



DUTCH  
SAFETY BOARD

# Summary General aviation accidents



# Summary

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*The Hague, January 2014*

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## **Dutch Safety Board**

The aim in the Netherlands is to limit the risk of accidents and incidents as much as possible. If accidents or near accidents nevertheless occur, a thorough investigation into the causes, irrespective of who are to blame, may help to prevent similar problems from occurring in the future. It is important to ensure that the investigation is carried out independently from the parties involved. This is why the Dutch Safety Board itself selects the issues it wishes to investigate, mindful of citizens' position of independence with respect to authorities and businesses. In some cases the Dutch Safety Board is required by law to conduct an investigation.

	<b>Dutch Safety Board</b>		
Chairman:	T.H.J. Joustra E.R. Muller P.L. Meurs		
General Secretary:	M. Visser		
Visiting address:	Anna van Saksenlaan 50 2593 HT The Hague The Netherlands	Postal address:	PO Box 95404 2509 CK The Hague The Netherlands
Telephone:	+31 (0)70 333 7000	Fax:	+31 (0)70 333 7077
Website:	<a href="http://www.safetyboard.nl">www.safetyboard.nl</a>		

NB: The full report is published in Dutch. The English summary is the translation of the summary, the lessons for the sector and the conclusions of the report. In the event of any discrepancy between these versions, the Dutch text shall prevail.

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In 2012, the Netherlands was shaken up by a rise in the number of serious incidents and accidents in the general aviation sector (17 serious incidents and 22 accidents compared to a previous annual average of 10 serious incidents and 11 accidents). The year saw seven people seriously injured and five killed, including the pilot of a Cessna 172 who died on the Tweede Maasvlakte and two people who died when two planes collided near Dronten. The rise in the number of reported accidents involving light aircraft has alarmed the Dutch Safety Board as it seems to point to a possible threat to the safety of air passengers.

To gain insight into the safety of general aviation, the Dutch Safety Board has launched a thematic study focusing on the following questions:

1. What is the state of affairs regarding the safety (in terms of accident figures) in general aviation?
2. What types of occurrences are taking place?
3. What are the causal factors of these occurrences?
4. How are these factors controlled by the parties involved?

The Dutch Safety Board analysed 189 occurrences (2005-2012) from its own database, collected statistics, conducted a survey among pilots and interviewed a various parties from both the sector and government.

## **General aviation**

A number of different definitions are used to describe 'general aviation'. This report defines the term as follows: general aviation covers gliders and aeroplanes with one or two piston engines or a turboprop engine in civil aviation with a maximum take-off mass of 5,670 kg. Helicopters, hot-air balloons, paragliders, business jets and fighter jets registered for civilian use do not fall within the scope of this investigation. This investigation therefore covers around 60% of the Dutch fleet (1 674 aircraft in 2012). General aviation covers recreational, commercial (especially flight training) and social flights (including police and inspection flights).

## **Safety in the general aviation sector**

Statistics for 2005-2011 reveal that four out of every one million general aviation flights in the Netherlands ended in a fatal accident. These figures are in stark contrast with the figures for scheduled air services, where an average of four to five flights out of every ten million end in a fatal accident. The figures for general aviation are also high when we contrast this sector with other forms of transportation. For example, the annual road accident death rate over the same period (2005-2011) was 0.05 per 1,000 for cars and vans and 0.12 per 1,000 for motorcycles, while the annual death rate in general aviation was 1.2 per 1,000 aircraft. As general aviation covers both transport flights and recreational or sports-related flying, we can also compare these figures with those for

fatalities in other sports. Of the approximately 11 million Dutch residents involved in sporting activity of whatever kind, around 30 die each year while practising their chosen sport. Most of these deaths occur in recreational flying, aquatic sports, swimming and horse riding. Given the small number of private pilots (there were 18,739 certified pilots in the Netherlands in 2012 compared with approximately 3 million swimmers and 350,000 horsemen and women), recreational general aviation can be considered a relatively dangerous pursuit.

Nevertheless, general aviation in the Netherlands does not appear to be any more unsafe than general aviation in other countries, such as the United States and Australia, where studies have also been conducted into safety in general aviation.

Although a number of passengers lost their lives in the general aviation accidents examined in the Netherlands (5 of the 25 fatalities were passengers), passenger and other third-party involvement in the accidents investigated remains small. The occurrences investigated did not involve any casualties on the ground, although a number of the accidents did cause material damage on the ground. Given the large number of fatalities and accidents that occur in general aviation, however, it is a matter of urgency that measures be taken.

