



THE DUTCH  
SAFETY BOARD



**Emergency assistance after Turkish Airlines  
aircraft accident, Haarlemmermeer**

25 February 2009

**Emergency assistance after  
Turkish Airlines aircraft accident,  
Haarlemmermeer 25 februari 2009**

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## THE DUTCH SAFETY BOARD

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## CONSIDERATION

### THE CRASH OF A TURKISH AIRLINES BOEING IN THE HAARLEMMERMEER

The number of fatalities during the aircraft accident on 25 February 2009 remained relatively limited in view of the circumstances. The aircraft had 135 people on board of which seven were crew members. Five passengers and four crew members died during the accident. Almost all of the 126 survivors sustained injuries. Only six people were physically uninjured.

Due to the efforts of all emergency services workers and the employees of the Municipality of Haarlemmermeer and Schiphol Airport but also due to the fact that the passengers were able to cope themselves and the spontaneous assistance provided by those in the vicinity, the negative consequences of the accident remained limited relatively speaking.

### INVESTIGATION INTO COURSE EMERGENCY ASSISTANCE PROVISION AFTER AIRCRAFT ACCIDENT

The Dutch Safety Board decided to investigate the sequence of the emergency assistance provision in addition to the statutory mandatory investigation into the cause of the crash<sup>1</sup> after the report on 25 February 2009.

Contradicting signals emerged about the course of the emergency assistance provision on the day of the accident itself and also during the days that followed. The late release of the names of the victims especially attracted attention as well as the reports that victims were trapped for a long time in the aircraft before they could be freed by the emergency services providers. In addition, much criticism was expressed by the emergency services providers about the way in which C2000 operated, that is, the national communication system for the emergency services.

Immediately after the aircraft accident, the Municipality of Haarlemmermeer and the Kennemerland Safety Region jointly had the emergency assistance assessed. This assessment was performed in the shape of a quick scan by the Dutch Public Order and Safety Inspectorate in partnership with the Healthcare Inspectorate. The Public Order and Safety Inspectorate published the results in June 2009 under the title 'Poldercrash 25 februari 2009' (25 February 2009 Polder Crash). The learned lessons were broadly shared thereafter.

The Safety Board appreciates the taken initiatives of the Municipality of Haarlemmermeer and the Kennemerland Safety Region and the fast publication of the report by the Inspectorate. The Safety Board continued with its own investigation after the publication of the investigation of the Inspectorate.

Despite the made efforts of all those involved, it has been determined that the emergency assistance was flawed with regard to specific issues. The issues concerned were the following:

- Time lost before the actual arrival of the emergency services because information was not exchanged properly and because the determination of the accident location was not coordinated;
- Time lost by the mobile medical teams<sup>2</sup> upon arrival at the accident site because they were not alerted by the Kennemerland control room;
- Congestion occurring during the use of the C2000 communication system;
- The period in which the names, location and type of injuries of the victims were not clearly specified was long due to the poor registration of victims;
- The limitation and the logics of the scope of application of the crisis response plans.

In 2007, it was decided, due to territorial correspondence<sup>3</sup>, that the Municipality of Haarlemmermeer including Schiphol Airport would be transferred from the Amsterdam region to the Kennemerland

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1 This investigation was published on 6 May 2010.

2 The mobile medical team (abbreviated to: MMT, also referred to as the trauma team). The team consist of a doctor (anaesthetist or surgeon), a nurse/paramedic and a pilot/driver. The doctor is trained to provide medical assistance outside the hospital under all conditions. This ensures that treatment by a doctor does not just have to start when the casualty arrives at the hospital.

3 'Territorial correspondence' means that the fire brigade, medical services for accidents and disasters (GHOR) and police all work in the same geographical region and that they cooperate with each other.

Safety Region. In anticipation of the adoption of the Dutch Safety Regions Act, the Kennemerland Safety Region worked on the implementation of the new vision from that moment. The intention of the Dutch Safety Regions Act, which has recently been approved of by the First Chamber, is to realise an efficient and high-quality organisation of the emergency services under one regional administrative authority. The Dutch Public Order and Safety Inspectorate has provided guidance with regard to this issue to the Kennemerland Safety Region. This Inspectorate had a positive opinion about the implementation of the new Act by the Kennemerland Safety Region in 2008, 2009 and, more recently, 2010. The Kennemerland Safety Region was prepared to deal with any aviation incidents systematically and uniformly in accordance with the Dutch Public Order and Safety Inspectorate.

In view of the importance of large scale emergency assistance required at Schiphol airport, the Kennemerland Safety Region and the Public Order and Safety Inspectorate, in charge of quality assessment, both had to bear a heavy responsibility as from the moment that Schiphol airport was transferred to this region.

The Dutch Safety Board argues, based on the findings of the investigation carried out by the Safety Board mirrored by the positive opinion of the Inspectorate, that the above inadequacies should not have taken place.<sup>4</sup>

It has also emerged during the investigation that the investigation results could also be important to other safety regions in the Netherlands and not just to the Municipality of Haarlemmermeer and the Kennemerland Safety Region.

Although the implementation of emergency assistance at accidents and incidents is a question of routine with regard to the emergency services workers, issues arise more often in the case of a critical large-scale deployment.

It is a fact that there will always be flaws with regard to emergency assistance linked to disasters and major incidents.

It has, however, been determined that the identified problems have a common aspect, that is, the impact of the first decisions on the further course of the emergency assistance. A few shortcomings had significant consequences. The most important issues from the Safety Board report are summarised below.

#### LOCATION DETERMINATION OF THE ACCIDENT

Immediately after the aircraft crashed, reports from eye witnesses were received at the different disciplines in the multidisciplinary Kennemerland control room. This was also the case with regard to the Amsterdam Ambulance Dispatch Centre. At least three eye witnesses immediately reported the exact location of the aircraft.

In addition to these reports from eye witnesses, the report from air traffic control was received at the central control room at Schiphol airport that an aircraft had disappeared from the radar during landing. The aircraft was missing. The most important information that was known at that moment in time, that is, that the aircraft had not crashed at the airport site of Schiphol but in a field situated on the road *Kromme Spieringweg* near the village of Zwanenburg<sup>5</sup>, was not shared amongst the operators of the Kennemerland control room, the Amsterdam Ambulance Dispatch Centre and the Schiphol Control Centre.

The location of the crashed aircraft was not shared either amongst the operators of the different emergency services (ambulance, fire brigade and police) at the Kennemerland control room. There was no direction with regard to information sharing at this control room.

An attempt by the Kennemerland control room (fire brigade) to verify the aircraft accident at Schiphol airport was cut short by the Schiphol Control Centre.

This made it possible for the deployment scenario '*aviation accident, rural, large aircraft*' selected on the basis of the already received reports, to be abandoned at the Kennemerland control room after Schiphol airport had raised a general alarm. After this report, the ambulance dispatch centre and fire

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4 The Dutch Safety Board has not investigated the role of the Public Order and Safety Inspectorate.

5 Zwanenburg and Schiphol Airport are a part of the Municipality of Haarlemmermeer. Haarlemmermeer is located in the Kennemerland Safety Region.

brigade control room in Kennemerland switched to the alarm protocol that is linked to the scenario involving a 'Schiphol aircraft accident six' (VOS 6), a scenario for an aircraft accident at the Schiphol airport site involving an aircraft carrying 50-250 people.

The immediate result was that the fire brigade and ambulance emergency services providers were sent to the emergency services rendezvous point at Schiphol Airport Centre instead of to the accident site on *Kromme Spieringweg*. This choice resulted in the regional fire brigade only arriving at the accident site nearly half an hour later.

This scenario choice at the start of the provision of emergency assistance was incorrect. After all, the police at the multidisciplinary Kennemerland control room knew as from when the first report was received that the aircraft was located outside the Schiphol airport site.

Although the Dutch Safety Board is aware that such decisions must be taken at short notice, it should be emphasised that the impact of the first decisions on the further course of the emergency assistance provision is significant because these decisions are often difficult to reverse.

## EMERGENCY MEDICAL SERVICES

### *Mobile medical team deployment*

Since the introduction in 1996 of the mobile medical teams (MMTs) in the Netherlands, the standard is for the (ambulance)operators to immediately request the assistance from an MMT after a report is received when possible life-threatening injuries are involved.

The added value of MMTs has been demonstrated through different investigations carried out during the past few years and, partly due to this, clear criteria for deploying MMTs have been formulated. These criteria are used on a daily basis during the request by the ambulance dispatch centres. Overall, eleven MMTs are available in the Netherlands of which four (flying) MMTs are permanently available (24 hours a day and seven days a week).

The Schiphol Crisis Response Plan describes which emergency services must be immediately alerted by the different disciplines at the Kennemerland control room with regard to the VOS 6 scenario. This concerns, amongst others, five MMTs and 64 ambulances with regard to the medical emergency assistance. In addition, different key officials and between seven and thirteen hospitals must also be alerted.

The MMTs were not called out by the Kennemerland ambulance dispatch centre after the first report. An aircraft accident involving multiple victims meets the criteria<sup>6</sup> to immediately deploy multiple MMTs. It is, therefore, inexplicable that while this is a standard procedure for serious accidents during daily practice, it was not included in the request for assistance.

It is also inexplicable that the Amsterdam Ambulance Dispatch Centre, which is responsible for the daily deployment of the MMT of the VU Medical Centre in Amsterdam, did not take the initiative itself to actively offer the MMT after receiving the first request for assistance from ambulances.

Immediately after arrival of the first ambulances at the accident site, the Kennemerland control room and the Amsterdam Ambulance Dispatch Centre were informed by the nurses on site about the situation when MMTs were also requested. The urgent request for making MMTs come to site went unheard. Ultimately, the urgent requests of the emergency services providers at the accident site led to the deployment of three (flying) MMTs after half an hour due to the actions of the Noord-Holland North control room and the National Ambulance Dispatch Center.

The MMTs were created to have a specialised team immediately offer medical care at an accident site. The operations during the first hour, the *golden hour*, in part determine the course of the recovery process of victims who have multiple injuries that are often life-threatening. A doctor has more competences than a nurse and can, therefore, signify more with regard to a seriously injured patient. It does, however, remain a fact that injuries can be so serious that even the quick arrival of an MMT cannot guarantee survival.

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6 Primary and secondary deployment criteria for MMTs have been drawn up by the National Association for Trauma Centres (LVTC; Landelijke Vereniging voor Traumacentra).



When the (flying) MMT of the VU Medical Centre from Amsterdam had been deployed immediately, this team could have been on site ten minutes after the first report and not after 55 minutes as was the case.

One of the victims died after the arrival of the first MMT. It has not been investigated whether there is a causal relationship between the late alert/arrival of the MMTs and the death of the persons who had been on-board the aircraft because an autopsy was not performed with regard to these persons.<sup>7</sup> Despite all the efforts of the nurses at the accident site, specialist knowledge that is reserved to the MMT was lacking during the first 45 minutes (after which the MMT from Rotterdam arrived) due to the late arrival of the MMT.

The administrative response from the Kennemerland Safety Region to the draft report has shown that the safety region views not alerting mobile medical teams as a minor problem. This response worries the Dutch Safety Board. The importance of the acute medical emergency assistance provided by mobile medical teams is seriously underestimated due to this response.

#### *Scaling-up emergency medical assistance*

A decision can be taken on the basis of the first available information, such as the number of victims to be expected and the nature of the injuries, at the specification of the casualty transport coordinator and the head of the accident and disaster emergency medical assistance department to start the 'Hospital Crisis Preparedness Plan' (ZiROP) procedure for hospitals. The hospitals will, next, prepare for the maximum number of victims that they can admit. The impact of starting this procedure is that a scale-up takes place at the indicated hospital, capacity is quickly released such as at the emergency room, operating rooms and the intensive care unit (ICU) and additional staff is called in. This, however, is at the expense of regular healthcare provision.

After the accident, nearly no injury registration took place when assessing the nature and gravity of injuries suffered by the victims (triage) in the triage stations. A complete picture of the injuries of victims was not available in part due to the lack of registration and coordination. This meant that the distribution of casualties and the scaling-up of the hospitals did not take place in a structured manner.

Between seven and thirteen hospitals should have been informed by Kennemerland in relation to the selected VOS 6 scenario depending on the number of victims. Only six hospitals were pre-warned due to the lack of information and coordination.

The consequence of this was that a few hospitals were left in the dark about whether to start or not the Hospital Crisis Preparedness Plan procedure. A few hospitals decided themselves to start this procedure in order to be prepared for the arrival of (many) victims because no information was provided by the Kennemerland Safety Region. Victims were, ultimately, distributed among fifteen hospitals. In a single case, only one victim arrived at a scaled-up hospital and, at another hospital, fifteen casualties were brought in any way without announcement and after the hospital had scaled down. The uncoordinated deployment of the Hospital Crisis Preparedness Plan procedure did not only lead to additional costs being incurred by the different hospitals, but also had an impact on regular healthcare provision.

#### *National Ambulance Dispatch Center deployment*

With regard to a major incident involving many victims in addition to the first deployment of the emergency services providers, ambulances are also required to take the casualties to the hospitals. A high number of medical staff is also required to treat the casualties both at the accident site and later in the hospitals.

After the aircraft accident on 25 February 2009, the deployment of and the harmonisation with a large number of ambulances and informing the required hospitals demanded much capacity from the Kennemerland control room.

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7 The Dutch Public Prosecution Service and the Dutch Safety Board have the authority to perform an autopsy with regard to an investigation to, thus, determine the cause of death of victims. The Dutch Public Prosecution Service and the Dutch Safety Board only performed autopsies on the pilots. The gravity of their injuries was so extensive that a timely arrival of the MMTs would not have made a difference. Immediately after the accident, the Safety Board saw no reason to perform an autopsy on the other fatalities. The Safety Board shall consider due to these findings whether a wider consideration should be made with regard to any new incidents.

The Kennemerland control room did not request assistance from the National Ambulance Dispatch Center (LMAZ) that could have taken over part of the workload despite the agreements made through a covenant. It is because of this task that the LMAZ was established after the lessons learned from previous major incidents. The Amsterdam Ambulance Dispatch Centre passed on the request for ambulances to the LMAZ after receiving the request for assistance from Kennemerland. In addition to deploying and coordinating the requested ambulance assistance, the LMAZ could also have monitored whether sufficient emergency services providers remained available in the other regions (residual capacity). This, however, did not take place. The LMAZ was not used either for the communication with the hospitals.

It surprises the Dutch Safety Board that the Kennemerland Safety Region did not ask the LMAZ for the required support for the deployment of ambulances since this organisation was created with this goal in mind. When the LMAZ finally performed a number of tasks, it emerged that consent had to be requested from Kennemerland with regard to every action.

The question whether the emergency medical assistance is correctly arranged with regard to major incidents and disasters is justifiable when it concerns the deployment of mobile medical teams, the deployment linked to interregional ambulance assistance and the release of hospital capacity in general. Before the intention of the Minister of Health, Welfare and Sport to close the National Ambulance Dispatch Center is effected, it should be investigated what can and must be arranged on a national level (i.e. centrally) and on a regional level. The basic principle within this context should not just be that the involved regional switchboard(s) is/are discharged (i.e. unburdened) but also that the reception of other accident victims or the gravely ill, the residual cover, is guaranteed for the other regions in the Netherlands.

#### VICTIM REGISTRATION

People believe that the passenger manifest will immediately make it clear who was in the aircraft with regard to an aircraft accident. Unfortunately, practice has shown that the passenger manifest<sup>8</sup> does indeed provide a picture but that this information is not complete or reliable. In addition to the passenger manifest, therefore, registering victims is of essential importance for the further emergency assistance process.

Victim registration must start immediately at the accident site. Firstly, this is important to ensure that victims can be traced. Secondly, this is important to ensure that victims are sent to the correct hospital after the initial assessment of injuries (triage). To conclude, it is also important to be able to inform, for example, the Policy Team and the next of kin but also the media.

The police and ambulance staff register data at the accident site during daily practice. After a major incident or disaster, however, this becomes a municipal responsibility and it is expected that the municipality performs this task. That this may cause problems in practical terms has been known for many years.

To simplify the registration process, tools have been developed and, a few years ago, national agreements were made to ensure that the registration of victims takes place in an unequivocal manner. The tools at the accident site are the victim registration cards and triage counting cards. The victim registration cards contain personal information such as the name of the victim and the information about the nature and gravity of the injuries. The triage counting cards contain group information about the nature and the gravity of the injuries of the victims. Even when victims cannot be addressed, what is to be expected with regard to major accidents, victims can still be 'followed' by using victim registration cards.

On 25 February 2009, victim registration in the triage stations and the distribution of casualties over the different hospitals did not proceed correctly. Victim registration cards were not used consistently in the triage stations. If the cards had been used consistently, it could have been traced earlier which victims were taken to which hospitals. After the first registration, the data was processed in the registration system of the Municipality of Haarlemmermeer. Additional effort from the Municipality of Haarlemmermeer, the Kennemerland police, the Royal Netherlands Military Marechaussee and the

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8 The passenger manifest as available in the first instance only provides limited information and is meant to be used as a checklist. A more extensive list can be compiled by the airline upon request at a later stage.

regional medical officer was required due to the poor initial registration. All of the above led to it only becoming clearly known who had been taken to which hospital the day after the accident. This resulted in the next of kin of the victims having to go through a long period of uncertainty.

It is worrying to see how informally national agreements are being dealt with that were made a few years ago. If safety regions organise victim registration with regard to major incidents differently, this will lead to problems in relation to supraregional deployment. One uniform, national approach (tasks, responsibilities, process description) is, therefore, required. The municipality is responsible for the registration of victims at the accident site itself with regard to current legislation related to major accidents. This is not doable for the municipality employees because this is not daily routine to them but also because emergency services providers from multiple safety regions are involved.

To make good on this responsibility, municipalities could make (additional) agreements with the emergency services to ensure that emergency services providers immediately start with the registration at an accident site and, subsequently, transfer the collected information to the employees of the municipality.

Everything considered, it is clear that the way in which the Municipality of Haarlemmermeer has set up the registration system is not geared towards the expectations of, for example, the Policy Team, the next of kin, the media and the parties that are in charge of legal processing. The expectations partly match such as knowing who is involved, what the situation of the victims is (casualty, fatality or missing) and where the victims are staying. The expectations deviate with regard to the speed with which the information is made available and the extent in which the information is precise in relation to each target group.

## C2000 COMMUNICATION SYSTEM

Since C2000 was implemented in 2003, the aircraft accident on 25 February 2009 was the baptism of fire for the C2000 communication system where it involved a truly major incident. Overall, 750 emergency services providers were active. C2000 worked correctly as a system. There were no technical faults or failures, no capacity shortage of the mast and no coverage problems.

C2000 was not used correctly during the emergency assistance process after the aircraft accident. The system was overloaded because too many users wished to speak to each other without harmonisation or coordination. The available mast(s) and channels did not have sufficient capacity for this. Users believe that the capacity is unlimited, that every call can be immediately honoured and that everything can and must be communicated through C2000.

The findings of other (earlier) investigations<sup>9</sup> related to the use of C2000 have also been included in this investigation. The investigation of the Safety Board focused on the cause of the congestion on 25 February 2009 because many problems have already been listed in these other investigations such as insufficient training and knowledge in the use of the system and the lack of standardisation with regard to peripheral equipment.

Three components play an important role when C2000 is used correctly: the technology, organisation and use.

- Technology is deemed to mean the masts with the available call channels, the radio telephones and two-way radios of the users and the availability thereof. The technical capacity is always a limiting factor.
- The organisation with regard to C2000 consists of, on the one hand, prescribing the communication method: who talks to whom. In addition, users can be connected in call groups. Connection diagrams have been defined for this purpose.

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9 *'Rapport Vliegtuigongeval 20090225' - Voorziening tot samenwerking Politie Nederland* (Aircraft accident report 20090225 - Facility for cooperation Police Netherlands); *'Evaluatie kennis C2000 eindgebruikers' - Politie Academie* (Assessment of C2000 knowledge amongst end users - Dutch Police Academy); *'Rapport VRK C2000 communicatie Poldercrash' - Veiligheidsregio Kennemerland* (VRK C2000 communication polder crash report - Kennemerland Safety Region) and *'Eindrapportage Expertgroep C2000'* (Final Report C2000 Expert Group).

- With regard to the organisation, the emergency services providers must also train and practice including the operators so that they know how they should use C2000 and to ensure that they are aware of the systems options and limitations.
- It is important that the emergency services providers also really use the C2000 communication system as they have learned to do and as has been agreed when the system is used.
- Not only the technical capacity of the system but also the processing capacity of operators must be taken into account with regard to a major incident. More was asked from the operators than could be reasonably expected during the accident on 25 February 2009.

The following also emerged:

- For the users of the C2000 system, 12,350 call groups<sup>10</sup> have been made available throughout the whole of the Netherlands. In daily practice, the fire brigade, ambulance services and police use approximately 15 call groups in the Kennemerland Safety Region. Many call groups are used by all involved emergency services providers with regard to major incidents; this was 127 on 25 February. The large number of calls when using the always limited mast capacity leads to overloading.
- There was little 'ether discipline' and a professional communication method was not involved during the emergency assistance. Channels were kept busy unnecessarily in part because a priority had not been implemented in advance in the required information exchange.

The capacity of the available masts and channels could not and will not be able to process this. It was not the technical issue (the capacity of the mast) but the organisational issue (the poorly set up call groups) that caused the congestion.

The large number of calls to the operators at the control room was disproportional to the processing capacity of the operators. All of this created the impression that the system had failed.

Too little attention was paid to supraregional cooperation when C2000 was introduced. The agreements made regarding the use (determination of the call groups and connection diagrams) are mainly directed to the internal organisations of the 25 individual safety regions and other users due to this. The safety regions lack a joint and uniform structure for using C2000.

The supraregional deployment of emergency services is required and a national uniform steering and set-up of the C2000 system is needed with regard to a disaster or a major incident. This to ensure that a better and structured information exchange is possible where only the really required information is exchanged.

#### CRISIS RESPONSE PLANS

After the initial report of an accident, scaling-up follows in practice when the emergency assistance units on site request this. It may also be the case that scaling-up occurs immediately when the control room operator estimates that this is required due to the report. In the case of a major incident such as an aircraft crash, the plans demand that the daily routine of scaling-up is abandoned. In this case, scenarios are used that are geared towards major accidents. This has a significant impact on the working method of operators. The operator must choose from various plans that are different with regard to content when a major accident is reported. The operator must immediately make a choice on the basis of possibly limited information.

Different scenarios are possible when an aircraft has disappeared at Schiphol Airport. The location where the aircraft crashed is the determining factor for the scenario choice:

- In the Kennemerland Safety Region;
  - *At* the site of Schiphol Airport; or
  - *Outside* the site of Schiphol Airport;
- In one of the bordering safety regions.

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<sup>10</sup> A call group is a group of users determined in advance that communicates with each other within one group.

The risk area (approach and take-off routes) of Schiphol Airport is, after all, geographically distributed over four safety regions, that is Kennemerland, Amsterdam-Amstelland, Zaanstreek-Waterland and Hollands Midden. Two of these four safety regions do not have a specific plan for aircraft accidents.

The Schiphol Crisis Response Plan and the related scenarios (VOS) are related to accidents at the airport site and are based on the *Leidraad vliegtuigongevallenbestrijding op luchtvaartterreinen* (Guideline to aircraft accident response procedure at airport sites). This refers to the approach after accidents during take-off or landing of an aircraft where it is assumed that there will be a large number of survivors. The Kennemerland Crisis Response Plan with the scenario *aviation accident, rural, large aircraft* relates to the area outside Schiphol Airport and is based on victims on the ground and a limited number of people on-board who survive the crash.

For the transition from the Schiphol Crisis Response Plan to the Kennemerland Aviation Accident Crisis Response Plan, whether the accident takes place within the borders of the working area of Schiphol airport or outside this area is the determining factor. The complete risk area was not considered including the approach and take-off routes when drawing up the plans.

Many plans and scenarios have been developed for emergency assistance with regard to major accidents and disasters on a national, regional and local level down the years. Just for an aircraft accident at or around Schiphol Airport there is a choice between two different plans for the Kennemerland Safety Region that in total cover fifteen different deployment scenarios where each has its own roll-out.

The choice to exchange the scenario *aviation accident, rural, large aircraft* of Kennemerland for the scenario *Schiphol aircraft accident six (VOS 6)*, had consequences for the deployment (number of people and resources) and, in particular, for the arrival location of the emergency services providers. These effects were not considered when the crisis response plans were drawn up.

An accident with this scope led to a profusion of calls to the ambulance discipline of the Kennemerland control room. After the request that 64 ambulances be deployed, quickly a flow of calls of the emergency services providers to the control room followed. This meant that the operator only dealt with these calls from that moment on. Ultimately, 82 ambulances were present at the accident site.

The complex plans involving extensive deployment scenarios that also differ between each other create confusion and promote making mistakes. They are, therefore, not suitable to provide support to operators during emergency assistance provision after a large-scale accident or a major incident. It is, in particular, a uniform national start scenario for the initial deployment with regard to a significant (aircraft) accident and a simple checklist that can offer support to emergency services providers including the operators at times when they are put under pressure and must quickly take far-reaching decisions.

The work processes as described in the crisis response plans of Schiphol Airport and the safety regions, insofar as these exist, are not harmonised with each other.

A quick investigation has shown that the issues related to the Schiphol Airport also occur with regard to other large civil airports in the Netherlands. The scenarios in the crisis plans are not unequivocal there either, which will lead to confusion with regard to supraregional emergency assistance. Many scenarios and crisis plans have been defined per region and are not identical.

#### SUPRAREGIONAL DEPLOYMENT

The analysis of the events that took place on 25 February 2009 shows that mainly problems ensue with regard to supraregional deployment, that is to say, when many emergency services providers from outside the relevant safety region are involved.

The identified shortcomings are not new. Again, lessons can be learned on a national level in relation to emergency medical assistance, communication through C2000, victim registration and crisis response plans.

Lessons that have been recommended before on a national level: medical assistance

The problems that have been observed with regard to the emergency medical assistance process after

the accident involving the Turkish Airlines aircraft are not new. They are the same as the problems that have been identified with regard to previous major accidents and disasters. The GHOR academy of the *Nederlands Instituut voor Fysieke Veiligheid* (NIFV, Netherlands Institute for Physical Safety)<sup>11</sup> has studied the assessment reports of five 'flash disasters'<sup>12</sup> to determine the extent to which related patterns or generic themes can be discovered that have occurred during these five disasters. This investigation has shown that eight subprocesses led to problems in all five disasters. They are:

- Information provision to the ambulance dispatch operator;
- Information provision by the ambulance dispatch operator to the emergency services providers in the field;
- Scaling-up prehospital care (the emergency assistance process before the victim has arrived at a hospital);
- Communication;
- Logistics;
- Registration;
- Multidisciplinary cooperation;
- Preparation.

The Dutch Safety Board has studied the extent in which lessons have been learned from previous disasters. Initiatives have been taken and plans have been developed to deal with the identified problems related to 'flash disasters' during the past few years. The National Ambulance Dispatch Center was, for example, set up in 2007. On the one hand, this was meant to unburden ambulance dispatch operators at the regional control rooms during a large-scale deployment and, on the other hand, to safeguard critical medical care (residual cover) for the rest of the Netherlands.

The assistance of the National Ambulance Dispatch Center was not called upon by the Kennemerland control room despite there being an agreement between both organisations with regard to this.

In addition, a national registration system has been developed for victim registration on site. The Dutch Safety Board has worriedly identified how informally previously made agreements are treated. In the Netherlands the responsibility for disaster response is covered by the Minister of the Interior and Kingdom Relations. Much has been invested in improving the set-up and implementation of crisis response during the past few years.

The supervision with regard to the implementation of crisis response is carried out by the Dutch Public Order and Safety Inspectorate on behalf of the Minister. This Inspectorate has published a large number of reports with recommendations for improving crisis response in the Netherlands. The Public Order and Safety Inspectorate has published a report about the performance of the regional organisation of medical assistance at accidents and disasters (GHOR)<sup>13</sup> on 30 June 2009.

The report of the Public Order and Safety Inspectorate shows that a number of the original goals have not yet been realised twelve years after the GHOR organisation started to set up and organise emergency medical assistance at accidents and disasters.

The Safety Board would like to highlight the following two issues in relation to the above:

- The GHOR organisation focuses on the relevant safety regions and does not examine the national uniform set-up of the GHOR organisation(s). This is the issue that leads to problems with regard to supraregional deployment;
- Model agreements and covenants are instruments that have been often applied during the past few years. When national agreements that were made in 2001 are not being observed now, the question should be asked whether the time of freely providing the specifics for model agreements and covenants has not passed and whether we should not choose one national uniform system.

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11 NIFV, 'Communicatie, afwijken van routinehandeling en de beperkte waarde van protocollen: repeterende problemen bij vijf recente flitsrampen in Nederland' (Communication, deviation from routine actions and the limited value of protocols: reoccurring issues with regard to five recent flash disasters in the Netherlands); December 2007.

12 The Hercules aircraft crash in Eindhoven (1996), the Dakota incident above the Wadden Sea (1996), the firework disaster in Enschede (2000), the Volendam pub fire (2001) and the Schiphol detention complex fire (2005).

13 'De organisatie van de geneeskundige hulp bij ongevallen en rampen' – Inspectie Openbare Orde en Veiligheid (The organisations of medical assistance at accidents and disasters - Public Order and Safety Inspectorate), 30 June 2009.



## UNIFORM AND FEASIBLE AGREEMENTS

Although progress has been achieved in the Netherlands in reducing the more than 400 municipal disaster plans to 25 regional crisis response plans, three items to be considered have, nevertheless, been identified, that is:

- The set-up of emergency assistance by the 25 safety regions is not uniform. This can lead to problems in case of supraregional deployment;
- Many agreements have been set down in covenants and scripts. It is possible to deviate from these agreements without justification.
- A profusion of plans and scenarios are involved. This is unworkable for all those involved in a critical large-scale deployment. No practical checklist is available to be used during large-scale deployment to take the appropriate decisions quickly.

The Dutch Safety Board is of the opinion that the set-up and organisation of emergency assistance in case of disasters that have a national impact should be covered uniformly and centrally. For example by:

- A national uniform registration method for the registration of large groups of victims.
- Uniform scaling-up of hospitals in case of supraregional emergency assistance and a nationally coordinated deployment of mobile medical teams.
- A uniform organisation and set-up of C2000.

The emergency services were confused and delayed at the start of the 25 February 2009 crisis response due to miscommunication regarding the site of the accident. This miscommunication subsequently led to selection of the wrong deployment scenario which in turn resulted in the sending of emergency services providers to the wrong rendezvous point.

The facts that the victims were not registered uniformly and that the locations to which these victims were taken were not available are unacceptable.

The Safety Board believes that simplified and uniform working methods, therefore, less complex scripts and implementable scenarios, would considerably support the work of emergency services providers in case of large-scale deployment.

During the last phase of the investigation information was received regarding the announcement of the Minister of Health, Welfare and Sport to terminate the (tasks of the) National Ambulance Dispatch Center at the end of 2010. The investigation of the Safety Board, however, has demonstrated that large-scale deployment always requires supraregional deployment and capacity.

This not only requires the uniform organisation by the regional control room that is responsible for the initial deployment but also national coordination to safeguard residual coverage. The central tasks require, in the opinion of the Safety Board, a predefined and unequivocal protocol. An in-depth assessment of these specific tasks is required before the decision is put into effect.

## FINAL REMARKS

In 2007, it was decided, due to territorial correspondence, that the Municipality of Haarlemmermeer including Schiphol Airport would be transferred from the Amsterdam region to the Kennemerland Safety Region. The Dutch Public Order and Safety Inspectorate issued a positive opinion on the implementation of the new Dutch Safety Regions Act in the Kennemerland Safety Region in 2008, 2009 and, recently, in 2010. The Kennemerland Safety Region was ready to process an aircraft accident systematically and uniformly according to the Public Order and Safety Inspectorate.

Based on the findings of this investigation and whilst reflecting upon the positive assessment of the Inspectorate, the Dutch Safety Board finds that during the emergency assistance provision on 25 February 2009 shortcomings have occurred that should **not** have taken place.

## RECOMMENDATIONS

The Mayor of Haarlemmermeer has the final responsibility for safety in the Municipality of Haarlemmermeer including Schiphol Airport. The administration of the Kennemerland Safety Region is responsible for the implementation of emergency assistance in Kennemerland of which the Municipality of Haarlemmermeer is a part.

**The Dutch Safety Board makes the following recommendations on the basis of its investigation.**

### RECOMMENDATIONS TO THE ADMINISTRATION OF THE KENNEMERLAND SAFETY REGION:

1. Ensure that the inadequacies mentioned in this report are dealt with quickly and adequately. This recommendation applies, in particular, to the Kennemerland control room and to medical assistance at accidents and disasters (GHOR). It is important that the entrusted tasks are performable and fit in with daily routine.
2. Make binding workable agreements with Schiphol Airport about sharing information with the Kennemerland control room.
3. The approach and take-off routes of Schiphol airport cover four security regions from a geographical perspective. Take the lead in a joint effort of the involved safety regions to draw up one controllable, supraregional crisis plan for the Schiphol airport risk area.

### RECOMMENDATIONS TO THE MINISTER OF THE INTERIOR AND KINGDOM RELATIONS:

4. Ensure that there are uniform national agreements for medical assistance at major accidents and disasters. The Safety Board believes the following are examples of this:
  - Unequivocal working method for the registration of large numbers of victims;
  - Uniform scaling-up of hospitals in case of supraregional emergency assistance;
  - National coordinated deployment of mobile medical teams;
  - Deployment of the National Ambulance Dispatch Center.
5. Ensure that the Guideline to aircraft accident response procedure at airport sites is amended. Create a uniform and national standard for crisis plans for airport sites and the surrounding areas. The Board also recommends that a 'pilot' be started for the area around Schiphol airport.
6. Victim registration is a daily task performed by emergency services workers with regard to minor accidents. Reconsider the requirement that municipalities register victims at an accident site to fulfil the legally determined responsibility.
7. Ensure that the use of the C2000 network is redefined so that it focuses on large-scale supraregional emergency assistance. Pay particular attention to the following within this context:
  - Reorganizing the multitude of call groups;
  - Harmonising the connection diagrams (for supraregional deployment);
  - User discipline;
  - Introducing communication management.In addition, define unequivocally who is responsible for implementing immediately the abovementioned measures for the redefinition of the use of C2000 on behalf of the Minister.



RECOMMENDATIONS TO THE MINISTER OF THE INTERIOR AND KINGDOM RELATIONS AND THE MINISTER OF HEALTH, WELFARE AND SPORT:

8. Ensure that the medical assistance at accidents and disasters is arranged uniformly where it concerns the supraregional deployment of the mobile medical teams, the deployment of supraregional ambulance services and the release of hospital capacity.
9. Ensure that it is determined what needs to be arranged nationally and regionally. Important basic principles with regard to this are that the involved regional control room(s) is/are relieved but also that the residual coverage of emergency assistance for other regions is safeguarded.

The Hague, July 2010

A handwritten signature in black ink, appearing to read 'Pieter van Vollenhoven', written over a horizontal line.

Pieter van Vollenhoven  
Chairman of the Dutch Safety Board

A handwritten signature in black ink, appearing to read 'M. Visser', written over a horizontal line.

M. Visser  
General Secretary

## 1. INTRODUCTION

### 1.1 REASON FOR THE INVESTIGATION

At 10:26 local time on Wednesday 25 February 2009, a Turkish Airlines<sup>14</sup> Boeing 737-800 crashed near Schiphol Airport. The aircraft ended up in a field about one and a half kilometres before Runway 18R, better known as the Polder Runway.

The number of fatalities remained relatively low under given circumstances. The aircraft had 135 people on board, seven of whom were crew members. Five passengers and four crew members died during the accident. Almost all of the 126 survivors sustained injuries. Only six people were physically uninjured.

The detrimental consequences of the air accident were limited as a result of the efforts of all members of the emergency services, employees of the Municipality of Haarlemmermeer and Schiphol Airport, but also due to the spontaneous assistance provided by bystanders and the passengers' ability to cope with the situation.

The Dutch Safety Board carries out investigation into the causes or suspected causes of incidents and the scale of their consequences. The aim of the Board's investigation is to prevent future incidents and/or to limit their consequences. The Board carried out two investigations in response to the accident of the Turkish Airlines aircraft:

- An investigation<sup>15</sup> into the causes or suspected causes of the accident, with the aim of preventing the recurrence of a similar accident; and
- An investigation into the sequence of emergency assistance provided after the accident, with the aim of enabling the emergency services to learn from the experience for major accidents in the future.

### 1.2 GOAL AND DEFINITION OF THE INVESTIGATION

Following reports of the aircraft accident on 25 February 2009, the Dutch Safety Board took the initiative to investigate the sequence of the emergency service response, in addition to the aviation investigation which is mandatory for the Dutch Safety Board. On the day of the accident and during the days that followed conflicting signals about the sequence of the emergency response began to be received. The late release of the names of victims received particular attention. Indications of problems with the C2000 communication system were also received.

The aim of the Board's investigation is to independently assess whether any lessons can be drawn from the sequence of the emergency response after the aircraft accident to improve the response to major accidents in the future. This is the main issue dealt with by the investigation and it can be divided into the following subissues:

- What was the sequence of the emergency assistance in practice?
- Did any problems arise during the provision of emergency assistance?
- What were the causes of these problems?
- What lessons can be learned?

The Dutch Safety Board has a statutory duty to state any structural shortcomings, where relevant, in its report and to submit appropriate recommendations on these shortcomings. This report is therefore limited to matters indicating any structural shortcomings in the emergency assistance system.

The investigation focussed on the course of events regarding the assistance provided by the emergency services during the first two days after the accident. This means that the period under consideration was from the point when the first reports of the accident were received on 25 February 2009 until the deceased passengers and crew members were identified on 27 February 2009. An exception is made for the medical assistance provided to injured passengers. The investigation into

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14 The aircraft's registration was TC-JGE and its flight number was TK1951.

15 This report was published on 6 May 2010 and can be downloaded via the following website: [www.onderzoeksraad.nl](http://www.onderzoeksraad.nl).

the medical assistance finishes at the time at which the victims were transferred to the hospitals by the emergency personnel and covers the pre-hospital phase. The Dutch Safety Board did not investigate the quality of the medical care at the accident site and in hospitals or the psycho-social assistance that was provided.

### 1.3 OTHER INVESTIGATION INTO THE SAME ACCIDENT

The Board became aware, during its investigation, that the Kennemerland Safety Region and the Municipality of Haarlemmermeer, within whose territory the accident occurred, had also arranged for an assessment of the emergency assistance provided for the accident involving the Turkish Airlines aircraft. This investigation was carried out by the Public Order and Safety Inspectorate (Inspectie Openbare Orde en Veiligheid (IOOV)) in the form of a 'quick scan', in conjunction with the Healthcare Inspectorate (Inspectie voor de Gezondheidszorg (IGZ)). This investigation was published in June 2009. The opinion of the Public Order and Safety Inspectorate and the Healthcare Inspectorate on the assistance provided after the accident is predominantly favourable, although the report also identifies four serious bottlenecks. These relate to: (1) information management, (2) triage and ambulance dispatch centre, (3) registration of victims and (4) municipal plans<sup>16</sup>. The Inspectorate's investigation did not examine the potential relationship with problems identified earlier in the preparatory phase of the Kennemerland Safety Region.

Immediately after the aircraft accident, the Netherlands Police Collaborative Taskforce (Voorziening tot samenwerking Politie Nederland, (VtsPN)), the operations manager of the C2000 communication system, carried out an investigation of the operation of the system. This investigation included an examination of the load imposed on the system.

Supplementary to the aforementioned investigations, the Expertgroep C2000 (C2000 expert group) carried out an investigation at the request of the Minister of the Interior & Kingdom Relations (BZK) to examine the general problems with the C2000 communication system. This investigation not only examined the communication problems that had arisen after the Turkish Airlines aircraft accident but also reviewed similar problems with other incidents (including the attack on Queen's Day on 30 April 2009 in Apeldoorn and the disturbances at Hoek van Holland during the beach party on 24 August 2009).

The group Medisch Onderzoek Turkish Airlines Crash (MOTAC; Medical investigation into the Turkish Airlines crash) investigated the accident under the following title: *Schiphol Airport aircraft accident 25-02-2009: Injuries and distribution of the casualties*. An article about this investigation was published in the Dutch Journal of Medicine (NTVG, Nederlands Tijdschrift voor Geneeskunde). The objective of this investigation was to describe the injuries and distribution of the casualties of the Turkish Airlines TK1951 accident near Schiphol Airport on 25 February 2009. The article is included in Annex 1.

### 1.4 INVESTIGATION METHOD

During the investigation, the Dutch Safety Board conducted interviews with the members of the emergency services involved and a large number of the passengers in the aircraft. The Dutch Safety Board also collected dozens of documents and audiovisual material. The information that was collected was analysed to establish and identify any structural safety failures that had occurred during the emergency services process. The account of the investigation is included in Annex 2. Following an analysis of the investigation material, the Dutch Safety Board identified bottlenecks in the following procedures:

- The processing of notifications of the accident, raising the alarm and control of the emergency services units;
- The communication via C2000 during the emergency assistance on the accident site;
- The registration of victims and provision of information to the hospitals about the way the distribution of the injured persons between them is done;
- The provision of information to relatives and other interested parties.

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<sup>16</sup> This is reviewed in more detail in section 5.

These bottlenecks are further investigated in the present report. In addition, the Board also examined previous similar incidents to determine whether the learning points identified in this investigation had occurred previously.

## 1.5 INVESTIGATION BY THE DUTCH SAFETY BOARD

After the first phase of the investigation it became apparent that the results would not only be of importance to the Kennemerland Safety Region but would also be of importance to other safety regions in the Netherlands.

The Dutch Safety Board has expressed its appreciation of the initiatives of the Municipality of Haarlemmermeer and the Kennemerland Safety Region and for the rapid publication of the quick scan investigation performed by the Inspectorate. The Dutch Safety Board continued its own investigation after this report was published because a few of the Inspectorate report findings were not explained or explained to an insufficient extent. The issues concerned were the following:

- The time lost before the arrival of the emergency services because information was not exchanged properly and because there was a lack of coordination on the exact location of the incident.
- The time lost before the arrival of the mobile medical teams because the alarm was not raised at the Kennemerland control room.
- The causes for the congestion during the use of the C2000 communication system.
- The long period in which the names of the victims, their location and type of injuries were not clearly specified due to the poor registration of victims.
- The boundaries and the logic of the operating area of crisis response plans.

## 1.6 READER'S GUIDE

In addition to general background information regarding emergency assistance for disasters and major accidents, Section 2 also contains a factual description of the emergency assistance process following the accident involving the Turkish Airlines aircraft. Section 3 details the manner in which the Dutch Safety Board assessed the sequence of the emergency service response. Section 4 gives a summary of the parties involved and their responsibilities. Section 5 contains the analysis of the emergency assistance process and presents the sub-conclusions from the analysis. Sections 6 and 7 respectively contain the conclusions and recommendations.

The report includes a number of text boxes with relevant background information to clarify the main text. Other background information can be found in the Annexes, with references in the text. References to sources are confined to footnotes whenever possible. Any references made to conversations are general references and do not state names.



Figure 1: The moment when the aircraft hit the ground, as seen by a motorist driving by on highway A9 (Source: N. Van der Smagt)

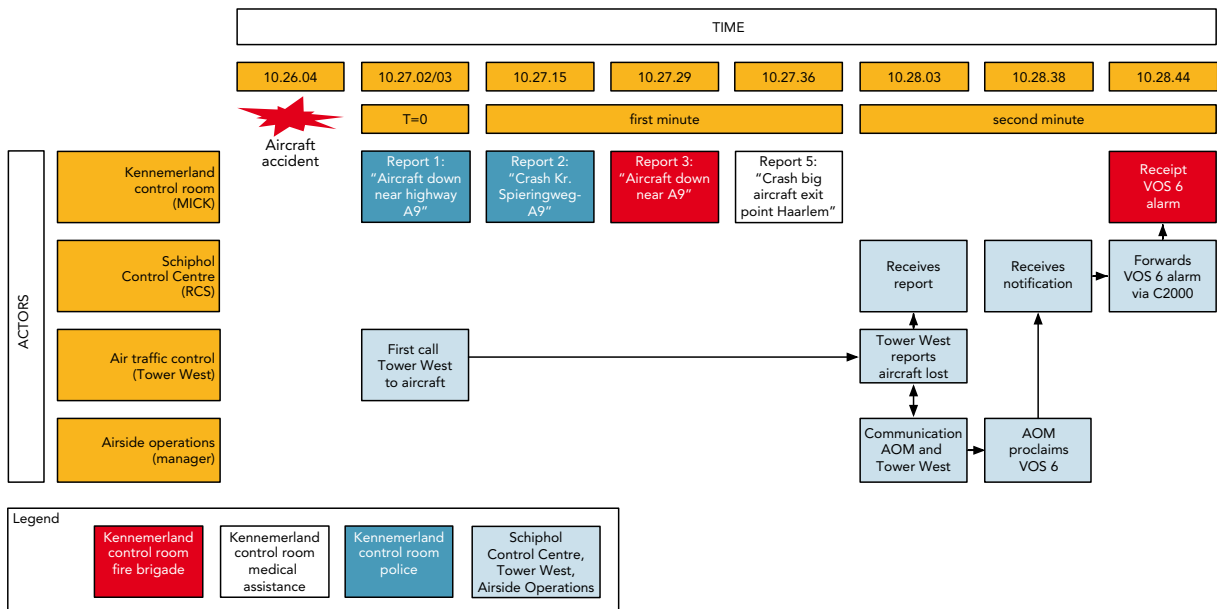


Figure 2: Summary of events in Kennemerland control room and Schiphol Control Centre during the first minutes

## 2. DESCRIPTION OF EMERGENCY SERVICES ASSISTANCE PROCESS

### 2.1 INTRODUCTION

The following sections describe the way in which the emergency services process progressed after the aircraft accident as from the first report on 25 February 2009 up to and including the identification of the deceased by the disaster identification team on 27 February 2009.<sup>17</sup> The course of the process is, where possible, described in chronological order and arranged by subject. Annex 5 contains a description of the relevant national guidelines, parties involved and the organisation of the emergency services to assist readers who are unaware of the Dutch organisation of the emergency services for disasters and major accidents within the Netherlands. Two fold-out sheets at the end of the report contain a list of abbreviations.

### 2.2 THE FIRST FEW MINUTES AFTER THE AIRCRAFT ACCIDENT

On Wednesday 25 February 2009 at 10:26 local time<sup>18</sup> a Turkish Airlines Boeing 737-800 crashed on a field between the Kromme Spieringweg at Zwanenburg and the A9 motorway (see Figure 1). This occurred near Schiphol Airport nearly one and a half kilometres before runway 18R (to the north) which is usually referred to as the Polderbaan (Polder Runway). Zwanenburg and Schiphol both are part of the municipality of Haarlemmermeer. Haarlemmermeer is part of the Kennemerland Safety Region.

The accident was reported by witnesses immediately after the accident at the Kennemerland Report, Information and Coordination Centre (Meld-, Informatie- en Coördinatiecentrum Kennemerland). At nearly the same time, the air traffic control tower crew at Schiphol Airport realised a Turkish Airlines aircraft had disappeared from the radar and that the crew was not responding to the air traffic control radio messages. Air traffic control the Netherlands (LVNL, Luchtverkeersleiding Nederland), the Schiphol Control Centre (RCS; Regiecentrum Schiphol) and the airport ground service communicated on this issue.

Figure 2 summarises the events that took place, more or less at the same time, during the first few minutes after the accident at the Kennemerland control room and at Schiphol Airport.

#### *The first reports received by the Kennemerland control room*

Immediately after the accident, there was a flow of reports from witnesses who called the 112 emergency number. The 112 control room operators forwarded the calls to the fire brigade, police and ambulance services at the Kennemerland control room. The first report was received by a police operator approximately one minute after the accident.<sup>19</sup> A witness stated to have seen a small aircraft crash "near the A9, near the Rottepolderplein". During this call, another police operator answered a second call. The witness calling stated that an aircraft had crashed "between the Kromme Spieringweg and the A9". The caller who lives at the edge of the Zwanenburg village could see the site. The operator received a live report from this second caller who subsequently drove his car to the accident site. At the same time, other operators at the Kennemerland control room received reports. One of the witnesses on the phone indicated that it was a Turkish Airlines aircraft, that the aircraft was not on fire and that people were walking out of the crashed aircraft. At 10:28 local time, two minutes after the accident, the fire brigade operator of the Kennemerland control room called the Schiphol Control Centre and asked whether at Amsterdam Schiphol Airport they knew anything about an aircraft that had crashed next to the A9 motorway. The Schiphol Control Centre operator stated that he was not aware of anything but corrected himself when he overheard a conversation between his colleague and air traffic control. The Schiphol operator then continued by telling the Kennemerland control room operator that they "were on it".

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17 Only the medical emergency services provided until the transfer of the casualty to the hospital are taken into consideration with regard to the treatment of casualties.

18 The time of the crash has been deduced from the information on the aircraft flight data recorder. The exact time the flight data recorder stopped recording was 10:26 (and 04 seconds) local time.

19 The Dutch Safety Board has compared the time data from the information carriers (including Kennemerland control centre tapes) and corrected the data where necessary. See Annex 3 for account of these time corrections.

#### *At the same time at Amsterdam Airport Schiphol*

At the exact moment the first calls reporting the aircraft accident were received by the Kennemerland control room an air traffic controller, the runway controller in the West tower, was attempting to contact the Turkish Airlines crew who had received permission to land just minutes before<sup>20</sup>. Since the air traffic controller did not get a response from the crew, flights arriving later were requested to fly on and the Schiphol Control Centre was contacted. At 10:28 local time, an air traffic controller called the Schiphol Control Centre to indicate that an aircraft had disappeared and that it had to have "disappeared just before short final".

The Airside Operations Manager (AOM) of the Schiphol Airport ground service, who was following the communication between the air traffic control tower and the Schiphol Control Centre, asked the air traffic controller (LVNL) whether the aircraft had crashed. The air traffic controller replied that he did not know<sup>21</sup>. The air traffic controller said that he was not able to see any smoke or fire from the traffic control tower and stated that the aircraft had disappeared from the radar. The Airside Operations Manager assumed that it was a crash and then decided to "proceed to a VOS 6 at runway 18R to be on the safe side" (see Box 1 for further information on the VOS 6 (Vliegtuigongeval Schiphol; Schiphol aircraft accident alarm)). At 10:28:55 local time the Schiphol Control Centre sounded the alarm Schiphol aircraft accident alarm code 6 as follows: "For all on these channels: We have a VOS 6 at runway 18 right". This ensured that the airport fire brigade was informed, which then set out towards runway 18 right, the Polderbaan.

#### **Box 1. Vliegtuigongeval Schiphol (VOS) 6 (Schiphol aircraft accident alarm code 6)**

The Schiphol Crisis Response Plan (Crisisbestrijdingsplan Schiphol; CBP-S) of the Kennemerland<sup>22</sup> Safety Region drawn up in consultation with the Municipality of Haarlemmermeer and Schiphol Airport includes various accident scenarios. There are seven alarm codes (VOS 1 through to 7) for an aircraft accident on or near a runway. An alarm aircraft accident Schiphol 6 is linked to a accident with a passenger aircraft carrying 50 to 250 people (passengers and crew) at the airport.

### 2.3 ALARMS AND ATTENDANCE OF THE EMERGENCY SERVICES UNITS

#### *Alarms*

After the first reports were received at the Kennemerland control room, a fire brigade operator tried to alert the fire services by selecting an accident scenario in the alarm system, in this case, the 'aviation accident, rural, large aircraft' scenario. Although the operator expected the alarm system to provide him a pre-programmed proposal for the deployment of emergency services it did not do so. The system provides a deployment proposal only once the location of the accident is entered. At this time others in the Kennemerland control room did know the location being Kromme Spieringweg, but the particular fire brigade operator did not. Next, the operator heard through the C2000 communication system that there was an alarm aircraft accident Schiphol 6 sounded. He replaced his previous selection of 'aviation accident, rural, large aircraft' with 'aircraft accident Schiphol 6' and subsequently had to select an emergency services rendezvous point (see Box 2).

20 At 10:27:03 and 10:27:29 local time, the air traffic controller in tower West attempted to contact the aircraft. The transcript of the communication between the air traffic control tower and the airplane shows that the last contact with the Turkish Airlines aircraft was at 10:24:46 local time when the crew was told that the aircraft was "cleared to land". This was confirmed by the aircraft with "Cleared to land, thank you".

21 At the time of the crash, visibility was limited. The head of the runway was not visible from air traffic control tower West.

22 Schiphol Crisis Response Plan, version 1.6, dated 5 December 2007



## **Box 2. Emergency services rendezvous points**

The emergency services usually drive straight to the emergency site. In the event of large-scale deployment it can also be decided to assemble the services at a central location, the emergency services rendezvous point, before they drive together to the site.

There are three emergency services rendezvous points (UGS A, B and C) in the Schiphol Crisis Response Plan (CBP-S) region. See Figure 3. The Airside Operations Manager (AOM) determines which emergency services rendezvous point will be used. The units are escorted from this point to the accident site in case of an incident on the Schiphol Airport site. The services need to be escorted because it is very dangerous to drive at an operational airport without an escort. Only the airport fire brigade drives directly to the accident site after having received air traffic control authorisation.

The fire brigade operator of the Kennemerland control room called the Schiphol Control Centre using the direct line to ask which emergency services rendezvous point was to be used by the emergency services that had come to assist. The Schiphol Control Centre operator did not answer the question but stated they were in the middle of their call-out. He promised to call back and hung up. The fire brigade operator at the Kennemerland control room did not want to lose any time: he selected emergency services rendezvous point A at the Schiphol site and alerted the appropriate regional fire brigade units. What the fire brigade operator – who was not informed about the location of the aircraft accident- did not realise was that emergency services rendezvous point A was not the nearest option. The Airside Operations Manager at Schiphol had prepared a different emergency services rendezvous point, emergency services rendezvous point C, for the regional emergency services. The Airside Operations Manager has chosen emergency services rendezvous point A for the internal Schiphol emergency services. This resulted in the late arrival of some emergency services at the accident site because they were first sent to the incorrect emergency services rendezvous point. At 10:44 local time the fire brigade operator alerted the second supraregional fire brigade squad from the Amsterdam-Amstelland Safety region. Section 5 of this report will go further into this.

One of the actions accompanying a scenario aircraft accident Schiphol 6 (VOS 6) is raising the alarm for 64 ambulances. At 10:29 local time the Kennemerland ambulance service operator deployed nine ambulances from his region and requested 55 backup ambulances from the Amsterdam ambulance dispatch centre (MKAA, Meldkamer Ambulancezorg Amsterdam, also referred to as Amsterdam dispatch centre). A total of 82 ambulances arrived at the accident site.

The Amsterdam ambulance dispatch centre also received a call from a witness: "*An aircraft crashed near the Kromme Spieringweg*", "*There is no fire*". The Amsterdam dispatch centre did not forward this information to the Kennemerland control room. However, the Amsterdam dispatch centre did send some of their own ambulances and forward a backup request towards the National Ambulance Dispatch Center (LMAZ, Landelijk Meldkamer AmbulanceZorg) in Driebergen explicitly requesting approximately 40 ambulances. The Amsterdam ambulance dispatch centre sent their first ambulance to the Kromme Spieringweg. The ambulances were later sent to emergency services rendezvous point A. One minute later (10:30 local time), the nearest police car was requested by the Kennemerland control room to go to the crashed plane near the Kromme Spieringweg.

At 10:31 local time the first Kennemerland regional ambulance reported to the ambulance service operator at the Kennemerland control room and asked for a destination. The operator did not know the exact location of the aircraft at this point in time but had understood from his colleagues' conversations that there was an alarm aircraft accident Schiphol 6 (VOS 6). The operator did send the ambulance to the 'standard' emergency services rendezvous point for Kennemerland, emergency services rendezvous point A, at the Schiphol site.





Figure 3: Map of Schiphol Airport and surrounding area (Source: Schiphol Crisis Response Plan)

The alarm aircraft accident Schiphol 6 (VOS 6) for the Polderbaan issued by the Schiphol Control Centre also raised the alarm for the Schiphol Airport fire brigade. The airport fire brigade who is stationed alongside the Polderbaan turned out directly according to the protocol. At 10:32 local time the airport fire brigade reported to the Schiphol Control Centre that they had driven along the complete runway and reached the head of the Polderbaan but had not seen an aircraft. At the same time, another Schiphol Control Centre operator was talking to a Kennemerland control room ambulance service operator. The Kennemerland control room operator was reporting (10:33 local time) the exact location of the crashed aircraft, the Kromme Spieringweg. At 10:35 local time the airport fire brigade reported to the Schiphol Control Centre that they were leaving the Schiphol site via gate 106 because the aircraft was said to be alongside the A9 motorway. At 10:44 local time they arrived at the accident site. The route is shown in Figure 4.

#### *First emergency services units on site*

The police arrived at 10:36<sup>23</sup> local time. They were the first emergency services on site. The first ambulance arrived eight minutes later (see Box 3 for further information). The airport fire brigade arrived within the same minute. The first ambulance, from the Amsterdam region, arrived at 10:44 local time at the accident site and had been sent as part of the requested ambulance backup by the Amsterdam dispatch centre directly to the accident site. This ambulance was immediately followed at 10:44 local time by an ambulance from the Kennemerland Safety Region and a third ambulance from the Noord-Holland North Safety region. This last ambulance had been travelling on the A9 motorway past the accident site and had seen the aircraft.

#### **Box 3. Role of the first ambulance**

During large-scale accidents and disasters, the first ambulance has a special task. Instead of immediately providing assistance, the first ambulance crew explores the site to assess the situation. The ambulance crew collects information on the accident, location, number of victims and the type of injuries (triage). This information is reported to the ambulance dispatch centre in a situation report. The ambulance crew also draws up a preliminary deployment plan for the ambulance assistance and is in charge of the coordination with the other emergency services during the meeting at the accident site. The first ambulance crew will continue to be responsible for this until the Medical Officer on duty (OvD-G; Officier van Dienst - Geneeskundig) takes over.

#### *Attendance of the other emergency services units*

The first fire brigade vehicles from the Kennemerland Safety Region including the vehicles stationed in the Municipality of Haarlemmermeer that were sent firstly to the emergency services rendezvous point A at the Schiphol site by the control room arrived at 10:54:00 local time at the accident site. The first ambulance from the Amsterdam region that arrived directly on site, and, therefore not through the emergency services rendezvous point A, asked the control room to alert the mobile medical teams (MMTs; see box 4) at 10:44 local time. The Kennemerland control room alerted the first medical combination (GNK-C; see box 4) from Kennemerland at 10:46 local time. Only an ambulance team (Ambu-team; see box 4) and a fast response group for medical assistance (SIGMA; see box 4) from their own organisation were alerted through the alarm system (see box 4).

A mobile medical team that originates from another organisation, that is, the trauma centre of the VU University Amsterdam (VU), must be mobilised by the operator of the Kennemerland control room through the Amsterdam dispatch centre for ambulance emergency services. The Kennemerland control room did not, however, mobilise a mobile medical team. At 10:52 local time, the Kennemerland control room also alerted the second medical combination from Kennemerland. The alerted 'Ambu-teams' and SIGMAs basically arrived at the same time around 11:30 local time at the accident site, 35 to 45 minutes after the alarm was sounded and 63 minutes after the first report of the accident at the Kennemerland control room.

23 This is apparent from the Kennemerland control centre audio files. At 10:38 local time the Dutch Directorate-General for Public Works and Water Management camera on the A9 motorway that recorded the crashed aircraft, made a record of the presence of a police car and police van.



Figure 4: Airport fire brigade services route from the Vijfhuizen fire brigade station, first along the runway and subsequently to the probable accident site situated beside highway A9

#### **Box 4. Medical Combination**

A medical combination (GNK-C) is a group of professionals and voluntary emergency response care providers who can be deployed when regular medical emergency services are insufficient with regard to a disaster or a large-scale accident. In principle, a medical combination consists of a mobile medical team (MMT), an ambulance team (Ambu-team) and a quickly deployable group that can provide medical assistance (SIGMA).

##### *Mobile medical team*

A mobile medical team (MMT) is a team consisting of three people whose task is to provide medical assistance. A mobile medical team works from one of the eleven trauma centres in the Netherlands. All mobile medical teams can use a vehicle. Four centres also have a helicopter; commonly referred to as the Lifeline or trauma helicopter.

A mobile medical team consists of a doctor (anaesthetist or surgeon), a driver or a pilot and a nurse. The mobile medical team revolves around the work of the doctor: supplementing the regular care provided by the ambulance team with medical specialist knowledge and actions. This supplementation mainly takes place in the area of ABC unstable patients, patients whose airway is threatened, who have breathing difficulties or whose circulation is compromised. When one of these vital functions is no longer present or is compromised, it is essential that they are restored as soon as possible. A doctor of a mobile medical team can contribute to this by using his or her knowledge and skills. Even when a patient has been trapped for a protracted period of time, the doctor can provide added value with regard to the care given to the patient. The doctor will have been trained to give first aid outside the hospital under basically all conditions. This ensures that treatment by a doctor does not have to wait until the patient has arrived at the hospital. The nurse will have first aid or ambulance experience and will have followed specialist training to be able to work in a mobile medical team.

##### *Ambu-team*

The Ambu-team of the medical combination is in charge of triage (see box 6) and/or carries out actions to retain and/or restore vital functions and focuses on preventing temporary or permanent disability. The Ambu-team consists of two paramedics and two ambulance drivers. The nurses of the medical combination can also act as the head of the triage station (see Box 5). If the Ambu-team is deployed, it will continue to work at the disaster site. Ambu-teams are not involved in the transport of patients to hospitals.

##### *SIGMA*

A quickly deployable group that can provide medical assistance and that consists of a team leader, a driver and six especially trained volunteers from mainly the Dutch Red Cross. The task of the team is supporting the other individuals of the medical combination logistically and medically. The members of this team will take care of a triage station, where required, and will ensure there are sufficient medical care resources. In addition, they carry out medical actions at the instructions of the Ambu-team members.



Figure 5: Accident site (Source: Nijmegen trauma helicopter team (MMT) Nijmegen)



At about 11:00 local time, the coordinating nurse at the aircraft asked the Noord-Holland North control room whether the mobile medical teams had already been alerted. The Noord-Holland North control room next contacted the National Ambulance Dispatch Center (LMAZ) and asked whether the mobile medical teams had been alerted. As this was not the case, at 11:01 local time the Noord-Holland North control room requested the National Ambulance Dispatch Center operator to mobilise the mobile medical teams<sup>24</sup>. In parallel with this call, another operator at the National Ambulance Dispatch Center was in contact with the Rotterdam-Rijnmond control room. During this conversation the Rotterdam-Rijnmond operator offered their mobile medical team. At 10:57 local time the National Ambulance Dispatch Center operator called the Kennemerland control room. The National Ambulance Dispatch Center operator reported that the Alkmaar control room operator (Noord-Holland North) had requested all four mobile medical teams with a helicopter and the operator asked for confirmation that this was required. The operator stated that she had already set a few other elements in motion but that she did, in principle, confirm the deployment of all mobile medical teams with a helicopter. Just after 11:00 local time, the trauma helicopter departed from the Rotterdam-Rijnmond location to the accident site and the National Ambulance Dispatch Center started to alert the other (flying) mobile medical teams. At 11:21 local time, nearly an hour after the accident, the helicopter with the Rotterdam mobile medical team landed at the field next to the crashed aircraft. The Amsterdam trauma helicopter landed nine minutes later. At 11:51 local time, the Nijmegen helicopter landed.

#### *Administrative scaling up*

Administrative scaling up was also performed by the Kennemerland control room as well as mobilising the different emergency services units based on the scenario aircraft accident Schiphol 6 (VOS 6). This was carried out using the Gecoördineerde Regionale Incidentbestrijdings Procedure (GRIP, coordinated regional incident control procedure; see Annex 5). At 10:30 local time, the Kennemerland control room first scaled up the incident according to GRIP 3. At 10:31 local time, this was converted into GRIP 2. At 10:35 local time, it was scaled up to GRIP 3 after the multidisciplinary process coordinator intervened. The officials who have to be alerted in case of GRIP 3 scenarios were next alerted by the Kennemerland control room.

