

Gospodarska  
zbornica  
Slovenije



Združenje kemijske industrije



ŠOLA INDUSTRIJSKE IN  
PROCESNE VARNOSTI

Procesna varnost  
Izhodišča za zagotavljanje ter nekatere izkušnje iz  
prakse

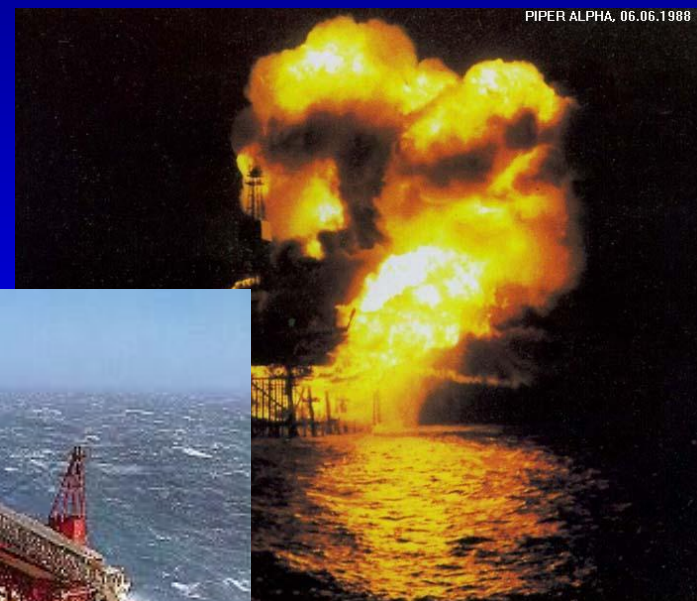
Mitja Kožuh

Šola industrijske in procesne varnosti, 2024



## Procesna varnost

### Izhodišča za zagotavljanje ter nekatere izkušnje iz prakse



**Mitja Kožuh**





## Razumevanje varnosti

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Some years ago I went to a conference at which a newly appointed director of safety began his presentation with the assertion that “safety management is not rocket science.” And he was right. Rocket science is a trivial pursuit compared to the management of safety. There are only a limited number of fuel types capable of lifting a payload into space; but the variety of ways in which harm can come to people is legion. Although writing a procedure to achieve some productive aim is not easy, particularly when the task is complex, it is always possible. In contrast, there are not enough trees in the rain-forest to support all the procedures necessary to guarantee a person’s safety while performing that activity. . . . James Reason



# Koncepti varnosti in tveganja

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Here's the story, titled

“Whose Job Is It, Anyway?”

*This is a story about four people named Everybody, Somebody, Anybody and Nobody. There was an important job to be done and Everybody was sure that Somebody would do it. Anybody could have done it, but Nobody did it. Somebody got angry about that, because it was Everybody's job. Everybody thought Anybody could do it, but Nobody realized that Everybody wouldn't do it. It ended up that Everybody blamed Somebody when Nobody did what Anybody could have.*



## Analogija iz literature

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„Človek je bitje, ki je bilo ustvarjeno ob koncu tedna...  
ko je bil Bog že utrujen“

Mark Twain

Vse srečne družine so si podobne, vsaka nesrečna družina pa je nesrečna na svoj način.

Uvod v Ano Karenino  
Lev Nikolajevič Tolstoj

Podobno je pravi način za vsako opravilo, toda vsaka napaka je napačna na svoj način.

Trevor Kletz



# Človek v središču procesa zmanjševanja tveganja

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„Modreci imajo večjo korist od bedakov kot bedaki od modrecev;

modreci se izogibajo napakam bedakov, toda bedaki ne posnemajo uspeha modrecev.

**Marcus Cato (234-149 BC)**



# Teorija temeljnega presenečenja

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## *Webstrova anegdota*

Osnova te teorije je razlikovanje med dvema različnima vrstama presenečenja: situacijskim in temeljnim. Eden od načinov za uvedbo te razlike je anekdota o Noahu Websterju, slavnem jezikoslovcu.

One day, he arrived home unexpectedly to find his wife in the arms of his servant.

**“you surprised me”**, said his wife. **“and you have astonished me”**, responded Webster.

Webstrova natančna izbira besed je zajela pomembno razliko med njegovim položajem in položajem njegove žene.



# Uvod

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- Poskusite spremeniti situacije, ne ljudi!
- Nesreče se dogajajo zaradi
  - nevednosti;
  - apatije; in
  - pohlepa

"Izkušnje so najboljši učitelji, le šolnine so visoke."  
Thomas Carlyle (1795-1881)

**Delovne organizacije nimajo spomina!**

Prof. Kletz je dejal, da "nesreč ne povzroča pomanjkanje znanja, ampak neuporaba znanja, ki je na voljo".





