



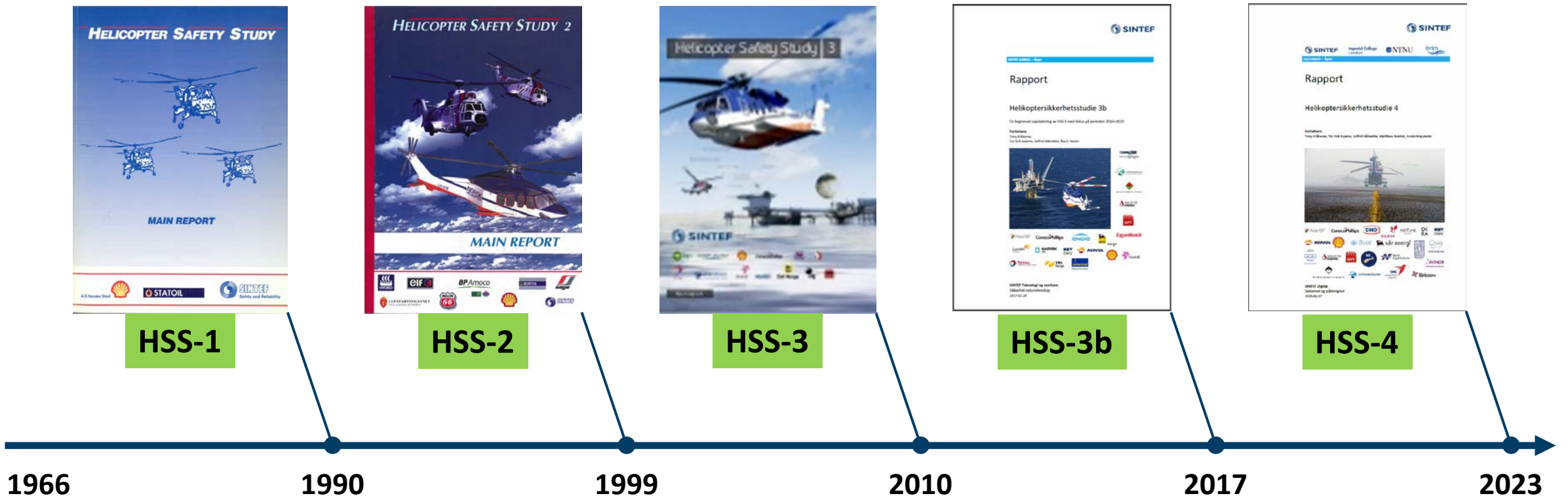
Helikoptersikkerhetsstudie 4 (HSS-4)

18.01.2023

Agenda

- Introduksjon ved Styringskomiteen v/ John Arild Gundersen, Aker BP / Offshore Norge
- HSS-4: bakgrunn og innhold v/ Tony Kråkenes, SINTEF
- Comparison UK–NO v/ Arnab Majumdar, Imperial College London
- Konklusjoner og anbefalinger v/ Tony Kråkenes, SINTEF
- Spørsmål og svar v/ Kråkenes / Majumdar / alle

HSS-historikk



Sponsorer / Styringskomite

- Offshore Norge
- 13 (15) energiselskap
- 4 fagforbund
- 2 tilsynsmyndigheter
- 1 tjenesteleverandør
- 2 helikopteroperatører



Prosjektgruppe



- **SINTEF** – Et av Europas største forskningsinstitutt – har utført alle de tidligere HSS-studiene



- **NTNU** – Norges største universitet med tung sikkerhetsfaglig kompetanse

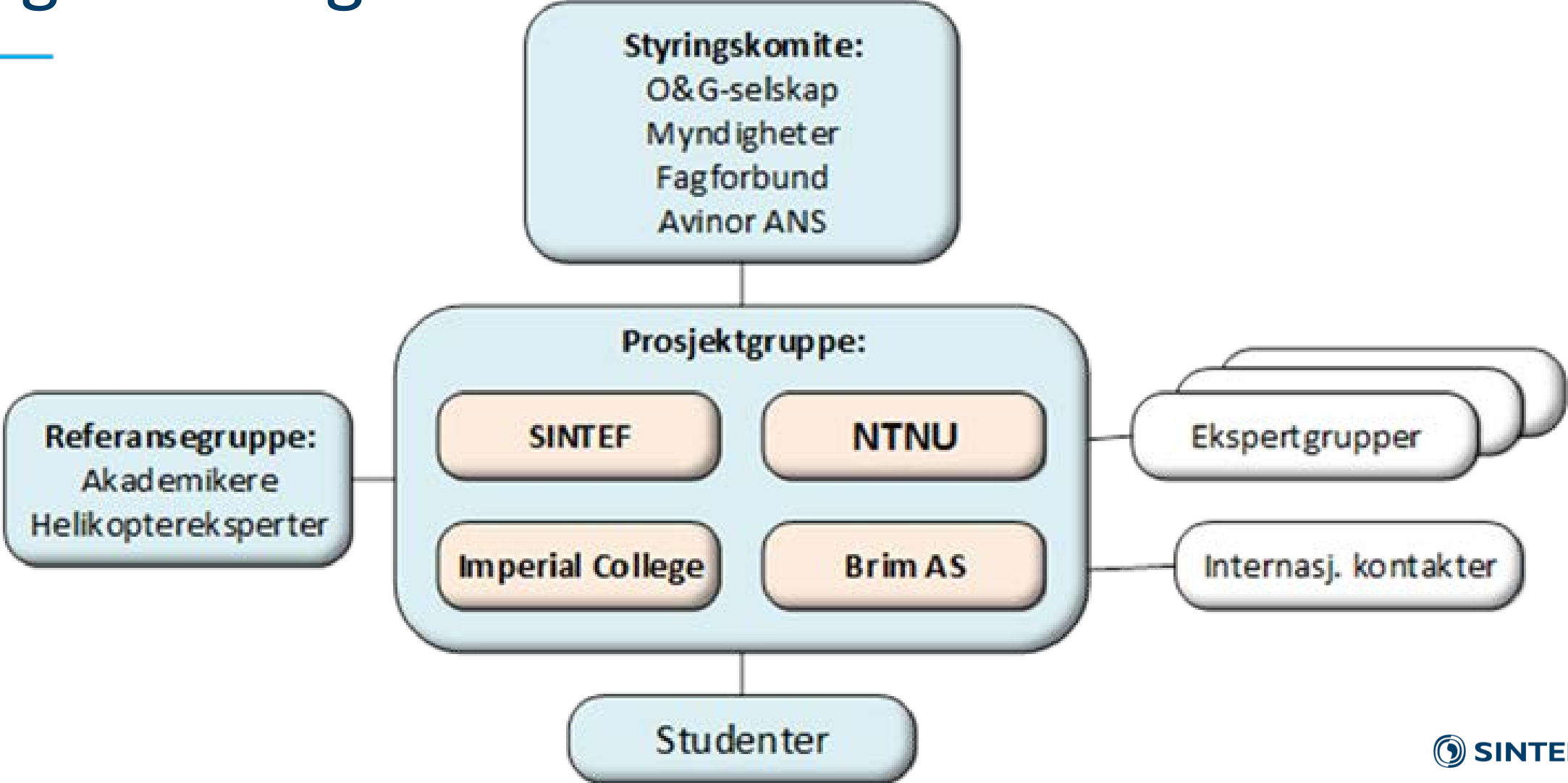


- **Imperial College** – Et verdensledende universitet med svært relevant arbeid innenfor offshore helikopter



- **Brim as** – Tung helikopterfaglig ekspertise, både norsk og internasjonalt

Organisering



Rapportens innhold

Del I - "Klassiske" HSS-tema:

- Utviklingstrekk
- Statistikk, ulykker, risikonivå
- Metodeutvikling

Del II - Spesifikke tema:

- Vedlikehold
- Crew Resource Management
- UK vs. NO
- Resiliens i praksis

Del III – Tiltak og anbefalinger:

- Tiltak
- Konklusjoner
- Anbefalinger

I tillegg:

- Sammendrag
- Div. vedlegg
- "Levende HSS"



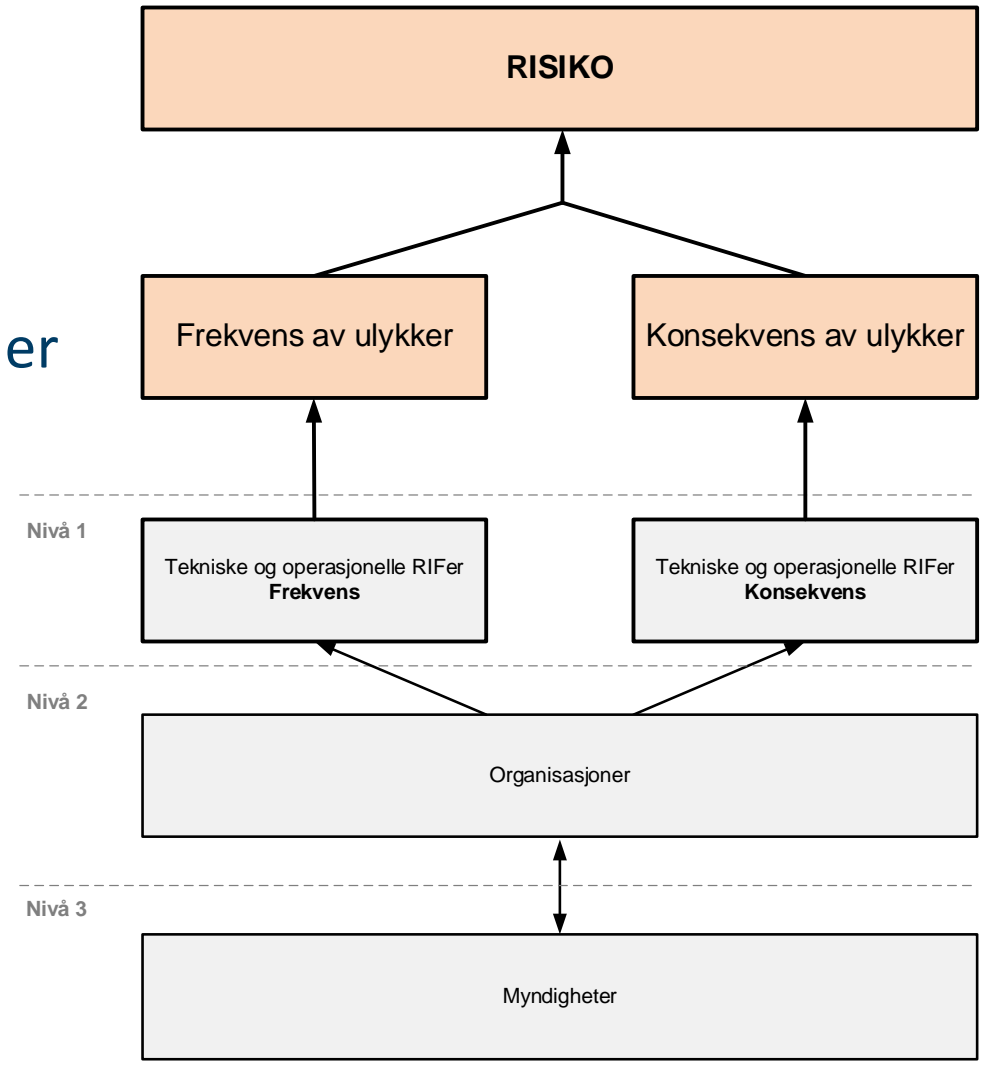
Sikkerhetsteoretiske aspekter

- Studien forankres i både tradisjonell og nyere sikkerhetsteori
- Sikkerhetsteori vil integreres naturlig i de ulike delene av studien, både i planlegging av aktiviteter og tolkning av resultater
- Tre hovedakser for nyere sikkerhetsteori:
 - Risikobegrep i endring - usikkerhet, kunnskapsstyrke
 - Organisatoriske betingelser for sikkerhet
 - Resiliens
- Nyere sikkerhetsteoretiske perspektiver (resiliens) legges også til grunn for en egen FoU-aktivitet i studien



