

# Cruise leader course

European Research Vessel Operators

2023



# Course topics

- Opening/admin info
- Purpose
- Legal framework
- Own organization's cruise planning system and procedures
- Cruise planning and execution
- Web-based cruise planning system
- Summary/End of course



# Purpose/Goal

To give both new and experienced cruise leaders and cruise participants necessary knowledge about :

- Cruise preparation
- Cruise execution
- Ending a cruise
- Post-cruise tasks

primarily from a Research Vessel Operator's point of view



# Legal framework - Sources

- International Maritime Organization (IMO)
- International Labour Organization (ILO)
- (*National*) Maritime Authorities (*List national agencies*)
- (*National*) laws (*List relevant examples, e.g. laws regulating ship ownership, ship operations, employment of maritime personnel etc.*)
- (*Name*) Classification society (*include name of relevant Class, e.g DNV GL, Bureau Veritas or other*)
- International Standardization Organization (ISO) (*If ISO certified for Quality Management, Environmental Protection management or other*)



# Guiding documents

- International Safety Management (ISM) Code
- International Ship and Port Security (ISPS) Code
- Maritime Labour Convention (MLC)
- Shipboard Oil Pollution Emergency Plan (SOPEP)
- Safety Of Life At Sea (SOLAS)
- Standards of Training, Certification and Watchkeeping for Seafarers (STCW)
- Polar Code
- *Relevant National laws*
- ISO 9001 (Quality management)
- ISO 14001 (Environmental protection management)
- Code of Conduct for Marine Scientific Research Vessels (International Research Ship Operators – IRSO)





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Kronprins Haakon



G M Dannevig



G.O. Sars



Prinsesse Ingrid Alexandra



Hans Brattström



Hydrograf



Research vessel fleet (2023) – *IMR example*

# (*Institution(s)*) cruise committee(s)

- A description of the cruise committee(s) involved in developing and maintain the cruise program for the Research Vessel(s) covered by this Cruise leader course. Elements could be:
  - Cruise committee composition: Leader, members, Secretary
  - Annual Cruise programming cycle:  
Application period followed by programming period and target date for publication
  - Cruise committee mandate
  - Cruise committee contact information
  - Other relevant Cruise committee information



# Where to find the (*Institution*) cruise program on the Intranet:

The image shows a screenshot of the HI Innsiden SharePoint intranet. The top navigation bar includes 'SharePoint' and the HI logo. Below this, the main header features 'HI Innsiden' and a navigation menu with 'Forside', 'Organisasjon', 'Temasider', 'Verktøy', and 'HI.no'. The 'Verktøy' menu is highlighted with a red box, and a blue arrow points to the expanded 'Verktøy' page. This page is organized into several columns of tool links:


- Arkiv**: Mediearkiv, Arkiv P360, Arkiv Ephorte
- DFØ og timeregistrering**: DFØ | Selvbetjeningsportalen, Timeregistrering, Citrix, Kundesenter
- Kvalitet og HMS**: Kvalitetsportalen, Avviksregistrering, Utstysregisteret, Chemical Database, Kjemikaliedatabase
- Kurs og kompetanse**: Kursportalen, Kompetanseportalen
- Regnskap og økonomi**: UNIT | DFØ-ID
- Annet**: Mine saker i OTRS, Møteromsoversikt, Biologiske forsøk og karbooking, Profiltorg, Reisebestilling, Toksystem

The 'Toksystem' link in the 'Annet' section is highlighted with a red box. In the bottom left corner, there is a circular logo for 'HAFORSKNINGS INSTITUTTET'.

(*IMR example*)



Where to find the  
cruise program on  
Internet:

 INSTITUTE OF MARINE RESEARCH

Research ▾ Advisory work ▾ Publications ▾ Topics ▾ Cruises and field work ▾ Lab and stations ▾ About us ▾

[Home](#) / [Cruises and field work](#) / Cruise planning system

## Cruise planning system




Photo: Kjartan Mæstad/IMR

The cruise planning system shows planned expedition for the various vessels and who is responsible for the cruise. The program is updated several times a year, and there may be changes.

[The cruise planning system \(new version 2023\)](#)

[You will find information about our cruises back to 2009 in this searchable database. \(Old version\)](#)

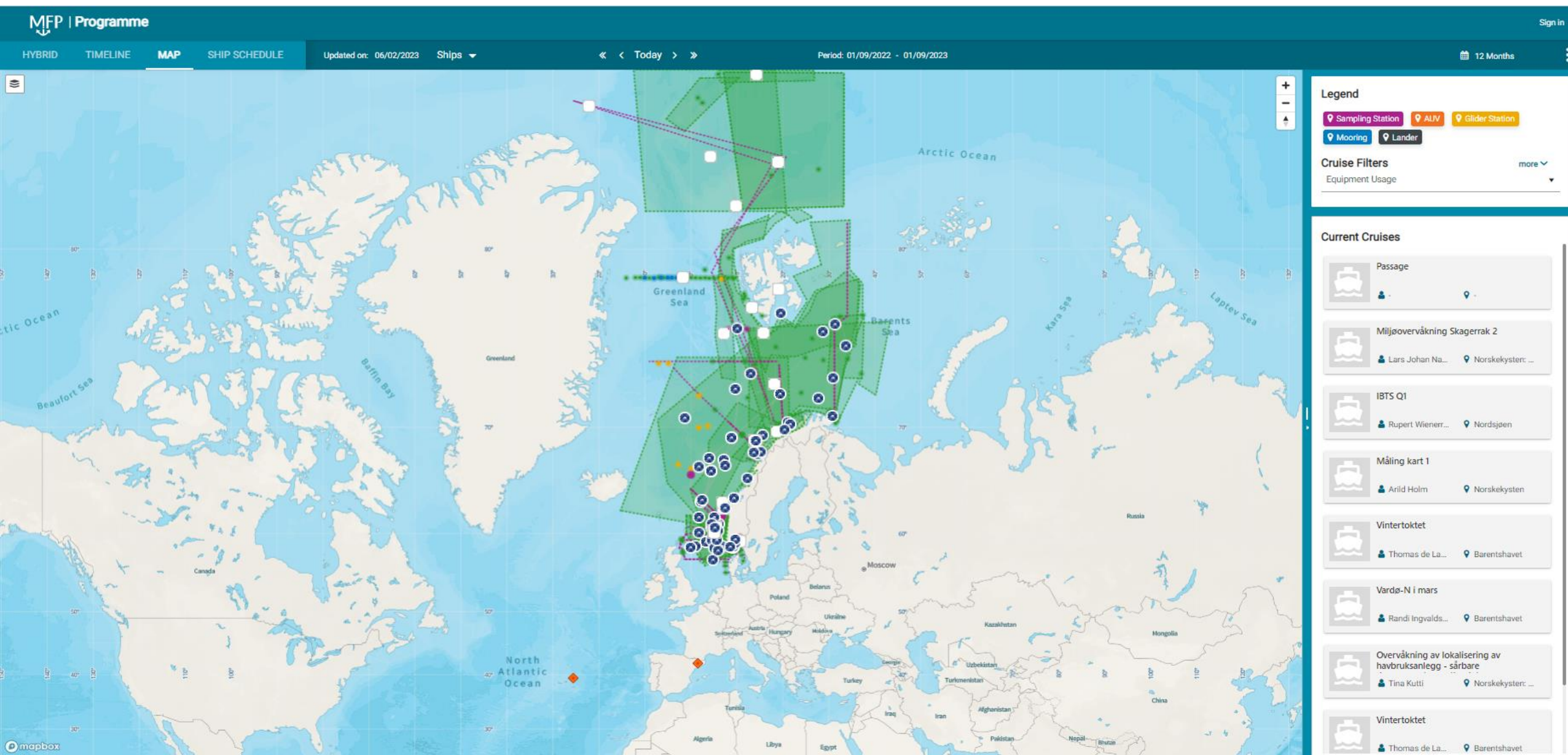
Published: 03.01.2023

(IMR Example)