# Uvod

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- Objavljenih je veliko raziskav, ki ugotavljajo, da so operaterji vzrok za 70–90 % nesreč. Težava je v tem, da ta raziskava izhaja iz poročil o nesrečah.
- Ali sklepi izhajajo iz dejstva, da so operaterji dejansko primarni povzročitelji nesreč, ali pa se jih običajno krivi v poročilih o nesrečah?
- Najverjetneje drži slednje. V najboljšem primeru takšni sklepi niso upravičeni zgolj s pregledovanjem poročil o nesrečah.
- Toda večina analiz nesreč izhaja iz prepričanja, da je napaka operaterja vzrok za večino incidentov in nesreč.



# Uvod

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- Domneva se, da mora biti operater vzrok in, kar ni presenetljivo, je operater nato v središču pozornosti v analizi nesreče in identificiran kot vzrok.
- Ko je operater vpleten, priporočila poudarjajo, da je treba nekaj narediti glede operaterja (ga kaznovati, odpustiti, prekvalificirati določenega operaterja ali vse operaterje, da ne bodo več storili iste napake).
- Poudarek na človeški napaki kot vzroku nesreč je deloma posledica teorije o »slabem jabolku«, ki je nastala pred sto leti in je bila pred približno sedemdesetimi leti znanstveno temeljito diskreditirana.
- Na žalost še vedno vztraja.
- Približno v istem času je to teorijo razglasil tudi Heinrich.



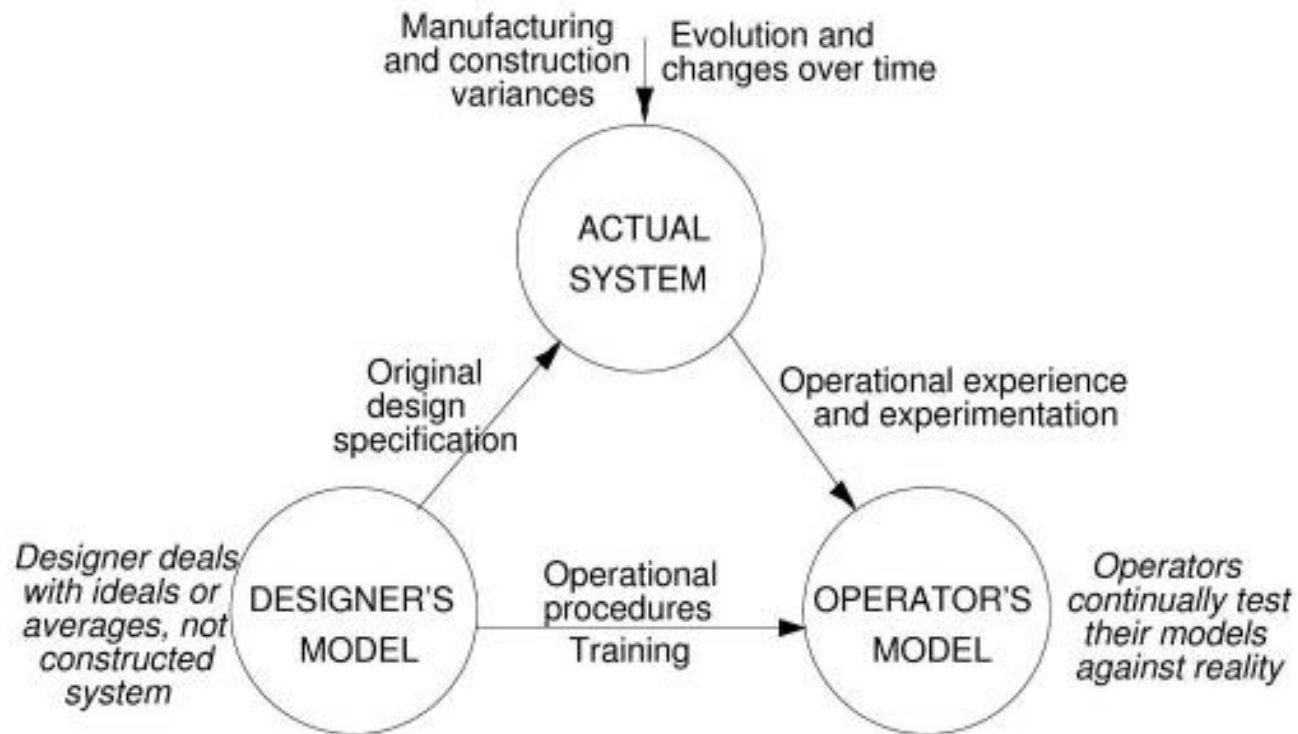
# Uvod

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- Sistemski pogled na človeško napako izhaja iz predpostavke, da na vsako vedenje vpliva kontekst (sistem), v katerem se pojavi.
- Zato je najboljši način za spremembo človeškega vedenja sprememba sistema, v katerem se pojavlja.
- To vključuje preučevanje zasnove opreme, ki jo operater uporablja, skrbno analizo uporabnosti in primernosti postopkov, ki so operaterjem na voljo.

