Interaction between technical and social systems for defense and security

Professor Hans Liwång
Department of Systems Science for Defence and Security
Swedish Defence University (hans.liwang@fhs.se)

Swedish Defence University

1

Outline

- My perspective
- Safety and military operations, differences and similarities
- The implications of for today's systems
- Conclusions

Swedish Defence University

2

My perspective

Research background: applied risk management for finding a balance between safety and security measures.

3

Safety and military operations, differences and similarities

Starting point:

- Within the field of safety science accidents are now widely acknowledged to be a system phenomenon.
- Security has seen no such a systematic development and the protection from accidents and attacks is often regarded as separate concepts.
- By not examining the links related to effects and measures between attacks and accidents several different important mechanisms related to military activity are omitted from the development of new knowledge.

”Liwång, H. The interconnectedness between efforts to reduce the risk related to accidents and attacks - naval examples. J Transp Secur 13, 245–272 (2020). https://doi.org/10.1007/s12198-020-00219-x”

Swedish Defence University

4

Safety and military operations, differences and similarities

- On board naval ships lifesaving (safety) cannot be limited to traditional maritime safety or to security.
- A large proportion of the performed studies on military organizations examine safety aspects of everyday military activity.
- Also, studies typically investigate safety issues emanating from within the studied organization. The external threat is best viewed as a stressor, but seldom the cause of the incident that the system must act on.
- In the military setting, both security and survivability relate to avoiding damage or losses yet still achieving goals.
- Military doctrines: Security is achieved when measures are taken to protect one's forces allows for freedom of action by reducing one's vulnerability to the actions of enemies.

Swedish Defence University

5

Studied naval incidents

Type	Case	Incidents	Fatalities	Injured	Ships lost	Ship years	Data quality
Naval war	The Falklands War 1982	Continuous	491	295	15	19	Complete
Peacetime Antagonistic attacks	Worldwide attacks 2000-2012, primarily terrorist and piracy attacks	17	143	43	5	-	Not complete
Peacetime accidents, military conditions	Worldwide submarine incidents 2000 - 2015 (North Korea and Iran excluded)	35	275	-	5	7000	Complete
Accidents in peacetime operations	Severe accidents involving military ships in Norway and Sweden, 1990 to 2015	14	5	38	5	5000	Complete

6

Findings, incidents

- Level of external supports varies in peacetime as a function of remoteness.
- In peacetime antagonistic attacks are typically close to shore => high level of external support (like accidents on land)
- Peacetime accidents happens in remote locations => low or no external support for lifesaving and firefighting (more like war)
- Low or no external support in war.

Swedish Defence University

7

War

- Fleet design and how the two navies had adopted technology into their strategies affected the type and number of incidents.
- Multiple attacks delivered in waves.
- Level of preparedness critical for how long a ship survives, but the enemy decides if it survives.
- A ship can be hit by a weapon without fatalities.
- Effective and timely response is critical in life-saving efforts.

Swedish Defence University

8

Attacks in other situations than war

- Possible to focus on life-saving efforts as a result of the limited continuity of the external threat and because there was often external support available.
- The ships informed about the risks, but the activity was considered important.

Swedish Defence University

9

Submarine incidents

- Large variety of type of incidents.
- Limited publicly available information.
- The combination of a large concentration of energy such as batteries, fuel and munitions with limited escape routes and subsurface operations lead to large consequences.
- The data includes one antagonistic attack: the arson on board the USS Miami by disgruntled shore personnel.

Swedish Defence University

10

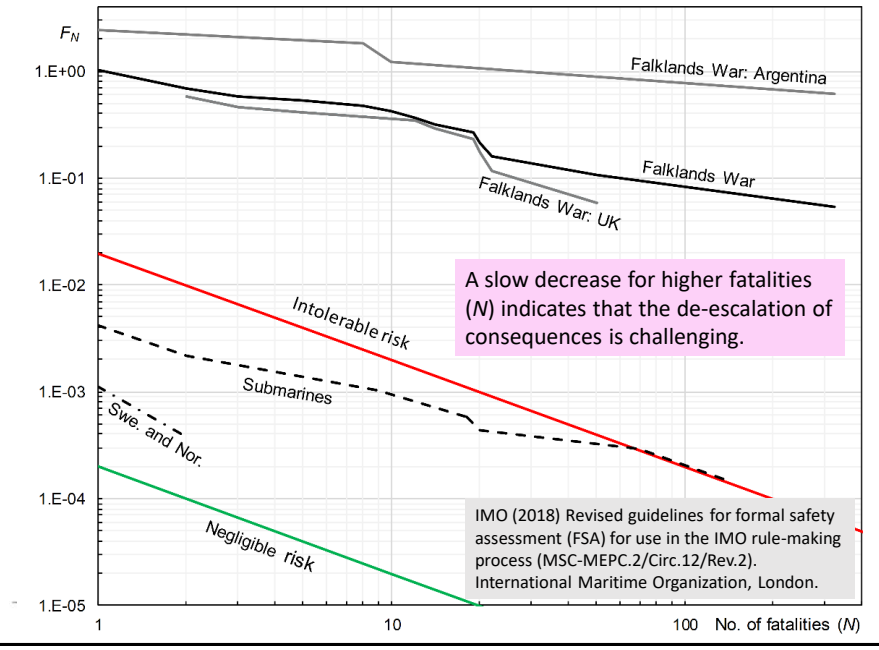
Military maritime accidents from Norway and Sweden