### **Peak in 2012**

The investigation reveals a significant rise in accidents in general aviation in 2012 compared to the previous years. This rise in 2012 does not necessarily represent a negative trend and an analysis of the occurrences that occurred in 2012 does not provide any clear explanation for the peak seen in this year. European figures, which show a decline in the number of general aviation accidents in 2012, seem to confirm that the peak may be down to coincidence. Furthermore, the provisional accident figures for 2013 also confirm this suspicion, with 16 accidents and 2 deaths up to the month of December.

### **Types of accidents**

The occurrences involving the highest number of deaths and injuries occur where the aircraft stalls in flight and crashes, followed by accidents where mist or clouds cause the pilot to become spatially disoriented and crash the aircraft into the ground, and mid-air collisions. Other occurrences which are common but do not usually end in death or injury are emergency or precautionary landings following engine trouble and occurrences where the pilot loses control of the aircraft while landing.

### **Accident factors**

The causes of each occurrence were examined, with a distinction made between (unclear) procedures, defects to the aircraft, environmental factors (such as weather conditions) and causes related to the pilot's actions (skills, risk perception, medical issues). It appeared that the majority of accidents - with the exception of the emergency and precautionary landings following engine trouble - are not the result of, for example, technical defects or weather conditions, but rather of poor flying skills and inadequate risk perception on the part of the pilot. Consequently, the focus of the investigation shifted to controlling these 'human' accident factors.

### **How are these factors controlled by the parties involved?**

The European Union seeks to control the skills and risk perception required for motorised general aviation through a system of training requirements, the pilot's exam and the minimum experience needed for ratings in pilot licences to be extended. This system has a number of weaknesses:

- The current minimum experience requirements offer no guarantee of an adequate level of skills and risk perception. This is due to two reasons. First of all, the requirements tend to be rather low. Second, the minimum experience requirements only consider flying duration and frequency (quantity). The regularity with which a pilot flies, the various weather condition he or she flies in as well as the actions practised during flights are however also important in keeping a pilot's skills and risk perception up to par.
- There is no mandatory system in place to maintain the level of pilots' knowledge of procedures and systems and thus improve their risk perception.
- For pilots that meet the minimum experience requirements, the training flight is the only time when their skills and risk perception are formally assessed. However, the training flight itself is not subject to any set requirements. Furthermore, the outcome of the training flight has no real consequences for the pilot in practice.
- It is possible for the examiner not to exercise sufficient independence and objectivity in his assessment, a situation that is especially problematic during so-called 'prof checks' of competence made when a pilot wishing to extend a rating fails to meet the minimum experience requirements. It is less of a problem during the initial practical exam, however, since these candidates will have received sufficient training at an approved training organisation prior to the exam.

In the case of gliders, the sector itself has devised a system to ensure the pilot's skills are kept up to scratch. Despite this system, however, the risks attached to gliding remain high since there is no measure in place that guarantees and, where need be, improves pilots' theoretical knowledge and thus raises their risk perception.

The monitoring of compliance with legislation and regulations by the Human Environment and Transport Inspectorate is limited. Consequently, the general aviation sector itself needs to be more aware of its own responsibility to ensure aviation safety.

Pilots of small motorised aircraft and gliders are themselves responsible for ensuring and maintaining adequate skills and knowledge levels, possibly by seeking assistance from the Dutch government, interest groups and flying clubs, etc. However, the support provided by the Dutch government in the form of inspections, supervision and active campaigns has fallen in recent years, shifting responsibility for safety in general aviation more towards the sector itself. The Human Environment and Transport Inspectorate has developed a 'safety management system light' (SMS light) to facilitate the general aviation sector in assuming responsibility for safety along structured lines. The Inspectorate assists organisations in general aviation in implementing SMS light by providing information and instructions.

However, a number of obstacles may prevent sector parties from benefiting from this assistance. For example, since not all pilots are members of interest groups and not all companies active in the sector are members of sector associations, the organisations concerned will not be able to reach all pilots. Furthermore, flying clubs, pilots and companies are free to decide for themselves what use they make of the services offered by these organisations.



# LESSONS FOR THE SECTOR

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## **Own responsibility**

A major conclusion of the report is that the general aviation sector itself bears primary responsibility for safety. Government involvement is limited primarily to establishing the legal framework and monitoring compliance to a limited extent. For the Dutch Safety Board, the decision to place responsibility for aviation safety primarily with the sector itself is obvious. The question is, however, what this means for the pilots and the sector. What are they required to know and do in order to assume this responsibility effectively? The Dutch Safety Board believes a number of measures need to be taken if the sector and pilots are to bear this responsibility correctly. The relatively high risk of fatal accidents in general aviation underscores the urgency of taking appropriate action in the years to come.