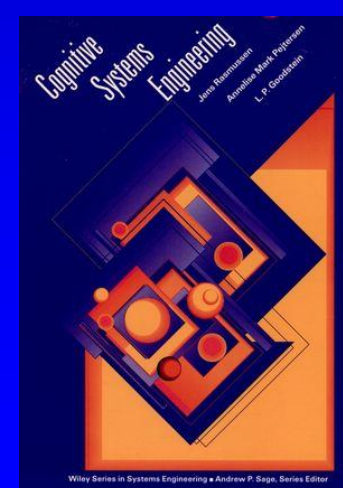
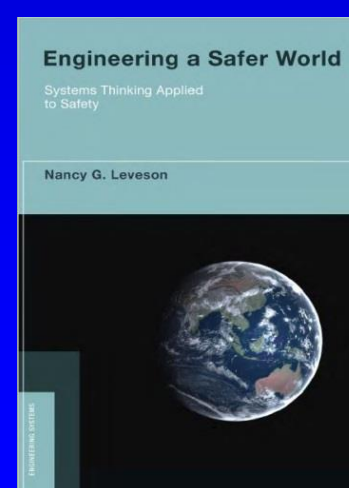
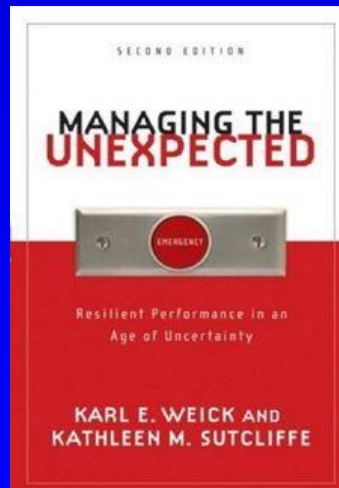
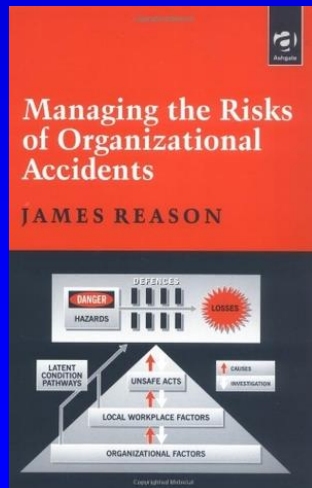
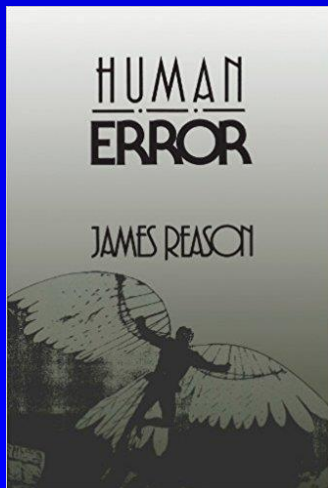
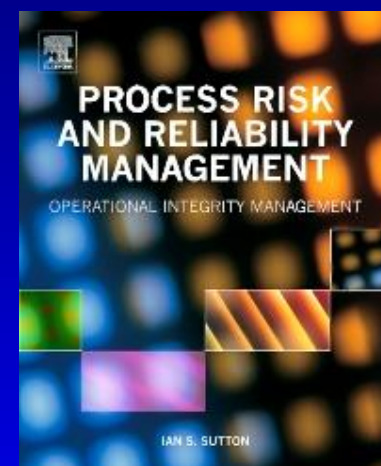
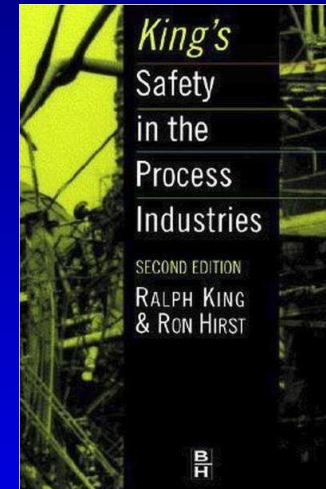
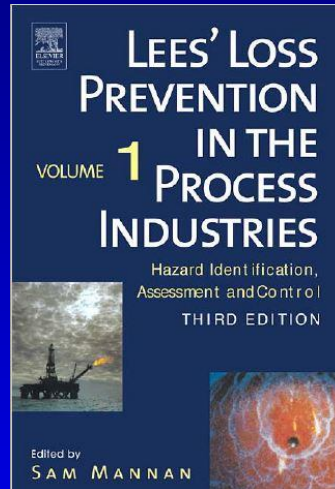
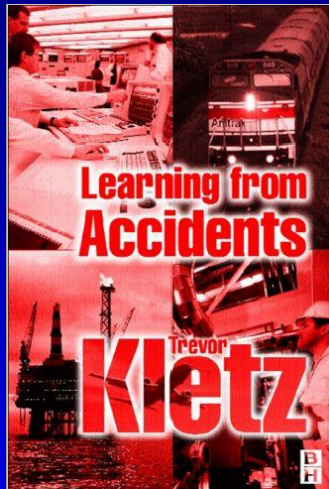
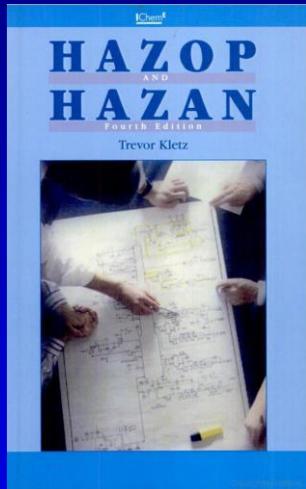