<https://www.hi.no/en/hi/cruises-and-field-work/cruise-planning-system>

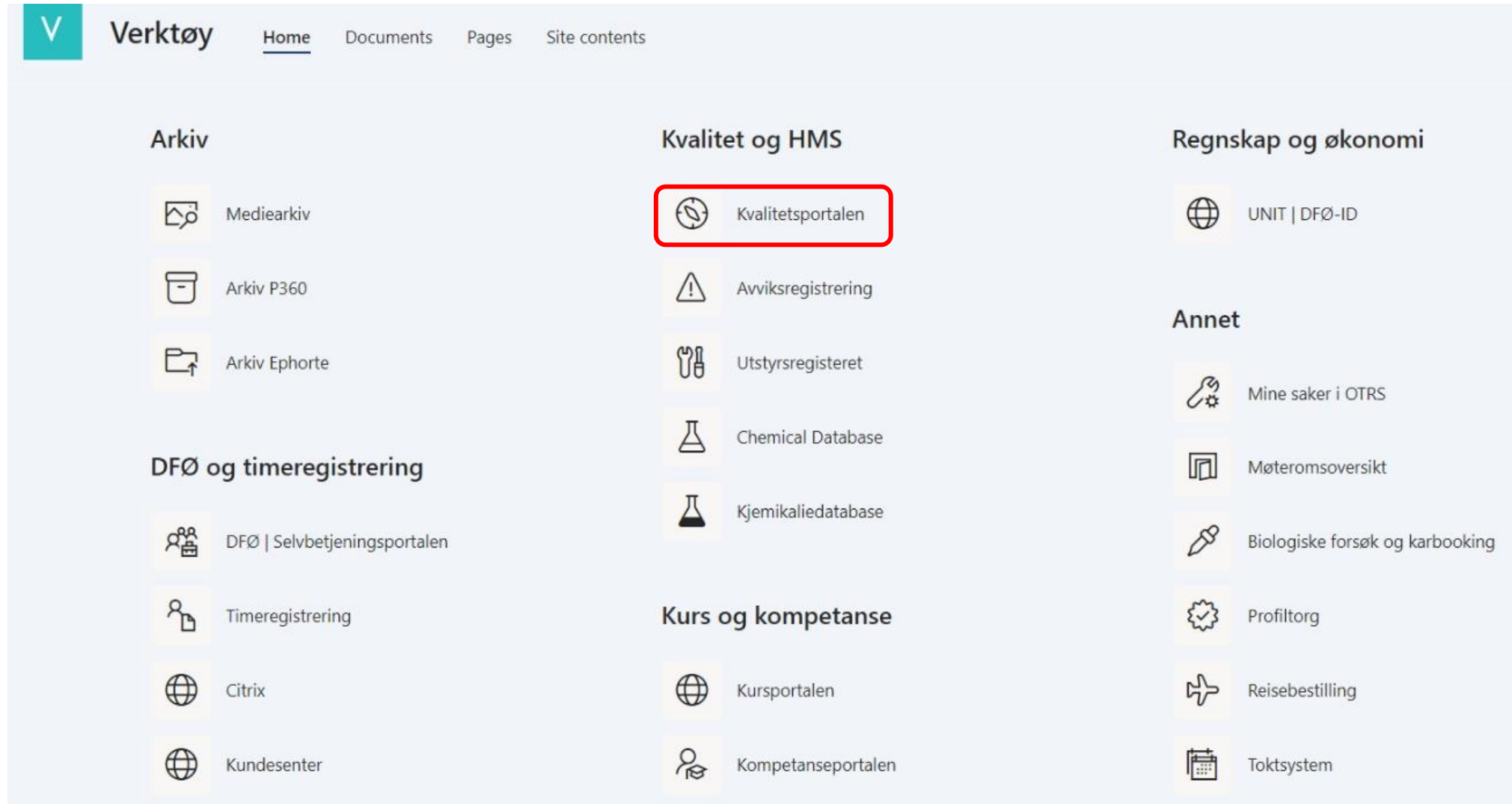
# IMR Cruise program using the Marine Facilities Planning (MFP) application



(IMR Example)

<https://marinefacilitiesplanning.com/programme>

# Primary Cruise planning information source(s)



The screenshot shows a web portal with a navigation bar at the top containing 'Verktøy', 'Home', 'Documents', 'Pages', and 'Site contents'. The main content area is organized into several columns of service icons:

- Arkiv**: Mediarkiv, Arkiv P360, Arkiv Ephorte
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(IMR Example)



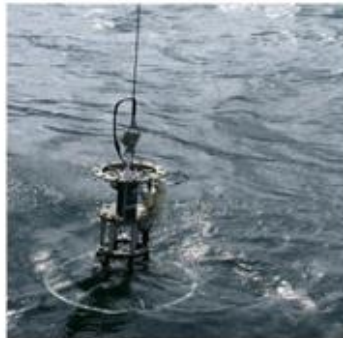
Kvalitetsstyring



Rådgivning



Forskning



Data



Beredskap



Helse, miljø og sikkerhet



Rederi



Infrastruktur



Laboratorier



Administrasjon / økonomi



Lederhåndbok



Personalhåndbok

Rederi/Research Vessel Department.



(IMR Example)



[← Tilbake](#)

## Rederi

[KS&SMS-01 Hovedmanual](#)

[KS&SMS-02 Administrative rutiner](#)

[KS&SMS-03 Skipsoperasjoner](#)

[KS&SMS-03-3 Beredskapsmanual](#)

[KS&SMS-04 Fartøyinstrument](#)

[KS&SMS-05 Tokt](#)

[KS&SMS-06 Fartøydrift](#)

[KS&SMS-07 Fangstutstyr](#)

[KS&SMS-08 Leiefartøy](#)

[KS&SMS-11 Fartøysinformasjon](#)

[KS&SMS-12 Koronatiltak - fartøy](#)

[FoU-håndbøker til bruk ombord - Toktpersonell](#)



(IMR Example)

# Document map Integrated QA&SMS - 05 Cruises



Kvalitetsportalen



Per

Q Søk...

Rederi ▾

[Forside](#) [Ny sak](#) [Saksbehandling](#) [Alle saker](#) [Nylig endrede dokumenter](#) [Lover](#) [Saksbehandling ROSA](#) [Utstyr](#)

[← Tilbake](#)

## KS&SMS-05 Tokt

Forberedelse

Laboratorier og kjemikalier

Toktavslutning

Tokt i utenlandske soner



(IMR Example)

[Forside](#)[Ny sak](#)[Min saksbehandling](#)[Alle saker](#)[HMS-saker](#)[Nylig endrede dokumenter](#)[Lover](#)[Utstyr](#)[← Tilbake](#)

## Forberedelse

[KS&SMS-05-1-01 Instruks for toktledelse](#)[KS&SMS-05-1-03 Prosedyre for toktøknad og tildeling av toktid](#)[KS&SMS-05-1-04 RSP - \( Risiko Styrings Plan\)](#)[KS&SMS-05-1-11 Rutine for dykking fra fartøy driftet av HI-Rederiavdeling](#)[KS&SMS-05-1-13 Acceptance form for flying from HI operated vessel](#)[KS&SMS-05-1-16 Risiko Vurdering - Reise på tokt i fjerne farvann](#)[KS&SMS-05-MAN-01 RETNINGSLINJER FOR MINIMERING AV AKUSTISKE FORSTYRRELSER FOR SJØPATTEDYR I FORBINDELSE MED SEISMISKE UNDERSØKELSER](#)[KS&SMS-05-2-06 Feltarbeid ved Nordaustlandet](#)[KS&SMS-03-2-5-20 Helseattest og sikkerhetskurs for tokttagere og gjester](#)[KS&SMS-05-1-12 Rutine for bruk av Drone fra fartøy driftet av HI-Rederiavdeling](#)[Kurs](#)[Kronprins Haakon](#)[Dr. Fridtjof Nansen](#)

(IMR Example)



# Cruise leader instructions

Ref.id.: KS&SMS-05-1-01

Procedure

Page 1 of 11

## Cruise leader instructions

### 1 Purpose

The purpose of these Cruise leader instructions is to ensure that cruises are planned, executed and completed in the best possible manner in accordance with the aim of the cruise.

### 2 Target group and responsibilities

This instruction applies to all cruises on research vessels manned and operated by IMR or chartered by IMR. It covers cruise planning, preparation, execution and post cruise activities.

### 3 Definitions

Cruise coordinator

The person named as «Cruise coordinator " in the cruise program and therefore has a particular responsibility for the planning and execution of cruises that includes two or more projects and/or two or more vessels. The cruise coordinator can appoint cruise leader(s) as necessary.



