Offshore activities in the Arctic waters

The Ice & Met.Ocean Perspective.

Danish Meteorological Institute
Our business philosophy:

“That we, by monitoring and predicting wind, weather and ice conditions and by making the Ice & Met.Ocean team an integrated part of the project, are able to optimize offshore operations and make them safer, cheaper and more effective.”
DMI Main office, Copenhagen

380 employees in total: 25 oceanographers, 125 meteorologists, 8 software developers, 15 weather model developers, 30 climate research scientists, 20 ice specialists, 28 weather routing duty officers (mariners and meteorologists).

DMI is serving:
- The Danish, Faroe and Greenlandic public.
- All civil and military aviation.
- The renewable energy sector.
- The media production.
- The offshore oil & gas industry.
- Public transportation: Trains, busses, car traffic.
- UN IPPC, climate change panel.
- and a lot of other clients…….
Full time chartered helicopter. Ice charting office, staffed with 2+2 Chief Mates from Royal Arctic Line (60/60 days, back2back). In-shore and Cape Farewell heli recco 3-4 times a week. Distribution of ice information in Greenland, ice pilotage and routing advisory.
DMI Ice Charting, Kazakhstan

Full scale ice charting office, staffed with 5 ice specialists. Distribution of ice information, ice pilotage and routing.

Satellite monitoring, analysis and ice charting in main office in Atyrau.

Routing advise, logistics optimization and ice pilotage from our office in Bautino.
Our toolbox to support operations:

- Sea ice and iceberg monitoring and forecasting.
- High resolution weather and ocean models.
- Short and long term weather forecasting.
- Tidal and ocean current predictions.
- On-site, web based or met.office based forecasters.
- Dedicated research in cooperation with operators.
- Project planning together with Logistic providers.
Our business partners:

- A team approach!
- Canatec Associates Inc., Calgary, Canada.
- DTU, Danish Technical University.
- University of Copenhagen.
- Saab, Sweden.
- InformiGIS, Copenhagen, Denmark.
- Force Technology, Denmark.
- BMTargos, Netherlands.
DMI commercial references

- Maersk Oil and Gas, Maersk Drilling, Maersk Line, Maersk Supply
  - Weather forecasts, routing advice, oilspill modeling, Arctic Drill Ship Project.

- DONG Energy, BP-Canada, Cairn Energy
  - Background studies and operational sea-ice and iceberg support in Greenland waters.

- Agip KCO, Kazakhstan
  - Setup of a full scale operational ice service and ice routing advice center for the NE Caspian Sea.

- GX Technology, Statoil-Hydro, Exxon-Mobil, TGS-NOPEC Geophysical Company
  - Ice charting and 24/7 direct operational ice advisory for the NW & NE Greenland Seas.

- Greenland Institute for Natural Resources, Bureau of Minerals & petroleum, Greenland

- London Mining, MT Hojgaard and other mining companies
  - Background sea-ice studies, seasonal variations in the Western Greenland waters and in the Fjords.

- C-Core, Canada
  - Partnership in the PolarView International sea-ice monitoring project.

- And many others……
Current JI projects:

• Cairn Energy:
  Integrated Weather Routing and Ice & Met.Ocean Info System
  Single point access setup.

• Maersk Arctic Drill Ship Team, Maersk Drilling:
  Developing a Situation Awareness and Decision Support system.
Operational Outline
Operational Outline

Synopsis issued: Tue Nov 09 19:00 UTC 2010

General inference:
A low west of the Disco Island is moving southward. Cold air moves from northwest to the area west of Greenland. Thursday a ridge of high moves eastward passing Labrador and the Baffin Island. During Friday and Saturday a new low moves eastward to the

Operation Area Northeast

Forecast for the period 18 UTC November 9 2010 until 18 UTC November 14 2010 based on latest available data.

Wave

<table>
<thead>
<tr>
<th>Wave Period</th>
<th>0 Wed</th>
<th>12</th>
<th>0 Thu</th>
<th>12</th>
<th>0 Fri</th>
<th>12</th>
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<td>0.5 m</td>
<td>1</td>
<td>1 m</td>
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</table>
Operational Outline

Shipping Information System

Clik on ship - or select ship name in drop down list - to get detailed ship information

Select ship
SeaPlanner with FuelSaver Onboard System

- Model parameters
  - Stillwater resistance
  - Wind
  - Waves
  - Shallow water
  - Current
  - Propeller characteristics
  - Specific fuel oil consumption of main engine(s)

- Supported propulsion plants
  - Single/twin screw
  - Fixed/controllable pitch propeller
  - 1 - 4 engines
SeaPlanner
Scheduled arrival in all conditions.
C3I SYSTEM FOR ALL YEAR ARCTIC OPERATION

Basis for a Joint Industry Project.

Command, Control, Communication & Information (C3I) System
Situation Awareness and Decision Support (SADS) System
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>$L_{pp}$ (approx.)</td>
<td>213.0m</td>
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<td>$L_{oa}$ (approx.)</td>
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<td>$B$</td>
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<td>$T_{design}$</td>
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<td>Drilling Depth</td>
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</table>
C3I SYSTEM STRUCTURE AND MAIN FUNCTIONS

- Command, Control, Communication and Information System (C3IS)
  - Command, Control and Communication System (C3S)
    - Command and Control System (C2S)
      - Ice management functions
      - SAR functions
      - Crisis management functions
      - Logistics support functions
    - Communication System (COMMS)
      - Communication planning & management
      - Internal and external communications
  - Information System (IS)
    - Ice modeling and analysis functions
C3I SYSTEM
EXAMPLE SYSTEM CONFIGURATION – DRILL SHIP
C3I SYSTEM  THE NEXT LEVEL

Merge all systems into 1.

Add Ons – All Near Real Time data:
- Port accessibility status – Plan your port operations.
- Fuel consumption – Emission control.
- Logistics – All in the right place at the right time.
- Personnel logistics – Planning of crew change.
- And so on........

Collect information – and distribute to the right people.

Don’t waste time – Don’t waste money.
Thank you for your attention.

Klaus Harnvig Krane (KLH@DMI.DK)