A Summary of Major Industrial Accidents

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CHERNOBYL

NUCLEAR PLANT

CHERNOBYL
NUCLEAR PLANT

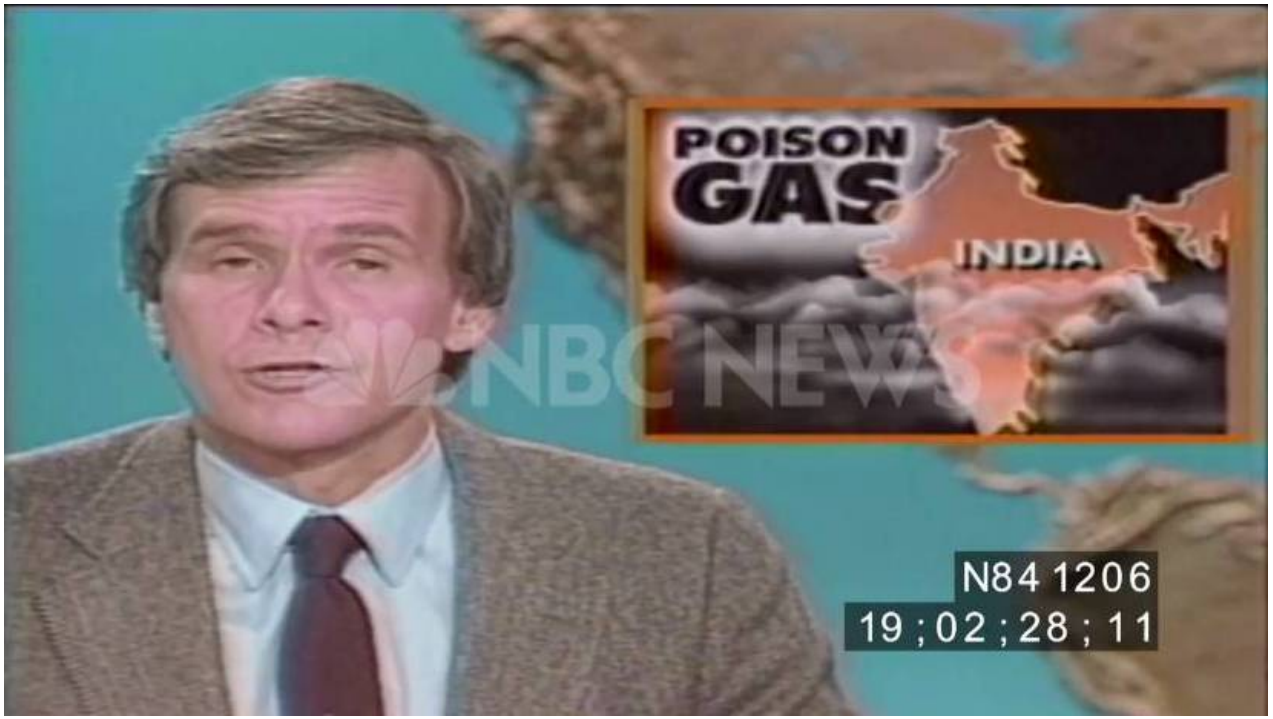
- What? Nuclear meltdown
- Where? Ukraine
- When? 1986
- Critical human factors
  - Culture
  - Violations of operating rules and regulations (NOPs and SOPs)
  - Lack of knowledge
  - Lack of experience
  - Lack of training

CHERNOBYL
NUCLEAR PLANT

- Plant Design – combination of events impossible:
  - Probabilistic risk assessment (low)
  - Intentional disabling of emergency protection equipment plus the violation of operating procedures “could never happen”
  - Rule infringement
  - Operational routine allowed by the power station staff

UNION CARBIDE

CHEMICAL PLANT

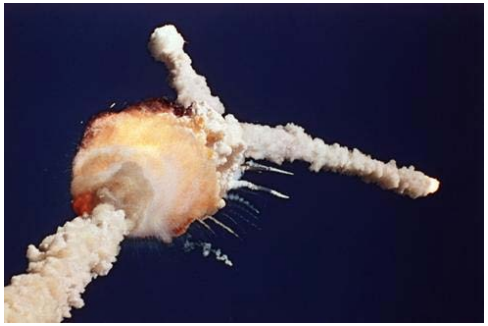


UNION CARBIDE
CHEMICAL PLANT

- What? Gas Leak
- Where? Bhopal, India
- When? 1984
- Critical human factors:
  - Poor safety culture
  - Under-maintained and decaying facilities
  - Weak attitude towards safety
  - Lack of/inadequate training
  - Lack of properly working safeguards

