Session 1C

Marine Accident Investigation

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Chair: Robin Snouck Hergronje

Speaker: Gavin Pritchard OBE

What is this all about?

Why things go wrong sometimes and…what we can learn from that

Herbert Heinrich

1886 – 1962

National Safety News

Published by the National Safety Council

VOLUME EIGHTEEN — CHICAGO, ILLINOIS, JULY, 1928 — NUMBER ONE

The Origin of Accidents

The Apparent Cause Is Not Always the Basic Cause

By H. W. HEINRICH

Assistant Superintendent, Engineering and Inspection Division, The Travelers Insurance Company

IN this age of exact knowledge, when facts of proved value are replacing theories and when business, under the pressure of economic necessity, must concentrate upon the

sistency in the assignment of accidents to cause is conspicuous chiefly by its absence and actual accident causes are rarely tabulated in such manner that the remedy can readily

THE FOUNDATION
OF A MAJOR INJURY

1
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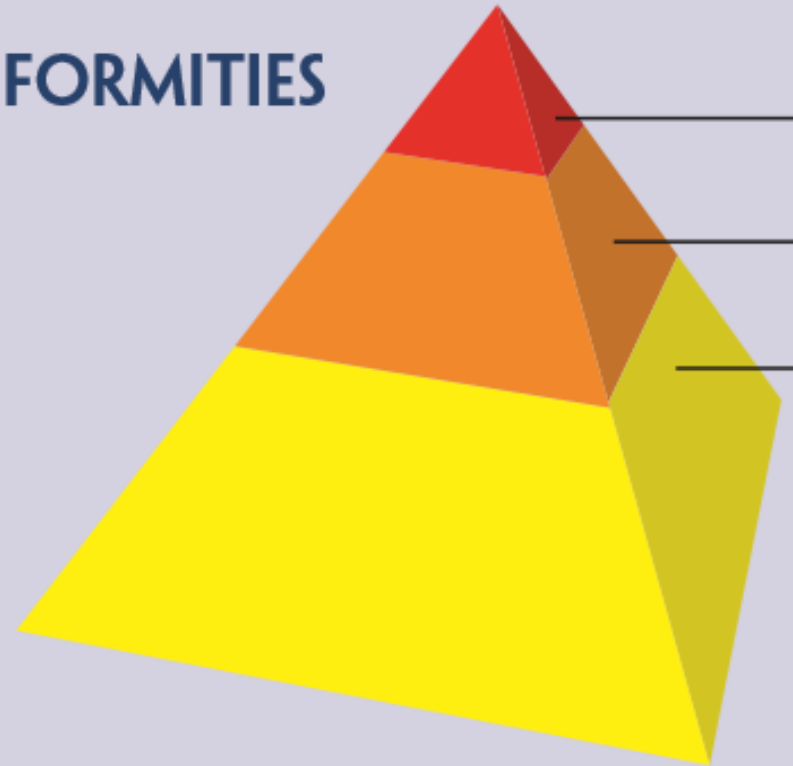
THE MA
ACCIDEN

MORAL—PREVENT THE ACCIDENTS AND THE INJURIES
WILL TAKE CARE OF THEMSELVES.

RELATIONSHIP BETWEEN UNSAFE ACTS/NON-CONFORMITIES AND MAJOR INCIDENTS



1 Major Injury (LTI)

30 Minor Injuries

330 Unsafe Acts or Actions

If 30 LTIs are prevented
a life will probably be saved!

Heinrich's domino theory (1930)

