Aircraft Effluent Claims

CIVIL AVIATION AUTHORITY OF NEW ZEALAND

History

The Civil Aviation Authority (CAA) has investigated numerous claims since September 2003 where residents of mostly rural areas, have complained that a foul smelling substance has been splattered over their properties. The residents have queried whether this substance has come from an aircraft toilet.

Pictures submitted by the complainants all showed reasonably large areas (some about 4-6 m^2), splattered with a brown substance. Some of the pictures indicated a clear direction to the splatter pattern, including splatter under the eaves of one house.

Nearly all of the cases reported to the CAA have been between August and November in any given year.

Aircraft Toilet Systems

Modern airliner toilets cannot be emptied in flight. While this may have been the case in the early days of aviation, sealed toilet systems were installed as far back as the 1950s.

The toilets can only be emptied while the aircraft is parked on the ground. This is achieved by connecting to a septic tanker unit, and only after numerous hatches and valves are manipulated manually. This task is carried out by trained airline ground staff several times a day, and the system is drained, flushed, recharged and checked at the same time. Each toilet holds a 20 litre charge of a water and Novirusac solution. Novirusac is the blue deodorant chemical used in aircraft toilets.

Aircraft Hull Design

The hull of an airliner is basically a sealed tube which is pressurised to maintain an altitude of about 8,000 feet inside. This is so aircraft can operate efficiently at much higher altitudes for a given route. The aircraft's toilets are within that sealed hull and they are designed to operate at all altitudes. The toilets cannot overflow, as their collection tanks are large enough to hold the total contents of all the toilets in the aircraft. Aircraft toilets do sometimes get blocked, most commonly by incorrect passenger use, or by component failures. The cabin crew will be notified of any problems, and their procedures are to simply isolate that particular toilet from use.

Internal leakage may occur, but any matter that does leak will still be trapped within the pressurised hull. Aircraft hulls are not 100% airtight so there is a possibility that some liquid matter (blue in colour and deodorised) may seep outside. This will leave a 'tell tale' blue streak mark along the outer fuselage which will alert ground staff to a possible leak in the toilet system. There are no gaps in the fuselage big enough to allow solid waste to escape. If such a hole was to develop, the aircraft would experience a rapid depressurisation requiring an emergency descent.

One must also consider the altitude and speed of an airliner (200 kph – 800 kph) and the effects these factors will have on any liquid that may seep out. At that speed any liquid would dissipate and evaporate in the atmosphere very quickly.

Airline Reporting Systems

The airline industry is highly regulated and airlines must all demonstrate to the CAA that they have a robust internal reporting system for all incidents and defects. These occurrences are reported to the CAA and an independent investigation into a given occurrence may be launched.

The CAA has had no reports of toilets leaking in flight. There have been a few occurrences reported where toilets have failed in flight and crew have isolated them from use, and a few cases where engineering inspections have found evidence of toilet leakage, but none of these have resulted in loss of toilet contents overboard.

Laboratory Test Results

In a 2003 case, the CAA collected a sample from a house and had it tested by a local laboratory. The tests were designed to specifically establish if there was a presence of Novirusac in the sample provided. While the tests were inconclusive, they did indicate there was no definitive link between the two samples as would be expected if they were from the same source.

In a 2010 case, the Institute of Environmental and Scientific Research (ESR) was engaged by the Auckland Regional Council to test a sample taken from a South Auckland property. The test results were inconclusive, but they did indicate a strong presence of sterol which is related to human waste.

While this was a curious result it does not, and cannot, explain where the human elements came from. A probable explanation could be that waterfowl are known to feed in various waterways and ponds, including waste water treatment ponds.

It is of further note that the sample was sent to ESR almost 3 weeks after the event, therefore it was not a good quality sample and some tests were unable to be conducted.

The ideal time for testing is within a few days, before the sample dries out and degrades. The sample was not tested for the presence of the Novirusac chemical used in aircraft toilets.

Department of Conservation Viewpoint

A sample from a house in Tawa (near Wellington) was taken to the Department of Conservation Science & Research Unit to be viewed by Dr Murray Williams, their waterfowl biologist (retired in 2007).

The dry sample was viewed under a 3D dissecting microscope, and he found that it was typical of what he would expect dried out waterfowl excrement to look like. It was predominantly fibrous in content and appearance. Some plant remains were clearly undigested and still green in colour and the cell contents were fully intact.

The sample was then hydrated and a small portion viewed with a powerful microscope at 25x and 40x magnification. Dr Williams noted several individual strands of the substance and he was able to determine, in his opinion, that their microscopic structure was typical of digested plant material.

Waterfowl Habits

Dr Williams also explained the nesting habits of most waterfowl species. During the nesting incubation period, roughly between August to October, the female will generally sit on her nest for most of the day without defecating. This causes the food in her stomach to be digested and retained and further broken down by bacteria for a far longer period than is normally the case.

Also, the extended time on the nest means that her excrement will be of a greater liquid content than normal. The water and wastes extracted by her kidneys are retained in the cloaca and this mixes freely with the undigested food remains. He also explained that the duck will deliberately not defecate near her own nest, as this will attract vermin, so she will fly some distance before releasing the waste. When released, the excrement is therefore both voluminous and very runny, as well as having a foul, almost putrid, smell.

In the case of ducks during nesting, the female tends to be a solitary bird, and will fly around on her own. Depending on the type of bird (duck or goose), the amount of excrement could vary from ½ cup to one cup of waste matter and this is quite capable of splattering a large surface area.

Conclusion

The CAA's experience is that these events are not aircraft related.

Recommendations

If you have been affected by airborne effluent, these suggestions may help:

Immediately collect a sample in a sterile container and contact your Local or Regional Council for advice on the matter.

Do not use tissues or toilet paper to take the sample as may be chemically treated.

Some of the sample should be sent to a laboratory for testing within a few days for analysis of the material.

The sample should be tested for the existence of the toilet deodorant chemical (Novirusac) which is the chemical used in aircraft toilets throughout New Zealand.

A small quantity of the sample should also be submitted to a known waterfowl expert for microscopic examination, photography, etc. The Auckland University Biological Science Unit is considered to be a leader in this field.

A written report should be requested on all testing, observations and analysis carried out on the sample(s).

This report was prepared by the CAA Safety Investigation Unit, September 2011