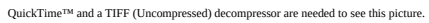

System oversight in a new regulatory era

Sidney Dekker

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President's memo to managers

"I have to get this off my chest: mistakes sometimes are brought about by carelessness; mistakes that could have been avoided. The consequences—aircraft turning back, dumping fuel, long delays, dissatisfied passengers, extra costs—are often underestimated or don't even occur to some. All employees must be aware of their responsibilities. I therefore strongly appeal to everyone to always treat airline property with care, follow procedures in detail and be focused and vigilant."

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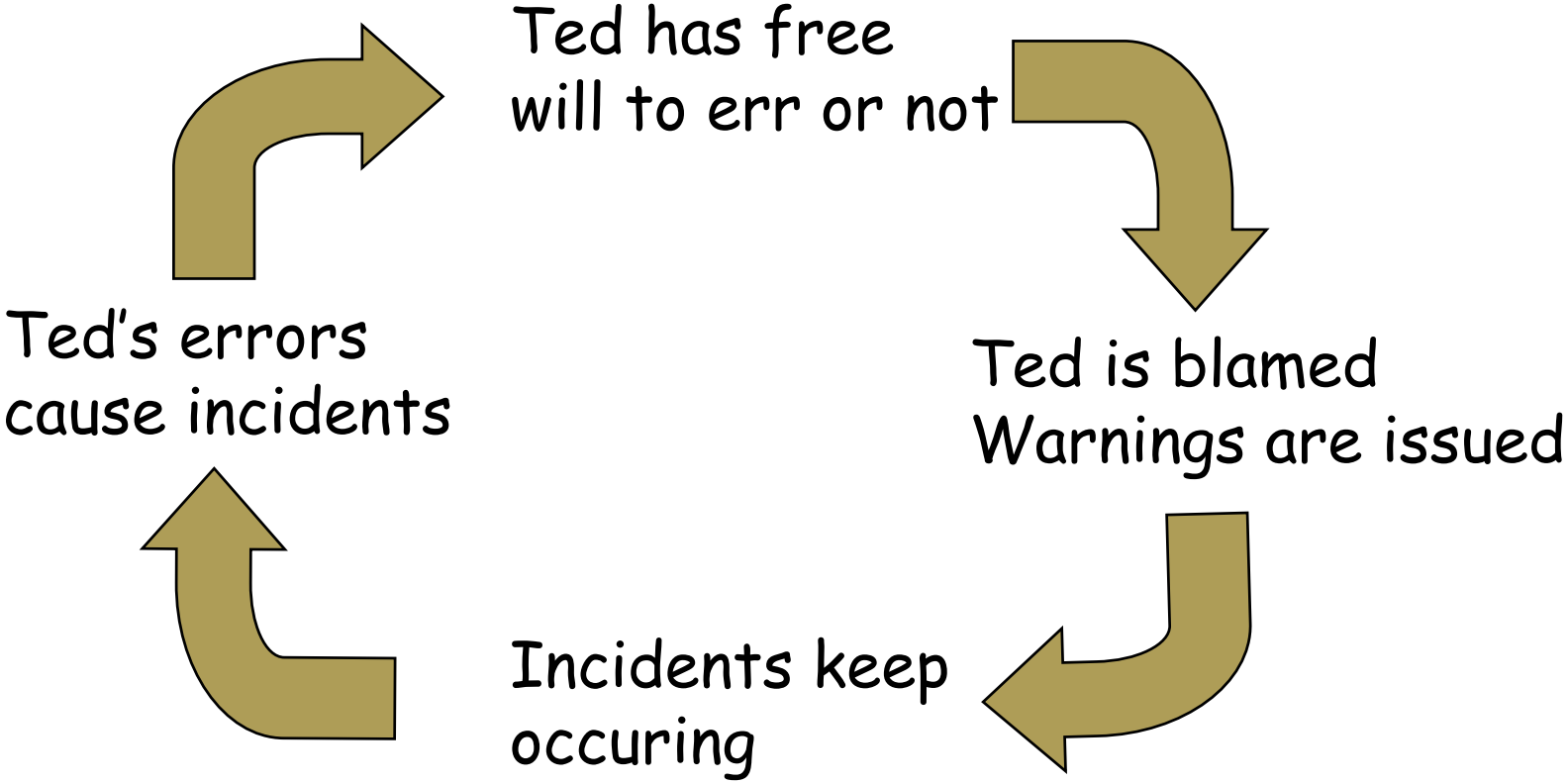
"blame cycle"



QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Old or New View?

