Environmental asbestos

Dispute on levels

Brussels

The European Commission's proposed directives on asbestos have come under attack from all sides. Many of the criticisms put forward by the European Parliament and environmental groups relate to the tougher restrictions on crocidolite (blue asbestos) than those for chrysolite (white asbestos). The dispute highlights the present uncertainty as to what can be considered a "safe" exposure to asbestos fibres.

Following the adoption of a framework directive on asbestos in 1976, the Commission has been working on four implementing directives. Two have already been put forward: one on the marketing and use of certain dangerous substances and preparations; and the other dealing with the protection of workers from occupational exposure to asbestos.

The draft directive on marketing would ban crocidolite except in the manufacture of asbestos cement pipes, acid-resisting seals, gaskets and gland packings. The marketing and use of chrysolite and other asbestos fibres would be banned for thermal and acoustic insulation, air filtering and roadway surfacing unless "the harmful use of fibres is prevented".

The directive on occupational exposure has provoked the greatest discussion. This sets limits on the concentration of asbestos fibres in the air, together with a ban on asbestos spraying, access restrictions, the keeping of health records and a commitment to introducing suitable substitutes as soon as these are available.

The Commission's proposal assumes that crocidolite is five times more dangerous than other types of asbestos. The maximum concentration allowable for crocidolite is 0.2 fibres per millilitre of air, compared with 1 fibre per millilitre for all other types.

Evidence presented at a recent international symposium on the biological effects of mineral fibres supports the Commission's position. Although earlier research with animals had shown that fibres of the same length and diameter cause the same number of mesotheliomas in the lung, more recent research suggests that human lungs react differently to different types of asbestos. Chrysolite enters the human lung less easily than crocidolite and clears more rapidly.

Some members of the European Parliament's Environment and Public Health Committee feel the evidence is inconclusive, and others feel it is confusing to have two different limit values. The Commission thinks that if a single limit value were to be adopted, it should be at the lower level of 0.2 fibres until further research is carried out. But other committee members favour using the upper level of 1.0 fibres. **Jasper Becker**

Spinning off research

Further reductions in the scale of in-house research carried out within the British Department of Defence are promised in the annual "Statement of the Defence Estimates", published last week. In a brief section on research, the white paper says that, in the years ahead, further efforts will be made to place design and development contracts with industrial companies.

This policy, recommended in a study begun in 1979 under Lord Strathcona, Minister of State at the Department of Defence, also recommended that private industry should be given (on a contract basis) more responsibility for the provision of technical and other services to the British defence research establishments. The white paper records with pride a 15 per cent reduction of research manpower between 1974 and 1980, one third of this in the last two years of the period.

At the same time, the ministry is planning to switch resources within its research establishments to long-range studies of various kinds. It cites as one promising field of research a programme now under way to develop and anti-tank weapon in which a single projectile will release a clutch of separate missiles independently guided (with the help of microprocessors) towards separate tanks.

Space shuttle

Bonding problems

Washington

As the US space shuttle achieved its first orbital test flight last week, the National Aeronautics and Space Administration (NASA) was working on proposals for an alternative thermal protection system involving large carbon/carbon panels rather than the ceramic tiles used so far.

The tiling system has been the Achilles' heel of the whole shuttle programme. Difficulty in fixing the tiles securely to the aluminium skin of the orbiter was largely responsible for the two-year delay — and corresponding cost overruns — in the first launch, and the problems are still not solved.

During last week's flight, seventeen of the protective tiles covering the engine housing on the upper surface of the shuttle became partially or totally unstuck during the launch. NASA maintained optimism, saying that none of the more important tiles on the bottom of the shuttle had been damaged, and fortunately this optimism proved justified when the shuttle returned safely to Earth.

The problems that have plagued the development of the present heat protection system — which requires 31,000 tiles, each between six and eight inches square, to cover 70 per cent of the spacecraft's surface — have recently led the space agency to look closely at different systems which might by used for future orbiters.

Shuttle tiles, a sticky problem

During re-entry, the wing tips and bottom surfaces of the shuttle are required to withstand temperatures of up to 1,370°C. In missiles and other conventional spacecraft, such temperatures have been tolerated by the use of an ablative heat shield which burns away during the heating; but as the space shuttle depends for its cost-effectiveness on reusability, a different solution had to be found.

Using what was the most advanced technology in the early 1970s, the shielding was designed to be provided by tiles of low-density high-purity silica fibre — sometimes referred to as "foamed glass" — made rigid by ceramic bonding. There are about 20,000 of these tiles on the bottom of the Columbia, the average size being about six inches square, and the thickness varying between 0.5 and 3.5 inches.

Each tile is bonded to a pad made of Nomex felt, and the total composite skin can heat up without placing stress on the silica, which is relatively easy to repair.

The ceramic tiles have the disadvantages, however, of being both brittle and not very strong. Furthermore, the aerodynamic stresses on the surface which tend to pull the tiles from the felt which binds them to the shuttle skin had been underestimated — whereas the bonding had originally been required to withstand pressures of up to seven pounds a square inch, in practice the stresses turned out to be twice as high.

The situation became particularly embarrassing when some temporary tiles were lost during the shuttle's transportation flight from California to the launch site in Florida two years ago. And subsequent weaknesses revealed by an intensive programme of "pull-testing" required a lengthy process of densification of many thousand tiles before NASA considered that they were safe.

