Victim Names
Body Numbers

"Crocodile" Dundee

Substitution Note!

Never Mind of the Scandics!

ÄÖÅ

Learning some ***Latin*** **Again!**

ResEdit 2.1

4.3.6. Data Entry with ToothPics

ToothPics® has its own quite comprehensive manual Here we discuss only the features and details necessary for our work.

The material to be processed can be arranged in two different ways in the ToothPics® databases. AM- and PM-data can be collected in two separate databases or both can be kept in one and the same. The advantage for the first alternative is clarity: the data cannot be mixed with each other. In the latter case it will be easier to compare manually the AM- and PM-files. The PM-records must then to be marked with a certain character. We can use here the letter Z: Z0001, Z0002, Z0003 etc. The Interpol DVI Manual uses Victim Names and Body Reference Numbers. In general the use of the program is basically similar in both cases.

In the dental data entry we can benefit all the features available in ToothPics®. For Personal Information we need at least the Family Name for the AM-records and for the PM records the Body Reference Number. There are two separate fields for forenames, First and Mid, but the nickname option "Nik" is recommended to be left blank. We have used it for Mr. "Crocodile" Dundee. The other fields in the dialogue box, such as D.O.B, Height, Weight, Male, Female and Address Information can be filled, but they will not be included in the comparison output.

ToothPics® does not recognize Scandinavian fonts Ä/ä, Ö/ö and Å/å. For Nordic (and German) names the following replacement scheme is recommended· use AE/ae for Ä/ä like Nykaenen, OE/oe for Ö/ö like Lindstroem, and AA/aa for Å/å like Aangstroem (instead of Nykänen, Lindström and Ångström). There is no harm in this, its just a simple substitution of a simple convention of characters. When the Finnish Gold Medalist's name of the javelin throwing on the Sydney (the birthplace of the DVI-Forms and the host of the Olympic Games, 2000) Stadium shines on the electronic results table there will be no ÅÄÖ's. Forget them.

You might as well forget the 50 or so "scientific" nomenclatures, because we do have their scientific Latin names, universally with the same locations: *dens* ***incisivus*** *centralis, - lateralis, -* ***caninus*** *, -* ***praemolaris*** *primus, - secundus, -* ***molaris*** *primus, - secundus and - tertius.* Then we only have to be careful with the following two parameters Left/Right, Upper/Lower - But this is sometimes difficult for the forensic dentists themselves, too.

Despite of the aforesaid the coming version 3.0 of the ToothPics & Identify package (for the PowerPC's) will add European fonts (German, French, Scandics etc.) and use the two digit FDI-System. Even Japanese, Chinese, Hebrew, Arabic etc. characters are easy to install. You can also easily customize with the ResEdit-program all the Identify Menus into German, Spanish, Italian, or Latin, if you like the classic style (the Finnish Broadcasting Company sends nowadays News in Latin!).

The **Data Entry Steps** are as follows:

1. Start ToothPics®. The Chooser (in the Apple Menu) shall be in the AppleTalk mode If the printer is connected straight to the Mac and it has been used, you should restart before setting the AppleTalk on.

2. Choose the right database, either the AM- or PM-file, if they are saved in separate databases. The location of the database (folder) is determined by the location of the ADA- (acronym for *American Dental Association*) Library.

3. Add the new records with personal and dental data (or update the old ones) Save the changes made after each record.

4. When all the input has been done create the AM- and PM-files for the comparison program (see next chapter).

5. Close ToothPics®

4.3.7. Creating the AM and PM Files

Transfer Information...

ToothPics® provides the ability to generate text files which can be examined, manipulated, and printed by a variety of database management and other programs. In the Detroit-case referred in 4.1. they used the **"Transfer Information... "** Command under the File Menu and selected the Patients name and Mouth Conditions to get the text file for the 4th Dimension ® sorting. The data to be fed into the comparison program is produced in ToothPics® and transferred the same way as said above to the comparison mode with 'Transfer Information ... '-command (under the 'File' Menu). ToothPics® shall be here in "Directory"-mode 3 (all the patients files closed). The creation of the file has three steps:

1. Choose **'Transfer Information '** from the **'File'- menu.**

2. Fill the output FORM. For the personal information only NAME should be selected. From the other patient information choose MOUTH STATE. The records to be included can be chosen according to the first letter of the Family Name. If for example the PM-data is saved in the same database with AM-data and the used markers is the letter Z, you choose for the AM-file the first letters A-Y and for the PM-file Z-Z. If you want to select all, the first letter can be left empty.

