



Fatalities of stowaways traveling in airplane wheel wells

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ABSTRACT

The earliest mention of a stowaway in the wheel well of an airplane dates back to 1947: A 30-year-old man chose this mode of travel for a trip from Lisbon to Brazil and survived (Véronneau et al., 1996).

In a retrospective study, we evaluated cases with lethal outcome of stowaways in airplane wheel wells by focusing on forensic autopsy results, in particular, in regard to hypothermia, hypoxia, and injuries. In addition, the flight routes, flight altitudes, and flight durations were analyzed. Using the *forensik*[®] program, a search of all the autopsies performed between 1994–2017 at the Institute of Legal Medicine in Frankfurt am Main, Germany, was conducted, using the key words “airplane,” “flights,” and “wheel well.” All of the thus retrieved autopsy reports, medicolegal expert reports, and police investigation reports were then evaluated.

Five cases were included in our study. The decedents were all men, aged between 14 and 26 years. Four of the decedents had been discovered at the Frankfurt Main airport within airplane wheel wells; the fifth man had been discovered in a woods underlying one of the flight approach paths to the airport. Two stowaways had died of hypoxic asphyxiation, possibly in conjunction with hypothermia as a contributing factor. One stowaway died of the polytrauma he sustained when he was crushed by retracting landing gear. For a further stowaway, the cause of death could not be macroscopically determined at autopsy. In one case, only an external postmortem examination had been performed, without autopsy. Analysis of the flight routes, altitudes, and durations showed that the flights had been international flights, the flight altitudes had varied between 7000 m (~23,000 ft) und 11,000 m (~36,000 ft), and the flight duration had been between 4 and 9.5 h. At high altitudes, the ambient conditions in wheel wells, which are not pressurized, are rarely survived by stowaways, with hypoxic asphyxiation likely posing greater peril than hypothermia. Further dangers are that of being crushed by retracting landing gear after takeoff, or of falling out of a wheel well, from a great height, when the landing gear is deployed. When it appears conceivable that a stowaway may have fallen from an aircraft wheel well during landing or takeoff, an autopsy and discovery scene investigation are essential to reconstructing the course of events.

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1. Introduction

The earliest report of a blind passenger stowing away in the wheel well of an airplane is likely that of a 30-year-old man who flew from Lisbon to Brazil on August 5, 1947. While he survived that journey [1], news releases in more recent times have only rarely reported the survival of stowaways traveling in this fashion [2,3].

Far more commonly, the media cover the lethal outcome of blind passengers stowing away in the wheel wells of passenger or cargo aircraft [4,5]. While, at the ambient conditions encountered in wheel wells at flight altitudes of approximately 9150–12,200 m (~30,000–40,000 ft), with temperatures as low as -56°C , and low

partial pressure of oxygen, death due to hypothermia or hypoxic asphyxia seems likely, to date, little data is available in regard to the actual causes of death in wheel-well stowaways.

The presented, retrospective, study, which to our knowledge is the first medicolegal study of its kind, examined cases in which the journey of wheel-well stowaways on flights to the Frankfurt (Main) airport in Germany had ended fatally. The aim of the study was to retrospectively examine the possible causes of death associated with this mode of travel. To this end, the forensic autopsy reports for wheel-well stowaway fatalities were analyzed, in particular in regard to macroscopic signs for hypothermia and asphyxiation, injury, and impairment through extraneous material or substances, and the pathophysiological aspects of the findings were considered. Additionally, the information contained in the police records in regard to flight routes, flight altitudes, and potentially unique technical characteristics of the involved airplane was

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consulted, where available, to provide clues about the settings in which the fatalities had occurred.

2. Material and methods

A *forensik*[®] database search of all autopsies or external postmortem examinations performed between 1994–2017 in Frankfurt am Main, Germany, was conducted using the keywords “airplane,” “flying,” and “wheel well.” The files, e.g., autopsy reports and complementary medicolegal expert reports, for all cases retrieved with these search parameters were evaluated (in particular in regard to chemical toxicological testing, blood alcohol concentration, and discovery scene investigation), as were the results of the police investigation, which included flight specifics such as duration, cruise altitude, and outside temperature.

3. Results

In all of the five cases found, the wheel-well stowaways had been exclusively men, ranging in age from 14 to 26 years, of Ghanaian, Russian, Mauritian, and Pakistani nationality (Table 1). Four of the five decedents (cases 1–4) had been found within airplane wheel wells; the fifth decedent had been found in a woods underlying one of the flight approach paths to the Frankfurt am Main airport (case 5). The flight routes, as well as the cruise altitude and duration, are given in Table 1 and Fig. 1.

In case number three, the prosecutor had not ordered a medicolegal autopsy, but a second external postmortem examination had been performed at the Frankfurt University Institute of Legal Medicine. The practitioner who had performed the first postmortem examination had diagnosed hypothermia as the cause of death.

