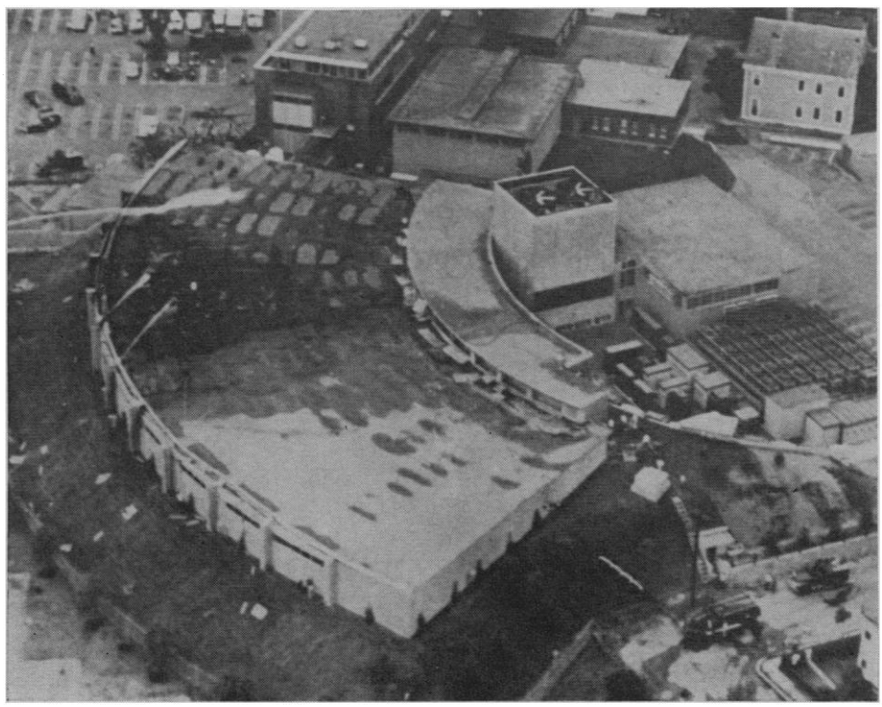
At 3:32 a.m. on 5 July 1965, an explosion occurred in the experimental hall of the Cambridge Electron Accelerator (CEA), a center for research in high-energy physics operated jointly by Harvard and M.I.T. and financed by the Atomic Energy Commission. Of the dozen or so individuals in the hall at the time—faculty members, graduate students, and technicians—seven were injured, some badly. One young M.I.T. technician died within a few weeks. Two victims are still hospitalized. The roof of the hall was shattered and burned. The hoses used to control fires left 14 inches of water on the floor and added to the damage to equipment. For several days, piles of rubble and falling debris blocked entry to the building. The total damage to building and equipment has been calculated at about $1 million. More than a month later, the facility still looked more like the bombed cathedral at Coventry than like part of a peaceable university campus.

Now, more than 4 months later, the cause of the explosion remains officially unknown. In the interim, a team of investigators from AEC has been at work, and, on the basis of photographs, reports, interviews with witnesses, and a variety of complex technical data, is attempting to develop analytical models of the accident which might lead it to some conclusions. At an early stage the investigators received methodological advice from the Civil Aeronautics Board, which reviews aircraft crashes, and at one time or another the expertise of a great many government, academic, and industrial scientists and engineers has also been utilized.

From the beginning, attention has focused on a new 40-inch bubble chamber which was being filled with liquid hydrogen for the first time when the accident occurred. In one of its few public pronouncements on its discoveries, the AEC, in a cautious bulletin issued on 30 September, said, "it appears that liquid hydrogen from the bubble chamber is the most likely source of the initial explosion." To most observers, who assumed nearly from the beginning that this was the case, the AEC analysis will seem like that of the coroner who announces that a man whom witnesses have seen shot died of bullet wounds. But the AEC, recognizing that the coroner occasionally finds arsenic as well as gunshot, wants to take nothing for granted. The release of "a large quantity of liquefied petroleum gas" is given as the second most likely cause of the initial explosion. While the AEC, in dealing with the liquid-hydrogen thesis, said, "the reason for the release of the hydrogen is still under investigation," scientists attending a fall meeting in Frascati, Italy, reported that CEA director M. Stanley Livingston delivered a paper there in which he disclosed his personal view that the beryllium windows of the bubble chamber ruptured and released the hydrogen. Many observers in Cambridge and elsewhere have tended to take the same view. Livingston's paper, however, has not been published, and he now feels that any formal comment from him should await completion of the AEC report.

A key feature which affected both the difficulty of reconstructing the Cambridge accident and its emotional impact on those involved was the complexity of the event. In the words of the AEC, "many fuel sources, including hydrogen, roofing material, electrical cables, propane and liquefied petroleum gas, contributed heavily to fires and explosions." As a result, investigators trying to account for the varieties of physical evidence they have uncovered have had to consider not only what happened but what role each event played in the total sequence. Moreover, discovery that the layout of the hall magnified rather than contained the initial explosion seemed to produce in many people involved with the CEA a sense of responsibility bordering almost on guilt. An AEC official interviewed in August observed, "everyone around here seems to feel it was partly his fault even if it was just that he might have left some old cardboard box somewhere in the hall."

