Maritime communication challenges, and the ArcticSat IAP project

- Background from Norway and the maritime sector
- Arctic
- Some initial ideas for services

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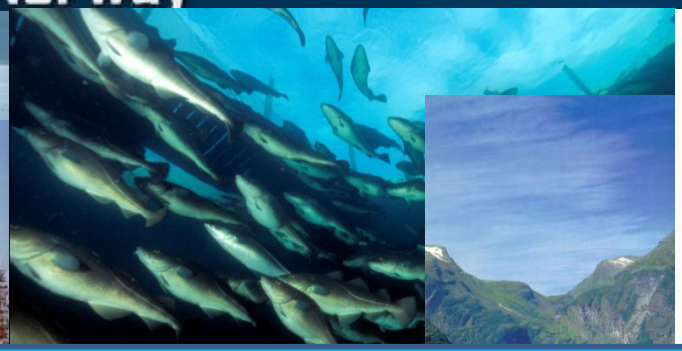
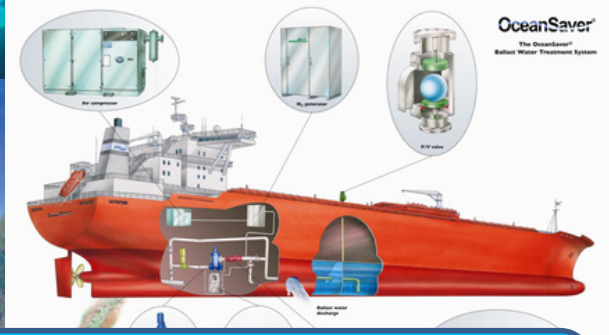
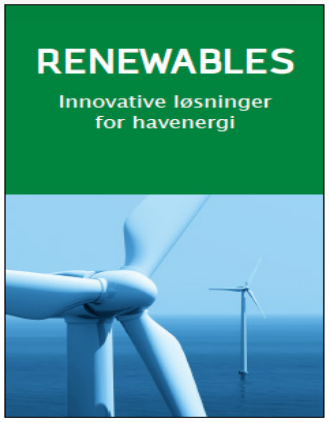
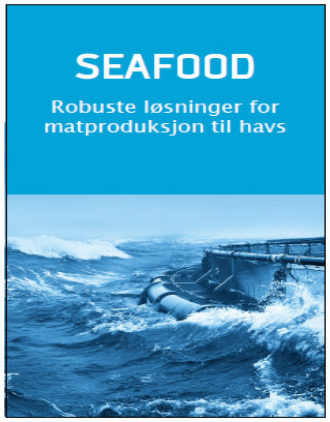


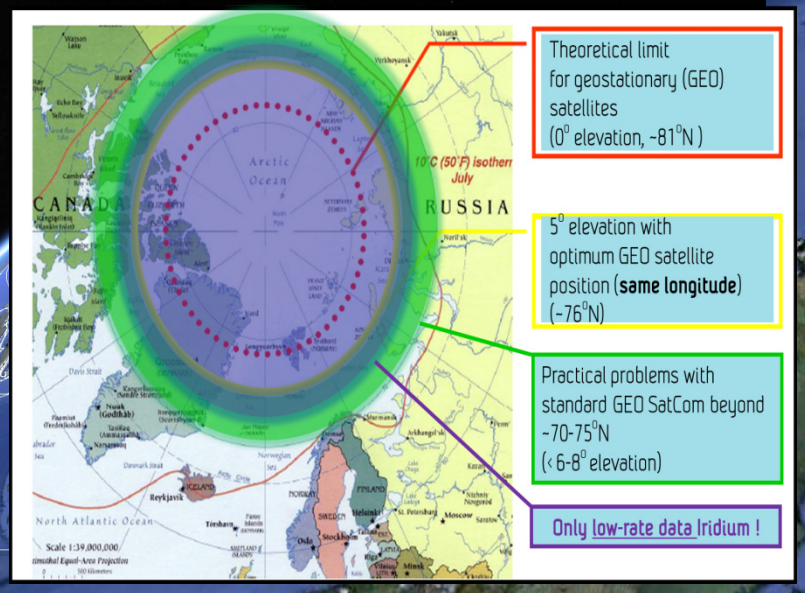


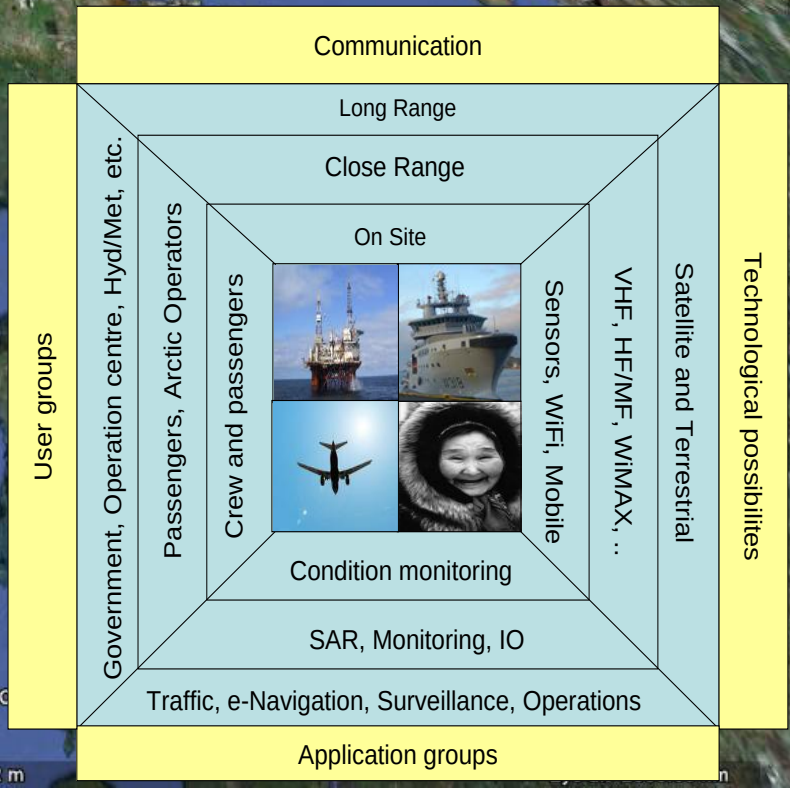
Communication, Observations, Situational Awareness, Human elements, Transport, Technology, Processes, Safety, Security, ...





