Living It Up with Concorde

A supersonic transport, operating between 60,000 and 65,000 ft. (18,000 to 20,000 m.), encounters important environmental problems, such as the effects of cosmic radiation and cabin ozone levels and the risk of decompression after a small structural failure. Concorde will be exposed to both galactic and solar cosmic rays of greater intensity than those reaching present subsonic aircraft operating at 35,000 ft. (11,000 m.). The galactic component is fairly constant at a particular altitude and latitude, and the maximum levels were measured[1] by physicists from the United Kingdom Atomic Energy Authority during the minimum solar activity of 1964. At altitudes used by supersonic transports and at a geomagnetic latitude of 70°N the maximum dose rate was 2·2 mrem per hour. It is generally accepted, however, that the average dose rate will be between 1·0 and 1·5 mrem per hour.

Continued exposure at maximum level could theoretically occur at latitudes exceeding 60°—north of Stockholm and the southern border of Alaska and south of Cape Horn and New Zealand. An exposure level of 2·2 mrem per hour would lead to a maximum permissible dose for passengers (0·5 rem per year) after about 225 hours' flying at cruise altitude. Passengers commuting each week from Europe to Japan by the polar route might conceivably need to carry a record of the dose of radiation absorbed on each journey. No passenger would be likely to be exposed repeatedly to the maximum dose rate, however, and a more reasonable assessment is that the maximum permissible dose per year will not be exceeded below 400 hours at cruise altitude or 600 hours total flight time. This assumes an average exposure rate of 1·25 mrem per hour at cruise altitudes. One can assume that aircrew will operate up to 600 hours per year. A proportion would be completed between the latitudes of 60°N and 60°S, and of the remaining hours outside these latitudes only about two-thirds would be at high altitude. It is, therefore, unlikely that the radiation dose level per year would exceed 0·6 to 0·8 rem even at the highest exposure rate. Some authorities consider that such exposures do not require medical supervision. In practice aircrew are unlikely to exceed the civilian maximum permissible level.

A further problem is cosmic radiation from solar flares. Solar activity runs in 11-year cycles, but it is not possible to predict the hazard with any accuracy. Observations[2] on the giant flare of 1956 showed that though increased solar radiation is of short duration it can be of very high intensity—several rems per hour at 60,000 feet.[3] For these reasons Concorde will carry its own detection equipment[4] and will descend during a period of solar activity.

H. J. Schaefer[5] has examined the radiation consequences of supersonic flight for the population as a whole. He estimated that the "population dose" from supersonic transport aircrew and passengers, assuming 10^7 passenger hours per year at altitude, could be equivalent to a yearly dose of 0·05 mrem, which may be compared with the contribution of radiation workers of under 0·3 mrem per year. To put this into perspective, the natural background radiation, medical *x*-rays, and fall-out account for 150, 100, and 25 mrem per year, respectively.

The concentration of ozone in the atmosphere rises rapidly above 40,000 ft. In supersonic flight air outside the aircraft is compressed, and the cabin could contain a high level of ozone. Ozone dissociates completely in the high temperature part of the air conditioning system of supersonic aircraft, except for a short period during the first part of the descent, when there is a reduction in compressor air temperature, which could lead to cabin levels just exceeding 0·1 p.p.m. for about 10 minutes.[6] There is no internationally accepted recommendation for a maximum permissible concentration of ozone, but two authorities have recommended[7,8] that the period of exposure to 0·1 p.p.m. should not exceed one hour a day. Studies on mental activity at ozone levels in the range 1·5–2·0 p.p.m. for more than an hour have given conflicting results.[9,10] In 1962 G. Bennett[11] found concentrations of ozone of up to 0·12 p.p.m. at 39,000 ft. towards the end of a flight in a Boeing 707. The only symptom reported was a slight upper respiratory tract irritation, which could have been caused or aggravated by several hours of low humidity. The threshold likely to be agreed for the supersonic aircraft is between 0·15 and 0·2 p.p.m. for a limited period.

