Shutting the stable door

THE Soviet response to the accident at Chernobyl seems to have been both thorough and, after some initial hesitation, speedy. Participants at last week's meeting were almost fulsome in their expressions of admiration for an "impressive" feat of organization.

The 49,000 inhabitants of the town of Pripyat were given prophylactic potassium iodide tablets from 06:00 on the morning of 26 April and were told to stay indoors and not to drink fresh milk. This was done by members of the communist youth organization Komsomol.

Although the authorities in Moscow had been told of the accident when it happened, the clarity of the message was afterwards muffled by misleading signals from Chernobyl, suggesting that because the fires in the reactor building had been put out, the emergency was at an end. Even so, a high-level team of managers from the Soviet nuclear industry was assembled in Moscow and arrived in Chernobyl at 20:00 on the Saturday.

They must have been appalled at what they found. While the fires in the reactor building had been extinguished by firemen every bit as heroic as they are described in the Soviet press, the graphite core of the reactor was seen (by helicopter pilots) to be on fire; 10 per cent of the graphite, 250 tonnes in total, is estimated to have been consumed in this way. As a consequence of the high temperature of the fuel and the gas flow through the damaged core, the escape of radioactivity was virtually undiminished. And there were acute casualties to be dealt with.

The evacuation of Pripyat, 10 km from the site, was decided upon at 21:00 in the evening of the 26th, when the automatic monitoring stations showed that fallout had begun after a surprising delay (caused by the wind pattern), but not carried out immediately because of nightfall and the contamination of the prescribed evacuation routes. At this stage, the external intensity of radiation due to gamma radiation is estimated to have been between 600 and 1,000 R an hour. By the time that 1,000 buses had been assembled for the evacuation and allowing that the majority of the population will have spent much of their time indoors, it is estimated that doses of radiation due to gamma rays will lie between 1.5 and 5.0 rads, with a further 10–20 rads on account of exposure of the skin to beta-radiation.

With the continuing release of radioactivity, and the recognition that the rural population near the reactor would be less well-protected than those living in towns, the decision was taken ten days after the accident to evacuate all 135,000 people from a 30-km zone, removing the children to summer camps and sanatoria where they could be given continuing medical supervision.

The treatment of those exposed to large doses of radiation in and around the reactor also won high praise last week, chiefly because of the accuracy with which the first damage assessments were made. The people exposed included firemen and reactor operators, including some who left the control room after the accident to see what had happened. One person was apparently killed within the reactor, where his body has not been found; another died of an excessive dose of radiation on the morning of 26 April at 06:00.

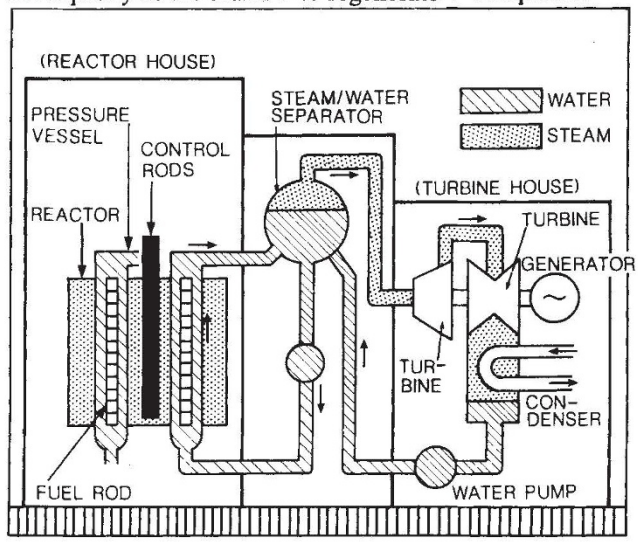
The treatment of the 350 people examined at hospitals within the first 36 hours was determined by the speed of onset of symptoms of radiation sickness (vomiting, headache and fever), and was afterwards confirmed by the associated fall of lymphocytes. People judged affected by radiation sickness were transferred either to specialized clinic Number 7 in Moscow or to a hospital in Kiev. The 20 classified as the most severely injured (of whom 17 died within 6 weeks) had received whole-body doses ranging upwards from 6 Gy (600 rem) to 16 Gy (1,600 rem).

Two features of the treatment of those acutely exposed to radiation appear to have surprised Soviet physicians and, last week, those who heard their account of the past few months. First, a large proportion of those exposed to large doses of radiation were found also to have been damaged seriously by exposure of the skin to beta radiation, causing burns that were themselves hazards to life. Second, according to the Soviet report of the accident, bone marrow transplantation was of only limited usefulness because of the frequency of extensive burning in those most severely exposed while there is some evidence that in those less severely affected by radiation (with doses of about 600 rem) the capacity of the marrow to regenerate spontaneously is sufficient to cause host-graft reactions (which may have contributed to the death of two patients). Platelet transfusion seems to have been invaluable in the prevention of bleeding in people with haematopoietic damage.

The treatment of the damaged reactor seems also to have been determined in the first few hours after the arrival of the team from Moscow during the evening of Saturday 26 April. Layers of boron carbide (to reduce the chance of a resurgence of nuclear fission), dolomite (as a heat sink and source of carbon dioxide) and metallic lead were dumped on the reactor from helicopters. With the continuing release of radioactivity, layers of sand and clay were added in the hope that they would absorb radioactive particles, but may in this respect have been counter-productive; their thermal insulation may have contributed to the increase of the temperature of the damaged core a week after the accident, and to the unexpected increase of the release of radioactivity then.

For the future, the recipe for the reactor is entombent. The final details have not yet been settled. For the present, vertical walls are being built around the reactor and those components in which fuel is thought to have lodged, the steam drums for example. The structure will be fitted with instruments for temperature and radiation measurements and provided with a closed-circuit gas-cooling system.

The future of the other reactors on the site remains uncertain, although the two operating reactors (called numbers 1 and 2) will probably be restarted when the problem of where the plant operators may live has been solved. The serious contamination of reactor Number 3, the twin of that damaged, appears to have been due to a delay in isolating the shared ventilation system; whether the reactor will be restarted remains to be decided, as does the question of whether the two reactors under construction at Chernobyl will be completed. □



The flow diagram for the Chernobyl reactor. A major deficiency in the design, Legasev acknowledges, is the tendency for the reactor's "reactivity" to increase when excess steam forms in the water-cooled fuel channels. The designs advantages are said to include simplicity and low cost, but a relatively complex system is required to keep the power output stable.