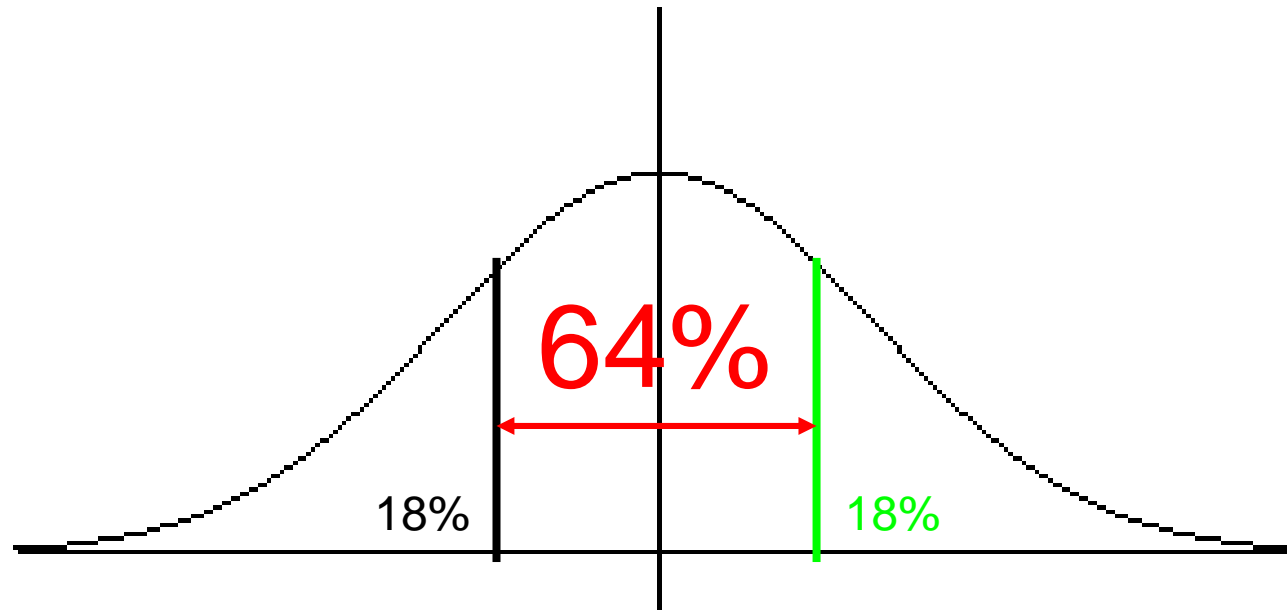
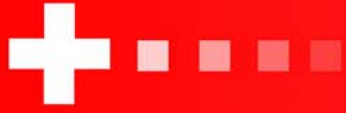


