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Intelligent hypermedia corrosion information tools

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Intelligent hypermedia corrosion information tools

What is a hypermedia system?

- the basic concepts of hypermedia
- why use hypermedia for corrosion engineering?

The Active Library® on Corrosion

- the goal of the system
- an overview of its functionalities

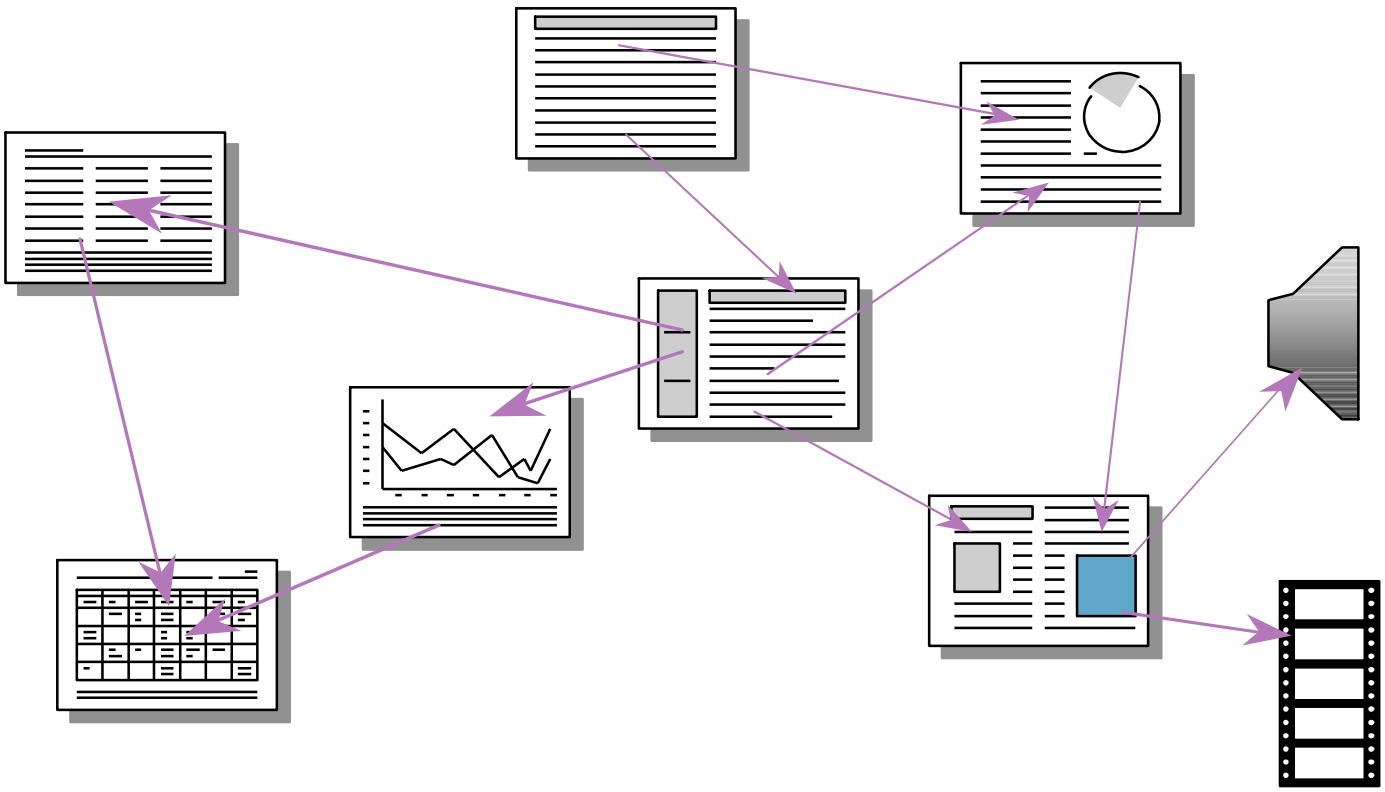
The GRACE™ system

- the goal of the system
- an overview of its functionalities

Conclusions

WHAT IS A HYPERMEDIA SYSTEM?

The basic concepts of hypermedia



Hypermedia = hypertext + multimedia

- hypertext = nodes + links
  - non-linear vs. linear
  - navigation vs. query
- multimedia
  - images, sounds, video, …

WHAT IS A HYPERMEDIA SYSTEM?

Why use hypermedia for corrosion engineering?

Corrosion engineering

- *corrosion diagnosis* based on the consultation of many different and dispersed information sources
- *corrosion recognition* is based on a visual comparison with corrosion phenomena identified in related incidents
- *corrosion prevention* requires the identification of the correct measures for a given material / environment / corrosion type
- *materials selection* is based on the careful examination of relevant criteria from a vast assortment of materials data

Hypermedia support

- swift and intuitive access to different information sources
- capability of displaying high resolution corrosion pictures
- capturing the relatedness between materials information

è greater interactivity in the retrieval of the appropriate data

è intelligent support for typical corrosion engineering tasks

The Active Library® on Corrosion

The goal of the system

System design objectives:

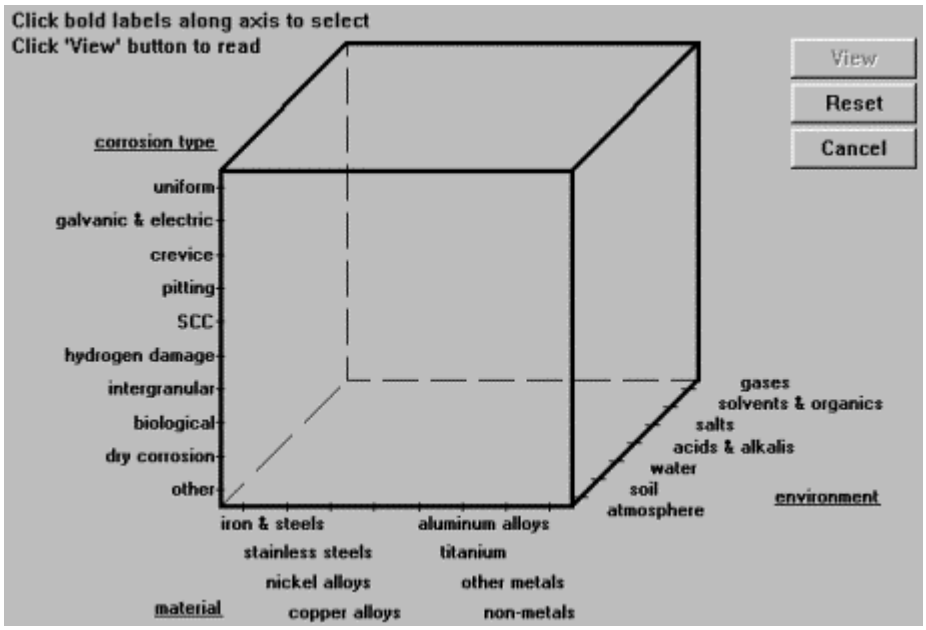
to build an easy to use CD-ROM based hypermedia system for providing access to corrosion prevention documents and materials engineering data, that can be used by both beginning and expert materials engineers