3. Give a name for the new file. ToothPics® places it as a default in the same folder with the database. This will not in general be the proper place, we recommend you place it within the same folder as the comparison program (or into a separate work folder).

4.3.8 Running the Comparison Program, Result Interpretation

8 Step Precedure

The comparison procedure of the AM- and PM-files and the finding of the corresponding pairs works step-by-step as follows:

1. Start the comparison program Identify©.

2. Give names to the AM- and PM-files (transferred Tooth-Pics®-files from the previous section)

3. Give a name to the output list. By choosing "Cancel" the output can be directed straight to the printer.

4. Choose the Search Mode and Criteria: Possible Match, Filling Surface, Filling Material or Identical Search.

5. Choose the size of the list of the next likely records. The maximum size is 20, generally 5-10 is enough. Additionally, you can choose if you want always print the list of the next likely records (even then, too, when there are files found fulfilling the criteria)

6. Decide if you want to use the Temporary File.

7. Wait until the comparison processing is done. Read the output on the screen or print it. It takes approximately 0.8 seconds/record- pair in the identical search mode with a Macintosh Plus, about 1 5 sec. searching with the other criteria (this without the temporary File).

The running time will be reduced significantly if we use the newest Macs. The secrecy is in their stronger processors. Anyway, if you have 400 bodies there is time to have a coffee break instead of watching the Mac screen and the "Thermometer" showing graphically the progress made - You can, of course, always stop the process by pointing and clicking STOP. Only the records processed so far will be included in the output list then For more information about comparison acceleration with RAM and RamDisk+ See Page 39.

Have A Break!
or
RAM

8. Delete the interim file ('Identify Temp, just for disk space housecleening).

The "Hit"- List

See Print Screen on page 38

The names of the files and the selected criteria are recorded in the beginning of the "Hit" List-document. The "Hit"- List consists of the marker of each PM-record (UL 0001, UL 0002, UL 0003, 007 or James Bond has to use four digits, 0007, because our program is for mass disasters with thousands of bodies) and then a list of the corresponding AM-records (names like *Dundee, Michael James* and so on, see page 38).

*** or !**

If there is no a special marker (* or !) at all before the name of a person, this person has fulfilled the preset search criteria. These names are in alphabetical order. Probability does not play a role yet. The names with an asterisk (*) or exclamation mark (!) in front belong to the list of the next probable records and they are in a probability order: i.e. the first is the most likely candidate, despite the fact that none of these fulfils the criteria exactly The exclamation mark in front of several names means they have the same score. It is then also possible that the right person has not been included on the list at all. You should run the results again by enlarging the size of the list of the next likely records.

4.3.9. Troubleshooting

Don't Panic, Check the Power First

This chapter lists some common problems (as encountered in the test phases) and suggests solutions. Many problems are easy to solve **Is the power cord plugged in ?**