- System is basically safe
- Erratic people undermine it
  - Need to be controlled, punished, exiled

- System is not basically safe
  - Human errors systematically connected to features of people's
    - tools,
    - tasks
    - organizational environment

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Old, componential view

- Find unreliable people or components in otherwise safe system
- Think that safety, once established, can be maintained by keeping human and system performance within bounds

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

In safe systems

- Partial awareness of paths to failure
- Paths are changing in a changing world
- Coping strategies may be weak, obsolete, mistaken
- Overconfidence about how well-calibrated
- Miss side effects of change

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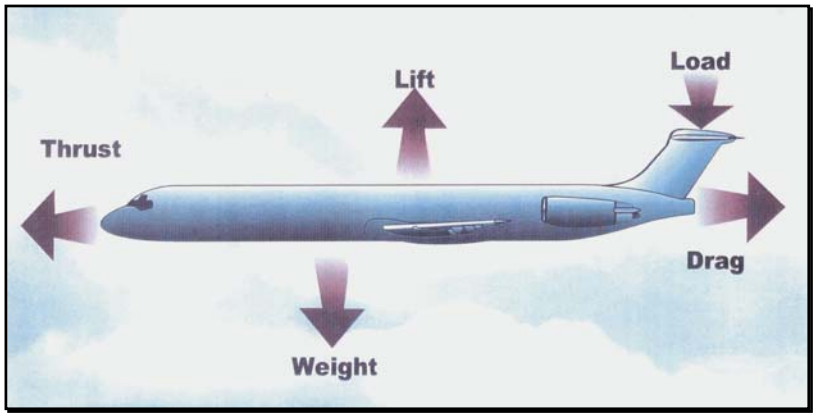
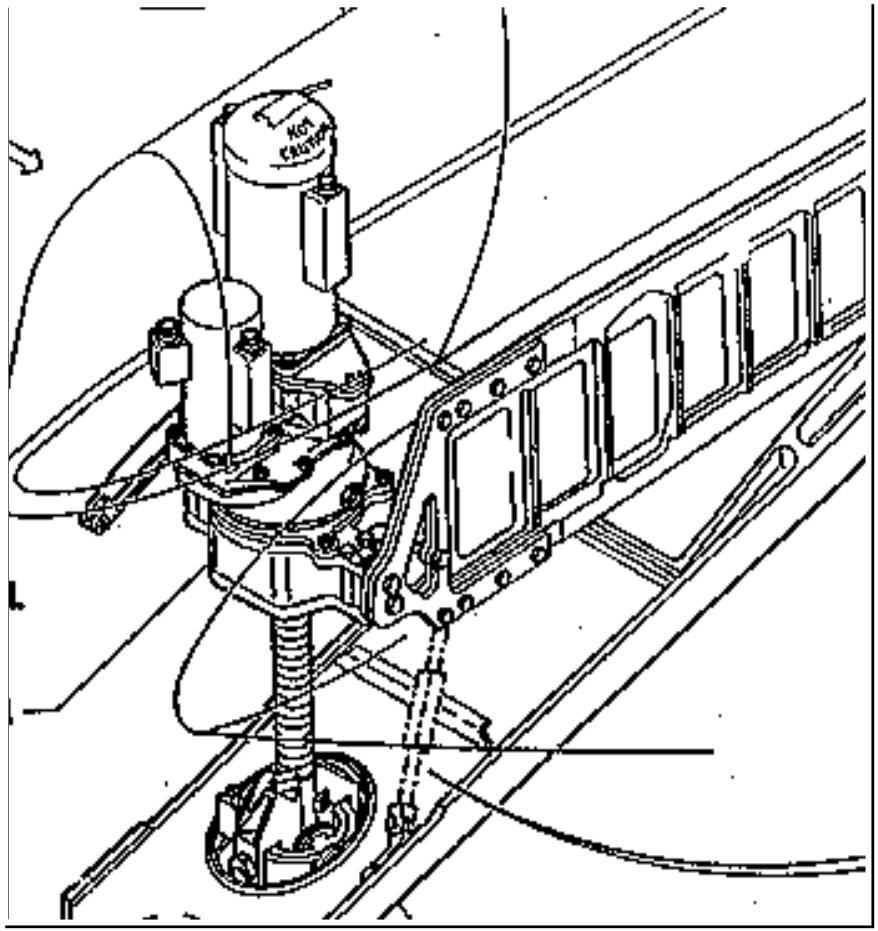
Rasmussen