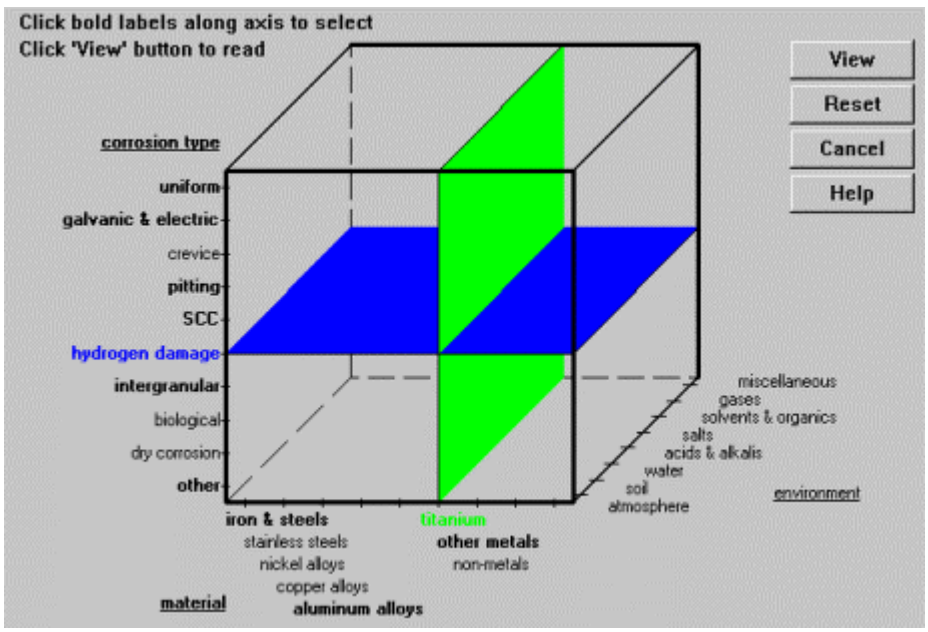
System information functionalities:

- 3-D Cube of Contents
- Corrosion Atlas
- NACE International books
- NACE International and Elsevier Science journals
- Databases (NACE International's COR.SUR ® and COR.SUR2 ® materials selection databases)