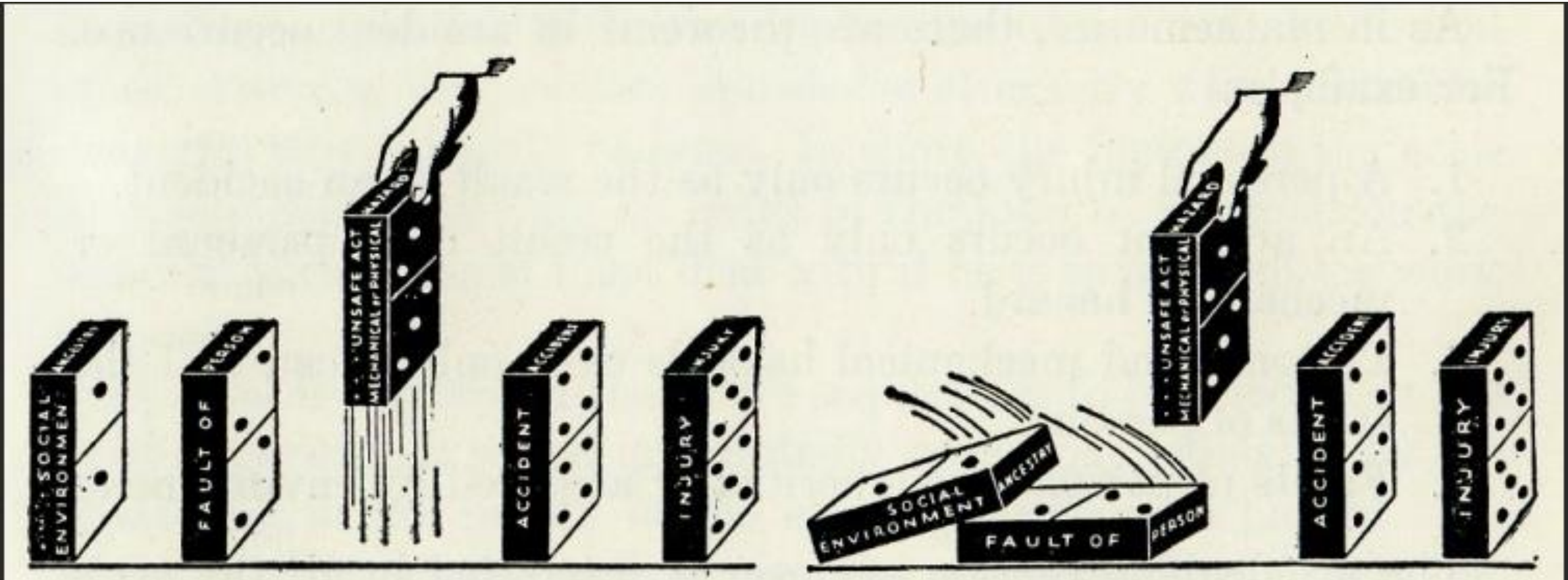
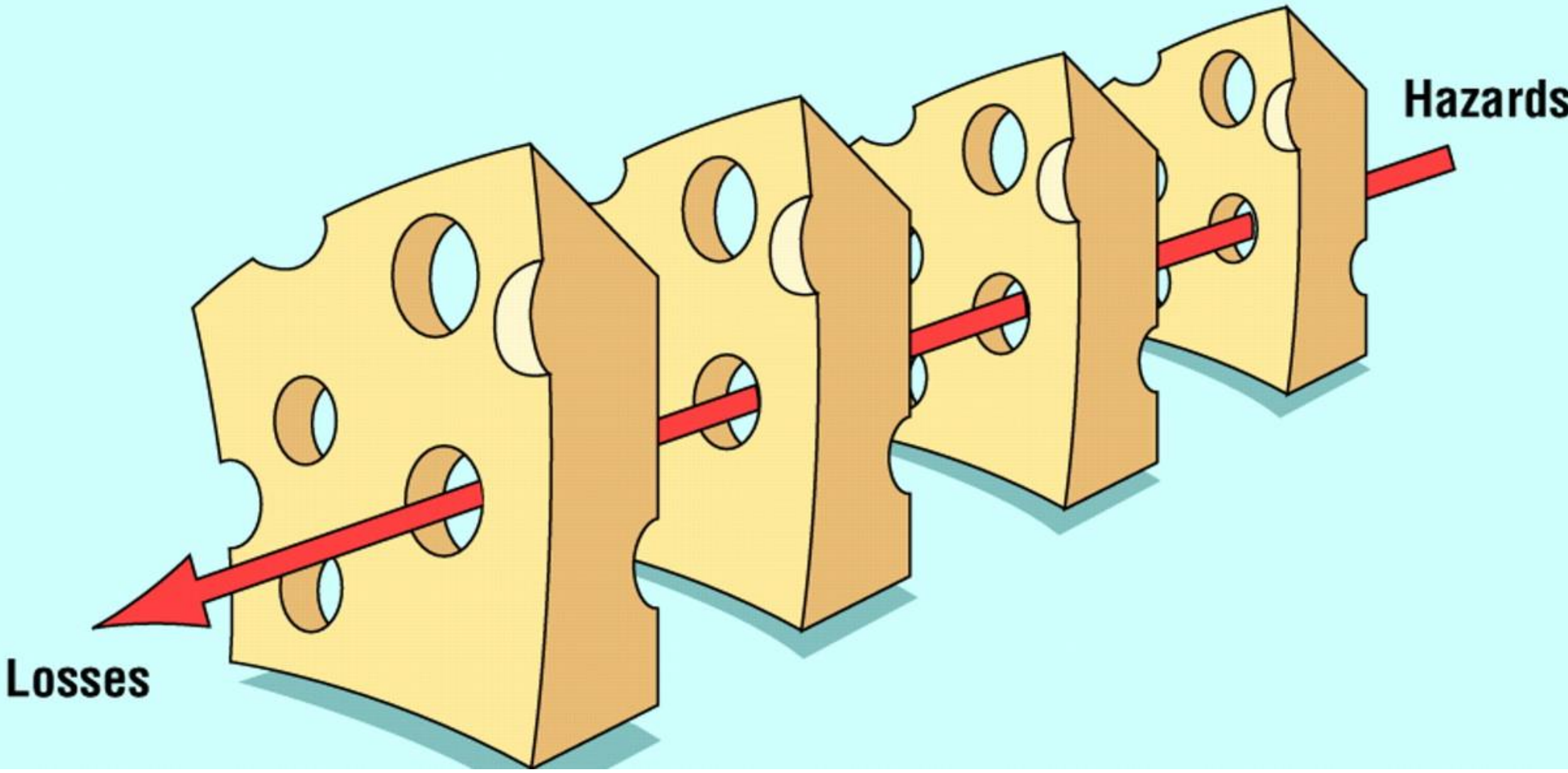


FIG. 4. The unsafe act and mechanical hazard constitute the central factor in the accident sequence.