## 2.4 EMERGENCY SERVICES ON SITE

#### *Ability to cope by passengers and first aid services by passengers and bystanders*

Just after the accident occurred, a witness reported to the Kennemerland control room that people were walking off the aircraft. Another witness reported that approximately 40 people, most calling on telephones, were gathered around the aircraft. Helpful bystanders immediately went towards the aircraft to offer assistance. They helped by fellow passengers assisted the (injured) passengers out of the aircraft. One injured person was able to leave the aircraft immediately without assistance after the accident but died before the first emergency services were on site.

#### *Situation assessment, inventory of casualty receiving options and separation of flows of casualties*

The first police vehicle arrived at 10:36 local time. After the first assessment of the situation, this unit assessed the casualty receiving options. The nearest house and the shed behind it (see Figure 5) were prepared for use.

Immediately upon arrival on accident site at 10:46 local time, the first fire brigade officer walked on to the field to explore the area. A minute later he was at the aircraft and started to explore the area to the north of the aircraft. At 10:48 local time, he was on the south side of the aircraft and was walking towards the opened doors. Shortly thereafter, at 10:49 local time, the crash tender drove backwards to attempt to run-up on to the field. At 10:50 local time, the first ambulance team members were at the field to the north of the aircraft. The result of this first inventory was that six to seven people were trapped which was reported by the fire brigade officer to the Kennemerland control room at 10:50

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24 The National Ambulance Dispatch Center can provide support upon the request of a regional control room. The National Ambulance Dispatch Center has been commissioned by the Ministry of Health, Welfare and Sport to provide 'support, in the broadest sense of the word' which is the main task of the national control room. This includes the control over the coordinated flow of emergency services in order to monitor the coverage of other emergencies. Agreements between the National Ambulance Dispatch Center and the safety regions have defined this task in more detail. The agreements between the Kennemerland safety region and the National Ambulance Dispatch Center does not explicitly define the alerting of the mobile medical teams as a support task.

local time. At 10:51 local time, the ambulance and fire brigade officers discussed the situation after which two ambulance team officers walked towards a casualty in the field and two went to the aircraft.

After the arrival of the first ambulance (at 10:44 local time) from Amsterdam, the ambulance nurse ordered the nurse of the second ambulance from the Kennemerland Safety Region to prepare a triage station in the house and the shed behind it (see Box 5 and Figure 5). The nurse of the third ambulance was asked to coordinate the work at the aircraft.

#### **Box 5. Triage station**

A triage station is, in the first place, a location where casualties are grouped, where (additional) medical assistance is given and where other triage activities take place (see Box 6). At the triage station that can, for example, be organised in a special tent for casualties of the quickly mobilised medical assistance group the casualties are treated on site insofar this is possible. The casualties are subsequently transferred to the hospitals after having prioritised the urgency of their treatment. The triage station manager is in charge of the triage station.

The nurse of the second ambulance found the 20 to 30 casualties in the house and started the triage procedure (see Box 6). At the same time as the ambulance workers started to provide medical assistance in the triage stations, the airport fire brigade started to explore the area around the aircraft<sup>25</sup> and ordered one of the special fire-fighting vehicles (the crash tender) to drive up to the aircraft. Based on the first assessment of the scenario, the airport fire brigade reported to the Kennemerland control room at 10:50 local time that there were six or seven people trapped inside the aircraft.

#### **Box 6. Triage and priority classification**

Triage is the fast assessment and classification of casualties into various priority classes depending on the seriousness of the injuries or the clinical picture. Various methods have been developed on a national and international level. The Verantwoording Landelijk Protocol Ambulancezorg<sup>26</sup> (VLPA; National ambulance assistance protocol accountability) states that the following classes must be used based on the Major Incident Medical Management and Support<sup>27</sup> method:

T1: ABC<sup>28</sup> unstable patients

Immediate; medical or surgical intervention required immediately and arrival at a hospital within an hour.

T2: ABC stable patients

Urgent; surgical or medical intervention required within six hours.

T3: ABC stable patients

Delayed; less serious injuries; intervention can be safely delayed for six hours.

After the arrival of the first three ambulances at 10:44 local time, multiple ambulances started to arrive at the accident site. Approximately 82 ambulances were mobilised in total. They were instructed by the ambulance team that was first on site to assist the casualties in the field and to help them to reach the triage stations. The ambulances were first assembled at emergency services rendezvous point A. Emergency services rendezvous point C and another gathering point, shed station 6, were also used later. The ambulances were sent through to the accident site from the emergency services rendezvous points. The transfer of casualties to the hospitals started as of 11:30 local time.

25 This was done in order to estimate the risks for the emergency services workers.

26 Both version 7.0 (dated December 2006 and the prevailing version for the emergency services care after the Turkish Airlines crash) and the latest version (version 7.1 dated June 2009) of the Verantwoording Landelijk Protocol Ambulancezorg (VLPA) includes priority classification based on urgency.

27 Major Incident Medical Management and Support (MIMMS) is a system to be used for large-scale incidents. The MIMMS method is implemented in many countries and has been integrally accepted by the NATO for large-scale incidents.

28 ABC stands for airway, breathing and circulation.

### *Release of trapped victims*

At about 11:13 local time, the nurse of the third ambulance on site, who was to coordinate the assistance at the aircraft, reported to his base, the control room of Safety region Noord-Holland North, that there were seven passengers trapped in the aircraft amongst whom one had died. At 11:21 local time, the first trauma helicopter carrying a mobile medical team from Rotterdam landed near the crashed aircraft. The team went to the aircraft after which the fire brigade assisted by the mobile medical team started working on freeing the trapped passengers 55 minutes after the incident was first reported. The Rotterdam team worked from the back of the plane towards the front. Nearly ten minutes later, at 11:30 local time, the Amsterdam mobile medical team arrived on site. This team also started working in the aircraft, from the cockpit backwards. Assisted by the fire brigade, the Rotterdam and Amsterdam mobile medical teams freed five trapped passengers alive, stabilised them and prepared them for transfer to a hospital. The sixth passenger died during the rescue operations in the aircraft cabin.

### *Medical combination and Nijmegen mobile medical team activities*

At approximately 11:30 local time, the North and South medical combinations (GNK-C, Geneeskundige combinaties) from the Kennemerland Safety Region arrived on site. The North medical combination treated the casualties in shed 1 in cooperation with two ambulance teams and a Medical Services Schiphol doctor. The South medical combination went to shed 2 where there were two casualties at that time. When the Nijmegen mobile medical team arrived at about 12:00 noon, this team was requested to go to the triage station at the shed behind the house (shed 1) by the coordinating nurse at the aircraft. The medical officer on duty (OvD-G) asked them on arrival at the triage station to perform retriage and to treat casualties on site.

### *Distribution of the casualties*

The official who was on standby duty on 25 February 2009 as casualty transport coordinator (see Box 7) was working as an operator at the Kennemerland control room when the accident occurred. The work pressure at the control room did not allow this official to leave the control room to take up his role as coordinator.

#### **Box 7. Casualty transport coordinator**

In case of *major incidents* the control room may not be able to coordinate the ambulance message traffic at and near the disaster area. The control room mobilises a casualty transport coordinator (CGV; Coördinator Gewondenvervoer) to the incident site to coordinate casualty transport and casualty distribution among the hospitals on site. The distribution of the casualties among the hospitals is based on seriousness and type of injury and the available hospital capacity.

The task of the casualty transport coordinator (CGV; Coördinator Gewondenvervoer) at the incident site was first performed by the nurse of the second ambulance and the triage station managers. At approximately 11:00 local time when the medical officers on duty arrived, one of them assigned the task of casualty transport coordinator to a different nurse. This nurse, who was not from the Kennemerland Safety Region, was not aware of the casualty distribution plan of the Kennemerland Safety Region and was unaware of the tasks and responsibilities of the casualty transport coordinator role.

At about 11:30 local time, the medical emergency services at the incident site started to transport the victims to the hospitals. Next, the ambulances drove towards hospitals and returned. 124 casualties were transported to fifteen hospitals between 11:30 and 16:15 local time. One patient was transported by the trauma helicopter to the Vrije Universiteit Medisch Centrum (VUMC; VU University Medical Center) in Amsterdam. Two other passengers went to the hospital by themselves for screening in the evening and the next morning.

### *Informing the hospitals*

At 10:50 local time, the Kennemerland control room (ambulance services) started to alert the Accident & Emergency department of the Rode Kruis Ziekenhuis in Beverwijk, the Spaarne Ziekenhuis in Hoofddorp and the Kennemergasthuis (South site) in Haarlem. Fifteen minutes later, the Head of



Medical Assistance at Accidents and Disasters (HS-GHOR) called the Kennemerland control room. The operator stated that the hospitals in their own Safety region had been alerted. When asked whether the VU Medical Center had been informed by the Kennemerland control room, the operator said this was not the case. A surgeon at the Kennemergasthuis called the Kennemerland control room (another operator) at the same time to request information on the accident. The surgeon concluded that it would be wise to start the ZiROP procedure (Ziekenhuizen Rampen Opvang Plan; Hospital Crisis Preparedness Plan, see Box 8).

#### **Box 8. Hospital Crisis Preparedness Plan (ZiROP; Ziekenhuizen Rampen Opvang Plan)**

ZiROP describes the internal hospital organisation as of the moment the crisis situation is reported by the ambulance dispatch centre (MKA; Meldkamer Ambulancezorg). The purpose of the plan is to provide clear instructions for all departments and staff involved on how to act in case of a crisis that takes place outside the hospital and which creates an acute imbalance between the supply and demand of medical assistance. It provides an overview of all activities from the moment the crisis alert is received through to the assessment of the actual assistance provided. The regular medical care at the hospitals is seriously disrupted by the Hospital Crisis Preparedness Plan procedure. Capacity of departments such as emergency room, radiology (X-ray and CT/MRI scanners) and intensive care unit (ICU) and operating rooms is released for the expected casualties. Additional staff is also called in to provide support.

The Hospital Crisis Preparedness Plan is put into action upon the request of the Head of Medical Assistance at Accidents and Disasters (HS-GHOR) of the coordinating region.

Immediately following the call with the Head of Medical Assistance at Accidents and Disasters (HS-GHOR) and the Kennemergasthuis surgeon, the Kennemerland control room asked the Meldkamer Ambulancezorg Amsterdam (MKAA; Amsterdam Ambulance Dispatch Centre) to call the Academic Medical Centre (AMC) and the VU Medical Centre requesting to put into action the Hospital Crisis Preparedness Plan. The Kennemerland control room also called the Noord-Holland North control room with the same request regarding the Alkmaar Medical Centre. The Kennemerland control room called three hospitals in their own region to put the Hospital Crisis Preparedness Plan into action. Next, both the Academisch Medisch Centrum (University Medical Centre) and the VU Medical Centre attempted to call the Kennemerland control room for more information. These attempts did not immediately succeed. Once the AMC was able to contact the Kennemerland control room, the control room reported that 135 casualties were to be expected, including 16 T1 casualties. The Kennemerland control room did not know the (exact) type of injuries nor to which hospital the casualties were to be transported.

The VU Medical Center could only reach the Amsterdam Ambulance Dispatch Centre. Their information consisted only of the number of people on the flight. The VU Medical Center stated they would wait for new information from the Kennemerland control room. After the call with the AMC, the Kennemerland control room did not exchange any information with hospitals regarding the type of injuries or distribution of the casualties. Between 13:00 and 13:30 local time only the Kennemergasthuis was informed, regarding the decision to transport seventeen casualties with cuts by bus with an attending nurse to the hospital.

Various hospitals complained later regarding the lack of information from the field. One hospital admitted that they had incurred high costs due to the scaling-up and only a single casualty was transported to their hospital. The daily assistance at the hospital was also compromised due to the freeing of the required crisis capacity (staff and beds).

At about 13:30 local time, the Kennemerland control room and the National Ambulance Dispatch Centre told the hospitals that they could start scaling down. But at about 15:00 local time the emergency services transported 35 casualties to six hospitals without prior notice. The casualties had first been classified as T3 or uninjured and had been transported to 'De Wildenhorst' reception centre for retriage and/or to meet their relatives.

### *Transport to 'De Wildenhorst' and referral to hospitals*

Immediately after the accident the Schiphol airport staff, following the Schiphol Crisis Response Plan, organised a reception centre for triage and for the uninjured to be reunited with their relatives at 'De Wildenhorst' sports complex in Badhoevedorp at the municipality of Haarlemmermeer. This reception centre was ready for use within an hour of the accident.

At approximately 13:30 local time, three buses with T3 or uninjured passengers left shed 1 to go to 'De Wildenhorst' reception centre. Every bus included a member of the quickly mobilised medical assistance group and an ambulance nurse. Just before 14:00 local time, the bus arrived at 'De Wildenhorst' where the passengers were received by nurses of the Noord-Holland North medical combination led by a medical officer on duty and, as a coincidence, an orthopaedic surgeon with trauma medicine training and experience. The medical team suspected that one of the first passengers who got off the bus was suffering from serious trauma. The passenger was immediately screened by the medical team. An ambulance nurse, who accompanied the passengers during the bus trip, stated that there may be more seriously wounded among the group. The decision was taken to medically screen all passengers under the supervision of a doctor who happened to be there. The medical team reclassified ten of the casualties who had at first been classified as T3 casualties (see Box 6) as T2 casualties. At about 14:15 local time, the Noord-Holland North medical combination team leader called the Kennemerland control room to request ambulance transportation for 35 casualties from 'De Wildenhorst' to the hospitals. This request is executed and was passed on to the head of the medical assistance section. This information has not reached the regional medical officer (RGF, Regionaal Geneeskundig Functionaris) in the Policy Team (PT).

### *Freeing the deceased crew from the cockpit*

After all passengers had been removed from the aircraft at 12:45 local time, the three Turkish Airlines pilots who had died during the accident were still in the cockpit. For investigation reasons, the three bodies were not immediately removed from the cockpit (by order of the Dutch Public Prosecution Service). Once the investigation activities in and around the cockpit had been completed, the bodies of the three crew members were recovered. This was approximately at 18:00 local time.

## 2.5 REGISTRATION, VERIFICATION AND COMMUNICATION OF VICTIM INFORMATION

### *25 February 2009*

A discussion about the aircraft accident took place in the command room of the Royal Netherlands Marechaussee (KMar) at Amsterdam Schiphol Airport soon after the various emergency services had been alerted, at approximately 10:30 local time. Following this briefing, the Royal Netherlands Marechaussee began collecting information about the passengers and crew in the aircraft on their own initiative. This was one of the actions the Royal Netherlands Marechaussee performed to determine whether the crash was an accident or a terrorist attack. A Royal Netherlands Marechaussee employee went to the Turkish Airlines desk to pick up the passenger list. The list contained the surnames of the passengers, restricted to the first eight letters, and a first name (if this was known). Date of birth, place of birth and nationality were not stated. The list did contain seat numbers, and included a total of 126 names, with a note that one adult was travelling with a baby. It did not contain any information about the aircraft crew. The passenger list was also faxed from the Turkish Airlines desk to the Head of Information at the Royal Netherlands Marechaussee.

The municipality of Haarlemmermeer initiated the Central Registration & Information Bureau (CRIB) procedure at about 11.00 local time. The first employees of the municipality and Royal Netherlands Marechaussee employees arrived at 'De Wildenhorst' sports complex. When setting up 'De Wildenhorst' for reception & care and registration & information for uninjured victims and relatives, the municipality employees decided, based on instructions from the municipality, that registration forms would only be completed once the uninjured victims and their relatives had been reunited.

From 12:00 onwards, several telephone numbers were published by numerous parties via the media in order to collect information. These were a number for the National Coordination Centre, the general number for the municipality of Haarlemmermeer (not accessible from abroad), two direct lines to the Civic Affairs department of the municipality of Haarlemmermeer and the number for the press agency centre at Schiphol Airport (a standard number for the press during disasters). The

Schiphol action centre made a note of the questions it received and passed them on by phone to the telephone team at the municipality of Haarlemmermeer.

At 12:54, the General Netherlands Press Office (ANP; Algemeen Nederlands Persbureau) reported that a special information number – i.e. 0900-1852 (general number for the municipality of Haarlemmermeer) – had been opened for people with queries about the aircraft accident. The number was manned from the point when it was opened up until the de-escalation following the incident. The same report incorrectly reported that the Dutch National Crisis Centre had opened an information line, 0800-1351.

At 13:30, a list of the first names and surnames of the 134<sup>29</sup> individuals on board flight TK1951 was published on the Turkish Airlines website. The list formed part of a press release issued by Turkish Airlines in Turkey over the internet. The internet publication was noticed by the Policy Team (PT) and the Operational Team (OT) but was not considered to be reliable information.

Buses containing the 44 passengers, consisting of either uninjured passengers or T3 casualties, arrived at 'De Wildenhorst' at about 14:00 local time. The Royal Netherlands Marechaussee staff, who had a passenger list, ticked off names as the uninjured victims alighted from the buses. This meant that the Royal Netherlands Marechaussee at least knew that these 44 individuals had been on board of the airplane.

The medical examination of the uninjured or T3 casualties showed that there were still injured individuals amongst them. The OvD-G, therefore, decided, in consultation with the trauma doctor who was on site, to arrange for all of these passengers to be taken to hospital. This meant that neither the reunification that had been planned nor the recording of uninjured victim details by the municipality actually happened. The municipality employees attempted, under the changing circumstances at 'De Wildenhorst', to register some personal details. The name, date of birth and partial (temporary) address details or telephone numbers were registered. Subsequently, the data was entered in the CRIB4ALL<sup>30</sup> computer system on site using the registration team laptops. Due to technical problems the victim registration made at 'De Wildenhorst' could only be accessed at the town hall by using the Print screenshot option. Aside from the municipal registration at 'De Wildenhorst', the Royal Netherlands Marechaussee managed to register the hospitals to which five of the victims had been transported. The town hall employees used the telephones to call hospitals to collect information on the victims. Some hospitals finally provided information on the victims to the municipality.

At about 14:00, the deputy mayor<sup>31</sup> of the municipality of Haarlemmermeer announced at a press conference that 9 people had died and at least 50 had been injured – 25 of them seriously – as a result of the accident. At about the same time, the Ministry of Foreign Affairs announced a telephone number for people calling from abroad. A separate line was opened for Turkish language speakers. In both cases, they were telephone numbers at the Civic Affairs department of the municipality of Haarlemmermeer. At the time, the telephone operators were unable to provide any information and could only note the queries of callers.

The first victims had already been discharged from hospital in the afternoon. At the Central Registration & Information Bureau action centre, no one knew at that point which victims were where. At 18:15, the Mayor took over leadership of the Policy Team from the deputy Mayor. At around 18:30 local time, the Policy Team requested assistance from the Royal Netherlands Marechaussee to find out details of the whereabouts of victims. Experts from the Royal Netherlands Marechaussee subsequently worked alongside the medical assistance at accidents and disasters, the Disaster Victim Identification team (RIT, RampenIdentificatieTeam) and the municipality in an effort to collect the required information.

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29 Initially, the passenger list was missing the name of one individual. Later, when the security video records at the gate in Istanbul had been checked, it became apparent that this passenger had not handed in his boarding pass at the gate. This meant that he was not recorded as a passenger. When the passengers were counted on board, a check generally consisting of the counting the unoccupied seats, the baby was probably not taken into account. The 135<sup>th</sup> individual on board (the 128<sup>th</sup> passenger) was listed as a victim at 'De Wildenhorst' by the Royal Netherlands Marechaussee. The Policy Team was informed on 26 February 2009 at 17:00 local time that this individual had to be added to the passenger list.

30 CRIB4ALL is a computer registration system for the registration of victims in which the searching relatives can be linked to the corresponding victims.

31 The first Deputy Mayor of the Municipality of Haarlemmermeer was the chairman of the Policy Team until the role was transferred to the Mayor of the Municipality of Haarlemmermeer at 18:15 local time.

A plan of approach was drawn up by the Operational Team (OT) at 21:30 local time for the verification of the available information and for securing additional information from the hospitals and elsewhere in order to prepare the list of those who were missing. The Royal Netherlands Marechaussee was made responsible for drawing up the registration list. They used their own protocols and verification resources. That same evening, the Disaster Victim Identification team informed the relatives of the missing victims which were known at that time regarding the identification procedure which would take place the next day.

At the end of the evening, at around 22:30, the first aircraft arrived with relatives from Turkey. This group, as was the first group of relatives who had already assembled at Schiphol, was received by Amsterdam Schiphol Airport staff. The telephone team at the town hall of the municipality of Haarlemmermeer recorded all incoming calls on paper. In total, 542 people contacted the municipality with a question about a missing individual. The telephone team records were entered into a computer by other municipality employees later<sup>32</sup>. Following the installation of a software update, municipality staff composed and printed a list of those being searched for at around 22:30 local time using the computer system. This list was then taken by an employee to Triport at Schiphol where Royal Netherlands Marechaussee staff were busy with victim registration. The CRIB4LL list did not contain any reports of the victims themselves, but consisted of reports of family members and acquaintances who were searching.

#### *26 February 2009*

Throughout the night, municipality employees, the Royal Netherlands Marechaussee, the medical assistance at disasters and accidents, the Disaster Victim Identification team and the operational team worked to complete the information on the passengers. For instance, Royal Netherlands Marechaussee investigators visited every hospital in the region and contacted consulates and embassies to obtain information about the victims. Around 01:00 local time, the relatives who had arrived on a flight for relatives were provided information by a municipality employee regarding the location of their family members. This information was based on a provisional list. It was not possible to give all of the relatives a whereabouts.

The names of all occupants were known to the Royal Netherlands Marechaussee by 08:00 local time, along with the locations of a large number of them. It was also clear that nine fatalities had been recovered, including four crew members. At that time, identification of the four seriously-injured occupants and nine fatalities had not yet been carried out by the Disasters Identification Team.

At 09:00 local time, the Royal Netherlands Marechaussee information list was released by the Mayor as chairman of the Policy team.

At around 11:00 local time the list was given to the telephone operator team who were authorised to inform close relatives of the survivors regarding the location of their injured family members based on the information available at that time. In the meantime, the majority had obtained this information themselves.

At 17:30 local time, the four seriously injured victims were identified by the Disaster Victim Identification team (RIT).

That evening, the embassies and consulates were given the names of the nine fatalities, five passengers and four crew members with appropriate reservation. This was because at that time the bodies had not yet been formally identified.

#### *27 February 2009*

All deceased passengers and crew members had been identified by 17:00 local time. Twelve different nationalities were stated on the passenger list. The nine deceased passengers all had foreign nationalities (not Dutch). The international death certificates were prepared by the municipality of Haarlemmermeer following an official report by the mortuary representative.

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32 The data is copied into CRIB4ALL, a computer registration system for the registration of victims and the searching relatives.

## 2.6 COMMUNICATIONS VIA C2000

When providing emergency assistance services after the accident the emergency service people used walkie-talkies and radiotelephones to communicate among themselves and with the control room using the C2000 digital communication system (see Box 9).

About 750 emergency assistance professionals were involved at the same time in the crisis response and emergency assistance process after the accident. The C2000 system was used intensively. Various C2000 communication system users stated that, when the emergency assistance was in full operation (approximately 30 minutes after the accident), it was difficult to impossible to communicate using the C2000. The ambulance services staff stated that the problems with the C2000 interrupted the emergency assistance process, especially regarding the exchange of information on the transportation of the casualties. The Kennemerland control room operators stated that they were regularly unable to 'send' via the C2000. These problems are analysed in further detail in section 5.4.

### **Box 9. The C2000 communication system**

C2000 is a network for mobile radio communication and sounding the alarm for public order and safety. It is a closed network with the following major users: police, fire brigade, ambulance services and the Royal Netherlands Marechaussee (KMar, Koninklijke Marechaussee). The C2000 communication system consists of multiple components: The network for voice and data communication (T2000), the alerting network (P2000) and the radio operation at the control room. Unofficially, C2000 is often used to refer to the voice communication and data communication elements such as preprogrammed status messages or short text messages. This definition is used in this document.

C2000 is a single digital network with national coverage and can, for what concerns this aspect, be compared to the standard GSM network. The C2000 network is based on a European standard for mobile communication for professional users such as public order and safety emergency assistance organisations. The number of frequencies available for the C2000 network is registered through European agreements. This means that the number of frequencies is limited and cannot be easily expanded.

The mobile communication network is divided in geographical service areas, the cells, with a base station, a tower or a mast, provided with multiple radio transmitter and receiver modules at the core (base radio). Radio frequencies cannot be reused within a specific area (50 km on average). The same radio frequencies cannot be used in the neighbouring cells. The allocation of the number of transmitter/receiver modules to the base stations is based on the expected use. The expected use is based on population density, the risks in a specific area and daily use. The cells or base stations are currently set to a capacity of 6, 10, 14 or 18 channels for voice communication.

The position of the user determines which base station is used. A user is 'registered' at a base station and as long as the user is within the range of this base station, the communication traffic from and to this user will be through this base station. Available voice channels of a mast are only taken over when someone from a call group speaks.

The C2000 system has a dynamic allocation of available capacity. The system does not have voice channels permanently available for the people involved as did the system that was used prior to the C2000 communication system (analogue era). When a voice channel is not used by a call group, the voice channel is released and made available for communication by another call group. This is different to the analogue era method as the analogue channels were permanently available. If all the voice channels at a base station are in use, a new call request (from a call group that is not in the queue) is placed in the queue until a voice channel is available.

### 3. ASSESSMENT FRAMEWORK

#### 3.1 INTRODUCTION

An assessment framework was used by the Dutch Safety Board to assess the emergency services after the aircraft accident. This framework consists of the following four elements:

Relevant legislation and regulations.

National standards, guidelines, manuals, guides and tools.

Regional and local plans and manuals.

General assessment framework for safety management.

The first three elements of the assessment are specific for the emergency services. The fourth element of the assessment framework is a general element. It describes the expectations of the Dutch Safety Board with regard to the interpretation of involved parties regarding their own responsibility for safety. These four elements are discussed in detail in this section.

#### 3.2 LEGISLATION AND REGULATIONS

The following Dutch legislation and regulations are relevant for the investigation of the emergency services after the aircraft accident:

- Disasters and major accidents Act (Wet rampen en zware ongevallen (Wrzo) 1985)
- Medical assistance at accidents and disasters Act (Wet geneeskundige hulpverlening bij ongevallen en rampen (WGHR) 1991)
- Safety regions Act (Wet veiligheidsregio's 2006-2010)
- Aliens Act (Vreemdelingenwet 2000)
- care institutions quality Act (Kwaliteitswet zorginstellingen 1996)
- Aviation Act (Luchtvaartwet 1958)

##### *Disasters and major accidents Act (Wrzo) 1985*

The Wrzo sets down the regulations for the (preparation for) crisis response. The preparation requirements of the Dutch Disasters and Major Accidents Act includes planning issues and makes it mandatory that municipalities and provincial and national government organisations exchange information on this subject. The Dutch Disasters and Major Accidents Act also describes the tasks and authorisation for the actual activities during disasters and major incidents. It also provides various regulations regarding backup options and special circumstances.

##### *Medical assistance at accidents and disasters Act (WGHR) 1991*

The Dutch medical assistance at accidents and disasters Act (WGHR, Wet geneeskundige hulpverlening bij ongevallen en rampen) consists of articles regarding the organisation of the emergency medical services in case of disasters, of medical combination backup and the remuneration for the costs incurred whilst providing medical assistance. The safety region in which the disaster takes place is responsible for the medical side of crisis response. The medical assistance at accidents and disasters coordinates the first aid services on site, the transfer of casualties and the reception, care and post-care. The medical assistance at accidents and disasters cooperate with the fire brigade and police to ensure good and efficient emergency services.

##### *Dutch safety regions Act*

This Act sets up safety regions, was passed on 9 February 2010 by the Senate, was published in the *Staatsblad* (bulletin of acts) of 1 April 2010, numbers 145 and 146, but has not become valid yet. The Act integrates the Dutch Fire Services Act (Brandweerwet 1985), the Dutch medical assistance at accidents and disasters and the Dutch disasters and major accidents Act. The objective is creating an efficient high-quality organisation for fire fighting, emergency medical services, disaster response and crisis response managed by one regional administration. In anticipation of the new legislation, the safety regions were allowed to come to an agreement with the Minister of the Interior and



Kingdom Relations.<sup>33</sup> The Kennemerland Safety Region organised the region according to the new legislative requirements based on this agreement.

#### *Dutch Aliens Act 2000*

The objective of the Dutch Aliens Act is to improve the quality of the decision whether an alien may or may not reside in the Netherlands, to simplify the residence permit system, to reduce legal actions and, thereby, decrease the time required for processing applications. The Dutch Aliens Act 2000 also states that upon arrival an aircraft captain has to deliver two copies of the passenger list to the civil servant guarding the border. In addition to the full first name and surname, this list must also include the date and place of birth and nationality of the passengers.

#### *Care institutions quality Act 1996*

Quality management policy is currently an important issue for many care institutions. The Dutch care institutions (quality) Act that came into effect on 1 April 1996 fits in with this development by just setting global quality requirements. The care institution still has the room required to develop a quality policy that corresponds with their specific situation. This is one of the Acts which specifies the tasks and responsibilities of hospitals in case of disasters.

#### *Aviation Act 1958*

The Aviation Act specifies the legislative requirements and responsibilities of both aircrafts and airport sites. The Aviation Act is mainly based on the international agreements of the International Civil Aviation Organization (ICAO). Further elaborations of this Act has charged the operator with the task of ensuring there is sufficient equipment and resources as well as sufficient expert and skilled staff to save human life and to prevent, limit and fight fires caused by aircraft accidents at or near the airport site<sup>34</sup>.

#### *International regulations*

The international regulations relevant to this investigation are the Standards and Recommended Practices in the Annex of the Chicago Convention of the International Civil Aviation Organization (ICAO).

Nearly all countries in the world are members of the convention on international civil aviation, also referred to as the Chicago Convention<sup>35</sup>. The convention contains principles and regulations about a number of issues that are important to the development of international civil aviation. It also forms the legal basis for the establishment of the International Civil Aviation Organization (ICAO). The Chicago Convention has a large number of annexes in which various topics are arranged with a large degree of details. These annexes are not binding to the same extent as the convention itself but do play a large role within the regulations of international civil aviation. The annexes contain, amongst other issues, the *standards and recommended practices*. The member states are, in any case, obliged to implement the *standards* as meticulously as possible in their national legislation. If a country deviates from the *standard*, the ICAO has to be notified. A *recommended practice* is a recommended method that a member state can include in national legislation. It is, however, not compulsory and no notification is required when a method is not incorporated in national legislation. Annex 9 of the convention a template for the '*general declaration*' and the '*passenger manifest*' is provided. The initials and surname must be taken down in the '*passenger manifest*' with regard to passengers.

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33 The Kennemerland Safety Region entered into an agreement for 2008-2009 with the Minister of the Interior and Kingdom Affairs regarding the quality of the emergency services in case of disasters and to organise a professional safety region; Agreement dated 9 July 2008.

34 An area of 100 metres in front of and behind the runways and no more than 150 metres to the left and right of the (continued) axis of each runway.

35 The Convention on International Civil Aviation (also known as the Chicago Convention) was signed on 7 December 1944 by 52 States. Pending ratification of the Convention by 26 States, the Provisional International Civil Aviation Organization (PICAO) was established. It functioned from 6 June 1945 until 4 April 1947. By 5 March 1947 the 26th ratification was received. In October of the same year, ICAO became a specialised agency of the United Nations linked to the Economic and Social Council (ECOSOC).

### 3.3 NATIONAL GUIDELINES, GUIDES AND HANDOUTS

This section contains a clarification on the following<sup>36</sup> relevant national guidelines, guides or handouts:

- Basic crisis response requirements (Basisvereisten crisismanagement)
- Guide to Set-up and Operation of the CRIB process (Leidraad Opzet en Operationeel CRIB Proces)
- Guideline to aircraft accidents fighting at airport sites (Leidraad vliegtuigongevallenbestrijding op luchtvaartterreinen)
- National fleet-mapping framework for C2000 (Landelijk kader fleetmapping in C2000)
- Functional statement of requirements for the C2000 Radio Network (Functioneel programma van eisen ten behoeve van het Radionetwerk C2000)
- National Frequency Plan 2005 (Nationaal Frequentieplan 2005)

#### *Basic crisis response requirements (deployment and emergency services)*

The Basic crisis response requirements consist of a limited set, to be legally anchored at a later date, quantitative and qualitative standards for crisis response and crisis control which have to be met by each and every safety region under operational conditions. These standards refer to processes such as reporting and alerting, scaling up and down, and the management and coordination of information management. The Basic crisis response requirements have been developed by the Landelijk Beraad Crisisbeheersing (Dutch National crisis response board) at the request of the Minister of the Interior and Kingdom Relations.

#### *Guide to Set-up and Operation of the CRIB process (registration)*

The experience with victim registration in, among others, Enschede in 2000 (firework disaster) and Volendam in 2001 (pubfire) led the Ministry of the Interior and Kingdom Relations to set up a broad project to inventory and analyse victim registration (CRIB) bottlenecks. Leidraad CRIB (CRIB guide; version 2.0) is the result of this project. The leidraad CRIB describes the Central Registration and Information Bureau process based on the following principles:

- Quick start-up;
- Intermunicipal cooperation;
- Use of national facilities (including the Relative information service of the Netherlands Red Cross);
- Use of the Central Registration and Information Bureau privacy regulations.

The guide also provides guidelines on the cyclic process, players, quality (assurance) and implementation.

The Guide to Set-up and Operation of the CRIB Process produced by the Ministry of the Interior and Kingdom Relations<sup>37</sup> states: The Central Registration and Information Bureau plays a central part in collecting and processing personal data collected by registration bodies, relatives' telephone lines and any registration teams at the Netherlands Red Cross and 'earmarked' as personal data relating to the disaster in question. The guide suggests that the municipality's Central Registration and Information Bureau should operate as the hub of the information web, where victim information and questions from Bureau are received or requisitioned from a range of organisations (see figure 6). The Central Registration and Information Bureau undertakes only the necessary checks and attempt to find connections between the relatives looking for information and the individuals who have been affected.

The Guide to Set-up and Operation of the CRIB Process also states that agreements can be made at the preparatory stage with bodies that are in a position to systematically provide information. The advantage of this is that information can be supplied relatively quickly in a previously agreed format, possibly via a computerised and standardised link. The bodies registering information and mentioned here are:

- Medical assistance at accidents and disasters action centre;
- The police;
- Relatives' telephone line at the Netherlands Red Cross (NRK).

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<sup>36</sup> The end of this section includes a non-exhaustive summary.

<sup>37</sup> Ministry of the Interior and Kingdom Relations; Guide to Set-up and Operation of the CRIB Process, version 2.0, 6 April 2005.



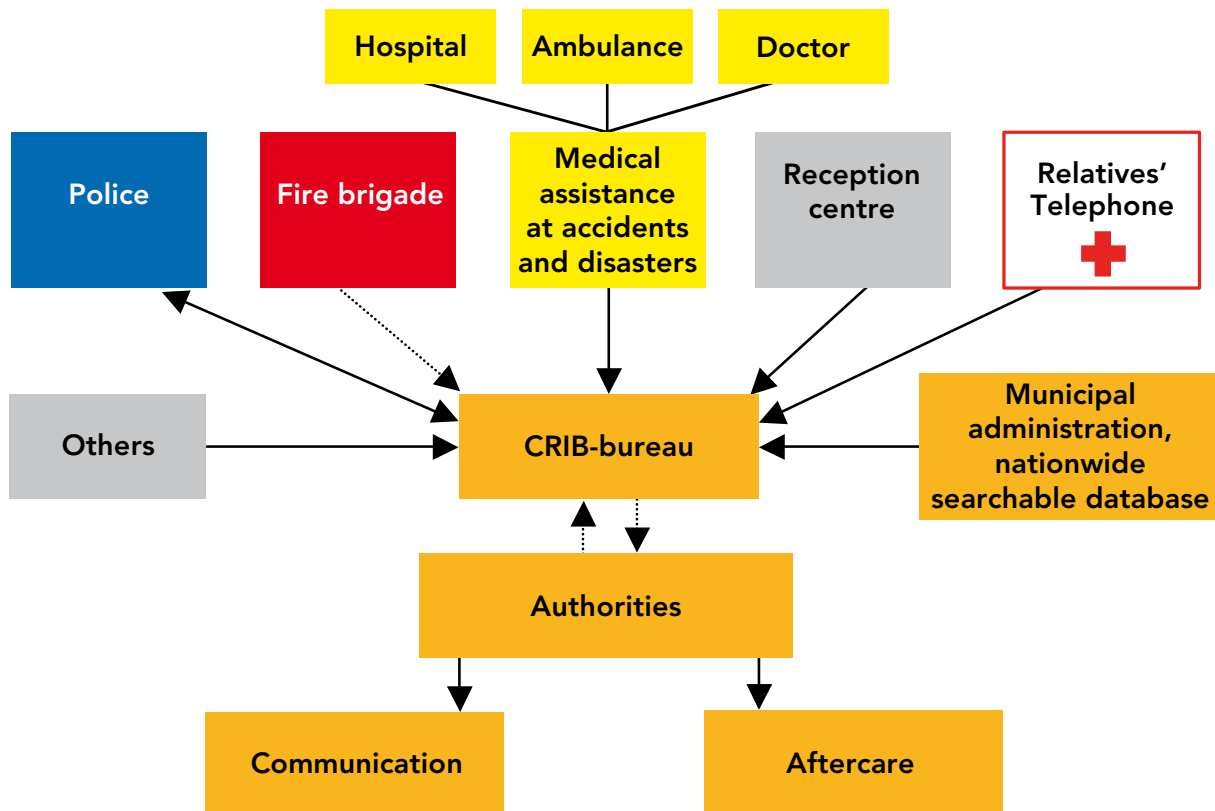


Figure 6: The Central Registration & Information Bureau process<sup>38</sup>

38 Figure based on the Guide to Set-up and Operation of the CRIB Process, page 24.

#### *Guideline to aircraft accident response procedure at airport sites*

This Guideline was drawn up by the Ministry of the Interior and Kingdom Relations, Fire brigade and disaster control management. The Guideline provides direction to local preparations for an aircraft accident inside airport premises. It contains basic elements for an airport crisis response plan. The Guideline is for three target groups: local administrative parties, aircraft operators or military commanders of air bases or camps and the responsible parties for all operational organisations that are (or may be) involved in case of an aircraft accident.

#### *National fleet-mapping framework for C2000<sup>39</sup> (communication)*

The national fleet-mapping framework for C2000 describes the call group composition and the operational procedures for police, fire brigade, ambulance services and the Royal Netherlands Marechaussee. This includes both the supraregional cooperation as well as providing backup both on a multidiscipline and a single discipline level. All disciplines have committed to the agreements as registered in the national fleet-mapping framework for C2000.

#### *Functional statement of requirements for the C2000 Radio Network<sup>40</sup>*

The Functional schedule of requirements document provides an outline of the national functional requirements and preferences for a radio communication system for the emergency services for public order and safety. The schedule of requirements includes the functional requirements for the infrastructure. The functionality that must be available at control rooms to properly manage the various units are also described. To conclude, the requirements of sending and receiving equipment and management aspects of importance for an efficient C2000 network are also described.

#### *National Frequency Plan 2005<sup>41</sup>*

The National Frequency Plan contains an elaboration of the intended use and use categories for the frequency spectrum that is available for radio communication. The distribution of the frequencies is based on this plan, i.e. the actual awarding of permits. The National Frequentieplan 2005 describes the location and functionality of the plan within the complete frequency policy (including the actual granting of permits). It also includes the objectives of the frequency policy such as a good distribution over the various categories, efficient frequency use and harmonisation. Modifications compared to the past and developments for the near future are summarised. The plan includes various annexes on the frequency range.

### 3.4 REGIONAL AND LOCAL ELABORATIONS IN PLANS AND MANUALS

This section describes the relevant elaborations at a regional or local level of the applicable legislation and regulations and any guidelines, guides and handouts. This concerned the following plans:

- Kennemerland Crisis Plan (Crisisplan Kennemerland)
- Schiphol Crisis Response Plan (Crisisbestrijdingsplan Schiphol)
- Kennemerland Aviation Accident Crisis Response Plan (Crisisbestrijdingsplan Luchtvaartongevallen Kennemerland)
- Kennemerland GHOR Ambulance Dispatch Centre Operator Manual (Handboek MKA Centralist GHOR Kennemerland)
- Subplan GH2: Emergency medical somatic services (Geneeskundige Hulpverlening Somatisch)
- Kennemerland GHOR casualty distribution plan (Gewondenspreidingsplan GHOR Kennemerland)
- Subplan: Central Registration and Information Bureau (Deelplan Centraal Registratie en Inlichtingen Bureau)
- C2000/P2000 radio communication part Connection Book Kennemerland Safety Region (Verbindingsboek Deel Radiocommunicatie C2000/P2000 Veiligheidsregio Kennemerland)
- Kennemerland Ambulance Services, Ambulance Dispatch Centre C2000 Procedures (C2000 Procedures Meldkamer Ambulancezorg, Ambulancediensten Kennemerland)

39 Landelijk Kader Fleetmapping C2000, version 6.1, 2008, Commissie Beheer landelijk kader fleetmapping C2000 (National C2000 Fleet-mapping Framework Management Committee).

40 Functional schedule of requirements for the C2000 radio network, version 2.0, 28 November 1996.

41 Nationaal Frequentieplan 2005 (National Frequency Plan 2005), Ministry of Economic Affairs, January 2009.

### *Kennemerland Crisis Plan*<sup>42</sup>

The Kennemerland Crisis Plan states in general terms what has to be done in case a disaster or crisis occurs or threatens to occur. This includes tasks, responsibilities and powers of the various parties. The crisis plan consists of seven sections (0 through to 6). Section 0 explains the structure of the plan. Section 1 provides an outline of the crisis response organisation: The crisis response organisation and coordination, upward and downward scaling system, alerting, the connection plan and a list of crisis response processes. Section 2 describes the partial processes for which the emergency services and municipalities are responsible. An initial start is, therefore, given to the distribution of the different tasks from the listed subprocesses. This is first of all important for the preparative phase, for example, when drawing up partial plans and scripts, but it also includes relevant information for the actions to be performed during the crisis itself. Sections 3, 4 and 5 include topics that are relevant when drawing up a crisis plan but that are not directly required for the crisis response itself, such as the legal framework and the crisis response policy. Section 6 contains annexes with definitions, abbreviations, et cetera.

In 2005 the ten municipalities<sup>43</sup> in Kennemerland decided to draw up a single plan as the required Disaster plan required by the Disasters and Major Accidents Act. In 2007 this resulted in the Kennemerland Crisis Plan, which has been undersigned by the Board of the mayor and aldermen of the various municipalities.

### *Subplan Central Registration and Information Bureau*<sup>44</sup>

The Kennemerland Crisis Response Plan led to the drawing up of a Central Registration and Information Bureau subplan. This Plan describes the tasks, authorisation and responsibilities of the municipal Central Registration and Information Bureau action centre. The object of the subplan is to provide an overview of the tasks that are to be performed by the Central Registration and Information Bureau (CRIB). The tasks are described, the primary objective or objectives of the registration are not described. The tasks are:

1. Collecting, recording, organising and verifying all relevant information about the fate and whereabouts of individuals involved in the disaster, independent of whether they have been evacuated, injured or are missing or dead.
2. Providing interested parties with information released by the Mayor about the whereabouts and fate of those involved.

The subplan consists of four sections. Section A and B is the same for the municipalities within the Kennemerland Safety Region. Section A describes general issues such as powers and responsibilities, the crisis response organisation and scaling-up procedure. Section B describes issues applicable specifically to the Central Registration and Information Bureau, such as the tasks and provisions for the officials. Section C is an elaboration of the subplan which is specific for each municipality. It is different for each municipality in the safety region. It provides the details of the municipality concerned regarding the tasks and responsibilities derived from the Kennemerland Crisis Response Plan. Section D contains the annexes for Sections A, B and C.

### *Subplan Medical Services Somatic*<sup>45</sup>

The Kennemerland Crisis Response Plan determines that the Medical Assistance at Accidents and Disasters Act (GHOR; geneeskundige hulpverlening bij ongevallen en rampen) is responsible for, among others, the emergency medical services. The objective is to provide fast and well-organised medical services to ensure the highest possible survival probability with the lowest possible residual disability. For this purpose, the tasks of the medical assistance at accidents and disasters are as follows:

1. Organising and executing the medical assistance and care of casualties on site.
2. Transportation of casualties to hospitals and/or treatment centres (casualty distribution plan).

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42 Kennemerland Crisis Plan, passed on 18 December 2007, effective as of 1 January 2008. The name was changed from Disaster Plan to Crisis Plan in anticipation of the Safety Regions Act.

43 In 2005, the Kennemerland municipalities were Beverwijk, Bloemendaal, Haarlem, Haarlemmerliede en Spaarnwoude C.A., Bennebroek, Heemskerk, Heemstede, Uitgeest, Velsen and Zandvoort.

44 Central Registration & Information Bureau subplan (GM5), municipality of Haarlemmermeer, adopted by the council of the Mayor and Aldermen on 18 December 2007.

45 GHOR Subplan: GH2 Geneeskundige Hulpverlening Somatisch (medical somatic services), December 2008

#### *Schiphol Crisis Response Plan*<sup>46</sup>

The Schiphol Crisis Response Plan (CBP-S, Crisisbestrijdingsplan Schiphol) describes the standard work method in case of a crisis in the plan work area. Schiphol Airport is within this region. The Schiphol Crisis Response Plan is applicable to GRIP-1 situations or higher in case of incidents and crisis within the region of the plan for which the coordinated mobilisation of emergency services is required. The Crisis Response Plan region includes the airport premises. The Schiphol Crisis Response Plan (CBP-S) describes the crisis response organisation, the partial processes and scenarios and contains various annexes including the decision matrices, scaling of medical assistance at accidents or disasters and a map of the region.

#### *Kennemerland Aviation Accident Crisis Response Plan*

The Kennemerland Aviation Accident Crisis Response Plan describes the standard work method in case of an aircraft accident in Kennemerland, outside the Schiphol Crisis Response Plan region.

#### *Kennemerland GHOR Ambulance Dispatch Centre Operator Manual*<sup>47</sup>

The objective of the ambulance dispatch operator manual is providing a guideline for the ambulance dispatch operator within the framework of large-scale emergency services. The manual first describes the general approach to incident processing, followed by an explanation of the coordination and management structure of the medical assistance at accidents or disasters, information management and backup procedures and geographical logistics. The manual annexes include the ambulance assistance plan, the casualty distribution plan and a section on the prewarning and alerting of hospitals.

#### *Kennemerland Medical Assistance at Accidents and Disasters casualty distribution plan*<sup>48</sup>

The casualty distribution plan organises the distribution of casualties with serious injuries among the hospitals in the Kennemerland Safety Region and neighbouring regions and concerns the North-West of the Netherlands trauma region. The casualty distribution plan is based on the number of casualties and the classification of the injuries. The combination of number of casualties and the seriousness of the injuries can result in supraregional distribution of casualties.

#### *C2000/P2000 radio communication part Connection Book Kennemerland Safety Region*<sup>49</sup>

The C2000/P2000 radio communication part Connection Book of the Kennemerland Safety Region describes how the regional fire brigade and ambulance services/medical assistance at accidents and disasters connect using the C2000/P2000 system in case of an incident. The connection diagrams for the police are not included. The connections of the fire brigade are based on the organisational structure and the mobilisation procedures of the regional Kennemerland fire brigade. The connections of the medical assistance at accidents and disasters are based on the connection procedures of the Kennemerland ambulance dispatch centre.

#### *Kennemerland Ambulance Services, Ambulance Dispatch Centre C2000 Procedures*<sup>50</sup>

This procedure manual describes the communication procedures for the operation of the C2000 system in the Kennemerland Safety Region, including the communication procedures for the ambulance dispatch centre operators at the Kennemerland control room.

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46 Schiphol Crisis Response Plan, version 1.6, dated 10 December 2007

47 Handboek MKA Centralist GHOR Kennemerland (Kennemerland GHOR Ambulance Dispatch Centre Operator Manual) version 2.0, 25 October 2007

48 Gewondenspreidingsplan GHOR Kennemerland (Kennemerland GHOR casualty distribution plan), version 2.0, effective as from 6 November 2007.

49 Verbindingsboek deel Radiocommunicatie C2000/P2000 (C2000/P2000 radio communication part connection book), version 1.1 dated 11 December 2007. P2000 stands for Pager system P2000, the pager system operates via the C2000 system.

50 C2000 Procedures Meldkamer Ambulancezorg, Ambulancediensten Kennemerland (Procedure C2000 Ambulance Dispatch Control Centre, Ambulance Services Kennemerland), version 5.1 dated 14 December 2008, determined on 21 January 2009.

### 3.5 GENERAL ASSESSMENT FRAMEWORK FOR SAFETY MANAGEMENT

Safety management refers to the elaborated procedures of the various organisations which are drawn up to fulfil their safety responsibilities. For example, the way in which risks are mapped for those involved and the way in which risks are controlled in a structural manner. The organisation requires a structure to ensure that the whole process can be executed and made transparent and to create possibilities for continued improvement. This structure is called the safety management system. Previous incidents have demonstrated that the safety management system structure and the elaboration of the system by the various parties involved plays a crucial role in the management, assurance and continual improvement of safety.

The Dutch Safety Board bases its investigations on five general safety principles. These principles are used to determine whether, and how, the parties have fulfilled their own responsibilities with regard to safety assurance. The Dutch Safety Board sent a letter to the Ministry of the Interior and Kingdom Relations to report this.<sup>51</sup> The five general safety principles are described below:

1. Insight into risks as the basis for the safety approach  
The starting point to achieve the required level of safety is:
  - a. Exploration of the system, followed by
  - b. Inventory of the corresponding risks.This information is used to determine which risks must be controlled and the corresponding preventive and repressive measures.
2. Demonstrable and realistic safety approach  
A realistic and practical safety approach, i.e. safety policy including the corresponding principles, has to be registered to prevent and control undesired events. This safety approach must be defined and driven on a management level. This safety approach is based on:
  - a. Relevant legislation and regulations in force;
  - b. Available standards, guidelines and best practices from the sector and own insights; and
  - c. Experience of members of the organisation and the safety targets specifically defined for the organisation.
3. Implementing and enforcing the safety approach  
The implementation and enforcement of the safety approach and controlling identified risks takes place through:
  - a. A description of the method in which the used safety approach is realised focussing on specific goals and plans including the preventive and repressive measures that arise from this approach.
  - b. A transparent and unambiguous subdivision of responsibilities on the work floor that is accessible to all for the implementation and enforcement of safety plans and measures.
  - c. A clear definition of the required staff deployment and expertise for the various tasks.
  - d. A clear and active central coordination of safety activities.
4. Tightening the safety approach  
The safety approach must be continuously tightened based on:
  - a. The performance of (risk) analyses, observations, inspections and audits regularly and, in any case, every time a basic principle changes (proactive approach).
  - b. An incident, near accident and accident monitoring and investigation system as well as an expert analysis thereof (reactive approach).Assessments are made based on the above and, if required, the safety approach is updated by management.

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51 Letter dated 17-11-2005, reference: OVV2005-010999

5. Management steering, commitment and communication  
The management of the involved parties/organisation must take care of:
  - a. Clear and realistic expectations within the organisation with regard to safety targets and a climate of continuous improvement of the safety on the work floor.
  - b. Clear external communication regarding the general work methods, their testing, the procedures when there are exceptions, et cetera, based on clear and defined agreements with organisations in the surrounding regions.





Medical assistance at accidents and disasters (Kennemerland)	Fire brigade (Kennemerland)	Police (Kennemerland) / Royal Netherlands Marechaussee
<ul style="list-style-type: none"> <li>• Medical assistance at accidents and disasters Act (WGHR)</li> <li>• Ambulance transport Act (WAV) The new Dutch ambulance care Act replaces the current Ambulance transport Act as of 1 January 2011.</li> <li>• National ambulance services Protocol</li> <li>• GHOR subprocesses based on the Kennemerland Crisis Response Plan: <ul style="list-style-type: none"> <li>- Subprocess GH1: Preventive public healthcare</li> <li>- Subprocess GH2: Medical services</li> <li>- Subprocess GH3: Psychosocial services)</li> </ul> </li> <li>• Manual medical officers on duty, version 2007</li> <li>• Manual head action centre GHOR Kennemerland</li> <li>• Manual Kennemerland regional medical officer, version 2007</li> <li>• Manual casualty transport coordinator</li> <li>• Coordination station plan</li> <li>• Casualty distribution plan GHOR Kennemerland, version 2 071106.</li> <li>• Ambulance assistance plan GHOR Kennemerland, version 2 071105</li> <li>• Agreement between MICK and LMAZ</li> <li>• Manual ambulance dispatch operator 1.6</li> <li>• C2000 Procedures, ambulance dispatch centre, Kennemerland ambulance dispatch services, affiliated parties</li> </ul> <p><b>Hospitals</b></p> <ul style="list-style-type: none"> <li>• Hospital Crisis Preparedness Plan (ZiROP), such as the AMC ZiROP Disaster care plan 2008</li> <li>• Covenant VUMC - Region Noord West Nederland Regional meeting on acute care chain 200612</li> </ul>	<ul style="list-style-type: none"> <li>• Fire brigade subprocesses based on the Kennemerland Crisis Response Plan: <ul style="list-style-type: none"> <li>- Subprocess B1: Source and effect control</li> <li>- Subprocess B2: Issuing public warnings</li> <li>- Subprocess B3: Disinfection of people and animals</li> <li>- Subprocess B4: Disinfection of vehicles and infrastructure</li> <li>- Subprocess B5: Rescue</li> <li>- Subprocess B6: Observation and measurement</li> <li>- Subprocess B7: Ensuring accessibility</li> </ul> </li> <li>• Covenant municipal fire brigade coverage within the Kennemerland Safety Region</li> <li>• Fire brigade deployment procedure - P611 Kennemerland aircraft accident response plan</li> <li>• Schiphol Crisis Response Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Conflict and Crisis control reference framework, police</li> <li>• CCB GRIP SGB0: Alerting schedule in case of (major) incidents according to the Coordinated Regional Deployment Procedure (GRIP), 2008</li> <li>• Police subprocesses based on the Kennemerland Crisis Response Plan: <ul style="list-style-type: none"> <li>- Subprocess P1: Monitoring and surveillance</li> <li>- Subprocess P2: Mobility</li> <li>- Subprocess P3: Maintaining law and order</li> <li>- Subprocess P4: Identification of the deceased</li> <li>- Subprocess P5: Intervention</li> <li>- Subprocess P6: Tracing</li> </ul> </li> <li>• The subplans include annexes such as: <ul style="list-style-type: none"> <li>- Traffic measures working instructions</li> <li>- Traffic measures regarding the Kennemerland circulation</li> <li>- Traffic measures regarding rendezvous point A Other incidents</li> <li>- Traffic measures regarding the Terminal rendezvous point</li> <li>- Traffic measures regarding rendezvous point B</li> </ul> </li> <li>• Disaster operations plan Royal Netherlands Marechaussee, including the following: <ul style="list-style-type: none"> <li>- Disaster duty officer checklist</li> <li>- Disaster duty officer checklist, public order and emergency services</li> <li>- Subplan A0, Imagery, Assessment and Decision-taking</li> <li>- Subplan A1, Alerting the administration and processes</li> <li>- Subplan A2, Logistical support management</li> <li>- Subplan A3, Connections</li> <li>- Subplan A4, Coordination</li> <li>- Subplan A5, Reporting</li> </ul> </li> <li>• National Forensic Investigation Team (LTFO) work instructions</li> <li>• Police officer on duty work method, 2009</li> </ul>

Table 1: Non-exhaustive summary of the documents that contribute to the structure and organisation of the emergency services process, listed per party involved.

Schiphol Airport	Municipality	Discipline exceeding
<ul style="list-style-type: none"> <li>• Guideline to aircraft accident response procedure at airport sites</li> <li>• Schiphol Crisis Response Plan</li> <li>• Schiphol Airport company manual, Section 5: Schiphol Airport disaster plan (CPAAS)</li> <li>• Schiphol Airport - Schiphol regulations</li> <li>• Reception at Schiphol Airport script, section of Crisis Response Plan, 2008</li> <li>• Manual Disaster duty officer, Introduction to disaster response organisation, 2007</li> </ul>	<ul style="list-style-type: none"> <li>• Municipality subprocesses based on the Kennemerland Crisis Response Plan: <ul style="list-style-type: none"> <li>- Subprocess GM1: Communication</li> <li>- Subprocess GM2: Evacuation</li> <li>- Subprocess GM3: Collection of infected products</li> <li>- Subprocess GM4: Reception and Care</li> <li>- Subprocess GM5: Victim registration (Central Registration and Information Bureau)</li> <li>- Subprocess GM6: Funeral services</li> <li>- Subprocess GM7: Providing primary necessities of life</li> <li>- Subprocess GM8: Damage registration and processing (Central Registration and Damage Processing)</li> <li>- Subprocess GM9: Environmental control</li> <li>- Subprocess GM10: Aftercare</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Disasters and major accidents Act (Wrzo)</li> <li>• Dutch Safety Regions Act</li> <li>• Basic crisis response requirements (national/branch document)</li> <li>• Coordinated Regional Incident response Procedure (GRIP)</li> <li>• Guide to Set-up and Operation of the CRIB process, version 2.0</li> <li>• Kennemerland Regional Crisis Response Plan; Sections I through to VI. The crisis plan consists of seven sections. <ul style="list-style-type: none"> <li>- Section 0: plan structure</li> <li>- Section 1: outline of the crisis response organisation</li> <li>- Section 2: subsections for which every emergency service and municipality is independently responsible</li> <li>- Section 3: general section</li> <li>- Section 4: legal framework</li> <li>- Section 5: crisis response policy</li> <li>- Section 6: annexes containing definitions, abbreviations and descriptions of the risks in Kennemerland Safety Region</li> </ul> </li> <li>• In addition to the Kennemerland Crisis Response Plan there are four other applicable plans for the Schiphol area (depending on the exact location where the accident or disaster takes place): <ul style="list-style-type: none"> <li>- the plan of Schiphol Airport;</li> <li>- region Amsterdam Amstelland;</li> <li>- region Hollands Midden and</li> <li>- region Noord Holland Noord.</li> </ul> </li> <li>• Kennemerland Aircraft accident Crisis Response Plan for accidents outside the airport terrain</li> <li>• National fleet-mapping framework for C2000, version 6.0</li> <li>• C2000 Emergency call procedure version 0.4</li> </ul>





## 4. INVOLVED PARTIES AND THEIR RESPONSIBILITIES

### 4.1 LOCAL AND REGIONAL INVOLVED PARTIES

This section contains an overview of the parties involved and their responsibilities. Section 4.1 describes the parties involved at local and regional level. Sections 4.2 and 4.3 describe the parties involved at national level and foreign parties respectively. Figure 7 at the end of this chapter gives a graphic overview of the parties and their mutual relations.

The following local and regional parties were directly involved in assistance and crisis management concerning the accident:

- Municipality of Haarlemmermeer
- Kennemerland Safety Region (VRK)
- Kennemerland Police
- Air Traffic Control the Netherlands
- Amsterdam Airport Schiphol (AAS)
- Emergency services from other regions
- Hospitals

#### *Municipality of Haarlemmermeer*

The Dutch Disasters and Major Accidents Act (Wrzo) dictates that the mayor and aldermen of a municipality is responsible for the preparation for disasters and major accidents. The mayor has overall command in case of a disaster or major accident or when there are serious fears that a disaster, or in case of a major accident. Those participating in responding to a disaster or major accident are under his command. The mayor is assisted by the multidisciplinary Policy Team he has set up.

On 25 February 2009 the mayor of Haarlemmermeer, in his role of overall commander, was responsible for the administrative settlement of the aviation accident.

The Dutch Disasters and Major Accidents Act requires the municipality to prepare for responding to crises within its territory. According to this Act, the way in which this obligation is fulfilled is to be laid down in a municipal crisis plan. The crisis plan was modified when the Municipality of Haarlemmermeer was added to the Kennemerland Safety Region and has been the same for all municipalities in the Kennemerland Safety Region since 1 January 2008 (the Kennemerland Crisis Plan). When the crisis plan was regionalised, the Kennemerland Safety Region anticipated on the Dutch safety regions act (Wvr) that came into effect in 2010. The Safety Regions Act stipulates that a regional plan must be drawn up. Refer to the previous section for a description of the Kennemerland Crisis Plan.

Under the Disasters and Major Accidents Act, the Municipality of Haarlemmermeer has a duty to prepare a crisis plan to deal with disasters or major accidents within its territorial area. This crisis plan must consist of a number of subplans including a subplan for the process of registration and information regarding those involved in a disaster or serious accident. The Municipality of Haarlemmermeer also has such a subplan: the Central Registration and Information Bureau Subplan<sup>52</sup>.

After an accident, the municipality, in consultation with the regional medical officer and the organisation for medical assistance at accidents and disasters, also has the task to offer post-care to those immediately involved, i.e. the victims but also the emergency response care providers and passers-by giving assistance (the Municipality of Haarlemmermeer has included this in the Project Concluding phase).

#### *Kennemerland Safety Region*

The Kennemerland Safety Region (VRK; Veiligheidsregio Kennemerland) is responsible for fire fighting, medical assistance at accidents and disasters (GHOR), crisis response and crisis control, and the management of one dispatch control room for police, fire brigade and ambulance services. The Kennemerland Safety Region is managed by the executive committee that gives account to a

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52 Subplan of Central Registration and Information Bureau (GM5), municipality of Haarlemmermeer, adopted by the council of the mayor and aldermen on 18 December 2007.

general committee consisting of all the mayors and all holders of the Health portfolio (aldermen) of the ten municipalities<sup>53</sup> in the region. The safety region encloses the municipal health service and the Kennemerland fire brigade, the Kennemerland Report, Information and Coordination Centre and a safety agency.

#### *Kennemerland Safety Team*

The safety team consists of the director of the safety region who is also the commander of the Kennemerland fire brigade, the chief of police of the Kennemerland Police, the director of the safety region, also director of the Kennemerland health service, the coordinating city clerk of the Municipality of Heemskerk and the commander in chief of the Royal Netherlands Marechaussee.

#### *Kennemerland health service*

The Kennemerland health service monitors, protects and fosters the health of the more than half a million inhabitants of the Kennemerland Safety Region. The Kennemerland health service consists of 300 employees across the following sections: general healthcare, youth healthcare, ambulance services and the agency for medical services at accidents and disasters. The ambulance services and the agency for medical services at accidents and disasters were, in particular, involved in the medical assistance after the aircraft accident on 25 February 2009.

The agency for medical services at accidents and disasters organises the emergency medical services at accidents and disasters, arranges for psycho-social assistance (assistance provided to victims and involved persons), monitors health and implements medical/environmental measures. The agency for medical services at accidents and disasters carries out these tasks by drawing up scripts, by arranging for training and exercise and by giving advice on events. When an accident or disaster occurs, the agency is responsible for the emergency medical assistance. The major processes for the Kennemerland region are described in the Kennemerland Crisis Plan. These involve, among others, medical assistance (somatic) and psycho-social assistance. In case of a crisis, the agency provides the medical staff such as a medical officer on duty (OVD-G) and a quickly deployable group that can provide medical assistance (SIGMA teams).

#### *Regional Ambulance Organisation*

The current legislation defines, a regional ambulance organisation (RAV; Regionale Ambulance Voorziening) as an organisation (a partnership or a merged organisation) where the ambulance services and the region's control room that corresponds to the police region work together. This organisation is registered with the Chamber of Commerce or has a on behalf of the RAV modified Mutual Arrangement. The RAV also has its own separated administration and management.

According to the above legal definition the Kennemerland region does not include a RAV. The ambulance services in Kennemerland are taken care of by:

- The Kennemerland Ambulance Dispatch Centre (Ambulancedienst Kennemerland), a private ambulance service; part of Connexxion Ambulancezorg;
- The Kennemerland Health Authority (GGD), ambulance service sector; part of the Kennemerland Safety Region;
- The VZA Hoofddorp, belongs to the Verenigd Ziekenvervoer Amsterdam (VZA)

However, the mutual cooperation between the three ambulance services and the control room is such that there is a cooperative RAV and the final setup of the RAV is currently being elaborated. The regional medical officer is responsible for coordinating medical assistance.