Functionalities

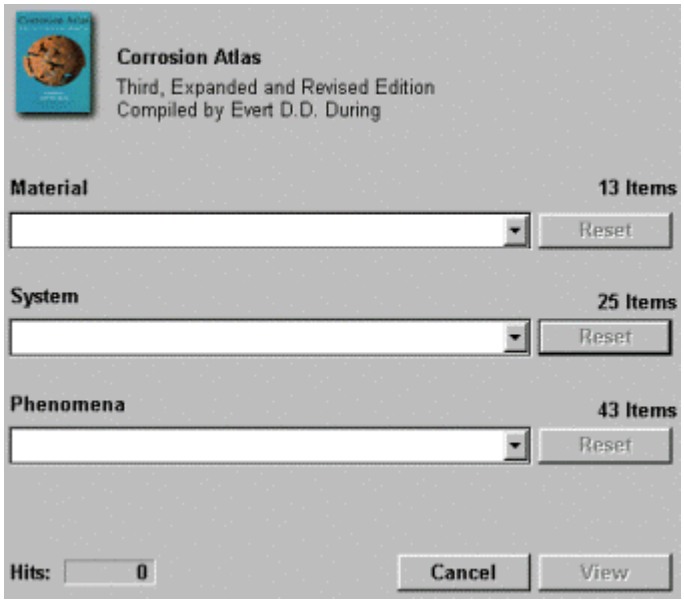
3-D Cube of Contents

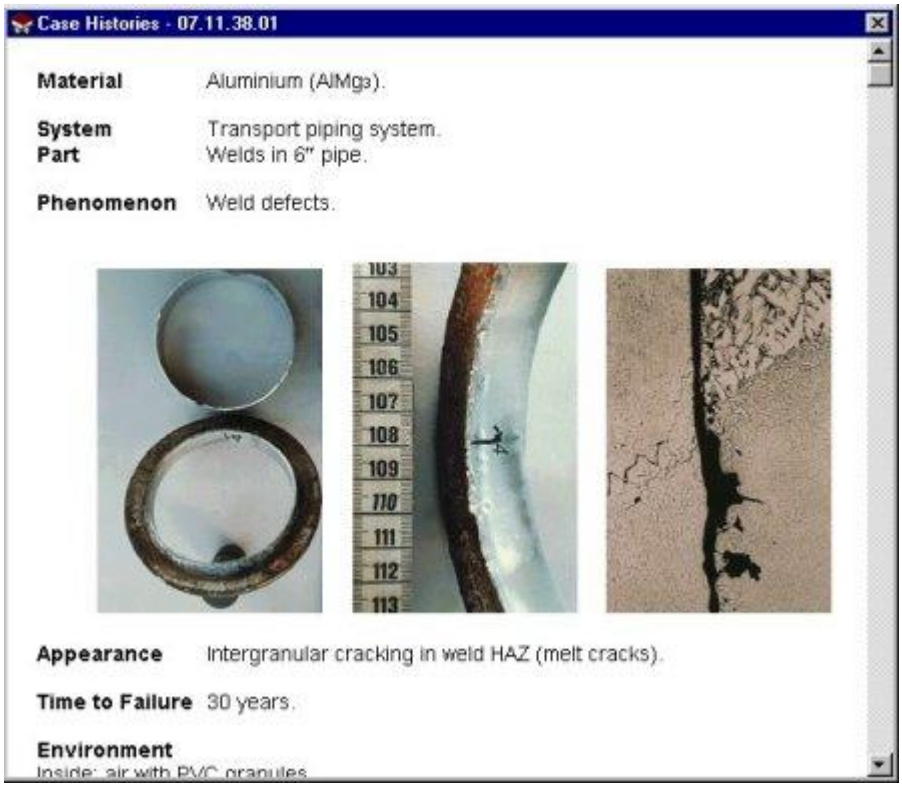




Functionalities

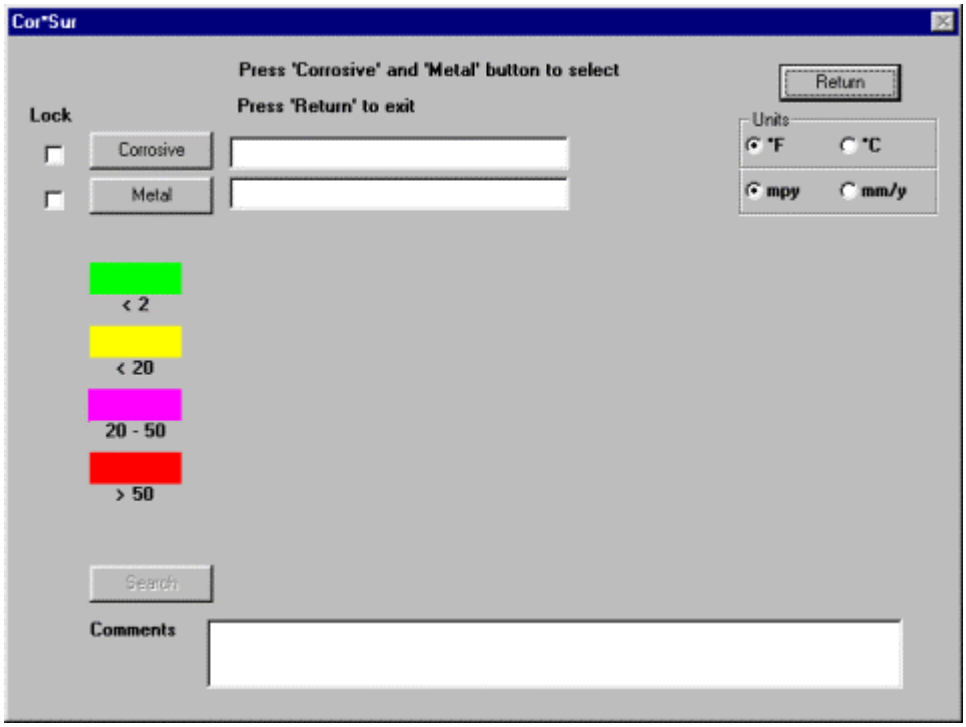
Corrosion Atlas

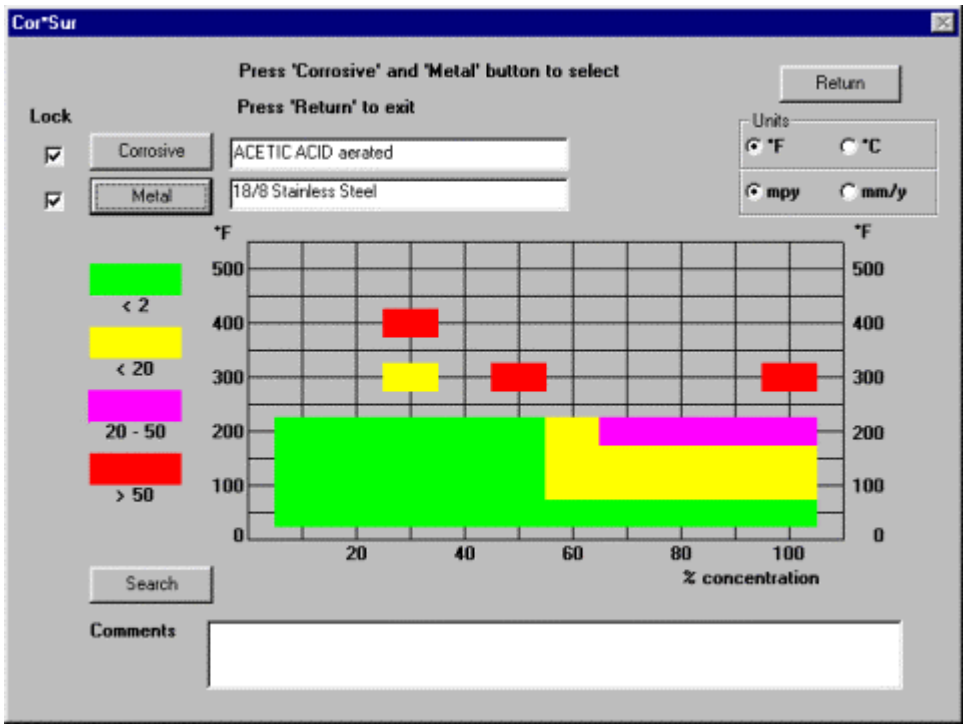




Functionalities

COR.SUR ® database





The GRACE™ system

The goal of the system

System design objectives:

to build an on-line hypermedia system using the World-Wide Web for providing access to materials engineering data and support from intelligent corrosion assistants

System information functionalities:

- **G**lobal : available to anyone with Internet access
- **R**eading : storage and sharing of data and documents
- **A**ccessing: smart retrieval of relevant data and documents
- **C**orrosion : corrosion and materials engineering information
- **E**xpertise : virtual, on-line centre of corrosion competence

System modules under development:

- Reference Manual on Corrosion Engineering
- Failure Analysis Assistant acting as a “virtual expert”

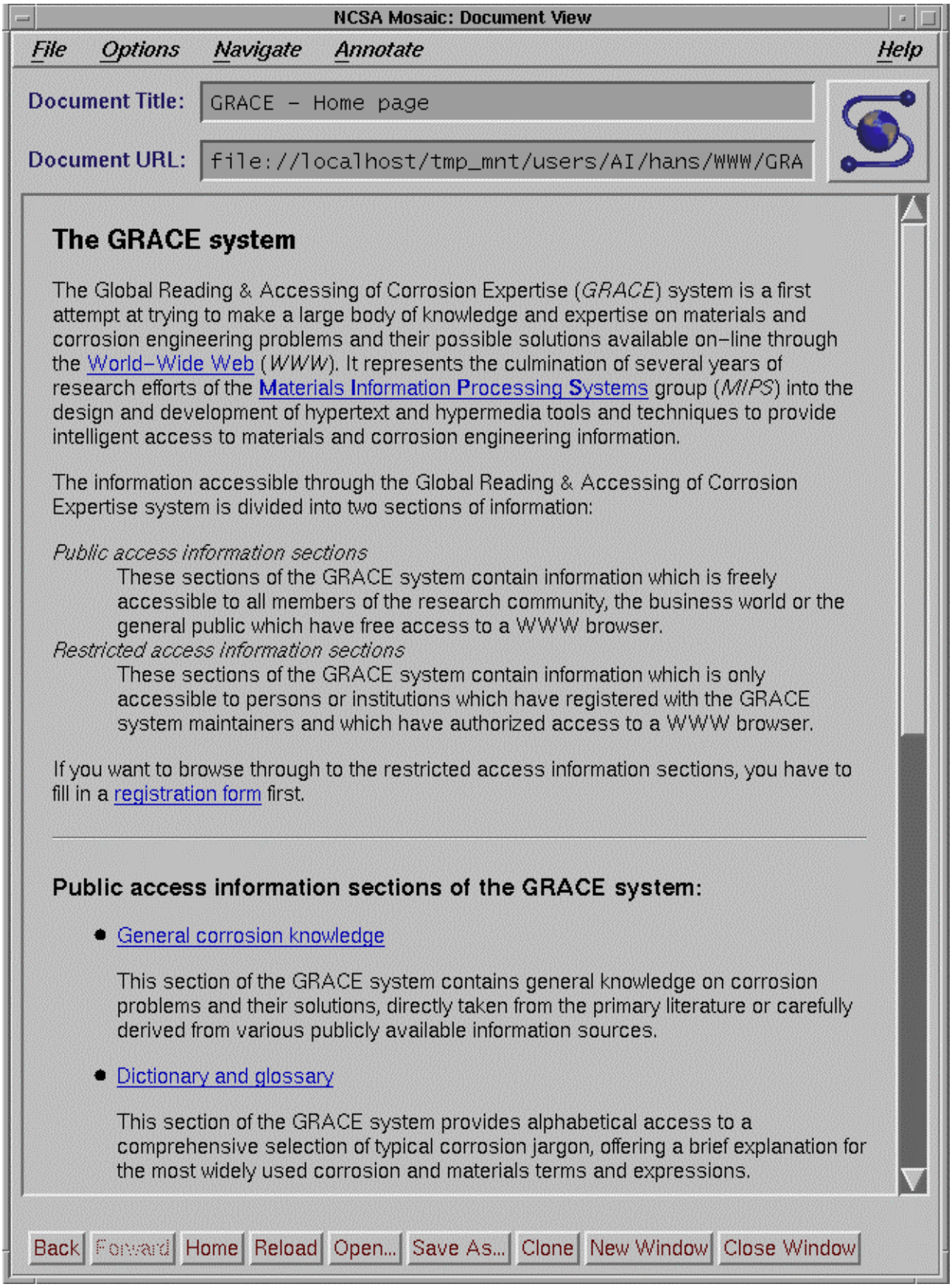
Goal:

