Computer Assisted Disaster Victim Identification Systems, CADVISYS, '93

CHAPTER 1. INTRODUCTION AND GENERAL BACKGROUND

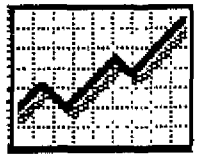
1.1. Disaster Victim Identification (DVI)

1.1.1. A Risk Analysis Snapshot

Disasters do not happen only in the air nowadays, although those seem to be the Prototype Disaster to come to our minds when speaking about this important topic. There are many other types such as major train and road traffic accidents. Fires in hotels and restaurants, even in metros, can have many casualties. Serious public disorders with fatal consequences have happened on football stadiums. Stadiums itself have not so long ago burnt or collapsed. Ferries and other ships sink, factories explode, poisonous gases kill people like insects. One does not need to continue the list with Lockerbie-type terrorist actions, Waco-type mass murders, floods, avalanches, earthquakes or nuclear accidents. Mass Disasters are almost everyday phenomenons somewhere in the world to everybody who just follows the daily newspapers.

Growing Risks of Air, Sea and Other Disasters

Near-by Disasters are more frequent than is publicly noticed. Often it is just a matter of good luck. The latest "Incident" was a couple of weeks ago in Stockholm. Though nobody died there, the worst scenario of the "Vattenfestival" -Happening was several hundreds or even thousands of the half a million spectators killed. Just eight weeks ago in Estonia, two Boeing B-747 with more passenger than 600 were less than 150 meters distance from each other. Not so long ago a Turkish aeroplane with about 250 passengers on board tried to land onto a small-plane runway about 20 kilometers off the Helsinki airport and another 250 passenger Spanish craft to an oil-refinery about 50 kilometers outside the beautiful city of Helsinki.



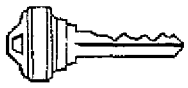
The future looks more risky than ever. The growing amount of traffic, the growing speeds on rail, the aging fleets in the air, all these mean more risks. The aviation security is all the time threatened by terrorists, the skies are jammed, flight controls lack money, work with aging computers, and so on. **It is only a matter of when and where the next disaster occurs.**

1.1.2. The Need for Concerted International Action - An Ad Hoc Strategy Model

And almost self evidently, most incidents have international implications in these days of easy trav-elling We all are really living in a "Global Village". Therefore, the DVI-Efforts are obviously a matter of increasing international importance and a kind of "Red Cross-Duty" for the Police Forces and the Forensic Community all over the world. All Police and Forensic Conferences and Working Groups mentioned below can be considered as links of a chain towards more and more professional systems in Crisis Management and Disaster Victim Identification. Lot has been done, but there still is a need for a concerted international action. We use here the word "concerted" instead of "coordinated", because it sounds more polite. Policemen are always polite when trying to advocate their ideas. As Appendix # 1 you will find **"An Ad Hoc Strategy Model For Concerted DVI-Efforts"**.

The Strategy Model is divided in three components. in the middle is the *Collection and Analysis of DVI-Experience* (Sine Experientia Nihil Scire Potest), on the left the *Normative Infrastructures* Agreements, Laws and Regulations, the cornerstones of DVI-Administration and Management, and on the right *Other Measures*, including resources, cooperation and a preliminary list of the national and international key-players. The details will be discussed within the following chapters.

The development of a strategic frame for the DVI-Work, an overall action plan, considering all aspects and avoiding fragmented approach, needs to be established It should include solutions for immediate and interim needs, evaluation of computerized systems plus other technological and operational developments. The DVI-work is based on know-how and it is extremely information intensive - thus ideal for forensic computer science and computerization.



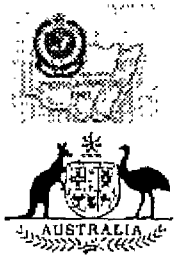
It should take into account and complement the already existing world-wide activities of the key players. As key players we *identify* here the I C P O. - Interpol, the United Nations (including the World Health Organization, WHO) the International Civil Aviation Organization, ICAO, the International Maritime Organization, IMO, the Council of Europe, CoE, etc These are all governmental organizations. Among non-governmental bodies we could identify the International Air Transport Association, IATA (there should be a similar one for the Airport Authorities), the International Association of Chiefs of Police, IACP, the Federation Dentaire Internationale, FDI, etc.

The **International Association of Forensic Sciences** (IAFS), first being a conference of Forensic Pathology, then Forensic Sciences generally from 1957 (Brussels, Belgium), has always had the identification of dead persons on the agenda. The computerization of the DVI-Work was first discussed in Bergen, Norway, 1981. The 12th Meeting in Adelaide, South Australia, 1990 had this topic both on the Forensic Pathology and Odontology Sessions Agenda. Now in Dusseldorf, Germany, in the 13 th Meeting, August 22-28, 1993, the President of **International Organisation For Forensic Odonto-Stomatology**, IOFOS, Dr. Dr. **Klaus Rötzscher**, has set up a really comprehensive package including among other forensic dentistry and DVI-topics the history, educational needs, international cooperation, national efforts, legal problems in federal countries, difficulties met in missions abroad, studies and reports, legal aspects in general, age estimation and determination, current computer applications (the real workhorses and time savers in DVI) and a whole bunch of poster demonstrations.