(IMR Example)



or from the "outside": [http://www.hi.no/om\\_havforskningsinstituttet/rederi/sms\\_systemet/nb-no/](http://www.hi.no/om_havforskningsinstituttet/rederi/sms_systemet/nb-no/)



## KS og SMS systemet

|                              |   |
|------------------------------|---|
| + Rederi ekstern web (hi.no) | 7 |
| + Skipsoperasjonsmanual      | 8 |
| + Fartøysinformasjon         | 8 |
| + Fartøyinstrument           | 1 |
| + Tokt                       | 4 |
| + Fangstutstyr               | 2 |
| + Leiefartøy                 | 6 |
| + Beredskapsmanual           | 6 |



(IMR Example)

# Part 1 - Preparations

- Cruise application
- Vessel information
- Cruise leader instructions
- Cruise manning
- Equipment planning and request
- Diplomatic clearance and other permits
- Safety instructions
- Risk management
- Course and station net
- Medical certificate and Personal safety training
- Logistics, transportation, intermediate storage etc
- Chemicals
- Cruise plan
- Instrument technicians
- Data collection and handling



# Toktsøknad/Cruise application

- Cruise application to be delivered via web-based cruise planning system Marine Facilities Planning (MFP) <https://marinefacilitiesplanning.com>
- See HInnsiden/”Verktøy» and click on «Toktsystem»
- Cruise application to be delivered to the ”Cruise committee” in late August the year before the cruise is planned to be executed
- Joint UiB/Hi cruise committee and “Kronprins Haakon” cruise committee meets in September/October
- National cruise committee (NTK) and Ocean Fleet Exchange Group (OFEG) meets in October/November
- Next year’s annual cruise program is usually ready in October/November



(IMR Example)

# Information about the Research Vessels



## Kvalitetsportalen

[Forside](#)

[Ny sak](#)

[Saksbehandling](#)

[← Tilbake](#)

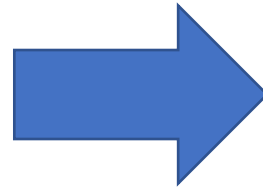
### Rederi

[KS&SMS-01 Hovedmanual](#)

[KS&SMS-03-3 Beredskapsmanual](#)

[KS&SMS-06 Fartøydift](#)

[KS&SMS-11 Fartøysinformasjon](#)



### KS&SMS-11 Fartøysinformasjon

[➤ KS&SMS-11.1 Johan Hjort](#)

[➤ KS&SMS-11.2 Kristine Bonnevie](#)

[➤ KS&SMS-11.3 G.O.Sars](#)

[➤ KS&SMS-11.4 Dr. Fridtjof Nansen](#)

[➤ KS&SMS-11.5 Kronprins Haakon](#)

[➤ KS&SMS-11.6 G.M.Dannevig](#)

[➤ KS&SMS-11.7 Hans Brattström](#)

[➤ KS&SMS-11.8 Hydrograf](#)

(IMR Example)

# Diplomatic clearance

- If the cruise includes data collection and/or sampling in other countries exclusive economical zone (EEZ), permission must be sought through diplomatic channels, ref UNCLOS (United Nations Convention of the Laws Of the Seas) Part XIII Marine Scientific Research [www.un.org/depts/los/convention\\_agreements/texts/unclos/part13.htm](http://www.un.org/depts/los/convention_agreements/texts/unclos/part13.htm)
- It is the cruise leader's responsibility to develop the application and send it to (**internal department**) who will relay the application to the (**National**) Embassy in the relevant foreign country, who in turn will distribute it to relevant institutions in the foreign country who will handle it and respond.
- Normal processing time is at least 3 months, but for UK, Ireland and Russia it is at least 6 months
- If the application needs to be translated, make sure to include time for it!
- It is the responsibility of the cruise leader to follow the conditions given in the diplomatic clearance!



For information about EEZs around the world, check:  
<https://www.marineregions.org/eezmapper.php>

# Port call(s) in foreign country and/or cruise outside the Norwegian Exclusive Economical Zone(s)

- If the cruise plan will include port call in a foreign country or operate outside Norwegian Exclusive Economical Zone(s) the vessel can procure fuel and provision tax free which means huge cost savings for IMR/Research Vessel Department and freeing up funds for other purposes!
- It is therefore very good if such information is included in the cruise application!



(IMR example)

# Application to Norwegian Petroleum Directorate (NPD) for geological and geophysical data collection and/or sampling of the Norwegian continental shelf

- If geological and geophysical data collection and/or sampling of the Norwegian continental shelf are planned, an application must be sent to the Norwegian Petroleum Directorate (Oljedirektoratet), see [www.npd.no/fakta/publikasjoner/vitenskapelige-undersokelser/](http://www.npd.no/fakta/publikasjoner/vitenskapelige-undersokelser/)
- Application to be sent to [postboks@npd.no](mailto:postboks@npd.no). Application will be reviewed by the Directorate of Fisheries, IMR and Norwegian Defense Forces. Objections could be received with regards to use of seismic equipment (sound).
- Relevant equipment to apply for permission to use can be seismics, sub-bottom profiler, gravity corer, Calypso corer, grab, multi beam echosounder and other equipment or instruments collecting data or samples of the seafloor or below the seafloor
- Application can be written as a Word document and include information about equipment and instruments, and where and when the cruise will take place. Include a map with coordinates if possible.
- For seismic exploration, include information about source volume and number of air guns in addition to lines/area and timeframe. Measures to protect sea mammals such as observers and/or use of «soft start» should be described.



(IMR example)

Regulation (temporary) for exploration of certain underwater natural resources other than petroleum on the Norwegian continental shelf <https://lovdata.no/dokument/SF/forskrift/1970-06-12-3>

- **§ 5.** Written application must be delivered to the Ministry of Petroleum and Energy (by NPD) no less than 30 days before start of the exploration.
- The application shall include information about:
  - a) Name, adress and nationality of the institution or person the exploration is done on behalf of, and information about who is the point of contact towards Norwegian authorities.
  - b) Name, adress and nationality of the person(s) or institution(s) who are going to execute the exploration.
  - c) What type of exporation is planned, the purpose of it, when it will start and end, and in which geographical area(s) it will be done.
  - d) Exploration method(s), information about the vessel(s), airplanes or other floating or airborne vehicles planned to be used.
  - e) If seismic exploration is planned, and if so which exploration methods and what type of explosives will be used, including size and depths for setting off the explosives. Information about research vessel's radar(s), echo sounder(s), sonar(s) and other fishfinding equipment to be included.
  - f) To what extent the exploration will be executed from Norwegian land territory, if possible with name(s) of Norwegian port(s), airport(s) or other Norwegian areas that are planned used as base for the exploration.



The Ministry can require additional information.

**(IMR example)**



# Formalities with regards to collection of samples

- Throw catch overboard?
  - IMR holds general permit for own vessels
  - For hired vessel, normally a need to apply for every cruise to Directorate of Fisheries (DoF)
- Sampling from the bottom
  - Apply for permit to Norwegian Petroleum Directorate (Oljedirektoratet)
- Trawling inside territorial waters (<12 nautical miles from baseline)
  - Apply to DoF for every cruise
- Quotas for research catch
  - IMR applies to DoF for quotas every fall for the coming year



(IMR example)

# Cruise manning

- Manning of IMR-cruises is the responsibility of the heads of the science groups (forskningsgruppetledere) and others with employer responsibility for potential cruise personnel.
- In the cruise application, only which kind of competence is required, number of staff and number of cruise person days for each position on the IMR cruise is to be filled in, not names of potential cruise participants

| CRUISE MANNING                               |  |      |            |  |
|--|--|------|------------|--|
| Department                                   | Role                                     | Days | Category   | Comments   |
| FG Pelagisk/RG Pelagic fish                  | Pelagiker/Pelagic fish                   | 35   | Technician | -  |
| FG Pelagisk/RG Pelagic fish                  | Pelagiker/Pelagic fish                   | 35   | Technician | -  |
| FG Pelagisk/RG Pelagic fish                  | Pelagiker/Pelagic fish                   | 35   | Technician | -  |
| FG Pelagisk/RG Pelagic fish                  | Pelagiker/Pelagic fish                   | 35   | Technician | -  |
| FG Pelagisk/RG Pelagic fish                  | Toktleder/cruise leader                  | 35   | Scientist  | -  |
| FG Plankton/RG Plankton                      | Plankton/Plankton                        | 35   | Technician | -  |
| FG Plankton/RG Plankton                      | Plankton/Plankton                        | 35   | Technician | -  |
| Fartøyinstrument/Research Vessel Instruments | Instrumenttekniker/Instrument technician | 35   | Technician | Erfaren i akkustisk tolking                                |
| Fartøyinstrument/Research Vessel Instruments | Instrumenttekniker/Instrument technician | 35   | Technician | Erfaren i akkustisk tolking                                |
| FG Fangst/RG Fish Capture                    | Redskap/Fishing gear                     | 35   | Technician | Må kunne Deep Vision. Avhengig av finansiering gjennom FFA |



(IMR example)

# Scientific equipment and instruments

- Request for mobile scientific equipment and instruments to be listed in the cruise application/cruise plan.
- Establish communication as early as possible with the vessel crew, and the RV operator to check availability of equipment, necessary modifications/adjustments, preparation, calibration, transportation, loading on board etc
- Many types of scientific equipment require dedicated instrument technicians!