"Accidents are … the effect of a systematic migration of organizational behavior under the influence of pressure toward cost-effectiveness in an aggressive, competitive environment"

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

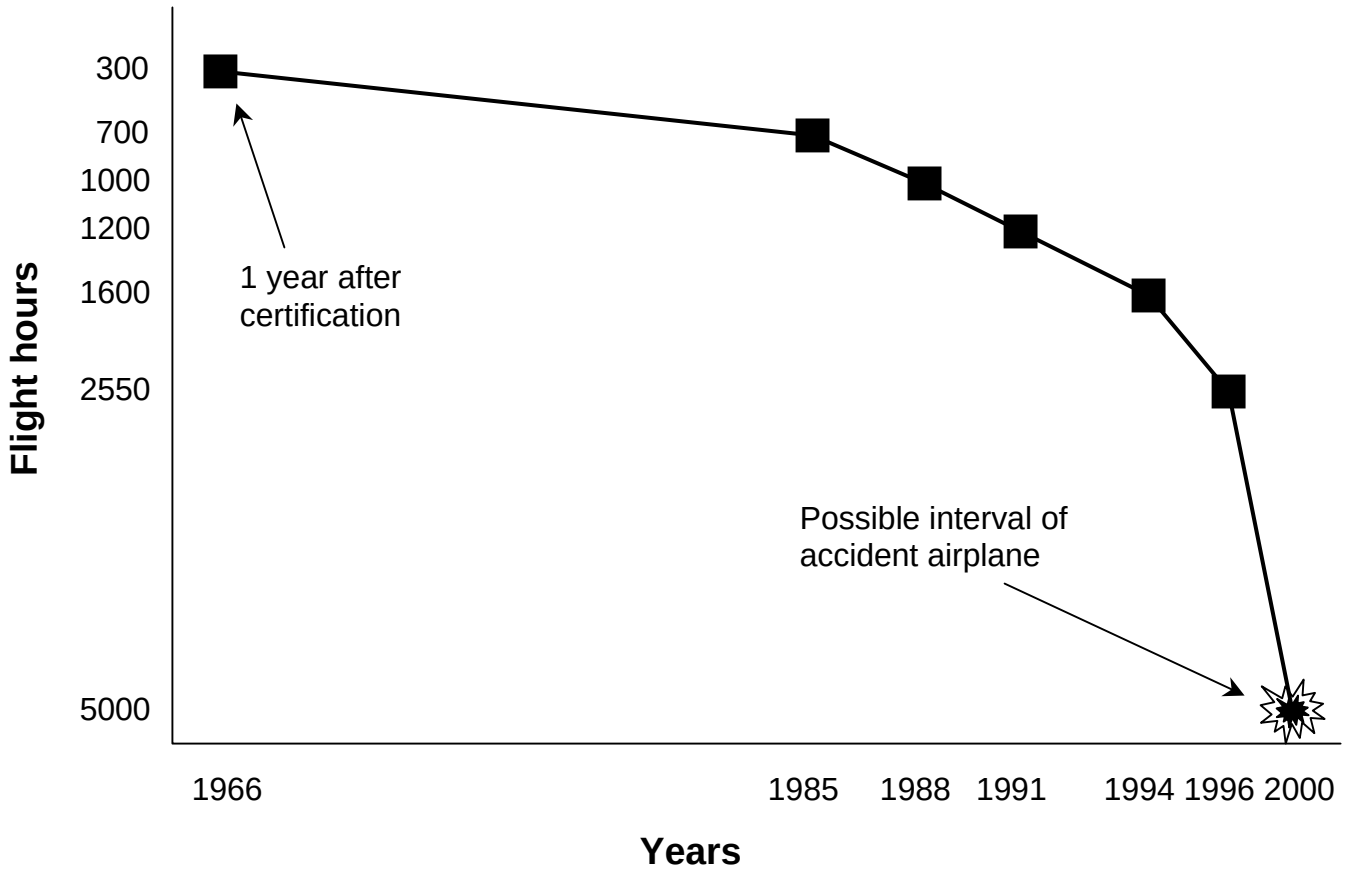
Alaska 261





QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Jackscrew lubrication intervals



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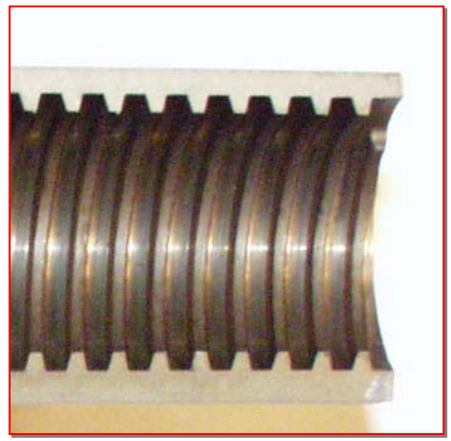
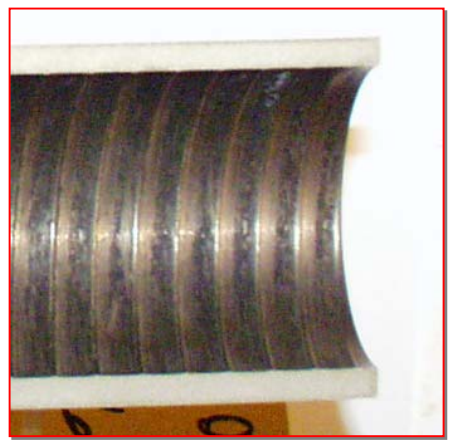




Photos courtesy NTSB

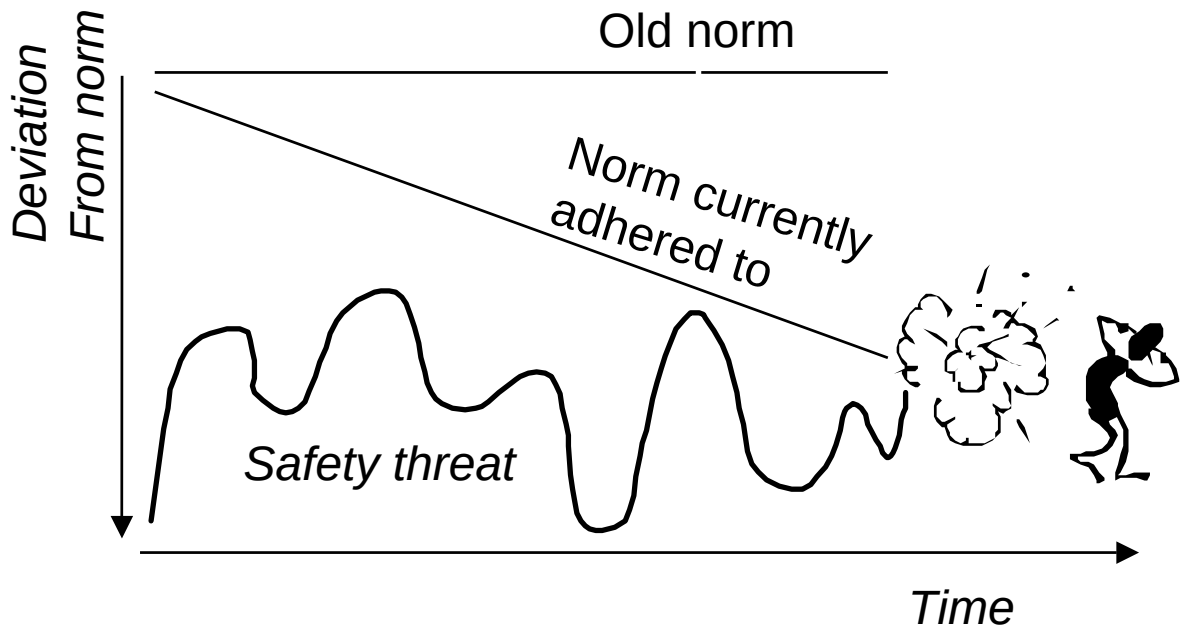
QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Drift into failure