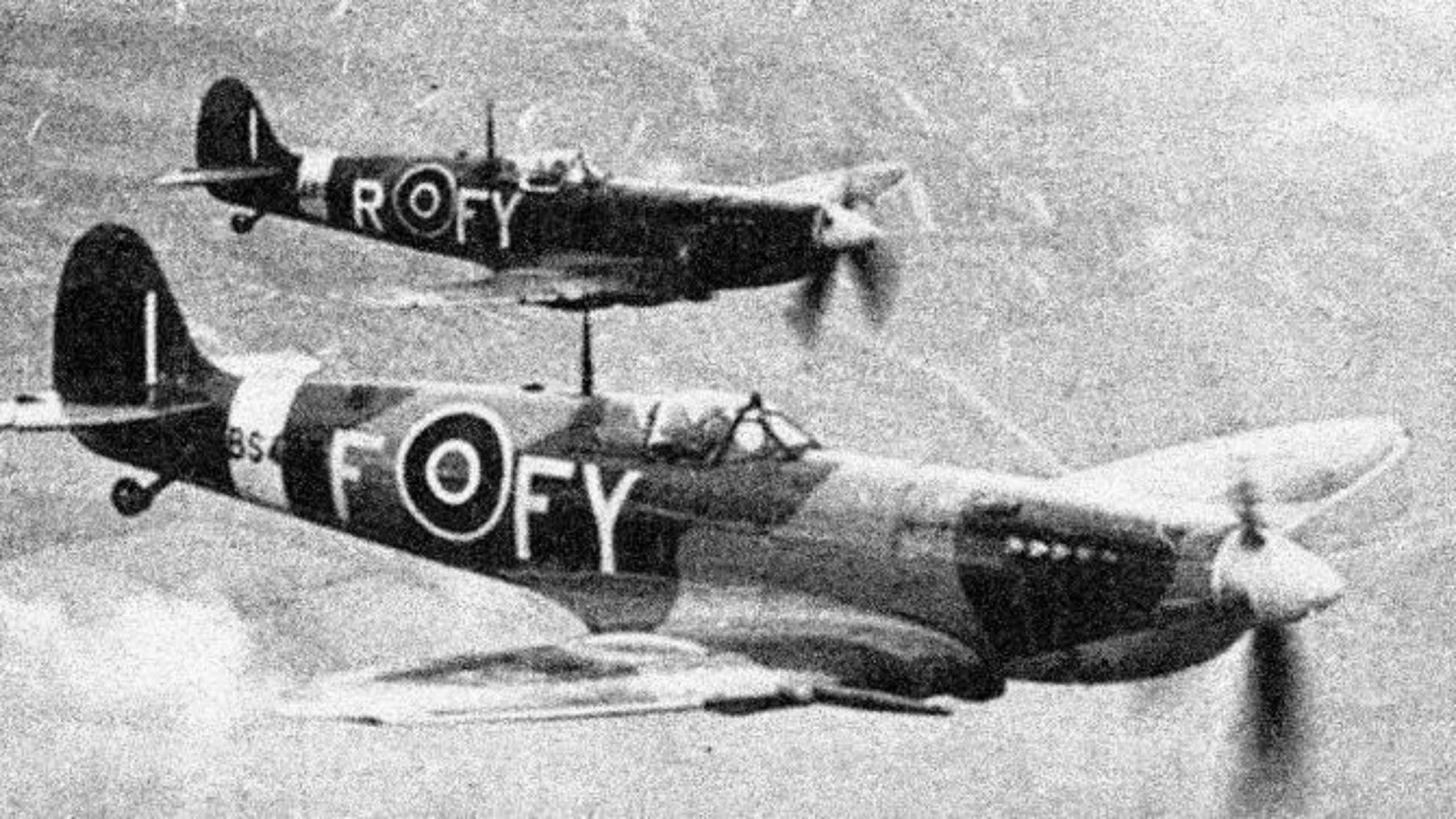
FIG. 5. The removal of the central factor makes the action of preceding factors ineffective.

Swiss Cheese Model



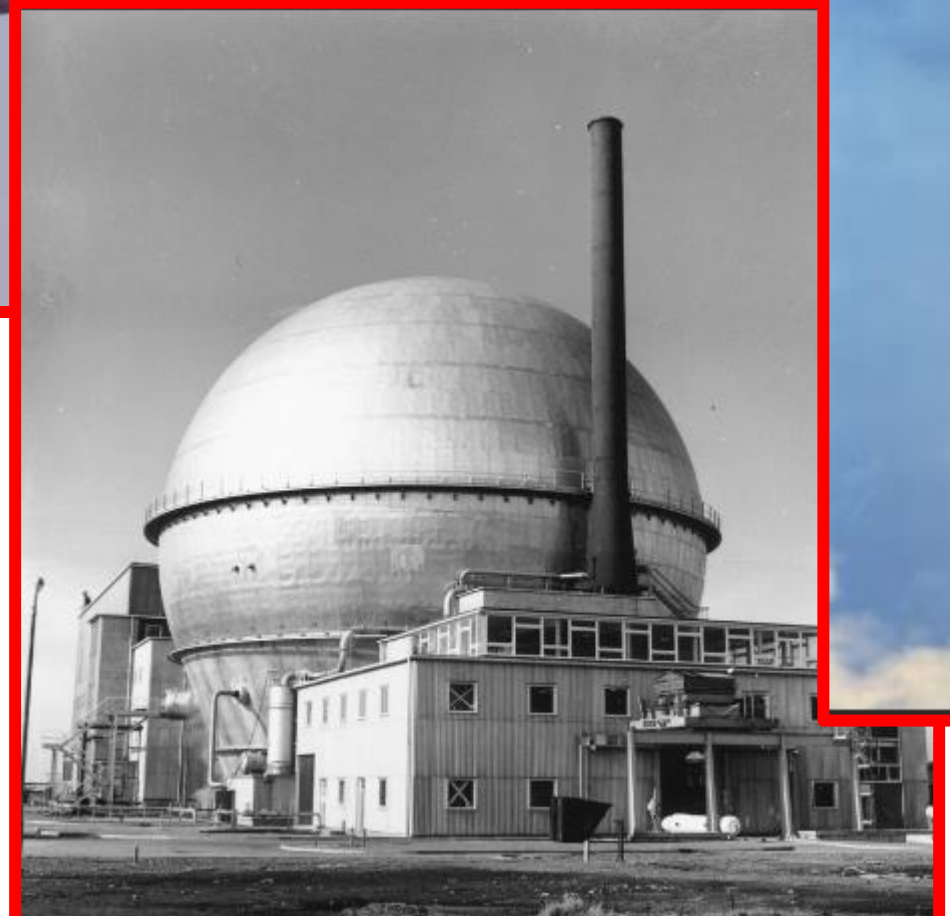
Early industrial revolution

- Societal risks: shipping and factories
- **Behaviorism:**
  - Physical barriers
  - Legislation (Factories Act 1802)
  - Early understanding of causes of accidents


