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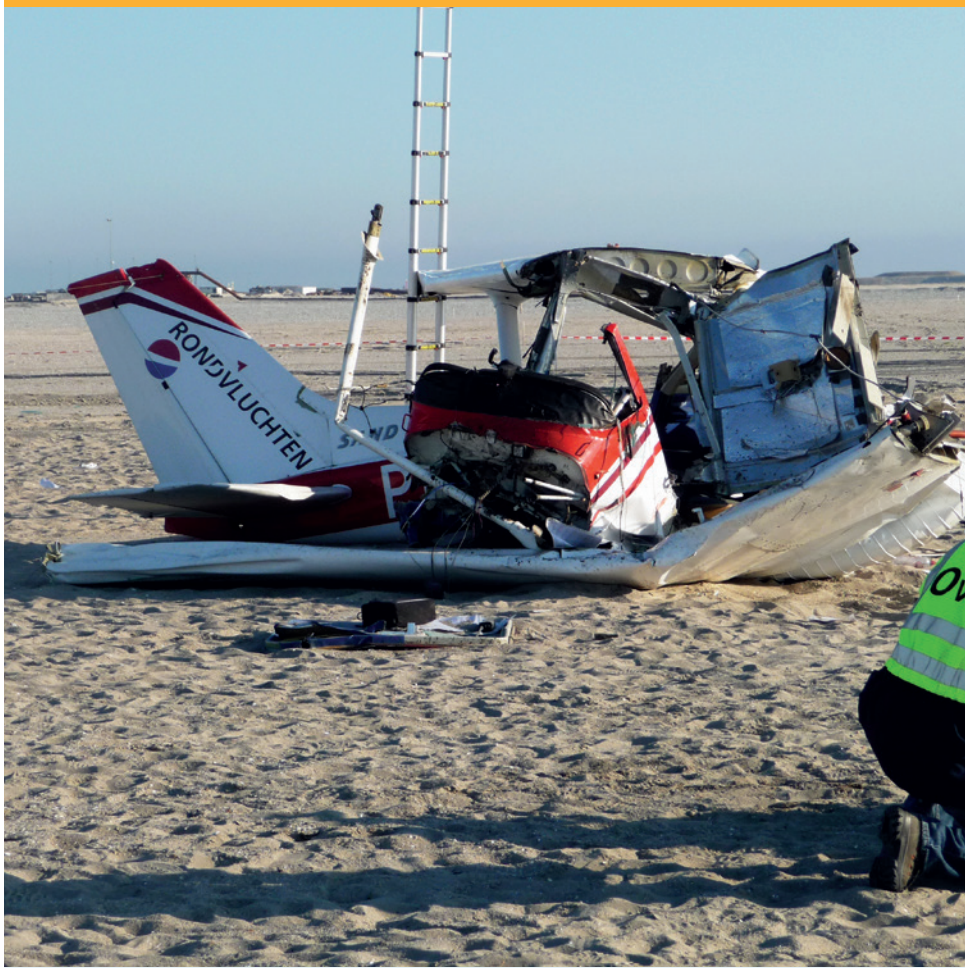
SAFETY BOARD

Summary
Aircraft missing
Cessna accident at Maasvlakte 2



Aircraft missing

Cessna accident at Maasvlakte 2

The Hague, May 2013

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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.

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The full report is published in Dutch. The English summary is the translation of the summary, the consideration and the recommandations of the report. In the event of any discrepancy between these versions, the Dutch text shall prevail.

SUMMARY

On 28 May 2012 an aircraft (PH-SKJ, a Cessna 172M) with four occupants on board crashed at Maasvlakte 2 near Rotterdam. No one witnessed the accident due to sea fog that had rolled in that day. The heavily injured occupants had been lying on a desolate piece of new land for five hours. Only after the fog had lifted were the aircraft and the occupants localised. After the emergency services found the aircraft, the occupants were taken to hospital. The pilot died of his injuries two weeks later. Two of the three passengers sustained serious and permanent physical injuries as a result of the accident.

The aircraft involved in the crash (PH-SKJ, Cessna 172M) at Maasvlakte 2. (Source: Dutch Safety Board)

Cause of the accident

The pilot of the aircraft had flown from Rotterdam Airport to Midden-Zeeland Airport on the morning of 28 May without any problem. He left Midden-Zeeland Airport at 11.03 to fly back to Rotterdam. Despite the weather forecast the pilot chose a route along the coastline; a route that turned out to be blanketed in fog and low-hanging cloud. The pilot failed to anticipate the deteriorating weather conditions during the return flight.

