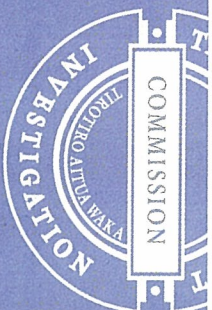


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AIRCRAFT ACCIDENT REPORT

No. 90-002T

DE HAVILLAND DH 82A TIGER MOTH ZK-ASG

Near Takapuna Beach

10 October 1990

**Transport Accident Investigation Commission
Wellington - New Zealand**

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

AIRCRAFT ACCIDENT REPORT NO. 90-002T

Transport Accident Investigation Commission
Wellington

**Aircraft Type, Serial Number
and Registration:** De Havilland DH 82A Tiger
Moth, 83080, ZK-ASG

Number and Type of Engines: One DH Gypsy Major 1

Year of Manufacture: 1940

Date and Time: 1338 hours NZDT, 10 October 1990

Location: In the sea near Takapuna Beach

Type of Flight: Private

Persons on Board: Crew: 1 Passengers: 1

Injuries: Crew: Serious Passengers: Fatal

Nature of Damage: Substantial

Pilot in Command's Licence: Airline Transport Pilot Licence

Pilot in Command's Age: 57

**Pilot in Command's Total
Flying Experience:** 11906 hours, 67 hours on type

Information Sources: Transport Accident Investigation
Commission field investigation,
Specialist Medical Investigation

Investigator in Charge: Mr J.J. Goddard

Chief Commissioner
Transport Accident Investigation Commission

The attached report summarises the circumstances surrounding the accident involving De Havilland DH 82A Tiger Moth aircraft ZK-ASG near Takapuna Beach on 10 October 1990 and includes suggested findings.

This report is submitted pursuant to Section 8(2) of the Transport Accident Investigation Commission Act 1990 for the Commission to review the facts and endorse or amend the findings as to the contributing factors and causes of the accident.

2 October 1991
R CHIPPINDALE
Acting Chief Executive

APPROVED FOR RELEASE AS A PUBLIC DOCUMENT

7 October 1991
M F DUNPHY
Chief Commissioner

1. NARRATIVE

- 1.1 The pilot had made a local flight of 1.75 hours to the north earlier in the day, with his son as passenger. A further similar flight, of about one hour, was planned with a friend as passenger. The weather was fine and sunny with a light northerly wind.
- 1.2 The aircraft took off from Ardmore Aerodrome at 1300 hours and departed to the north without incident. The flight was conducted at 800 feet against the VFR Transit Lanes, along the east coast bays.
- 1.3 As the aircraft approached Whangaparoa Peninsula the pilot suddenly started to feel unwell, so he turned the aircraft back along the coast with the intention of returning to Ardmore.
- 1.4 His symptoms of illness intensified quickly over two or three minutes as the aircraft proceeded south. The main feeling was of an acute stomach upset, which caused him to belch repeatedly. He then realised that he might become incapacitated, so he reduced engine power and trimmed the aircraft to initiate a slow descent before he lost consciousness.
- 1.5 The aircraft was observed to commence a moderate, descending left turn which continued until it collided with the sea some 50m offshore.
- 1.6 The pilot regained consciousness underwater and was able to swim to the surface. He made several dives in spite of his serious injuries, to try to rescue his passenger, without success.
- 1.7 Rescuers arrived at the scene within a few minutes of the accident, and dived to attempt to rescue the passenger without success. The aircraft was dragged ashore and turned upright within 30 minutes. The passenger was then extricated but did not respond to resuscitation.
- 1.8 Examination of the wreckage disclosed no evidence of pre-impact failure of the aircraft structure or control systems. The propeller damage showed evidence of power-on rotation at water impact. The damage was consistent with a severe cartwheeling impact with the water surface.
- 1.9 Both occupant harnesses had failed on impact. The front (passenger) right lap belt suffered a webbing material failure and the right shoulder harness bracket failed at the longeron attachment. The rear left lap belt and left shoulder harness both suffered material failures. These harnesses were of the original "Sutton Harness" pattern and appeared to be quite old. While they might well have met the design strength requirements, their failure probably exacerbated injuries to the occupants.
- 1.10 The medical investigation into the cause of the pilot's incapacitation (See Annex A) concluded that his incapacitation was a vasovagal syncope (a simple faint) caused by acute gastrointestinal disturbance.
- 1.11 After his earlier flight he had felt mildly unwell, but the feeling was brief and had passed completely. There were no significant premonitory symptoms before his second flight to alert him to any possibility of medical incapacitation. The onset of the in-flight symptoms, over about three minutes, was too rapid to allow him to land the aircraft.

1.12 The majority of acute gastrointestinal disturbances, the most common cause of pilot medical incapacitation, were caused by viral or bacterial infection, or by food poisoning. Pilot susceptibility was not assessable by any medical screening; the pilot involved in this episode was no more at risk than any other member of the pilot population.