- to extend the functionalities of the ALC
- to facilitate typical materials engineering tasks
- to experiment with knowledge-based hypermedia

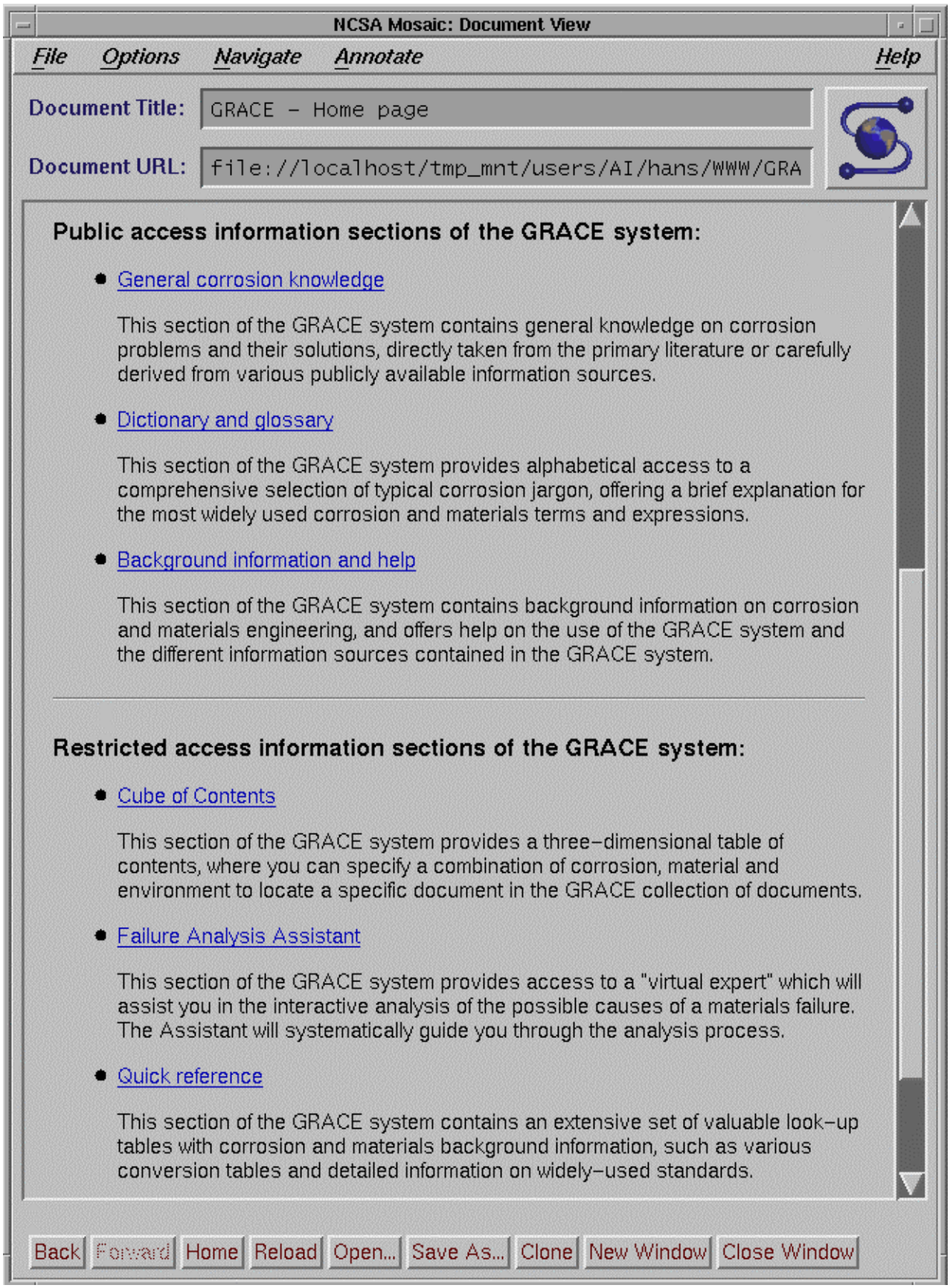
Design:

- hypermedia documents generated “on the fly”
- using domain knowledge: corrosion and materials expertise
- responsive to reader (beginner, professional, expert) and task (recognition, diagnosis, treatment, prevention) profile