# Human Factors Training ANZSASI 2006

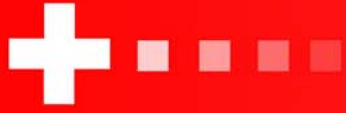
Werner Naef  
Naef Limited



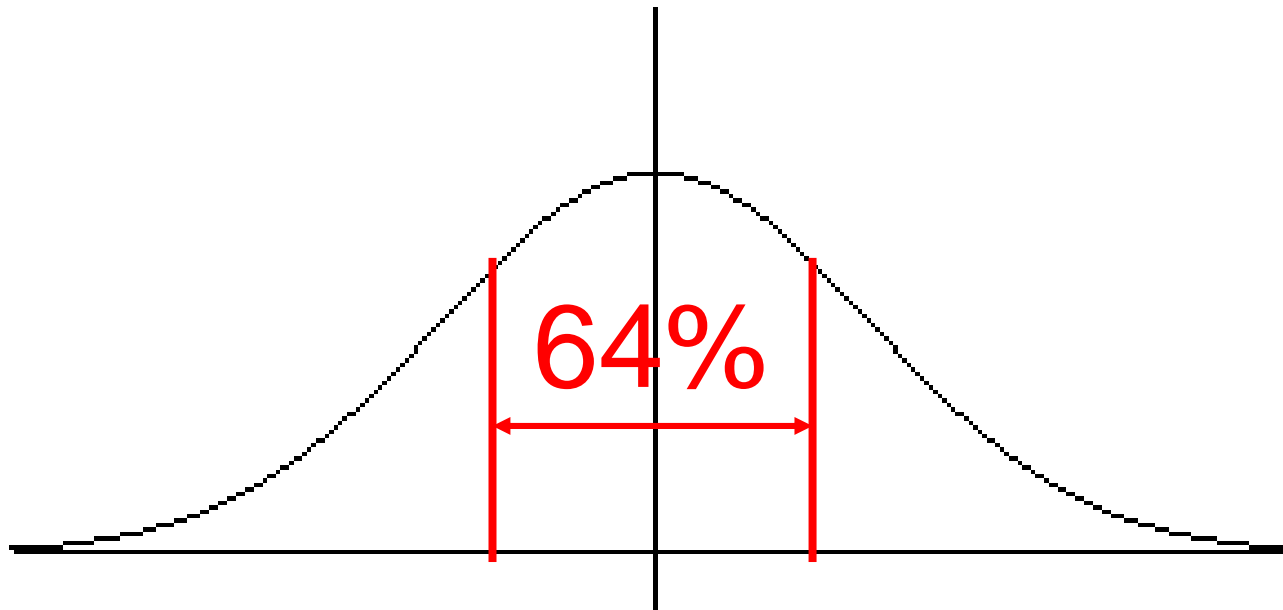


64% of crew do not show a valid predictor in terms of:  
CRM behaviour versus technical performance.





# GIHRE aviation research outcome



- Good CRM behaviour, but unsafe operation, or
- Bad CRM behaviour, but safe operation, or
- Inconsistent link between CRM behaviour and performance.





In spite of everything like...



- CRM
- TEM
- AQP

We unfortunately still see incidents and accidents occurring and the human factor being a major issue in the causal tree.





In spite of everything like...



- CRM
- TEM
- AQP



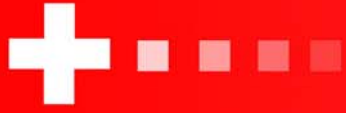
We unfortunately still see accidents and accidents occurring and the human factor being a major issue in the causal tree.





Human Error is a major causal factor





**swissair**



Capt Werner Naef

GM Training / CRM & Human Factors

AEA at JAA HFStG

HF expert of NAA

HF in air force

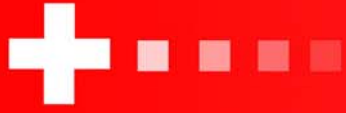
HF in medicine

HF in ATC

HF in rail

EAAP

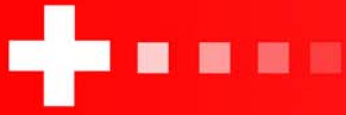




# Risk Assessment - a personal input



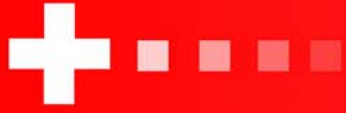




# Risk Assessment - a personal input



Zurich -  
New York



Was it safe?

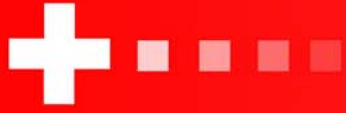


Did it make sense?

Was the risk level assessed?

- Likelihood and consequence

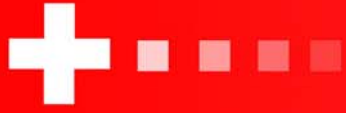




What was applied?

- Gut feeling
- Established practice
- Good faith
- Trust in others
- Experience.

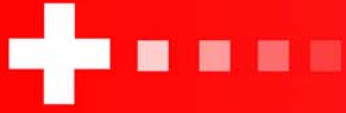




## Justification: Formal Criteria

- Management issues to be resolved
- Requirement for flight hours
- Requirement for flight duty days.

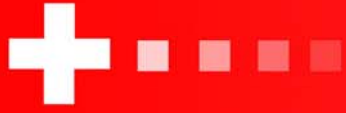




## Motivational Criteria

- I have to be perfect, others do it as well
- I am able to do it
- I have to demonstrate that I can do it
- It is my job
- It gives me a good feeling
- I am important
- Great challenge.

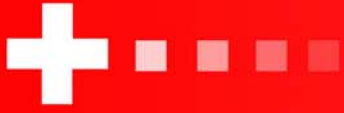




It was also part of the corporate culture

- The corporate culture did not prevent this from happening
- The corporate culture actually fostered the attitude.

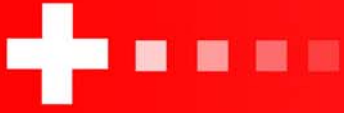




So, what was the all dominant factor?

