



Aircrew exposed to fumes on the BAe 146: an assessment of symptoms

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An earlier version of this paper was presented at the British Airline Pilots Association Contaminated Air Protection Conference, held in London on 20–21 April 2005.

The case histories of 39 aircrew with symptoms following exposure to aircraft cabin air contaminated with engine fluids are discussed. The aircrew presented independently of each other. Their histories were remarkably consistent in the reporting of events and symptoms, and there was a definite temporal relationship between the onset of symptoms and exposure history. The crew members reported symptoms which were of both short and long-term duration. The most common symptoms were nausea, headache, mucous membrane irritation, lethargy and cognitive dysfunction. There were several reports where more than one member of the crew was symptomatic and several reports where both the Captain and the First Officer were symptomatic, raising serious concerns for air safety. Fume events consistently occurred at times of mass air flow and there was frequent correlation of fume events with documented technical faults. These effects have far-reaching consequences on worker health, finances, future work capacity and relationships. There are also real concerns regarding the safety of both crew and passengers.

KEYWORDS

- AVIATION INDUSTRY
- COMMERCIAL AIRLINES
- AIRCREWS
- AIRBORNE CONTAMINANTS
- HEALTH SYMPTOMS

Cabin air quality problems: experience to date

Since 1999, I have seen 39 flight crew and one passenger who have reported symptoms in relation to exposure to fumes in the cabin space of the BAe 146 aircraft. Some have also reported incidents on other aircraft, including the A320 and the B737.

Assessment process

Many times each day GPs are presented with problems that require defining, for example, the nature of a patient's chest pain. As such:

- GPs operate in a set framework or context (that is, our understanding of disease) and follow a set routine of questioning and decision-making in an attempt to determine the underlying cause;
- GPs ask a lot of questions, one after the other;
- the process is relatively objective;
- this type of process occurs many times each day, often in a standard consultation of 10–15 minutes and with a waiting room full of other patients; and
- GPs work under pressure.

The challenge

The challenge in general practice is not to operate in this manner at all times. When new patients with an obviously complex problem come along, it is important to recognise that they need time to express themselves and that we, as GPs, need time to be able to listen to their story. Then we can begin to understand the context of their presentation, identify the problem, and make decisions about diagnosis and management. Patients must be able to tell their story and we must resist the temptation to constantly interrupt and ask questions.

To do this, GPs have to make some decisions about the way they practise medicine, such as:

- Am I going to be available for longer consultations, often outside of my normal general practice sessions?

- My usual practice is to book such patients outside of my general practice sessions so that I can spend the necessary time to obtain a detailed history and, after the initial consultation, further consultations are arranged as necessary.
- Am I willing to get involved in difficult and complex medical problems and be prepared to think about areas of medicine that are not familiar to me? If necessary, am I prepared to operate out of my current framework of understanding of disease?
- In the case of patients who have been exposed to contaminated cabin air, am I prepared to get involved in the workers compensation process which is very demanding of my time and energy?
- If necessary, am I prepared to maintain independence and not be swayed by vested interests?

So, with this background and general approach, I was presented with my first flight attendant in 1999. She had already been diagnosed with a primary anxiety disorder and was on workers compensation. After listening to her story, it was clear to me that there was definitely some relationship between her exposures and her symptoms.

Approach to patient assessment

My approach has been to objectively assess such patients by:

- taking a detailed history;
- examining the patient;
- using standard investigations, as necessary, to eliminate any condition that may be causing the patient's reported symptoms; and
- referring the patient to independent specialist physicians when necessary.

With regard to a patient's history, questions have to be open-ended and allow the patient to tell his/her story. As well as allowing me to listen to the patient, this also prevents me from biasing the consultation in favour of my framework of understanding of

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disease. Direct questions should also be asked and specific enquiry of each system completed.

Once examination is completed, symptoms and signs may point to differential diagnoses and specific investigations are then performed to rule out any other condition that may possibly explain the findings.