ROFY
FOFY

The Cognitive revolution (1940s – 1970s)

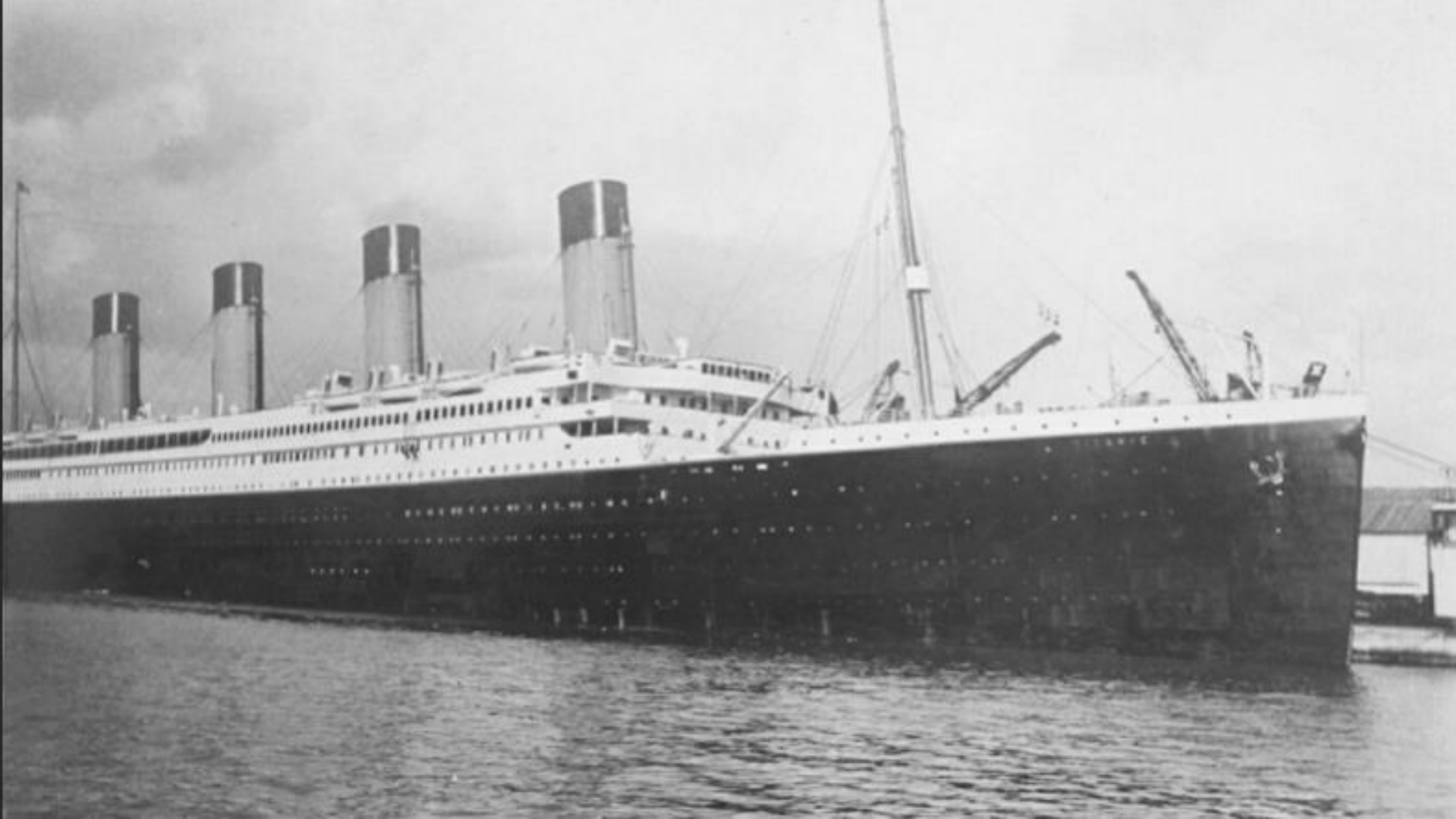
- Analysis of **thinking**:
  - Memory, learning, fatigue, decision making, emotion, perception
- The magic number = 7 plus or minus 2 (Miller, 1956)
- The OODA loop (Col John Boyd, 1961)
  - Observe – orientate – decide - act



What happened next….


Met-Ed
GPU
THREE MILE ISLAND
NUCLEAR
GENERATING STATION
Authorized Personnel Only
OBSERVATION CENTER
3/4 Mile Ahead


BOEING
737 MAX




COSTA CONCORDIA

Titanic to Costa Concordia

(A century of not learning lessons, Hollnagel and others, 2012)

- Experienced masters with excellent service records
- Both masters were aware of the potential dangers
- Both masters judged the risks to be manageable
- No challenge of the navigational decisions
- Companies encouraged performance over safety
- Neither ship was designed for the scenario encountered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MARCHIONESS

