



AIRCRAFT CABIN AIR
International Conference 2019

IMPERIAL
COLLEGE
LONDON
SOUTH KENSINGTON

INTERNATIONAL AEROSPACE CONFERENCE

AIRCRAFT CABIN AIR CONFERENCE

Flight Safety and Cabin Air Quality

2 Day Conference

17-18 SEPTEMBER 2019

aircraftcabinair.com



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THE GLOBAL CABIN AIR QUALITY EXECUTIVE (GCAQE)

A global coalition of health and safety advocates committed to raising awareness and finding solutions to poor air quality in aircraft. Established in 2006, the GCAQE is the leading organization representing air crew (pilots, cabin crew and engineers) and passengers, that deals specifically with contaminated air issues and cabin air quality. The GCAQE represents over 30 organisations, and over one hundred thousand workers around the world.

gcaqe.org



PALL AEROSPACE

Technical innovation, custom design engineering, dedicated customer support and years of experience in the development and deployment of robust integrated filtration and separation equipment are the key elements which make Pall Aerospace a reliable partner in the implementation of contamination control solutions for aircraft cabin air environment.

pall.com



BASF CORPORATION

Since 1980, BASF has been a leading supplier of ozone removal systems for Airbus, Boeing, Gulfstream, Dassault, and many other aircraft. BASF offers technology to reduce both harmful ozone and Volatile Organic Compounds (VOC) in aircraft cabin air. This technology helps improve the quality of the air provided to cabin environment and improve passenger, pilot and flight attendant comfort.

basf.com



THE AUSTRALIAN FEDERATION OF AIR PILOTS (AFAP)

AFAP is a professional association and industrial organisation for commercial pilots in Australia. As a professional association, it provides pilots the opportunity to meet and discuss aviation-related matters. Its Technical Committee is involved in the development of Australian and international aviation safety standards. As an industrial organisation, its role is to improve employment conditions for its members, including collective bargaining, negotiating labour contracts, representing members involved in a dispute with their employer or assistance in the event of an accident or incident.

afap.org.au



UNITE THE UNION

Unite is dedicated to serving the best interests of its members, protecting workers' rights and improving the quality of life by negotiating with employers and government. As a primarily industry-based union, Unite's structure means they can effectively represent workers' interests in the workplace, no matter where the worker works or what sector they're from.

unitetheunion.org

AIRCRAFT CABIN AIR CONFERENCE 2019

Dear Delegate

On behalf of all our sponsors and partners, welcome to the Aircraft Cabin Air Conference 2019. We are delighted to be back at Imperial College where the 2017 Conference was held. I am certain that over the next two days, our diverse range of speakers will provide you with a unique and greater insight into the issue of contaminated air on aircraft and the solutions available to operators.

I organised the 2017 Conference and the 2005 Conference for the British pilot union BALPA. Pall Aerospace have sponsored both these previous conferences and I am delighted they have again chosen to be part of the 2019 conference where they will also present their latest technical achievements and R&D into providing solutions to this issue. Fourteen years on from the first conference, the theme is much the same but the science and understanding of the issue has vastly improved and today we are much closer to an effective resolution of the problem.

I became involved in this issue in 2001 when I was a Captain with British Airways whilst flying the Boeing 757 and Boeing 767. At the time, I was a Health & Safety representative for the UK pilot union BALPA and part of my duties involved dealing with long-term sick pilots. A fellow Captain phoned me and informed me that he had experienced a number of exposures to contaminated air in the aircraft he flew and was being ill health retired by the company. He believed that the exposures to oil fumes we were experiencing were a serious health and flight safety issue. He mentioned the word 'organophosphate', a word I had never heard of and asked me to investigate the issue. I have been doing so ever since.

Over my eighteen year journey, I have debriefed more than a thousand crews and passengers over six continents who have had contaminated air exposures. I have heard their concerns about flight safety being compromised; a reluctance to report events; pilots not using emergency oxygen when the air was suspected of being contaminated; crews becoming impaired and incapacitated; their desire to have a definitive medical test to confirm exposure to one or more of the contaminated air ingredients and their collective desire that this issue be resolved for the benefit of all in aviation. Some of these crews and passengers have lost their health and their livelihoods and some are no longer with us.

I have seen the misinformation put out by those who fear the consequences of contaminated air; I have witnessed the vested interests at work; the denial and the fear of litigation. I have sat on aerospace and Government committees; briefed regulators and safety agencies; met and discussed the issue with lubricant manufacturers, politicians, aircraft and engine manufacturers, press, doctors, scientists, union leaders and countless others. I have also made five documentaries and a feature film on the issue. My latest two films 'Everybody Flies' and 'American 965' will be released soon.

I have heard all sides of the debate. I have met many people who lack the expertise and knowledge of the issue, yet are empowered to make key corporate or operational decisions in these matters. I have heard it said that contaminated air events are some form of global mass hysteria; it's all linked to the contraceptive pill or something a person ate. On the other side, I have heard it called the asbestosis of the skies or aviation's biggest cover-up.

Having experienced the flight safety consequences of exposure, suffered the health effects first hand and having lost my own career to repeated exposure to contaminated air at the age of 44; I know it is a very real issue and one that has to be addressed.

I love aviation, I love what it has achieved and I miss the job I once had but the simple reality is that aviation has a design flaw in providing breathing air on aircraft as unfiltered bleed air from engines. The original passenger jet aircraft like the Boeing 707, DC-8, Convair 880/990 and VC-10 designed their aircraft not to use bleed air directly for pressurisation and air conditioning and like many things in life – the first ideas are often the best.

The Boeing 787, with its revolutionary bleed free architecture, is without doubt the only sensible solution for future aircraft design. The crews who work on the 787 tell me it is a whole new world compared to other aircraft. I believe all current 'bleed air' aircraft should have an effective filtration system and warning systems installed to minimise as much as possible, the health and flight safety consequences of exposure.

In my opinion, it's not morally or ethically right to continue to debate the health and flight effects of exposure to contaminated air, whilst still allowing crews, fare-paying passengers (some pregnant) and others to be exposed to contaminated air. In my career, I have seen aviation effectively mitigate the risk of numerous threats to flight safety: TCAS, EGPWS, CRM, the 'glass cockpit' and the advent of fly-by-wire to name a few. Aviation has the ability to resolve this problem. All it needs is the will to do so.

Most passengers I have met would pay for clean air if given a choice. Every airline shareholder I met feels that airlines should fix the problem but the problem still exists. All it needs is airline leadership. Stop the denial, fix the problem and make air travel as safe as is reasonably possible; Minimise the risk - adapt the Precautionary Principle.

United Airlines took a world lead many decades ago by being the first airline in the world to introduce HEPA filters in all their aircraft for the re-circulated air. DHL introduced a Pall Aerospace Cockpit Filter Unit (CFU) nearly 10 years ago to filter the air their pilots breathe on their Rolls-Royce powered Boeing 757 aircraft. Today, the world waits for the first airline to introduce an all 'bleed free' fleet or the introduction of an effective bleed air filtration system to all their aircraft. It is just a matter of time.

Therefore, I am glad the Aircraft Cabin Air Conference 2019 will provide an arena for delegates to better understand the contaminated air issue and conduct productive discussions towards a positive solution to this issue.

Captain Tristan Loraine BCAi
Conference Director
GCAQE Spokesperson
September 2019





STEVE SIMPSON

SENIOR DIRECTOR
MARKETING,
PALL AEROSPACE

From the world's first cabin air assembly, to our state-of-the-art Advanced Cabin Air Filters, Pall Aerospace has an unparalleled legacy of innovation in the field of Cabin Air Quality.

Our integrated filtration, separation, and purification solutions weave together decades of experience in developing and selecting media, designing strong and lightweight hardware, and constantly testing and refining our products to ensure they remain the best solution to both operational and business needs in the challenging aerospace environment.