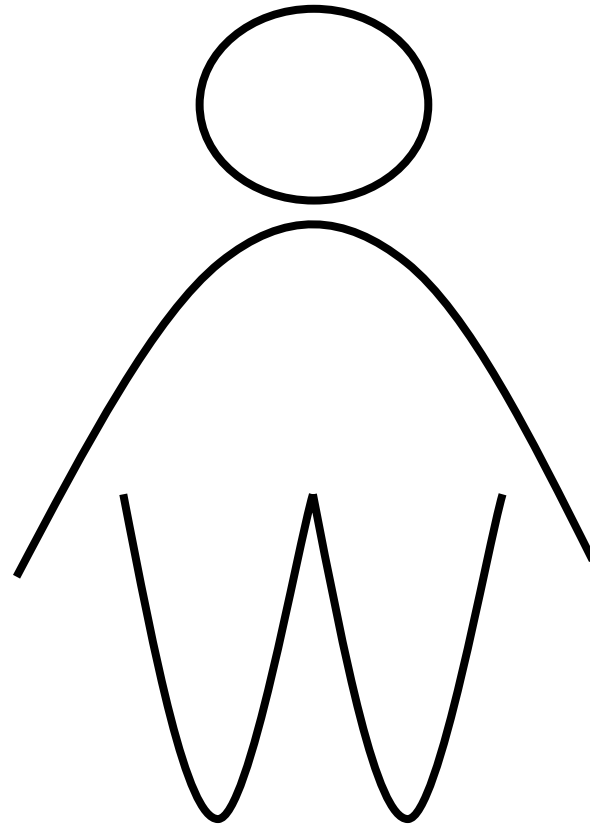
- Rules & Regulations? \_\_\_\_\_ **No!**
- Training? \_\_\_\_\_ **No!**
- Personal motivation? \_\_\_\_\_ **Yes!**
- My 'home-made' pressure \_\_\_\_\_ **Yes!**
- Habit / Culture \_\_\_\_\_ **Yes!**
- Individualistic human factors? \_\_\_\_\_ **Yes!**



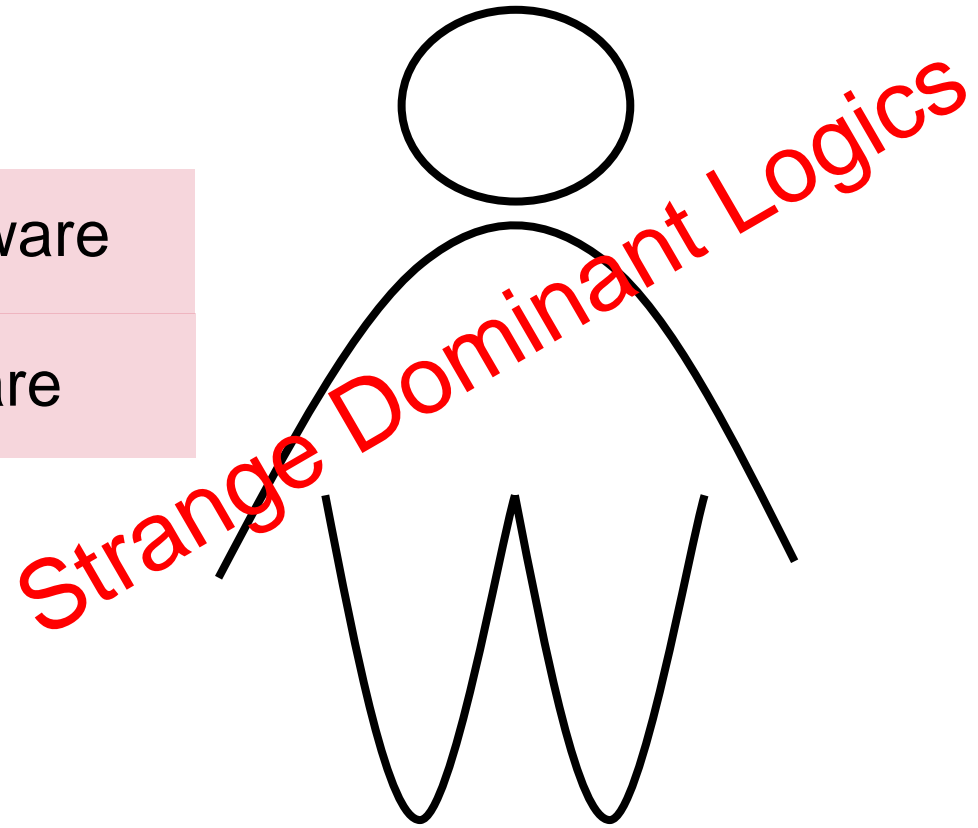
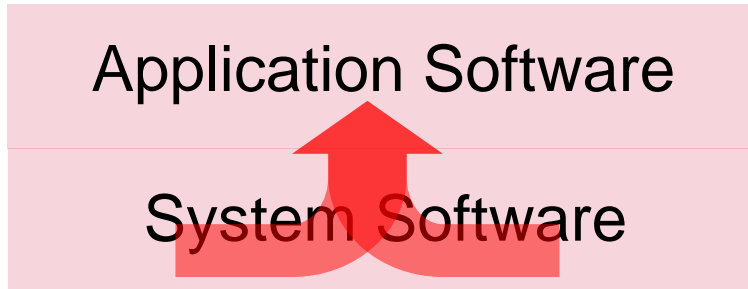
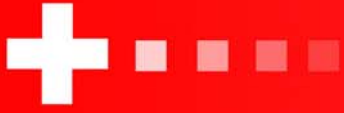