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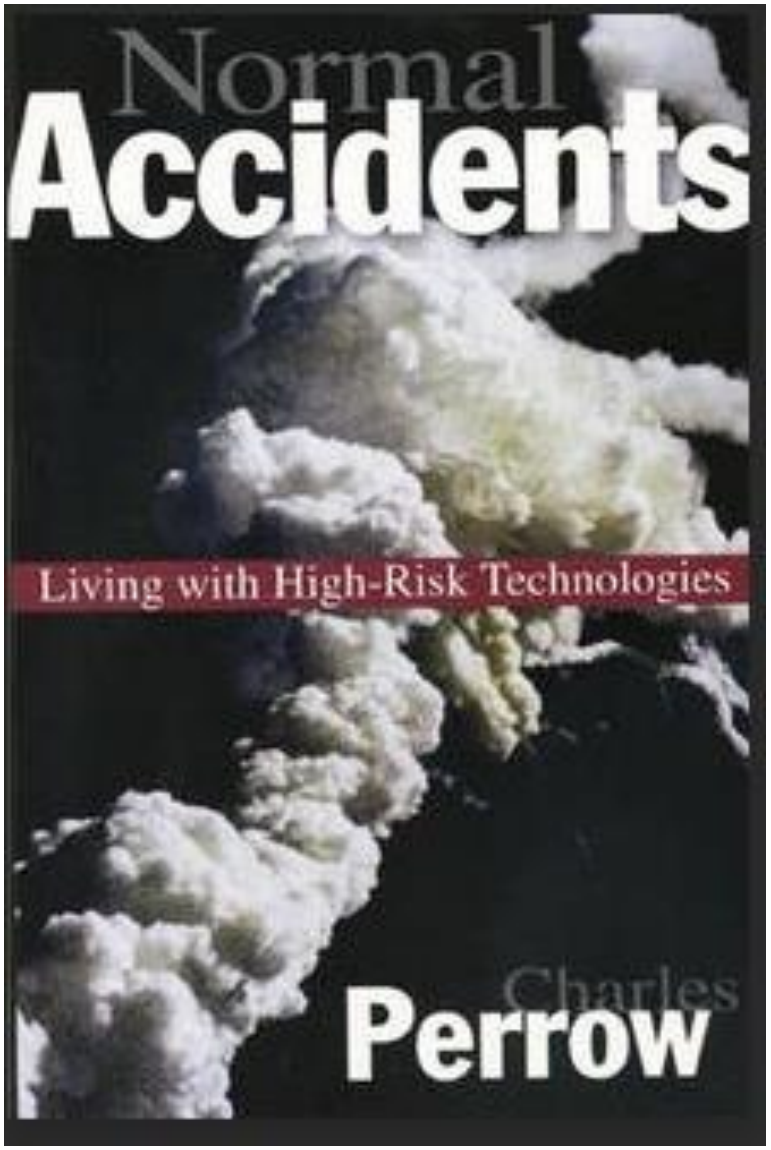
Charles Perrow

- Sociology professor
- Creator of the ‘normal accident’