"You begin to think about the meaning of the word 'accident,' " a scientist



CEA shortly after explosion, 5 July 1965.

commented, "and wonder whether accidents are accidental or whether they mean you've been doing something wrong." "It isn't that we didn't worry about safety," one of the CEA scientist-administrators explained. "We were extraordinarily conscious of radiation hazards, and we thought hard about other things too. But some things just never entered our minds—who would have thought that coaxial cables, for instance, would burn the way they did?"

Whether or not anyone would have thought about it before, it is plain they will begin thinking about it now. Accelerator safety is a joint responsibility of the AEC and the research laboratories which look to it for support. So far, the AEC has said little publicly, but there is speculation on the part of some scientists that, if its findings warrant, the commission may issue new safety regulations. Meanwhile, scientists at other laboratories are said to have reacted to the Cambridge incident by checking and reviewing their own procedures and policies.

In Cambridge, the emphasis seems to have shifted from taking things apart to putting them back together again. The question of safety appears to have been one factor leading the CEA to abandon its $1-million bubble chamber. A post-accident survey of the facility led to the conclusion that an instrument the size of the M.I.T.-designed chamber, which, when full, would have contained about 500 liters of liquid hydrogen, could not be safely operated under the crowded conditions existing in the CEA's relatively modest experimental space (about 100 feet wide by 300 feet long). To house the bubble chamber in a separate building adjacent to the present site on the Harvard campus would have cost several hundred thousand dollars and have caused a delay of at least 2 years while funding was obtained and construction undertaken. By that time, it appears, the completion of other research facilities in this country and abroad would have made the CEA bubble chamber less useful for the experimental program it was designed to carry out. As a result, it was decided that the rebuilt chamber will be offered to either Brookhaven National Laboratory, the Argonne National Laboratory, or the Stanford Linear Accelerator; all these facilities have larger experimental areas than the CEA, and their accelerators will be operating at energies higher than those available on the 6-Bev machine in Cambridge.

The Cambridge bubble chamber group, at present made up of scientists from Harvard, M.I.T., and Brown, will meanwhile proceed with another phase of its experimental program, utilizing a 12-inch bubble chamber which was used in an earlier phase of the program and which will now be reactivated. The scientists plan to take the later phases of their experiment elsewhere. "Of course it is always easier to do the work in your own back-yard," one M.I.T. physicist commented, "and no one believes the accident contained any hidden benefits, but we do feel its bad effects can be minimized." For the dozen or so graduate students working with the bubble chamber, the disruption may be more serious, but Livingston and other scientists feel the students can be accommodated either through modifications of their own plans or through the hospitality of other laboratories. As for other experiments in the CEA, they await the rebuilding of the roof and restoration of heating and electricity; all this work, having missed a November target date, is now expected to be finished by January. The AEC's final report, which has also missed a few target dates, is expected to be out about the same time.—ELINOR LANGER

Research Triangle Seeks High-Technology Industry

Durham, N.C. After a modest beginning and a few quiet years that some well-wishers found discouraging, North Carolina's "Research Triangle" is entering a phase of rapid growth that has produced a mood of unlimited optimism. The Triangle is bounded by the Chapel Hill and Raleigh campuses of the University of North Carolina and by Duke University at Durham. Near the center of the 5000-acre research park within the Triangle is the Research Triangle Institute (RTI), a not-for-profit, multidisciplinary institution which, since its founding in 1959, has gradually built up its capabilities until now it has eight laboratories and divisions that earned about $3½ million on contracts in fiscal 1965. As a symbol, the Triangle represents the idea that industrial advance and innovation are closely linked to centers of learning.

Until this year, the Triangle's hopes have ridden well ahead of its success. But now it has captured two major enterprises that would make any economic development specialist ecstatic. In January the Triangle was chosen as the site for the $25-million Environmental Health Center to be built by the U.S. Public Health Service; then in April it was selected as the location for a $15-million International Business Machines plant. It is beginning to live up to its billing as a promising venture for encouraging the growth of technologically advanced industry in a state long dependent on farming and such traditional low-wage industries as textiles and tobacco.

As one looks back, the Triangle has about it an aspect of historical inevitability. In the years since World War II such a multitude of industrial parks have sprung up across the United States that the smallest towns often advertise one, even if sometimes it is hardly more than a weedy pasture. More recently, "research parks," a refinement encouraged by the rapid growth of research activities, have multiplied until now they number at least 80.

A further refinement has been the research park created and nurtured by a university. These parks reflect the theory that the natural habitat of industries based on a high technology is a region, such as the Boston and San Francisco Bay areas, where strong educational institutions exist. The first park of this kind was created in the early 1950's by Stanford University. Its success in attracting firms such as General Electric, Control Data Corporation, and Beckman Instruments, Inc., has encouraged the establishment of similar parks, and today about one-fourth of all research parks are associated with a university or technical college.