

OCCUPATIONAL INJURIES IN FLEMISH PILOTS IN BELGIUM A QUESTIONNAIRE SURVEY

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ABSTRACT

A questionnaire survey was conducted in Antwerp, Belgium in 2002-2004 on the factors influencing the occurrence of work-related accidents and injuries in Flemish maritime pilots.

130 questionnaires were collected and analysed, and the response rate was 37,6%.

The accidents reported in the questionnaire occurred between 1980 and 2005, and most of them (70,7%) during the last 10 years.

Various factors were taken into consideration: causes of accidents, their time and site, type of injury, human factors, transfer to ships, use of safety equipment, state of the sea, visibility, etc.

The obtained results were summed up in 3 tables, and were compared with data from the literature. In this study, authors attempted to assess the importance of these various factors on the occurrence of work-related accidents among pilots, and improve their prevention.

Key words: pilot, seapilot, occupational accidents, occupational injuries

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INTRODUCTION

Accidents involving ships are often dramatic, both due to loss of human lives, and because of their economic and ecologic consequences. To minimize the accident risk in waters difficult to navigate, it is essential to have experienced and qualified specialists aboard. Pilots can give advice on these routes and take over the wheel when necessary, to guarantee 'safety and free flow of traffic' as well as 'protection of the environment and prevention of hazards to persons and objects' as stated by the president of the International Maritime Pilots' Association (IMPA), captain Mehrkens. Pilots are highly qualified seafarers and bear a huge responsibility. Their work exposes them to a lot of pressure. This is even enhanced due to irregular working hours and nightwork. Physically, the job is demanding as well, especially when boarding or disembarking in poor weather conditions. All things considered, the proportion of occupational accidents in this demanding job is rather low^{1,2}. During 2002, 3,8% of Flemish pilots reported accidents and during 1991, 2% of Swedish pilots reported accidents, compared to more than 3% in other occupations. Near-accidents are very common, on the other hand: 96% of the Swedish pilots had experienced at least one near-accident¹. One possible explanation of the huge discrepancy between reported occupational accidents and experienced (near-)accidents is underreporting, a fact well known in physically demanding, male-dominated occupations, such as piloting¹.

MATERIALS AND METHODS

A search in literature was conducted, but no questionnaire met our particular needs. Hence we used a questionnaire of our own design, taking into account previous research and relevant findings on this topic. Questions aimed at general topics, such as biometric parameters, type of piloting and career, and were completed with questions about health (diseases, sleep quality, stress and tobacco and alcohol consumption) and occupational accidents (when, where, conditions, injuries, protective measures taken). A next series of questions investigated safety and organizational topics. Room was left for additional remarks from the pilots themselves. Questionnaires were processed using the statistical program SPSS® (version 11.0.2 for Mac). Analyses were made using Pearson Chi-Square and Wilcoxon Signed Ranks Test. There was no external financial support for this study.

The study was conducted using a questionnaire. This method makes it possible to reach more pilots in a relatively short time and produces a lot of information concerning

the accidents' circumstances, which could not be obtained only by a study of the already existing accident report forms. However, an important disadvantage of this method are concerns about the reliability of the obtained information. This should be taken in account when it comes to interpretation of data.

The pilot associations (European Maritime Pilots' Association, Beroepsvereniging van Loodsen) were involved by their technical workgroups in this process, and provided valuable information on a number of issues. A psychologist was involved to make sure the questionnaire would not suggest nor induce answers. An informed consent and a letter explaining the aims of the study were added to the questionnaire itself. On behalf of ethical aspects, the study was presented to an ethical committee, which gave positive advice. Syndical representatives and staff of the piloting service (Dienst Autonoom Beheer Loodswezen) were previously informed about the study and agreed to cooperate. Questionnaires were distributed and collected in an anonymous and confidential way amongst all Flemish pilots that could be reached through this service.

RESULTS

A total of 130 questionnaires were returned, and the response rate was 37,6%. Due to missing values, total percentages in the results do not always reach 100%.

Most of the participants were river- (54,6%) and sea pilots (30,0%). The others were coastal pilots and river/canal pilots. The age of the questioned pilots varied between 31 and 64 years (mean 47,5 years standard deviation 7,7). Pilots were between 1 and 34 years in service as a pilot (mean 14,3 years standard deviation 2,7).

