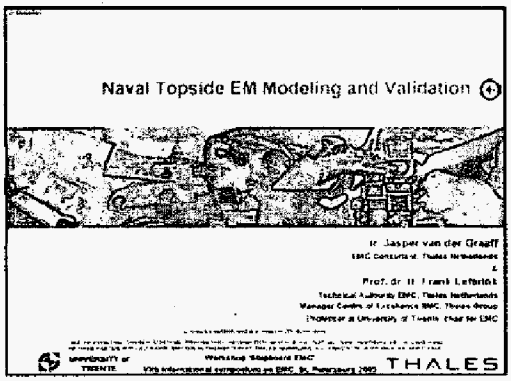
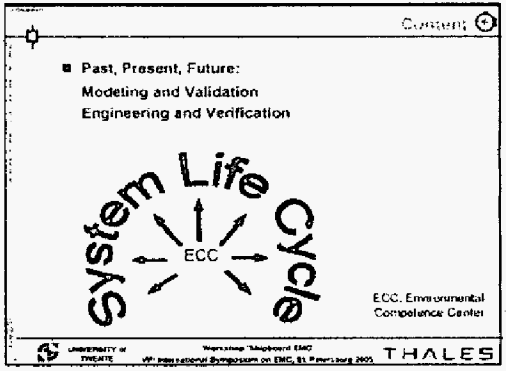
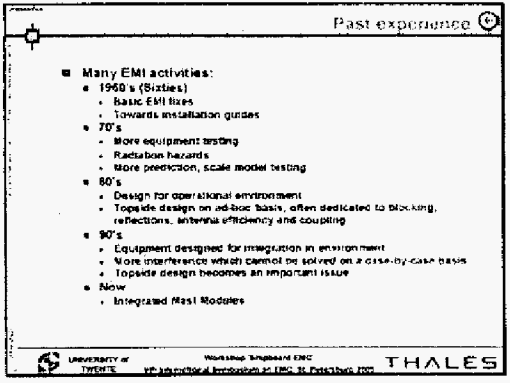
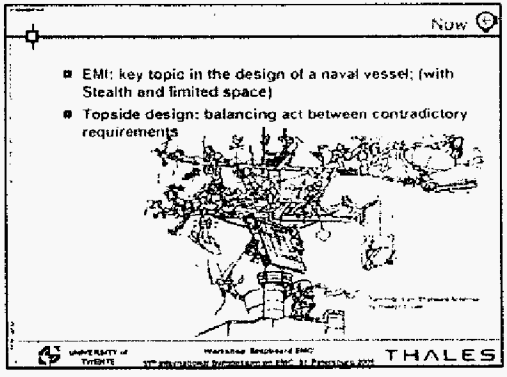
NAVAL TOPSIDE EM MODELING AND VALIDATION

JASPER VAN DER GRAAFF, FRANK LEFERINK









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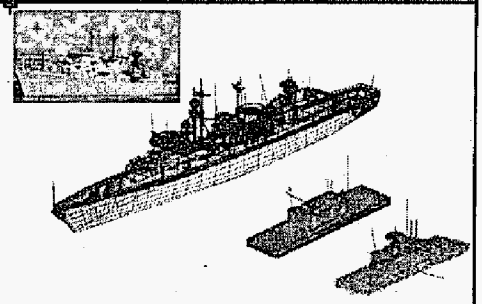
Now, 2

- More and more Computational Electro-Magnetics (CEM) in naval topside design
- We need confidence in simulation tools and to replace scale model and full-scale measurements in the optimisation process during the design
- Full-scale verification of the design will remain important

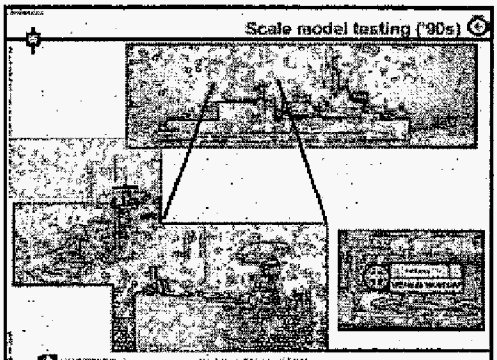
THALES

Cad, meshing, example ('90s)



