

07/13-2001 - Utrecht Netherlands – William T Brewer - FF PSD - Training

2001 - On July 13, the fire watch **WT Brewer** hit during a diving exercise in the Core Port in industrial Lage Weide Utrecht unconscious. He is in critical condition to the hospital brought, where he dies on 17 July

Diving Accident Key Haven – Netherlands

<https://translate.google.com/translate?hl=en&sl=nl&u=http://nationaalbrandweerdokumentatiecentrum.nl/rapporten/overige-rapporten/duikongeval-kernhaven/&prev=search>

Diving Accident Key Haven July 13, 2001 - Firefighters City of Utrecht

November 2001

1 Introduction

1.2 Research

1.1 General

On Friday, July 13th, 2001 took firemen William Brewer part in a diving exercise in the Core Port in the industrial area Lage Weide. It was an exercise in fast-flowing water of the cooling water outlet of the UNA-power station.

During the dive exercise was William difficulties. After several rescue attempts by colleagues, he was removed from the water and resuscitated them. CPR was taken by ambulance personnel. Accompanied by his post commandant, William was then transferred to an alarming situation at the Utrecht Medical Center, where he died on Tuesday, July 17th, 2001.

Some aspects make the accident noteworthy:

- * There was hiding in a place where it was practiced for years, albeit in highly pressurized (about one meter per second), but relatively shallow (between two and three meters) of water;
- * Diver, diving supervisor and the spare diver were trained according to national standards and found suitable for the task;
- * There was hiding with a commonly used diving equipment, which was in good condition;
- * Concerning the exercise was a standard practice that had never been a problem;
- * When he got into difficulties William did not make use of the various opportunities available to him to save himself;
- * There was ample potential (divers and support staff) on site for quick rescue;
- * Six rescue attempts were unsuccessful, William was removed from the water at the seventh attempt.

The diving accident also brought out the family and friends and especially the Utrecht fire department about a deep dejection. There was a great need for information on the circumstances and cause of the accident.

The commander gave an internal committee to conduct a thorough investigation with the aim to give a better overall picture of the events and draw lessons from this accident to prevent a recurrence. The

announcement concerning the investigation of which this report is the result, is included as Appendix 1. This appendix is shown, among other things, the composition of the committee.

1.2 Research

On August 1 this year, gave the committee an interim report after a brief for research. This report indicates that police and judicial authorities, the Labour Inspectorate and the Fire and Disaster, also assess the accident from their responsibilities. In addition, the interim report contained a preliminary and very broad description of the accident and some main points of the internal fire investigation.

Upon further investigation, the committee first investigated the circumstances of the accident and the way functioned stakeholders. Then the accident is placed in the organizational context of the Utrecht corps and, especially for the training aspects, in a rural context.

This broad approach was chosen:

- * The root causes of the accident and the failure of the rescue efforts on tresporen;
- * All stakeholders, both in the Utrecht police force as well as to provide policy makers and curriculum at national level, understanding how their actions have had influence on the accident;
- * As much as possible to draw lessons from the accident, both at individual level and at korps- and national level.
- * To investigate the commission utilized:
 - * Interviews with stakeholders;
 - * Various publications in the area of the fire brigade diving, including the material for the fire department diver and Guidance combat water accidents by fire, both published by the Dutch Institute for Fire Service and Disaster Management (NIBRA) in 2000;
 - * The Practice Guidance, Ministry of the Interior and Kingdom Relations, 2000
 - * The Working Decision 1999 Chapter 6 Section 5 Working under pressure Section 6.13 t / m 6:16, Occupational Health and Safety Regulations 1999 Chapter 6 Section 6.1 t / m 6.6 and the accompanying policies;
 - * Research in the context of the judicial investigation:
 - *** Royal Navy (machinery and equipment);
 - * The Royal Military Police (site of the accident / underwater obstacles);
 - * Police Region of Utrecht;
 - * Dutch Forensic Institute;
 - * Own investigation on the accident location.

A comprehensive overview of the research activities can be found in Annex 2.

In this final report after the introduction, the description of the accident (chapter two). This description is based largely on the account of those present at the accident. After the chapter devoted to the accident, following a critical review of the national teaching and learning material for the fire brigade diver (chapter three).

In chapter four the accident is placed in the context of the Utrecht fire service. In addition, all relevant parts of the preparation (training and exercises, materials and procedures, and data) as well as the organizational embedding and diving policy at issue.

Then be put into chapter five causes of fatal accidents in a row, is given to subjects in chapter six attention, although initially suspected, ultimately can not be regarded as one of the causes and describes the follow-up to chapter seven and to a certain extent considered critical.

Chapter eight lists the conclusions and recommendations that are derived directly from the accident.

In the course of the investigation identified a number of issues by the commission, although they have no direct relationship with the accident, still need improvement in its opinion. In chapter nine are listed related conclusions and recommendations, and the report concludes, inter alia, references to (partly) similar accidents that occurred elsewhere in Chapters 10 and 11. There is also the case for better

communication about such accidents and near-accidents by collecting reports nationwide in one place and make it available.

2. The Accident

2.1 The location of the accident

The accident occurred in the cooling water outlet of the power plant in the industrial area Lage Weide. This plant has recently owned by Reliant Energy Power Generation Benelux NV and better known as the UNA-center. The central cooling water discharges are that at the time of the accident had a temperature of 25.5 °C through a small channel (6 m wide, 50 m long and 2.5 m deep) in the Key Harbour which opens in the Amsterdam-Rhine Canal (see figure 1). In this slightly curved duct with a concrete bed, the water flows at a speed of one meter per second on average. When the canal exit is a threshold which the depth in the direction of the Nuclear Harbour suddenly decreases with circa 10 meters. A few meters upstream of this threshold drifts from shore to shore from a paired floats existing dirt removal, which prevents floating debris from the outflow channel floating in the harbor.

During the accident was blowing a southwest wind with a force of three Beaufort. In this wind force and direction of the surface of the cooling water outlet showing small waves (± 10 cm).



- * O - global positioning accident
- * D - site diving supervisor at dirt removal
- * L - Ladder / start exercise

Although there is no particular obstacles previously were found in the canal, it was everyone for the exercise clear that there may be clutter would lie on the bottom of the canal. However, it is not common prior to an exercise explores the soil for possible obstacles.

After the accident found, hired by the criminal investigation department, divers from the Royal Military Police, the following obstacles on the ground:

- * Large, unidentified concrete objects;
- * A large metal cable reel (diameter 2.25 m, height 1 m) (see Figure 2);
- * A metal pipe (diameter 7 cm, height 4 m) protruding obliquely upwards in the direction of flow, apparently because he was resting on other obstacles, and not because he was stuck in the (concrete) floor;
- * Close to the reel diving knife which was lost in the rescue attempts one of the divers.



Fig 2 The Reel

The diving supervisor and some of the other divers knew the location of traditionally as a dive site with a high flow rate and an elevated temperature. The elevated temperature made this location before, when there was still hiding with wet suit, though attractive especially in winter. Even then they swam across the bottom against the strong current to the beginning of the cooling water outlet and back.

The location was therefore known to many. Yet it can not be spoken about explored practice location. The diving supervisor who was also driving leader, was not aware of specific obstacles that can get stuck (with the command line) and the fact that the flow rate can change suddenly by ringing or shutdown of a cooling water pump. The latter is due to the absence of contact with the power plant. Change of flow rate, moreover, had no role in the accident.

Firefighters Utrecht uses the coolant outlet for years to practice occasionally with diving in fast-flowing water. Until the accident with William have, as far as the Committee is aware, not before diving critical situations or accidents occurred.

2.2 Description of the exercise / accident

In the Utrecht Corps divers are deployed operational only after they have gained in addition to obtaining the diploma fire diver, additional experience in a number of exercises. Va these necessary additional experiences concerning diving in water. Such exercises are held in both the Curve Rhine as the UNA-power plant. In this case, the UNA-location was chosen.

On the morning exercise William makes sure his personal diving equipment is (a dry- duikpak, fins, weight belt) in order. Then he took the diving equipment (diving bottle, demand valve and full face mask), which he needs for the exercise of the respiratory protection workshop, checks it and put the scuba gear ready for the afternoon workout. After lunch, from 12 to 13:30 307u you leave the divers and the diving supervisor at the practice location involved in the exercise.

