

International Aircraft Cabin Air Conference

19 - 20 September 2017

Flight Safety and Cabin Air Quality

A Captain & Cabin Crew Perspective

Cpt. Michael Kramer

Representative



Occupational Biography

1984 – 1990

Aircraft Mechanic at German Naval Air Squadron 2



As Service Member training for A/P certificate at



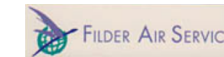
1990 – 1995

A/P mechanic later engineer and Certifying of Staff worked on Executive Aircraft and in Engine Shop at



1996 – 1999

Executive Aviation Cessna 421, Metroliner, BAe Jetstream 32



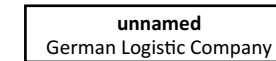
1999 – 2011

Airline 2 Years BAe146
10 Years CRJ 100, -200, -700, -900



2011 – today

Airbus A300-600R



10 years experience in aviation maintenance, I started in the **military** as **aircraft mechanic**, then became an **engineer** and thereafter went to **flight school** to train as a **pilot**.

20 years experience as a pilot on several aircraft types.

Sep. 3rd, **2015**, my **last flight** as **Captain on Airbus A300-600R** after **fume event**.



What was my knowledge about a fume event at this time?

- A sudden **exposure** to **pyrolysed engine oil** due to a **broken seal** in a compressor bearing housing

Does it happen very often?

- **NO**, it **happens on occasions** of **bad maintenance**

Did it happen to me?

- Flying the **BAe146** I smelled a lot of **engine oil** on a **regular basis**, especially in the morning after starting the APU, but assumed it **to be normal**.

We did not even use the term „fume event“.

What did the company do about it?

- They **took the issue very seriously**
Flight Safety Officer himself cut a pack open to find out what might produce **this kind of fumes**.
He found residuals of **De-icing Fluid**.



Could I imagine if a fume event is harmful to health?

- Probably for **some people**, but after I **encountered** so many **fume or just transient smell events** with **engine oil** or more often with small **exposures of jet fuel** either at **engine start up** or **shut down**, my health **never degraded** significantly.

What degraded my health, BUT NOT significantly?

- I remember by the time I **left the BAe146** for the new fleet I had a weakened **immune system**. I was **catching every cold** I could probably get. With my **actual job** I **gained weight**. I got **food allergies**. I experienced **digestion problems**. But at the end I **put it down to my age**, the **kind of job**, but **never on toxic cabin air**.

Why did I not take the issue of exposures serious?

- I was **convinced the authorities** would **take proper action** if there is a **danger for crew and passengers**.

I trusted the system. Aviation is the best regulated and controlled industry of all.

„I WAS WRONG“

What changed my attitude?

- After my **last flight** I experienced **long lasting symptoms**.



My last rotation ... the two legs before.

Sep 2nd, **BRU – LTN**
2015 oil smell after T/O
(gave it a try) **Pack 1 Off**
smell **disappeared**
Engineer transferred to HIL
„Pack 1 INOP“



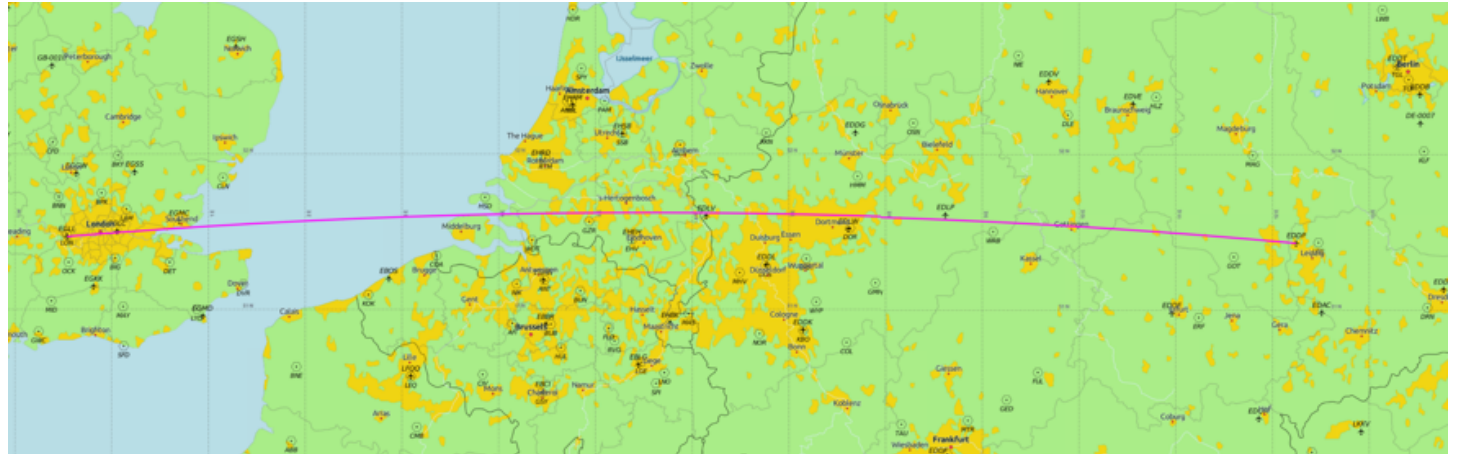
Sep 2nd, **LTN – LHR**
2015 short low level positioning flight
NO oil smell at all