I·O·F·O·S

IOFOS covers the whole globe and has therefore a prominent role in the future development of DVI-Work. As Dr. Rötzscher puts it in his IOFOS Newsletter Editorial (June 1993): "If the DVI-Teams do come together, there is a good way of sharing information and progress of mutual understanding. The IAFS/IOFOS Meeting in Düsseldorf may be a good international forum for a long time to get together the members of the above mentioned teams "

1.1.3. A Brief History of Disaster Victim Identification In the I.C.P.O. - Interpol Framework



How it all Started - Australian NCB Forms Initiative, 1968

The idea for Interpol DVI-Forms was "born" in Sydney, New South Wales, Australia. On 30 November 1961 a Viscount aircraft crashed in Botany Bay (remember Captain James Cook, who found it in 1770?). All bodies of the crew and passengers from various countries were mutilated and dismembered. The task for collecting and managing AM and PM information was very difficult, because the information collected would have no standardized order or format. Detective Sergeant *W.B. Ross*, now retired as Assistant Commissioner, was the man behind the first generation set what we have now as the disaster victim identification form. The 37th General Assembly, Teheran, 1968, in Resolution AGN/37/RES/4, thanked the **Australian NCB** for studying the identification of disaster victims by means of its draft form, decided to adapt it with minor amendments and asked the General Secretariat to have the forms printed in English, French and Spanish and distributed them to the NCBs. The work was completed in 1970.

Missions Abroad

Several other Interpol General Assembly Resolutions (AGN49/RES/2, *Manila*, 1980, AGN50/RES/3, *Nice*, 1981, AGN51/RES/7, *Torremolinos*, 1982 and AGN55/RES/14, *Belgrade*, 1986, AGN58/RES/10, *Lyons*, 1989) have drawn attention to disaster victim identification The Manila Conference set up a Working Party to modify the 1968 Forms. This composed of experts from the following countries: *Belgium Denmark, Federal Germany France, Netherlands, Norway, Peru, Philippines, Spain and the United Kingdom.* The Nice General Assembly approved the second version of the forms and established a **Standing Working Party** to consider new developments. This DVI-SWP held the first meeting in Paris 1981 Onginally this vehicle was proposed to Interpol by the "*Appeldoorn Symposium*", initiated by the Dutch Col. **Ari van den Bos**, with a dozen countries, representatives of police and forensic medicine, plus a delegate from Interpol GS.

The Torremolinos Conference stressed the importance of international cooperation "conscious of the fact that identification can be facilitated if assistance is given to the competent authorities by identification teams from countries whose citizens or residents may have been victims of the disaster" and recommended that ICPO-Interpol Member Countries co-operate closely so that decisions about the admission of foreign identification teams can be taken rapidly.

Interpol Manual On Disaster Victim Identification, 1984

The Interpol **Manual** on Disaster Victim Identification was developed by the "Standing Committee on Disaster Victim Identification". At its meeting in Paris in June of 1982, the Committee set up a Working Group to draft the text of this manual. The members of the Working Group were: Colonel W. Bruggeman (Belgium; chairman), Doctor M. Durigon (France), and Doctor S. Keiser-Nielsen (Denmark). Over the following year, the Working Group prepared a draft based on a text submitted by Dr. **Keiser-Nielsen**. The draft was circulated to all member countries of the Committee for comment and was subsequently adopted - with appropriate amendments - and approved by the Interpol General Assembly during its 53rd meeting in Luxembourg in 1984. The manual was submitted to all Interpol member countries to make future disaster handling procedures more effective to the benefit of all concerned.

Sub-Committee, 1986-1989

The 55th meeting in Yugoslavia in 1986 approved the proposal of the Standing Working Party on Disaster Victim Identification to establish a Sub-Committee to study the following:

(1) updating of the Disaster Victim Identification **Form** in the light of the experience gained in the different countries, as reported to the Standing Working Party at its second meeting;

(2) the possibility of **using electronic data processing techniques** to identify disaster victims and the possible influence of such techniques on the lay-out and contents of the Form;

New Form(s), 1989 (3rd Edition)

The New Forms were approved by the '89 Lyons General Assembly These comprehensive, logically well thought out and internationally acceptable documents were prepared to meet the needs of computerization. This was done under the experienced guidance of Mr. **Günther Flossmann** (BKA) as chairman of the Sub-Committee The GA unanimously adopted, by the 103 delegations voting, the recommendation that all the Organization's member countries use the Disaster Victim Identification Form in all appropnate circumstances including cases in which there is only one victim to be identified.

Every country, even outside the Organization, can now without hesitation adapt them for use with their computer systems. These **Information Management Tools** are totally independent of certain types of information processing environments or programs. Computer searches are done with equal ease if your victim, for example, has one nose ring instead of two ear rings. If you describe them, say, in subsection 30.02 or 30.10. - there is no difference from the information processing point of view. There is no need to rewrite either your program or the forms. Simply use the form(s), your computers (micros - minis - mainframes, whatever environment you like best) and some common sense. Internationally we all have to play with the same standardized cards, even though some ambitious local patriots would like their own design best, and desire to remodel the IP-Forms every second year

Use Them - Not Your Own Design!

All Interpol member countries should become familiar with the Interpol form as quickly as possible it is surprising that some police forces, particularly across the Atlantic, seem to be unaware of the mere existence of the form. The main topic for the practical DVI-work is still for the time being the new (1989) Interpol DVI-Form. There has also been much discussion that the new form is too long. Actually it is no problem, because you can fill the more time consuming parts in later better conditions They are not intended to be filled in extenso on site in a desert. Other critics want own boxes for albinos For the proper use and interpretation of the various details there should be a comprehensive and well argumented discussion. The objective, reasoned discussion could quite well start in the context of the IAFS '93.

"*European Working Meeting On The Role Of The Police Following Air, Sea Or Other Disasters Having An International Perspective*", with delegates from 15 countries was arranged in **Interpol HQ, Lyons**, France, August 20-21, 1990 - It stated, that the role of the police is obviously a general one controlling the disaster site, access and routes to and from, traffic, crowds, press, coordinating all services and specialist team efforts, especially the DVI-Teams, preserving evidence of incident/crime, locations of wreckage, locations of bodies, preventing further unnecessary damage, looting, any other crime, contamination of the disaster scene etc.
The Finnish police suggested there an equipment pool be set up, say for European States: so that light equipment, stored centrally (in Frankfurt or Paris, for instance), could be transported quickly to the scene of the disaster. We also suggested setting up an international data-base of AM and PM information, which topic will be discussed in more detail below.

