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Common cold transmission in commercial aircraft: Industry and passenger implications

Implications and Suggestions

Taken as a whole, the evidence appears to suggest that aircraft passengers do indeed develop colds with a higher than normal frequency in the week following their flights. However, this seems more likely to be due to the depressed humidity of cabin air or to an inadequate provision of outside air, than to its recirculation. Substantial overlap of personal air spaces causing mixing of these, and high person-toperson contact could also be factors, as explained earlier. It would be possible, although not simple, to conduct survey tests of each of these hypotheses to determine the possible significance of these air quality variables. Aircraft specially modified to increase the relative humidity of the cabin air to the normal comfort level of about 20% (Wang, 2000), both with an outside airflow of 7.1 L/s person (15 cfm/person), and with an airflow of 3.5 L/s person (7.5 cfm/person, about one-half of the office building standard) would be needed. These aircraft should be operated on a common route to that used by conventionally-equipped aircraft to minimise other variables. An attempt to correlate colds transmission with the lengths of flights of aircraft using the same amounts of outside airflow per person and humidity could also provide useful answers (Nagda and Hodgson, 2001). To be meaningful, these research projects would need to be on at least the scale of the impressive survey conducted by Zitter and colleagues (Zitter et al, 2002).

If one or both of the humidity or outside airflow hypotheses were found to be correct, improving these aircraft cabin air quality factors may prove to be extremely beneficial in lowering the incidence of in-flight, or post-flight infections. Promise of the potential benefit from increased humidity is seen from the anecdotal reports of the apparent effectiveness of the use of personal nasal mist dispensers such as Rhinaris, or Otrivin, or even a mist dispenser containing distilled water, or of antiseptic creams such as Secaris, in reducing the incidence of flight-related illness (Ross, 2002; Nykodym, 2002). The wearing of an appropriate, well fitted filter face mask, which became commonplace during the Severe Acute Respiratory Syndrome (SARS) outbreak of Spring 2003 (Zurer, 2003), would also have maintained a much more humid breathing microenvironment for the wearer (Hocking, 2002).

Superficially, it would appear to be relatively simple to increase the humidity of aircraft air. However, as found by British Airways during humidification experiments conducted on Boeing 747-100/200 aircraft in the 1980s, problems arose, mainly from solutes blocking water passageways and spray bars, (Bagshaw, 2003) (De Ree et al, 2000). Not infrequently during these tests, solutes also caused the air conditioning system to spray small white pellets along with the air supply, particularly to the flight deck. As a result of these difficulties, it was only possible in this study to maintain the mean relative humidity above 10% for three of the twelve British Airways flights (De Ree et al, 2000). This marginal increase meant that no conclusions could be drawn on the effectiveness of humidification from these tests.

It is possible that the humidification problems could be solved, without introducing new difficulties, by using de-ionised water. However, even using such essentially solute-free water, there could still be operational difficulties associated with the raising of cabin humidity, such as the risks of moisture condensation and freezing already occasionally observed on the very cold inner surfaces of aircraft pressure shells at cruising altitudes (Sloan, 1999). Also the potentially increased operating cost of a reduced payload equivalent to the mass of water required for the inflight humidification process itself, would have to be considered to safely test this option.

Fuel costs for the compression of outside air to cabin pressures are estimated to be US$0.33 per hour to provide 7.2 L/s person (15 cfm/person) and US$0.22 per hour to provide 4.7 L/s person (10 cfm/person), based on a jet fuel cost of US$0.52/L (Hocking, 2002). In 1984, it was estimated that the fuel for aircraft ventilation amounts to 1 to 2% of the total operating fuel costs (Lorango & Porter, 1984). Some years ago, the Douglas and Boeing aircraft companies reported 0.0009 or 0.015 US gallons of jet fuel per hour was required for each cubic foot per minute of outside air supplied for ventilation of aircraft (NRCC, 1986). With the improved overall efficiencies now achieved by the newer fan jet engines, the present ventilation fuel consumption should have dropped to somewhat less than these figures. To provide some recent perspective to the older figures, the fleet-wide specific total fuel consumption figures of 5.2 and 6.2 L/100 passenger km have been reported recently by Lufthansa, and the Scandinavian Airlines System, respectively (Lufthansa, 2000; SAS, 2000).

Conclusions

Fendrick and coworkers recently calculated an US $80 average cost of respiratory tract infection (Fendrick et al, 2003). This suggests that, given the relatively low expense, increasing air humidity in passenger aircraft would have a very positive benefit to cost ratio. Clearly, the issues discussed in this article are of considerable economic significance. If, in future studies, a substantial reduction of colds transmission were observed from the resumption of increased outside air flows, and/or from an increase of the relative humidity to the 20% comfort level (Wang, 2000), then the societal cost saving from adoption of such strategies would be far higher than the societal costs of implementing these air quality improvement measures.

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