# Uvod





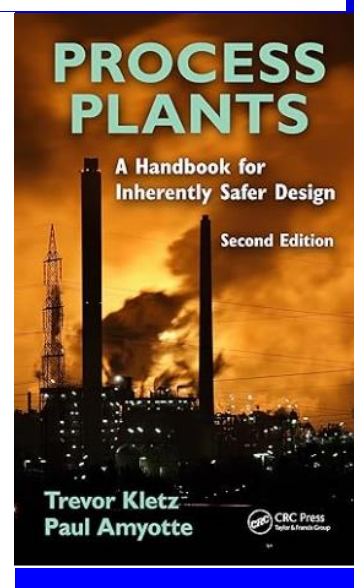
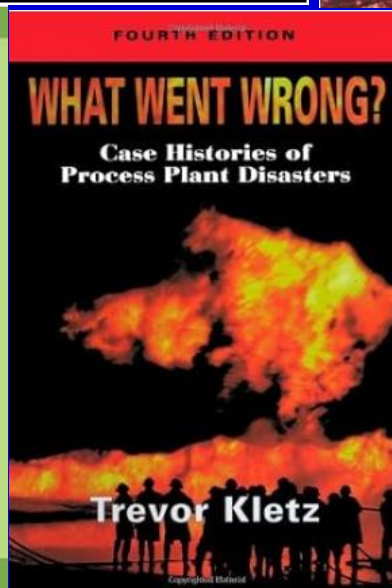
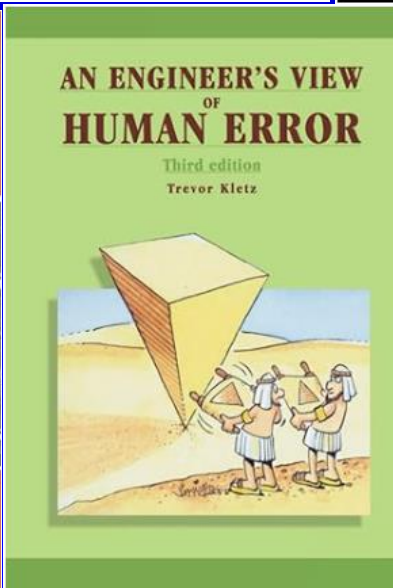
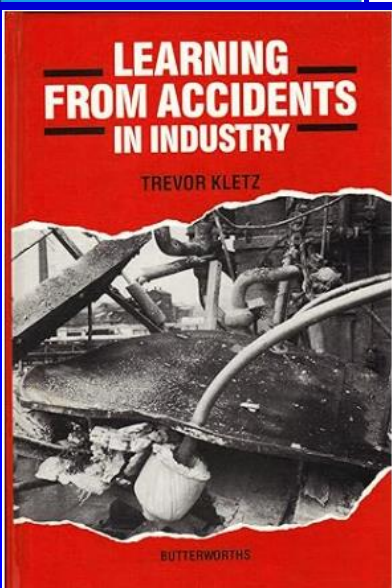
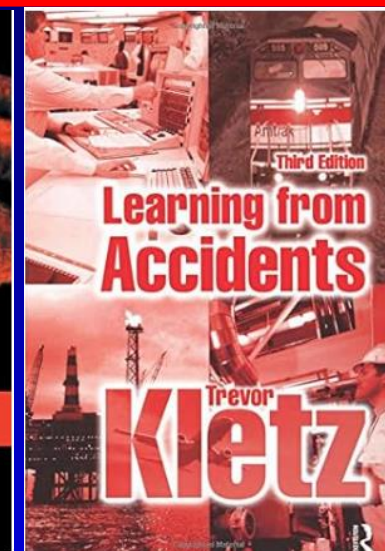
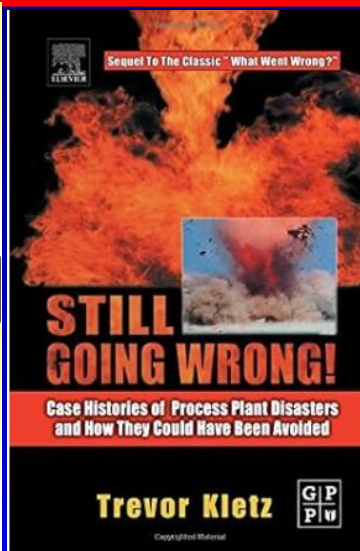
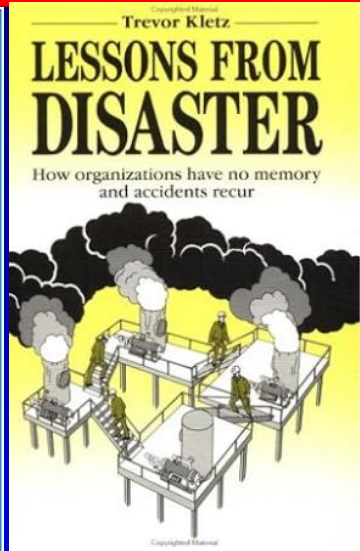
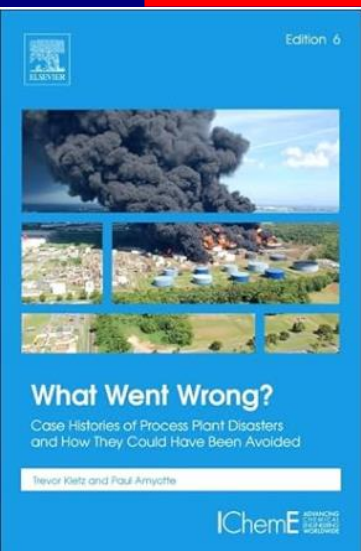
# Literatura