Arctic Challenges





Towing of fishing vessel KAMARO – late October 2012

- Engine problems – close to Bear Island
- Initially assisted by another fishing vessel
  - Towing towards Norwegian mainland was started
- Norwegian Coast Guard asked to take over the tow

Preparation on board NCG vessel HARSTAD

- The crew on NCG HARSTAD started planning the towing operation during the transit from Norwegian mainland to Bear Island
- They used experience from a similar situation as the baseline for their planning
- There had been a major change of crew since then

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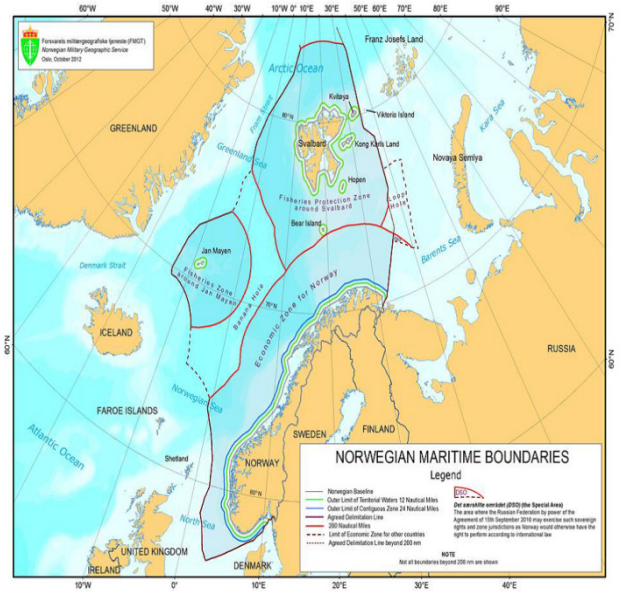
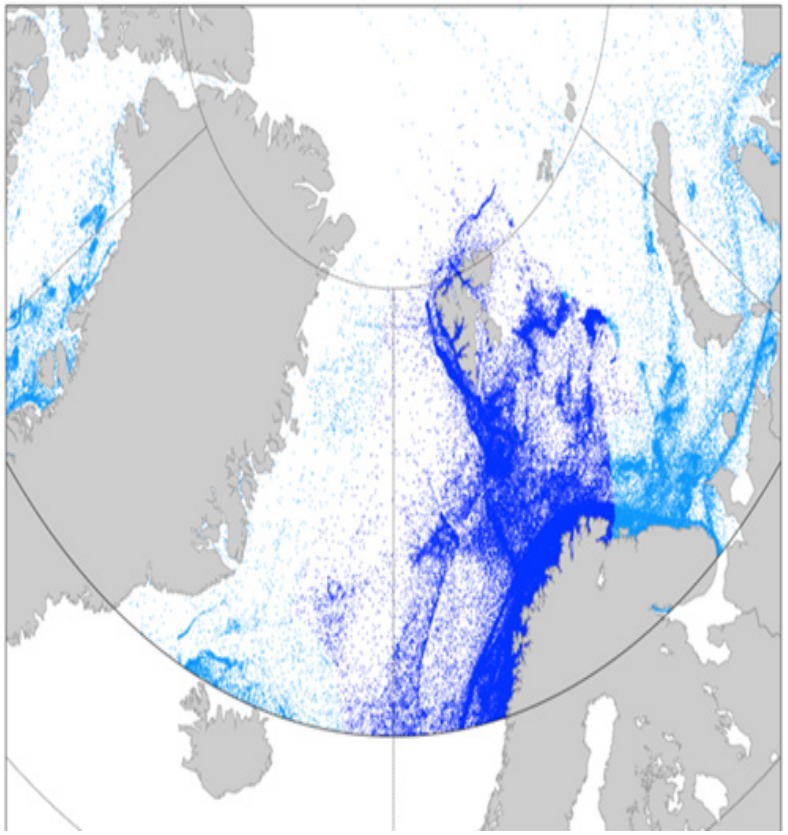
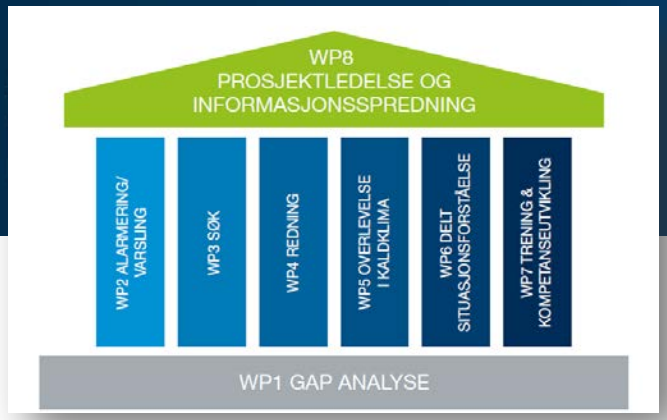
- A large part of Arctic maritime activities takes place in waters under Norwegian jurisdiction





Increased activity – more incidents?

SARiNOR



On behalf of the Maritime Forum North and the SARiNOR project MARINTEK, SINTEF Fisheries and Aquaculture and SINTEF ICT completed work package 2 (WP2): Alerting and Notification. The focus of the work package was on how accidents reports today, analyses of requirements, technology and gaps within alerting and notification for "Search and Rescue" (SAR) services in the Norwegian sector.

The methodology behind this work consists of three main steps:

1. Collection of data on alerting and notification, including empirical knowledge from users, information technology and statistics about incidents
2. Any data collected is analysed to identify gaps and challenges with current systems and technology, and it is simultaneously made an assessment of risks related to notification and alerting
3. The results of the analysis are used to recommend measures, identify requirements for future systems, and to prioritize research and development tasks

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- Basic map
- Radio stations and coverage
  - VHF/MF/HF public
  - DSC watch VHF/MF/HF
  - Coverage DSC VHF/MF
- Navigational aids
  - LORAN-C transmitters
  - CHAYKA transmitters
  - NAVTEX transmitters
- Vessel density
  - Month, type, zone
- Vessel accidents
  - Type, zone
- Combination
- Reports

Stasjon	Assistansetype	Jan	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Des	Totalt	1.Tert.	2.Tert.	3.Tert.	1.Halvår	2.Halvår
Alle KRS	Brann	1	2	5	6	10	11	17	10	4	3	4	1	74	14	48	12	35	39
	Div. assistanse	14	7	13	23	48	39	64	60	24	41	22	16	371	57	211	103	144	227
	Etterlysning	2		6	4	12	9	11	7	5	7	2	1	66	12	39	15	33	33
	Forlis				3	4	1	1	1	1	1			12	3	7	2	8	4
	Grunnstøting	3	2	11	10	30	49	83	38	25	26	13	13	303	26	200	77	105	198
	Kollisjon	1				1	2	1	1			1		7	1	5	1	4	3
	Lekkasje	1	3	7	5	11	14	25	11	7	7	9	5	105	16	61	28	41	64
	Mann over bord	4	1	2	1	5	5	11	8	5	1	1	1	45	8	29	8	18	27
	Medico	147	218	213	212	173	239	261	287	244	212	256	241	2703	790	960	953	1202	1501
	Motor/gir	29	22	39	42	167	240	412	227	127	76	43	30	1454	132	1046	276	539	915
	Not/bruk/ror	15	12	22	13	28	31	37	27	20	32	23	9	269	62	123	84	121	148
	Sykdom/skade	2	4	4	3	3	8	4	9	4	7	2	5	55	13	24	18	24	31
Alle KRS	Total	219	271	322	322	492	648	927	686	466	413	376	322	5464	1134	2753	1577	2274	3190