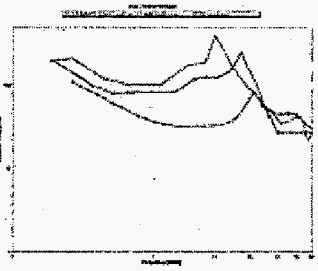
THALES

Scale model testing ('90s)



THALES

Simulation and validation

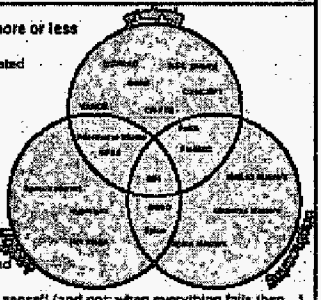


- Accuracy: ok
- Difficulties:
  - definition of the problem
  - importing geometry from CAD files
  - Mesh generation

THALES

Simulation tools

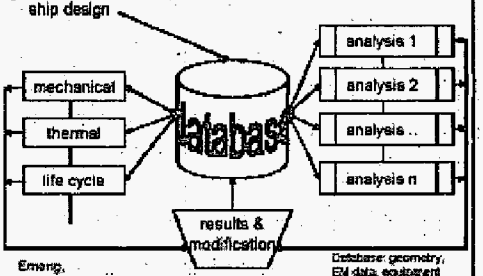
- A box with many more or less integrated tools:
  - Completely integrated
  - Off the shelf (some very good), asymptotic (UTD, PO, GTD) & full wave (MoM), with interface via DXF, IGES etc.
  - Engineering models in mathematical tools such as Matlab and MathCAD



But always: common sense!! (and not: when everything fails then....)

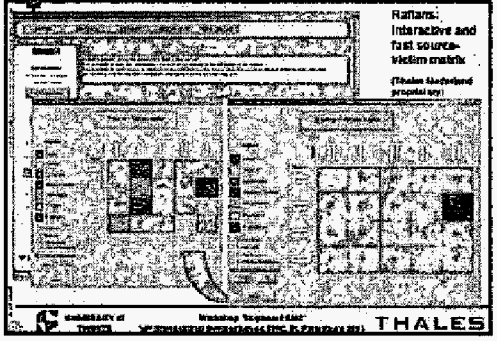
THALES

Structure of Integrated Toolset



THALES

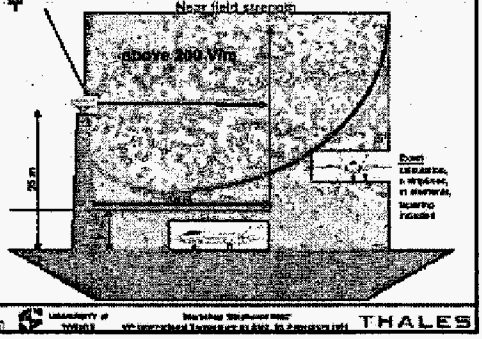
Singular tools, 1



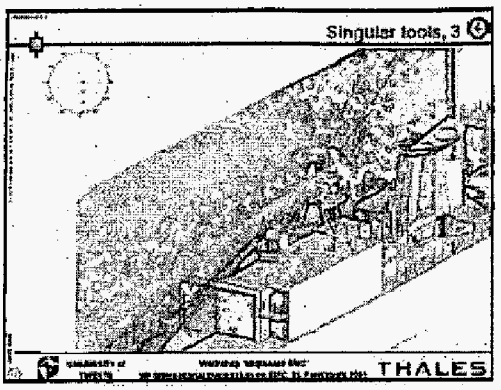
Raitans: Interactive and fast source-victim matrix