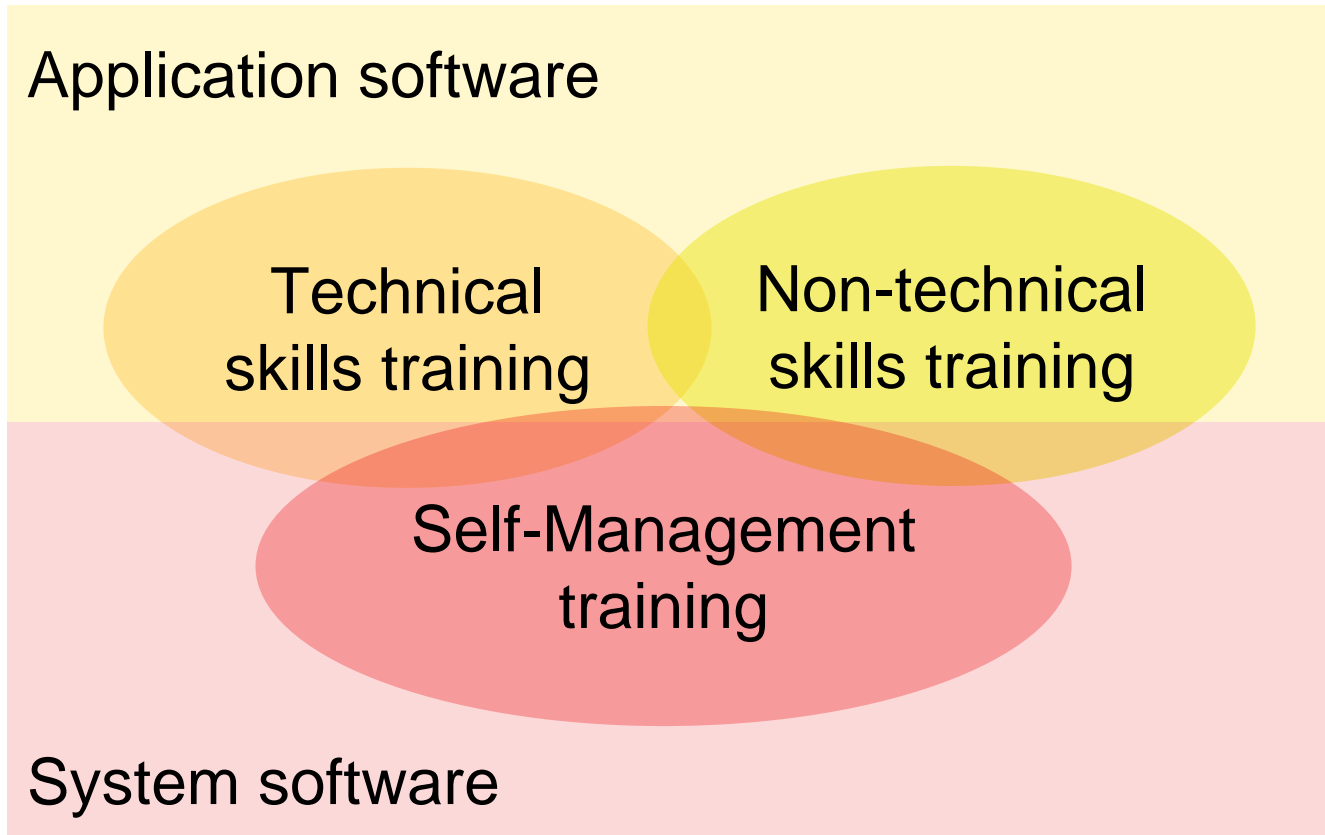
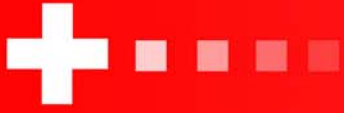
Application Software

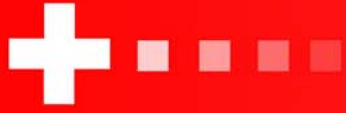
System Software







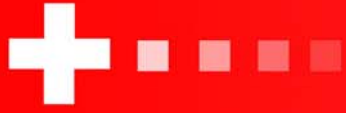




Why did my training not help to prevent this?

- 90% technical training
  - Technical systems and performance
  - Stick and rudder skills
  - Systems operations
- 10% non-technical skills training
  - Co-operation
  - Leadership
  - Situational awareness
  - Decision making
- 0% self-management training.