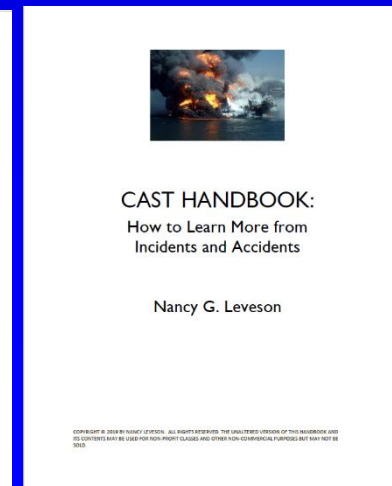
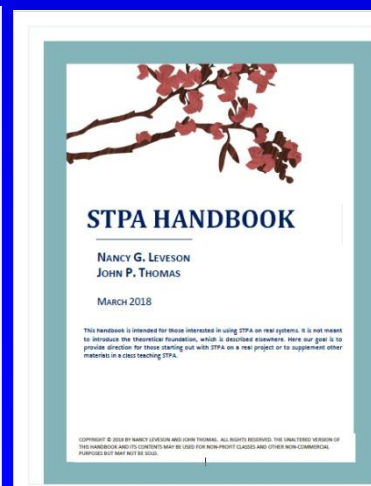
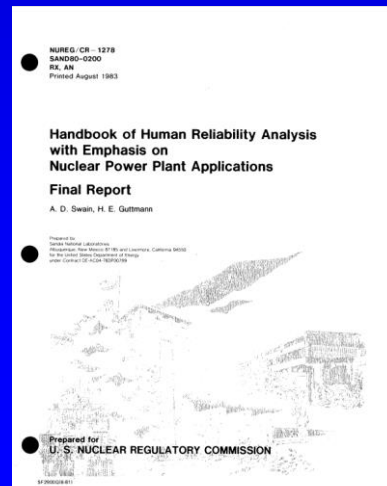
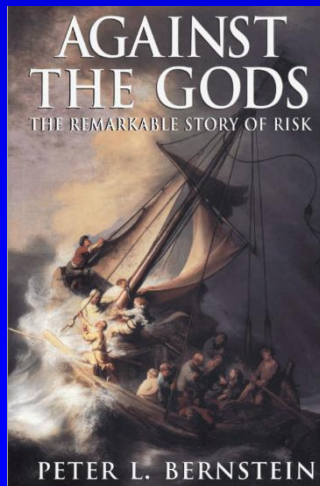
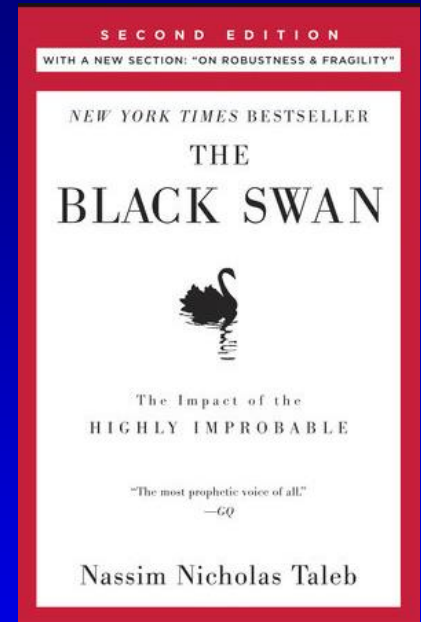
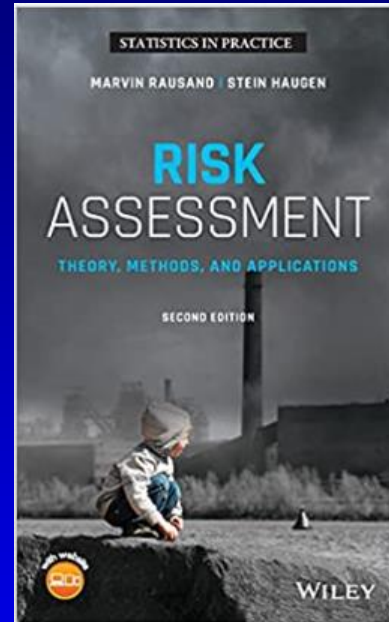
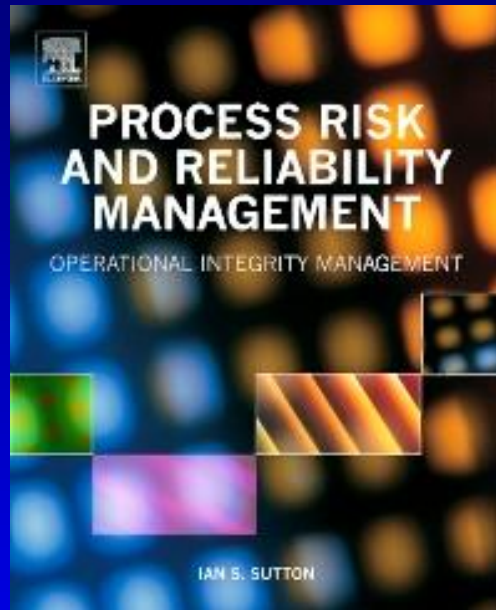