The flight of concern Sep. 2nd, 2015

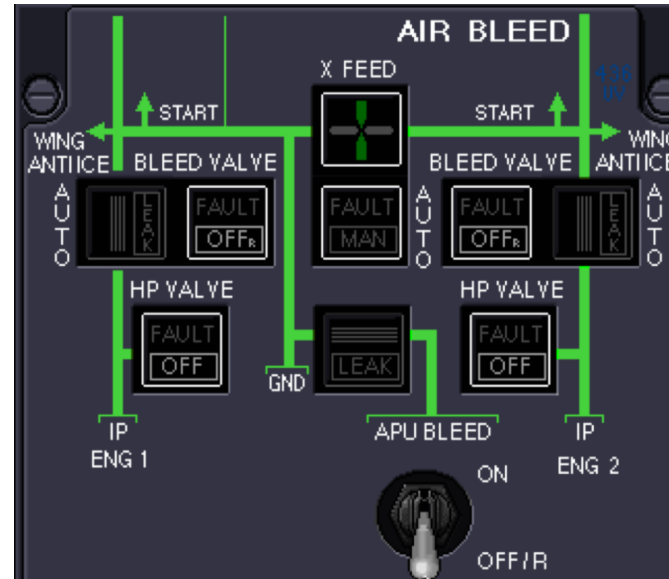
LHR - LEJ

- oil smell **after T/O** again
- after **intensifying** of smell
- remaining **Pack 2 OFF**
- INOP labeled **Pack 1 ON**
- smell **disappeared**
- **reaching CRZ LVL** with thrust reduction
smell **got worse** again
- **Pack 2 ON** and **Pack 1 OFF**
- smell disappeared, **uneventful CRZ**
- when **starting descent** both pilots
began to **feel dizzy, nausea, fatigue**
- **oil smell starts**, quickly intensifying



The flight of concern Sep. 2nd, 2015 continued

- smell **got worse** again
- passing FL 230 **APU started** to get a **third air source**
- **NO** improvement of air quality
- **both Packs** and **all Bleed OFF**
- use of **Oxygenmasks (EMER)**
- **20 times better** than before
- both pilots **did not recover** sufficient to **land the A/C manually**
- successful **Autoland** executed
- cockpit **switches** were **covered** with **mist of engine oil**
- the **problem** was **already known** by maintenance for several months
- the aircraft had a long history of fume events even at former operator