About 2/3 of the accidents (67,0%) is reported to the insurance and registered. Coastal and sea pilots have significant (Pearson Chi-Square, $p < 0,05$) more accidents compared to river- and canal pilots (table 1). No significant relation was found between their age or career length and number of accidents.

The accidents reported in the questionnaire occurred between 1980 and 2005, most of these during the last 10 years (70,7% of the accidents).

Body mass index varied between 20,59 and 35,92 (mean 25,57 SD 2,66). No significant relation between body mass index and number of accidents was found. There was however a connection between body mass index and age (table 2). In the youngest group of pilots (age under 45 years) about 1/3 presented excess weight. In the older group (45-55 years), this increased to 2/3, and in the oldest group (above 55 years) even to 3/4 of the pilots.

Table 1. The occurrence of accidents in river, canal, sea and coast pilots in Belgium

| Number of accidents recorded | The number of accidents reported by pilots in 4 types of pilotage | |
|------------------------------|---|----------------------|
| | River and canal pilots | Sea and coast pilots |
| 0 | 53 (63,1%) | 15 (33,3%) |
| 1 | 21 (25,0%) | 15 (33,3%) |
| ≥2 | 10 (11,9%) | 15 (33,3%) |
| Total | 84 (100%) | 45 (100%) |

Table 2. Proportion of overweight of pilots in different age

| Age | < 45 years | 45 – 55 years | > 55 years |
|---|-------------------|-------------------|-------------------|
| Normal weight (number of pilots) | 37 (67,3%) | 16 (33,3%) | 7 (26,9%) |
| Overweight (number of pilots) | 18 (32,7%) | 32 (66,7%) | 19 (73,1%) |
| Total | 55 (100%) | 48 (100%) | 26 (100%) |

Table 3. Injured body part following accidents in maritime pilots Data of the questionnaire compared to data of the insurance company

| Place of injury | Percentage of cases from questionnaire | Percentage of cases in data from the insurance company |
|-----------------------|--|--|
| Legs and feet | 47,5% | 36,2% |
| Arms and hands | 15,5% | 18,4% |
| Trunk | 12,6% | 22,7% |
| Head | 11,7% | 7,1% |

No statistical significant relation was found between the number of accidents and any of the following parameters.

According to pilots, the cause of accident was, according to the pilots, mostly due to the environment (51,5%; speed of wind, state of the sea, poor visibility). Human factors counted up for 11,7% (stress, sleep deprivation, bad physical condition). Transfer and safety equipment was involved in 8,7% of the cases (pilot ladder, gloves, lighting). Only in 2,9% of accidents, the organizational aspects (resting/sleeping periods) were to blame.

Types of accidents were put together in groups: slipping/falling on deck, falling into the water, road accidents and 'other'. Most common type of accident was slipping/falling on deck (50,5%). Road accidents counted up for 9,7% of the total, in

another 5,8% it was falling into the water. 29,1% of the accidents were classified as 'other'. This last group includes squeezing, concussion, bumps.

Injured body parts (Table 3) were head, trunk, arms, hands, legs, feet and other parts. Most injuries occurred to legs (29,1%), followed by feet (18,4%), trunk (12,6%), head (11,7%), hands (9,7%) and arms (5,8%). Other injuries counted up to 10,8%.

Place of accident was only reported in 65,0% of accidents. Most accidents occurred at sea (32,0%) or ashore (23,3%). Accidents on rivers/canals happen less often (9,7%).

Data concerning windspeed were available only for 40,8% of accidents, and varied between 2 and 11 grades Beaufort. Most accidents (19,4%) happened during when the speed of wind was between 5 and 7 Beaufort (median 6,0 variance 5,3). Data concerning the state of the sea were available only in 33,0% of the accidents. Most accidents (20,4%) happened during the sea state 4 to 6 (median 4,00 variance 3,24). In 35,9% of the accidents of which this parameter was known happened in good visibility, 34,0% of them - in the dark, and only 1,9% of them happened in bad visibility/fog.

For the next 3 parameters, data were available for about 1/3 of the accidents. The time spent on duty before the accident happened was mostly (26,3%) between 4 and 8 hours, however with important individual differences (mean 5,79 hours, standard deviation 4,51). Sleep length before the accident happened was mostly (in 16,6% of cases) between 7 and 9 hours (mean 6,03 hours standard deviation 2,37). The mean period of standby before the accident happened was 5,19 hours, again with important individual differences (standard deviation 5,01).