(IMR example)

# Example of scientific equipment request in cruise application

## SHIP FITTED EQUIPMENT

- ✓ CTD and water sampler  
Seabird 911: GOS, DFN, KH, JH, KB, PIA, -  
GMD. RBR Maestro: HB
  
- Water sampling rosette(s) pr vessel -
  
- ✓ Trawl equipment
  
- ✓ EK80 Echosounder  
GOS, DFN, KH: 18, 38, 70, 120, 200, 333 kHz -  
  
JH: 18, 38, 120, 200, 333 kHz. KB: 18, 38, 120, 200 kHz. PIA: 38, 120, 200 kHz. -
  
- ✓ Fish finder sonar  
SU 90: DFN, KH, GOS. SU 94: JH -  
  
SH 90: DFN, KH, KB -

## MARINE POOL EQUIPMENT

- Fishing equipment  
Other fishing gear  
Trawl sensors
  - ✓ Catch sensor
  - ✓ Depth sensor
  - ✓ Trawl eye
  - ✓ Deep Vision
  
- Pelagic trawl
  - ✓ VITO trawl
  
- Plankton  
Multinet
  - ✓ Multinet Mammoth  
DFN, KH, GOS, JH, KB -
  
- WP Plankton Net
  - ✓ WP II Plankton net
  - ✓ Macrozooplankton trawl
  - ✓ Algea landing net/Algehåv

## USER SUPPLIED EQUIPMENT

-

(IMR example)



# Cruise leader instructions

- Planning and preparations
- Cooperation
- Safety
- Risk assessment
- Scientific tasks
- Chemicals
- Certification of equipment
- Work and rest regulations
- Diplomatic clearance
- Safety training
- Health certificate
- Passport and visa
- Next of Kin
- HSE committee
- Spare cruise time
- Information to media



# Risk assessment and risk management

- Risk management is necessary in order to ensure the safety of personnel, equipment and the environment.
- In the IMR QA-system you can find descriptions, procedures etc for how to conduct risk assessment in due time before cruise commencement.

Kristine Bonnevie

- › KS-SMS-03-02 Skipsoperasjonsmanual
- › KS&SMS-03-04 SOPEP manual
- › KS&SMS-03-05 ISPS manual
- › KS&SMS-03-06 SEEMP manual
- › Risikovurderinger
- › Fartøyspesifikke sjekklister og prosedyrer
- › Maritime Labour Convention (MLC)
- › Polar Operasjons Manual (POM)

▼ Risikovurderinger

- › Daglig drift
- › Vedlikehold
- ▼ Forskningsarbeid
  - KS&SMS-03-2-6-1-4-01 Risiko vurdering - Bruk av fryserom for fisk
  - KS&SMS-03-2-6-1-4-02 Risiko vurdering - Bruk av div. forskningsutstyr
  - KS&SMS-03-2-6-1-4-03 Risikovurdering - bruk av gass ombord (nitrogen beholdere og/eller annen gass)
  - KS&SMS-03-2-6-1-4-04 Risiko vurdering - Bruk av kjemikalier ifm forskning aktivitet
  - KS&SMS-03-2-6-1-4-05 Risiko vurdering - Tråling
  - KS&SMS-05-1-16 Risiko Vurdering - Reise på tokt i fjerne farvann
- › Fartøyspesifikke



(IMR example)

# Risk assessment and certification of equipment

- For non-routine operations Risk assessment shall be done on board before cruise commencement.
- All equipment which will be lifted, towed, handled by cranes and/or winches must have certified lifting points, lifting wires, towing wire etc.
- Self insurance principle applies.  
If equipment is lost, the equipment owner is responsible if gross negligence from the crew can not be proved or substantiated.



# Covid-19

- Rules, see <https://www.hi.no/en/hi/cruises-and-field-work/imrs-research-vessels-department/covid-19-related-information-cruise-and-vessel>

Covid-19 related information cruise and vessel



Illustration SARS-CoV-2 (ill.: Alissa Eckert, MS; Dan Higgins, MAMS / DCD) (Handwash: Erlend A. Lorentzen / HI)



## Covid-information - vessels

### Risk Assessments

- [Risk assessment Covid-19 on board research vessels 1.6.pdf](#) (15.10.21)

### Guidelines

- [Guidelines for the handling of Covid-19 on vessels manned and operated by IMR - Ver 5.5.pdf](#) (15.10.21)

### Guidance for Ship Operators

- [Guidance for Ship Operators](#)

(IMR example)



# Flying drones



- Permission to operate drones must be obtained in beforehand!
- The form to be filled in and presented to the Captain when approved can be found in KS&SMS-05 «Forberedelser» and is named: “Acceptance form for flying from HI operated vessel”

See: <https://luftfartstilsynet.no/en/drones/fly-drones-safely/> for more details



(IMR example)

# Course and station net

- It is very useful for the Captain to receive early indications on planned course and station net in order to check if there are potential conflicts with wrecks or other obstacles.
- Marine protected areas.
- Check planned port of departure and arrival, and port visits in the cruise program vs planned course and station net!
- Inform the crew about planned port visits during the cruise.
- Plan with economical speed and bad weather!



(IMR example)

# Collection of bathymetric data within the territorial border

Collection of high-resolution bathymetric data in areas inside the territorial border of 12nm from the coastline of mainland Norway, Svalbard, Bjørnøya and Jan Mayen are classified iaw <https://lovdata.no/dokument/NL/lov/2017-06-21-88?q=bunnforhold>

In order to collect such data, a number of security measures must be in place. The vessel must be divided into zones (Controlled, Protected and Barred), the multibeam echo sounder is not connected to the Internet, use separate server located in the Barred area, data must be stored on separate discs labeled CONFIDENTIAL and personnel must have a security clearance.

If/when not formalities are in place, application to Norwegian Mapping Authority is necessary, 6 weeks prior to start gathering data.



(IMR example)



Norges territorialgrense  
Kartverket.

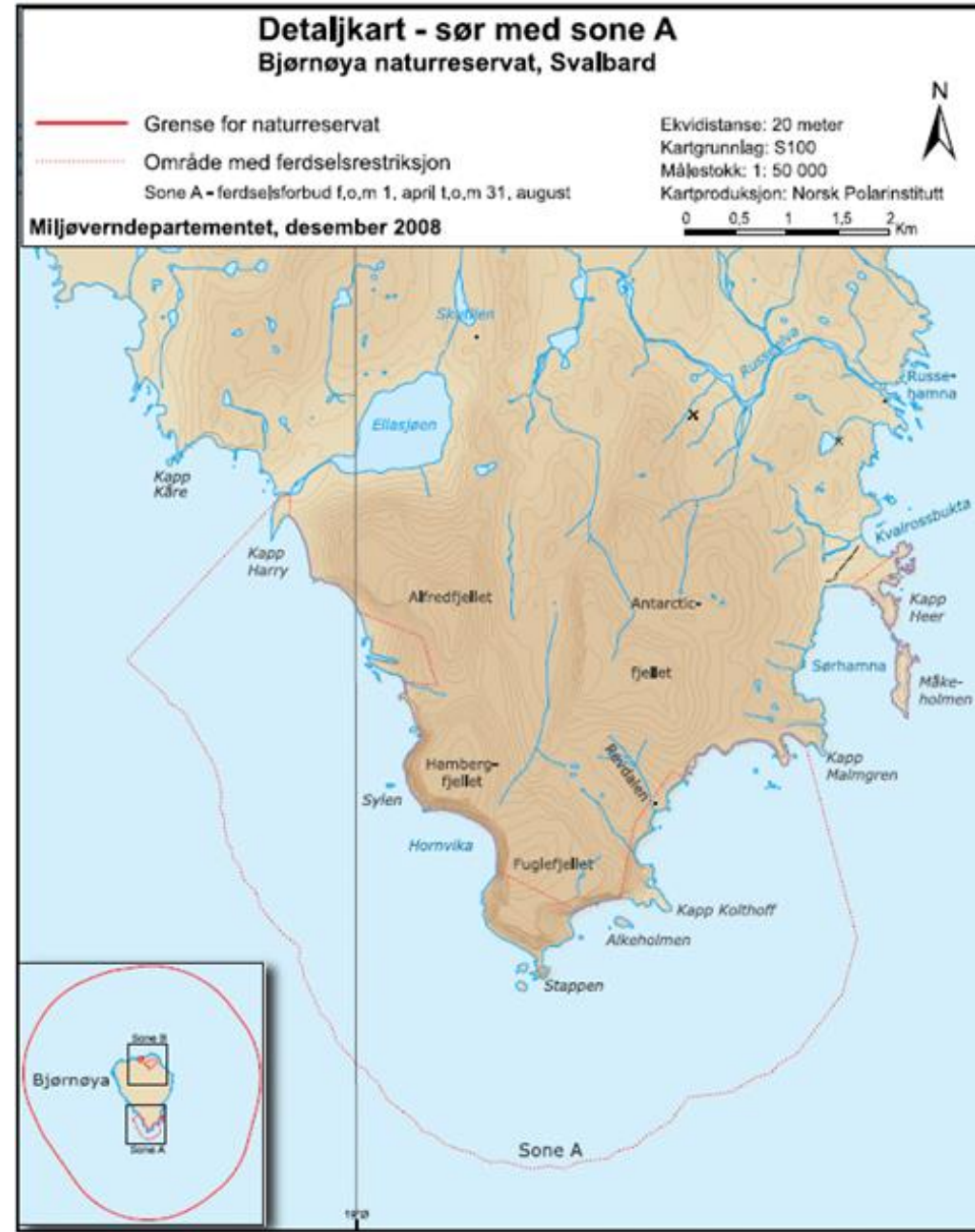
# Environmental protection regulations, Svalbard