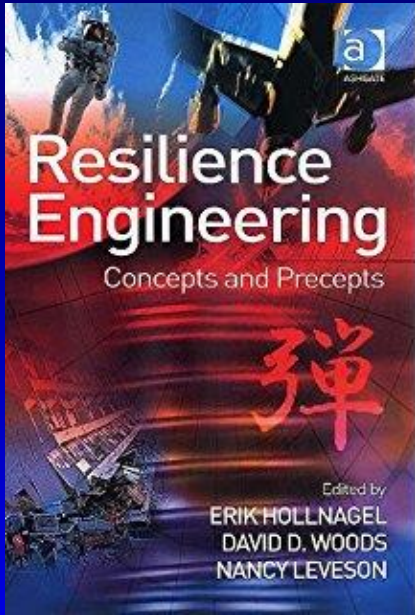
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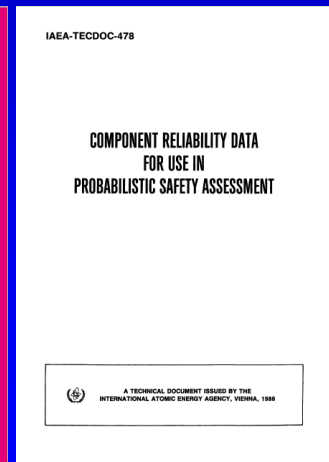
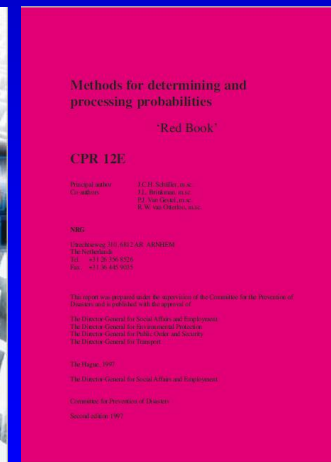
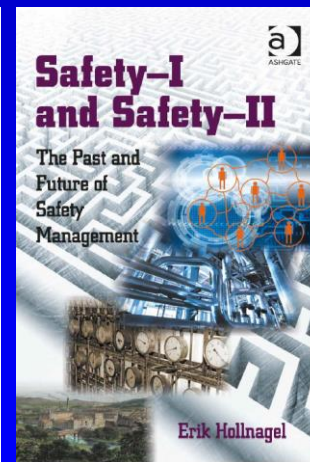
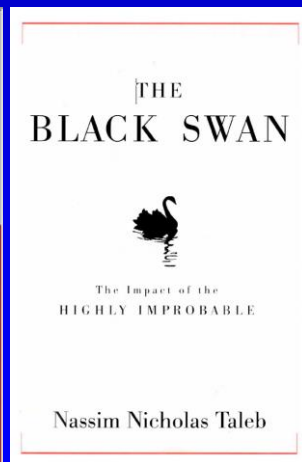