As transport medium, the pilot boat with jollyboat was mostly used (30,1%), followed by the fast pilot boat (22,3%). The helicopter as means of transport was used in 2,9% of cases.

Transfer method was mostly the pilot ladder (40,8%), followed by 'deck to deck' transfer (7,8%), gangway (2,9%), helicopter (1,9%) and pilot hoist (1,0%).

At the time of the accident, most commonly used safety equipment was the lifejacket (17,5%), sometimes in combination with gloves (14,6%), safety shoes (6,8%) or both (4,9%). The combination of lifejacket with gloves and waterproof clothing was used in 4,9% of cases. Another combination, gloves and safety shoes and waterproof clothing, was worn by 3,9% of the pilots at the time of accident, as much as the use of a survival suit. Safety shoes as the only means of protection were used by 2,9% of the population. Only one of the questioned pilots carried a flashlight at the time of accident.

Most pilots in this population did not smoke (84,5%). Those who smoke, consume mostly less than one package a day (13,1%). Only 2,4% of them smoked more than one package a day. About a third of these pilots did not drink alcohol (28,5%). Most of

them (57,6%) used to drink between 1 and 2 glasses a day, and only 13,0% drank more (with a reported maximum of 5 glasses a day on average).

Stress was quoted in the questionnaire on a scale from 0 (no stress) to 10 (unbearable stress). Stress caused by the job itself was low for most pilots (mode 2 range 0-10). Stress due to relations with colleagues was very limited (mode 0 range 0-7). Stress due to private problems was also very low (mode 0 range 0-9). Stress due to the job was significantly higher than stress due to relations with colleagues and private problems (Wilcoxon Signed Ranks Test, $p < 0,05$). Stress due to job content did not differ significantly from stress due to job organisation, and stress due to relations with colleagues did not differ significantly from stress due to private problems.

Sleep quality was very good on days off (mode 8 range 1-10) on a scale from 0 (very bad sleep) to 10 (very good sleep). When on duty, sleep quality was lower (mode 6 range 0-10). Sleep quality after nightshift was even worse (mode 5 range 0-10). Sleep quality on days off was significantly better than sleep quality when on duty, which was in turn better than sleep quality after nightshifts (Wilcoxon Signed Ranks Test, $p < 0,05$).

Most pilots (91,5%) reported sleep disturbances, mostly poor maintenance of sleep (60,5%), less frequently poor sleep induction (20,2%) or both problems combined (19,3%). Most of the pilots (56,9%) take a nap several times a week during daytime.

About three quarters of the respondents (76,9%) were never treated for cardiovascular diseases. Treatment was mostly for high blood pressure (7,7%), varicose veins (3,8%) or haemorrhoids (3,8%). Only 1,5% of pilotes were ever treated for myocardial infarction. Most pilots (86,9%) were never treated for gastrointestinal diseases. Gastric ulcers are the most common cause of treatment (7,7%) within this group.

The majority of pilots admitted having sufficient participation in planning of hours on duty-off duty and in the job rotation (respectively 85,4% and 71,5%). Although no significant differences in participation were noted when compared with age, a significant relation (Pearson Chi-Square, $p < 0,05$) was found between participation and stress due to job organisation. Less participation goes together with more stress due to work organization.

When asked about the use of safety equipment in the whole enquired population (instead of only the ones who had an accident, at the time of the accident, as in one of the previous questions), most pilots (96,2%) used the lifejacket all the time. Two thirds of them (66,2%) wore gloves as well most of the time. Safety shoes were worn by 55,4% of the pilots most of the time. Only a small fraction of the respondents always used waterproof clothing (11,5%), survival suit (5,4%) and a flashlight (3,8%).

Most of the pilots (83%) carried personal luggage with them: 39,2% carried a rucksack, and 43,8% had a shoulderbag, instead of hoisting it separately, as required by international standards. Older pilots relatively more often asked for hoisting of their luggage. They also used more often shoulderbags than rucksacks, compared to younger pilots (Pearson Chi-Square, $p < 0,05$). 63,8% of the pilots had an additional remark on the questionnaire, mostly about pilot ladders, safety equipment, absence of sufficient lighting and general remarks about transfers. The importance of a well-trained crew in the pilot boat to facilitate transfer was stressed by several pilots.

