CLIMATE CHANGE

UN sets out emissions plan for planes

Standards aim to reduce CO_2 produced by new aircraft.

BY JEFF TOLLEFSON

A United Nations panel has proposed the first global greenhouse-gas emissions standard for aircraft.

The draft rule, released by the International Civil Aviation Organization (ICAO) on 8 February, would apply to most new commercial and business aircraft, including designs already in production. But it would require only minimal changes to aviation technology over the next 12 years, and many environmentalists say that the proposal is inadequate.

The ICAO standard would take full effect in 2028; the panel is expected to adopt the plan later this year. Doing so could cut the amount of fuel used at cruising speed by an average of 4% compared with current levels, according to the International Council on Clean Transportation (ICCT), a non-profit research group in Washington DC.

But many environmental groups found the proposal wanting. "We think that this is just woefully insufficient," says Vera Pardee, a lawyer with the Center for Biological Diversity in Oakland, California. She notes that the plan would not apply to aircraft that are already flying.

Daniel Rutherford, programme director for marine and aviation at the ICCT in San Francisco, California, agrees that the ICAO could have been more aggressive. An ICCT study released in December found that manufacturers could reduce fuel consumption in new planes by 25% in 2024 and by 40% in 2034 by improving engine technologies and aerodynamics, and reducing aircraft weight.

Nonetheless, Rutherford says, the ICAO's plan is a step forward. "These standards do tend to matter over time as you update them and make them more stringent," he adds.

The ICAO process aims to plug a gap in the UN climate agreement signed in Paris last December. The panel also is working on a market-based offset mechanism that would levy a fee on international flights.

In the meantime, individual countries might implement more-stringent standards for aircraft emissions, and environmentalists are gearing up for a fight. For instance, lawsuits from environmental groups helped to push the US Environmental Protection Agency to begin developing its own greenhouse-gas standards for aircraft. ■

Pollution in New Delhi fell by 10% when vehicle numbers on its roads were temporarily reduced.

MEERA SUBRAMANIAN

ATMOSPHERIC SCIENCE

Car ban yields science bounty

Scramble by researchers to monitor driving restrictions in Indian capital pays off.

BY MEERA SUBRAMANIAN

New Delhi may be the world's most polluted city, but it's making an effort to relinquish that title. With pollution from particulate matter at potentially lethal levels early last December, city officials took a drastic step: they announced that they would temporarily restrict the use of private vehicles by allowing owners to drive only on alternate days, based on the sequence of their number plates.

The initial results of that 15-day trial, which began on 1 January, are now in. Although traffic actually increased in the first week of the ban, the levels of $PM_{2.5}$ — particulate matter measuring less than 2.5 micrometres across — fell by roughly 10%. That is a victory not just for New Delhi officials, but also for the scientists who sprang into action to collect the data necessary to determine whether the test had achieved its goal.

"This experiment with 'live research' has been really quite exciting," says Santosh Harish, assistant director of the India centre of the Energy Policy Institute at the University of Chicago (EPIC-India). EPIC-India and the New Delhi-based Council on Energy, Environment and Water (CEEW), an independent think tank, used video monitors around the city to document the types and numbers of vehicles on the roads. The groups had less than a month to collect baseline data before the driving restrictions began.

But they weren't the only researchers interested in Delhi's living lab. Economist Gabriel Kreindler of the Massachusetts Institute of Technology in Cambridge scrambled to secure human-study approval and funding for a survey of driver behaviour during the traffic restrictions. Within 18 days of the announcement of the driving ban, he had arrived in New Delhi to oversee a surveying team from the Abdul Latif Jameel Poverty Action Lab's office there. Kreindler's work eventually found that the alternate-day restrictions were

© 2016 Macmillan Publishers Limited. All rights reserved

well received by most drivers, who, in spite of the disruption, were willing to comply and alter their behaviour for short periods of time.

Other researchers built on work already under way. The Centre for Science and Environment (CSE), a non-profit research and advocacy group in New Delhi, had been closely analysing government air-quality data since last October. By December, government monitors were recording daily levels of noxious $PM_{2.5}$ in the range of 400–600 micrograms per cubic metre. This is much higher than the Indian legal standard of 60 micrograms (which itself is more than double the 25-microgram target threshold set by the World Health Organization).

$PM_{2.5}$ particles cause more than 600,000 premature deaths in India each year, from lung cancer, asthma, and cardiovascular and respiratory diseases. There is no known safe level for this pernicious pollutant.

The CSE's analysis found that, despite unfavourable weather conditions, the peak pollution during the driving scheme was lower than it would have been without the restrictions in place.

"The region is geographically disadvantaged," says M. P. George, a scientist with the government's Delhi Pollution Control Committee. In winter, particulate levels can be twice as high as during the summer, because 'inversion layers' of warm air trap cold air close to the ground. This prevents pollution from dissipating into the atmosphere. Emissions from vehicles and construction dust also combine with raised levels of black carbon generated from winter sources — fires for warmth, brick kilns that are lit in the autumn, and widespread field burning in neighbouring states.

"This experiment with 'live research' has been really quite exciting."

"It's a very simple math," says Sarath Guttikunda, director of the independent research group Urban Emissions, which is registered in New Delhi. "In winter, your air volume is going down and your emissions are going up."

Because atmospheric conditions such as wind and temperature can greatly affect particulate-matter measurements, researchers from EPIC-India and the Evidence for Policy Design initiative at Harvard University in Cambridge, Massachusetts, gathered data from air-quality monitors in New Delhi and placed monitors in three adjacent cities as a control. They found that the daily level of $PM_{2.5}$ pollution in Delhi dropped by 10–13% during the vehicle restrictions. Hourly comparisons showed an even greater improvement, at times an 18% fall.

The question now is whether New Delhi, the capital of a nation with dozens of growing cities choked by pollution, can build on the experiment for long-term gains in air quality. "Delhi has to get it right," says Namit Arora, a member of the pollution task force of the Delhi Dialogue Commission, a government initiative. This will require long-term strategies and coordination between local, regional and national efforts, he says, as well as a reduction in all sources of air pollution. Other researchers stress the need for more open-access data from a wide range of well-calibrated instruments.

But the driving-restriction experiment has given researchers a tantalizing glimpse of one possible future. "We need to re-imagine the way we think about cities," says Hem Himanshu Dholakia, a research associate at the CEEW. "That's the real opportunity." ■

CORRECTIONS

The Editorial 'Blue future' (Nature 529, 255–256; 2016) should have said that 2.4–4.6% of the world's carbon emissions are captured and sequestered by living organisms in the oceans. And the power of ASTRO-H probe is 3,500 watts not 2,500 as stated in the News story 'High stakes for Japan's space probe' (Nature 530,

© 2016 Macmillan Publishers Limited. All rights reserved