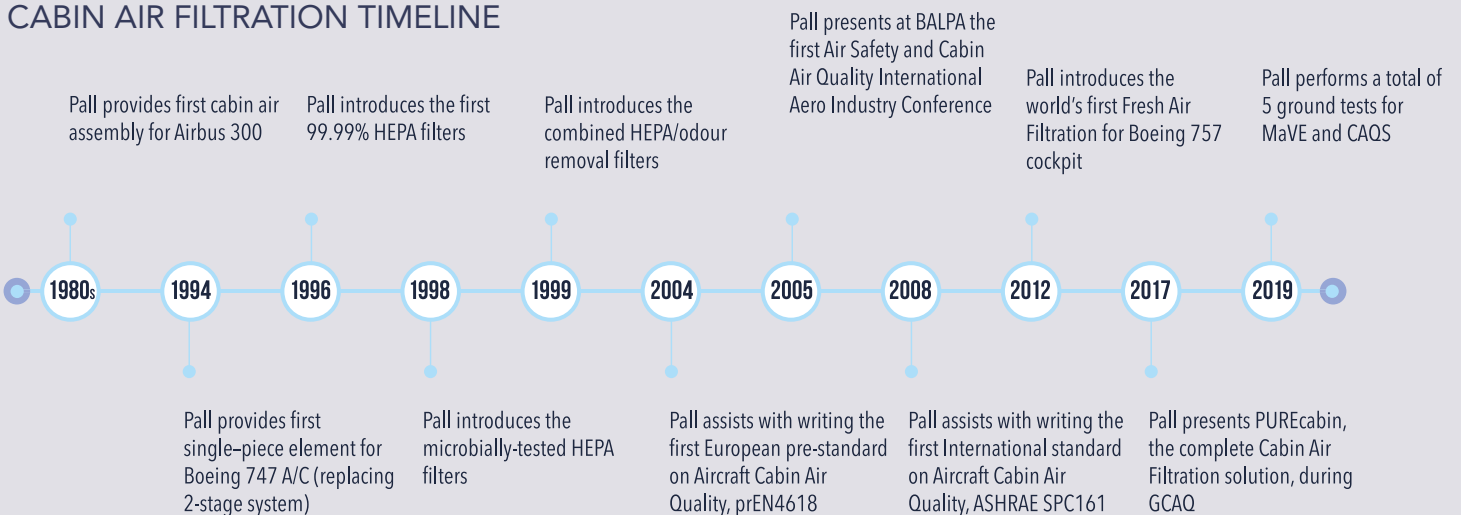
Accelerating technology development and promoting a culture of innovation is critical to the success of our business. It is through our work with agile and responsive partners and customers that we are able to maintain our finger on the pulse

of the industry, gain insights into current challenges and in some cases, anticipate market needs.

We work closely with Original Equipment Manufacturers (OEMs) to provide game-changing products and we address the needs of operators around the globe by designing custom-tailored solutions that seamlessly retrofit existing systems. We are proud to be able to enable our commercial partners to meet today's industry wide challenges when it comes to fleet maintenance. Our PUREcabin product lines directly address the industry's need to efficiently and effectively retrofit fleets to ensure the optimum level of Cabin Air Quality.

Pall Aerospace is pleased to be able to share details of these products at the 2019 GCAQE conference. We look forward to seeing you there!

PALL AEROSPACE CABIN AIR FILTRATION TIMELINE



ABOUT PALL AEROSPACE

Headquartered in New Port Richey, Florida, Pall Aerospace is a global filtration, separation and purification solution provider with worldwide offices and plants principally engaged in the research, design, a development, manufacture, integration and sustainment of Cabin Air Filtration products. For additional information, visit our website www.aerospace.pall.com

CONTAMINATED CABIN AIR

KEY TIMELINE 1930-2019

- 1930** Ortho isomers of TCP responsible for toxicity - Ginger Jake
- 1946** Synthetic lubricants developed
- 1953** Pyrolysed oil contains irritant and toxic substances. Impairment causing pilot error and hazardous situation - Aero Medical Association
- 1953** Toxic effect of oil contamination unknown - Boeing
- 1954** Inhalation toxicity of jet oils related to pyrolysis of base stock at high temps - USAF
- 1955** Cabin air contamination problems in crew - USAF
- 1955** The separate compressor as a solution – This method of eliminating contamination is considered to be the most positive - North American Aviation
- 1955** First civil airliner flies using direct bleed air for pressurisation and air conditioning - Sud Aviation Caravelle
- 1959** Other ortho isomers of TCP: MOCP and DOCP 10 and 5 x more toxic than TOCP - Henschler
- 1960s** TCP in lubricants replaced with other phosphate esters in all markets except aviation / military
- 1961** Active metabolite causing TOCP toxicity identified - Casida
- 1962** Oils shall have no adverse effect on human health / carcinogens prohibited - MIL Specs
- 1965** Other Triaryl phosphate (TAP) isomers very likely to contribute to toxicity - US Navy
- 1969** Oil consumption mainly linked to oil leakage past seals/loss via breather - Rolls-Royce
- 1970** Cockpit warning systems required - FAR 1309c - Not met as of 2017
- 1973** Internal engine oil leakage shall not contaminate the bleed air - MIL-E-5007D
- 1977** Aircrew incapacitation due inhalation exposure to aerosolized or vaporized synthetic lubricating oil - Montgomery
- 1981** Oils being stressed to limits due increased engine temps - Royal Dutch Shell
- 1981** At temps >320°C oil breaks down into toxic and carcinogenic compounds - SAE
- 1983** Mobil Jet Oil II assumed to be causing dirty socks odour - Cone
- 1988** TOCP level in TCP is not a reliable indicator of potential TCP neurotoxicity - Mobil
- 1989** Recommendation to ban Exxon 2380 from US Navy and test all base stocks - US Navy
- 1990** Not possible to establish safe level of exposure to TOCP. TCP mixed isomers including TOCP considered major hazard to human health - WHO
- 1995** Air oils seals must be improved now! - Aerospace consortium – NASA / Allied Signal - ongoing (1950s - present)
- 1997** Reluctance of crews to report events to employer - fear of reprisals - ATSB
- 1998** Short term symptoms associated with odours on the BAe 146 and other types are substantiated - Ansett
- 1999** Oil fumes in cabin air represent a possible safety deficiency - ATSB
- 1999** TCP is toxic and Inhaling engine oil / TCP is hazardous - UK House of Commons
- 1999** Employee 'Suffered injury arising out of and in the course of her employment.' - Compensation Court - NSW
- 1999** TOCP exposure standards not adequately protective for products containing TCP / TOCP - Mobil
- 1999-2000** Australian Senate Inquiry
- 1999-2012** ASHRAE studies
- 2000** UK HOL Inquiry
- 2001** 10 nanogrammes of TOCP found in pilot's blood after a reported contaminated air event
- 2001** Oil fumes seen as a nuisance / should be seen as flight safety hazard (SB/AD) - BAe Systems
- 2001** Recommendation that crew use oxygen at 100 %, International database established, Oil effects research – SHK
- 2001-2002** US NRC inquiry
- 2001-2004** UK CAA cabin air quality report
- 2002** Charge of reprehensible conduct appropriate if necessary precautions and measures not taken by airlines - Abeyratne (ICAO)
- 2002** Oil leaks and cabin / flight deck odours must be regarded as a potential threat to flight safety - CAA
- 2002** No aircraft airworthy as no contaminated air detection systems fitted - FAA
- 2003** Airline cannot guarantee a safe working environment free of oil fumes - NJS
- 2003** Leaking oil is hazardous - Rolls Royce
- 2003** Survey of British Airways Boeing 757 pilots shows 96% of all contaminated air events not reported - Michaelis
- 2004** ExxonMobil oil MSDS citation issued by OSHA / cancelled 2005 - OSHA
- 2004** Airworthiness Directives - Oil contamination - Unsafe condition / design problem - FAA
- 2004-2012** ASD-STAN - air quality standards - withdrawn (2013)
- 2005** International conference in London - acknowledges workplace problem - BALPA
- 2005-2007** UK COT inquiry
- 2006** TOCP found in pilot's blood after a reported contaminated air event / ill health retired 6 months later.
- 2006** Under-reporting is occurring - FAA
- 2007** Oil fumes reported in 1% of UK flights - COT
- 2006** Global Cabin Air Quality Executive (GCAQE) established