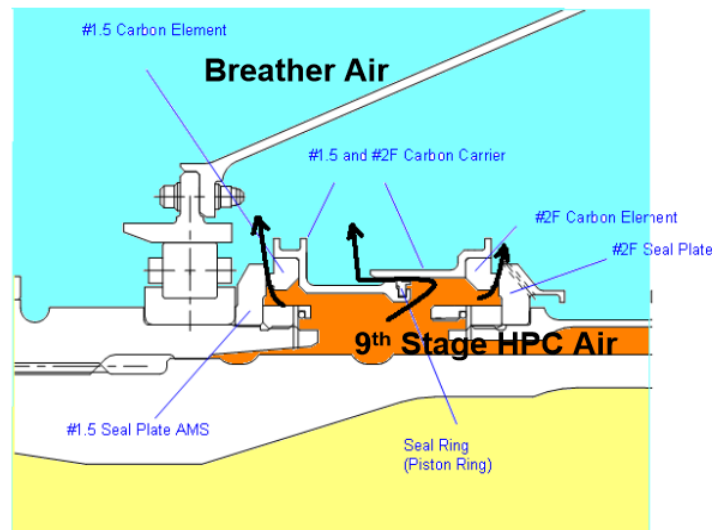
Technical findings in the aftermath

due to a **leakage of bearing #2 back plate carbon seal on both engines** the Enviromental Control System became **severely contaminated with engine oil**

#1.5 / #2 F Seal Assembly Wear Leads to Oil Leakage of #1 and #2 Rear Carbon Seals

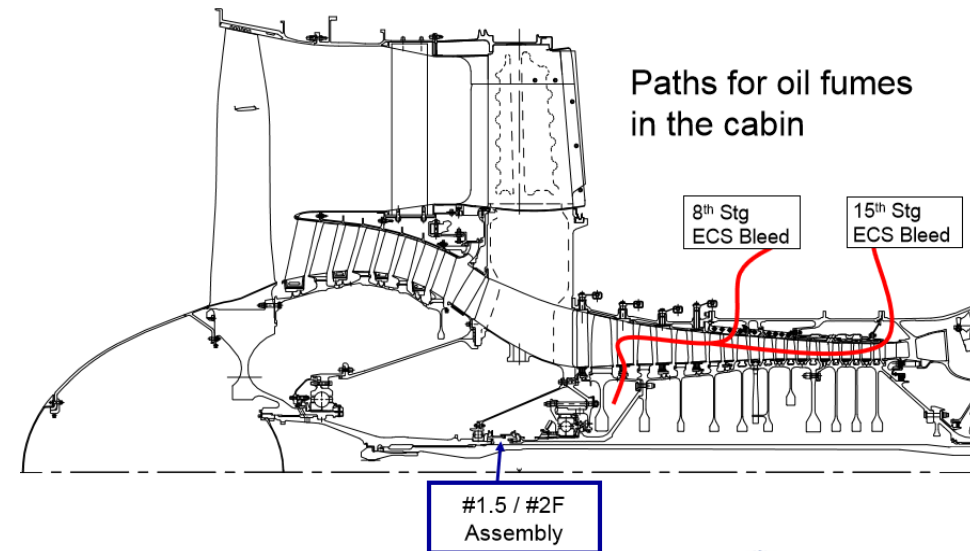
PW4000-94/-100 Engine and Nacelle Technical Review – October / November 2010

- Wear of intershaft seal assembly results in air leakage of 9th stage HPC air into the front bearing compartment
- Leads to excess pressure in the front compartment
- This reverses the #1 and #2R bearing seal pressurization causing oil leakage



Oil Leakage Past #2 Rear Carbon Seal

PW4000-94/-100 Engine and Nacelle Technical Review – October / November 2010



Physical symptoms of flightcrew in the aftermath

After arrival at the **local hospital**: medical examination **according to a guideline** of the employer's liability insurer „Berufsgenossenschaft Verkehr“ (BG),

check from head to toe, **ONLY** full blood count, **NO** urine sample, **NO** check for toxins,

First Officer recovered fully, it was his first fume event at age of 26

First week for the Captain:

overall symptoms

- „**high**“ feeling for **5 days**,
- extreme fatigue,
- extreme headaches,
- sleep disorders,
- metallic taste,

lasting cognitive and neurological impairment

- speech,
- concentration,
- memory,
- slow motoric movement,
- balance problems,
- digestion problems
- skin /tingling sensation
- brain fog

- aching joints and muscles after longer periods of sitting and lying

lasting respiratory problems

- breathing problems, deep, but somehow restrictet,
- quickly exhaustet,



After 8 days I found out about „Göttingen“

University of Göttingen, „Fume event“ consultation with

Priv. Doz. Dr. med. Astrid Heutelbeck and her team.

