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# TECHNICAL REPORT

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Client : DNV

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Title : **MOBILE WORKER:** Evaluation of  
the Inspection suitcase

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Report No. : DNV 1999-2025

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## TECHNICAL REPORT

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**Summary:**

This report describes the experiences from an inspection suitcase. This suitcase is meant to support the work of ships inspectors by providing the access to a laptop, a printer, modem and a digital camera. The whole equipment is battery driven. The basic configuration of the suitcase is that of Bergensen ship owner company. The feedback from the field tests and our own indicate that the standard VerIT 3.0 OS system is not desirable due to the lack of plug&play feature and high power consumption (ca. 1hr battery time). The suitcase is further much too heavy and not splash proof. The digital camera should be replaced with one allowing speech recording to each picture. A much more powerful slave flash triggered by the cameras own should be also supplied. The whole suitcase concept should be abandoned in favour of a backpack solution.

However, the main drawback of this concept is that it cannot assist the surveyor at the inspection site – only in the e.g. captains office when finishing up the inspection.

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**Indexing terms**

Survey  
Suitcase  
Mobile work

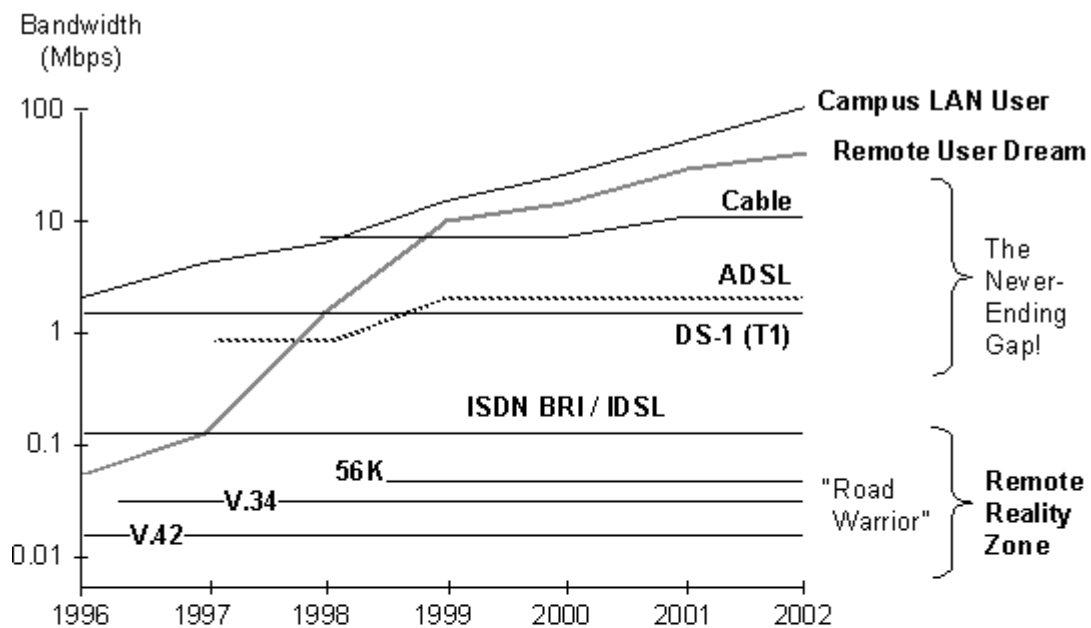
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- Unrestricted distribution since March 2000

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# 1 INTRODUCTION

Miniaturisation of electronic devices and remote access to information is not a reversible trend. Enterprises must anticipate growing remote access requirements, and plan to modify their business processes accordingly. IT budgets have to be adapted to exploit these new work paradigms and IT planners must much more take the end-user into the processes connected with design of remote work styles. Enterprises that fail to address the evolution of network services and technologies to provide for remote workers will incur higher-than-necessary costs for connections and support, and lower user-satisfaction levels (Girard & Smith, 1999).