- 2007** Cabin air quality standard - ASHRAE SPC-161
- 2007** Senator O'Brian reveals in Australian Senate 'cash for silence' - BAe Systems, Allied Signal, Garrett
- 2007** Safety Recommendations - Recommended FAA / EASA consider system to enable flight crew to identify rapidly the source of smoke by providing a flight deck warning of smoke or oil mist in the air - AAIB
- 2007** 'Welcome Aboard Toxic Airlines' documentary film released - Fact Not Fiction Films
- 2007** Public Enquiry into oil fumes called for in the UK - Conservative Party, Liberal Democrats and Green Party
- 2007** By-products of hot synthetic turbine oil unknown - Boeing
- 2007** All oil chemical ingredients must abide by regulations - SAE / FAA
- 2007-2014** Bleed air monitoring required - APH, NRC, US Senate and Congress, CASA EPAAQ, Bundestag, ASHRAE, AAIB, BFU
- 2007-2014** Bleed air filtration / cleaning required - APH, SAE, US Senate and Congress, CASA EPAAQ, Bundestag, ASHRAE, BFU
- 2008** FAA funded medical protocol for fume exposures - OHRCA
- 2008-2012** Australian CASA EPAAQ
- 2009** Is Inhaling oil fumes safe? No - Bundestag
- 2009** Toxicity of oils raised with EASA and upgraded MSDS risk phrases - NYCO
- 2009** Investigate possibility of installing smoke warning system in bleed air ducting of B757 - IPFS Iceland
- 2010** 1st successful civil litigation - J Turner, Australia: Oil harmful to lungs
- 2010** Documentaries 'Angel Without Wings' and 'Broken Wings - The BAe 146 Story' released - Fact Not Fiction Films
- 2010** Boeing 757 DHL aircraft - introduce PALL cockpit bleed air filters
- 2011** Identification of increased TCP / TAP toxicity: Durad 125, TpCP - Furlong
- 2011** Fumes mostly related to oil / under-reported - EASA
- 2011** First ever awarded PhD on contaminated air - Dr. Susan Michaelis
- 2011** German Parliamentary hearings
- 2011** Boeing settles legal case (Williams / USA)
- 2011** Blood test for TOCP exposure developed - Lockridge
- 2011** Boeing 787 with bleed free architecture enters commercial airline service
- 2012** Cabin air position statement - ECA
- 2012** Toxic cabin air 6th biggest engine problem - RR
- 2012** Air accident report - TOCP in pilots blood after incapacitation - BFU
- 2012-2013** All future aircraft to be bleed free - CASA EPAAQ, Bundestag, ASHRAE
- 2012-2019** US Senate / Congress CAQ bills
- 2013** OSHA and ACGIH have not set exposure limits for decomposition product of synthetic jet engine oils - ExxonMobil
- 2013** Decomposition reactions of engine oils and toxicity largely unknown - FAA
- 2015** Cabin fume event guidance published - Cir 344 - ICAO
- 2014** Certification does not cover all contaminated air substances or crew impairment (only Incapacitation) - BFU
- 2015** Feature film 'A Dark Reflection' exploring contaminated air is released - Fact Not Fiction Films
- 2015** Documentary 'Unfiltered Breathed in: The Truth About Aerotoxic Syndrome' released - TVBMedia
- 2016** Do not breathe mist or vapor from heated material / avoid eye and skin contact - Eastman Turbo Oil 2197
- 2016** TCP inhalation toxicity for engine oils to be undertaken by 2018 - ECHA
- 2016** Engineering design and operational problem - explains frequency (unairworthy system) - Michaelis
- 2016** ICAO monitor international actions to determine impact on health and take safety actions - Spanish CIAIAC
- 2017** Permanent low-level oil leakage in aircraft / >120 contaminants released from heated oils - EASA
- 2017** Aerotoxic Syndrome - new occupational disease? - Panorama WHO Journal
- 2017** Aircraft Cabin Air Conference, London
- 2017** GCAQE introduces Global Cabin Air Reporting System - GCARS starts evaluation
- 2017-2018** Increased Ultra Fine Particle levels measured on aircraft show correlation with engine & APU operation
- 2018** FAA issues a Safety Alert for Operators (SAFO 18003) calling for enhanced procedures for contaminated air events
- 2019** UK union Unite the Union calls for a Public Inquiry into contaminated air
- 2019** Documentary 'Everybody Flies' released - Fact Not Fiction Films
- 2019** Pall Aerospace test their 'Total Cabin Air Filtration System' for Airbus A320 series aircraft
- 1954-2019** 100 Published papers to date on contaminated air



AGENDA DAY 1

Subject to change

08:00-08:54 REGISTRATION AND REFRESHMENTS

SESSION ONE:

- 08:55-08:59 CONFERENCE INTRODUCTION
Conference Host
- 09:00-09:20 OPENING KEYNOTE SPEECH
Captain Tristan Loraine BCAi
GCAQE Spokesperson
- 09:21-09:41 DEALING WITH CABIN ODOR EVENTS
Ricardo Pavia
TAP Engineers
- 09:42-10:02 A COMMANDER'S PERSPECTIVE
Captain Janet Bevan
Captain Eric Bailet
- 10:03-10:17 A UNION PERSPECTIVE
Howard Beckett
Assistant General Secretary of Unite for
Legal and Politics
- 10:18-10:29 Q&A
- 10:30-10:59 REFRESHMENTS AND NETWORKING

SESSION TWO:

- 11:00-11:08 CABIN AIR QUALITY AN FAA OVERVIEW
Short Film
- 11:09-11:29 IFALPA POSITION ON CABIN FUMES
Dr. Antti Tuori IFALPA - HUPER Vice chair,
A320 CDR, M.D, PhD
- 11:30-11:50 FLIGHT CREW RELATED ISSUES
Gitte Furdal Damm
Human Factors Consultant
- 11:51-12:11 A BRIEF BACKGROUND - AN AIR
ACCIDENT INVESTIGATOR'S PERSPECTIVE
Tony Cable
Aircraft Accident Investigation Consultant
(AAIB - retired)
- 12:12-12:32 CONTAMIANATED AIR:
A FLIGHT SAFETY ISSUE.
Captain Nick McHugh
GCAQE Board Member
- 12:33-12:59 Q&A
- 13:00-13:59 REFRESHMENTS AND NETWORKING

SESSION THREE:

- 14:00-14:23 CABIN AIR SAMPLING OF
ORGANOPHOSPHATES DURING FUME
EVENTS IN AUSTRALIA.
Marcus Diamond
Australian Federation of Air Pilots
- 14:24-14:47 BLEED AIR CONTAMINATION DETECTION
Professor Byron Jones
Professor of Mechanical Engineering,
Kansas State University
- 14:48-15:13 MONITORING CABIN AIR QUALITY ON
COMMERCIAL AIRCRAFT
Rick Mlcak
Senior Principal Engineer and Cabin
Air Quality SME at PALL R&D
- 15:14-15:29 Q&A
- 15:30-15:59 REFRESHMENTS AND NETWORKING

SESSION FOUR:

- 16:00-16:10 TIPP AND TCP IN PROFILE
Short Film
- 16:11-16:31 WHY THE BRAIN IS THE MOST
VULNERABLE TARGET ORGAN IN CHRONIC
ORGANO-PHOSPHATE EXPOSURE
Emeritus Professor C. V. Howard
MB. ChB. PhD. FRCPATH. Professor of
Pathology (toxicology) - University of Ulster
- 16:32-16:52 HEALTH EFFECTS OF AIR POLLUTION
Professor Terry Tetley
PhD, FSB, Professor of Lung Cell Biology
- 16:53-17:13 AIRCRAFT CABIN AIR - NEUROTOXICITY
Daniel Dumalin
M.Sc.(Psy) Research Psychologist specialised
in Neurophysiology
- 17:14-17:34 RESPIRATORY DISEASE CAUSED BY
AEROTOXIC SYNDROME: A CASE SERIES
Jordi Roig
MD, PhD, FCCP Respiratory physician
- 17:35-17:59 Q&A
- 18:00-20:30 JAZZ DRINKS RECEPTION

AGENDA DAY 2

08:00-08:54 REGISTRATION AND REFRESHMENTS

SESSION FIVE:

- 08:55-08:59** CONFERENCE INTRODUCTION
- 09:00-09:24** THE TRIUMPH OF DOUBT: DARK MONEY AND THE SCIENCE OF DECEPTION
Professor David Michaels PhD, MPH
Milken Institute School of Public Health of George Washington University
- 09:25-09:48** THE REGULATORY IMPLICATIONS OF BLEED AIR SUPPLY CONTAMINATION
Dr. Susan Michaelis PhD, ATPL
University of Stirling
- 09:49-10:09** CABIN AIR CONTAMINATION - A SUMMARY OF ENGINEERING ARGUMENTS
Professor Dr.-Ing. Dieter Scholz MSME
Aircraft Design and Systems Group (AERO) - Hamburg University of Applied Sciences
- 10:10-10:25** A GPS PERSPECTIVE ON FUME EVENTS OVER 20 YEARS.
Dr. Moira Somers MD General Practitioner
- 10:26-10:40** Q&A
- 10:41-11:09** REFRESHMENTS AND NETWORKING

SESSION SIX:

- 11:10-11:30** OIL FUME EVENTS: HOW OFTEN?
Judith Anderson
MSc CIH – Industrial Hygienist, Association of Flight Attendants - CWA
- 11:31-11:51** AN APPROACH TO THE INVESTIGATION OF SYMPTOMATIC PERSONS AFTER EXPOSURE TO AIRCRAFT FUME EVENTS
Dr. Jonathan Burdon
Consultant Respiratory Physician
- 11:52-12:12** LEGAL SUMMARY
Judy Cullinane
Aviation Legal Consultant
- 12:13-12:33** OCCUPATIONAL HEALTH PROBLEMS OF FLIGHT ATTENDANTS
James E. Cone
MD, Adjunct Assistant Professor
- 12:34-12:59** Q&A
- 13:00-13:59** REFRESHMENTS AND NETWORKING

SESSION SEVEN:

- 14:00-14:25** DEOXOTM OZONE AND OZONE/VOC CONVERTERS: ESSENTIAL FOR CABIN CLEAN AIR
Victor Leung
Global Marketing Manager,
Clean Air BASF
- 14:26-15:01** COLLABORATIVE DEVELOPMENT OF AN AIRCRAFT FRESH AIR FILTRATION SYSTEM
Dr. David Stein
VP, Aerospace Global Strategic Marketing,
Pall Corporation
- 15:02-15:29** Q&A
- 15:30-15:59** REFRESHMENTS AND NETWORKING

SESSION EIGHT:

- 16:00-16:20** MAKING THE SAFETY CASE FOR AIRCRAFT OPERATORS (FUME RISK IN THE CABIN/COCKPIT)
Cliff Edwards
Aviation Risk Management Consultant (Retd)
- 16:21-16:41** SUSPECTED AIR QUALITY PROBLEMS ON BOARD - EXPERIENCES & ACTIONS
Richard Hansen
Technical Safety Officer
Safety Office - Icelandair
- 16:42-17:02** CABIN CREW AND TOXIC FUMES
Lori Bassani
President of APFA
- 17:03-17:18** CABIN CREW PERSPECTIVE
Melissa Dray
Former crew member
- 17:19-17:34** CLOSING SPEECH
Countess of Mar
Member of the House of Lords
and GCAQE Co-Patron

MEMBERS OF THE GCAQE INCLUDE:

ACA - Austrian Cockpit Pilots Association;

ACPA - Air Canada Pilot's Association;

Aeropers - Swiss Airline Pilots Association (Swiss ALPA);

AFAP - Australian Federation of Air Pilots;

ALAEA - The Australian Licensed Aircraft Engineers' Association;

APA - Allied Pilots Association;

ALPL - Association Luxembourgeoise des Pilotes Ligne;

APFA - Association of Professional Flight Attendants;

AIPA - Australian & International Pilots Association;

BASSA - British Airlines Stewards and Stewardesses Association;

BECA - Belgian Cockpit Association;

CUPE - Canadian Union of Public Employees;

FPU - Flight Personnel Union, Denmark;

FSC-CCOO - Federation of Citizen Services;

FAAA - Flight Attendants Association of Australia-International Division;

FIA - Icelandic Airline Pilots' Association;

Kapers - Kapers Cabin Crew Union;

NFO - Norsk Flytekniker Organisasjon - Norwegian Aircraft Engineers;

PPU - Professional Pilots Union

Rolls-Royce Unite the - Union Branch;

SNPL - Syndicat National des Pilotes de Ligne;

SNPNC - Syndicat National du Personnel Navigant Commercial;

SWEALPA - Svensk Pilotförening | Swedish Airline Pilots Association;

TWU - Transport Workers Union of America;

UFO - Unabhängige Flugbegleiter Organisation e.V.;

Vereinigung Cockpit - German Airline Pilots Association;

VIPA - Virgin Independent Pilots Association (Australia)

VIDA - Austrian Federation of Trade Unions;

ZZPK - LOT Polish Airlines Pilots Union;

Aerotoxic Association

P-CoC

Stichting Fly Aware

FumeEvents.com

AIMS AND OBJECTIVES GCAQE 2019/2020



BACKGROUND

The Global Cabin Air Quality Executive (GCAQE) is a global coalition of health and safety advocates committed to raising awareness and finding solutions to poor air quality in aircraft. Established in 2006, the GCAQE is the leading organisation representing air crew (pilots, cabin crew and engineers) and passengers, that deals specifically with contaminated air issues and cabin air quality. We represent over thirty organisations, and over one hundred thousand workers around the world.

The primary aim of the GCAQE is to effect the changes in the aviation industry that are necessary to prevent exposure to heated synthetic jet engine oils, hydraulic and de-icing fluids; that are known to contaminate ventilation air supplied to the cabin and flight deck.

In all modern commercial jet aircraft with the notable exception of the Boeing 787, the cabin air supply is taken unfiltered directly from compressors in the engine or the Auxiliary Power Unit (APU), using a process known as 'bleed air'. Current jet engine oil systems, by design, will enable oil to contaminate the 'bleed air' at low levels in all conditions. As the oil contamination levels increase, a smell can often be noticed, often described as a dirty sock, acrid, chemical or oily smell. This is often referred to as a 'fume event'. 'Fume events' can range from transitory exposure as part of normal operations, to more continued exposure due to abnormal conditions such as engine seal wear, engine oil over fill or seal failure. In extreme levels of contamination, a visible smoke or mist may become apparent. Contaminated air exposures are acknowledged to occur by regulatory authorities, aircraft manufacturers, safety agencies, scientists, airlines, occupational doctors, oil manufacturers, and crew unions. Some reports dating back as far as the 1950s. Contaminated air may result in crew impairment or less frequently, in crew incapacitation and jeopardise flight safety. Both short and long term health effects have been reported as a consequence of these exposures.