#### *Kennemerland fire brigade*

The Kennemerland fire brigade stems from the ten municipal<sup>54</sup> fire services in the region. The fire services in Kennemerland have seventeen fire stations (five of which are manned 24/7). The aircraft fire fighting agency of Schiphol Airport in part also belongs to the Kennemerland fire brigade because it carries out tasks in the region of the municipal fire services based on the Schiphol fire fighting agreement with the Municipality of Haarlemmermeer. The aircraft fire fighting agency of Schiphol Airport consists of three stations with professional staff. In case of a disaster or a crisis, the fire

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53 The Kennemerland municipalities are Beverwijk, Bloemendaal, Haarlem, Haarlemmerliede and Spaarnwoude C.A., Haarlemmermeer, Heemskerk, Heemstede, Uitgeest, Velsen and Zandvoort.

54 After merging of the municipalities of Bennebroek and Bloemendaal on 1 January 2009, ten municipalities.

brigade is responsible for the response with regard to source and/or effect. In case of crises, the fire brigade also provides the leader of the command place for the incident, the operational leader of the operational team and a representation in the policy team.

#### *Kennemerland Report, Information and Coordination Centre*

The Kennemerland Report, Information and Coordination Centre (MICK; Meld-, Informatie- en Coördinatiecentrum Kennemerland) is an integrated control room; i.e. the control rooms for the fire brigade, ambulance and police have been incorporated into one centre. The idea is that the operators of these services can communicate better and information can be shared relatively easily by having this setup.

#### *Kennemerland Safety Agency*

The Kennemerland Safety Agency (VBK; Veiligheidsbureau Kennemerland) offers a platform for multidisciplinary cooperation and consists of a fixed staff base composed from people of the regional fire brigade, the Kennemerland police, the medical assistance at accidents and disasters, the municipal crisis organisation, the Royal Netherlands Marechaussee and the regional military command post West. The VBK tasks are, for example, drawing up the regional risk profile and multidisciplinary plans, arranging multidisciplinary training and exercise, managing the Regional Crisis Centre (RCC; Regionaal Crisis Centrum) and operational management.

#### *Regional Kennemerland Police Services Agency*

The Dutch police services consist of 25 regional agencies and the Dutch National Police Services Agency (KLPD; Korps Landelijke Politiediensten). The 25 regional agencies contribute to the improvement of safety, quality of life and combating crime in their own region. The regional police services have concluded an agreement with the Kennemerland Safety Region and are part of the Kennemerland Safety Team. The Municipality of Haarlemmermeer, with the exception of Schiphol Airport, falls within the scope of the regional Kennemerland police force.

In case of an accident, disaster or crisis, the police give first aid services and often coordinate the activities in the disaster area. The Kennemerland Crisis Plan describes the processes for which the police is responsible, among others, monitoring and protecting, mobility, keeping law and order and identifying the deceased. The (highest) operational scaling of the police is called large-scale and special acting support (SGBO; staf grootschalig en bijzonder optreden). The police services at Schiphol Airport are provided by the Royal Netherlands Marechaussee.

#### *Air Traffic Control the Netherlands*

Air Traffic Control the Netherlands is an independent administrative body that falls under the responsibility of the Minister of Transport, Public Works and Water Management. Air Traffic Control the Netherlands is charged with promoting the highest level of safety in air traffic in the Amsterdam flight information area. This area extends over the Dutch territory and a large section of the North Sea. Air traffic services are rendered in the interest of general air traffic safety and to guarantee safe, orderly and speedy air traffic. The air traffic services at Schiphol Airport have to comply with the rules for route and lane usage. The Air Traffic Control the Netherlands has a shared duty of care regarding the distribution of noise pollution across legal enforcement areas surrounding the airport. Air traffic services have three tasks: air traffic control, flight information and warning.

#### *Amsterdam Airport Schiphol*

Amsterdam Airport Schiphol (AAS) is the largest Dutch airport and one of the major European airports. The airport is twelfth in the list of global airports where the number of passengers is concerned. The airport is owned by the Schiphol Group (statutory name: N.V. Luchthaven Schiphol), the shareholders are the Dutch State and the municipalities of Amsterdam and Rotterdam.

The airport has a number of control centres: the Schiphol Control Centre (control centre and emergency centre), a safety control centre, the KLM control centre, the customs control centre and the Royal Netherlands Marechaussee control centre. The Schiphol Control Centre controls the operation 'on land' during normal and disrupted operational management and crises. The Schiphol Control Centre is responsible for warning and informing organisations and officials.



Schiphol has an extensive organisation of in-house emergency and first-aid services (BHV; Bedrijfshulpverlening) and the previously described private fire brigade that specialises in extinguishing aircraft fires.

Schiphol Airport facilitates issues for the municipality and airlines, in this case Turkish Airlines with regard to reception, care, registration, reunion and support of the uninjured and relatives.

#### *Emergency services from other regions*

Besides emergency services from the Kennemerland region, emergency response care providers from thirteen other safety regions were involved in emergency services on 25 February 2009.

#### *Hospitals in the region*

The tasks and responsibilities of hospitals in case of a disaster are laid down in various acts including the Care institutions quality Act. This act obliges hospitals to provide quality medical care, irrespective of the circumstances. The hospitals have to systematically monitor, manage and improve the quality of medical care. The role of hospitals is also laid down in the Medical Assistance at Accidents and Disasters Act. Article 7 states that hospitals have to take all necessary measures to prepare for disasters or in view of their tasks, respectively, when providing medical assistance.

## 4.2 NATIONAL ORGANISATIONS INVOLVED

The following Dutch national organisations are consecutively discussed:

- Ministry of the Interior and Kingdom Relations
  - Dutch Public Order and Safety Inspectorate (IOOV; Inspectie Openbare Orde en Veiligheid)
  - Dutch National Police Services Agency (KLPD; Korps Landelijke Politiediensten)
  - The Netherlands Police Collaborative Taskforce (VtsPN; Voorziening tot samenwerking Politie Nederland)
  - Safety Council (Veiligheidsberaad)
  - National Crisis Centre (NCC; Nationaal Crisiscentrum)
- Ministry of Defence
  - Royal Netherlands Marechaussee (KMar; Koninklijke Marechaussee)
- Ministry of Health, Welfare and Sport
  - Healthcare Inspectorate (IGZ; Inspectie voor de Gezondheidszorg)
  - National Ambulance Dispatch Center (LMAZ; Landelijk Meldkamer AmbulanceZorg)
  - Mobile medical teams
- Ministry of Foreign Affairs
- Ministry of Justice

### *4.2.1 Ministry of the Interior and Kingdom Relations*

The Minister of the Interior and Kingdom Relations is the coordinating minister in the area of crisis control (including crisis response) and safety in a more general sense. The Minister makes arrangements with regard to the required preconditions to ensure all responsible boards and services can carry out their tasks. The Ministry makes arrangements with regard to the applicable legislation and regulations, tests the quality of the crisis response chain, funds (part of) the costs and arranges additional facilities for large-scale activities such as connections, the siren network and the required equipment. The Minister of the Interior and Kingdom Relations reports to the Dutch House of Representatives at least four times a year about the state of crisis control and preparations.

#### *Public Order and Safety Inspectorate*

The Dutch Public Order and Safety Inspectorate, that falls under the responsibility of the Minister of the Interior and Kingdom Relations and the Minister of Justice, supervises the quality of the tasks executed by the responsible administrative authorities and the operational services active in various sections for public order and safety (police, fire brigade and medical services in case of accidents and disasters).

#### *National Police Services Agency*

The Dutch National Police Services Agency falls under the responsibility of the Ministry of the Interior and Kingdom Relations and is directly controlled by the Dutch minister. The agency provides the partners in the safety chain with various, mostly specialist, safety products (such as threat analyses or international (criminal) investigation information). In addition, the Dutch National Police Services Agency supports the regional agencies by providing staff, means and expertise in the execution of basic police services in the region. The Dutch aviation police, the Dutch traffic police and the National Team for Forensic Tracing are a part of the Dutch National Police Services Agency.

#### *The Netherlands Police Collaborative Taskforce*

The Dutch police, consisting of 60,000 employees, is subdivided into 25 regional agencies and the Dutch National Police Services Agency. In 2006, the Netherlands Police Collaborative Taskforce (VtsPN; Voorziening tot samenwerking Politie Nederland) was established by and for these agencies. The VtsPN provides services, products and advice to the agencies and chain partners. The board consists of the police agency commanders of the regional police forces and the Minister of the Interior and Kingdom Relations in its capacity as manager of the KLPD. VtsPN manages the C2000 infrastructure.

#### *Safety Council*

The Safety Council was established on 10 February 2007. The chairpersons of Dutch safety regions, united in the Safety Council, act as the leading board in the development of safety regions. The Safety Board is the point of contact for the government for making arrangements regarding crisis control and response. The chairpersons of safety regions, together with the partners in the region, are responsible to set up a decisive organisation for crisis control and response. Safety regions have to develop into locally managed, democratic and legitimate partnerships. The basic model for the safety regions is that of extended local management.

#### *National Crisis Centre*

The National Crisis Centre, among others, coordinates general public information provision during crises on a national level. The National Crisis Centre offers a Public information call centre to other government bodies so they can inform the public. In case of a local level crisis, the National Crisis Centre can be requested to provide recommendations and support regarding the wording and the press and public briefing, to perform media analysis and to provide strategic advice on communication. The mayor always has final responsibility in these cases.

#### *4.2.2 Ministry of Defence*

The Ministry of Defence consists of the Administrative Staff (the department), the Royal Netherlands Navy, the Royal Netherlands Army, the Royal Netherlands Marechaussee, the Command Support Centres (CDC; Commando Diensten Centra) and the Defence Equipment Organisation (DMO; Defensie Materieel Organisatie).

The Ministry of Defence is organisationally responsible for the staff and the organisation of the Royal Netherlands Marechaussee. But for the implementation of 80% of their tasks, the Royal Netherlands Marechaussee falls under the authority of other ministries.

#### *Royal Netherlands Marechaussee*

The Royal Netherlands Marechaussee (KMar; Koninklijke Marechaussee) is an independent branch of the military within the Ministry of Defence. The police task at civil airport sites has been assigned to the Royal Netherlands Marechaussee (Article 6, clause 1, Dutch Police Act (Politiewet 1993)). Since 2002, the Royal Netherlands Marechaussee at Schiphol Airport has been responsible for keeping public order and for emergency assistance (this is not an exhaustive list). The Royal Netherlands Marechaussee also provides a Disaster officer on duty to support, among others, the Consultation committee at Schiphol Airport.

#### 4.2.3 *Ministry of Health, Welfare and Sport*

The Minister of Health, Welfare and Sport is responsible for the quality of medical and psychosocial healthcare and emergency assistance. The policy and supervision of medical assistance at accidents and disasters (GHOR; geneeskundige hulpverlening bij ongevallen en rampen) is the responsibility of the Minister of the Interior and Kingdom Relations and the Ministry of Health, Welfare and Sport. The Ministry of Health, Welfare and Sport is responsible for the content of the medical assistance at accidents and disasters: the medical treatment of the care providers such as ambulance services, hospitals and psychosocial care institutions.

#### *The Healthcare Inspectorate*

The supervising body, the Healthcare Inspectorate (IGZ; Inspectie voor de Gezondheidszorg), fosters public health through effective enforcement of the quality of health services, prevention measures and medical products. It advises the responsible ministers. They encourage, advice and enforces when needed the healthcare providers in order to contribute to 'responsible' care.

#### *National Ambulance Dispatch Center*

The Landelijke Meldkamer AmbulanceZorg (LMAZ, National Ambulance Dispatch Center) is an organisational element of the Ministry of Health, Welfare and Sport. In case of a major incident, disaster or crisis<sup>55</sup> they have a facilitating role. This organisation has been set up by the Dutch National Police Services Agency and a few regional ambulance facilities (RAV; regionale ambulancevoorzieningen). The regional ambulance facilities outsource operators to the National Ambulance Dispatch Center. The National Ambulance Dispatch Center steering group consists of the members of Ambulancezorg Nederland (AZN; Netherlands ambulance care), the Council of Regional Medical Officers (Raad van Regionaal Geneeskundig Functionarissen) and the Ministries of Health, Welfare and Sport and of the Interior and Kingdom Relations. The steering group protects the interests of the regional ambulance facilities, the regionally organised medical assistance at accidents and disasters and hospitals at the National Ambulance Dispatch Centre and provides tactical steering of the National Ambulance Dispatch Centre in consultation with the manager. The National Ambulance Dispatch Centre is a support control centre for the regular ambulance dispatch centres. In contrast to regular ambulance dispatch centres, the National Ambulance Dispatch Centre does not have a primary organisational function. The National Ambulance Dispatch Centre has been commissioned by the Ministry of Health, Welfare and Sport to provide 'support in the broadest sense of the word'.

#### *Mobile Medical Teams*

The Netherlands is subdivided into eleven trauma regions. Eleven trauma centres assigned by the Minister coordinate the emergency assistance given to accident victims in these areas. The Academic Medical Center and the VU Medical Centre trauma centres are responsible for the Northwest of the Netherlands area. The VU trauma centre makes agreements with the affiliated safety regions, but the central agreements are concluded through regional meetings on emergency assistance. The trauma centre is in contact with regional medical officers and medical assistance at accidents or disasters managers in case of large-scale accidents and disasters. There are eleven mobile medical teams in the Netherlands.

Four trauma regions have a trauma helicopter with which the mobile medical team can arrive on site quickly. The helicopters are stationed at Amsterdam, Rotterdam, Nijmegen and Groningen. Trauma helicopters from Belgium and Germany can also be mobilised within the Netherlands. The whole of the country can be reached by helicopter. The helicopter for the Northwest of the Netherlands is stationed at the VU University Medical Center (VUMC; Vrije Universiteit Medisch Centrum) in Amsterdam.

#### 4.2.4 *Ministry of Foreign Affairs*

The Ministry of Foreign Affairs keeps in contact with embassies and consulates. This ministry became involved in the accident in its capacity as one of the parties that were informed and had a role as liaison to embassies and consulates. An embassy is a diplomatic representation of a country in another country. The embassy arranges communication and negotiations between the two countries and cultural exchanges. It also acts as the point of contact for citizens of the homeland who at that time are staying in the host country. A consulate represents a country to the population of another

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55 The National Ambulance Dispatch Center was involved in the accident by alerting ambulances and mobile medical teams.

country mainly in the area of registry, the issue of visas and the promotion of trade contacts. In the case of the accident of the Turkish Airlines airplane ten embassies and/or consulates were involved because the aircraft carried passengers of various nationalities.

#### *4.2.5 Ministry of Justice*

The Ministry of Justice is responsible for 'the foundation of the legal system', i.e. the Dutch and international legal system, judicial procedures and legal assistance, enforcement of law and order and combating crime (including sanction application). The Minister of Justice heads nine agencies and the autonomous administration of justice. The ministry is responsible for the admittance of aliens into the Netherlands and for the repatriation of those who are not allowed (anymore) to remain in the Netherlands.

### 4.3 FOREIGN ORGANISATIONS INVOLVED

#### *Turkish Airlines*

Turkish Airlines is a Turkish airline established in 1933 that has its registered offices in Istanbul. It is the national airline of Turkey and serves more than 170 destinations in Europe, the Middle-East, Asia, Africa and the United States of America. The hub is Istanbul Ataturk Airport in Istanbul. The airline had a fleet of 134 Boeing and Airbus aircraft, including 52 Boeing 737-800 aircraft, at the time of the accident at Schiphol.

As with other airlines, Turkish Airlines is responsible for maintaining a record of passenger information. The International Civil Aviation Organization (ICAO) has laid down guidelines for this. Dutch legislation includes various regulations on this topic.



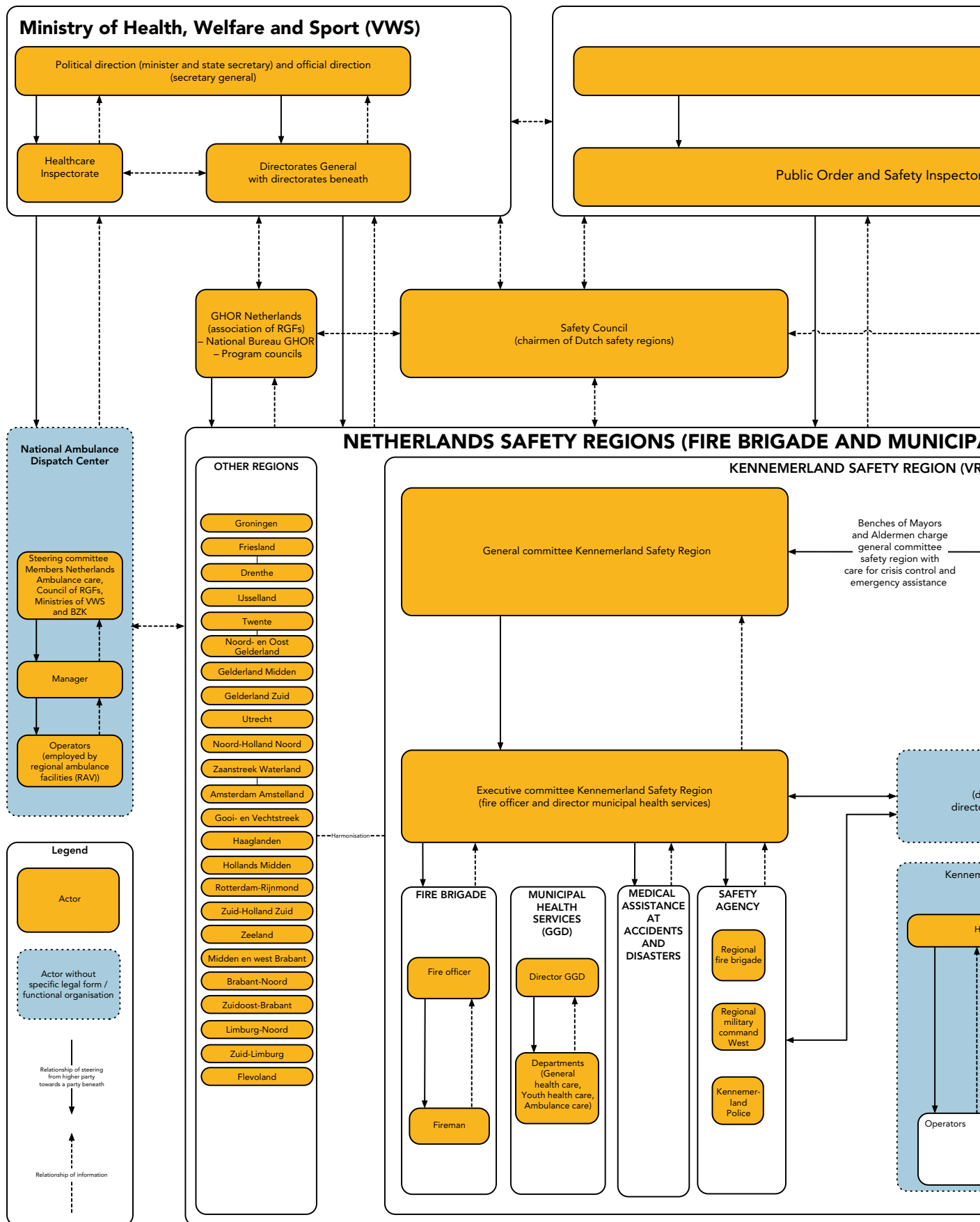
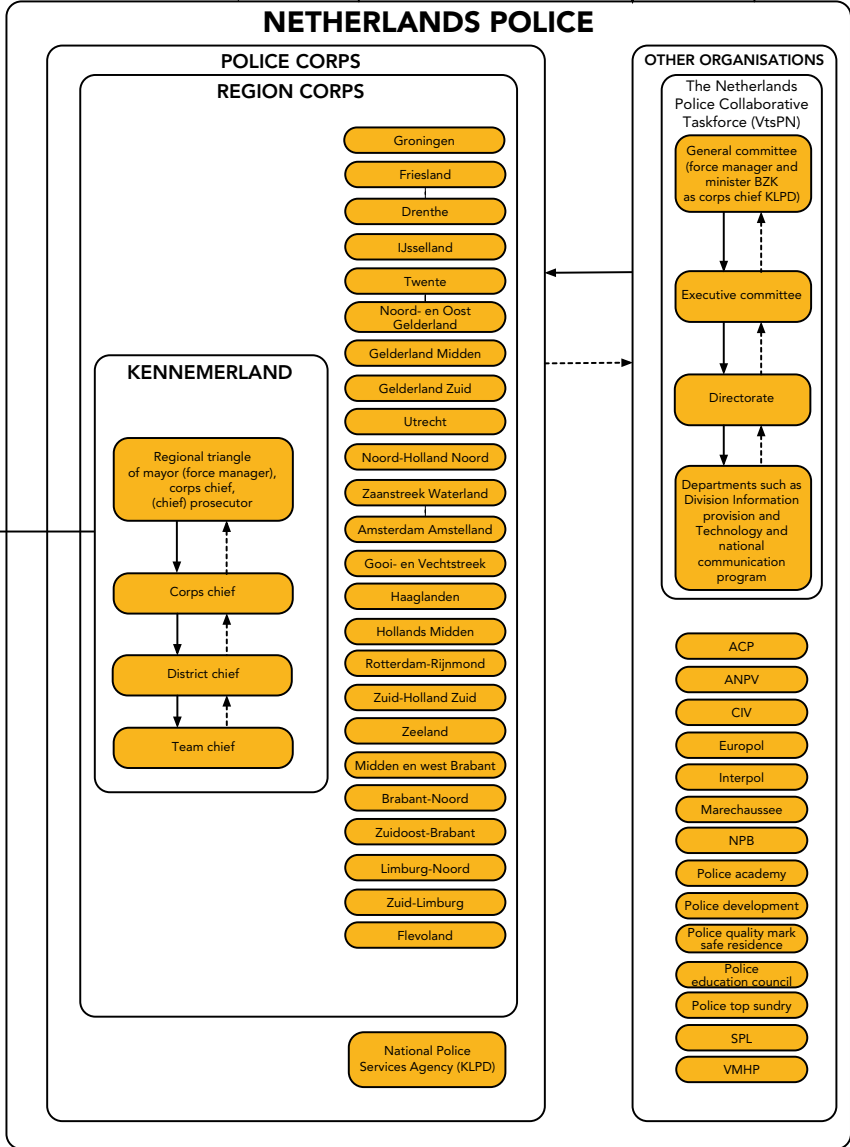
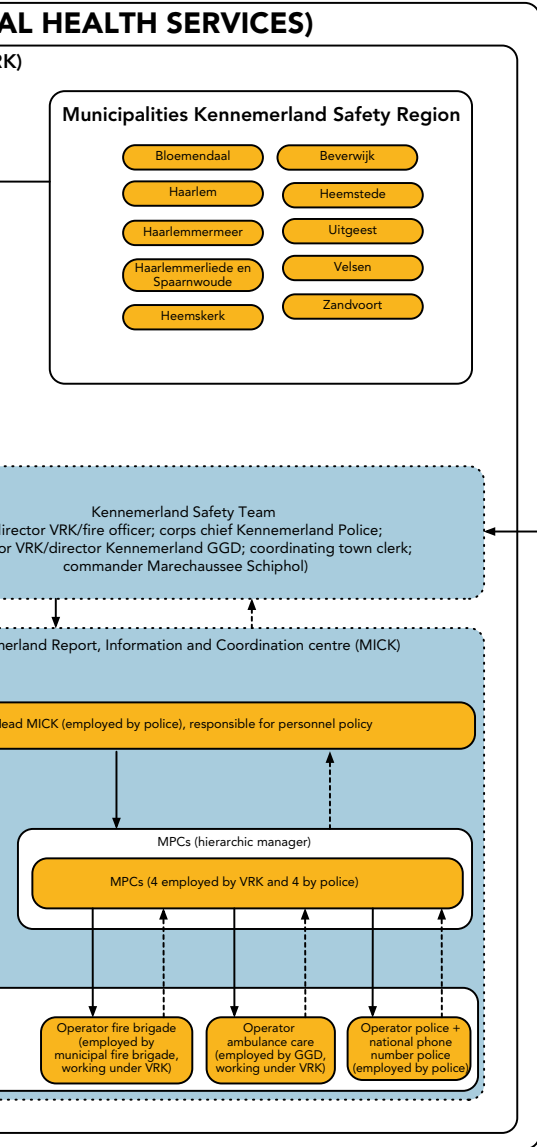
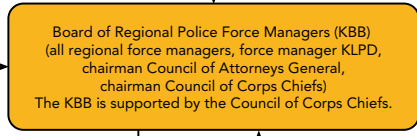
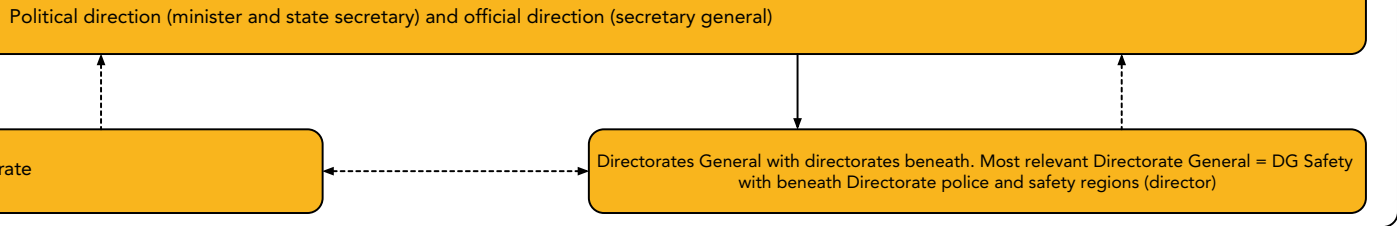


Figure 7: The involved persons with regard to administrative issues in the emergency services provided on 25 February 2009. The relations within the framework of terror threat are not included.

# Ministry of the Interior and Kingdom Relations (BZK)









## 5. ANALYSIS

### 5.1 INTRODUCTION

The number of fatalities remained relatively low under given circumstances of the aircraft accident on 25 February 2009. The aircraft had 135 people on board, seven of whom were crew members. Five passengers and four crew members died during the accident. Almost all of the 126 survivors sustained injuries. Only six people were physically uninjured.

The detrimental consequences of the accident were relatively limited as a result of the efforts of all members of the emergency services, employees of the Municipality of Haarlemmermeer, Schiphol Airport, and also due to the spontaneous assistance provided by bystanders and the passengers' ability to cope with the situation.

The aim of this investigation is to assess whether any lessons can be learned from the sequence of the emergency response process after the accident, in order to improve these responses to major accidents in the future. This main question can be divided into the following subissues:

- What was the sequence of the emergency assistance in practice?
- Did any problems arise during the provision of emergency assistance?
- What were the causes of these problems?
- What lessons can be learned?

Each section starts with a brief description of the sequence of events and the problems that were experienced during the process. The factors that contributed to the occurrence of these problems are then described in more detail.

After analysis of the first findings from the investigation, it became apparent for the Board that a number of factors that had contributed towards the problems identified in the four subprocesses had also been noted<sup>56</sup> during earlier disasters and major accidents, i.e.:

- Overload of the central ambulance services;
- Plans, procedures and guidelines are not practical in case of a major incident;
- Training and practice relating to large-scale, multidisciplinary operation of control rooms is limited;
- Management in communication via C2000.

This section contains a more detailed analysis of the sequence of the emergency assistance process as described in Section 2. In the following sections, the Board explores the following key areas in greater detail:

- The processing of notifications of the accident, raising the alarm and control of the emergency services units;
- The registration of victims and provision of information to the hospitals about the distribution of the injured persons between them;
- The provision of information to next of kin and other interested parties;
- Communication via C2000 during the emergency assistance on site.

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<sup>56</sup> Report by the Netherlands Institute for Physical Safety - GHOR academy - Communication, deviations from routine handling and the limited value of protocols: repeat problems at five recent disasters (flitsrampen) in the Netherlands. (2007)

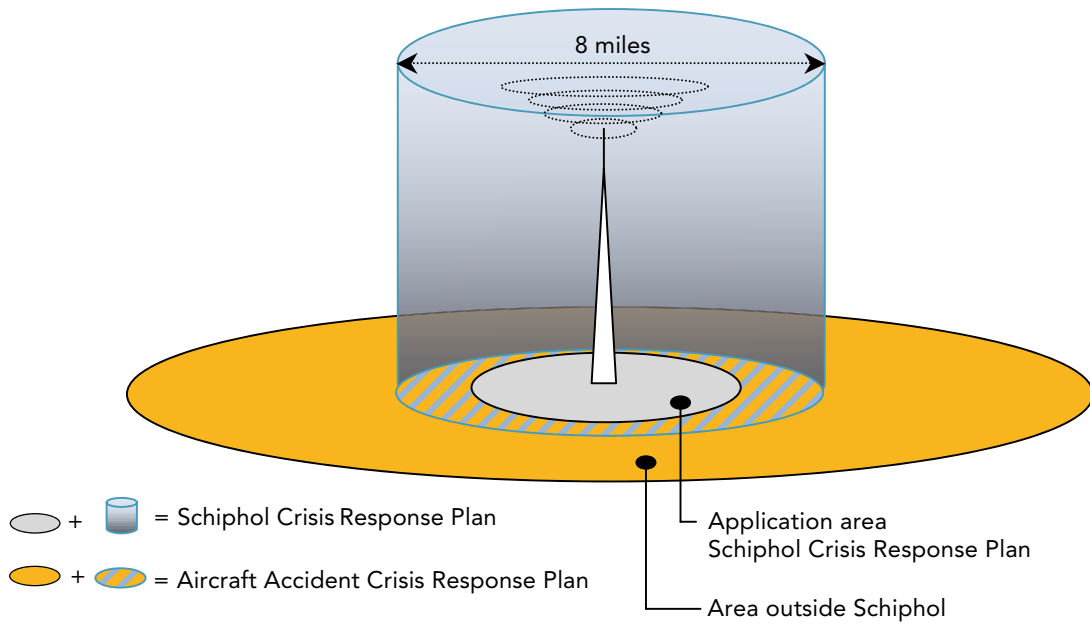


Figure 8: Kennemerland Crisis Response Plan zone for aircrafts

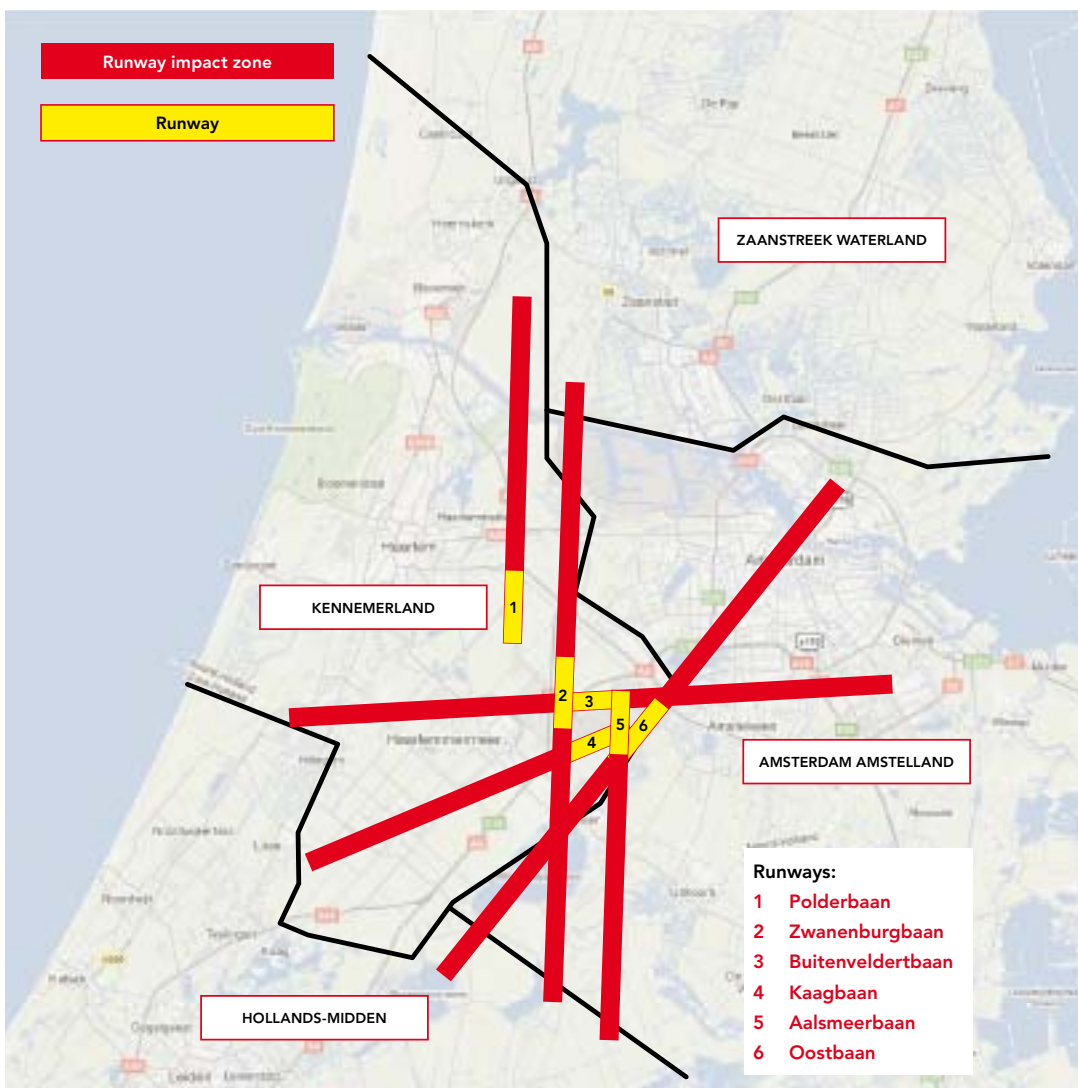


Figure 9: Overview of the runways in the Schiphol Airport risk area in relation to the four safety regions

## 5.2 PROCESSING REPORTS AND ALERTS ISSUED BY EMERGENCY SERVICES

### 5.2.1 Crisis response plans

The Dutch disasters and major accidents Act demands the drawing up of crisis response plans for disasters and major incidents for which the location, type and consequences can be anticipated. These plans are referred to as crisis response plans in the Kennemerland Safety Region. Two crisis response plans anticipate for an aircraft accident scenario in the Kennemerland Safety Region. The location of the crashed aircraft, within or outside the airport site, determines which crisis response plan is applicable. The Schiphol Crisis Response Plan includes, for example, the airport site (see Figure 8). The Kennemerland Aviation Accident Crisis Response Plan is applicable to accidents that take place on land outside the Schiphol Airport site. The emergency services required for a crisis on an airborne aircraft and for which the crew reports their situation to the air traffic control staff at Schiphol Airport are organised in the first-mentioned plan, the Schiphol Crisis Response Plan. Aircraft contact the local air traffic control staff (runway controller) within a zone of 8 nautical miles (about 15 kilometres) around the air traffic tower.

### Deployment scenarios

The Kennemerland Safety Region has described the scenarios of the most probable accidents in the crisis response plans. The Kennemerland Safety Region used these scenarios to determine which emergency services are required to respond appropriately to the scenario concerned, resulting in the deployment scenarios. The Kennemerland Safety Region assessed the probability that the crew and passengers would survive an aircraft accident outside the Schiphol Airport site as very low when drawing up crisis response plans. The operational preparation however was still based on the principle that victims could possibly be saved. The plans are focussed on victims on the ground such as residents of a house on which the aircraft landed. In case of an accident in a rural area, a polder, the Kennemerland Safety Region did not expect any victims because usually one does not expect people in a polder. The Kennemerland Safety Region, therefore, had decided that a limited deployment of emergency services was required for this scenario. In case of an accident with a landing or departing aircraft at Schiphol Airport, the opposite would be the case. In such a case, the Kennemerland Safety Region would deploy large numbers of emergency service units to prevent or fight fire and to free the passengers.

### 25 February 2009

The Turkish Airlines aircraft disappeared from the radar approximately 1 nautical mile (1.8 kilometres) before the runway and crashed outside the Schiphol Airport site without a fire breaking out. The consequences corresponded with the crisis response plan the Kennemerland Safety Region had prepared for an accident at the Schiphol Airport site and not with that of the crisis response plan for an accident outside the Schiphol Airport site. The Kennemerland Safety Region applied the wrong scenario and, therefore, the emergency services were deployed on a large scale immediately.

### Subconclusion

- The crisis response plans of the Kennemerland Safety Region assessed the probability that the crew and passengers would survive the accident if an aircraft crash occurred outside the Schiphol Airport site as very low because they always assumed a fire would break out. In that case, not many emergency services vehicles would be required to save passengers. The 25 February 2009 accident has shown that an aircraft crash can be survived by many. The Kennemerland Safety Region applied the wrong scenario, Vliegtuig Ongeval Schiphol (VOS) 6 (Schiphol aircraft accident alarm code 6), which did result in an immediate deployment of emergency services on a large scale.

### One airport and four crisis response plans for the areas bordering on to Schiphol Airport

The Guideline to aircraft accident response procedure at airport sites (Leidraad vliegtuigongevallenbestrijding op luchtvaartterreinen) that was published in 1997 by the Ministry of the Interior and Kingdom Relations states that approximately 85% of accidents in civil aviation occurs during take-off or landing near the airport. Approximately 75% of accidents occur within a zone that covers 150 metres on both sides of the take-off/landing runway and up to 1 kilometre in front and behind the runway. The zone in which 75% of accidents occur lies completely within the gates of Schiphol

Airport. Another 10% of accidents occur in a strip that is relatively close to the airport: it covers 10 kilometres around the airport site in global terms. When this zoning is placed over the take-off and landing runways of Schiphol Airport, the risk area covers four safety regions. This is shown in Figure 9. They are the safety regions Amsterdam-Amstelland, Hollands Midden, Zaanstreek Waterland and Kennemerland.

Schiphol Airport is one of the main sources of risk in all four safety regions. All four safety regions have their own crisis response plan. The crisis response plans of the Amsterdam-Amstelland and Kennemerland Safety Region pay specific attention to the risks of the Schiphol area. The Zaanstreek Waterland and Hollands Midden safety regions do not have a plan for aircraft accidents. The airport site itself also has a crisis response plan. In total there are three crisis response plans applicable to the risk area of Schiphol Airport.

#### **Subconclusion**

- The Schiphol Airport risk area is located within four geographically delimited safety regions. The crisis response plans and emergency services for the Schiphol Airport risk area is managed by two of the four safety regions and Schiphol Airport.<sup>57</sup>

#### *5.2.2 Summary of the process sequence*

At the time of the accident, the clouds were low and visibility was limited. The air traffic controller in the West tower near the Polderbaan runway (also called runway 18 Right or 18R) could not see the runway. The runway has an instrument landing system (ILS) so the low visibility is not a problem for air traffic. The traffic controllers of Air Traffic Control the Netherlands monitor aircraft movements using radar images. The images presented to the traffic controllers originate at the secondary radar. This radar only receives signals that are emitted by an aircraft. The presented radar image is refreshed every four seconds. The Air Traffic Control the Netherlands computer system adds all known flight information to the radar image which, therefore, displays a labelled aircraft (see Figure 10). The system supports the air traffic controllers and also predicts the expected flight plan on the screen. The aircraft that emits the signal is required to fly at a minimum altitude for the radar to be able to receive the signal.

#### *Transfer and disappearance*

During the approach of the aircraft at 10:15:02 local time, the approach controller transferred contact to the runway controller. The runway controller and his colleague in the West tower, the ground controller, were not aware that there was anything wrong with the aircraft. The radio contact was normal and even after issuing the final authorisation to land there was no indication that there was a problem (see Figure 11).

When the runway controller expected the aircraft to land based on the predicted flight plan stated by the system, the aircraft did not show up and the runway controller realised that the aircraft had 'disappeared'.

#### *Information processing*

After the runway controller had contacted the approach controller again, he realised the aircraft had really disappeared and he had no other course of action than to conclude that the aircraft had crashed on the short final. The short final is the area of approximately 1.8 kilometres before the beginning of the runway. As it was the Polderbaan, this meant that the aircraft had crashed outside the Schiphol Airport site. Once he had concluded that this was what had happened, the traffic controller contacted the Schiphol Airport Control Centre and reported the disappearance of the aircraft.

57 Schiphol Airport recognised this omission when reading the draft report and contacted the other two safety regions, Hollands Midden and Zaanstreek Waterland, to come to an agreement.

*Kennemerland control room, no information regarding exact location of aircraft was exchanged*

The accident was first reported to an operator at the Kennemerland Report, Information and Coordination Centre (MICK; Meld- Informatie en Coordinatiecentrum Kennemerland) about one minute after the accident occurred (10:27 local time). During this conversation, a witness stated to have seen an aircraft crash near the A9 and the Rottepolderplein. A second report was received during this conversation by another operator of the same control room. During this conversation, the witness provided a description of the exact location (between the Kromme Spieringweg and the A9 motorway). In both cases the crucial information regarding the location of the aircraft was not exchanged by the operator concerned with the other operators in the Kennemerland control room using the integrated control room system that is specifically designed for this purpose (refer to Annex 6) or in any other way.

The control room had only recently been put into service. The facilities to visualise the location at the Kennemerland control room were, therefore, not all operational. Other operators at the Kennemerland control room did enter the reports that followed into the system. Within three minutes after the first report, the following data was entered into the system: *aircraft accident; on A9 42.2 left; people walking off the aircraft, aircraft not on fire.*

The information entered into the integrated control room system regarding the site of the accident was not read by the operators of the other disciplines because they were performing their own tasks. At 10:44 local time, 18 minutes after the accident, the exact location (*Kromme Spieringweg 74*) was entered into the integrated control room system by the operator receiving this information from the first ambulance on site. The aircraft accident was first reported at 10:27 local time. The whole of the Kennemerland control room did not know where the aircraft had crashed until 10:44 local time.

*The exact location was not known at first at Schiphol Airport*

The runway controller in the West tower could not see any smoke or fire. He indicated that the aircraft had disappeared at the *short final* before runway 18R. *Final* of a runway is the flight path that starts at about 10 nautical miles (18 kilometres) before the runway threshold, the start of the runway. *Short final*, a term first used at the start of the radio telegraphy period and still in the ICAO Manual of Radiotelephony, indicates the last section of about 1 nautical mile (1.8 kilometre) before the runway, an area outside the Schiphol Airport site.

The traffic controller reported the disappearance of the aircraft to the Schiphol Control Centre including all the information he had at the time. During the conversation between the runway controller, the operator at the Schiphol Control Centre and the Airside Operations Manager, the Airside Operations Manager ordered the VOS 6 alarm scenario<sup>58</sup> to be put into action to be on the safe side. After all, everything indicated that the aircraft had run into trouble on its final approach to Schiphol Airport. The Schiphol Control Centre sounded the VOS 6 alarm at 10:28 local time with the following message on the C2000 communication system: *"For all on these channels: We have a VOS 6 at runway 18 Right"*. This instructed the airport fire brigade to go to the head of runway 18R. The Airside Operations Manager requested the safety services at Schiphol Airport to prepare emergency services rendezvous point A (UGS A) for the reception of the Schiphol emergency services and emergency services rendezvous point C (UGS C) for the assisting regional emergency services (see Figure 3). The Airside Operations Manager, however, did not discuss this with the Schiphol Control Centre. The Kennemerland control room was, therefore, not informed regarding the rendezvous point.

The information provided by the air traffic controller stated a missing aircraft (flying over land). The Kennemerland Safety Region crisis response plan and the Schiphol crisis response plan did not anticipate this scenario; i.e. that an aircraft disappears.<sup>59</sup> The disappearance of an aircraft may involve not only Schiphol Airport but also one of the four neighbouring safety regions. The role of the Airside Operations Manager, as the person responsible for the operational safety at the airport, is crucial when determining the location of the problem when Schiphol Airport sounds an alarm.

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58 VOS 6 – VliegtuigOngeval Schiphol 6 (Schiphol aircraft accident)- Alarm scenario for a real aircraft accident at the airport with a passenger aircraft carrying 50 to 250 passengers.

59 The Kennemerland Safety Region does have a scenario for an aircraft disappearing when flying above sea.





Figure 10: The radar plot on which aircraft TK1951 is still indicated, six miles before the runway.



Figure 11: The next radar plot, just before flight TK1951 is no longer visible. After the next screen refresh, the aircraft had disappeared.

### **Subconclusion**

- The role of the Airside Operations Manager, as the person responsible for the operational safety at the airport, is crucial when Schiphol Airport sounds an alarm. The decision of the Airside Operations Manager has a far-reaching effect on the deployment of (supra) regional emergency services. The Kennemerland Safety Region crisis response plan and the Schiphol crisis response plan did not anticipate a scenario in which an aircraft disappears when flying over land.

#### *Regional fire brigade and ambulance emergency services lost time driving to the site*

An operator at the Kennemerland control room (where they listened to the C2000 channel on which the Schiphol Control Centre raised the VOS 6 alarm) and who knew an aircraft had crashed but not the exact location of the accident site, entered the VOS 6 alarm. The VOS 6 (Vliegtuigongeval Schiphol 6) is a scenario for an accident which occurs at the airport. This accident occurred outside the airport site. The Kennemerland control room should, therefore, have followed the 'aviation accident, rural, large aircraft' scenario. The information on the exact location was not exchanged at the Kennemerland control room. The required people were, therefore, not informed on the correct location of the accident. The VOS 6 alarm was copied by the operator and this was not corrected by anyone in the integrated control room system at the Kennemerland control room.

The fire brigade vehicles could not be alerted once the report was received, because the alarm system of the integrated control room system requires the operator to first select an emergency services rendezvous point if the alarm type is VOS 6. The fire brigade operator contacted the Schiphol Control Centre to find out which emergency services rendezvous point would be used but was told that the Schiphol Control Centre did not have time to communicate with the Kennemerland control room. This operator subsequently selected emergency services rendezvous point A, which is the most often used emergency services rendezvous point (in deviation of the Schiphol Crisis Response Plan). He did not choose rendezvous point C, which Schiphol Airport was, at the same time, preparing for the assisting emergency services.

The VOS 6 scenario states that the fire brigade should alert two fire brigade units, one of which should be supraregional. The supraregional unit from the Amsterdam-Amstelland Safety Region was not alerted until 10:44 local time. The reason why the second unit was not alerted could not be determined during this investigation.

The alerting and dispatch process of the (first) emergency services units that subsequently was set into motion is summarised in Figure 12.

The ambulances and the fire brigade vehicles from the Kennemerland Safety Region including the vehicles stationed in the Municipalities of Haarlemmermeer and Heemstede, were initially sent to the emergency services rendezvous point A at the Schiphol Airport site by the Kennemerland control room. Approximately fifteen minutes after the first report was received, the Kennemerland Safety Region fire brigade vehicles arrived at emergency services rendezvous point A. The coordinator at the emergency services rendezvous point A, subsequently, sent them to the accident location on the Kromme Spieringweg, where they arrived 28 minutes after the first report was received. The airport fire brigade had arrived ten minutes earlier. A number of ambulances had already arrived, one of which had been driving past the accident site by coincidence. This ambulance had independently decided to drive immediately to the accident site.

#### *Administrative scaling-up*

Administrative scaling-up was also performed by the Kennemerland control room as well as mobilising the different emergency services units based on the VOS 6 scenario. This was carried out using the Coordinated Regional Incident Control Procedure (GRIP). According to the Schiphol Crisis Response Plan of the Kennemerland Safety Region, the control room should scale up to the Coordinated Regional Incident Control Procedure 3 (GRIP 3) in case of a VOS 6. The investigation has shown that the Kennemerland control room first scaled up the incident to GRIP 3 at 10:30 local time. At 10:31 local time, an operator scaled down to GRIP 2. At 10:35 local time, an operator again scaled up to GRIP 3 after the Multidisciplinary Process Coordinator intervened. The officials who are to be alerted in case of GRIP 3 scenarios were next alerted by the Kennemerland control room (see Annex 5).

Emergency services	Unit	The time between the report and the arrival at the accident site <sup>60</sup>	Standard times for the arrival at accident sites <sup>61</sup>
Police	Kennemerland Police	10 minutes	n.v.t.
Fire brigade	Schiphol Airport fire brigade <sup>62</sup> Haarlemmermeer fire brigade	18 minutes 28 minutes	15 minutes 15 minutes
Medical services	First ambulance on site	18 minutes	15 minutes
	First mobile medical team (Rotterdam trauma helicopter)	55 minutes	30 minutes
	Kennemerland ambu-teams and SIGMA	64 minutes	60 minutes

Table 2: Summary of the arrival times of the first emergency services units arriving on site after the accident was reported to the Kennemerland control room. The Safety Board is aware that the standard times apply for the destination set by the control room.

### Subconclusions

- On 25 February 2009, the Kennemerland control room applied the incorrect scenario because of which the emergency services were deployed on a large scale instead of on a limited scale as the plans stated.
- When a (wrong) decision is taken at the start of an emergency services deployment, this has an impact throughout the deployment development of the emergency services.
- A few medical emergency services arrived late at the accident site because the control room did not direct them directly to the accident site. The reason for this was that the Kennemerland control room adhered to the agreements for a scenario of an accident at Schiphol Airport even after it had become clear that the aircraft had crashed outside the airport site.

#### *The mobile medical teams were not (immediately) alerted*

The Kennemerland control room did not call in a mobile medical team (MMT) even though this is the standard procedure which is used on a daily basis in case of major accidents. The Kennemerland control room also did not take notice of the explicit request by the first ambulance for a MMT at 10:44 local time. The MMTs are essential when providing emergency medical assistance to victims with life-threatening injuries such as trapped victims. The MMTs were alerted at a later stage through the assistance of the control rooms of the other safety regions. The first MMT that was offered by the Rotterdam-Rijnmond control room arrived 54 minutes after the aircraft accident, while the standard time is 30 minutes if the Kennemerland control room deploys the MMT in accordance with the standard procedure. The second MMT, from Amsterdam, arrived 63 minutes after the first report was received. The third MMT, from Nijmegen, arrived after 84 minutes. The Nijmegen team could not contact the Kennemerland control room, therefore, they contacted the control rooms of the other safety regions. A full hour after the first report was received, the exact location could not be specified. Therefore, the helicopter from Nijmegen first searched near the village Vijfhuizen until it found the accident site.

60 The times were determined based on the Dutch Directorate-General for Public Works and Water Management (RWS) cameras and the audio tapes of the control centres concerned.

61 Sources for the arrival times, care standard risk classification, Dutch Safety Regions Act, GNK-C guideline, Ministry of Interior & Kingdom Relations 1997. These times apply to the arrival at the destination provided to the vehicle staff by the control centre.

62 The airport fire brigade became part of the regional fire brigade when it left the Schiphol Airport site.

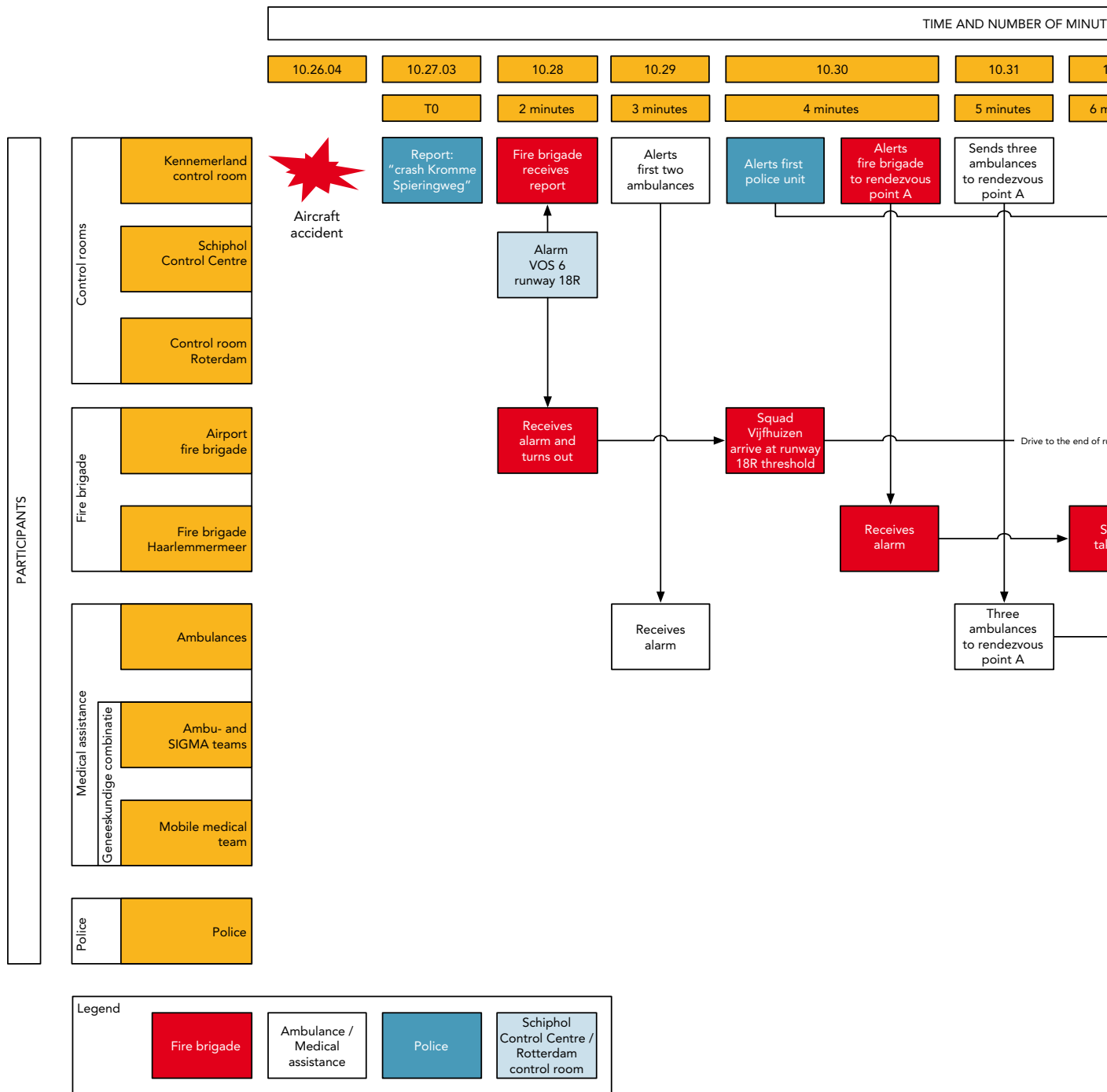
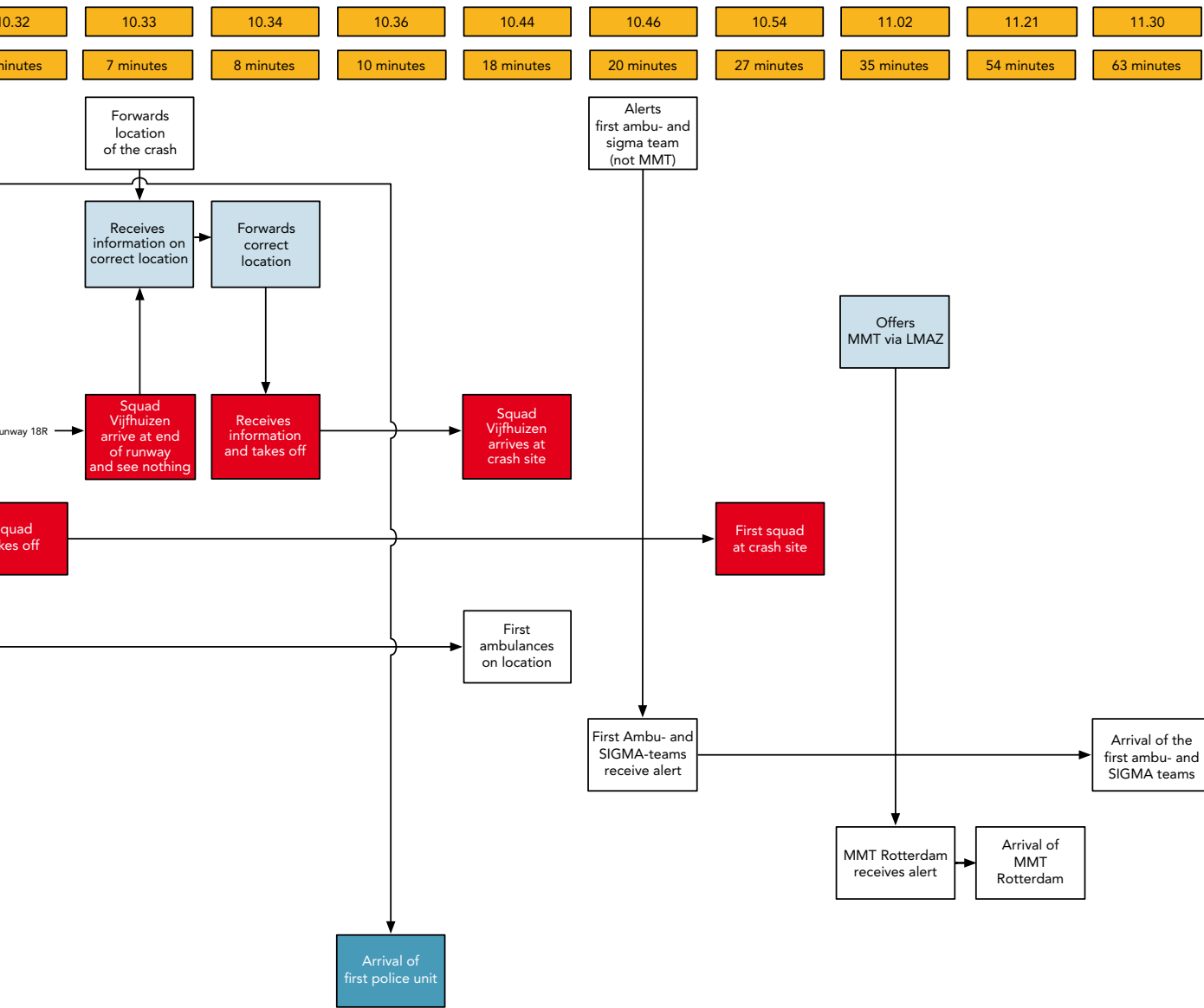


Figure 12: Timeline with regard to sounding the alarm and arrival of the emergency services units

EVENTS PAST AFTER THE FIRST REPORT TO KENNEMERLAND CONTROL ROOM





One of the victims died after arrival of the first MMT. Causal connection between the late alerting/ arrival of the MMTs and the death of passengers has not been investigated, also because autopsies were not performed on the deceased passengers. An exploratory study regarding survival issues is included in Annex 7. This study is derived from the investigation of the Dutch Safety Board into the cause of the aircraft accident, which was published on 6 May 2010. This study provides information about the gravity of the injuries of the occupants, as a function of the aircraft seat where they were allocated.

When the (airborne) MMT of the VU Medical Centre from Amsterdam had been deployed immediately, this team could have been on site ten minutes after the first report and not after 55 minutes as was the case. One of the victims died after arrival of the first MMT. It has not been investigated whether there is a causal relationship between the late alert/arrival of the MMTs and the death of the persons who had been on-board the aircraft because an autopsy was not performed with regard to these persons.<sup>63</sup> Despite all the efforts of the nurses at the accident site, specialist knowledge that is reserved to the MMT was lacking during the first 45 minutes (after which the MMT from Rotterdam arrived) due to the late arrival of the MMTs.

The Kennemerland control room contacts the Amsterdam ambulance dispatch centre regarding the deployment of the VU mobile medical team on a daily basis. The Kennemerland control room requested the assistance of 55 ambulances for this accident. The investigation shows that the Amsterdam control room decided only to provide that which was explicitly requested. The mobile medical team was, therefore, not offered by the Amsterdam controlroom. The Noord-Holland North control room received a request from an ambulance nurse in the field to alert the mobile medical teams at approximately 11:00 local time. The Noord-Holland North control room next contacted the National Ambulance Dispatch Center and, after contacting the Kennemerland control room, immediately dispatched the trauma helicopters with the mobile medical teams.

The administrative response from the Kennemerland Safety Region to the draft report has shown that the safety region views not alerting mobile medical teams as a minor problem. This response worries the Safety Board. The importance of the acute medical emergency assistance provided by mobile medical teams is seriously underestimated due to this response.

Not only were the airborne mobile medical teams not alerted as is standard procedure but the land mobile medical teams such as the teams of the Academic Medical Center (AMC) in Amsterdam and the Leiden University Medical Center (LUMC) were not requested to assist either.

The following was also observed:

- The medical combinations from the region of the accident were not alerted immediately. The response time of the Kennemerland regional medical combinations was 60 minutes. They arrived just after the standard response time expired. As such, this is not a serious deviation. The Kennemerland control room, however, did not alert the medical combinations in their own region (Ambu-teams and SIGMA) until 10:46 and 10:52 local time either. This is 20 and 26 minutes after the accident, respectively.
- The National Ambulance Dispatch Centre (LMAZ) did not alert the ambulances until the request was issued by the Amsterdam control room. The Kennemerland medical assistance at accidents or disasters plans indicate that the ambulance assistance had to be requested from the National Ambulance Dispatch Centre. This also applied to the request for the assistance of the medical combinations.<sup>64</sup> This agreement was in force since 20 December 2007.<sup>65</sup>

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63 The Dutch Public Prosecution Service and the Dutch Safety Board have the authority to perform an autopsy with regard to an investigation to, thus, determine the cause of death of victims. The Dutch Public Prosecution Service and the Dutch Safety Board only performed autopsies on the pilots. Immediately after the accident, the Safety Board saw no reason to perform an autopsy on the other fatalities. The Safety Board shall consider due to these findings whether a wider consideration should be made with regard to any new incidents.

64 Kennemerland Region Crisis Plan, GHOR subplan: Geneeskundige Hulpverlening Somatisch (Emergency medical somatic services), December 2008, page 11.

65 Letter dated 4 January 2008 of the Kennemerland Safety Region to the National Ambulance Dispatch Center.

- After the operator of the National Ambulance Dispatch Center was in contact with the operator in Kennemerland at 10:33 local time, first the availability of deployable ambulances was mapped using the Octopus system at the request of Kennemerland (Box 10). The National Ambulance Dispatch Center also called a number of regions to verify actual capacity (an unknown number of regions did not work with Octopus at the time of the disaster). At 10:36 local time, the LMAZ was informed by the Hollands Midden control room that they had sent seven ambulances already. An operational alarm in Octopus was, therefore, no longer efficient. Ambulances from two regions, Hollands Midden and Amsterdam Amstelland, were already on their way. Therefore the Octopus information would not be completely correct which in turn would lead to the wrong results. At 10:45 local time, the LMAZ asked the Kennemerland control room whether they required further assistance or not. The Kennemerland control room stated they did. The LMAZ subsequently contacted the other regions by telephone. If direct alerting had been selected immediately, by using Octopus the alerting of the free ambulances (40 units) would only have required a single digital message. The decision was taken to do no direct alerting. The LMAZ operators were, therefore, required to call each region to request the free ambulances and dispatch these to the location of the accident.

### **Box 10. Octopus**

All ambulance dispatch centres in the Netherlands have been equipped with the geographic information system (GIS) since 2005. This has considerably improved the management of the ambulance transport capacity. The GIS and automatic vehicle location system (AVLS) systems contribute towards the efficient organisation of interregional ambulance transport. Ambulance dispatch centres can view the transport movement of vehicles from other regions in their own area using the link to the GIS system. See figure 13.

A control room, therefore, has the option to dispatch vehicles from other regions for an urgent trip or ordered transport job. The operator first has to contact the control room of the ambulance concerned to ask whether they may dispatch this specific ambulance. The national Ambunet information network and a central server of Netherlands ambulance care (AZN,) in Maarsse in both provide a complete summary of all available ambulances to the ambulance dispatch centres.

Octopus was developed to provide an immediate summary of the data. Octopus is a dynamic system that can provide current information on the available ambulance capacity in the Netherlands in order to be able to organise the required assistance quickly and efficiently via a single action. The need for an information system was explicitly confirmed during the Enschede and Volendam disasters. Octopus provides the required functionality to support control room tasks when up-scaling.

The Dutch National Ambulance Dispatch Center (LMAZ) mainly uses the national summary. The functionality added by Octopus to this consists of a decision support instrument which generates a dispatch suggestion for the needed ambulances, based on the demand and the available capacity in all regions.