He did not choose another approach route to Rotterdam Airport, for instance, nor did he divert to another airport. He consequently found himself in an area with deteriorating visibility. Near Ouddorp the pilot descended to fly briefly below the cloud and then returned back to the previous altitude.

Near Maasvlakte 2, the pilot initiated a second descent, probably in an attempt to fly below the blanket of clouds and to improve his visibility. However, the cloud changed into sea fog, which was hanging on the ground. While descending the pilot failed to monitor his altitude and hit the ground.

Missing

If an aircraft is equipped with an Emergency Locator Transmitter (ELT), it transmits an emergency signal. There was no ELT on board the PH-SKJ. It was not an obligation for this particular flight. No emergency signals were therefore received of the crashed PH-SKJ. Because Air Traffic Control the Netherlands (ATCNL) could no longer contact the pilot, the organisation initially assumed the aircraft had gone missing. It happens quite regularly that ATCNL cannot make contact with an aircraft pilot. A procedure has therefore been designed to first try to rule out that the aircraft is located elsewhere before assuming an accident has occurred. The majority of missing aircraft are located using this so called communication search. For instance sometimes the aircraft did not take off at all, and sometimes they had landed elsewhere,. Only a small percentage of missing aircraft are actually involved in an accident. Needless to say, it does take time to rule out the other options first.

Slightly over half an hour after last having been in radio contact with the pilot of the Cessna, ATCNL notified the Coastguard Centre that the aircraft was missing.

Sense of urgency

ATCNL recognised the gravity of the situation and classed the missing aircraft as an accident half an hour after the organisation had last had radio contact with the aircraft. However when ATCNL first contacted the Coastguard Centre, it did not state that it assumed that the aircraft was involved in an accident. The Coastguard Centre, in turn, failed to recognise the seriousness of the situation and awaited the results of the communication search by ATCNL before alerting the Search and Rescue units. This took place three quarters of an hour after ATCNL had reported that the aircraft was missing to the Coastguard Centre. However, there were sufficient indications for the Coastguard Centre to assume that an accident had happened. This is illustrated by the pilot's failure to respond to calls made by Air Traffic Control Rotterdam, the fact that he did not answer his mobile telephone, had not reported to ATCNL and had exceeded his scheduled arrival time. Furthermore the Coastguard Centre and ATCNL were aware of the thick fog off the coast of Hook van Holland.

The search for the aircraft could have been expedited by carrying out procedures concurrently. In this particular case other procedures could already have been initiated during the communication search.

ATCNL could have replayed the radar images to determine the aircraft's position according to its last recorded bearings, the Coastguard Centre could have requested the

Dutch National Police Services Agency [*Korps landelijke politiediensten (KLPD)*] to localise the pilot's mobile telephone while the Coastguard Centre could have (earlier) alerted the Search and Rescue units.

The search began when the uncertainty phase had been concluded with ATCNL notifying the Coastguard Centre that the aircraft was not located at any airport. This was one hour and twenty minutes after ATCNL had last been in contact with the aircraft. The Management of the Coastguard Centre decided that the burden of the search operation was not such that it would need to increase in scale internally.

Determining the aircraft's location

If an aircraft disappears from radar, ATCNL can replay the radar images to determine the aircraft's last known position. The Coastguard Centre requires this data to determine a search area. Based on the last measured bearing and distance the system makes a prediction for the next measurement. ATCNL initially passed on this predicted position to the Coastguard Centre adding 'we have seen, what we believe [to be the aircraft ed.] crash into the sea…'. predicted position and later (over two and a half hours after having last been in contact with the pilot) adjusted the predicted position based on raw data in the system. The adjustment was more accurate and was based on the actual aircraft's last known position. In emergency situations the Air Traffic Control system evidently is less suitable for determining an aircraft's actual geographical position after radar images vanish.