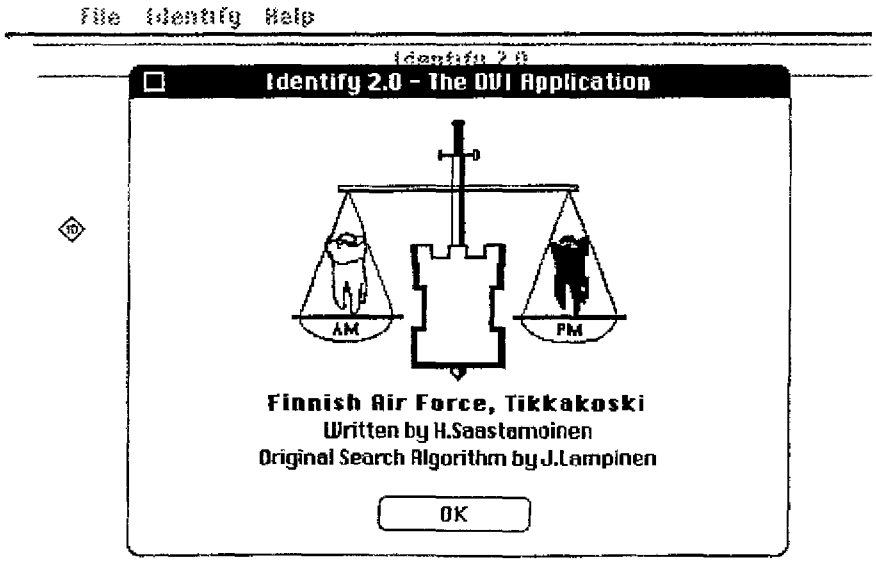
AM- or PM-file stays empty

Indicates most likely confusions in the different ways to display the date. ToothPics® uses the Anglo-American convention to show dates: Month/Day/Year. In the various Macintosh programs it is also possible to use other conventions : Day/Month/Year or Year/ Month/Day. The first is used for example in Finland and the latter in Sweden. - So, don't panic here either. Correction: Give the dates in proper form (enough from backwards and until to day). For example, dates beginning January 1st, 1985, up to day, Octber 26th, 1990, should be given in form: 01/01/85 - 26/10/90.

The comparison program **Identify** © gives a clear text message for each type of error.

4.3.10. Identify© 2.0 Screens and Menus

The Screens and Menus are straightforward and typical for Macintosh. The opening ("double-cklicking" the program icon, you will learn it, do not be afraid, even if you are "Character Oriented" and suffer Mouse Allergy) presents the logo:



Identify 2.0

Clicking the **OK** button brings us to the Menus, first on the right is the standard Apple followed by three Identify Menus: **File, Identify and Help.** We have already set up here the AM and PM Files and named the output as **"Düsselforf, IAFS'93"**.

OK

File Identify Help

Identify 2.0

Ante Mortem File:	AM-File
Post Mortem File:	PM-File
Output File:	Düsseldorf, IAFS'93
Hardcopy:	No
Criterion:	Identical Dentition
Print Mode:	No
Size of the List:	10

Our Criterion Choice (see the explanations somewhat later when we explain the Help-feature) is *"Identical Dentition"*.

File Identify Help

Search Criteria

Search Criteria

- ○ Default Search
- ○ Compare Surface of Fillings
- ○ Compare Material of Fillings
- ● Identical Dentition

Then we set the size of the Probability List: **Top Ten** like in the multimillion pricetag bearing Automated Fingerprint Identification Systems (remember most of the DVI dental systems available **do not have this feature at all**, they are actually only **semi-automated** and represent an earlier generation).