Any aircraft can suffer a small structural failure, such as loss of a window, at high altitude. Early studies on the cabin of a hypothetical supersonic aircraft suggested that in certain circumstances severe neurological damage could be caused by such a decompression.[12] The occurrence of brain damage secondary to profound hypoxia evoked scientific interest, and recent research at Farnborough has been concerned with the end-tidal and arterial oxygen tensions which may lead to limited brain damage[13] and the behavioural sequelae and neuropathology.[14] Studies on Concorde, however, have indicated that the high descent rate and limited window size provide a descent profile which will avert brain damage even if there is a loss of one engine and the passengers fail to breathe oxygen.[15]

1 Fuller, E. W., and Clarke, N. T., *United Kingdom Atomic Energy Authority Report 064/68*. London, H.M.S.O., 1968.
2 Neher, H. V., and Anderson, H. R., *Journal of Geophysical Research*, 1962, **67**, 1309.
3 Upton, A. C., *et al.*, *Health Physics*, 1966, **12**, 209.
4 Hepburn, A. N., *Annals of Occupational Hygiene*, 1968, **11**, 341.
5 Schaefer, H. J., *Aerospace Medicine*, 1968, **39**, 1298.
6 Rudman, J., and Methven, T. J., *Royal Aircraft Establishment Technical Memorandum ME 356*. London, Ministry of Technology, 1966.
7 Stokinger, H. E., *et al.*, *Archives of Environmental Health*, 1964, **9**, 545.
8 Clayton, G. D., *et al.*, *American Industrial Hygiene Association Journal*, 1968, **29**, 299.
9 Griswold, S. S., Chambers, L. A., and Motley, H. L., *Archives of Industrial Health*, 1957, **15**, 108.
10 Hore, T., and Gibson, D. E., *Archives of Environmental Health*, 1968, **17**, 77.
11 Bennett, G., *Aerospace Medicine*, 1962, **33**, 969.
12 Nicholson, A. N., and Ernsting, J., *Aerospace Medicine*, 1967, **38**, 389.
13 Ernsting, J., and Nicholson, A. N., *Proceedings of the International Symposium on Brain Hypoxia*. London, Medical Education and Information Unit of the Spastics Society, 1970.
14 Nicholson, A. N., Freeland, S. A., and Brierley, J. B., *Brain Research*, 1970, **22**, 327.
15 Brierley, J. B., and Nicholson, A. N., *Aerospace Medicine*, 1969, **40**, 830.

Life in Flats

Doctors with patients in tall blocks of flats soon notice that when they do visits they rarely meet neighbours. In contrast, the door of a house is still commonly opened by the "woman next-door." Loneliness and isolation for the inhabitants seem to be inherent in the design of many of the modern tower blocks, and the N.S.P.C.C. report[1] *Children in Flats*, published last week, offers some constructive comments on the problem.

The report is based on interviews with one or more members of 280 families. Most of the mothers with small children were

1 National Society for the Prevention of Cruelty to Children, *Children in Flats: A Family Study*. London, N.S.P.C.C., 1970.
2 Fanning, D. M., *British Medical Journal*, 1967, **4**, 382.

lonely, unhappy women with few or no friends in the block, and their children spent most of their days inside the flat. There was no place for them to play outside safe enough for the mother to leave them unsupervised. What such families wanted was "a place of our own with a back garden." Families with teenage or grown-up children were much more content.

This report adds further weight to the case against tall flats as a solution to housing problems. D. M. Fanning[2] has shown that flat dwellers are unhealthier than families who live in houses, and he, too, suggested that they were unhappier as well. The N.S.P.C.C. study found that balcony flats seem to offer chances of meeting and gossip, and complaints of loneliness were less common in such blocks. Unfortunately this design is now architecturally unfashionable. The report recommends that families with very young children, and those likely to have babies, should not be housed in flats if there is any alternative; and that purpose-built blocks designed for young families, with a room for a playgroup, for example, may be another solution worth investigation. There is little point in a family exchanging one kind of misery in a slum for loneliness and despair half way to the sky.

Parotid Swellings

With the exception of mumps, a single lump in the parotid region is nearly always a neoplasm, mostly non-malignant. A slow growing mass within the gland is difficult to diagnose with precision; its physical characteristics are usually non-specific and its depth in the gland illusory. In fact only about three-quarters of such lumps prove to be neoplasms arising in the parotid gland substance, the rest being a mixed bag of other tumours arising outside the gland.[1] About 70% of parotid gland tumours are of the mucoepidermoid type, including the so-called mixed parotid tumour. Of the remaining 30% adenolymphomas are chiefly confined to the inferior portion of the gland, whereas the rarer carcinomas tend to grow rapidly and invade the trunk or branches of the facial nerve. Punch biopsy has been used in an attempt to clinch the diagnosis, but too often it has been found an inconclusive measure and it is not without risk of implantation. Painless swellings in the parotid gland are best excised and the whole tumour then submitted for histological examination.