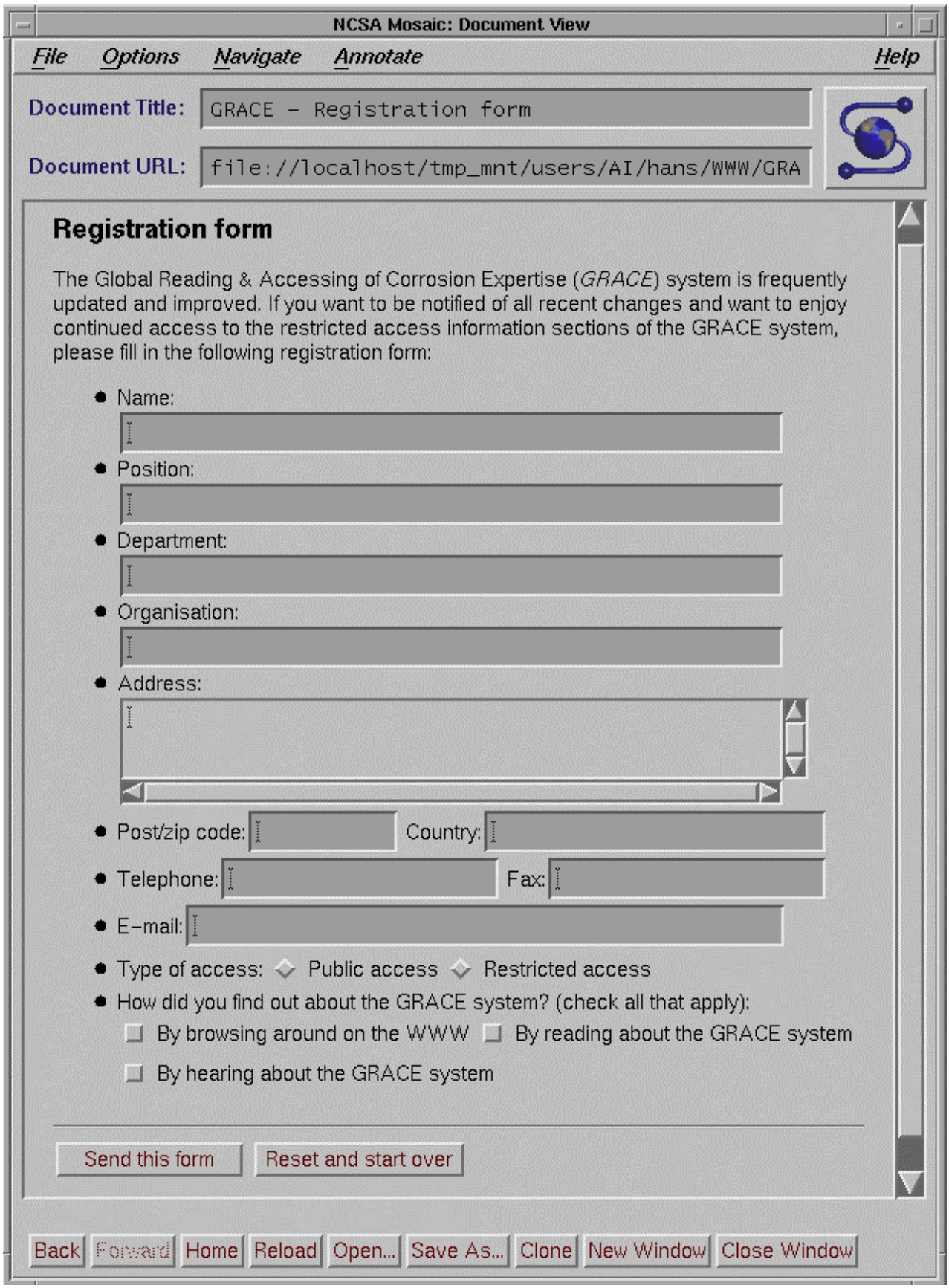
The GRACE™ system



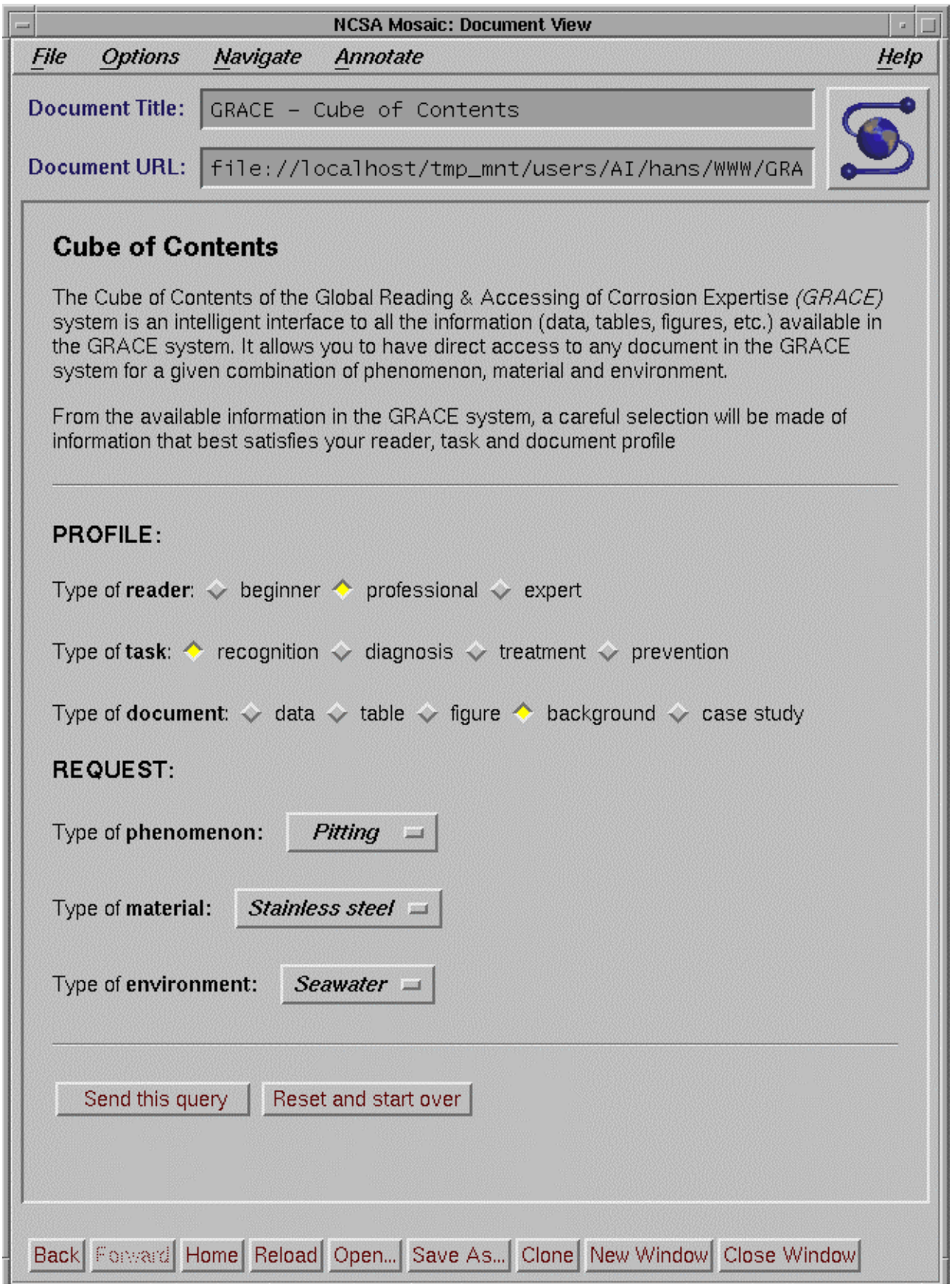
The GRACE™ system

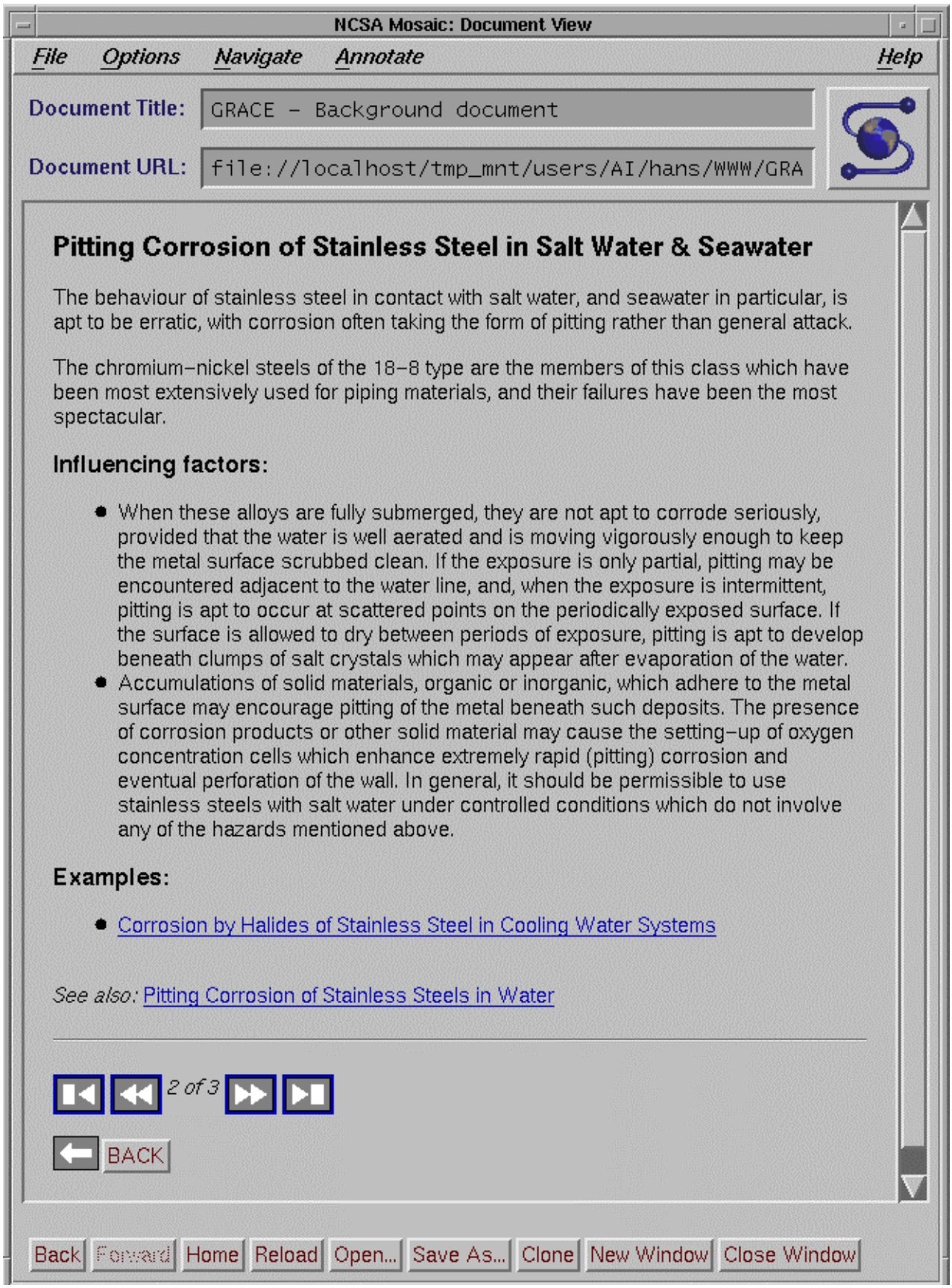


The GRACE™ system



The GRACE™ system




NCSA Mosaic: Document View
File
Options
Navigate
Annotate
Help
Document Title:
GRACE - Background document
Document URL:
file://localhost/tmp_mnt/users/AI/hans/WWW/GRA
Pitting Corrosion of Stainless Steel in Salt Water & Seawater
The behaviour of stainless steel in contact with salt water, and seawater in particular, is apt to be erratic, with corrosion often taking the form of pitting rather than general attack.
The chromium–nickel steels of the 18–8 type are the members of this class which have been most extensively used for piping materials, and their failures have been the most spectacular.
Influencing factors:
When these alloys are fully submerged, they are not apt to corrode seriously, provided that the water is well aerated and is moving vigorously enough to keep the metal surface scrubbed clean. If the exposure is only partial, pitting may be encountered adjacent to the water line, and, when