

Study confirms nuclear winter

NUCLEAR winter—the onset of winter-like weather after a nuclear war—gained new believers this week after scientists in Washington agreed that such a disaster is a “clear possibility”.

The US's National Academy of Sciences has completed a year-and-a-half review of the slender scientific literature on the subject. Exhibit A was a seminal paper by five scientists published in December 1983. Known as “TTAPS” after the initials of its authors, Turco, Toon, Ackerman, Pollock and Sagan. It shocked the world with its predictions.

TTAPS unsettled the Pentagon's strategists, whose best-laid plans on a nuclear tit-for-tat had failed to calculate long-term weather changes. The academy was asked to review the science.

“Some panel members were less than convinced that this could happen,” conceded Dr Richard Turco, one of the “Ts” in TTAPS. Turco was a member of the academy's panel. Its report, *The Effects on the Atmosphere of a Major Nuclear Exchange*, warned against “accurate, detailed accounts” of wind, weather, temperature and other atmospheric changes, saying such predictions are still “unreliable”.

Nonetheless, the panel affirmed the mathematical models used by Turco and his colleagues. These predict drops in temperature in the northern hemisphere ranging from 10° C to 25° C for six to 20 weeks after dust blots out the Sun.

The report assumes that half the world's nuclear arsenal, about 6500 megatons of explosive force, would be detonated. The explosions and ensuing infernos would

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engulf cities, forests and crops and raise columns of soot and dust. Particles smaller than one micron would rise to the upper atmosphere and circle the globe for more than a year. Like tiny mirrors, they would reflect the Sun's radiation back into space, heating the upper atmosphere and cooling all below. The panel cited evidence that particles from volcanoes and Saharan dust storms have cooled parts of the Earth's surface in this manner.

Nitrogen oxides would also rise into the stratosphere and destroy ozone, which filters out harsh ultraviolet radiation. In two years, ozone would be cut by half, and ultraviolet intensity on the ground would be one and a half times the normal levels. The effects of ozone depletion would hit about the time the dust settled.

“There was a lot of scepticism when the [TTAPS] study came out,” says Turco. “But the academy's report makes it a ‘legitimate’ scientific problem.” The panel added some twists to TTAPS as well. The “freeze” would occur within two or three days after a war, not a week or two as TTAPS predicted. Oceans should moderate the effects near coastlines, but the way the air circulates in the atmosphere could change significantly, said Turco.

The panel also recommends the study of city-wide fires. This may help our understanding of how rain “scavenges” particulate matter and returns it to Earth, as in Hiroshima's “black rain”. Stores of urban fuels and chemicals could be menacing, too. “Bhopal is an example,” Turco said. “If you start blasting away at industry... the whole thing could be quite a mess.” □