File Identify Help

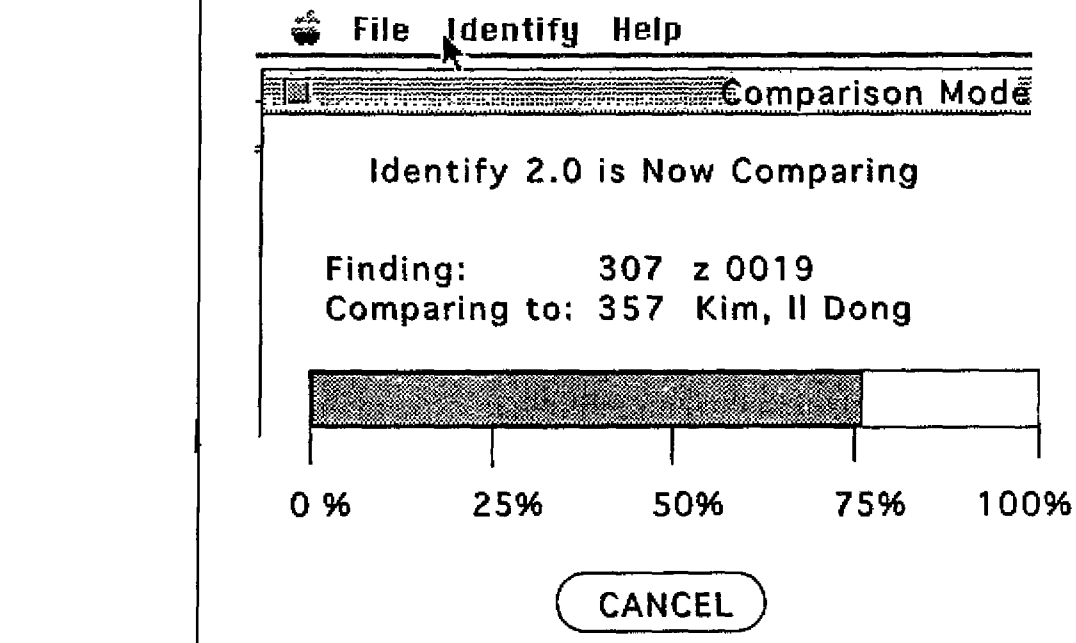
Search Criteria

Size of the Probability List

○ 5 ● 10 ○ 15 ○ 20

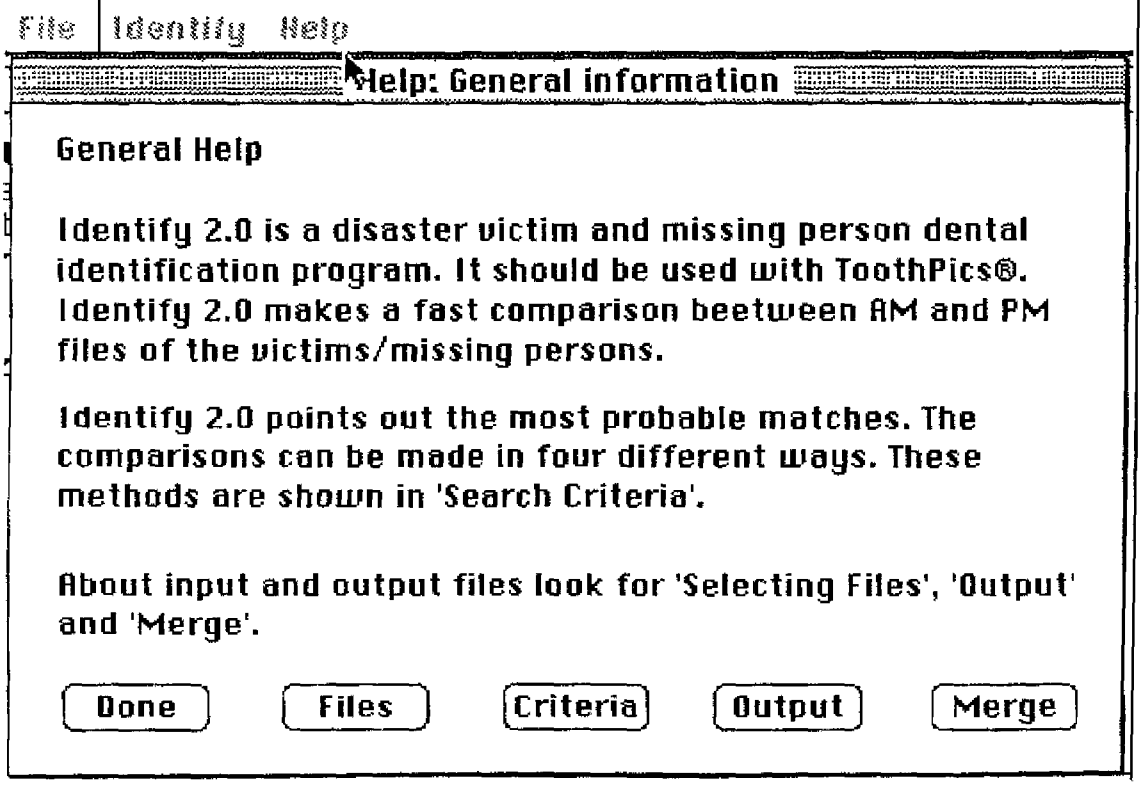
- ○ Write List as Default
- ○ Write List if Necessary

For those with mouse-allegy or good memory we have several shortcuts with Command Keys The most important is **Command + I**, which gets the comparison running On the next page we have the screen after abou tthree fouths or 75 % of the AM and PM files being compared and results calculated



When the program is running with the remaining 25 % we will have a quick look for the six **Help Screens**:

1) General Information,
2) Selecting Files,
3) Search Criterias I
4) Search Criterias II,
5) Output, and
6) Merge.