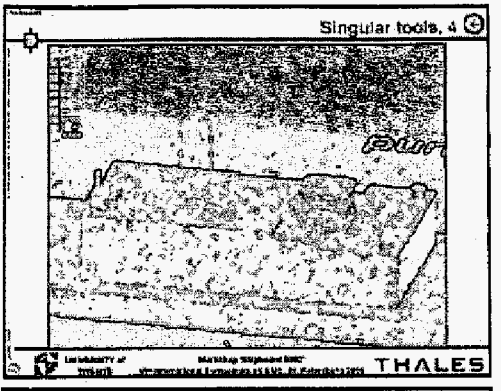
THALES

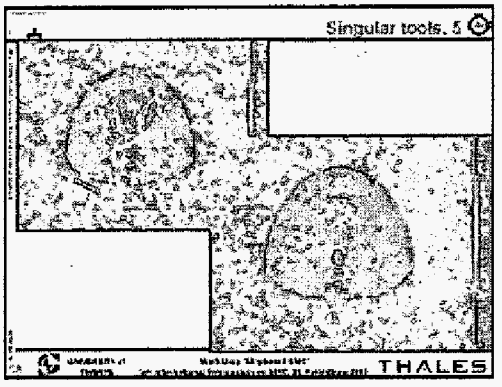
Singular tools, 2

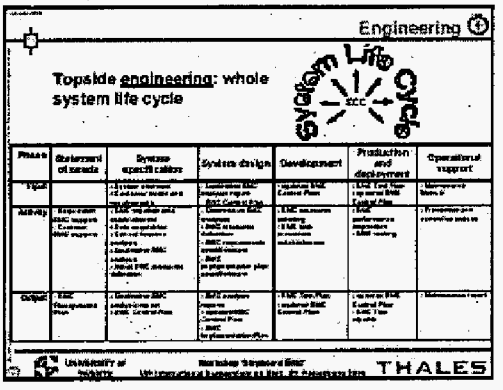


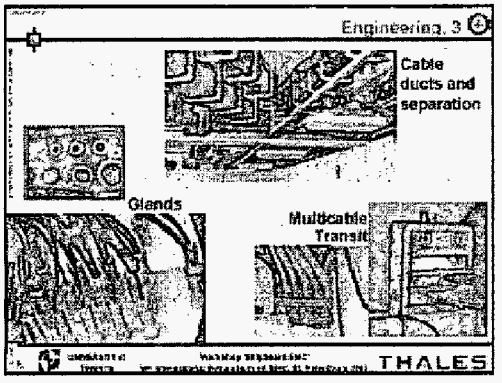
THALES

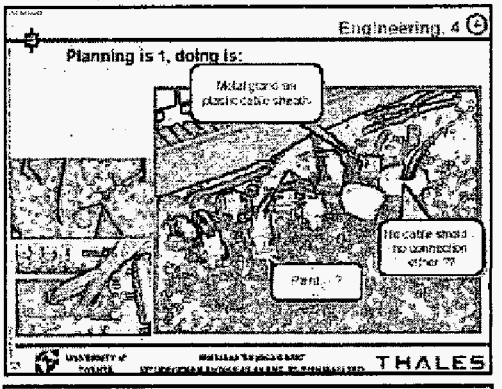

Singular tools, 3
THALES

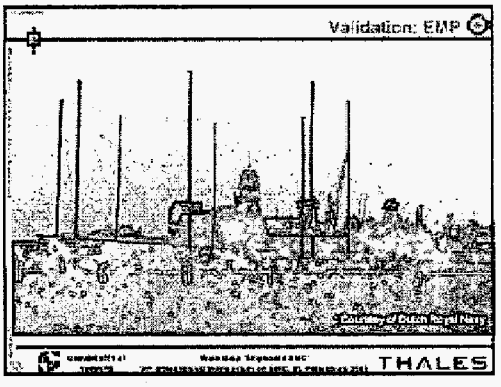

Singular tools, 4
THALES

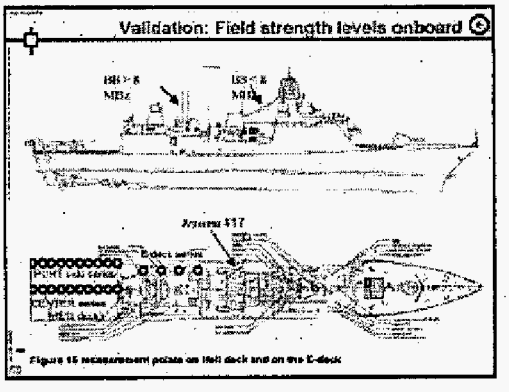

Singular tools, 5
THALES


Engineering
Topside engineering: whole system life cycle
System Life Cycle
THALES