The Dutch Safety Board is of the opinion that the various parties concerned should be able to more clearly define what each of their own responsibilities involves. The Dutch Safety Board acknowledges the current efforts being undertaken by the various sector parties and encourages them to continue and further refine their safety control activities. In the section below, the Dutch Safety Board has formulated a number of lessons that the sector should heed in the interest of advancing safety in general aviation. The sector as a whole is responsible for actually taking these lessons to heart. Assuming responsibility means taking action and implementing changes independently. Failure by the general aviation sector to adequately assume responsibility for the sector's own safety will result in louder calls for external interventions in the form of new regulations and supervision.

## **Lessons for flying clubs, flying schools and aviation companies**

Flying clubs, flying schools and aviation companies bear an important and direct responsibility for safety in the sector. It is vital that they create a culture in which people dare to call each other to account on matters of safety. Such a culture could be stimulated by a system that enables pilots to learn from occurrences that have taken place. Flying clubs, flying schools and aviation companies should encourage pilots to report any occurrences and dangerous situations.

The mandatory implementation of a safety management system (SMS) presents opportunities for placing safety on the agenda in the short term and getting relevant safety measures implemented. The investigation revealed that increasing numbers of flying clubs, flying schools and aviation companies are implementing SMS light. Important pillars of the SMS are the identification of hazards and the adoption of mitigating measures. Hazards need to be identified on the basis of the organisation's experiences with previous occurrences or what people within the organisation observe. It is therefore important that people are able to speak freely and openly about occurrences and dangerous situations during specially organised meetings, for example. Furthermore, organisations need to focus on the five serious incident categories identified in the report so that they themselves are able to recognise hazards and reduce the most serious risks. Organisations must encourage pilots to report occurrences and situations by analysing

reports when submitted and getting back to the pilots with the results of the analysis while guaranteeing anonymity.

Flying clubs must take measures aimed at safeguarding the skills and risk perception of their members. In this regard, the Board refers to measures for instructing and communicating with flying club members, but also - and especially - to more mandatory measures. Clubs could make attendance of safety meetings or refresher courses mandatory, thereby obliging pilots to brush up their knowledge of systems and procedures. In addition, clubs could implement requirements with respect to flying frequency and flight variation, make flying lessons mandatory and arrange pilot assessments themselves.

Aviation companies must also take measures aimed at safeguarding the skills and risk perception of their employees. The management or safety manager of a company could oblige pilots to fly with an instructor on a regular basis with the aim of brushing up those skills the pilot may not require on a daily basis, or compel pilots to take a theoretical training course that reinforces the knowledge of particular procedures as well as the pilot's understanding of their necessity, with the ultimate aim of keeping the pilot's risk perception up to scratch. In addition, companies can inform and instruct pilots on matters of aviation safety.

Measures specifically aimed at younger and older people can be particularly useful, both at flying clubs and aviation companies. Young people would benefit especially from measures aimed at imparting and maintaining skills, while older people would benefit from both skills and risk-perception measures.

### **Lessons for pilots**

It is important that pilots are aware of their own responsibility to keep up their flying skills and knowledge.

Pilots should ensure their flying skills are up to scratch by, among other things, flying under various weather conditions (within reasonable limits), visiting different airports and occasionally flying with an instructor and performing flying exam exercises, such as a simulated engine failure. Accompanying another pilot as a passenger is a further measure pilots could consider. The Board is aware that aviation costs, such as fuel and landing costs, have risen. Nevertheless, it is necessary for pilots to fly on a regular basis and under different circumstances.

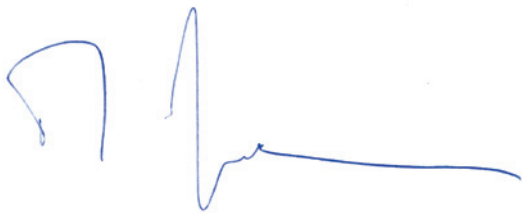
Pilots must know and be able to identify the risks in order to anticipate them. This is why it is essential for pilots to keep their knowledge up to the mark. Pilots can brush up on their knowledge by, for example, reading publications, books and websites, attending meetings and seminars and sharing their knowledge with other pilots.

Joining an interest group can ensure a pilot is kept abreast of developments in the sector, including developments in aviation safety. Furthermore, it is important that pilots feel they can freely share their experiences concerning aviation safety (e.g. incidents or dangerous situations) with their fellow pilots. Finally, it is important that pilots feel free to speak openly about unsafe behaviour and unsafe actions.

### **Lessons for interest groups and sector associations**

Safety is high on the agenda of the Aircraft Owners & Pilots Association (AOPA) and Royal Netherlands Aeronautical Association (KNVvL). These organisations provide a wealth of information to pilots and support flying clubs in implementing safety management systems. We recommend that the AOPA and KNVvL formally communicate the results of this investigation to the pilots among their members. The results of this investigation should also serve as input for the safety management systems of flying clubs.