## National parks/nature reserves

- Helicopter landing prohibited
- Flight ban below 300m/1nm offshore
- Diving prohibited
- Bottom trawl, agazziz trawl prohibited on depths less than 100m
- Landing prohibited near defined cultural monuments
- No intervention allowed
- For scientific activities a permit must be obtained from the the Governor of Svalbard



(IMR example)



# Environmental protection regulations, Svalbard

## Bird reserves

- All traffic incl. Ships and ariplanes is prohibited between 15<sup>th</sup> May – 31<sup>st</sup> August
- Seafloor down to 100m is protected
- No intervention allowed



(IMR example)



# Environmental protection regulations, Svalbard

## Cultural monuments

All traces of human activities prior to 1946

- All residue of human graves
- Protected zone in 100m in all directions where camping is prohibited
- A full overview can be found on <http://svalbardkartet.npolar.no>

## Glacier fronts

- Recommended minimum distance to calving glacier fronts is 200m.
- If the glacier front is more than 40m high and in narrow fjords the distance should be increased



(IMR example)

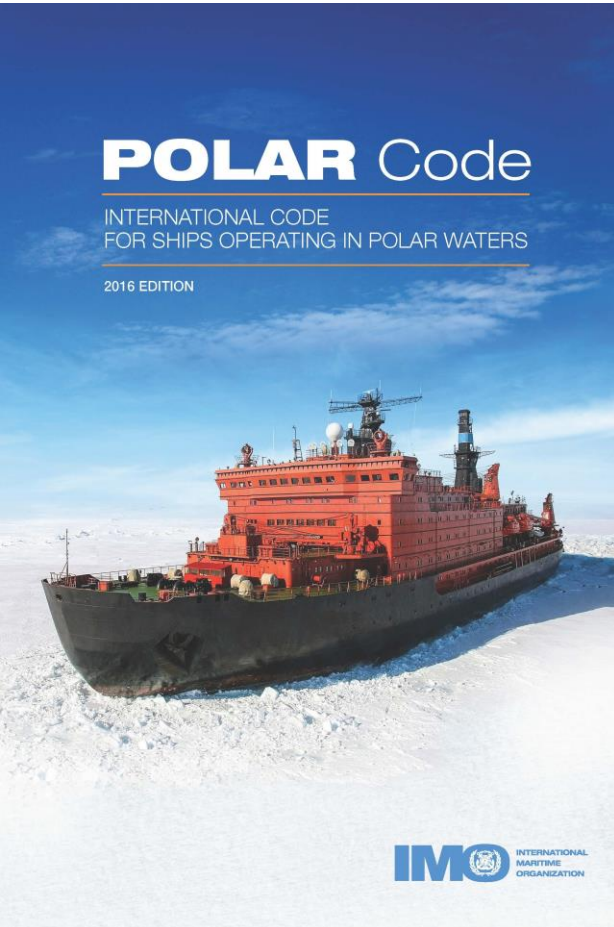
# Environmental protection regulations, Greenland

- Movements within the territorial border in Northeast-Greenland national park requires permission
- A number of forms must be filled in [http://en.mipi.nanoq.gl/sitecore/content/Websites/uk,-d-,nanoq/Emner/International\\_relations/expeditions.aspx](http://en.mipi.nanoq.gl/sitecore/content/Websites/uk,-d-,nanoq/Emner/International_relations/expeditions.aspx)
- Notification of proposed research cruise
- Diplomatic clearance to be obtained via Danish Arctic Command: [vfk-ktp-a-mar@mil.dk](mailto:vfk-ktp-a-mar@mil.dk)



(IMR example)

# Polar code and limitations in geography, temperature and ice conditions



- Vessels operating in polar regions must be certified iaw the IMO Polar Code (PC).
- IMR operates the following PC certified vessels:
  - *Kronprins Haakon, Johan Hjort, G.O. Sars, Kristine Bonnevie, Hydrograf*
- Other Norwegian PC certified research vessels are:
  - *Helmer Hanssen, HU Sverdrup*
- The vessels have different polar capabilities and it therefore varies in which polar areas they can operate at different times of the year, ice conditions and minimum allowed air temperature.  
See KS&SMS-03 Skipsoperasjoner/Polar Operasjons Manual (POM) for each IMR operated vessel.
- This capabilities and limitations must be taken into account when developing cruise applications and cruise plans in order to execute the cruises within the PC framework for each individual vessel, regardless of it is an IMR operated vessel, a barter vessel or a charter vessel.



(IMR example)



# WHAT DOES THE POLAR CODE MEAN FOR SHIP SAFETY?

## EQUIPMENT



**WINDOWS ON BRIDGE**  
Means to clear melted ice, freezing rain, snow, mist, spray and condensation



**LIFEBOATS**  
All lifeboats to be partially or totally enclosed type



**CLOTHING I**  
Adequate thermal protection for all persons on board



**CLOTHING II**  
On passenger ships, an immersion suit or a thermal protective aid for each person on board



**ICE REMOVAL**  
Special equipment for ice removal: such as electrical and pneumatic devices, special tools such as axes or wooden clubs



**FIRE SAFETY**  
Extinguishing equipment operable in cold temperatures; protect from ice; suitable for persons wearing bulky and cumbersome cold weather gear



## OPERATIONS & MANNING



**NAVIGATION**  
Receive information about ice conditions



**CERTIFICATE & MANUAL**  
Required to have on board a Polar Ship Certificate and the ship's Polar Water Operational Manual



**TRAINING**  
Masters, chief mates and officers in charge of a navigational watch must have completed appropriate basic training (for open-water operations), and advanced training for other waters, including ice

## DESIGN & CONSTRUCTION



**SHIP CATEGORIES**  
Three categories of ship which may operate in Polar Waters, based on:  
A) medium first-year ice  
B) thin first-year ice  
C) open waters/ice conditions less severe than A and B



**MATERIALS**  
Ships intended to operate in low air temperature must be constructed with materials suitable for operation at the ships polar service temperature



**INTACT STABILITY**  
Sufficient stability in intact condition when subject to ice accretion and the stability calculations must take into account the icing allowance



**STRUCTURE**  
In ice strengthened ships, the structure of the ship must be able to resist both global and local structural loads

## BACKGROUND INFO

❄️ THE INTERNATIONAL CODE FOR SHIPS OPERATING IN POLAR WATERS WAS ADOPTED NOVEMBER 2014 BY THE IMO MARITIME SAFETY COMMITTEE

❄️ IT APPLIES TO SHIPS OPERATING IN ARCTIC AND ANTARCTIC WATERS

❄️ THE AIM IS TO PROVIDE FOR SAFE SHIP OPERATION AND THE PROTECTION OF THE POLAR ENVIRONMENT BY ADDRESSING RISKS PRESENT IN POLAR WATERS AND NOT ADEQUATELY MITIGATED BY OTHER INSTRUMENTS