Shortly before the exercise he puts on his diving gear and once again checks his equipment (visual and taste breathe). The duikploegleider ordering him to be from the ladder (see Figure 3) on the bottom and

along the quay wall to the outlet of the central swimming and after terugtochtsignaal (three stools after attentiesein) along the same path back to return.

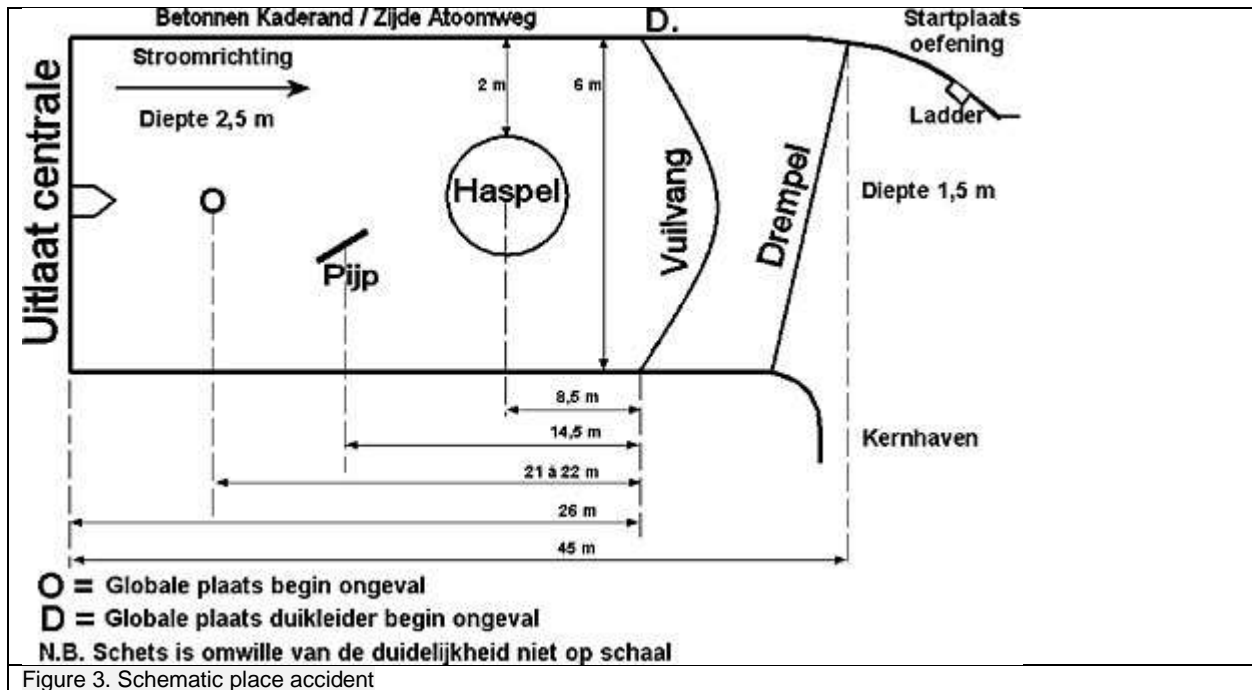


Figure 3. Schematic place accident

On the threshold that is present in the channel is not more than noted that there is a "difficulty" is in the approach route. In any case, one explanation that this exercise does not always advance attention was paid to the way in which had to be returned (with head in the direction of flow). It is not impossible that William was not informed in advance about this way of return.

The dive instructor itself acts as a signal (signal line) container.



Figure 4 General view site accident. The swirls at the surface are a clear indication of the location of the threshold.

After the command is going to William via the ladder, and water goes to the bottom in order to go to the grid along the concrete quay edge, whereby the central discharges the cooling water. On the way he comes (in that direction) sloping threshold against. He must against the strong current, the threshold for diving downwards. As he travels this route runs the diving supervisor, which holds the signal line, with him to the dirt removal. Once there, the diving supervisor does not go as the line now runs beneath the dirt removal. From the dirt collecting the diving supervisor celebrates the signal line according to the claims of William.

After initially remained along the shore, William does get to the center down for unknown reasons. Later he comes back at the quay edge and there along the bottom swimming he reached the grate. It is then almost 30 meter line and the diving supervisor feels in his own words, partly due to the strong current, little of the movements of the diver.

After the agreed signal (three stools) William returns. Remarkably, he follows the same route as on the way. So he departs back to the center off. After the start of the return sees the diving supervisor William suddenly in the middle come up. He suspects that there are problems and gives the reserve diver an attention signal. William goes straight again and rises again above. The diving supervisor see him at that moment pulling his mask from his face and disappear under water. He calls against William that he must withdraw his redvest.

The diving supervisor then jumps into the water with the aim of William's to blow redvest (pulling), thereby coming to the line of William with the corresponding ton up in the water. When William again (almost) comes to the surface, he grabs hold of him by his tank, but due to the strong currents are they both pulled under water. Also came to the rescue and only in diving suit (without diving equipment) inserted diver (diver A) sees no chance to pull William surfaced and / or withdraw his redvest and should release him. William then disappears under water. At this stage of the accident indicates the diving supervisor assignment to an ambulance. The line has been fished again.

Immediately after the rescue efforts, the diving supervisor already out of the water and put the spare diver. The rescue attempt is abandoned because the reserve diver due to a problem with his mask water gets inside. At that moment the emotions and there are more people who are going engaged in the effort.

At the next rescue attempt gets another diver (diver B), the command "cut him loose," adding that he William must hold and not to let go. This command is given both by the present commander and by the diving supervisor. Diver B can this afterwards, he attributes this to the hectic pace of the moment, not fully bevestigen. Duiker B goes along the signal line from William down and discovered that it passes through a construction which proves to be the reel. Apparently William d - r one of the openings of the reel swimming. Diver B intersects the signal line by William, for it turns on 2.1 m from the wrist. Then he tries his way to William through the part that is still associated with him continue. His colleagues ashore to see the other part of the line of William fall limp, infer that William found and respond by diver B without that so request, to put on his command line above water. Diver B must then release the line to William and comes up again.

Immediately after B diver emerges he undertakes a rescue attempt again. At the same time also the reserve diver to William searching. Diver B does not realize that the reserve diver is also under water. When they encounter each other thinks diver B he found William. He tries to pull the redvest of his colleagues. A struggle follows and eventually two divers come empty-handed above water.

At that time believe their colleagues on shore they see William exorcise the harbor and on this data, attention is also focused on the end of the canal and is at least one diver (the reserve diver) there. Having established that it is a false alarm (it turns out to be a ton and a glove) will be sought again to the original position. There will reserve diver William in the reel and brings him above water.

Once William no longer breathe on the side. The oxygen equipment should therefore not be used and his colleagues begin pending the alarmed ambulance with resuscitation.

The ambulance crew will find an excited team of firefighters. They take over the resuscitation, supported by the available fire brigade and later by the staff of the second ambulance. When William again showing some signs of life, he is accompanied by his post commandant, with an ambulance under police escort to

the University Medical Center Utrecht. Despite the parties concerned as characterized impressive efforts of the staff of both the ambulance, the police and the hospital, he dies there on Tuesday, July 17th, 2001.

2.3 Reconstruction

The committee has attempted to reconstruct the accident based on the available data. That is only partly successful. The interviews with the persons present, the data and observations at the accident location provided by Justice provide insufficient basis for a comprehensive reconstruction in the accident. The committee has therefore chosen to outline the most likely scenarios that are consistent with the available data. Where the following reconstruction is based on probabilities, this is mentioned.

After he went to William swims water according to instruction under water and along the quay in the direction of the outlet. After he crossed the threshold, he does not clarified reasons for his race to the middle. The diving supervisor sees this as a flaw in the implementation of the exercise. He sends not and will discuss this with them for William.

At about two meters from the wharf William takes the reel. He did not dodge him but he apparently experienced as an obstacle that must be overcome. He crawls through one of the openings and continues on his way, which he again chooses a route close to the quay. At that time, the signal line runs from the diving supervisor, via the opening in the reel to William. Ashore manifests that the fact that the line has the diving supervisor in hand, no longer in line with the rate of William (see the call path).

If William has arrived at the outlet he gets to return the signal (three stools). This sign means that the diver 180° must go short with his head in the opposite direction to go swimming. The diver in favor and oactue r William knew carried out the exercise (merely) of colleagues, you cannot do that because the power will get too much control over you and has his head against the current lower back.