### Minimum Online Bandwidth Expectation (1999)

Feature	Minimum Kbps
Desktop video	64
Replicated data	128
Two voice calls	64
Client/server	256
Dedicated Web	64

**Total = 576 Kbps uncompressed, unmultiplexed**

- ADSL Asymmetric digital subscriber line
- BRI Basic Rate Interface
- IDSL ISDN digital subscriber line
- ISDN Integrated Services Digital Network

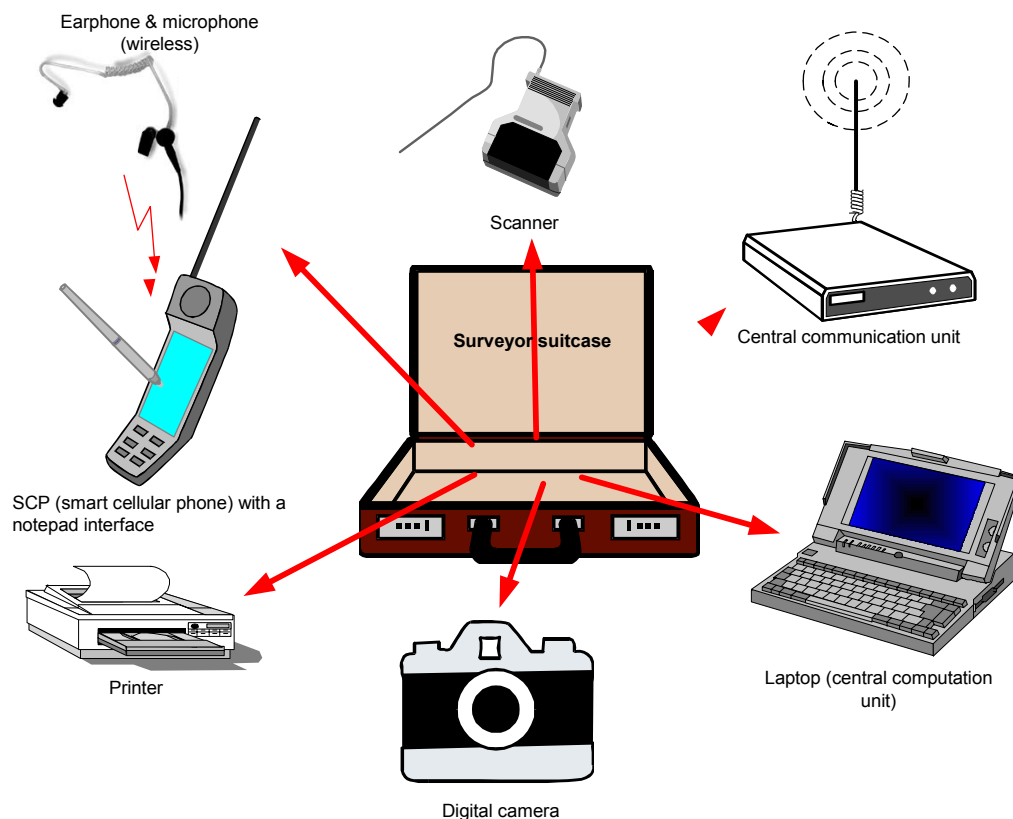
**Figure 1: Available bandwidth** (Source GartnerGroup)

The introduction of mobile solutions and mobile equipment to surveyors will provide a variety of challenges, as the transition from the traditional work method to a more mobile computing-based work method will be quite comprehensive. These challenges are related to

- technology (what are the tools),
- work processes (how things are organised and done),
- human motivation (how they are accepted).

Traditionally, the surveyor collects data during an inspection using a notebook and a pencil, and can rely only on his or her knowledge and experience during the survey. A most problematic aspect of introducing new technology is to break habits and procedures that interfere with efficient use of the new technology. Two solutions are common: either punish the users who stick to old habits, or adjust the technology and work process so as to motivate change to the most effective means and ways of working.

Tests with the inspection suitcase shall indicate whether the concept of having a suitcase containing various IT-devices will really give added value to DNV or the surveyor or even both.



**Figure 2:** A Inspection suitcase with various IT-equipment suggested on a brainstorming meeting with a couple of experienced surveyors.