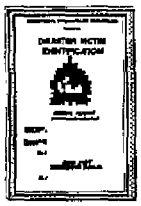
ICPR, Special #

The *International Criminal Police Review* dedicated its Special Number (# 437-438, September-October, 1992, 65 pages) to DVI with the following motto: "The response to a disaster is a response to chaos. Whether order can be brought out of the chaos will depend on co-ordinated action, the commitment of all those concerned and devotion beyond the call of duty."

Some excerpts from the main article "Interpol and Disaster Victim Identification" by **Raymond Kendall**, ICPO-Interpol Secretary General:

"For many years this important aspect of international police co-operation has been one of Interpol's main concerns In practice, this means circulating notices on unidentified dead bodies, publishing the disaster victim identification form which we prepared, and regularly organizing meetings which are attended by eminent specialists." -

"The international notices intended to assist with the identification of corpses - generally known as "black notices" - are published and circulated whenever other attempts to identify a body have been unsuccessful. Generally speaking, such notices contain photographs and, depending on the condition of the body, fingerprints " -



"The form can be filled in without reference to any other material and is perfectly suited to the electronic processing of the data it provides. It consists of two distinct sections, the first (printed on yellow paper) for ante-mortem information and the second (on pink paper) for all the data collected after death by the police or medical services, as well as the conclusions of any autopsy conducted. Since dental information can often be used to prove or disprove the identity of a body, there is a special "Dental findings" section on the form. Whenever it is possible to make a formal identification, a third section of the form (printed on white paper) is filled in by the expert or technician responsible." -

"The General Secretariat publishes the form in Interpol's four working languages: Arabic, English, French and Spanish However, a number of member countries have already translated one of these versions into the language normally used on their territory and printed it in the same format as the original version." -

"I cannot think of a better conclusion to this editorial of the special number of the Review devoted to the problems that can arise in connection with the vast subject of disaster victim identification than to quote the two goals the Standing Working Party set itself at its fourth meeting. If we are to provide even more assistance in this domain, we should now concentrate on two aspects: new identification techniques made available by sophisticated technology and post-traumatic stress disorders suffered after a disaster by the identification teams who are often required to work under extremely difficult conditions " -

The reader of this highly recommended paper will find that the special number consists of three sections. The first articles deal with the type of action that was taken in connection with different disasters that occurred in areas where geographical, atmospheric and other natural factors made it essential for the identification teams to adapt their techniques to circumstances The second section deals with methods and describes different ways of identifying victims. The final article entitled "Establishing a model for police response to disasters" gives us an opportunity of reflecting carefully on the whole subject and raises the question of how to co-ordinate human resources at the scene of a disaster.

The 5th Meeting of the Standing Committee on Disaster Victim Identification was held at the ICPO-Interpol General Secretariat, Lyons, in March, 1993. The Agenda included among others the Election of the new Chairman, Creation of a new Sub-Committee to revise the Manual on DVI procedures, and Experiences at recent disasters (Nepal, The Netherlands and Portugal, etc.). Dr. **Jay Levinson**, a globally well known and active DVI-Officer from the Israeli National Police Headquarters, Jerusalem, was elected unanimously as Chairman. The new Chairman has already cultivated valuable contacts with the "Grand Strategy"-organizations mentioned in our Ad Hoc-Model (ICAO, IATA, UN, UNDRO, WHO, PAHO, EEC, CoE, NC, IAFS, IOFOS, FDI, IACP, etc.).

An important part of the task is to raise DVI-Awareness among the Key-Persons in these organizations. The cause is much depending on the "His Masters Know-How", not only on the experts knowledge and skill.

1.1.4. Future International Development: Normative Infrastructures - Practical Steps Ahead

It is important to cite here what the **1984 Interpol DVI Manual**, the real classic, which we translated into Finnish in 1986, states about the international co-operation: "The victims of a disaster may not all be citizens of the country in which it occurs. Whenever foreigners are involved, it is recommended to establish close cooperation with - preferably to attach a liaison officer from each of their home countries. Hereby, a faster and more reliable exchange of information will be ensured.

.--- If many victims originate from a foreign country in which a State Police Victim Identification Commission already exists, broader assistance from that country may be asked for. While an expert group from a foreign country will normally work under the authority of the country inviting it, there are several cases on record from the past decades in which a disaster occurred in a country that did not possess the expertise and the resources necessary for effectively handling victim identification, and in which the responsibility for handling these operations was therefore more or less fully delegated to the foreign group

--- International agreements have not yet been reached for the regulation of such cooperation and delegation of responsibility. When it comes to sending out experts, member countries are advised to explore the possibilities for one or more identification experts to travel immediately to another country. It may mean that a file must be kept on appropriate persons listing their personal data, their passport number and date of issue (reminding them of times for renewal), their inoculations (reminding them of deadlines for re-inoculation), and including a set of photographs for immediate visa application, in some cases, a temporary diplomatic status may be obtainable. For each key person in such an expert group there will have to be one or two stand-ins - in case the former is not available at the critical time - and they must all be prepared to travel on hour's notice. In the case of a commercial aircraft accident, it may be possible for identification experts to travel as affiliated to a commission of technical experts for which international regulations exist (viz. *ICAO Standards and Recommended Practices, Annex 13 to the Chicago Convention on International Civil Aviation*)."

The IP 1984 Manual

A Real Classic!

A Model For The Legal Infrastructure, ICAO Annex 13

This document (Doc 6920, 7th Edition, May 1988, as appended up to day, cover page attached here as Appendix # 2) has laid down many important basic principles of disaster victim identification. Chapter 5. Investigation recommends (5.9) the autopsy examinations to be expeditious and complete, done by pathologists experienced in accident investigation. Particular attention (5.10) should be given to evidence which requires prompt recording and analysis for the investigation to be successful, such as **the examination and identification of victims.** ICAO has published a Manual of Civil Aviation Medicine (Doc 8984, 2nd Ed., 1985), which deals with Aviation Pathology, too.