GCAQE OBJECTIVES

CLEAN AIRCRAFT AIR SUPPLY

We recommend that aircraft manufacturers incorporate bleed-free technology on future aircraft types and that regulators (EASA, FAA, CASA, TC, etc.) require that all aircraft certificated to use 'bleed air', be equipped with an effective and suitably maintained air cleaning technology in the shortest time frame possible.

AIR SUPPLY MONITORING

We recognise the need to define appropriate chemical markers or particulates of air supply contamination, to implement continuous monitoring onboard, and to develop procedures for crew to respond to elevated levels at the earliest possible time. We wish to remind our industry colleagues that air accident investigation departments have been also calling for this for over a decade. The failure to install such technology contravenes the regulatory requirements.

EXISTING REGULATIONS/STANDARDS TO BE MET

We call on regulators to ensure compliance with existing regulations, certification standards and compliance guidance material, including an air supply without harmful or hazardous concentrations of gases or vapors that can cause impairment or degraded crew performance, and reporting of smoke/fume events, and proper maintenance follow-up. We also call on regulatory bodies with expertise in occupational health and safety to work with aviation regulators to ensure that crewmembers' health and safety is best protected.

PREVENTIVE MEASURES TO REDUCE THE RISK OF AIR SUPPLY CONTAMINATION

We call on aircraft and component manufacturers to develop design and operational features that are proven to reduce the frequency of oil and hydraulic fluid contaminating the air supply system (e.g. improved seal design, etc.) and for regulators to require airlines to implement them.

EDUCATION AND TRAINING PROCEDURES

We call on manufacturers and airlines to acknowledge the potential for air supply contamination and to provide crewmembers with information on chemical contaminants to which crews may be exposed, symptoms, and standardised checklists, procedures suitable for fume events, and oxygen usage. We wish to remind our industry colleagues that ICAO introduced Fumes, Education and Training guidance material in 2015 and the FAA issued a Safety Alert for Operators (SAFO) in 2018 calling for enhanced procedures in this regard, yet no airline has to date adequately implemented these.

MAINTENANCE

We call on the regulators to require manufacturers and airlines to improve their investigative procedures following report fumes events; and to provide access to relevant aircraft maintenance records to enable affected crewmembers and passengers to determine if the air supply was contaminated, and if so, with what.

HEALTH IMPACT OF EXPOSURE TO BE PROPERLY ASSESSED

We urge the industry to adapt a more precautionary approach to this problem as opposed to an entrenched position of denial by looking at all the currently available data. If further research is undertaken to further clarify the toxicological mechanism, we recognise the need for truly independent and relevant inhalation toxicity research to be funded, and to be carried out by independent researchers, to properly investigate the health impact of inhalation exposure to pyrolised engine oils with an emphasis on the chronic neurotoxic effects (e.g. difficulty concentrating, memory and communication problems, difficulty multitasking, etc.) reported by crews. The toxicity of oils should not be defined according to dermal and ingestion toxicity studies that assess peripheral neuropathy and paralysis when, by definition, aircraft occupants are exposed via inhalation and report chronic neurotoxic symptoms. We also call for an epidemiological survey of crew members to properly assess the health impact of exposure to contaminated cabin air.

READY ACCESS TO INFORMATION ON MEDICAL EVALUATION AND TREATMENT

We recognise the need for a comprehensive medical protocol to be readily available to passengers, crew members and their physicians, and for physicians to have access to any onboard air sampling data to assist in diagnosis and treatment.

REPORTING

Under reporting of contaminated air events has been acknowledged globally for nearly two decades. We urge the industry to encourage the reporting of all contaminated air events. This will ensure all events are fully reported and help all stake holders better understand the frequency, nature and operational factors related to contaminated air events, and their effects on crew, passengers and maintenance practices.

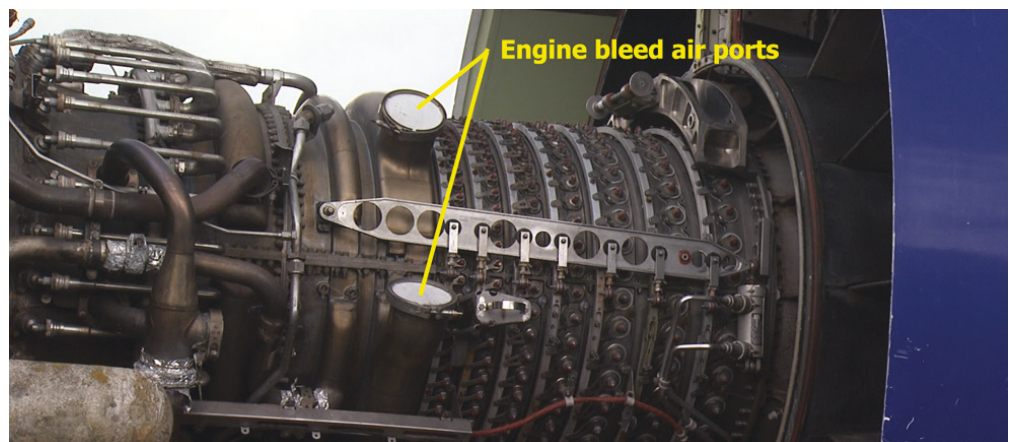
In addition, we recognise that aviation maintenance workers are also impacted by these exposures, and that turbine engines maintained with the same oils have additional applications such as oil and gas production, marine, and military vehicles. The spirit of the aims and objectives described above apply equally in these other fields.

'BLEED AIR' SIMPLIFIED

The air you breathe in-flight, onboard all currently flying commercial passenger jet aircraft (apart from the Boeing 787), originates from the compression section of the engine in a process known as 'bleed air' as it is bled off the engine. This air is supplied to the cabin totally unfiltered. Only the recirculated air is filtered, primarily for bacteria and viruses.

In modern jet airliner engines, 'bleed air' is usually provided from two regulator valves on the high stage and/or low stage engine compressor section of the engine. These usually turn on and off automatically. 'Bleed Air' is also used for some other purposes like engine anti-icing.

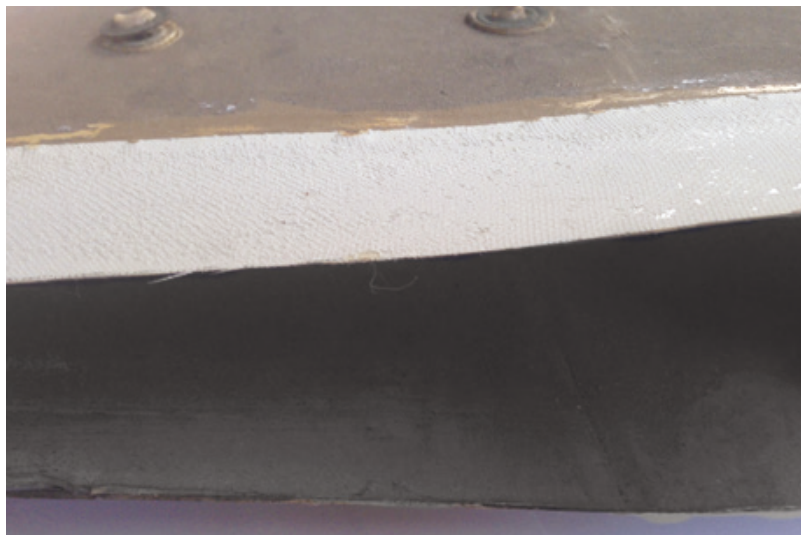
Low stage air is used during high power setting operation, and high stage air (see picture right) is used during descent and other low power setting operations. Because the low stage air is a significantly lower temperature than the high stage air, the pyrolysed engine oil decomposition products will differ and may provide a different smell in the cabin and cockpit due to a different chemical mixture.