**Added Value**

It is important not to be distracted from all the potentials modern high-tech equipment may provide. There are a lot of devices that are very fancy and nice to have. The question however is: what's the pay back value? It is by no means obvious what advantages high-tech devices available nowadays will actually give. It is very easy to be distracted and to focus on minor or secondary problems that fit to the equipment but where nothing is actually gained. Success factors may be:

- time saved
- money saved
- increased work quality
- increased people satisfaction

## 2 REQUIREMENTS AND CONSTRAINTS

The usefulness of any equipment for surveyors is constrained by ambient conditions typically encountered on a vessel. They are

- temperature,
- shock resistance,
- dust and splash proof,
- intrinsic safety
- power supply
- burglary

Especially the aspect of burglary must explicitly be considered. The value of the equipment might correspond to several years of income for a decks hands in developing countries. If the effort of preventing stealing exceeds the expected return value from the equipment it won't be used away from office. Locking it up in the captains cabin may often not be enough.

If a piece of equipment is not ignition safe it cannot be brought into e.g. oil or gas tanks. If it is very bulky it won't be taken into confined spaces such as double bottom etc.

### **Surveyor attitudes**

The attitudes of surveyors towards new technology will also play a major role in their introduction. If a surveyor has no or little experience with e.g. computers he might be quite rejective to any attempt of making him use e.g. a laptop.

If the equipment requires some awkward set-up process every time it is used – it won't be used unless it is absolutely required. This will however lead to dissatisfaction and maybe even sabotage of the equipment.

Further, if the equipment does not function properly, say, a lot of re-starts are necessary or it is slow, people will avoid using it. In this respect equipment is hardware as well as the software.

Other constraints will be weight, size and even appealing. If it is too heavy and too bulky it can only be used in certain situations and environments. If it looks home-made it may be rejected by surveyors with self respect and engaged with prestige.

### 3 INSPECTION SUITCASE

A brain storm meeting in Nov. 1998 together with experienced DNV surveyors resulted in a large lists of items that could be potential candidates of the suitcase contents (see Appendix ).

The results were discussed in the KOMPIS group consisting of researchers from DNV, SINTEF, NORSK REGNESENTRAL, ERICSSON and TELENOR. It was argued that the surveyor himself should be allowed to compose its content (not prescribed). The content should not a god start could be fixed and forced upon the surveyor.

#### 3.1 Possible content:

It was agreed on that the core of the suitcase could be a laptop, printer and modem that could support remote working. Further, it might proof valuable to allow video conferencing, shared screen, internet - telephone connection.

On board the surveyor is often confronted with a lot of drawings. With help of a hand scanner the drawings could then be loaded into the laptop or small notepad. Text documents could be scanned (automatically translated) and converted into editable text (easy info gathering). A printer may provide paper based info if desired.

Requests to Høvik/ local station could be sent from this suitcase. It could therefore act as a base station for the surveyor on the ship. Fax should directly go into his laptop (not rely on ship equipment).

A smart mobile "telephone" (SMT) could be included. It should contain

- a handsfree Dictaphone
- earphones
- small monitor
- connection to basis station (surveyor suitcase)
- drawing facilities

Ships specific drawings, standard drawings and the previous scanned drawings are downloaded into the SMT. SMT should also display items in checklist where in ship. Confronted with a damage the corresponding drawing should be called on the screen and could be modified with a pen. Voice recordings and pictures should be attached on various objects in the drawing.

The SMT should automatically dump its content to the basis station whenever possible. It should be able to down load from the laptop (incoming drawings, sending pictures). Audio messages as e.g. reads a specific rule. Voice recognition e.g. what rules to look for.

Spare audio-video units should be connected with SMT for test purposes, communication with crew, surveillance, ect.

The video /camera should be integrated with the halogen flashlight preferable in the hard hat. Bluetooth connection to SMT. It may also be used in video conferencing.