The aircrew were referred to specialist physicians for two reasons: first, to assist with the diagnosis; and second, in some cases to provide a double-check on my assessment. I was very aware of my responsibility to the patient as well as my responsibility to the employer. As no definitive tests were available, I consulted with a practitioner who was experienced in this area and, as a result, referred some patients for AERP (audio evoked response potential) testing and chromosome analysis. I also referred some patients for SPECT (single photon emission computed tomography) scanning.

One important role that I played was in educating the patients. Many of the aircrew were concerned about what was happening to them. They wondered where they were on the continuum of this experience and what they could do to improve their health and prevent deterioration.

Data

The data were collected by reviewing the files of 36 flight crew. Not all statistics total to 36 as the information was collected from open-ended questions and not by using a template.

Number of aircrew

Over the past six years, I have seen 40 people during 275 consultations regarding exposure to contaminated cabin air. This number included seven pilots, 32 flight attendants (in one case, the flight attendant presented to me because of exposure events, but the final diagnosis was not related to fume incidents), and one passenger.

My impression was that the crew members presented independently of each other and often

without discussing their situation with others. It seemed that they were careful not to be identified in the workplace as having taken any position with regard to this issue. There was a remarkable consistency in their reporting of exposure events and symptoms and a definite temporal relationship between symptoms and events.

Reasons for presentation

The crew members came to see me for a number of reasons:

- 14 were concerned about their poor health;
- two requested chromosome analysis (no detailed history was taken other than a history of exposure events);
- one was concerned about his future health and needed assistance in making a decision about future work (he was symptomatic from exposure events);
- one expressed concern about future pregnancy;
- six requested an exemption from flying on the BAe 146 (all six were unwell with a significant history of exposure events and one had had a miscarriage while flying on the BAe 146); and
- five requested general information about their symptoms and future health (all had been symptomatic from exposure events).

Prior education

Many of the aircrew had attained high levels in education, and had been successful in business and in management. Prior to their employment with the airline, the crew members were well and psychologically robust, as evidenced by their successful completion of the pre-employment selection process. For seven pilots, no educational history was obtained. Of the flight attendants, two reported completing high school, one studied at TAFE, seven had completed university degrees (and, of these, two had completed two degrees), and five had run their own business prior to becoming flight attendants.

Symptoms

The symptoms recorded for each crew member are set out in Table 1, and the incidence of the symptoms is displayed in Figure 1. The most common symptoms were nausea, headaches, mucous membrane irritation, lethargy and cognitive dysfunction.

Reports of other crew involved

Most of the presenting aircrew mentioned that other aircrew and some passengers had also complained of being affected by the exposure events:

- four: entire crew (two reports made by flight crew);
- one: entire crew and one passenger;
- one: Captain, three flight attendants and one passenger;
- one: one flight attendant and First Officer (report made by Captain);
- nine: one other flight attendant;
- four: two other flight attendants;
- one: three other flight attendants;
- one: child had an asthma attack;
- two: two passengers;
- one: three passengers;
- one: nine passengers and two flight attendants; and
- one: First Officer.

Aircraft

A specific group of BAe 146 aircraft were frequently reported by flight crew as having exposure events, namely, JJW, JJP, NJD, NJL, NJA, NJZ. In addition to incidents on the BAe 146, nine crew also reported fume incidents on the A320 and one reported an incident on the B737.

Timing of symptoms

Fume incidents were reported as having occurred during the following stages of flight:

- pushing back and taxiing (seven incidents);
- taking off (six incidents);
- climbing (five incidents);
- the top of descent (four incidents);
- descending (six incidents); and
- landing (two incidents).

Correlation of fume incidents with documented technical faults

Of the flight crew, 12 reported that they were involved in fume incidents that correlated with documented technical faults, and some reported more than one incident that correlated with a technical fault.

On one occasion, a technical fault had been documented regarding engine no 1 and the flight attendant reported that she had been informed by management that no cause was found. Also, the employer of one of the pilots provided me with extensive documentation outlining several fume incident reports, as well as the documentation confirming that technical faults correlated with each report.