the exposure is intermittent, pitting is apt to occur at scattered points on the periodically exposed surface. If the surface is allowed to dry between periods of exposure, pitting is apt to develop beneath clumps of salt crystals which may appear after evaporation of the water.
Accumulations of solid materials, organic or inorganic, which adhere to the metal surface may encourage pitting of the metal beneath such deposits. The presence of corrosion products or other solid material may cause the setting–up of oxygen concentration cells which enhance extremely rapid (pitting) corrosion and eventual perforation of the wall. In general, it should be permissible to use stainless steels with salt water under controlled conditions which do not involve any of the hazards mentioned above.
Examples:
Corrosion by Halides of Stainless Steel in Cooling Water Systems
See also: Pitting Corrosion of Stainless Steels in Water
2 of 3
BACK
Back
Forward
Home
Reload
Open...
Save As...
Clone
New Window
Close Window

The GRACE™ system

Failure Analysis Assistant

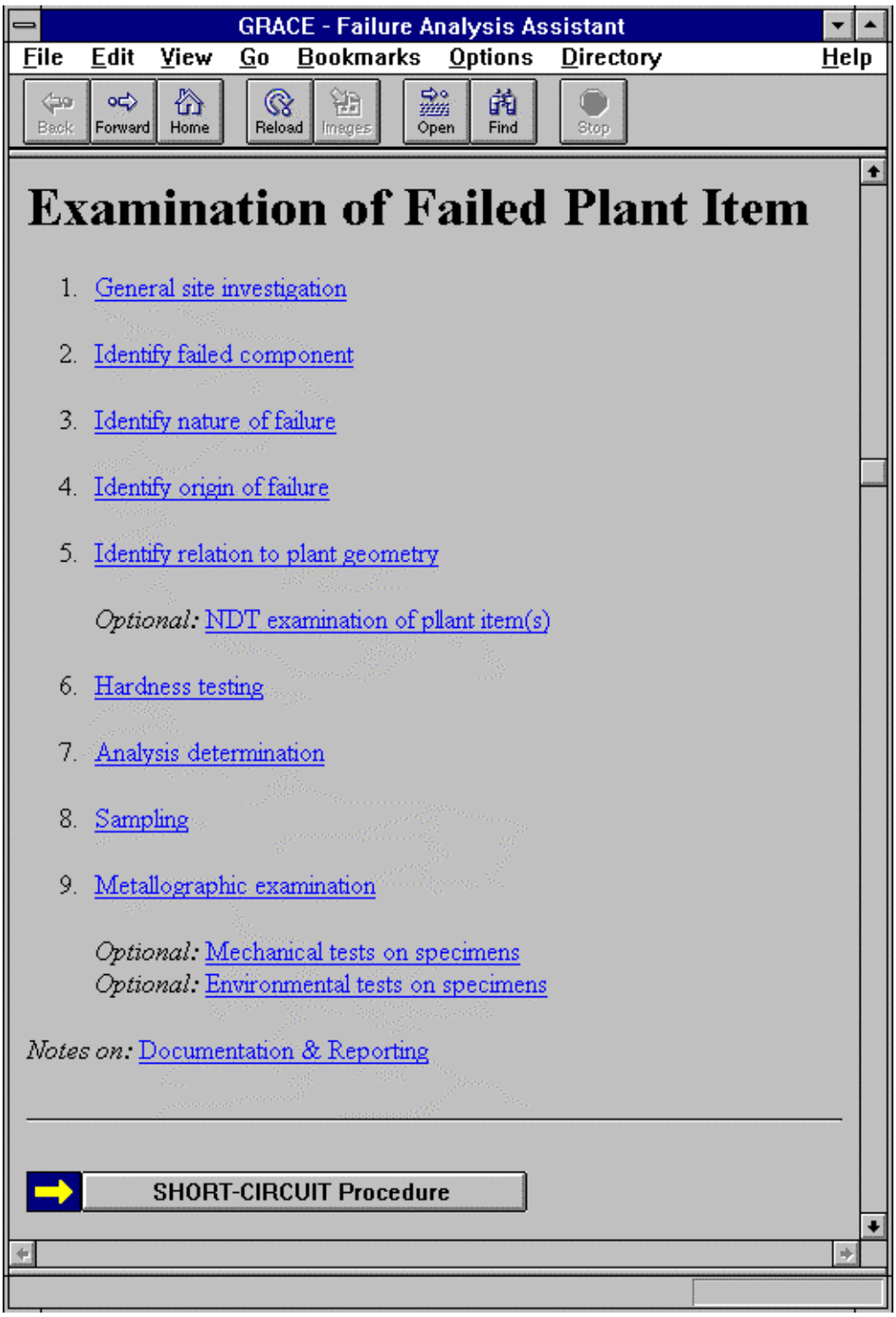
Goal:

- ad-hoc availability of corrosion failure expertise
- valuable independent second opinion
- interactive “check-list”

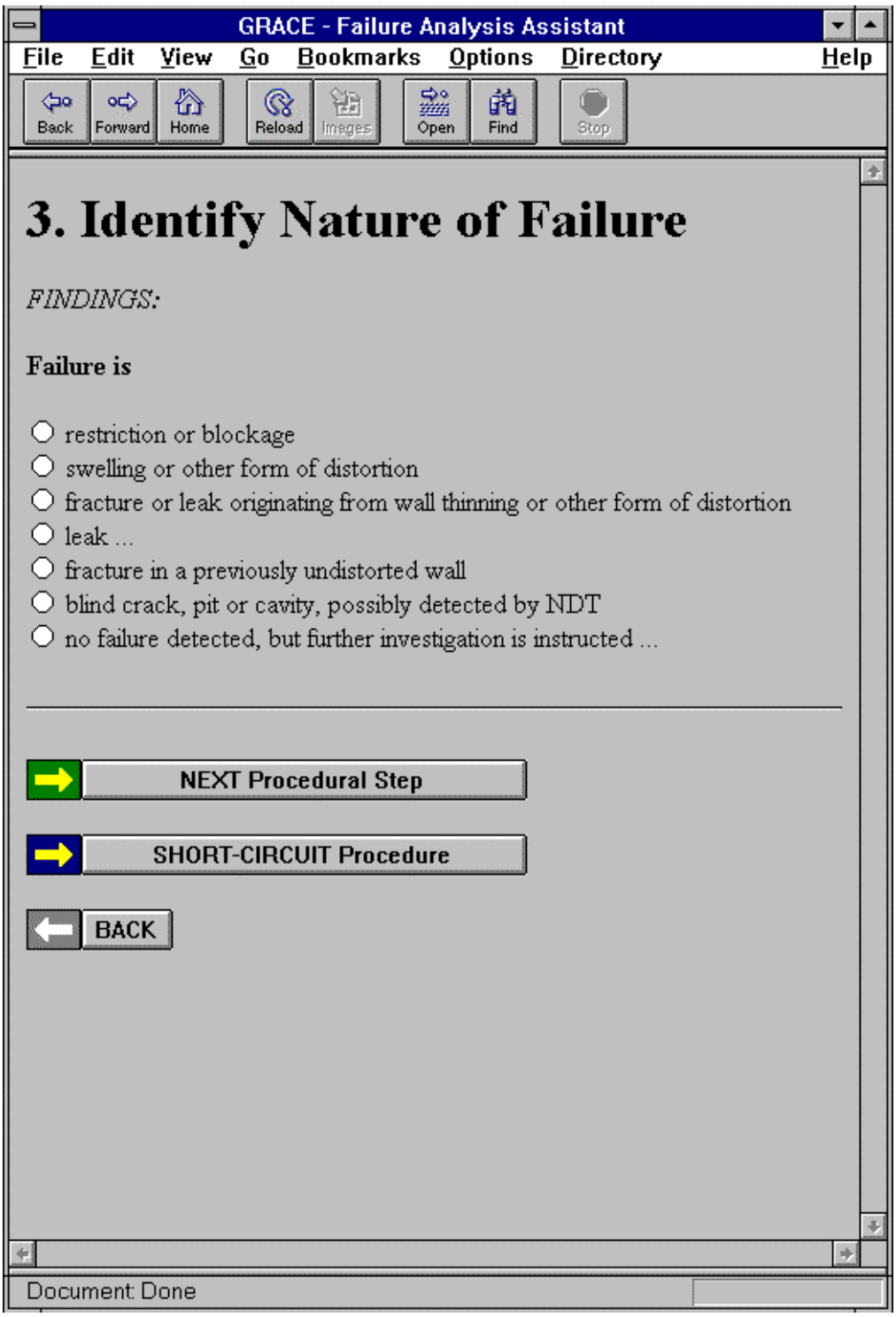
Design:

- based on MTI “Atlas of Corrosion and Related Failures”
- analysis steps cross-linked to general corrosion information
- generic approach, extendible to other materials problems e.g. paint failures