Help: Selecting files

Selecting Files

Identify 2.0 operates with ToothPics® created files. The AM-file consists of the dental data of the victims or missing persons, the PM-file of the recovered and unknown bodies.

These files can be opened and closed from the File Menu. Different AM and PM files can be merged together. More about this option in Merge Help.

The Output File shows the probability list of the best matches. Print this file with your favorite word processor or TeachText. A hardcopy can also be simultaneously produced with List To Print.

Done

Help: Search criterias

Search Criteria

There are two main methods to compare AM an PM dental statuses, Identical and Default Search.

Identical Search compares all the dental surfaces including the general condition of dentition and amount and material of fillings.

If a matching AM and PM pair is not found, Identify 2.0 will create a probability list. Choose the size of the list by selecting 'Specify List' from the 'Identify' Menu.

More Done

Help: Search criterias

The deduction of the best candidates is done by certain logical rules. For the complete description of these rules, consult the Identify 2.0 Manual.

Default Search determines if a PM dentition can be derived from a certain AM dentition. In this case the program checks only if a tooth is treated or virgin.

If no match is found, a probability list will be given. For comparing the surfaces of the fillings or the filling materials, choose the corresponding option in Search Criteria.

For best results, select 'Identical Dentition'. Enhance the comparison with Default Search. Comparisons with the surfaces and the filling materials are supplementary features.

Done

Help: Output

Identify 2.0 produces a standard text file which can be viewed and printed with almost any word processor.

To direct the output to the printer, select 'Print List' item from 'File' menu.

Output to the file and the printer can run simultaneously. The printer should be set ready before starting comparison to avoid write error. The printing starts immediately when the comparision begins.

Done

Help: Merge

Merge

Merge is a function combining two text files to one. It has no effect to the original files, they are just copied.

Select the files to be linked from 'Merge' under the 'File' Menu. 'Open First File' selects the first part of the merge. 'Open Second File' selects the last one.

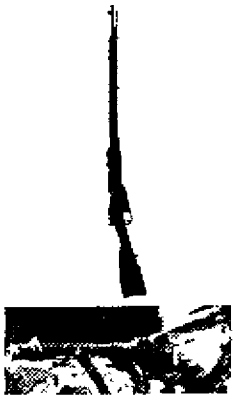
Use the 'Open Result File' to create and open the combined file. To close these files use 'Close All' command. After the merging operation the files will be closed automatically.

Done

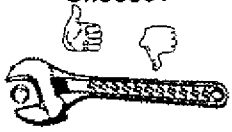
File Edit Search Format Font Compile Transfer

Identify 2.0 368-results

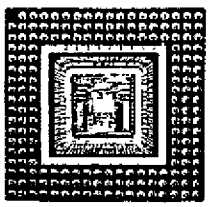
```
Identify 2.0 DVI Program
Ante Mortem File: AM-368
Post Mortem File: PM-368
Criterion:        Identical Dentition


UL 0001
      * Dundee, Michael James
      * Bargeld  Hans
      * Mustonen  A
      * Schütze  JU
      * Sarlin  Marjatta
      * Jaervinen  VT
      * Aaltonen  T
      * Joule  KG
      * Krogg  Elias
      * Lehtimaeki  JV

UL 0005
      * Zeuge  Marianne
      * Jeppesen  Lars
      * Korhonen  S
      * Frick, Jürgen
      * Laitinen  Matti
      * Zapata  Rosita
      * Zapata  Hans Petter
      * Fastnäs  Christian
      * Goldfinger  John
      * Hansen  Helly

UL 0006
      * Tuan  Chin-Jui
      * Tu Tse  Kong
      * Laitinen  Matti
      * Toivanen  Reino
      * Fastnäs  Christian
      * Goldfinger  John
```



Which One Would You Choose?