Stasjon	Varslingsvei	Jan	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Des	Totalt	1.Tert.	2.Tert.	3.Tert.	1.Halv	2.Halv
Alle KRS	Annen varsling	142	215	212	208	170	226	247	287	240	205	249	241	2642	777	930	935	1173	1469
	HF/Sat	1										1		2	1		1	1	1
	HRS	15	7	16	20	54	44	36	51	22	35	23	14	337	58	185	94	156	181
	LRS					3					1			4		3	1	3	1
	MF						1	2		5	1	1	3	13		3	10	1	12
	MF m/DSC						1			1	1			3		1	2	1	2
	Telefon	20	8	37	44	207	290	539	272	141	113	59	33	1763	109	1308	346	606	1157
	VHF	38	35	58	48	57	88	103	75	34	55	43	31	665	179	323	163	324	341
	VHF m/DSC		2		1	2		4	1	20	1	1	1	33	3	7	23	5	28
Alle KRS	Total	216	267	323	321	493	650	931	686	463	412	377	323	5462	1127	2760	1575	2270	3192

Alle stasjoner	Type fartøy	Jan	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Des	Totalt	1.Tert.	2.Tert.	3.Tert.	1. Halvår	2. Halvår
	Fiskefartøy	31	27	46	37	30	26	18	27	29	42	33	19	365	141	101	123	197	168
	Fritidsfartøy	16	17	42	56	265	365	638	332	183	141	57	33	2145	131	1600	414	761	1384
	Yrkesfartøy	160	222	225	226	184	243	256	305	250	219	276	263	2829	833	988	1008	1260	1569
	Annet	12	5	9	3	13	14	15	22	4	11	10	7	125	29	64	32	56	69
Alle KRS	Total	219	271	322	322	492	648	927	686	466	413	376	322	5464	1134	2753	1577	2274	3190

Recommendations: Alerting and Notification

Technological recommendations

- Easier functionality on emergency equipment, less information, standardization is important
- Too many different system (integration of systems, use of daily systems such as the chart plotter also for alarm and notification)
- Receipt back to the sender of received alarm
- Position data as standard integrated in emergency equipment (suits, lifeboats, rafts, etc.)
- Higher focus on mobile equipment, also recommended regulated in to GMDSS
- New and better procedures for technical maintenances on equipment such as the emergency beacons
- Better procedures for maintenance of safety equipment, in order to avoid false alarms (in some contexts this counts for more than 90% of the alarms)

Organization and human recommendations

- Use of 120-number, a service number, should be investigated. Frequently used within the leisure fleet in Norway
- Better knowledge on communication limitations, should be part of the SAR-training courses.
- Better understanding of cultural differences as well as organizational barriers
- Establish procedures for vessels sailing in the northern waters, that not have the expertise on board
- Establish back-up resources regarding interpretation services

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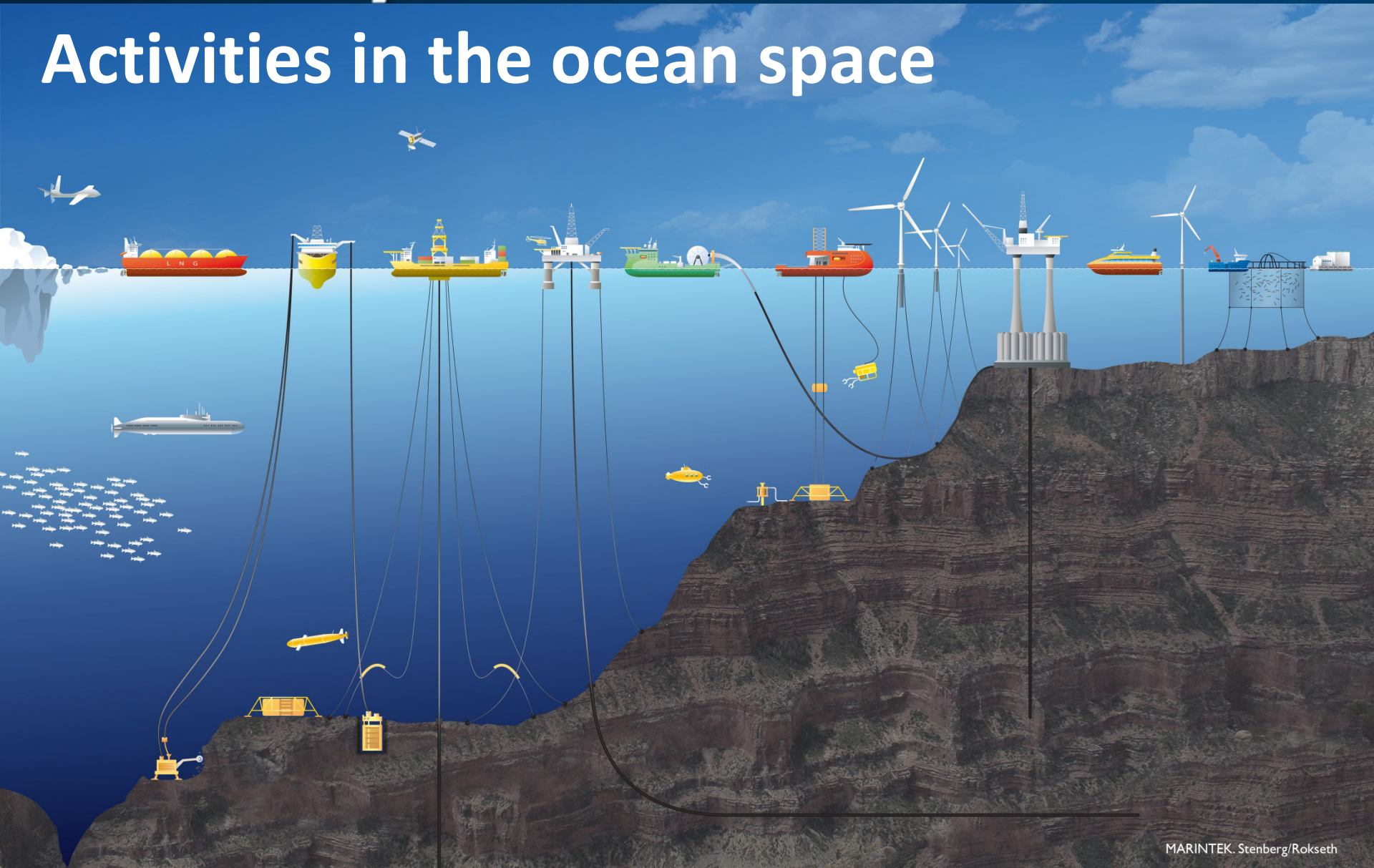
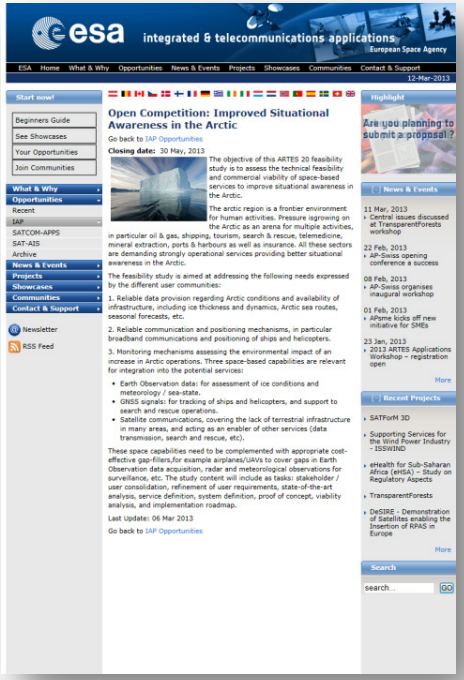
Activities in the ocean space