2. FINDINGS

- 2.1 The aircraft was airworthy.
- 2.2 The aircraft was suitable for the flight undertaken.
- 2.3 The pilot was properly qualified for the flight.
- 2.4 No lifejackets were worn by the occupants.
- 2.5 There was no requirement for lifejackets to be carried on the flight.
- 2.6 Had a lifejacket been worn by the passenger it would not have enhanced her chances of survival in this accident.
- 2.7 The pilot suffered a medical incapacitation which caused him to lose consciousness.
- 2.8 The pilot was unable to retain control of the aircraft due to a medical incapacitation.
- 2.9 The survivability of this accident was reduced by the failure of the occupant harnesses.
- 2.10 The pilot's incapacitation could not have been prevented by current aircrew medical examination techniques.
- 2.11 The pilot had no significant premonitory symptoms to warn him not to fly.
- 2.12 The pilot's actions prior to losing consciousness were appropriate.

7 October 1991

M F DUNPHY
Chief Commissioner

Medical Investigation of the Pilot's Incapacitation

The pilot was interviewed and examined by the Medical Advisor to the Transport Accident Investigation Commission on 12 October 1990. A number of further investigations were also carried out with the intention of establishing the cause of his medical incapacitation. These examinations were focussed on medical conditions that may have caused non-specific symptoms such as nausea, belching, restlessness and an urgent desire to defaecate which are commonly experienced by individuals about to experience a syncope attack, due to whatever cause. These symptoms are commonly seen before syncope attacks arising from any of a number of medical conditions other than acute gastrointestinal disturbance and are not specific in nature or cause. These medical conditions include:

Vasovagal: emotion, heat, standing still for prolonged periods, illness, diarrhoea, micturition, coughing, hypersensitive carotid sinus, postural hypertension due to drugs, neuropathy or prolonged lying down.

Cardiac: Disorders of heart rhythm, reduced cardiac output, abnormal heart structures altering blood flow, myocardial infarction (heart attack) or ischaemic heart disease, hyperventilation and/or breath holding

In addition to those procedures and investigations carried out as necessary for the clinical management of his injuries and their consequences, additional examinations were performed to exclude any of the causes of syncope given above. By a process of exclusion, it could then be concluded that his incapacitation had been the result of a vasovagal attack caused by an acute gastrointestinal disturbance.

These medical investigations followed two separate paths, namely:

(a) To exclude a cardiac abnormality as the cause of the syncope

To achieve this, all of the pilot's electrocardiograms taken at Auckland Public Hospital since admission were reviewed by a consultant cardiologist, who also performed special investigations such as full exercise electrocardiography and 24 hour ambulatory cardiac monitoring on two occasions. These examinations would be reasonably expected to detect ischaemic heart disease if there was any narrowing or occlusion (blocking) of the coronary arteries, and any disorder of heart rhythm. All tests were completely normal and it was considered that structural or functional abnormalities of the heart were satisfactorily excluded. The final comments of the cardiologist were as follows:

"I did not find any evidence of cardiovascular disease in this man and it was reassuring to find that he could exercise for 13 minutes on the treadmill without developing any unusual discomfort or electrocardiographic abnormalities ...", and

"It seems more likely that (this syncope attack) may have been a vagal response ..."

(b) To exclude a potentially recurring gastrointestinal abnormality that would lead to further symptoms including syncope

The symptom complex of flatulence, nausea, a desire to defaecate and abdominal discomfort may be associated with a number of acute gastrointestinal conditions, as well as being a non-specific precursor to a syncope attack. Such conditions could include food poisoning, viral gastroenteritis, regional ileitis, renal colic, mesenteric adenitis and vascular disease of the gastrointestinal tract. The upper gastrointestinal tract symptoms alone may occur as the result of conditions such as peptic ulcer, gastritis or hiatus hernia. The pilot had experienced mild dyspepsia some years previously, but a Barium Meal examination carried out at the time was completely normal. However to exclude a peptic ulcer or hiatus hernia, a gastroscopic examination and computerised tomography of the abdomen was performed after the accident. These were essentially normal except for some evidence of the effects of trauma.

When examined on 12 October his abdomen was distended and tender. This is a common occurrence following major trauma involving the abdomen and chest. The abdominal distension tended to mask any other abnormalities in the abdomen. This distension eased over the next few days and subsequent examination of his abdomen was entirely normal. There was no diarrhoea at any time and no blood was found in the gastrointestinal tract. The symptoms have never recurred.

The possibility of regional ileitis, mesenteric ischaemia or renal colic was ruled out by the investigations carried out. The normal gastroscopic findings and Barium Meal excluded peptic ulcer and hiatus hernia, but did not exclude acute gastritis, viral gastroenteritis affecting primarily the upper gastrointestinal tract i.e. stomach, duodenum and ileum, or food poisoning. A dietary history revealed that meals taken the previous day were also partaken by other family members, who experienced no symptoms thus excluding the possibility of food contamination. For breakfast, the food taken (coffee, weetbix and grapefruit) was not likely to be contaminated. The symptoms were therefore most likely to be due to acute gastritis or gastroenteritis due to a viral infection.