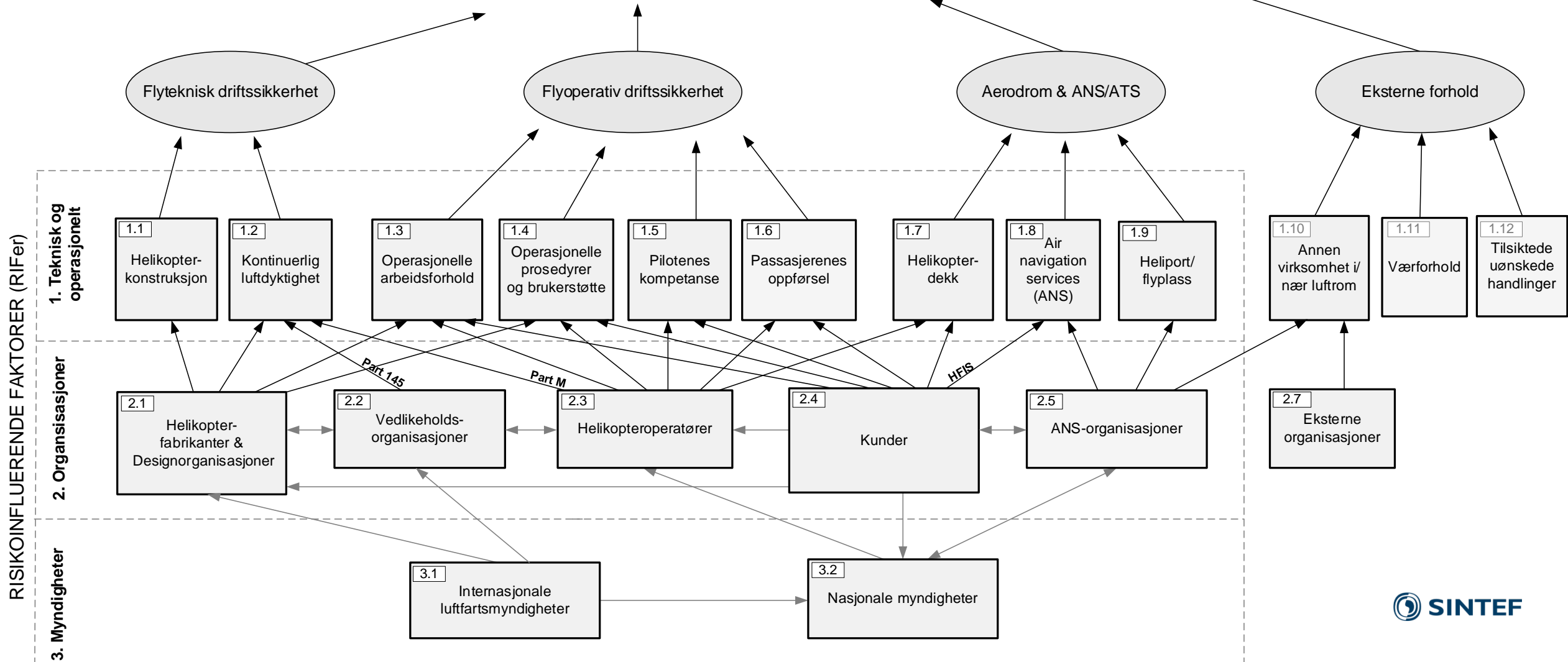
"HSS-modellen"

- Risiko: Antall omkomne pr. million personflytimer
- Risikobidrag fra åtte ulykkekategorier
- Risikoinfluerende faktorer (RIF-er) som
 - påvirker *frekvensen* av ulykker
 - påvirker *konsekvensene* av ulykker
- Tre RIF-nivå:
 - 1) Tekniske og operasjonelle RIF-er
 - 2) Organisatoriske RIF-er
 - 3) Myndighetsrelaterte RIF-er



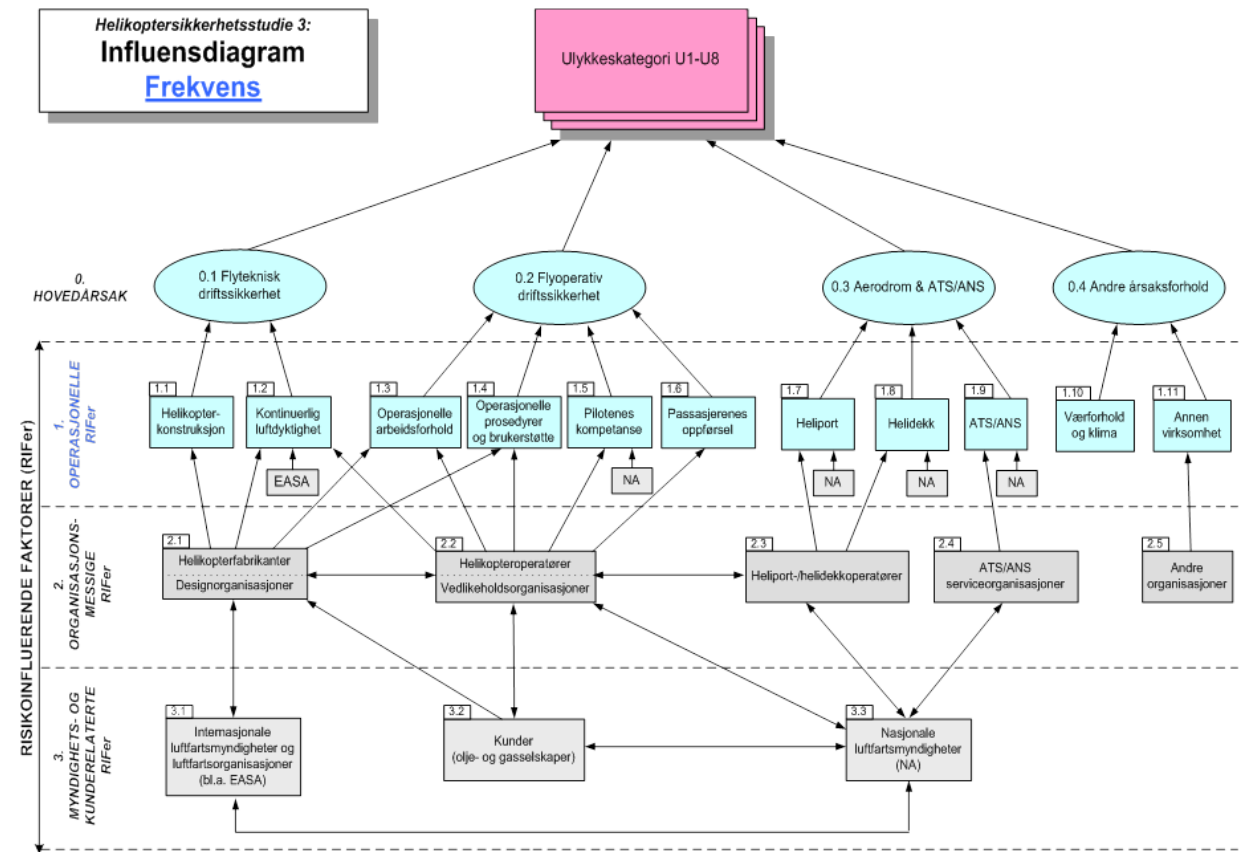
Helikoptersikkerhetsstudie 4:
Influensdiagram
FREKVENS

- ### Ulykke
1. Ulykke ved take-off eller landing på helikopterdekk/heliport
 2. Kontrollert nødlanding / Landing på ikke-klarert landingsplass
 3. Ukontrollert landing el. kollisjon med terreng/sjø (tap av kontroll)
 4. Kollisjon i luft med annet luftfartøy
 5. (Plutselig) kollisjon med terreng, sjø eller bygning
 6. Brann, røykutvikling, eksplosjon eller giftig gass
 7. Ulykke med personer utenfor helikopter
 8. Kollisjon med kjøretøy/luftfartøy/annet på aerodrom



HSS-modellen har flere formål

- Visuell fremstilling av risikofaktorer og forholdet mellom disse
- Strukturerte diskusjoner i arbeidsmøter
- Tematisk fremstilling av resultater
- Kvantifisering av risiko
- Bidrag til risiko fra ulike ulykketegorer og RIF-er
- Kvantifisering av forventet risikoreduserende effekt av sikkerhetstiltak

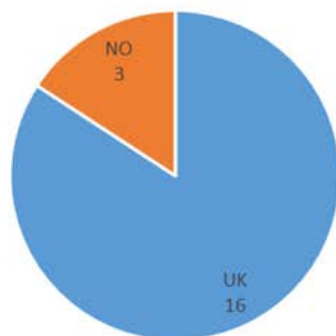


Ulykketekategorier

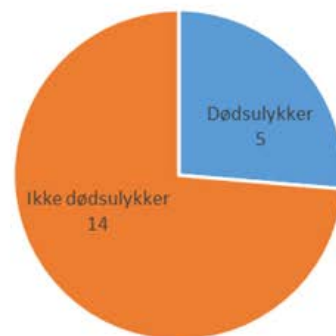
- U1: Ulykke ved take-off eller landing på helikopterdekk/heliport
- U2: Kontrollert nødlanding / landing på ikke-klarert landingsplass
- U3: Ukontrollert landing eller kollisjon med terreng/sjø grunnet tap av kontroll
- U4: Kollisjon i luften med annet luftfartøy (MAC)
- U5: Kollisjon med terreng, sjø eller bygning (CFIT)
- U6: Brann, røyk, eksplosjon eller giftig gass
- U7: Ulykke med fare for personer utenfor helikopter
- U8: Kollisjon på bakken (GCOL)