## Question

„What was your last safety-related event and when did it happen?“

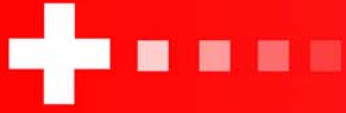
4400 pilots from across Lufthansa Group

Feedback : 2070 (47%) pilots

Events : 1897

Questionnaire : 1653 data categories

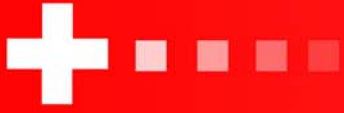




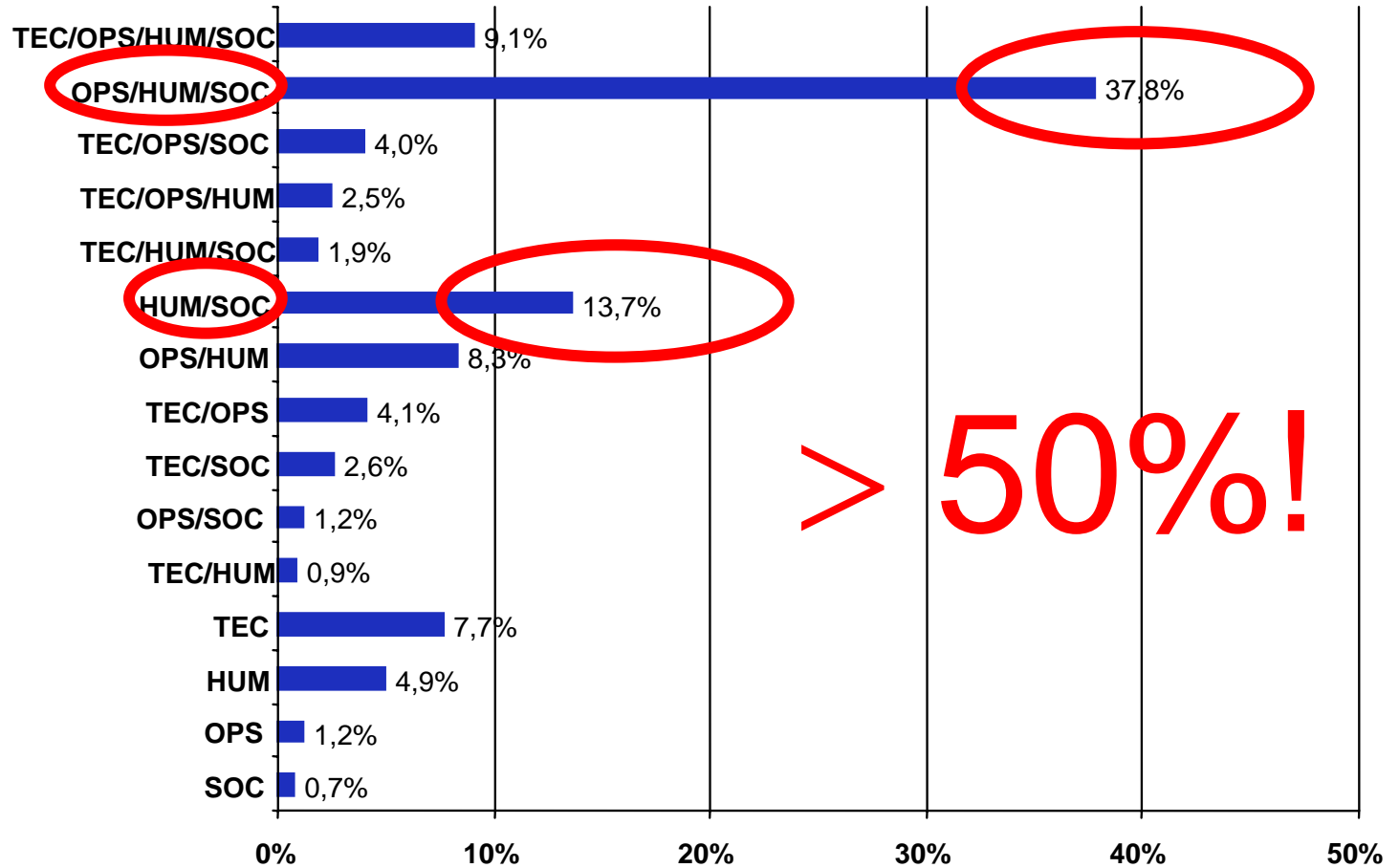
Which **combination** of the following four factors is the **most dangerous** one?