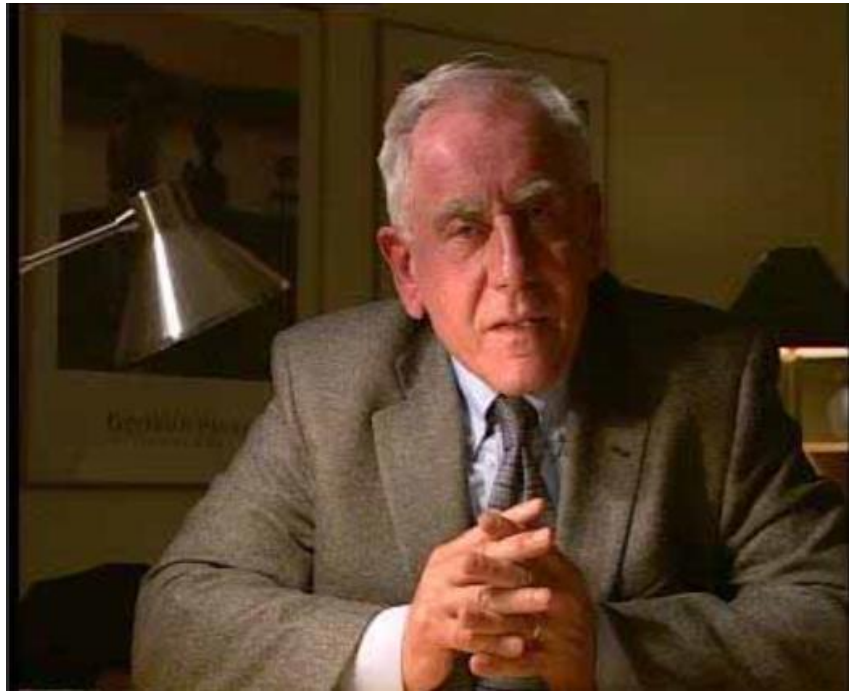


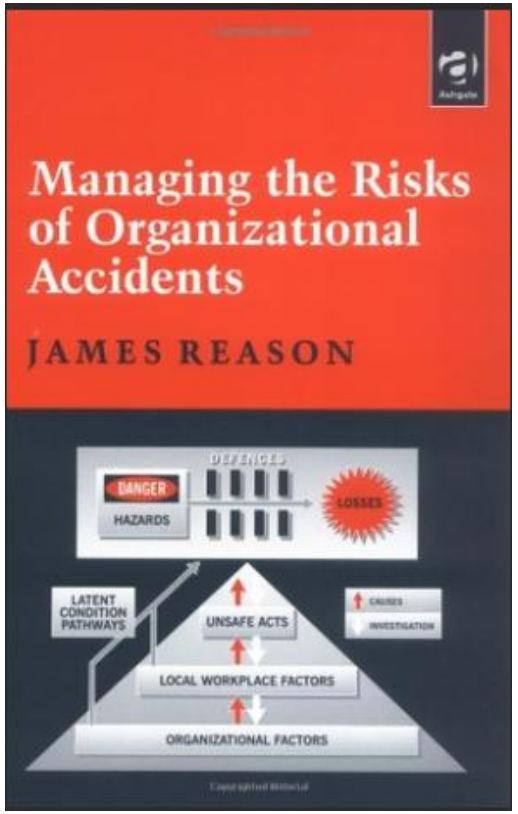
Normal Accident Theory

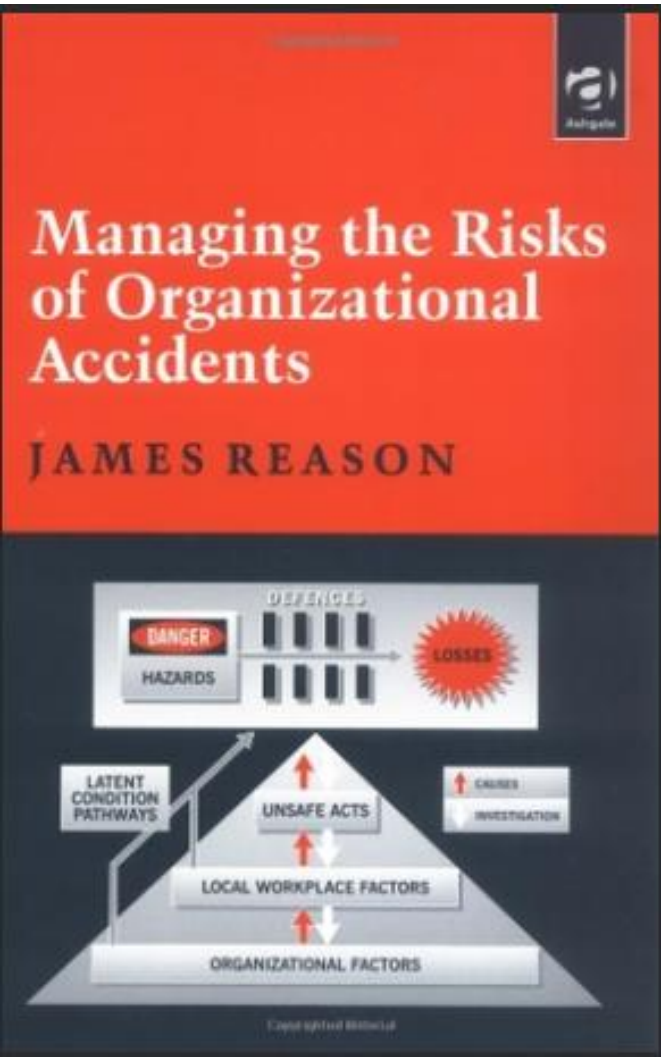
- Catastrophic accidents are inevitable
- Systems complexity and coupling
- Accident scenarios are unimaginable
- Safety is a competing objective
- The organisational contradiction

Sir James Reason

- Psychologist
- Prolific writer on risk and safety







High reliability theory

- Accidents can be avoided
- System resilience
- Preoccupation with failure
- Embrace and understand complexity
- Anticipate problems and encourage innovation
- Deference to expertise

The core (and unsettled) safety debate

Normal Accident Theory:

Accidents result from the unimaginable outcomes in complex organisations

High Reliability Theory:

Highly reliable organisations can create the conditions to anticipate failure

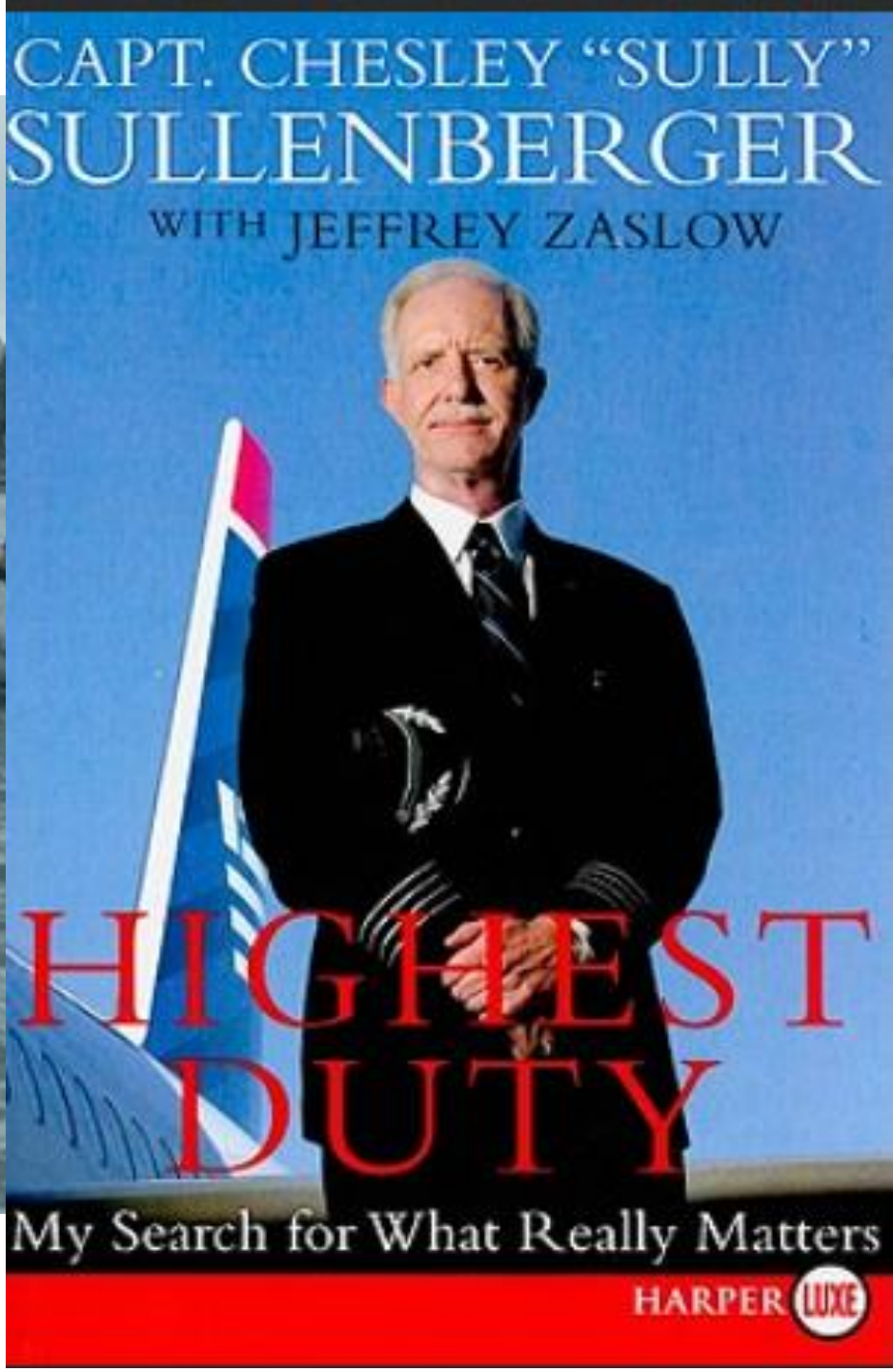
Therefore, accidents are unpredictable and cannot be prevented

