THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY • NEW SOUTH WALES 2052 • AUSTRALIA

Date: 26 March, 2008

To: GCAQE
c/o IPA
The Old Refectory
The Priory
Haywards Heath
West Sussex RH16 3LB, UK

SCHOOL OF RISK AND SAFETY SCIENCES

From: Prof Chris Winder BA(Hons), GCert OHSM, MSc, PhD, FSIA, JP
Professor in Applied Toxicology
Head of School
School of Risk and Safety Sciences
Faculty of Science

Phone: (61 2) 9385 5370
Fax: (61 2) 9385 6190
Message: (61 2) 9385 4144
email: c.winder@unsw.edu.au

Regarding: Cabin Air Sampling Study Functionality Test, Cranfield University

Dear GCAQE

I have reviewed the recent Muir Report, available on the Internet at: http://www.dft.gov.uk/pgr/aviation/hci/cabinairtest.pdf. This is a Cabin Air Sampling Functionality Test, carried out in 2007-08 as contracted research for the UK Department for Transport, and published this year (Muir, H., Walton, W., McKeown, R., *Cabin Air Sampling Study Functionality Test: Report for the Department for Transport,* Cranfield University, Cranfield, 2008.

This study tested monitoring technologies in a BAe 146 on the ground in a hangar and a B757 in flight. The methodologies used suffer from many of the criticisms acknowledged elsewhere (Winder, C., Air monitoring studies for aircraft cabin contamination., *Current Topics in Toxicology* **3:** 33-48, 2006), and include monitoring on the ground and sampling for volatiles/semi-volatiles and not mists or particulates. The report also makes the assumption that workplace exposure standards apply at altitude, something that is, in a technical report that might be used by Government agencies to set policy or make recommendations, incorrect, misleading and unusually misinformed.

The results, such as they were, indicated that during the BAe 146 tests (held on the ground):

- Tributylphosphate was present at all times within the cabin, even before switching on the APU. This is a major component of hydraulic fluids and indicates residual contamination of the aircraft environment;
- Kerosene range (C_9-C_{15}) compounds and Lubrication oil range (C_9-C_{15}) compounds were detected when the APU was switched on (indicating unburned fuel and oil were being passed into the air conditioning system);
- Tricresyl phosphate was detected when the APU and ECS systems were running (also indicating oil was being passed into the air conditioning system).

During the B757 tests (held in flight):

- A qualitatively similar variety of volatile/semi-volatile organic compounds were found as on the BAe 146;

- Similar levels of Tributylphosphate were found as on the BAe 146;
- Higher levels of Tricresyl phosphate were found than on the BAe 146.

This study identified that two techniques; (i) the pumped thermal desorption technology and (ii) the photoionisation detection (PID) technique were the most appropriate techniques for determining the compounds likely to be present on aircraft.

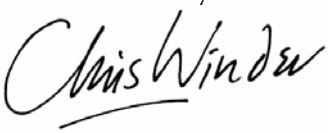
I cannot agree with this. With regard to sample collection and desorption techniques, collection of non-volatiles in mists would probably be poorly extracted during desorption for analysis, thereby underestimating the true concentration of particulate mist in air. Sample collection for later analysis by extraction or desorption techniques cannot accurately quantify poorly volatile particulate contaminants. The only technically functional way to identify the presence of poorly volatile contaminants present in aircraft environments is to place a direct reading machine on the aircraft during flight.

Further, the use of PID technology in this study failed for technical reasons, and there is no evidence in the report to support the authors' suggestion that PID may be better using other equipment.

Most importantly, during the flight of the B757, a "fume event" occurred, noticeable by "a distinct oily type odour which persisted for less than a minute before dissipating," and which formed part of a pumped sample collected over an eighteen minute period. Monitoring indicated that there was a sharp rise in "ultrafine particles", higher concentration of Jet Oil II, and higher levels of tricresyl phosphate.

Overall, limited though these results may be, this study did identify the presence of tricresylphosphate on aircraft, something that continues ti be strenuously denied by sectors of the aviation industry. Further, the report indicates that normal APU operation releases a range of compounds into the aircraft environment, something that can no longer be denied. And, for the first time, albeit incomplete and non-quantitative, evidence is available that particles (designated as ultrafines), volatiles and tricresyl phosphate are released during an (in this case, minor) "fume event."

Yours sincerely



CHRIS WINDER BA(Hons), GCert OHSM, MSc, PhD, FSIA, JP
PROFESSOR IN APPLIED TOXICOLOGY
and HEAD OF SCHOOL
SCHOOL OF RISK AND SAFETY SCIENCES

26 March, 2008