ADP
alias
EDP



68040

RamDisk+

4.3.11. Identify© 2.0 Comparison Time and RAM

As stated before there are two types of dental DVI-programs. The first is the Simple Search-Type. This type can be compared with single shot infantry rifles. The good old **Infantry rifles** used in the **World War I** and after. The "sniper" is looking for special details in AM and PM dentition characteristics to hit his target. The system is accurate but too slow to load, if you have a tight situation. The Finns learned it in the Winter War, 1939-1940. The Suomi Submachine Gun (SMG) created its own discipline in target shooting. With it the best Forest Fighters could kill more than one enemy company in less than 30 minutes. The Winter War revolutionized attitudes to the employment of the SMG as well as the number of guns required. It is not boasting to say, that **SUOMI SMG** has been one of the most famous and respected military innovations in its series of the 20th century

The same HEUREKA-effect will perhaps be discovered, if someone used to "snipe" with his/her old, trusted Simple Search Non-Automatic Dental DVI-Program dares to try more modern tools. We know this is hard, because the principle and mechanism in automatic weapons is different and strange to them. The rusty bolts in the heads should be wrenched with the great Swedish Innovation, the Adjustable Spanner. The basic principle, as we have mentioned earlier, is totally diffrent in automated dental identification programs. The honor of the discovery belongs to Colonel Lewis Lorton and the U.S. Army Institute for Dental Research. Decision-Making Concepts in Postmortem Identification and Criteria for Optimized Searching Methods in Identify c 2.0 are "stolen property". We did not begin from scratch, like some others. We "spied" on Col. Lorton and his system in USA. The basic rule (if you do not believe, look Lorton et alii, *Journal of Forensic Sciences*, 1985, three separate articles) is the same as Field Marshall von Hindenburg's. Only simple things will succeed. In Information Technology (IT, InformationsTechnik) like most of us already know, the axiom is: **"Keep It Simple, Stupid, KISS (acronym)."**

In Identify 2.0 if you compare 10 AM and 10 PM forms there will be 10x10 comparisons on the file level and 32x5=160 on the surface level. We do not have a degree in arithmetics, but the amount of comparative calculations in a Jumbo-Jet disaster of 400 victims is as follows. 400x400 = 160.000, multiplied by 160, makes 25.600.000. If you do it manually, it takes some time, even you would have the velocity of Mr. Speedy Gonzales. Think in your mind a long, long, table with the AM and PM dental forms wide open and the forensic dentist running, taking notes and comparing. How long would it take manually? A day, a week, a month, or a year?

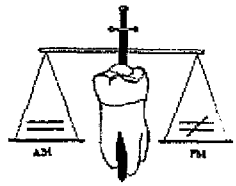
Automated Data Processing is nothing else than a queue of successive primitive operations. But fast. There are two systems to do the DVI-comparison trick with the computer: the old one and the new one.

In the old one the processor (in the old Macs generally a Motorola 68xx0) asks a hard drive to retrieve specific blocks of information, the drive's logic board positions the read-write head over the track that contains the requested blocks (each block has a specific, known location). Then the logic board waits for the rotating disk to bring the reguested blocks to the head. Without going further, even this takes some time. With 400 AM and PM files a little more than an hour.

RandomAccess Memory, RAM, then, is an internal memory component, usually a semiconductor, that data can be read from and written to. Data is transfered from a disk or diskette to RAM during processing. Since a semiconductor is volatile, data can be lost from RAM if electrical power is interrupted during processing. But the Motorola processors shine in the ability of pointing large areas of the RAM. Therefore, the comparison time can be reduced by half. From one hour to 30 minutes. This will only succeed with the 68040 chip, at the actual size on the right. The new Macs come with this nicety. If you have atleast 8 MB of RAM, the AM and PM files (about 3,5 MB) will fit, and you can run Identify 2.0 straight, without "jogging" back and forth the hard-drive basement

The rest of us can circumvent the problem, if we have a small program, *RamDisk+*. This little program creates a virtual memory and shortens the "jogging" time and distance by 50 %.
The new IBM, Apple, and Motorola's Power PC technology promises low-cost, high-speed systems (several new RISC-processors), that not only can run Windows, Mac, O/S2, and Unix software, but will reduce the time for Identify 2.0 (or 3.0) to compare 400 AM and PM dental and other than dental files in 1/5 of the time needed at the moment. These things are promised to be ready next year.