On 25 February 2009 Octopus was not yet operational at the Kennemerland control room. The functionality available at the National Ambulance Dispatch Centre at Driebergen was not optimally used. At the request of the Kennemerland control room, the availability was first inventoried and not immediately alerted.

The Dutch Safety Board discusses the contributing factors which resulted in the Kennemerland control room not organising the emergency medical assistance below. The consequences for the emergency medical assistance are described in section 5.3.



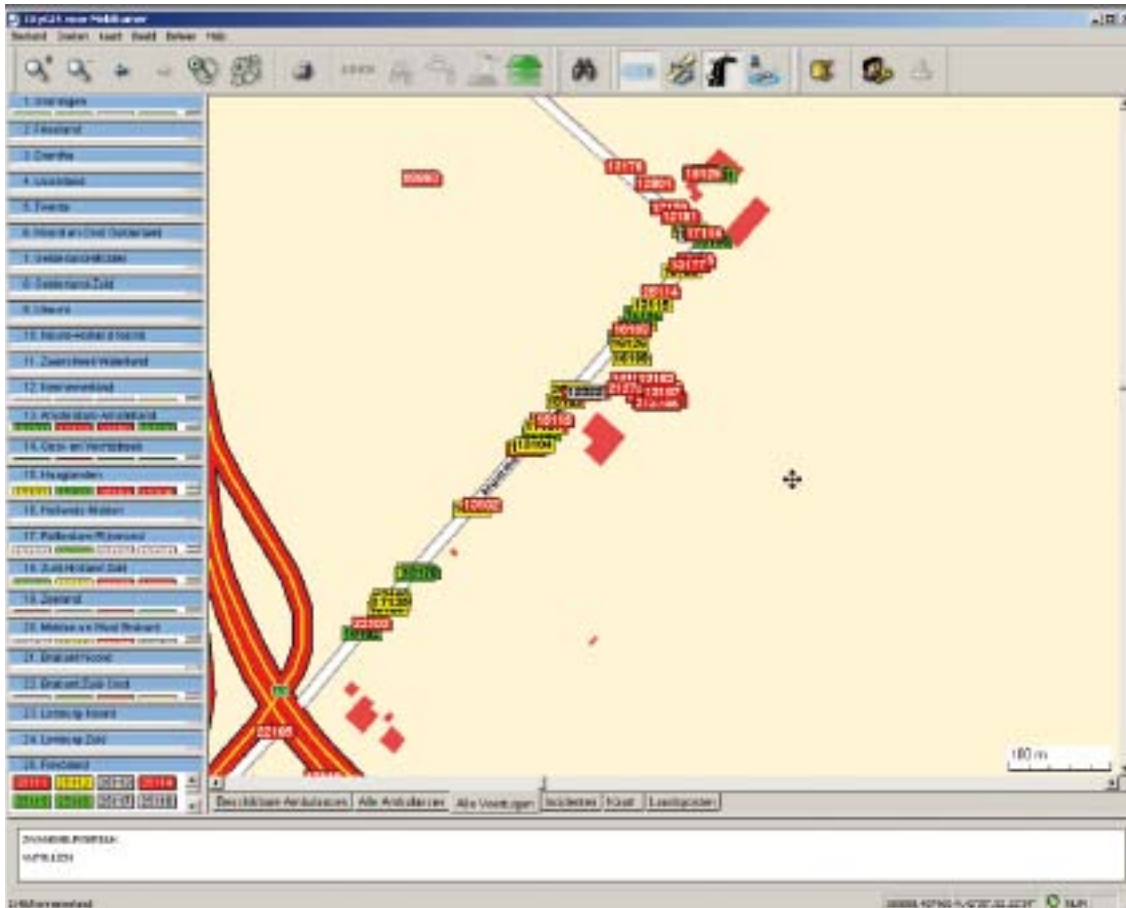


Figure 13: Screen view from the geographic information system (GIS) of 25 February 2009 (Source: LMAZ)

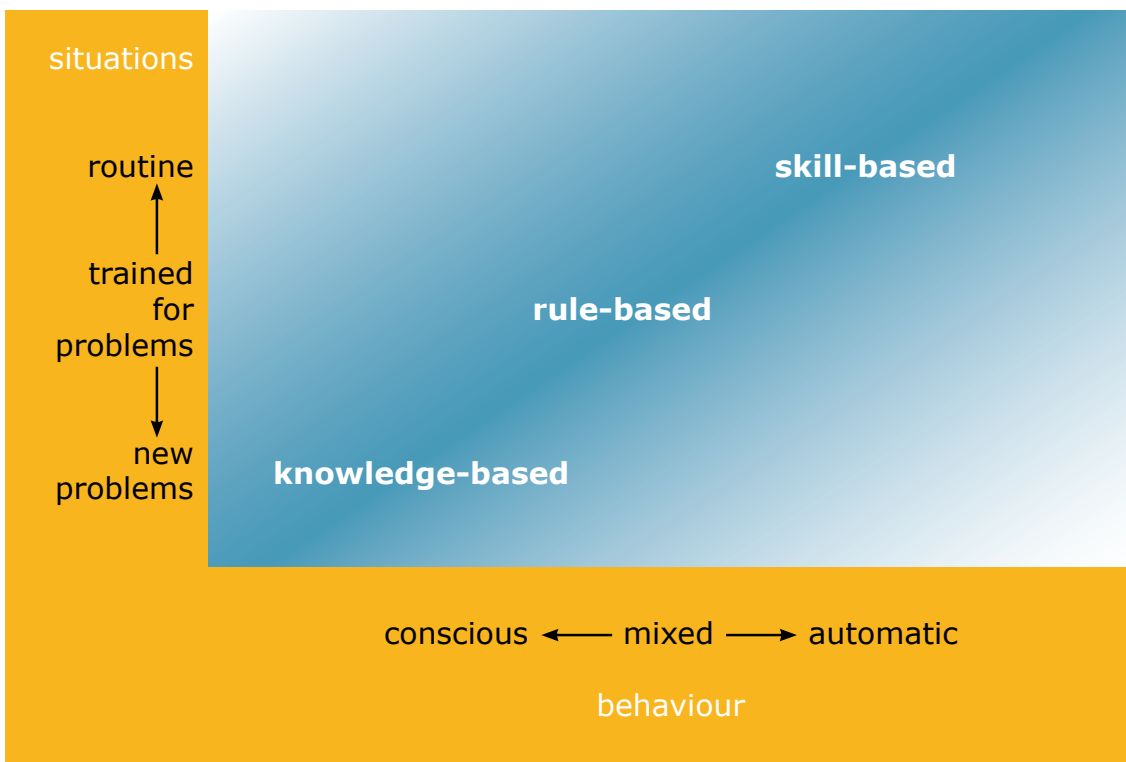


Figure 14: Skill-, rule- and knowledge-based behaviour according to Rasmussen<sup>66</sup>

66 Reason, J.T. (1997), *Managing the Risks of Organizational Accidents*, 11<sup>th</sup> edition. Aldershot: Ashgate Publishing Limited, page 69.

### **Subconclusions**

- The Kennemerland control room did not organise the mobilisation of the emergency medical assistance.
- The Kennemerland control room did not alert the mobile medical teams, even though this is standard procedure which is daily followed in case of accidents. Even after the first ambulance explicitly requested a mobile medical team, the team was not alerted. Mobile medical teams, who have the specific skills and power to perform life-saving actions should be alerted as soon as possible when this type of accidents occur.
- The Kennemerland control room did not request assistance from the Dutch National Ambulance Dispatch Center that could have take over some tasks from the Kennemerland control room in case of this large-scale medical mobilisation in order to decrease the work load at the Kennemerland control room. The National Ambulance Dispatch Centre was alerted by the Amsterdam Ambulance Dispatch Centre.
- The Dutch National Ambulance Dispatch Centre did not use the automatic ambulance dispatch system in Octopus.
- The administrative response from the Kennemerland Safety Region to the draft report has shown that the safety region views not alerting mobile medical teams as a minor problem. Based on this information, the Safety Board has arrived at the conclusion that the Kennemerland Safety Region underestimates the importance of the acute medical emergency assistance provided by mobile medical teams.

#### *5.2.3 Manual information processing*

During the last ten years, a lot of research has been carried out within (aviation) industry why wrong decisions are made by people. In order to be able to find out why it went wrong, one first needs to map the standard routine. Well-known scientists such as James Reason (University of Manchester) and Jens Rasmussen (Risø Laboratory in Denmark) gained significant insight on this subject in cognitive<sup>67</sup> psychology combined with safety management.

The quality of the processing of an alert and the dispatching of emergency medical assistance is mainly determined by how the emergency services workers process the information. Rasmussen developed a model in the 1980s which describes the processing of information by people (see Figure 14). This model distinguishes three levels of human performance: skill-based, rule-based and knowledge-based.<sup>68</sup> It is not a conscious process or even strictly separated levels: people can simultaneously perform activities at various levels. This classification provides a useful framework for the identification of error types that may occur in various operational situations.

##### *Skill-based level*

At the skill-based level, people perform automatically and unconsciously. This usually involves repetitive (routine) tasks. This can be the routine work performed under standard conditions but also includes driving without thinking from A to B.

##### *Rule-based level*

People switch over to a rule-based level of acting when a task has to be performed with more attention. It involves known situations for which one has trained or which are performed based on protocols, plans and procedures. During the application of these rules, people unconsciously combine the signals and symptoms of the problem with the knowledge that has been stored somewhere in their brain. In this last situation especially, people are able to retrieve the order from their brain quickly only to a limited extent, for example, when the environment is hectic or when a situation has a high impact on the processing of information.

67 Cognitive skills are skills related to thinking processes that focus on absorbing, processing, assessing, applying and (re)producing information.

68 This classification, known as the skill-, rule- and knowledge-based behaviour, is described in various publications, for example, by Rasmussen (1979, 1982 and 1987) and Reason (1990).

### *Knowledge-based level*

People do not often perform on a knowledge-based level. These are difficult, unknown circumstances in which one really has to think things through. People are usually not good at this. This is especially true if there is a lot of pressure (time-related or otherwise).

Scientific research has taught us that many mistakes are made when taking decisions. Errors are a fact of life that have to be accepted. Even though skill-based errors are the most frequent types of errors, these are often detected and, therefore, their contribution towards accidents is smaller. Recognising and undoing errors at rule-based and knowledge-based decisions are, however, much less frequent. One of the factors that make detection of errors more difficult at the rule-based and knowledge-based level is the "strong-but-wrong" phenomenon: People ignore the signals that indicate that they are applying the wrong rule and persevere in their action plan.

In a complex situation in which a decision has to be taken quickly and which has been insufficiently drilled and that is not supported by operational checklists, the probability of an error that is not detected and, therefore, not undone, is highest.

This knowledge was used to research the factors that contribute towards problems with determining the exact location of the accident and the alerting of medical units.

#### *5.2.4 Factors that contributed towards the problems related to determining the exact location*

The Dutch Safety Board has identified four factors that contributed towards the Kennemerland control room and the Schiphol Control Centre operators not knowing the exact location of the aircraft for a long time:

1. There was no proper exchange of information and coordination of the determination of the location was lacking at the Kennemerland control room.
2. There was no proper harmonisation between the Kennemerland control room, the Schiphol Control Centre and the Schiphol Airport Airside Operations Manager.
3. There was no internal harmonisation of information between the Amsterdam ambulance dispatch centre and the Kennemerland control room.
4. There was insufficient support of the operators due to missing operational protocols.

#### *No proper internal harmonisation and coordination of information at Kennemerland control room*

The operators have stated that they were too busy handling calls and alerting units immediately after the accident and could not enter the information into the integrated control room system or to check what others had entered in the system. The fire brigade operator at the Kennemerland control room is, however, for alerting the units using the integrated control room system dependent on the exact location. The fire brigade operator did not know the exact location but he did not ask his colleagues at the Kennemerland control room for this information. The coordination of the exchange of information between the operators of the various disciplines is apparently still highly necessary. The coordination was not performed because the responsible party at the Kennemerland control room, multidisciplinary process coordinator, assumed the integrated control room system would coordinate the assistance.

The Ministry of the Interior and Kingdom Relations published the Basic crisis response management requirements<sup>69</sup> in 2006. This lists standards for processes such as reporting and alerting, scaling-up and -down, and the management and coordination of information management. This document states that the principle of processing a major incident is that the incident approach should be transferred from the control room to the multidisciplinary coordination centre. The investigation has shown that this was not performed at the Kennemerland control room. The police operators did move to the separate area for the large-scale and special acting support (SGB0), but there was no multidisciplinary coordinated action at the Kennemerland control room. This created a situation in which crucial information on the exact location of the aircraft, that was reported to the police operators, was not shared with the other disciplines and the exact location of the aircraft was unknown for a long time both to colleague operators at the Kennemerland control room and the Schiphol Control Centre. Only when the first ambulance was on site and the team contacted the Kennemerland control room at approximately 10:44 local time did the Kennemerland ambulance dispatch centre operator

<sup>69</sup> Basic crisis response requirements, naming the local standards (Basisvereisten Crisismanagement, de decentrale normen benoemd ) Dutch National crisis response board, The Hague, November 2006.

know the exact location of the aircraft and was the location entered into the integrated control room system by the ambulance dispatch centre operator. The first police officers on site had also reported the exact location five minutes earlier (at 10:40 local time) to the Kennemerland control room, but this information was again not entered into the system.

According to the basic crisis response requirements, the multidisciplinary process coordinator (MPC) is responsible for the coordination of reporting and alerting and the scaling-up and -down of the alert until the operational team (OT) is operational. A multidisciplinary process coordinator had been working at the Kennemerland control room for a few months prior to the accident. The multidisciplinary process coordinator was to assume the coordinating role in case of large-scale multidisciplinary mobilisation. The multidisciplinary process coordinator depends on the information provided by the operators to be able to perform this role. Research has shown that the multidisciplinary process coordinator did not receive information because the operators and himself had not gotten used to working as a team during the few months they had been together.

There was no common ground because, even though the control room had been put into operation in January 2009, it was not completely ready. The Kennemerland control room did not have the required facilities to present the common information such as maps and on the wall screens.

### **Subconclusions**

- There was no internal harmonisation and coordination of information at Kennemerland control room.
- The operators who were processing the incident were not physically separated from the operators who were performing the daily duties which meant that the tasks got mixed up.
- The operators did not inform the multidisciplinary process coordinator because they were not yet used to this new coordinating role. The coordinator could, therefore, not perform his/her duties.
- The facilities to present the integrated information were not present.

### *No proper harmonisation between the Kennemerland control room, the Schiphol Control Centre and the Schiphol Airport Airside Operations Manager*

The audio tapes at the Schiphol Control Centre have shown that the Airside Operations Manager sounded the Schiphol aircraft accident six alarm code (VOS 6) just to be on the safe side. The decision to select this scenario just to be on the safe side was based on knowledge of the available scenarios (knowledge-based level). The Airside Operations Manager knew that there was no scenario for a situation where an aircraft disappeared from the radar without prior warning from the crew regarding problems on board<sup>70</sup> and without being able to be sure that a crash took place. The air traffic controller no longer saw the aircraft on the radar, could not contact the crew and did not see the aircraft, smoke or fire. Of all the available scenarios, the VOS 6 scenario, that of an aircraft accident with 50 to 250 passengers on its way to Schiphol, fitted the actual situation best.

The Airside Operations Manager can be heard on the audio tapes instructing the preparation of emergency services rendezvous point C for the assisting emergency services and this information is not exchanged with the Schiphol Control Centre nor the Kennemerland control room. The Schiphol crisis response plan does not state who is responsible for the transfer and distribution of this information. The Schiphol crisis response plan does state that the Airside Operations Manager is responsible for the selection of the scenario and the emergency services rendezvous point. The Schiphol Control Centre did not inform the Airside Operations Manager that the Schiphol Control Centre had been informed by the Kennemerland control room regarding reports of a crashed aircraft. If that had been done, the Airside Operations Manager would have immediately known that not only had the aircraft disappeared from the radar but that an aircraft had actually crashed along the motorway A9.

After receiving the VOS 6 alarm via the C2000 communications system, a Kennemerland control room operator linked emergency services rendezvous point A to the incident, because he was not informed on the emergency services rendezvous point by the Schiphol Control Centre. The emergency

<sup>70</sup> Panpan (VOS 1) and mayday (VOS 2 – 4) are warning codes which can be sent by an aircraft crew to the air traffic controller in case of problems.

services, therefore, were all sent to emergency services rendezvous point A. The operator performed at a rule-based level. Emergency services rendezvous point A is the most commonly used emergency services rendezvous point. The operator also knew the incident involved an aircraft on its way to the Polderbaan, runway 18 right. For this runway, as opposed to most scenarios, the standard emergency services rendezvous point is C. The control rooms did not have contact regarding the alarm on the direct line.

A few minutes later, when another Kennemerland control room operator requested the emergency services rendezvous point from the Schiphol Control Centre, the Schiphol Control Centre specified emergency services rendezvous point A and not C. This shows that the internal communication regarding the emergency services rendezvous point between the Airside Operations Manager and the Schiphol Control Centre did not run smoothly. The Airside Operations Manager had, after all, instructed emergency services rendezvous point C to be prepared. The external emergency services, therefore, drove to emergency services rendezvous point A. Emergency services rendezvous point C is much closer to the accident site.

### **Subconclusions**

- The harmonisation between the Kennemerland control room, the Schiphol Control Centre and the Schiphol Airside Operations Manager did not go well. This led to the assumption of two different incidents, a disappeared aircraft and a crashed aircraft, during the first few minutes of the incident.
- The Schiphol Control Centre, furthermore, did not inform the Airside Operations Manager that the Schiphol Control Centre had been informed by the Kennemerland control room regarding reports of a crashed aircraft.
- The Schiphol Control Centre operator did not inform the fire brigade operator at the Kennemerland control room using the direct line regarding the issue of the VOS 6 alert.
- The Airside Operations Manager internally instructed the preparation of emergency services rendezvous point C for the assisting emergency services but the responsibility for forwarding this information to the Schiphol Control Centre and the Kennemerland control room is not defined in the crisis response plans.

### *No harmonisation of information between the Amsterdam ambulance dispatch center and the Kennemerland control room*

At 10:29 local time, the Kennemerland control room requested the assistance of 55 ambulances for a VOS 6 alarm at Schiphol from the Amsterdam ambulance dispatch centre.

The Amsterdam ambulance dispatch centre subsequently received a report from a witness: "*An aircraft crashed near the Kromme Spieringweg. I do not see fire*". The Amsterdam ambulance dispatch centre did not forward this information to the Kennemerland control room. The Amsterdam ambulance dispatch centre did send an ambulance directly to the Kromme Spieringweg. The Kennemerland control room contacts the Amsterdam ambulance dispatch centre regarding the deployment of the VU Medical Centre mobile medical team on a daily basis. The investigation shows that the Amsterdam control room decided only to provide that which was explicitly requested. They, therefore, sent ambulances and did not offer to mobilise the mobile medical team. The Amsterdam ambulance dispatch centre finally sent a fax to the Kennemerland control room asking the following: "*Does Kennemerland ambulance dispatch centre require medical combinations or other units?*".

### **Subconclusion**

- The harmonisation between the Amsterdam and Kennemerland ambulance dispatch centres did not go well. The mobile medical team was not requested as it should according to protocol.
- The Amsterdam ambulance dispatch centre did not offer to mobilise the regional flying mobile medical team even though it was available.

### 5.2.5 *Factors that contributed to the problems related to alerting medical units*

The investigation shows that there were issues involving processing reports, deployment and coordination especially with regard to medical assistance. As section 5.2.1 states, the Kennemerland control room did not call out a mobile medical team (MMT) and assisting medical combinations (GNK-Cs). The Dutch Safety Board has identified three factors that have contributed to the established problems:

1. The plans and protocols are not unequivocal;
2. Operational protocols are lacking;
3. The operators have been insufficiently trained for the work in case of disasters.

#### *Plans and protocols are not unequivocal*

Section 3 of this report provides a list of the relevant legislation and regulations, national standards, guidelines, tools and the regional and local elaborations thereof in plans and manuals. The plans and manuals of the Kennemerland Safety Region should be a translation of legislation and regulations in such way that it ensures that the legislation and regulations are complied with automatically when the operators follow these plans and manuals. The investigation shows, however, that the Operator Handbook is not unequivocal. Based on this handbook<sup>71</sup>, it could be concluded that when a medical combination is called in, it would automatically include a group that can be quickly deployed to provide medical assistance and a mobile medical team. Based on the deployment scenarios in that same handbook<sup>72</sup>, it could be concluded that medical combinations and mobile medical teams should be called in separately. In day-to-day practice, for example, in case of a serious accident, the Kennemerland control room contacted the Amsterdam ambulance dispatch centre when they needed a mobile medical team.<sup>73</sup> The Amsterdam dispatch centre then called in the mobile medical team upon request.

The skill-, rule- and knowledge-based system can be recognised in the described problems. In day-to-day practice, routine prevails and it is scaled up regularly.

In case of unexpected, large-scale deployment, as was the case with the aircraft accident, factors such as crisis response plans and scenarios, the profusion of information coming in and the hectic situation create a situation in which there is no time for reflection or extensive assessment. This assessment has to be done in the preparatory phase.

#### *Useful protocols*

Large and complex accident scenarios are necessary to elaborate in advance scenarios and deployment strategies but are not suitable to support the operator in a hectic situation.

This is also the reason why in aviation, process industry, nuclear installations and in trauma or crash rooms<sup>74</sup> of trauma centres simple checklists are used. The checklists force the pilot, (process) operator or doctor to systematically go through the items that have been determined beforehand. Trauma rooms have charts on the wall with rules of thumb. These charts support the systematic processing of crucial steps to prevent making mistakes. Similar checklists could be used to support operators in a control room to take the right decisions.

#### *Insufficient training with regard to the work related to disasters*

The Kennemerland Safety Region has a multidisciplinary 2008 - 2010 policy plan for training and performing drills. This policy plan was also the annual plan that describes the training and drill performance for 2008. It only describes the deployment of multidisciplinary units and teams. According to the plan, the multidisciplinary units and teams are: the Policy Team (PT), Operational Team (OT), Command Place of Incident (CoPI) and control room. The control room is only involved in training when it deploys the other multidisciplinary units. According to the Kennemerland Safety Region, the officers involved should have sufficient subject-matter knowledge before participating in multidisciplinary training and performing drills. The multidisciplinary services were responsible for the subject-matter knowledge of the members.

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71 MKA Operator Handbook, pages 91 and 202.

72 MKA Operator Handbook, pages 19.

73 Kennemerland Region Crisis Plan, GHOR medical somatic services subplan, December 2008, page 9.

74 Advanced Trauma Life Support (ATLS: *advanced life support in case of accidents*) is a protocol for trauma doctors and nurses to enable them to take the right decisions in the trauma room. The protocol sets clear priorities and is very useful in hectic situations that may occur. It was devised in the United States and is used in 50 different countries. It was introduced in the Netherlands in 1995.



The safety region refers to the Kennemerland control room as a multidisciplinary unit when the Policy Team, Operational Team and/or the Command Place of Incident are deployed in this plan. All other activities of the Kennemerland control room are regarded as monodisciplinary by the safety region. A MICK training and drill performance policy plan should be in place. It has emerged that it is not available. The operators of the Kennemerland Safety Region are not trained in all aspects of processing calls and alerting emergency services units at the same time as would be required in case of a real accident.

#### *Operator limitations*

Shortcomings with regard to the actions of the operators at the Kennemerland control room can be explained with the results of scientific research into human behaviour as described in section 5.2.3.

They work based on routine at the control room during daily practice. Even when they need to scale up, skill-based working is still generally involved.

In addition to pressure, confusion also often occurs in the case of a major incident. This is understandable. After the initial shock due to the improbability of the report(s), the sudden realisation comes that something significant and unusual is really going on. Its processing will be accomplished in a few seconds by one individual while another person may require more time to recover.

The following factors played a role after the Turkish Airlines aircraft crashed on 25 February:

- the different scenarios that are only applied by the operators in case of a drill;
- the lack of clarity about the location;
- the control room systems that did not support operators;
- the lack of training;
- the lack of familiarity of the operators with the new official, the multidisciplinary process coordinator;
- the control room that was not set up.

These factors made the transfer to rule-based acting by the operators difficult.

Part of these problems had been previously identified by the Dutch Public Order and Safety Inspectorate on 20 March 2008 during a simulation drill.<sup>75</sup> It also did not emerge during this investigation that operators were being supported with workable solutions or through tailor-made training to process a major supraregional incident rule based.

The Safety Board has not found any documents that show what has been done about the differences that were determined by the Public Order and Safety Inspectorate during the simulation training. It was established during the training that the operators continued taking calls for too long and for a long time it was unclear where the plane had crashed, despite the profusion of information.

#### **Subconclusions**

- The plans and protocols of the Kennemerland Safety Region are not unequivocal to operators.
- The sudden change from a daily practice to the reality of a crashed aircraft seriously disrupted the working pattern at the control room.
- The crisis response plans are not workable for a fast and effective support of operators. Simple uniform scenario cards/checklists are not available.
- Operators are insufficiently trained for the work that is involved in major incidents, which has meant that the control room alerting the medical units did not run smoothly.
- The Kennemerland Report, Information and Coordination Centre was not fully set up on 25 February 2009.

<sup>75</sup> A multidisciplinary control centre was not yet involved during this drill. Instead, the control centre consisted of an integrated control centre for the fire brigade and ambulance service.

### 5.3 TRIAGE, DISTRIBUTION OF CASUALTIES AND INFORMATION PROVISION TO HOSPITALS BY THE MEDICAL ASSISTANCE AT ACCIDENTS AND DISASTERS (GHOR)

#### 5.3.1 Summary of the process sequence

##### *Triage and registration and distribution of casualties*

Even before the first medical assistance workers were on site, the police officers set up a triage station in a house and a shed in a short period of time. As from 10:44 local time, three ambulances arrived one after the other at the accident site. The first ambulance team took the initiative to assign tasks and roles with regard to the triage and preparing casualties for transport and transporting them in accordance with the protocol. The second ambulance team fulfilled a coordinating role in the house. The third ambulance fulfilled a coordinating role at the aircraft.

The first ambulance suggested to the police that another shed be found in the area near-by that was available for use as a triage station due to the large number of victims. This was done and, therefore, there were three triage stations around the accident site. The coordinating role of the first ambulance team was taken over by three medical officers on duty when they arrived around 11:00 local time.

The official who was on duty on 25 February 2009 to fulfil the role of Casualty Transport Coordinator (CGV) was working as an operator at the Kennemerland control room when the accident occurred. The investigation has shown that this official was not aware of the current casualty distribution plan. Due to work pressure at the control room, this official could not leave the control room and go to site. The task of Casualty Transport Coordinator was, in the first instance, fulfilled by the nurse of the second ambulance and the heads of the triage stations at the accident site. When the medical officers on duty arrived, one of them appointed another nurse as the Casualty Transport Coordinator. This nurse, however, was not aware of the casualty distribution plan for the Kennemerland region because he did not come from this region. Neither was he aware of the number of victims that needed to be conveyed and the gravity of their injuries.

#### **Subconclusion**

- The coordination of the transport of casualties was insufficient because the Casualty Transport Coordinator was not available and the substitute was not familiar with the region.

The police and emergency medical assistance kept a register of victims during the first hours after the aircraft accident. A register was kept by the emergency services workers of the number of casualties (20) in the house (triage station 1). The involved people tried to register the names of the casualties and the number plate of the ambulance with which they were taken to hospital on the back of a piece of cardboard. Victim registration cards and triage cards were not available.

More than 80 (injured) passengers were at the largest triage station (triage station 2) in the shed behind the house (shed 1). Registration barely took place at triage station 2. We know that victim registration cards were used for a number of victims by the emergency services workers (see Box 12). The head of triage station 2 has stated that he did receive a number of torn-off slips of the victim registration cards. There was an A4 sheet on which T2 and T3 victims were registered. The T1 victims were sent on to the hospitals by the emergency services workers without registration. The A4 sheet was handed in to the action centre for medical assistance at accidents and disasters.

Interviews have shown that there were 12 to 15 casualties at the third triage station (shed 2). They came in with a victim registration card. The tear-off slips were collected of these cards. What happened to them afterwards, is unclear.

The substitute Casualty Transport Coordinator determined whether a victim was taken to an academic hospital or a regional hospital based on an assessment of the gravity of the injuries. T2 victims went to hospitals outside the region and T1 victims to one of the two academic hospitals in Amsterdam. The substitute Casualty Transport Coordinator did not take into account the medical treatment capacity (see Box 11) of the hospitals and the fact that different hospitals had by this stage put their own Hospital Crisis Preparedness Plan (ZiROP) into action.



### **Box 11. Medical treatment capacity**

The medical treatment capacity of hospitals is the number of casualties that can be treated in a hospital per hour. The medical treatment capacity of a hospital is influenced by many factors such as the time of day, the available staff, the arrival speed of staff and the availability of rooms. The casualty distribution plan of the Kennemerland region specifies the medical treatment capacity for thirty hospitals in its own region and adjacent regions.

The Safety Board made a reconstruction of the information that has been submitted by different parties about the number of victims and the gravity of their injuries. Annex 9 contains a summary of the information that is known at the Safety Board. The summary shows that the information about numbers of victims and the gravity of the injuries at the different actors was not consistent during the assistance process. It also shows that at approximately 13:30 local time, three hours after the accident, an initial summary existed in the field of the total number of victims and the gravity of their injuries. The transport of casualties has already been going for about two hours. The last casualties were, currently, being taken away from the accident site. The Dutch Safety Board has not been able to find any information about the nature of the injuries except afterwards as provided by the hospitals.

### **Subconclusion**

- The emergency services workers had an initial overview of the number of victims and the gravity of their injuries three hours after the accident. Most casualties had already been taken to a hospital by this stage.

#### *Information provision by the hospitals*

At approximately 10:50 local time, twenty minutes after the first report of the aircraft accident, one of the Kennemerland control room operators commenced the pre-warning process of the departments for emergency assistance of the three hospitals in the region, that is, the Rode Kruis Ziekenhuis in Beverwijk, the Spaarne Ziekenhuis in Hoofddorp and the Kennemergasthuis, location South in Haarlem. The handbook states that between seven and thirteen hospitals must be warned by the operator. Information had not yet been received at this point at the control room from the field about the number of victims and the type of injuries. Afterwards this happened only barely or not at all.

Half an hour later at approximately 11:20 local time, Kennemerland control room asked the Amsterdam Ambulance Dispatch Centre at the advice of a surgeon of the Kennemergasthuis in Haarlem whether they could ask the VU Medical Centre and the Academic Medical Centre to put into action the Hospital Crisis Preparedness Plan (ZiROP). Kennemerland control room asked the Noord Holland-North control room whether they could ask the Alkmaar Medical Centre to put into action the Hospital Crisis Preparedness Plan. The three aforementioned hospitals were also asked by Kennemerland control room to put into action the Hospital Crisis Preparedness Plan. Ultimately, the HS-GHOR gave the instructions to put into action the ZiROP at the Spaarneziekenhuis, the Kennemergasthuis and the VU Medical Centre.

Interviews with the representatives of the different hospitals have shown that a few hospitals called the Kennemerland control room to obtain information about the number of victims that they could expect. The operators at the control room, however, were difficult to reach and, when they were reached, they did not have the information from the field with regard to the number of victims and the nature and gravity of the injuries. The hospitals stated that this is crucial information for them to determine how many beds and personnel capacity they had to make available.

Ultimately, the victims were distributed by the medical assistance workers over fifteen hospitals. The first victim arrived at 11:40 local time at the hospital and the last victim at 16:15 local time. One of the victims left the accident himself and had himself checked at 22.50 local time at a hospital. Another victim had himself checked at a hospital the day after the incident.

### **Subconclusion**

- Of the fifteen hospitals to which victims were taken, six were pre warned and the Hospital Crisis Preparedness Plan (ZiROP) was put in motion. These six hospitals did not receive information from the Dutch Medical Assistance at Accidents and Disasters (GHOR) about the number of victims and the nature and gravity of their injuries. This led to unnecessary cancellation of standard care at these hospitals. The other nine hospitals did not receive a warning in advance at all.

#### *5.3.2 Factors that contributed to the problems related to information provision to hospitals*

The above section shows that hospitals have experienced problems with regard to the information provision by the Kennemerland control room about the number of victims and the nature and gravity of their injuries. It has also emerged that the emergency medical assistance in the field had unsatisfactory insight into this. The following factors have contributed significantly with regard to this:

- Correct victim registration did not take place in the field;
- Appropriate management and steering were not in place;
- There were problems with the communication;
- The plan formation for the distribution of casualties was not organised appropriately.

#### *Incorrect victim registration*

Correct victim registration in the field must take place to ensure an appropriate distribution of casualties and correct information provision about the number of and type of victims that can be expected to hospitals. The registration data (number of victims, nature and gravity of the injuries) must be gathered at a central point so that consultation can take place with the hospitals and instructions can be given to the Casualty Transport Coordinator on site from this point.

Different plans of the Kennemerland medical assistance at accidents and disasters have shown that the registration of the number of victims, the nature and gravity of the injuries at an incident is one of the tasks of the medical emergency services. It has, for example, been specified in the GHOR subplan<sup>76</sup> of the Kennemerland municipal health service that in addition to organising medical assistance and care of injured people at the incident site, the emergency services must, as one of their tasks, ensure that there is a uniform registration of accident victims. This plan also specifies that the victim registration and triage cards (see Box 12) must be used for the registration of medical data on site.

<sup>76</sup> Kennemerland Region Crisis Plan, GHOR subplan: GH2 Medical Services Somatic, Kennemerland Municipal Health Service, December 2008.

Ongevalsemechanisme: .....

Hoofddiagnose: .....

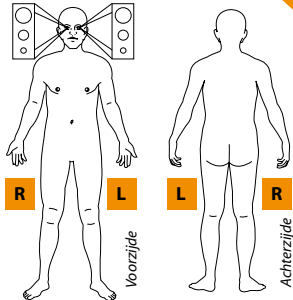
**Letfels:**

- A: amputatie
- B: brandwond (gebied arceren)
- G: gesloten #
- H: schedel-/hersensletsel
- I: inwendig letsel
- L: luxatie/distorsie
- O: open #
- VZ: vaat-/zenuwletsel
- W: wond

Notities: .....

**Pupilreactie op licht**

Ja / Nee Ja / Nee



GEMOM

3

Mag niet worden gereproduceerd zonder toestemming van het Ministerie van Binnenlandse Zaken en Koninkrijksrelaties en TSG Associates Ltd.

# TRIAGE KLASSE

6

	Tijdstip	.....	.....	.....	.....	.....
<b>Ogen (E):</b>						
Spontaan	4					
Aanspreken	3					
Pijn prikkel	2					
Geen reactie	1					
<b>Motorisch (M):</b>						
Volgt bevelen	6					
Lokaliseert pijn	5					
Pijn: trekt terug	4					
Pijn: flexie	3					
Pijn: extensie	2					
Geen reactie	1					
<b>Verbaal (V):</b>						
Georiënteerd	5					
In de war	4					
Onjuist woordgebruik	3					
Onbegrijpelijke woorden	2					
Geen	1					
<b>Totaal GCS</b>						

7

<b>Totaal Glasgow Coma Scale (GCS):</b>						
13 - 15	4					
9 - 12	3					
6 - 8	2					
4 - 5	1					
3	0					
<b>Ademfrequentie (AF):</b>						
10 - 29	4					
> 29	3					
6 - 9	2					
1 - 5	1					
0	0					
<b>Systolische bloeddruk (RR):</b>						
90 of >	4					
76 - 89	3					
50 - 75	2					
1 - 49	1					
0	0					
<b>Totaal</b>						

8

12 = 13, 11 = 12, 10-1 = 11, 0 = OVERLEDEN

Triage klasse:



Bestemming:

.....

.....

.....

Figure 15: Victim registration card, triage priority classification 1

## **Box 12. Victim registration cards and triage counting cards (also see annex 11)**

### **Victim registration card**

The victim registration card is a uniform national card that has been developed at the initiative of the Dutch Safety Board of Regional Medical Officers and is funded from the medical/administrative information provision programme of the Ministry of the Interior and Kingdom Relations. The object of the card is to ensure that an unequivocal triage and registration of casualties is made possible at disasters and major incidents. See Figure 15.

Sets of victim registration cards with triage counting cards are available on all ambulances and in the containers of the group that can be quickly deployed to provide medical assistance. Every victim registration card has a unique number with a barcode and, therefore, can be used in automated systems for ambulance assistance and distribution of casualties. The identification data of the victim can be added in different boxes on the card. Patient data can be added in one of the boxes. The cards have a unique patient number and an extension for the triage class. Changes in triage class can also be registered. This ensures that dynamic registration is possible that can be used by the whole of the emergency services chain and ensures that patients can again be quickly found. Every victim registration card has a tear-off slip that must be torn off by the Casualty Transport Coordinator (CTC) before leaving the disaster site for this person's overview of the casualty transport.

### **Triage counting card**

The triage counting card has two sides: a primary triage side and a counting side. There is a flowchart on the primary triage side that can be used in extreme conditions as a structural aid for primary triage. The number of patients of which category has been triaged can be kept updated on the counting side of the card.

The investigation has shown that victim registration cards were used in the house (triage station 1) and in shed 2 (triage station 3) but in shed 1 (triage station 2) they were not or only incidentally utilized. In addition, it also showed that two of the three heads of a triage station could not exactly state how many casualties were being kept in their triage station and that the triage counting cards meant for this purpose were not used (see Box 12). The officers on duty have not supervised the use of the victim registration and triage counting cards either. None of the involved parties could explain why the victim registration and triage counting cards were not used consequently.

## **Subconclusions**

- Registration of victim information only took place to a limited degree at the triage stations by using the triage counting and victim registration cards meant for this purpose.
- There was no supervision on the actual use of the triage counting and victim registration cards.

### *Incorrect management of the distribution of casualties*

There was no unequivocal management of the distribution of casualty process in the field within the medical units because the Casualty Transport Coordinator (CGV) who was on duty, was not on site. Both the Casualty Transport Coordinator on duty and substitute were unaware of the casualty distribution plan in Kennemerland. The fact that the Casualty Transport Coordinator was on duty as operator at the Kennemerland control room illustrates that the role of the Casualty Transport Coordinator and the coordination of transport of casualties at the location of the incident, during major incidents, had not been thought through properly.<sup>77</sup>

<sup>77</sup> After 25 February 2009 the method of working has been adapted so that someone who is on duty as an operator will not, simultaneously, be on duty as the Casualty Transport Coordinator.

### *Problems in the communication*

A circumstance that contributed to the problems with regard to the distribution of casualties is the uncoordinated exchange of information between the emergency services workers in the field, the control room and the hospitals. The control room should be at the centre of this process but was incapable of managing the information exchange in the field. The operator must have available information with regard to victim logistics and accurate information about the number of victims, the nature of the injuries to ensure he or she can inform hospitals. The investigation has shown that this was not the case (see section 5.4 for more information).

### *The plan formation for the distribution of casualties was not organised appropriately.*

The Board ascertained that the organisation of the distribution of casualties (and informing hospitals) did not run smoothly. This has emerged from, for example, the fact that the ambulance dispatch operators at the Kennemerland control room were not quite sure which hospitals to inform. Ultimately, six hospitals were informed while the Operator Handbook (Handboek Centralist) states that seven to thirteen hospitals should have been informed with regard to the VOS 6 alarm (taken over by the Kennemerland control room). It was, moreover, not stated which hospitals this concerned. The casualty distribution plan that has been added to the Operator Handbook as an annex does not make it clear either which hospitals must be informed when, by whom and what about with regard to a VOS 6 or any other accident scenario. The investigation has also shown that an updated casualty distribution plan was not available in the control room at the time of the accident.

### **Subconclusions**

- There was no updated casualty distribution plan of the Kennemerland Safety Region in the control room during the accident.

### *Turkish Airlines Crash Medical Investigation group*

As already indicated, the Safety Board did not investigate the quality of the provision of medical assistance. The Turkish Airlines Crash Medical Investigation (MOTAC) group<sup>78</sup> that was established after the incident did investigate this issue. The first results were published on 30 January 2010 in the *Nederlands Tijdschrift voor Geneeskunde* (see annex 1). Although the fact that the Safety Board has a different picture of the alerting and dispatch of the mobile medical teams, a number of issues are raised in the first investigation of the MOTAC group that correspond with the findings of the Dutch Safety Board.

This investigation, for example, states: *"Firstly, it appears that the 1<sup>st</sup> patient arrived at the hospital an hour and 15 minutes after the incident. After 3 ½ hours, 50% of the victims had not yet arrived at a hospital. Local conditions at the incident site, the soft substrate and victims being trapped in the wreck, made fast evacuation of seriously injured patients difficult and, therefore, the golden hour was exceeded considerably. The golden hour is a maximum used in trauma surgery that states that seriously injured patients must be identified and treated with regard to life-threatening injuries in a hospital within the first hour in order to minimise secondary morbidity and mortality."*

*"Although the literature does not provide any proof of any stature with regard to this golden hour, it is implemented widely.<sup>79</sup> Since we do not know the exact time of death and are unaware of the exact injuries of the nine fatalities, we cannot give an opinion about any possible impact of these time factors on their survival."*

*"Secondly, the hospitals in the region could easily scale-up and create capacity for the reception of casualties in a short period of time. Hospitals spontaneously put into motion the Hospital Crisis Preparedness Plan (ZiROP) due to a lack of clear information about the number of victims. This means that elective surgery and out-patient appointments were cancelled and that staff was made available to deal with large numbers of seriously injured patients. The initial uncertainty about the number of and the gravity of the casualties played a role within this context. The ZiROP should, in accordance with common practice, only be put into operation after consulting the Ambulance Dispatch Centre."*

78 Medisch Onderzoek Turkish Airlines Crash (MOTAC)

79 Lerner EB et al The Golden Hour Scientific Fact or Medical Urban Legend *Acad Emerg Med* 2001,8 758-60.

*"Thirdly, 125 of the 126 survivors were ultimately taken to an emergency department on the day of the incident to be medically assessed. In view of the high-energetic character of the incident to which all passengers were subjected, this was justified in our opinion. Only 6 passengers turned out to be completely uninjured physically. Ultimately, it was not found possible to determine pre-hospital triage after the event with regard to retrospective analysis.*

*Casualty cards often were missing and, therefore, the T1, T2 or T3 status of patients could not be linked to the final ISS<sup>80</sup>. After all data of individual patients was analysed, however, 12 patients had an ISS > 16, which applies as the standard for a multitrauma patient. Although not every T1 victim has, by definition, an ISS > 16, this may still concern over-triage at the location of the incident or when arriving at the emergency department. This could not be demonstrated due to the limited documentation. Only 3 patients were referred to a level 1 hospital based on their injuries after having been assigned a level 2 or 3 hospital upon arrival. This concerned patients with fractured vertebrae. One of these patients was referred from a level 3 hospital and had an ISS of 17. The other 2 were referred from a level 2 hospital; the ISS of these patients was 8 and 9, respectively."*

*"Although the incident took place in the Randstad conurbation, there was a considerable time interval between the incident and the arrival of casualties in the hospital."*

*"All survivors were examined at the hospital; fifteen hospitals participated in providing care to casualties. Casualties did not die at the hospital."*

## 5.4 REGISTRATION, VERIFICATION AND COMMUNICATION OF VICTIM INFORMATION

### 5.4.1 Introduction

Society, the crisis organisation, the victims and next of kin have very different implicit expectations concerning the victim registration process. Some parties, i.e. those involved with the legal process, mainly need clear and accurate information. Other parties however, such as the next of kin and media, mainly benefit from being informed as quickly as possible. Described below are the victim registration process and the communication about this process on 25 and 26 February 2009 as well as the bottlenecks encountered.

### 5.4.2 Summary of the sequence of events and the problems experienced

Almost immediately after the aircraft accident, a number of the next of kin at Schiphol (as well as in Turkey and elsewhere in the world) received telephone calls from the survivors of the aircraft accident. As a result, the group awaiting the arrival of flight TK1951 at Schiphol, was already informed of the accident shortly after the crash. These reports were received before it had been made public at the airport that the aircraft accident had occurred. Part of this group did not receive calls and was left in a state of uncertainty from this time with regard to the fate of their next of kin.

Immediately after the accident, the Schiphol emergency response plan was put into effect by the Kennemerland Safety Region. In accordance with this plan, subsidiary plans and instruction manuals, the reception centre at 'De Wildenhorst', normally a sports centre in the nearby town of Badhoevedorp, was cleared and made ready for the registration and informing of the next of kin and for the reception, care and registration of uninjured passengers. At around 11:00 local time, the first employees arrived at 'De Wildenhorst' including employees from the Municipality of Haarlemmermeer and Schiphol airport, in order to get organised and to set up 'De Wildenhorst'. Within an hour of the accident, the reception centre was ready for use.

In accordance with the crisis plan, waiting next of kin were received at Schiphol by employees of Schiphol. Once the next of kin had been assembled at Schiphol, they were transferred to 'De Wildenhorst'. The first next of kin arrived at 'De Wildenhorst' at about 13:00 local time. At that point, the municipal employees staff who were responsible for the registration and informing of those involved at 'De Wildenhorst', knew very little about the fate of the passengers and crew. They were, therefore, not in a position to provide information to the next of kin or (where possible) to reassure them.

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80 ISS stands for Injury Severity Score that has a range between 0 and 75.

The whereabouts of the casualties remained unclear for a considerable time, both for the next of kin and for those leading the crisis organisation. The Policy Team, leading the crisis organisation, decided at 18:30 local time that a major effort had to be made to determine the whereabouts of the victims. For this purpose the Royal Netherlands Marechaussee was deployed. Initially, the Royal Netherlands Marechaussee visited hospitals known to have received victims of the accident.<sup>81</sup> The Royal Netherlands Marechaussee managed to trace the whereabouts of most of the passengers and crew during the night. The only individuals that the Royal Netherlands Marechaussee had not succeeded in identifying with certainty at this point were four of the seriously injured, nine fatalities and a single individual who had managed to leave the disaster site under his own initiative.

On Thursday 26 February, at about 11:00 local time, approximately 24 hours after the accident, the Policy Team felt that enough information was now available about the fate and whereabouts of the injured passengers<sup>82</sup> and a decision was taken to call the next of kin who had previously contacted the information number and inform them. Most of them had already received information at that point, some of them actually from the victims themselves.

The following day, Friday 27 February, investigators from the Disaster Identification Team established the identities of the fatalities (see box 14) and the municipal authorities prepared international death certificates.

#### **Subconclusions**

- As registration was not (effectively) carried out from the very beginning of the emergency assistance process, the emergency organisation was not able to determine the identities of the victims or whereabouts.
- Due to the prolonged absence of detailed information, the Policy Team could only provide information to the next of kin, media or diplomatic services at a late stage.

#### **Box 14. Identification procedure for the fatalities**

The identification of the nine fatalities was undertaken in accordance with Interpol's Disaster Victim Identification Guide (DVI Guide). This internationally used guideline states that it is necessary for methods of identification to be sufficiently reliable from a scientific perspective. It states that the most reliable, primary identification methods are based on (comparative) analysis of fingerprints, dental information and DNA. Secondary possibilities for identification include any evidence found on the body (tattoos, clothing, identification documents, et cetera) or other medical information (e.g. broken bones). These secondary characteristics may only be used, according to the Guide, to support the primary method of identification. The Guide also states that material remains may not be identified by visual recognition. According to the Guide, next of kin should not be confronted with photos or the material remains because this is known to be an unreliable method of identification. A precise approach is key in this procedure.

#### *The need for information and how information was provided to the Policy Team*

One of the primary tasks assumed by the Policy Team on 25 February 2009 was taking care of the reception of the victims. The Policy Team has the managerial responsibility of informing victims, next of kin, the media and those involved with the legal process.

81 At 13:44 local time, a summary of the number of victims transported to different hospitals was phoned through from the main GHOR action centre to the GHOR staff section. According to this summary, 15 T1, 17 T2 and at least 30 T3 victims had been divided among eight hospitals in the region (Spaarne Hospital (Hoofddorp), Kennemer Hospital South (Haarlem), Red Cross Hospital (Beverwijk), VU Medical Centre (Amsterdam), University Medical Centre Utrecht, Leiden University Medical Centre, Academic Medical Centre (Amsterdam) and the Deaconess Hospital Leiden).

82 Communication with regard to the fate of the crew members was dealt with by Turkish Airlines.



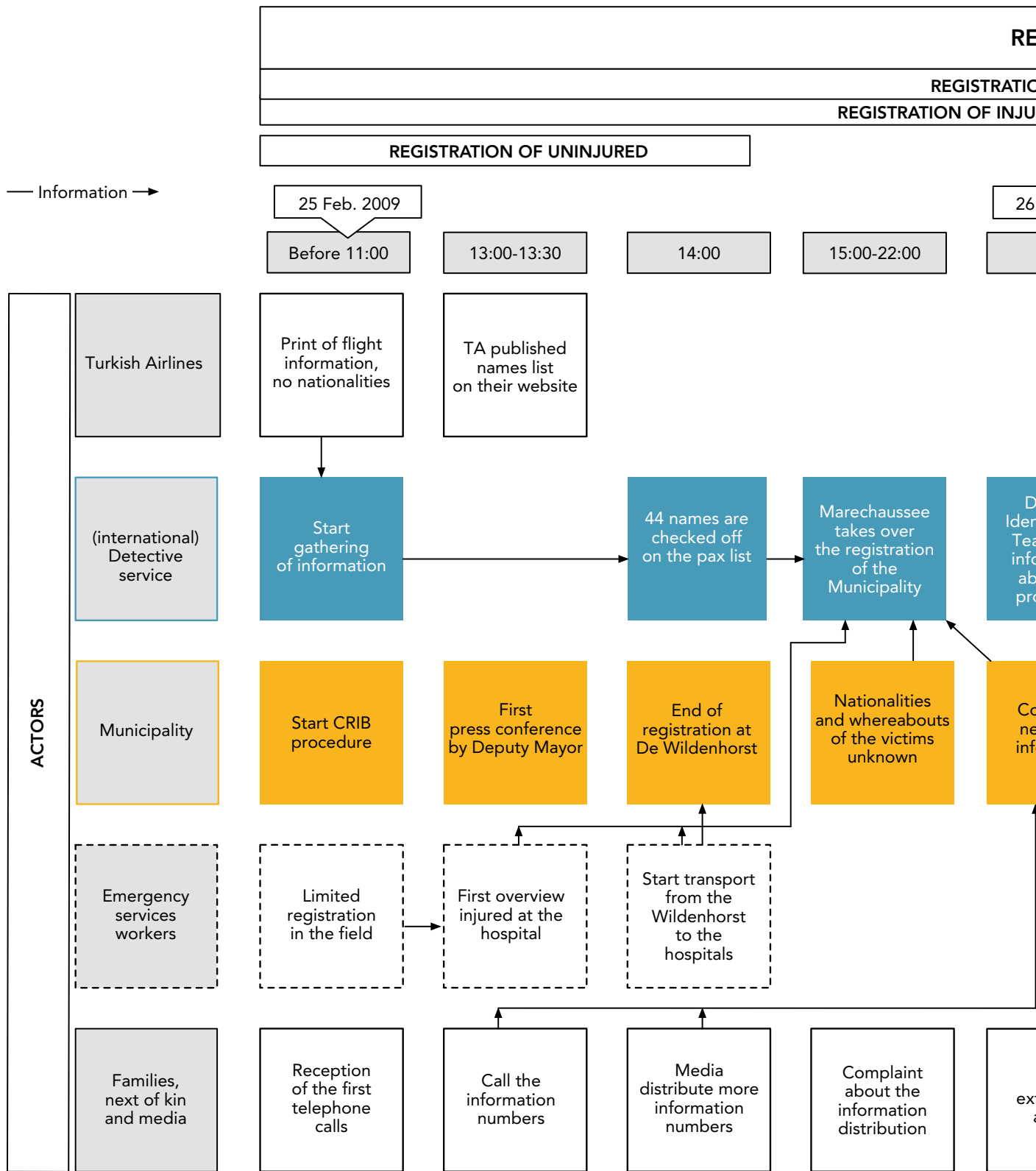


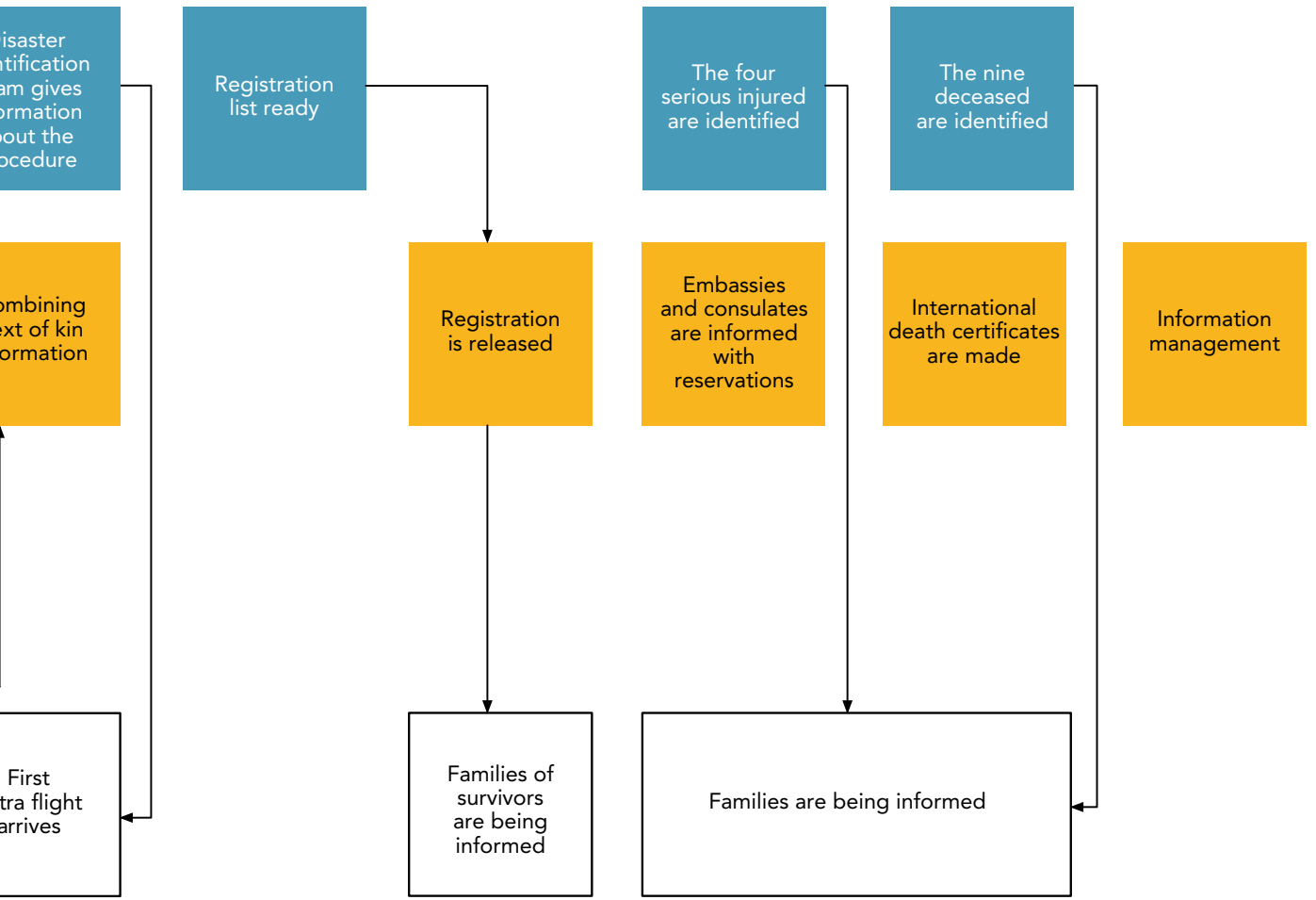
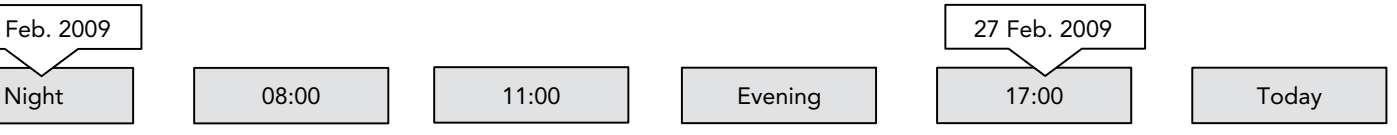
Figure 16: Timeline of the registration process



# REGISTRATION OF VICTIMS

## IDENTIFICATION OF DECEASED

### REGISTERED





To this end, the Policy Team also required information. It is apparent from the Policy Team's logbook that, almost immediately after meeting up, they asked for information about:

- The number of passengers and nationalities on board;
- The number of injured and casualties;
- The reception site for the victims.

Quite soon after the Policy Team's meeting (11:00 local time) it appeared that the number of passengers and crew members was clear. Based on a manifest printed off by Turkish Airlines at Schiphol, it appeared that there should have been 127 passengers on board the aircraft.<sup>83</sup> 36 hours later, it transpired that one person was missing from this initial manifest.<sup>84</sup> There were seven crew members on board, meaning that in total there were 135 people on board.

During the meeting of the Policy Team at 12:15 local time, information was received from the organisation of the medical emergency services for accidents and disasters about the number of fatalities and injured individuals known at that time. This included: 1 fatality, 25 T1 and 30 T3. At the Policy Team's first press conference, held at Schiphol at around 14:00 local time, it was announced that at that point there were nine fatalities and around 50 injured, 25 of which were seriously injured. At that stage, the Policy Team knew nothing about the identities or nationalities of the victims. The deputy Mayor of Haarlemmermeer stated during the press conference that further analysis of the passengermanifest would be carried out.

The Policy Team's logbook shows that the members of the Policy Team felt there had been a lengthy delay before the information they required about the passengers and crew became available. The members of the Policy Team made repeated requests for the Operational Team to provide information. When the Policy Team again requested the analysis of the passengermanifest from the Operational Team at 15:15 local time, and this could not be provided, the chairman of the Policy Team stressed that the matter had priority and that he wished to have the analysis at 16:00 local time. Even at 16:00 local time, however, it seemed that no information could yet be issued by the Operational Team regarding the nationality, fate or whereabouts of the passengers and crew. It ultimately took until the following morning for the Policy Team to gain proper insight into this. Due to the absence of the required information, the Policy Team was unable to issue any reliable information to the next of kin, media or those involved with the legal process.

#### 5.4.3 Registration of information regarding those involved<sup>85</sup>

##### *Central Registration & Information Bureau (CRIB)*

Under the Dutch Disasters and Serious Accidents Act, municipal authorities have a duty to draw up a crisis plan to deal with disasters or serious accidents within their territorial area. This crisis plan must consist of a number of subplans including a subplan for the process of registration and information regarding those involved in a disaster or serious accident. In the Municipality of Haarlemmermeer, this is elaborated in the subplan of the Central Registration & Information Bureau (GM5).<sup>86</sup>

The aim of the Central Registration & Information Bureau subplan is to give more clarity to the manner in which the tasks of the Central Registration & Information Bureau should be carried out.

The tasks are:

- Collecting, recording, assessing and verifying all relevant information about the fate and whereabouts of individuals involved in the disaster (people who have been evacuated, injured, who are missing or deceased);
- Providing interested parties with information released by the Mayor about the whereabouts and fate of those involved.

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83 This list was printed by the Turkish Airlines Station Manager before the aircraft accident occurred, in preparation for the arrival. The manifest printed by the Station Manager only contained the first names and first eight characters of the surnames of the 126 individuals. There was an indication – "I" (infant) – that one passenger was travelling with a baby. The manifest did not specify dates or places of birth or nationalities.

84 This individual was marked down as a victim by the Royal Netherlands Marechaussee at "De Wildenhorst". It later transpired that this individual had not surrendered his boarding pass at the gate in Istanbul. This meant that he was not recorded as a passenger. Counting the number of individuals on board is generally done by counting unoccupied seats, and it is quite likely that the baby was not included.

85 This investigation focused on the occupants of the aircraft. There were no emergency services workers registered by the Municipality of Haarlemmermeer. Civil emergency services workers were registered by the municipality after the event.

86 Subprocess Central Registration and Information Bureau (GM5), Municipality of Haarlemmermeer, decreed by Mayor and aldermen on 18 December 2007.

It also specifies whose details must be recorded in the event of a disaster, which of their details should be recorded and how this is to be done. It also specifies where the information for those involved should be registered. The speed with which information is to be gathered and provided is not discussed. The Central Registration & Information Bureau subplan does not mention what the objectives of the registration process are. The CRIB process could not meet the Policy Team's needs, namely to quickly deliver accurate information about the number of passengers, their nationalities, the number of casualties and fatalities and the victims' whereabouts.

According to the municipal subplan, the registration begins with the victim himself or herself entering personal details into a CRIB registration form. The information in the form is supplemented by the staff of the Central Registration & Information Bureau. Concerning the registration of the fatalities, the police are expected to fill in the CRIB registration form. The registration of those who are uninjured must take place at the reception site (here 'De Wildenhorst'), casualties are registered in hospital in order to avoid delays in throughput. This means that when drawing up the plan, a deliberate choice was made not to register details among crowds of casualties or, for instance, just before transportation to the hospitals, with the result that the desired information on the fate and whereabouts of victims could only be gathered after the event. A precise approach is key in this procedure. It was not determined how rapid the entire registration or parts of should be completed. In relation to the aircraft accident, it was the Royal Netherlands Marechaussee that visited the hospitals, not the municipality. The Central Registration & Information Bureau list, compiled by the Royal Netherlands Marechaussee, was declared complete<sup>87</sup> at 08:00 local time on 26 February 2009 by those responsible within the Constabulary. At 09:00 local time, the Policy Team met again and released the list. At 11:00 local time, around 24 hours after the accident, the list was known to the municipality Telephone Team, which was then allowed to release this list. The majority of the next of kin appeared to have already received information at that point, some of them from the victims themselves. Management of the Central Registration & Information Bureau list was ultimately transferred back from the Royal Netherlands Marechaussee to the municipality. The municipality has managed the Central Registration & Information Bureau list from 28 February 2009<sup>88</sup> until today.

A guide in which the set-up of the Central Registration & Information Bureau's operational process is detailed was prepared by the Ministry of the Interior and Kingdom Relations in 2005.<sup>89</sup> The registration and information task was approached in this guide from a process-specific point of view, in order to increase the speed and quality of registration and the provision of information. Precision and speed were key in this guide. This guide acted as an aid and did not constitute a rule. The Municipality of Haarlemmermeer did not set up the Central Registration & Information Bureau subplan in accordance with the guide for setting up and making the Central Registration & Information Bureau process operational of the Interior and Kingdom Relations. A reason for neglecting to follow the guide could not be given by the Municipality of Haarlemmermeer.

Amongst other things, the guide recommends using the I-RIS system for registering the victims and those searching for someone. In 2007, when it was still part of the Amsterdam region, the Municipality of Haarlemmermeer decided to use a competing product, CRIB4ALL, because this system was thought to offer better possibilities.

During the registration process, municipality staff was, however, not able to retrieve the data from the system because the latest software update had not been installed. Screenshots were made of the limited registration of 44 persons at 'De Wildenhorst'. After installation of the update by the supplier, the data collected by the Telephone Team could be retrieved from the system late in the evening on 25 February, at around 23:00 local time, in the form of a list.

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87 Later, on the same day, the manifest turned out not to be 100% accurate.

88 The Central Registration & Information Bureau manifest was sent to the municipality at 21.22 local time on 27 February 2009.

89 Ministry of the Interior and Kingdom Relations; Guide for setting up and making the CRIB Process operational, version 2.0, 6 April 2005.

### **Subconclusions**

- The Municipality of Haarlemmermeer did not organise the registration process in accordance with the guide issued by the Ministry of the Interior and Kingdom Relations.
- The information that was issued by the Municipality of Haarlemmermeer did not meet the information needs of the next of kin or the media. Not speed was but as accuracy was key to this. The process of the Central Registration and Information Bureau ultimately provided the required information, but at the time that this information could be provided, the majority of the next of kin had already been informed by the passengers and crew of the aircraft, who were able to do so, of their fate and whereabouts.
- At the time of the accident, the Municipality of Haarlemmermeer was not in a position to process the data effectively into a central registration system.