It will never be clear what William at this point and then did. There are several possibilities. The committee has chosen to paint two likely scenarios. Both are based on two firm conclusions:

- * William has upstream of the reel, for some time with its signal line stuck on an obstacle on the ground;
- * After he last came over the line, either by pulling from the shore, it loose.

The committee leading these conclusions on the fact that William in the fast-flowing water, three times in much the same place, upstream of the reel, has come to the surface. Had he not detained at that time he had drifted at least ten meters in this period, which is not consistent with the observations of those involved.

The conclusion that the line came loose again is derived from the following data.

- * William finally came, downstream from where he came to the surface, into the reel.
- * When the rescue was the signal line, which was then tightly, cut in the vicinity of the reel.

* The piece signal line which was still connected to William apparent in subsequent measurements to be 2,1 m long (measured from the wrist), it is slightly shorter than the diameter of the reel.

These data cannot be reconciled with the previous data which was stuck to the line upstream of the reel at the bottom, and that upstream of the reel William also came to the surface. The line is so obviously at some point come loose again.

In observance of the above, the Committee to the following two scenarios:

William has as its predecessor quietly lower back. He was, by his line ran through the reel, again obliged to deviate towards the center. During this retreat is its fixed line hit the bottom. He noticed this because he could not go back at some point and, moreover, was pushed underwater by the current. He has tried to solve this by themselves to work with a lot of force to the surface. When he came up for the second time he tore off his mask. The factors that may have played a role are: water in the mask are completely out of breath (breath crisis) and / or panic. When he was then pushed back under by the current, he did not have enough strength and more air to come up again.

William has, conversely accordance with the data signal and in this maneuver had the power as much grip on him uncontrollably back flush. Its signal line thereby scraped along the bottom and got caught. William is in this scenario with a jerk to a halt and it is not unlikely that taking his mask full of water has passed through hard contact with the soil. As in the previous scenario he fights himself up and pulls his mask off because it is full of water, he is in a crisis of breath and / or panic.

In the final phase of the accident touches the line loose from the soil, and is, perhaps by the flow, back through the reel. It is certain that the line after it is exhausted is tightened at some point. Eventually William is located in the reel with line taut to colleagues on the side.

The committee could find little hard data to put all events in time in a row. There are recorded only two times. At 14:53 pm the request comes in at the control room to urgently send an ambulance. At that time, already one William two minutes in difficulty.

At 15:04 pm reporting the first ambulance is on site. William is already one two minutes above the water and resuscitated.

Application of these times, the committee concludes that William, after he deducted his mask, has been under water for about 10 minutes.

It is noteworthy that William himself to overcome his efforts have not made use of the emergency measures at his disposal. He has not used his diving knife to cut himself loose, he has his weight belt not shed nor he has used his redvest and / or inflator.

When not using his redvest applies a gloss. The study showed that the string with which the redvest can be activated, such a small size that find it difficult and (with gloves) is also difficult to operate. It is therefore not impossible that William does have attempted to use his redvest, but he did not succeed.

The committee has not been able to figure out which William's command line is snagged.

Certainly it was not the reel as William trapped upstream of the reel.

In view of the fact that the bottom of the channel is of concrete, it is unlikely that the observed iron pipe was firmly anchored in the soil. As a result, it is also unlikely that the signal line behind this pipe is snagging. Encountered by the State Police "large concrete objects" appear to be the most suitable. Certainly we will never know this

3. The national teaching and learning material for the fire department diver

After the commission got the impression that some of the security issues essential not sufficiently included in the national teaching and learning material for the fire diver, they examined the following diving area authoritative texts:

- * The teaching and learning material for the fire department diver, Dutch Institute for Fire Service and Disaster Management, 3rd edition July 2000;
- * The teaching and curriculum instructor Fire Loon, Dutch Institute for Fire Service and Disaster Management, 4th Edition January 2001;
- * Guide the Fight Water Accidents by Fire, Dutch Institute for Fire Service and Disaster Management, 1st edition 2000;
- * Directive Firefighters Diving, Ministry of Interior, 1994;
- * The course book Scuba diving, Dutch Onderwatersportbond, Utrecht 1998;

The findings are shown in the following paragraphs.

3.1 Both the 'Guidance' and the teaching and curriculum still mainly geared to 'wet' diving

The fire started diving at the time that the wet suit, mask and breathing machine were the norm with bite block. The teaching and learning material is still largely geared to diving with this material, while being given relatively little attention to it much later in the fire service introduced dry suit and full face mask.

In the inland area (pool) of the program participants will learn skills that are essential for safety (with the traditional material), but they are not focused on diving with a dry suit and full face mask. These include:

- * Clearing (clearing) of the glasses;
- * The withdrawal from the mouth under water and reinsert the breathing machine;
- * Underwater discharge and again hung;
- * Buddy breathing (use of two or more people a breathing machine).

Similar topics not return to the open water portion of the training is often performed in the dry suit, with or without full face mask. Partly understand this because the full face mask does not loose machine. However, the clearing of the goggles or full-face mask does not come. This means that unless instructors here on their own initiative to pay attention to, graduate fire department divers blowing out the full face mask, which in practice will plunge many of them have not learned.

3.2 Insufficient attention to emergency measures by diver

A second gap that discovered the commission in class and subject matter concerns the emergency

measures. This topic is approached from the perspective of those who stand on shore, the diving supervisor and the spare diver. No attention is paid to the measures that a diver who has a problem underwater themselves could take to the failure of equipment, the tightness of the command line or equipment, etc. The result is that the skills associated with self-rescue / noodopstijging not be taught by definition.

The skills referred to here are:

- * The use of the diving knife for cutting a jammed signal line;
- * Shedding the weight belt and, if necessary, the equipment;
- * Inflation (pulling) of the redvest;
- * The use of the inflator to rise.

The use of the redvest and weight belt for this purpose is discouraged by the dangers of this method of taking off heavy to turn and not to weigh against the only alternative that is sometimes available, drown.

The recreational diver training for such skills be accommodated.

3.3 Insufficient attention to emergency procedures

It is the committee noticed that the procedures in the teaching and learning material contain little evidence of the reserve diver and diving supervisor regarding an ailing diver.

More and better evidence are necessary. Also could be given to continue the collaboration between a diving team and the occupation of the accompanying water tender.

3.4 Imbalance

After going through the teaching and curriculum committee had moreover the impression that relatively much attention to all aspects of diving which, given the limited depth at which 95% of the fire brigade diving takes place, occur relatively low while there is much less attention is allerlei'gewone 'safety and procedures

Moreover, the teaching and curriculum appears to be highly focused on executing the previously known test command, which we missed safety issues not dealt with.

These findings lead to the conclusion that there is a certain imbalance in the teaching and learning material that can cause is not given attention in training for fire department diver to the important safety aspects mentioned by us.

4. The diving at fire Utrecht

4.1 General

Firefighters Utrecht has 24 hour a ready diving team to pull out of the water crashes car into incidents in the wetland catchment area In this area there are several ponds, canals in the inner city, the Amsterdam-Rhine Canal, the River Vecht and other waters. Also committed to strong running water, such as the Curve Rhine, and in the case of assistance in Lek, are among the possibilities.

The diving team is housed at the fire station Utrecht South and consists of two divers and a diving supervisor. The diving team is working on an accident location usually in tandem with the occupation of other firefighting vehicles such as a fire engine, a ladder or a rescue vehicle with crane and boat. In total, the fire department has a thirty firefighters who are deployed as a diver or diving supervisor.

4.2 The selection

In recent years, all the staff is adopted by firefighters Utrecht for the repressive service, eligible to be trained and deployed as a diver. The basic selection for fire watch has been considered in an assessment of the applicant is in principle suitable for diving. Additionally create both a medical and a dive dive psychological tests form part of the selection process for fire watch.

The following selection threshold for culvert consists of training and examination for fire service diver. During this process may show that a staff member, despite earlier approval, however, is less suitable for diving work. This conclusion can be drawn by both the service management as well as by the person himself. After a reinspection can swim free of labor are obtained.

It should be noted that there are clearly some personal courage needed to confess in front of the diving colleagues that you consider yourself suitable for this work. From the fact that such processes are not an exception, the last few years, however, it appears that the threshold is not prohibitively high.