# HOW THE **POLAR CODE** PROTECTS THE ENVIRONMENT

## OIL



**DISCHARGES**  
Discharge into the sea of oil or oily mixtures from any ship is prohibited



**STRUCTURE**  
Double hull and double bottom required for all oil tankers, including those less than 5,000dwt (A/B ships constructed on or after 1 January 2017)



**HEAVY FUEL OIL**  
Heavy fuel oil is banned in the Antarctic (under MARPOL). Ships are encouraged not to use or carry heavy fuel oil in the Arctic



**LUBRICANTS**  
Consider using non-toxic biodegradable lubricants or water-based systems in lubricated components outside the underwater hull with direct seawater interfaces

## INVASIVE SPECIES



**INVASIVE AQUATIC SPECIES**  
Measures to be taken to minimize the risk of invasive aquatic species through ships' ballast water and biofouling

## SEWAGE



**DISCHARGES I**  
No discharge of sewage in polar waters allowed (except under specific circumstances)



**TREATMENT PLANTS**  
Discharge is permitted if ship has an approved sewage treatment plant, and discharges treated sewage as far as practicable from the nearest land, any fast ice, ice shelf, or areas of specified ice concentration



**DISCHARGES II**

- Sewage not comminuted or disinfected can be discharged at a distance of more than 12nm from any ice shelf or fast ice
- Comminuted and disinfected sewage can be discharged more than 3nm from any ice shelf or fast ice

## GARBAGE



**PLASTICS**  
All disposal of plastics prohibited (under MARPOL)



**FOOD WASTES I**  
Discharge of food wastes onto the ice is prohibited



**FOOD WASTES II**  
Food wastes which have been comminuted or ground (no greater than 25mm) can be discharged only when ship is not less than 12nm from the nearest land, nearest ice shelf, or nearest fast ice



**ANIMAL CARCASSES**  
Discharge of animal carcasses is prohibited



**CARGO RESIDUES**  
Cargo residues, cleaning agents or additives in hold washing water may only be discharged if: they are not harmful to the marine environment; both departure and destination ports are within Arctic waters; and there are no adequate reception facilities at those ports. The same requirements apply to Antarctic area under MARPOL

## BACKGROUND INFO

- ❄️ THE INTERNATIONAL CODE FOR SHIPS OPERATING IN POLAR WATERS WILL ENTER INTO FORCE ON 1 JANUARY 2017
- ❄️ IT APPLIES TO SHIPS OPERATING IN ARCTIC AND ANTARCTIC WATERS: ADDITIONAL TO EXISTING MARPOL REQUIREMENTS
- ❄️ IT PROVIDES FOR SAFE SHIP OPERATION AND PROTECTS THE ENVIRONMENT BY ADDRESSING THE UNIQUE RISKS PRESENT IN POLAR WATERS BUT NOT COVERED BY OTHER INSTRUMENTS

## DEFINITIONS



**SHIP CATEGORIES**  
Three categories of ship designed to operate in polar waters in:

- A) at least medium first-year ice
- B) at least thin first-year ice
- C) open waters/ice conditions less severe than A and B



**FAST ICE:** Sea ice which forms and remains fast along the coast, where it is attached to the shore, to an ice wall, to an ice front, between shoals or grounded icebergs



**ICE SHELF:** A floating ice sheet of considerable thickness showing 2 to 50m or more above sea-level, attached to the coast

## CHEMICALS

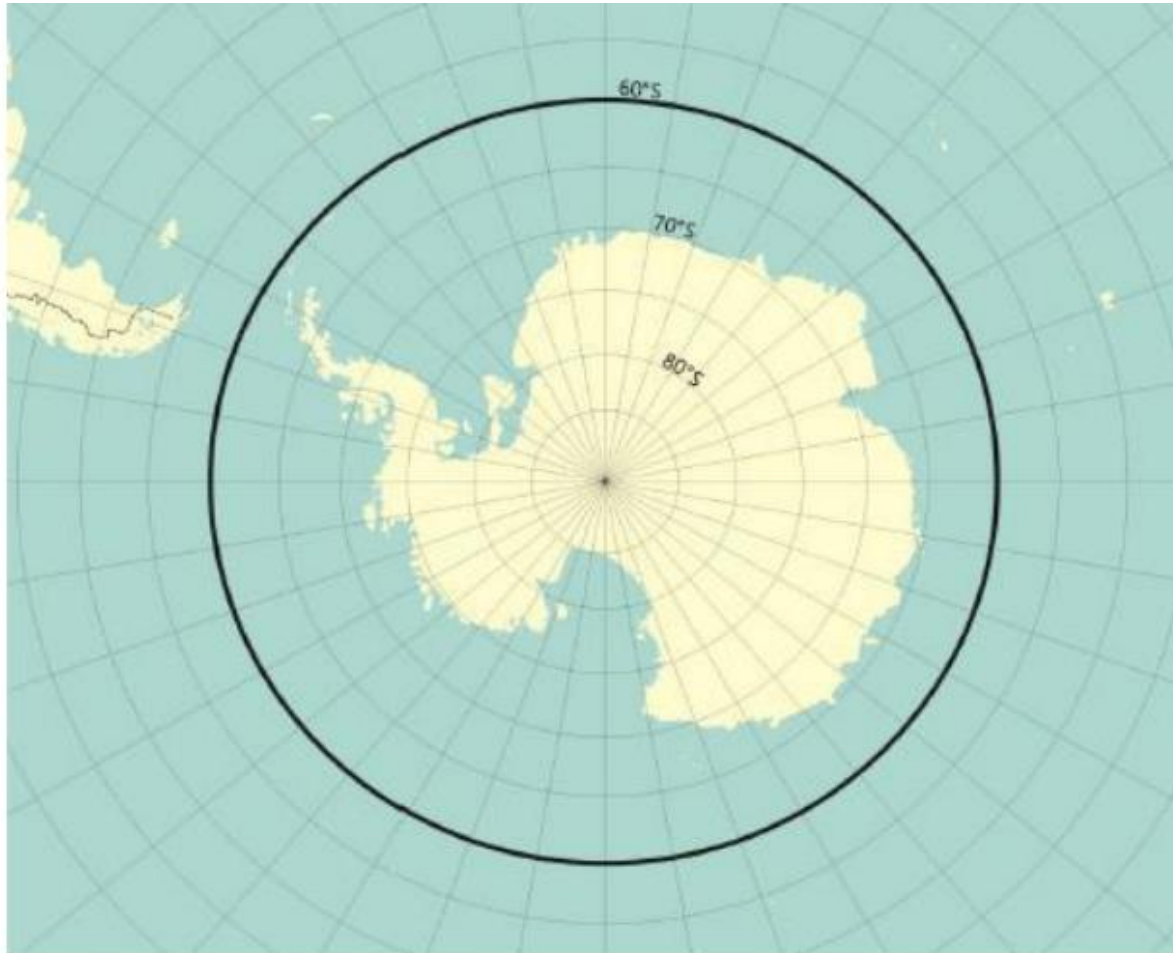


**DISCHARGES**  
Discharge of noxious liquid substances (NLS) or mixtures containing NLS is prohibited in polar waters



# Polar Code areas

Antarctica: South of 60°S



Arctic: Area inside the black line



Jan Mayen and Bjørnøya are two of the southernmost positions in the Barents Sea

# *Kronprins Haakon*

- *Kronprins Haakon* has class notation PC 3 Icebreaker.
- This allows all-year operations in 2-year ice with elements of multi-year ice.
- Icebreaker-notation means that the vessel is expected to meet ice barriers with much larger thickness than the specified nominal ice thickness for the vessel.
- *Kronprins Haakon* is constructed for operations under the following ice conditions:
  - Winter ice with icebarriers and multi-year ice and elements of glacier ice.
  - Nominal average ice thickness: 1,0m
  - Minimum speed under icebraking: 3,0 knots
  - Continuous speed under breaking of 1,0m ice with 0,2m snow coverage: 3,75 knots
  - Continuous speed under breaking of 0,4m ice: 10,0 knots
  - Design speed for ramming of icebarriers: 5,8 knop
  - Vessel draught under breaking of heavy ice must be between 7,50–8,10m to utilize the vessel's ice belt.The Icebreaker-notation allows the vessel repeated ramming with maximum ramming speed to break heavy ice.
- Polar Service Temperature (PST): -35°C. Mission critical systems and equipment on board must be fully operational at given PST.
- This means that it is the ice conditions and air temperature that set the limits for where and when *Kronprins Haakon* can operate in polar waters.