### *Passenger manifest*

Annex 9, Facilitation, section of the guideline issued by the International Civil Aviation Organization (ICAO) details the facilities that must be available at an airport. It also describes the measures that must be taken in order to enable effective assessment of aircraft, individuals and freight by border monitoring, without causing hindrance to (other) air traffic. The International Civil Aviation Organization has also set standards with regard to how various types of data are to be recorded by airlines and how the data may be used. It also states that airlines may not be requested further data unless specified in advance in the supplements. National differences in the guidelines must be taken into account in the supplements to the annexes.

The anomaly for the Netherlands comes from the fact that the captain of a flight to the Netherlands whose origin is a country that does not fall within the Schengen treaty must submit upon arrival a manifest, in duplicate, of all passengers on board the aircraft to the officials tasked with border monitoring. This requirement is stipulated in the Netherlands in the Aliens Act 2000. In addition to the full first name and surname, this manifest must also include information on date and place of birth and nationality.<sup>90</sup> The deviating Dutch legislation in respect of the registration of passengers stipulated in the Aliens Act 2000 has not been incorporated into the ICAO supplements and can, therefore, not be assumed to be known to international airlines. The passenger manifests maintained by international airlines for flights destined for Amsterdam must conform to the 'passenger manifest' format as a minimum, in accordance with the International Civil Aviation Organization.<sup>91</sup> This means that the surnames and initials of passengers must be registered. This information may only be requested by the authorities in exceptional circumstances. Further clarification of these exceptional circumstances is not provided.

In the event of an air accident, airlines generally block their own records in relation to the flight in question. The data in the records are checked, verified and only then released by the airline. The aim is for this to be completed within three hours of the accident. The purpose of this manifest is to inform the authorities of who was on board the aircraft. The verified manifest of names contains the same information as the 'passenger manifest', but is compiled more accurately. This manifest may be used as an aid when identifying victims whenever it is requested.

The initial manifest that was collected from the Turkish Airlines desk by the Royal Netherlands Marechaussee directly after the accident contained information that was obtained by the Station Manager from the administration in preparation for receiving the flight. The Policy Team was aware that these lists were not 100% reliable.

At 11:03 local time, following confirmation of the accident, Turkish Airlines blocked the administration. At 13:30 local time, on approval from the Turkish authorities, the verified manifest of names of the crew and passengers was published in Turkey and posted on the Turkish Airlines website.<sup>92</sup> This information was not requested from the Turkish Airlines headquarters by the Dutch authorities. The Turkish Airlines Internet manifest was not recognised as reliable information by the Policy Team.

<sup>90</sup> The format is prescribed in Annex 16 pertaining to section 4.5(2) of the Dutch Aliens Act 2000.

<sup>91</sup> Appendix 2 of annex 9 of the International Civil Aviation Organization.

<sup>92</sup> At 13:30 local time, the verified manifest was published on [www.turkishairlines.com](http://www.turkishairlines.com) as part of a press release.

On the basis of the initial manifest, the Policy Team was not able to obtain a summary of the nationalities of passengers. The Policy Team requested information on the nationalities of the passengers from Turkish Airlines. Neither Turkish Airlines in the Netherlands nor Turkish Airlines in Turkey had this information. In light of this, the Policy Team was not in an immediate position to inform embassies and consulates of other countries. Information was finally assembled about the passengers' nationalities, partly through international investigation work, so that embassies and consulates could ultimately be informed about any of their nationals among the victims. It appeared that 12 nationalities were involved.

Five days after the accident, a passenger manifest was found by police employees in the cockpit. No nationalities were stated on this manifest. During a discussion with Turkish Airlines, the Board established that the company was not aware of the Dutch Aliens Act 2000. In the guideline of the International Civil Aviation Organization<sup>93</sup> for the Netherlands, no exception was stated regarding information that must be recorded.

Turkish Airlines stated that the Dutch authorities, in this case, the Royal Netherlands Marechaussee, responsible for border monitoring at airports had not requested this manifest on the basis of the Dutch Aliens Act 2000.

### **Subconclusions**

- For a considerable period of time, the Policy Team had no information on the nationalities of the passengers and crew as Turkish Airlines in the Netherlands stated that it did not have that information available. According to the Dutch Aliens Act 2000 and the legislation based upon this Act, the nationalities, amongst other things, must be registered, and this registration must then be submitted to the officials, charged with border monitoring upon arrival of the aircraft.
- The manifest of names of passengers and crew, verified by Turkish Airlines, was published in Turkey and posted on the website of Turkish Airlines<sup>94</sup> following permission from the Turkish authorities. This information was not requested by the Dutch authorities.

The manner in which the Royal Netherlands Marechaussee carried out its task in relation to border monitoring falls entirely outside the scope of this investigation as the investigation is focused upon the emergency assistance as a result of the air accident. For this reason, the Dutch Safety Board does not comment on this and the Dutch Safety Board shall not examine whether or not Turkish Airlines had been informed of the specific Dutch requirements by the Dutch border monitoring authorities, and whether it would have been appropriate to do so.

## **5.5 C2000 COMMUNICATION PROBLEMS**

### **5.5.1 Introduction**

This section treats the problems experienced by emergency services workers with the communication through C2000. The Dutch Safety Board has limited itself to the problems on 25 February 2009 as they occurred during the process of emergency assistance after the aircraft accident.

C2000 is a complex technical system. This is discussed in detail in this section. The section is, therefore, concluded with a short summary that is more easily accessible.

Recently, there have been multiple investigations on the performance of C2000.<sup>95</sup> The analysis in this investigation is based on the events on 25 February 2009. The other investigation reports have been analysed insofar as relevant facts for the investigation were included.

93 In Supplement (12<sup>th</sup> edition 12/12/2008) of Annex 9, Facilitation.

94 At 13.30, the verified manifest was published on [www.turkishairlines.com](http://www.turkishairlines.com) as part of a press release.

95 The final report of the Safe Port exercise, Multidisciplinary C2000 Final Scenario, Rotterdam-Rijnmond Safety Region, July 2006 (Eindrapportage Veilige Haven, MultiDisciplinair Slotsscenario C2000), the C2000 end user knowledge evaluation report, Dutch Police Academy, 2008 (Evaluatie kennis C2000-eindgebruikers) and the C2000 expert group final report, Ministry of the Interior and Kingdom Relations, 22 December 2009 (Eindrapportage expertgroep C2000).

The findings of the Dutch Safety Board are in line with the results from the aforementioned reports but not all facets return (in detail) in the investigation. Problems with, for example, peripherals, user competences and education and training are cited in the aforementioned reports as issues to be improved. This is endorsed by the Dutch Safety Board, however, the Board does not discuss this extensively in its own investigation because these issues are already considered known.

In addition, relevant information from two investigations that also were specifically focussed on the C2000 communication during the aircraft accident was used by the Safety Board.<sup>96</sup>

In the analysis of the problems with the C2000 communication system there are two main questions:

1. What were the problems with the C2000 communication system?
2. What caused these problems?

Various emergency services workers have stated that it was impossible or very difficult to communicate through C2000 when, about 30 minutes after the aircraft accident, the emergency assistance on site was fully operational. In particular, medical assistance workers (ambulance paramedics) have stated that the communication problems with C2000 disrupted the assistance process with regard to the exchange of information about the transport of casualties. Operators of the Kennemerland control room stated that they were regularly unable to 'send' via the C2000.

The communication traffic at and near to the accident site was investigated to determine how these problems with C2000 were caused. The board mainly investigated the first hours after the incident because at this time the problems manifested themselves and the communication pressure was the greatest. After a short explanatory note regarding the usage aspects of C2000, the board describe in the sections below how the communication between the emergency services workers developed on the day of the aircraft accident. Next, we provide an analysis of issues that have arisen from the reconstruction of the way in which the process developed.

#### *5.5.2 Organisation of the C2000 user aspects*

##### *Communication through call groups*

Communication between the emergency services workers through C2000 takes place in call groups. Emergency services workers who are within the same call group with their two-way radio or radiotelephone can communicate with each other. There are no technical limitations with regard to the number of participants in one call group. The number of members of a call group varies from a small specific group of emergency services workers, for example, the medical officers on duty who are on site, to a large group, for example, all deployed ambulances. Only one user can talk at a time within a call group. This takes place by pressing the call button of the two-way radio or radiotelephone (what is commonly called the 'push to talk'). The other members of the call group will hear everything that is said within that call group and every member of a call group can participate in a current call by pressing the push to talk once the previous speaker has released his or her push to talk. An operator can always interrupt a conversation provided that the operator is a member of the relevant call group.

Only two-way radios or radiotelephones registered by the emergency services organisations, in which call groups have been preprogrammed, can participate in a call group. An emergency services worker becomes a member of a call group by tuning in to the relevant call group through a radiotelephone or two-way radio. The number of call groups in a two-way radio or radiotelephone preprogrammed by the administrator is usually limited. The users of equipment cannot harmonise with call groups that have not been preprogrammed by the administrator.

The required ether discipline of the users has in part remained the same as the analogue systems such as one speaker and multiple listeners. The way in which communication takes place in the C2000 system has changed with regard to one issue: the operator does not have to be a member of all call groups that are being used. Call groups of which an operator is not a member can therefore not be listened to by the operator.

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<sup>96</sup> Kennemerland Polder Crash C2000 Communication Report, Kennemerland Safety Region, 12 August 2009 (Rapportage C2000 Communicatie Poldercrash Kennemerland) and Aircraft accident 25 February 2009 report, VtsPN, 21-04-2009 (Rapportage vliegtuigongeval 25-02-09)

There is no calling time of listeners when communicating in call groups as is the case with normal telephony where the telephone needs to be answered. If a call channel is available, the user can immediately communicate. Only when a call channel is not immediately available the requested call will be placed in a queue. This situation can only occur when all call channels are occupied and a new call request is received. The person making the request will receive a signal once that he or she is in a queue. When a call channel becomes available, the person requesting the call will receive a signal<sup>97</sup> and the person making the request can speak by pressing the push to talk (send key). The network will keep an active call group operational for another 2.5 seconds<sup>98</sup> after the call channel has become available and after the send key has been released. Next, the call will be broken off by the system and it will be released for any new request for a call. Ultimately, all call requests will, therefore, be honoured.

During the analogue era, the period before C2000, there was no queue as described above. Then, there were basically two analogue channels available for each discipline and a channel was used by a large group of emergency services workers with different information flows that crossed each other. Users had to wait until a speaker had finished speaking. When a channel was busy, this could be immediately heard and recognised by the control room and other users.

#### *Connection diagrams*

The emergency services arranges who speaks with whom and in which call group, using connection diagrams. Connection diagrams can be regarded as a schematic working instruction for an operator at a control room for setting up the communication structure. Emergency services organisations set up separate connection diagrams for different situations that may arise. The command structure at the different organisations specifies who is formally charged with the management of the communication through C2000. The management can be delegated to the operators or other officials such as the nurse of the first ambulance and the Casualty Transport Coordinator when drawing up the connection diagram. How the management for the communication has been organised can be derived indirectly from the connection diagrams.

Section 5.4.4 discusses how connection diagrams are realised.

#### *Requesting calls in C2000*

The emergency services worker can start a call in C2000 in two different ways:

1. By sending a data message with a request to have speech contract to a control room;
2. By pressing the button (so called push to talk (PTT)) to speak through the two-way radio/radio telephone.

The call requests that have been sent by data message will be displayed to the operator on the computer screen of the integrated control room system and/or the radio control system (see Box 13). These computerdisplays have a central position on the control board of the operator. These call requests will continue to be displayed on the computer screen until they have been processed by an operator. A call request for a data message will only be honoured if the operator selects the relevant box on his or her screen. When a request is received through push to talk, the operator will hear the person making the request speak.

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<sup>97</sup> The signal type (for example, a peep) will depend on the settings of the equipment.

<sup>98</sup> The duration of the so called 'hang time' of 2.5 seconds is a adjustable setting of the C2000 system and has been determined by trial and error. Equilibrium was sought within this context where, on the one hand, it becomes possible to have a consecutive conversation without a new connection having to be realised after every speaker and, on the other hand, the best possible use is made of the available capacity where the network is burdened as little as possible.



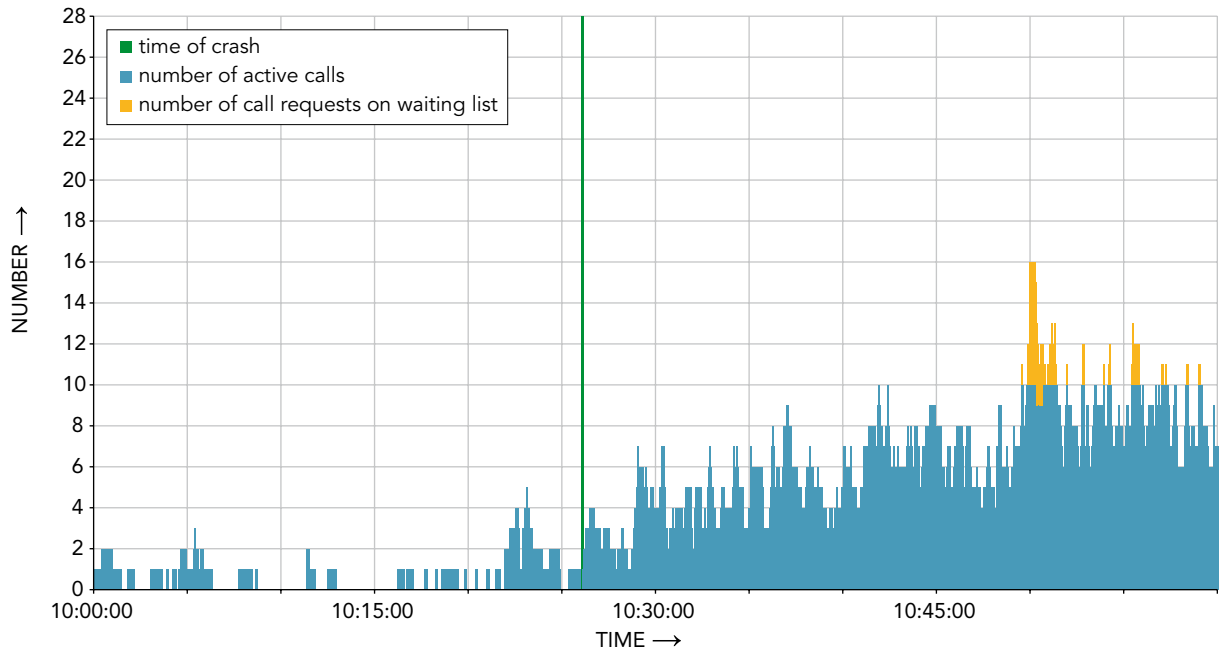


Figure 17: Load Halfweg mast of the C2000 system between 10:00 and 11:00 local time

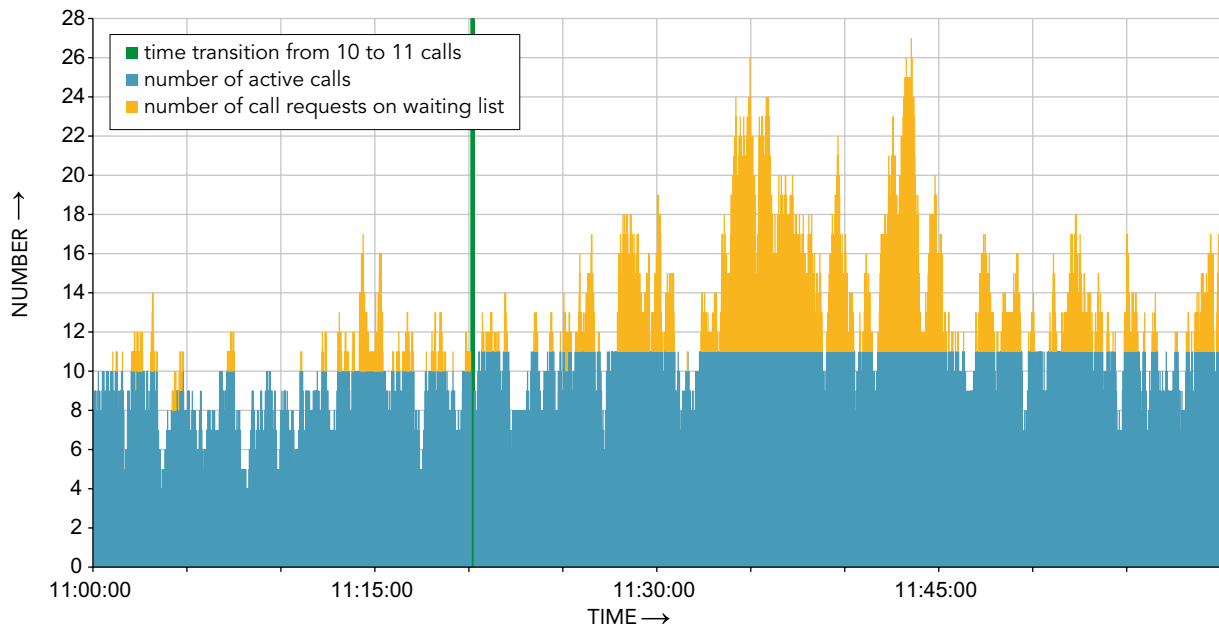


Figure 18: Load Halfweg mast of the C2000 system between 11:00 and 12:00 local time

### **Box 13. Radio control system**

The radio control system provides the operator access to the C2000 communication network and the operator can coordinate communication with this network. An operator can connect call groups, receive and send status and data messages, localise radios, speak over the call of another person, et cetera. The radio control system is often connected to the integrated control room system (GMS) so that access can also be obtained from the GMS to the communication network.

The radio control system is more suited to have the control over the C2000 communication during complex situations than the GMS because on (the screen of) the GMS not all functions can be found for the control of C2000. In the radio control system the operator sees, among other things, who has made a call and he can move an individual user to another call group. Moreover, there is in the radio control system better insight into the queue growing than in the GMS.

#### *5.5.3 C2000 communication during the first hours after the incident*

##### *Technology*

Due to problems that different emergency services workers have experienced with the communication through C2000, the Dutch Safety Board investigated whether there were technical issues with the C2000 network on 25 February 2009. The administrator of the network, the Netherlands Police Collaborative taskforce (Voorziening tot samenwerking politie Nederland (VtsPN)), has determined that there were no technical faults or failures in the C2000 network and that the communication system was continuously available during the deployment of the emergency services.

Nearly all two-way radios and radiotelephones at the site of the incident were routed through the mast in Halfweg. This mast has a capacity of twelve channels. In addition to a control channel, the other eleven channels can be configured for speech or data traffic. When the aircraft accident occurred ten channels had been reserved for speech and one channel for data traffic. At the request of Kennemerland the capacity for speech was temporarily increased by one channel to eleven on 25 February 2009 by converting the data channel into a speech channel. This switch was carried out at about 11:20 local time by the Network Management Center (NMC) of the VtsPN.

The local Kennemerland management implemented a change for four police call groups at approximately 12:45 local time with regard to the method in which a call is realised. This is realised to ensure that sending from the Kennemerland control room was possible in these call groups. With this method (fast start) the communication traffic is broadcasted at all times and there is no, as is standard the case, check by the C2000 system to verify whether all participants can actually receive the call. There is no queue option with this method but users who depend on an overburdened mast cannot receive messages. The two-way radios and radio telephones that were used by the emergency services workers during this incident have all worked correctly except for one.

### **Subconclusion**

- On 25 February 2009 there were no technical faults or failures and without coverage problems in the C2000 network. The communication system was available continuously during the deployment of the emergency services. The two-way radios and radio telephones that were used by the emergency services workers during this incident have all worked correctly except one.

#### *The demand for communication and the available capacity*

Data of all calls via the C2000 system is logged to a data file. This concerns data such as the used call group, the time of the call request, the time when the call channel becomes available, which individual users have pressed the send key during a running call and the time when the call or the call request ended. Since the Halfweg mast was used very intensively to process the communication at the aircraft accident site, the Dutch Safety Board has analysed the logged data insofar as this was related to the mast (see annex 10). Other available masts also processed a high volume during the aircraft accident but due to its location near the aircraft accident site, the Halfweg mast was the most important junction for processing the C2000 communication.

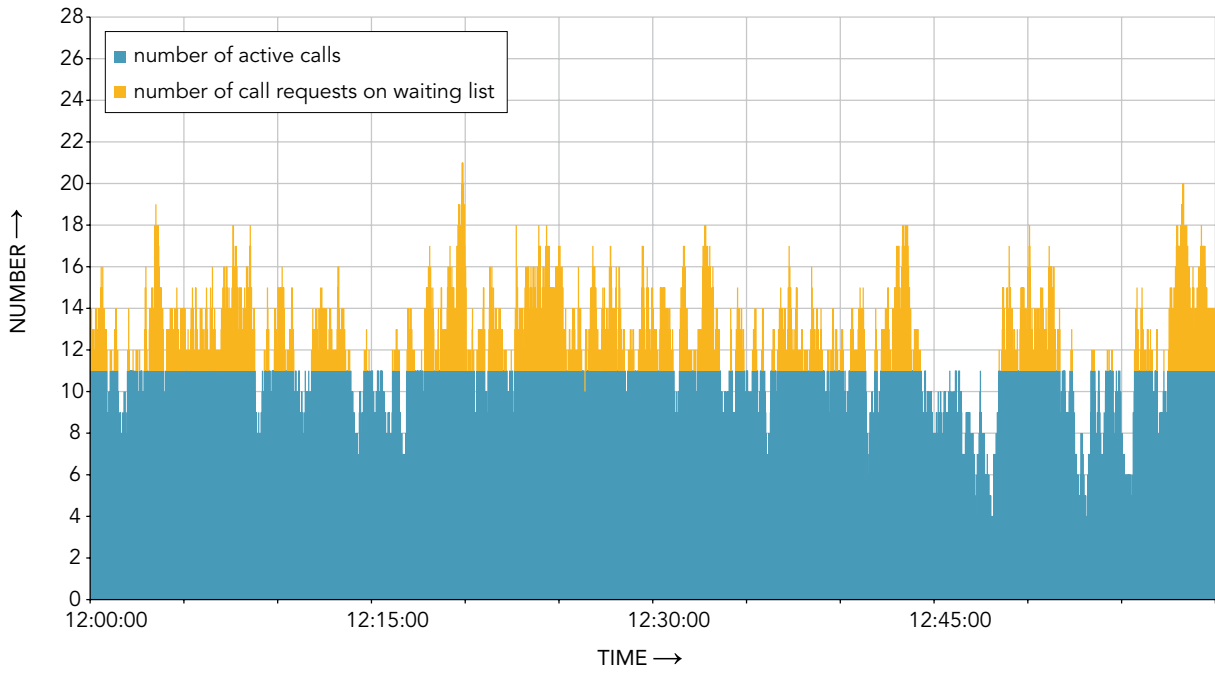


Figure 19: Load Halfweg mast of the C2000 system between 12:00 and 13:00 local time

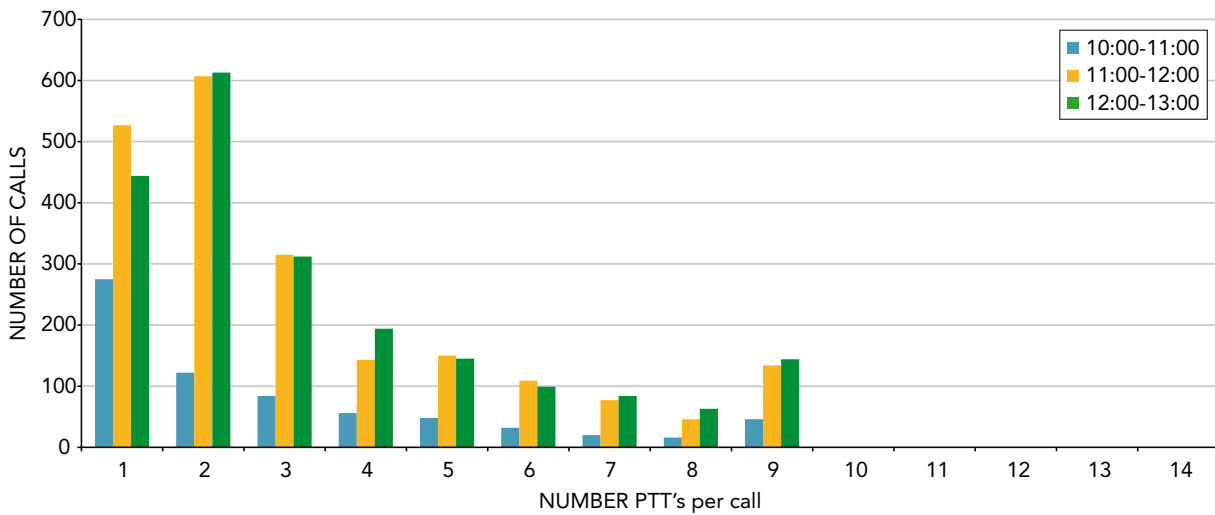


Figure 20: The number of times that the push-to-talk button was pressed per call held

The figures 17, 18 and 19 show the development of the number of call requests that have been plotted (vertically) based on time (horizontally). The blue bars specify the number of calls that were held at that time. The red bars specify the number of call requests in the queue (the 'busy calls'). The members of the call group in which the call request was placed cannot communicate with each other at that moment in time and must wait until a call channel becomes available. If red peaks cannot be seen, there was, therefore, no queue. The fast changes in the blue and red bars show that the number of current calls and the length of the queue fluctuated highly.<sup>99</sup>

The first figure starts at 10:00 local time on 25 February 2009. There is a limited use of the available ten call channels until approximately 10:25 local time. This picture changes soon after the Turkish Airlines aircraft crashes (at 10:26 local time). The number of channels used for speech increases at this point.

The first exceedances of the available capacity took place at 10:49 local time. This means that a new call request is placed in the queue at that time. The person making the request will receive a signal that he or she has been placed in the queue. The length of the queue and the period will be unknown to the user because he or she will not receive information about this.

The second and third figure show that the pattern of exceedances of the available capacity continued to approximately 11:25 local time. After this time, the exceedances of the capacity increases. The greatest exceedances of the capacity occurred during the period from 11:30 to 11:45 local time. After this, the number of call requests was still regularly higher than the available capacity but the duration of the exceedance was shorter than in the period from 11:30 to 11:45 local time. The load gradually reduced after 12:00 local time. The greatest demand for capacity took place at approximately 11:43 local time. At that moment (during 1 second) there was a need for communication in 27 different call groups at the same time while a group channel could be assigned to eleven call groups.

Between 11:00 and 12:00 local time emergency services workers placed a total of 2091 call requests. This includes the call requests to which ultimately a call channel was not assigned. Regarding this, a call channel could be assigned directly or within one second of the request to 1207 call requests. The other 884 call requests did not have a call channel assigned within one second of the request being made and were put in the queue. Between 12:00 and 13:00 local time there were 2085 call requests from which 989 were not assigned a call channel within one second.

### **Subconclusion**

- Congestion occurred at different times during the first hours after the aircraft accident with regard to the communication through C2000. Due to this different call requests of emergency services workers were put in a queue and, therefore, immediate communication was not possible.

#### *The waiting times during the hours after the aircraft accident*

It was investigated how long C2000 users had to wait for their call. The results of this investigation are shown in annex 10: Summarising, the results have indicated the following:

Of the 884 call requests that were put in a queue between 11:00 and 12:00 local time, 630 (71%) call requests were assigned a call channel after a waiting time of no more than 5 seconds and 116 (13%) call requests were assigned a call channel after a waiting time of between 5 and 10 seconds. The waiting time was longer with regard to the remainder of the call requests. The maximum waiting time that occurred within this context was 55 seconds.

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<sup>99</sup> A call request can also end up in the queue because there is congestion with regard to another mast than the Halfweg mast but where the Halfweg mast is required to reach all members of a call group. This may lead to the channel being deemed busy while the capacity of the Halfweg mast has not yet been fully used. This can be seen in the graphs when orange bars also appear at the times where the blue bars are lower than the capacity of the Halfweg mast (10 call channels and, from 11:20 local time, 11 call channels). Even when the call request has not been initiated under the Halfweg mast, it is shown with the load of the Halfweg mast in the figures as capacity needed from the Halfweg mast.

Between 12:00 and 13:00 local time, the total number of call requests that were put in a queue was greater than during the preceding hour. The general picture, however, is the same; 77% of the calls in the queue had a waiting time of no more than 5 seconds and 14% a waiting time between 5 and 10 seconds.

The investigation into the duration of the waiting time between 11:00 and 13:00 local time has shown that 92% of users regarding whom initially their call request had been put in a queue, used the option to speak after a call channel became available. The waiting time was longer than 30 seconds in 2.4% of the number of call requests that had been put in a queue. In 8% of cases, the user did not wait for an available call channel and the call was broken off<sup>100</sup> or the caller did not make use of the option to speak.

#### **Subconclusion**

- All call requests of emergency services workers led to a possibility to call and the waiting time for the majority of the call requests that had been put in a queue was less than 5 seconds.

#### *Ether discipline, investigation into the nature and content of the calls held*

Since the congestion that occurred does not seem to provide a full explanation for the experienced problems, the Safety Board also analysed the nature and content of held calls. It has transpired that all calls could mainly be classified into two categories calls during which the assistance was coordinated and 'unanswered calls'.

The Safety Board listened to all calls that were answered at the Kennemerland control room.<sup>101</sup> This concerns calls made by the ambulance teams, the fire brigade and the police from the Kennemerland Safety Region, from and to the control room. All calls between 10:30 and 11:30 local time were specifically listened to, to determine their nature. Beside this the communication within the ambulance/medical assistance at accidents and disasters (GHOR) between 11:30 and 12:00 local time was also listened because communication problems were experienced mainly by ambulance workers and the ambulance dispatch operators and because from the reconstruction of the emergency services process (see section 2.4) it has transpired that as from 11:30 local time the transport of casualties started. On behalf of the analysis 676 calls in total were listened to.

207 of the listened-to calls consisted of unanswered calls, which represent 31% of the made calls. This percentage is uniformly distributed over the made calls by the police, fire brigade and ambulance/medical assistance at accidents and disasters (GHOR). We can establish from this that the involved parties did not hear the call or ignored the call due to having other priorities.

The phenomenon of unanswered calls can also be determined through another route. When someone wishes to speak through the C2000 system, he or she can do this by pressing the push-to-talk (PTT) button. The person who answers must also press the push-to-talk button to respond to what has been said. At least two people must, therefore, press the push-to-talk button to exchange information or to confirm that the person who has spoken has been heard. One push for the first speaker and one push for the response to this. Figure 20 shows the number of times the push-to-talk button was pressed per call between 10:00 and 13:00 local time.

100 The Safety Board could not determine the exact reasons why these call requests were broken off. It is known that (nationally) a number of emergency services have 'old' two-way radios where you must keep the button (PTT) pressed in to be able to speak. If this button is released, the call request is terminated. A possible reason why a small part of the emergency services workers terminated the call requests is, therefore, that these emergency services workers had this 'old' equipment and that the button was not kept pressed all of the time. In addition, it is possible that switching to another call group while being in the queue may have resulted in the call request being terminated.

101 An investigation into which masts were required for the processing of the C2000 communication traffic was not carried out with regard to these calls. These calls have, therefore, not necessarily been processed by the Halfweg mast.

Figure 20 shows 280 times the push-to-talk button was pressed once, between 10:00 and 11:00 local time and, therefore, the call did not lead to a response.<sup>102</sup> A single response was given to 120 calls. The second and third considered hour show a different ratio with regard to the unanswered calls when compared to the calls that involved more than one push-to-talk instance; 525 and 440, respectively.

With regard to the analysis of the number of times the push-to-talk button was pressed per call, it should be noted that it is possible that answering calls did not always happen within the 2.5 second hang time. Should this be the case, the network will log the call going unanswered as a 'new' call in the database. The analysis of the accepted calls has, however, shown that there have been many calls that remained unanswered. The number of logged calls with 1 push-to-talk instance is (only) an indication of the number of unanswered calls. However answering a call within 2,5 seconds, can be deemed to be good practice with regard to C2000 communication.

### **Subconclusion**

- A significant part of the demand during the first hour consisted of unanswered calls. The Dutch Safety Board considers it likely that due to these unanswered calls of some of the users, wrongfully the impression is created that there were technical problems with the C2000.

### *Analysis of the connection diagrams*

Since the percentage of unanswered calls possibly contributed to the impression that there were problems with the C2000 system, it was investigated whether the communication organisation, i.e. the connections which were used during the hours following the accident, contributed to the experienced problems.

In the Kennemerland Safety Region the connection diagrams for ambulance care have been defined in the C2000 procedure handbook. In addition, there is a connection book called 'Section on radio communication C2000/P2000 for the Fire brigade, Ambulance services (GHOR), and the Police (provisional)'.<sup>103</sup> This document was devised for training and practising connections, and as a working instruction to be followed by the fire brigade and ambulance services/medical assistance at accidents or disasters. It contains connection diagrams for the fire brigade and the ambulance services. For the police, there were no connection diagrams for large-scale operations available on paper on 25 February. The Kennemerland police used their daily structure to communicate.

The Kennemerland Safety Region's police are able to communicate in four districts. In each district there are three call groups, one of which is meant for emergency services. In normal circumstances, the districts are coupled in pairs by the operator. This means that there are six call groups available for communication, two of which for emergency services in case of major accidents as well as standard accidents within the whole safety region. On 25 February communication at first took place mainly in two of the coupled call groups for emergency services. At 10:39 local time, the districts were uncoupled and police communication mainly took place in a single call group for emergency services, specifically the call group of the district where the aircraft had crashed. In addition to the Kennemerland Safety Region's police, there were police units from the Dutch National Police Services Agency and from other regions on site. They communicated in interregional call groups for assistance and in their own organisation's call groups.

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102 Including the first half hour before the disaster.

103 In this document space was reserved to insert the police connection structure and procedure, at a later stage.

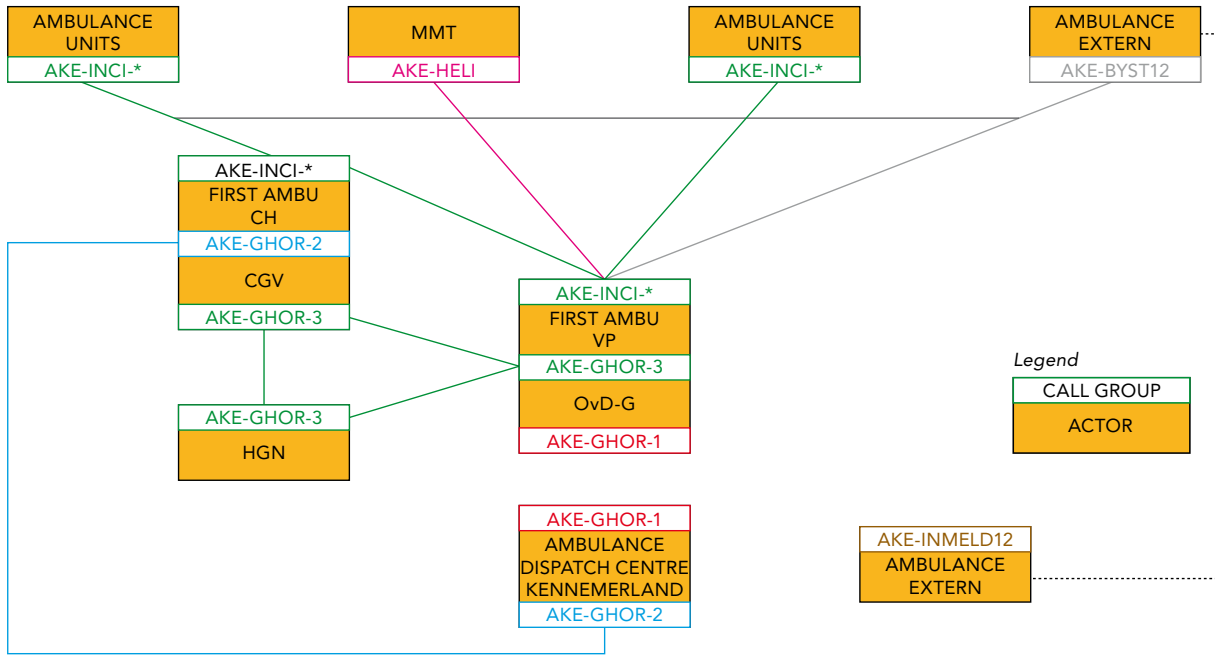


Figure 21: Kennemerland connection diagram medical assistance at accidents and disasters

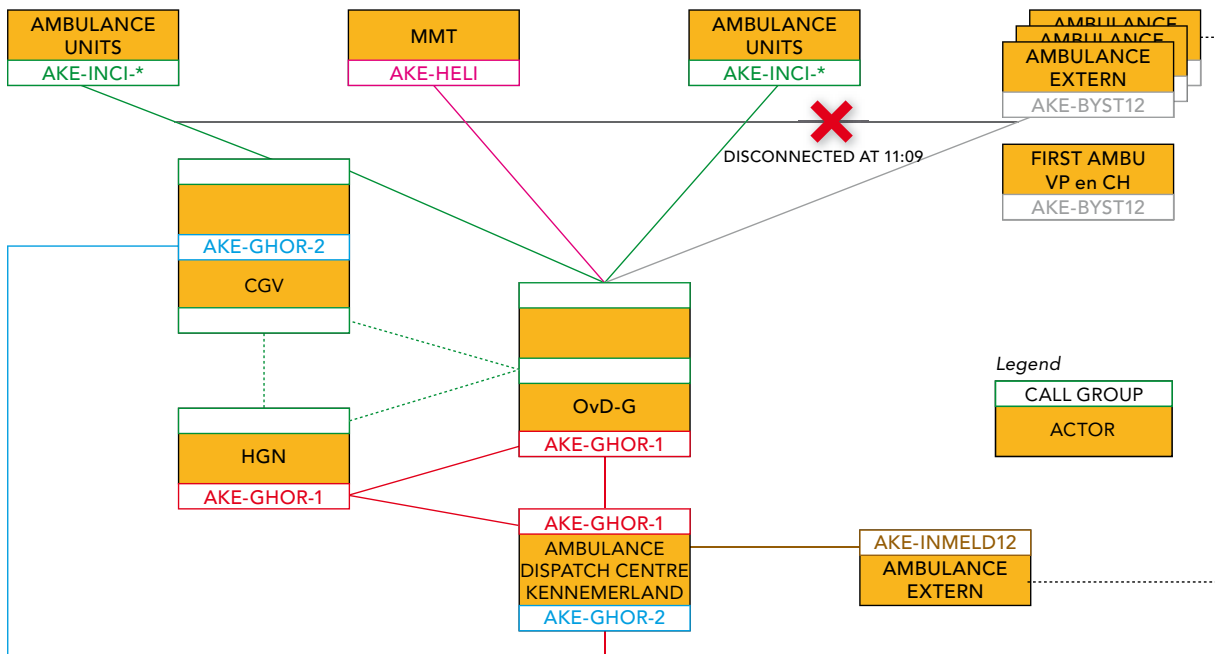


Figure 22: Actual connections on 25 February 2009

The fire brigade of the Kennemerland Safety Region also handled the aircraft accident according to the daily call group structure. This entails that all fire brigade units involved in the handling of the incident are coupled with a single 'incident call group'. From Amsterdam Amstelland, one squad was dispatched. This is an organic support unit which is part of the fire brigade of the Kennemerland Safety Region in accordance with the planning. Because of the heavy load on the Kennemerland control room, the Amsterdam control room was asked to coordinate and supervise the deployment of this squad from the Amsterdam control room. After a short time, the fire brigade of the Kennemerland Safety Region placed a connection command vehicle containing an operator at the site of the accident. The connection command vehicle served as a link between the control room and the field by passing along pooled information, often by telephone. This reduced the load on the Halfweg mast.<sup>104</sup>

When analysing the connection diagrams, the Board focused on the communication connections between medical assistance workers because this group experienced the most problems.

*Connection diagram for the Kennemerland ambulance services / medical assistance at accidents and disasters*

At the time of the aircraft accident on 25 February 2009 the operators in the Kennemerland control room had to their disposal a procedure handbook of Kennemerland ambulance dispatch centre.<sup>105</sup> This procedure handbook contains a connection diagram which is shown in figure 21.

As can be concluded from figure 21, the first ambulance on site plays a central part in the communication concerning medical assistance. The first ambulance on site communicates with the ambulances arriving later and coordinates the deployment of these ambulances. The first ambulance on site communicates with the other ambulances in the incident call group (AKE-INCI\*). External ambulances report to the operator at the control room and are ordered by the operator to switch to the assistance call group (AKE-BIJST12). This group is connected to the incident call group (AKE-INCI\*). Coupled call groups work as one single call group.

As soon as the medical officer on duty arrives, he takes over the general command of the emergency medical assistance from the first ambulance on site. In the communication line, the medical officer on duty comes between the first ambulance on site and the control room. The medical officer on duty communicates with the control room in AKE-GHOR-1 and, when necessary, with the team members of the first ambulance on site through AKE-GHOR-3 call group. The team members of the first ambulance on site continue to communicate with the other ambulances in the coupled incident call group. The ambulances do not communicate directly with the control room. This is done only by the team members of the first ambulance on site or, after his or her arrival, the medical officer on duty.

If necessary, other officials are assigned in addition to the medical officer on duty. There will be assigned a head of the triage site and a Casualty Transport Coordinator. These officials communicate with each other and with the medical officer on duty in the AKE-GHOR-3 call group. The Casualty Transport Coordinator communicates with the (driver of the) first ambulance on site in call group AKE-GHOR-2. The operator is also part of this call group on a coordinating level.

A distinction is made between the executing level and the coordinating level which means that the key officials only have to follow the communication in one or two call groups. The Dutch Safety Board does, however, question whether the first ambulance is really able to execute its coordinating communication task through C2000. Both the driver and the nurse are expected to communicate in two call groups each. This can only be done properly if the driver and the nurse both are equipped with two two-way radios or radio telephones. In practice, these officials have two two-way radios and one radio telephone between them. That means there is not enough for four call groups. On top of that the first ambulance also has various other coordinating tasks besides coordinating communication. In addition, one condition is also that the two-way radios and radio telephones have been programmed by the manager for communication in the intended call groups. This is not the case if the first ambulance is not from the Kennemerland region. According to the diagram, the first ambulance uses a regional call group.

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104 At the time of the aircraft accident the C2000 peripherals were not used to communicate through the Direct Mode Operation (DMO) mode. DMO is radio communication between two peripherals without using the C2000 network.

105 C2000 Procedures ambulance dispatch centre / Kennemerland ambulance services / affiliated parties, version 5.1 dated 14 December 2008.



### *Connections on 25 February 2009*

On 25 February 2009, prior to the aircraft accident, the ambulance dispatch centre operators communicated in four regional call groups. It soon became clear that this accident could possibly involve a large number of casualties. For this reason, the ambulance dispatch centre operators switched to an incident call group (AKE-INCI 1) after only a few minutes, as prescribed in the procedure handbook. See figure 22.

Because 55 ambulances from other regions had been called in through the Amsterdam Ambulance Dispatch Centre (which brought in the National Ambulance Dispatch Center) to provide assistance, ambulances from outside the Kennemerland region started reporting to the operators at the Kennemerland control room. In accordance with the specified rules these external ambulances logged on to the standard regional AKE-INMELD call group. They had to be told by the Kennemerland control room which call group they should switch to. However, because the logging on all happened within a short time period, the operator was flooded with ambulances logging on.

Because the operator was not able to process all calls to log on separately, the operator sent out a general call through the check-in channel to all ambulances on their way to the accident site, asking them to switch to the assistance channel (AKE-BIJSTAND12). Principally, this channel is coupled with the incident call group, yet was, in deviation of the connection diagram, uncoupled by the Kennemerland control room at 11:09 local time. The Dutch Safety Board has asked the Kennemerland Safety Region the reason for this. It is, however, unknown.

One thing known is that, no communication is allowed during that time when coupling or uncoupling takes place in call groups. In contrast to the Kennemerland police, where an explicit call for radio silence went out because of the uncoupling of call groups, there was no request for radio silence at all to be heard on the channels of the emergency medical assistance around 11:09 local time.

The uncoupling resulted in two different call groups with ambulances (assistance and incident) between which communication was not possible. It also resulted in the first ambulance on site, in this case an ambulance from the Amsterdam-Amstelland region, not being able to communicate with the ambulances from the Kennemerland regions anymore and to stay in charge of the ambulances. As stated before in the report, the first ambulance on site has a special function. It is not used for stabilising victims or transporting casualties. Instead, it makes an assessment of the medical assistance required and takes care of the coordination until the medical officer on duty is on site. The only one able to communicate with both the ambulances from its own region and the assisting ambulances was the control room. The investigation showed that the operator did not fulfil the managing role, probably because he was very busy with other tasks such as accepting and processing telephone calls. As from that moment, there was, in fact, no central control of the communication between the emergency medical assistance through C2000. When the emergency services were, as a result of insufficient control, not supplied with the necessary information, a need for information was created, which resulted in a large number of call requests.

The lack of control was amplified by a number of technical characteristics of the C2000 system. For example, after the call groups had been uncoupled, the operators had to interact with their own and the external ambulances in several different call groups simultaneously. The system is designed in such a way that the operator talking in a specific call group cannot hear what is being said in other call groups while he is speaking. In the GMS used by the operators, an operator cannot see at that time, or later, that a conversation is or was taking place in another call group. This is, however, possible using the radio control system. But the radio control system was not used by the Kennemerland control room during the handling of the aircraft accident.

Regarding the connection diagram in the procedure handbook another identified deviation was that the AKE-GHOR3 call group was never established. This channel should be used for communication between the Casualty Transport Coordinator, the head of the triage site, and the medical officer on duty about the transport of casualties. It also emerged that between 11:00 and 12:00 local time only two calls took place in the AKE-GHOR2 call group, which is to be used by the Casualty Transport Coordinator and the control room to coordinate casualty transport. This was probably caused by the fact that the Casualty Transport Coordinator on duty was also on duty as control room operator as a result of which he did not fulfil the position of Casualty Transport Coordinator on site. Later on a

nurse fulfilled this position. The nurse came from another region and wasn't familiar with regional agreements.

### **Subconclusions**

- The connection diagram for emergency medical assistance in Kennemerland was not carried out due to the lack of a Casualty Transport Coordinator who was familiar with regional agreements and the uncoupling of the two call groups assigned to ambulances.
- Also, the connection diagram does not take the possibility into account that the first ambulance, which has an important coordinating function, could be an external ambulance. To the opinion of the Dutch Safety Board this caused a lack of control of the communication through C2000. This is one of the explanations for the communication problems encountered by the emergency services workers.

#### *5.5.4 The organisation of communication at major incidents*

Connection diagrams for major incidents are drawn up by each safety region separately. The Safety Board has found that there is no national approach to this. There is, however, a national framework for the classification of call groups; the National C2000 Fleet-mapping Framework (LKF).<sup>106</sup> This framework consists of a number of call groups and operational procedures for C2000 use by the police, the fire brigade, ambulance care and the Royal Netherlands Marechaussee. The framework is mainly related to supraregional cooperation. It, however, does not describe unequivocal steering with regard to what a connection diagram for a major incident must look like. Every region and discipline provides its own specifics with regard to this. This results in differences in the communication structure in the different regions.

The National Fleet-mapping Framework enables the safety regions to define a large number of call groups (100-150) for each user organisation such as regional forces of the fire brigade or the police. The existing working method and classification of the call groups is sufficient with regard to the daily load without involving major incidents. The average load on the call channels with regard to the Halfweg mast, for example, was on average approximately 6% the past two years.<sup>107</sup> The probability of experiencing congestion is, therefore, very slight under normal conditions. A very different situation, however, emerges with regard to a major incident. The number of call groups that becomes active with regard to a major incident in part determines the load on the C2000 system.

During the aircraft accident many organisations were active within their own call groups when providing assistance. Examples are the national and regional police forces, the Royal Netherlands Marechaussee, the fire brigades from different regions and the ambulances from other regions that maintained contact with the control room of their own region. During the two busiest hours after the aircraft accident on 25 February (from 11:00 to 12:00 and from 12:00 to 13:00 local time), call requests were placed through the Halfweg mast by approximately 600 emergency services workers in 127 and respectively 122 call groups. These call groups all made use of the same C2000 infrastructure including, in this case, the 11 call channels running through the mast at Halfweg. In view of the congestion that ensued, we can determine with hindsight that the number of call requests of the active call groups was not in proportion to the capacity of the mast at Halfweg.

A large part of the active call groups were call groups from outside the Kennemerland region. A considerable capacity was used for communication among call groups outside the region itself by, in particular, the police<sup>108</sup> and ambulance workers. In addition to the management from the control room of Kennemerland, the steering of the communication was partly in hands of other control rooms such as the ones from Amsterdam-Amstelland and Noord-Holland North. This is not taken into account in the existing connection diagrams of the Kennemerland Safety Region.

106 National C2000 Fleet-mapping Framework, National C2000 Fleet-mapping Management Committee, version 2008/6.1. (Landelijk Kader Fleetmapping C2000, Commissie Beheer Landelijk Kader Fleetmapping C2000)

107 25-02-09 Aircraft Accident C2000 Report, version 1.0, 21-04-09, VtsPN (C2000 Rapportage vliegtuigongeval 25-02-09 Voorziening tot samenwerking Politie Nederland).

108 Police including Kennemerland, the Royal Netherlands Marechaussee, the Dutch National Police Services Agency, Amsterdam Amstelland and special departments/services

#### *5.5.5 Summarising*

C2000 is the communication system for emergency services workers in the Netherlands. It became known during the days after 25 February 2009 that the emergency services workers who were involved in the assistance after the aircraft accident had problems with the underlying communication. Especially the medical assistance workers experienced hindrance due to this when coordinating the transport of casualties.

The Safety Board has investigated what caused these problems. Three issues play a role when using a technical system such as C2000: the technology, organisation and use. With regard to the technology, the way in which the system has been designed and built is important. This determines the possibilities and impossibilities for users of the system; the emergency services workers. It is, therefore, important that the design is harmonised with the preferences of future users. To ensure that the system is used optimally, it is required that the use by emergency services workers is organised in such a way that the expected need of communication does not exceed the capacity of the system. On the one hand this organisation consists of prescribing the communication method, that is, who speaks to whom and regarding what, and, on the other hand, training emergency services workers so that they know what is being expected from them. To conclude, the ether discipline of emergency services workers is important to really use the system as has been agreed and learned during training. The Safety Board has found that there was an imbalance between the technical capacity (the mast and the call channels) and the communication need due to a lack of organisation of the communication need and calling discipline on 25 February 2009.

#### *Technology*

It has been determined by the Netherlands Police Collaborative Taskforce that the technology worked correctly on 25 February 2009. There were no technical faults or failures and the network was continuously available. The Safety Board has examined this investigation and endorses this conclusion. This means that the problems experienced by emergency services workers are linked to the organisation and use. The possibilities for the user will, after all, always be limited by the capacity of the technology.

#### *Organisation and use*

The Safety Board has established that use was insufficiently structured. The communication need was greater than the technical capacity of the system and, therefore, the users ended up in a queue. It is also established that the waiting time for most of the calls, regardless of the fact on how inconvenient this may be when providing assistance, remained limited to at most 5 seconds.

The use of C2000 was organised in such a way that communication with regard to medical assistance ran through the control room. In addition to this, the fact that an operator himself or herself also has a limited capacity, that is, only one call at a time, was not taken into account. Since use was insufficiently organised, the operator was overburdened. This resulted in emergency services workers in the field not being able to contact the operator anymore. According to the Safety Board this is the reason why the impression was created that the system did not work.

Furthermore, the fact that, in case of a major incident such as the aircraft accident on 25 February 2009, emergency services workers from the bordering safety regions could be involved was not taken into account. Agreements about this between the safety regions had not been made in advance while a national uniform working method of connection diagrams for the use of C2000 do not exist either. This meant that the system was additionally burdened with all types of communication about how emergency services workers from the different regions could contact each other.

The Safety Board has established that there was no ether discipline due to the lack of organisation and structure. After all, nobody knew who could communicate with whom and how information should be distributed. This resulted in the communication need of the involved emergency services workers exceeding the capacity of the system.

### **Subconclusions**

- It is important that when a major incident occurs the communication is organised and structured in such a way that the number of call requests to be expected is proportional to the capacity of the operators who work at the control room.
- Every system has its capacity limits and this is also the case with C2000. Streamlined agreements about the ether discipline are required with regard to large-scale deployment.
- The specifics for the connection diagrams are currently being provided per region and organisation. Insufficient attention to the integrated and uniform use of the C2000 infrastructure is being paid by the involved emergency services organisations from the relevant region and other regions with regard to major and often supraregional incidents.
- The number of call requests of the emergency services workers was disproportional to the capacity of the operators in the Kennemerland Safety Region during the emergency assistance after the aircraft accident. The congestion that ensued, therefore, is not due to a technical cause but an organisational one.

## 5.6 UNIFORM AND FEASIBLE AGREEMENTS

### 5.6.1 *Introduction*

During the past few years, a lot of energy was invested in developing the emergency services approach in case of major incidents. The Safety Board appreciates that. It is, however, of the opinion that improvements are possible. For this reason, the lessons to be learned that have been identified were compared to previous investigated incidents.

### 5.6.2 *Problems identified*

As can be concluded from the sections above, the following bottlenecks in the emergency assistance after the Turkish Airlines aircraft accident have been identified:

- The fire services were alerted on time, yet were not sent to the accident location by the Kennemerland control room.
- A few medical emergency services, e.g. the mobile medical teams and the medical combinations, were alerted too late by the Kennemerland control room or not at all.
- The organisation of Medical Assistance at Accidents or Disasters (GHOR) did not have any insight into the number of victims, the gravity of the injuries of the victims and the distribution of the injured.
- The hospitals were not sufficiently informed.
- There are no clear guidelines regarding the communication with the C2000 system concerning who communicates what and how (and in which call group) in case of a major incident that involves more than one discipline and where assistance is provided by emergency services from other regions.
- The municipal registration process was not set up to collect information about victims' fate and whereabouts as quickly as possible.

Aside from the fact that the problems can be traced back to the involved organisations themselves (Kennemerland Safety Region and the municipality of the Haarlemmermeer), a number of problems also stem from the fact that assistance from external emergency services was needed. This investigation has shown that the supraregional cooperation is inadequate.

### 5.6.3 *Lessons to be learned by the Kennemerland Safety Region*

This section discusses the territorial corresponding process for the Municipality of Haarlemmermeer. This process entailed that the Municipality of Haarlemmermeer (including Schiphol Airport) were transferred from the Amsterdam-Amstelland region to the Kennemerland Safety Region. During this process, several testing instances took place in order to assess whether the Kennemerland Safety Region is capable of taking responsibility for the crisis response in this area. Also, this section addresses the question how the safety region has been preparing for crisis control during the past period.

*Territorial correspondence for the Municipality of Haarlemmermeer (including Schiphol Airport)*

On 30 March 2006, the Minister of the Interior and Kingdom Relations informed the Dutch House of Representatives of the decision that the Municipality of Haarlemmermeer including Schiphol Airport was, as of 1 January 2007, to be part of the Kennemerland Safety Region in regard to the fire brigade and the medical assistance at accidents or disasters (GHOR).<sup>109 110</sup> The minister assigned the task of monitoring, testing and, where necessary, supporting the implementation process regarding the crisis response preparation to the Public Order and Safety Inspectorate.<sup>111</sup> This territorial correspondence came into effect on 1 January 2008. That means that from this moment on the Kennemerland Safety Region had to be able to handle the emergency assistance after a large-scale aircraft accident.

To reach territorial correspondence, the Dutch Public Order and Safety Inspectorate conducted an audit (zero assessment) in 2006 of the Kennemerland Safety Region in order to gain insight into the state of the crisis response preparations.<sup>112</sup> The Inspectorate looked, amongst other things, at the interregional cooperation, the municipal processes, the available emergency services capacity as well as the harmonisation and cooperation with Schiphol Airport's administrative partners. Also, the Public Order and Safety Inspectorate inventoried the elements in the Amsterdam-Amstelland region and the Municipality of Haarlemmermeer (including the Schiphol Airport fire brigade) which could lead to a strengthening of the (preparations for the) crisis response in the Kennemerland region.

Following this zero assessment, the Public Order and Safety Inspectorate concluded that the Kennemerland Safety Region did not meet the standards set by the region itself and the Public Order and Safety Inspectorate concerning the operational as well as the municipal processes. The audit showed that the critical reporting and scaling-up processes, the information management as well as the set-up and size of the main structure and the municipal processes did not meet the basic standards. The organisational (pre-)conditions were missing with regard to a number of relevant elements.

Within the Kennemerland region, eight subprojects were created with a view to the territorial correspondence project.<sup>113</sup> Four critical activities were identified to be able to determine when the operational preparations should be carried out:

- Alerting and scaling-up
- Command and control
- Information management
- Training and holding drills

As a result of the zero assessment, the Kennemerland Safety Region initiated an improvement plan. The planning that had already been started was adjusted accordingly. Also, a correspondingschedule was devised. The zero assessment caused, amongst other things, the plans to be reviewed, the control room processes to be tested and, where necessary, the processes to be critically assessed and rewritten.

According to the Public Order and Safety Inspectorate, the Kennemerland emergency services then created the organisational (pre-)conditions necessary to enable a basically adequate response to the consequences of the most serious scenario described in the Schiphol Crisis Response Plan (i.e. an aircraft accident at Schiphol Airport) on 1 January 2008. The Public Order and Safety Inspectorate found, however, that a lot of work still had to be done concerning the municipal processes.<sup>114</sup>

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109 Dutch House of Representatives, working year 2005-2006, 29,517, no. 12, 30.03.06.

110 Up to this point, the fire brigade and the GHOR in the municipality of Haarlemmermeer fell under the Amsterdam region, while the police was part of the Kennemerland police region. At Schiphol Airport, the police tasks are carried out by the Royal Netherlands Marechaussee.

111 Dutch House of Representatives, working year 2006-2007, 29517, no. 21, 21 November 2006.

112 The audit fit in with the system for the general disaster investigation (Public Order and Safety Inspectorate).

113 Fire brigade and ambulance dispatch centre, regional fire fighting, planning, GHOR, ambulance care, administrative and legally, financial, personnel. Source: Kennemerland emergency service, Amsterdam-Amstelland Safety Region, Municipality of Haarlemmermeer; territorial congruence, integrated plan of approach; version 7.0., 25 April 2007.

114 This mainly concerned issues such as workplaces and arrival times of the Municipality of Haarlem.

### *Drills*

On 20 March 2008, a simulated large-scale aircraft accident took place in the urban area of Haarlem. This simulation was the last test<sup>115</sup> concerning the territorial correspondence project during which the Public Order and Safety Inspectorate assessed the operation of the crisis control organisation. In its final report, the Public Order and Safety Inspectorate concludes that the Kennemerland Safety Region has developed very quickly within a short period. The Inspectorate established that the foundation for the crisis response organisation is in place. A large number of aspects of the crisis response went according to plan during the simulation. These aspects included processing and registering alerts on time, organising assistance from other regions, scaling-up, alerting (except the Large-scale and Special Acting Support (SGB0) and the municipal staff), attendance and starting up the most relevant processes by the operational services of the safety region.

Following the simulation on 20 March 2008, the Public Order and Safety Inspectorate report (June 2008) showed that the region had not yet completed all aspects of the improvement plan but that the safety region was equipped to handle the task. One of the aspects to be completed was the exchange of information during a crisis. Regarding the Municipality of Haarlem<sup>116</sup>, the Public Order and Safety Inspectorate found that there still were problems with the municipal processes.

The Public Order and Safety Inspectorate report showed that the Kennemerland Safety Region had made plans to prepare for the emergency assistance process. These plans were based on the Basic Crisis Response requirements and were prompted by the territorial correspondence project.

The Safety Board also looked at the various disaster drills carried out by the safety region. The Kennemerland Safety Region has devised a multidisciplinary policy plan 2008 - 2010 for training and performing drills (Opleiden, Trainen en Oefenen). This policy plan describes the goals, planning, execution and manner of registration and assessment of the multidisciplinary policy for training and performing drills. Another item to be addressed is reporting and alerting where the skills of the control room operators are defined specifically. The assessment system described in this plan entails securing the lessons learned in the new policy. In practice, however, the Safety Board finds that this policy plan has been put into effect only to a limited extent. The Kennemerland control room has participated in a number of drills but its part was limited to arranging the regular deployment of emergency services without the disturbance created by callers reporting the incident or requesting information. The activities and the 'flooding' with calls of the control room were not practised and neither was the central harmonisation of information received. Other goals of the training and performing drills plan have not yet been put into effect by the safety region. The agreements about securing the lessons to be learned cannot be found by the Safety Board. The Kennemerland Safety Region has crisis response plans. There are no manageable, practical clear instruction manuals for the control room operators.

The Safety Board concludes that the Kennemerland Safety Region cannot be said to have a sufficient and also secured improvement process in place. The plans made had been put into effect only partially and possible lessons to be learned had not been integrated in the policy.

After the aircraft accident, the Kennemerland Safety Region and the Municipality of Haarlemmermeer instructed the Public Order and Safety Inspectorate (IOOV) to assess emergency assistance following the aircraft accident. The lessons learned were then shared.

The Safety Board has expressed its appreciation of this attitude and the initiatives taken but feels that, in addition to the items to be addressed as listed by the Public Order and Safety Inspectorate, there are more lessons to be learned. This applies not only to the Kennemerland Safety Region but to all safety regions in the Netherlands.

#### *5.6.4 Lessons to be learned nationally*

The Safety Board finds that the problems identified on 25 February 2009 have also been encountered during earlier investigations. It is also apparent that these problems occur frequently in case of supraregional deployment, i.e. when emergency services workers and hospital capacity from other regions are used.

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115 The results of this simulation were included in a report. Inspectie Openbare Orde en Veiligheid, Veiligheidsregio Kennemerland, project Territoriale Congruentie Simulatie, June 2008, version 1.1.

116 The municipality of Haarlem was not involved in the airplane accident on 25 February 2009 with regard to the problems described.



### *Emergency medical assistance*

The problems found by the Dutch Safety Board with regard to the emergency medical assistance process following the Turkish Airlines aircraft accident corresponds to a large extent with the problems identified during earlier major incidents and disasters. This is apparent, for example, from the 2007 study by the Netherlands Institute for Physical Safety (Nederlands Instituut voor Fysieke Veiligheid, NIFV)<sup>117</sup>, in which the assessment reports of five sudden disasters were studied: the Hercules accident in Eindhoven (1996), the Dakota incident above the Wadden Sea (1996), the firework disaster in Enschede (2000), the Volendam pub fire (2001) and the Schiphol Airport cell complex fire (2005). The object of the analysis was to determine which problems occurred within the medical assistance provided during disasters, to what extent they occurred and if certain patterns can be detected. The report shows that there were a number of repeated problems during these sudden disasters. The report contains three general conclusions:

- During processes in which communication plays a large role more problems occur than during subprocesses in which communication is less important.
- Processes deviating widely from the normal course of events in regular medical care or which are not applicable in regular medical care, lead to more problems than subprocesses that are very similar to the normal course of events.
- During processes for which protocols have been developed, problems still occur and many problems are solved adequately through improvisation.

Similar conclusions have been drawn by the Public Order and Safety Inspectorate in earlier investigations. Since the 2001 report 'Melding en opschaling' (reporting and scaling-up) in 2001<sup>118</sup> the lack of quality and multidisciplinary of the processes reporting and alerting, scaling-up and -down, management and coordination, and information management has been pointed out repeatedly. 'The general 2003 - 2005 disaster response investigation position'<sup>119</sup> shows that the safety regions have worked on improving the quality of these processes. The Inspectorate has, however, subsequently come to the conclusion that the multidisciplinary crisis control organisation is not yet in order.

In June 2009, the Public Order and Safety Inspectorate published an investigation report<sup>120</sup> concerning the regional medical assistance at accidents and disasters (GHOR). The objective of this investigation was to describe the regional medical assistance at accidents and disasters, focussing specifically on the organisation, the role and position of the regional medical officer (RGF) and the operational performance capacity. The investigation shows that the regions have made progress during the last ten years regarding medical assistance at accidents and disasters. The regions have made plans, many regions are HKZ<sup>121</sup>-certified and have made agreements with the most important medical care partners about the drills and the performance to be delivered in case of a disaster or major incident.