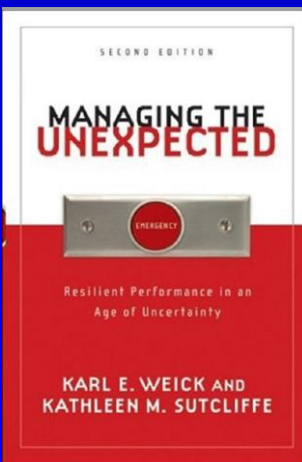
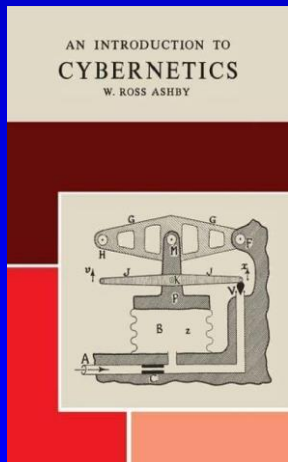
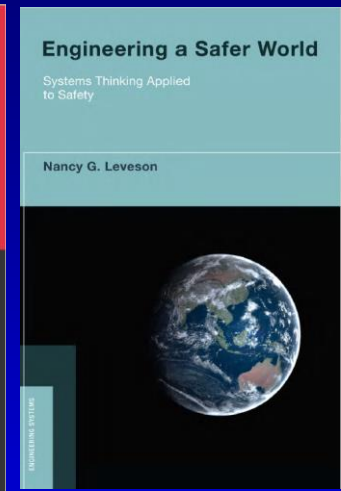
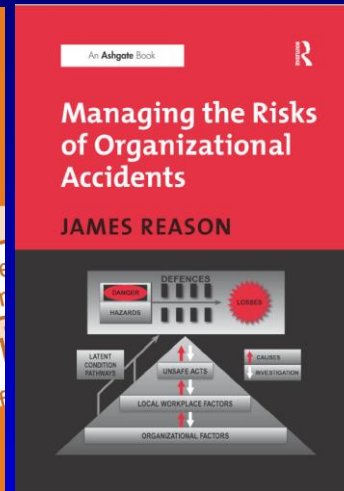
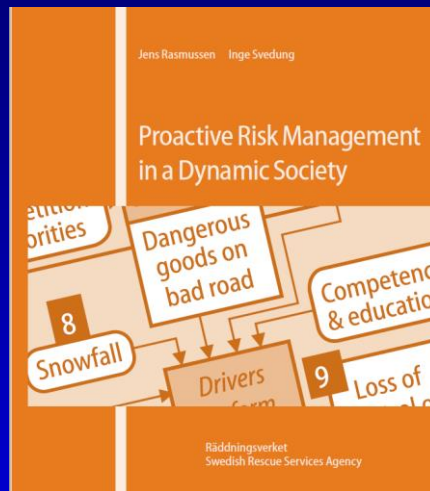
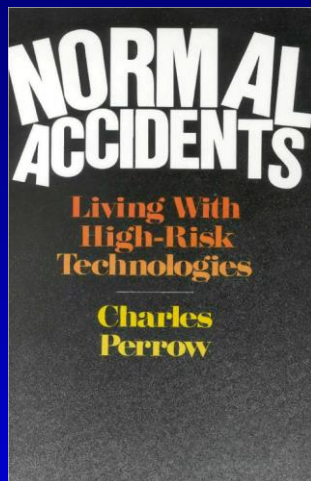
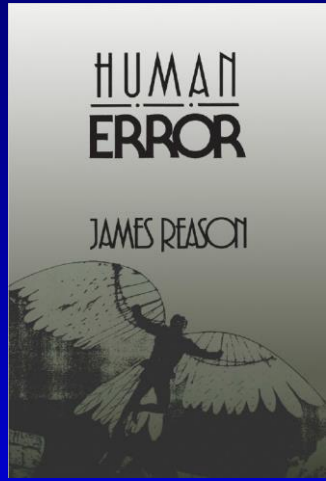