Particular Attention to the Identification of the Victims

Participation in the investigation is regulated primarily by the state of registry, operator and manufacture, but also others may participate in the investigation. Participation of States Having Suffered Fatalities to its Citizens is codified in article 5.27 (Rights and Entitlement):

The Right to Participate in the Investigation

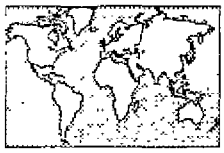
"*A State which has special interest in an accident, wherever it occurred, by virtue of fatalities to its citizens should, upon making a request to do so, be permitted by the state conducting the investigation to appoint an expert to participate in the investigation to facilitate the availability of factual information to the former State. The entitlement to participation of this expert should be limited to*

a) visiting the scene of the accident;
b) having access to the relevant factual information
c) providing assistance and information concerning the identification of the victims
d) receiving a copy of the Final Report

The State requesting such participation should justify to the State conducting the investigation the basis for its request."

When discussing about meaningful and thoughtful international legal infrastructure the possibility to broaden the idea of Annex 13 into the **Interpol Constitution** might be worth considering. A strong recommendation for the cooperation and Missions Abroad. The Joint Team Approach would certainly with modern telecommunications and other back-up equipment be the answer for the future. Because of the different material and administrative situations existing in various countries contact would best be established through the National Central Bureaus. The reins will of course stay within the NCB of the inviting country but the practical work and flow of information is accelerated enormously.

The Interpol Constitution



The General Secretariat has issued and updated lists of countries with disaster victim identification units. The list now (March 1989, 3rd Edition) comprises the following twenty countries: *Australia, Belgium, Canada, Chile, Colombia, Denmark, Germany, the United Kingdom* (including *Hong-Kong*), *Israel, the Netherlands, Kenya, Korea, Malta, New Zealand, Norway, Singapore, Spain, Sweden, Switzerland and the United States*. Of those countries, the following were listed as using computerized techniques: **Belgium, Canada, Denmark, Germany, Korea, the Netherlands and Norway** *Peru* has recently established a special DVI-Unit. **Finland** has had a *de facto* national forensic identification unit since 1977. From 1991 a DVI-Unit was finally acknowledged by the bureaucrats, though in another composition. The computerization of the de facto Finnish DVI-Team, Interpol-Helsinki, is described in detail later in Chapter 4. In **Sweden** the DVI-Team has computerized their dental comparisons, as might be the current state with some other countries as well.

"Old Boy Network"

The Nordic Countries (*Denmark, Finland, Iceland, Norway, Sweden*) have arranged DVI-Conferences annually for over 15 years now. In fact, **the first National DVI-Team in the world** was established in **Sweden**, long before Interpol started to recommend such teams and now over a quarter of a century ago.

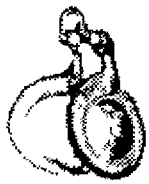
DVI Missions Abroad have already been the practice in many previous mass disasters all over the world. These Missions and the Nordic, European and Worldwide DVI-Meetings mentioned in the beginning of this paper with representatives of perhaps about 100 Interpol member countries are certainly creating an important way of trusted co-operation, an "***Old Boy Network***". These contacts will make establishing liaison and sending experts abroad to work together even more flexible in the future. We just need a list of names and numbers (phone & fax connections) of the DVI-Professionals in each country.

UNDRO, Geneva

Interpol counts today (August, 1993) 169 member countries, the United Nations 184. Interpol has an observer status in the UN The strengthening of the cooperation between these two big world organizations also in DVI seems natural. When visiting the Israeli Police and Dr. Levinson last month in Jerusalem we got valuable information about the **Office of the United Nations Disaster Relief-Co-ordinator** (UNDRO, Geneva, Palais des Nations, 1211 GENEVA 10, Switzerland). Through Interpol channels Dr. Levinson will soon contact the UNDRO to establish connection between the Interpol DVI Committee and the UNDRO Search and Rescue Committee.

SAR Directory, 1991

UNDRO has published a *Directory of International Search and Rescue Teams* (New York, July, 1991). In his foreword the Under-Secretary-General, Disaster Relief Co-ordinator, **M'Hamed Essaafi** stated that the Directory has been prepared in response of the 3rd Meeting of Officials in Charge of National Emergency Relief Services (NERS III), held by UNDRO, Oct. 1989. It provides an authoritative and dynamic register of teams with specialized expertise and equipment which can be deployed with great speed to save lives anywhere in the world, particularly in the developing countries. UNDRO envisages that in addition it will foster an exchange of ideas and experience between the teams included, thereby improving their capability to respond rapidly, effectively and internationally when disaster occurs."



This is almost the same task what DVI-Work is all about, the difference being only if the victims are dead or alive Therefore it seems natural to handcuff these operations and develop a joint strategy. The first edition of the Directory contains information submitted by Governments on 23 governmental and non-governmental Search and Rescue (SAR) Teams, many of which have wide experience in disasters both in their own country and abroad.

Following a recommendation of the NERS III, UNDRO consultants defined a list of criteria to be fulfilled by International SAR-Teams for registration. The criteria covered proven ability and resourcefulness in Search and Rescue, self-sufficiency, particularly with regard to accommodation, food and equipment for a minimum period of 14 days a command/organizational structure for effective and efficient deployment speed and efficiency in response and deployment, both Search and Rescue components, together with a comprehensive list of equipment on hand to support these activities, a Medical component, consisting of Doctors and/or Paramedics specialized in rescue work with a trauma management capability, ethical standards to enable the team to play an effective role in the International SAR effort, displaying sensitivity to local cultural and social customs.