4.3.12. Identify©2.0 Accuracy - A Real Precision System



Captain **Hannu Mäkelä,** a Dental Officer in the Finnish Air Force is in the finishing stages of an academic dissertation hopefully approved next autumn by the Faculty of Medicine of the University of Helsinki. The aim of the study, "Computer Assisted Identification of Disaster Victims", was:
1) to find out possibilities for developing an in-the-field utilizable computer application for dental identification in investigation of mass disasters,
2) to prove the application concerning about processing of missing persons and unknown bodies,
3) to find out influences of identification material on the operation of the application using separate test records and authentic records of various disasters, and
4) to analyze investigation material in view of forensic dental identification.

Captain Mäkelä presents as his first table the following collection:

Disaster	Date	Fatalities	ID %
KLM/Pan AM	27.03.1977	577	89
Pan AM	09.07.1982	154	75
Beirut	23.10.1983	239	83
Delta Air Lines	02.08.1985	131	68
Arrow Airlines	12.12.1985	256	90
Aeroméxico	31.08.1986	100	77
Northwest	16.08.1987	156	83
Ramstein	28.08.1988	43	17
Scandinavian Star	07.04.1990	158	68

The Criminalistic Bottom Line - Dental ID is by far #1 DVI - Workhorse

For DVI-Work the criminalistic bottom line is clear: *dental identification presents by far the most important way of do the job successfully and beyond reasonalble doubt (so und so, und nicht anders)* There is no need to add the figures from Appendix # 7a, the Sioux City (more than 100 of 111). The analysis of the investigation material representing random population samples gives even more criminalistic basis for the dental DVI-Work in general (remember the Finnish retired peoples home fire mentioned earlier, with only one tooth left for the whole bunch). Just like the population study in the field of DNA-Identification done by *Antti Sajantila* and *Bruce Budowle,* FBI.

Missing Persons & Unknown Bodies Database Application

The computer application Identify© completed with the ToothPics® is also suitable for identification of unknown individual bodies and missing persons. In this case a database that includes the dental data of unknown bodies corresponds a post mortem database. An ante mortem database includes the dental data of missing persons. It would be rational and advisable to request dental data of missing persons from their dentists after a certain time has elapsed from a disappearance and save it in a computer for possible identification later. The actual search and comparison for example in the Missing Persons and Unknown Bodies Batabase with 1.000 individuals takes less than a second and the analysis speed is virtually the same as the users brain.

Accuracy Testing - Compare Identify & Tomahawks "Hit Lists" (see next page)

The accuracy of the Identify© program was proved with: 1) a test group having a known dentition, and 2) recorded authentic dental data from disasters and regarding the results of investigation boards as reference. The second category test groups were built of the authentic material from different kinds of mass disaster. Any influences of real investigation material in test results were thus determined.

The number of missing and restored teeth counted in the ante mortem and post mortem data remained so high, despite the severity of the disasters, that the number of variations necessary for successful identification of victims by dental means was still evident. Depending on the degree of destruction, a sufficient amount of dentition of a burnt body can remain for identification while facial soft tissues are charred. However, victims are mutilated in a more severe manner in aircraft disasters. Mechanical hit energy and broken pieces of an aircraft cause additional damage.