# Literatura





# LITERATURA





# Literatura

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## Fault Tree Handbook

U.S. Nuclear Regulatory Commission



NUREG/CR-2300  
Vol. 1

## PRA PROCEDURES GUIDE

A Guide to the Performance of Probabilistic Risk Assessments for Nuclear Power Plants

Final Report  
Vol. 1 - Chapters 1-8  
Vol. 2 - Chapters 9-13 and Appendices A-G

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Vol. 2

## PRA PROCEDURES GUIDE

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NUREG/CR-1278  
SAND80-0200  
RX, AN  
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## Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications

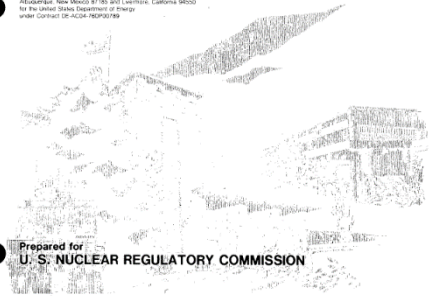
Final Report

A. D. Swain, H. E. Guttman

Prepared by  
Sandia National Laboratories  
Albuquerque, New Mexico 87185 and Livermore, California 94550  
for the United States Department of Energy  
under Contract DE-AC02-76NP01464

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U. S. NUCLEAR REGULATORY COMMISSION

SF260038-811



NUREG/CR-6823  
SAND2003-3348F

## Handbook of Parameter Estimation for Probabilistic Risk Assessment

Sandia National Laboratories

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NUREG-1792

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Final Report

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Sandia National Laboratories

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NUREG-1756

## Safety Culture: A Survey of the State-of-the-Art

Prepared for the Advisory Committee on Reactor Safeguards

U.S. Nuclear Regulatory Commission  
Advisory Committee on Reactor Safeguards  
Washington, DC 20555-0001





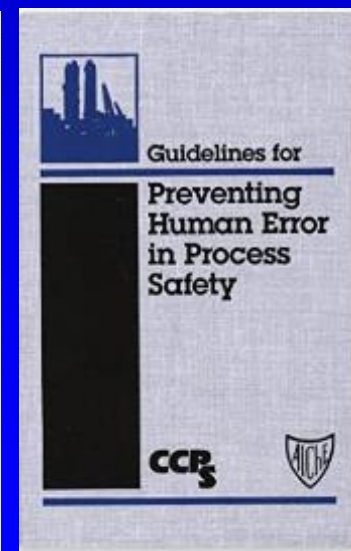
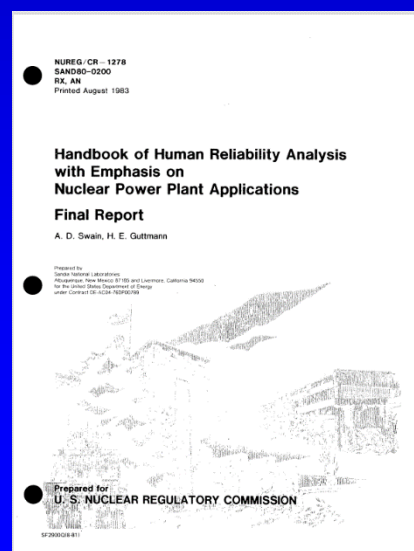
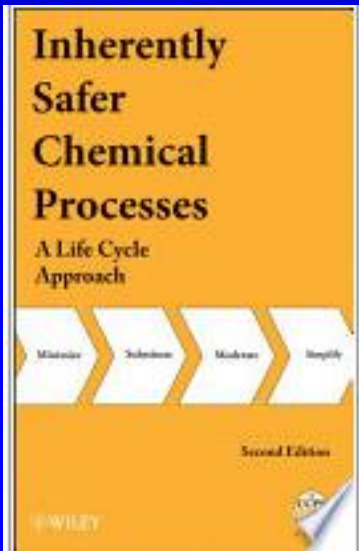
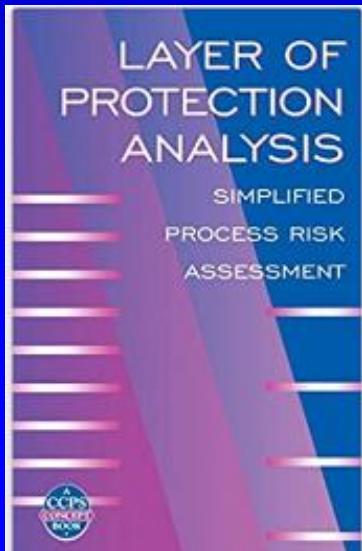


# Uporaba podatkov o stopnji napak

## Stopnje človeških napak

- Viri podatkov:

- Sami po sebi varnejši kemični procesi: življenje Cycle Approach , CCPS (1996)
- Priročnik analize človekove zanesljivosti s poudarkom na uporabi v jedrski elektrarni, Swain, A.D., in H.E. Guttman, (1983)







# Podatki o zanesljivosti