Better understanding of the anatomy of the parotid gland has led to the abandonment of enucleation as a surgical technique. Often the result has been incomplete excision followed by recurrences. The tumour should be excised with a margin of healthy gland. Sometimes, if the tumour is deep to the plane of the facial nerve, a complete parotidectomy will be needed. An interesting finding quoted by M. Hobsley,[1] that half the carcinomas in one series[2] possibly started as benign tumours, strengthens the case for partial parotidectomy for all lumps in the gland.

There are occasionally technical difficulties in isolating the trunk of the facial nerve, the essential preliminary step in the modern operation. It can be displaced and difficult to find if a very large tumour is present. Sometimes considerable fibrosis is present in the cellular tissue at the angle of the jaw. It may be easier in such cases to uncover a large branch of the nerve and trace it back to the trunk. Once the nerve is isolated dissecting the gland and tumour forwards demands care but should present no technical difficulty. In cases of carcinoma the nerve is often invaded and destroyed. It may sometimes be possible to lay nerve grafts between the stump of the nerve and the facial muscles. A nerve graft can also be used to repair an accidental injury. The result is usually acceptable, though restitution is never full.

Irradiation is unnecessary when benign tumours are radically excised, and it has little to offer except temporary palliation for the carcinomas—which tend to be uncompromisingly deadly. Fortunately they are uncommon.

[1] Hobsley, M., *Annals of the Royal College of Surgeons of England*, 1970, **46**, 224.
[2] Patey, D. H., Thackwray, A. C., and Keeling, D. H., *British Journal of Cancer*, 1965, **19**, 712.

Noise in the Laboratory

Florence Nightingale is said to have been the first to emphasize the harmful effect of noise on the sick.[1] Only in the past ten years, however, has much been done to reduce noise levels in our hospital wards.[1-3] Patients have been asked what kinds of noise bother them particularly, and this knowledge applied in campaigns for reducing noise. The problem has also been approached from the other side, and several features in the design of new hospitals, such as smaller wards and postoperative and casualty observation units,[4] should lead to further improvement.

Surprisingly, little attention seems to have been paid to noise levels in other parts of hospitals. For one group of staff, at least, this has now been remedied, and Professor P. D. Griffiths and his colleagues have shown how noisy a clinical chemistry laboratory may be.[5] Using a sound meter modified to resemble the response of the human ear, they measured noise levels in decibels (dB(A)) in various parts of the laboratory in Dundee Royal Infirmary. In the main laboratory the noise level ranged from 70 to 75 dB(A), with occasional peaks up to 80 dB(A). Nobody who has been in a laboratory in full swing will be surprised to find that the flame photometer was the chief culprit, generating levels of 75 and 71 dB(A) at 3 and 6 feet (1 and 2 metres), respectively. Noisy apparatus included the fume cupboard fan, centrifuges, and stirrer motors, while further sources of noise were the fans and the punch tape reader in the computer room and a stamping punch for forms.

The noise levels are below the threshold level that damages hearing, which would be about 85–90 dB(A) for the same working conditions. Nevertheless, they are well above the level of 55 dB(A), which the Wilson Committee recommended as the upper limit for places where speech needs to be intelligible.[6] So, quite apart from any effect on efficiency in working—an unknown factor at these levels—the noise level in some laboratories is too high for the staff to hear what each other is saying, whether in conversation or on the telephone. The potential dangers of instructions or laboratory results being incorrectly heard are obvious, and Griffiths and his colleagues should be supported in their efforts for improvements in the design of hospital laboratories and the machines used in them.

[1] *Noise Control in Hospitals*. London, King Edward's Hospital Fund for London, 1958.
[2] *Noise Control in Hospitals: Report of a Follow-up Enquiry*. London, King Edward's Hospital Fund for London, 1960.
[3] *Control of Noise in Hospitals*. London, Ministry of Health, 1961.
[4] *British Medical Journal*, 1970, **3**, 576.
[5] Griffiths, P. D., Kell, R. L., and Taylor, W., *Journal of Clinical Pathology*, 1970, **23**, 445.
[6] *Final Report of the Committee on the Problem of Noise*. London, H.M.S.O., 1963.