The images below show the air supply ducting on a Vickers VC-10 aircraft which first flew in 1962 (the last non-bleed air aircraft before the Boeing 787 flew) removed from an aircraft at the end of its service life. Compare this to the bleed air-ducting pipe from a Boeing 737 engine, which is black from pyrolysed oil contamination.



Bleed air off take port from a Boeing 737.
Interior is black from oil contamination.



Air supply ducting on a VC-10.
Interior is dirty and dusty but has no oil.

Consequently, aircraft should be designed with a 'bleed free' architecture, like the Boeing 787 or the 'bleed air' should be effectively filtered with accurate contaminated air sensors installed.

GCAQE

CONFERENCE SPEAKERS



CAPTAIN TRISTAN LORAINE - BCAi GCAQE SPOKESPERSON

Captain Tristan Loraine BCAi is a former British Airways Captain and was ill health retired in 2006, due to the health effects of repeated exposure to contaminated air in the cockpits of the aircraft he flew.

He was Co-Chairman of the Global Cabin Air Quality Executive (GCAQE) from its inception in 2006 until 2016 when he became the GCAQE Spokesperson.

Previously a Health and Safety representative and National Executive Council member of the UK pilot union BALPA, he was a recipient in 2015 of the British Citizen Award for services to Industry (BCAi) for his work on the contaminated air issue since 2001.

He is also an independent film maker. His latest film on the issue of contaminated air, 'Everybody Flies' is due to premiere next week at the Raindance Film Festival, the largest and most important independent film festival in the UK.



RICARDO PAVIA - TAP ENGINEERS

Ricardo Pavia has a Mechanical Engineering Master Degree and has been working at TAP since 2014 on Aircraft Maintenance as an Expert Engineer on Air Conditioning (ATA 21), Pneumatic (ATA 36) and Ice and Rain Protection (ATA 30) Systems for Single Aisle Airbus Aircrafts.

Ricardo has the responsibility to support Line Maintenance and Base Maintenance regarding his ATA chapter expertise. He also has to analyze all SB (Service Bulletins) from Airbus and Airworthiness Directives (AD's) from EASA.



CAPTAIN JANET BEVAN

Initially Captain Janet Bevan started her career in banking but did her first solo flight in 1987 and was very fortunate to get her first commercial pilots' position on the Vickers Viscount. She was promoted to Captain on the BAe 146, in 1995, and flew as Captain for over 20 years.

Janet has over 19,000 hours flying experience. She has flown a wide variety of aircraft including the Vickers Viscount, British Aerospace BAe 146, Boeing 737-300/400/700 and Airbus 319/320 aircraft.



CAPTAIN ERIC BAILET

Captain Eric Bailet is 56 years old. He was an Airbus A320 Captain for 16 years with a British low cost operator. He lost his medical certificate to fly due to neuro-cognitive impairment after several fume events.



HOWARD BECKETT -
ASSISTANT GENERAL SECRETARY
OF UNITE FOR LEGAL AND POLITICS



ANTTI TUORI - IFALPA - HUPER VICE CHAIR, A320 CDR, M.D, PHD

Antti Tuori is Vice-Chair of the International Federation of Airline Pilots' Associations (IFALPA's) Human Performance (HUPER) Committee and is responsible for medical matters at IFALPA. He is a medical doctor (University of Helsinki, 1996), Doctor of Philosophy (University of Helsinki, 1998) and EASA aeromedical examiner (Trafi 2013). He started flying at Finnair in 2002 and has flown as a first officer in A320 (2002-2007) and in A330 & A340 (2007-2016), and as a captain in A320 (2016-2019) and is currently flying as a captain in A320 and A330. He has been involved in the EASA medical rulemaking tasks as well as in the ICAO medical activities. Tuori was the IFALPA representative in ICAO working group for the ICAO Circular 344 Guidelines on Education, Training and Reporting of Fume Events.



GITTE FURDAL DAMM - HUMAN FACTORS CONSULTANT

Gitte Furdal Damm is a former captain on the ATR 72-600 and has been working at various Danish Airlines such as Cimber Air and Jetttime. Since 2015 she has been a CRM Trainer and is the owner of About Human Factors, which provides CRM courses in aviation. She is currently also attending the MSc program in Human Factors and System Safety at Lund University.



TONY CABLE - AIRCRAFT ACCIDENT INVESTIGATION CONSULTANT (AAIB - RETIRED)

University of London Aeronautical Engineering degree. Worked for Boeing and British Aerospace for a total of 9 years.

32 years with the UK AAIB, investigating the engineering aspects of accidents and incidents to many types of fixed-wing and rotary-wing aircraft with the aim of improving flight safety. These include the crashes of Pan Am Flight 103 Boeing 747 at Lockerbie, the RAF Chinook on the Mull of Kintyre, and the Air France Concorde at Paris.

Consultant on engineering failures for Accident and Failure Technical Analysis Ltd (AFTA), for around 15 years, chiefly in relation to major public transport accidents.

Cranfield University aircraft accident investigation Lecturer, and Visiting Fellow. Licensed fixed-wing and helicopter pilot.



CAPTAIN NICK MCHUGH - GCAQE BOARD MEMBER

I completed my first solo flight on a de Havilland Chipmunk on the 24th September 1975 at Casement Aerodrome Baldonnell, County Dublin. After completing my military service, I have been a fulltime commercial pilot, and currently an Airbus 320 Captain. I was privileged to have flown a variety of aircraft over my career, from the BAC 1-11, to the magnificent Boeing 747/400, in worldwide operations.

I have held various minor airline management positions and was a type rating Instructor/Examiner (TRI/TRE) on the Boeing 737. I hold a first-class honours Bachelor of Science degree.



MARCUS DIAMOND - BSC (MELB UNIVERSITY) AUSTRALIAN FEDERATION OF AIR PILOTS, SAFETY AND TECHNICAL MANAGER

After working in medical science, Marcus started flying and holds fixed wing ATP licences under the Australia, Papua New Guinea and New Zealand authorities.

He has extensive aviation operational and management experience in the Australasian region, experienced in operator management with fixed wing turboprop and narrow-bodied jet commands. His roles have included Jet fleet captain, Deputy Chief Pilot and CEO of a Part 121 regional airline. His most recent operational role was as a Flight Operations Manager of a fleet of classic B737's.

Marcus has a 20-year association with the AFAP. Ranging from an industrial representative to more recently working with the AFAP safety and technical team to develop and represent the Federations Safety and Technical capabilities for its pilot members.



DR. BYRON W. JONES - PROFESSOR OF MECHANICAL ENGINEERING, KANSAS STATE UNIVERSITY

Dr. Byron W. Jones, Professor of Mechanical Engineering, Kansas State University, has over 40 years of research experience with a focus on aircraft air quality for the past 20 years. He is the technical director for the Airliner Cabin Environment Research Center, a multi-university center of excellence initiated by the US Federal Aviation Administration, and was a team member for the NASA-VIPR project where controlled bleed air oil contamination experiments were conducted on a C-17 transport aircraft. Dr. Jones is a member of SAE, a Life Member of ASME, and a Fellow and Life Member of ASHRAE. He is a licensed professional engineer and a licensed pilot.



RICK MLCAK PH.D. - SENIOR PRINCIPAL ENGINEER AND CABIN AIR QUALITY SME AT PALL R&D

Rick Mlcak graduated with a Doctor of Science in Materials Science & Engineering from MIT. He was a founder, president and CTO of Boston MicroSystems which invented the piezoelectric microsensors used in PUREcabin®. Boston MicroSystems was acquired by PALL in 2013, and Rick now serves as Senior Principal Engineer and Cabin Air Quality subject matter expert at PALL R&D.