In the light of these difficulties, NASA last year awarded a contract to Rockwell Corporation Inc. in Downey, California, for a study of alternative thermal protection systems. Three alternative systems

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are being studied, each involving a combination of three different forms of protection. For temperatures less than 540°C, insulation would be provided by panels of titanium facing covering an insulating honeycomb. In the 540°C to 980°C range, the same arrangement would be used, this time using a superalloy known as Inconel 617.

The most significant change would be in the high temperature panels, where heat shielding would be achieved by panels of reinforced carbon/carbon, up to three feet square. Various insulating materials would be placed between the shielding and the aluminium surface. The panels would be mechanically attached to the shuttle, avoiding the bonding problem associated with the ceramic tiles. Carbon/carbon is already used in limited quantities for the nose-cap and the leading edges of the shuttle's wings.

But however the new systems perform, there is still the problem of cost to be resolved. Moving to a new system would be expensive, and NASA may not be able to afford a switch. **David Dickson**

Nuclear reactor safety

Go for Super-Sara

Brussels

The months of deliberation in Brussels on the future of the Super-Sara project have ended with a decision to press ahead on the lines of the Commission's original proposal. The EEC's joint research centre at Ispra in Italy will now be able to start the second phase with funds totalling 50 million European Units of Account (£0.54 = 1 EUA).

The Super-Sara project will use the experimental ESSOR reactor to study loss of coolant and other accidents in water reactors. More than 200 staff have been left in limbo since last November when the member states first began to hesitate about releasing the bulk of the project's money. In March 1980, 3.31 million EUA was granted for feasibility studies after the project was agreed in principle. But when it came to making available the 40 million EUA for the major part of the project, Germany and others began to have cold feet. The negotiations over the past six months left Germany as the only member state withholding agreement. Germany has now given way to pressure from its partners but has insisted that the project be kept below its budgetary ceiling.

However, the European Commission's initial cost projections have had to be raised since they were first made last year. Automatic salary increases and rising equipment costs mean that 64 million EUA needs to be set aside to take the project up to 1983, when it is due to be reviewed.

It seems increasingly likely that it will overshoot its schedule by as much as two years. **Jasper Becker**

Election in Israel

New deal for science?

Rehovot

If, as expected, Labour Party leader Shimon Peres becomes Israel's next Prime Minister after the election in June, he will be the first man with a good grasp of science and technology to hold that office. Although not a scientist or engineer himself, Peres was responsible for initiating many large-scale research and development projects undertaken by the Ministry of Defence, where he served from 1952 to 1977, becoming minister in 1974.

These projects contributed substantially to Israel's military capabilities and also laid the groundwork for its sophisticated aircraft industry (with a turnover in 1980 of $500 million) and for its rapidly developing electronics industry. Indeed, a very large percentage of Israeli exports based on local research (an estimated $1,000 million last year) were spin-offs from defence research set in motion by Peres.

Peres, Prime Minister in June?

Peres has placed heavy emphasis on science-related projects in outlining the goals of a Labour-led government. There are plans for a huge "science city" in the Galilee, heavy government subsidies for energy research, a continuation of the recently inaugurated Mediterranean–Dead Sea Canal project for hydrological power and, significantly, the establishment of two nuclear power stations in the Negev.

Israel already has two research reactors, a 5-MW facility supplied by the United States and set up just south of Tel Aviv, and a more controversial 24-MW reactor from France, located near the Negev town of Dimona. But, despite an absolute dependence on imported fossil fuel for the generation of electricity and the existence of the necessary nuclear technology, Israel still has no nuclear power stations.

This anomalous situation arises primarily because the United States, the most obvious supplier of such power stations, is prevented by the Anti-Proliferation Act from selling them until Israel signs the nuclear non-proliferation agreement and opens its nuclear facilities to inspection by the International Atomic Energy Agency.

It was only after Egypt signed this agreement in February that the United States agreed to provide that country with two nuclear power stations with a combined capacity of 2,000 MW. But Peres refuses to say whether a Labour-led government will do what all previous governments have refused to do, namely sign on the dotted line, or, if not, how he expects to get the reactors he proposes to place in the Negev.

Peres sees a close link between the country's economic development on the one hand and its scientific and technological development on the other. He accuses the present Begin government

Kamikaze to Halley

The European Space Agency (ESA) is hoping to enlist the help of the Soviet and Japanese space agencies in sending its Giotto spacecraft on a kamikaze mission to Halley's comet in 1986. ESA would like to send Giotto to within 200 km of the comet's nucleus to observe molecules evaporating from it before they recombine or are interfered with by the solar wind. Initial plans had assumed a closest approach of 1,000 km because of the difficulties of pinpointing the precise position of the comet in advance and because of the risk to the spacecraft of cometary dust. If Giotto gets within 200 km of the comet it may manage a couple of hours of observation before being destroyed.

Such a close approach can only be made, however, with help from the Russian space agency which is also sending a spacecraft to the comet. The hope is that data from the Russian craft, due to arrive at the comet four days before Giotto, could provide precise details of the comet's whereabouts and allow last-minute corrections to Giotto's course. The Russian spacecraft itself will not be able to approach nearer than a few thousand kilometres to the comet nucleus because, unlike Giotto, it lacks a dust shield.

The Japanese space agency will also be sending a spacecraft — at 135 kg the smallest of the three — to photograph the comet in the hydrogen Lyman alpha line. The three space agencies are discussing how they might exchange data gleaned from their separate missions, and next summer the three, together with the US National Aeronautics and Space Administration (NASA), will be meeting to discuss a collaborative project between all four agencies. Although NASA has no mission of its own to Halley's comet, it is organizing a "Halleywatch" which will make use of ground as well as space based observations. **Judy Redfearn**

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