We present here as an example some facts about the FINNRESCUEFORCE: Ministry of Interior, Rescue Department, Number of Personnel: 128 (to be extended to 280 persons, excluding affiliations and liaison), Structure: Commander of Force: Commanding Officer, Chief of Staff Section: Staff Commander, Staff Squad (7 persons), Situations Assessment Section (4 persons) Maintenance Section (11 persons): Transport Team, Repairs Team, Supplies Officer, Communications Service Expert (Radio and Satellite), Technical Service Experts Communications Section (9 persons): radio and satellite communications personnel Information Section (2 persons) Personnel section (3 persons) total: 37 persons, Company Command (6 persons): rescue company chief; chief of rescue operations; command section persons), 3 Rescue Platoons (each of 24 persons) as follows: platoon leader (chief); 3 platoon officers; 3 group leaders (chiefs); 1 rescue officers; 3 engineers (totalling 84 persons) (Note: All rescue platoon crews are multi-skilled professional emergency rescue officers, trained in technical, medical (EMT-A, EMT-P) rescue and firefighting tasks. In addition, one platoon is capable of undertaking airborne (helicopter) operations. Two professional ambulance doctors (EMC-FR traumatologists) can be affiliated to the detachment as well as six search dog teams with 18 search dogs), Response following alert: 4 - 8 hours, Transport· no existing arrangement for priority air transport to Disaster Zone Arrangement foreseen with State-owned airline or with Coast Guard (Ministry of Interior) for military helicopters. No suitable domestic carrier (C-130) available for the transport of very large equipment (trucks). Deployment upon arrival: immediate, SELF-SUFFICIENCY: 14 days· accommodation radio communications 7 - 10 days: food no transport capacity except where off-road crew vehicle and communications vehicle is supported by foreign air carriage (cargo flight or C-130); fuel limited to equipment carried by crew, SEARCH COMPONENT: 1 thermal-imaging detector 1 sonic detector, fixed frequency 18 search dogs (can be affiliated) no ultrasonic detectors, no fibre-optic detectors, Light rescue equipment. 10 hydraulically-operated units, RESCUE COMPONENT: Heavy lifting equipment: 10 airbags, series, 2 heavy-duty jacks, pneumatic, 10 mechanical jacks, 1 hydraulic jack, Pulling equipment: 3 winches, portable, 1 winch, on off-road vehicle, Cutting equipment 10 disc-cutters, 3 gas cutters, 4 electrically-operated chisels, 3 fuel-operated chisels, no pneumatic chisels, LIGHTING EQUIPMENT: 5 portable generators and associated lighting equipment: 5 portable electrical searchlight units, 1 generator 40 KW (on trailer), 1 generator 20 KW (on off-road vehicle), MEDICAL: qualified paramedics, qualified physicians, trauma management capability". - Look, just all the same needed in DVI-Operations. Even Inmarsat Communications!

FINN-RESCUEFORCE

Inmarsat Communications Anywhere

Identity can be well included in the UN and CoE Human Rights, not only when a person is alive, but also after the death. Legally the proper identification of the dead is quite important to avoid many difficulties for the relatives. In most jurisdictions identification is the job of the police . In Anglo-American system the Coroner or Medical Examiner must be satisfied with sufficient ID-evidence, in the Continental systems the police is investigating sudden unexpected deaths using the help of the medicolegal experts and it is an essential part of the whole investigation to identify the bodies. Not only as Mr. Al (fredo) Capone stated: "The job of the police is to count the corpses", but use their scientific expertise in homicide investigations. Already from the ancient times of the birth of Legal Medicine as art and science If you have not read your history quite recently: The Idus of March 15, 43 BC , the Roman Police Chief, the *Praetor*, trusted **Dr. Antistius** in counting and evaluating the 34 wounds of Gaius Iulius Caesar, made with the daggers of the suspected conspirators. The examination of the body was not done in the Forum, but in the Praetorial HQ Laboratory.

A Human Right,

and A Police Matter

It has been the job of the police to preserve the evidence and evaluate it according to generally accepted forensic (the mere word is derived from *Forum* Romanum) principles. Therefore it seems only natural **not** to do the whole ID-Work in a jungle or in a desert, **but** to move the bodies to proper premises, like the procedure went in the classic New Zealand case called *"Operation Overdue."*

Practical Step # 1, after the contacts with Interpol and UNDRO have been cultivated, might be the idea of a **Joint Venture Back-Up System**. These arrangements are a current trend now in the Computer Security. The benefits are obvious enough: **it saves time and money.** The DVI-Application would for example include special DVI-Stakes and **DVI-Coffins**. The Finnish DVI-Team has about 6000 Glass-Fibre **Stakes** with coloured number sheets and 300 DVI-Coffins **(see Appendices # 3a, and 3b)** stored in the basement of the Finnish DVI Centre (Helsinki University, Institute of Forensic Medicine). As **Appendix 3c** we include here the innovation of a **DVI-Cooltainer**, a special design flight cargo container, which fulfils international body transport regulations.

DVI-Cooltainers

For details, consult your Interpol 1984 DVI-Manual, pp. 34-35, Berlin, 1937, Agreement's Articles 3, 5-8, and pp. 36-37, Council of Europe's, 1973, Strasbourg Agreement's Article 6, pp. 38-39, Pan American and World Health Organizations's Resolution, Washington, D.C., 1966, Articles 5-8.

The cargo space dimensions of many aircraft types will allow the DVI-Cooltainers (filled with DVI-Coffins). For example Van Riemsdijk Rotterdam's Cooltainers are made to measure. Exact specifications vary from one situation to another. They consist of aluminium sandwichpanels filled with insulation foam. A choice can be made from two cooling systems: dry ice or battery operated fan. Tare weights are minimal, three hundred bodies inside (300 x 75 kg = 22.500) in DVI Coffins (300 x 12 kg = 3600) makes a total of 26.100 kg. It has been estimated that one large size DVI-Cooltainer would cost less than 5.000 USD. The duplication of the DVI-Coffin and DVI-Cooltainer (the latter is non existent yet) equipment would cost approximately 25.000 USD.