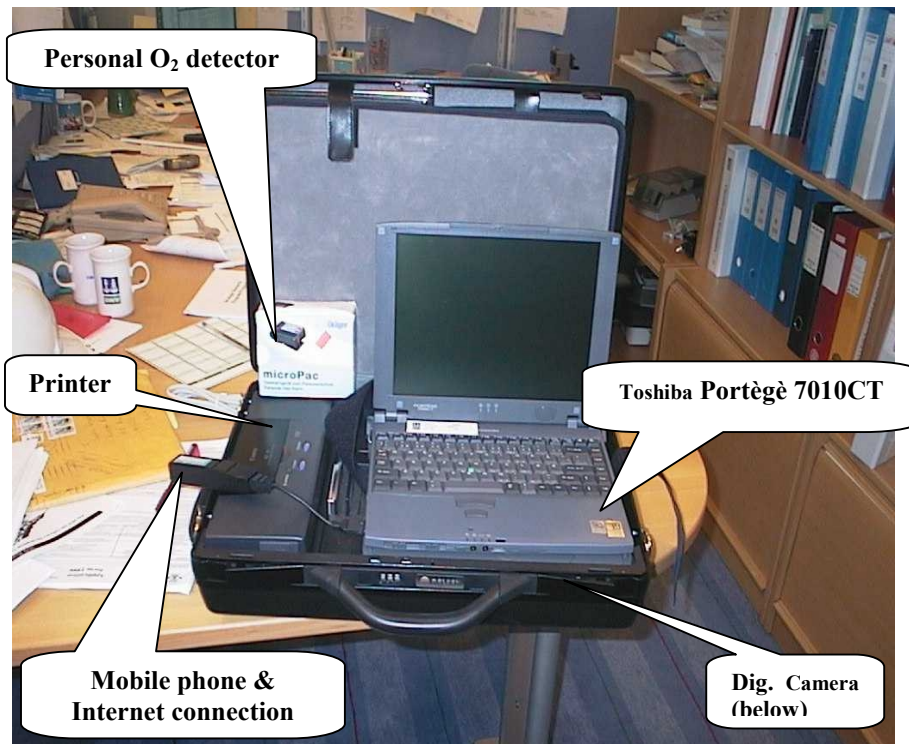
A safety unit could detect hazardous environment (O<sub>2</sub>, H<sub>2</sub>, CO<sub>2</sub>) and give alarm (DNV's reputation!!!)

A surveyor sees an unknown sign in a foreign language (e.g. Russian). The video camera (evt. hand scanner) takes a picture and a connected program translates the picture into text and translates it.

#### 3.2 Implementation

An article by Bjørngaas (1998) presented a suitcase solution for the ships inspectors for Bergensen

shipping company. The suitcase was designed and produced by SYSTEM SENTERET AS. See Table 1 for a detailed list of contents. Roughly their suitcase contained a Toshiba laptop, a battery driven colour printer, a network card, a modem and a digital battery.



**Figure 3:** The inspection suitcase as it was given to the surveyors at the DNV Singapore station.

The specification of the suitcase offered by the SYSTEM SENTERET AS is as follows:

**Table 1:** Content of inspection suitcase.

<b>Declaration:</b>	<b>Price:</b>
Suitcase Bergesen	Kr. 8.737,-
Sadlebag	Kr. 473,-
Toshiba Portégè 7010CT	Kr. 26.374,-
128MB extra memory	Kr. 5.000,-
High capacity battery	Kr. 1.551,-
CD/Nettverks docking	Kr. 5.059,-
Calluna PCCard	Kr. 4.981,-
Canon BJC50 printer	Kr. 4.550,-
Canon PowerShot A5	Kr. 5.550,-
Canon flashcard holder	Kr. 450,-
Canon flashcard 4MB	Kr. 1.950,-
Kensington wire lock	Kr. 450,-
3 com fast ethernet PC card	
ComOne analog+ISDN	Kr. 4.200,-
Set-up of suitcase	Kr. 2.250,-
<b>Sum:</b>	<b><u>Kr. 72.724,-</u></b>

The Mobile Worker project bought 2 suitcases that in addition were equipped with a personal O<sub>2</sub> meter and a CrossPad. One of the suitcases was sent with Albert Au to Singapore to be tested in the field.