**NB! For cruises in Antarctica an Environmental Assessment Document must be developed and delivered to Norsk Polarinstitutt for approval at least one year before cruise start!**

(IMR example)

# Cruise leader requirements

- Cruise leader shall, if four or more cruise participants on board, in addition to «Cruise leader course» (the one you are attending right now 😊) og through training in Health, Safety and Environment (HSE)
- HSE course link(s) .....



# Cruise personnel requirements

- Health certificate
- Passport and visa
- Safety training
- Insurance
- Next of Kin
- Health information/medicines
- Dietary requirements



# Health certificate

Medical certificates accepted on Norwegian vessels

Persons working on board Norwegian ships shall have a medical certificate in accordance with the Health Regulations. This implies the following alternatives:

1. You may have a medical certificate issued by a seafarer's doctor approved by Norwegian authorities.
2. You may alternatively have a medical certificate issued in your home country or most recent country of residence provided that this country is an EEA country.
3. You may have a medical certificate issued by flag states approved by the Norwegian Maritime Authority.  
At present the UK, the Netherlands, Germany and the People's Republic of China are approved flag states.

This means that an ENG1 Medical Certificate issued by a UK/ MCA approved doctor, a Dutch Seafarer Medical Certificate (SMC) issued by an approved doctor with the Minister of Infrastructure and the Environment in the Netherlands, a German certificate issued by an authorized doctor with the Maritime Medical Service of the BG Verkehr, or a Medical Certificate for Seafarers of the People's Republic of China issued by a recognized China MSA Medical Practitioner is valid for persons working on board Norwegian ships.



<https://www.sdir.no/en/shipping/seafarers/health/seafarers-health/medical-certificatedeclaration-of-unfitness/>

(IMR example)

# Health certificate

- All cruise personnel must have a valid health certificate from an approved seafarer's doctor.
- The certificate must be valid for the whole cruise period and the original document shall be brought on board in order to be available if the vessel is undergoing port state control. Cruise leader to deliver all health certificates for the cruise party to the Captain before cruise commencement.

Exception: Norwegian regulations says that students and «passengers» on board for a short period of time and who are not performing any ship work related activities when on board, do not need a health certificate.

Nevertheless, if it is a cruise of some length (more than a couple of days) and far from nearest land (e.g more than 24 hours transit), it should be considered carefully if also students/passengers should have a health certificate, in particular if the cruise is in support of scientific advice to the Government or a monitoring cruise, due to the very negative consequences if a medical evacuation leads to aborting or shortening the cruise.

- Clarification from the Norwegian Maritime Authority:  
Students participating in a course, or collecting samples for their own student projects, do not need a health certificate if they are not employed by the university running the course.

However, be aware that the following student groups shall have a valid health certificate since they are regarded as ship workers according to the Ship Security Act § 17, and because they are employed by IMR or a University owning the vessel:

- PhD students employed by the University
- Observers collecting data to be used in Government management activities



For a list of approved seafarers doctors, see

<https://www.sdir.no/en/shipping/seafarers/approved-seafarers-doctors/>

(IMR example)



# Passport and visa in the Schengen area

- Passport

For vessels crossing the **national** territorial border (12 nm) on it's way to a **national** harbour, the Captain must provide personal data for all persons on board (crew and cruise party) to the Immigration Authorities. This is done electronically on board, and passport # (EU and EEA citizens) or visa # (3. country citizens) to be filled in to identify each individual on board.

- Visa

Cruise participants from some countries outside Schengen must have visa, see <https://www.schengenvisainfo.com/>.

They should apply for «multiple entry» visa, in particular if the cruise start and/or end outside Schengen.



(IMR example)

# Safety training

- All cruise personnel shall as a minimum have certified safety training within the last 5 years.

The Captain can give dispensation to guests, students etc and give the necessary training/instructions on board before cruise commencement.

Proof of course participation to be delivered to the Captain before cruise start.



HMS - helse, miljø og sikkerhet [Se alle Q](#)

**HMS for laboratorier**  
HMS-pakken består av flere e-læringskurs. Alle ansatte skal ha

**HMS SJØ: Arbeidsmiljø, Sikkerhet og Helse for**  
Ref 55 i Forskrift om arbeidsmiljø, sikkerhet og helse for de som har

**Redningsdraktkurs / Survival Suit Training**  
Skal du på tokt? I 1993 ble det vedtatt at alle tokt deltakere skal

**Ved farlig arbeid**  
Her er e-læringskurs som omhandler HMS og sikker



(IMR example)

# Insurance

- Government employees are covered by Government insurances such as work injury, disability, death, loss of personal effects etc
- Cruise personnel from private companies, foreign countries or students not employed by a **government owned** university must bring their own insurance coverage for all potential incidents during cruises on our vessels
  - Not necessarily straightforward, start early to examine coverage of participants
  - Many companies may have coverage, individuals rarely



(IMR example)

# Next Of Kin

- All cruise personnel must give information about their Next Of Kin (NOK) to the Captain before the vessel leaves port.
- Cruise personnel not employed by **RV Operator or .....** must in addition give contact information to their employer.



(IMR example)

# Health information/medicines

- If a cruise participant has a medical condition that under certain circumstances can result in a kind of reaction (allergies, breathing problems, dizziness, unconsciousness etc) and need medication or other kind of assistance, the Captain should be informed before the cruise begins.
- It also applies if you are allergic to some kind of medication you may be given as part of first aid.
- •Pregnancy is also recommended to inform the **RV Operator** or the Captain to discuss if it is regarded as safe to join the cruise or not.
- If you bring life supporting medication it can be good to know where you have it in your cabin if you for some reason are unable to reach it yourself.
- One method is to put all necessary information in a sealed envelope and give it to the Captain who will open it if you for some reason are unable to take care of yourself, and hand it back to you at the end of the cruise.



# Dietary requirements

- Dietary requirements are the needs of someone who has specific and/or a restricted diet. Some of the most common dietary requirements are those founded on religious or allergy-related grounds. Allergy. Allergies are very common. A food allergy is when the body's immune system reacts badly to a specific food.
- Some of the most common dietary restrictions include vegan and vegetarianism, peanut allergies, lactose intolerance, and gluten intolerance.
- If any of the science party have such requirements/needs, it should be communicated to the vessel crew (Steward and Master) in beforehand so that they can make the necessary arrangements and preparations for the cruise in question.



# Logistics (transportation, intermediate storage)

- Contact **RV Operator** logistics unit as early as possible about transportation and storage needs!
- Marking of equipment and goods!
- Self-insurance principle applies also to transportation of equipment on own vessels.
- Important to store equipment temporarily ashore instead of on board if possible!
- **RV Operator** transport/logistics agreement shall be used for transportation with commercial companies.
- For cruise start in Longyearbyen, see «Logistics manual for cruises with KH from Longyearbyen»

and

for «Dr. Fridtjof Nansen» see «Logistics manual for DFN»



(IMR example)

Marking of goods to be loaded on board

(IMR example)





Example of content  
information  
template



UTSTYR TIL

**F/F G.O.Sars**



**Toktperiode: 16.08.08 – 30.09.08 (2008106)**

Bruker: Havforskningsinstituttet

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**Toktleder:**

Sondre Aanes – 97 77 64 68

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Utstyret skal brukes på:

- Fabrikkdekk
- Tråldekk
- Instrumentrom
- CTD/Vannhenterlab
- Tørrlab

Pakket av: \_\_ Ingrid Sværen / Anne Lene Brungot

mob.tlf. \_\_ 45201380 \_\_\_\_\_

**Kommentar:** \_\_

Justin Gwynn er også kontaktperson, Strålevernet i Tromsø, 77 75 01 65

(IMR example)

Example of warehouse  
packing of goods on  
pallets for handling  
with fork lift



(IMR example)

Example of warehouse packing of goods on pallets for handling with fork lift



(IMR example)



# Chemicals

- Check if it is on board already, before bringing more!
- Check if data sheets for all chemicals are already on board.
- Ensure proper marking of chemicals before transportation and loading on board.
- Ensure that proper protective equipment is in place on board, and that necessary training/information regarding handling, storage etc is given.
- A chemicals responsible person shall be appointed before cruise commencement. He/she should also be responsible for the preparation of chemicals for the cruise.



# Cruise plan

- Cruise plan shall be developed by the cruise leader using the web-based cruise planning system and be approved at least two weeks before cruise start



# Instrument personnel main tasks and responsibilities

- Calibration, operation and maintenance of scientific instruments and equipment on board.
- Operation and maintenance of IT networks and communication equipment.
- Assist in maintenance of navigation equipment.
- Ensure that current measurement methods are in use and quality assurance of acoustic data.