Insurance Pool

If we consult and convince for example the Insurance Companies Associations on different continents it might be possible to get the necessary financing with their help. Besides, its totally a part of the overall Risk Management, what Insurance Business is all about. Sharing risks reduces the cost enormously. When you buy a flight ticket you can legally expect that you or in the worst scenario your body will be transported to the promised destination. So, legally, the obligation is self evident. It's just a question of awareness of the key persons to build the framework.

The Back-Up Material would not, of course, be free of charge for the insurers. The country (or for example a Commercial Aviation Company or perhaps the European / North American /South American etc. Aviation Insurers Pool behind), which orders the material, has to pay 25.000 USD to build up a similar preparedness again. If so, then it would take only 2-6 hours to airlift the DVI-Stakes, - Coffins and -Cooltainers (about 4 - 5000 kilograms) almost to any disaster scene in the countries concerned. The same basic idea applies, of course, to other geographical areas and to other, more expensive equipment, as well.

The use of special DVI-Coffins and Cooltainers is admittedly a matter of opinion, but we can presume, that the family members of the victims would certainly see their next of kin more likely in the DVI-Coffins than in more or less primitive plastic bags or heavy zinc boxes. This is also an image question for the countries and companies concerned.

Preserving the Evidence Is Elementary, My Dear Watson!

But the most important features of the DVI-Coffins and Containers are the forensic ones: it ensures that the vital evidence, the true identity of the victim, will not be lost forever. The evidence material should not be damaged by motion. impacts or excessive handling. As a general rule in criminalistics evidence must be transported to a well equipped laboratory. Therefore ad hoc crime labs, if possible, should not be established in deep, snowy forests, rainy jungles, hot deserts, Hindu-, Shinto- or any other temples etc. Experience has proved, that then you often get zinc coffins with "Do Not Open"-Tags. If you do, you will find amazing things like we: three legged Finns, coffins filled with mere sand or logs simulating bodies (even with the formaline treatment charged, so that "the relatives believe better the symbolic body").

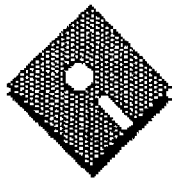
A M and P M FORMS International Database

As a **Practical Step # 2** forward in the chain of Interpol efforts in the computerization of the identification process could be what the de facto Finnish DVI-Team, Interpol-Helsinki, suggested in Lyons August, 1990. Creating an International Databank of Disaster Victim Identification Information based on Interpol AM and PM FORMS There are no legal obstacles either, because the names of the persons are easily changed as fictitious for privacy protection reasons. We presume that the lack of understanding the proper interpretation of privacy laws and international agreements (UN, CoE or any) has prevented the various DVI-Teams from sending the material to us Then, of course, filling the forms will take some time and manpower But the wise DVI-Team Chief will always find it, when he thinks closer about our reasoning.

Here is our **idea in a nutshell** . When all the DVI-Teams mentioned before would collect ten (10) sets of **real** disaster victim information this could easily be compiled into a database of about 250 victims. - We are ready to do the processing work and distribute the final database for all DVI-Teams of all countries in an electronic form suitable for all and for the benefit of all concerned.

There are no technical obstacles whatsoever, because every microcomputer nowadays understands the "Text Only" (ASCII) Format. We just have to know your favourite diskette size (720, 1.4, 2.8 KB/MB) and then your country's national DVI-Team will receive the whole database in what format you prefer. If you additionally mention the name of your favourite word processor program (Word, Word for Windows. Word Perfect, etc.) we even can get it in the same lay-out for you. The diskettes are free of charge, of course. The only must is to use one common language. This, we propose, would be English, as were the originals of the new Interpol DVI-Forms. The yellow and pink forms can be filled with handwriting, if it is readable (we have some handwriting wizards in the crime lab, too, and a pharmacy just around the corner). If typed, even better.

Why do we need such a database? - The answer is simple. Computer Aided Disaster Victim Identification Systems are not yet perfect. There certainly is a need for further Research and Development. With this model database every country would possess real international material for testing their programs and mock-training their staff. Product testing and evaluation must follow the same scientific protocol (i.e. the Interpol DVI-Forms) if the results and comparisons are to be meaningful. It would then be much more comfortable to internationally exchange experiences about the different features of different solutions and see the bottom line of next generation applications. The collection of common AM and PM Benchmark Data is undoubtedly a Conditio Sine Qua Non for objective evaluation and testing. With the valuable help of the Norwegian, German and Austrian DVI-Teams (special thanks again to Dr. ***Tore Solheim,*** Oslo) we now possess a dental AM-PM information file with about 400 persons, which very well simulates the real world DVI-environment. The unsolved problem still is **other than dental** data.



Research & Development

Mock-Training

358-0-134471, (International)

The Final Argument: the mere filling of ten (10) new forms gives well needed practice to everyone. It would deepen the practical cooperation between the various DVI-Teams and at least draws attention in every country to the benefits of using the new (unanimously adopted and mostly due misunderstanding criticized) forms. Please, fill and send them at your earliest convenience. If some ignorant bureaucrat or lawyer claims that you are breaking the privacy law when collecting and sending this data abroad to a foreign policeman, call us Being a member of a Council of Europe Working Group on Computer Crime Procedural Problems we offer competent legal consultation also in privacy protection for free

Practical Step # 2 is a prerequisite for **Step # 3.** We do not want to go too deep in technical details here, but for example following four different basic DVI-Computerization solutions exist already in Europe and North America alone:

1. Processing Environment: *Mainframe - Mini - Microcomputers*
2. User Interface: *Code Oriented - Graphic Oriented*
3. Comparison Criteria: *Dental Data - Other Physical Characteristics*
4. Comparison Mode. *Simple Searches - Top Ten Hit List Approach*

There is no need for any country to change their working habits and throw their software and hardware through the window. No extra cost is necessary. But the Collection of AM and PM Benchmark Data is a must for the Objective Evaluation of Computerized DVI-Systems. If you do not know the others, it is impossible to estimate yourself The AM + PM Database (both dental and non-dental) is the yardstick.