**Features & Set-up**

The suitcase is wired such that one 220V contact supplies all the power requiring equipment. All equipment (laptop, printer, camera) is battery (rechargeable) driven giving power independence.

Short cuts to the most used programmes (Word, CrossPad Manager, Photo Editor, PowerPoint) was put on the START button to allow easy access. Since the suitcase was thought to be used off line most of the time and by different users the login name and password was hold as simple as possible; login: *surveyor*, paswd: *surveyor*. Since documents are saved locally or on diskettes no downloading of the personal profile is necessary.

The software that was installed on the laptop was

- standard Verit 3
- CrossPad Manager
- Nauticus SIO (online)

The software (PhotoImpact 4) that followed the Canon A5 camera was not installed on the laptop since its usage was too complicated. The Microsoft photo editor is a much better choice since the surveyors are not supposed to perform sophisticated image processing. Further, transmitting pictures from the camera via a serial cable to the laptop is too slow. A faster way is to insert a PCMCIA card (containing the flash card from the camera) into the laptop. Unfortunately this alternative requires that the laptop is started with the PCMCIA card inside since Windows NT does not support pug & play (this awkwardness will be eliminated with Windows 2000).

**4 EXPERIENCE FEEDBACK**

Experience so far is based on feedback from Singapore, from personal at Høvik (machine inspection) and from our own testing. A series of shortcomings indicate that a suitcase solution is not preferable for surveyors. However, for other professions such as auditors, consultants a modified suitcase solution may still be advantageous.

In general, the suitcase is too heavy (ca. 9 kg) although the wheels are often nice to have. It is not water or splash proof, neither does it float.

**Table 2:** Feedback of suitcase

<b>Digital Camera: Canon A5</b>	<b>Toshiba Portègè 7010CT</b>	<b>Canon Printer: BJC50</b>
☺ simple handling, easy to understand	☺ enough RAM and hardisc	☺ acceptable colour quality
☺ large capacity	☺ relatively light	☺ serial cable OK, don't have to be in line with IR beam
☺ interfaces with video canon	☺ fast	
☺ long battery life		
☹ audio recording desired	☹ difficult to come to CD drive and ports	☹ too much start up mickmack
☹ need flashcard (diskette would be better),	☹ docking station can not be taken out	
☹ no zoom	☹ NT operative system not good	
☹ better flash light (light from torch should be enough)	☹ short battery life ca. 1hr then battery empty	

The battery lifetime for the laptop is too short probably caused by the power drain from the docking station. The suitcase is without doubt at its best provided AC power. The digital camera is in frequent use in Singapore. It is often borrowed by various personal at Høvik inspecting ships resulting in that many of them have actually bought a Cannon A5.

The laptop was not used due to the lack of useful software (Nauticus offline). At the present time a mobile version of Nauticus is not yet available. Using it online is very slow due to time sharing usage.

#### **4.1 Improvements:**

A couple of improvements both in design of the suitcase, its hardware and software content are thinkable.

##### **Suitcase**

If a suitcase solution is chosen it should be watertight and float. It must however be much lighter than the current version.

Further, the fact that the laptop couldn't be taken out was not satisfactory. It was 'redesigned' with a burdock band and is now relatively easy removable.

A lot of space in the suitcase is 'wasted' by hiding off the cables under a plastic cover. This could be optimised better.

##### **Software**

The standard VerIT 3.0 operation system should be removed in favour of Windows 95/98. This is because Windows NT does not support:

- NO plug & play !! have to restart the system when inserting the camera's flash card or any other peripheral device.
- NO infra-red connection in WinNT possible leading to that a lot of devices cannot be used.
- NO power savings in WinNT.

The logging into its own personal folder should be easier, it should also be possible to switch between survey user and private user.

The online Nauticus SiO version is not acceptable, it took too long time. An offline version of Nauticus SiO may be more promising.

##### **Computer:**

An additional mouse should be given. The rubber mouse button in the keyboard is just a piece of shit!