MARINTEK. Stenberg/Rokseth

- The ArcticSat feasibillity structure

The Tender (topic and timing)



The feasibility study is aimed at addressing the following needs expressed by the different user communities:

1. **Reliable data provision** regarding Arctic conditions and availability of infrastructure, including ice thickness and dynamics, Arctic sea routes, seasonal forecasts, etc.
2. **Reliable communication and positioning mechanisms**, in particular broadband communications and positioning of ships and helicopters.
3. **Monitoring mechanisms assessing the environmental impact of an increase in Arctic operations.** Three space-based capabilities are relevant for integration into the potential services:
   - **Earth Observation data**: for assessment of ice conditions and meteorology / sea-state.
   - **GNSS signals**: for tracking of ships and helicopters, and support to search and rescue operations.
   - **Satellite communications**, covering the lack of terrestrial infrastructure in many areas, and acting as an enabler of other services (data transmission, search and rescue, etc.).

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ARCTICSAT

Optimising situational awareness in the Arctic through integrated space technologies

Volume 2 – Financial, Management and Administrative Proposal to ESA

In response to
Invitation to Tender
AO/1-7446/13/NL/AD

Submitted by MARINTEK

KONGSBERG | GEOCENTO | British Antarctic Survey | MARINTEK | ASTRIUM | KYSTVERKET

ARCTICSAT

Optimising situational awareness in the Arctic through integrated space technologies

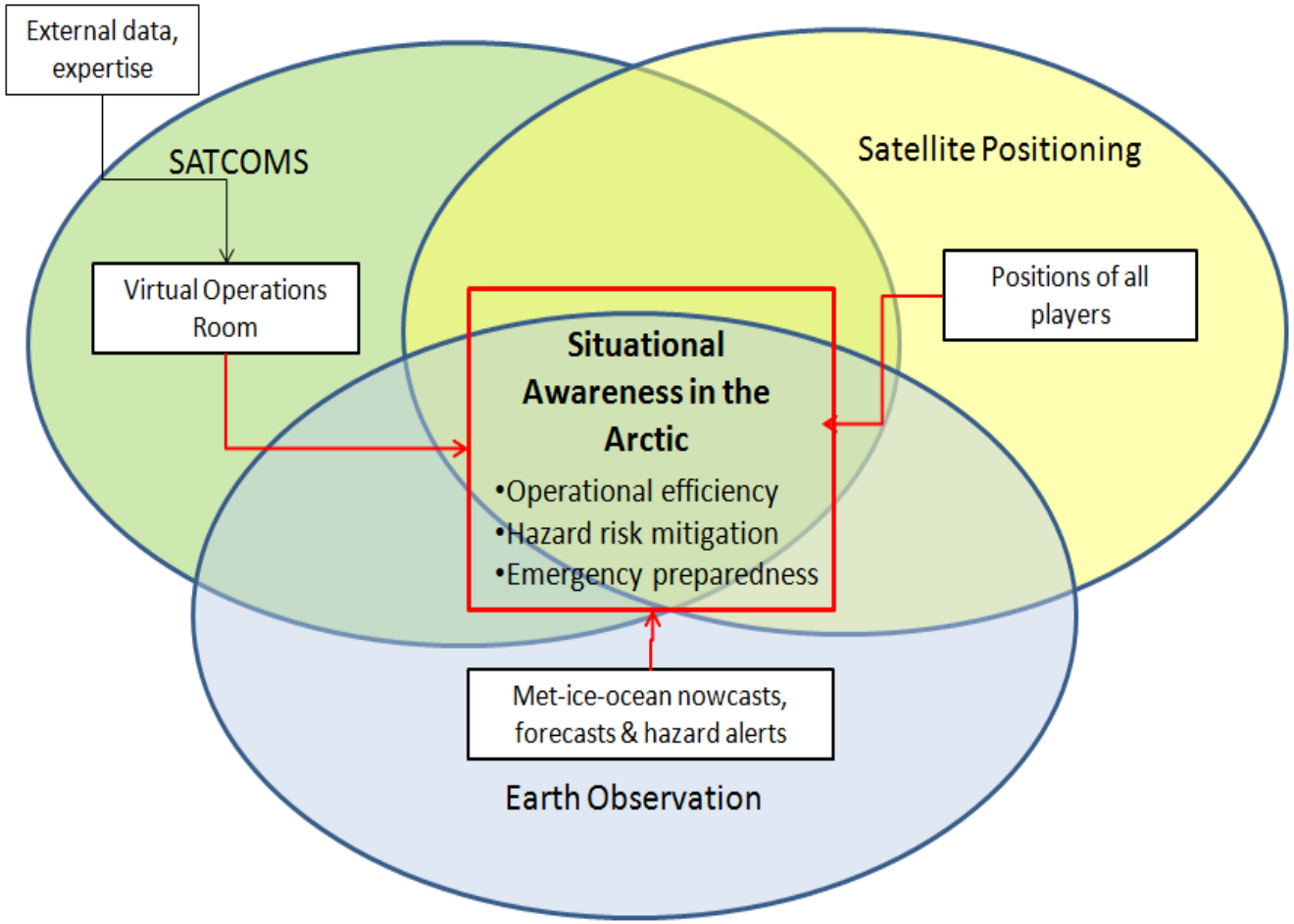
Volume 1 – Technical Proposal to ESA

In response to
Invitation to Tender
AO/1-7446/13/NL/AD

Submitted by MARINTEK

KONGSBERG | GEOCENTO | British Antarctic Survey | MARINTEK | ASTRIUM | KYSTVERKET