Ulykker 1999–2019 (NO + UK)

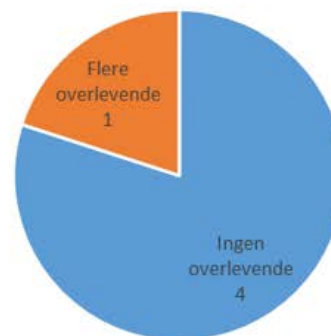
Lokasjon



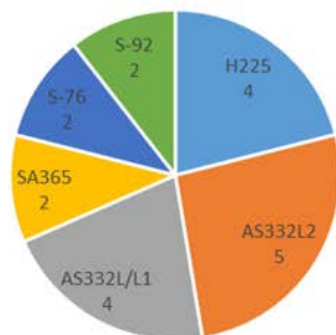
Alvorlighet



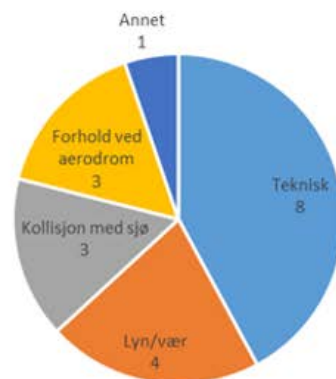
Overlevelse i dødsulykker



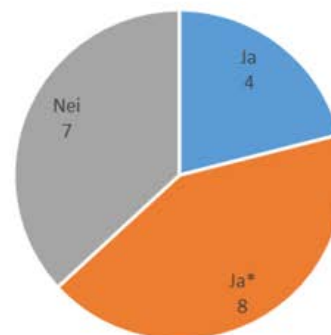
Helikopter



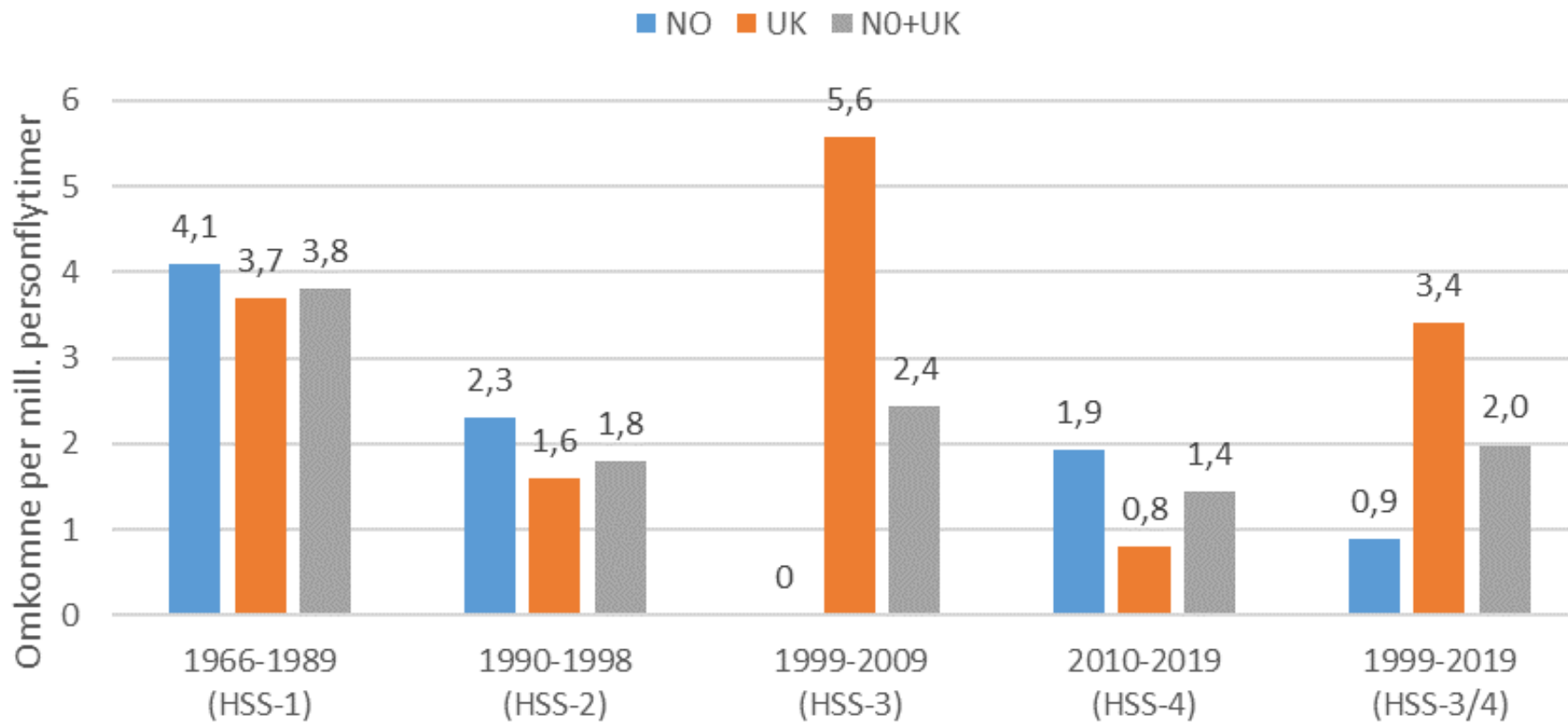
Rotårsak



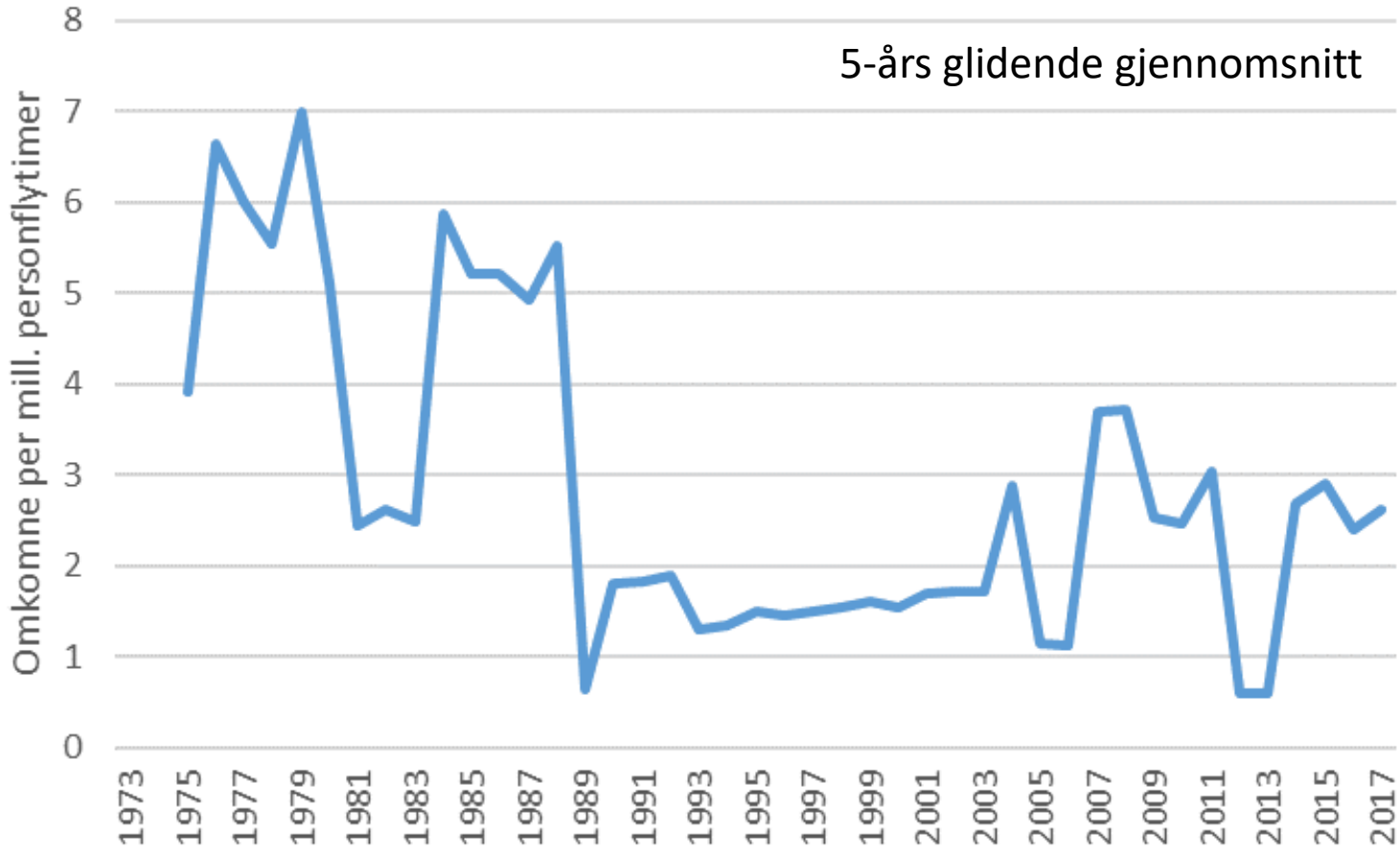
Skjedd i Norge i dag?