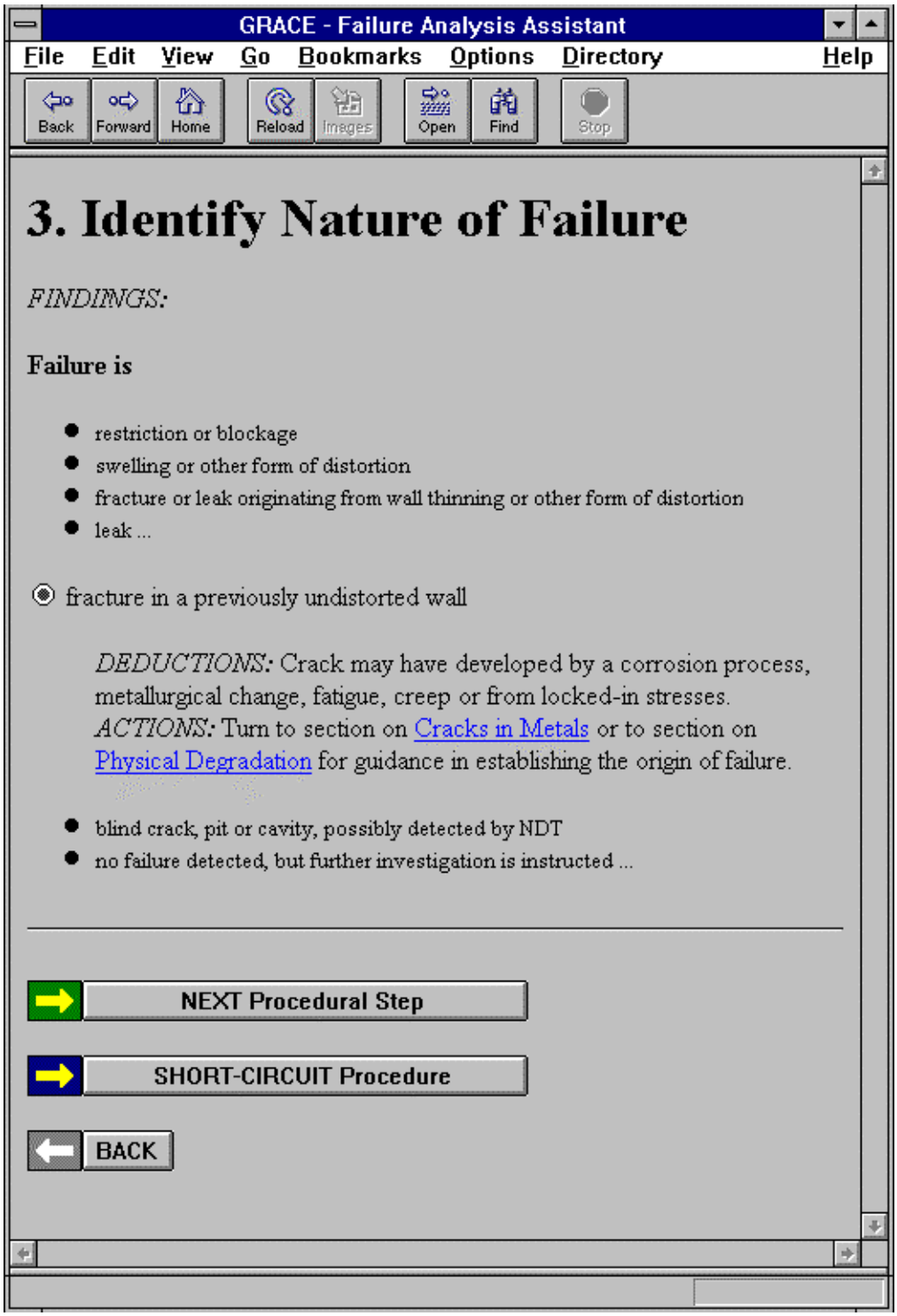
Failure Analysis Assistant - Step 1



Failure Analysis Assistant - Step 2



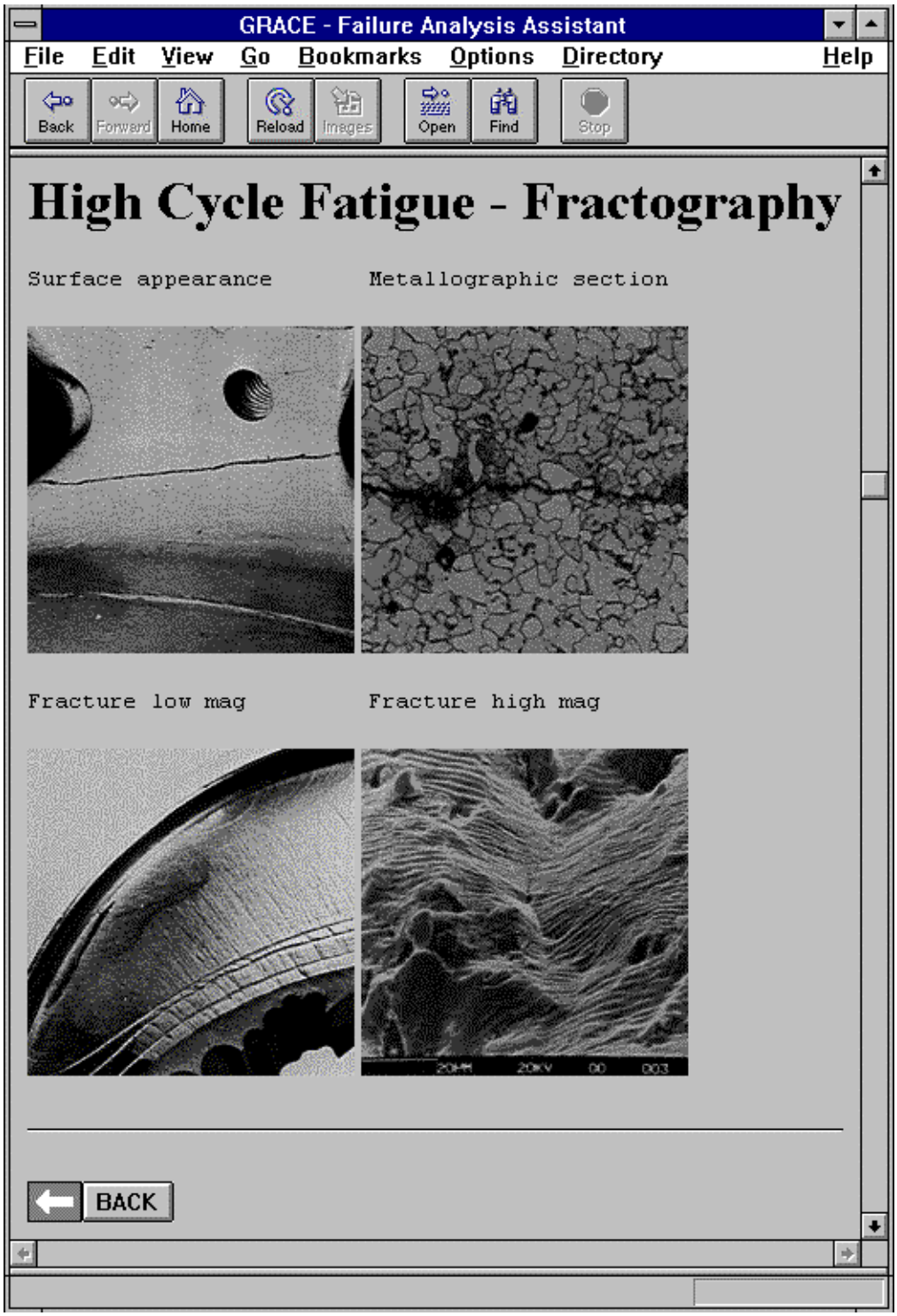
Failure Analysis Assistant - Step 3



Failure Analysis Assistant - Step 4

Failure Analysis Assistant - Step 5

Failure Analysis Assistant - Step 6



CONCLUSIONS

Using hypermedia for corrosion engineering

The Active Library® on Corrosion

+ proof of suitability of hypermedia for corrosion engineering
– lacking true intelligent support for navigation and retrieval

The GRACE™ system

+ broadening access and extending functionality of the ALC
– gathering / validating of general and industry-specific data

Future developments:

- second edition of the Active Library® on Corrosion
  - Ÿ new information: water treatment, oil and gas industry
  - Ÿ new books & primary literature (e.g. “Corrosion Science”)
- public availability of the GRACE system
  - Ÿ basic research into intelligent hypermedia navigation
  - Ÿ first attempt to build a virtual community of corrosion experts

http://www.mtm.kuleuven.ac.be/MIPS/GRACE/