Situational Awareness: Key elements



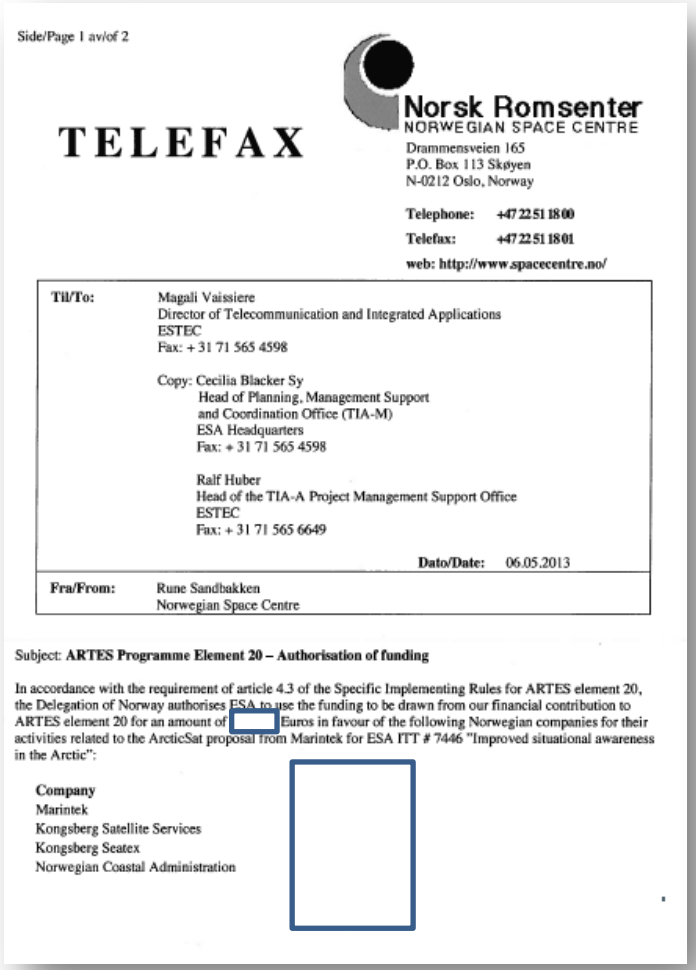
Situational Awareness in the Arctic

Our own initial assessment suggests that situational awareness depends on three critical applications of space technologies, namely:

1. Effective **communications** to enable a complete virtual view of operations based on standards, compliant protocols and availability of all required data sources and information, allowing efficient and effective decision making, effectively mitigating the remoteness of the activities.
2. The ability to **access existing and locally forecasted met-ice-ocean conditions** (including **hazards**) over the field of operations, and upstream where potential hazards exist for dynamic risk assessment;
3. To monitor and be able to act upon the **positions of all players**, so that these can be deployed and monitored effectively for situational awareness, particularly in relation to efficiency and safety, emergency preparedness and compliance with relevant agreements and legislation.

Letter of Support

- Norsk Romsenter



Side/Page 1 av/of 2

TELEFAX

Norsk Romsenter
NORWEGIAN SPACE CENTRE
Drammensveien 165
P.O. Box 113 Skøyen
N-0212 Oslo, Norway

Telephone: +47 22 51 18 00
Telefax: +47 22 51 18 01
web: http://www.spacecentre.no/

Til/To: Magali Vaissiere
Director of Telecommunication and Integrated Applications
ESTEC
Fax: + 31 71 565 4598

Copy: Cecilia Blacker Sy
Head of Planning, Management Support
and Coordination Office (TIA-M)
ESA Headquarters
Fax: + 31 71 565 4598

Ralf Huber
Head of the TIA-A Project Management Support Office
ESTEC
Fax: + 31 71 565 6649

Dato/Date: 06.05.2013

Fra/From: Rune Sandbakken
Norwegian Space Centre

Subject: **ARTES Programme Element 20 – Authorisation of funding**

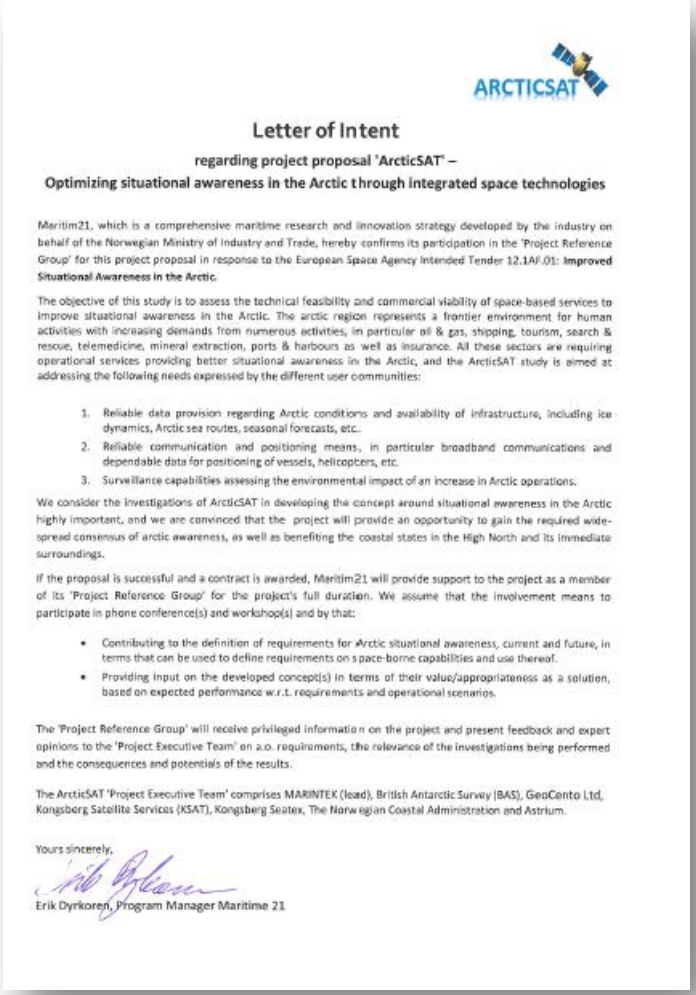
In accordance with the requirement of article 4.3 of the Specific Implementing Rules for ARTES element 20, the Delegation of Norway authorises ESA to use the funding to be drawn from our financial contribution to ARTES element 20 for an amount of [redacted] Euros in favour of the following Norwegian companies for their activities related to the ArcticSat proposal from Marintek for ESA ITT # 7446 "Improved situational awareness in the Arctic":

Company
Marintek
Kongsberg Satellite Services
Kongsberg Seatex
Norwegian Coastal Administration

[redacted]

Lettor of Intent

- Maritime 21



ARCTICSAT

Letter of Intent

regarding project proposal 'ArcticSAT' –
Optimizing situational awareness in the Arctic through integrated space technologies

Maritim21, which is a comprehensive maritime research and innovation strategy developed by the industry on behalf of the Norwegian Ministry of Industry and Trade, hereby confirms its participation in the 'Project Reference Group' for this project proposal in response to the European Space Agency Intended Tender 12.1AF.01: **Improved Situational Awareness in the Arctic**.

The objective of this study is to assess the technical feasibility and commercial viability of space-based services to improve situational awareness in the Arctic. The arctic region represents a frontier environment for human activities with increasing demands from numerous activities, in particular oil & gas, shipping, tourism, search & rescue, telemedicine, mineral extraction, ports & harbours as well as insurance. All these sectors are requiring operational services providing better situational awareness in the Arctic, and the ArcticSAT study is aimed at addressing the following needs expressed by the different user communities:

1. Reliable data provision regarding Arctic conditions and availability of infrastructure, including ice dynamics, Arctic sea routes, seasonal forecasts, etc.
2. Reliable communication and positioning means, in particular broadband communications and dependable data for positioning of vessels, helicopters, etc.
3. Surveillance capabilities assessing the environmental impact of an increase in Arctic operations.