- 3 hours **cognitive test** package
- **respiratory test** DLCO, KCO
- **neurological tests**
- **biomonitoring**

Results of the biomonitoring (sample taken by own means on the day of the accident)

2-Butanon/MEK	µg/l	11,3
Isopropanol	µg/l	304,3

Isohexan/2-Methylpentan	µg/l	49,9
Toluol	µg/l	0,8



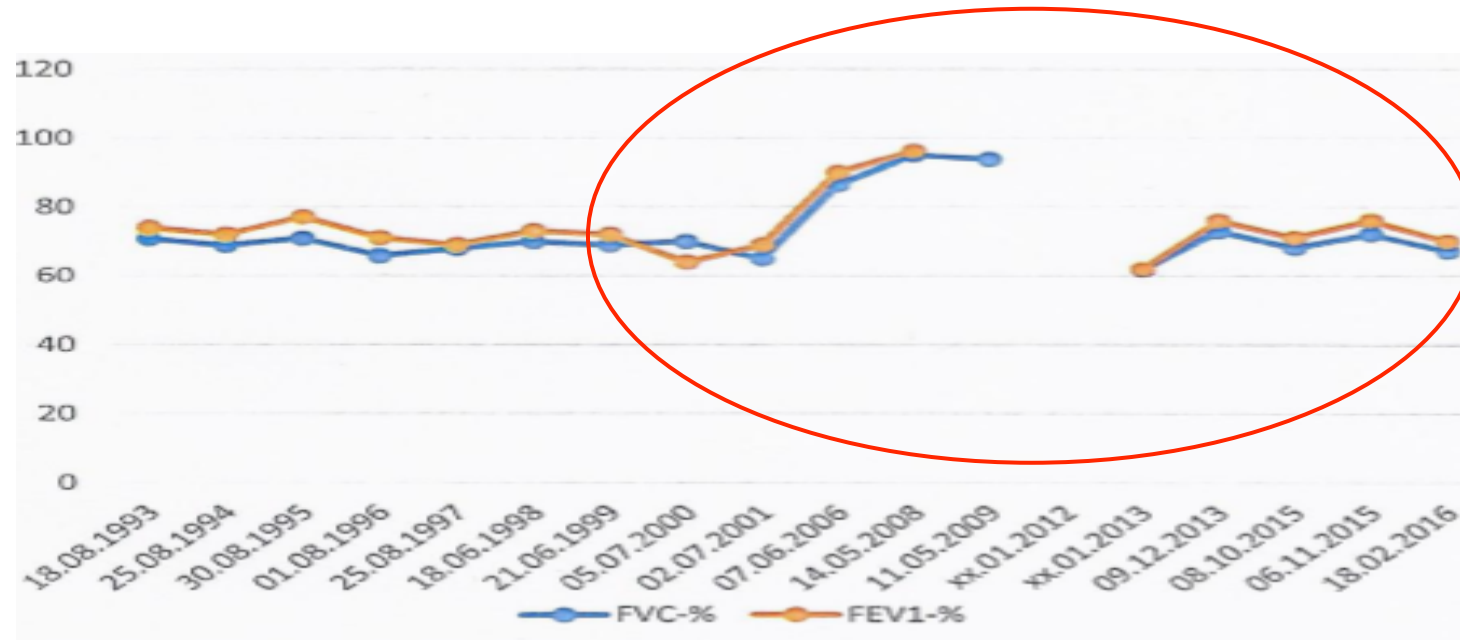
Clinical Examinations,

what is still remaining?

- | | | | |
|-------------------|-----------------------------|-------------------------------------|--------------------------------------------------------------------|
| • Oct. 8th, 2015 | local respiratory physician | ergospirometry | weak lung performance, thorax x-ray, dark dots |
| • Oct. 13th, 2015 | local diagnostic radiology | thorax MRT | pulmonary nodules , some already calcified |
| • Oct. 21st, 2015 | local respiratory physician | ergospiro. | „acc. age, a little obese, no sports, ex-smoker, ALL OKAY “ |
| • Nov.11th,2015 | Göttingen | neurological re-check | still residuals of cognitive impairment |
| • Jan. 13th, 2016 | local diagnostic radiology | thorax MRT re-check | no growth or changes |
| • Mar. 29th, 2016 | radiology Göttingen | brain MRT | a very small lesion added compared to exam |
| • Jun. 8th, 2016 | respiratory phys. Munich | ergospirometry | capillar perfusion disorder |
| • Jun. 9th, 2016 | Hospital | bronchoscopy | later samples confirmed FIBROSIS unknown source |
| • Jul. 14th, 2016 | Göttingen | skin sample | SMALL FIBER NEUROPATHY |
| • Sep. 5th, 2016 | respiratory exam by BG | ergospirometrie | lung disorder confirmed |
| • Sep. 6th-8th | neurotologist in BK | several procedures | damaged nervesystem and brainstem |
| • Sep. 14th,2016 | neurological exam by BG | cognitive and nerve system testing, | all confirmed |
| • May 30th,2016 | repiratory check Göttingen | perfusion | DLCO still 66% |