The Public Order and Safety Inspectorate, however, has identified a few important shortcomings. For example, the Inspectorate states: "*The GHOR is, however, characterised by the almost complete lack of nationally supported quality standards. This concerns the sector's own quality standards (professional standards) as well as the quality standards in regulation.*" A second identified shortcoming is that: "*An unequivocal system (including standards) for determining the operational performance capacity (the 'output') of the organisation is also lacking.*" "*The operational performance capacity differs widely per region. Because the standard for stabilising T1 victims (very seriously injured) is one hour (also called the 'golden hour'), based on information supplied by the regions, the chances of survival during daytime are slim in half of the regions for a large percentage of, for example, 25 T1 victims.*" "*The agreements made with hospitals about the number of available beds to be used for those injured during a disaster or major incident often concerns (very) low numbers.*"

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117 Report 'Communicatie, afwijken van routinehandeling en de beperkte waarde van protocollen: repeterende problemen bij vijf recente vlitsrampen in Nederland' (Communication, deviation from routine acting and the limited value of protocols: problems that reoccur with regard to five recent sudden disasters in the Netherlands), Nederlands Instituut voor Fysieke Veiligheid, December 2007.

118 Report 'Melding en opschaling' (Reporting and scaling-up), Fire fighting and crisis response inspectorate(now: Public Order and Safety Inspectorate), 2001.

119 Report 'General disaster response investigation, position 2003 - 2005', Public Order and Safety Inspectorate, December 2007

120 Report 'The organisation of medical assistance at accidents and disasters', Public Order and safety Inspectorate, 30 June 2009

121 Stichting Harmonisatie Kwaliteitsbeoordeling in de Zorgsector (Foundation for the Harmonisation of Quality Assessment in Healthcare).

It is remarkable that: *“The Public Order and Safety Inspectorate finds that not in all regions a one-to-one relationship exists between the region’s risk picture (relevant risk) and the operational performance capacity.”*

Each safety region needs support when dealing with a major disaster or incident. The Safety Board, therefore, considers it remarkable that there are clearly still some regions that have not made any agreements with neighbouring regions. Especially when the lessons to be learned arising from this investigation also mainly concern the supraregional deployment of emergency services again.

The Safety Board is concerned about the fact that various studies show that the quality of the enabling processes for the emergency (medical) services is lacking. These processes have a critical function. An adequate crisis response is only possible if the main structure is solidly designed and works efficiently. In light of the developments with regard to medical assistance at accidents and disasters since the Hercules aircraft accident, one would expect there to be less problems during the next disaster. The Safety Board was, therefore, confident that the administration responsible would learn from shortcomings and took measures to eliminate these shortcomings. It is, however, remarkable that, in spite of this, during this investigation of the aircraft accident similar problems to those identified during the 2007 investigation of sudden disasters were encountered yet again.

In June 2007 the National Ambulance Dispatch Center (LMAZ) and the Ministry of Health, Welfare and Sport established the National Ambulance Dispatch Center to take the pressure of ambulance dispatch centre operators at the regional control rooms. On a national level, the LMAZ is not supervised, nor are there checks to ensure that the regional control rooms use the LMAZ as intended.

The Council of Regional Medical Officers has developed a system for victim registration in the field. The Safety Board’s investigation of the aircraft accident on 25 February 2009 shows that the National Ambulance Dispatch Centre was not asked for assistance (in spite of an existing agreement) and that the victim registration system in the field was not structurally used. The Safety Board could see no supervision of any kind of the victim registration system either on a regional or on a national level.

The aircraft accident on 25 February 2009 demonstrated that a number of processes with regard to medical assistance do still not run smoothly. In case of a major incident, a large number of ambulances has to check in with the control room, causing the ambulance dispatch centre operators to become overburdened. This is a recurring issue. The deployment of mobile medical teams and the clearing of often specialist hospital capacity has also still not been regulated properly.

### **Subconclusion**

- In day-to-day practice, emergency assistance in the Netherlands is well-organised. When scaling-up from the regular process, the emergency assistance usually works well. The Dutch Safety Board observes, however, that in case of large-scale deployment many things do not go as intended anymore.

### **C2000**

Since the introduction of C2000 in 2004 the regions have a lot of autonomy when setting up call groups, connection diagrams and the communication structure. The set-up for daily use in their own region is often workable but usually there is no harmonisation with other regions at all. According to the Safety Board an unequivocal and easily manageable connection diagram should be established nationally including a corresponding procedure for the connection of (assisting) units in call groups during disasters and major incidents. Next, it must be ensured that each (assisting) unit is able to access the call group processing the incident. The number of call groups should be limited to a manageable number per operator. The manner in which the multidisciplinary control room is to be controlled during major incidents must be prescribed and practised. This does, however, require knowledge of emergency assistance processes during major incidents as well as direction by one party to ensure that this is done uniformly. At the moment, this is not the case. Each region can complete the connection diagram and the call groups to be set up more or less as they please. The current investigation shows that this does not work and that strict regulation of the system’s set-up is necessary, as far as major incidents are concerned. The purpose is not only to limit the load on the system, but also to enable better communication where only necessary information is exchanged.



### *Municipal process: registration*

The prevailing legislation (Wvzo; Disasters and Major Accidents Act) stipulate that municipalities are responsible for the registration of injured persons following a disaster or serious accident. In many cases, the plans are established regionally on the basis of national guidelines (Ministry of the Interior and Kingdom Relations) but their implementation remains the responsibility of the municipality. In the case of major emergencies in the past, it has appeared that there is a high chance of this process not running smoothly at the time of a disaster or major accident occurring, simply because the work involved does not form part of the day-to-day activities of those involved. Were this task to be charged to the safety regions, better coordination could be achieved with registration processes that should be carried out in the field (for example to guide and inform hospitals). It cannot be the case that each region organises registration in the case of major incidents differently, as this can lead to problems in the case of supraregional deployment. A uniform national approach (tasks, responsibilities, process description) and drill programme are, therefore, required.

As stated before, the Minister of the Interior and Kingdom Relations has final responsibility for crisis response in the Netherlands. During the past few years, many initiatives have been taken to not only improve, but also professionalise emergency assistance.

In the Netherlands many parties are involved in the organisation of emergency assistance in case of disasters or major accidents. Regional parties often come to agreements on mutual cooperation which are set down in written agreements. For example, the Leidraad vliegtuigongevallenbestrijding op luchtvaartterreinen (Guideline to aircraft accident response procedure at airport sites). This Guideline forms the basis for the drawing up of the Crisis Response Plan for airport premises. The identified problems are not only applicable for Schiphol but may occur at other airports as well. Research at other airports in the Netherlands (see Annex 12) has demonstrated that standard deployment scenarios and alarm protocols cannot be applied to all aircraft accidents. Problems are bound to arise when parties from various regions are involved who do not know the regional agreements.

In the reports by various investigation committees and the Safety Board issued the past few years and also in the reports by the Public Order and Safety Inspectorate, many lessons to be learned have been clearly identified but often they are repeating the moves.

The Safety Board has not investigated this in depth, as it goes beyond the actual scope of the investigation, i.e. the emergency assistance following the Turkish Airlines aircraft accident.

### **Subconclusions**

- The choice of scenario, the determination of the right location, the proper deployment of the necessary emergency services and the use of the available resources determine the sequence of emergency assistance process.
- In the emergency service sector there is a lot of freedom, and many things are arranged after mutual consultation such as agreements. Large-scale emergency assistance, however, requires a limited number of workable agreements made binding in advance which are complied with.
- When preparing for disasters and major incidents, it is important that all relevant processes are practised and that all involved are trained.
- During the past few years many lessons to be learned have been identified during various investigations. In this investigation report, the Dutch Safety Board finds that these lessons to be learned have not been sufficiently addressed during the past few years.

## 6. CONCLUSIONS

The number of casualties resulting from the aircraft accident on 25 February 2009 remained relatively limited in view of the circumstances. The aircraft had 135 people on board of which seven were crew members. Five passengers and four crew members died in the accident. Nearly all of the 126 survivors suffered injuries. Only six people were physically uninjured.

The negative consequences of the accident remained relatively limited due to the efforts of all emergency services workers and employees of the Municipality of Haarlemmermeer and Schiphol Airport, but also due to the fact that the passengers were able to cope themselves and to the spontaneous assistance provided by those in the vicinity.

The objective of this investigation is to assess whether lessons can be learned from the emergency assistance process after the aircraft accident to improve the emergency assistance provided during major incidents in the future. In its investigation, the Safety Board answers the following questions:

- What was the sequence of the emergency assistance in practice?
- Did any problems arise during the provision of emergency assistance?
- What were the causes of these problems?
- Which lessons can be learned?

Despite the efforts made by all those involved, this study reveals several shortcomings regarding the emergency assistance provided:

- Time lost before the actual arrival of the emergency services because information was not exchanged properly and because there was a lack of coordination regarding the exact location of the accident;
- Time lost by the mobile medical teams upon arrival at the accident site because they were not alerted by the Kennemerland control room;
- Congestion occurring during the use of the C2000 communication system;
- Information about the names of the victims, their location and the type of injuries they sustained was lacking for a long time due to the poor registration of victims;
- The limitation and the logics of the scope of application of the crisis response plans.

In 2007, it was decided that, because of territorial correspondence<sup>122</sup>, the Municipality of Haarlemmermeer including Schiphol Airport would be transferred from the Amsterdam region to the Kennemerland Safety Region. In anticipation of the adoption of the Dutch Safety Regions Act, they worked on the implementation of the new vision at the Kennemerland Safety Regions from that moment. The intention of the recently introduced Dutch Safety Regions Act is to realise an efficient and high-quality organisation of the emergency services under one regional administrative authority. The Dutch Public Order and Safety Inspectorate has provided guidance with regard to this issue to the Kennemerland Safety Region. This Inspectorate had a positive opinion about the implementation of the new Act by the Kennemerland Safety Region in 2008, 2009 and, more recently, 2010. The Kennemerland Safety Region was prepared to deal with any aviation incidents systematically and uniformly in accordance with the Dutch Public Order and Safety Inspectorate.

A considerable responsibility was being borne by the Kennemerland Safety Region as from the transition because the Kennemerland control room was, therefore, deemed ready to coordinate large-scale emergency assistance at Schiphol Airport.

Based on the findings of this investigation and whilst reflecting upon the positive assessment of the Inspectorate, the Safety Board finds that the above mentioned shortcomings should not have occurred.

Although the provision of emergency assistance at accidents and incidents routine for the emergency services workers, issues arise more often in the case of an acute large-scale deployment.

During its investigation, the Safety Board concluded that the investigation results are not only relevant to the Municipality of Haarlemmermeer and the Kennemerland Safety Region, but to the other safety regions in the Netherlands as well.

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<sup>122</sup> 'Territorial correspondence' means that the fire brigade, GHOR and police all work in the same geographical region and that they cooperate with each other. 117

The investigation of the Dutch Safety Board has resulted in the following conclusions:

1. DETERMINATION OF THE ACCIDENT LOCATION:

The Kennemerland control room was not appropriately prepared to respond adequately to the crash of an aircraft in the Kennemerland region. Immediately after the report of the incident, the accident site, *Kromme Spieringweg*, was not shared within the Kennemerland control room or between the Kennemerland, Amsterdam and Schiphol control rooms. This had an effect on the arrival times. Many emergency services workers arrived late at the accident site.

- The report of the incident was incorrectly logged at the Kennemerland control room and, therefore, the information about the accident site was not available to everyone. This information was not shared verbally either.
- The exchange of information about the accident site between the Kennemerland control room and the Schiphol Control Centre and between the Kennemerland control room and MKAA (Amsterdam Ambulance Dispatch Centre) did not run as it should.
- The Schiphol Control Centre did not immediately verify whether the VOS 6 (Schiphol Aircraft Crash 6) alarm as passed on through C2000 had really been received by the Kennemerland control room.
- Because the Kennemerland control room decided to base itself on the VOS 6 scenario, they implicitly chose to send the emergency services workers to the emergency services rendezvous point at Schiphol Airport Centre.

2. PROVISION OF MEDICAL ASSISTANCE:

The deployment of medical assistance was not managed by the Kennemerland control room. The mobile medical teams were not alerted after the first reports of the accident. The scaling-up of medical assistance was not executed in accordance with the VOS 6 scenario of the Schiphol Crisis Response Plan. The scaling-up of the hospitals did not take place in accordance with the ZiROP procedure (Hospital Crisis Preparedness Plan) either.

- Despite three requests being made by the ambulance staff, the mobile medical teams were not alerted by the Kennemerland control room nor actively offered by the MKAA (Amsterdam Ambulance Dispatch Centre). The mobile medical teams were alerted later, after 30 minutes, by the National Ambulance Dispatch Center (LMAZ). The first mobile medical team (MMT) could have arrived 45 minutes earlier at the accident site. The trauma doctor of an MMT has more competences and treatment options than a nurse/paramedic and, therefore, has more to offer to a seriously injured patient.
- Nearly no injury registration took place when assessing the nature and gravity of the injuries of the victims (triage) at the accident site. In part due to this, a correct picture of the injuries of the victims was not obtained and the distribution of casualties and the scaling-up of hospitals did not take place in a structured manner.
- The Hospital Crisis Preparedness Plan (ZiROP) was not applied consistently and, therefore, hospitals did not know what to expect. The involved hospitals suffered inconvenience due to this and it had an adverse effect on regular healthcare as the hospitals cancelled planned appointments and medical treatments to release capacity to receive victims. This was unnecessary in a number of cases.
- Despite previously made agreements, the Kennemerland control room did not request assistance from the National Ambulance Dispatch Center (LMAZ) that could have taken over part of the workload. The MKAA passed on this request to the LMAZ after having received the assistance request from Kennemerland. The LMAZ made an inventory at the request of Kennemerland and only started the alerting process later. The LMAZ could have alerted and coordinated the requested assistance immediately. The LMAZ was not called in either for the communication with the hospitals (scaling-up, informing and scaling-down).
- The administrative response from the Kennemerland Safety Region to the draft report has shown that the safety region views not alerting mobile medical teams as a minor problem. Based on this information, the Safety Board has arrived at the conclusion that the Kennemerland Safety Region underestimates the importance of the acute medical emergency assistance provided by mobile medical teams.

### 3. VICTIM REGISTRATION:

Victims at the triage stations were not registered or only to a very limited degree at the start of the emergency assistance provision. The victim registration did not take place as defined in the municipal CRIB (Central Registration & Information Bureau) subplan. This had repercussions with regard to the whole of the emergency services and registration process due to which information about victims in the follow-on process became available late.

- The emergency services workers registered victims to a degree that was too limited at the accident site and they did not use the victim registration and triage counting cards. As a consequence it was unknown during the first hours who the victims were and to which hospitals they were taken.
- The employees of the Municipality of Haarlemmermeer did not register any victims at the accident site.
- The victims that were taken from the triage stations at the accident site to the care and reception centre 'De Wildenhorst' were not registered either. This meant that the Municipality of Haarlemmermeer did not have information based on which it could take over the registration of victims from the emergency services workers.
- Contrary to expectations, it turned out that the victims at 'De Wildenhorst' also required medical care. The employees of the Municipality of Haarlemmermeer could only partly carry out their registration duties due to this required medical intervention. The victims were provided with victim registration cards at 'De Wildenhorst' but the card numbers were not registered by the employees of the municipality.
- The way in which the municipality has now set up the registration system is not geared towards the expectations of, for example, the Policy Team, the next of kin and the media. Neither is it harmonised with the legal settlement by Justice or the Municipality of Haarlemmermeer.

### 4. THE C2000 COMMUNICATION SYSTEM:

C2000 functioned properly as a system. Technically the system did not malfunction, the mast did not have a capacity shortage and there were no coverage problems.

C2000 was not used correctly during the emergency assistance provision after the aircraft accident. The system was overloaded on 25 February 2009 due to too many users wanting to speak at the same time without harmonisation and coordination. The available mast(s) and channels did not have sufficient capacity due to this. Users are under the impression that the capacity is unlimited and that every call can be connected immediately.

- The emergency assistance workers did not make disciplined use of C2000 and communication did not take place in a business-like way.
- Channels were kept busy unnecessarily because the required information was not prioritised in advance.
- The large number of calls to the operators at the control room were not proportional to the processing capacity of the operators; too much was expected from them. The ambulance operators had to work in too many call groups simultaneously.
- Very limited use was made of the option of sending status messages about departures, arrivals and availability of units. Partially due to this, a profusion of verbal logging on instances in call groups occurred.
- In the Netherlands 12,350 call groups<sup>123</sup> in total have been made available to users of the C2000 system. In daily practice, the fire brigade, ambulance services and police use approximately 15 call groups in the Kennemerland Safety Region. All involved emergency services workers use many more call groups in case of major incidents. On 25 February, for example, 127 call groups were active through the mast in Halfweg. The large number of calls paves the way to overloading the always limited mast capacity.
- Too little attention was paid to supraregional cooperation when C2000 was introduced. The agreements made regarding the use (determination of the call groups and connection diagrams) are mainly directed to the internal organisations of the 25 individual safety regions and other users due to this. The safety regions are lacking a joint and uniform structure for the supraregional use of C2000 by the involved emergency services organisations.

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123 A call group is a group of users defined in advance who communicate with each other within one group.

## 5. CRISIS RESPONSE PLANS:

A large number of crisis response plans has been laid down during the course of time. This, however, has led to differences in the approach to emergency assistance with regard to (major) incidents. The large number of crisis response plans, scenarios and handbooks have not been translated into workable tools for operators in the control room. The scenario selection, the determination of the correct location, the correct deployment of emergency services workers and the use of the tools are the determining factor as from the start with regard to the further course the emergency assistance will take. There is no time for reflection or extensive consideration during the initial decision-making. Provision must, therefore, already have been made with regard to these choices during the preparations for the emergency assistance.

- When the crisis response plans were drawn up, too little attention has been paid to the translation thereof into the work of the operators and emergency services workers.
- Different scenarios are possible when an aircraft has disappeared at Schiphol Airport. The location where the aircraft has crashed is the determining factor when selecting the scenario:
  - In the Kennemerland Safety Region;
    - At the site of Schiphol Airport; or
    - *Outside* the site of Schiphol Airport;
  - In one of the bordering safety regions.

The risk area (approach and take-off routes) of Schiphol Airport is, after all, geographically distributed over four safety regions, that is Kennemerland, Amsterdam-Amstelland, Zaanstreek-Waterland and Hollands Midden. Two of these four safety regions do not have a specific plan for aircraft accidents.

- The Schiphol Crisis Response Plan including the linked scenario for aircraft accidents at Schiphol Airport (VOS) relates to accidents at the airport site and is based on the Leidraad vliegtuigongevallenbestrijding op luchtvaartterreinen (Guideline to aircraft accident response procedure at airport sites). This concerns accidents during take off or landing where a large number of survivors can be expected. The Aviation Accident Crisis Response Plan for the Kennemerland region with the large aviation accident in a rural area scenario concerns the area outside Schiphol Airport and assumes victims on the ground and a limited number of surviving passengers and crew.
- For the transition from the Schiphol Crisis Response Plan to the Aviation Accident Crisis Response Plan for the Kennemerland region, whether the accident takes place within the borders of the working area of Schiphol Airport or outside this area is the determining factor. The complete risk area was not considered due to the approach and take-off routes when drawing up the plans.
- The choice to exchange the scenario *aviation accident, rural, large aircraft* of Kennemerland for the Schiphol Airport (VOS) aircraft accident scenario has had consequences with regard to the deployment (number of people and resources) and the arrival location of the emergency services workers. These effects were not taken into account when the crisis plans were drawn up.
- The working methods as described in the crisis response plans of Schiphol Airport and the bordering safety regions, insofar as these plans exist, are not identical.
- The scenarios in the crisis plans are not unequivocal either with regard to other large civil airports in the Netherlands, which may lead to confusion should supraregional emergency assistance be required.

## 6. UNIFORM AND WORKABLE AGREEMENTS:

Despite having conducted an in-depth investigation, the Dutch Safety Board has not been able to determine why the operators did not alert the MMTs immediately, why the victim registration cards in the triage stations were not used and why the administrators of C2000 did not foresee the large number of C2000 users and the problems to be expected in case of a major incident.

It has, however, become clear that issues are no longer running in a structured manner when suddenly people need to deviate from daily routine as is the case with regard to a major incident.

Supraregional emergency assistance is not organised uniformly. Many parties are involved, each with their own methods of working and their own interests. This results in diversity in plans that makes

cooperation difficult in practice.

Moreover, important lessons to be learned from previous investigations into emergency assistance during disasters and major incidents have been insufficiently adopted. In addition, every safety region has a large degree of freedom when implementing the national guidelines. Cooperation with other parties is arranged through mutual consultation and in individual agreements. The result of this is that a disorganised 'patchwork' of agreements has been created that is not really workable as such.



## 7. RECOMMENDATIONS

The Mayor of Haarlemmermeer has the final responsibility for safety in the Municipality of Haarlemmermeer including Schiphol Airport. The administration of the Kennemerland Safety Region is responsible for the implementation of emergency assistance in Kennemerland of which the Municipality of Haarlemmermeer is a part.

**The Dutch Safety Board makes the following recommendations on the basis of its investigation.**

### RECOMMENDATIONS TO THE ADMINISTRATION OF THE KENNEMERLAND SAFETY REGION:

1. Ensure that the inadequacies mentioned in this report are dealt with quickly and adequately. This recommendation applies, in particular, to the Kennemerland control room and to medical assistance at accidents and disasters (GHOR). It is important that the entrusted tasks are performable and fit in with daily routine.
2. Make binding workable agreements with Schiphol Airport about sharing information with the Kennemerland control room.
3. The approach and take-off routes of Schiphol airport cover four security regions from a geographical perspective. Take the lead in a joint effort of the involved safety regions to draw up one controllable, supraregional crisis plan for the Schiphol airport risk area.

### RECOMMENDATIONS TO THE MINISTER OF THE INTERIOR AND KINGDOM RELATIONS:

4. Ensure that there are uniform national agreements for medical assistance at major accidents and disasters. The Safety Board believes the following are examples of this:
  - Unequivocal working method for the registration of large numbers of victims;
  - Uniform scaling-up of hospitals in case of supraregional emergency assistance;
  - National coordinated deployment of mobile medical teams;
  - Deployment of the National Ambulance Dispatch Center.
5. Ensure that the Guideline to aircraft accident response procedure at airport sites is amended. Create a uniform and national standard for crisis plans for airport sites and the surrounding areas. The Board also recommends that a 'pilot' be started for the area around Schiphol airport.
6. Victim registration is a daily task performed by emergency services workers with regard to minor accidents. Reconsider the requirement that municipalities register victims at an accident site to fulfil the legally determined responsibility.
7. Ensure that the use of the C2000 network is redefined so that it focuses on large-scale supraregional emergency assistance. Pay particular attention to the following within this context:
  - Reorganizing the multitude of call groups;
  - Harmonising the connection diagrams (for supraregional deployment);
  - User discipline;
  - Introducing communication management.In addition, define unequivocally who is responsible for implementing immediately the abovementioned measures for the redefinition of the use of C2000 on behalf of the Minister.



RECOMMENDATIONS TO THE MINISTER OF THE INTERIOR AND KINGDOM RELATIONS AND THE MINISTER OF HEALTH, WELFARE AND SPORT:

8. Ensure that the medical assistance at accidents and disasters is arranged uniformly where it concerns the supraregional deployment of the mobile medical teams, the deployment of supraregional ambulance services and the release of hospital capacity.
9. Ensure that it is determined what needs to be arranged nationally and regionally. Important basic principles with regard to this are that the involved regional control room(s) is/are relieved but also that the residual coverage of emergency assistance for other regions is safeguarded.

The governmental bodies towards which a recommendation has been issued must take a stance regarding the follow-up of this recommendation within 6 months of publication of this report to the minister concerned. Non-governmental bodies or individuals towards which a recommendation has been issued must take a stance regarding the follow-up of this recommendation within a year of publication of this report to the minister concerned. A copy of this reaction must simultaneously be sent to the Chairman of the Dutch Safety Board and to the Minister of the Interior and Kingdom Affairs of the Netherlands.

**ANNEXES**



## **ANNEX 1 INJURIES AND DISTRIBUTION OF THE CASUALTIES**

The group Medical investigation into the Turkish Airlines crash (MOTAC; Medisch Onderzoek Turkish Airlines Crash) investigated the aircraft accident. An article about this investigation was published in the Dutch Journal of Medicine on 20 January 2010 (Nederlands Tijdschrift voor Geneeskunde, 2010;154:A1064, 'Vliegtuigongeval Schiphol 25-02-2009: letsels en verdeling van gewonden'). The full article is only available in Dutch, below is an English summary.

### **AIRPLANE CRASH NEAR SCHIPHOL AIRPORT 25 FEBRUARY 2009: INJURIES AND CASUALTY DISTRIBUTION**

#### *Authors*

Jasper Winkelhagen, Taco S. Bijlsma, Frank W. Bloemers, Martin J. Heetveld, J. Carel Goslings and the steering committee of the MOTAC group, existing of J. Carel Goslings (chairman), Taco. S. Bijlsma, Martin. J. Heetveld, Frank. W. Bloemers and Ineke van der Zande.

#### *Objective*

To describe the injuries and distribution of casualties resulting from the crash of Turkish Airlines flight TK 1951 near Schiphol Airport on 25 February 2009.

#### *Design*

Retrospective, descriptive.

#### *Method*

We reviewed the hospital case notes of all casualties of the airplane crash and scored triage at the scene, time to emergency department, Abbreviated Injury Scale (AIS) and Injury Severity Score (ISS), mortality, length of hospital stay and surgical procedures.

#### *Results*

Of the 135 passengers, 9 died on the scene. A total of 126 survivors were examined in 15 hospitals; data from 125 were available for our research. Median time between crash and arrival at an Emergency Department was 3.5 hours (range 1.25-5.5 h). Six passengers were uninjured and 64 were admitted to hospital. A total of 297 injuries were registered. Most injuries were to the head and face (81), spinal injuries (31) and fractures of extremities (34). In the study group 17% of the patients had a spinal fracture. The mean ISS was 6.5 (range 1-57). In 12 patients the ISS was  $\geq 16$ . Surgical procedures (80) were necessary in 23 patients. There was no in-hospital mortality.

#### *Conclusion*

Of the 135 passengers, 9 died and 120 were injured. Although the accident was in an urban area, there was a significant delay between the accident and the arrival of the casualties at Emergency Departments. Most of the injuries were to the head and face, and to the spine and extremities.



## ANNEX 2 INVESTIGATION INFORMATION

### START OF INVESTIGATION

Immediately after the Turkish Airlines air accident on 25 February 2009, investigators from the Dutch Safety Board with the support of external experts began an orienting investigation into the assistance provided by the emergency services as provided. In addition to this investigation, the Safety Board also began an investigation into the cause of the accident. The Safety Board provides details of the results of the investigation into the cause in the report 'Crash during approach of Boeing 737-800, Amsterdam Schiphol Airport, 25 February 2009'.

At the beginning of the investigation into the assistance provided by the emergency services, the focus was upon collection of information, but also an initial exploration of possible subjects of interest for the follow-up investigation. During the course of the orienting investigation, the Safety Board conducted more than one hundred interviews, collated audio, imagery<sup>124</sup> and requested dozens of documents - including disaster plans, procedures and handbooks. The Board decided on 19 March 2009 to conduct a follow-up investigation.

### SCOPE

The aim of the investigation was to examine whether or not a structural safety shortcomings had played a part in the emergency assistance following the Turkish Airlines air accident. The Safety Board chose a wide-ranging approach. An investigation has been carried out into the course that the emergency services assistance took, the identified problems and the factors that contributed to this. In addition, it has been investigated whether these problems stood on their own or whether they were identified more often. In addition to examining any structural safety shortcomings in terms of the emergency assistance, the question of the extent to which the sector learns from earlier similar incidents within its own organisation was also raised. This aspect was also included in the investigation.

### OTHER INVESTIGATIONS

In addition to the investigation carried out by the Safety Board into the assistance provided by the emergency services after the accident, four other parties began an investigation. Initially, the Kennemerland Safety Region and the Municipality of Haarlemmermeer conducted an investigation into the emergency assistance surrounding the Turkish Airlines air accident. The Public Order and Safety Inspectorate (IOOV) carried out this investigation in collaboration with the Healthcare Inspectorate (IGZ). The investigation was published in June 2009.

Secondly, an investigation into the C2000 communication system was initiated immediately after the air accident, with regard to the system's operation, by the Operations Manager of the Netherlands Police Collaborative Taskforce (VtsPN), and this included identifying the load on the system. Supplementary to this investigation, the Expert group C2000 began an investigation, at the request of the Minister of the Interior and Kingdom Relations (BZK), into problems that had recently become apparent in the C2000 communication system. That investigation explored not only the communication problems that had arisen after the Turkish Airlines aircraft accident, but also similar problems surrounding other incidents (including the attack on Queen's Day, 30 April 2009 in Apeldoorn and the disturbances in Hoek van Holland during the beach party on 24 August 2009).

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124 The Board is in possession of dozens of photographs from emergency personnel and investigators from the Board itself. In addition, the Board also has video imagery from the Directorate-General for Public Works and Water Management taken by cameras on the A9. The Board also has audio recordings from, amongst others, the control rooms involved.

The group Medical investigation into the Turkish Airlines crash (MOTAC; Medisch Onderzoek Turkish Airlines Crash) investigated the accident under the following title: *Schiphol Airport aircraft accident 25-02-2009: Injuries and distribution of the casualties*. An article about this investigation was published in the Dutch Journal of Medicine (NTvG, Nederlands Tijdschrift voor Geneeskunde). The objective of this investigation was to describe the injuries and distribution of the casualties of the Turkish Airlines TK1951 accident near Schiphol Airport on 25 February 2009. The article is included in Annex 1.

#### INVESTIGATION METHOD

Following an investigative analysis of the material available at that time, a report was formulated containing initial observations and provisional findings. This report indicated that bottlenecks had occurred in the following cases:

- the processing of reports, raising alarms and directing the emergency assistance units;
- the casualty distribution over and the provision of information to hospitals;
- the registration of victims and provision of information to relatives.
- the communication via C2000;

On the basis of the provisional findings of the orienting investigation (and the report by the Public Order and Safety Inspectorate published in the interim period), the Inspection Board carried out a further investigation with the aim of identifying the underlying causes of the bottlenecks that had been established.

Below follows a brief description of the approach to each sub-investigation.

##### *The processing of reports, raising alarms and directing the emergency assistance units*

In order to obtain an image of the processing of the reports, raising the alarms and the directing of the emergency services, those directly involved were interviewed (such as employees of the control room) and responsible individuals (such as the control room supervisor and the board of the Kennemerland Safety Region). In addition, the Safety Board also analysed sound recordings from the control room. The Safety Board also studied the relevant crisis management plans, procedures, protocols, handbooks and agreements, in order to obtain a clear picture of how the process should have gone, according to the plan, and which deviations could be established in respect of this plans and/or the 'ideal situation'.

The Board completed a visit to the control room of the Twente safety region as part of the investigation.

##### *Distribution of injured passengers to hospitals and the information provided to hospitals*

In order to gain an overview of the distribution of injured passengers across hospitals and the provision of information to hospitals, the Dutch Safety Board conducted interviews. The Dutch Safety Board also studied the relevant crisis management plans, procedures, protocols, handbooks and agreements. In this way the Board tried to obtain a clear picture of how the process should have gone, according to the plan, and which deviations could be established in respect of these plans and/or the 'ideal situation'.

##### *Registration of victims and provision of information to relatives*

In order to understand the registration of victims and the provision of information, the Dutch Safety Board interviewed those directly involved, such as the employees of the municipality and the Royal Netherlands Marechaussee, and responsible individuals such as supervisors. The Board also held conversations with representatives of Turkish Airlines in Turkey. In addition, all lists (both passenger- and victim lists) were analysed that were used on 25 February and later days. The Dutch Safety Board also studied the relevant crisis management plans, procedures, protocols, handbooks and agreements in order to obtain a clear picture of how the process should have gone, according to the plan, and which deviations could be established in respect of this plan and/or the 'ideal situation'. In order to gain an understanding of the passenger registration process the Board spoke to employees of KLM as well.

### *Communication via C2000*

In order to gain an understanding of the communication via C2000, the Dutch Safety Board requested the raw data for the C2000 from the mast Halfweg up at the VtsPN. This data was investigated as follows. To begin with, the Dutch Safety Board placed all conversations in a row and then looked at how long people had to wait (the number of busy tones) and the duration of the conversations. Of the unanswered conversations, the Dutch Safety Board looked at how frequently the transmit switch was pressed (this is a measure of how many people spoke).

In addition to the C2000 data, the Board also used the data from the control rooms' sound recordings. All calls have been listened to, from the beginning to about 14:00. The sound recordings from the Kennemerland control room were analysed per call group over the time period 10:30 and 11:30 (25 February). Conversations with the ambulance services between 11:30 and 12:00 local time were also analysed. With the help of experts the Dutch Safety Board classified the conversations into two categories: 'informative' and 'incoming' calls. The Netherlands Police Collaborative Taskforce (VtsPN) provided the Dutch Safety Board with advice in this respect. In addition to analysing the data, the Board also held conversations with among others the control room supervisor of Kennemerland and the regional manager of the C2000 system. The national and regional standards and manuals (see section 3) were used during the analysis.

After observing the deviations, hypotheses were drawn up for each sub-analysis. These related to the possible causes of these deviations. The hypotheses were then tested in order to establish the actual causes of the deviations observed. In pursuit of this, the Dutch Safety Board conducted additional interviews and studied additional investigation material, including investigation and evaluation reports.

### ANALYSIS

At the same time, and in support of these subinvestigations, the audio and visual material that was available was re-analysed thoroughly in order to accurately determine how the emergency assistance process had progressed, particularly in the first hour following the accident. In support of this, a timeline and overview of those involved was created, which served as the basis for stratification in respect of the four aforementioned points. The incident was reconstructed with the help of Sequentially Timed Events Plotting (STEP). With STEP, the events are plotted in sequence two-dimensionally over time. The horizontal axis represents the time, and the vertical axis the individuals to which the events relate.

#### *Timeline analysis*

In order to gain an idea of the sequence of the emergency assistance process, a timeline was drawn up in which the different events are described. The timeline begins at the time of the accident, as indicated by the data on the Flight Data Recorder (FDR). The information about the successive events in the timeline was provided by different source files including audio fragments from the Kennemerland control room and the Schiphol Control Centre. As these information bearers each have their own time indication, and the analysis requires that the events are placed in the correct sequence, the Board conducted an analysis of the differences in time indications for the following information bearers:

- audio files from the Kennemerland control room;
- audio files from the Schiphol Control Centre;
- transcript of conversations at Schiphol (between air traffic control and the Schiphol Control Centre and between air traffic control and the aircraft);
- data on the Flight Data Recorder.

It seems possible to be able to analyse the differences in time indication as i) all four information bearers possess their own time indication and ii) communication took place between the different parties on a number of occasions. Therefore, a conversation between the Kennemerland control room and the Schiphol Control Centre took place at different times, from which one can derive that the time indication on the MICK time files precedes that of the Schiphol Control Centre by 2 minutes and 56 seconds (with a possible defect of 1 second).



In addition, frequent communication occurred between the Schiphol Control Centre and air traffic control (LVNL) in the West Tower, from which one can derive that the time indication on the audio files from the Schiphol Control Centre precedes that of the air traffic control by 1 hour and 2 seconds (see annex 4).

The analysis of the difference between the time indication on the Flight Data Recorder in the aircraft and the transcript from the air traffic control indicates that the time indication from the air traffic control lags behind that of the Flight Data Recorder by 1 second.

#### *System Theoretic Accident Model and Process (STAMP)*

STAMP assumes that accidents are the result of disorganised interaction between components within a system. According to STAMP, accidents occur as the result of inadequate command (control) or inadequate maintenance of safety-related restrictions (constraints) on the development, design and the construction of the system. According to STAMP, safety is a 'management problem' and accidents occur when responsible parties do not manage defective components, external failures and/or dysfunctional interaction between components within the system. A STAMP analysis is carried out in four stages. At the first stage, the system risk is identified. At the second stage, the system management measures are identified. At the third stage, the structure that must ensure that these management measures are realised is identified. At the fourth stage, either the components within the system that have failed are identified or the failed interaction between components within the system.

#### THE ROLE OF THE DUTCH SAFETY BOARD

The Dutch Safety Board has assessed the way it acted on site and communicated the findings to the Minister of the Interior and Kingdom Relations and the mayors of the municipalities of Haarlemmermeer and Haarlem in a letter on 21 July 2009. The contents of this letter is as follows.

DATE  
July 21, 2009

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CONTACT

OUR REFERENCE  
OVV 09500826

ENCLOSURE(S)  
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TELEPHONE

PROJECT NUMBER



Minister of the Interior and Kingdom Relations  
Mrs dr. G. ter Horst  
Postbox 20011  
2500 EA The Hague

SUBJECT  
Action of Safety Board at crash Turkish Airlines, February 25, 2009

Dear Mrs Ter Horst,

I would like to draw your attention to the following matter.

After the investigation was completed as carried out by the Dutch Public Order and Safety Inspectorate (IOOV), which had the goal of generating lessons to be learnt in the short term for the Kennemerland Security Region, the IOOV report was published on 22 June 2010.

With respect to the problems as experienced on the crash site on February 25th and as described in the report of the IOOV, I would like to present you the following.

This report again contained quotes about the way in which the Dutch Safety Board acted in addition to a number of identified lessons to be learnt. The IOOV has taken over these quotes integrally without any further details or explanations. In particular, the quotes from the reports of the multidisciplinary Command Place of Incident (CoPI) meeting, the Operational Team (OT) and the Policy Team (BT) have attracted our attention:

*"As a bottleneck, the presence of investigating authorities <sup>1</sup> at the disaster site is also mentioned during this meeting. During the second CoPI meeting, it emerged that employees of the Safety Board had procured access for themselves to the disaster site and started investigative activities:  
They never reported to me directly or indirectly. At 13:00 local time, employees of the Safety Board were removed from the disaster site by the Royal Netherlands Marechaussee at the command of the mayor and at my instructions. (...). It did not impede the actual assistance provided by the emergency services but you do end up in an atmosphere of irritation due to the 'larking around' with the Safety Board and the Public Prosecution Service. (...)  
External investigating departments that wish to start their work at a disaster site should at least first report to the person who is in control since this would avoid friction."*

<sup>1</sup> Safety Board's note: The report has shown that it concerns the Public Order and Safety Inspectorate, the Safety Board and the Transport, Public Works and Water Management Inspectorate.

BEZOEKADRES

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*"The operational leader has reported in the Policy Team that the employees of the Safety Board reported at different locations and threatened to stop the assistance of the emergency services should they not be given access. Not only are the employees of the Safety Board present at the disaster site, but also the chairperson of the board. Later the police officer in the Policy Team reported that the Safety Board is legally authorised to access the location. The General Commander of the SGBO of the Royal Netherlands Marechaussee has indicated within this framework that the Policy Team should have known that it was legally impossible to deny access to the investigators. As long as nobody is impeded in performing his or her job, this General Commander believes that it should be allowed. This could avoid a lot of tension on site according to him."*

The above are a few quotes from the report. After having studied the aforementioned report, the Safety Board has come to realise that different parties were given the opportunity to respond to the contents of the draft report in advance. The Safety Board was not given this opportunity and was not included within the framework of the Public Order and Safety Inspectorate (IOOV) investigation. We deem it a pity that we were not given this opportunity.

An internal investigation was carried out into the acting of the involved investigators because the Safety Board deems learning from experience a high priority. I would like to share the findings of this internal investigation with you in outline. A timeline has been created to ensure that correct analysis is possible (see the annex).

- The first investigator on site of the Safety Board reported, in the first instance, to the CoPi after having contacted the representatives of the Dutch National Police Services Agency – Aviation Department (KLPD-DLv), in accordance with the instructions of the Safety Board and the agreements as defined in the Aviation Accident Crisis Response Plan of the Kennemerland region. It was indicated that a meeting was currently taking place and that he should wait until the meeting had concluded. The investigator then went away, started with his explorative investigation and did not report personally anymore.
- The first investigator on site observed and photographed the wreck and the rescue work from a suitable distance. The fire brigade pointed out the Flight Data Recorder (FDR) and the Cockpit Voice Recorder (CVR), that is, the black boxes, to him that had already been put to one side. Because the recorders were too close to the wreck, he left them where they were until the rescue action had finished. Subsequently, the



recorders were handed over to the first investigator on site of the Safety Board by the fire brigade. The recorders were handed over to him in the presence of police staff of the KLPD-DLv. Since both the investigators from the Safety Board and the police staff of the KLPD-DLv were aware that the Department of Justice was not authorised to seize the recorders but the Safety Board did have this authority, the seizure of the recorders was not explicitly reported to the CoPI. The seizure of the recorders was, however, reported by telephone by police staff to the head of the Dutch National Police Services Agency - National Forensic Investigation Team (KLPD-LTFO) that was present at the regional Operational Team on Zijlweg in Haarlem and, subsequently, to the public prosecutor who was also present at that location.

- The instructions to leave the crash site were, in the first instance, followed by the Safety Board investigators (who by now were two) but, when the rescue action was completed, they returned to the crash site.
- The Investigator in Charge (IIC) and the Investigation Manager (OM) of the Safety Board reported their presence at Amsterdam Airport Schiphol in the Triport building but were finally referred to the Regional Operational Team on Zijlweg in Haarlem after having waited for nearly two hours.
- The Safety Board investigators were again ordered by the Police Duty Officer (OvD) to leave the site when the recovery was started (rescue was not involved in any way) of the victims in the cockpit. Since the investigators have the duty of determining what has changed after impact (for the recovery) in the cockpit, they stated based on their powers that, if required, the recovery work would have to be stopped to consult with the public prosecutor.

The Safety Board investigators tried to do their job in accordance with the agreements but we can learn from the expressed criticism with regard to two issues.

After the initial attempt to report to the CoPI, the first Safety Board investigator who was present on site did not attempt for a second time to verify whether his presence was not only known to the KLPD-DLv but to the CoPI as well as.

After the recorders were handed over, the Safety Board investigator ascertained that this was known by the KLPD-DLv but he did not explicitly report the seizure to the CoPI.

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OUR REFERENCE  
OVV 09500826



We regret these issues and the atmosphere of irritation that was created to and fro. We have now tightened the guidelines internally in the sense that investigators must report to the CoPI regardless of whether other judicial representatives are aware of their presence. The CoPI will also be explicitly informed when objects are seized.

The second aspect concerns the fact that the tasks and powers of the Safety Board investigators are correctly described in the Aviation Accident Crisis Response Plan of the Kennemerland region. In practice, however, it has emerged that only specialist parties such as the KLPD-DLV and the KLPD-LTFO are aware of the tasks of the Safety Board but that many other executives cannot quite place the task of the Safety Board and have been difficult to access due to this.

The Safety Board would like to propose that the task, role and position of the Safety Board be explained in a presentation to, for example, executives of the police, the municipality and the Kennemerland Safety Region to ensure that more mutual understanding is created for each other's tasks and responsibilities.

I have sent a similar letter to the mayor of the municipality Haarlemmermeer and to the police agency commander of the Kennemerland police region.

Yours sincerely,

  
Pieter van Vollenhoven  
Chairman Dutch Safety Board

Enclosure: Timeline activities investigators in relation to crash site

Annex: Timeline activities investigators in relation to crash site

<b>Time</b>	<b>Activities of the Safety Board investigators</b>
10:35	Report obtained through the media.
10:40	First internal harmonisation with the Safety Board about the deployment of staff and the contacts to be made: <ul style="list-style-type: none"> <li>• Safety Board duty investigator is to go from home base to the crash site.</li> <li>• Investigator in Charge (IIC) and the Investigation Manager (OM) of the Safety Board are to go to the Operational Team Triport.</li> </ul> <p>One Safety Board investigator is to go to Air Traffic Control the Netherlands (LVNL) to secure information and for the first interview with the traffic controller.</p> <ul style="list-style-type: none"> <li>• Two Safety Board investigators are to go from The Hague to the crash site.</li> </ul>
10:58	First contact of the Safety Board staff Investigation Manager, The Hague, with the Head of KLPD-LTFO.
11:00	The investigators, Investigator in Charge and the Investigation Manager leave to go to Amsterdam Airport Schiphol from The Hague. The Safety Board duty investigator leaves home to go to the crash site.
11:30	The Safety Board duty investigator arrives on site at Schipholweg and parks there. Next, he went to the location where the fire brigade had access to the field where the wreck was located. He observed the crash site from the road; the emergency assistance was well under way.
11:38	The Investigator in Charge has contact with the KLPD-DLv by telephone.
11:40	The Safety Board duty investigator has had contact with people from the KLPD-DLv who were going to the CoPI. Next, the Safety Board duty investigator also went to the CoPI. When he arrived, he was told that he had to wait because a meeting was being held. The Safety Board duty investigator did not wait for its conclusion and went to the crash site.
11:43	The Safety Board duty investigator started to take photographs from a (suitable) distance. The emergency assistance was still going on. He, therefore, mainly stayed on the road side and rear side of the aircraft. A fire brigade officer pointed out the Flight Data Recorder and the Cockpit Voice Recorder to him that they secured and had placed together. He stayed near the wreck and kept an eye on the recorders.
11:45	The Safety Board Investigator in Charge and the Investigation Manager arrive at Triport Schiphol.
11:55	The Investigator in Charge and the Investigation Manager tried to contact the Operational Team (OT) and Policy Team (BT). They waited for the briefing at the OT to the BT.
12:10	At the instructions of the BT, the Safety Board duty investigator was sent away from the crash site by a Royal Netherlands Marechaussee officer. Next, he contacted the Investigator in Charge and asked that access be arranged.
12:17	The Safety Board Investigator in Charge and Investigation Manager have contact by telephone with the Aviation public prosecutor. He stated that he was going to the "Policy Centre" in Haarlem.
12:37	End of the rescue action and transition to the recovery action; end of VOS6 and transition to "HV groot" (large-scale emergency assistance).
12:40	Safety Board duty investigator is again given access to the crash site.
12:40	The Safety Board staff, The Hague, Investigation Manager has contact for a second time with the Head of the KLPD-LTFO. The names of the Safety Board Investigator in Charge and Investigation Manager and Leader of the investigation of the KLPD-LTFO are exchanged.
12:45	Official feedback in OT. All people have been removed from the aircraft and the deceased in the cockpit are checked.

<b>Time</b>	<b>Activities of the Safety Board investigators</b>
12:50	The second and third Safety Board investigators (from The Hague) arrive at the crash site.
12:56	Both aircraft recorders are handed over to the Safety Board duty investigator by the fire brigade in the presence of the KLPD-DLv.
13:05	Recorders are accepted and secured in the duty vehicle of the Safety Board.
13:10	The Safety Board duty investigator has entered the aircraft to inspect the cockpit. The mortal remains of the pilots were still in the cockpit.
13:25	The Safety Board Investigator in Charge and Investigation Manager have brief contact with the OT. They are told that the policy centre is in Haarlem and that the police and public prosecutor are also present there.
13:30	The Investigator in Charge and the Investigation Manager leave to go to Haarlem.
13:50	The second Safety Board investigator and the chairman of the Safety Board who has now arrived are at the aircraft. The emergency assistance had now been fully completed. In due course, they were sent away from the crash site by the Police Ovd but allowed to return after consultation.
14:00 /18:00	The police had the intention to remove parts from the cockpit to ensure it could recover the bodies from the cockpit without the Safety Board investigator being present. The Safety Board duty investigator started a discussion about this and stated that he would stop the recovery and investigation work in the cockpit should this extreme measure be necessary if he, in accordance with his task, could not witness the proceedings. After an officer of the KLPD-DLv intervened, he was given permission to be present but under the responsibility of the KLPD-DLv in accordance with the Police Ovd. Next, he entered the aircraft and examined the cockpit. The door was ajar and could not be opened further. Later on, it was broken open by the fire brigade after which the first crew member could be removed from the cockpit.
14:00	The third Safety Board investigator leaves with the recorders to go to The Hague.
14:05	The Safety Board staff, The Hague, Investigation Manager has contact with the Head of KLPD-LTFO for the third time. He stated during this contact that the recorders were in the possession of the Safety Board and would be transferred to Paris for investigation purposes.
14:19	The Investigator in Charge and the Investigation Manager arrive in Haarlem where consultation takes place with the public prosecutor in the presence of the Head of KLPD-LTFO as well as others. Seizure of the FDR and CVR by the Safety Board duty investigator was discussed during this consultation.
17:20	The Investigator in Charge and the Investigation Manager leave to go to the crash site.
19:55	The Safety Board staff, The Hague, Investigation Manager and the Head of KLPD-LTFO are in contact for the fourth time.
20:44	The Safety Board staff, The Hague, Investigation Manager and the Head of KLPD-LTFO are in contact for the fifth time.

## PROJECT TEAM

Many employees of the Dutch Safety Board contributed to the investigation for example by conducting interviews or by facilitating the investigation.

<b>The members of the project team were:</b>	
R. Smits	Investigation Manager/ Project Manager (16 April 2009 till the end of the investigation)
M.C.F. Konijn	Investigator/ Acting Project Manager
R. Lagendijk (external)	Project Assistent
A.C.J.G.M. van Roosmalen	Investigator
L.P. Sluijs	Investigator
W. Walta	Investigator
E. Willeboordse	Analyticus

<b>The following employees made an important contribution:</b>	
T.M.H. van der Velden	Project Manager (start till 16 April 2009)
E.M. de Croon	Analyticus
R.P. van den Dikkenberg (external)	Investigator
M. van Dorssen (external)	Investigator
S. Groenendal	Communication counsellor
R.R. Hagen (external)	Investigator
H.J. Heins (external)	Project Assistent
A. Kooiman (external)	Secretary
H. Koolstra (external)	Investigator
M. van het Loo	Secretary
M.H.E. Madern (external)	Investigator
J. Molenaar (external)	Investigator
S. Pijnse van der Aa	Investigator
J.G. Post (external)	Investigator
B.M.L.D. Renier	Investigator
S. van Rossenberg	Investigator
K.J. Schaardenburgh Verhoeve	Analyticus
M.J. Schuurman	Investigator
P. van der Torn (external)	Investigator
G.L. de Wilde (external)	Analyticus





## ANNEX 3 READING RESPONSES

### VERIFICATION OF DRAFT REPORT

In the Dutch Safety Board Act it is stipulated that those directly involved with an incident are provided with the opportunity to respond within 30 days in writing to the findings of a draft report by the Dutch Safety Board. This provides the opportunity to specify any factual inaccuracies. The Dutch Safety Board is able to correct these inaccuracies in the final report.

The draft report (without consideration or recommendations) shall be made available for verification to those involved following positive recommendation from the advisory commission and approval by the Board. The following parties have received a draft report:

- Expertgroep C2000;
- Municipality of Haarlemmermeer;
- Amsterdam Municipal Health Service;
- Healthcare Inspectorate;
- Public Order and Safety Inspectorate;
- Royal Netherlands Marechaussee, Schiphol district;
- Dutch National Police Services Agency;
- National Ambulance Dispatch Center;
- Ministry of the Interior and Kingdom Relations;
- Ministry of Health, Welfare and Sport;
- Ministry of Transport, Directorate-General of Civil Aviation (Turkey);
- Kennemerland Safety Region;
- Kennemerland Police;
- Schiphol Group;
- Turkish Airlines;
- The Netherlands Police Collaborative Taskforce.

In so far as they are relevant, the Dutch Safety Board has incorporated the responses received into the final report. The responses that were not adopted are listed below together with the Dutch Safety Board's justification for not amending the report on these points.

The responses to the examination of the report can be classified in three categories. Firstly, textual remarks and factual inaccuracies. These have usually been amended and copied across. Secondly, remarks due to issues that were unclear when presenting the facts. The text in the final report has been clarified or tightened up with regard to these points. The involved parties have requested that special attention be paid to three topics. Firstly the impression that may have been created that there was a cause-and-effect relationship between the mobile medical teams arriving late and the death of the passengers and crew. The Safety Board has not investigated whether there was a relationship. The second point concerned losing the 'golden hour'. The figure showing the route that the fire brigade took which, according to the involved parties gives the impression that the wrong route was taken. These topics are further explained in this final report. The last category concerned the comments that are not being processed. Next, a summary is provided of these comments that have not been processed and the motivation behind this. The comments are classified based on the party that has made them.

### KENNERLAND SAFETY REGION

#### *Observation:*

*Determining the exact location of an accident is always problematic with regard to motorways, navigation ways and railways and in a rural environment and, therefore, not only with regard to this aircraft accident.*

#### Safety Board response:

It is true that determining the exact location is always problematic. However, on 25 February 2009 the exact location "it is situated between Kromme Spieringweg and the A9 motorway"

was stated by a caller (to the Police at the Kennemerland control room). This information was not used. No further questions were either asked to determine the reliability of this description.

*Observation:*

*Draft report P41/ 2<sup>nd</sup> paragraph; Add: "...that always fire would break out and that a crash was really involved rather than an emergency landing."*

Safety Board's response

The word emergency landing is not used in the Schiphol Crisis Response Plan. This term is used in the Kennemerland Aviation Accident Crisis Response Plan, however, only in the context of a sea emergency landing.

*Observation:*

*Draft report P51/ No proper harmonisation between the Kennemerland control room, the Schiphol Control Centre and the Schiphol Airport airside operations manager (at the bottom). Text proposal: "No proper harmonisation of the Schiphol Control Centre and the airside operations manager with the Kennemerland control room."*

*Draft report P52/ Subconclusion 1: The harmonisation between the Kennemerland control room, the Schiphol Control Centre and the Schiphol airside operations manager was not correctly arranged..... Text proposal: "The harmonisation of the Schiphol Control Centre and the Schiphol airside operations manager with the Kennemerland control room was not correct."*

Safety Board response:

This refers to the communication between three parties to and fro. The safety region's text proposal would place the emphasis on the communication of the two parties at Schiphol Airport with the Kennemerland control room. This expressly refers to the two directions between three parties in the opinion of the Dutch Safety Board.

*Observation:*

*Draft report P55/ Last paragraph: MKA operators, who are Casualty Transport Coordinator as well, are trained in accordance with the Regionaal Opleidingsplan (Regional Training Plan) of the RAV (Regionale Ambulance Voorziening; Regional Ambulance Organisation) in formation.*

Safety Board response:

The information available to the Dutch Safety Board does not show that the training took place in this way before 25 February 2009.

*Observation:*

*The analysis has not shown whether the impact of the eight C2000 telephone calls that were held during the congestion period have been taken into account. A C2000 telephone call means that a call channel is used and, therefore, no longer available. Intervening in the mutual distribution system could have been a possible solution. This competence, however, has not been allocated to anybody in the Netherlands.*

Dutch Safety Board response:

The telephone calls (private calls) were taken into account in the analysis. They only took up a limited degree of the capacity (between 11 and 12 local time 2% and between 12 and 13 local time 0.8% of the total call time). These telephone calls were included in the statistics under the heading "Other" in Annex 10 of the report as also stated in the explanatory notes.

*Observation:*

*Draft report P 60/ 4<sup>th</sup> paragraph; connection diagrams apply to all C2000 users and not only to operators.*

Safety Board response:

The statement is correct but irrelevant with regard to the analysis at this point.

*Observation:*

*Draft report P65/ The fact that calls were also realised through alternative routes or other connection media such as walking towards each other and/or using mobile telephones while the communication should have taken place through C2000 was not considered. If these alternatives had not been used, the congestion would have been even greater. The deployment of the connection/command vehicle 2 (VC2) at the disaster site also unburdened the connections. This share was not involved in the analysis either (see the observation on page 66; "The VC2 has also unburdened the system; if it had not, the load on the C2000 network would have been even greater").*

Safety Board response:

The Dutch Safety Board focused on speech communication through C2000 because many complaints were received regarding this. It is evident that other communication media has been used. This does not impact the C2000 analysis carried out in the report.

The observation with regard to the command vehicle has been processed in the final report.

*Observation:*

*Draft report P65/ The assumption has been made that all calls from the MICK and to the MICK were transferred through the Halfweg mast; this is doubtful. If all 207 unanswered calls run through Halfweg, it is important to know how many of the 676 calls were realised through the Halfweg mast; this may entail a significant correction. Another assumption is that a call is confirmed by a 2<sup>nd</sup> push-to-talk; does this tally with practice? It may be the case that messages/instructions are not confirmed because the instruction is clear under these conditions.*

*Draft report P65/ Paragraph 1: subconclusion; Please further elaborate the subconclusion in view of the above.*

Safety Board response:

The figures with regard to unanswered calls refer to the calls that were listened to by the Safety Board. It is not important through which mast(s) the calls were transferred within this context. The Safety Board is not assuming that the calls that have been listened to were only transferred through the Halfweg mast. The Safety Board does not deem it necessary to correct the figures.

The observation with regard to the second push-to-talk has been processed in the final report.

*Observation:*

*Draft report P66/ 5<sup>th</sup> paragraph; the Royal Netherlands Marechaussee was forgotten here.*

Safety Board response:

Connection diagrams of the Royal Netherlands Marechaussee have not been investigated by the Safety Board. The focus has been on the communication of the medical assistance because this group experienced problems.

*Observation:*

*Draft report P86/ there are two-way radios and radio telephones enough for everybody to participate in 23 call groups....*

Safety Board response:

This observation is irrelevant with regard to the analysis.

*Observation:*

*Draft report P68/ "Because these notifications, however, all....flooded with notifications"; The speech contact requests appear on a line at the bottom in the GMS screen; if this line on the screen is full, the latest requests fall outside the area of the screen and the operator loses control over the overview.*

Safety Board response:

The statement is correct but irrelevant with regard to the analysis.

*Observation:*

*Draft report P68/ With regard to the full paragraph; the report does not pay attention to the behaviour of the radio control system when overloaded.*

Safety Board response:

The radio control system has not been used therefore no attention is paid to the behaviour of the radio control system when overloaded.

*Observation:*

*In the report, the Board has also found that a sufficiently high improvement process is not involved in the Kennemerland Safety Region that is also being safeguarded. The improvement process has been safeguarded in the Schiphol Crisis Response Plan management group and steering group specifically for Schiphol Airport. Assessments of drills and recommendations are discussed during these meetings and specific agreements are reached on how the lessons learned are safeguarded in the plan formation and execution of the different services.*

Safety Board response:

The observation is correct. What, however, is actually involved is how this is translated to the work floor. This translation to the work floor is insufficiently safeguarded.

*Observation:*

*A scenario that has been selected must be maintained to ensure that chaos does not ensue.*

Safety Board response:

The Safety Board agrees with this observation of the safety region. This is why the Safety Board has taken the stance that the emergency services must be organised in such a way that the probability of the incorrect scenario being selected is as small as possible.

*Observation:*

*Draft report P78/ This statement is incorrect. VOS 6 alarm means working with emergency services rendezvous points; this is in accordance with the Schiphol Crisis Response Plan.*

Safety Board response:

That automatically an emergency services rendezvous point at the Schiphol site is linked to VOS 6 is exactly the problem that the Safety Board has identified. Because emergency services rendezvous points are used at Schiphol, all emergency services will also go to Schiphol when there is a VOS 6 even when the accident involves an aircraft that has crashed in, for example, the dunes. They will not, therefore, be going to the accident site. This is not the preferred scenario because, as Kennemerland has stated here, a VOS report is also issued when aircraft have problems far from Schiphol.

*Observation:*

*The crisis organisation had the passenger manifest that was obtained by the Royal Netherlands Marechaussee from Turkish Airlines and the verified passenger manifest of Turkish Airlines that was published on the Internet. It was unnecessary to request this manifest again through official channels from Turkish Airlines. The different passenger manifests were placed next to the registered data of victims and the questions raised by the next of kin who/that were registered by the municipality. (Inter)national investigations had to be carried out to complete the registration because none of the passenger manifests matched the registered persons and questions raised by the next of kin.*

Safety Board response:

None of the Dutch parties requested from the Turkish Airlines headquarters officially the passenger manifest. The passenger manifests were requested by Dutch authorities from the station manager of Turkish Airlines at Schiphol but these were not verified by the headquarters of Turkish Airlines. A manifest was also found on the Internet by Dutch authorities. The status of the Internet manifest of THY.com was not recognised by Dutch authorities on 25 February 2009.

*Observation:*

*Draft report P72/ Subconclusions:*

- Perhaps the report should have gone into greater depth about the fact that registration was not carried out properly. There are several causes: victims left the disaster site themselves and one passenger took the next flight; comparable behaviour occurs more often. Sometimes victims went directly to the hospital, the passenger manifest was incorrect and language and cultural differences played a role which led to the names not being able to be recognised sufficiently.

Safety Board response:

This suggestion for further investigation will not be included. It is correct that deviations occurred but these were not of such importance that additional investigation is necessary.

*Observation:*

*Draft report P75/ 5<sup>th</sup> paragraph; "at the aviation accident.... See observation on page 22, 5<sup>th</sup> paragraph. Explanation: The task force (charged with victim registration) under the management of a Royal Netherlands Marechaussee officer was driven based on processes by the staff officer from the Kennemerland police from the operational team. This official was also in charge of the contact with RIT and the LTFO. The progress of the registration process was always harmonised and coordinated within the task group.*

Safety Board response:

The Kennemerland Safety Region refers to the observation they made on page 22, 5<sup>th</sup> paragraph. This observation, however, is not present in the response from the Kennemerland Safety Region. Nothing was, therefore, done with this issue.

*Observation:*

*The municipal registration process was set up in such a way that the victim list was made complete in the shortest possible time period where the principle was that this had been verified. As evidenced by the report, it was not possible to draw up a complete victim list in the short term. Drawing up this list was made more difficult because the registration at the disaster site could not take place unequivocally, the communication between ambulances, control room and hospitals was defective, the registration process was interrupted in 'De Wildenhorst', victims were taken as emergencies to hospitals anyway and some passengers left the disaster site themselves.*

Safety Board response:

It concerns a statement, and not a comment with regard to content. Inquiries were made regarding this on 22 April 2010 at the Municipality of Haarlemmermeer. After the "Twister II" drill, there was a need to amend the CRIB -procedure. Discussing the amendments had been put on the agenda for 26 February 2009. The amendments concerned the speed of the reunification process of those who had not suffered injuries as well as other issues. The proposed amendments to the CRIB -procedure did not concern (the speed with regard to) the registration of casualties. The improvement of the registration of casualties is a new insight that, was raised after the aircraft accident.

*Observation:*

*You have stated in your report that, when the next of kin could be informed by the municipality, most of the next of kin had already been informed by the passengers and crew who were capable of doing this, about what had happened to them and where they were staying. Now a days, due to mobile telephony victims will quickly contact next of kin to report where they are. We believe this is a positive development that ensures that family members do not have to camp with uncertainty for long about the state of the health of their family members. This has meant that the authorities have been given a different role when informing the next of kin. The role of the authorities now mainly focuses on informing the next of kin of victims who are not capable of contacting family members themselves.*

Safety Board response:

This concerns a statement, and not a comment with regard to content.

*Observation:*

*Draft report P22/4<sup>th</sup> paragraph: Addition: Hospital information was lacking in the CRIB action centre so that they did not know where the victims could be currently found.*

Safety Board response:

In accordance with the plans, the employees of the action centre should have visited the hospitals themselves to obtain information. This did not take place.

*Observation:*

*Draft report P22/8<sup>th</sup> paragraph: addition: On behalf of the Dutch government the mayor spoke to the next of kin in the aircraft. This group was received by personnel from the airport and by CRIB and Haarlemmermeer Reception and Care employees as had happened with the first group of next of kin who were already at Schiphol Airport.*

Safety Board response:

This is irrelevant with regard to the investigation.

*Observation:*

*Draft report P27/ 4<sup>th</sup> paragraph: Addition regarding the list of the plan formation:*

- *Crisisbestrijdingsplan Luchtvaartongevallen Kennemerland (Kennemerland Aviation Accident Crisis Response Plan)*
- *Reception at Schiphol script*
- *Registering victims/CRIB Schiphol script*
- *AAS Crisis Response Plan.*

*Draft report P29/1<sup>st</sup> paragraph: Addition: the Register victims/CRIB Schiphol and Reception at Schiphol scripts also apply to Schiphol Airport.*

Safety Board response:

The Registering victims/CRIB Schiphol script will not be added. It is irrelevant because the accident did not take place at the airport, GM5 was in force.

*Observation:*

*Draft report P32/ Amend: "CRIB guideline" (national document) must be "CRIB script".*

Safety Board response:

The specified document is correct in view of the title of the table.