All cases were evaluated for frequently found macroscopic signs for hypothermia or asphyxiation (Table 2). In cases number one through number three, the pigmentation of the decedents' skins, however, precluded proper evaluation of the color of the postmortem lividity and the existence of possible cold erythema. No postmortem CT-imaging or histological examinations had been performed in any of the cases. Further, there had been no macroscopically visible signs for serious pre-existing disease in any of the autopsied decedents.

In case one, the body of a 14-year-old, male juvenile had been found in one of the wheel wells of an airplane, during maintenance work. According to the police report, the corpse had been frozen when it was discovered. The juvenile had probably climbed into the wheel well of the airplane, in Mauritius, through a 70 cm gap that remains when the panels of the wheel well close again after the airplane's landing gear has been deployed. He was found dressed in a t-shirt, a pair of pants, a pair of sneakers, and a baseball

cap. A blood alcohol concentration of 0.03‰ had been found. Chemical toxicological tests had not been performed.

In case two, a section of the decedent's upper body had hung out of the wheel well while the airplane was in park position. This circumstance had led to discovery of the corpse. The man had been dressed in a blouson jacket, a pair of shorts in addition to a pair of long trousers, and brown sandals. The alcohol determination for blood and urine was negative. Chemical toxicological testing had not been performed.

In case three, the man had tied himself to one of the structures within the wheel-well with an approximately 6-cm-broad strap. The corpse had been found by a technician during routine inspection of the airplane's landing gear. The man had been dressed in a t-shirt, a sweatshirt, a jacket, a pair of jeans, and a pair of shoes.

The corpse in case four had been found under circumstances similar to those in case two: In this instance, the decedent had been discovered because his right arm had hung out of the wheel well while the airplane was in park position. This was likely also the reason why an error message in regard to the wheel-well panels had been relayed to the cockpit during the landing approach. In the wheel well, cigarettes, matches, and two bottles filled with a yellowish liquid had been found close to the decedent. The man had been dressed with a shirt, a cardigan, a pair of jeans, socks, and a pair of shoes. No chemical toxicological tests were performed, but alcohol determination indicated an alcohol concentration of 0.04‰ for blood, and 0.08‰ for urine.

In case five, the corpse of a 19-year-old man was discovered by a jogger, in a woods underlying one of the flight approach paths leading to the Frankfurt Main airport. The decedent's body had been found in a shallow crater rimmed with what appeared to be freshly tossed up earth. The man had been dressed with a t-shirt, a pair of jogging pants, socks, and trekking sandals. The ambient temperature had been 6.5 °C, the temperature of the ground beneath the corpse had been 8.8 °C, and the deep rectal temperature of the decedent had been 12.9 °C. The location of the postmortem lividity did not correspond with the position the corpse was discovered in (Fig. 2). The severity of the injuries (e.g., numerous open skull fractures with extrusion of brain tissue) that had already been evident at the discovery scene, and smudges of a dark oily substance on the right forearm, had initially raised the suspicion of a traffic accident with removal of the corpse from the scene of the accident. But, in addition to the already evident serious craniocerebral trauma, massive thoracic trauma, with cardiac rupture, complete avulsion of the lung lobes at the hila, fractures of the thoracic and lumbar vertebrae, separation of the pubic symphysis and the sacroiliac joints, multiple fractures of the axial skeleton and ribs, and ruptures of the spleen and liver had then also been found at autopsy. Although there had been signs of

Table 1
Wheel-well stowaway flights. The specifics about flight altitude, duration, and ambient temperature were taken from the police reports. In case five, the flight route was unknown, (VAE = United Arab Emirates, MUC = Munich, FRA = Frankfurt am Main).

Case no.	Sex/age	Nationality	Airplane type	Flight route (see Fig. 1)	Flight altitude/duration	Outside temperature
1	Male/14 years	Mauritian	Airbus A340-400	Mauritius → Munich → Frankfurt/Main	At least 8000 m (~26,000 ft)/9.5 h (Mauritius/MUC)	At least -15 °C (given as maximum temperature in the wheel well)
2	Male/26 years	Ghanaian	Airbus A300-600	Lagos/Nigeria → Accra/Ghana → Frankfurt/Main	11,000 m (~36,000 ft)/7 h (Accra/FRA)	Between -45 °C and -50 °C
3	Male/21 years	Pakistani	McDonnell Douglas MD-11	Chennai/India → Penang/Malaysia → Sharjah/VAE → Frankfurt/Main	Unknown/6 h (Sharjah/FRA)	Unknown
4	Male/24 years	Russian	Airbus A319	Perm/Russia → Ekaterinburg/Russia → Frankfurt/Main	7000–10,500 m (~23,000–35,000 ft)/4 h (Ekaterinburg/FRA)	Up to -51 °C
5	Male/19 years	Russian	Unknown	Unknown	Unknown	Unknown

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