The sector association, the Netherlands Association of Commercial Aviation (NACA), could do more in the way of providing information and promoting best practices in the area aviation safety, for which the results of this investigation could also be applied.

A handwritten signature in blue ink, consisting of a large, stylized 'J' followed by a series of connected loops and a long horizontal stroke.

T.H.J. Joustra  
Chairman of the Dutch Safety Board

A handwritten signature in blue ink, featuring a series of vertical, wavy lines followed by a long, sweeping diagonal stroke.

M. Visser  
General Secretary

## **What is the state of affairs regarding the safety (in terms of accident figures) in general aviation?**

In the 2005-2011 period, there was an average of 11 accidents and 10 serious incidents each year. 2012 saw 17 serious incidents and 22 accidents. The safety risk in the 2005-2011 period remained reasonably stable (0.4 fatal accidents per 100,000 flights and 2.6 accidents per 100,000 flights). The safety risk for 2012 was 1.2 fatal accidents per 100,000 flights and 4.3 accidents per 100,000 flights, which is significantly higher than in the 2005-2011 period. The safety risk for general aviation is considerably higher than that for scheduled air services, other means of transportation and sports.

## **What types of occurrences are taking place?**

Occurrences in general aviation involving fatalities or serious injuries can be divided into five categories: occurrences where the aircraft crashes or stalls; occurrences where an airworthy aircraft flown by a pilot flies into the ground; collisions and near-collisions and occurrences where loss of separation occurs; emergency and precautionary landings following engine failure; and problems during landing caused by insufficient control of the aircraft. Most casualties occur when an aircraft stalls and crashes (accounting for more than half of all deaths and nearly half of all injuries).

## **What are the causal factors of these occurrences?**

Technical problems on the aircraft occur in virtually one category only: emergency and precautionary landings following engine failure. The technical problems concerned are varied. By contrast, most occurrences in all categories are the result of factors related to the pilot, in particular poor flying skills and inadequate risk perception.

The analysis of the occurrences does not yield any clear explanation for the peak in the number of occurrences seen in 2012. The peak in the number of occurrences may be down to a coincidence, something that European figures, which dropped in 2012, seem to confirm. It is therefore essential that the number of accidents and serious incidents continue to be monitored in the years ahead. What is clear, however, is that the increase in the number of serious incidents in 2012 can be largely attributed to the rise in the number of reported near-collisions. Furthermore, we can observe an increase in the number of accidents in the categories 'collisions' and 'emergency and precautionary landings following engine trouble'.

## **How are these factors controlled by the parties involved?**

The European Union seeks to manage the skills and risk perception required for motorised general aviation through a system of training requirements, the pilot's exam and the minimum experience needed for ratings in pilot licences to be extended. This system has a number of weaknesses:

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The monitoring of compliance with legislation and regulations by the Human Environment and Transport Inspectorate is limited. Consequently, the general aviation sector itself needs to be more aware of its own responsibility to ensure aviation safety. The risk factors relating to flying skills and some of the risk factors relating to risk perception cannot be determined during inspections on flights.

The minimum experience requirements for retaining the ratings offer no guarantee of an adequate level of knowledge and skills. As a result, pilots are themselves responsible for ensuring the appropriate level of knowledge and skills, possibly by seeking assistance from the Dutch government, interest groups and flying clubs, etc. However, with the exception of the implementation of a safety management system (SMS light), the support provided by the Dutch government in the form of inspections, supervision and active campaigns has fallen in recent years, shifting responsibility for safety in general aviation more towards the sector itself. SMS light may assist the sector parties in defining this responsibility. However, a number of obstacles may prevent sector parties from benefiting from this assistance. For example, as not all pilots in the non-commercial arm of general aviation are members of an interest group, the organisations concerned will not be able to reach all pilots. Furthermore, flying clubs and pilots are free to decide for themselves what use they make of the services offered by the AOPA and the KNVvL. The NACA could do more in the way of providing information and promoting best practices in the area aviation safety.

In the case of gliders, responsibility for safety has rested with the sector parties for years. The sector has devised a system to ensure the pilot's skills are kept up to scratch. Despite this system, however, the risks attached to gliding remain high since there is no measure in place that guarantees and, where need be, improves pilots' theoretical knowledge and thus raises their risk perception. It is therefore important that pilots assume responsibility for brushing up their own risk perception. Pilots can seek assistance in this regard from interest groups and flying clubs.

**Visiting Address**

Anna van Saksenlaan 50  
2593 HT The Hague  
T +31(0)70 333 70 00  
F +31(0)70 333 70 77

**Postal Address**

PO Box 95404  
2509 CK The Hague

[www.safetyboard.nl](http://www.safetyboard.nl)