*Observation:*

*Draft report P33/2<sup>nd</sup> paragraph: Addition: The Royal Netherlands Marechaussee is also a party who is involved.*

Safety Board response:

This is correct. This is why the Royal Netherlands Marechaussee, a national body, has also been added to national parties and not to regional and local parties.

*Observation:*

*Draft report P33/6<sup>th</sup> paragraph: Addition: The municipality has.... and an information agency and a CRIB script that is specific for Schiphol. Addition: The mayor must also define a Disaster Response Plan for the airport based on the Besluit rampbestrijdingsplannen luchtvaartterreinen (Dutch Aviation site disaster response plans decision).*

Safety Board response:

The Registering victims/CRIB Schiphol script will not be added. It is irrelevant because the accident did not take place at the airport, GM5 was in force.

*Observation:*

*Draft report P37/2<sup>nd</sup> paragraph: Addition: The Royal Netherlands Marechaussee supplies representatives to all teams such as the COPI, OT and PT, but also to the mobility action centre and the consultation committee at Schiphol in accordance to the Schiphol Crisis Response Plan.*

Safety Board response:

This observation is correct but irrelevant to this investigation.

*Observation:*

*Draft report P41/2<sup>nd</sup> paragraph: Amend facts: "The emergency services focused on ....would come" (delete; after all, the Coordinating Police Council for aviation accidents does not state anywhere on which victims the emergency services focus on).*

Safety Board response:

The Coordinating Police Council for aviation accidents states the following on page 23: 25% of passengers and crew and 75% of people on the ground is assumed with regard to victims. If there are no people on the ground then only emergency assistance to victims on the aircraft will be involved.

*Observation:*

*Draft report P71/5<sup>th</sup> paragraph: observation regarding content: The hospitals did not initially wish to issue information about the victims who had been admitted to their hospital and that is why the Royal Netherlands Marechaussee visited the hospitals.*

Safety Board response:

This observation does not correspond with the information obtained from the investigation.

*Observation:*

*Draft report P73: Amend: 9 bodies had been identified in the morning around 12:00 local time and not at 17:00 local time.*

Safety Board response:

12:00 is the time when identification took place of one specific person. At 12:00 local time, only the mayor was informed about this. The announcement was made that all bodies had been identified during the meeting with the Policy Team at 17:00 local time.

*Observation:*

*Draft report P73: Amend: "The Royal Netherlands Marechaussee takes over registration" should be "The Royal Netherlands Marechaussee chairs the multidisciplinary project group for the registration process"*

*Draft report P73: Amend: in relation to the previous observation. The Royal Netherlands Marechaussee was the chairperson of this project group as from approximately 21:30 local time.*

Safety Board response:

This observation does not correspond with the information obtained from the investigation.

*Observation:*

*Draft report P75/2<sup>nd</sup> paragraph: A reference to the CRIB script is missing.*

Safety Board response:

A reference to the CRIB script is not required here.

*Observation:*

*Draft report P75/4<sup>th</sup> paragraph: Amend the facts: "the registration of casualties must realised by the employees of the central registration and information desk at the hospital in accordance with the municipal subplan" should be "the registration of casualties must also take place in the hospital in accordance with the municipal subplan. The hospitals in the region must use the registration forms from the annex of the subplan (p. 4 subplan)"*



Safety Board response:  
This is not in accordance with page 4 of GM5.

*Observation:*

*Draft report P75/5<sup>th</sup> paragraph: Amend the 1<sup>st</sup> sentence: "It has been established with regard to the aviation accident that the Royal Netherlands Marechaussee visited the hospitals and not the municipality" must be "The hospitals did not themselves provide the registration data nor did they do this at the request of a body with regard to the aviation accident. The Royal Netherlands Marechaussee visited the hospitals following this to collect information".*

Safety Board response:  
In contrast to what the script specifies, the municipality did not visit the hospitals.

*Observation:*

*Draft report P75/5<sup>th</sup> paragraph: Amend 2<sup>nd</sup> sentence: The CRIB list composed by the task force consisting of the Municipality, GHOR, Police and Royal Netherlands Marechaussee under the leadership of the Royal Netherlands Marechaussee.*

Safety Board response:  
Listing all involved parties here serves no purpose.

*Observation:*

*Draft report P77/2<sup>nd</sup> paragraph: Amend the facts: "this information was not requested by the Dutch authorities". The Royal Netherlands Marechaussee requested the passenger manifest (also see p. 76 5<sup>th</sup> paragraph of the draft report). In addition, the Ministry of Transport, Public Works and Water Management asked for the passenger manifest. Furthermore, the Turkish Airlines Policy Team requested the nationalities of passengers. To conclude, the Policy Team also used the Turkish Airlines website.*

Safety Board response:  
This is not shown by the facts. The passenger manifest was not requested by any of the Dutch parties officially from the Turkish Airlines headquarters. Several Dutch authorities did request, however, passenger manifests from the station manager. A list was also found on the Internet by the Dutch authorities. The status of the Internet manifest of THY.com was not recognised by Dutch authorities.

#### SCHIPHOL AIRPORT

*Observation:*

*The establishment that the improvement process is not safeguarded sufficiently is not acknowledged.*

Safety Board response:  
The Safety Board accepts this observation as information provision.

#### AMSTERDAM HEALTH SERVICE (GHOR AMSTERDAM-AMSTELLAND)

*Observation:*

*GHOR Amsterdam-Amstelland is surprised about explicitly stating that Mobile Medical Teams were not offered by the Amsterdam Ambulance Dispatch Centre. The procedure for calling out Mobile Medical Teams is demand-driven assistance provision. If the observation is not removed, GHOR Amsterdam-Amstelland would like to request that the fact that the Amsterdam Ambulance Dispatch Centre tried to contact the Kennemerland control room to ask whether Mobile Medical Teams were not required be added.*

Safety Board response:  
The Safety Board would still expect some initiative from the Amsterdam Ambulance Dispatch Centre when offering Mobile Medical Teams to the Kennemerland control room despite the

procedure. Mainly because the requests for Mobile Medical Teams by the Kennemerland control room always run through the Amsterdam Ambulance Dispatch Centre. The Amsterdam Ambulance Dispatch Centre did not receive a request from the Kennemerland control room and could have undertaken action based on this to assist the Kennemerland control room. Evidence was not found by the Safety Board about any contact about Mobile Medical Teams between the Amsterdam Ambulance Dispatch Centre and the Kennemerland control room either by fax or through telephone calls.

#### TURKISH AIRLINES

*Observation:*

*Draft report Section 5.5.3, paragraph 1.*

*Text in the report: The deviating Dutch legislation with regard to the registration of passengers as determined in the Dutch Aliens Act 2000 is not defined in the annex of the ICAO and is, therefore, not generally known amongst foreign airlines.*

*Observation: 'The necessity and imperatives of conformance with the Aliens Act 2000 should be clarified in the recommendations section of the report.'*

Safety Board response:

The investigation has shown that the Dutch Aliens Act 2000 is not (completely) clear to the Royal Netherlands Marechaussee and the Dutch Immigration and Naturalisation Service either. A message was sent to Turkish Airlines by the Dutch Immigration and Naturalisation Service within the framework of this Act but we have found no evidence of any verification of compliance with the Act. The Safety Board did not investigate this issue further because it falls outside the scope of the investigation.

#### ROYAL NETHERLANDS MARECHAUSEE

*Observation:*

*Since the accident was initially approached as a Vliegtuig Ongeval Schiphol (Schiphol Aircraft Accident; VOS) 6 in accordance with the CBPS (within the airport area), the Reporting and Information Centre (MIC) alerted the Royal Netherlands Marechaussee in accordance with the CBPS and it was scaled up and the whole of the available capacity linked to this alert of the DKMar-SPL was deployed at all levels. As from the moment when it became clear that the accident had taken place outside of the airport area, the police tasks were transferred in proper consultation with the Kennemerland regional police and the DKMar-SPL provided support to the regional police in the execution of its tasks.*

Safety Board response:

The Safety Board accepts this observation as information provision. It concerns more detailed information that does not have any added value with regard to the overall picture.

#### DUTCH PUBLIC ORDER AND SAFETY INSPECTORATE

*Observation:*

*Draft report page 90 the role of the Dutch Safety Board itself: "In this specific case it would, however, have been better if the Dutch Public Order and Safety Inspectorate had also given the Dutch Safety Board the opportunity to respond to that which has been included in the (draft) report about (employees of) the Dutch Safety Board".*

Safety Board response:

The Safety Board accepts this observation as information provision.



## ANNEX 4 TIME INDICATION DIFFERENCE ANALYSIS INFORMATION CARRIERS

### INTRODUCTION

In order to gain an idea of the sequence of the emergency assistance process, a timeline was drawn up in which the different events are described. The timeline begins at the time of the accident, as indicated by the data on the Flight Data Recorder (FDR). The information about the successive events in the timeline was provided by different source files including audio fragments of the Kennemerland control room (MICK) and the Schiphol Control Centre (RCS). As these information bearers each have their own time indication, and the analysis requires that the events are placed in the correct sequence, the Board conducted an analysis of the differences in time indications for the following information bearers:

- Audio files of the Kennemerland control room;
- Audio files from the Schiphol Control Centre;
- The transcript of conversations at Amsterdam Schiphol Airport (between air traffic control and the Schiphol Control Centre and between air traffic control and the aircraft);
- The data on the Flight Data Recorder.

### ANALYSIS OF THE DIFFERENCES

It seems possible to be able to analyse the differences in time indication as i) all four information bearers possess their own time indication and ii) communication took place between the different parties on a number of occasions. A conversation, for example, takes place between the Kennemerland control room and the Schiphol Control Centre at different moments (see table 3) from which it can be derived that the time indication on the Kennemerland control room audio files runs ahead by 2 minutes and 56 seconds (with a potential deviation of 1 second) when compared to the that of the Schiphol Control Centre

Conversation between the MICK and RCS	Literal text	RCS time at which text was expressed	MICK time at which text was expressed	Difference
RCS passes on VOS 6 report	"...For all on these channels: it is VOS 6 18 R".	10:28.55	10:25.59	00:02.56
Operator of the MICK calls RCS with a question about the exit position	"We are in the middle of a call-out. I'll call you back in a second."	10:29.24	10:26.28	00:02.56

*Table 3: Conversations that were held between the Kennemerland control room and Schiphol Control Centre and that have been recorded by both the Kennemerland control room and Schiphol Control Centre.*

In addition, frequent communication occurred between the Schiphol Control Centre and air traffic control (LVNL) in the West Tower, from which one can derive that the time indication on the audio files from the Schiphol Control Centre precedes that of the air traffic control by 1 hour and 2 seconds (see table 4).

Conversation between RCS and the West Tower	Literal text	RCS time when the text that is spoken was started	Time in accordance to the transcript	Difference
RCS passes on the runway to the airport fire brigade	"...8 right, I didn't understand the rest."	10:28.15	09:28.13	01:00.02
Airport Operations Manager	"OK, understood. Then we will go to VOS 6, Airport 1, VOS 6 to be sure."	10:28.40	09:28.38	01:00.02

Table 4: Conversations that were held between the Schiphol Control Centre and the air traffic control in the West Tower and that were recorded by both the Schiphol Control Centre and air traffic control.

The analysis of the difference between the time indication on the Flight Data Recorder in the aircraft and the transcript from the air traffic control indicates that the time indication from the air traffic control lags behind that of the Flight Data Recorder by 1 second. The difference of one hour is caused by the time difference between UTC (Universal Time Coordinated) and Amsterdam.

#### SUMMARY OF THE RESULTS

MICK = RCS - 00:02.56  
RCS = LVNL + 01:00.02  
LVNL = FDR - 00:00.01

This means that:

$FDR = LVNL + 00:00.01 = RCS - 01:00.02 + 00:00.01 = MICK + 00:02.56 - 01:00.02 + 00:00.01$

Local time = FDR + 1:00.00 (UTC) = MICK + 00:02.55

## ANNEX 5 GENERAL BACKGROUND INFORMATION ABOUT EMERGENCY ASSISTANCE AT ACCIDENTS<sup>125</sup>

This section contains a description of the relevant national guidelines, parties involved and the organisation of the emergency services to assist readers who are unaware of the Dutch organisation of the emergency services for disasters and serious accidents within the Netherlands.

### PREPARATION WITH REGARD TO EMERGENCY ASSISTANCE AT DISASTERS AND MAJOR INCIDENTS

#### *Obligations that arise from the legislation in force*

In accordance to the definition in the Dutch disasters and major accidents Act, a disaster or major incident is an event where:

- A serious disruption to public safety has occurred where the lives and health of many people, the environment and large material interests are being threatened or have been damaged to a serious degree; and
- A coordinated deployment of services and organisations of different disciplines is required to remove the threat or to limit the damaging consequences.

The Act prescribes that the mayor and aldermen of every municipality must draw up a *Disaster Plan* at least once every four years in which risks are inventoried, the organisation, responsibilities, tasks and powers within the framework of the disaster response are described and the policy with regard to determining *disaster response plans* is laid down. The policy included in the Disaster Plan with regard to determining *disaster response plans* must, in any case, contain a summary of disasters and major incidents regarding which the location, nature and consequences are foreseeable and for which a *disaster response plan* is defined.

#### *Dutch Safety Regions Act*

In July 2007, a proposal for the Dutch safety regions Act was sent to the Dutch House of Representatives that had the central objective of improving the *disaster response* and *crisis control* in the Netherlands. Now, an (amended) legislative proposal has been adopted by the Dutch House of Representatives and has been adopted by the Dutch Senate on 9 February 2010. The proposal offers the basis for setting up a joint regulation between municipalities in a region.<sup>126</sup> In anticipation to the Dutch safety regions Act becoming law, now 25 safety regions have been established in the Netherlands that are attempting to provide the details to the (amended) legislative proposal.

### SCALING-UP AND COORDINATION WITH REGARD TO DISASTERS AND MAJOR INCIDENTS

#### *Coordinated Regional Incident Response Procedure (GRIP)*

When a large-scale incident is involved, fast decision-taking and intensive cooperation are required between officials and services that are involved in responding to the consequences of the incident. Emergency services can scale up as required during an incident. In the Netherlands, arrangements are made for the scaling-up of steering in the nationally defined *Coordinated Regional Incident Response Procedure* (GRIP; Gecoördineerde Regionale Incidentbestrijdings Procedure).<sup>127</sup> The objective of this procedure is to ensure that there is appropriate coordination and harmonisation between all involved emergency services on an operational and administrative level when responding to an incident. A distinction is made into the different scaling-up stages in the procedure. The organisation

125 Terms such as disaster, crisis and incident are used for the same term in the text by the authors of the different documents that have been consulted. The Safety Board has used these terms in the same way as much as possible and, when quoting literally, the text has been put in italics.

126 The proposal integrates the acts that currently make arrangements for the fire brigade services, emergency medical assistance and disaster response. They are the Dutch Fire Services Act 1985, the Dutch medical assistance at accidents and disasters Act (WGHR) and the Dutch disasters and major accidents Act (Wrzo). These acts are being repealed. Issues with regard to the ambulance services are arranged through the Dutch ambulance care Act. This Act comes into force on 1 January 2011 and replaces the current Dutch ambulance transport Act.

127 GRIP reference framework, 28 March 2006, drawn up by the multidisciplinary GRIP workgroup. The Ministry of the Interior and Kingdom Relations has now brought this reference framework to the attention of the safety regions and the mayors and aldermen through a ministerial circular dated 11 September 2006 in which the Ministry asks that the reference framework be implemented within the regions within a year.

is further built up and organisation components and officials are allocated specific tasks, powers and responsibilities in each scaling-up stage. In addition to the normal, daily response of operational emergency services (GRIP 0), four scaling-up stages have been identified:

- GRIP 1: An incident with a limited scope is involved that can be controlled through source response but where harmonisation is required between the different disciplines. On site, a Command Place of Incident (CoPI) is established made up from the operational people in command (duty officers) of the different emergency services.
- GRIP 2: An incident is involved with clear consequences for the immediate area. In addition to a CoPI where often the commander of the fire brigade is in operational command over all disciplines present, an operational team (OT) is also established to coordinate the emergency assistance remotely.
- GRIP 3: A threat to the wellbeing of a large group of people in the jurisdiction of a municipality is involved. In addition to the CoPI and the operational team, the Municipal Policy Team (GBT) also meets. This Municipal Policy Team is led by the mayor of the municipality where the incident is taking place.
- GRIP 4: A municipality cross-border incident is involved. A CoPI is established on site. The operational team will also meet and a Regional Policy Team (RBT) is established. The Regional Policy Team is led by the mayor who has been appointed as the coordinating administrator for the safety region. The Queen's Commissioner of the relevant province will be informed.

#### *Command Place of Incident (CoPI)*

A CoPI is formed at the disaster site. The duty officers of the Police, the fire brigade and the emergency medical assistance at accidents and disasters harmonise their emergency services activities in this team.<sup>128</sup> Depending on of the nature of the disaster, a disaster site commander is appointed. This commander will be in charge of the CoPI as the chairperson. In practice, the duty officer of the fire brigade performs this task.

#### *Operational team*

The operational team is a part of the crisis staff together with the Policy Team and it coordinates the execution of the response tasks. This team is composed of multiple disciplines and consists of representatives from the fire brigade, the emergency medical assistance at accidents and disasters, the Police and the municipality.<sup>129</sup> The operational team is led by the operational leader who also participates in the Policy Team. The operational leader is directly responsible for a coordinated execution of the decisions of the mayor. He or she will convert these decisions into binding instructions or guidelines for the different services in the operational team. Usually, the main duty officer of the fire brigade is the operational leader.<sup>130</sup>

#### *Municipal policy team*

The mayor has overall command when responding to a disaster or a major incident.<sup>131</sup> He or she will be politically and administratively responsible for the disaster response and finally will take the decisions. He or she is responsible for an appropriate policy coordination of the activities of all organisations and services that are involved in the disaster response effort. The mayor will be assisted by (municipal) crisis staff consisting of a municipal policy team and an operational team. The policy team will provide recommendations about the policy to be pursued during a disaster or major incident and will, at least, consist of representatives from:

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128 Depending on the nature and scope of the disaster, representatives of other emergency services will also participate in the CoPI.

129 Depending on the situation, representatives of other services or companies can be a part of this team upon request. For example, the Airside Operations Manager of Schiphol Airport was also part of the operational team that met after the Turkish Airlines aircraft crashed.

130 There are, however, disaster types where the operational leadership is allocated to a different discipline. For example, to the chief officer of the Police when there are large-scale breaches of the peace or the regional medical officer with regard to accidents involving a large number of victims where the fire brigade does not have a task to perform.

131 If the disaster concerns multiple municipalities, the administrative management will be fulfilled by the coordinating mayor. It will have been agreed in advance who the coordinating mayor is. This mayor is the chairperson of the Regional Policy Team as well as the chairperson of the consultation amongst the mayors.

- The fire brigade (fire brigade commander);
- The emergency medical assistance at accidents and disasters (regional medical officer);
- The police (district police chief);
- The municipality (municipality information officer, city clerk and public safety official).

#### EXECUTION OF EMERGENCY ASSISTANCE AT DISASTERS AND MAJOR INCIDENTS

When a disaster or major incident occurs, a number of parties will at least play a role when limiting the consequences:

- The safety region;
- The fire brigade;
- The emergency medical assistance at accidents and disasters (GHOR);
- The police;
- The municipality where the accident is taking place.

The role of these parties is further explained in the following sections. Depending on the nature and scope of the disaster, other emergency services may also play a role.

#### *The Kennemerland Safety Region*

As indicated before, the safety region is primarily responsible for preparing and executing tasks in the area of disaster response. The safety region consists of different emergency services organisations including the fire brigade and the municipal health service. The Kennemerland Safety Region also has a safety agency that is involved in the preparation with regard to acting on a large scale whilst involving many different disciplines during events, disasters and crises. The safety agency consists of people from the regional fire brigade, the Kennemerland police force, the emergency medical assistance at accidents and disasters and the regional military command post West. The control room of the safety region also plays an important role during the response to the consequences of disasters and major incidents. There is also an agreement between the safety region and the regional police force. Each of these organisations/departments has its own tasks to perform and responsibilities in responding to the consequences of disasters and major incidents that are explained below.

#### *Control room*

The Netherlands is split into 25 safety regions. With the exception of the Amsterdam-Amstelland region, every region has a shared control room that caters for the police, fire brigade and ambulance care. The staff at a control room consists of specially trained operators who work in shifts. This ensures that requests for assistance from citizens who are experiencing an emergency can be answered 24 hours a day, 7 days a week. It also ensures that emergency services staff can be quickly deployed to the location of the incident. Generally, the control room has the following tasks:

- Receive reports;
- Gain and log information;
- Determine deployment;
- Alerting and assisting emergency services;
- Coordinate during emergency assistance.

When an incident occurs, witnesses usually call the alarm number 112 to report the incident and to request assistance. These calls are transferred by the 112 operator to an operator of the fire brigade, police or ambulance care that, depending on the nature and scope of the accident, will alert one or more emergency services (fire brigade, emergency medical services organisations and/or the police). Operators must collaborate when there is a major incident to ensure that the units of the different emergency services are alerted as soon as possible in parallel to each other.

The Kennemerland Report, Information and Coordination Centre (MICK) is the shared control room of the Kennemerland Safety Region.



### *Fire brigade*

In Kennemerland, the fire services have been regionalised and fall completely under the scope of the Kennemerland Safety Region. The objective is to arrive at an effectively organised and coordinated execution of the activities as referred to in the provisions of Article 1, sixth paragraph, of the Dutch Fire Services Act and to foster appropriate emergency assistance at an accident or disaster.

This refers to the actual execution of the following activities:

- Preventing, limiting and responding to fire, limiting the risk of fire, preventing and limiting accidents involving fire and everything that may be related to this;
- Limiting and responding to risks to people and animals with regard to accidents that do not involve fire.

Limiting and responding to disasters and major incidents are part of the fire brigade's assignment.

The Dutch Fire Services Act 1985 describes the tasks that the municipalities in a region must charge to the regional fire brigade (compulsory). This refers to setting up and maintaining a regional fire brigade emergency service, purchasing and managing shared equipment, preparing and coordinating when responding to disasters and major incidents, preparing the organisation for the fire brigade to act under extraordinary conditions and putting in place the operational leadership when responding to disasters and major incidents.<sup>132</sup>

### *Emergency medical assistance at accidents and disasters (GHOR)*

The organisation in charge of emergency medical assistance at accidents and disasters set up by the administration of the safety region is charged with the coordination, steering and management of the emergency medical assistance and with providing advice to other authorities and organisations in the area of emergency medical assistance. The emergency medical assistance at accidents and disasters organisation coordinates the deployment of medical services during disasters and major and large-scale incidents and focuses on optimising this medical assistance chain to respond adequately to the consequences of large-scale incidents and disasters (in terms of injury and suffering).

Every region will have appointed a Regional Medical Officer (RGF) who is supported by an emergency medical assistance regional agency for accidents and disasters. The Regional Medical Officer can be compared with the commander of the regional fire brigade and the chief officer of the regional police during scaled-up situations with regard to his or her powers and tasks.

The Regional Medical Officer acts as the point of contact for all medical parties and public administration. The officer formulates the policy for coherent emergency medical assistance at accidents and disasters in partnership with all involved parties. In contrast to the fire brigade, police and municipality, emergency medical assistance at accidents and disasters does not have its own daily execution organisation. Regular emergency medical assistance is provided by a range of care institutions including:

- Hospitals and trauma centres;
- Regional ambulance facilities (RAV, consisting of the ambulance dispatch centre and ambulance service);
- Municipal Health Service (GGD);
- Dutch Red Cross (NRK);
- Dutch Mental Healthcare Association (GGZ);
- General practitioners.

The emergency medical assistance at accidents and disasters organisation has final responsibility for the process of the emergency medical assistance when responding to disasters.<sup>133</sup> The emergency medical assistance focuses on preventing illness, permanent injury and death of accident victims as much as possible. The emergency medical assistance process includes the treatment and coordination of casualties from the moment the alarm is sounded through to revalidation and the deployment and coordination of ambulances and medical combinations (with regard to large numbers of victims).

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<sup>132</sup> Dutch Fire Services Act 1985, Article 4, paragraph 1.

<sup>133</sup> The GHOR is also responsible for providing psychosocial assistance (PSHOR) and preventive public health-care (POG).

### *Police*

The police in the Netherlands provides supportive tasks at disasters and major incidents for the emergency assistance. These arise from legal powers and responsibilities. The execution of tasks are mainly on a regional level at the police regions. In special situations (as at Schiphol Airport), the Royal Netherlands Marechaussee carries out these police tasks.<sup>134</sup>

When a (major) incident occurs somewhere, the police are usually the first on the scene. The first police unit has a coordinating task with regard to the accident location. Should the incident be scaled up to national police services, the harmonisation with the regional level usually takes place through the regional staff large-scale and special acting support (SGBOs). The regional police can be supported by special police services with regard to both emergency assistance and when investigating. These special police services are often housed nationally with the Dutch National Police Services Agency.

### *Municipality*

As already indicated, a municipality must prepare to respond to crises in its territory by, for example, drawing up municipal disaster plans and disaster response plans. This is made mandatory due to the Dutch disasters and major accidents Act. It has also been stated before that, in anticipation to the Dutch safety regions Act, safety regions have been established that have drawn up disaster response plans on a regional level. This is also the case with regard to the Kennemerland Safety Region, the region in which the Turkish Airlines aircraft crashed, and where the Schiphol Airport is located. The Schiphol Airport Crisis Response Plan has been drawn up on the basis of the Dutch airport sites disaster response plans Decision.

The Kennemerland Crisis Plan states which crisis response processes fall under the responsibility of the municipalities<sup>135</sup> in Kennemerland. This concerns the following processes (this is not an exhaustive list):

- Reception and care;
- Communication;
- Registration of victims;
- Aftercare.

Every municipality elaborates how the subprocesses will be executed in municipality-specific scenario plans to prepare for crises. One or more subprocesses are activated during a crisis depending on the situation after which an action centre is established for the relevant subprocess. This can be, for example, an information provision action centre or a central registration and information agency action centre. A coordination centre for municipal services is made operational for coordinating municipal processes in accordance with the crisis plan. The (deputy) city clerk is the chairperson of this.

### *Deployment of emergency services units at Schiphol Airport*

Control centres such as the Schiphol Control Centre work with deployment scenarios that have been drawn up in advance and that are a part of the disaster response plans with regard to major foreseeable disasters. Seven different scenarios are used for aircraft accidents at Schiphol Airport. Schiphol aircraft accident alarm code one (VOS 1) is the smallest disaster for which provisions have been made and Schiphol aircraft accident alarm code seven (VOS 7) is the largest disaster for which provisions have been made. It has been determined for each scenario which emergency services providers are required to respond to the relevant disaster. When a disaster occurs, the control centre determines which scenario produced in advance matches the event and alerts the emergency services providers. When the coordinated regional incident response procedure is alerted, people are called up who manage the work of the alerted emergency services providers.

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134 The Royal Netherlands Marechaussee also participates in the consultation committee at Schiphol Airport. This committee mainly focuses on the continuity and/or recovery of operational management at Schiphol Airport after a disaster. Next, this committee supports and facilitates the operational team at Schiphol Airport.

135 The Kennemerland municipalities are Beverwijk, Bloemendaal, Haarlem, Haarlemmerliede and Spaarnwoude C.A., Haarlemmermeer, Heemskerk, Heemstede, Uitgeest, Velsen and Zandvoort.



## **ANNEX 6 BACKGROUND INFORMATION ABOUT THE INTEGRATED CONTROL ROOM SYSTEM**

A general description is provided in this annex of (the way in which) the Integrated Control Room System (GMS) (works) that has been developed at the instructions of the Dutch ministries of the Interior and Kingdom Relations (BZK) and Health, Welfare and Sport (VWS) in close partnership with the control room sector itself. The execution was in the hands of the Information and Communication Technology Organisation (ITO) in Odijk. This has been added to the Voorziening tot samenwerking Politie Nederland, Control Room Systems Unit. The description of the integrated control room system in this annex is based on a factsheet of the ITO as available on the website of the Dutch ministry BZK.

### **WHAT IS THE INTEGRATED CONTROL ROOM SYSTEM?**

The integrated control room system is an advanced system for the control room that, in the first instance, supports the activities of the operator. The integrated control room system is suitable for control rooms in which multiple disciplines (fire brigade, police and ambulance) work together. This is supposed to save a lot of time especially when processing multidisciplinary incidents. By using this system, data related to a report only has to be entered once to ensure that all involved disciplines are aware of the report.

The integrated control room system can be linked to an innumerable number of other systems at the control room such as radio control systems, telephony systems, business process systems, geographical information systems (GIS) and public fire detection systems.

### **HOW DOES THE INTEGRATED CONTROL ROOM SYSTEM WORK?**

The integrated control room system supervised the full processing process that is gone through when a report is received: taking the (telephone) call, issuing the made report to the different disciplines, making a deployment proposal and the further processing of the incident. All this data is, next, filed and passed on to a business process system at the police and ambulance care. Below the operation of the integrated control room system is explained further.

#### *Call acceptance screen*

The 'Call acceptance screen general' forms the starting point for all people who require assistance from the fire brigade, police or central ambulance service post (CPA). At the top of the screen on the left, the reports that are waiting and the reports that are being processed are shown. They may be telephone reports that arrived through the optional link with 112, another reporting number or an automatic reporting system. The summary of outstanding reports also specifies how long a call has been in the 'queue'. When a call is removed from the queue, the data will be moved to the 'Reports being processed' summary. At the same time, a new tab is opened on the right at the top of the screen in which the data of the caller will automatically be displayed. Now the caller can be asked more questions by the operator. The operator can be supported in this task through a 'hints and characteristics' questioning system at the bottom of the screen on the left. The clipboard can be found at the bottom of the screen on the right. Notes can be jotted down using free text here that are normally taken down on paper. The system can recognise all the important data in the clipboard and automatically copy the data across to the prepared fields on the incident tab.

#### *Issue screen*

The data about the incident or the journey for the Central ambulance service post are, next, further processed by the issue operator to produce a deployment proposal. This will immediately specify which unit can best be deployed based on status, priority, distance, and care area. When the integrated control room system and the geographical information system are linked, the deployment proposal will be based on mobilisation times. As an example we will take the 'fire brigade issue screen'. At the top of the screen on the left the summary of current incidents is displayed that are already being processed as well as the queue of outstanding incidents regarding which action must still be taken. At the bottom of the screen on the left summaries are displayed of the equipment and the status of the units. The data about the incident being processed is displayed on the right side of the screen.

The control room operator can immediately see what is going on, which information is known and which units are linked to the incident. Changes that are implemented by the operator with regard to the incident can result in follow-on actions.

The fire brigade, police and ambulance issue screens obviously all have matching section but also differences. In addition to deployment proposals, the integrated control room system also ensures that procedures are issued. They, for example, specify which officials and bodies must be informed with regard to a major disaster. Operators will then not have to refer to scripts anymore but can simply read the information on their screens. The issue data is filed and passed on to the business process system.

#### WHAT DOES THE INTEGRATED CONTROL ROOM SYSTEM LOOK LIKE?

In general, two large (21 inch) screens are used for the display (see the photo below). The integrated control room system does not have a fixed layout; the lay-out can be configured by the administrator. This applies to both the screen layout and colour settings.

#### OTHER DETAILS

##### *Discipline-specific functions for every discipline*

Every discipline will find functions in the integrated control room system that have been tailor-made for the working process. There is, for example, a 'shift schedule function' in the system for the fire brigade deployment with which it can be determined which shifts must be alerted at a specific moment. The integrated control room system also supports the ordered ambulance transport through, for example, the option of planning reoccurring journeys with few actions. Once they have been entered once, patient details can be quickly retrieved with regard to follow-on and new journeys. It applies with regard to the police that the integrated control room system can be linked to police databases.

##### *Link to the 112 number*

Due to an optional link with the telephone exchanges of the national alarm number, 112, the name, address and city of a caller will be presented immediately on the screen in most cases when a call is taken. This information will not have to be entered. In many cases this means that time is saved and that there are no doubts about the personal details of the caller being correct.

##### *Smart clipboard*

The integrated control room system is equipped with a 'smart clipboard', that is, a field on the screen in which data can be taken down quickly when taking the call. This replaces the paper clipboard on the desk. The clipboard can recognise frequently used terms and descriptions linked to incidents and can automatically complete the correct fields on the screen. The system, for example, recognises streets, objects and terms such as 'burglary', 'casualties' and 'trapped' and will start the required actions based on this. These terms can be configured by the administrator.

##### *National location file*

A location file is part of the integrated control room system. This file contains all roads, streets, railway lines and navigation routes for the relevant control room and the immediately bordering municipalities.

##### *Links*

Due to the links other systems can be operated from the keyboard. This ensures that the operator's work is better organised because he or she does not have to continuously switch to another system. It will, for example, be possible to operate C2000 from the integrated control room system in the near future. The operator can query different police databases directly through the screen of the integrated control room system due to a system link. The integrated control room system can also be linked with geographical information systems, vehicle location systems, public reporting systems and business process systems. The hazardous substances database has also been included in the integrated control room system.

## ANNEX 7 EXPLORATORY STUDY REGARDING SURVIVAL ASPECTS

### INTRODUCTION

The Dutch Safety Board has carried out an exploratory study into the survival aspects of the aircraft of Turkish Airlines with registration number TC-JGE. Correct construction of the Boeing 737-800 and particularly of the seats and safety belts can limit the risk of injury to passengers in the event of an accident. The analysis of aircraft accidents can provide an understanding of the survival aspects of aircraft, based on which measures can be taken to improve this. It might, for instance, result in adjustments or new requirements in relation to an aircraft's survival aspects. Of prime importance in this case are the statutory requirements<sup>136</sup> imposed on aircraft seats and seatbelts.

The purpose of the exploratory study was to examine whether it would be sensible to undertake an extensive study into the safety aspects for this accident. The data used for the study included the medical information for the passengers, summarised by the Amsterdam Academic Medical Centre, along with extensive measurements of the damage in the cabin and cockpit.

Few aircraft accidents take place that lend themselves to a detailed analysis of survival aspects. The reasons for this include fire or serious damage, rendering such an analysis either meaningless or impossible. The accident with the aircraft of Turkish Airlines lends itself well to detailed analysis, however.

### INJURY TO PASSENGERS

There were 128 passengers and seven crew members in the aircraft. Five passengers and four crew including three pilots died as a result of the accident. Most of the deaths and serious injuries were seated in the front section of the aircraft. This is also the section where there was the greatest damage to the interior. Of the remaining 126 occupants (including a baby), most had one or more injuries. Six passengers did not suffer injuries. Most of the occupants with minor injuries were sitting in the main section. It should be pointed out here that the category of "minor injuries" also includes wounded occupants who fell unconscious for a brief period. In the event that fire had broken out, this injury might have had life-threatening consequences, because these passengers and crew would have been unable to evacuate the aircraft themselves in good time. The injury status of one passenger is not known precisely. This individual was discharged after treatment at an accident and emergency unit.

The injuries are accorded on the basis of the international standard AIS scale (Abbreviated Injury Score). This score has a classification that increases with regard to seriousness of the injury from 0 to 6. The AIS 0 code is allocated when injury has not been identified, AIS 1 means a slight injury and this increased up to AIS 6 for fatal injury.

Table 4 provides an overview of the AIS scale with examples of typical injuries that occurred frequently during the accident with the Turkish Airlines aircraft. The cause of death for those passengers who died during the accident is unknown, as no autopsies were performed on them.

AIS	Description of injuries
1	Sprains, a broken rib
2	Brief unconsciousness, fractured sternum, 2 to 3 fractured ribs
3	fractured vertebra (without damage to the spinal cord), complex broken bones
4	pulmonary contusion
5	serious brain injury

Table 4: Examples of injuries with AIS codes

<sup>136</sup> FAR Part 25 Airworthiness standards: Transport category airplanes. Emergency Landing Conditions, Parts 25.561 (General) and 25.562 (Emergency landing dynamic conditions).

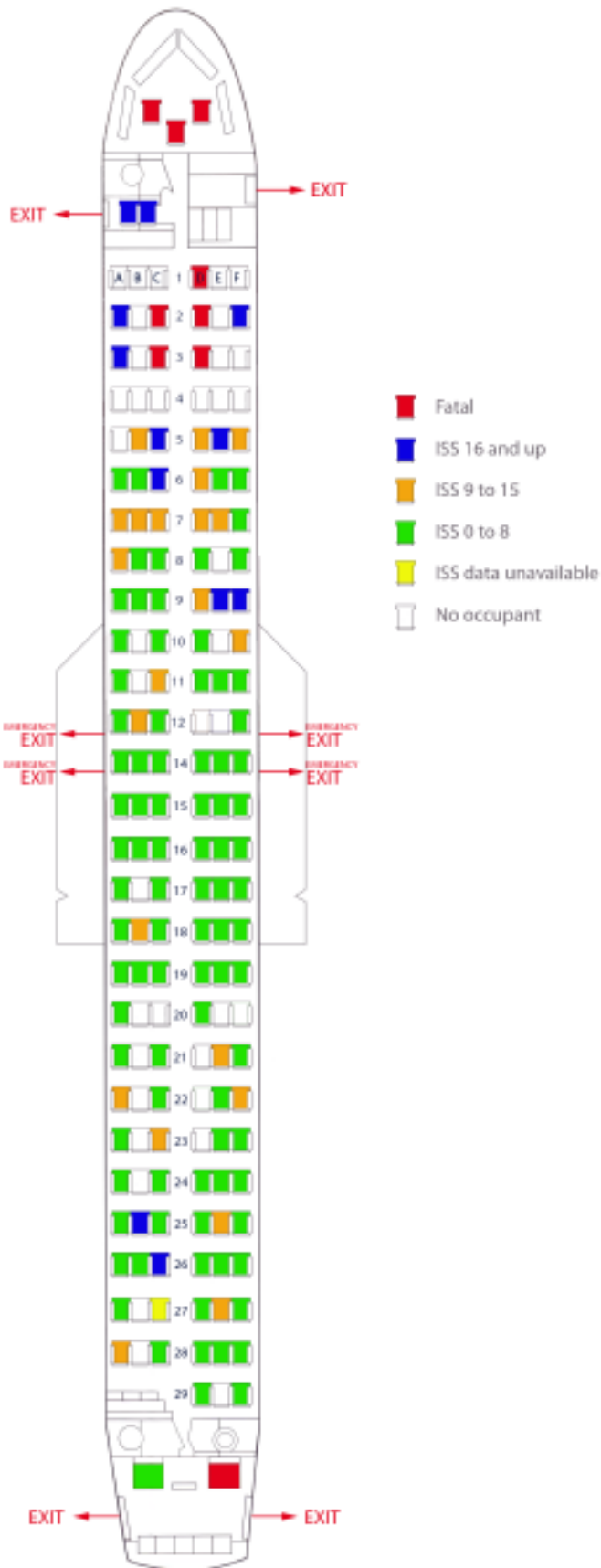


Figure 23: Gravity of injuries to passengers by seating position according to ISS scale  
Please note that not all of the occupants were interviewed or returned the questionnaires. Therefore, it is possible that a few positions in this figure do not coincide with the factual situation.

Many of the wounded had several injuries. The international custom in such cases is to use the ISS scale (Injury Severity Score) instead of the AIS scale. For the three areas of the body where the most serious AIS injuries have occurred, this scale applies the sum of the square of the maximum AIS value in that area.<sup>137</sup> The following table indicates the ISS codes, with the relevant gravity of the injury.

ISS code	Gravity of injury
0-8	None/slight
9-15	Moderate
16 and above	Serious

Table 5: ISS codes with related gravity of injury

Figure 23 provides information about the gravity of the injuries of the occupants in relation to the aircraft seat where they were allocated. The positions where the passengers were seated at the time of the accident were determined on the basis of the passenger manifest, interviews with passengers and questionnaires they completed. It is worth pointing out here that not all of the occupants were interviewed or returned the questionnaires. It is therefore possible that some positions in the illustration do not coincide with the factual position.

No injuries or minor injuries (ISS 0-8) are shown in green, moderate injuries (ISS 9-15) in orange and serious injuries (ISS 16 and above) in blue. The seating positions of the deceased victims are shown in red. The seats shown in white were not occupied. There was one baby on board, sitting on the lap of one of its parents (seat number 21 E/F). The passenger whose ISS score is unknown is shown coloured yellow. 12 of the victims who survived the accident had serious injuries and 22 of them had moderate injuries.

#### DAMAGE TO THE AIRCRAFT

Detailed measurements of the damage sustained to the aircraft's interior were taken after the accident. The purpose of this was to document these as accurately as possible in connection with a possible subsequent follow-up study into survival aspects.

The Dutch Safety Board performed measurements which included those for passenger and crew seats (distortion of frames, damage et cetera), the seat attachment points, the safety belts (minor damage to the belts indicating whether or not they were being worn), the baggage accommodation above the seats, the distances between the seats, floor and cabin deformations and emergency exits. The damage and deformation to the seats were at their greatest in the front part of the aircraft and at those points where the aircraft fuselage had been broken.

Aircraft seats must meet aviation requirements in relation to crash safety. These requirements are based on crash tests in a laboratory. There are two types of tests: one test where the load is mainly imposed in a forward direction with a maximum deceleration of 16g (16 times the force of gravity) and one test where the load is mainly imposed in a vertical direction with a maximum deceleration of 14g. An initial study of the seat distortions led to the conclusion that the loads involved in this accident were primarily vertical. The distortions to a number of seats indicated that a deceleration force of more than 14g had occurred.

137 E.g. two AIS 3 injuries (9+9) and one AIS 2 injury (4) result in ISS 22.





## **ANNEX 8 FLIGHT ROUTES MOBILE MEDICAL TEAMS (MMTS)**

As described in section 5, the deployment of the air-linked mobile medical teams did not run smoothly. The Dutch Safety Board has stated in this section as well as in the analysis that if the mobile medical teams (MMTs) had been called out immediately, the team from Amsterdam stationed at the VU Medical Centre, could have been present as the first emergency medical provider on site.

The Dutch Safety Board bases this statement on information as requested from the Air traffic control the Netherlands (LVNL). The helicopters of the mobile medical teams are provided with transponders that enable the tracking and tracing of every aircraft by its unique ID.

In addition to the (actual) flight duration it was assessed whether the MMTs were available for deployment. The Rotterdam team, Lifeliner 2, was occupied at the time of the accident. Two airborne MMTs, Lifeliner 1 from Amsterdam and the team stationed at the Volkel air base, Lifeliner 3, were available. After alerts by the National Ambulance Dispatch Centre it turned out that the helicopter of the fourth team, Groningen, could not take off due to a technical defect.

By request of the Dutch Safety Board plots were made by Air traffic control the Netherlands of the flight movements of the three MMTs involved on 25 February to project the flight paths. Analysis has shown that less than 10 minutes is a feasible flight duration (including taking off and landing) for the Amsterdam MMT. After (direct) alerts to Lifeliner 1 by the National Ambulance Dispatch Centre, Lifeliner 1 reported to the Ambulance Dispatch Centre in Amsterdam. Although the fact that the Amsterdam dispatch centre was aware of the location of the aircraft accident, Lifeliner was instructed to contact the Kennemerland dispatch centre. The contact between Lifeliner 1 and the Kennemerland control room was difficult and various locations were dispatched to the team (Figure 24).

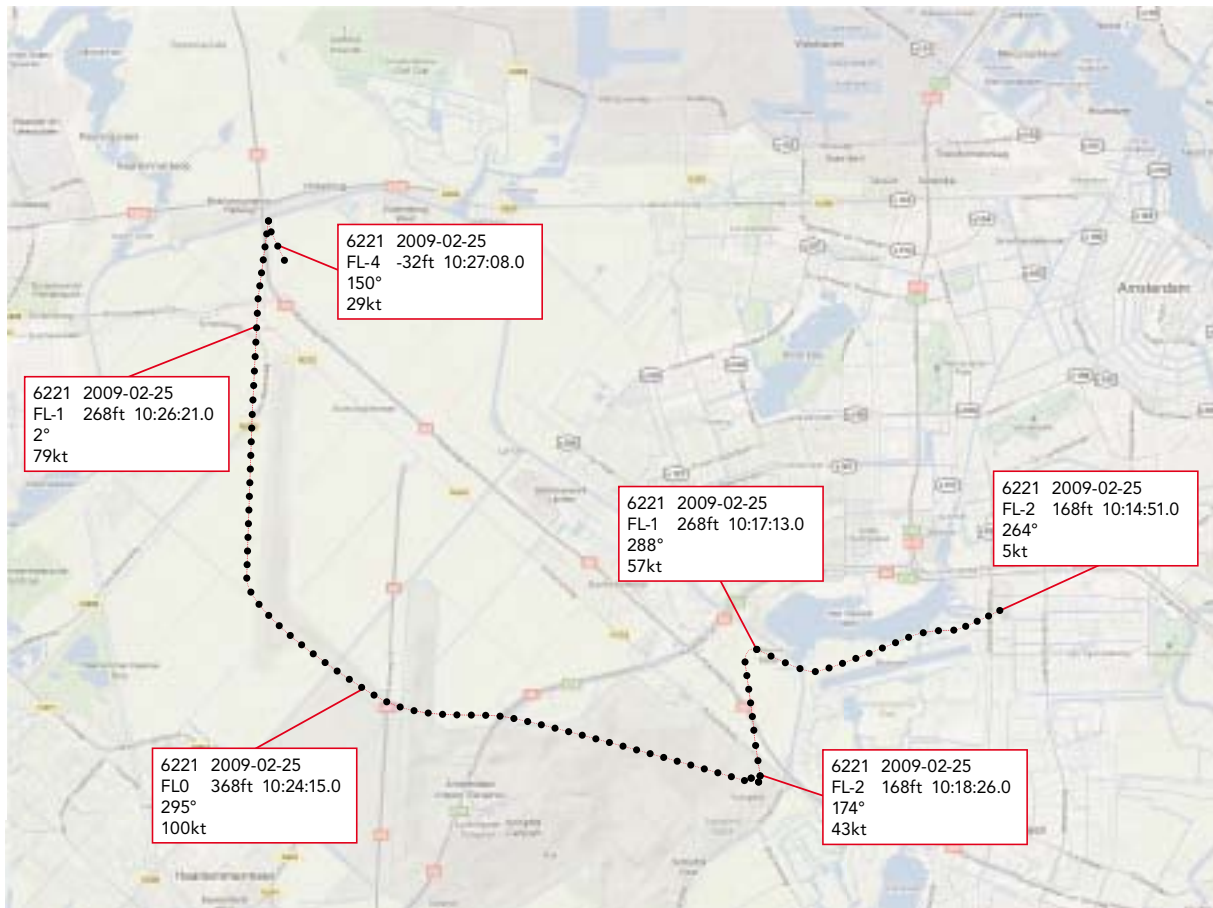


Figure 24: Flight course 1<sup>st</sup> flight of Lifeliner 1 VU Amsterdam → Kromme Spieringweg

Action	Corrected time compared to UTC	Flight duration
Departure from VU/airborne	11:14.51	
Schiphol-East UGS B	11:18.26	
Schiphol-West UGS C	11:24.15	
Kromme Spieringweg	11:27.08	12 minutes 17 seconds

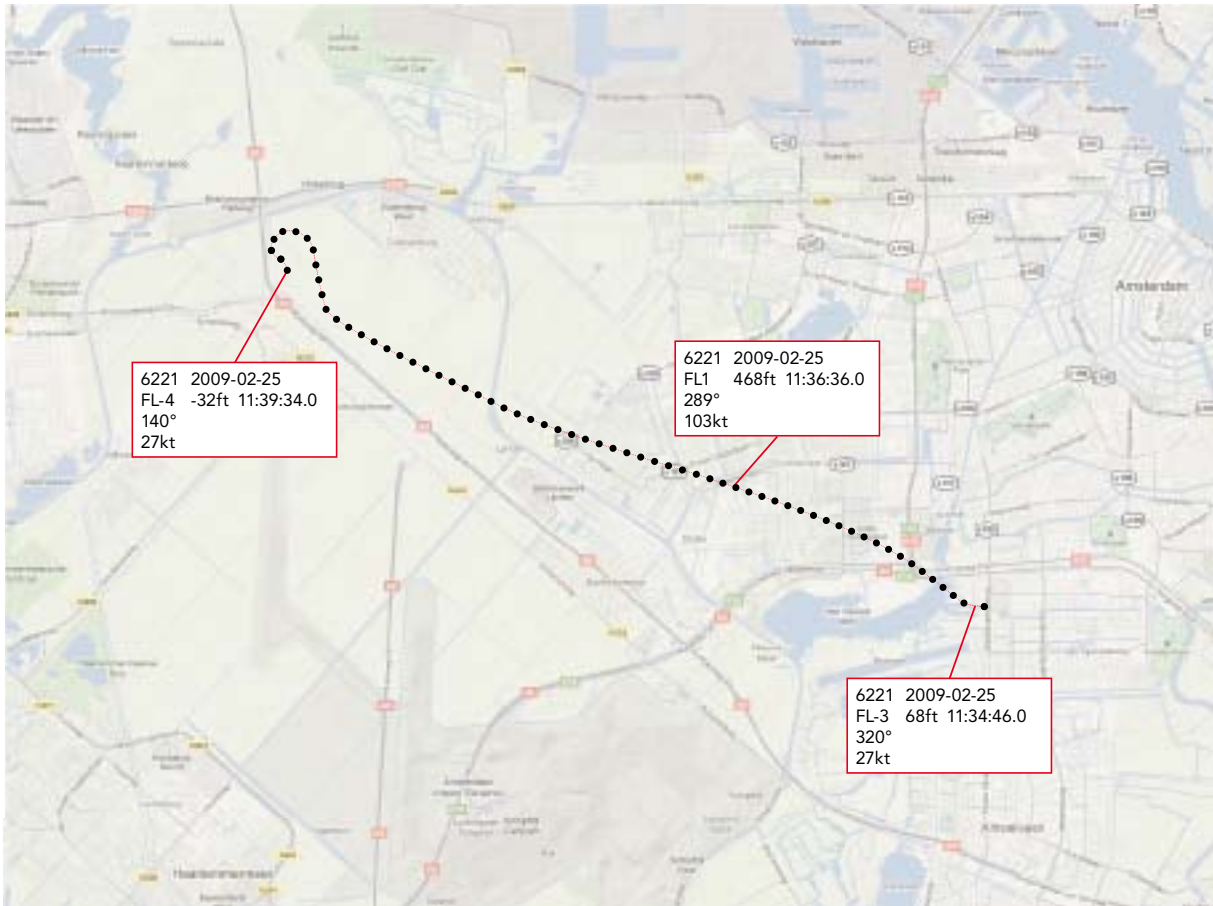


Figure 25: Flight course 2<sup>nd</sup> flight of Lifeliner 1 VU Amsterdam → Kromme Spieringweg

Action	Corrected time compared to UTC	Flight duration
Departure VU/airborne	12:34.46	
Kromme Spieringweg	12:39.34	4 minutes 48 seconds

After the first deployment the Amsterdam Lifeliner made several flights. Initially the helicopter returned to collect an additional trauma doctor and one T1 patient was taken to the VU Medical Centre. Additional equipment was also collected. The Safety Board included the return flights in the analyses.

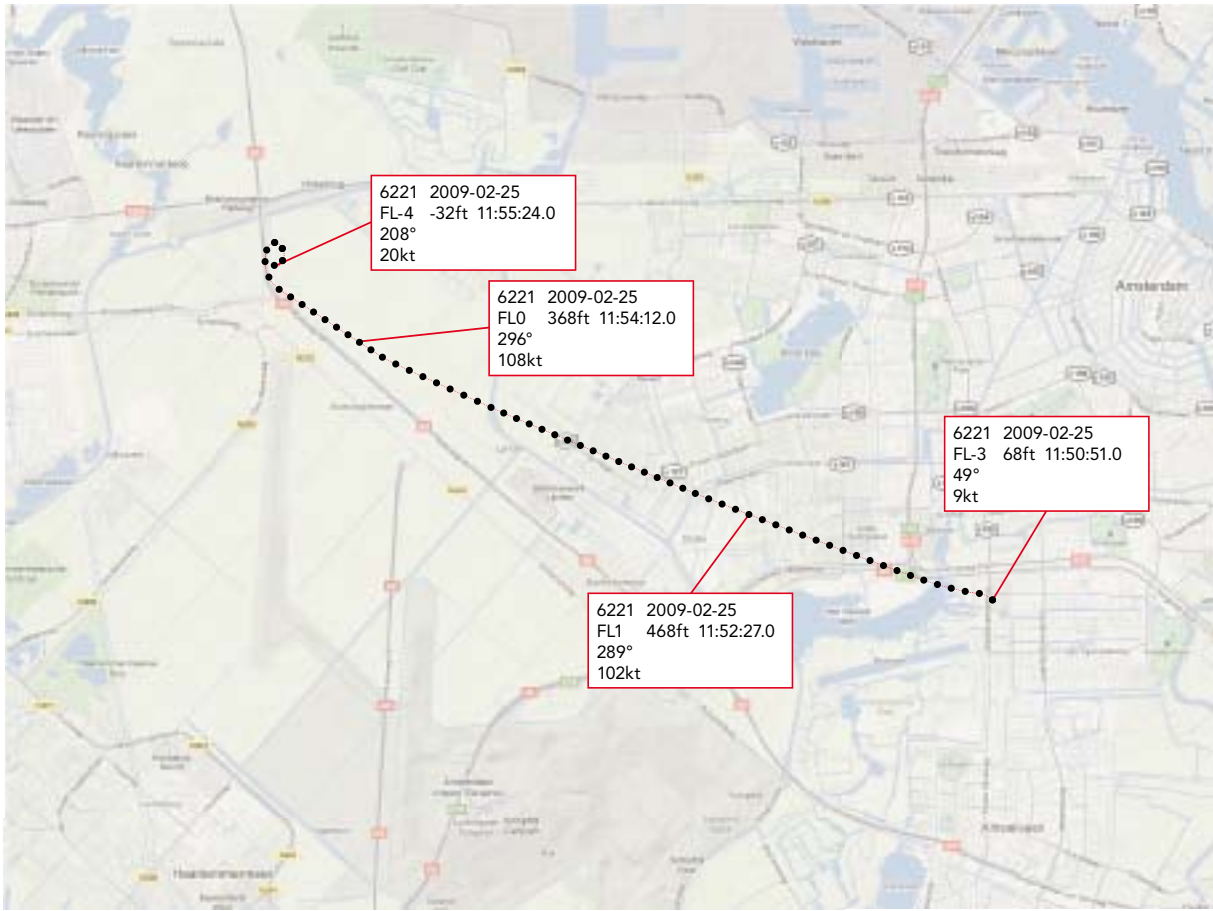


Figure 26: Flight course 3<sup>rd</sup> flight of Lifeliner 1 VU Amsterdam → Kromme Spieringweg

Action	Corrected time compared to UTC	Flight duration
Departure VU/airborne	12:50.51	
Kromme Spieringweg	12:55.24	4 minutes 33 seconds

In addition to the analysis of the flight duration of the Amsterdam team, the flight path of the Gelderland MTT was also checked. Despite repeated requests directed to the various control rooms involved, this team was unable to obtain an exact accident location. After first having been directed by Air Traffic Control the Netherlands from Volkel in the direction of Pampus the helicopter had to fly to Vijfhuizen where the pilot could not find the accident location.



Figure 27: Flight course of Lifeliner 3 flight, Volkel air base → Kromme Spieringweg (part 1)

Action	Corrected time compared to UTC	Flight duration
Departure from Volkel/ airborne	11:11.57	
Kromme Spieringweg	11:52.17	40 minutes 20 seconds

Note: The Lifeliner 3 transponder was set to local time.



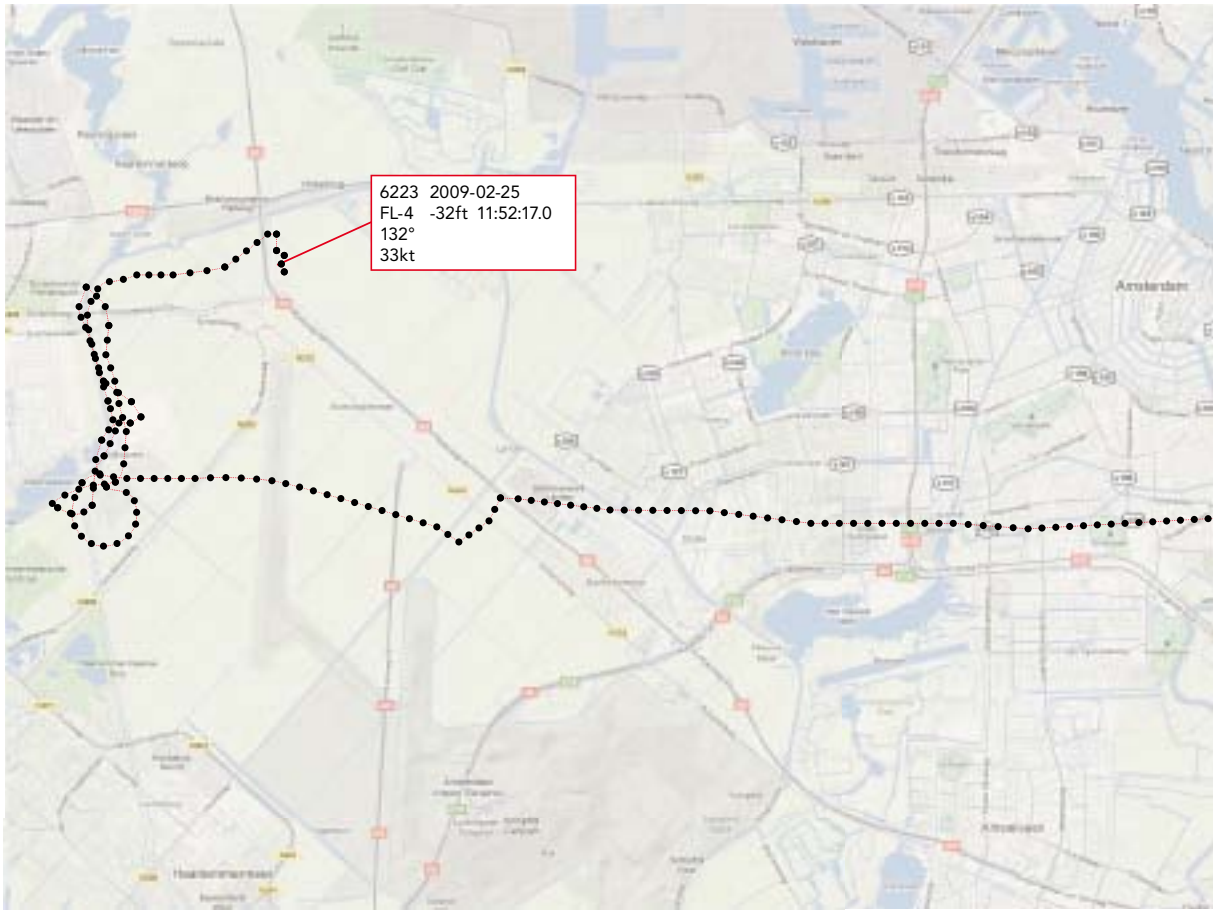


Figure 28: Flight course of Lifeliner 3 flight, Volkel air base → Kromme Spieringweg (part 2)

Action	Corrected time compared to UTC	Flight duration
Departure from Volkel/ airborne	11:11.57	
Kromme Spieringweg	11:52.17	40 minutes 20 seconds

During the last phase of the flight the Lifeliner 3 was sent in the direction of the village of Vijfhuizen. Because the team could not get the exact accident location, multiple searches were carried out. Note: The Lifeliner 3 transponder was set to local time.

## ANNEX 9 OVERVIEW OF INFORMATION ON VICTIMS

The following table provides an overview of the information on the victims after the aircraft accident of the Boeing 737 of Turkish Airlines. The table shows that during the process of emergency response the information on the number of victims and the seriousness of the injuries deviate where several factors are concerned. The course of the information streams cannot be ascertained on the basis of the available information. There is no clear answer on the question through which actors and channels the information reached those who were responsible for medical emergency service within the command place of incident (OvD-G) and the operational team (HS-GHOR). Furthermore, the analysis shows that no information seems to have been exchanged about the nature of injuries. The used triage class T4 signifies that the victim has died. T4 is normally only applied in times of war.

Recipient	Dispatcher	Information	Time	Source
RCS	VBB	Trapped: 6-7	10:52 local time	RCS tapes
MICK	Police	T4: 1	10:52 local time	MICK tapes
MICK	Police	Trapped: 6-7	10:52 local time	MICK tapes
MICK	1 <sup>st</sup> ambulance	Many seriously wounded, 2 triage stations set up	10:54 local time	MICK tapes
Coordinator at aircraft (Den Helder)	NHN <sup>138</sup>	People with broken bones outside the aircraft T4: 1 Trapped: 6	10:59 local time	Interview report
OvD-G	Unknown	T1: 5 (in house) T3: 30 (in shed)	11:00 local time	CoPI Sitrap <sup>139</sup>
Unknown	RCS	Trapped: 9	11:05 local time	RCS tapes
HS-GHOR	Unknown	T3: 3-6 (light casualty) T4: 1	11:15 local time	OT report
NHN	MICK	Trapped: 7 of which 2 T4	11:19 local time	MICK tapes
HS-GHOR	Unknown	Trapped: 5-6 T2-T3: 5-6	11:20 local time	OT report
MICK	Police	T1: 6 at aircraft T1: 10 with Willem	11:23 local time	MICK tapes
HS-GHOR	Unknown	T1: 25 T2: Unknown T3: 30	11:30 local time	OT report
MICK	Police	T3: 56 in shed 6 in aircraft	11:30 local time	MICK tapes
HM <sup>140</sup>	LMAZ	T1: 16 T2: 30 T3: rest T4: 1	11:34 local time	LMAZ tapes
OvD-G	Unknown	Trapped: 6 T4: 1	12:00 local time	CoPI Sitrap

138 NHN: dispatch centre Noord-Holland Noord

139 Sitrap: situation report

140 HM: head of the dispatch centre



Recipient	Dispatcher	Information	Time	Source
OvD-G	Unknown	T1: 5 on site T2: Unknown T3: 50 to Wildenhorst T4: Approx. 10	13:00 local time	CoPI Sitrap
OvD-G	Unknown	T1: 25-30 T2: 25 T3: Approx. 60 T4: 6 17 T3 to Kennemergasthuis	13:25 local time	CoPI Sitrap
HS-GHOR	HAC <sup>141</sup>	HAC calls and passes on the summary of victims per hospital (Spaarne, KG, RKZ, VU, UMCU, LUMC, AMC, Diaconessen): T1: 15 T2: 17 T3: 42	13:45 local time	OT report
OvD-G	Unknown	T1: 25 T2: Approx. 25 T3: to 'De Wildenhorst' T4: 9	14:00 local time	CoPI Sitrap
OvD-G	Unknown	Approx. 40 to hospital 35 to 'De Wildenhorst'	14:45 local time	CoPI Sitrap
HS-GHOR	Unknown	T3 victims taken to hospital from Wildenhorst	15:00 local time	OT report
OvD-G	Unknown	125 victims to hospital. Victims 'De Wildenhorst' to hospital too	16:00 local time	CoPI Sitrap
OvD-G	Unknown	Start of crew recovery	17:00 local time	CoPI Sitrap

Table 6: Overview of information on victims

141 HAC: head of the action centre

## ANNEX 10 C2000 COMMUNICATION SUMMARY

The two busiest hours were between 11:00 and 13:00 local time. The table below shows the most important properties of the communication during these busy hours.