- Probability for incidents can be affected.
- The actions taken by personnel on board following the accidents indicate a high level of training and skill in relation to life-saving and recoverability. Therefore, the capability to limit secondary consequences of accidents was high.
- Of the 14 incidents, four were the result of activity called for by the military role of the ship. These four accidents make up four out the five fatalities, but only five of the 38 injured.

Swedish Defence University

11

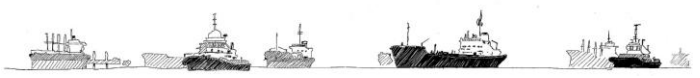
Level of societal risk



12

Learnings 1(3)

- In the military context an unwanted event is not necessarily an avoidable event.
- The consequences for externally initiated events can be reduced substantially with training and preparations.
- Risk is high when the ship is not managed in preparation for war. The ability to limit consequences and especially large-scale consequences, was a safety factor (improves safety) in all operational types studied.



Swedish Defence University

13

Learnings 2(3)

- Avoiding dangerous training to reduce peacetime risks will increase wartime risk.
- Political and strategic decisions have a substantial, though indirect, effect on safety on board naval vessels. The organization and coordination of the fleet have large effects on risk levels during war.
- The consequences are low relative to the severity of the incident and the extent of damage.

Swedish Defence University

14

Learnings 3(3)

- Antagonistic attacks are typically an attack from outside the system, and the initiating event is therefore not the result of an action or mistake on board. Internal safety factors that limit the consequences of the initiating event should therefore be a focus.
- A substantial focus must be placed on situations that are, in every aspect, very far from typical operational situations.
- It must be possible for all important tasks on board to be performed when the performances of the management, crew and technical systems are heavily degraded. This leads to a need for extra levels of system understanding, for management and for personnel.

Swedish Defence University

15

Interaction between technical and social systems

What stands out onboard in these incidents?

- Most persons involved (onboard) have enough system knowledge and competence to act at an incident.
- Most act and take relevant initiatives.
- Level of consequences low in relation to level of damage (compared to civilian accidents).
- The crew reconfigure the technology during the emergency response.

Swedish Defence University

16

My takeaway

In the face of situations with limited external support the operator(s) of a system should have the access (and training) to operate the system outside intended configuration/purpose.

Swedish Defence University

17

Now 40 years since the Falklands War

- 40 years of war where western nations have had "control".
- 40 years of "more important that no one of ours dies than that we achieve something".
- 40 years of implementation of civilian safety in military organizations with too little adaption to the actual operational conditions (e.g. military air operations).
- No experiment can create the level of stress we will face in war.

Swedish Defence University

18

Today and non-military systems

- Many reports of sabotage, probably an over reporting of some types of incidents and possibly an under reporting of more critic clandestine incidents.
- Today's systems and operations are affected by each other across sectors and boarders (also between civilian and defence operations).
- Geopolitical tensions create incidents.
- An increased probability of severe weather.

=>

A possible increase in probably for severe incidents created by a mix of incidents (some random, some antagonistic)

Swedish Defence University

19

At large incidents

- Nations expect communities, companies, and individuals to act locally so that the emergency resources can be focused to strategic aspects.

Swedish Defence University

20

Today and non-military systems

At large-scale disturbances to society everyday systems face new challenges.

Operating systems under large uncertainties.

Can we have:

- Civilian air traffic (and military air operations) without control over the airspace.
- Train operations without knowing if the rail is clear.
- Homeowners operating their electric house grid as an island (all inverters should have an emergency outlet)
- All car owners easily overriding all safety measures.

Are built-in well-defined safety models the most dangerous thing we have?

Swedish Defence University

21

Conclusions

- If this is to work, we need to trust people and give them the possibility to do the craziest things with our designs.
- But there must be limits, but where and who decides?
- These aspects are today so technically complicated, only engineers have the expertise to consider these aspects.

Swedish Defence University

22


Thank you!
Hans Liwång
hans.liwang@fhs.se
Swedish
Defence
University

23