We consider the investigations of ArcticSAT in developing the concept around situational awareness in the Arctic highly important, and we are convinced that the project will provide an opportunity to gain the required wide-spread consensus of arctic awareness, as well as benefiting the coastal states in the High North and its immediate surroundings.

If the proposal is successful and a contract is awarded, Maritim21 will provide support to the project as a member of its 'Project Reference Group' for the project's full duration. We assume that the involvement means to participate in phone conference(s) and workshop(s) and by that:

- Contributing to the definition of requirements for Arctic situational awareness, current and future, in terms that can be used to define requirements on space-borne capabilities and use thereof.
- Providing input on the developed concept(s) in terms of their value/appropriateness as a solution, based on expected performance w.r.t. requirements and operational scenarios.

The 'Project Reference Group' will receive privileged information on the project and present feedback and expert opinions to the 'Project Executive Team' on a.o. requirements, the relevance of the investigations being performed and the consequences and potentials of the results.

The ArcticSAT 'Project Executive Team' comprises MARINTEK (lead), British Antarctic Survey (BAS), GeoCento Ltd, Kongsberg Satellite Services (KSAT), Kongsberg Seatex, The Norwegian Coastal Administration and Astrium.

Yours sincerely,

Erik Dyrkoren, Program Manager Maritime 21

Cover letter

MARINTEK

Norsk Marinteknisk Forskningsinstitutt AS
Norwegian Marine Technology Research Institute
POB 4125 Valentinlyst
NO-7450 Trondheim
NORWAY
Location:
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Direct line: +47 92067068
Telefax: +47 73595776
marintek@marintek.sintef.no
www.marintek.sintef.no
Enterprise /VAT No: NO 937 357 370 MVA

SINTEF

The Central Registry Office
AO/1-7446/13/NL/AD ARTES 20
"Improved situational awareness in the Arctic"
THE EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTRE
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands

Your ref.	Our ref.	Project No. / File code	Date
AO/1-7448/13/NL/AD	Kay Fjørtoft	Project / File code	2013-05-13

For the attention of Ms. Andrea Dean

Dear Madam,

Subject: ITT AO/1-7446/13/NL/AD
Improved Situational Awareness in the Arctic

MARINTEK is pleased to submit its Firm Fixed Price (FFP) proposal entitled "ArcticSAT" in response to the above referenced Invitation to Tender.

In accordance with the ITT, this proposal is submitted in 8 (eight) paper copies and 8 (eight) pdf searchable, non-copyrighted or password protected USB sticks.

The proposal comprises the following:

1. This cover letter dated 13 mai 2013 plus its Annex and attachment containing statements signed by the Delegates representing Norway and UK, authorizing the Agency to fund the quoted price from their contribution to the ARTES 20 Programme
2. Volume 1 - Technical Proposal
3. Volume 2 - Financial, Management and Administrative Proposal

1. Price, Price Type and Bidding Team Information

For this activity, led by MARINTEK, the team offers the combined expertise of MARINTEK, Kongsberg Satellite Services AS, Kongsberg Seatex AS, The Norwegian Coastal Administration, GeoCento Ltd, British Antarctic Survey and Astrium Ltd.

In compliance with the ITT requirements, MARINTEK offers a total Firm Fixed Price of three hundred thousand euro (300 000 €).

The Firm Fixed Price breakdown information and bidding team details are as shown in the following table:

Economic Operator Name and legal nature	Address & contact details	SME	Large space integrator	EMITS Bidder Code	ESA-P2 Bidder Code	ESA-P Vendor Code	Country	Price (EURO)
MARINTEK Public Research Institute	See Section 5.2 of this letter	NO	NO	36005	7000060114	1000004218	Norway	[redacted]

2. Validity

In accordance with the ITT the Tender remains valid until the 15th of September 2013, corresponding to 4 (four) months after the closing date of the ITT.

3. Compliance

MARINTEK confirms that the technical and management requirements of the ITT, including the requirements of the Statement of Work (SoW), will be met, and furthermore confirms that the contract conditions are read, understood and accepted, and that sales conditions of MARINTEK do not apply. A list of Background Intellectual Property Rights, as currently known, is provided in Appendix I of the Financial, Management and Administrative Proposal.

MARINTEK confirms compliance with the "Key Acceptance Factors" listed in the ITT cover letter and that the information requested is provided either in this cover letter or in its signed Annex.

4. Geographical Distribution

Country	Name of tenderer/ subcontractor	Amount		% of total amount of tender
		NC	EURO	
Norway	MARINTEK, Kongsberg Satellite Services, Kongsberg Seatex, Norwegian Coastal Administration	[redacted]		
United Kingdom	GeoCento Ltd, Astrium Satellites Ltd, British Antarctic Survey			

APNorway Ambassador Platform for Norway

ARCTICSAT

Optimising situational awareness in the Arctic through integrated space technologies

Volume 1 – Technical Proposal to ESA

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KONGSBERG | GEOCENTO | British Antarctic Survey | MARINTEK | ASTRIUM | KYSTVERKET

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6 Table of Compliance with the SoW: Technical Items

GEN = General requirements
USR = User involvement requirements
PRD = Proposal documentation requirement

FC = Fully Compliant
PC = Partially Compliant
NC = Non-Compliant

Requirement ID	Requirement Description	Comments	Statement of Compliance
C-1	The Tenderer shall provide an introduction showing his understanding of the background and motivation of the objective of the feasibility study as well as of the scope and the tasks of the activity.	Chapter 3	FC
C-2	The Tenderer shall submit a study plan, in the form of a flow chart, showing the logic of the envisaged work to be undertaken. Furthermore, the Tenderer shall present an overview of the processes and methodologies which will be used during the feasibility study to arrive at the required results of the study and individual tasks.	Chapter 4	FC
C-3	The Tenderer shall make clear in this proposal which service provision value chain will be addressed in the Feasibility Study. This shall include the users and stakeholders relevant for this service provision value chain.	Chapter 5.3.3	FC
C-4	The Tender shall submit an initial elaboration, as far as practicable, of the deliverables required in the Statement of Work	See Financial, Management and Administrative Proposal	FC
C-5	The Tenderer shall submit a statement of compliance to the ESA Work Statement, clearly defining any proposed deviation with the relevant justification in matrix form.	This chapter	FC
C-6	If the Tenderer intends to make use of Background Intellectual Property or Third Party Products/Rights, the Tenderer shall explain the rationale for this choice in technical terms. The impact of this approach on the technical activities and resulting products - as well as their usage – shall be indicated.	See Financial, Management and Administrative Proposal	FC
C-7	The Tenderer shall involve at least one service provider and may involve specific users / stakeholders.	Chapter 5.3.3	FC