- Normal work by normal people
  - Extensions in maintenance common
- Competition and scarcity
  - Balancing economy / safety
- Uncertain technology
- Incrementalism
  - Each deviation only small step
  - Past success guarantees future safety
- Entire protective structure contributes
  - Condones, regulates, normalizes new definition of "acceptable"

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Drift into failure



Causes ever reported as "incidents"?

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Normal work

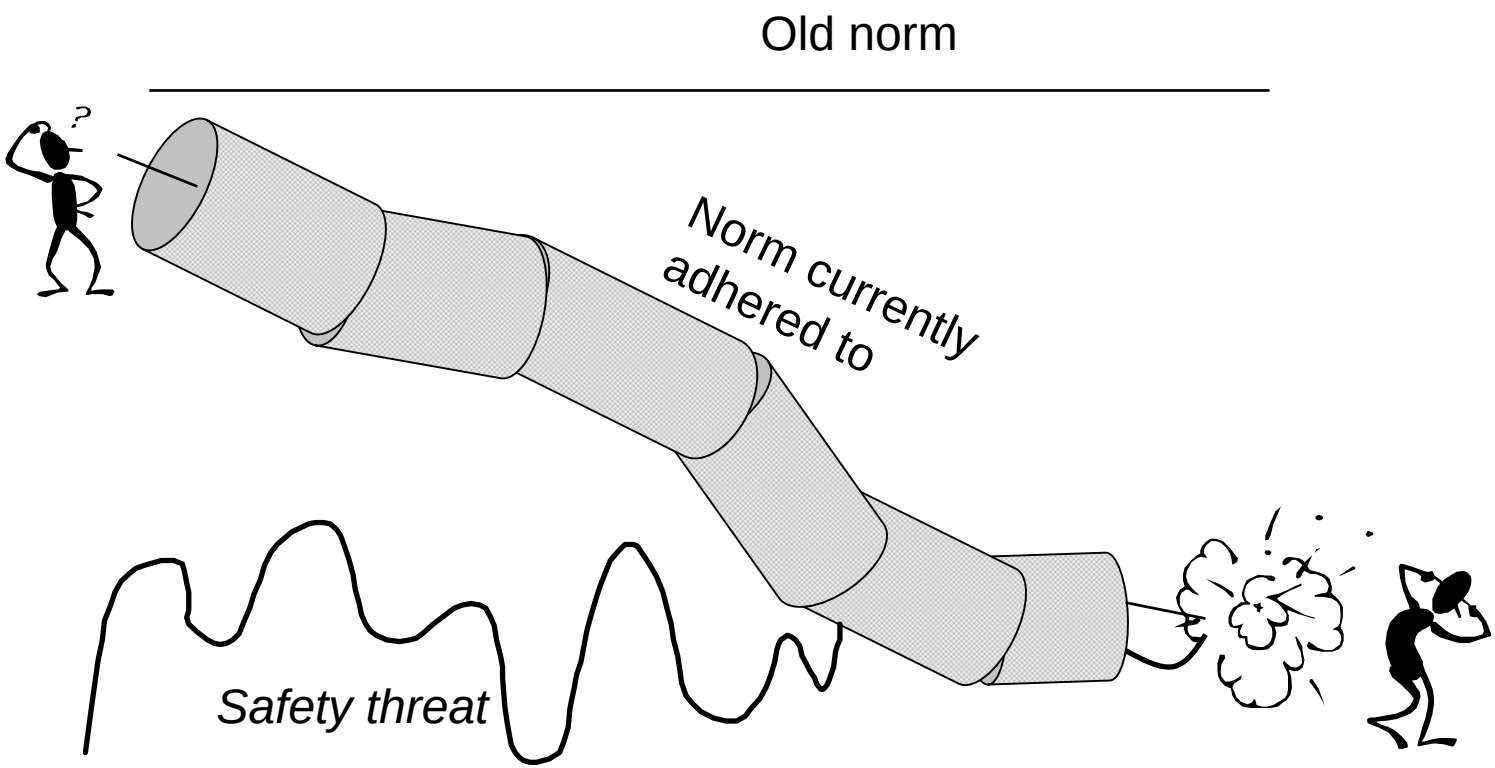
"Normal" people

doing "normal" work

in a "normal" organization

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Drift not seen from inside



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Safety culture

Is a culture that allows the boss to hear bad news


OLYMPIC
Λευκίμμη
Lefkimmi
Αχιλλείο
Achilleio
PEUGEOT

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Finding the "bad news"

- Bring in new people, with diverse viewpoints
- Take in fresh perspectives
- Generate more hypotheses
- Resist fragmentation of problem solving
- Openly debate rationales for decisions
- Identify more contingencies
- Reveal erroneous or hidden assumptions

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

System oversight

- Regulator in second-order role
  - Not: let me find out what your bad news is
  - But: ***what is your capability to discover and deal with the bad news that comes your way?***

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

From nuts & bolts to SMS?

- From nuts & bolts…
  - to safety management & quality systems

- Risks:
  - From one kind of nuts & bolts to another
    - Paperwork, organigram, processes
      - Can become substitute for actual organization & work
      - Lead to fragmented picture of creation of safety
  - Confuse safety & quality management

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Safety ≠ Quality

Safety is not the sum of quality of components

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Decomposition assumptions

- Each component or subsystem operates independently