4.3 Training and exercise

Utrecht divers, dive team leaders and instructors are trained and tested according to national fire standards. The training of fire department diver includes: 24 hours theory, 24 hours of practice inland (in a pool) and 24 hours of practice open water. The course which William Brewer participated was composed in the spring of 2001: 28 hours of theory, 28 hours of practice inland and 40 hours of practice open water. These extra hours were used to transfer the standard curriculum (the module fire department diver) better students. Content Utrecht course followed the national pattern.

William graduated with good results for his diving exam and thus possessed just like any other in the accident contained divers have the requisite qualifications.

In the Utrecht corps are the requirements for operational diver higher than just having the country, diploma awarded by the Dutch Centre for Fire Service Examinations. Before one becomes operational diver must first still to be gained some additional experience. One of these experiences is diving into water. This addition to the diving program is offered at the discretion of the instructors of the teams. The program is not recorded in writing, or find some verbal coordination place in the concert of the dive instructors.

The 'practice Guideline "of the Ministry of the Interior and Kingdom Relations is not yet implemented in the fire Utrecht. Practicing for the diving takes place in a traditional place. The diving team which then is ready, practice on Friday under the guidance of an instructor. The exercise program is not documented and coordination is also based here on oral consultations.

4.4 Risk Assessment

The Working require the employer that the risks are identified and evaluated at work. This is connected with fire diving for risks not specified in the Working Conditions Decree 01-07-1997, nor in the policy 6:15 Diving work of 25-10-1999. It is to give the employer fulfill the above requirement. It in the fire service normally used for this model, the IASB model, nor provides detailed specifications for the risk assessment and evaluation regarding diving operations.

The Guidelines combat water accidents by fire 'indicates that the risk assessment should be defined scenarios for possible water accidents. Thereby highlighting special situations at bridges, narrow roads along the water, locks, barriers, strong currents, tides, greater depths, high embankments and contaminated water. In addition, specific risks mentioned for the fire department diver such as primary and secondary dive diseases, infections, injuries and overvaringen. Nowhere is indicated in the Guideline how those scenarios might look out.

It is striking that the next, the fire department diver very serious events,

not mentioned: getting stuck under water (with the command line) are unwell, underwater equipment failure, hit gedesori'nteerd be afraid, panic. In the treatment of the line signals and the emergency procedure is also not paid attention to these aspects.

In the year 2000 by Arbo Ned, commissioned by fire Utrecht made a general risk inventory and evaluation. This does not provide specific information about the diving.

The dive instructors have taken the initiative in the past to the various places where diving is or could be, including bringing any details (hazards) chart. The dive site in the core Haven was already mapped. To date, such health and safety initiatives are coordinated anywhere in the organization.

4.5 Procedures

The diving is embedded in a rather diffuse manner in the Corps. The committee has noted that this fire at Utrecht in the field of diving many issues are implicitly covered and rely on verbal or barely minuted meetings between the instructors. This could hardly be considered whether the preparation goes on fighting water accidents in an optimal manner. It is certain that the way in which potential incidents should be dealt with is described formally (there is no instruction).

Under the Working serve there for various processes, including diving, but be prepared work instructions.

In the Guidelines combat water accidents' is specifically serving the dive included a model for such instruction. Firefighters Utrecht, however, the existing procedures to date not been processed in a complete instruction. Has been found that, probably due to the lack of such a structural approach, the existing procedures not cover all aspects of diving.

Incidentally, a personal dive logbook (model NIBRA) each diver has a general instruction which is included and the water vehicle accidents is a reference book containing details of dive sites and data that are important in emergencies. Both books, however, in the opinion of the Committee for adaptation and improvement susceptible.

It is usual in cases where there are no specific procedures laid down for its own police force, the suggested procedures are used in teaching and curriculum. When the lesson and curriculum offers no solace, like the case of the emergency procedures and cooperative input / division of responsibilities between a leader of a diving teams, the commander of a fire engine, traded at their discretion.

Lack of appropriate mechanisms for the latter two subjects showed a clear handicap in this accident.

The committee also considers that the procedures laid down in writing no guarantee of security, but they provide direction and structure to the dive processes and thereby reducing the risk of accidents. The need for a complete and proper instruction can not be stressed sufficiently clear.

4.6 The diving equipment

4.6.1 Composition of the diving equipment

Utrecht divers have a kit that meets the Guidelines combat water accidents' and consisting of the following components: dry suit, weight belt, diving gear, full face mask, redvest, diving knife, flippers, cap and gloves. The suit and weight belt belonging to the personal equipment. A single diver still has a personal diving mask of the 'dirty water' type.

The diving equipment is of good quality and recently purchased a large extent. Equipment and meet the breathing air with the applicable standards.

The diving unit where William popped up was six months old and still with it, since the first service takes place only after half a year, still not serviced after purchase. Research by the Royal Navy diving equipment which gave William used during the accident showed the following results:

- * Breathing machine functioned properly (maximum air flow 1600liter per minute);
- * The cylinder still contained plenty of air (160 bar)
- * The air in the bottle was of good quality.

With a total test by the Navy proved the equipment to operate without problems, although the full face mask on a test depth of 21 meters, in certain positions (lying on the back and head down) water to leak inside. Thereby, in the fact that head shaking did not affect, concluded that the harness 'was good'.



Figure 5 A diver in Utrecht operational equipment

The full face mask generally

In the interviews with those involved in the accident was the full face mask as a potentially problematic part of the equipment forward Therefore, we consider here this piece of equipment in some detail.

The mask is relatively short at the fire department in use. Traditionally ducked the fire with a single mask and a demand valve with bite block. When clearly was how dirty were some water and especially to work the sludge at the bottom, there was pressure to hygi'nischer. The full-face masks available in the market for it seemed to offer a good solution.

Then in the first half of the nineties, the Labour published a draft decision which Plunge full face masks were imposed in heavily contaminated sludge (class 1) went firefighters Utrecht, as well as many other

forces fully on this mask on. It is not known if there have been concerns at the time to draw the consequences for our education, training or further equipment. For example, in the last one can think of a second demand valve fitted with bite block. Buddy-breathing (with a colleague in need) is possible again.

The Commission has doubts (afterwards) if the security was served with entering without further modifications of the full face mask.

On the (draft) Decision Diving has never entered into force. In the current situation is no obligation to use a full face mask with highly contaminated sludge. However, the general occupational health and safety requirement to optimize safety apply.

The full face mask used in Utrecht

The full face mask used at present in Utrecht after extensive comparative testing, purchased on the advice of both the divers and dive instructors. Even then it was clear that not everyone respirator fit well. Depending on the shape and size of the head, could cause leakage. This drawback would, however, according to the supplier, also disappear as soon as a larger and a smaller size would be put on the market. The latter has never happened and also other action to resolve the problem was omitted. The result was that older, non CE-certified 'wastewater-face pieces "that better fit some divers remained in circulation. The reserve diver in the accident used such a skirt.

The signal line

In the Guidelines combat water accidents' is probably because a floating line has less chance of hooking on the bottom, recommended a floating command line. The Committee observed in experiments on the accident spot that the usual Utrecht command line as quickly disappeared under water in the fast flowing water. A specially purchased floating line appeared to have more buoyancy and is clearly better behaved. Incidentally, it turned out to drive the traditional Utrecht line in stagnant water.

The commission, the reasoning that the signal line is always taut and therefore irrelevant does not endorse the buoyancy. There may be, just missing out if things, circumstances arise that the line is slack and then sinks or floats. The probability of hooks at the surface is smaller and certainly less threatening than on the bottom.

4.6.2 Maintenance

Major maintenance of the equipment is largely privately run and generally in a good way. The people working in the respiratory protection workshop, trained and certified and have the necessary tools. In addition, they are trying to maintain (not described) maintenance policy.

In practice, the respiratory protection workshop, perhaps partly due to the organizational set-up which does not guarantee 100% -bezetting, accessible to non-certified persons. The result is that there is no officially modified facemasks in circulation (can).

It is the committee found that handwritten changes are not so much the result of the desire of people to act outside the system, but rather the fact that problems encountered in the workplace (eg. Leaking full face masks), the lack of good communication structures and insufficient management attention, appear to be hardly soluble.

The small maintenance of the equipment carried by the divers themselves. In practice, this means that the diver cleans the stuff itself used and put back into the magazine. Only if there are problems with the equipment are identified, it will be offered to the respiratory protection workshop by the diver for major maintenance.