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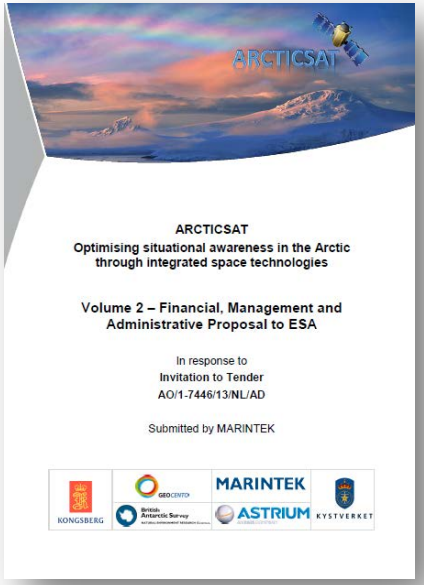

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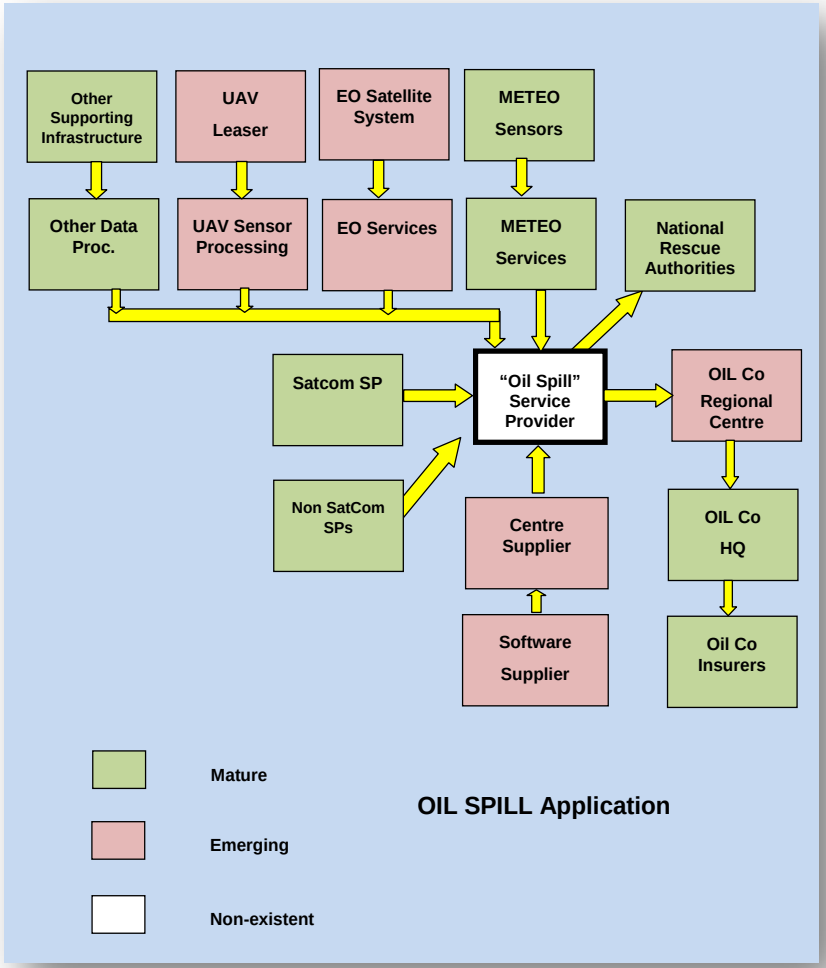
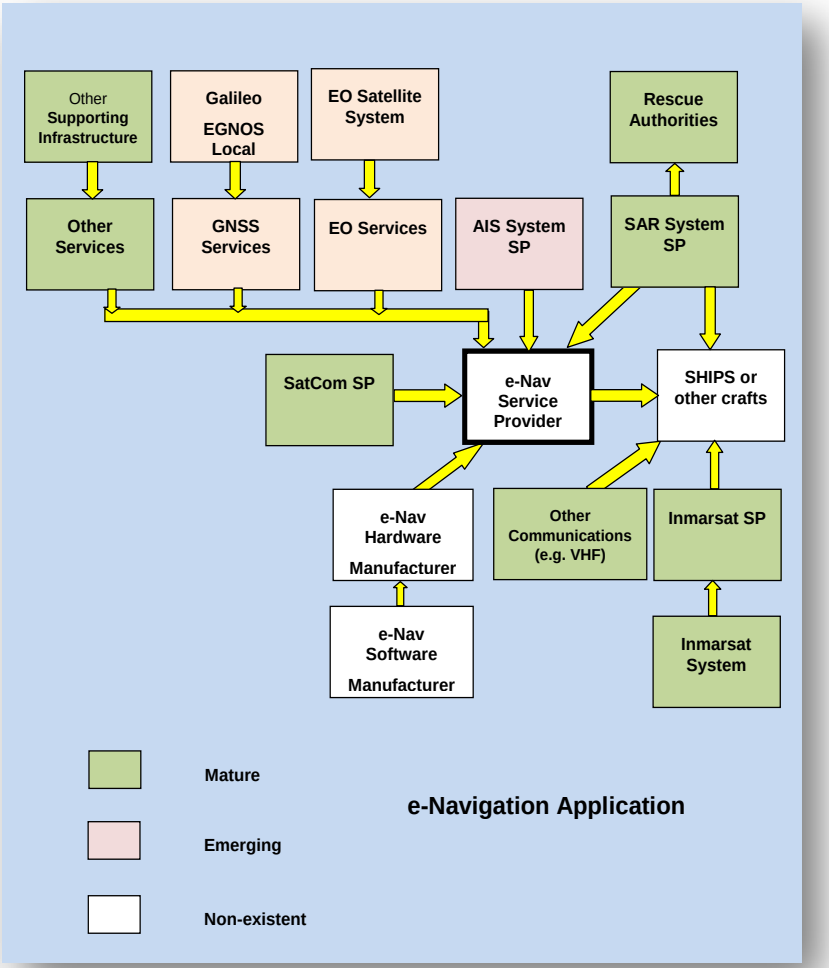
Business cases





7.2 Work Package Descriptions

The following work package's descriptions are compliant to the (slightly modified) PSS-A20 form.

WORK PACKAGE DESCRIPTION			
Project	Optimising situational awareness in the Arctic through integrated space technologies	WP No:	100
WP Title:	User and Stakeholder Analysis and User Requirements Definition	Issue:	1.0
Contractor	MARINTEK		
Start Event:	KO	Start Date:	T0
End Event:	PRM-1	End Date:	T0+3
WP Manager	Beate Kvamstad		
Purpose:	To identify Arctic users and stakeholders who will benefit from improved services for shared situational awareness, to identify and describe their needs and requirements.		
Inputs:	1. SoW for AO/1-7446/13/NL/AD 2. Reference documents 3. Results from previous projects (ArctiCOM, MarCom, MarSafe North)		
Tasks:	• WP 110 – Stakeholder overview o Based on literature studies, reference group and project partner networks, identify and describe the potential users and stakeholders of shared situational awareness services. o Select one or two user communities for detailed analysis • WP 120 – User needs and use cases o Run a workshop where representatives from different user communities are invited o Interview the users and stakeholders selected for detailed analysis in WP 110. o Produce use cases which describes the behaviour and operations of these users and stakeholders, related to shared situational awareness. • WP 130 – User requirements o Further detail the use cases from WP 120 to describe the user needs in detail. o Identify already existing applications or services for shared situational awareness o Identify the gap between user requirements and already existing applications and services • WP 140 – Assessment of potential for space-based services o Propose new potential services for space-based services related to shared situational awareness o Develop KPI's for measurement the success of implementation of such services		
Outputs:	D1: "User / Stakeholder overview, Applications and User Requirements".		