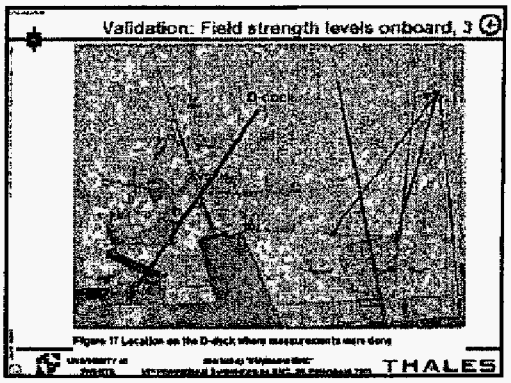

Engineering, 3
Cable ducts and separation
Glands
Multicable Transit
THALES

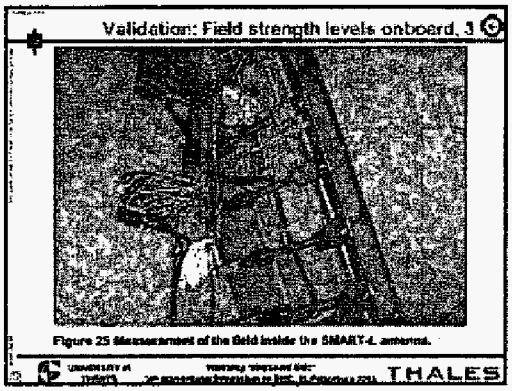

Engineering, 4
Planning is 1, doing is:
Metal gland on plastic cable sheath
No cable shield no connection either ??
THALES

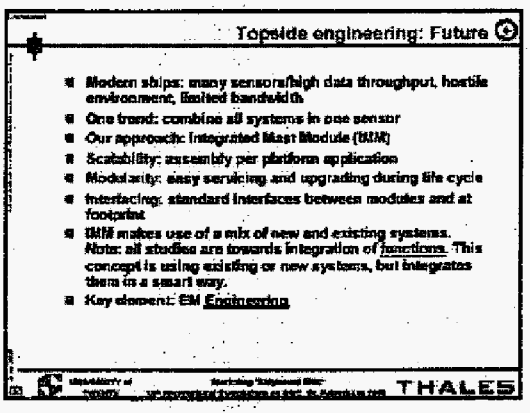

Validation: EMP
THALES

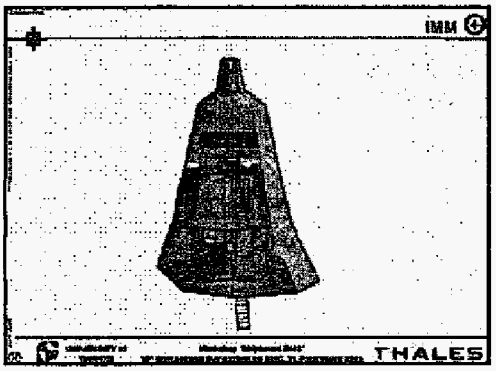

Validation: Field strength levels onboard


Validation: Field strength levels onboard, 2
THALES


Validation: Field strength levels onboard, 3
THALES


Validation: Field strength levels onboard, 3
Figure 25 Measurement of the field inside the SMART-L antenna.
THALES


Topside engineering: Future
Modern ships: many sensors/high data throughput, hostile environment, limited bandwidth
One trend: combine all systems in one sensor
Our approach: Integrated Mast Module (IMM)
Scalability: assembly per platform application
Modularity: easy servicing and upgrading during life cycle
Interfacing: standard interfaces between modules and at footprint
IMM makes use of a mix of new and existing systems.
Note: all studies are towards integration of functions. This concept is using existing or new systems, but integrates them in a smart way.
Key element: EM Engineering
THALES


IMM
THALES