Alternative diagnoses

The following diagnoses have been given to flight crew (generally by company medical personnel, insurance medical personnel, or by medical personnel who had only seen an isolated case): infection; primary anxiety disorder; hyperventilation; post-traumatic stress disorder; depression; dehydration; gastro-oesophageal reflux disease; mass psychogenic illness; “all in the head”; “just flying”; stress; bronchitis; viral illness; and no diagnosis — fit to fly.

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TABLE 1
Raw data of symptoms

Symptom	Total number with symptom	Case number																																					
		1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25	26	27	28	29	30	31	32	33	34	35	36	37	38		
Nausea	32	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Lethargy	32	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Sore throat	30	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Cognitive dysfunction	29	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Sore eyes	28	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Headaches	27	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Improve away from fumes	23	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Breathing difficulties/ chest tightness	22	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Prolonged recovery	18	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Dizziness	17	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Chemical sensitivity	17	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Paresthesia/tingling	13	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Balance disturbance	12	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Anxiety	11	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Depression/stress	10	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Palpitations	9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Altered smell/taste	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Abdominal discomfort/ diarrhoea	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Epistaxis	5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Blurred vision	3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Reflux	3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Hair loss	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Rash	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Swollen glands	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Bladder dysfunction	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Descriptions of cognitive impairment

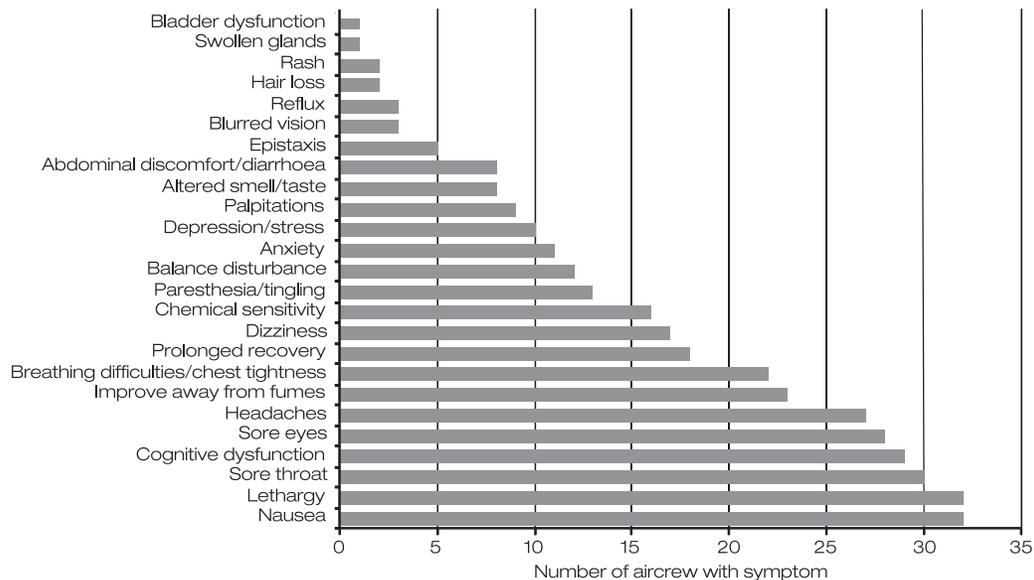
The following descriptions of cognitive impairment have been reported by flight crew: unable to write report post-flight; unable to speak; poor memory; poor coordination; felt drugged; unable to remember passenger requests; can't think clearly; can't think of words; trips over words; loses train of thought; disorientation; working in slow motion as if drunk or stoned; couldn't put dates in order; conversation with other flight attendants bizarre — in case of an emergency wouldn't function; slurred speech; had to close own business — too unwell with lack of energy and poor coordination; can't

handle multiple pieces of information; can't do simple calculations; concentration span very poor; has to follow the PA script with her finger; difficulty negotiating simple program on home computer; difficulty doing simple personal tax return — previously had read and implemented complex changes to the tax laws relating to a multimillion dollar business; and has to constantly relearn simple tasks.

Case studies

Four case studies that illustrate some common characteristics among the presenting aircrew are outlined below.

