Alarms and alarm problems
(very short here...)

- Alarm systems can be important parts of an operators information system. E.g. to provide safety.
- Alarms can be very disturbing and something the operator tries to turn off.
- It is difficult to design alarms that always are efficient and support the operator.
Different approaches

- An alarm function can be seen as a barrier against operator errors caused by lack of attention.
- An alarm function can be avoided if the system provides enough awareness.
- Compare “control by exception” vs. “control by awareness”.

Alarm och alarm problems

- An alarm should warn for something important or dangerous, that has happened.
- Should provide important and useful information to the operator.
- What has happened? Where? What does this mean? What should be considered and done? What can/will the effects be?
- Alarm situations are often complex.
- Problems with “unimportant” or false alarms.
- Large disturbances, incidents and accidents occur very seldom.

Example

- Many alarms during a short time period.
- In complex situations one alarm can cause a cascade of secondary alarms.
- This can be completely impossible to handle for the human operator.
- In Harrisburg, 800 000 alarms were registered during the first two hours of the nuclear power plant accident.
- The operators were unable to understand what was going on....
Example: Gottröra

Some alarm problems
- Unclear cause-effect relationships
- Many different possible causes
- A mix of many sounds and signals
- Alarm lists often of no use
- Recovery work often complex
- Alarms are often turned off, when they are not considered useful.
- High stress!

Solutions?
- Try to reduce the number of alarms needed.
- Build for high situation awareness, support the operator to act preventive.
- The design of usable, supportive alarm systems is a large problem!
- This problems is not solved!
- What is an "intelligent alarm"?
- If interested: You can find a lot of information and examples of problems and examples on Internet. (e.g. http://en.wikipedia.org/wiki/Alarm_management)
A model of control

- We need a model that helps us to
  - describe,
  - analyse,
  - design,
- control of a complex dynamic system

The GMOC model

Human control of a dynamic system requires:
- Goal (G)
- Model (M)
- Observability (O)
- Controllability (C)

E.g.: Car driving

Going safely from A to B in heavy traffic......
Goals
- Goals are often complex
- Contains conflicts (e.g. safety vs speed)
- Are:
  - Formal - informal
  - Organisational - individual
- Operators have their own goals...
- To relate design to the goals, we must understand (all) the goals!

Models
- Models are mental models.
- Models are individual and subjective.
- Models are (mainly) developed during work. This takes time!
- Different operators often have (very) different models.
- Organisational development of models and control strategies (more unified) can solve many problems.

Observability
- We can only observe what the interface shows.
- We often lack information and precision in information.
- Often observations require actions.
- We can overview much but remember little. Example??
- Difficulties to identify and understand complex patterns (requires good design).
Controllability

- We can only control what the interface allows us to control.
- We can sometimes only control a process at certain times.
- Different control modes can cause confusion.
- Time delays make control complex.
- Problems with feedback (feedback is always important!).

How to use the GMOC model?

- Structure for describing and analyzing.
- Understand problems and difficulties for the organisation and operator.
- Design so that all requirements are fulfilled.

An example

- Train traffic control
- From today’s system to something new and better.
- More details next lecture.....
Communication and cooperation

Humans in complex systems

A complex organisation

Humans in complex systems

Exemple

Train traffic control:
- Goals not related to observation and control possibilities
- Can not observe decision relevant data
  - How trains are moving, speed position
  - Presentation not geographically correct
- Observation do not support development of a mental model
- Control actions can not be taken when the decisions are made