Therefore, accidents are predictable and it is possible to prevent them

Heroes and villains

or…. perception and reality


FROM WARNER BROS


CAPT. CHESLEY "SULLY"
SULLENBERGER
WITH JEFFREY ZASLOW
HIGHEST DUTY
My Search for What Really Matters
HARPER LUXE

Safety Culture?

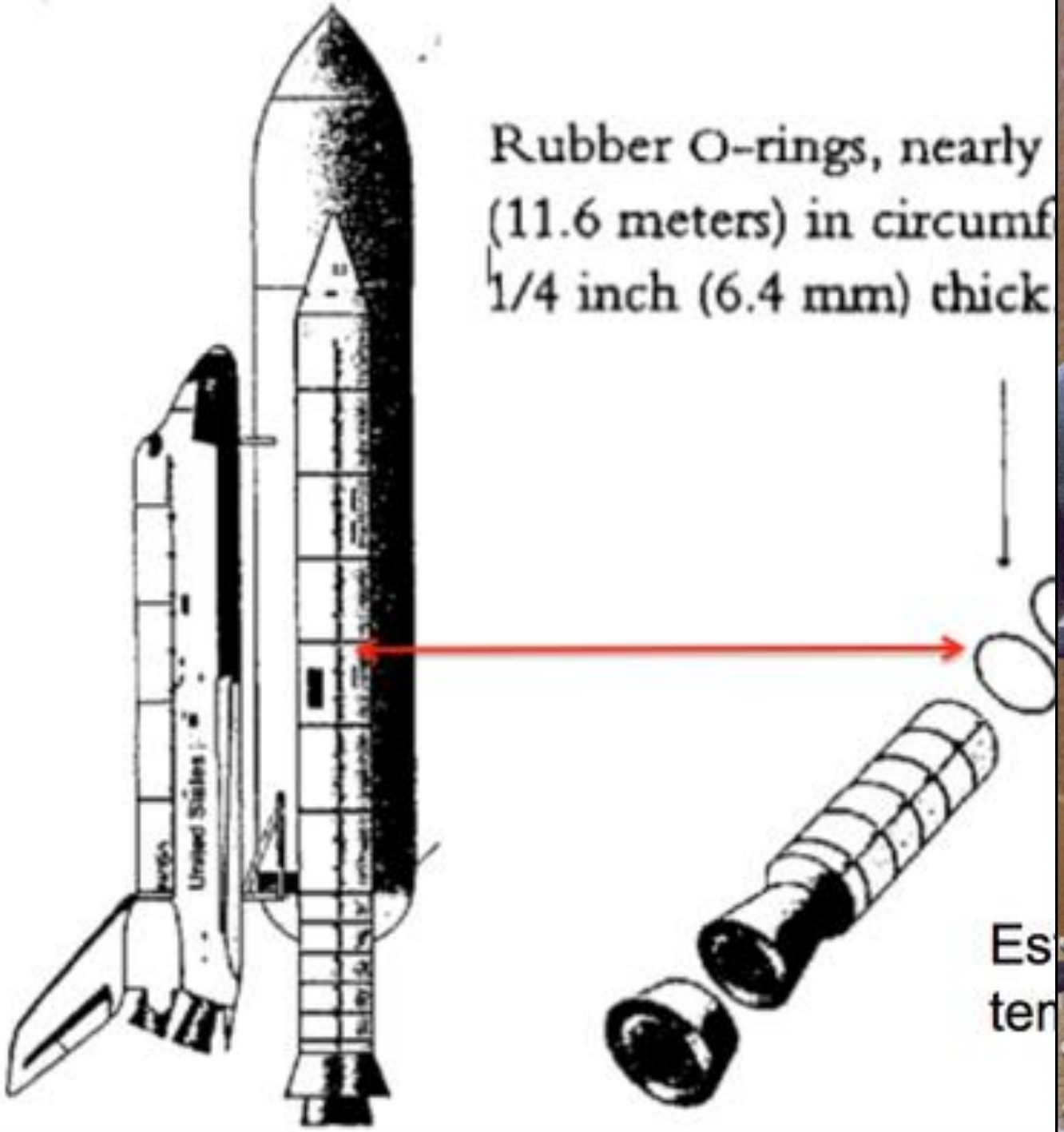
What makes a strong safety culture?