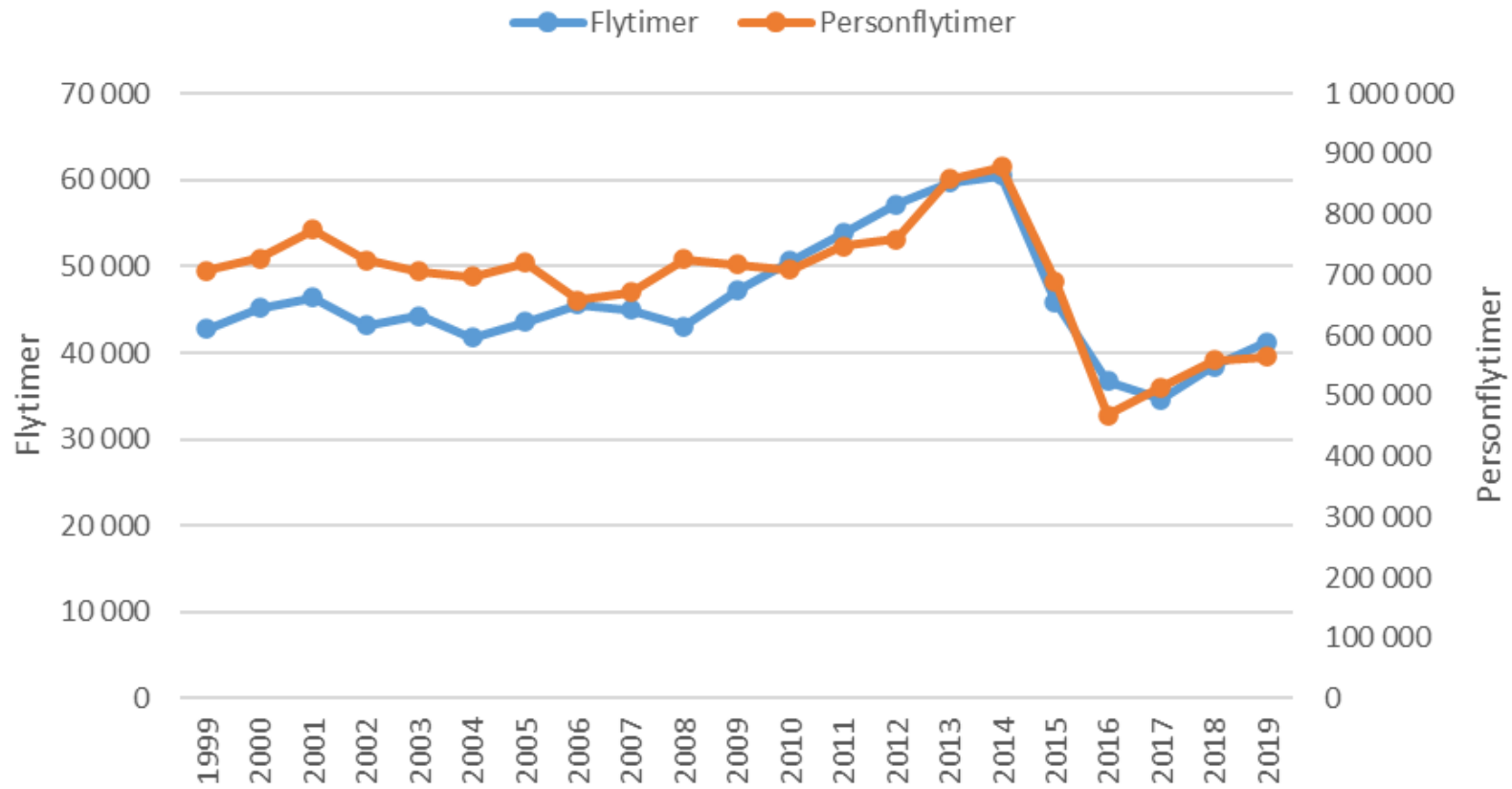
Risikonivå



Risikonivå (NO + UK)



Trafikkvolum (NO)



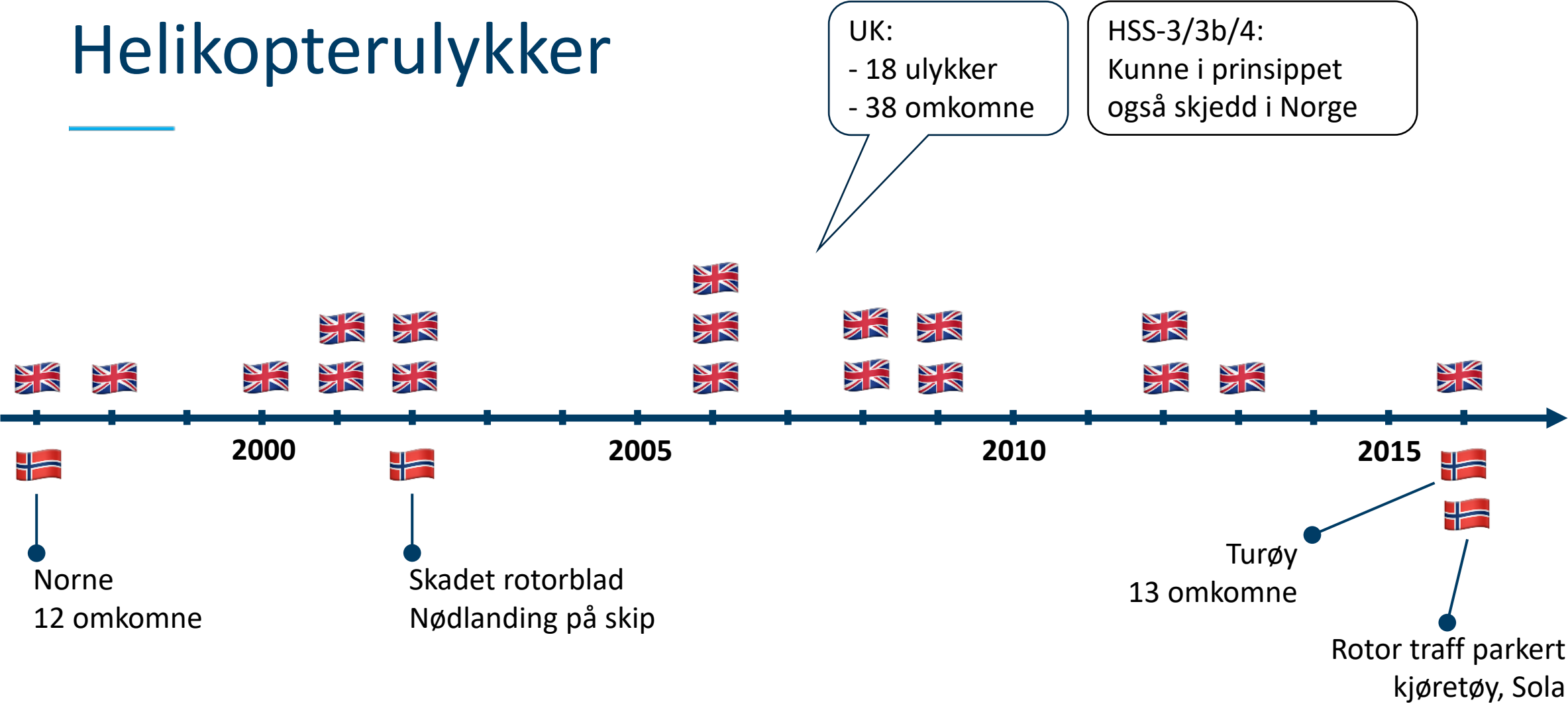
Vedlikehold – fokusområder

- Tilrettelegge for og sikre en "**just culture**"-tilnærming forankret i hele vedlikeholdsorganisasjonen. Erfaringer fra flybransjen har vist at dette kan være utfordrende som følge av liberalisering og økt markedskonkurransen.
- Viktigheten av **tydelig ansvar og rapporteringsrutiner** i vedlikeholdsorganisasjoner og helikopterselskaper må ikke undervurderes. Nye måter å organisere på, som f.eks. bruk av underleverandører og organisatorisk fragmentering gjør dette spesielt relevant.
- **Tilstrekkelig tilgang på ressurser**, operasjonelle så vel som ledelsesmessige, inkludert teknisk ekspertise og kompetanse. Endrede (og stadig tøffere) konkurransevilkår og krav til effektivitet i bransjen gjør at lokal teknisk kompetanse ikke skal undervurderes. I denne sammenheng er uavhengig inspeksjon også relevant å diskutere.
- **Trepartssamarbeid** er en viktig bidragsyter til sikkerhet gjennom å ivareta dialog og meningsutveksling, samt tillitsbygging mellom de ulike aktørene i bransjen.

Crew Resource Management – fokusområder

- **Kommunikativ praksis:** Økt fokus på hvordan CRM gjennom opplæring av kommunikative praksiser letter håndteringen av komplekse situasjoner, spesielt der sjekklister/SOP er utilstrekkelige
- **Håndtering av inkapasitering:** Spesifikt fokus på å utvikle CRM-treningsmetoder inkludert verktøy for å sikre at flygere utvikler strategier for å gjenkjenne situasjoner som involverer egen og hverandres varierende grad av inkapasitering.
- **Trening på kritiske oppgaver:** Eksplisitt trening på oppgaveforløpet ("task trajectory") og tilhørende koordinering ved utførelse av kritiske oppgaver under tidskritiske hendelser.
- **Tilstrekkelighet av gjeldende CRM-regelverk:** Vurdering av om gjeldende CRM-regelverk er tilstrekkelig for å møte behovet for fleksibel og grundig CRM-opplæring, samt behovet for å sikre grunnleggende CRM-ferdigheter og identifisering av standard beste praksis.