DISCUSSION

Considering the participation rate of pilots, we see a smaller participation amongst coastal pilots (18,8% of their total number), and sea pilots (29,3%), compared to the river pilots (47,0% - 51,0%). Participation of canal pilots was between 23,3% and 43,3%. Exact percentages of river- and canal pilots are impossible to obtain because of classification problems (some pilots indicated more than one type of pilotage, and this is not registered as such in the personnel register of the employer, so percentages were calculated assigning these data to one of the groups indicated, which explains the range in the results for river- and canal pilots).

Coast- and sea pilots reported significantly (Pearson Chi-Square, $p < 0,05$) more accidents compared to river- and canal pilots, possibly due to rougher weather conditions at sea, but this could not be confirmed in this study.

The population questioned subjects had overweight (body mass index ≥ 25), only 46,2% has a normal weight. This number is comparable to other studies, where about half of the pilots had overweight^{1,3}. Older pilots were relatively more overweighted as compared to their younger colleagues (Pearson Chi-Square, $p < 0,05$), as described in literature¹. Overweight is an important factor in occupational accidents, because it often is a compromising factor for good physical fitness, hence it increases the risk for occupational accidents. Pilots with overweight had twice the number of accidents as compared to pilots with a normal weight¹. This could however not be confirmed in our study. Body weight can be followed during regular medical examinations and pilots should be encouraged to work on their physical condition.

When the accident rates from the questionnaire are compared to the numbers of reported accidents to the insurance⁴, underreporting in the questionnaire is obvious, only 67,0% of accidents were reported. Participation in the questionnaire survey was of course not mandatory, and only covered 34,0% of the total population of Flemish pilots.

Even after correction for this parameter, underreporting still exists. Possibly many pilots with a series of accidents have not participated in this survey. Memory bias is probably also part of the explanation. Underreporting is well known in physically demanding, male-dominated occupations¹. Moreover, pilots indicated themselves that the elaborate procedure for reporting occupational accidents did not encourage reporting. An increase of accidents with increasing age, as reported in other studies¹, was not confirmed in our study.

As the type of accident is compared to the accidents reported to the insurance ⁴, a similarity is found: 65,3% of the accidents in our study were due to slipping/falling (on deck); in the insurance study it was 66,5%). Other studies indicated as well that this was the most common type of accident aboard ships ^{5,6,7}. It is obviously very common among pilots, so it would be reasonable to concentrate efforts on the prevention, for example wearing safety shoes, using flashlight. Falling in the water counted for up to 5,8% of the occupational accidents in our study, which is comparable to other reports in the literature ¹.

The pilots themselves link many accidents (51,5%) to environmental factors: rough sea, wind, poor visibility), and only a minor part (11,7%) of them to the human factor: health problems, or to the defective equipment (8,7%). Organizational factors were reported only in 2,9% of cases. These numbers are very difficult to compare with data from the insurance companies, and they are of course based upon the pilots' own interpretation, but they show us that the environment is a major issue to pilots, in relation to occupational accidents.

In our study, injuries to feet and legs were more frequent than reported by the insurance company (Table 3). Possibly a lot of these injuries were not severe, and thus not reported to the insurer. Prevalence of injuries to arms and hands as well as those to the head are comparable to data of that company. Injuries of the trunk were less frequent in our study. A possible explanation is that some of these injuries, were reported in the category 'other' (which includes injuries of the back, for instance).

Most of the accidents occurred at sea (32,0%), where the influence of rough weather conditions is more apparent as compared to the rivers and canals (9,7%). Data concerning the state of the sea and wind were not available for most of the accidents, so it is not possible to estimate the influence of these factors on the occurrence of accidents. Accidents ashore (23,3%) included car accidents and those which occurred when boarding/disembarking from the shore.

About half of the accidents occurred in the dark, which is an important fact because only 3,8% of the pilots carry a flashlight regularly, and poor lighting is one of the top 5 factors in accidents aboard ships ⁸.

The parameters 'time on duty before the accident happened', 'time of sleep before the accident happened' and 'time standby before the accident happened' were only completed in the questionnaire for about one third of the total number of accidents. This makes interpretation of these factors difficult.

The data concerning piloting boat, the method of transfer and the use of safety equipment did not provide additional information on accidents.

Most pilots (84,5%) did not smoke, as reported in other studies as well¹¹, and alcohol consumption was not excessive according to the pilots themselves. Only 13% drank more than two glasses (standard units of alcohol) a day.

The stress due to the job itself and job and its organization was higher than stress due to relations with colleagues and private problems (Wilcoxon Signed Ranks Test, $p < 0,05$). Stress due to job organisation was higher when participation was lower (Pearson Chi-Square, $p < 0,05$). Either kind of stress seemed not to be a major problem to most pilots (modes between 0 and 5/10).