ATCNL passed on the new coordinates to the Coastguard Centre. In terms of flight distances the adjustment (of 3.5 kilometres) was limited. In terms of the search operation, however, the new coordinates actually did make a difference. The new position was not over the sea but over land. Even the difference in the distance between the two positions is of vital importance for nautical Search and Rescue parties during a search operation. The Coastguard Centre did nothing with the new position information for a whole hour and then contacted ATCNL asking for a further explanation of the positional information that had been passed on. The Coastguard Centre and ATCNL then jointly reached the conclusion that the adjusted position was in the vicinity of the position that had been given earlier.

In addition to ATCNL' technical limitations, the manner in which information was exchanged impeded the swift and accurate determination of the search area. The following problems existed during the exchange of information:

- A common conceptual framework was lacking.
- Value judgements were added to geographical information.
- Understanding of each other's context was lacking.

Inward focus

The Coastguard Centre concentrated its search operation on the sea, inter alia because the first position that had been communicated lay over sea. Another factor that came into play was that ATCNL had stated that it had seen the aircraft plunge into the sea. Lastly, another factor that came into play was that the Coastguard Centre had not received a report from the landside about an aircraft that had crashed. To them this corroborated the assumption that the aircraft had not come down over land.

In addition the Rotterdam-Rijnmond Security Region [*Veiligheidsregio Rotterdam-Rijnmond (VRR)*] had informed the Coastguard Centre by telephone that the police were looking for the aircraft. This led the Coastguard Centre to assume that a search for the aircraft was also being carried out on land.

Prior to and during the search operation the Coastguard Centre received signs that could have prompted it to widen its search operation to include a land search. These indications were as follows:

- the pilot's mobile telephone rang (but was not answered);
- the operational units had found no trace of wreckage in the sea;
- suggestions made by the rescue boat crew to start searching on land;
- the adjusted coordinates that ATCNL had passed on to the Coastguard Centre were located in the Maasvlakte 2 area.

The duty officer was faced with a heavy workload due to the fact that the Coastguard Centre had decided against scaling up internally. The duty officer is the person responsible for directing the control room operators and takes decisions on the action to be taken. Due to his heavy workload he neither had the opportunity to reflect on the operations set in motion nor to reflect on the information received. The Coastguard Centre furthermore had no overview of, nor insight into the available information. As time went by and new information was received, the Coastguard Centre failed to reconsider the focus of the search operation.

Some of the maps used during the search operation showed the Maasvlakte 2 still as water. This contributed to the belief that the aircraft had crashed at sea. The possibility that the aircraft had come down on the newly reclaimed land of Maasvlakte 2 had not been 'seen'. Where use was made of maps which did indicate the Maasvlakte 2 in some way, it did not prompt a search operation on land.

The exchange of information between the Coastguard Centre and the Rotterdam-Rijnmond Security Region was not efficient. A single, brief search operation conducted by the Rotterdam-Rijnmond Security Region gave the Coastguard Centre the impression that the Security Region was conducting an extensive search for the aircraft on land. The Coastguard Centre, however, failed to verify this picture with the Security Region. The Coastguard Centre also omitted to share the adjusted coordinates with the Security Region.

Co-operation
ATCNL, the Coastguard Centre and the Rotterdam-Rijnmond Security Region failed to co-operate effectively. The Coastguard Centre and the Rotterdam-Rijnmond Security Region received information which they failed to verify but assumed to be correct. ATCNL added its own incorrect interpretations to coordinates or passed these on in an unusual manner. This in turn meant that the Coastguard Centre failed to understand how the information should be used, failed to use new information for quite some time and failed to pass on the information to all the involved and interested parties. As asserted above, the manner in which ATCNL and the Coastguard Centre exchanged information furthermore adversely affected the nature and duration of the search operation.

Sharing information and having the same picture of the situation, are yet vital for properly assessing emergency situations as well as for making sound decisions. The Coastguard Centre, ATCNL and the Rotterdam-Rijnmond Security Region have no system in place or a proper form of collaboration to ensure that they can make information accessible to each other and share it easily. Consequently, no clear picture of the situation emerged.

The investigation brought to light that the three parties did not know each other well. In practice it was found that they either do not, or rarely carry out emergency exercises together, thereby creating a lack of understanding of each other's range of tasks, mutual information needs and a common conceptual framework.

In conclusion
Based on the information examined, the Dutch Safety Board has assessed that the weather conditions seriously impeded the search operation. Due to the fog and the difficult terrain in the Maasvlakte 2 area, the Dutch Safety Board is unable to state *conclusively* whether a search operation at sea and over land would have helped locate the aircraft much faster. However, the Dutch Safety Board deems this likely.