Helikopterulykker



UK-Norway: Offshore Helicopter Operational Safety Main Findings

18 January 2023

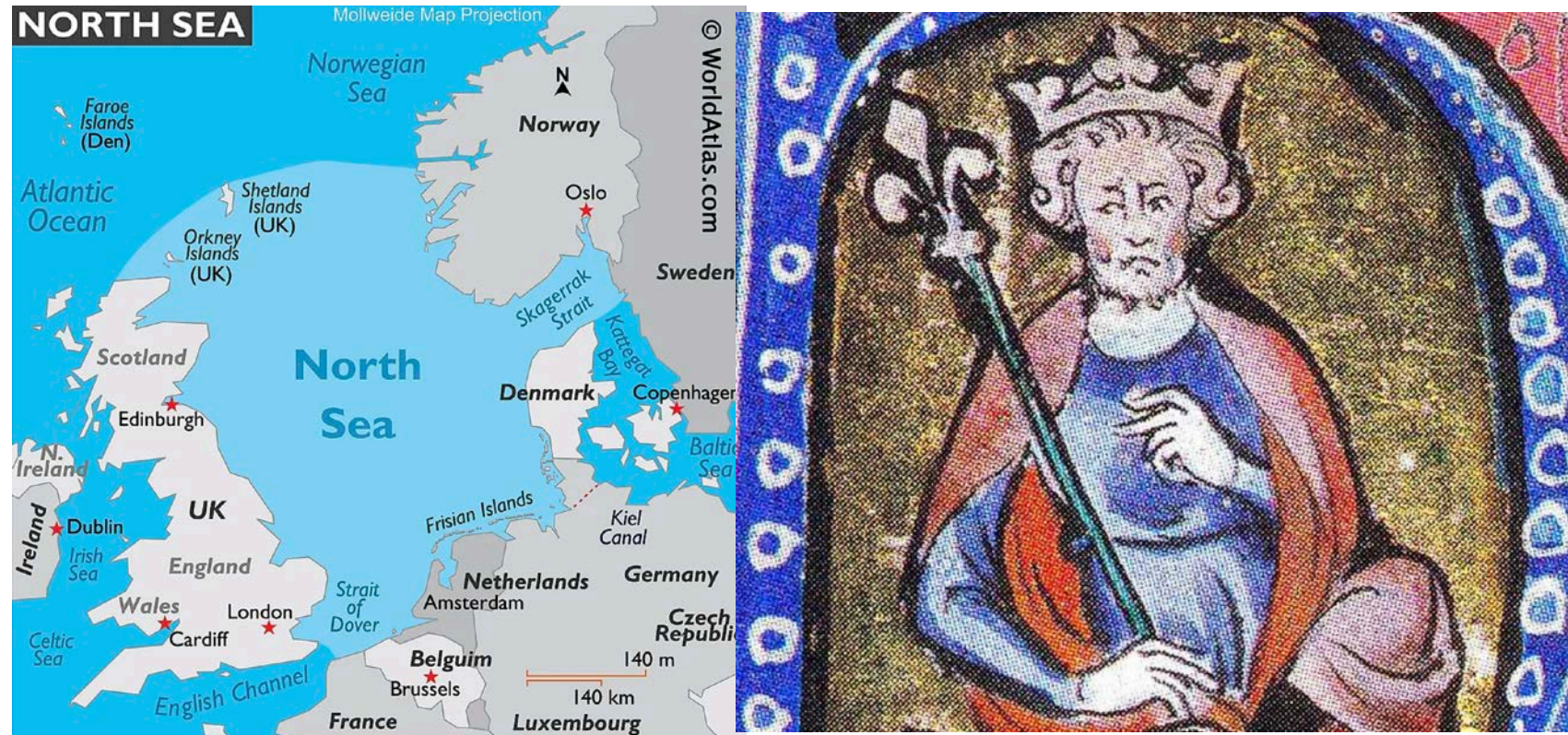
Professor Arnab Majumdar
a.majumdar@imperial.ac.uk

Structure of the presentation

- Understanding the context
- Interview structure + interviewees
- Main findings
- Differences
- “National” characteristics
- Implications

UK and Norway -1

Both nations in Northern Europe sharing resources and common history – so similar cultural aspects?



UK Background

Well it has been a while since Cnut ruled both nations...and :

- United Kingdom – is **not** one country but four
- One major dominant nation - **England**
- 3 Different legal systems – England & Wales; Scotland, NI
- 4 Different legislatures – Westminster, Holyrood, Senedd and Stormont

Each nation and the UK itself has:

- Different histories
- Some aspects unique – legacy of the Industrial revolution leading to a battle between management and unions

But what are the implications of this?

UK and Norway share the North Sea's O&G resources:

- Similar conduct of helicopter operations including: helicopter types and equipment, helicopter operators, regulatory requirements, customer base, activity level, environmental conditions

BUT:

Cultural differences mean:

- not necessarily share the same views of decision making and behaviour that affects safety

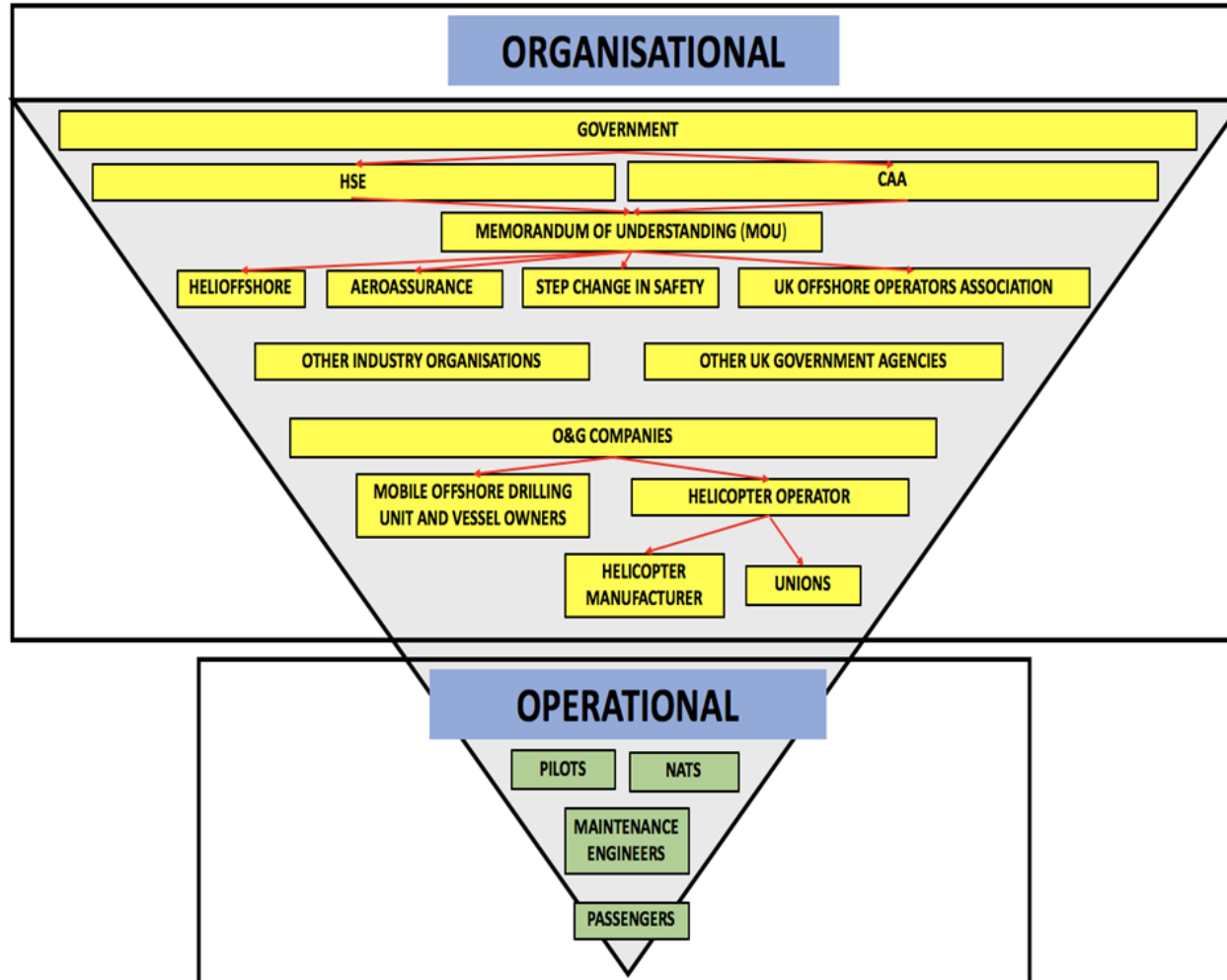
Study approach

No clear documentation and study of the similarities and differences in helicopter operations in the UK and Norway.

Mixed Methods Approach:

- Quantitative Accident Analysis – useful but limited
- **Qualitative analysis** – interview based analysis of themes

UK Stakeholders



Interviewees

Interviewees represented a range of stakeholders, including:

- CAA
- OGUK
- Unions
- Pilots and maintenance workers
- Helicopter operators
- HeliOffshore
- Safety organisations
- Expert consultancies

Close to 30 interviews were conducted, the majority on the UK side.

Interview Questionnaire – 7 categories

- 1. Personal details**
- 2. Safety culture, reporting and training**
- 3. Typical flight details**
- 4. Equipment and material**
- 5. Regulatory factors**
- 6. Contractual factors and the future**
- 7. Any other factors?**

Interviews

- Semi-structured interviews
- Individual and recorded
- Free-flowing responses
- Some had experience of working with Norwegians
- Typical interview length >1.5 hours
- Interviews recorded and analysed

National Themes

Theme	Main Findings
Government involvement	Relatively little government involvement with oil and gas (O&G) operations in the North Sea
Market	Dynamic, competitive market in O&G operations
Legislation	Legislation in its various forms and their impact on the O&G sectors
"Greening"	"Greening" of UK's energy sources, with reduced reliance on fossil fuels and decommissioning of oil rigs

Government “non” involvement

Why is the UK Government so reluctant to intervene?

- financial imperative - O&G companies have brought in **GBP 360 billion** in tax revenue since 1970 - critical to the country's economy!
- the lack of requirements in issuing licenses— finances vital.
- wish for O&G companies remain in the UK and indeed the UK government provides some of the ‘most attractive tax regime’ in the World and financial relief for the decommissioning of oil rigs

Consequence:

O&G companies have a large degree of freedom in their operations **free from government interference and regulations,**

- Allowing them to adhere to and further develop their own “brand”.

Market

UK government's reluctance to interfere in the operations of O&G operations in the North Sea partly due to:

- nature of competitive, dynamic market in the UK across all sectors of the economy.

Helicopter Market dynamics in the UK very different from Norway

- Between 20-24 customers
- No dominant O&G company
- 4 Helicopter Operating companies
- Operators with two helicopter types
- **Considerable focus on reducing costs**

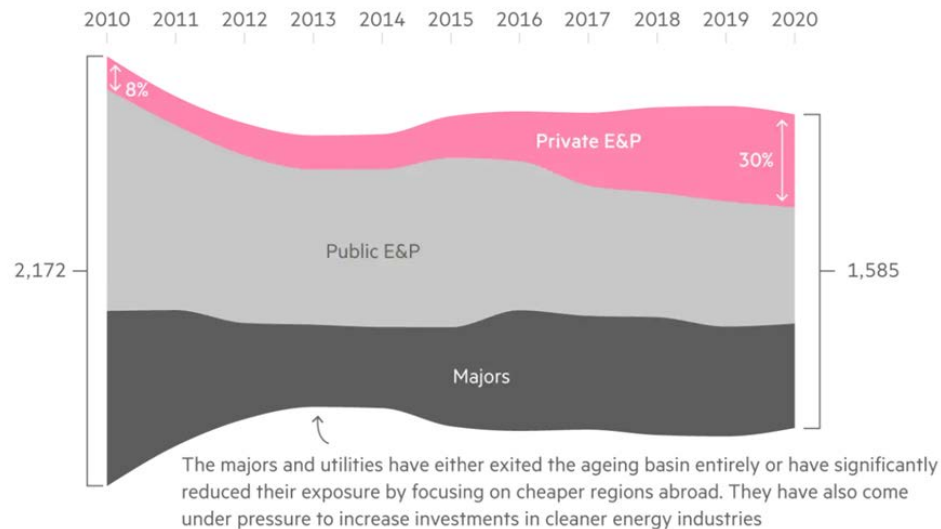
importance of private equity and entrants