The maintenance system thus offers the possibility that not properly cleaned and possibly malfunctioning equipment back to be placed in the operational stock. This is no control.

4.7 Policy and management diving task

The diving is embedded in a complex way in the organization. There are many people involved and the allocation of responsibilities is not always clear. In practice, a lot of business with regard to diving in the often informal consultations between the dive instructors and dive coordinator (no function described) to be adjusted.

In particular the training, practice, preparation of procedures and tracking of risk data is not clearly and unambiguously assigned to the organization. This makes these tasks, which, in particular working closely with the dive instructors and dive coordinator, approached little policy, insufficiently supported and not monitored for quality.

4.8 Enhancements

It has been found that there are some shortcomings to ask for improvement in fire Utrecht at operational level. Some shortcomings are partly due to the current composition of the teaching and learning material, or the examination regulations. Others, however, are (also) caused by the aforementioned organizational ambiguities concerning the dive task and thereby lack of a clear and defined policy that covers all aspects of the dive task.

In summary, it relates to the following matters:

* A number of divers has never practiced blowing out a full water run full face piece. Others who have recognized this problem for themselves, have this skill learned on their own initiative.

- * It is possible that a certified diver only at a practice session for the first time in open draws his redvest. A clear evidence of a more or less reflexively use the redvest can be no question.
- * The use of other resources that can be instructed neither practiced helpful in a self-rescue / noodopstijging. For example, some divers have their knife never actually used underwater / tested.
- * Exercises where emergencies are simulated underwater (facepiece full of water, trapped, etc.) do not occur at the Utrecht fire.
- * In situations where both a refinish as diving accidents car on the spot, there are also two leidingevenden site. The division of labor between these two, the commander and the diving supervisor is not described anywhere. The divers do not have a formal instruction set tailored to the Utrecht police force. The general instruction contained in the personal dive logs is considered insufficient by the committee.
- * In the absence of procedures in this area may prevent exercises are organized so that simultaneously pursue multiple divers, said the diving supervisor also functions as signal holder of one of the divers. In those cases, the diving supervisor will often lack the capacity for effective monitoring of the total bet.
- * The maintenance system for the diving equipment is not conclusive.

5. The causes of the accident

The committee has come on the basis of the collected data to the conclusion that everyone both before and has made great effort during the incident in order to prevent the fatal outcome. Then rapidly penetrates the thought that everything went well and that the outcome is due only to fate is. Upon detailed examination of the data, the Committee rejects this idea. Indeed, there are both before and during the accident indeed gone wrong things. The cause of this accident does not fix simple. There is a chain of factors which determined jointly led to the emergence of the accident and the fatal outcome. None of these factorenis be regarded as the cause of the accident or your explanation of the fatal outcome. Why are almost all attributable to these factors on human behavior. The consequence of this reasoning is that no blame can be discerned for the accident with William. If there is already talk in terms of debt must be over this appears to be shared by many.

Almost all the factors together caused the accident, turn out to be no deviation from the usual pattern; they were for a long time until the accepted situation. Together they formed as it hit a solid has long been existing danger to any inexperienced diver at this place.

The following factors have led to the accident:

5.1 Exercise dangers were previously insufficiently recognized / analyzed

Getting stuck on exercise these dangers that were previously insufficiently recognized:

- * The specific danger of a strong current in combination with the possibility of snagging of the signal line, so that a trapped diver can be pushed by the flow under.
- * The chance to get stuck was relatively large due to the fact that there are many stone layers.
- * The fact that the current (short) can fluctuate widely unknown. Contacts with the UNA could reveal this risk earlier. Incidentally, this fact played no role in the accident.
- * The sign (+ Attention snatch three) that the diver had meant to the grid in fact that he had to go physically (180j). Was not recognized that such a maneuver can lead to a situation in which the plunger beyond its control and is entrained by the stream.

* The dirt removal was an obstacle that hindered the diving supervisor. He could consequently not run with the diver and his control over the culvert impaired thereby.

5.2 Inadequate instruction beforehand about the potential dangers

The instruction preceding the exercise was given little information. On the possible dangers and how these could be countered was ignored. No indications were given on whether or not to return to the grid. The risk of this increases was to arrive in an uncontrollable situation.

5.3 No experience with self-rescue

William Brouwer during his training the inflator used regularly once he has served his redvest. This was not in the context of training for emergencies and must be said that he was not trained in the use of emergency procedures and noodopstijging with the diving equipment used in open water. The following he had never done:

- * The use of the diving knife;
- * Shedding the weight belt;
- * Inflating the redvest for noodopstijging;
- * The use of the inflator for noodopstijging.

5.4 Insufficient skill in clearing the mask

Will never be able to prove that William much water has gotten into his mask, which was impossible to breathe. It is a possible answer to the question why he deducted his mask. Given training and experience could not be expected of him that he was able to blow the mask blank.

5.5 The position of the diving supervisor in the dirt removal

The diving supervisor was, as usual in this exercise, only to catch the dirt along with the diver. The probability that this line had got stuck larger (more length and more line along the bottom). Also reduced thus control the diving supervisor and fell down before him the opportunity away to pull the diver quickly surfaced.

* The committee conducted under the same meteorological and flow conditions as at the time of the accident, with the assistance of a diving team, a test. This test has shown that the control of the diving supervisor from the dirt trap, a join the roster contained diver, has been reduced but that it should still be regarded as sufficient. The line signals came under these conditions still well and also the call path of the diver showed visible.

* It was also found that it from this place, as opposed to a position on the grid, it is not possible to pull the plunger to its line quickly out of the water and / or the line becomes free of obstacles to make upstream.

5.6 Problems with the diving mask of reserve diver

The reserve diver had to abort his first rescue attempt because there is water in his (dirty water) mask and an improperly mounted bite piece also came into his mouth.

The maintenance system in the breath work is such that the problem with the installation of the aforementioned bite block in a timely manner, so immediately after the assembly, came to light.

5.7 Lack of procedures and coordination

The stakeholders did not have good and ingrained procedures for conducting and coordinating rescue operations. This meant that they had to improvise in this rapidly developing and emotionally very stressful situation. will afterwards be considered insufficiently coordinated various rescue operations, and the result was affected negatively.

The following actions illustrate this:

- * The diving supervisor was, incidentally, against the procedure in the 'Guidance' in, own water. This reaction is understandable because a quick rescue seemed to belong to the possibilities. Unfortunately it must be noted that this rescue attempt, despite the rapid recovery of the diving supervisor, yielded only delay and loss of coordination.
- * The assignment diver B under hectic circumstances was once given by two executives.
- * When B diver who still had been drawn by William upwards through the line contact, this happened without the diver this gave a signal. The result was that the last contact with William was broken. Additionally could deliver this action threat for that diver.
- * The uncoordinated deployment of two divers simultaneously at about the same spot yielded a struggle under water and loss of time. With a commitment gecoördineerde moreover could have covered a larger search area.

5.8 The swim through the reel

William swims through an opening of the reel. Normally produces such a situation no problems. Yet this situation came to be more on edge. After this came the possibility that he could be pulled down into the drum through its signal line.

5.9 The jamming of the signal line

William arrives, after it has been passed to the reel, to be stuck with its signal line to an obstacle on or to the soil. Such a situation is no diver enviable, but not particularly disturbing. Indeed, there are many loopholes, by its own action or intervention by colleagues, especially the spare diver.

In this case there was a combination of factors, each of which were not particularly threatening, but still could not cause the accident in this combination.

6. Fallen causes

In the course of the investigation, the committee many topics briefly discuss. In addition, many potenti'le causes were traced. It covered both topics were selected by the committee as issues that were raised by

corps members. The previous chapter lists the causes of the accident. Below are listed those things that are dropped after investigation, as the cause.

6.1 The exercise was too heavy

In the exercise, which aims was to gain experience with diving in water, several training aspects were hidden. It concerns the following:

- * The stress due to the unknown 'difficulties';
- * The lack of visibility;
- * The high temperature of the water in combination with the heavy work of the counter-current swimming;
- * Responding to line signaling,
- * Figuring itself the mode of locomotion (using stones), etc .;
- * Needs to figure out how to return.

The committee classifies the practice both physically and psychologically as heavy. However, William was approved diving work, in good condition and well trained and qualified. Of his colleagues with a similar background, as the exercise tough but doable. Based on this information, the committee cannot exercise as 'overweight' fault for William.