The Dutch Safety Board has also established that the Coastguard Centre, Air Traffic Control the Netherlands and the Rotterdam-Rijnmond Security Region failed to collaborate effectively.

As a land search operation had not been initiated and due to the ineffective co-operation, time was lost in which the parties involved could have found the aircraft and its passengers. The emergency services could then have arrived on the scene earlier. The Dutch Safety Board is unable to judge, however, whether this would have affected the ultimate consequences of the accident for the passengers.

Exceptional circumstances
The accident involving the PH-SKJ on 28 May 2012 occurred in specific and exceptional circumstances. The fog was very thick along the coast. On average this occurs once every two years. The fog obstructed the pilot during the execution of the flight. It was equally exceptional in that the aircraft came down on 'nascent land', a new piece of land that had not yet been put into use.

The search operation for the missing aircraft may be termed as exceptional on account of the duration of the operation, the weather conditions and the limited information available. In a country such as the Netherlands, it is uncommon for an aircraft to be untraceable for a period of five hours. Units from the various organisations were searching for the proverbial needle in a haystack in extremely thick fog and were impeded by the lack of – what later proved to be – the correct information about the aircraft's position.

Importance of flight preparation and visibility conditions
Pilots cannot always be prepared for the exceptional circumstance of sea fog or cloud. But it is a factor that should indeed play a role in flight preparation, both in determining the route to be flown and having concern for the need for a 'plan B'. Thinking about alternative operating routes beforehand makes it easier to anticipate unforeseen circumstances during the flight. For that matter, the need to make thorough flight preparations and the ability to anticipate unforeseen circumstances properly is nothing new. These aspects after all form a standard component of education and training. The accident involving the PH-SKJ yet again shows just how important these aspects are.

A further lesson is that pilots who do not hold an IFR Rating should avoid running into conditions where they no longer have sufficient visibility during VFR flights. It is a known problem that this may lead to spatial disorientation, consequently creating the risk of an accident.

Search and Rescue supply chain approach
The parties who have a specific role in Search and Rescue operations collectively form a chain. The information or actions of one party affect the level of information, the actions or the choices of the other party.

The investigation into the search operation revealed that the parties having responsibilities on the water, on land and in the air failed to co-operate effectively. This occurred in part because Air Traffic Control the Netherlands (ATCNL), the Coastguard Centre and the Rotterdam-Rijnmond Security Region were incapable of looking beyond the scope of their own work field. Information was interpreted against the background of their own expertise and operating procedures.

Consequently, ATCNL and the Coastguard Centre were unable to assess properly what information the parties required to enable them to perform their tasks properly, nor how the other parties could contribute to the search operation. The conclusion can be drawn that the parties in the chain were not on the same wavelength.

When working together, the organisations employed fixed procedures and protocols. They passed on a great deal of information mainly by means of radiotelephony or telephone. While they did share information in this manner, not all parties received the same information, nor was it complete. This applies, for instance, to the Rotterdam-Rijnmond Security Region. The Security Region was in contact with the Coastguard Centre in the early stages of the search operation but was subsequently no longer updated on new developments and information. The Coastguard Centre furthermore failed to share new information about the aircraft's position with the party coordinating the local search operation.

In the Dutch Safety Board's view, when working together it would help the parties involved if they shared information with each other and collectively maintained a Common Operating Picture offering a standard overview of the incident. Collecting and sharing information from the various organisations involved increases the likelihood of bringing to light discrepancies, inconsistencies and areas of uncertainty. This will help organisations such as the Netherlands Coastguard to better anticipate ongoing developments. Moreover the parties will be able to coordinate their decisions and efforts with each other more effectively. To that end, the relevant organisations must be familiar with each other's context, tasks and information needs.

The basic crisis management requirements dictate, among other things, that the information available must be processed as swiftly as possible in a Common Operating Picture of the incident, the effects and the prevention proceedings. The Common Operating Picture must be continuously updated and accessible at all times to all interested parties or made available on a timely basis. Net-centric operations could contribute in this respect by ensuring that each person working within each party can exchange real-time information, regardless of the hierarchical levels. The latest information will then be available immediately, and to all those involved.