##### **Camera:**

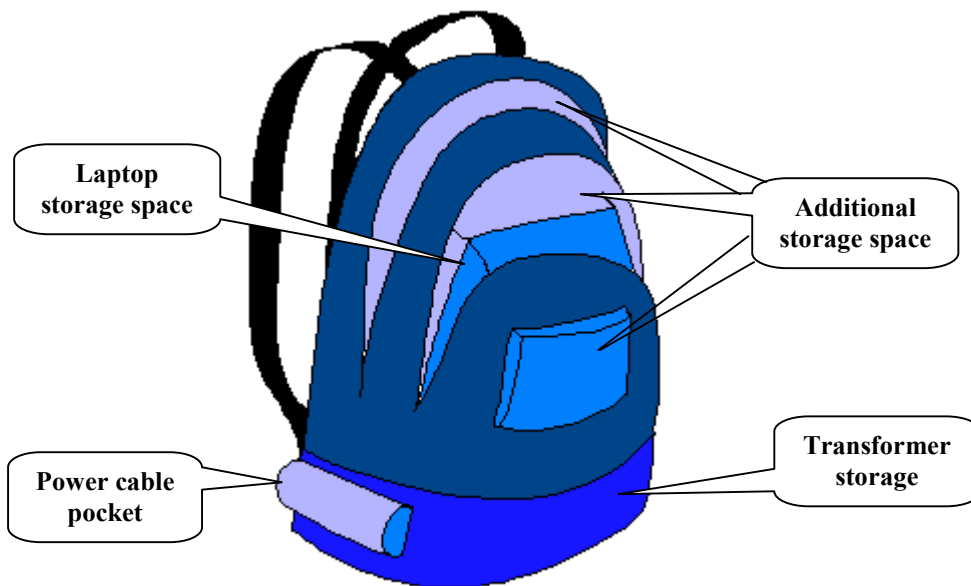
The desire was expressed that the camera should not only allow taking a picture but also allowing recording some (15-20 sec) speech. This is very convenient when taking many similar pictures then it is not necessary to write down what picture shows what. There are some alternative cameras on the market that have these features, e.g. Agfa ePhoto CL50 or Kodak DC240.

A second more powerful flashlight that is triggered by the camera's own is recommended because the built in flash is too weak.

## 4.2 Pre-project: Backpack solution

However, instead of modifying the suitcase it was dropped in favor of a backpack.

The initial backpack is specially designed to transport a laptop. The transformer and cables are stored in the bottom compartment whereas the power supply cable is contained in a small pocket on the outside of the backpack. There are small holes between all compartments allowing to connect and charge the laptop or the digital camera even they are stored away in the backpack.



**Figure 4:** The backpack solution with space for a laptop, printer etc. At the bottom there is a storage room for power supply cables and transformers

This backpack solution however without the laptop is frequently in use of our contacts at the Singapore station. They are very satisfied.

A pre-project was initiated with together with Nauticus Implementation DTP 207 and SYSTEMSENTERET AS to suggest improvements to the backpack solution. If it can be agreed upon a design some 50-100 trial backpacks will be produced and distributed among centrally placed persons within ships inspection in DNV.

## 5 CONCLUSION

This suitcase is meant to support the work of ships inspectors by providing the access to a laptop, a printer, modem and a digital camera. The feedback from the field tests and our own indicate however that the current solution does not fulfil this goal.

The standard VerIT 3.0 OS system is not desirable due to the lack of plug&play feature and high power consumption (ca. 1hr battery time). The suitcase is further much too heavy and not splash proof. The digital camera should be replaced with one allowing speech recording to each picture. A much more powerful slave flash triggered by the cameras own should be also supplied.

In our opinion the whole suitcase concept should be abandoned. If office-like assistance is preferred then a backpack solution should be chosen.

However, the main drawback of this office-concept is that it cannot assist the surveyor at the inspection site – only in the e.g. captains office when finishing up the inspection.