This judgment does not mean that the commission finds a good exercise. She believes that exercises are constructed according to the scheme of the Guidelines Practice 'by the Ministry of BZKmoeten. The particular exercise does not meet there.

6.2 William was unfit for diver

The committee has no indication could find for such an assertion. William was approved previously mentioned for fire service diver. During this inspection it is both (diving) psychological and (diving) tested medically. Neither test has some limitation with respect to results diving.

The dive instructors nor the immediate colleagues of William ever pointed out that he did not feel confident when diving. He himself has, in spite of the fact that the possibilities for this purpose are open, and others as well using it, nor to know ever given of the diving except to want to be.

6.3 A dive buddy had prevented the accident

When two divers in a buddy-pair do this exercise, and one of the two is about what happened to William, then in the first place, the likelihood present on a duo-accident, wherein the one plunger entrains the other. Another possible scenario is that the second diver prevents unwanted movements of the first and / or both of them cut free when things go wrong. In short, in the case of a buddy dive both positive and

negative scenarios. The claim that could have prevented the accident by a dive buddy is not true or false. It remains speculate what effect a buddy dive would have been in this case.

6.4 The use of communication sets could have prevented this accident

The committee can not support this assertion. A communication kit gives a voice connection between the diver and the diving supervisor. A voice would probably not prevent William got into trouble. Nor is it likely that these difficulties, which occurred very suddenly and were quickly spotted by the diving supervisor, were important previously noted.

The committee is moreover of the opinion that such sets, provided they do not ask for extra lines to the diver, can contribute to safer diving.

6.5 The redvest has a small button, or short string

This assertion can hardly be denied. The button is very small and very short string. It is therefore conceivable that a diver with glove, difficulties in locating the button. Given the way the redvest covered in the training and lack of experience, William has had in this area, it is hardly conceivable that he tried to pull his redvest.

This re'le problem redvest worth further consideration, however, it cannot simply be regarded as the cause of the accident. Still have those right who say that it is quite possible William may have tried to pull his redvest.

6.6 There should be adjusted

The thesis is that the diving supervisor at William should send when he deviated from the specified route. At that time, however, it was not foreseeable that William as a result of its other currency could come in the difficulties.

The Committee endorses, moreover, only on the basis of training for technical reasons, the advisability of adjusting.

6.7 The water should have been previously explored

In the 'practice Guideline "literally:

The exercise not re'le hazards may be present and may be run any risks during exercise. However, the exercise should be as realistic as possible and the practice goal must be achieved as far as possible. This process of balance requires a lot of creativity and improvisation. Especially for the exercise leader is a great responsibility here.

The question is whether the 're'le dangers' in this position also meant obstacles underwater. The committee believes that this cannot be the case. A fire department diver may encounter underwater and everything is there to bring the best possible deal at their discretion. In addition, a reconnaissance requires the use of another diver, which risks are not reduced but only shifted from one person to another.

This does not affect the instruction prior to be given to the exercise, which warned of the possible dangers and showing how those dangers to go. Also must always be balanced to the usefulness of the exercise against the dangers.

6.8 Physical causes

The data provided by Justice include the section on the remains of William give no reason to suppose that physical causes have contributed to the accident.

Diving Accident Key Haven July 13, 2001 - 7. Aftercare

The follow-up is separate from the perspective of the company receiving team (BOT team), extensively evaluated. The inquiry is confined to this subject is to show the overall of the follow-up process and display the conclusions obtruded themselves quite automatically during the research process.

Immediately after William at 15:27 hours by ambulance to the University Medical Center Utrecht was brought launched the Public Service, which coincidentally was also the coordinator BOT team, the procedure "bet BOT team. This gave start, for lack of good access control to see some hitches, but succeeded in the end. Shortly thereafter, in accordance with the Utrecht 'Care Plan', set up a crisis unit to coordinate all follow-up processes. Efforts were focused on:

- * Support the family;
- * Reception of its own staff;
- * Internal communication as well as communication with external parties.

The day after the accident, in accordance with the care plan, decided to give an internal inquiry commission to investigate the accident. This committee is quite late (after a few days) commenced its work.

7.1 Family

- * There is provided a contact close to William from the time he was transported to the hospital to family in the hospital was present.
- * A second contact maintained contacts with the family. Through this contact are all sorts of practical matters arranged with the family, including:
 - * Transferring the personal belongings contained in the fire
 - * Tune with the family of the contribution of fire to the funeral.

* The interim and final in which the investigation into the accident is described personally were first handed over to the family and where the need was explained.

7.2 Aftercare own staff

After the accident absolved all those directly involved in their operational task to be the experience to handle quietly as an opportunity. They have started to organized care, self-invested locally agree on a first spontaneous meeting. In retrospect, this is experienced as a very positive event for processing.

The aftercare was organized (and is) aimed to bring the operational capacity of the force to the level of the accident by:

* The parties concerned, it is in fact to enable the entire corps to handle events in a good way and to support them;

* Provide the divers directly involved again so much confidence and motivation that the dive mode could be resumed.

This policy was given using the following activities form:

* The first meeting is processed in accordance with the procedure 'commitment BOT-team', accompanied by three members of the BOT team already organized about an hour after the accident. At this meeting was next to the staff of the teams involved, including the staff of the two ambulances available. The told directly involved on their findings and paramedics responded to questions of a medical nature, who lived in the fire.

* On Monday morning, a second meeting was held after the accident. The ambulance staff while not present. They had as stressful the last meeting. One of the nurses even nav that meeting contact gezochtmet own care team.

* During this second meeting, the emotions came up and got the blame on the agenda. The BOT team has been able to lead this meeting smoothly. Still, not all stakeholders after very pleased with this meeting, because they felt that the meeting should be reserved only for those directly involved.

* The divers are involved in the accident, accompanied by members of the BOT team who are also diving instructor, three days after the accident made another diving exercise. This exercise showed the divers to give sufficient confidence to hold on to their job. A few days later dropped, after the discovery of an error in the maintenance system, confidence again and diving task had to be temporarily transferred back to the Corps Maarssen. After confidence was restored a number of intensive discussions and task resumed.

* The BOT team members have visited all the fire crews on the posts. During these meetings, the events were described and answered questions.

* BOT team members have with anyone who needed it, lined one or more personal interviews.

7.3 Communications

In the crisis is, in order to prevent, for example, would ascertain the family of new developments out of the paper, determined that all the information would be distributed according to the following hierarchy:

- * family;
- * Directly involved colleagues;
- * Other colleagues;
- * Outside world.

This strategy has not deviated so far.

The family grew through personal contacts informed.

Communication with their own personnel went along the following lines:

- * Immediately after the accident was announced a day and night telephone number where people could get information.
- * In the period between the accident and the funeral published a number of publications (Email + boards) which were made more business announcements.
- * The first publication, which appeared on the day of the accident included the Communication on the information number and the text of the press release issued.
- * In these disclosures attention was paid to the study, expressions of sympathy from other fire departments and how the funeral would take place.
- * The service transfers after the accident, the colleagues, the teams through their territory commander or another senior, personally briefed on the events.
- * On the death of William evening were the corps members shall be notified in the same personal way informed.
- * In the context of the BOT-activity was much information to the plowing transferred to the stations.

Contacts with the media went through its own officer. Immediately after the accident, a press release was issued. The local press was in a cautious manner attention to the accident and the death of William. The interim report was, especially for the regional radio and TV station, reason to suggest more than previously disclosed with that report. This is reacted with a neutral press release.

NB

At start-up of the after-care, to be as well as at other times were found at that time essential fire department officials by telephone not or difficult to reach. The reception of the COV-building, which takes over the phone if that is not absorbed by the demand, offer no alternatives.

The same accessibility issue has been identified by the wife of one of the divers concerned that after the accident information in wild win over the welfare of her husband. She got zero oprekest both heading South (answering machine), and in the COV-building at the clerk.

7.4 Other aspects of aftercare

7.4.1 Maintaining operational

After the accident the diving and the occupation of the station north and south have been relieved for a time from their operational duties. The necessary coverage during those periods was provided by the volunteers of Columns and the fire brigade divers Maarssen.

During the condolence and the funeral was provided to cover the city by a large number of fire brigades from the Utrecht region.