EMERITUS PROFESSOR C. V. HOWARD - MB. CHB. PHD. FRCPATH.

Professor C. Vyvyan Howard MB. ChB. PhD. FRCPath is a medically qualified toxicopathologist specialising in the problems associated with the action of toxic substances on the foetus during development. In particular, and of relevance to cabin air quality, he has investigated the toxic properties of mixtures of organo-phosphates and the effects of chronic low dose exposure. He is Emeritus Professor of Bioimaging at the University of Ulster.

Professor Howard's work has emphasized the research reporting very low dose effects from endocrine disrupting chemicals on the foetus, their potential to lead to subtle functional deficits and cancer in adult life and the inadequacy of current regulatory risk assessment to address these hazards.

He is a Fellow of the Royal College of Pathologists, Fellow of the Collegium Ramazzini, Past President of the Royal Microscopical Society, Member of the British Society of Toxicological-Pathologists and Past President of the International Society of Doctors for the Environment. He was a toxicologist on the UK Government DEFRA Advisory Committee on Pesticides from 2002-2008



PROFESSOR TERRY TETLEY - PHD, FSB, PROFESSOR OF LUNG CELL BIOLOGY IMPERIAL COLLEGE LONDON

Her research focuses on mechanisms of pulmonary inflammation and lung disease due to inhalation of airborne toxicants, including ambient particulate air pollution, cigarette smoke, engineered nanoparticles (therapeutic and accidental exposure) and microbial material. Her group has established novel in vitro human lung cell models of the blood-gas barrier for mechanistic studies to inform in vivo and translational studies. Her work aims to address the mechanisms by which airborne toxicants might trigger unwanted adverse effects that impact on the lung and cardiovascular system. Her multidisciplinary research involves collaborations with basic and clinical respiratory scientists, material scientists, chemists, engineers and bioengineers. She is a past President of the British Society for Lung Research, and has had a number of roles within the European Respiratory Society. She is a Fellow of the Royal Society of Biology (UK) and a Fellow of the European Respiratory Society.



DANIEL DUMALIN - M.SC.(PSY) RESEARCH PSYCHOLOGIST SPECIALISED IN NEUROPHYSIOLOGY

He has 29 years of clinical experience with qEEG (quantitative EEG) and ERP (Event-Related Potentials) in assessing dysfunctions in a wide range of neurological and psychiatric disorders.

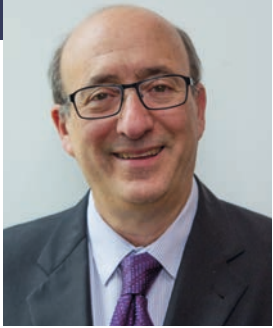
He is specialised in demonstrating the functional consequences of traumatic brain injuries due to traffic accidents and falls among other things. He is involved in screening of suspected dementia in patients with memory problems, combining qEEG/ERP, SPECT and neuropsychological evaluation. He has a special interest in multimodal data fusion of brain imaging data from different sources to obtain a comprehensive understanding of brain functioning in the state of health of the individual subject.



DR. JORDI ROIG - MD, PHD, FCCP RESPIRATORY PHYSICIAN

Dr. Jordi Roig is currently consultant physician on Pulmonary Diseases at "Clinica Creu Blanca" in Barcelona (Spain). He became Fellow of the American College of Chest Physicians in 1991. Research achievements on pneumonia, Legionnaires' disease, lung cancer, airway diseases and other topics. Over 100 publications, including articles (New England Journal Medicine, Thorax, Chest, European Respiratory Journal, ...), proceedings and book chapters. Other scientific activities and appointments:

- International Reagent for Spain of the American College of Chest Physicians (ACCP) 2006-2012.
- Member (2006-2008) of the Scientific and Research Committee of the Spanish Society of Pulmonology (SEPAR) and President of this Committee (2009-2010)
- Reviewer of grants for several organisations and reviewer of papers published in over fifteen journals.
- Principal Investigator of 10 international clinical trials



PROFESSOR DAVID MICHAELS - PHD, MPH MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH OF GEORGE WASHINGTON UNIVERSITY.

He was US Assistant Secretary of Labor for the Occupational Safety and Health Administration (2009-2017), the longest serving in OSHA's history. He served as US Assistant Secretary of Energy for Environment, Safety and Health 1998-2001, charged with protecting workers, community residents and the environment at US nuclear weapons facilities.

In addition to his epidemiologic research, Michaels has focused on protecting the integrity of the science underpinning public health and environmental protections. He is the author of *Doubt is Their Product: How Industry's Assault on Science Threatens Your Health* (Oxford University Press, 2008), and the forthcoming *The Triumph of Doubt: Dark Money and the Science of Deception*.



DR. SUSAN MICHAELIS - CONSULTANT AND HEAD OF RESEARCH FOR THE GCAQE

Dr. Susan Michaelis, a former Australian ATPL airline pilot holds a PhD in Safety Science, specifically addressing the health and flight safety implications of exposure to aircraft contaminated air. She holds an MSc in Air Safety and Accident Investigation and is a qualified air accident investigator. In 1987 she was awarded the Australian Civil Aviation Authority's award for academic merit, while in 2017 she was awarded the Cranfield University MSc Course Director's best overall student for her MSc, which included a thesis reviewing how oil leaks in turbine engines. For over 20 years she has led much of the global research on the aircraft contaminated air issue and has widely published on this topic. She is also qualified in hazardous substances and general occupational health and safety. She is now a visiting Researcher at the University of Stirling.



PROFESSOR DR.-ING. DIETER SCHOLZ - MSME AIRCRAFT DESIGN AND SYSTEMS GROUP (AERO) - HAMBURG UNIVERSITY OF APPLIED SCIENCES

Since 1999 Professor for Aeronautical Engineering: Aircraft Design, Aircraft Systems, Flight Mechanics at Hamburg University of Applied Sciences, Department of Aeronautical and Automotive Engineering, Head of Aircraft Design and Systems Group (AERO).

PhD from Hamburg University of Technology (TUHH). Master of Science in Mechanical Engineering (MSME) from Purdue University, USA. Diplom-Ingenieur (Mechanical Engineering) from University of Hannover, Germany.

Worked at Airbus, Hamburg (1988-1992) and at Queen's University Belfast (QUB) (1991-1992).



DR. MOIRA SOMERS - MD GENERAL PRACTITIONER

Graduated in Medicine from the University of Western Australia in 1979 and has been established in General Practice since 1983. In addition to general practice, I have a diving medical practice and as well have worked closely with patients who have been unwell as a result of chemical exposures. I first saw a flight attendant who was unwell as a result of a fume incident in 1999 and then saw several other air crew who were similarly unwell and by 2005 had seen 38 aircrew similarly effected. I continue to see aircrew involved in fume incidents.



JUDITH ANDERSON. - MSC CIH, INDUSTRIAL HYGIENIST ON STAFF IN THE AIR SAFETY, HEALTH, AND SECURITY DEPARTMENT OF THE ASSOCIATION OF FLIGHT ATTENDANTS-CWA, AFL-CIO (AFA). AFA

AFA is a union representing cabin crew at 20 US airlines. Judith works primarily on chemical exposure issues for crewmembers, including oil/hydraulic fluid fumes, contaminated crew uniforms, and pesticides. She has a MSc in industrial hygiene from the University of British Columbia (Canada) and is certified by the American Board of Industrial Hygiene.



DR JONATHAN BURDON AM, MBBS, MD, M HLTH & MED LAW, FRACP, FCCP, FACLM, FAICD

Dr Burdon graduated in 1971 from the University of Melbourne, trained at the Royal Melbourne Hospital and was a post-doctoral Fellow at in the Department of Respiratory Medicine at McMaster University, Hamilton, Ontario.