# Instrument chief role

- Calibration, operation and maintenance of scientific instruments and equipment on board.
- Together with cruise leader decide, and if necessary, execute calibration of acoustic instruments.
- Ensure that collection and processing of scientific data is done iaw approved QA-procedures.
- Assist the cruise leader in analysis and interpretation of data on board.
- Ensure that collected data are stored properly on board and transferred ashore to **Norwegian Marine Data Center (NMDC)**.
- Writing instrument technical report during the cruise.



# Data collection, storage and transfer

- Reference data (time-, position-and weather data) is collected continuously during the cruise and distributed on the vessel network for merging with the scientific observation data.
- Scientific data are collected iaw established procedures for collection of data for different categories of equipment, ref QA-manuals for the Vessel instruments section.
- At the end of the cruise all cruise data is copied and transferred to **Norwegian Marine Data Center (NMDC)**.
- **NMDC** performs quality control and manages the data for future use.





# Software

- **RV operator** standard software including postprocessing software for the following systems ..... is available on board.
- Other licensed software for analysis and processing of scientific data can be brought on board for installation and de-installation after the cruise.
- If particular software is planned to be used, it may be useful to contact the Instrument chief before the cruise to explore what possibilities are available.



# Data responsible

- Since the amount of data collected during a cruise has grown exponentially due to new equipment such as the change from EK 60 to EK 80 fisheries echo sounders, introduction of ME70 and MS 70 multibeam sonar and echo sounder, multi beam echo sounders for bottom contour mapping etc for each cruise, it should be considered to appoint a data responsible person among the cruise participants when the planned collection of data is very large to ensure proper storage, management and post cruise distribution of data.



# Part 2 - Execution

- Information
- VSAT
- AMU - Work environment committee
- Leadership
- Work and rest regulations
- Alcohol and other substances
- Metoo
- End of cruise tasks



# Information

- Safety briefing.
- Cruise leader information to all about the cruise.
- Cruise leader's instructions to cruise personnel (choice of HSE-responsible, chemical responsible, division in to work shifts, routines for the cruise duties etc).
- Daily meeting/talk with the captain about today's and/or tomorrow's planned tasks, changes due to weather forecasts, technical problems etc.



# VSAT – Rules for use of internet on board

- This must be done on shore or at home, before and after a cruise:
  - Computers supported by IMR must be disconnected from IMR-network (via VPN or in the office) to avoid automatic synchronization with Outlook, updates to Windows, anti-virus programs and all other programs installed on the computer that require regular updates.
  - Computers not supported by IMR must be connected to Internet on shore to update Windows, anti-virus programs and all other programs installed on the computer that require regular updates and synchronize its email program.
  - Disconnect all network stations connected to servers on shore (shown under «This PC»).
  - At the end of the cruise; disconnect network stations connected to servers on board.
- We encourage everyone to use <https://webmail.hi.no> to check email.
- Do not use such as Skype, FaceTime, Spotify, Netflix, tv/radio etc, Dropbox etc.
- Do not update programs when connected to the vessel's network, e.g. Adobe, Firefox, Java, etc.
- It is forbidden to set up private connection points (WiFi) on board.
- Remember to close Internet Explorer, Firefox, Chrome etc when you are not using it.



(IMR example)

# Two-level authentication outside mobile coverage

Before the vessel is going outside cell phone coverage, download the app «Google Authenticator» on your device and use the 6-digit code next to your password for verification. It works regardless of mobile coverage or not.



# Information regarding software

- Software that needs to be installed onboard must be whitelisted by RV Operator if the software is not signed by the software developer.
- If there is a new version of already whitelisted software, this must be whitelisted again.
- Software developers are encouraged to have their products electronically signed/certified.
- Contact RV Operator and/or assigned Instrument technicians in due time before cruise start if any questions about this.



# Work and environment committee

- An HSE responsible holding a HSE Sea course certificate shall be appointed among the cruise personnel for each cruise.
- HSE rep for the cruise party cooperates with the HSE rep for the crew.
- HSE rep for the cruise party and the cruise leader shall be invited to Work and environment committee meetings held on board during the cruise.





# Leadership

- Visible leadership and management!
- Follow up of cruise personnel at their workplaces on board.
- Cruise personnel needs and expects the cruise leader to "see them" and be concerned about their working conditions, results, productivity and efficiency.
- Cruise leader shall cooperate with the Captain about the work environment, flow of information, handling conflicts, motivating people etc!



# Code of conduct

- Sexual harassment is a problem in society in general and can be a very difficult issue if it happens on a cruise where there is «no place to hide» and to avoid meeting the other person(s) involved for days and weeks afterwards.
- It is therefore very important to avoid such situations in the first place and it is the employer representatives (Captain and Cruise leader) who are formally responsible for the necessary information and motivation of their employees about expected conduct, and to take necessary action during the cruise if such situations occurs, in addition to take the necessary formal steps after the cruise with regards to potential sanctions against the offender(s).



# Reporting

- A person experiencing sexual harassment in any shape or form is encouraged to report it to their department head if crew, and to the cruise leader if cruise participant, or to their HSE rep or Union rep on board, or to their line manager after the cruise.
- It can also be reported to the RV Operator Designated Person Ashore (DPA):  
Name ....., Mobile: ..... Email: .....  
who has direct access to the top management of the RV operator institution with regards to HSE-related issues on board the (RV operator) manned and operated vessels.
- The main challenge is to get reports about unacceptable behavior.  
It is not difficult to understand why some are hesitant to report a colleague or shipmate, but that can lead to underestimating the problem, and that necessary action and precautions are not implemented.
- Cruise leaders, together with the Captain, are encouraged to put this topic on the agenda at the beginning of each cruise and in HSE-meetings on board since it is better to acknowledge a potential problem and discuss it up front then hope it will not happen and have a much bigger problem to deal with afterwards!



(IMR example)

# Alcohol and drugs

- See RV Operator guidelines for storage and use of alcoholic beverages.
- In general, it is forbidden to bring on board, and consume alcohol on board.
- The Captain can apply to the RV Operator for permission to serve alcohol in given quantities at official functions in port.
- Breaches to be reported to responsible line manager ashore!
- Use of illegal drugs is of course not allowed.
- Possession and use of cannabis for medical purposes must be cleared with the RV Operator and the Captain in beforehand!



# Work and rest regulations

- Working periods regulated by the ILO 180 convention.
- Rest period regulations given by Norwegian Maritime Administration.
- These regulations applies to everyone on board, including the cruise leader!
- At least 10 hours rest during any given 24 hours period is mandatory.
- Rest can be divided in two periods, of which one must be at least 6 hours, and the interval between rest periods shall not exceed 14 hours.
- Rest period form to be filled in by everyone and be delivered to the Captain before disembarking.



# Sharing of cabins

- When cruise participants must share a cabin, an extra allowance will be paid from day **xx** of the cruise if the length of the cruise is more than **yy** days.
- Proposed procedure:
  - Those sharing cabins should be on opposite watches and the person on duty should not access his/her shared cabin during watch hours.
  - Those who share cabins should follow the same watch cycle and not different ones, eg. that one is only working daytime and the other working the 00-06 and 12-18 watch cycle.
  - Cleaning of shared cabins should be done around change of watch to avoid waking up the one off-duty.
  - Sharing of cabins should be by persons of the same sex.
- Single cabins
  - Cruise leader, maritime crew and instrument technicians are always entitled to single cabins.
  - In some cases, other cruise participants can be entitled to single cabins based on their function on the cruise.



(IMR example)

# End of cruise duties

- Make sure that all scientific work is stored, packed, labelled and offloaded and shipped.
- Check cleaning of labs, packing of equipment etc.
- Check chemical log, bring ashore "left overs".
- Make sure that all goods to be shipped is prepared, properly packed and labelled.
- All cruise personnel, equipment, samples and chemicals to be ashore before 23.59 on the last day of the cruise, since the vessel shall be ready for the next cruise party arrival at 0800 the following day.
- If agreed with the Captain and/or the Steward to stay on board over night, make sure to be out of the cabin(s) before 0800.



## Part 3 - Post cruise tasks **Examples**

- Transfer of data to ..... Marine Data Centre.
- Transfer of samples to .....
- Reporting cruise allowance (if applicable).
- Report to line managers ashore about the cruise personnel work efforts and results during the cruise.
- Fill in Post Cruise Assessment (PCA).
- Deliver Instrument technical report.
- Deliver Cruise Summary Report (CSR).
- Deliver scientific cruise report
- .....





Thank you for your attention!