Learning from accidents

The Dutch Safety Board believes that ATCNL, the Coastguard Centre and the Rotterdam-Rijnmond Security Region have missed an opportunity by not holding a debriefing session on, or an evaluation of the search operation. An official evaluation has likewise not been held between the Coastguard Centre and the Search and Rescue units deployed by that organisation. Numerous resources of different parties were deployed in exceptional circumstances. According to the Dutch Safety Board, this is all the more reason to hold an evaluation with all the parties involved. Such debriefing sessions and evaluations with all parties enhance mutual understanding and organisational learning capabilities. They will help bring about improved co-operation among the parties in the future and help them to cope with challenges.

Earlier the Dutch Safety Board investigated Search and Rescue operations. In 2010 the Dutch Safety Board published its investigation report on the emergency landing made by a Bristow Search and Rescue helicopter. In its investigation report on the emergency landing, the Dutch Safety Board formulated a recommendation for the Minister of Defence stating to ensure that the Director of the Netherlands Coastguard takes responsibility for the Coastguard's executive tasks. To that end, a system should be put in place for assessing the quality of such tasks.

The Coastguard Centre complied with the recommendation by appointing a quality officer effective September 2012. However, a quality assessment system is still under development. It has emerged from the current investigation that in future evaluations will centre mainly on the Coastguard Centre's internal organisation and regrettably not on co-operation with the parties who work with, or at the request of the Coastguard Centre.

Following the accident involving the Baltic Ace on 5 December 2012, the Coastguard Centre conducted an extensive debriefing session with all the parties involved in the rescue operation. The Dutch Safety Board deems it a favourable development if the Dutch Coastguard proceeds to evaluate larger scale operations which involve external parties in a similar fashion in the future.

RECOMMENDATIONS

The Dutch Safety Board has formulated the following recommendations.

To the Minister of Infrastructure and the Environment, the Minister of Defence and the Minister of Security and Justice:

The launch and execution of Search and Rescue operations involves a chain of parties who are reliant on one another. They are: Air Traffic Control the Netherlands, the Netherlands Coastguard and the security regions.

1. In consultation with the Chairman of the Executive Board of Air Traffic Control the Netherlands, the Chairman of the Safety Council [Veiligheidsberaad] and the Director of the Netherlands Coastguard, develop and implement standards for co-operation, communication and information-sharing between the partners in the chain. Emphasis should in any case be placed on the following:

    - making information accessible to and sharing it unequivocally with the partners in the chain;
    - updating the information shown on maps of Dutch territory and the digital versions thereof and ensuring the information continues to be updated;
    - improving the mutual understanding of the tasks, responsibilities and information needs of each other's organisation. This could, for instance, be achieved by periodically staging joint exercises and cross-training sessions as well as organising joint evaluation sessions.

2. Ensure that the parties co-operate in accordance with these standards.

To the Chairman of the Executive Board of Air Traffic Control the Netherlands and the Director of the Netherlands Coastguard:

The current process, which commences with the report of a missing aircraft, involves sequential activities. Time gains can yet be achieved by carrying out the various activities concurrently during the uncertainty phase. The parties could, for instance, simultaneously perform the communication search, locate mobile telephones, read out radar data and alert the Search and Rescue units.

3. Jointly ensure that the requisite information is made available as swiftly as possible so that decisions on and preparations for a possible search operation can already be taken and implemented during the uncertainty phase.

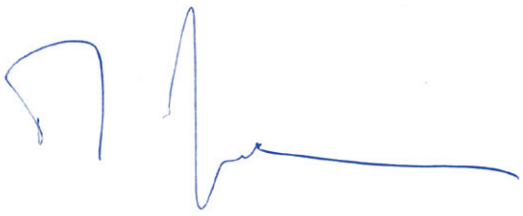
To the CEO and Chairman of the Executive Board of Air Traffic Control the Netherlands:

4. Implement a system which will enable Air Traffic Control the Netherlands to swiftly and accurately determine the latest bearings taken of the geographical positions of aircraft.

To the Director of the Netherlands Coastguard:

5. At operational level ensure a critical and open mind, to overcome inward focus or to minimise the risk of inward focus arising. In this context, you may wish to consider:

    - training staff to take a critical look at the information received, irrespective of its origin, and to view it in its entirety;
    - organising internal sessions on argumentation to reflect on the strategy chosen for a specific operation. This can be achieved by allowing staff who were not involved in the relevant operation to review decisions on a continuous basis.



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