	Period of time	
	11:00 - 12:00	12:00 - 13:00
Number of active call groups <sup>(1)</sup>	127	122
Total call time <sup>(2)</sup> <sup>(3)</sup>	10 hours 39 minutes	10 hours 3 minutes
Number of call requests <sup>(3)</sup>	2091	2085
Call time distribution:		
Ambulance services	16.1%	16.7%
Fire brigade	23.4%	24.0%
Royal Netherlands Marechaussee <sup>(3)</sup>	11.4%	14.5%
Police <sup>(4)</sup>	41.3%	37.3%
Other <sup>(5)</sup>	7.8%	7.5%
Call requests that ended in the queue (busy calls)	1080	1166
Call requests that ended in the queue (busy calls) excluding call requests regarding which a call channel was assigned within a second <sup>(4)</sup>	884	989
Average congestion time (seconds)	5	4
Maximum congestion time (seconds)	55	46
Total waiting time <sup>(2)</sup>	1 hour 3 minutes	1 hour 3 minutes
Distribution of the waiting time <sup>(6)</sup> :		
Ambulance care	27.1%	21.6%
Fire brigade	32.8%	31.8%
Royal Netherlands Constabulary	3.5%	7.2%
Police	30.4%	25.7%
Other	6.3%	13.8%

Table 7: C2000 use statistics through the Halfweg base station during the busiest 2 hours

- (1): Including the call groups in which a call request has been made but of which ultimately a call channel has not been assigned (has only been placed in the queue). This concerned two call groups for the 11.00 till 12.00 local time period and one call group for the 12.00 till 13.00 local time period.
- (2): The duration is based on data from the HistoricReport analysis tool (Motorola tool) as available at VtsPN.
- (3): Including 1 emergency call through C2000 that is given priority above all other communication.

- (4): Of all the emergency services providers the police took up most of the capacity during these time periods. The investigation has shown that the police has had most of the peripherals in use of which the C2000 communication was operated through the Halfweg mast (see table 11). The distribution of the quantity of peripherals for each discipline in table 11 matches in outline the distribution of the call time as specified in table 7. The relatively large number of police officers who used C2000 who were involved in the emergency assistance has significantly contributed towards the relatively high use of call time by the police when compared to the other disciplines in the opinion of the Dutch Safety Board.
- (5): Including individual calls using two-way radios through C2000 (what is commonly referred to as 'private calls'). This concerns 9 and 8 requests for the 11:00 till 12:00 and 12:00 till 13:00 time periods, respectively, where an individual call is realised or where the request has been placed in the C2000 system queue but has not led to a call.
- (6): It follows from the numbers that call groups from the Royal Netherlands Marechaussee and the Police have had a relatively short waiting time when compared to fire brigade and ambulance services calls (taking into account the overall call time per discipline). Analysis of the used call groups shows that specific important call groups of the police and Royal Netherlands Marechaussee have a priority of 3 and 5 in the queue while multiple important call groups have had a priority of 7 during the incident with regard to the fire brigade and ambulance services. From the above the Dutch Safety Board concluded that the priority setting with regard to call groups at the police and Royal Netherlands Marechaussee has contributed to the fact that these disciplines have had relatively lower waiting times. It, however, also remains true that the police and Royal Netherlands Marechaussee have experienced high levels of congestion. The personal experience will have influenced the fact whether the user has or has not been inconvenience by the C2000 congestion.

Note: The priority of the call groups only has an impact on the position in the queue when all call channels of the mast are in use.

Region	Period of time	
	11:00 - 12:00	12:00 - 13:00
Amsterdam-Amstelland	3.2%	2.0%
Brabant South East	0.0%	0.2%
Flevoland	0.9%	0.6%
Gelderland South	0.4%	-
Gooi en Vechtstreek	-	1.6%
Haaglanden	1.6%	3.1%
Hollands Midden	7.6%	11.7%
Kennemerland	63.4%	61.0%
National Ambulance Dispatch Center	-	0.1%
Noord-Holland North	20.0%	18.4%
Rotterdam-Rijnmond	1.8%	1.2%
Utrecht	1.1%	-

Table 8: C2000 use statistics through the Halfweg base station during the busiest two hours. Distribution of the call times for the ambulance services over the regions

Region	Period of time	
	11:00 - 12:00	12:00 - 13:00
Amsterdam-Amstelland <sup>(1)</sup>	18.8%	15.1%
Kennemerland	79.9%	75.3%
Noord-Holland North	-	5.4%
Zaanstreek Waterland	1.3%	4.2%

Table 9: C2000 use statistics through the Halfweg base station during the busiest two hours.  
Distribution of the call times for the fire brigade over the regions

- (1): The Kennemerland control room asked the Amsterdam-Amstelland control room to coordinate and supervise the deployment of the squad from Amsterdam-Amstelland by its own control room.

Region	Period of time	
	11:00 - 12:00	12:00 - 13:00
Amsterdam-Amstelland <sup>(1)</sup>	23.4%	19.3%
Supraregional	17.6%	29.4%
Flevoland	-	0.1%
Kennemerland	25.2%	19.4%
Dutch National Police Services (on a national level)	26.1%	17.0%
Noord-Holland North	5.5%	12.3%
Training	1.6%	-
Rotterdam-Rijnmond	0.5%	-
Zaanstreek Waterland	0,03%	2.5%

Table 10: C2000 use statistics through the Halfweg base station during the busiest two hours.  
Distribution of the call times for the police over the regions

- (1): The Halfweg C2000 mast was also used for the communication of the Amsterdam-Amstelland police officers who were not related to the aircraft accident. This mast also covers the Westelijk Havengebied (harbour) of Amsterdam-Amstelland.

Region	Period of time		
	11:00 - 12:00	12:00 - 13:00	
Number of used peripherals <sup>(1)</sup>	745	738	
Distribution per discipline	Ambulance services	23.6%	23.2%
	Fire brigade	21.3%	19.9%
	Royal Netherlands Marechaussee	13.6%	12.5%
	Police	34.9%	38.8%
	Other	6.6%	5.7%

Table 11: C2000 use statistics through the Halfweg base station during the busiest two hours.  
Number of used peripherals

- (1): This concerns all two-way radios, radio telephones and control room desks for which the user has used the speech key to talk or to place a call request.

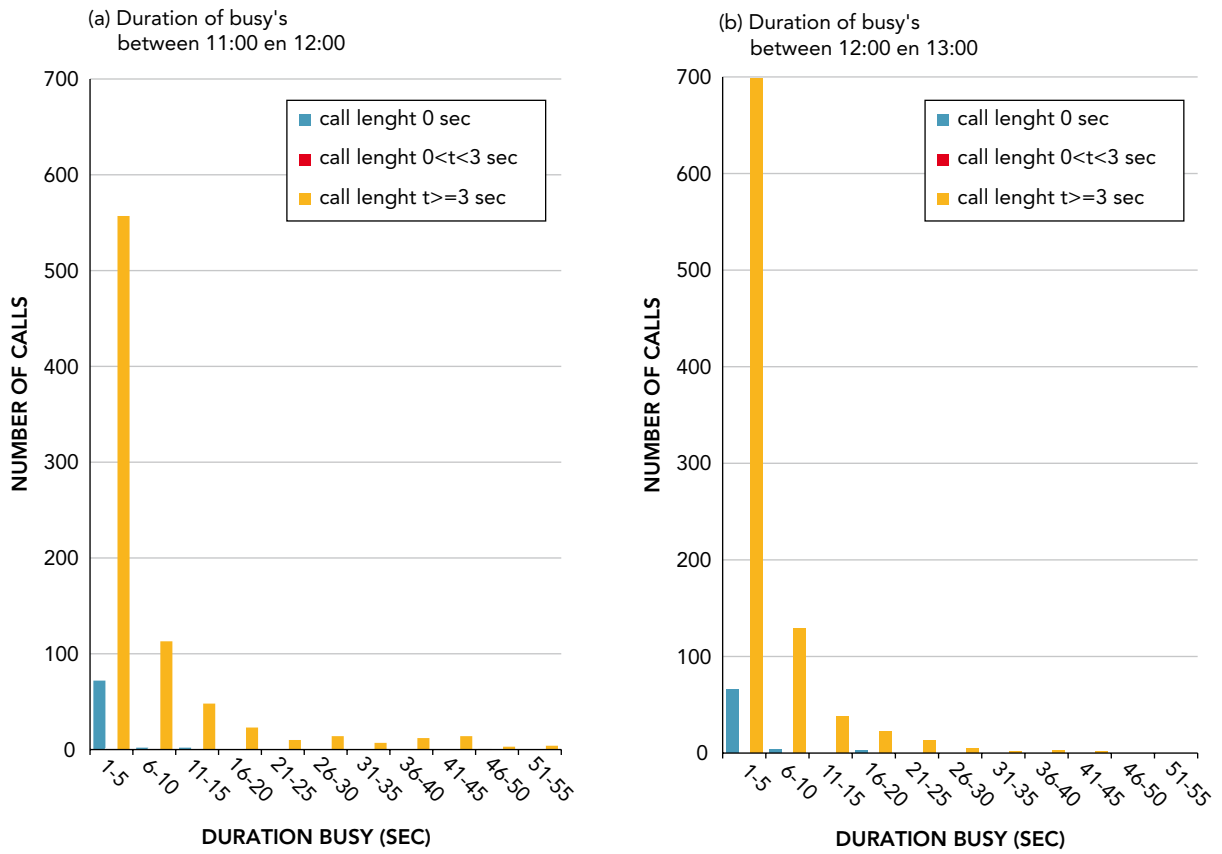


Figure 29: Distribution of 'busy' calls between 11:00 and 12:00 local time and between 12:00 and 13:00 local time (the category 0<t<3 seconds (red) has been left out due to the calibration of the Y-axis)

The Safety Board has checked how long the C2000 users regarding whom the request was not fulfilled within a second in which the request was made have had to wait for their call. See table 12.

The results are also shown in figure 29 (remark: not all points from table 12 are visible due to the scale of the vertical axis). This shows all call requests vertically that were not immediately taken ('busy'). Not only has a subdivision been implemented horizontally based on the waiting times that took place in seconds but also based on the duration of the call time that followed after the call having been busy. The following subdivision was used:

- A call duration of zero (0) seconds (blue), which means that the call request was interrupted by the caller;
- A call duration from zero to three (0-3) seconds (red), which means that the calls are dropped that have been interrupted by the C2000 system because the caller of a call has not used the opportunity to speak within the required two and a half seconds.
- A call duration that lasted longer than three (3) seconds (green) where it is assumed that the caller has used the released capacity to start a call.

Duration busy	Number of call requests					
	11:00 - 12:00			12:00 - 13:00		
	Call time after busy (in sec)			Call time after busy (in sec)		
	0	0<t<3	t>=3	0	0<t<3	t>=3
1-5	72	1	557	66	1	698
6-10	2	1	113	4	1	129
11-15	2	0	48	2	0	38
16-20	0	0	23	3	0	22
21-25	0	0	10	0	0	13
26-30	0	0	14	0	0	5
31-35	0	0	7	0	0	2
36-40	0	0	12	0	0	3
41-45	0	0	14	0	0	2
46-50	1	0	3	0	0	0
51-55	0	0	4	0	0	0

Table 12: Number of call requests in the queue during the busiest two hours subdivided based on duration of the busy and the call time after busy.

The figures in section 5 already showed that the demand for call channels was regularly greater than the available call channels between 11:00 and 12:00 local time and between 12:00 and 13:00 local time. 2091 calls were requested in total between 11:00 and 12:00 local time. 1207 calls could be made immediately. There were 884 calls put in a queue of this number. Figure 29a shows that 630 (71% of the total number of 'busy' calls) took place after a waiting time of no more than 5 seconds. 116 calls (13%) took place after a waiting time between 5 and no more than 10 seconds with regard to these 884 calls. The waiting time was longer with regard to 40 calls. The maximum waiting time that occurred was 55 seconds.

A total of 78 calls were interrupted by the caller before a call was actually connected between 11:00 and 12:00 local time. Of this number, 73 requests (the ones furthest to the left in the blue column in figure 29a) were interrupted by the caller within five seconds. Four interrupted the call within ten seconds and one caller interrupted the call after 50 seconds. The C2000 system did not break off any calls due to the two and a half seconds in which the caller must speak were exceeded.

The total number of call requests that was placed in the queue was greater than in the preceding hour between 12:00 and 13:00 local time (see figure 29b). The overall picture, however, is the same:

- The number of call requests that was broken off by the user (blue columns) remained limited;
- The largest part of the call requests that were placed in the queue could be processed within 5 seconds.

It has been shown by the investigation into the duration of the 'busy' calls between 11:00 and 13:00 local time that 92% of users regarding whom the call request was initially placed in the queue has used the option to speak after a call channel became available. In 8% of cases, the user did not wait for an available call channel and the call was broken off<sup>142</sup> or the caller did not make use of the option to speak.

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142 The Dutch Safety Board could not determine the exact reasons why these call requests were broken off. It is known that (nationally) a number of emergency services have 'old' two-way radios where the user has to press the button (PTT) to speak. If this button is released, the call request is broken off. A possible reason why a small part of the emergency services broke off the call requests is, therefore, that these emergency services had this 'old' equipment and the users did not press the button all of the time. In addition, it is possible that switching to another call group while being in the queue may have resulted in call requests being broken off.



De Nederlandse  
slachtofferregistratiekaart



## Algemene informatie

De Slachtofferregistratiekaart is een uniforme nationale kaart. Doel van de kaart is eenvormige triage en registratie. De kaart is ontwikkeld door een landelijke werkgroep op basis van bestaande internationale kaarten. Deze werkgroep heeft een inhoudelijke afstemming verzorgd met o.a. de Stichting Opleidingen Scholing Ambulancehulpverleners (SOSA). De Slachtofferregistratiekaart sluit zoveel mogelijk aan bij de landelijke ontwikkelingen, zoals de internationale MIMMS rampentriage, OCTOPUS (ambulance-onderstand en gewondenspreiding), IRIS (Rode Kruis registratie) en andere initiatieven. Door middel van de barcode met een uniek nummer is het mogelijk de kaart in geautomatiseerde systemen te gebruiken. De kaart kan worden gebruikt voor elk slachtoffer, dat betrokken is bij een grootschalig incident, gewond of niet gewond. Deze Nederlandse Slachtofferregistratiekaart is tot stand gekomen op initiatief van de Raad van RGF'en en wordt gefinancierd vanuit het programma Geneeskundig-Bestuurlijke Informatievoorziening van het Ministerie van Binnenlandse Zaken, dat tevens eigenaar is.

### Inhoud triage-etui

De kaarten zitten in een waterdicht etui. Het geopende etui kan aan de broekriem worden gedragen zonder dat de kaarten eruit vallen. Het etui bevat:

- 20 Slachtofferregistratiekaarten
- 5 primaire triage/telkaarten
- 1 kinderlint (t.b.v. triage van kinderen)
- 10 kaarten voor overleden slachtoffers
- lichtsticks rood en geel om in het donker getrieënde patiënten te kunnen lokaliseren
- potloden

### De Slachtofferregistratiekaart

Iedere Slachtofferregistratiekaart is verpakt in een plastic beschermhoes waar die gemakkelijk uit te halen is. De kaart is waterbestendig en kan met potlood, ballpoint of watervast viltstift worden beschreven. Zoals eerder vermeld bevat iedere kaart een nummer met barcode. Deze identificatiegegevens zijn op de verschillende vlakken van de kaart aangebracht en bevatten een uniek patiëntnummer en een extensie voor de triageklasse. Veranderingen in de triageklasse (bijvoorbeeld na stabilisatie) worden automatisch meegeregistreerd. Dit maakt een dynamische registratie mogelijk die door de hele hulpverleningsketen kan worden gebruikt en maakt dat patiënten snel terug te vinden zijn. *Het is van belang dat bij het*

*eerste patiëntencontact altijd een kaart met de juiste triageklasse wordt omgehangen, ook bij niet gewonde slachtoffers.* Dit voorkomt onnodige dubbele triage en schept direct helderheid in het rampterrein. Recente geschiedenis laat zien dat goede en complete registratie ten behoeve van onderzoek van groot belang is. Het barcodenummer wordt gebruikt in het geautomatiseerde systeem van ambulancebijstand en gewondenspreiding. Dit systeem sluit op zijn beurt weer aan op het IRIS-informatiesysteem van het internationale Rode Kruis. Ziekenhuizen kunnen de barcodes van de Slachtofferregistratiekaarten koppelen aan de ziekenhuisregistratie. Dit maakt het traceren van slachtoffers makkelijker. Verder kan het barcodenummer worden gebruikt om persoonlijke bezittingen van de (bewusteloze) patiënt te markeren. Ook kan het ziekenhuis door middel van het barcodenummer op een gemakkelijke manier bloed of urinemonsters van het juiste patiëntnummer voorzien.

### De primaire triage/telkaart

Triage is van belang om snel en efficiënt slachtoffers te kunnen indelen naar de ernst van het letsel. De primaire triage/telkaart heeft twee zijden: een primaire triagezijde en een telzijde. Deze kaart is met een touwtje aan het etui bevestigd zodat u hem niet kunt verliezen.

#### Primaire triagezijde

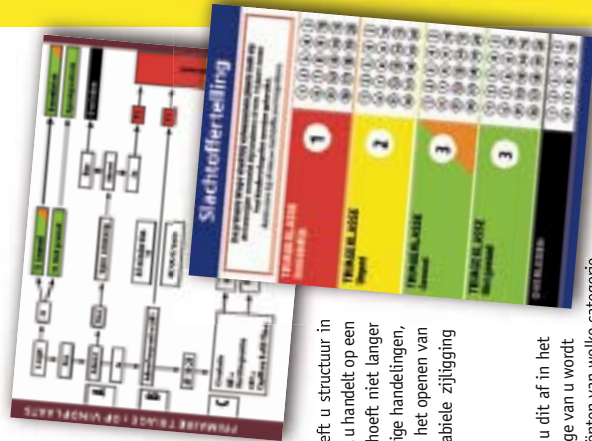
Hierop staat het stroomschema voor de primaire triage. Primaire triage vindt plaats bij het eerste patiëntcontact. Volg het stroomschema op de kaart. Dit geeft u structuur in extreme omstandigheden en zorgt ervoor dat u handelt op een veilige en optimale manier. Primaire triage hoeft niet langer dan 30 seconden per patiënt te duren. De enige handelingen, die u in deze fase buiten de triage doet, zijn het openen van de ademweg en de patiënt zo nodig in stabiele zijligging leggen.

#### De telkaartzijde

Zodra u een patiënt hebt getrieërd, streept u dit af in het juiste triagevak. Indien een situatierapportage van u wordt verlangd, kunt u direct aflezen hoeveel patiënten van welke categorie u hebt getrieërd.

### De triage

De kaart wordt gebruikt bij de primaire en secundaire triage. Het is van essentieel belang bij het eerste contact tussen slachtoffer en hulpverlener de kaart in de juiste triageklasse met het elastiek aan (bij voorkeur de linker)poos te bevestigen. In een oogopslag is te zien dat de patiënt getrieërd is. Dit spaart tijd als elke seconde telt.



Een slachtoffer wordt ingedeeld in de triageklassen:

- T1 (rood) ABC instabiel binnen 6 uur te hospitaliseren
- T2 (geel)
- T3 gewond (groen met oranje hoekje) gewond maar kan lopen
- T3 niet gewond
- T4 uitgesteld

### Aandachtspunten bij triage

**T3 gewond** - Dit is een 'gevaarlijke' patiëntenklasse; iedere ervaren hulpverlener weet dat er zwaar-gewonde slachtoffers zijn die in eerste instantie kunnen lopen. Denk hierbij bijvoorbeeld aan patiënten met een inhalatie- of stomp buiktrauma. Toch laten hulpverleners ze na de primaire triage naar veilig gebied lopen. Pas tijdens de secundaire triage in veilig gebied gaat de ervaring van de hulpverlener meertellen en kan de patiënt in een ander triageklasse worden ingedeeld.

**T4** - Deze klasse wordt gebruikt als het hulpverleningsaanbod voor langere tijd tekortschiet. Denk hierbij aan oorlogssituaties of hele grote rampen zoals aardbevingen en overstromingen. Dan kan de dienstdoende MMT-arts besluiten, in overleg met de Officier van Dienst-Geneeskundig/Commandant van Dienst-Geneeskundig, om triageklasse T4 in te stellen.

**Triageklasse overleden** - Tenslotte is er nog de triageklasse 'overleden'. Hoewel wettelijk niet iedereen een verklaring van overlijden mag afgeven, mag een hulpverlener met voldoende achtergrond wet de dood constateren en zodoende deze triageklasse instellen. Hiervoor is in het etui een aparte kaart aanwezig. Deze triageklasse kan ook in het geautomatiseerde systeem worden geregistreerd. Overledenen zijn echter een verantwoordelijkheid van Politie.

OVERLEDEN

### Door wie wordt de kaart gebruikt?

- De kaart dient te worden gebruikt door:
- ambulanceteams
  - mobiele medische teams (MMT)
  - sigmaleden van de geneeskundige combinatie (GNK-C)
  - personeel van spoedeisende eerste hulpafdelingen (SEH) van ziekenhuizen

### Gebruik kaart op de SEH

Bij plotseling grote toestroom van patiënten op spoedeisende eerste hulpafdelingen van ziekenhuizen kan de kaart ook uitkomst bieden. Voordelen zijn:

- aansluiting op de prehospitalaire zorg
- direct herkenbare triageklasse
- aansluiting van de barcode op de ziekenhuisregistratie
- snelle traceerbaarheid van alle bij de ramp betrokken slachtoffers

In de minder chaotische fase kan dan worden overgegaan op de normale ziekenhuisregistratie en wordt de kaart in het patiëntendossier opgenomen. In de toekomst worden ook HAP's (Huisartsenposten) ingeschakeld bij rampen. Nog niet geregistreerde slachtoffers, die naar de huisarts worden verwezen of die zich spontaan melden, kunnen dan alsnog worden geregistreerd.

### Waar is de kaart te vinden?

De kaarten zijn aanwezig in elke ambulance en geneeskundig hulpverleningsvoertuig en op elke eerste hulppost van de ziekenhuizen in Nederland.

### Wanneer de kaart te gebruiken?

De kaart wordt ingezet bij incidenten met meer dan drie slachtoffers. De kaart is een hulpmiddel bij het eerste patiëntcontact met een hulpverlener. Hang elk slachtoffer een kaart om de pols; ook de niet gewonde slachtoffers. Hiermee is duidelijk dat de patiënt reeds door een hulpverlener is gezien en triage is verricht.

### Hoe de kaart te gebruiken?

Bij patiënten die nog niet zijn voorzien van een kaart gaat u als volgt te werk:

- Neem de primaire triage/teelkaart die met een touwtje vast zit aan het etui.
- Volg met de vinger het verloop van het stroomschema en kies de juiste primaire triage.
- Neem een Slachtofferregistratiekaart uit het etui.
- Vouw de kaart op de juiste triageklasse. Het is niet mogelijk de kaart te vouwen zodat aan beide kanten triageklassen zichtbaar zijn.
- Hang de kaart om de pols van het slachtoffer. Bij voorkeur de linkerpol, dat werkt makkelijker in de ambulance.

### Gebruik Kinderlint

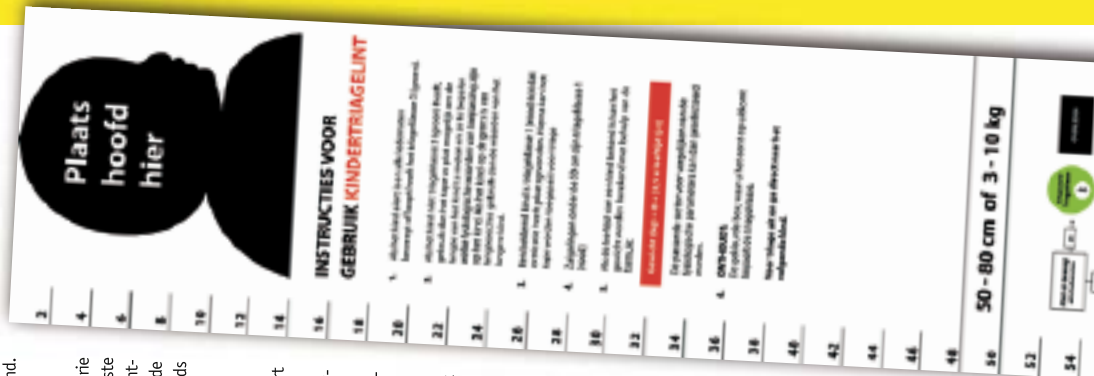
Wanneer het slachtoffer een kind is, dient u gebruik te maken van het kindertriangelint (zie afbeelding rechts). Het lint legt u langs het kind en u meet de lengte van het kind. Vervolgens handelt u zoals staat beschreven in het vak waar u met deze meting uitkomt.

### Beschrijving van de Slachtofferregistratiekaart

De kaart bestaat uit acht vlakken met een af-scheurstrook.

### Vlak 1 Triageklasse 3 kleur groen

Uit evaluaties bij rampen blijkt dat T3 de meest voorkomende (60%) triageklasse is. Vandaar dat de kaart standaard op T3 gevouwen is. Ieder



lopend slachtoffer is in eerste instantie een T3 slachtoffer. Bij lopende slachtoffers met klachten of met zichtbare verwondingen wordt het oranje rechter bovenhoekje van de kaart omgevouwen. De patiënt is dan geclassificeerd als 'Gewond T3'. Dit maakt duidelijk dat deze patiënt in ieder geval in de 'nevenketen' door een arts gezien moet worden. Het slachtoffer kan verwondingen hebben die in eerste instantie niet zichtbaar zijn. Van belang is dat de T3 patiëntengroep direct naar een veilig gebied wordt begeleidt om erger letsel te voorkomen.

Als het slachtoffer duidelijk aangeeft geen klachten te hebben (en dus het hoekje omvrouwen niet nodig is) dient de kaart als registratiemiddel. Het slachtoffer kan de kaart zelf invullen en vervolgens inleveren bij de hulpverlener. Dit bespaart de hulpverleners kostbare tijd, wat zeker van belang is wanneer er snel veel slachtoffers geholpen moeten worden. De kaart geeft aan dat deze persoon bij de ramp of het incident betrokken was. Dat werkt ook makkelijk voor hulpverleners die in een latere fase optreden zoals bij de psychosociale hulpverlening (PSH) en nazorg.

### Vlak 2 Behandeling

Bij het vlak 'behandeling' zijn tijdstip, plaats en triageklasse van belang om in te vullen. Schrijf in het vak behandeling alleen de letter van het symbool. Bijvoorbeeld de Z van zuurstof, dit scheidt tijd. Bij items als 'infuus' en 'medicatie' is het belangrijk de naam van het gebruikte middel te vermelden.

### Vlak 3 Triageklasse 2 kleur geel

Dit zijn patiënten die binnen 6 uur ziekenhuiszorg behoeven. Denk hierbij aan patiënten met bijvoorbeeld gebroken ledematen.

### Vlak 4 Patiëntgegevens

- Persoonlijke gegevens van de patiënt.
- AMPLÉ (Allergie, Medicatie, Past (voorgeschiedenis), Laatste maaltijd, Exposure (zie ATLS, PHTLS en TNCC)). Ook kan hier worden aangegeven of de patiënt al dan niet RNBC besmet is, en of er op het rampterrein ontsmetting heeft plaatsgevonden.

*ATLS - Advanced Trauma Life Support*

*PHTLS - Pre Hospital Trauma Life Support*

*TNCC - Trauma Nursing Care Course*

*Dit zijn op elkaar afgestemde hulpverleningsdoelstellingen voor traumapatiënten die gebaseerd zijn op ABC-methode.*

### Vlak 5 Patiëntonderzoek

Op dit vlak geeft u op de 'poppetjes' aan - met de letter van het letsel - waar het letsel zich op het lichaam van de patiënt bevindt. Bij 'ongevalmechanisme' dient men aan te geven wat het ongeval veroorzaakte, bijvoorbeeld een treinongeluk. Bij hoofddiagnose geeft u de belangrijkste verwonding aan. De hoofddiagnose dient als indicatie voor verdere behandelaars in het geval dat de patiënt nog wel aanspreekbaar is in het gewondennest, maar niet meer bij aankomst in het ziekenhuis.

### Vlak 6 Triageklasse 1 kleur rood

Triageklasse 1 rood wordt gebruikt bij A (airway), B (breathing) of C (circulation) ABC- instabile patiënten. Deze patiënten zijn levensbedreigend gewond. Het kan bij sommige ramptypen voorkomen, dat er zoveel slachtoffers zijn dat het hulpverleningspotentieel voor langere tijd tekort schiet. Door middel van het omvrouwen van het blauwe hoekje rechtsom, kunt u aangeven dat het om een T4 uitgestelde behandeling gaat. Dus een T1-patiënt met een blauw hoekje is een T4 uitgestelde behandeling.

### Vlak 7 Secundaire triagegegevens

Vlak 7 bevat de methode van de Trauma Revised Trauma Score (TRTS). De T4-patiënt heeft dan een TRTS-score kleiner dan 3. Het gebruik van de TRTS mag alleen door professionals gebeuren die ATLS, PHTLS en TNCC zijn opgeleid. De secundaire triage kan meerdere malen plaatsvinden, vanaf aankomst in het gewondennest tot aankomst in het ziekenhuis. Bij de secundaire triage spelen ook ervaring en de klinische blik van de professional een belangrijke rol.

### Vlak 8 Vervolg secundaire triagegegevens

#### Afscheurstrookje

*Afscheurstrookje ten behoeve van de Coördinator Gewonden Vervoer (CGV)*

**Elke ambulance die een patiënt vervoert van de plaats incident naar het ziekenhuis, moet voor het vertrek van het rampterrein voor registratie en ziekenhuiswijzing via de CGV.**

De CGV registreert met behulp van een barcodelezer en scheurt het strookje onder de stippellijn af bij het vertrek van de patiënt naar een ziekenhuis. De CGV noteert de naam van het ziekenhuis waarnaar hij de patiënt laat vervoeren. Dit strookje wordt door de CGV bewaard en dient als back-up bij uitval van het geautomatiseerde systeem.

#### Tips voor het gebruik

- Gebruik altijd handschoenen bij triage.
- Stop de kaart zodanig terug in de plastic hoes dat de goede triageklasse én de patiëntgegevens zichtbaar blijven.
- Bevestig de plastic hoes met daarin de kaart aan de patiënt, aan een bij voorkeur ongedeerde linkerpols of -been.
- Vul zo veel mogelijk patiëntgegevens in.
- Vul zo veel mogelijk gegevens betreffende het patiëntenonderzoek in.
- Gebruik voor het invullen van de kaart bij voorkeur het bijgeleverde potlood. Deze blijft ook onder extreem slechte condities schrijven.

#### Nabestellen

De Nederlandse Slachtofferregistratiekaart is gebaseerd op een idee van TSG Associates, SMART Equipment te Leeds in Engeland. De Nederlandse kaarten zijn (vanaf 1 december 2006) alléén na te bestellen bij de LFR (Landelijke Faciliteit Rampenbestrijding) via telefoonnummer 079 - 33 04 732 of via [www.lfr.nl](http://www.lfr.nl).

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## ANNEX 12 SUMMARY OF DEPLOYMENT SCENARIOS (FIRE BRIGADE AND GHOR) FOR AIRPORTS IN THE NETHERLANDS

As described in paragraph 5.6.4, the Safety board has surveyed the deployment scenarios of other Dutch airports. This annex provides a summary of the proposed deployment of the fire brigade and medical emergency services in the crisis response plans as drawn up for airports in the Netherlands, that is:

1. Schiphol Airport
2. Rotterdam Airport
3. Eindhoven Airport
4. Groningen Airport Eelde
5. Maastricht Aachen Airport

Reference is made to the list with abbreviations that has been appended to the end of this report for an explanation of the used abbreviations.

### 1. SCHIPHOL AIRPORT

Aircraft alerts can occur in different forms in accordance with the alarm regulations that applies to Schiphol Airport: ascending from VOS 1 to VOS 7. VOS stands for Vliegtuig Ongeval Schiphol (Schiphol Aircraft Accident) and the figure refers to the criticality of the alert (the GRIP situation specifies the minimum escalation of the emergency services).

The table below shows the decision matrix for determining the alarm with regard to an aircraft accident in the operational area of Schiphol Airport. This has been taken over from Schiphol Crisis Response Plan (CBP-S).<sup>143</sup>

Situation	If	Configuration	Number of passengers+ crew	Alarm type
Aircraft in the air + in mid-flight from or to a processing position	Pan-pan call	Not applicable.	Not applicable.	VOS 1
	Mayday call	Passengers	< 50	VOS 2 (GRIP 2)
			50-250	VOS 3 (GRIP 2)
			> 250	VOS 4 (GRIP 2)
		Cargo	Not applicable.	VOS 2 (GRIP 2)
	Crash	Passengers	< 50	VOS 5 (GRIP 3)
			50-250	VOS 6 (GRIP 3)
			> 250	VOS 7 (GRIP 3)
Cargo		Not applicable.	VOS 5 (GRIP 3)	
Aircraft on the ground at processing position	Minor accident (assistance from outside AAS not required)	All aircrafts	Not applicable.	VOS 1
	Major accident (assistance from outside AAS required)	Passengers	< 50	VOS 2 (GRIP 2)
			50-250	VOS 3 (GRIP 2)
			> 250	VOS 4 (GRIP 2)
Cargo	Not applicable.	VOS 2 (GRIP 2)		

Additional explanation:

- A 'Pan-pan call' is a warning from the pilot that something is wrong.
- A 'Mayday call' is a warning that there are serious problems.

143 Kennemerland emergency services Safety Agency, 5 December 2007



The following table specifies the request for assistance related to the different VOS alarms that have been provided in the plans.

Alarm type	Provided request for assistance		
	Airport fire brigade <sup>(1)</sup>	Regional fire brigade <sup>(2)</sup>	GHOR <sup>(3)</sup>
VOS 1	-	Fire engine on standby	2 ambulances OVD-G
VOS 2	2 VBB (Vliegtuig Brand Bestrijding; Aircraft Fire Response) groups and the AFO go to site. 1 VBB group sets up strategically.	1 Rescue Squad/emergency assistance VC-01	5 ambulances OVD-G
VOS 3	See VOS 2.	1 Rescue Squad/emergency assistance VC-01	10 ambulances 1 MMT 2 OVD-G vs. 1-6 Hospitals
VOS 4	See VOS 2.	1 Rescue Squad/emergency assistance VC-01	14 ambulances 1 GNK-C 1 MMT 2 OVD-G 1-6 Hospitals
VOS 5	2 VBB groups go to site and ensure the aircraft fuselage is fire-free and create a safe working area and a situation that can be survived by passengers and crew. 1 VBB group is strategically placed and is deployed when the AFO (Airport Fire Officer) deems this necessary.	1 Rescue Unit/emergency assistance VC-01	25 ambulances 1 GNK-C 1 MMT 2 OVD-G 7-13 Hospitals
VOS 6	See VOS 5.	1 Rescue Unit/emergency assistance VC-01	64 ambulances 5 GNK-C 5 MMT 4 OVD-G 7-13 Hospitals
VOS 7	See VOS 5.	1 Rescue Unit/emergency assistance VC-01	127 ambulances 10 GNK-C 10 MMT 7 OVD-G 13-22 Hospitals

- (1): Based on the Bedrijfshandboek Schiphol Airport (Schiphol Airport company manual) – Part 5: CPAAS (Schiphol Airport Crisis Plan) [version 6 – October 2008];
- (2): Based on the Convenant brandweezorg Schiphol (Schiphol fire brigade services agreement [Municipality of Haarlemmermeer, Schiphol Nederland B.V., 29 August 2005];
- (3): Based on the Schiphol Crisis Response Plan (CBP-S) [Kennemerland Emergency Services, 5 December 2007].

For aircraft accidents that occur outside the operating area of the Schiphol Crisis Response Plan, scenarios have been elaborated for crisis response by the Kennemerland Safety Region. The two tables below show the alerting proposal for each scenario in relation to an (initial) report and the operational deployment requirement that applies to the Kennemerland Safety Region as described in Kennemerland Aircraft Accident Crisis Response Plan.<sup>144</sup>

Aviation accident scenario (location and aircraft type <sup>(1)</sup> )	Alerting proposal with regard to the (initial) report	
	Fire brigade	GHOR
Rural Small aircraft	Fire-fighting squad Bulk foam unit (H)OVD-B ROGS (Regional Hazardous Substance Officer) (optional VBB AAS, AB)	2 ambulances, OVD-G
Rural Large aircraft	Fire-fighting unit Bulk foam unit (H)OVD-B ROGS (Regional Hazardous Substance Officer) (optional VBB AAS, AB)	8 ambulances, 1 GNK-C, OVD-G
Urban Small aircraft	Fire-fighting squad Bulk foam unit (H)OVD-B ROGS (Regional Hazardous Substance Officer) (optional VBB AAS, AB)	2 ambulances, OVD-G
Urban Large aircraft	Fire-fighting unit Bulk foam unit (H)OVD-B ROGS (Regional Hazardous Substance Officer) (optional VBB AAS, AB)	8 ambulances, 1 GNK-C, OVD-G
Industrial Small aircraft	Fire-fighting squad Bulk foam unit (H)OVD-B ROGS (Regional Hazardous Substance Officer) (optional VBB AAS, AB)	2 ambulances, OVD-G
Industrial Large aircraft	Fire-fighting unit Bulk foam unit (H)OVD-B ROGS (Regional Hazardous Substance Officer) (optional VBB AAS, AB)	8 ambulances, 1 GNK-C, OVD-G
North Sea Small aircraft	Possibly on standby	2 ambulances, 1 GNK-C, OVD-G
North Sea Large aircraft	Possibly on standby	8 ambulances, 1 GNK-C, OVD-G

(1): Additional explanation:

- A small aircraft is deemed to be an aircraft with 6 or fewer passengers.
- A large aircraft is deemed to be an aircraft with 7 or more passengers.

144 Kennemerland Safety Agency, Version 1.0; came into force on 1 January 2008



Aviation accident scenario (location type)	Operational deployment requirement		
	Regional fire brigade	Schiphol Airport fire brigade	GHOR
Rural (normative scenario)	1 unit 1 OGS (Hazardous Substance Officer) Squad, bulk foam support	2 crash tenders, Chief officer (optional)	31 ambulances, 1 GNK-C
Urban (worst case scenario)	3 units 1 OGS Squad, bulk foam support, 4 measuring teams;	2 crash tenders, Chief officer	171 ambulances, 5 GNK-C
Industrial	The Corus Crisis Response Plan came into effect at the accident at the Corus industrial estate Ambulances. When the accident is elsewhere, the 'urban' scenario is applied.		
North Sea <sup>(1)</sup>	1 squad		31 ambulances

(1): Proposed deployment of the Coastguard/Royal Dutch Lifeboat Institution + rescue brigades are not specified here.

## 2. ROTTERDAM AIRPORT<sup>145</sup>

Aircraft alerts can occur in different forms in accordance to the alarm regulations of Rotterdam Airport: ascending from VOR 1 to VOR 7. VOR stands for Vliegtuig Ongeval Rotterdam (Rotterdam Aircraft Accident) and the figure refers to the criticality of the alert.

The first deployment of the fire brigade and GHOR is specified for aircraft accidents in the crisis response plan drawn up for Rotterdam Airport; see the table below<sup>146</sup>. The crisis response plan only applies to a disaster/crisis within the operating area of the plan (airport and described area around the airport).

Alarm form	Applicable to	Initial fire brigade turn-out capacity	First GHOR deployment
VOR 1	Precautionary landings or minor incident	Possibly airport fire brigade The government is not deployed but informed	None
VOR 2	Emergency landing of an aircraft with 1 – 6 persons on-board	Airport fire brigade 2 TS 1 emergency assistance OD	2 ambulances 1 OVD-G 1 MMT (0 GNK-C)
VOR 3	Emergency landing of an aircraft with 7 – 54 persons on-board	Airport fire brigade 4 TS 1 emergency assistance 1 RV2 1 OD 1 HO 1 AG 1 AB/SW	14 ambulances 2 GNK-C (Schiedam/West and Barendrecht/East) 2 OVD-G 1 VC-GHOR/TC-VC 1 CGV 1 HAc 1 MMT 1 CvDG 1 HS-GHOR 1 HCPA

<sup>145</sup> Rotterdam Airport has officially been called 'Rotterdam The Hague Airport' since 10 February 2010.

<sup>146</sup> Rotterdam Airport Crisis Response Plan, Confidential draft, December 2006 version

Alarm form	Applicable to	Initial fire brigade turn-out capacity	First GHOR deployment
VOR 4	Emergency landing of an aircraft with > 54 persons on-board	Airport fire brigade 1 fire brigade unit 1 RV1 1 AG 1 AB/SW	50 ambulances 3 GNK-C (Schiedam/West, Barendrecht/East and Goedereede/ZHE) 2 OVD-G 1 VC-GHOR/TC-VC 1 HAc 1 CGV 1 MMT 1 CvDG 1 HS-GHOR 1 HCPA
VOR 5	<ul style="list-style-type: none"> <li>Crash of an aircraft with 1 – 6 persons on-board</li> <li>An accident involving an aircraft that is in mid-flight from or to a processing position with 1 – 6 persons on-board</li> <li>An accident involving an aircraft at a processing position with 1 – 6 persons on-board</li> </ul>	Airport fire brigade 2 TS 1 emergency assistance OD	2 ambulances 1 OVD-G 1 MMT (0 GNK-C)
VOR 6	<ul style="list-style-type: none"> <li>Crash involving an aircraft with 7–54 persons on-board</li> <li>An accident involving an aircraft in mid-flight from or to a processing position with 7–54 persons on-board</li> <li>An accident involving an aircraft at a processing position with 7–54 persons on-board</li> </ul>	Airport fire brigade 4 TS 1 emergency assistance 1 RV1 1 OD 1 HO 1 AG 1 AB/SW	14 ambulances 2 GNK-C (Schiedam/West and Barendrecht/East) 2 OVD-G 1 VC-GHOR/TC-VC 1 CGV 1 HAc 1 MMT 1 CvDG 1 HS-GHOR 1 HCPA
VOR 7	<ul style="list-style-type: none"> <li>Crash involving an aircraft with &gt;54 persons on-board</li> <li>An accident involving an aircraft in mid-flight from or to a processing position with &gt;54 persons on-board</li> <li>An accident involving an aircraft at a processing position with &gt;54 persons on-board</li> </ul>	Airport fire brigade 1 fire brigade unit 1 RV1 1 AG 1 AB/SW	50 ambulances 3 GNK-C (Schiedam/West, Barendrecht/East and Goedereede/ZHE) 2 OVD-G 1 VC-GHOR/TC-VC 1 HAc 1 CGV 1 MMT 1 CvDG 1 HS-GHOR 1 HCPA

The Regionaal Rotterdam-Rijnmond Crisis Plan 2010 - 2013<sup>147</sup> replaces the 20 municipal crisis plans of the municipalities from the Rotterdam-Rijnmond region. The crisis plan describes the full approach to all possible crisis situations in the region including a description of the agreed competences, tasks and responsibilities and the agreements about preconditions such as start-up and scaling-up, management and information provision. Specific scenarios for aircraft accidents have not been elaborated in the crisis plan. Should an aviation accident occur outside the operating area of the Rotterdam Airport Crisis Response Plan, standard deployment and scaling-up processes will be activated.

### 3. EINDHOVEN AIRPORT

Deployment proposals for aviation accident scenarios have been elaborated in the crisis response plan for Eindhoven Airport [Eindhoven Airbase Crisis Response Plan - Part C, October 2006 (incl. first change of 1 May 2007)]; see the table below. The plan applies for an indicated area at and near the airport as described in the plan.

Scenario	Description	Alerting the fire brigade	Deployment proposal GHOR
Standby call scenario 1	Expected aviation accident; minor accident (GRIP 0) Incident involving an aircraft with at most 6 persons on-board.	OVD	2 Ambulances 1 OVD-G
Standby call scenario 2	Expected aviation accident; moderate accident (GRIP 1): Incident involving an aircraft with 7 to 49 persons on-board.	Squad (rescue) SPB, RV, VC2 OVD RCVD ROGS (Regional Hazardous Substance Officer)	2 ambulances OVD-G
Standby call scenario 3	Expected aviation accident; major accident (GRIP 1): Incident involving an aircraft with 50 or more persons on-board.	Squad (rescue) SPB, RV, VC2 OVD RCVD ROGS (Regional Hazardous Substance Officer)	5 ambulances OVD-G CVD-G VC Ambulance Station CGV
Crash call scenario 1	Actual aviation accident; minor accident (GRIP 0): Incident involving an aircraft with at most 6 persons on-board.	OVD RCVD	MMT Ambulances during the first hour: 4 to 6 (due to the sitrep (situation report)) OVD-G
Crash call scenario 2	Actual aviation accident; moderate accident (GRIP 3): Incident involving an aircraft with 7 to 49 persons on-board.	Squad (rescue) SPB, RV, VC2 OVD RCVD ROGS (Regional Hazardous Substance Officer)	GNK-C MMT MUG team (from Belgium) Ambulances during the first hour: 4 – 20 due to the sitrep (situation report) Hook lift container material vehicle VC Ambulance Station CGV Reception site for casualties CGV

Scenario	Description	Alerting the fire brigade	Deployment proposal GHOR
Crash call scenario 3	Actual aviation accident; major accident (GRIP 3): Incident involving an aircraft with 50 or more persons on-board.	Unit (rescue) SPB, RV, VC2 OVD RCVD ROGS (Regionaal Officier Gevaarlijke Stoffen; Regional Hazardous Substance Officer)	The subscenario 'Number of people with heart failure' is the determining factor within this context (GNK-C, MMT, MUG team (from Belgium), First Hour Ambulances: 20, Ambulances after the first hour, Material vehicle, Hook lift container, VC, Ambulance Station CGV, Reception location for casualties CGV)

Municipal crisis plans in the surrounding area of the air base have been drawn up generically. Specific aviation accident scenarios, for example, have not been elaborated in the Crisis Plan for the Municipality of Eindhoven (plan for the approach to major incidents and disasters, Augustus 2009). Standard scaling-up in accordance to the GRIP structure is applied with regard to aircraft accidents outside the operating area of the Eindhoven Airbase Crisis Response Plan.

#### 4. GRONINGEN AIRPORT EELDE

Different predictable scenarios are described in the Groningen Airport Eelde Incident and Crisis Response Plan (IRP-GAE).<sup>148</sup> Operational data from the IRP-GAE have been taken over in the table below for the (possible) crash scenarios described herein.

Scenario	Description	Composition of the (airport) fire brigade	Medical service operability
1A	A (small) aircraft with a capacity of up to 6 persons on its way to the IRP operating area with a fault indication.	CT GAE 81-61 Possibly supplemented with: CT GAE 81-62, CT GAE 81-63	1 <sup>st</sup> hour 1 ambulance on site 1 OvD-G on standby 1 MMT on standby
1B	An actual or unavoidable crash of a (small) aircraft with a capacity of up to 6 persons in the IRP operating area.	CT GAE 81-61 TS Eelde 31-11 AS Eelde 31-31 Possibly supplemented with: CT GAE 81-62, CT GAE 81-63  OVD-B North OVD-B Central (CoPI Leader)	1 <sup>st</sup> hour 3 ambulances 3 ambulances on standby 1 MMT Groningen 1 OvD-G Drenthe
2A	A (medium-sized) aircraft with a capacity of 7 up to 55 persons on its way to the IRP operating area with a fault indication.	Squad 100 CT GAE 81-61 Possibly supplemented with: CT GAE 81-62, CT GAE 81-63  SB Groningen GR 760 SB Assen 21-61 TS Eelde 31-11 1 <sup>st</sup> CUGS AS Eelde 31-31 TS Vries 32-11  Support to CoPI VC 2 Assen 20-99 COH Assen 10H99 HA 982 Assen 20-41  OVD-B North/ PC 100, OVD-B Centre/ PC 200 and PC 900 Chief officer of the emergency services rendezvous point unit Unit chief officer Complement for the coordinating teams.	1 <sup>st</sup> hour 2 ambulances on site 10-15 ambulances released and on standby 1 OvDG CoPI 1 OvDG Terminal Team GNK arriving 1 C-OvDG on standby HSGHOR arriving to ROT

Scenario	Description	Composition of the (airport) fire brigade	Medical service operability
2B	An actual or unavoidable crash of a (medium-sized) aircraft with a capacity from 7 up to 55 persons in the IRP operating area.	<p>Squad 100 (for fire fighting)  CT GAE 81-61  Possibly supplemented with:  CT GAE 81-62, CT GAE 81-63</p> <p>SB Groningen 760  SB Assen 21-61  TS Eelde 31-11  1<sup>st</sup> CUGS  AS Eelde 31-31  TS Vries 32-11</p> <p>Support to CoRT  VC 2 Assen 20-99  COH Assen 10H99  HA 982 Assen 20-41</p> <p>Squad 200 (for emergency assistance)  TS Zuidlaren 33-11  TS Haren GR 535  TS Peize 35-11  HV2 Haren GR 575  HA Zuidlaren 20-42  HVH-B Zuidlaren 20-H72</p> <p>Squad 900 (for support)  TS Zuidlaren 66-11  DPA Zuidwolde 60A39  VW Havelte 60-89  HA Hoogeveen 61-42  SLH Hoogeveen 60H69  HVH-S Zuidwolde 60H79</p> <p>HA Hoogeveen 61-41  SIGMA RAV Beilen</p> <p>OVD-B North/ PC 100,  OVD-B Centre/ PC 200  and PC 900  Chief officer of the emergency services  rendezvous point unit  Unit chief officer  Complement for the coordinating teams.</p>	<p>1<sup>st</sup> hour  20 ambulances on site  1 MMT  3 OVDGs  1 C-OVDG  GNK Drenthe and GNK Groningen arriving</p> <p>2<sup>nd</sup> hour  10 additional ambulances  1-2 additional MMTs  2 GNKs (Drenthe and Groningen)</p>

Scenario	Description	Composition of the (airport) fire brigade	Medical service operability
3A	A (large) aircraft with a capacity of more than 55 persons on its way to the IRP operating area with a fault indication.	<p>Squad 100  CT GAE 81-61  CT GAE 81-62  Possibly supplemented with:  CT GAE 81-63</p> <p>SB Groningen GR 760  SB Assen 21-61  TS Eelde 31-11  1<sup>st</sup> CUGS  AS Eelde 31-31  TS Vries 32-11</p> <p>Support to CoPI  VC 2 Assen 20-99  COH Assen 10H99  HA 982 Assen 20-41</p> <p>OVD-B North/ PC 100,  OVD-B Centre/ PC 200, PC 300 and PC 900  Chief officer of the emergency services rendezvous point unit  Unit chief officer  Complement for the coordinating teams.</p>	<p>1<sup>st</sup> hour  2 ambulances on site  10-15 ambulances released and on standby*)  2 OVD-Gs  GNK Drenthe arriving  1 C-OVDG on standby*)  HSGHOR arriving ROT</p>

Scenario	Description	Composition of the (airport) fire brigade	Medical service operability
3B	An actual or unavoidable crash of a (large) aircraft with a capacity of more than 55 persons in the IRP operating area.	<p>Squad 100 (for fire fighting)  CT GAE 81-61  CT GAE 81-62  Possibly supplemented with:  CT GAE 81-63</p> <p>SB Groningen GR 760  SB Assen 21-61  TS Eelde 31-11  1<sup>st</sup> CUGS  AS Eelde 31-31  TS Vries 32-11</p> <p>Support to CoPI  VC 2 Assen 20-99  COH Assen 10H99  HA 982 Assen 20-41</p> <p>Squad 200 (for emergency assistance)  TS Zuidlaren 33-11  TS Haren GR 535  TS Peize 35-11  HV2 Haren GR 575  HA Zuidlaren 20-42  HVH-B Zuidlaren 20-H72</p> <p>Squad 300 (for general assistance)  TS Bedum GR 530  TS Ten Boer GR 520  TS Harkstede GR 529  TS Hoogezand GR 546  HA Hoogezand GR 587  HVH-B Hoogezand</p> <p>Squad 900 (for support)  TS Zuidlaren 66-11  DPA Zuidwolde 60A39  VW Havelte 60-89</p> <p>HA Hoogeveen 61-42  SLH Hoogeveen 60H69  HVH-S Zuidwolde 60H79  HA Hoogeveen 60-41  SIGMA RAV Beilen</p> <p>GAE emergency services rendezvous point head  Squad Head for squads 100, 200, 300 and 900  Unit Head</p> <p>Complement for the coordinating teams.</p>	<p>1st hour  25-35 ambulances on site  2-3 OvDGs  1 C-OvDG  1 MMT (helicopter)</p> <p>2<sup>nd</sup> hour  20-25 additional ambulances  3 GNKs  2 additional MMTs  2-3 additional OvDGs</p> <p>3rd hour  An additional 20 ambulances  1-2 additional GNKs  1-2 additional MMTs</p>



Scenario	Description	Composition of the (airport) fire brigade	Medical service operability
4	An aircraft related to GAE (coming from/on its way to the IRP operating area) crashes outside the IRP operating area.	Only the coordinating officers related to GRIP 1 will be alerted in the first instance when sounding the alarm linked to scenario 4. Next, it is determined in the CoPI which crisis response processes must be started and whether scaling-up is required.	

## 5. MAASTRICHT AACHEN AIRPORT

The predictable emergency services and response activities are elaborated for a specific scenario that is relevant for the airport in the crisis response plan for Maastricht Aachen Airport (RBP MAA).<sup>149</sup> The Guideline to aircraft accident response procedure at airport sites (Leidraad vliegtuigongevallenbestrijding op luchtvaartterreinen) of the Ministry of the Interior and Kingdom Relations of January 1998 was used as the basic principle for this crisis response plan.

A normative scenario formed the foundation for this. The ready and not ready emergency services prepare themselves for an aviation accident involving an aircraft with 300 persons. The following requirement for fire brigade deployment has been indicated within this context:

- Capacity requirement for fire fighting provided by the airport fire brigade: structural category 7, can be scaled up to category 9 (category refers to the Guideline for normative disaster).
- Capacity requirement for rescue, recovery and fire control:
  - With regard to a minor aircraft accident: 1 Fire engine;
  - With regard to a medium-sized aircraft accident: 1 unit;
  - With regard to a major aircraft accident: 1 unit.

The required medical capacity is indicated for each tailor-made scenario:

Tailor-made scenario	GNK-C	Ambulances	Ambulances used for transport
6 (150 passengers)	3	16	23
7 (250 passengers)	5	26	38
8 (300 passengers)	6	30	45

It is concluded in the RBP MAA that the capacity required for tailor-made scenario 6 will be supplied within an hour, the capacity for tailor-made scenario 7 will be supplied within 1.5 hours and the capacity for tailor-made scenario 8 can only be supplied after 1.5 hours.

For predictable scenarios, a smaller number of emergency services providers may be sufficient and a less extensive organisation is set up. A few derived scenarios have been determined for this purpose that have been called 'small, medium and large' for simplicity's sake:

- Small: aircrafts under a maximum takeoff weight  $\leq 6$  metric tons;
- Medium: aircrafts with a maximum takeoff weight  $> 6$  and  $\leq 22$  metric tons;
- Large: aircrafts with a maximum takeoff weight  $> 22$  metric tons.

It has also been determined that when an aircraft that is in trouble makes a request for assistance with regard to landing or takeoff, that a pre-alarm will be emitted that matches the same naming convention.

The deployment of emergency services is described in the crisis response plan for derived scenarios; see the table below.

<sup>149</sup> Intermunicipal RBP MAA Crisis Response Plan, Municipality of Beek – Municipality of Meerssen, 15 February 2007

Scenario	Description	Emergency services deployment
Pre-alarmed Small aircraft (GRIP 0)	Concerns an aircraft with a maximum takeoff weight $\leq$ 6 metric tons.	The airport fire brigade has capacity for fire fighting and rescue. Report to the RAC. RAC alerts 1 x TS + OvDb. CPA alerts 1 x ambulance (A-1-journey) and OvDg. UGS = gate 13. Royal Netherlands Military Marechaussee opens the gate. After a safe landing, further messages to the aforementioned services/officers.
Pre-alarmed Medium aircraft (GRIP 1)	Concerns an aircraft with a maximum takeoff weight $>$ 6 and $\leq$ 22 metric tons.	The airport fire brigade has sufficient personnel and equipment for fire fighting. Report to the RAC. Rescue by the authorities' fire brigade (squad + RV). CPA alerts 1 x ambulance (A-1 journey). Number of persons is the determining factor for GHOR scaling-up. UGS = gate 13. Royal Netherlands Military Marechaussee opens gate 13. RAC alerts GRIP 1. After safe landing, message to the previously informed services/officers. Message to the Mayor and Public Order and Safety Officer of Beek .
Pre-alarmed Large aircraft (GRIP 1)	Concerns an aircraft with a maximum takeoff weight $>$ 22 metric tons.	The airport fire brigade has sufficient personnel and equipment for fire fighting. Report to the RAC. Rescue by the authorities' fire brigade (squad + RV). CPA alerts 1 x ambulance (A-1 journey). Number of persons is the determining factor for GHOR scaling-up. UGS = gate 13. Royal Netherlands Military Marechaussee opens gate 13. RAC alerts GRIP 1. After safe landing, message to the previously informed services/officers. Message to the Mayor and Public Order and Safety Officers of Beek .
Minor aircraft accident (GRIP 0)	A accident involving an aircraft with a maximum takeoff weight $\leq$ 6 metric tons.	This accident will be processed as a 'minor aircraft accident' in accordance with the internal alarm role of the airport. Report to RAC listing the number of casualties. RAC alerts 1 x TS + OvDb and CPA. Number of casualties will determine the number of ambulances. Access through gate 13. Royal Netherlands Military Marechaussee opens gate 13.
Medium aircraft accident (GRIP 3)	Accident involving an aircraft with a maximum takeoff weight $>$ 6 and $\leq$ 22 metric tons.	The airport fire brigade has sufficient capacity for fire fighting. Rescue by authorities' fire brigade (unit + 2x RV). Number of casualties / persons is the determining factor for GHOR scaling-up. Report to the RAC. Access through gate 13. Royal Netherlands Military Marechaussee opens gates 3 and 13. RAC alerts GRIP 3. This is the Municipality of Beek as standard unless the accident occurred on the territory of Meerssen, then it will be the Municipality of Meerssen.

Scenario	Description	Emergency services deployment
Major aircraft accident (GRIP 3)	This is the normative scenario. Accident involving an aircraft with an initial weight > 22 metric tons.	<p>The airport fire brigade has sufficient capacity for fire fighting.</p> <p>Rescue by authorities' fire brigade (unit + 2x RV).</p> <p>Number of casualties / persons is the determining factor for GHOR scaling-up.</p> <p>Report to the RAC.</p> <p>Access through gate 13. Royal Netherlands Military Marechaussee opens gates 3 and 13.</p> <p>RAC alerts GRIP 3.</p> <p>This is the Municipality of Beek as standard unless the accident occurred on the territory of Meerssen, then it will be the Municipality of Meerssen.</p>

The operating area of this crisis response plan includes the airport site and the immediate environment. This is the area where the airport fire brigade can effectively act.

The RBP MAA specifies that aircraft accidents outside the operating area will be dealt with in accordance with the municipal crisis plans. Specific scenarios for aircraft accidents have not been elaborated in the crisis plans of the Municipality of Maastricht (Crisis Plan 2005 version 1.2; the ZL fire brigade has a version from 2007) and the Municipality of Beek (Crisis Plan version from September 2007).

Standard scaling-up is applied with regard to aircraft accidents outside the operating area of RBP MAA (deployment proposals for minor/medium/major accidents). Verbal agreements have been made with regard to support by crash tenders of the AWACS and MAA airport



## LIST OF ABBREVIATIONS

A	AAS	Amsterdam Airport Schiphol
	ABC	Airway, breathing, circulation
	AMBU	Ambulance
	AMC	Academic Medical Centre (Amsterdam)
	AOM	Airside operations manager
	AZN	Netherlands Ambulance Care (Ambulancezorg Nederland)
B	B&W	Mayor and aldermen (Burgemeester en wethouders)
	BT	Policy team (Beleidsteam)
	BZK	Ministry of the Interior and Kingdom Relations (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties)
C	CBP-S	Schiphol Crisis Response Plan (Crisisbestrijdingsplan Schiphol)
	CGV	Casualty transport coordinator (Coördinator Gewondenvervoer)
	CoPI	Command place of incident (Commando plaats incident)
	CPA	Ambulance transport central post (Centrale post ambulancevervoer)
	CRIB	Central registration & information bureau (Centraal registratie- en Inlichtingenbureau)
G	GBT	Municipal policy team (Gemeentelijk Beleidsteam)
	GGD	Municipal health service (Gemeentelijke gezondheidsdienst)
	GGZ	Mental healthcare organisation (Geestelijke gezondheidszorg)
	GHOR	Medical services at accidents and disasters (Geneeskundige hulpverlening bij ongevallen en rampen)
	GMS	Integrated Control Room System (Geïntegreerd Meldkamersysteem)
	GNK	Medical (Geneeskundig)
	GNK-C	Medical combination (Geneeskundige combinatie)
	GRIP	Coordinated regional incident response procedure (Gecoördineerde regionale incidentenbestrijdingsprocedure)
H	HGN	Head of triage station (Hoofd gewondennest)
	HS-GHOR	Head of section medical services at accidents and disasters (Hoofd sectie geneeskundige hulpverlening bij ongevallen en rampen)
I	ICAO	International Civil Aviation Organization
	IGZ	Healthcare Inspectorate (Inspectie voor de Gezondheidszorg)
	IOOV	Public Order and Safety Inspectorate (Inspectie Openbare Orde en Veiligheid)
K	KLPD	National Police Services Agency (Korps Landelijke Politie Diensten)
	KMar	Royal Netherlands Marechaussee (Koninklijke Marechaussee)
L	LKF	National fleet-mapping framework (Landelijk kader Fleetmapping)
	LMAZ	National Ambulance Dispatch Center (Landelijke Meldkamer Ambulancezorg)
	LTFO	National forensic investigation service (Landelijk Team Forensische Opsporing)
	LVNL	Air Traffic Control the Netherlands (Luchtverkeersleiding Nederland)
M	MBC	Medical treatment capacity (Medische behandelcapaciteit)
	MICK	Kennemerland Report, Information and Coordination Centre (Meld-, Informatie- en Coördinatiecentrum Kennemerland)
	MIMMS	Major Incident Medical Management and Support
	MKA	Ambulance dispatch centre (Meldkamer ambulancezorg)
	MKAA	Amsterdam ambulance dispatch center (Meldkamer ambulancezorg Amsterdam)
	MMT	Mobile medical team (Mobiël medisch team)
	MPC	Multidisciplinary process coordinator

N	NCC	National Crisis Centre (Nationaal Crisiscentrum)
	NIFV	Netherlands Institute for Physical Safety (Nederlands Instituut voor Fysieke Veiligheid)
	NRK	Netherlands Red Cross (Nederlandse Rode Kruis)
O	OM	Public Prosecution Service (Openbaar Ministerie)
	OOV	Public order and safety (Openbare orde en veiligheid)
	OT	Operational team (Operationeel team)
	OvD	Duty officer (Officier van dienst)
	OvD-B	Fire brigade officer on duty (Officier van dienst - brandweer)
	OvD-G	Medical officer on duty (Officier van dienst - geneeskundig)
	OvD-P	Police officer on duty (Officier van dienst - politie)
OVV	Dutch Safety Board (Onderzoeksraad voor Veiligheid)	
P	PTT	Push to talk
R	RAV	Regional ambulance organisation (Regionale ambulancevoorziening)
	RBT	Regional policy team (Regionaal beleidsteam)
	RCC	Regional crisis centre (Regionaal crisiscentrum)
	RCS	Schiphol Control Centre (Regiecentrum Schiphol)
	RGF	Regional medical officer (Regionaal geneeskundig functionaris)
	RIT	Disaster Identification Team (Rampen Identificatie Team)
S	SGBO	Large-scale and special acting staff (Staf grootschalig en bijzonder optreden)
	SIGMA	Quickly deployable group that provides medical assistance (Snel inzetbare groep ter medische assistentie)
T	T1, T2, T3	Triage priority classification 1, 2 and 3
U	UGS	Rendezvous point (Uitgangstelling)
	UTC	Universal Time Coordinated
V	VOS	Schiphol aircraft accident alarm code (Vliegtuigongeval Schiphol)
	VRK	Kennemerland Safety Region (Veiligheidsregio Kennemerland)
	VUMC	VU University Medical Centre (Vrije Universiteit Medisch Centrum, Amsterdam)
	VWS	Ministry of Health, Welfare and Sport (Ministerie van Volksgezondheid, Welzijn en Sport)
W	WRZO	Disasters and major accidents Act (Wet rampen en zware ongevallen)
	WVR	Safety regions Act (Wet veiligheidsregio's)
Z	ZiROP	Hospital crisis preparedness plan (Ziekenhuis rampenopvangplan)