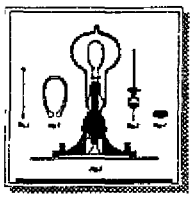
Practical Step # 4. When planning for future we will benefit much from the past experiences of many international DVI-Teams The only way to make proper use of this vast know-how reservoir is to collect and analyze the material and condense the knowledge into a **DVI Reference Databank.** It has already been agreed that Interpol should establish a comprehensive DVI Library. *Dr. Levinson* has suggested that the effort be coordinated with PAHO and their index/abstract programme. There are many other excellent sources, too. For example the U.S. Index Medicus, which your can read with your CD-drive. There is much practical work to be done with the Manual Update, DVI-Team Inventory, Inventory of the Other DVI-Key Players, (and finding out how they can participate in DVI-R&D), Collection and Analysis of DVI-Case Reports, Collection of DVI-Videos, etc. The possible output after the collection phase could be deliverables in the form of a DVI-Video and a DVI-CD-ROM. The first can be done in many crime labs today and latter is not time consuming or expensive any more The answer is Recordable CDs. We could have all the valuable articles, case-reports and photographs on a tiny CD-R disc Even the New Manual, which could be then printed and translated without sending papers to any National Central Bureau of Interpol. This is the way by which for example the Swedish National Police operates nowadays.

1.2. Criminalistics and DVI

1.2.1. The Definition of Criminalistics

"How To Find Out"

Modern *Criminalistics* (*Alias* Investigation or Forensic Science) can as a science and practical work be *defined* "to be the sum of such knowledge based systems which create the theoretical and practical basis for crime repression and prevention by legislative actions and other measures." - This criminalistic approach is very comprehensive in nature including not only the criminal proceedings, the investigation of crimes (including accidents) and prosecution *in casu*, but also the components of legal infrastructures and other protective policing countermeasures in the law enforcement arsenal of the modern society. The investigative frame has always to be established with the possibility of human act or omission in mind No need to be a terrorist attack, merely drinking a few beers in connection of commercial flying is severe enough to endanger human lives.



Criminal investigation, in turn is for the essential parts nothing but applied informatics. Logically and philosophically: collecting and analysing information to **extract evidence** - The former President of International Association of Forensic Sciences (IAFS), Mr. **Stuart S. Kind**, defined the science of Criminal Investigation in Vancouver, B.C., Canada, at the 11th Meeting, 1987, to be **"a heuristic study how to find out "**. Mr. Kind wrote in a letter about the subject to the Finnish de facto DVI-Team as follows: "Currently I am concerned, inter alia, with promoting the idea that there is such a thing as "Investigation Science". Were one to mention the name to a forensic scientist he would nowadays respond by enumerating all the things that "science" can do for the investigator in terms of anything from *postmortem technique* to document examination, bloodstain grouping, toxicological analysis, automatic fingerprint searching and *computer filing systems* to mention only a few.- This is **not** what I mean. What I have in mind has a much more logical and philosophical emphasis and deals with the *structures and functions of whole systems* which are designed to investigate crime." - This seems to suit very well to disaster investigation as such, too. The philosophy in the latest work of Mr. Kind, "The Scientific Investigation of Crime" (1987, Forensic Sciences Services Ltd, Harrogate, England, ISBN 0 9512584) is highly recommended reading, if you really have interest to see the "Big Picture" of Criminalistics.

1.2. 2. E Mortuis Verum

The Truth From The Dead

The National Image at Stake

The purpose of ID in mass disaster is expressed in a nutshell in the Latin maxim of forensic medicine: "*E Mortuis Verum* " - "The Truth from the Dead ". Legal and human interests investigations and identification are inter-dependent. Identification is pre-eminently a tool of investigation: the cause of accident, the sequence of accident, the effect on safety factors, possible crime and perpetrator(s). But it also has major medico-legal significance and judicial application. The questions of the division of inheritance, problems of who of the relatives survived longer alive, matrimony and insurance need to be answered. Quickly and correctly. And there are important humanitarian, religious and sociological interests involved If the repatriated bodies are not correctly identified it will cause much unnecessary sorrow and trouble for the families concerned. From the national point of view. the proper handling of the overall situation affects the **image of the whole nation** and country, where the disaster happens.

1.2.3. The Basic Question of Criminalistics: *QUIS* - WHO ?

In disasters (even in minor cases with 10-20 victims, we include them, too, in the definition) the proper identification of the victims is of paramount importance for the success (or failure) of the whole investigation. It is apparent that the useful interpretation of human factor findings is dependent upon accurate identification of the casualties involved. If we can not tell in flight accidents and crimes connected with flying, who are passengers and who the members of the crew, how can we expect to be able to answer the other very essential questions like why etc.

The whole business idea of the "heuristic study" is to find answers to the *Seven Golden Questions of Criminalistics*:: **1. Who?** (the perpetrators, accomplices, plaintiffs, witnesses), **2.** When? (time of the offences, observations), **3.** Where? (the scenes of the crimes), **4.** What? (the nature of the crimes), **5.** How? (description of the deeds), **6.** With What? (instruments of crimes), and **7.** Why? (the reasons for the crimes or incidents).