7.4.2 Capacity problems

The extra work brought with aftercare at this holiday time it led to an acute capacity problem. Despite postponing vacations and returning from an employee who had recently gone to FLO, the capacity for the various care tasks proved in retrospect to be low.

7.4.3 BOT team

The company care team has been working intensively in the period after the accident with the reception of the colleagues. They are taking, emotionally, fully loaded and escorted to its own processing by a professional counselor. There are sensed signals which indicate that some may have been overtaxed.

Due to the structure of the team is not unlikely that there are involved in an accident BOT team members. They are seeking help and sponsor at a time. In this case the wrong OvD / BOT team coördinator in this impossible situation.

7.4.4 Consensus building

The research went into the accident with William, and this was not in accordance with the care plan, only a few days after the accident started. Meanwhile had already veelBOT activities occurred. Especially during the initial arose Common reconstructed "story" about the circumstances of the accident. This "story" was then transferred by BOT team members to other posts and teams.

When the committee turned its investigation began, although there are still some conflicting statements were recorded, that this process of consensus building was already in an advanced stage.

The Committee believes that in the present case, the BOT activities in the above manner, have hampered the investigation. In the future, both interests, good reception and a good research must be better balanced with each other.

8. Conclusions and recommendations regarding the accident

The Committee has thoroughly examined the accident. This means that where individual actions have influenced the accident, is also wanted by coming to causal factors in the organization of the national diving policies and teaching and curriculum. The committee came to the conclusion that there had been no conscious wrong transit act or negligence of people, but that deeper organizational causes in both rural alslocale scale have made the accident possible, after the disaster struck.

Nevertheless, the Committee wishes to point out that this the persons in question are not relieved of the responsibility for their actions and using their common sense. The incident described is indeed caused by human activity and could be therefore prevented. However, it is not correct to point to one or perhaps several people.

The conclusions and recommendations are therefore focused on improvements identified shortcomings of a general nature, which in the future could have a positive effect on the safety of the divers.

8.1 The exercise failed to appoint (safety) requirements

The committee believes that "practice Guidelines' exercises in accordance with the need to be designed and implemented. The particular exercise was traditional in scope and did not meet the directive. For example, the exercise had no clear practice goal. In the light of the new approach of the exercise suits the question whether such a practice can be effective. First directed flow diving in clear water, for example a swimming pool, and later added other aspects, is a better option. Other aspects of the exercise not answer or insufficient to the Directive:

- * Exercise risks were not sufficiently recognized / analyzed.
- * The instruction precede the exercise was too brief, no threats have been reported.
- * The type of exercise is debatable.
- * The fact that has not been adjusted when the diver of his instruction was different is considered a fault on training technical grounds.
- * The site of the diving supervisor in the dirt removal was not optimal and gave reduced control over the culvert.

Conclusion:

The committee has gained the impression in various interviews that the relevant exercise their design was no exception. The good, effective and safe practice seems to be a structural weakness of the Utrecht corps. Many exercises as well as the present, based on tradition. It is simply not thought about it. recommendations:

- * Identify at management level responsible for 'practicing'.
- * Implement without delay 'practice Guide "and give the thus start practicing structured and conscious in the Utrecht corps.

8.2 Missing procedures for rescue and cooperation

In the rural teaching and learning material and in the Guidelines combat water accidents by firefighters' lack of CCRB (to put on) procedures gecoördineerd rescue divers. The 'Guidance' has attached a model instruction in which rescue divers also remains underexposed. The model is not included in the Utrecht police force to date and the divers have only the instruction contained in the logs provided by the Nibra. Here, too, lack adequate procedures for rescue divers.

Conclusion:

Corps with a dive team should have procedures for emergencies, contained in a handy 'instruction'. The available models offer especially for emergencies little guidance. The corps will to the extent that they should fill the instruction have not yet done any for himself with this subject.

recommendations:

- * Identify at management level responsible for the preparation of the diving task.
- * Set as soon as possible in an accessible and comprehensive instruction for the dive task of Utrecht corps.
- * Find out whether there are missing from other subject areas of work instructions and, if so, provide such instructions.
- * Identify the omissions in the Guidelines "and the teaching and learning material for those involved with the aim of promoting the creation of additional national models.

8.3 Lack of coordination and effectiveness in the rescue efforts

The Committee notes that the rescue efforts as they emerge from the study:

- * Were sometimes impulsive character;
- * Were not well coordinated;
- * Have been hampered by a mounting error that should have been noticed in the maintenance.

Conclusion:

Rescue efforts were ineffective because there has been coordinated impulsive and too little; the mounting error in the mask of the reserve diver has caused delays in the rescue attempts.

recommendations:

After drawing up an instruction / emergency procedures should aim to be trained in this type of emergency.

8.4 The lack of attention to emergency procedures dire divers

In the rural teaching and learning material and the aforementioned 'Guidance' no attention to the way in which a diver might behave in difficult situations under water. There is only given (too limited) attention to the way in which the diving supervisor and reserve diver should behave. This fact is also the Utrecht instructors fiscal years. This knowledge / skills, however, have been commonplace in the sport divers.

Conclusion:

- * Nationally, there has been no attention for years on the emergency procedures for divers.
- * In Utrecht existed when the divers not pay sufficient attention to this issue so that the divers were not taught the relevant knowledge / skills.
- * It is likely that William himself, under pressure of circumstances, has not realized the opportunities for self-rescue him were available.

recommendations:

- * Own divers Learn yet the missing skills and practice them.
- * Identify nationwide that emergency procedures / emergency ascents missing divers in teaching and curriculum with the aim to include these subjects still in the teaching and curriculum.

8.5 The full face mask hazards insufficiently recognized

The full face mask appears beside the desired protection against toxic and unsanitary conditions, also have less desirable properties. In the transition to this mask is that, at least in the Utrecht corps sufficiently recognized so that no measures were taken to offset those disadvantages.

Conclusion:

- * The full face mask has some underexposed drawbacks which has never responded adequately to at least in Utrecht. It is:
 - * The mask is apparent in a number of divers do not properly seal and thereby leaking water in the mask.
 - * A mask threatens filling up, thereupon, in contrast to the situation with the use of mask and breathing machine with bite block, directly to the breathing.
 - * The full face mask is much harder empty blow than the previous mask. The clearing of the full face mask in accordance with the national curriculum and teaching) not taken into account in some courses. However, it is always taught and practiced blowing out the mask.
 - * Divers can with a full face mask, unlike scuba divers with a bite block, hit a diver in distress not equipped with air (buddy breathing).

recommendations:

- * Reconsider the use of the full face mask
- * Find out whether this should always be used.
- * Find out whether a combination with an additional vending machine serving buddy-breathing should be introduced.
- * Set a procedure for clearing a flooded facepiece
- * Education and train all divers in these proceedings
- * Identify the problems identified at national level so that solutions in the curriculum / programs are processed.
- * Education and train all divers in these proceedings

* Identify the problems identified at national level so that solutions in the curriculum / programs are processed.

8.6 The maintenance system

The mounting error in the reserve diver mask was only noted in an operational situation, which ought not to occur. Such errors should in an audit not be noted assembly.

Conclusion:

Apparently not all work in the respiratory protection workshop followed by proper checks on the quality.

Recommendation:

The maintenance system should be reviewed and made watertight.

9. Other conclusions and recommendations

9.1 The operation of the redvest

The (surface) of the divers redvest is operated by pulling on a drawstring with a bead at the end. Given the dimensions of both the rope and the bead falls for a (gloved) diver does not operate with the redvest. Moreover, it is not impossible that the pull cord, in the non-inflated condition in collapsed vest, hidden comes to be seated.

Conclusion:

* The operation of the redvest can, as a result of the small dimensions of the pull cord in difficult conditions are too great a task.

* It is not impossible that the pull cord when you are hidden in the vest.

recommendations:

* Practice all divers regularly use the redvest.

* Investigate whether an easier and more secure operation of the redvest is feasible and provide for possible improvements.

9.2 Communication

The Commission denies that the use of communication, allowing the diver to oral contact state with the diving supervisor, could have prevented the accident. However, it considers that the use of such equipment could contribute to safer diving. The priority to be given is not particularly high estimated by the commission to the purchase of such equipment.

Conclusion:

* Communication can contribute to safer diving.

Recommendation:

* Purchase, with observance of the modest priority communications equipment for divers.

9.3 Combinations BOT team / victim

The BOT team coordinator was during the accident Public Service. Yet he himself has the BOT procedure must start and he then must hold his position as coordinator. With this he was seeking help and guide simultaneously.