FIGURE 1
Frequency of symptoms recorded for 36 aircrew



Case study 1

Background

A 34-year-old female flight attendant presented with a history of being unwell after several fume incidents on the BAe 146. Nine months prior to presentation she had experienced an incident that involved misting in the cabin. She reported nausea and disorientation. Three days later, she reported another incident on the same aircraft with symptoms of nausea, flushing and problems with her speech. She had further symptoms on the return leg during take-off, with heavy limbs, breathing difficulty and clouded mental function. She was unable to write her trip report and on the way home she drove off the side of the road. She was extremely tired after the incident and for the next five days had headaches and nausea and felt as though she was in a trance.

She experienced further fume incidents over the following months, with increasing symptoms. She particularly noted difficulty with her memory and an inability to express herself. She reported that she felt as though her vocabulary was locked in her brain and she would frequently lose her train of thought.

She was unable to negotiate simple computer packages and her memory was poor.

Like others, she was reluctant to seek medical advice as she saw herself as a company person and was fearful of reprisal from the company. She reported that the final straw — and the reason for her requesting exemption from the BAe 146 — was when she could not calculate simple arithmetic. She was very distressed by this. She had an outstanding academic record from both school and university, graduating with honours in the top few per cent of her class.

Although she was given an exemption from the BAe 146, she unfortunately had a recurrence of symptoms while flying on the A320. She also developed sensitivities to other agents, such as petrol and household cleaning agents.

The flight attendant did not feel depressed and still loved her job, though she was angry with her employer and stressed by the whole experience. She became distressed when she learnt of private investigators telephoning other flight attendants to

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talk about her, and she had great difficulty dealing with the way things had been handled by management.

Neuropsychometric testing demonstrated cognitive impairment and AERP confirmed attention abnormality that would have a detrimental impact on psychomotor function and memory. She also underwent chromosome analysis and was referred to a specialist physician who confirmed that no other medical condition was present to explain her symptoms.

Points of interest

1. Repeated exposure events on the same aircraft — putting crew at risk of illness.
2. Breakdown of communication between employer and employee.
3. Staff reluctant/fearful to present for health assessment.
4. Major symptoms of nausea, headache and cognitive impairment lasting several days.
5. Eventual development of sensitivities to a broader range of products.

Case study 2

Background

A 39-year-old male pilot flew commercial passenger aircraft for several years before deciding to return to Perth. He flew the BAe 146 for approximately 75 flying hours per month and did not notice any problems in the first one to two years. However, he started to notice problems in 1998 and, over the next two years, symptoms became so problematic that he had to hand over controls to his co-pilot on several occasions.

The pilot reported a noxious, acrid smell and at times noted misting in the cabin. His symptoms included mucous in the back of the throat, tingling in the head and lower back, sensitive skin (as though sun burnt) and pressure headaches over the temples and bridge of the nose followed by nausea and constriction of the throat. He reported that he felt

as though he was going to vomit and that he was light and sound sensitive. He had lethargy, fatigue and some deterioration in memory, but his symptoms settled over a number of days and completely resolved with longer breaks.

The pilot's symptoms occurred at take-off, at times of maximum mass air flow at 1,000 ft, at changeover from the auxiliary power unit to the engines, and on descent. He noted that the highest levels of operational activity in the cockpit (up to 1,500 ft) corresponded with the times of highest fume exposure. He also explained that, during these times, he was unable to use oxygen. When oxygen was used, it was well after the onset of symptoms and at around 10,000 ft when critical operations were completed.

In January 2002, the pilot was suspended from flying duties as he had submitted a number of operating crew reports and had been required to use crew oxygen while flying. Copies of his incident reports were provided to me by his employer (with the corresponding technical reports of oil leaks and the maintenance performed). There was remarkable consistency between the incident reports and the documented leaks. In 2003, the pilot's case came before the Australian Industrial Relations Commission. He was not prepared to take the lower position of flying on the Dash8 and, despite his employer admitting that a safe working environment could not be provided, his employment was terminated.