Still the same basic problems as the old Roman Police Chief, the *Praetor*, and his adjutant, Dr. *Antistius*, had to solve about 2000 years ago: ***"Quis,** Quid, Ubi, Quibus Auxiliis, Quomodo, Quando, Cur?"* Notice, that # 1 of the seven, Who?, has to be answered first. Before you can catch your murderer you have to identify the victim.

1.2.4. The Basic Concepts of Criminalistics: Characteristics and Identification

The definitions of **Identity** and **Identification** (the words come from Latin, *idem* =same and *facere*=to make) are elementary, but widely unknown concepts for all DVI-Team members. We would like here to recommend the reading of the excellent work of Dr. Dr. *Rolf Endris*, a most experienced member of the German BKA IDKO (Forensische Katastrophenmedizin, p. 23-, Heidelberg, 1982).

Rolf Endris

Endris cites among other great scientists the good old *Aristotle*. He explains then mathematical logic like this: "Der mathematischen Logik (Prädikatenkalkül) ist das Identitätsprinzip vertraut -- x und y sind dann und nur dann identisch, wenn jede Eigenschaft P von x zugleich auch Eigenschaft von y ist, und umgekehrt." - All right, but in criminal investigations one must take into account that for example a fingeprint pattern in a "living" or "dead" finger is not at all exactly the same as the image of black ink or computer bit stream in an AFIS-file. One compares the **characteristics** *(Merkmale)* of two different items, which never van be the same. Actually, idem facere, is impossible

Probability and Information Theories

The evidence evaluation in criminalistics is not mathematical, but legal. In the Continental Law, *conviction raisonnée, kein vernünftiger Zweifel*, etc., and in Anglo-American Law *"Beyond reasonalbel Doubt"*. This does not mean that the investigators do not apply mathematics and logic in their thinking On the contrary The investigative frame is reduced just like the famous Russian probability mathematician **A.N. Kolmogorov** presented ("Foundations of the Theory of Probability", in English 1950) as his basic postulate: "If two or more casual entities occur at the same time, the probability of the combined occurrences becomes relevant." The graphic shows the idea very clearly:

Andrey Nikolayevich Kolmogorov

John Maynard Keynes

And, on the other hand, the famous English economist **John Maynard Keynes**, has stressed the importance of the following principle: " *The probability is such a degree of rational belief, which **not necessarily** can be put in a measurable form*". - For example: identifying a suspect in a homicide investigation with the help of fibers (contamination between the victim and the perpetrator, items on the crime scene etc.) does not need any statistics about how common a certain type of a textile fiber is in certain geographical area If there are enough matching items, the probability it is beyond reasonable doubt. The chance of the formation of the crossing of the, say, 12, rings of unknown size, is very small. Just like with fingerprints. As a rule many countries use 12 identical characteristics called *minutiae*. But even less could be enough, if the characteristic feature is very uncommon. Then we come to the Information Theory: the more uncommon the characteristic or feature (signal, item, fingerprint pattern, bitstring, dental characteristic, etc.) the more information it yields.

Information Theory

Individual Uniqueness - A Rule of Experience

The answer to the question # 1 of criminalistics is based on the law of non-disappearance of the materia and the rule of experience that **all items and individuals are unique**. We do not have to list here in this paper all the various biological features on which this important capability is forensically based on. There are very many of them, for the living and for the dead, but the two most important for us today are based on fingerprints and dentition. The newcomer, DNA identification, has enormous potential with human, animal and plant cells, but for various reasons still only a limited application in DVI

1.2.5. Legal (and DVI-) Evidence Evaluation Rule: Beyond Reasonable Doubt

A Convincing "Big Picture" of Facts

The Identification Board, which according to the Interpol 1984 DVI Manual consists of the heads of the various Special Sections, is like a court. The rules in finding the truth are exactly the same. The result of the AM and PM data comparison has to be "beyond reasonable doubt". The evidence has to be **evaluated as a whole**, be it categorised in nature to Forensic Medicine (Pathology, Odontology, Serology, Biology, Chemistry etc.), Fingerprints, Personal Effects or Other. It must create a **convincing** and **harmonic entity** consisting of **accurate, numerous** and **different** pieces of **facts**

1.2.6. DVI, Difficult Multi-Disciplinary Operation

DVI-Teams Recommended

"In a case of disaster, many police, technical, medical, and other investigations will have to be carried out" states the Interpol DVI Manual, in which the procedures concerning Disaster Victim Identification are the main theme; and continues. "Disaster Victim Identification is a difficult, multi-disciplinary operation which can only be brought to a successful conclusion if carefully planned. Interpol recommends the formation in every country of permanent Disaster Victim Identification Commissions responsible for pre-planning actions to be taken and for training key personnel foreseen to become involved at various levels.

Three Phases:

Victim identification is only one aspect among several in the handling of a disaster situation. The identification procedures proper have been described in Chapter 4; they include three major phases:

1. AM - 2. PM - 3. COMPARISON

> **1)** the procurement of antemortem physical descriptions of all persons who may possibly be victims (**AM-data**);
> **2)** the recovery and examination of all dead victims in order to establish a reliable postmortem physical description of each victim (**PM-data**);
> **3)** the **Comparison** of AM-data with PM-data. - Whenever appropriate experts find two data sets to correspond, the identity of the victim in question has been established "

In brief : *Compile* the most detailed descriptions possible, *compare* with the help of modern computers, then *do the forensic verifications* and *write the identification certificate.*

As an example see *Appendix # 4,* a model for the **Dental Comparison Report** (Nature of disaster: Flight Accident (Swearingen N 26 RT, Fairchild Merlin 3), Place of disaster: Tuusula, Finland, Date of disaster: Day 23, Month 02, Year 1989). The AM X-Rays showing the teeth and ten (10) amalgam fillings and the X-Ray-anatomical shape of the root filling of d 37 correspond perfectly the shape visible in the PM OPG. Totally 23 id+, id- none. - **The dental identification is therefore beyond reasonable doubt.**

Definition

History