The sleep quality was comparable to data in the literature¹: good sleep quality on days off (mode 8 range 1-10), not so good when on duty (mode 6 range 0-10), and worst after nightwork (mode 5 range 0-10). Differences were significant (Wilcoxon Signed Ranks Test, $p < 0,05$). The larger spread within data 'on duty' and 'after nightshift' suggests a larger individual variance. Age can be part of the explanation for these differences, something that is suggested also by the sleep disorders reported by 91,5% of the pilots. Sleep disorders are a well known problem in pilots^{9,10}. Napping reported by 56,9% of the pilots was a possible way of dealing with these sleep disturbances (recuperation of 'lost' sleeping time).

Varicose veins and haemorrhoids were expected diseases in jobs that are mainly done standing upright, whereas high blood pressure is also a common disease in the general population. The proportion of cardiovascular diseases (13,1%) was comparable to data from the literature (14,0%)¹, as goes for gastrointestinal diseases (12,3% compared to 12,0% respectively). Peptic ulcers are expected in a population exposed to a lot of stress.

Most popular safety equipment is the lifejacket, which is of course the lifesaving device for all seafarers. 96,2% of the pilots in our study claimed always to wear a lifejacket, which was more than in another study (77,0%)¹. However, in the prevention of (mostly non-fatal) occupational accidents, a lot of progress still can be made. The high prevalence of accidents with injuries to feet and legs, and the large proportion of accidents due to slipping/falling (50,5%) justifies more attention for slip-proof safety shoes, as only 33,8% of pilots wore them. The same goes (to a lesser extend) for injuries to hands (9,7% of all accidents) and the use of appropriate gloves, which 18,5% of the pilots never used. Last but not least, a more wide use of flashlights could help in the

prevention of the large number of accidents occurring in the dark (34,0% of all accidents, while only 3,8% of the pilots always carried a flashlight).

Another important issue is the separate hoisting of personal luggage, which is an international requirement. Pilots did not do this in 83,0% of the cases. Keeping on the rucksack or shoulderbag can impair climbing on the pilot ladder, interfere with insufflation of the lifejacket, and thereby complicate rescue after falling in the water. One of the pilots' arguments to keep their luggage with them anyway, is that separate hoisting slows down the transfer and that it distracts the attention of the assisting sailors from the transfer of the pilots themselves. Moreover, some of the pilots consider the rucksack a protective element when falling back from the pilot ladder on the deck of the pilot boat.

CONCLUSIONS – KEY MESSAGES

Sea pilots and coastal pilots are more at risk for occupational accidents as compared to river- and canal pilots. Preventive measures should therefore be adapted to the type of pilotage.

Overweight is once again confirmed as a serious problem in pilots. Weight is not only important because of the long-term cardiovascular effects, but mostly because of the impairment of physical capabilities. Overweight makes transfer more difficult and the risk of injuries in accidents increases. Other parameters concerning health: smoking, alcohol consumption, diseases, are less important. Improvements in physical fitness could help in prevention of accidents, and should therefore be encouraged and monitored, for example during the annual medical examination.

The subjective feeling of stress is overall low. Job content and job organization cause more stress than relations with colleagues and private problems. Individual susceptibility to stressing factors can however be very different, and should be of concern, both for staff and for medical follow-up. Sleeping disorders are common, especially after nightshifts. Irregular working hours are of course typical for this job. A good individual sleep hygiene, in combination with reasonable working hours and the right sleeping environment, could limit the consequences of these irregular hours. Napping can be of help in recuperation of sleep deprivation.

Slipping/falling on deck is an important cause of occupational accidents which often results in injuries to feet, legs and hands. Underreporting is common, certainly for minor injuries to legs and feet. The role of the environment (rough sea, visibility, etc)

should not be underestimated. Appropriate safety equipment, and its correct use could play an important role in reducing accidents.

Better registration of near-accidents, paying attention to important factors such as weather conditions, hours of sleep/standby/duty, and the correct functioning of all safety equipment is needed. Further research could help to evaluate the exact role of these factors in the occurrence of accidents among pilots.

Despite all of these possible ways to improve prevention, or by improving safety equipment, the important issue remains the condition of the equipment to board/disembark the ships. The pilots themselves should report deficiencies, using their Report Information System.

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