The effect of lung performance and aircraft type flown over 20 years



documented fume/smell events
with actual employment:

Jan. 15th, 2013 oil fume event
even with haze, no mask, normal ldg.

Jun. 27th, 2014 electrical smell
phys. symp., mask used, emer ldg.

Sep. 3rd, 2015 oil fume event
phys. symp., mask used, emer. ldg

1996 began to fly on turboprops, no fumes

1999 began to fly on „stinky“ BAe146

2011 began to fly Airbus A300-600

2001 began to fly on always new CRJ's, no fumes

*2009 to 2013 no valid data available.



My present situation:

The **company remains silent**, I only have contact to council members.

After almost two years the **BG** sent a report **denying** contaminated cabin air is being the **reason** for my **long term health problems** and stopped the monthly compensation.

At this time I do **not have any income**.

I had to **engage a lawyer to represent my legal interest**

The **BFU**(Accident Investigation Agency) has **NOT released their report until this day**.

In **January** this year **we started a petition to keep** the one and only consultation **clinic** for toxic fume victims in Germany **in service**. Now we addressed it to the Minister of Labor&Transport.

Over **87.500** people have already **signed** it in support.

We founded a non profit organisation called „P – CoC“ after receiving such a positive reaction.

change.org Eine Petition starten Durchsuchen Förder/in werden Q Anmelden

Petition richtet sich an Vorstand der Universitätsmedizin Göttingen und an 1 mehr

Keep the one and only consultation clinic for toxic fume victims in Germany in service!

Kerstin Konrad Deutschland

Petition unterschreiben
@ Ihre Informationen bleiben privat.
87.510 Unterstützer/Innen auf Change.org
Noch 62.490 Unterstützer/Innen auf Change.org bis zum 150.000-Meilenstein.

Vorname
Nachname
E-Mail

☐ Mit Facebook-Freunden teilen

German Version **Unterschreiben**



What is **P-COC** ? www.p-coc.com



It stands for: **Patient initiative – Contaminated Cabin Air e.V.**

- We aim to **bring information** to the **broader public** and **support affected crew**
- We **keep contact with attorneys** as well as **scientists** and **aviation experts** to make sure the **latest knowledge is accessible for everybody**
- We are trying to **build a network** to connect everybody who is involved, e.g. **crewmembers, passengers, physicians, scientists, attorneys, politicians etc.**
- We plan on **educating practitioners** and **medical staff** to make sure that **passengers will not experience the same disaster** as the **crews do** after exposure to a **fume event**.



Therefore, we as P-COC demand:

- to equip all aircraft immediately with **sufficient protection** for **crew and passengers**, like masks, filters etc.
- Public **information** about the problem of contaminated cabin air by the responsible representatives of industry and politics, as well as general information for passengers by the airlines in the case of an incident with contaminated cabin air
- the **immediate** implementation of all **prevention measures**, e.g. crew training on proper reporting, health checks etc.
- the **proper investigation** of Fume Events by the Bundesstelle für Flugunfalluntersuchung (BFU) **according to EU-Regulation 996/2010**
- the **proper handling of** occupational accidents with contaminated cabin air by the **BG Verkehr according to prevailing law**
- the **complete scientific research** of all circumstances **causing incidents** with contaminated cabin air by using all available resources and creating additional, **independent institutions to support** the process.
- the **continuous monitoring** of the **cabin air** on commercial aircrafts **on toxic components** by using the **latest technology available**



Thank you for your attention.