Conclusion:

- * Combinations of care user and supervisor do not do justice to the first roller and avoid.

Recommendation:

- * Absolve BOT team members who experience a traumatic event as soon as possible of their BOT job and replace them.

9.4 Research and BOT activities

The accident investigation and the BOT activities can interfere with each other. For the future will need to find a mode that ensures that adequate justice is done to both activities. Thereby surely must be that the examination time, ie immediately after the accident started.

Conclusion:

- * The BOT activities the truth hindered the investigation.
- * The study was retrospective review initiated too late.

Recommendation:

- * Investigate how in the future both activities could be better coordinated. Think of combinations such as the writing in the context of the processing of experiences before a document is mutually discussed these experiences. The resulting descriptions are of great value for research.
- * Identify, possibly in a regional context, a permanent commission of inquiry with powers laid down that in case of accidents and near misses, can decide independently to investigate.

9.5 Accessibility BOT / COV - building / Kazer nes

During the period after the accident revealed that both BOT team members as officers in the COV-building and the barracks can be very difficult telephone.

Conclusion:

- * The accessibility of BOT team members, staff in the COV-building in the barracks showed clearly problematic. Only by coincidences and sustain the desired contacts were established.

Recommendation:

- * Improve the accessibility of the fire and the BOT team members, eg. By posting the number one device that is continuously staffed by someone who knows how to get the various officials.

10. Lessons from research

The committee has found that there are substantial improvements needed in the approach of the fire brigade diving in Utrecht corps. Besides organizational issues that are bound to the Utrecht situation also shows the need to be amended training based on national grids.

The committee considered it inconceivable that the deficiencies were not previously observed in the rural teaching and learning material for diving and that nowhere were previously drawn conclusions similar to ours. After some searching, including the Internet, we came to the conclusion that there is no place where research on (almost) accidents in the fire, bundled available. Well we finally two accident reports on the track.

It is:

* A report from Amsterdam's origin, which is reported on an accident on May 1 1998, with nearly one (student) diver drowned. In this report, we found include the following factors as the cause:

* There is not practiced with practical emergencies.

* This creates a panic situation due to which the person concerned could not find the market for spare air and he did not think the redvest.

* Among the recommendations in this report, we found one that appeals to us:

"In the pool one has been training with the redvest, grab blow, blinded swim while tangling, etc. Not only can one see how students respond to these situations, one can also practice and an actual emergency is or may not be the first time that the redvest old. The experience gained through exercise increases safety. "

* A report from Zutphen, where an accident is described on November 29, 1998. In this report, we found a number of issues that now no more strange occurred to us. The causes are mentioned include:

* The waterway is not diving with full equipment.

* The complete handling of the emergency procedure under water is not practiced in the backwater.

* The student involved in the accident is not panicked during the accident. Due to a lack of skills, however, they could find no solution to the problems encountered.

Both reports have undoubtedly led to improvements in their own corps and possibly in the entire region. Unfortunately, they have not led to changes in the national approach to diving, so we had to draw similar conclusions in Utrecht after a fatal accident.

We therefore advocate the national pooling of experience with (almost) accidents on a universally accessible place. The Internet seems to be a good medium and general fire site www.brandweer.nl an okay place. The commander of the Utrecht fire is hereby recommended to publish the present report on that site.

11. Final Words

11. Final

This report is written from the worst of the accident met William Brouwer. The committee hopes that thanks to this report, this low may lead to a new situation where improved teaching and learning material and improved training methodology, will provide increased safety for both the Utrecht and other Dutch fire brigade divers.

Utrecht, November 7, 2001.

Appendix 1 The research mission

Internal communication - Fire, communications - PUBLICATION NO. 37 -2001.

Research on the accident William Brewer during a diving exercise in the Kernkade Utrecht on July 13, 2001

Client: Commander fire city of Utrecht.

target

The study has the following objectives:

- 1 fulfill the obligation imposed on the employer Working to carry out its own investigation (in addition to the research carried out by the police or Labour);
- 3 family, colleagues, and various municipal authorities to provide information;
- take measures to prevent similar accidents in the future.
- 2 it is explicitly not to answer the aim of the research questions to blame and liability.

Content

An important part of the content of the research consists of the making of descriptions of the following elements that played a role in the accident:

- * The preparation of the exercise;
- * The fire brigade involved in the exercise;
- * The material involved in the exercise;
- * The training site;
- * The exercise leadership;
- * The circumstances of the accident;
- * The measures taken during / immediately after the accident.

The descriptions should together give a good picture of the accident and the circumstances in which this took place.

Based on the descriptions of the elements that played analyzed a role in the accident by considering them in relation to legal guidelines, codes of practice without legal status, the practice of exercise or diving and opinions of experts in firefighting organizations and other bodies.

Recommendations to prevent similar accidents complement the content.

inquiry

The inquiry commission is composed as follows:

- * Mr WJ Klijn, fire city of Utrecht Chair
- * Ms MAM Veldscholten, regional fire commissioner Utrecht
- * Mr MJ Grocery, regional fire commissioner Utrecht
- * Mr L. Verhoeven, works committee

The inquiry will present its independent judgment at the same time on both the client and the works of firefighting Utrecht.

reporting

Interim report: August 7, 2001

Final report: to be determined

Outside the internal investigation into the cause of the accident are being established two separate investigations. Namely through the technical investigation of the police and the Labour Inspectorate.

These investigations have already begun.

Wim Klijn for firefighters Utrecht contact for both agencies.

Utrecht, 2001 19juli

Commander fire Utrecht

ing. FSW of Wijland

Appendix 2

Typical activities related research

1. The establishment and staffing of the fire department inquiry was announced in writing by the commander. The committee has its work actually on 19 July, began to imagine the participants in the accident, the C-team South and some others. During this session, several questions were answered and it was made clear that the committee is sufficiently independent. This is evident from the fact that the report in due course at the same time to both the commander and the works will be offered. The persons concerned and the Chairman of the Works Council then expressed their confidence in the commission.

2. The Committee has all attendees of the fire in the accident heard the same day (19-7) and reconstructed a provisional state of affairs in their statements. In addition, a few things were found to be still unclear. For this reason, few were heard again at 25-7. This gave the desired clarity. Later interviews were conducted with a number of diving instructors, dive coordinator and the BOT coordinator.
3. The study of the Amsterdam (permanent) inquiry committee has been requested and used in determining the manner in which the investigation should be further developed.
4. The commander and the chairman of the works were during the investigation by the president of the inquiry kept informed of the progress of the work.
5. On the basis of a provisional reconstruction in the interim report have been defined a number of issues that would be considered further examined by the Committee /.
6. The practice diving, as was often made at the UNA power plant, including weather conditions of the moment, mapped.
7. Data are collected on the site of the accident. Also, data are obtained about the temperature and the amount of water which was discharged at the time of the accident and the degree to which that can vary over time.
8. There have been made overview of the location of the accident and the situation has been measured in practice. Locally are twice trials. Examined how floating and sinking lines behaved in the fast flowing water and how the audit was a diver when diving supervisor stood in the dirt removal.
9. Corps members have been able to contribute to larger ideas for research.
10. The way in which maintenance is carried out at Utrecht diving equipment in the respiratory protection workshop is globally vetted.
11. The reel found was examined and photographed. An experiment showed that a large man with a SCUBA unit without any problems through the openings in the cheeks of the reel (diameter 2.25m height 1m) could pass.
12. All relevant formal arrangements for diving are retrieved and studied, it relates to the health and safety regulations, the Guide Tackling Water Accidents of CCRB, the material fire department diver, instructor fire department diver and Medical diving supervisor, the examination regulations, the Guidelines Practice, the curriculum for sport diver, etc.
13. Commissioners have discussions with experts, discussion with them about:
 - The content of the curriculum
 - How the curriculum is established

- Experiences elsewhere with the full face mask
- Experiences elsewhere with emergency procedures

14. The contents of the documents justitie been studied and incorporated into the final report.

15. On August 1, 2001 an interim report was published.

16. On November 1 was discussed a draft report to the parties directly involved, they were given the opportunity to comment. The comment was true may seem justified incorporated into the final report.

17. On November 7, the text of this report was presented to both the commander and the chairman of the Works of Fire City of Utrecht.

18. Half November 2001 this final report was published.