  - Analysis results not distorted when components considered separately
- Components or events not subject to feedback loops and other non-linear interactions
- Principles governing assembly of system from sub-components is straightforward

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Resilience

- Is system…

…able to recognize, adapt to and absorb disruptions or drift outside the set it was designed to handle?

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Pick right analogy

- To keep machine working
  - You check the parts
  - And their interaction
- To keep living system working
  - You check its ability to resist or accommodate harmful influences

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Awareness by any means possible

- Formal report

  "On final approach at 2000 feet AGL the first stage of flaps was selected. Flaps failed with no flap movement. A decision was made to go around and hold while preparing the aircraft for a flapless approach. Flapless approach completed on runway XX".

- Confidential report

  "During the go-around, I was distracted by concern for proximity of high ground as the clearance was non-standard. 'Gear-up' was called. I was about to select it up when Air Traffic Control called again. After the call, I continued the after-take off checks as if the gear was up. Neither of us realized it was still down for some five minutes."

From: O'Leary & Pidgeon, 2005

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

So, system level

- Safety is not something a system HAS
  - Does not just inhere in quality of its components
- Safety is something a system DOES
  - Emerges from activities to recognize and adapt to harmful influences
  - And system's continuing monitoring of whether these activities (and models on which they are based) are still accurate

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Ask yourselves this

- Keep discussion of risk alive when things look safe
- Don't take past success as guarantee of future safety
- Identify gap between work as imagined and work as actually done
- Have resources/authority to invest in safety when cannot afford to