## 6 REFERENCES

- /1/ J. Girard, C. Smith. 1999. The Remote Access Business Scenario: Key Issues for IT Planners. Gartner Group. 4. June 1999.
- /2/ Bjørngaas T. 1998. Små systemer for krevende brukere. Søndags Aftenposten 20. 12. 1998

## Appendix: Results from brainstorming: What could a surveyor need?

- need of putting info on a drawing (picture and speech)
- a close-up tool (goggles / video)
- surveyors helpdesk (who to call, 24 hours)
- ask for details in the rules, search engine (via telephone or head monitor)
- Dictaphone handsfree
- hammer, målebånd, hard hat, Skyvelær
- Flashlight (halogen)
- O<sub>2</sub>, H<sub>2</sub>, CO<sub>2</sub> detector
- Nauticus: support in Renewal survey of what to do and follow up
- Evacuation tests (Video + time + Dictaphone)
- can cal from ship to e.g. Høvik and send a picture, (audio and common screen with two pointers)
- picture transmission
- fax connection to laptop
- Surveyor suite case
- Dictaphone integrated in mobile telephone that dumps info into laptop when full
- hand scanner
- scanned text into editable text
- simple translator (e.g. Russian signs -> English)
- handsfree mobile combined with Dictaphone
- object attached to drawing details
- surveyor is often confronted with unexpected damages -> need communication, info about similar damages
- would like to have many standard drawings that can be modified and the damages sketched in
- would like to have a crack detection equipment (UV light??)
- 90 % of items on check list not hull related (machinery, safety equipment)
- machinery and safety equipment better suited for checklist
- immediate reporting not desired because needs often time to judge overall condition
- wish digital camera, positioning with simple text
- equipment must deal with -10-+50, 100% humidity, explosion compliance, water resistance
- NO earphone = very dangerous
- must be explosion save
- require experience data base that helps in standard situations (e.g. beam with cut-out)
  - tension pattern
  - where cracks
  - **how** to repair (suggestions)
- wish laptop
- wish hand scanner
- Require link from ship (deck) to station (Høvik or local) that allows videoconference.
- need digital camera and video
- available information (original thickness)
- summary of approbation (where are the critical areas ect.)
- Problem: converted ships surveyor to platform surveyor -> need assistance
- experience feedback: searchable reporting (use word now)
- online / email discussion group
- combination tools e.g. camera - flashlight or camera- head light
- Machine condition measurements: reference against current condition
  - must download a set up
  - must download reference measurement
  - need effective download connection
- text recognition
- Nauticus thin client
- crew contact with additional spare mobile units
- mobile videos that can stand alone
- powerful zoom
- laser distance measure equipment
- Picture of checklist = where in ship, not only list
- microphone should be removable
- reordering of checklist, sort: test, what documents, location -> list to captain, chief engineer, chief officer,..
- fibre optics for confined spaces (video can be lowered down in tank)

## 7 CHECKLIST FOR INTERNAL VERIFICATION OF REPORTS

### MAIN PROJECT: Surveyor's Mobile Suitcase of IT reporting tools

**Part Project:**

**Report ID:**

CHECKPOINT To the verifier's best knowledge and understanding, it is confirmed that:	VERIFIER'S CONFIRMATION	
	Sign.	Date
1 Relevant methods and techniques are employed.	aua	99.10.08
2 Measurements, tests and analyses are performed in accordance with standards, rules, descriptions and/or good practice.	aua	99.10.08
3 Calculations and technical analyses are correct.	aua	99.10.08
4 Interpretations and conclusions are technically sound and logically correct.	aua	99.10.08
5 The results are described and documented in sufficient detail.	aua	99.10.08
6 Uncertainties in the results are reported or at least indicated.	aua	99.10.08
7 Interpretations and conclusions are clearly and unambiguously identified and stated.	aua	99.10.08
8 Figures, illustrations and tables are relevant, of sufficiently high standard and contain no errors.	aua	99.10.08
9 Text is written in clear and understandable language and contains no typing errors.	aua	99.10.08
10 The report is orderly and logically structured.	aua	99.10.08
11 The scope of work is covered and other specifications are fulfilled.	aua	99.10.08

**Verifier's comments:**

Date and signature: 99.10.08 *Albert Au*