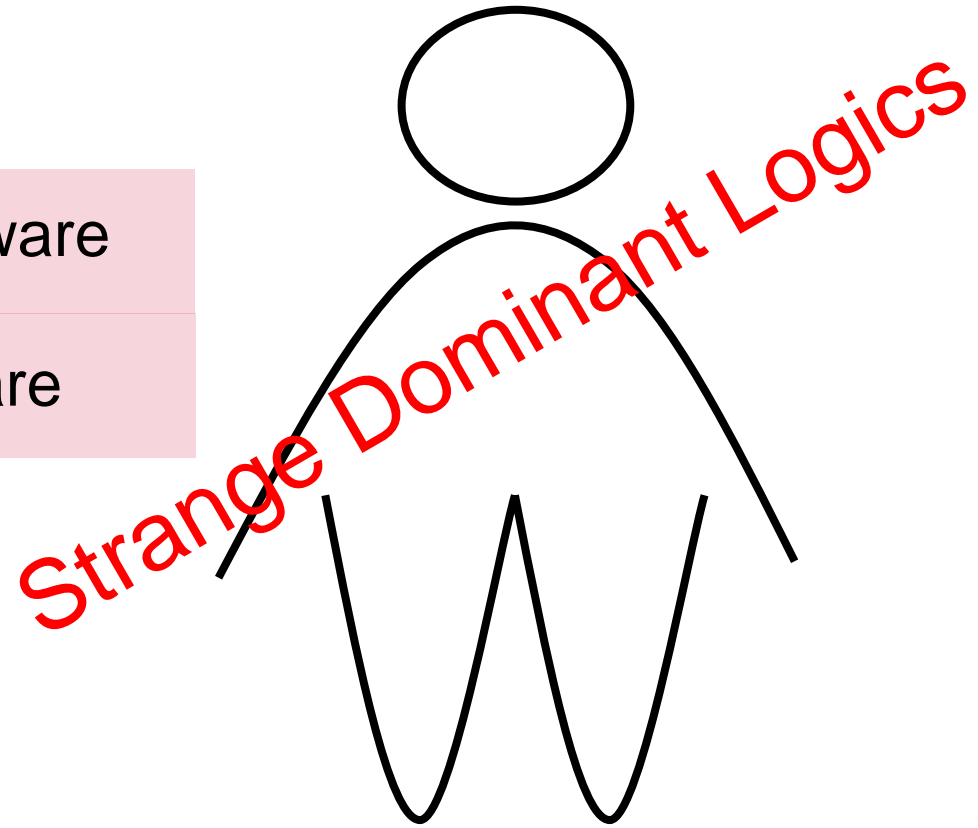
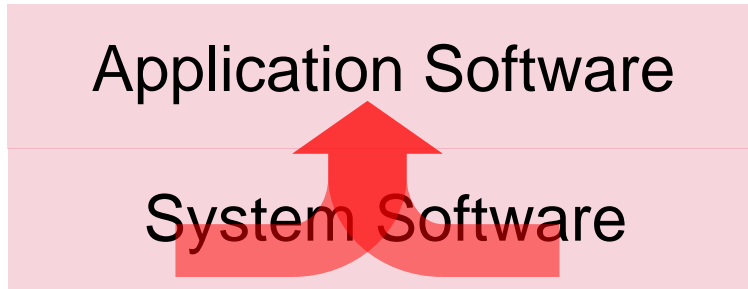
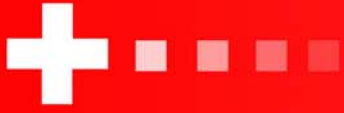
- Technical (**TEC**) factors
- Operational (**OPS**) factors
- Human Error (**HUM**)
- Social Deficits (**SOC**)