Increased private equity funds backed operators:

- smaller, private companies “Uber-type of services”, i.e. a cheap and basic service without further commitment

Private companies' share of output has risen as UK production has fallen

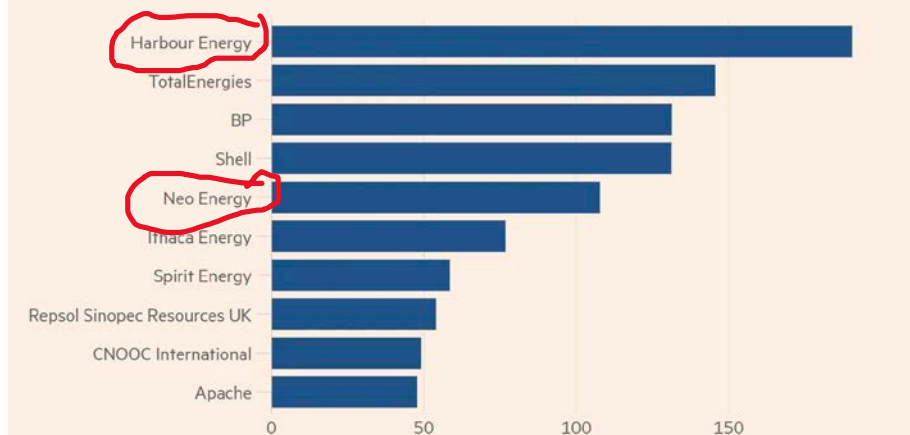
Total UK oil and gas production by company type (kboe/d)



Source: Rystad Energy
© FT

Top 10 UK oil and gas producers in 2022

Forecast production (kboe/d)



Source: Wood Mackenzie
© FT

Legislation

English law is based upon “Common Law” principles,

- a body of unwritten laws based on legal precedents established by the courts.
- Basis is 1100s by Henry II and reinforced by the Magna Carta
- influences the decision-making process in unusual cases where the outcome cannot be determined based on existing statutes or written rules.
- Active role for judges

Within UK, the law differs between England and Scotland.

- Scotslaw is a combination of “Common Law” and “Civil Law” principles

Norway is predominantly “Civil Law”:

- emphasis is on legislation as the primary source of law

Greening

- UK government policy moving towards Net Zero for emission by 2050 and **enacted into legislation**.
- Government plan for the transition in the North Sea outlined in March 2021 highlights the steps and investment required to move away from O&G exploitation.
- Increasing wind turbine energy in the North Sea, in the same regions as certain oil rigs.
- Helicopter operations needed for turbine maintenance, but at a much smaller scale and considerably less revenue for the operators.
- Planned decommissioning of oil rigs, with a cost to the taxpayer of £18 billion. Still some requirements for helicopter operations on decommissioned rigs, but reduced.

Ten major implications

- **The 90-day termination clause**
- **Role of the trade unions**
- **Discouragement of legal protections of employees**
- **The role of the regulator in offshore operations**
- **Helideck safety and its certification**
- **The co-ordination of safety bodies and its implication**
- **Safety Audits**
- **Catering for O&G and renewables**
- **Helicopter training**
- **Air Traffic Services**

90 day termination clause

Helicopter operators aim to fulfil their contracts for O&G companies by leasing helicopters for the duration of the contract.

- **90-day termination clause** associated with each such contract,
- risk exists that the operator may lose the contract whilst still having the financial obligation for the lease.

To minimise this risk, operators provide low bids.

- Competitive nature of the market means always another operator willing to work at a lower cost
- No financial incentive to invest in better technology and equipment, and this restricts how safe the operator is.
- Employees aware of the financial constraints on the operator so no reporting?

Note: O&G companies are not forcing anyone to work at a certain price, it is the competition that is driving down the prices.

Role of Trades Unions

Unions contribution to safety far greater in Norway than UK

- UK Unions simply an assurance to employees that it is “safe to fly”
- Employees fight battles “alone” given lack of legal protection

Union safety representatives may attend meeting **BUT**

- No legal power to stop operations
- No legal need for employer to involve them

If Unions earn respect of O&G. companies then good collaboration.

Considerably different from Norway

Discouragement of legal protection

Contractual aspects of UK law need to be considered:

- Considerable flexibility to O&G companies and helicopter operators to dismiss their employees under UK Employment law
- Can dispute the dismissal but the law as currently constituted favours the employers since the compensation they have to pay is quite small (£6K) and they have no obligation re-employ the employee.
- Employees are hesitant to raise concerns in order to prevent themselves being dismissed.
- Amplified by the competitive nature of the industry where there are more skilled people than jobs currently available.

This was **not** the aim of the legal system or legislation!

Legal protection and data sharing

Also consider:

- Better legal protection for operators relates to share their data, specifically in relation to safety.
- Operators don't completely share data with one another due to fear that shared data would be used against the operators in:
 - law suits or
 - to win contracts.

Regulatory role

Two features of the U.K. worth noting:

- Defender of the consumer
- Performance based regulation
 - is this well understood though by operators?

Note pandemic funding issues for U.K. CAA based

Non-CAA – perhaps CAA needs to be more active?

Role of the regulator - competence

- After many years of downsizing staff numbers, transferring expertise to EASA in Koln, Brexit has brought the UK CAA to a situation where it must now hire competent staff and improve its expertise to take on its new role as the UK's regulator.
- Enough aviation professionals in the UK to be able to staff the CAA, though questions relating to pay and conditions need to be addressed.
- Rapid developments in aviation mean there is a need for CAA staff to have the relevant knowledge and competence updated regularly.
- Always an issue as to whether the CAA regulates all aviation in a “fixed-wing” mode of thinking, or if it is sufficiently flexible to understanding the needs of rotary aircraft.

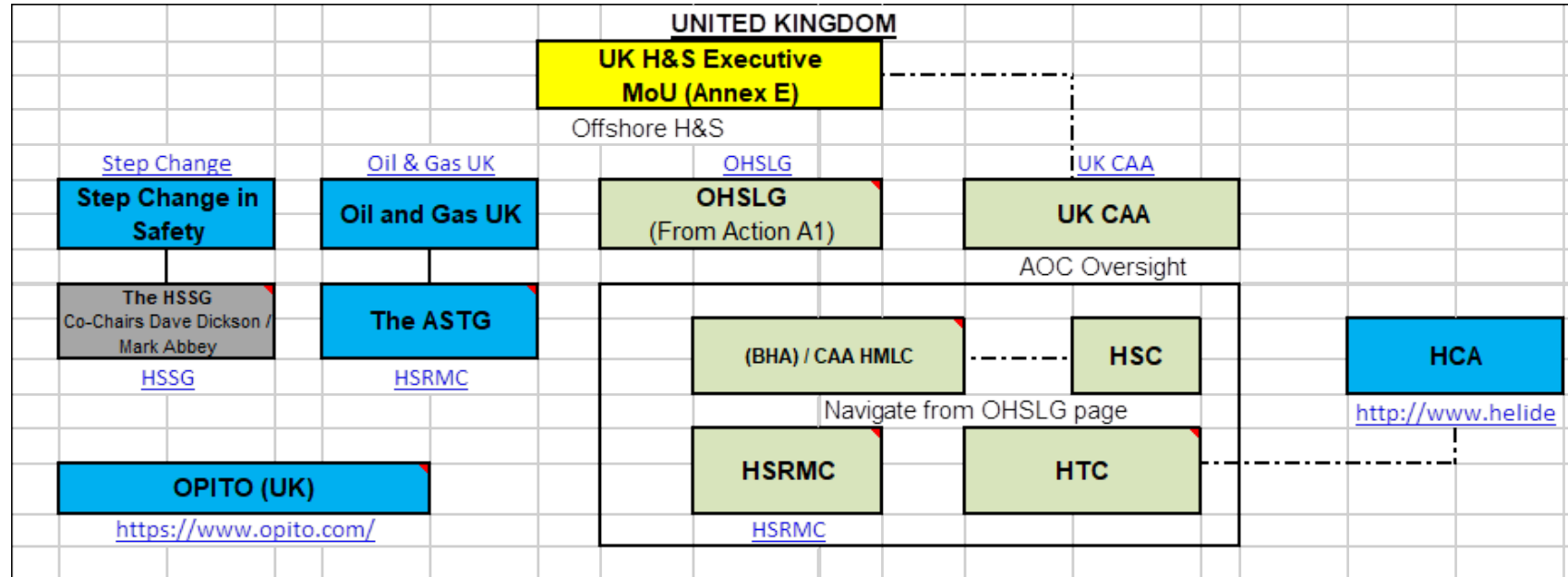
Role of the regulator - Independence

- UK CAA was not a participant to the discussions on future aviation regulatory requirements.
- Concerns that any move to regulatory independence will lead to a drop in standardisation,
 - leads to inefficiencies in operations.
- A series of bilateral agreements with neighbouring countries with regards to operations which will enable a reduction in duplication of processes.
- One advantage is to have the ability to understand offshore helicopter operations
 - develop regulations based upon this knowledge
 - Not follow generic knowledge.