It was significant that he was aware of abdominal distension by gastric gas and the need to belch. During the time that he was attempting to relieve the pressure by belching and controlling his breathing he may have been alternately hyperventilating and breath holding. Breath holding after any hyperventilation may on its own account cause syncope, although it was unlikely that this was the sole cause of syncope in this episode. The vagus nerve supplies the lower oesophagus and stomach, and stimulation of the vagal nerve by stretching and pain of the oesophagus may initiate a vasovagal syncope. Syncope is caused by slowing of the heart rate and reduced cardiac output, causing reduced blood supply to the brain. It was probable that a combination of these effects, namely viral infection of the upper gastrointestinal tract with local and systemic effects, gastro-oesophageal distension and breathholding following hyperventilation, induced an acute vasovagal syncope.

Acute viral gastroenteritis may affect any individual, with only a brief warning period of premonitory symptoms. There were no risk factors to indicate increased

susceptibility and this episode did not indicate that this pilot was any more likely than any other member of the pilot population to have any symptoms in future.

DISCUSSION

A number of studies have shown that acute gastrointestinal disturbances are the commonest cause of pilot medical incapacitation in flight. The majority of these gastrointestinal disturbances are caused by viral or bacterial infection or consumption of contaminated food or water (food poisoning). Food poisoning is generally avoidable if care is taken that only hygienically prepared food and clean water is consumed and that food is consumed soon after cooking or washing. In this case, there was no evidence that the gastrointestinal symptoms experienced by the pilot were caused by food poisoning.

Viral gastroenteritis is a short lived illness caused by a variety of different viruses endemic in the community. Viral gastroenteritis is a frequent illness experienced by most members of the population at some time. Symptoms commonly experienced are nausea and vomiting, abdominal discomfort, pain, or distension, flatulence, loose motions and an urgent desire to defaecate (diarrhoea). The individual usually feels mildly generally unwell (systemic symptoms) as well as experiencing symptoms of gastrointestinal irritation such as queasiness, increased bowel movements (local symptoms), before more severe symptoms develop, often suddenly.

In aircrew, the effects of viral gastroenteritis may be more severe for two reasons:

- (a) The pilot is not able to relieve himself to defaecate and is disturbed by having to cope with diarrhoea as well as having to continue to fly the aircraft.
- (b) The effects of any abdominal distension by gastrointestinal gas are exacerbated by reduced atmospheric pressure so that any gas produced in the gut or swallowed will have a greater volume at altitude.

MEDICAL ASSESSMENT OF AIRCREW

Acute gastrointestinal disturbances are the commonest cause of pilot incapacitation but there is little the civil aviation medical licensing authorities can do to prevent or reduce such occurrences. In the absence of risk factors for developing acute gastrointestinal disturbance, and in the view of the frequency of illness among the population, it is not possible to select any aircrew who will not be susceptible to gastroenteritis. However, food hygiene education may prevent many instances of food poisoning, especially for aircrew staying overseas. Health education about eating the right food and how to avoid contaminated food and water is freely available from public health agencies and the risk of acute gastrointestinal illness from eating unhealthy and unhygienic food in New Zealand appears to be low.

Viral gastroenteritis is a common illness and may be spread through food and water or person to person, through faecal, oral or droplet spread. It is not feasible to avoid contact with the virus and episodes of viral gastroenteritis will

continue to occur among aircrew from time to time. The mildness of the premonitory symptoms and the brevity of the period of such symptoms before more severe symptoms occur, makes it difficult for the pilot to land or hand over control in sufficient time to avoid in-flight pilot medical incapacitation. Therefore aircrew should always ensure that they are completely fit before flying and should not fly if they feel at all unwell.

Acceptable levels of flight safety are indicated by maintaining an incidence of pilot medical incapacitation that would probably cause an aircraft accident at less than a certain rate, appropriate to the type of flying undertaken. For private and sports aviation the level should be less than once every million flying hours. While gastrointestinal disturbance is the most common cause of pilot medical incapacitation the observed incidence of such disturbances under circumstances and at a severity that would probably cause incapacitating symptoms is below this rate.

Therefore, the inability of medical screening and standards set for aircrew to prevent episodes of pilot incapacitation due to acute gastrointestinal disturbance, while undesirable, does not impose a serious flight safety hazard. There are no recommended practices or actions that could remedy the inability of current medical practice to prevent acute gastrointestinal disturbances.

However, this accident highlights the importance for crews in multi-crew aircraft operations to eat different meals prior to or during flight, to ensure that they avoid any such disturbance due to food contamination.