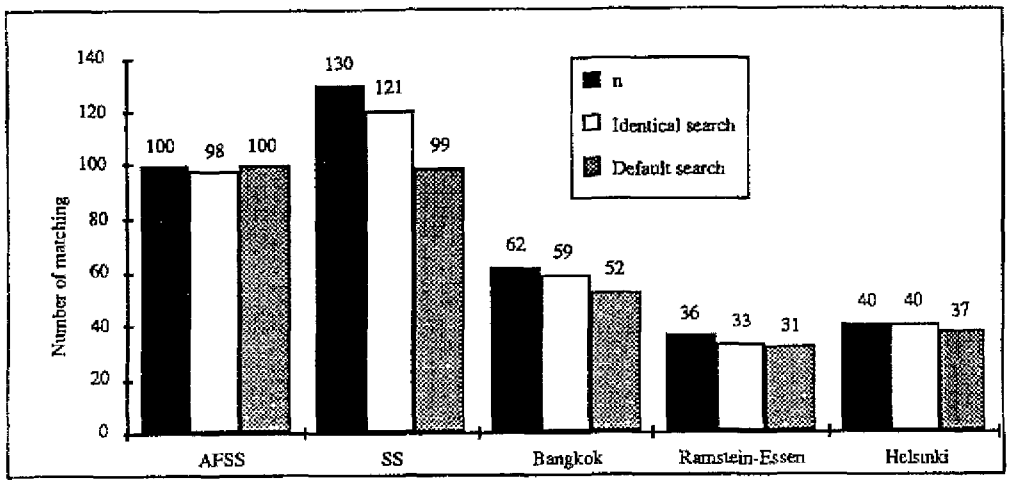
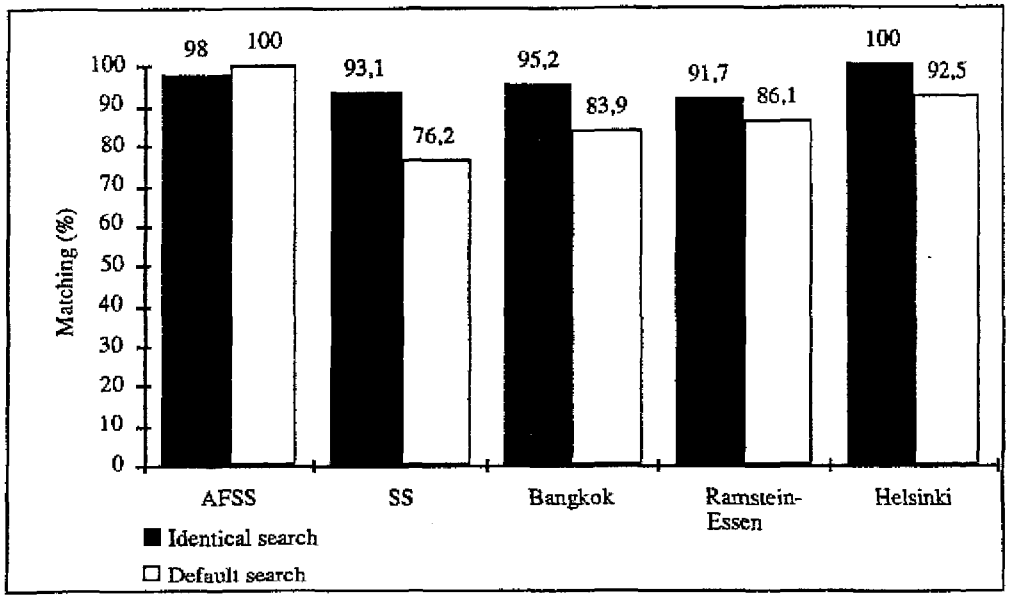


Fig. 108. Matching of ante mortem and post mortem pairs in different test groupsAFSS = Air Force Signal School, SS = Scandinavian Star disaster, Bangkok = Bangkok aircraft accident, Ramstein-Essen = Ramstein and Essen aircraft accidents, Helsinki = Finnish material.

PRINTRAK™ MORPHO™ NEC™, TOP TEN CAPABILITY

The percentage of successful matchings in different test groups with the identical and the default search is shown in Fig. 109 below. This material could be run also with CAPMI and IBIS, which besides Identify are still the only system s(at least known to us today, pardon & Entschuldigung, if incorrect) capable for real criminalistic Top Ten Hit Listings like the counterparts in computerized fingerprint identification (Printrak Orion, NEC, and Morpho).



Accuracy Testing - Compare Identify & Tomahawk "Hit Lists" (see this page)