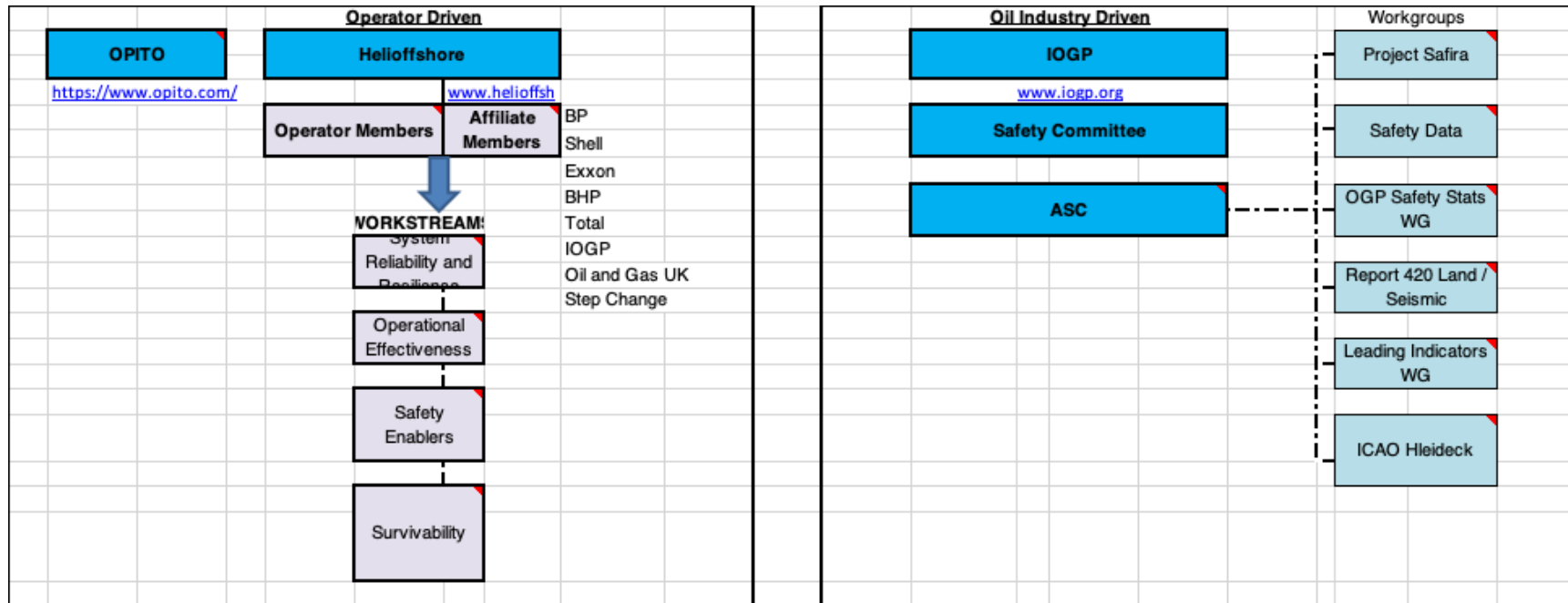
Co-ordination of safety bodies

- Considerable number of stakeholders
- Safety initiatives require much cooperation and management across many shareholders
- Time and effort
- While it's good to talk - is it efficient?
- More focus needed – Terms of Reference clarified
- New entrants reluctant to participate
- Distinctly different from Norway

Nature of the UK stakeholders - 1



Nature of the UK stakeholders -2



Helioffshore role – future opportunities

- Acts as a body to increase cooperation with the helicopter operators and O&G industry
- Unifying flight safety rules + audit rules
- By collaboration and not laws
- Global operational remit BUT relatively little Norwegian input

Helideck safety

Helicopter operators must satisfy themselves that each helideck they operate to is 'suitable for the purpose', through an inspection.

UK does not require helidecks to be licensed:

- helicopter operator is required to ensure that a particular helideck is adequate for the type of helicopter and the operation concerned.

Helideck Certification Agency (HCA) undertakes inspection programme:

- Considerable collaboration between HCA, helicopter operators and UK CAA when it comes to helideck certification in order to ensure that O&G companies maintain their helidecks safely;
- No energy companies in this collaboration;
- Many helidecks are currently **beyond their design life**:
- risks as certain safety features may be no longer fit for use, especially as O&G companies are not investing to improve their condition.

Different legal requirements in Norway

Safety Audits

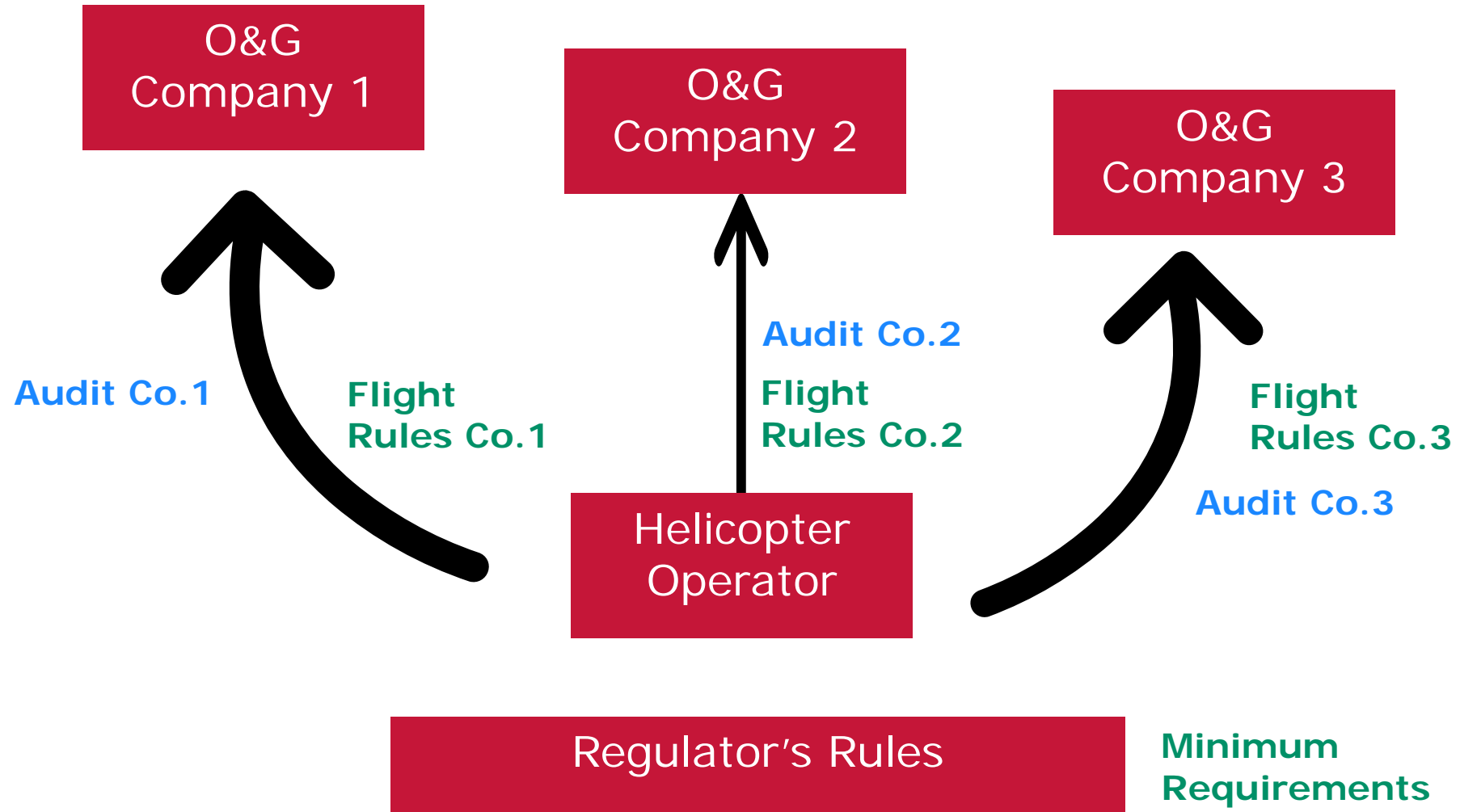
Greater numbers of customer organisations in the UK sector leads to:

- **a notable audit and inspection commitment** by the customer for the helicopter operators
- One operator may see a audits from all their customers separately
- Moving towards joint audits

Consequences of rules

- One helicopter operating company serves many customers (O&G) companies
- Each O&G company has different rules
- Stringency different
- Add in the rules of CAA + Operating Company
- Layers of rules!
- Do O&G companies use audits post-tender and contract award to revisit the terms of the contract?
- Pooled audits from new entrants
- But multiple audits not necessarily a bad thing!

Flight rules to remember + Audits

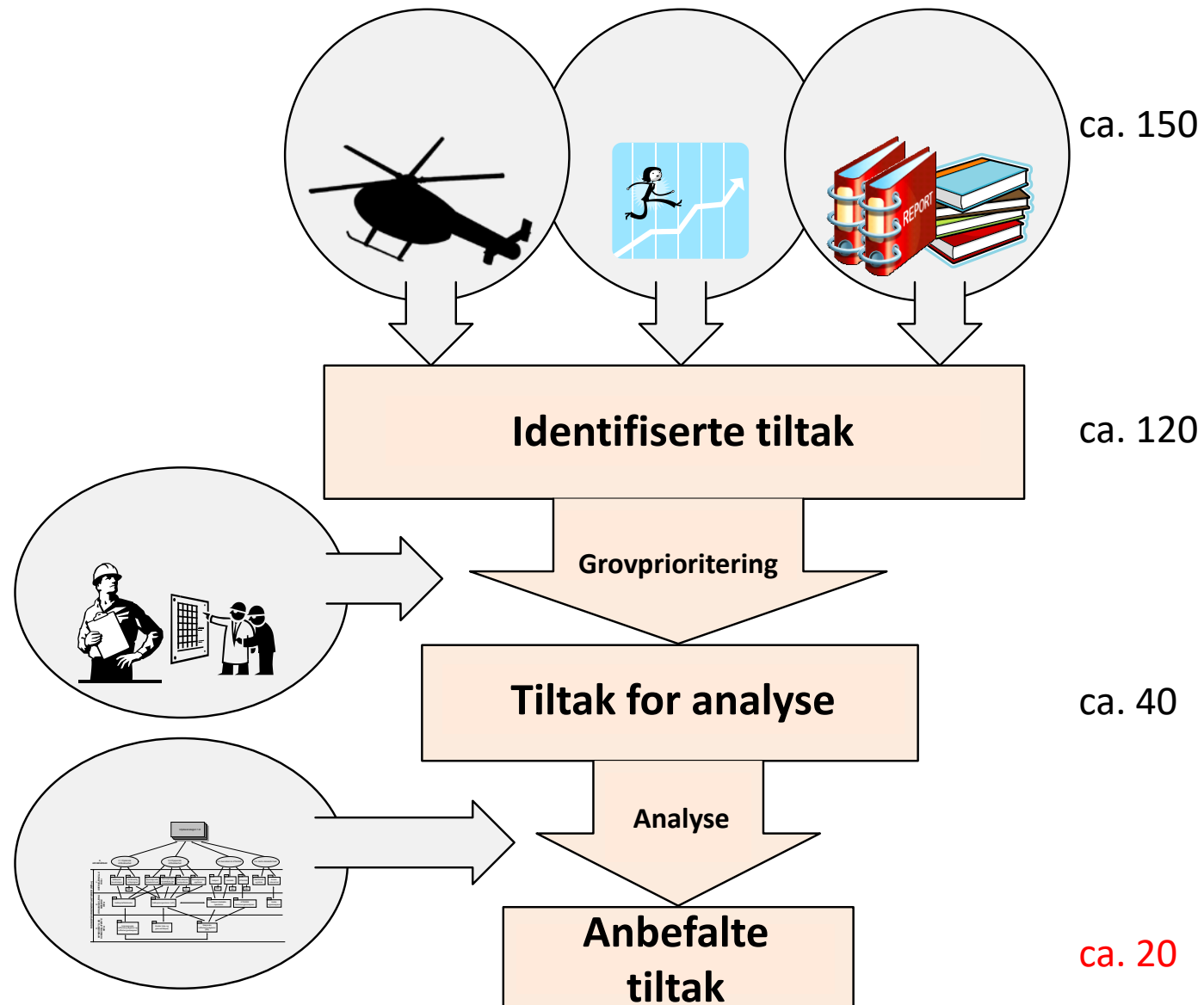


Catering for renewables and traditional O&G

- Government focus on renewable energy means wind farms exist in close proximity to traditional O&G infrastructure.
- Renewables often see O&G as old-fashioned and antagonistic.
- Desire to do away with the experience of helicopter operation gained from O&G.
- Helicopters needed for maintenance of wind-turbines, but
- used in a different manner to O&G facilities.
- Need to change current business model?