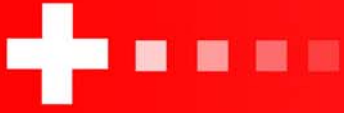




# Incident Survey Lufthansa 1998

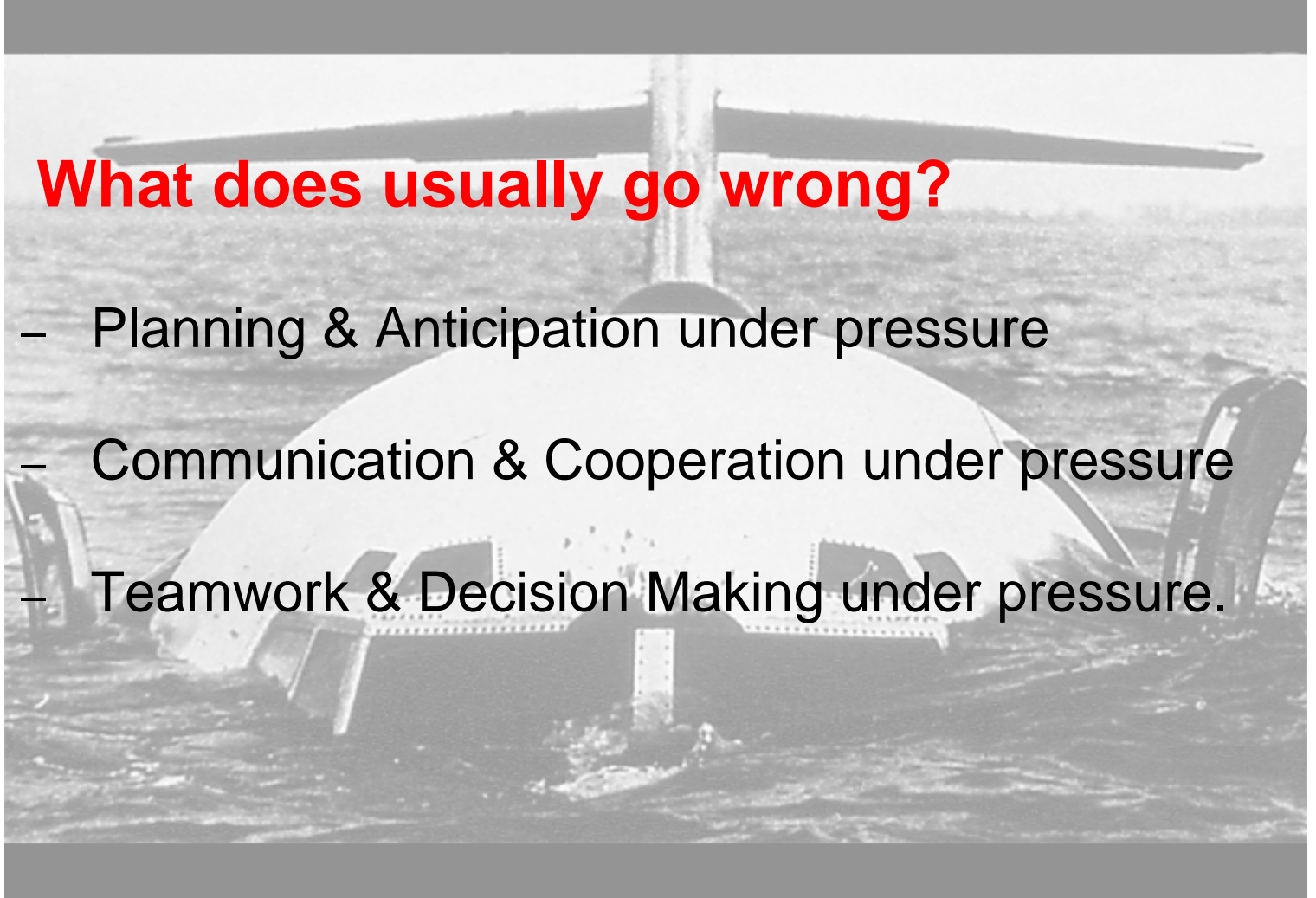




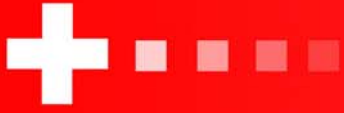


## What does usually go wrong?

- Planning & Anticipation under pressure
- Communication & Cooperation under pressure
- Teamwork & Decision Making under pressure.







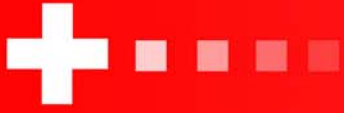
According to our experience....



This finding is not limited to aviation, but has been found in:

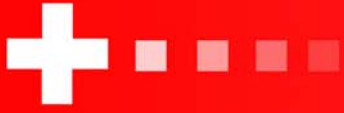
- Management (crisis management)
- Operations control centre (airline)
- Rail Operations (footplate and control centre)
- Medicine (operating theatre crew)
- Maritime (master, engineer and deck hand).





- All key players were under stress
- They all were well trained and highly experienced
- At a certain stress level, a different behavioural pattern took over, the 'thinking' became biased
- Specific drivers delivered the motivation to act as they did
- The switchover from **green-**, to **orange-** & to **red range** ops made them follow a different **dominant logic**
- This different **dominant logic** has nothing to do with what had been learnt or what had been accumulated as experience.





- Key players under stress make errors, mistakes
- They often happen beyond traditional CRM concepts
- And at a rather individualistic level
- Therefore: need to focus on both, on the generic concepts as well as on the individualistic component
- The latter - much less established yet - needs to concentrate on self-management, especially when under pressure.





1999 - 2004:

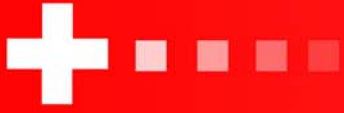
- Daimler-Benz Foundation Germany:
  - Group Interaction in High Risk Environment
    - Medicine : NASA/UT (Bob Helmreich)
    - Nuclear : German Govt
    - Aviation : Swissair
- GIHRE aviation:
  - 46 crew on video, 4hrs each crew, 4 scenarios
  - Behavioural analysis with NOTECHS and LOSA





- How to measure team performance?
  - NOTECHS and LOSA: Two behavioral marker systems for the measurement of crew resource management (CRM)
- How stable is teamwork across different situations?
- How does non-technical performance relate to technical performance?
- How does task load affect CRM performance?