Appendix III: CURRICULA VITAE of Project Managers and WP Leaders

Kay Endre Fjørtoft (General Project Manager and WP700 leader)

SUMMARY: Kay Fjørtoft has been a Senior Research Scientist at MARINTEK since 1995, and is currently Research Manager at the department of Maritime Transport Systems, where he is leading an RTD team of about 15 researchers specialized in logistics, maritime communications and integrated operations. He has been leading and participating in numerous RTD projects, mainly covering software architecture and developments, freight transport, safety management, port community systems, and communications within shipping and the oil & gas business sectors. Previously he has a.o. been working as a sailor within the fishery and the transport freight sector, where he also was co-owner of a deep sea trawler. Kay has published several papers and articles mainly focusing maritime communications, software architecture and logistics challenges, and he is currently also heading the recently established Maritime Communication Center.

NAME: Kay Endre Fjørtoft

DATE OF BIRTH: 01.06.1967

NATIONALITY: Norwegian

FAMILY: Married, three kids

LANGUAGES: Scandinavian and English

POSITION: Research Manager at MARINTEK, Maritime Transport Systems (Norwegian Marine Technology Research Institute A/S)

Contact details: Mobile: +47 90057068, email: kay.fjortoft@marintek.sintef.no

EDUCATION:

1994	M.Sc. in Computer Sciences at University of Essex, Colchester UK

EXPERIENCE:

1986-87	Sailor. Crew on board a cargo catamaran vessel operating in the North sea pool
1988-90	Supervisor/Leader at the interview section, Marked and Media Institute, Oslo, Norway
1994-95	Teacher at InfoPartner Learning System, Ålesund, Norway
1995-2010	Senior Research Engineer at MARINTEK, Trondheim, Norway
2010 -	Research Manager, Dep of Maritime Transport Systems, MARINTEK

MAIN FIELDS OF COMPETENCE

- Project management,
- Software architecture,
- Software development,
- Freight Transport and logistics,
- Port community,
- Communication
- Arctic challenges

Short list of essential projects (PL= Project Leader, WP=Workpackage leader)

1995-97	Emergency Management Station - a safety system on-board ships
1996-97	Maritime National Information Network
1997-99	TRANSDATA. Data modelling and standardisation
1998-99	INFOLOG. Architecture, data modelling and demonstrators (WP)
1998-99	INFRATRANS. Standardisation, architecture, dangerous goods transport. (PL)
1999-2002	ShipLog. Architecture, prototyping of a chain management system (TCMS) (PL)
1999-2001	Intermodal Portal. Exchange of data between port systems in Europe. (WP)

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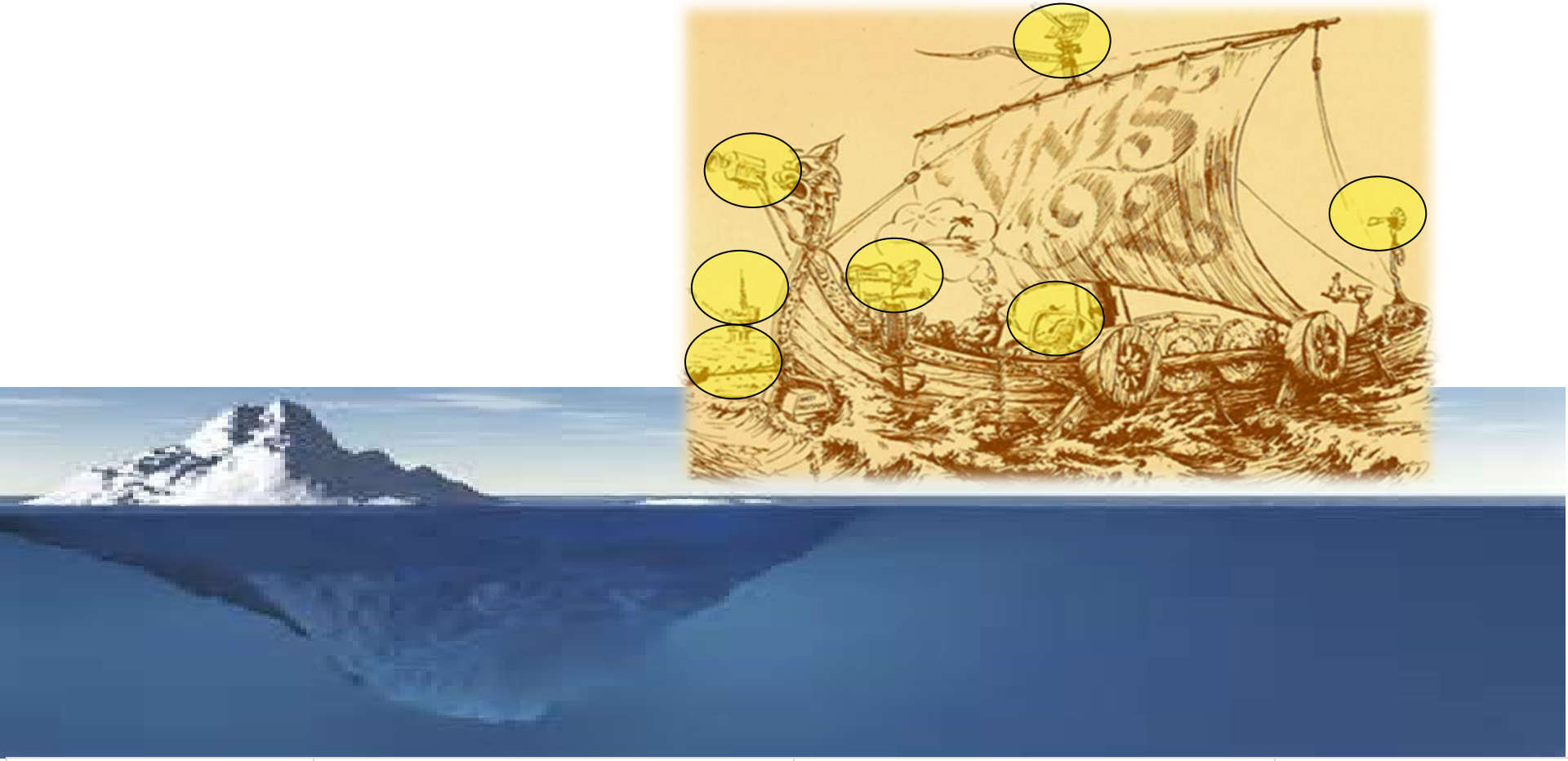

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