What about the Safety Culture

- Operators in the UKCS have experience globally and have developed mature safety systems.
- Moves towards “just culture” in the UKCS operations, with improved reporting, analysis etc.
- Good communications has ensured pilots are supportive of such a culture.
- Impediments remain with HR departments showing reluctance; though by training HR personnel, this resistance is reducing.
- Need to be aware that engineering maintenance departments do not report to the same extent as pilots
 - - lack of awareness to report or other cultural factors.
- Need to constantly work at maintaining the “just culture” approach and enabling trust.



- Tiltak identifisert fra:
- **Forslag fra bransjen**
 - HSS-3b (og HSS-3)
 - Andre HSS-4 aktiviteter (intervjuer, workshops, utviklingstrekk, osv.)
 - Hendelser rapportert til LT
 - Litteratur (HeliOffshore, CAA UK, osv.)
 - Granskningsrapporter

- Realistisk å gjennomføre neste 10 år
- Sikkerhetseffekt (og kostnadseffektiv)
- Kan ha en tydelig ansvarsadresse

Tiltaksanalyse vha. HSS-modellen

Tiltak	RIF		Ulykke- kategori	Effekt ^{c)}		Reduksjon ^{d)}			Kost ^{e)}	Relativ effekt/kost ^{f)}	Impl.tid ^{g)}	Bransje- behov ^{h)}	
	F ^{a)}	K ^{b)}		F	K	F	K	R					
Forbedre pålitelighet av helikopter og tilhørende systemer													
T1	Oppgradere tilbringerhelikoptre til nye modeller	1.1–1.4	-	alle	M	-	11 %	0 %	11 %	H	2 %	> 5 år	H
T2	Oppgradere eldre SAR- og skyttelmaskiner	1.1– 1.3	1.10	alle	L	H	4 %	3 %	7 %	H	1 %	2–5 år	H
T3	Sikre tilgjengelighet av informasjon i <u>electronic flight bag (EFB)</u>	1.3–1.4	-	alle	M	-	2 %	0 %	2 %	L	4 %	< 2 år	M
T4	Sikre kontinuerlig og oppdatert informasjon underveis	1.4, 1.11	-	alle	M	-	3 %	0 %	3 %	M	1 %	2–5 år	H
T5	Gjøre riggdata elektronisk tilgjengelig	1.4	-	1	M	-	0 %	0 %	0 %	L	0 %	2–5 år	M
T6	Modernisere prosedyrer	1.1, 1.4	-	alle	L	-	0 %	0 %	0 %	M	0 %	> 5 år	M
T7	Sikre infrastruktur av redundant navigasjonssystem til GPS	1.4, 1.8	-	1, 2	M	-	1 %	0 %	1 %	L	2 %	2–5 år	H
T8	Sikre dekning med ADS-B og VHF på norsk sokkel der det er regelmessig trafikk	1.8	-	alle	M	-	1 %	0 %	1 %	L	2 %	> 5 år	H
Forbedre vedlikehold													
T9	Sikre at vedlikehold og modifikasjonsarbeid utføres under norsk myndighetstilsyn	1.2	-	alle	L	-	3 %	0 %	3 %	L	6 %	< 2 år	H
T10	Forbedre tilgang på reservedeler	1.2	-	alle	M	-	8 %	0 %	8 %	M	3 %	> 5 år	H
T11	Standardisere krav om "independent inspection"	1.2	-	alle	L	-	3 %	0 %	3 %	L	6 %	< 2 år	M

Anbefalte tiltak (1/2)

- T1: Oppgradere tilbringerhelikoptre til nye modeller
- T2: Oppgradere eldre SAR- og skyttelmaskiner
- T3: Sikre tilgjengelighet av informasjon i electronic flight bag (EFB)
- T4: Sikre kontinuerlig og oppdatert informasjon underveis
- T7: Sikre infrastruktur av redundant navigasjonssystem til GPS
- T9: Sikre at vedlikehold og modifikasjonsarbeid utføres under norsk myndighetstilsyn
- T10: Forbedre tilgang på reservedeler
- T11: Standardisere krav om "independent inspection"
- T13: Forbedre trening for teknisk personell
- T15: Opprettholde basiskompetanse til flygere

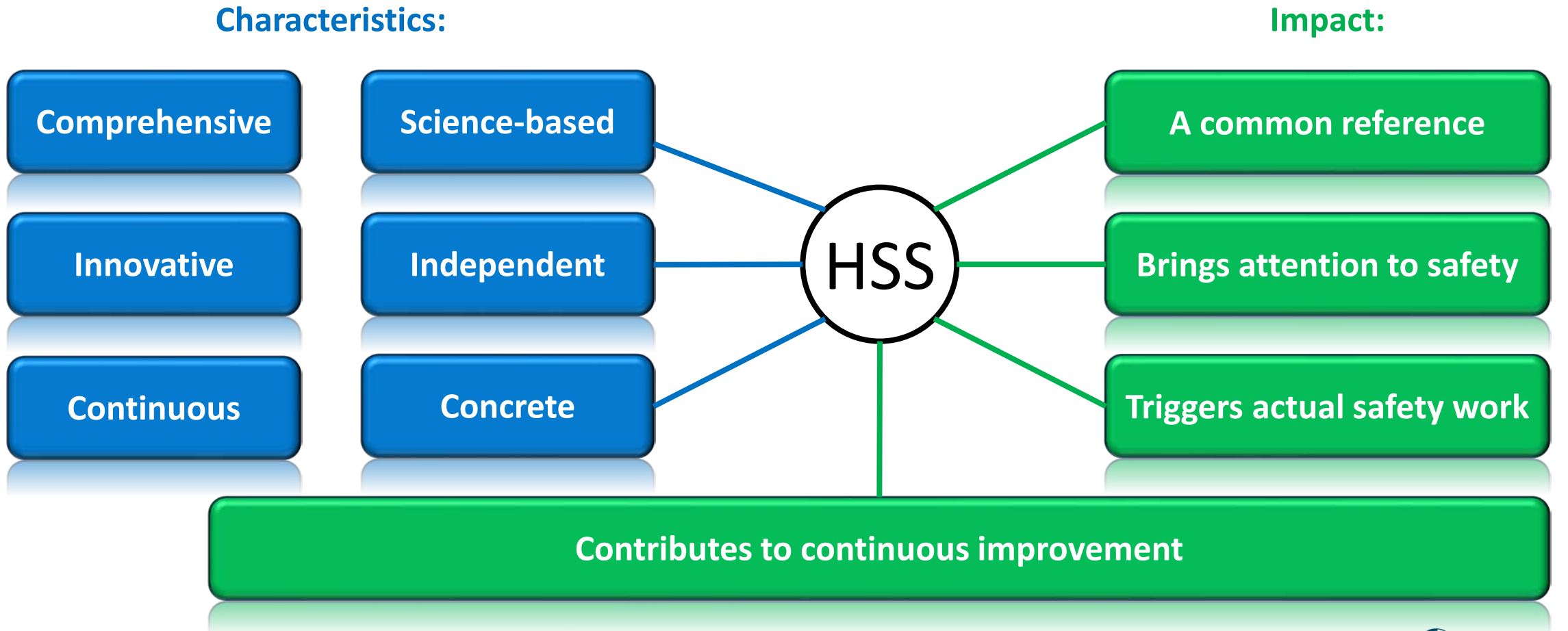
Anbefalte tiltak (2/2)

- T16: Justere programmet for simulatortrening
- T20: Innføre krav om kommunikasjon for flygere som beveger seg på helikopterdekket
- T22: Implementere fullstendig innholdet i ON-066
- T23: Omforene om snutid og penalty
- T27: Styrke kapasitet og nødvendig kompetanse i Luftfartstilsynet
- T33: Utvikle gode indikatorer og analyser for offshore helikoptertransport
- T35: Forbedre rapporteringssystem for tilbakemelding fra flygere til helikopterdekk/heliport
- T39: Kartlegge opplevd risiko

Viktige forutsetninger

- a) Fortsette å overholde ON-066 som anerkjent norm
- b) Opprettholde unntak fra EUs standardiserte regelverk, for eksempel sikre krav om norsk AOC med alle dens elementer intakt
- c) Opprettholde eksisterende kompetanse på offshoreoperasjoner innen luftrafikkjenesten
- d) Utvikle en infrastruktur for luftrafikkjeneste samt beredskap i Barentshavet
- e) Revitalisere Samarbeidsforum for helikoptersikkerhet på norsk kontinentalsokkel ("Samarbeidsforum") til å bli mer enn et forum for informasjonsutveksling

Relevance of the HSS studies



Interaktiv HSS-4 rapport

Blir tilgjengelig på www.sintef.no/helikoptersikkerhet

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legislation, standards, and guidelines

in Norway (CAA-N)

has introduced an opportunity to audit less frequently, however the offshore sector is considered a complex operation annual. An inspection from the CAA-N involves the following conditions: Technical, operational (Part M) and HSE, in check of helicopters. New from the CAA-N is that they participate during helicopter flights on jump seats - previously, the for this. Furthermore, the secondary bases (Florø, Bergen, Hammerfest, etc.) are inspected. The managerial side of the CAA-N as active and cooperative in general - responding quickly to operational questions concerning helicopters. Sometimes experience that the CAA-N spends quite a long time on specific case processing.

ed to available resources – for example is BSL D 5-1 several years delayed. It is emphasized that there are good within the CAA-N. Audit work is carried out as previously done with approvals and inspections, etc. Audit is, however, 65 - with improved checklists, new IT tools, etc. However, the supervisor does not control beyond the time (plans, what es and dialogue meetings. This has little effect on the operators, and discrepancies or findings are communicated in a risk-based supervision has not affected the supervisory work to any great extent.



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Teknologi for et bedre samfunn