- Collective mindfulness
- Commitment of leaders
- Shared understanding of risk
- Clear goals
- Time for training and learning
- Absence of blame

Captain Hindsight

With his sidekicks, Shoulda, Coulda, and Woulda


NASA
NASA
NASA
NASA
NASA
NASA



Rubber O-rings, nearly
(11.6 meters) in circumf
1/4 inch (6.4 mm) thick

Es
ten

Challenger disaster

- **Influences:**
  - Organisational
  - Technical
  - Social
- **Normalisation of deviance:**
  - ‘Groupthink’


PRISCILLA

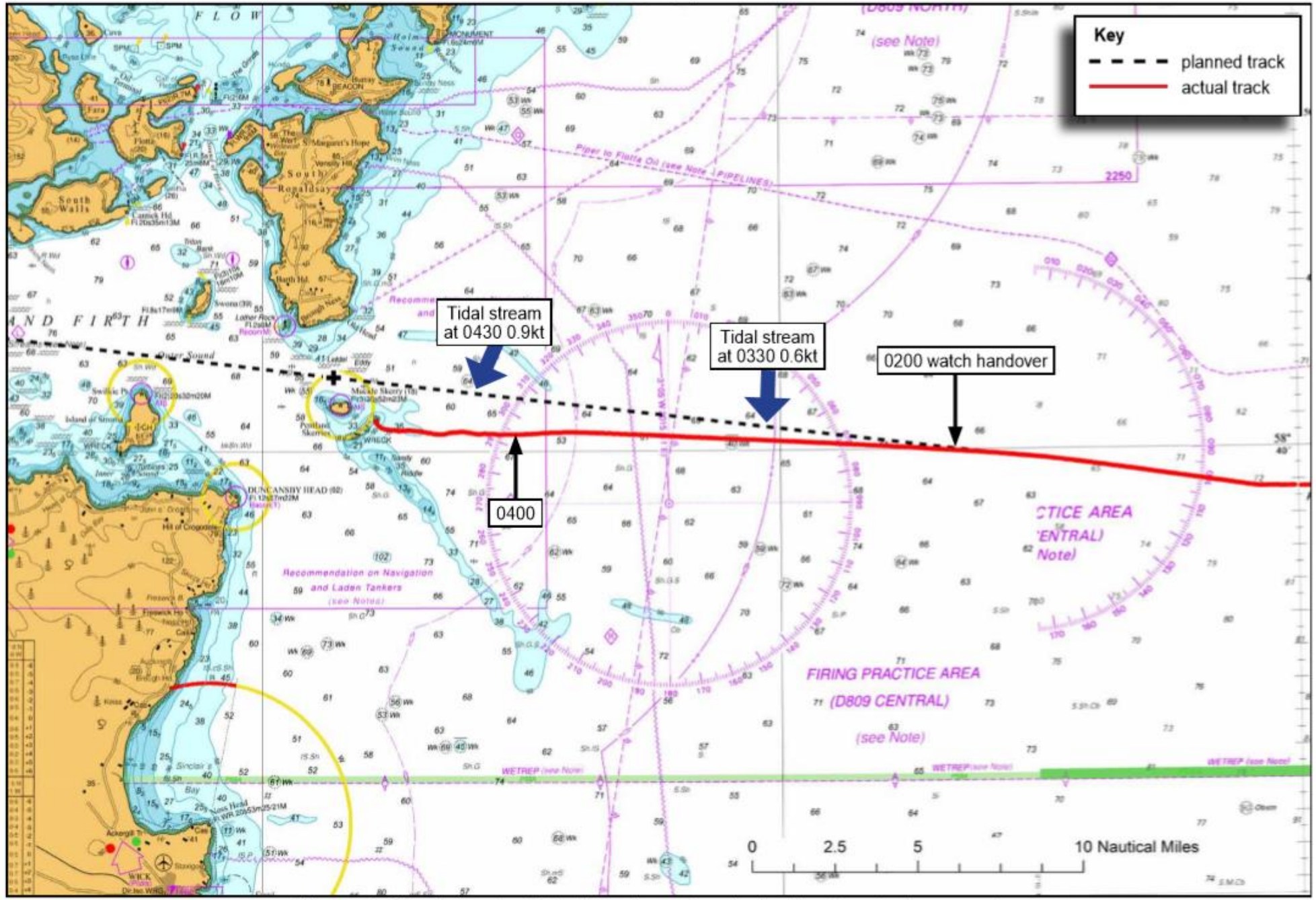


Figure 3: Chart showing *Priscilla*'s planned and actual tracks prior to grounding

Figure 4: *Priscilla* aground with Pentland Skerries lighthouse visible in the background

Report on the investigation of

the grounding of the sail training vessel

TS *Royalist*

near Chapman's Pool

off the south coast of the United Kingdom

5 April 2009

TS *Royalist* aground off Chapman's Pool

3.2 SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION WHICH HAVE NOT RESULTED IN RECOMMENDATIONS BUT HAVE BEEN ADDRESSED

1. The master had developed a low perception of risk

more demanding vessel than the yachts he had previously navigated in the area; and he was over-confident that his level of planning and

2. The MSSC had given no instructions for the manning of the cockpit.

3. The master assumed all three roles of navigation, steering and lookout. [2.4]

Had other crew members been tasked to steer and navigate, the master could have maintained overall situational awareness. [2.4]

6. The delay in reporting the accident to the MAIB was not in accordance with The Merchant Shipping (Accident Reporting and Investigation) Regulations 2005. [2.5]

7. Although there was no statutory requirement for TS *Royalist* to be operated under a formal safety management system, MSSC did provide a suite of safety management procedures for its fleet. However, with respect to cockpit manning and navigational practices, the causes and circumstances of this accident demonstrate that these procedures were insufficient. [2.6]

Summary

- **Watch out for the ‘normal’**
  - it could be unsafe – ‘we always do it this way’
- **Safety culture**
  - Understand risk and share responsibility
  - Encourage teamwork and challenge