Returning to Melbourne, he was appointed as Respiratory Physician at St. Vincent's Hospital in 1983, and assumed the Directorship in 1990, stepping down ten years later. He continues in private practice with research interests and activity in occupational lung disease. He is the author of over 120 publications, is a past President Thoracic Society of Australia and New Zealand and previously Chairman of the National Asthma Council Australia.

He has had an active and close interest the medical effects of aircraft cabin fume events since 1999.



JUDY CULLINANE - AVIATION LEGAL CONSULTANT

Judy Cullinane, Ansett Australia Flight Attendant, flying the BAe-146 aircrafts in Australia since 1984, became incapacitated 6-8 November 1997, while flying 3 days on BAe-146 VH-JJW. Judy exposed to fumes, (toxic vapours) through the cabin air, become totally incapacitated, semi-paralysed and barely able to speak, during flights to and from Alice Springs. The aircraft maintenance report stated, "Number 2 bleed inlet duct and both sleeves on air cycle machine replaced. Duct cracked and leaking hoses". Judy and National Jet First Officer, Susan Michaelis, raised safety concerns and health problems (Senate Transport References Committee Australia).

August 2002, Judy settled with Ansett's Insurer, nearly 6 years after becoming ill and suffering injuries that ended her career through no fault of her own.

Judy received her MBA in 2012 and in 2016 she was admitted to the bar in Queensland as a practicing solicitor.



DR. JAMES E. CONE - MD, ADJUNCT ASSISTANT PROFESSOR

James Cone is Medical Director of the World Trade Center Health Registry in the Division of Epidemiology of the New York City Department of Health and Mental Hygiene. He is Adjunct Assistant Professor in the Department of Medicine, New York University. He also served as Chief of the Occupational Health Branch of the California Department of Public Health, and served for over 20 years as Clinical Assistant Professor at University of California, San Francisco/SF General Hospital. He has worked as a consultant to the Association of Flight Attendants, Washington, DC. He obtained his MD degree from UCSF and his Masters in Public Health from UC Berkeley.



VICTOR LEUNG - GLOBAL MARKETING MANAGER, CLEAN AIR BASF

Vic Leung has over 35 years of experience in the chemical industry and has been with BASF for the past 12 years. He is the Global Marketing Manager for BASF's Catalyst Division, Clean Air Solutions Group responsible for marketing, product management, and new business/product development. The Clean Air Solutions Group is committed to providing innovative solutions to the most complex emissions control problems for stationary source, indoor air, and aviation. Prior to joining BASF, Vic held roles in engineering, sales, innovation and technology management at various companies including DuPont and Honeywell.

Vic earned a B.S. in Chemical Engineering from Columbia University and a M.S.E. in Technology Management from the University of Pennsylvania.



DR. DAVID STEIN - PH.D. VICE PRESIDENT STRATEGIC MARKETING, PALL AEROSPACE

Dr. Stein's prior leadership positions include roles at Pall, Boeing, and Sandia Laboratories in R&D for new products and technologies associated with filtration, aircraft materials and chemistries, as well as microelectronics.

He earned his Bachelor of Science (BS) in Chemical Engineering from Rensselaer Polytechnic Institute and then his MS and Ph.D. in Chemical Engineering from the University of New Mexico.

Fully certified both in PMP and Lean Six Sigma Green Belt methodologies, Dr. Stein also holds an MBA with a specialty in Management of Technology.C



CLIFF EDWARDS - AVIATION RISK MANAGEMENT CONSULTANT (RETD)

Cliff Edwards worked in aviation for 58 years, retiring in 2017. His career spans maintenance engineering, managerial and consultancy posts. For 30 years Cliff has worked as an aviation safety consultant, initially for Shell and subsequently through his own consultancy. Amongst other initiatives, from 1991 Cliff was one of the first to develop Aviation Safety Management Systems, and played a leading role with a number of Aircraft Operators and International Aviation Regulators. Particularly he has specialised in the identification of hazards and the management of the associated risks.

He is proud of being the 2004 recipient of the "Sir Frank Whittle Medal", the International Federation of Airworthiness award, the citation reads: "For individual efforts in improving aviation safety".



RICHARD HANSEN - TECHNICAL SAFETY OFFICER

Started as a Systems Engineer in the Technical Management for Icelandair in 1999, and had that position the next 15 years. One of the responsibilities was for the airplane's Air Condition System. Changed to current position in 2014 as Technical Safety Officer, where the job is, amongst others, to investigate technical incidents that might occur in the operation, and follow up on the corrective action is taken where it is possible.

LORI BASSANI - PRESIDENT OF APFA



Lori Bassani is currently serving as the 13th National President of the Association of Professional Flight Attendants (APFA), the Union representing 28,000 American Airlines

Flight Attendants. APFA is currently in Section 6 bargaining and Lori is Chairperson of the negotiations committee. A 33 year veteran flight attendant, her flying career began in 1986.

Born in Germany and seeing the world at an early age as an army brat, she was introduced to flying, foreign cultures and languages. Prior to her election as APFA National President, Lori served in many Union leadership positions: within APFA, she has served as Strike Coordinator, Board of Director, Base President, Regional Representative, Executive Board member, and Public Relations; and, has consulted with several other labor unions in PR, communications and bargaining strategy. Prior to flying, she co-owned a PR/ advertising agency. Lori is married and divides her time between her home in Seattle, Washington and Dallas, Texas, where the Association of Professional Flight Attendants is headquartered.

MELISSA DRAY - FORMER CREW MEMBER



Melissa was 24 years old and had been flying for only 3.5 years when she was involved in a large fume incident in April of 1999 on a BAe146 aircraft. She suffered immediate side effects and was taken to hospital off the flight. Subsequent investigations of the aircraft found it had experienced a major engine oil leak. Her health deteriorated over the weeks and months following this incident and by September of 1999 she had crewed her last flight.

In conjunction with trying to get well, Melissa ended up pursuing a 20 year legal battle at times representing herself against her employer and then the aircraft manufacturer British Aerospace. Melissa was forced to discontinue her claim when it got to the point of being listed for trial in 2017 and then filed for personal bankruptcy in 2018 as she did not have the funds to pay her lawyer's costs. The Defendants, British Aerospace tried to obtain a signed confidentiality agreement at the discontinuance of the claim in exchange for not pursuing Melissa for their legal costs. She refused to sign anything.

COUNTESS OF MAR - MEMBER OF THE HOUSE OF LORDS AND GCAQE CO-PATRON



Margaret of Mar, 31st Countess of Mar (born 19 September 1940), is a crossbench member of the House of Lords, an elected hereditary peer, and Deputy Speaker/Deputy Chairman in the House of Lords. She is the holder of the original Earldom of Mar, the oldest peerage title in the United Kingdom, and a farmer and former specialist goats cheesemaker in Great Witley, Worcestershire. She is the only suo jure countess in the House of Lords.

She has lived with the chronic effects of organophosphate poisoning since coming into contact with sheep dip in 1989 on her farm. Lady Mar founded Forward-ME to promote effective joint working by ME and CFS organizations to maximize impact on behalf of all people with ME and CFS in the UK.

Lady Mar has also served on a number of parliamentary select committees and is an officer in several All Party Parliamentary Groups. The Countess of Mar has been a joint co-patron of the Global Cabin Air Quality Executive (GCAQE) since its creation in 2006 and has raised the issue of contaminated air within the British political arena for over a decade

KIND THANKS TO ALL OF OUR SPEAKERS
and thank you all for coming to this year's conference.

You keep wishing.

We'll keep innovating.

Our breakthroughs help cities use less energy, make the air we breathe cleaner and turn electric transport into a practical reality. That's why at BASF, we're optimistic about the future.

Find out more at
wecreatechemistry.com



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