# Measuring team performance

46 Crew in A320 simulator



Alt. : 726.95	Pitch : -0.08	Loc Dev : 0.000
Speed : 0.0	Bank : 0.00	GP Dev : 0.000
Head. : 348.98	PWR Setting : 0.00	

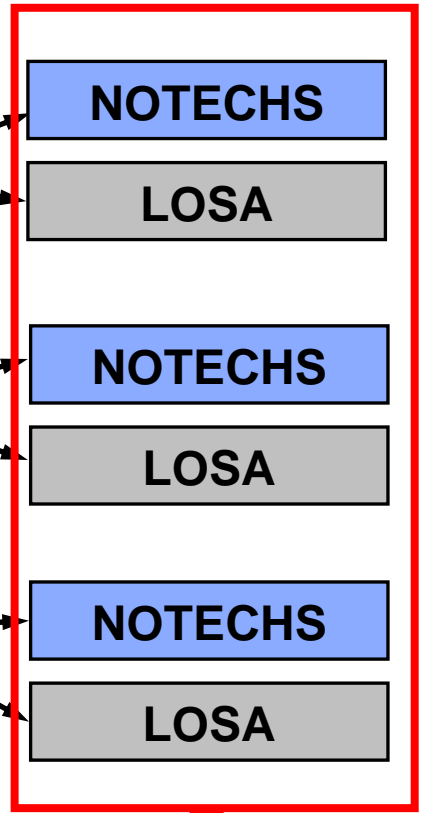


**Technical performance**

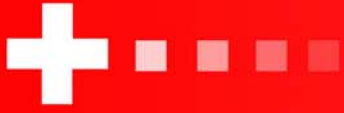
Scenario 1

Scenario 2

Scenario 3



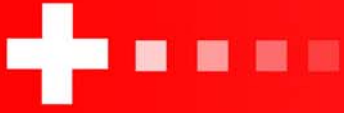
**CRM performance**



- Majority: CRM performance is situation-dependent
- 64% of crew do not show a valid predictor in terms of CRM behaviour versus technical performance
- Team performance is impaired by task load, thus:
  - Stress exposure training needs to include the maintenance of CRM performance under stress.

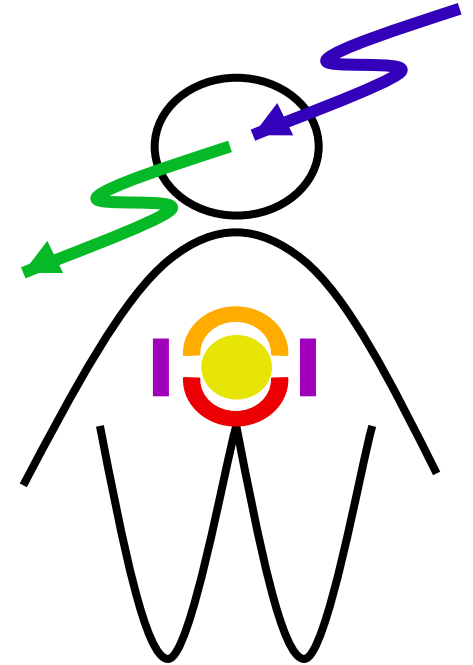
**How specific are stress mechanisms for the individual?**



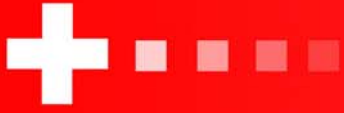


# What Does This Mean?

- We are different
- We should know
- We should be able to systemise
- We should be able to better monitor
- We should be able to improve through training.



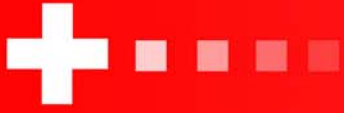




## Step 1: Awareness and experience

- Learn about your own stress mechanisms and about those of others in the team
- Learn about stress prevention technique aimed at your and others' personality structure
- Learn about stress intervention technique aimed at your and others' personality structure

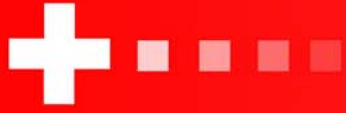




## Step 2: Application and Training

- Stress exposure training using high fidelity simulation scenarios
- These allow for genuine stress experience
- Behaviour is captured by video
- Debriefing: individual stress behaviour can be analysed, discussed and modified
- Repeated scenario training allows for implementation of modified behaviour.





# Practical Training Application - Example

Training of Non-technical skills and Self-management in stressful situations



[www.gemasim.com](http://www.gemasim.com)





- [www.e-collection.ethbib.ethz.ch/ecol-pool/bericht/bericht\\_379.pdf](http://www.e-collection.ethbib.ethz.ch/ecol-pool/bericht/bericht_379.pdf)
- [www2.hu-berlin.de/GIHRE/Download/einlei.pdf](http://www2.hu-berlin.de/GIHRE/Download/einlei.pdf)
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Thank you for your  
attention!

Werner Naef  
Naef Limited