NASA

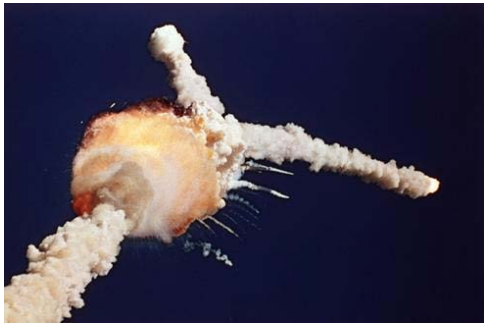
Challenger Space Shuttle



NASA

Challenger Space Shuttle

- What? Explosion
- Where? Cape Canaveral, Florida
- When? 1986
- Critical human factors:
  - Poor safety culture
  - Groupthink
  - Faulty design of O-rings
    - Low temperature tolerance



EXXON VALDEZ

OIL TANKER

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OIL TANKER

- What? Oil Spill
- Where? Prince William Sound, Alaska
- When? 1989
- Critical human factors:
  - Fatigue: the 1989 tanker crew was half the size of the 1977 crew, worked 12-14 hour shifts, plus overtime. The crew was rushing to leave Valdez with a load of oil
  - Third mate was at controls…Captain was sleeping off a “bender”
  - Inoperative RAYCAS (radar)

EXXON VALDEZ

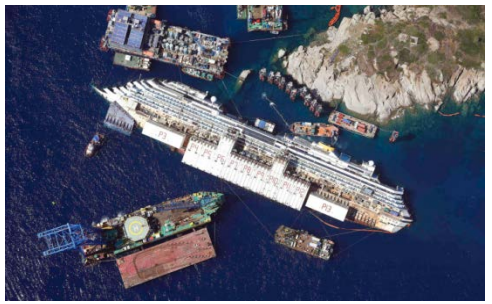
OIL TANKER

Latent Threats

- Ships were not informed that the previous practice of the Coast Guard tracking ships out to Bligh Reef has ceased
- The oil industry promised, but never installed, state-of-the-art iceberg monitoring equipment
- Exxon Valdez was sailing outside the normal sea lane to avoid small icebergs thought to be in the area
- Coast Guard vessel inspections in Valdez were not done, and the number of staff was reduced

Costa Concordia

Cruise Ship



COSTA CONCORDIA

CRUISE SHIP

- What? Capsized
- Where? Off Isola del Giglio, Tuscany, Italy
- When? 2012
- Critical human factors:
  - The ship was sailing too close to the coastline, in a poorly lit shore area, under the Master's command who had planned to pass at an unsafe distance at night time and at high speed (15.5 kts)
  - Distractions, errors and violations can be established as the elements which characterized the human factors as root causes

COSTA CONCORDIA

CRUISE SHIP

- BRM (Bridge Resource Management) training not mandatory at time. None of the crew had BRM training
- Optimizing violation by Captain (showing off)
- Decision error by Captain (perceived risk/reward)
- Complacency by Bridge Team (reduced vigilance regarding proximity to rocks)

ALVIA

TRAIN DERAILMENT

ALVIA
TRAIN DERAILMENT

- What? Derailment
- Where? Northwest Spain
- When? 2013
- Critical human errors?
  - A year earlier, the driver bragged on Facebook about train's speed capabilities
  - Train was travelling at high speed (111-118 mph) as it approached the curve
    - Speed limit in area was 50 mph

ALVIA

TRAIN DERAILMENT

- Driver said that he suffered a “lapse of concentration” as he approached the curve
- Driver was on cell phone just before curve
- The high-speed track has ERTMS-compliant signaling which is designed to slow or stop a train whose driver is ignoring signals or the speed limits. But….
  - The new high-speed line joins a conventional track shared with low-speed trains, at the curve where the accident happened. The conventional track only had the older ASFA signaling system, which will warn drivers if they are exceeding speed limits, but will not automatically slow or stop a speeding train.

Pan Am and KLM
747 Collision

- What? Runway collision
- Where? Tenerife, Spain
- When? 1977
- Critical human factors:
  - Airport congestion due to bomb threat (re-routes)
  - Pan Am aircraft had not exited the runway C-3 taxiway
  - KLM Captain took off without proper clearance:
    - Duty-time regulations
    - Fatigue
    - Deteriorating weather (fog)

Pam Am and KLM

747 Collision

- Non-standard phrases by the KLM co-pilot (“We’re at take off”) and the Tenerife control tower (“OK”)
- Lack of assertiveness by KLM co-pilot
- Fatigue?
- Stress?
- Pressure?
- Situational violations?

Thank You!

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