Points of interest

1. Short-term health effects.
2. Pilot fit to fly as long as a safe working environment provided.
3. A particular group of BAe 146 aircraft are consistently reported as having problems with cabin air quality. It may be, then, that other BAe 146 aircraft that do not have a history of cabin air contamination could possibly have been safe for the pilot to operate.

4. If assurances cannot be given regarding a safe working environment, it raises serious air safety issues for both crew and passengers.
5. Given the correlation with documented technical faults, it is highly unlikely that this pilot is alone in his experience with the ill effects from leaked fumes and it is of great concern that there may be underreporting of such incidents. His integrity and courage in objectively recording the incidents has significantly contributed to air safety.
6. It is the legal obligation of the Captain and First Officer to report exposure events to the Civil Aviation Safety Authority and the airline. There have been cases where the First Officer has been overridden and prevented from submitting such a report and therefore prevented from performing his legal duty.
7. For the issues of air safety to be adequately addressed, a system of incident reporting should be introduced that protects aircrew from fear of reprisal.

Case study 3

Background

A 30-year-old flight attendant presented with a history of being unwell after several fume incidents on the BAe 146. She had been involved in a significant incident and had required oxygen. Her symptoms included nose and throat irritation and an inability to understand and complete the occurrence report. Her arms were weak and her chest and throat felt closed up. The flight attendant reported that she was confused and disorientated. She was unable to stand and was hospitalised after landing. After the incident, she experienced a pounding headache and tiredness. On the return flight, she was extremely tired and reported that she felt confused and could not remember drink orders. She was unable to drive herself home and, when she did get home, she could not remember the name of a family member and could not remember what she wanted to say. Words came out in the wrong order and she had slurred speech. The flight attendant's symptoms persisted for weeks and when she

returned to work she requested that the company doctor contact her. He eventually did and reassured her that the aircraft had been pulled apart and no problem had been found. That same day, she signed onto the aircraft involved and checked the logbook — only to find that the number 1 engine had been replaced after her incident due to a major oil leak. Up until that point in time, she had had no idea of the health effects associated with the BAe 146. The flight attendant's managers contacted her and advised her to see a counsellor.

The flight attendant continued to work over the next five months, but she experienced frequent fume incidents and moderately severe symptoms. Other symptoms included nausea, epigastric discomfort, myalgia, arthralgia, hair loss, flushing and difficulty with temperature control, lethargy and fatigue, cough and wheeze. She developed sensitivities to a broad range of other chemicals and, with exposure, experienced recurrence and/or aggravation of symptoms.

When I first saw this patient, she was being treated for anxiety disorder. I certified her unfit for work. She had also experienced fume incidents on the A320. Eventually she attempted to return to work and had a further incident on the B737. She then attempted to work as ground crew but was unable to sustain that work due to extreme tiredness and chemical sensitivities. She also tried to work outside of the aviation industry, but has not been able to work due to the persistence of symptoms. Her memory has deteriorated and she has difficulty learning new tasks. She has developed progressive muscle weakness in her arms and legs and paresthesia in a stocking and glove distribution. She reports that she is clumsy and tends to drop things and fall over. She also has difficulty with coordination and balance.

The flight attendant's health symptoms include asthma, neurotoxic injury (with both central and peripheral nervous system damage), multiple chemical sensitivity, and psychological injury which may be related to the neurotoxic agent itself or secondary to the impact of the injuries sustained.

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She has had extensive investigation and has seen numerous specialists from several disciplines and no other cause has been found to explain her symptoms.

Points of interest

1. Employee put at further risk of injury with lack of adequate information about the nature of the injury and further exposure over several months.
2. Symptoms have persisted over six years.
3. Central and peripheral neurotoxic injury.

Case study 4

Background

A 40-year-old male passenger frequently flew on the BAe 146 from Perth to Karratha, Broome and Port Hedland. He flew approximately twice a week on other small-range flights.

