says. Bathymetry has been meagre, and yet there is a risk of sudden slippage of sediment caused by the shock of an explosion which could launch an asymmetric sea-wave kilometres long and of about one minute period — something between ocean swell and a tidal wave. Without detailed knowledge of the sediment form around the island "it is extremely difficult to calculate the degree of stability [of the sediments] and hence to calculate the level of risk". If launched, the wave could swamp Mururoa, which rises only two metres above sea level. Warning systems and escape platforms for Mururoa personnel should be strengthened, the report says.

As for general radioactive emissions from the aerial tests and the later tests underground, these are "feeble compared with other regions" and with respect to natural radioactivity, the report says. However, the Tazieff team was able to make few measurements of its own, and in fact criticizes the absence of French monitoring stations on surrounding islands, thus forcing critics to rely on measurements by foreigners.

The Tazieff team had itself to rely on data provided by the local monitoring groups, which were divided into three independent — and warring — teams (concerned with physical, biological and medical measurements). And the report of one of them (physical), which had estimated that plutonium-239 emissions from Mururoa were "a little less" than those of Cap de la Hague, the French reprocessing plant near Cherbourg, "did not respect the usual rules of scientific publications: absence of certain numerical results, mean values without errors, descriptions of sampling without indication of date, incomplete references".

The Tazieff group concludes that research on and around Mururoa must be strengthened. Releases of radioactivity are unlikely "in the short term" — from individual underground tests — but there is an unknown risk of long-term releases into the ocean if test chambers are connected with the sea through cracks in the coral basement of the atoll.

"The absence of such information disarms defenders of the French nuclear test programme", the report says. There should be official announcements of tests (frequently the news of a test first comes from seismic monitoring in New Zealand or Australia) and "the publication of unattackable scientific documents" that would contain "all measurements not directly relevant to defence secrets". This action, says the report, "would considerably improve the psychological climate" surrounding French testing.

"Safety has always been our major concern", replied the ministry. "But it is always possible to do better". The recommendations in the Tazieff report "will certainly permit us to make progress in this field." **Robert Walgate**

UK rf exposure

New standards unrestrictive

MANUFACTURERS of microwave ovens in Britain will be relieved to learn that proposed new standards of human exposure to high-frequency and microwave radiation are unlikely to affect their operations. But some industrial operations, such as those in which high-frequency radiation is used for heat-sealing plastic envelopes, will be affected and may even become "impracticable".

These are among the conclusions of a survey carried out by the National Radiological Protection Board (NRPB), the source of the advice on which draft standards for the protection of people from the effects of non-nuclear radiation were published in Britain last year. S.G. Allen and F. Harlen of the board's staff have now assembled data from a variety of sources that suggest that television transmitters are not the ogres that they have sometimes been represented, but that some fixed radar installations (civil as well as military) could be restricted by a tightening of standards beyond those now proposed.

The British standards (like the equivalent US standards) start from the proposition that the rate of heat dissipation within the human body caused by radiation should not exceed 0.4 W kg^{-1} on the average or 4.0 W kg^{-1} in the most dissipative cm^3 of tissue. The consequence is a frequency-dependent limit on power intensity amounting to 10 W m^{-2} between 30 and 100 MHz, inversely proportional to the square of the frequency below 30 MHz and proportional to the frequency itself between 100 MHz and 1 GHz.

The report* embodying the results of the surveys that have been carried out says that while there may be overt damage to body tissues if heat dissipation causes temperatures to increase, stress of the body's thermoregulatory apparatus by the absorption of radio energy may also be damaging in unknown ways.

The report also gives some credence to reports in the British popular press in recent years that some people are able to recognize their presence in or out of radar beams by means of sounds heard within their heads. The cause of the phenomenon appears to be the movement of the various pieces of a person's skull as a consequence of *in situ* heating by radio absorption, and tends to be heard as a series of clicks in a pulsed radar beam. The NRPB report estimates that the new standard should ensure that the noises are not audible except perhaps in a rotating pulsed beam. (For a review, see James C. Lin, *Proc. IEEE* **68**, 67-73; 1980.)

For the rest, there is some concern about the use of portable radio transmitters, with some evidence that a driver sitting too close to his antenna might be on the threshold of safe exposure. Industrial microwave plants, which the report says are often "effectively unshielded", are likely to be "significantly" affected by the introduction of the new standards. This opinion is based on Swedish and Finnish measurements of field intensities around radio-frequency equipment. And it seems that physiotherapists administering diathermy treatment may also have to be restricted to keep them within the now proposed limits of exposure. □

*Sources of exposure to radiofrequency and microwave radiations in the UK, NRPB-R144.

Spacelab delay

THE launch of Spacelab, the joint scientific mission of the National Aeronautics and Space Administration (NASA) and the European Space Agency, will be delayed by a month, NASA announced late last week. The new launch date is 28 October.

The delay stems from continuing uncertainty about the condition of the Tracking and Data Relay Satellite (TDRS), which was placed into the wrong orbit when the shuttle Inertial Upper Stage malfunctioned during deployment from the shuttle last April. NASA scientists had been working since then to nudge TDRS into its correct geosychronous orbit, which was finally attained last month.

Spacelab's pressurized module

NASA officials decided that the originally scheduled launch on 30 September of Spacelab, which will be carried aboard shuttle flight number nine, would not allow enough time for completion of ground tests of the TDRS communication systems. The acid test of TDRS will come from the in-orbit testing of the satellite's systems by the crew of shuttle flight eight, which will be launched on 30 August, ten days later than originally planned.

If TDRS turns out to have been damaged during the deployment malfunction, Spacelab will probably be delayed by many months; the second TDRS is not scheduled for deployment until March 1984, and even that date is contingent upon successful debugging of the Inertial Upper Stage in time. Stephen Budiansky

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