The passenger presented in September 2000 and had been unwell on and off over the previous three and a half years. He reported a gradual deterioration in health since commencing flights to Karratha. His symptoms included lethargy and fatigue, slowed mental function, and skin irritations; the symptoms were always worse immediately after the flight. On the day of the flight, he could not work effectively and noted poor memory and inability to link jobs with numbers. He was able to work more effectively on the day after the flight.

Having consulted his regular GP, the passenger was referred to a rheumatologist and given a diagnosis of chronic fatigue syndrome. Six months prior to presenting to me, he had decreased his flying and had noted a marked improvement in his health.

As this passenger did not fit the diagnostic criteria for chronic fatigue syndrome, a letter was provided to his insurance company outlining his history and the reasons why his diagnosis was incorrect.

Points of interest

1. Wide-reaching impacts when explanation of illness not apparent.

2. The temporal relationship between the onset of symptoms and exposure was clear.
3. Improvement was noted with a decrease in flying.

Discussion

After seeing the first patient with symptoms from exposure to contaminated air, it was clear that there was a definite relationship between her symptoms and events in the workplace. That association has been further confirmed after seeing the many aircrew who have presented. In addition, over 300 reports of fume incidents can be found in Appendix 4 of the Senate Inquiry report on cabin air quality.¹ I have no doubt that the aircrew are genuine and that their problem is significant — both for themselves and for the wider community.

Several factors point to this phenomenon being a genuine illness:

- the temporal relationship between symptoms and exposure events;
- the frequent correlation of exposure events with technical faults;
- the consistency between symptom reporting and exposure events; and
- the range of symptoms reported by aircrew. The pattern of nausea, headaches, mucous membrane irritation, lethargy and cognitive dysfunction is consistently reported by crew members.

In addition, the fact that this illness occurs in previously physically, intellectually and psychologically robust individuals makes any suggestion of primary psychiatric illness and mass psychogenic illness less plausible.

Of particular note, five incidents were reported involving both the Captain and the First Officer. Given the apparent level of underreporting, this must raise serious concerns for air safety.

From a GP perspective, the main point to make is that patient history is without doubt the most important component of what we do. Without a detailed history being taken in a manner that allows the patient to tell his/her story, we cannot ever begin to address such health problems. Context is also important — not only the context in which the patient presents, but also that not everything fits into the context (our understanding of disease) in which we operate. Every so often a new phenomenon presents itself, and just because we may not fully understand it does not mean that it is not real or genuine. The phenomenon has to be recognised before the pathophysiology can be determined.

Response to the problem

The various parties involved (including aircrew, ground staff, management and the medical profession) have responded to this issue in different ways. It is important to note that, at times, the responses have been less than adequate. This has engendered fear and antagonism, added to the burden of illness, and impacted on air safety. Working in this type of environment is not going to achieve the best outcome for anyone. The problem needs to be clearly defined so that all parties are better able to understand the challenge and plan appropriate and effective responses.

Future needs

The most obvious need is for a reporting system that is totally objective and independent of the operator. Only then will employees be protected from fear of

reprisal and the issue of air safety be addressed. In addition, the true incidence and spectrum of symptoms need to be determined and this can only be achieved with reliable reporting.

Also, the reason why certain individuals are affected should be determined (for example, whether this is due to individual susceptibility or the fact that basic toxicological principles are operating) and research into the pathophysiology to define the illness should be undertaken (one particular area of concern expressed by aircrew is the need to understand the impact, if any, of this type of injury on offspring).

Conclusion

After extensive clinical assessment, I consider that what is being reported by flight crew is genuine and has wide-reaching consequences on their health, finances, future work capacity and relationships. In addition, there are real concerns regarding the safety of both flight crew and the public.

From a medical point of view, patient history is vitally important: it is the cornerstone to diagnosis. The context in which illness occurs, and the context of the communication between the practitioner and the patient, are also important.

Somewhere in all of this lies the truth. Reliable reporting will allow us to understand that truth.

Reference

1. Senate Rural and Regional Affairs and Transport References Committee. *Report into air safety and cabin air quality in the BAe 146 aircraft*. Canberra: Parliament of Australia, October 2000, App 4.